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STEEL

The Magazine of Metalworking and Metalproducing

VOL. 116. No. 4 JANUARY 22, 1945

NEWS

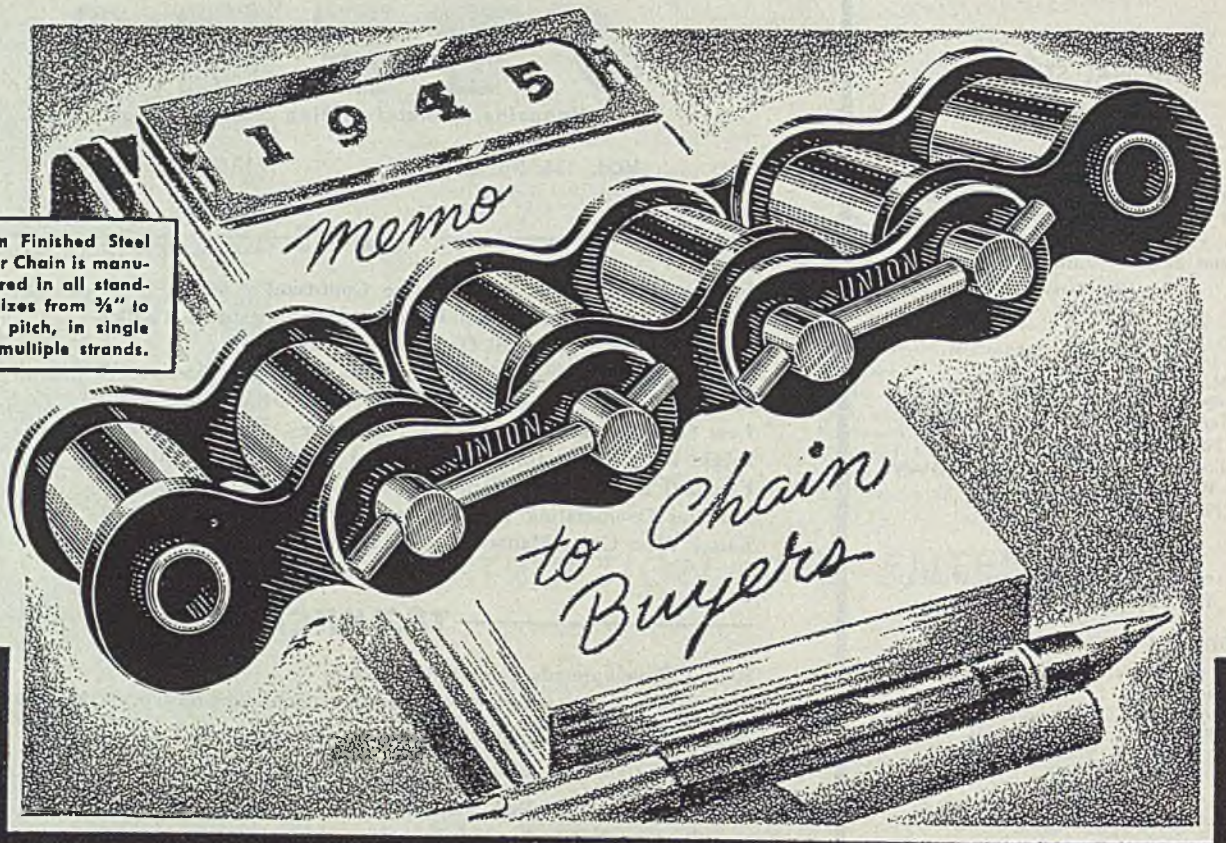
TECHNICAL

FEATURES

MARKETS

NEXT WEEK...

Aircraft Standardization Activity Spurred
How National Screw & Mfg. Co. Heat Treats Fasteners
Kaiser's Practice in Making Coke from Utah Coal
Precision Casting Turbine Buckets at Allis-Chalmers
Radical New Induction Heating Circuits Developed
Latest Developments in Metal Marking Methods



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STEEL
January 22, 1945

The Budget Message

President Roosevelt's budget message hints at a new concept of government financial policy which deserves critical study by every qualified citizen. On top of his 12-year consistent record of violating his 1932 pledge for economy in government expenditures and in spite of the fact the Treasury's disbursements invariably have exceeded the Rooseveltian budget estimates by alarming margins, the Executive now proposes to key government outlay to the job situation in the nation.

This in itself would not be too disconcerting because enlightened public opinion is prepared to go to great lengths to insure a satisfactory degree of employment in the transitional and postwar periods. Industry has pledged the utmost support of this objective. However, Mr. Roosevelt envisions the present wartime activity as normal for the postwar period. Specifically he cites 60,000,000 jobs as the level to which the nation's finances are to be adjusted. Furthermore, while as in his campaign speeches he gives devoted lip service to private enterprise, he is careful to say that if private enterprise cannot supply the jobs, the government will.

We would have no quarrel with this program if we were fairly certain that private enterprise would be given a reasonable priority and a free opportunity to do what it can in the postwar economy. Unfortunately, such assurances cannot be found in the record of the past 12 years nor can it be found in the attitude of the executive branch of the government at the present time. There are too many signs that the government will give private enterprise only a portion of the opportunity to which it is entitled and that the powerful centralized bureaucracy will see to it that real or fancied emergencies will afford it excuses to engage in gigantic projects to "provide" jobs through deficit spending.

This doubt about the government's sincerity in regard to private enterprise is widespread. It is important enough to argue for a clearer statement on the part of the President or other high government officials as to the extent to which the administration will encourage private enterprise in its attempt to establish economic stability after the war.

From the budget message one would conclude that the idea is to pump purchasing power into the pockets of consumers, regardless of its effect upon the cost of production and distribution. What price a manipulated consuming market if in creating it we destroy the ability of private enterprise to serve it properly?

PRICE CONFUSION: OPA has granted price increases of from $2 to $5 per ton on hot-rolled sheets, galvanized sheets, plates rolled to universal and sheared mill tolerances, rails and bright nails and staples. It is estimated these advances will increase the income from steel sales by $36 million annually. This, of course, is insufficient to cover increased out-of-pocket costs, to say nothing of the $70 to $80 million in additional costs occasioned by the recent WLB wage grant.

At the moment, buyers and sellers are more concerned with the way OPA explained the increase than with its effect upon income. The board's announcement defined the increases as advances in "delivered prices" and stated specifically that they were not to be construed as increases in base prices. Obviously such language presents a poser to sellers and buyers, and to publications which quote prices.

At this writing the confusion regarding OPA's action is so widespread that clarification from that board is expected. Meanwhile, most persons concerned with the market have no alternative but to

(OVER)

think of the increase in terms of base prices. The consumer must pay more and since no extra is involved, the new price—by any name—is equivalent to a new base price. —p. 51

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IMPROVED BESSEMER: Bessemer steel not only is contributing handsomely to the war effort but is rapidly gaining an acceptance that will insure wider use in the postwar period.

This brighter outlook for the product of the converter arises from the notable progress that has been made during the past few years in overcoming some of the traditional handicaps of the bessemer process. Steelmakers, recognizing the objections to the high nitrogen and phosphorus content of the metal, have been working on improved deoxidizing and dephosphorizing processes and on better control of nitrogen and other elements. As a result, they have succeeded in producing impressive tonnages of full-killed, soft, non-aging bessemer steel, with lower phosphorus content and better nitrogen control than hitherto had been achieved.

This steel is being used satisfactorily for seamless tubes, numerous flat-rolled products and bar stock for screw machine products. On the basis of progress already made, it is safe to predict that bessemer steel will more than hold its own after the war.

—p. 58

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IF IN DOUBT, CANCEL: Since the ban on conventions was issued, hundreds of directors of technical and trade associations have been called upon to decide whether or not to cancel their scheduled meetings. In many instances, they have been prompt in voting unanimously not to convene until after the present crisis has passed. Others have held their plans in abeyance, awaiting further developments. Still others have applied to the War Committee on Conventions for permission to go ahead with their meetings.

It would be unwise for an outsider to say that a specific convention should or should not be held. Every doubtful case sould be judged on its own merits. But we believe that in general, most associations—especially those whose conventions attract large crowds—will do well to cancel promptly. General acquiescence now will hasten the day when the more important meetings can be resumed on a normal basis. —p. 63

GOOD PRESCRIPTION: Suggestions for strengthening Congress have come from a most unusual source. At the request of the National Planning Association, Robert Heller, well known as a consultant in business management, has prepared a 14-point program designed to enable the upper and lower houses on Pennsylvania avenue to do their work more efficiently.

The recommendations include certain changes in the organization of committees, a reduction in the number of standing committees, a substitute for the seniority rule in selecting committee chairmen, more adequate staff assistance, the elimination of overlapping functions, an increase in salaries and provision for retirement pay. It is obvious that the program is intended to implement Congress with efficient practices which are more or less commonplace in well-managed businesses. Mr. Heller observes that Congress "is operated with hand tools in a mechanized age" and he proposes to put it on an up-to-date basis.

It will be interesting to see how the members of Congress—most of them politically-minded—react to this business-like approach to their problems.

—p. 60

° ° °

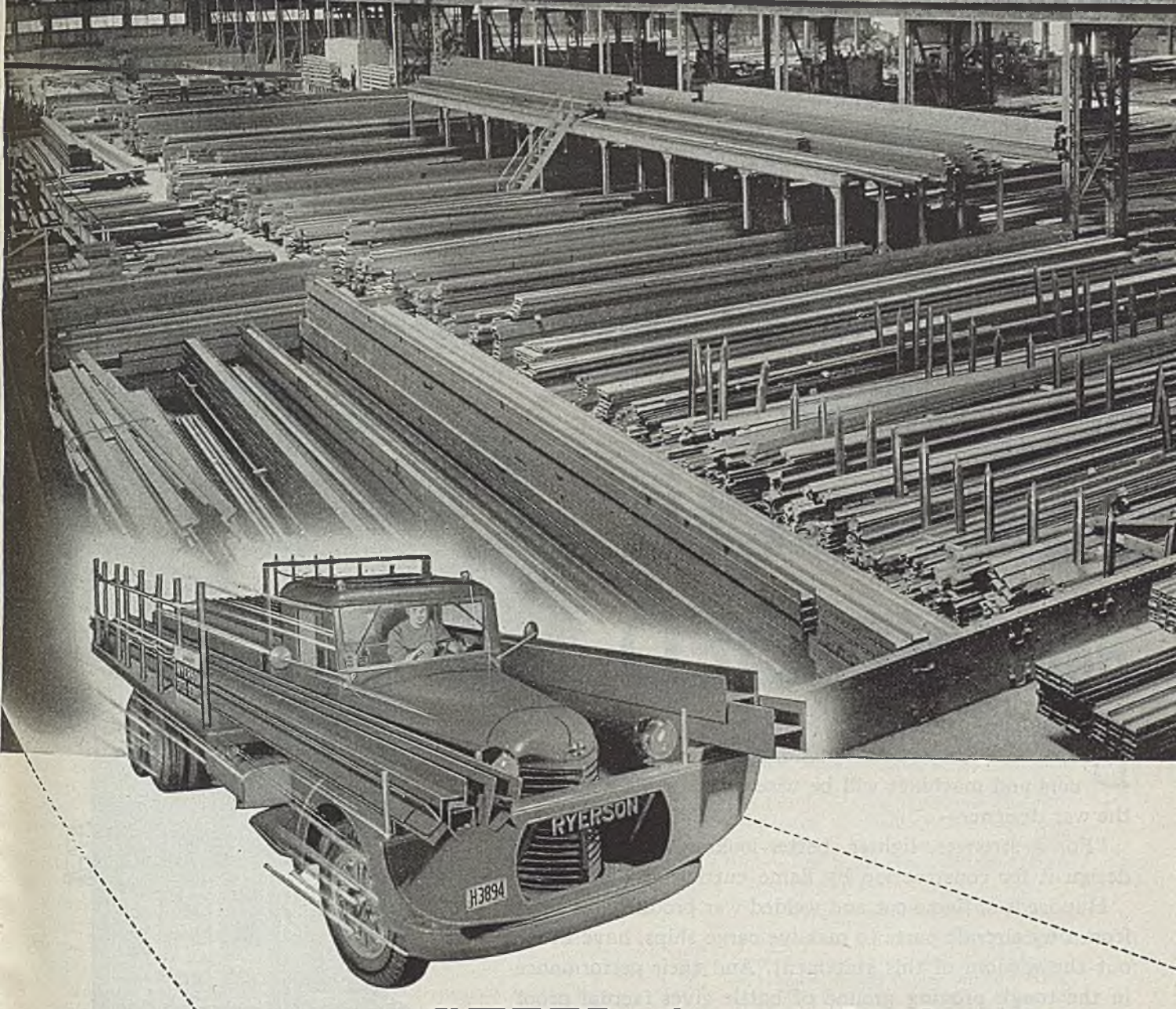
HIGH STRESS FORGINGS: Although most manufacturers recognize the principal advantages and limitations of forgings, it is doubtful whether they appreciate fully the degree of co-operation between engineering departments, laboratories and forge departments that is required to insure the consistent production of high quality forgings and forged parts.

Such co-operation is particularly important in the case of forgings for applications where high stresses are encountered. If the forgings are properly designed they will have the ability to supply the extra amount of reserve strength in emergencies which is so desirable in work of this kind. Proper design, in turn, takes into account the positioning of flow lines in parts subjected to impact, shock, vibration, stress concentration and unexpected stresses.

This explains why the success or failure of a forging application often depends upon the extent to which the engineering and production departments consult each other while the design still is on the drawing board. —p. 82

E. L. Shaner

EDITOR-IN-CHIEF



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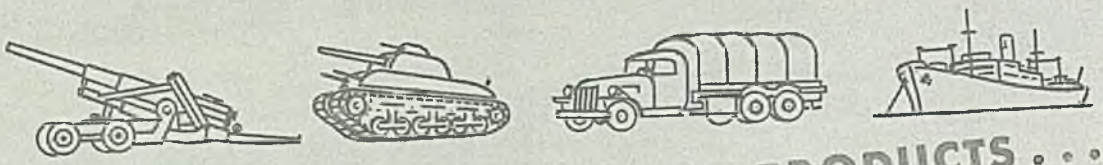

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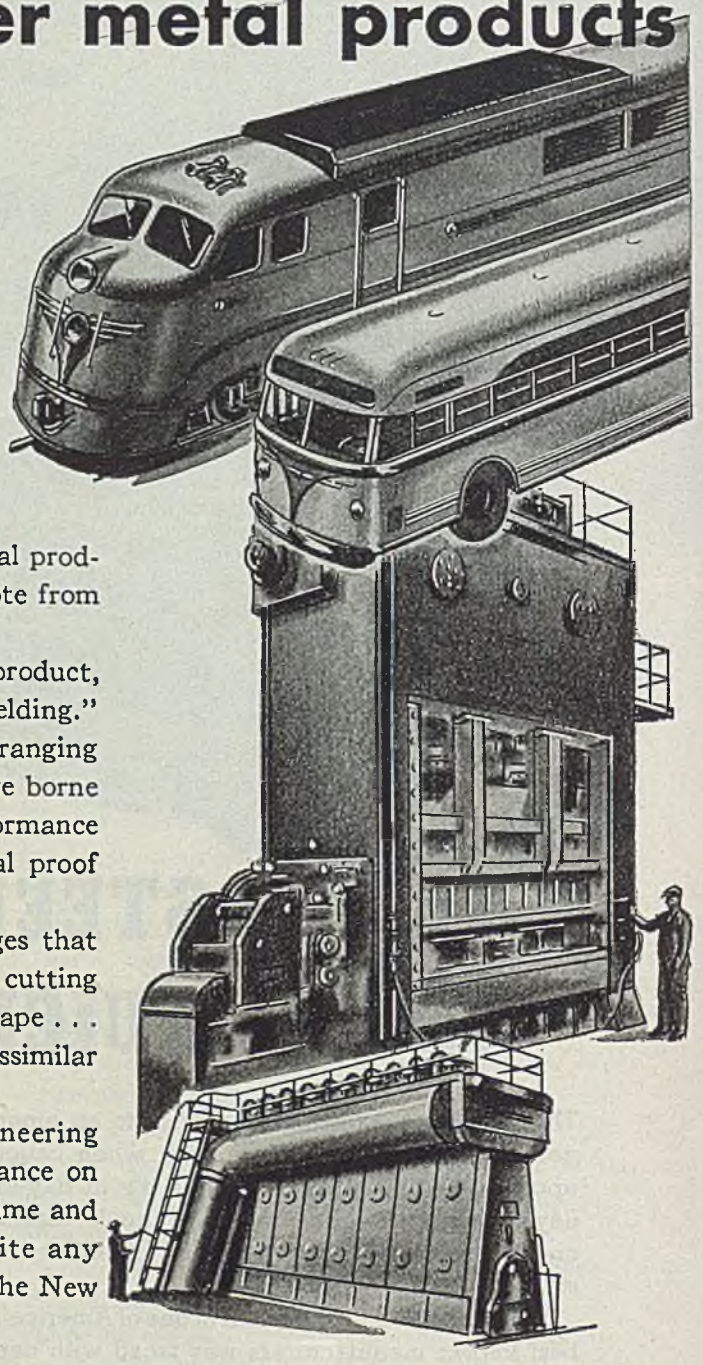

DESIGNERS who are now planning peacetime metal products and machines will be wise to take this note from the war designer—

"For a stronger, lighter, better-looking metal product, design it for construction by flame-cutting and welding."

Hundreds of flame-cut and welded war products, ranging from tiny aircraft parts to massive cargo ships, have borne out the wisdom of this statement. And their performance in the tough proving ground of battle gives factual proof of their superiority.

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Interim Increase Confuses Industry

OPA insists base prices are not raised by higher delivered quotations. Producers and consumers at loss to define increase

Warehouses penalized. Pay higher prices to mills but can pass on added costs only on bright nails and staples, and on roofing and siding

"CONFUSION worse confounded." To steel producers, distributors and consumers this Miltonian description fitted the interim price increase granted by the Office of Price Administration Jan. 11.

The increase—ranging from $2 to $5 a ton on hot-rolled sheets, galvanized sheets, plates rolled to universal and sheared mill tolerances, rails and bright nails and staples—is held by OPA not to be an increase in base prices, but an increase in the maximum "delivered price." If the increase is not to be considered a boost in the base price, steel interests are at a loss to define the increase. OPA's own announcement defines a "delivered price" as the "base price plus extras and transportation."

Obviously, the increase is not transportation; nor can it be considered an extra in the usual meaning of the term. For practical purposes, steel producers consider the raise to be an increase in base prices and STEEL's price quotations are based on this interpretation (see pp. 134-135).

Reasons for OPA's refusal to consider the increase a boost in base prices are obscure. Two possible explanations, however, are offered.

Two Explanations Offered

The first of these is that OPA desires to block increases in the prices charged by steel warehouses, which under the terms of revised price schedule 49 are permitted to revise prices in line with any adjustments in the mill base price. Some OPA authorities are reported to have been "miffed" by reluctance on the part of distributors to voluntarily submit financial statements to the price agency and took this means to penalize warehouse operators. The effect of the OPA action has been to reduce the warehouse spread from $2 to $3 a ton on hot-rolled and galvanized sheets, plates and rails. The move was bitterly protested by the distributors and it was considered likely that the price control agency would reconsider and modify its ruling as regards warehouses.

The second interpretation of the OPA action was that it constitutes a political subterfuge, similar to that employed by the War Labor Board in granting certain fringe wage concessions to the United Steelworkers of America in the steel wage case. The WLB held that because it had not granted an increase in base pay it had not even "dented" the Little Steel formula although it actually had given the steelworkers a wage increase averaging about 8 cents an hour, exceeding the wage formula.

By following the same line of reasoning, observers pointed out, OPA could argue that because it had not increased base prices, steel prices had not been advanced. This argument is considered as absurd as that advanced by the WLB in saying that the Little Steel formula had not been flanked by the wage increases granted to steelworkers.

The interim price increases will raise the steel industry's return on sales by $36 million annually on the basis of current volume, it is estimated. The steel wage increase ordered by the WLB and approved by Fred M. Vinson, director of economic stabilization, will lift labor costs by $75 to $80 million a year or more. However, OPA in granting the price increases, stated that these did not take into consideration the higher wages and that a cost study now underway will determine what final adjustment in steel prices would be necessary.

This action again is at variance with an OPA statement to Mr. Vinson several weeks ago when approval of the increased steel wages was at issue. Mr. Vinson then said: "The Office of Price Administration states that for some time increases in the prices of certain steel products have, in its opinion, been required by law but that, with the acquiescence of the steel industry, it has delayed the consideration of these increases until the wage case was settled, so that it would be unnecessary to consider steel prices more than once."

Within two weeks after the wage increase was approved, OPA changed its mind and allowed a price increase on the basis of a cost study completed in the spring of 1944 and promised that further adjustments would be made when a study of current costs—under the new wage schedules—is completed.

Steel producers generally believe the interim increases are insufficient to compensate them for higher costs on the products affected and that they do not cover many products now being produced at out-of-pocket losses—notably bars. "They've thrown us a damned skinny bone, if you ask me," one steel producer commented. Generally producers believed the raised ceilings were not high enough to make a "sizable dent" in previously increased costs in raw materials and labor, exclusive of the recent concessions to the United Steelworkers in shift differentials, liberalized vacation and holiday pay, and other wage increases.

Most adversely affected by the price revisions are the warehouses, the small hand mills or mills which purchase hot-rolled strip for rerolling, and those producers which have a large proportion of their plate production originating from converted strip mills.

Warehouse Spread Reduced

Warehouses are permitted to add the increased costs to their selling prices only on bright nails and staples and on roofing and siding when the maximum delivered prices of these products are obtained by using the 20 per cent formula contained in the warehouse price regulation or by using the lowest combination based on this formula. Thus for hot-rolled sheets, galvanized sheets, plates and possibly rails, the distributors pay an increased price to the mills but are held to former ceilings on selling prices. This has the effect of reducing the warehouse spread from $2 to $3 a ton.

Also caught in the squeeze play are those nonintegrated mills which buy hot-rolled strip and sheet for further processing. Their raw material costs are up while their selling prices remain at ceilings prevailing before the increase.

The $2 increase on hot-rolled carbon sheets and hot-rolled sheet specialty products, which are priced as an extra over the hot-rolled sheet base price, alters the price relationship between hot-rolled pickled and cold-rolled sheets in the 19 to 22 gage sizes. This has placed the small hand mills at a distinct disadvantage pricewise as the hot-rolled sheet in this gage range is now as high or higher in price than the more highly finished cold-reduced sheets.

The increase in plate prices of $2 a net

WAREHOUSES' SHARE

From 11 to more than 17 per cent of total steel production has been distributed through warehouses during recent years. Normally, the percentage of total output handled by distributors is higher in years of low production, lower in years of high production.

The percentage of steel production sold by warehouses since 1929 is shown below:

Year	Per Cent	Year	Per Cent
1929	11.05	1938	17.13
1930	12.21	1939	15.64
1931	12.68	1940	14.60
1932	16.12	1941	14.70
1933	14.91	1942	14.00
1934	14.02	1943	11.4
1935	14.43	1944	12.7*
1936	14.13		
1937	13.28	*(9 mos.)	

ton applies only to those carbon plates rolled to length and width tolerances which come within the American Iron and Steel Institute's standard classification for sheared and universal plates. Most material rolled on strip mills does not come within these tolerances.

OPA regional offices last week were deluged with inquiries from metalworking companies as to the agency's attitude in regard to an upward adjustment in prices of fabricated items. In most cases, OPA advised the companies to file a formal application for price relief with profit figures and other data.

At week's end, producers had not yet decided on any uniform method for invoicing sales under the interim increases. At least one large producer notified customers of new "base" prices incorporating the increase. Other producers are simply invoicing at the new figures without any reference to the OPA order. Still others add the information that the increases are in delivered prices but not in base prices—for whatever their customers care to make of that. One producer intends to attach separate slips to invoices attempting to explain the situation. In some producers' offices the interim increase was referred to as "the OPA extra."

Steel consumers generally accepted the price increase calmly by whatever name it was called. Most users had anticipated higher ceilings and since the steel bill is paid finally by the government on most production today, the normal concern over price changes is absent.

Iron and steel warehouses have played an important role in the war production program, serving industry as a source for quickly needed steel supplies. In the above illustration, structural steel is shown being loaded on a truck at a Chicago steel warehouse

U. S. Steel Plans Gary Expansion

Olds, chairman of board, tells Gary Chamber of Commerce corporation will spend $50 million in postwar improvements to steelworks in area

IRVING S. OLDS, chairman, United States Steel Corp., New York, addressing the Gary Chamber of Commerce Jan. 18, revealed the corporation will invest not less than $50 million in postwar improvements to its Gary mills. The program embraces for the Gary steelworks of Carnegie-Illinois Steel Corp. improvements and additions to equipment for handling raw material; also extensive repairs and renovation of blast furnaces and machinery and improved facilities for the manufacture of wheels and axles.

At the Gary sheet and tin mill the program provides for an increase in capacity for production of cold-reduced tin plate, as well as modification of facilities to keep pace with the probable increased demands of the automobile industry.

At the Gary plant of American Bridge Co. rebuilding and modification of the bridge and structural steel fabricating plant is planned.

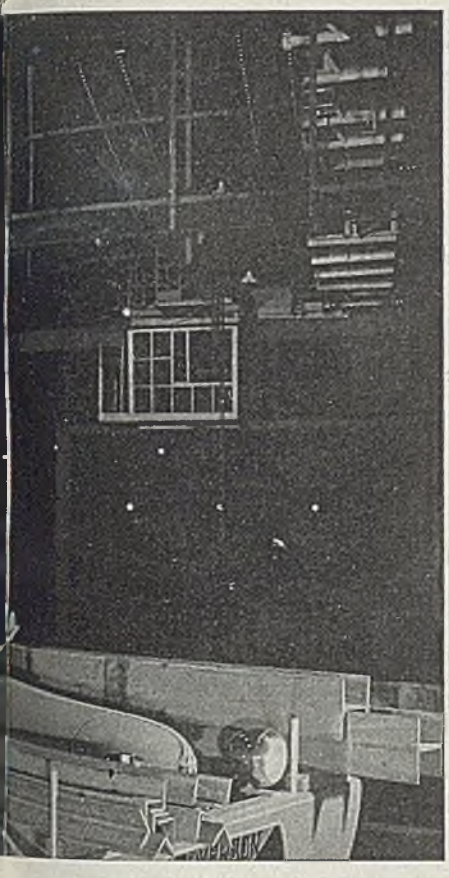
Mr. Olds expressed confidence in the economic future of the Chicago-Calumet region and the corporation's objective is to have facilities of subsidiary companies as modern and as efficient as any similar plants in the country, as well as of a size and character capable of properly taking care of likely postwar needs of customers in the area served by the Gary mill.

In connection with his visit to Gary, Mr. Olds inspected subsidiary operations in the district accompanied by J. L. Perry, president, Carnegie-Illinois Steel Corp., Pittsburgh; L. A. Paddock, president, American Bridge Co., Pittsburgh; and C. R. Cox, president, National Tube Co., Pittsburgh; as well as Gustav Metzman, president, New York Central railroad; J. F. Deasy of Philadelphia; J. M. Symes of Chicago, vice president, Pennsylvania railroad and C. W. Van Horn, Baltimore, vice president, Baltimore & Ohio railroad.

Discussing postwar plans, Mr. Olds said: "The number of plants built for wartime uses seemed too large or otherwise unadaptable for normal peacetime requirements. Whether new consuming industries can soon be established after the war in portions of the country not now possessing such industries, in order to take up the production of these war-built plants and enable them to be operated in the future, poses a doubtful economic experiment. Based on past experience the cart would appear to precede the horse.

"In my opinion the prospects for steel at the conclusion of the war can be appraised as promising—at least until such time as production has caught up with the pent-up demand for various products made largely of steel.

"However, the quality of our national policies will have a direct bearing upon the possibilities of the steel industry in the postwar period. The main objectives of a national program should be toward securing expanded production and increased employment through measures which do not have the effect of discouraging the initiation and development of new enterprises, or the expansion of existing enterprises. The steel industry of itself can not create an overall demand for its products and thus maintain its plants in reasonably full operation. That demand is dependent upon general business conditions and in the main is beyond the control of the steel producer. Customers are in the market for steel in large tonnages only when they can put their steel purchases to a profitable use.



"The management of United States Steel Corp. looks ahead with confidence. We are hopeful the bugaboos of an apparent excess capacity in the industry may blow away in large measure in the days to come through the closing of marginal, high cost facilities, through creation of new and wider uses for steel as a consequence of more intensive research and technology, and through development of larger export markets. Probably the course which will prove to be the most fruitful in results is the scientific study of the application of steel to the needs of customers of one kind and another, with a view to the development of new uses for steel.

Allen Named Chairman of Colorado Fuel & Iron Corp.

Charles Allen has been elected chairman of the board, Colorado Fuel & Iron Corp., Denver, succeeding Arthur Roeder who resigned. Mr. Allen is a partner in Allen & Co., New York, which, with associates, recently purchased the Rockefeller holdings in Colorado Fuel, estimated at $13 million. He is also chairman of the board, Wickwire Spencer Steel Co., Buffalo.

Following new directors of Colorado Fuel were elected: E. P. Holder, president, Wickwire Spencer Steel Co.; Charles G. Terry, vice president, Schoellkopf, Hutton & Pomeroy; Franklin Berwin, vice president, Polarus Steamship Co.; and Jacob L. Holtzmann, attorney. These new directors succeed Bertram Cutler, Carl Schmidlapp, Fred Farrar and J. F. Welborn, resigned.

ICC Ruling on Coal Freight Rate Cut to Youngstown Is Awaited

Reduction of 7 to 20 per cent recommended by examiner on hauls from Pittsburgh area. If granted, cut would substantially lower Valley steel producing costs and improve district's competitive position

PITTSBURGH

RECOMMENDATION is before the Interstate Commerce Commission on a proposed decrease in the freight rate for hauling bituminous coal from the Pittsburgh district into Youngstown. Findings of the examiner, Howard Hosmer, are of particular interest to all coal producers and consumers, not only because reductions of 7 to 20 per cent on coal rates are recommended, but also because the Pittsburgh-Youngstown coal rate has been considered for many years the keystone of the entire coal rate system in this area, and also an important factor in steel production costs and, as corollary, steel prices.

The recommendation of Mr. Hosmer, however, states that this rate is not necessarily related to any other rate, and in granting the increase, it was considered on its own merits as an isolated rate and not in its relationship with any other rate.

The difficulty of this position is easy to see. Coal hauled from West Virginia or western Pennsylvania to Youngstown would, under the new recommendation, take a lower rate than to other consuming points of similar distance from the source. Likewise, the rates to intermediate points between the mines and the Youngstown area would apparently be subject to review as to their validity. Also, this reduction changes the competitive relationship between mines in the Pittsburgh district and those of other areas for the Youngstown consuming market, and presumably the competing areas will ask for similar changes in rates to maintain their competitive position.

If granted, the reductions should work to the advantage of steel producers in the Youngstown area. Several large coal mines in the affected district are captive operations supplying their entire production to steel plants and coke ovens in the Youngstown district. Costs of finished steel to such a producer would be reduced substantially, even if the total coal supply received only the minimum 7 per cent rate reduction.

For many years, steel producers and other consumers in the Youngstown district have been attempting to get passage through Congress of a bill to canalize the Beaver and Mahoning rivers. This would provide a waterway from the Pittsburgh district to Youngstown and would make it possible to barge coal at a lower freight rate. It would also presumably cause a water-compelled freight rate on railroads paralleling the waterway. The project was most recently active as a proposed amendment to the rivers and harbors act passed in December. The Beaver-Mahoning canalization amendment, however, was rejected by the Senate before passage of the bill.

Apparently the suggested action of the ICC would accomplish at least in part the objective sought through the proposed canal. Informed quarters here believe the reduction will be approved. Coal producers in this district expect to benefit by increased coal demand from Mahoning Valley consumers, although there are no estimates as to how much of a shift in business can be expected. Steel producers likewise are waiting for final action to estimate the amount of cost reduction such action would have on Youngstown steel production, and its effect on steel marketing practice as a whole.

Foundrymen's Association Cancels Annual Meeting

The American Foundrymen's Association last week canceled its forty-ninth annual meeting in response to War Mobilization Director James F. Byrnes' request to forego conventions during wartime. The meeting had been scheduled for April 30 to May 4 in Detroit.

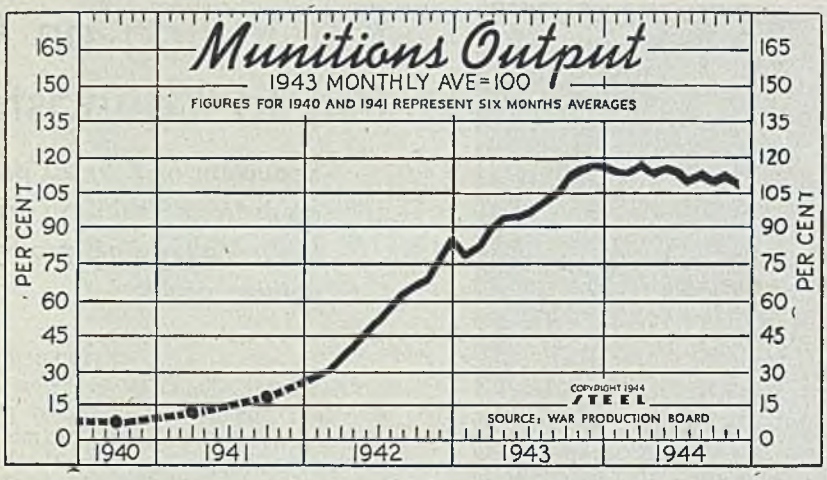
In a telegram to Mr. Byrnes, Ralph J. Teetor, president of the association, said that while its national meetings are directed toward increased effectiveness in producing castings for war it believes that "these purposes may be effected through processes involving no large gatherings and through full utilization of avenues now open for consultation with Army and Navy ordnance. "The association," Mr. Teetor promised, "will continue and extend its work in the interest of war production through every available means recognizing the necessity for minimizing travel during this crisis."

Steel Institute's General Meeting in May Called Off

General meeting of the American Iron and Steel Institute, customarily held in New York city each May, will be omitted this year, in accordance with the request of the Office of Defense Transportation. Close to 1000 members have attended the general meetings of the institute in recent years. In 1942, 1943 and 1944 banquets were omitted. This year's meeting would have been the 54th.

Squeeze In Civilian Goods Seen

Enlarged munitions program to force curtailment in production of some items. Some steel products to tighten



BOOST in munitions production from the original estimate of $56.5 billion to $64.5 billion for 1945 has substantially darkened the steel supply outlook on some key items at a time when growing manpower shortage, slower flow of scrap and coal to the mills, and overtaxed facilities are hampering steel production.

Overall steel demand in the first two quarters this year, as estimated by claimant agency requirements, is expected to be unchanged from the fourth quarter 1944 estimate when carbon and alloy steel production of around 16 million net tons balanced essential needs. However, a number of steel products may be forced on the critical list due to the above mentioned factors.

New war production schedules call for an increase in output of "critical" aircraft to $925 million a month by April 1, from $367 million on Oct. 1. Output of the overall number of planes this year has been scheduled at 86,250 units, against former goal of 76,000. Ammunition production schedule for 1945 has been increased $2.5 billion, up 30 per cent over last fall's level. Output of combat vehicles will be boosted by $1 billion, and ship construction by the same amount.

Fifty per cent of the war programs are being increased. Those programs tending downward represent 35 per cent of the total, with the balance of 15 remaining relatively stable. By the second quarter this year the programs that have been expanded are scheduled to record an average increase in output of 65 per cent over the October, 1944 production level—some being up only 5 per cent and others 500 and even 600 per cent.

War Production Board officials are uncertain whether the existing levels of essential civilian goods output will have to be reduced, but state some things will have to be curtailed to squeeze in the new war steel requirements. J. A. Krug, chairman, WLB, stated outstanding authorizations are not being canceled but shortages in materials may bring about a slowdown or stoppage in some plants operating under the spot authorization plan. It is understood WPB's order PR-25 is being amended, to reflect the growing shortages of materials as the result of expanding war requirements.

Steel available under the spot authorization plan has been reduced from 250,000 tons of carbon and 25,000 tons of alloy for the first quarter to 150,000 and 10,000 tons, respectively. The authority to purchase stainless steel has been withdrawn entirely. There will be no new allotments of carbon or alloy steel under PR-25 except those to consumers to obtain from warehouses a maximum of 10 tons of carbon steel and 2 tons of alloy in a quarter, although this does not affect the quantities obtainable without authorization.

WPB is not going to cancel allotments made on copper, but warehouse delivery limits on these authorizations have been reduced to 200 pounds per quarter and only 50 pounds of copper wire.

Indications are there may develop an even tighter material supply situation during second quarter which may force a reduction in "essential" civilian production as well as complete elimination of the "spot authorization" plan. In a growing number of instances the "Z" allotments for civilian production are not being honored by steel mills since they are booked up with war orders.

The revised view of the war's probable duration is evidenced by the Army's stepped-up demands for carbon shell steel extending throughout 1945, upward revision in the landing mat program and addition of one million tons of plates required by the Maritime Commission.

Shell steel production is expected to reach 400,000 tons monthly by the end of 1945. A large part of the additional tonnage will be needed for the 105-millimeter and higher caliber shells. Steel mill schedules must be reshuffled somewhat to accommodate the ammunition program. Increases in shell billets and other types of steel for this program will cut into first quarter output of quality carbon bars, semifinished, rails and structural steel at some mills. Quality "hot-topped" steel will be in increased demand for this program.

Consumption of wire has been far beyond calculated expectancy. With scheduled 1945 requirements of assault, field and tactical communication wire running 30 per cent over 1944, these products are expected to continue on the critical list throughout most of this year.

The supplemental Maritime shipbuilding program will hit the plate mills hardest during second quarter. Some strip mills, which recently had been partially reconverted to the rolling of sheets and strip, soon are expected to be operating 100 per cent on plate production.

Increased landing mat demands and large steel shell containers requirements may bring about an overtaxed situation on many strip mills.

Steel Manpower Shortage at Chicago Little Relieved by New "Work or Fight" Policy

CHICAGO

STEEL mills here have profited little from the rush of draft-age men to USES offices following adoption by Selective Service of its "work or fight" policy. Principal reason for this is that steel plants are not on the critical list of plants deficient in manpower.

Steelmakers report more men are appearing at their employment offices, but the majority turn away when they learn the nature of jobs available. One steelmaker reports it is losing ground less rapidly than recently, but the new hiring is still below quits.

Republic Steel Corp. needs 861 additional workers at its new DPC plant in South Chicago. M. E. Goetz, district manager, reported the company recently received military orders, particularly shell steel, calling for a two-thirds increase in production.

Critical Items Show Gains but Index Declines

Overall war production fell 3 per cent behind schedule in November despite 11 per cent gain in critical items

NOVEMBER gain of 11 per cent in output in critical war programs over October production was not paralleled by overall munitions production. Total war goods output of $5,171,000,000 in the month was 2 per cent below the October level and 3 per cent under the November schedule.

Aircraft production which accounted for 26 per cent of the total dollar value of munitions output in November was responsible for $87 million, or 48 per cent, of the total deficit in the November munitions production.

Of the six major categories of combat munitions, ammunition alone met scheduled output. Although production in the categories of aircraft and ships was not scheduled to go above the October levels, production fell too much. In the four categories which were scheduled to rise above October levels, output in combat and motor vehicles made the only substantial gain—8 per cent. In the other three groups it was the critical items within each category which made the sizable gains. For instance, the total ammunition category rose only 1 per cent, but the critical heavy ground artillery ammunition program increased 23 per cent.

Output of guns and fire control equipment fell 7 per cent below October production, while the critical item, Navy 40-millimeter antiaircraft guns, rose 14 per cent. Output of communication and electronic equipment as a whole was 1 per cent below the October level, but the critical communication wire program was up 5 per cent.

As long as the two-front war continues and production in particular programs falls behind schedule for a period of months, new programs will have to be added to the critical list. Three new programs added to the list for this reason during November were: Navy's Catalina patrol bomber, 57-millimeter gun and the Victory ship. However, in some cases a sharp step-up in schedules rather than consistent failure to meet schedule requires that a specific item be placed on the critical list. The P-47 Thunderbolt has been placed on the list for this reason.

WPB's Munitions Production Index

(1943 Monthly Average = 100)

Month	1940	1941	1942	1943	1944
Jan.	..	..	29	79	113
Feb.	..	..	31	82	113
March	..	..	12° 36	90	117
April	..	..	43	97	112
May	..	..	48	95	114
June	..	..	53	97	112
July	..	..	59	101	110
Aug.	..	..	66	105	110
Sept.	.. 6°	..	17° 69	106	110
Oct.	..	..	70	114	†112
Nov.	..	..	78	117	†109
Dec.	..	..	85	117	

°Six-month average. †Revised. ‡Preliminary.

Size Simplification for Steel Products Sought

The steel industry through American Iron and Steel Institute has made overtures to the United States Bureau of Standards, Simplified Practice Division, looking to formulation of voluntary simplified practice recommendations adapting and revising wartime limitations of sizes and shapes of various steel products under WPB order L-211 to best meet steel needs in the postwar period.

Schedules on which such action immediately is contemplated cover wheels, axles, pressure pipe, merchant pipe, structural shapes, poultry netting, woven wire fence, barbed wire and nails.

Broader Standardization In Industry Is Promoted

Broader participation of industry in the work of the American Standards Association was urged at a conference of 50 industry leaders in New York recently. The conference was called for the purpose of recommending action that will meet the large volume of criticism "leveled at alleged inadequacy of function and lack of coverage by the existing organizations in the standardization field."

Present, Past and Pending

■ FORD REPORTED DISCUSSING INCENTIVE-PAY SYSTEM
DETROIT—Ford Motor Co. is reported to be developing an incentive-pay system to cover 3000 employes in blast furnace, open-hearth and rolling mill departments. Purpose of the plan would be to step up per-man tonnage of steel production which has slipped to the point where company officials say it may be impossible to operate the mills in the postwar period.

■ STEEL WAGE NEGOTIATIONS FLOUNDER, SAYS MURRAY
PITTSBURGH—Negotiations between steelworkers and basic steel industry on compliance with War Labor Board's recent decision have floundered beyond "reasonable hope" of agreement, Philip Murray, president, CIO and of the Steelworkers union, said last week.

■ RFC SUBSIDY PAYMENTS TOTAL $80 MILLION MONTHLY
WASHINGTON—Subsidiaries of Reconstruction Finance Corp. have made direct subsidy payments, as of Dec. 31, 1944, of $1,410,328,121 to increase or maintain production of strategic or critical materials. Monthly expenditures of about $80 million will be necessary to continue making these subsidy payments.

■ NATIONAL TUBE CO.'S LORAIN MILL GETS ARMY-NAVY "E"
LORAIN, O.—Over 8000 employes and guests attended the reception at the No. 2 skelp mill, National Tube Co., this city, on Jan. 17 when the Army-Navy "E" award was conferred upon the plant for outstanding achievement in war production.

■ WESTINGHOUSE HALTS ELECTRIC IRON OUTPUT AT MANSFIELD
MANSFIELD, O.—Westinghouse Electric & Mfg. Co. has voluntarily halted manufacture of electric irons in its plant here in order to transfer workers to critical work.

■ INTERNATIONAL CARTEL AGREEMENT SUIT FILED AGAINST GE
NEWARK, N. J.—General Electric Co. and International General Electric Co. are charged in a suit filed in United States district court here by the attorney general, with maintaining international cartel agreements governing manufacture and sale of electrical equipment in violation of the Sherman Antitrust and Wilson tariff acts.

■ WAR EXPENDITURES INCREASED $740 MILLION IN DECEMBER
WASHINGTON—United States war expenditures totaled $7835 million in December, an increase of $740 million over November. Total of 1944 came to $91,174 million, an increase of 7.1 per cent over 1943, the Treasury Department announced.

■ MAY RESUME OUTPUT OF COPPER-CLAD STEEL BULLET JACKETS
WASHINGTON—Production of copper-clad steel bullet jackets may be resumed, according to plans being considered by War Production Board. Formulation of such a program will depend upon whether the brass companies can supply an adequate amount of gilding metal for the jackets.

Scrap Industry Advisory Group Wins Public Citation from OPA

Committee members honored at New York meeting in recognition of contribution to stabilization program. Other industry groups to be similarly honored. Scrap men told some troublesome days are ahead

IN THE first public citation of an industry advisory group for its assistance in administration of price control, James F. Brownlee, deputy administrator for prices, Office of Price Administration, at a meeting of the Steel Scrap Industry Advisory Committee at Hotel Roosevelt, New York, Jan. 15, presented each member of the committee with a certificate in recognition of "Sound advice and devotion to the welfare of the nation which have helped the economy withstand the strains of global war."

OPA plans to give similar recognition to its 517 industry advisory committees which have been in operation as long as two years.

William Betzler, scrap buyer, Republic Steel Corp., Cleveland, was elected chairman of the scrap committee at the meeting, succeeding William T. Kelly Jr., American Brake Shoe Co., New York, resigned. Marshall A. Shapiro, California Scrap Iron Co., Oakland, Calif., was named vice chairman, and Joel Claster, Luria Bros. & Co., Philadelphia, was re-elected secretary and treasurer.

Members honored with certificates were Glenn G. Coe, National Tube Co., Pittsburgh; A. L. Prentice, New York Central railroad, Cleveland; Paul Farrell, Great Lakes Steel Co., Washington; Moses A. Temperson, Temperson & Co., Tuscaloosa, Ala.; Joseph Paper, Paper-Calmerson & Co., Minneapolis; and Leo Block, M. Block & Co., Seattle.

Others were L. D. Greene, Bethlehem Steel Co., Bethlehem, Pa.; W. W. McMillen, National Malleable & Steel Castings Co., Cleveland; Lewis L. Middleton, Sheffield Steel Corp., Kansas City; Marshall A. Shapiro; William J. Wolf, Wolf & Co., Hamilton, O.; Joseph Cohen, General Scrap Iron Co., Providence, R. I.; Ed L. Solomon, Max Solomon & Co., Pittsburgh; Everett B. Michaels, Hyman-Michaels Co., Chicago; Samuel H. Bassow, Bassow Bros., New York city; Mr. Kelly; Mr. Claster; and Mr. Betzler.

Pointing to the existing stringency in scrap, Mr. Brownlee said he saw some troublesome days ahead and that he was not in position to say exactly the nature of the problems which will have to be disposed of before price control ends.

Guests at the luncheon included Mrs. Ethel B. Gilbert, director of OPA's Office of Industry Advisory Committees; Warren M. Huff, price executive of OPA's Iron and Steel Branch; C. D. Scully, head of OPA's Scrap and Reusable Products Section; and Morris Hershson, chief counsel of OPA's Iron and Steel Branch.

Others were James R. Mills, iron and steel representative of OPA's New York region; Edwin C. Barringer, president, Institute of Scrap Iron and Steel; Alex Miller, chief, Raw Materials Branch, WPB's Steel Division; Herman Moscowitz, WPB's consultant for iron and steel scrap; and John Sheehan, deputy director, WPB's Salvage Division.

ARMY HALTS STRIKE: Col. E. A. Lynn, seated, and Lieut. Col. G. D. Lynn, Army Ordnance, Cleveland, conferred after the Army, on President Roosevelt's orders, took control Jan. 13 of the Cleveland Electric Illuminating Co., Cleveland, terminating a 16-hour wildcat strike which forced a serious curtailment in war production in the Cleveland area. An Army representative said the strike caused "greater loss to the armed forces than any other strike, no matter how prolonged, since the start of the war." After 60 hours, the Army returned control to the utility's owners.

Scrap Men Told Industry's Job Is Double-Barreled

Speaking at the dinner meeting closing the seventeenth annual convention of the Institute of Scrap Iron and Steel in Cincinnati, Jan. 11 (See STEEL, p. 48, Jan. 15), Charles R. Hook, president, American Rolling Mill Co., Middletown, O., warned that industry must be double-barreled to care for war demands and at the same time be ready for peacetime production when the battle ends.

At the closing business session of the convention six directors at large were elected as follows: C. C. Cohen, I. J. Cohen & Co., Kansas City, Mo.; Harry J. Kiener, Hickman, Williams & Co., St. Louis; Milton W. Mahler, Detroit; I. W. Solomon, I. W. Solomon Co., Pittsburgh; George L. Sturm, Middletown Iron & Steel Co., Middletown, O.; and Harold Weinstein, East Chicago, Ind.

At the meeting of the board of directors, which includes chapter presidents, Edwin C. Barringer was re-elected president of the institute for a fourth term. In addition, he continues as executive secretary. At the same time Lieut. Col. Philip W. Frieder, Cleveland, was elected first vice president, and William J. Wolf, Wolf & Co., Hamilton, O., second vice president. Walter Erman, Erman, Howell & Co., Chicago, was re-elected secretary, while Samuel G. Keywell, the Samuel G. Keywell Co., Detroit, was re-elected treasurer.

Finished Steel Production for Sale in November

AMERICAN IRON AND STEEL INSTITUTE
CAPACITY, PRODUCTION AND SHIPMENTS

Period November - 1944

Steel Products	Number of companies	Items	Maximum Annual Potential Capacity Net Tons	Current Month: Production Net Tons	Current Month: Production Per cent of capacity	Current Month: Shipments (Net Tons) Total	Current Month: Shipments (Net Tons) To members of the industry for conversion into further finished products	To Date This Year: Production Net Tons	To Date This Year: Production Per cent of capacity	To Date This Year: Shipments (Net Tons) Total	To Date This Year: Shipments (Net Tons) To members of the industry for conversion into further finished products
Ingots, blooms, billets, tube rounds, sheet and tin bars, etc.	20	1	xxxx	xxxx	xxx	719,942	220,201	xxxx	xxx	8,014,940	2,628,561
Structural shapes (heavy)	10	2	9,179,250	310,772	44.3	312,365	xxxx	3,479,104	42.8	3,493,087	xxxx
Steel piling	4	3		22,610		24,803	xxxx	120,025		118,389	xxxx
Plates (sheared and universal)	26	4	16,885,220	958,192	69.2	938,720	39,177	12,057,181	78.0	11,741,862	597,745
Skelp	6	5	xxxx	xxxx	xxx	72,636	58,176	xxxx	xxx	770,193	608,212
Rails—Standard (over 60 lbs.)	4	6	3,625,000	193,202	64.9	190,032	xxxx	2,116,639	63.6	2,095,579	xxxx
—All other	6	7	526,000	14,024	32.5	14,450	xxxx	173,349	36.0	179,014	xxxx
Splice bars and tie plates	13	8	1,747,260	58,680	40.9	61,662	xxxx	717,900	44.9	735,177	xxxx
Track spikes	10	9	350,640	12,270	42.6	12,867	xxxx	134,990	42.1	143,097	xxxx
Hot Rolled Bars—Carbon	39	10	xxxx	716,880	xxx	586,286	87,423	8,005,342	xxx	6,566,916	694,033
—Reinforcing—New billet	15	11	xxxx	69,492	xxx	66,236	xxxx	488,700	xxx	510,607	xxxx
—Rerolled	14	12	xxxx	4,931	xxx	8,241	xxxx	63,444	xxx	75,460	xxxx
—Alloy	25	13	xxxx	249,445	xxx	174,342	19,134	2,822,879	xxx	2,065,658	382,626
—TOTAL	47	14	22,264,720	1,040,748	57.0	835,105	106,557	11,380,365	55.8	9,218,641	1,276,659
Cold Finished Bars—Carbon	24	15	xxxx	150,884	xxx	147,470	xxxx	1,644,942	xxx	1,635,519	xxxx
—Alloy	23	16	xxxx	30,913	xxx	28,019	xxxx	384,546	xxx	348,042	xxxx
—TOTAL	30	17	2,940,510	181,797	75.3	175,489	xxxx	2,029,488	75.4	1,983,561	xxxx
Tool steel bars	17	18	271,460	12,663	56.8	12,748	xxxx	134,711	54.2	129,107	xxxx
Pipe and Tubes—Butt weld	16	19	2,162,520	122,189	68.9	120,662	xxxx	1,318,764	66.6	1,315,675	xxxx
—Lap weld	8	20	842,200	51,090	73.9	48,606	xxxx	532,003	69.0	527,936	xxxx
—Electric weld	10	21	1,299,900	66,906	62.7	67,928	xxxx	750,585	63.1	745,304	xxxx
—Seamless	15	22	2,678,100	203,367	92.5	201,814	xxxx	2,156,438	88.0	2,164,520	xxxx
—Conduit	7	23	187,000	6,548	42.7	6,351	xxxx	56,738	33.1	56,965	xxxx
—Mechanical tubing	12	24	1,117,600	69,850	76.2	66,953	xxxx	761,167	74.4	745,427	xxxx
Wire rods	27	25	7,058,470	390,962	67.5	107,781	37,443	4,245,171	65.7	1,266,823	408,865
Wire—Drawn	42	26	5,653,440	310,439	66.9	183,063	9,744	3,366,877	65.1	1,998,433	94,719
—Nails and staples	19	27	1,249,020	49,258	48.1	49,246	xxxx	596,084	52.1	587,126	xxxx
—Barbed and twisted	15	28	546,390	21,553	48.1	21,091	xxxx	233,512	46.7	231,066	xxxx
—Woven wire fence	16	29	1,106,200	34,010	37.5	33,958	xxxx	352,942	34.9	349,851	xxxx
—Bale ties	12	30	152,500	5,344	42.7	5,932	xxxx	70,068	50.2	70,958	xxxx
Black Plate—Ordinary	9	31	xxxx	xxxx	xxx	44,993	242	xxxx	xxx	454,402	1,265
—Chemically treated	8	32	464,000	7,223	19.0	6,981	xxxx	119,951	28.2	113,469	xxxx
Tin and Terne Plate—Hot dipped	9	33	3,718,850	178,416	58.5	157,848	xxxx	1,826,731	53.7	1,827,473	xxxx
—Electrolytic	10	34	2,173,850	53,921	30.2	44,191	xxxx	590,989	29.7	543,925	xxxx
Sheets—Hot rolled	29	35	19,536,820	1,160,823	72.4	530,244	33,898	11,771,063	65.8	5,904,196	270,710
—Cold rolled	13	36	7,234,260	369,615	62.3	200,819	xxxx	3,500,193	52.9	1,882,322	xxxx
—Galvanized	16	37	2,892,130	134,380	56.6	136,281	xxxx	1,257,522	47.5	1,248,933	xxxx
Strip—Hot rolled	23	38	7,117,390	215,986	37.0	140,356	19,679	2,461,557	37.8	1,572,637	247,563
—Cold rolled	35	39	2,879,310	104,953	44.4	99,585	xxxx	1,111,389	42.2	1,043,090	xxxx
Wheels (car, rolled steel)	5	40	319,400	26,020	99.3	25,500	xxxx	274,742	94.0	270,656	xxxx
Axles	6	41	408,170	11,501	34.3	12,373	xxxx	178,210	47.7	174,564	xxxx
All other	5	42	168,790	3,416	24.7	2,951	xxxx	43,872	28.4	42,818	xxxx
TOTAL STEEL PRODUCTS	154	43	xxxx	xxxx	xxx	5,686,527	525,117	xxxx	xxx	63,761,216	6,134,299
Effective steel finishing capacity	154	44	64,722,000	xxxx	xxx	xxxx	xxxx	xxxx	xxx	xxxx	xxxx
Percent of shipments to effective finishing capacity	154	45	xxxx	xxxx	xxx	97.2 %	xxxx	xxxx	xxx	97.3 %	xxxx

Less Steel Produced for Sale In November, Institute Reports

STEEL products produced for sale in November totaled 5,686,527 net tons, according to the American Iron and Steel Institute, New York, compared with 5,752,147 tons in October and 5,718,490 tons in November, 1943.

Plate output was 958,192 tons, 69.2 per cent of capacity, compared with 1,029,452 tons, at 72 per cent of capacity, in October. Hot bar production was 1,040,748 tons, 57 per cent of capacity, compared with October production of 1,014,959 tons, 53.7 per cent. Hot-rolled sheets totaled 1,160,823 tons, at 72.4 per cent, against 1,106,769 tons, 66.9 per cent, in October. Hot-rolled strip production in November was 215,986 tons, representing 37 per cent of capacity; in October, 237,266 tons, 37.8 per cent.

For eleven months of 1944 total output was 63,761,216 tons, compared with 61,593,530 tons in the comparable period in 1943. Shipments to members of the industry for conversion into further finished products in November were 525,117 tons, compared with 568,635 tons in October.

During 1943 the companies reporting shipments as shown in the accompanying table represented 98.9 per cent of the total output of finished rolled steel products as reported to the institute.

Electric Metal Makers' Guild Discusses Problems

New efficiency index for electric furnace deoxidizing agents, melting practice and problems were discussed at the Jan. 13 meeting of the Pittsburgh section, Electric Metal Makers' Guild at Hotel Roosevelt, Pittsburgh.

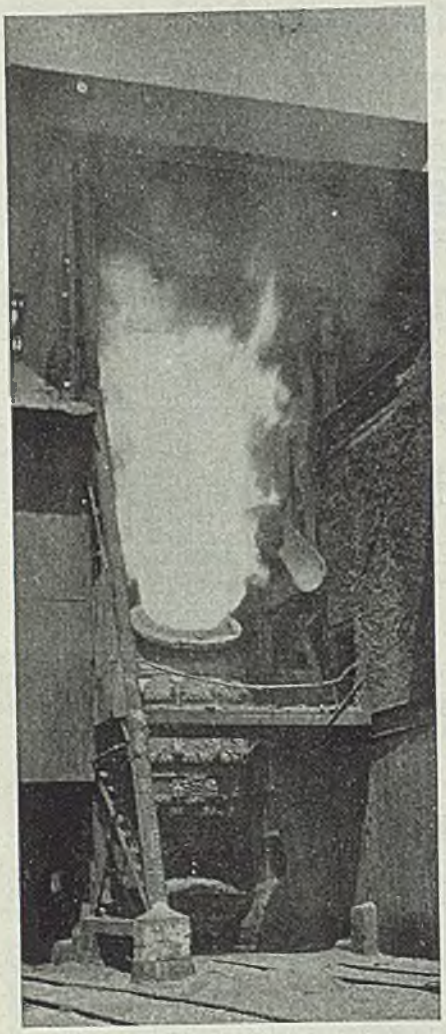
R. K. Kulp, Electro Metallurgical Sales Corp., told the morning session of the meeting that anything which can increase the efficiency of electric furnace operation and thus lower cost will be of considerable importance from now on, because electric furnace capacity has been enlarged to the point where demand will not be sufficient to insure an adequate level of operations for all plants.

Several factors make such a proposition more easily described than accomplished. Adequate sampling procedure must be established to determine that the full range of inclusions and their occurrence are included. Proper preparation of the sample is necessary to insure uniform results.

Hoyt Says Spring Stocks Of Ore Will Be Adequate

Inventories of iron ore are ample to maintain wartime production levels until opening of lake navigation, it was indicated in a report Jan. 17 to directors of the American Iron and Steel Institute by Elton Hoyt II, senior partner of Pickands, Mather & Co., Cleveland.

Mr. Hoyt predicted an inventory of around 16,000,000 gross tons of ore at lower lake ports and blast furnaces on April 1, 1945.



Bessemer Steel Gains in Favor

Bright Future Seen for Bessemer Steel in Many Important Applications

Panel of experts, speaking at Pittsburgh chapter meeting of ASM, thinks successful wartime performance of bessemer in many uses previously calling for open-hearth or electric furnace steels assures broad use of bessemer by postwar industry

PITTSBURGH

BESSEMER steel, which for the past 30 years has been considered an inconsistent and unpredictable metal, has done an excellent job in important applications during the war and has an unusually bright future, according to a panel of experts speaking before the Pittsburgh chapter, American Society for Metals, on Jan. 11.

Under the leadership of C. C. Henning, general metallurgist, Jones & Laughlin Steel Corp., Pittsburgh, who acted as discussion leader, papers were presented by E. C. Wright, assistant to the president, National Tube Co., Pittsburgh, on "The Manufacture and Application of Seamless Tubes from Killed Bessemer Steel;" by G. M. Yocum, metallurgical engineer and assistant to the general manager, Wheeling Steel Corp., Wheeling, W. Va., on "Dephosphorized Bessemer Steel;" and by J. D. Armour, chief metallurgist, Union Drawn Steel Division, Republic Steel Corp., Massillon, O., on "The Future of Bessemer Steel for Automatic Screw Machine Parts."

Because it was possible to increase production of bessemer steel 40 per cent of capacity without construction of any additional plant facilities, this type of steel has filled an important niche in the war program. In the most critical period of the war it also played an important part because scrap requirement is so low; scrap consumption by the bessemer process is virtually negligible.

Use of bessemer steel has proved acceptable in many applications which formerly called for open-hearth or even electric furnace steel, and in many of these applications it is expected bessemer steel use will continue after the war.

Chief difficulty in application of bessemer steel to most jobs is high nitrogen and phosphorus content. On the other side of the ledger, bessemer steel has good characteristics of machinability, weldability, and exhibits greater stiffness and resistance to corrosion than steels made by other methods with similar analyses.

According to Mr. Wright, 700,000 tons of bessemer steel ingots have now been produced for seamless tubes. This has been the so-called killed bessemer steel. Research work on the use of this steel for seamless tube applications began about six years ago when excess bessemer capacity was available. Under previous experience it had been shown that the better deoxidized the steel, the higher quality in seamless tube which could be pierced from the billet. However, conventional methods of deoxidizing failed to produce the desired result in bessemer.

Carbon Is Best Deoxidizing Agent

Research indicated the best deoxidizing agent was carbon and it was determined that addition of carbon after the end point of the blow did the job. This carbon is added in the form of molten pig iron and was found to be the most efficient deoxidizer. Addition of iron in combination with other deoxidizers added in the ladle produces a very high percentage of deoxidization.

Tubing from ½-inch to 24 inches outside diameter has been produced using this process. Tensile strengths up to 100,000 pounds per square inch have been obtained on these steels and their characteristics are equivalent to SAE 1035 open-hearth. This steel has a high elastic limit, which in turn produces a high collapse value. This is particularly important in oil well casing where long strings of pipe must be forced into the well as it is drilled and extremely high collapse strengths are necessary. Success of killed bessemer steel in this application indicates that wide possibilities exist for additional applications of this steel to tubular goods.

In speaking on the market for steel in flat rolled products, Mr. Yocum indicated that the applications here lie primarily in consumer goods where only forming qualities are required. The difficulty in the past, he said, has been not so much with actual fabrication, but the difficulty in rolling bessemer steel on high-speed mills. High rolling speeds like deep drawing require a relatively soft uniform steel to prevent cracking and tearing. In order to obtain a full killed, soft, non-aging steel, lower phosphorous content and better nitrogen control are required. In order to obtain this in bessemer steel, only the lowest phos content materials may be charged in the blast furnace and special practice must be followed in regard to slag and ladle additions. About a million tons of bessemer steel using this dephosphorizing process have now been produced successfully. Close control of ratio of silicon to manganese in the region of 2½ to 1 is required. Dephosphorizing is accomplished by addition of lime, iron oxide and flux to the ladle, followed by ferromanganese. This gives the necessary thick slag and makes possible elimination of 50 to 70 per cent of the original phosphorus content.

It is impossible to compare these bessemer steels with open-hearth products because of the presence of additional elements in the bessemer steel which change the physical properties although carbon and manganese content may be similar to open-hearth specifications.

Flat rolled products in gages of 0.009 to 0.020-inch are most common. Corrugated galvanized roofing and siding have been successfully produced from 28 gage sheets of dephosphorized bessemer steel. These sheets have been cold reduced on tandem mills at speeds comparable to

open-hearth steels, which was impossible with ordinary bessemer steel. Annealing cycles also have been improved considerably using the dephosphorized bessemer steel. Forming operations are considerably easier and the sheets have a high standard of flatness. No difference can be discerned in the galvanizing properties of these sheets as compared with open-hearth. Some typical applications include pail bottoms made from 28 to 32 gage black plate requiring mild drawing properties and on which the bessemer steel showed 8 per cent lower ductility and 12 per cent greater hardness than a similar open-hearth product.

Government specifications permit the use of dephosphorized bessemer sheet in heavier gages for aircraft landing mats and it has been successfully applied in the production of welded pipe. Heavier sections up to 0.110-inch gage thickness have been used in many applications such as floor spans and in welded assemblies. In addition to the flat rolled product, Mr. Yocum emphasized the fact that there is a large field for dephosphorized bessemer steel in rods, wire and cold-drawn bar stock.

Probably the most logical and widely accepted application of bessemer steel in the past has been in automatic screw machines and similar applications because of its excellent machinability. According to Mr. Armour, the future of bessemer steel in these applications is even brighter than in the past.

Critical Manpower List Revised

War Manpower Commission lists 35 categories of essential and critical industries, with subdivisions, as guide in drafting industrially deferred men for military service

ACTION was taken last week by the War Manpower Commission to facilitate induction into military service of an estimated 200,000 men in the 26-29 age bracket now holding industrial deferments. The commission set up a list of 35 critical and essential industries to govern the order in which registrants in this class will be called. As a general thing, men in the limited list of critical employments will be deferred longest.

The 35 work categories of critical industries, with their various subdivisions follow:

Production of Aircraft and Parts: Production, maintenance and repair of aircraft, gliders, parachutes, dirigibles, balloons, aircraft engines, aircraft parts, pontoons, propellers and similar products.

Production of Ships, Floats and Parts: Production, maintenance and repair of ships, boats, ship and boat parts and equipment.

Production of Ordnance and Accessories: Production, maintenance and repair of firearms, guns, howitzers, mortars, gun turrets and mounts, tanks, sighting and fire-control equipment, torpedo tubes and similar products.

Production of Ammunition: Production of bombs, mines, torpedoes, grenades, chemical warfare projectiles, small arms, rockets, explosives, fuses, pyrotechnics, as well as products such as glycerin which go into the manufacture of ammunition.

Agriculture and Commercial Fishing: (No critical listing).

Processing of Food: Meat packing and slaughtering; production of dairy products, eggs, sugar.

Forestry, Logging, Lumbering and Forest Industries: Timber tracts and logging camps, cutting of pulpwood, wood for tanning extract, sawmills, veneer, planing and plywood mills.

Construction: Construction of approved industrial plants, hospitals and military projects.

Coal Mining: The mining of anthracite, bituminous and semi-anthracite coal.

Metal Mining: The mining of iron, copper, lead, zinc, mercury, molybdenum, vanadium and the dressing of such ores.

Nonmetallic Mining and Processing and Quarrying: The mining, processing or quarrying of phosphate rock, sulphur potash, graphite, pyrites, graphite, borates and other salines, fluorspar, talc, abrasive sands.

Smelting, Refining and Rolling of Metal, Scrap Salvage: Primary and secondary smelting, and refining, alloying, rolling and drawing of iron, steel, copper, lead, zinc, magnesium, aluminum, brass, bronze, nickel, tin, cadmium, ferroalloys, and any other metals used in the production of war materials.

Production of Metal Shapes and Forgings for Essential Products: The manufacture of castings, die castings, forgings, wire, nails, chains, anchors, axles, pipe, springs, screws, bolts, tubing, stampings, pressings, structural shapes, and machined parts for essential products.

Finishing of Essential Metal Products: (No critical listings).

Production of Industrial and Agricultural Equipment: Power boilers, wiring devices and supplies; agricultural implements, electric lamps, storage and primary batteries, pumps, compressors and pumping equipment; recording, controlling and measuring instruments and meters; conveyors, industrial cars and trucks; blowers, exhaust and ventilating fans; mechanical power-transmission equipment, such as clutches, drives and shafts; mechanical stokers; tools, files and saws, plumbers' supplies, professional and scientific instruments, photographic apparatus and optical instruments, and all equipment necessary to operate plants producing essential commodities.

Production of Machinery: Engines and turbines, metalworking machinery and equipment; electrical generating, distribution and industrial apparatus for electric public utility, manufacturing, mining, transportation and construction use, for use in manufactured products or in service industries; construction, mining, agricultural, oil field, smelting and refining machinery, as well as all machinery necessary to produce, equip and maintain aircraft, ships, ordnance and other military equipment.

Production of Chemicals and Allied Products: Industrial organic chemicals, coal and petroleum crudes, coal tar intermediates, dyes, color lakes and toners, explosives and components of explosives, synthetic rubbers, plastics materials, noncoal-tar intermediates and solvents, and miscellaneous organic chemicals; gum and wood chemicals, plasticizers, rubber chemicals and tanning extracts. Drugs, medicines and insecticides: Drug grinding, crude botanical drugs, botanical drugs, derivatives and synthetic equivalents, biological products, drugs of animal origin, pharmaceuticals for use in proprietary remedies and prescriptions, insecticides, fungicides, fumigants or rodenticides. Heavy inorganic chemicals: Acids, alkalies, carbonates and miscellaneous heavy chemicals. Industrial, industrial fine and related inorganic chemicals: Inorganic compounds. Compressed and liquefied gases: Gaseous hydrocarbons, elemental and nonhydrocarbon gases. Vegetable and animal oils and fats. Animal oils and fats: Vegetable oils, miscellaneous chemicals and chemical products: Bleaching compounds, boiler treating compounds, catalysts, chemical cotton pulp, emulsifiers, oil-treating compounds, photographic and pharmaceutical gelatin, synthetic resin adhesives and glue, analytical reagents, water treating compounds and wetting agents, including sulfonated oils.

Production of Essential Rubber Products: Essential rubber products—tires, tubes and other essential products including parts and components of other products included in the essential activities list.

Production of Leather Products: The pro-

(*Please turn to Page* 150)

POSTWAR PREVIEWS

SIMPLIFICATION— Voluntary simplified practice recommendations adapting and revising wartime limitations on sizes and shapes of various steel products to meet postwar needs are under consideration. See page 55.

BESSEMER STEEL— Postwar uses of bessemer steel expected to be greater than in prewar era due to successful applications for war uses and knowledge gained therefrom. See page 58.

AUTOMOBILES— Corrosion resulting from long-time ownership during war may encourage drivers to trade in cars more frequently. See page 67.

STAINLESS— Belief that a new type of stainless steel which can be substituted for duralumin in aircraft expressed by alloy steel manufacturer. See page 78.

HIGH SPEED HEATING— Improved equipment now forces old rule-of-thumb heat penetration rate of 1 hour per inch of thickness to give way to 2 to 4 minutes per inch. Billets, bars, tubing and strip are brought to high temperatures in minutes by automatic continuous operations portending wider use of this efficient method. See page 86.

DEEP DRAWING PLATE— Amazing press job which forms 60-millimeter mortar shells by stamping 0.67-inch steel plate in a production line operation forecasts important revisions in manufacturing many industrial items and consumer goods. See page 92.

WELDED TRUSS DESIGN— New design for standard 50, 60 70, and 80-foot lengths puts all web members in vertical plane to eliminate gusset plates and facilitate assembly. Employing rolled members which are simply cut to desired lengths without splitting, blocking, slotting or chipping, this technique of welded fabrication shows possibilities for new concepts in assembly practice. See page 110.

Integrated Program Is Suggested For Strengthening the Congress

Fourteen recommendations advanced by Robert Heller, business consultant, in report prepared for the National Planning Association. Study shows Congress operating with hand tools in a mechanized age

FOURTEEN recommendations which constitute an integrated program for strengthening Congress, so that it can properly function and assume its ever-growing responsibilities in preserving an effective American democracy, were made public last week in a report prepared by Robert Heller, prominent business management consultant.

The report, entitled "Strengthening the Congress," was prepared at the request of the Business Committee of the National Planning Association. Its recommendations have been unanimously endorsed by the agriculture, business and labor committees of that organization.

In his analysis Mr. Heller declares, "It appears obvious that Congress is operating with hand tools in a mechanized age."

Practically all the improvement needed can be effected by Congress itself, he maintains, but it must be undertaken as a unified program.

Usual Approach Distorts Picture

"Too frequently analysis of Congress has been microscopic, with concentration on deficiencies to the exclusion of the soundness of the whole," Mr. Heller states. "This approach distorts the picture, resulting in superficial and unjustified criticism."

The Heller report, as the result of an extensive study of the overall needs of Congress, and our government as a whole, sets forth in detail a 14-point program for action that can be taken by Congress. Its recommendations call for:

1. Reorganization of the structure, and reduction in the number, of standing committees in both houses, so as to minimize overlapping of jurisdictions and permit members to do a good job on one or two important committees rather than scatter their efforts over several.

2. Establishment in each house of a Majority Policy Committee and a Minority Policy Committee, thereby providing an effective mechanism for the exercise of party leadership and a focus of responsibility for Congress' actions and inactions.

3. Provision of adequate assistance for individual members of Congress, to help reduce the work load on members themselves and allow them to spend more time on major issues.

4. Provision of competent staffs for congressional committees and expansion of the legislative reference service, to enable committees, and ultimately Congress as a whole, to function efficiently.

5. Adoption of a cloture rule rigid enough to eliminate the filibuster, thus preventing a small group of men from imposing their will on the majority.

6. Expansion of provisional legislation, to enable Congress to avoid bogging down over details and yet exert control in advance of executive action.

7. Discontinuance of riders that are unrelated to the main contents of bills, thus eliminating a practice which virtually forces the President to accept legislation of which he disapproves.

8. Development of a trend toward reasonably broad appropriation bills and away from detailed bills, thereby allowing more of Congress' time for the important matter of expenditure policy and permitting sufficient flexibility for administrators to operate efficiently.

9. More effective use of the general accounting office as an instrument for control of executive expenditures.

10. Experiment with periods for questioning executive department heads before each of the whole houses, thereby furthering the desirable principle of party and departmental accountability.

11. More frequent formal and organized inquiries into basic national affairs, so as to focus the people's attention on the significant aspects of an unsatisfactory situation with a view to obtaining corrective action.

12. Development of a substitute for the seniority rule for committee chairmanships, to help insure that the best qualified men are appointed to these influential positions.

13. An increase in salary for members of Congress to $25,000 a year, thereby bringing the compensation for the nation's top legislative job more closely in line with that of top jobs in other fields.

14. Provision of service retirement pay, at the age of 55, of $1000 for each full year of Congressional service, up to a maximum of $10,000 annually, to provide reasonable economic security justified by the uncertainties of service in Congress.

Jobs well done by state and local governments, industry, labor and agriculture can largely be nullified by inadequate performance of the federal government, the report points out. In the crucial years ahead, America needs a federal government which is capable of building and executing timely constructive programs for full employment and full production. This government must by all means be a democracy.

Must Command Confidence

If Congress is to operate effectively as an instrument of this democracy, it must be adequately equipped to meet its ever-increasing burdens. It must be able to command a high degree of public respect and confidence.

The cost of maintaining our legislative branch is so infinitesimal, Mr. Heller asserts, that no sound recommendation for strengthening Congress should be rejected because of cost considerations. It is interesting to note that of every $7 spent by the federal government in 1940, only one cent was spent on Congress.

While the Heller report concentrates mainly on action that can be taken by Congress itself, the author maintains that a program for strengthening Congress cannot be effectively carried out without full public support. Moreover, if America is to achieve the ultimate goal of a federal government which in fact, as well as in form, is a true democracy, there must be gained a new level of party responsibility and accountability.

"Politics controls the election of those who represent us and is a major motivating force behind our government machinery," Mr. Heller asserts. "It is vitally important that the citizens of the United States take a greater and more sustained interest in the functioning of their political parties."

Adoption of the proposed program for strengthening Congress, or a satisfactory alternative, plus development of party responsibility and accountability, Mr. Heller believes, "should enable our federal government to be a democracy, to be effective, and to prove its inherent superiority in the never-ending competition with other forms of government in our world society."

ROBERT HELLER

The author of the report "Strengthening the Congress", at the age of 45 is head of Robert Heller & Associates, Cleveland, a firm which specializes in the management problems of business. In 1945 he participated in one of the biggest management advising jobs, that concerning the modernization of the United States Steel Corp.

Our sons are fighting to free the world from ignorance, intolerance and want . . .

. . . While some 6,000,000 of our people are wholly illiterate, and the majority of Americans have less than a completed high school education.

. . . While there were more than 3,000 strikes during the past year, some of the bloodiest of which were based upon race intolerance.

. . . While more than one-third of this nation's dwelling units are still without flush toilets or any bathing facilities whatever. Ignorance, intolerance and want!

America will soon have the chance to help write a peace plan for the rest of the world — and that plan can begin here at home. For our country's greatest immediate contribution to world reconstruction and peace would be to make ourselves lastingly strong, with jobs enough for all.

Today, the engineers of the machine tool industry can greatly help the men of government and of industry to write that plan . . . to prepare now for the reconversion of our tremendous wealth of resources, skills and machinery to all-out production for a better America! One of these engineers is a Bryant man, and we invite you to call upon him now.

BRYANT CHUCKING GRINDER COMPANY SPRINGFIELD VERMONT, U.S.A.

Longer Work-Week Raises Total Output, but Lowers Efficiency

Production per man-hour decreases after 40 or 48 hours a week, Bureau of Labor Statistics survey in 12 metalworking plants shows. Advantages of incentive wage systems decline as working time is lengthened

HOURS worked beyond 40 or 48 per week result in additional output but at the price of continuous decreases in efficiency and marked increases in absenteeism as hours rise, the Bureau of Labor Statistics concludes following a survey of experience in 12 manufacturing plants. A point is finally reached at which the longer work schedule is no more productive, and actually may be less productive, than a shorter work-week schedule.

With few exceptions, the longer working time resulted in a general slowing down, not only during the added hours but throughout the entire work-week.

Another conclusion as a result of the survey is that the 7-day week, as a steady program, is uneconomic and may actually result in less production than the 6-day week.

The survey was conducted entirely in 12 plants in various branches in the metalworking industry.

"The operations varied from foundry and forge shop work to bench operations which required the processing of metal parts weighing as little as one ounce," says the report. "There was no intention to study metalworking operations exclusively; it simply happened that long working hours were found most frequently in these industries.

Patterns Would Be Similar

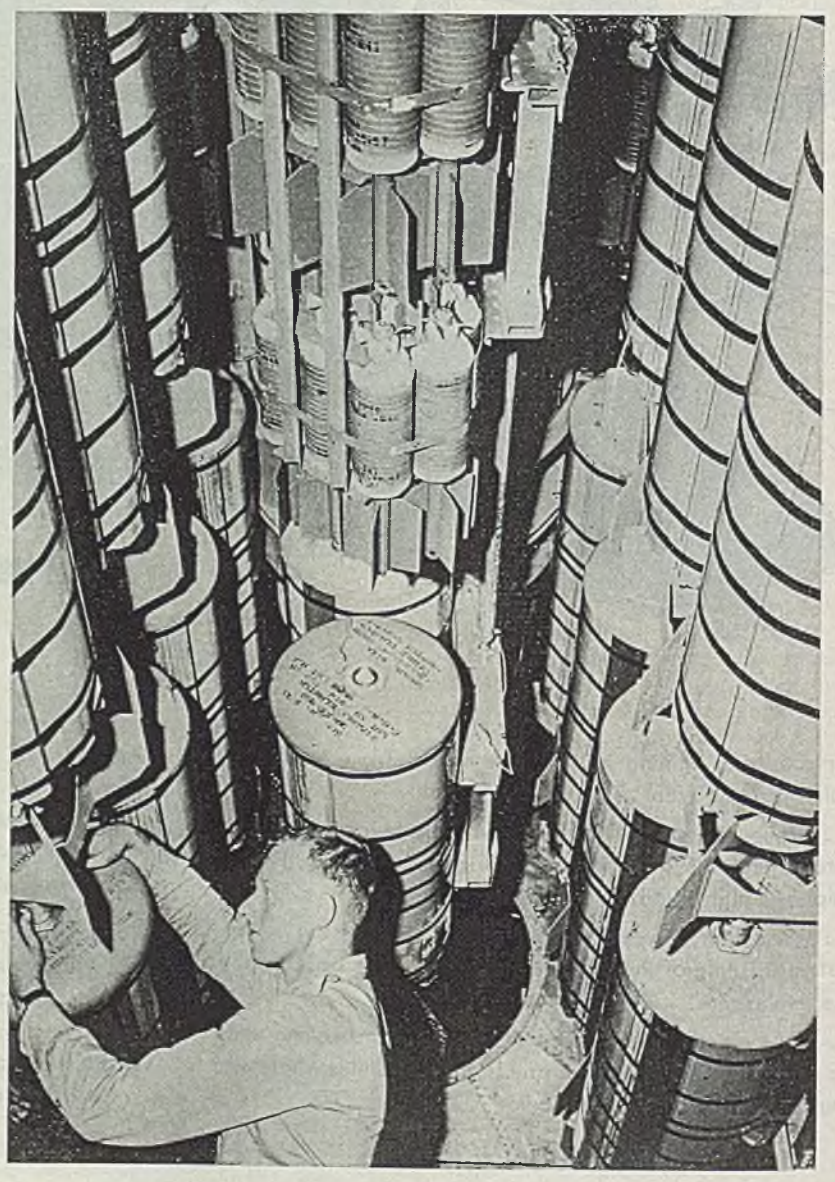
"The material worked, however—whether metal, or wood, or leather, or paper, or any other substance—is of no great significance. Given the same types of exertion requirements, control over speed, and wage incentives, the work performance under the same hours schedules will probably follow much the same patterns."

There is no such thing as "optimum hour schedule" for all of industry, the survey indicated.

"What appears to be a satisfactory schedule of hours for a plant with light machining operations," says the report, "may be economically wasteful in a foundry. Further, there is a marked difference in the performance of men working under wage incentives and those working at straight hourly rates without any kind of wage incentive. Much depends on the type of work and the requirements it exacts from workers, the degree to which workers can control the speed of operations, and the incentives which motivate them—whether in the volume of pay, participation in the war effort, labor relations, or working conditions generally.

"The available evidence indicates that, on the whole, the 5-day week and 8-hour day are more efficient than a work schedule with longer hours. This does not mean, however, that longer hours are not productive. There is little sacrifice of efficiency if a sixth day of 8 hours or less is added.

"The sharper break comes when daily hours are raised from 8 to 9½ or 10 or 11, provided the workers operate under an incentive-wage system. The primary effect of this lengthening of daily hours for workers on the day shift, when the 5-day week is maintained, is to wipe out the midweek spurt. The analysis of daily production patterns in several plants under a 40 or 48-hour schedule shows a building up of hourly efficiencies toward a peak on the third and fourth days of the week, with a slight drop thereafter. When daily hours were lengthened to 9½ or more, however, this peak disappeared. The production curve for the successive days of the week flattened out, and any one day was about as good as any other day. When a sixth day was added, the



PRESENTS FOR TOKYO: An ordnance officer of Brig. Gen. Haywood Hansell's 21st Bomber Command headquarters on Saipan attaches the finely-adjusted fusing mechanism to bombs getting them ready for Tokyo in the cavernous maw of a B-29 Superfortress. Army Air Forces photo from NEA

line of production remained flat, but dropped to a lower level. The data indicate clearly that workers adjust themselves to longer hours by slowing down, not because they want to, but because they have to.

"For workers on the second or night shift, the pattern is somewhat different. Their daily efficiency performance under the 8-hour day and 5-day week looks much like that of the day shift on the 10-hour day. There is practically no midweek spurt, and production tends to flatten into a fairly level line. The reason for this appears to be that these workers are somewhat tired when they come to work, having been up for some hours and probably at work around home. In any case, they are not so refreshed when they come on the job as the men on the day shift who have their leisure hours after, not before, the day's work. When a sixth day is added to stretch the week to 58 or 60 hours, the result is likely to be a steady decline in the efficiency level, day after day, with the peak points on Monday or Tuesday, at the very beginning of the week.

"These 'fatigue patterns' furnish a reasonably accurate basis for anticipating, for incentive-wage workers, the result of (a) changing daily hours from 8 to 10, or from a 40-hour week to one of 50 hours, and (b) from this level to a still higher one, by adding a sixth workday. The first decrease in efficiency may amount to about 5 per cent, and the second from 7 to 10 per cent if hours do not exceed 58 or 60, but may be as high as 20 per cent when hours reach 66.

Straight Day-Work Rates

"For men on straight day-work rates, the lengthening or shortening of hours seems of considerably less significance. This was observed in two foundries. In one, daily scheduled hours remained at 10, but the sixth day was dropped. In the other, daily hours during a 6-day week were raised from 8 to 9½. In each plant the hourly efficiency level remained essentially unchanged under the different levels of hours. Apparently the pace at the shorter hours was not so fast that the addition of extra hours caused a slowing down; nor did the shortening of hours bring about any quickening of the work tempo.

"In plants in which work was light or very light, the general tendency for workers under incentive systems, and with weekly hours ranging between 55 and 58, was to produce about a 2-hour volume of production for every 3 hours added above 48 per week (i.e., 6 days at 8 hours each). When work was heavy, as in foundries, the ratio was more nearly 1 hour's additional output for every additional 2 hours worked. One reason for this was the greater need for rest pauses.

"The studies included two plants in which shorter hours were found to result in a volume of output as great as

(*Please turn to Page* 152)

Societies Co-operating with Byrnes by Canceling Meetings

War Committee on Conventions' form of application, required of organizations planning large meetings, calls for information on type of meeting, date, location, facilities to be used and other relevant data

WIDESPREAD co-operation is greeting War Mobilization and Reconversion Director Byrnes' ban on conventions which had been scheduled to be held after Feb. 1 and which would have been attended by more than 50 persons.

The new War Committee on Conventions by last week had received notice of voluntary cancellation of conventions scheduled by many organizations, including the following: American Mining Congress, American Society of Tool Engineers (Industrial Production Planning Exposition), Chamber of Commerce of the United States, National Automobile Dealers Association, National Association of Credit Men, Radio Manufacturers Association, American Institute of Mining and Metallurgical Engineers, National Metal Trades Association, Institute of Aeronautical Sciences, National Office Machine Dealers Association, World Invention Exposition, National Association of Purchasing Agents (Public Utility Buyers Group), National Institute of Governmental Purchasing, and National Canners Association, American Steel Warehouse Association, and Packaging Institute Inc.

Many other voluntary cancellations are expected, according to preliminary advices received by the committee. On the other hand, applications are in hand for a large number of conventions on the ground that the nature of the programs is such as to directly help the war effort.

Organizations planning to hold conventions, conferences, trade shows or group meetings after Feb. 1 will have to show how the war effort would suffer if the meetings were not held, Col. J. Monroe Johnson, chairman of convention committee, has announced.

"The committee," Colonel Johnson asserted, "has decided that the yardstick it will use to measure the essentiality of any meeting is how the winning of the two wars we are fighting will be impeded if the meeting in question were held to an attendance of 50 or canceled outright."

The committee has approved a form of application required of organizations planning group meetings to be attended by more than 50 people. Information required by the committee includes: Whether the meeting is a convention, conference, trade show, or government meeting; date and location of the meeting and name of hotels or other facilities that will be used; attendance planned; previous frequency of similar meetings before and during the war; from what area those attending are drawn; what steps have already been taken to curtail attendance; why the objectives of the meeting cannot be attained through "conventions by mail;" why a group of 50 or less to whom powers are delegated cannot transact the necessary affairs of the organization, and in what way and to what extent the war effort would suffer if the meeting were not held. These applications will be studied carefully by the committee.

Newly Formed Lubrication Society Meets Feb. 8-9

Lubrication engineers of prominent industrial and transportation companies and educational institutions have organized the American Society of Lubrication Engineers, with headquarters at 135 South LaSalle street, Chicago.

Officers are: C. E. Pritchard, Republic Steel Corp., president; J. C. Peebles, dean of engineering, Illinois Institute of Technology, vice president; B. H. Jennings, professor of mechanical engineering, Northwestern University, secretary and treasurer. Directors include D. N. Evans, Inland Steel Co.; I. L. Harper, Lehigh Valley railroad; and D. E. Whitehead, Carnegie-Illinois Steel Corp.

Objective of the organization is to put on a sound basis the fundamental precepts of lubrication.

First convention of the society is scheduled for Feb. 8-9 at the Stevens hotel, Chicago. The program, under direction of E. M. Kipp, Aluminum Co. of America, has been formulated primarily around technical papers which are to be given by leading authorities on subjects pertiment to various phases of the lubrication profession.

Steel Warehouse Men Call Off 1945 Convention

The American Steel Warehouse Association which had planned to hold its 1945 convention at the Waldorf-Astoria, New York, in conformance with the request of War Mobilization Director James F. Byrnes, will hold no annual meetings until the war emergency has passed, W. S. Doxsey, president, Cleveland, announced last week. Attendance at these meetings has averaged approximately 500 in recent years.

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

COPPER WIRE MILLS: Copper wire mills must notify WPB's Copper Division 10 days in advance of scheduling orders bearing Z-1 allotments. Direction 60 to Controlled Materials Plan regulation No. 1 provides for the substitution of Army and Navy orders for such deferred orders. Brass mills were instructed previously to give five days notice to the Copper Division before scheduling deferred orders. Copper wire mills are required also to furnish WPB with information regarding the amount and identification of type of copper wire mill products involved in such orders and also to advise WPB as soon as possible regarding "Z" orders that have been scheduled before Jan. 13 but not yet put into production.

HAND TOOLS: Hand broom rakes, exempted from restrictions of schedule V of the hand tool simplification order L-157, as amended in December, are still controlled by order M-126 (iron and steel), being included in the category "lawn brooms," which appears on list A of M-126. Items on this list may be manufactured only on WPB authorization, which under current procedure is applied for under priorities regulation No. 25 (spot authorization).

Quota limitations on the manufacture of general purpose rakes, established by schedule V of L-157 do not apply to purchase orders by or for the account of the Army, Navy, Maritime Commission or Veterans Administration. Production year to which the quota applies has been changed from the calendar year to the industry's fiscal year (July to July) in the December amendment of schedule V. Each manufacturer may produce in the fiscal year ending July 1, 1945, not more than 60 per cent by weight of the general purpose rakes he produced in 1940 or 1941, whichever was greater.

TEXTILE MACHINERY: In replacement of used machinery in a textile mill, WPB permission is not required if production will be at least as great after installation of the new machinery.

L ORDERS

FURNITURE: Substitution of metal for wood in furniture manufacture is now permitted, subject to certain restrictions. Provision limiting the number of furniture patterns manufacturers may make has been eliminated from the order. Use of metal swivel irons in chairs is permitted to be resumed under a new order, L-13-b which supersedes revoked orders L-62 and L-13-a.

Production of office chairs now is subject to L-260-a which permits each furniture manufacturer to substitute metal parts for wooden ones, provided: (1) That he does not increase the total dollar value of his quarterly production above his dollar volume in the fourth quarter of 1944, unless the increase is authorized under the "spot authorization" procedure; (2) that no article of furniture contains more than 95 per cent of metal by weight after substitution.

Furniture manufacturers who wish to make metal parts in their own plants should apply for controlled materials under PR-25. Manufacturers who receive "deferred" (Z) allotments of material from WPB under PR-25 may use them only to obtain controlled materials for their own use in making parts. They may not transfer the allotments to their suppliers to make parts for them.

Use of casters and joining hardware made of iron and steel is not limited by L-13-b. Each manufacturer may use metal upholstery springs, per quarter, at the rate of 12½ per cent by weight of the 1941 rate of consumption. Production of any article of furniture or fixtures containing 5 per cent or less of metal by weight, exclusive of joining hardware, swivel irons, casters and upholstery springs, is not limited by the order. L-13-b does not limit the use of metal in furniture or fixtures made to fill preferred orders actually on hand. In making visible reference panels for other than preferred orders, each manufacturer may use iron and steel at 40 per cent of his rate of use in the year ended June 30, 1941. Lists appended to the order name certain, but not all, items subject to the order and certain items which are not covered by order L-13-b. (L-13-b, L-260-a)

HAND TOOLS: Manufacture of forged axes, adzes and hammers of types required for specialized jobs, is now permitted, in accordance with specifications stated in schedule II appendices of order L-157. The amended schedule also permits the use of alloy steel (NE series 8600 or 9400) as well as carbon steel for mine and railroad adzes. (L-157)

PLUMBING TANKS: Manufacturers of plumbing and heating tanks may produce only 25 per cent of their yearly quotas during any one calendar quarter. Yearly quotas of 70 per cent of 1941 unit production of range boilers and expansion tanks and 75 per cent of 1941 unit production of storage tanks remain unchanged. Manufacturers must file monthly reports on form WPB-3717. (L-199)

LUGGAGE: Free use of aluminum and the use of copper and copper-base alloys when authorized under order M-9-c and use of zinc alloys when permitted under M-11-b in production of luggage is now permitted. Persons who had no base period production are permitted now to apply for a quota under provisions of priorities regulation No. 25. Present manufacturers may file applications for an increased quota under PR-25. (L-284)

METAL SCREEN CLOTH: Complete control over distribution of metal insect screen cloth has been established. Producers may make deliveries of this product only in accordance with schedules authorized by WPB. No deliveries may be made on unrated purchase orders. Producers must file monthly reports giving data on shipments, unfilled orders, etc., and quarterly reports on proposed delivery schedules for the coming quarter, both on form WPB-4062 and due by the tenth of each month. Distributors may extend customers' preference ratings in purchasing from producers. To obtain screen cloth for sale to civilian users who do not have ratings, distributors may apply for ratings on form WPB-547. Screen products manufacturers must obtain WPB authorization to purchase the cloth, effective Feb. 1, 1945. Application is made on form WPB 4079 filed with the Lumber and Lumber Products Division. (L-303)

INDEX OF ORDER REVISIONS

P ORDERS

AIRLINE OPERATORS: Airline operators now may obtain maintenance, repair and operating supplies by filing a single application, on form WPB-1747, for authorization of a dollar-value quota covering MRO purchases for the entire year 1945. Form WPB 1747 also may be used for subsequent applications in event an airline finds that its MRO requirements increase during the year through acquisition of additional planes or other unforeseen circumstances. Pending WPB approval of new quota authorizations, airlines that have been obtaining MRO supplies under order P-47 will be provided with interim priorities assistance through use of previously granted quotas, as specified in the order. Airlines have been granted permission to spend up to $2500 for construction purposes. (P-47)

OIL WELL EQUIPMENT: Production operators must obtain approval of Petroleum Administration for War's district offices before using AA-1 preference ratings to obtain any one of the following 16 units of oil well drilling-rig equipment for maintenance and repair purposes: Crown blocks, traveling blocks, hooks and connectors, elevators, swivels, grief stems, rotary tables, drawworks, tongs, master gates, blowout preventers, drill collars, slush pumps, boilers, weight indicators, and steam drilling engines. These items have been added to schedule B to order P-98-b. If an operator chooses to use a preference rating of AA-2X instead of the higher rating of AA-1 for any of the complete units, he may do so without first obtaining PAW approval. Operators may use the AA-1 preference rating for repair parts for any of the listed items without complying with provisions of schedule B. (P-98-b)

PRIORITIES REGULATIONS

ORDER CANCELLATIONS: A manufacturer who has received a cancellation of an order from a customer need not withdraw any extension of the customer's rating that he has used on orders for material valued at $25 or less. Extensions of ratings on customers' orders for more than $25 worth of material must be withdrawn on notification of a customer's cancellation. Certain restrictions have been removed on the sale of material that has been obtained with priorities assistance and can no longer be used for the purpose for which that assistance was given. If the holder does not sell similar material in the regular course of his business and the sale is one covered by priorities regulation No. 13, he may sell it only as provided in that regulation. If he regularly sells such material, he may make the sale freely if he meets WPB requirements.

The holder may use such material, whether or not he is in the regular business of selling it, only if he has the necessary rating or other qualification which would be required from him if he were to buy the material on a special sale under PR-13 or if his use is specifically authorized by WPB. However, if the material is a controlled material or a class A product obtained pursuant to an allotment under CMP regulation No. 1, the holder may use it only as provided in that regulation. (PR No. 1)

BLANKET MRO RATINGS: The following items may no longer be acquired with the assistance of blanket maintenance, repair and operating supply ratings: Metal insect screen cloth; class D scales, as defined in order L-190; hard rubber drums; incandescent photo flash lamps; photographic papers. (PR No. 3)

PRICE REGULATIONS

ELECTRIC IRONS: An adjustment provision under which narrow margin producers of low-priced electric irons may apply for price increases has been authorized. Any increased maximum price will not exceed an amount equal to the manufacturers' total October, 1941, cost to make and sell the article (or his October, 1941, selling price where that was lower), plus present increases in manufacturing costs that have resulted from legal changes in material prices and straight time factory wages, plus an amount determined by applying his average percentage profit on net sales in the years 1936-39 to his October, 1941, total cost. (No. 188)

These 11 Ohio veterans are learning the machinist trade at the Cooper-Bessemer Corp. plant, Mt. Vernon, O. Shown above in a shop arithmetic class, the returned servicemen are paid apprentice rates by the company which, with their government allowances, bring their income up to the wages of a journeyman machinist

Ohio Plant Training 17 Apprentice Machinists

Returned servicemen offered 4-year course of shop work and classroom instruction. Receive apprentice rate of pay from company which, with government allowances, brings their income to level of journeymen machinists

AN INDUSTRIAL rehabilitation program for returned war veterans, inaugurated at the Mt. Vernon, O., plant of the Cooper-Bessemer Corp. last June, is now settling the postwar job future for 17 former members of the armed forces.

The initial trainee class of nine veterans who began studying to become journeymen machinists when the program was started has been expanded gradually, B. B. Williams, chairman of the company, declares, and additional veterans will be absorbed as soon as they become available and can qualify.

The Cooper-Bessemer program is being conducted with the co-operation of the Rehabilitation Division, Veterans Administration. The courses take four years to complete and call for 8232 hours of shop work and 768 hours of related classroom instruction.

As they complete the course, the veterans receive from the state a "certificate of completion" to give evidence that they qualify as full-fledged machinists and the company presents each man with a $100 bonus and offers him a job as a journeyman machinist. During the course the participants receive standard apprentice pay from Cooper-Bessemer in addition to their government allowances. The total is equivalent to a journeyman machinist's pay, thus enabling the trainee veteran to take his rightful place in the life of his community at the beginning of the training period.

"The Cooper-Bessemer program provides for the veteran who may have joined the armed services from high school, without previous job training; a physically disabled veteran unable to pursue his former occupation; or a veteran who may have been engaged in a type of work that does not give him special postwar qualifications," Mr. Williams asserted.

"Cooper-Bessemer, now totally engaged in producing diesels, gas engines and compressors for the Army, Navy, Maritime Services and critical industries, knows from experience that many workers available today are necessarily limited in the things they can do. Some have learned to operate only one machine or to complete only one operation. While this enables them to do their part in behalf of the war effort, greater versatility will be essential in the postwar industrial picture. It is this versatility that is provided for in the present veterans' program."

Inland Steel Launches Medical Program To Aid Veterans' Return to Health, Jobs

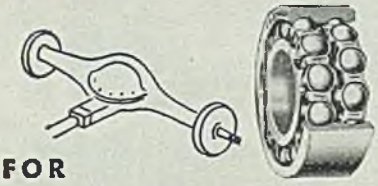
IN A pioneer program to help soldiers return to health and employment, physicians of Inland Steel Co., Chicago, have been provided with a complete analysis of tropical, Asiatic, and similar diseases to which a soldier might have been exposed but which may not affect him until he has re-entered civilian life.

Compiled by Dr. E. H. Carleton, medical director of the company, the list describes in detail the symptoms and after effects of 55 different ailments encountered in 207 regions throughout the world will be changed whenever new medical literature is issued.

"Most of the diseases rarely would be encountered by a physician in the course of ordinary practice," Dr. Carleton said. "A soldier's story of his travels and experiences may put the doctor on the trail of a hidden or latent disease, leading to observation for symptoms, laboratory examinations or quick treatment which often will cure the ailment or lessen its ravages. Some of the diseases won't show up for two or three years; the man himself may forget about it, but the doctor can pick up the trail."

Inland's program to detect and arrest inroads of tropical diseases is only part of a complete plan for re-employment and rehabilitation of returning veterans.

FOR A WORLD OF USES



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Combinations of Heavy Loads
Heavy Thrust (Either Direction)
Great Axial Rigidity

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DOUBLE ROW BEARINGS
Bore sizes:
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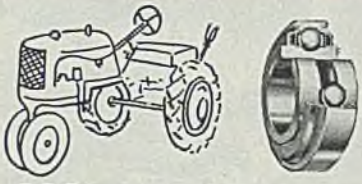

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A Permanent Seal
100% Effective Seal
Longer Bearing Life

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FAFNIR MECHANI-SEAL
TYPE BALL BEARINGS
Furnished with single seal, double seal, seal and shield combination and with provision for relubrication.

FOR

Non-Pulley End of electric motors.
Interchangeability of motor end-bells.
Elimination of lock nuts and washers.
Interchangeability with Double Row Bearings.

SELECT

FAFNIR EXTENDED
INNER RING TYPE BEARINGS
Bore sizes:
17 Mm to 140 Mm

FOR

Combinations of Light Loads
Weight and Space Saving
Easiest Installation
Positive Protection against dirt

SELECT

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PILLOW BLOCKS
For shaft diameters from 9/16" to 2 7/16".

When you reach a "Turning Point"... STOP!

The bearings that supported every rotary moving part in your pre-war models may be far down the line in comparison with developments in ball bearing design and in available self-contained units.

Post-war advances are not limited to mystery products like electronics, nor to the eye-appeal qualities of plastics. Performance is still a matter of the efficient operation of moving parts.

Because Fafnir has a greater variety of types of ball bearings, we are working with a correspondingly greater variety of manufacturers. A development in ball bearings for a textile machinery maker, for instance, may offer multiple benefits to you.

One of Fafnir's strengths lies in this better informed field engineering service. Use it. The Fafnir Bearing Company, New Britain, Conn.

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BALL BEARINGS

BUY MORE WAR BONDS AND STAMPS

By A. H. ALLEN Detroit Editor, STEEL

MIRRORS of MOTORDOM

Deterioration of automobile bodies is principal complaint developing from long-time ownership. Corrosion troubles may be of advantage to manufacturers' sales departments in post-war era. Many will trade every year or two

DETROIT

A PARTICULARLY interesting discussion presented at the recent Society of Automotive Engineers meeting here by John Oswald of General Motors dealt with the war-enforced long-time ownership of passenger cars on drivers who ordinarily trade in every two or three years for new models. Average age of cars is now estimated to be 7¼ years, providing a much better basis for the appraisal of durability of the product by original owners.

What are some of the difficulties now being experienced by such owners? For one, Mr. Oswald mentioned door keys which break off in locks, particularly when a little ice has lodged in the lock. Another—window regulators and door handles which become creaky and stiff with age. Most of the regulator units in use are stamped roughly out of flat-rolled steel and hurriedly assembled with plenty of grease. They are not precision products designed for long wear.

Age also exerts its toll on starting and ignition systems to the discomfiture of many owners. Bad wheel alignment and front wheel suspension geometry which has been disturbed by repeated impacts contribute in a major way to excessive tire wear. Crankshaft and connecting rod bearing life has been improved in engines built during recent years, but frequent cleaning and replacement of spark plugs is still an annoyance.

Deterioration of bodies, however, is the principal complaint developing from long-time ownership, according to Mr. Oswald, which checks squarely with the findings of newspaper automobile editors summarized here last week. Corrosion troubles—in body sills, rocker panels, lower edges of door panels, fender to body joint areas, window wells, drip moldings, around edges of luggage compartments, around tail and headlamps and on sheet steel below radiator grille—present a distinct challenge which car manufacturers could well determine to meet.

"Car manufacturers plugged all the holes and sealed all the joints to keep dust out of the car interiors and better please the car owners," says Mr. Oswald, "and apparently they did such a good job that moisture and water which collect is retained long enough to increase corrosion. Seldom does the industry get into trouble by trying to please the car owner, but in this instance such was the case."

Troubles May Become Assets

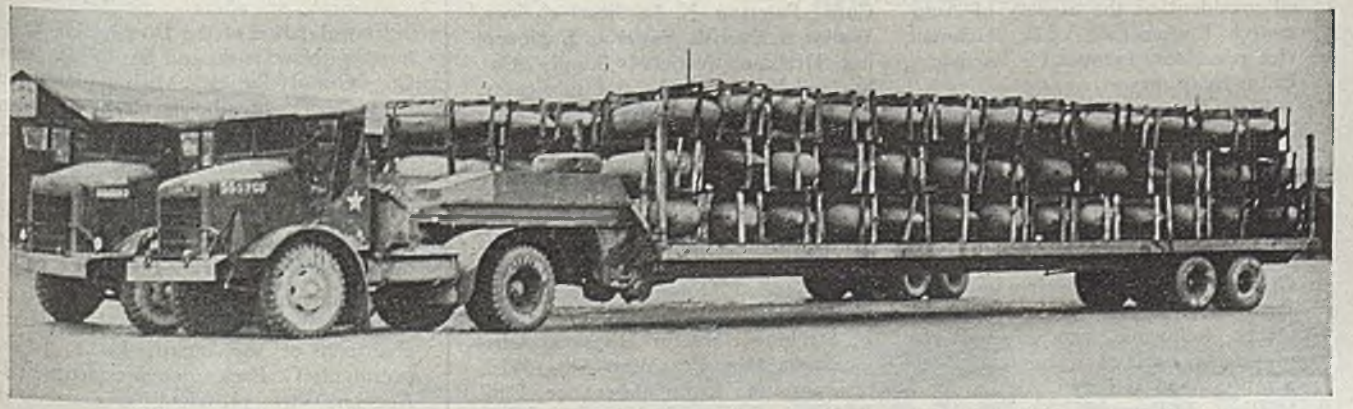
Some owners who have experienced bad rusting conditions blame it on the fact they have been forced to keep their cars too long. Such owners, in the period which follows the war, will be convinced more than ever of the wisdom of trading in every year or two. In this respect, current corrosion troubles may become an advantage to the manufacturers' sales departments. Of course, present owners may be somewhat perturbed when they find out how much rusted bodies subtract from trade-in values when new cars are offered for sale again. But, again quoting Mr. Oswald, it is an ill wind that does not blow someone some good and in certain localities especially there is going to be increased business for those boys who really are clever in the use of oxyacetylene torches, wiping solder and spray guns.

There is another aspect to this matter of long-time ownership which bears examination. Thousands of owners are discovering to their amazement that their cars are standing up beyond all expectations and where once these drivers observed a policy of trading in every two or three years, they may now be convinced it is more economical to retain their cars for seven or eight years. About the only way to correct this slowing down in automobile turnover—and a high turnover makes for the greatest annual volume of sales—is to obsolete each year's models so thoroughly and so rapidly that buyers will be persuaded to continue frequent trade-ins to keep up with style and performance characteristics.

Considerable mystery surrounded sudden restriction placed on an SAE paper written by C. F. Kettering, GM research chief, and dealing with the new super-fuel known as triptane. An almost identical paper was presented by Mr. Kettering last fall before the American Chemical Society, abstracted extensively in STEEL for Oct. 2. Why the same material was labeled as confidential "information affecting the national defense of the U. S." was not readily explained. There have been numerous discussions of triptane appearing in print, including a detailed discussion many months ago in *Fortune*. The new fuel, known specifically as 2,2,3-trimethyl butane, was originally produced at a cost of $35 a gallon, but later experiments have reduced this sharply, although it must still be classed as an experimental material.

Track Slack Compensator

Contributions of industry to ordnance tank-automotive engineering were summarized for the SAE by Col. J. M. Colby, chief, Development Division, Office of the Chief of Ordnance, Detroit. He referred to one particular mechanism developed for recent tank models which has not received much publicity; it is known as the track slack compensator. With high amplitude movement of road wheels, there is a tendency of the track to become slack when either the fore or aft wheels are fully raised. To overcome this tendency toward track slackness, a design was developed to provide linkages between the front wheels and sprockets, and between rear wheels and idlers. When the fore and aft wheels are raised, the idler or sprocket moves out to adjust



TRUCKLOAD OF BELLY TANKS: Auxiliary gasoline belly tanks are shown at a U. S. Army 9th Air Service Command depot before delivery to a fighter-bomber field. Auxiliary gasoline tanks enable fighter-bombers to escort bombers on long-range missions, an increasingly important factor in European and Pacific operations

for the slack in the track. Tests ultimately proved compensators at the forward end were sufficient.

Efficiency and advanced nature of German metallurgical practices were revealed from study of some captured Nazi equipment, according to a report delivered by Col. J. H. Frye, of the Ordnance Department, who prior to entering the service was active in the steel industry. Among a number of innovations noted in German fabricating practice, the most interesting was the use of hot pressing on castings of both ferrous and nonferrous metals. Hot pressing adds considerable to the soundness and homogeneity of such castings, and etched cross sections of aluminum, magnesium and steel attested the beneficial effects of this operation. The technique never has developed to any extent in this country.

Injection of water or water-alcohol mixtures as an internal coolant to eliminate detonation is one of the hottest subjects in the field of internal combustion engine design, forgetting perhaps the jet propulsion and gas turbine developments which seem to attract even more interest, but detailed discussion is restricted.

A. T. Colwell of Thompson Products Inc., Cleveland, presented a scholarly discussion of the water-alcohol injection phenomena, pointing out that it is an old art which has been revived because of successful use in aircraft engines, where it has provided remarkable bursts of power on takeoff and during flight. Virtually all aircraft engines now in production embody provision for injection. A 50-50 water-alcohol mixture appears to be the most economical fluid for best results, although 100 per cent alcohol is perfectly satisfactory.

Incorporating the injection device in the engine carburetor would eliminate an additional accessory, and Mr. Colwell was of the opinion this could be done. Best gains are realized when fuel of approximately 12 octane numbers lower than the engine requirement is used, indicating economies in fuel usage which might even cancel out the extra cost of the added fuel system.

Shell production in General Motors Corp. plants is being accelerated by many thousands of shells daily to meet expanding requirements of the armed forces.

Chevrolet Division has started a 105-millimeter program at St. Louis, Fisher Body Division has a 155-millimeter program under way at its Grand Rapids, Mich., Stamping Division plant, Oldsmobile Division is producing shells of various sizes at the plants in Janesville, Wis., Kansas City, Mo., and Lansing, Mich. Pontiac Division's 155-millimeter shell program has been operating since September. In addition to shell production by these four divisions, other General Motors divisions are producing shot, cartridge cases and shell parts and fuses.

STEEL Index Ready

The index to Volume 115, STEEL, *for the last six months of* 1944, *is ready for distribution. Copies will be sent to all subscribers requesting them.*

Maremont Co. Enters Farm Tool Manufacturing Field

Entry in the farm tool manufacturing field with a complete line of ground working elements including disks, sweeps, shovels, and teeth has been announced by Maremont Automotive Products Inc., Chicago, a leading manufacturer of automotive springs and mufflers.

J. Mader, implement engineer for the past 23 years for the S. L. Allen Co., Philadelphia, has joined the Maremont Co. as chief engineer of the Farm Tool Division, and William Stout, associated for the past 20 years with automotive, hardware, and farm equipment distribution, has been appointed sales and distribution manager of that division.

Storage Battery Industry Boosts Production in 1944

The industrial storage battery industry stepped up production in 1944 to approximately $70 million, an increase of $4 million over the previous year, M. W. Heinritz, vice president in charge of Philco Corp.'s storage battery division, Trenton, N. J., announced.

Present indications are that further increases in industrial battery production will be required until Germany is defeated, he said.

Transportation Equipment Companies Merged

ACF-Brill Motors Co., Philadelphia, is now carrying on all design, manufacture, and marketing of the types of vehicles previously handled by its two predecessor companies, the J. G. Brill Co., builder of trolley coaches and street cars, and the A. C. F. Motors Co., producer of motor coaches.

President and general manager of the company is R. R. Monroe, and purchasing agent is F. J. Larkins.

The Hall-Scott Motor Car Co., wholly-owned subsidiary of ACF-Brill Motors Co., will continue as exclusive supplier of engines for ACF-Brill motor buses. Servicing of all equipment and operation of all parts stations will be carried on by ACF-Brill Motors Co. under direction of L. M. DeTurk, service manager, except on the West Coast where Hall-Scott will continue to operate parts stations.

Consolidation of Doehler And Jarvis Firms Approved

Consolidation of the Doehler Die Casting Co., New York, and the W. B. Jarvis Co., Grand Rapids, Mich., under the name of Doehler-Jarvis Corp. has been approved by stockholders of both firms.

The board of directors of the Doehler-Jarvis Corp. will be made up initially of eight of the present directors of the Doehler Die Casting Co. and five of the directors of the W. B. Jarvis Co.

Management of the Doehler-Jarvis Corp. will consist of H. H. Doehler, chairman of the board; L. A. Jarvis, president; C. Pack, vice president; F. J. Koegler, vice president, treasurer and controller; D. H. Osborn, vice president and secretary; L. H. Pillion, vice president; A. G. Gutmueller and W. G. Gutmueller, vice presidents; and E. R. Zabriskie, vice president.

AUTOMOTIVE ENGINEERS NAME NEW OFFICERS

James M. Crawford, chief engineer, Chevrolet Division, General Motors Corp., Detroit, has been elected president of the Society of Automotive Engineers. B. B. Bachman, vice president, Autocar Co., Ardmore, Pa., is treasurer.

Elected to serve as members of the council for two years were: James C. Armer, vice president, Dominion Forge & Stamping Co. Ltd., Toronto, Ont.; Fred C. Patton, manager, Los Angeles Motor Coach Lines, Los Angeles; R. J. S. Pigott, chief engineer, Gulf Reserve & Development Co., Pittsburgh.

The following were elected vice presidents, each of whom will direct a professional activity: Air transport, William Littlewood, vice president, American Airlines, Jackson Heights, L. I., N. Y.; aircraft, J. L. Atwood, executive vice president, North American Aviation Inc., Inglewood, Calif.; aircraft engines, Raymond W. Young, chief engineer, Wright Aeronautical Corp., Paterson, N. J.; diesel engines, Walter A. Parrish, Superior Engineering Division, National Supply Co., Springfield, O.; fuels and lubricants, Macy O. Teetor, Perfect Circle Co., Hagerstown, Ind.; passenger cars, Alexander G. Herreshoff, Chrysler Corp., Detroit; passenger car bodies, Walter T. Fishleigh, consulting engineer, Detroit; production, Leroy V. Cram, Detroit Diesel Engine Division, General Motors Corp., Detroit; tractors and farm machinery, Walter F. Strehlow, Tractor Division, Allis-Chalmers Mfg. Co., West Allis, Wis.; transportation and maintenance, Emil P. Gohn, Atlantic Refining Co., Philadelphia; trucks and buses, Howard A. Flogaus, J. G. Brill Co., Philadelphia.

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When you need non-ferrous and stainless bolt and nut products the logical source—the natural source—is Harper.

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Harper specializes on non-ferrous and stainless bolts, nuts, screws, washers, rivets and accessories . . . is not concerned with common steel. The Harper engineering and manufacturing staffs are composed of men who have concentrated on the working properties and peculiarities of brass, copper, bronzes, Monel and stainless steel. Through long, practical experience, they have built up a vast fund of specialized "know how."

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The plant houses hundreds of machines, some standard some special . . . machines for heading, forging and threading huge fastenings and small . . . all engineered to do the best job on non-ferrous and stainless alloys.

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Harper maintains large stocks of a great variety of sizes and types of non-ferrous and stainless fastenings, many of which are considered "hard-to-get." The number and variety of stock items are being constantly enlarged.

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THEODORE H. DIEMER

Hans A. Eggerss, president, Container Co., Van Wert, O., wholly-owned subsidiary of Continental Can Co. Inc., New York, has been elected a director and vice president in charge of the Paper Container Division, Continental Can.

—o—

Fred McLean, manager of the Bethlehem-Alameda shipyard, has been appointed assistant to **W. M. Laughton**, general manager, Bethlehem Steel Shipbuilding Division, San Francisco. Mr. McLean is succeeded at Alameda, Calif., by **Thomas C. Ingersoll**, who will have **Robert D. White** as his assistant.

—o—

S. M. Nuttall, purchasing agent of Henry Vogt Machine Co., Louisville, Ky., retired Dec. 29 to look after his personal affairs. Mr. Nuttall, who is 73, started his business career in 1887 with the George H. Hull Co., pig iron merchants, and in 1890 he became associated with Dennis Long Pipe Foundry, leaving in September, 1913 to join the Henry Vogt Machine Co.

—o—

F. H. Craton has been appointed assistant manager of General Electric Co.'s Transportation divisions. For the present Mr. Craton continues his duties as manager of the Industrial Haulage Division.

—o—

Archibald J. Cooper has been appointed manager of the New York district office for Allis-Chalmers Mfg. Co., Milwaukee. Mr. Cooper succeeds **A. F. Rolf**, who now devotes full time to his duties as assistant secretary of the company.

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J. J. La Salvia, chief mechanical engineer, and **H. T. Borton**, chief structural engineer, Osborn Engineering Co., Cleveland, have been appointed to the board of directors.

—o—

Charles T. Zaoral has been appointed to co-ordinate the foreign operations of Bendix Aviation Corp., South Bend, Ind. Mr. Zaoral has been associated with General Motors Corp., Detroit, for the past 15 years, having been managing director of that corporation's wholly-owned foreign subsidiary, General Motors Suisse, S. A., Bienne, Switzerland, at the time the war brought an end to its operations. Recently he has been on special assignment for the GM Electro-Motive Division.

—o—

LeRoy A. Petersen, formerly executive vice president, Otis Elevator Co., New York, has been elected president to succeed the late Jesse H. Van Alstyne. **Edward A. Fitch**, vice president, has been elected to the board of directors.

—o—

Theodore H. Diemer has been appointed assistant superintendent of industrial relations at the Gary Sheet and Tin Mill of Carnegie-Illinois Steel Corp., Chicago. He succeeds **William P. Jones**, recently transferred to the company's Pittsburgh industrial relations department.

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Wesley L. Wilson has been appointed commercial manager, Quartz Crystal Division, North American Philips Co. Inc., New York. Mr. Wilson has been purchasing agent for the company since 1942.

—o—

Charles J. Black has been named sales manager for Oklahoma and the northern half of Texas for National Steel Products Co., Houston, Tex., and **Clyde M. Williams** is sales manager for Louisiana and the southern half of Texas. Mr. Black's headquarters are in Ft. Worth, Tex., and Mr. Williams will make his base in Houston.

—o—

Thomas B. Smith has been appointed to the newly-created post of welding engineer, Federal Shipbuilding & Dry Dock Co., Kearny, N. J., United States Steel Corp. subsidiary.

—o—

Monsanto Chemical Co., St. Louis, has announced promotion of the following sales staff members, Organic Chemicals Division: **R. F. Caulk**, manager, flavors and condiments sales; **I. J. Stanley Jr.**, manager, heavy chemicals sales; **G. W. Buhrman**, assistant manager, heavy chemicals sales; **A. P. Kroeger**, manager, intermediates chemicals sales; **R. B. Semple**, manager, petroleum chemicals sales; **C. W. Merrell**, manager, pharmaceuticals sales; **C. H. Sommer Jr.**, manager, plasticizers and resins sales; **H. C. Koehler**, manager, special products sales, and **H. F. Shattuck**, assistant manager, sales development. Mr. Semple succeeded **Arnold H. Smith**, now assistant director of the company's foreign department.

—o—

Ralph D. Haviland has joined Snyder Tool & Engineering Co., as head of the purchasing department. Mr. Haviland formerly was associated with the Ternstedt Division of General Motors Corp., Detroit.

—o—

Rae F. Bell, formerly first vice president, A. O. Smith Corp., Milwaukee, has been elected board chairman, to succeed the late L. R. Smith. **Anthony von Wening**, who joined the A. O. Smith Corp. in 1940, has been elected vice president and controller.

—o—

T. F. Rahilly has been appointed vice president and general manager, Toronto Iron Works Ltd., Toronto, succeeding **Alexander Dawson**, who has retired but remains a company director. Mr. Rahilly also has been elected a director. For the past year he has been adviser to the steel controller of Canada, and previously he was vice president and general manager, Algoma Steel Corp. Ltd., Sault Ste. Marie, Ont.

—o—

Clarence A. Thumm, since 1929 exclusive dealer in the Washington and Baltimore areas for Cincinnati Milling Machine Co. and Cincinnati Grinders Inc., Cincinnati, retired from active agency business Dec. 31.

—o—

Charles C. Bray has been appointed assistant to the manager, Worm Gear Division, De Laval Steam Turbine Co., Trenton, N. J. Prior to this appointment Mr. Bray served as metallurgist for the special steel department, Philadelphia office, Joseph T. Ryerson & Son Inc.,

WALTER W. BERTRAM

Who has been elected vice president in charge of sales, Morse Chain Co., Ithaca, N. Y., reported in STEEL, Jan. 15, p. 64.

Chicago. For ten years he had served as a sales engineer for De Laval.

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K. C. Gardner, president, United Engineering & Foundry Co., Pittsburgh, and **A. J. McFarland**, president, Wheeling Steel Corp., Wheeling, W. Va., have been elected directors of the First National Bank at Pittsburgh.

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W. S. O'Connor has been named district sales manager for the New York office of United States Gauge Co., Sellersville, Pa.

—o—

C. A. Woodley has been promoted to assistant general factory manager, Caterpillar Tractor Co., Peoria, Ill., and **William Naumann** succeeds him as factory manager.

—o—

Jeffrey S. Granger, partner in Sulzbacher, Granger & Co., security dealers, has been elected board chairman of Harvill Corp., Los Angeles, succeeding **J. F. McNamara**, resigned. **W. E. Sprackling**, vice president, Anaconda Wire & Cable Co., New York, and **Allan Burleigh**, president, Harvill Processes Corp., have been elected directors of Harvill Corp.

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J. M. Record has been named district manager for Lake Shore Engineering Co., Iron Mountain, Mich., in charge of new sales offices in the Union Commerce building, Cleveland.

—o—

Alexander Gobus, chief metallurgist, Sam Tour & Co. Inc., New York, and **Charles Davidoff**, chemical engineer, have been elected vice presidents. **Dr. E. I. Valyi**, formerly vice president, and **Fred J. Tobias**, formerly production engineer, are no longer associated with the company.

—o—

H. F. Henriques has been named general sales manager, Air Reduction Co., New York, **J. J. Lincoln** has been appointed director of sales services, and

LEWIS M. PARSONS

Who has been appointed assistant to vice president-sales, United States Steel Corp., Pittsburgh, noted in STEEL, Jan. 15, p. 65.

A. P. HASCALL

JOSEPH PFEIFFER

N. M. SALKOVER

C. M. Bloodgood has been appointed assistant to the vice president in charge of sales. **H. P. Etter** has become sales manager of the company's Pacific Coast Division, with offices in the Mills Tower building, San Francisco.

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A. P. Hascall has been named director of purchases, Chrysler Corp., Detroit, and **Joseph Pfeiffer** succeeds him as general purchasing agent. **E. L. Reason**, assistant general purchasing agent for the past 20 years, has resigned.

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E. S. Holden, formerly associated with Jones & Laughlin Steel Corp., Pittsburgh, as manager of the Denver sales office, has become associated with **Donald G. Crowell** as partner in Rufus Crowell & Co., Cambridge, Mass.

—o—

Arthur Tuckerman has been appointed assistant to **Charles J. Hardy Jr.**, vice president, American Car & Foundry Co., New York. He will assist Mr. Hardy in the field of public relations.

—o—

Dr. R. C. Benner, for the past 18 years director of research, Carborundum Co., Niagara Falls, N. Y., has announced his retirement as of Jan. 1. After a brief rest Dr. Benner plans to do consulting research work.

—o—

Robert Bland has been named assistant advertising manager, Perfect Circle Co., Hagerstown, Ind., and **A. Hindman** has been named supervisor of advertising production to succeed Mr. Bland.

—o—

Col. George C. Hale, with the Army Air Forces since 1942 as communications equipment engineer, has joined Emerson Radio & Phonograph Corp. as director of Special Products Division.

—o—

Frederick C. Crawford, president, Thompson Products Inc., Cleveland, has been elected president of the Automotive and Aviation Parts Manufacturers Inc. **John Airey**, president, King-Seeley Corp., Ann Arbor, Mich., was elected a vice president of the association, and **J. L. Myers**, executive vice president, Cleveland Graphite Bronze Co., was elected secretary-treasurer. Four new directors are: **Walter Rockwell**, president, Timken-Detroit Axle Co., Detroit; **W. A. Baker**, president, Firestone Steel Products Co., Akron, O.; **D. H. Kelly**, executive vice president, Electric Auto-Lite Co., Toledo, and **George Kennedy**, president, Kelsey-Hayes Wheel Co., Detroit.

—o—

N. M. Salkover, for the past 20 years vice president and general manager of Queen City Steel Treating Co., and also vice president, Cincinnati Mine Machinery Co., both of Cincinnati, has sold his interests in those corporations in order to devote his entire time to Salkover Metal Processing Co. which he organized in 1941. Mr. Salkover will direct the Salkover plants from his newly opened offices in the Dixie Terminal building, Cincinnati.

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G. F. Gerhauser has been named chief tool engineer at the San Diego Division of Consolidated Vultee Aircraft Corp., succeeding **E. P. Myers**, resigned.

—o—

Gene Franke has been named director of advertising and public relations, Aireon Mfg. Co., Glendale, Calif.

—o—

E. H. Farrell, former regional chief of the Machine Tool Division, WPB, has been named sales manager, Hasco Machinery Co., Newark, N. J.

—o—

Charles R. Matthews has been named manager of the northern California district of Westinghouse Electric Supply Co., New York, and will make his headquarters in San Francisco. Since February, 1943 Mr. Matthews has been manager of the company's marine department.

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Ethel Serfas Klingman has been appointed assistant manager of advertising, Pennsylvania Salt Mfg. Co., Philadelphia.

—o—

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has announced the following personnel changes: **Norman C. Hurd** is acting manager of the Cincinnati Manufacturing and Repair de-

partment; **Miss Beryle Priest** has joined the illuminating engineering department of the Lamp Division, Bloomfield, N. J., and **Elliott R. Vinson** has been appointed electronic tube specialist for the Pacific Coast district, with headquarters in San Francisco.

—o—

Earl L. Wiseman, manager of the Ventilator Division, Swartwout Co., Cleveland, has been named a vice president. **Royal L. Meyer** has been appointed chief engineer and assistant manager of the Steam Division. Until recently Mr. Meyer was a partner of Vern E. Alden, Chicago, consulting engineer.

—o—

Mark Price has been elected vice president and a director, Aircraft Nut Corp., Cleveland.

—o—

Glen McDowell has been made assistant to the vice president, Aetna-Standard Engineering Co., Youngstown, O.

R. J. HERBENAR

Who has joined the Craine-Schrage Steel Division of Detroit Steel Corp., Detroit, as chief metallurgist, as mentioned in STEEL, Jan. 15, p. 66.

JOHN M. OLIN

Who has become president of Olin Industries Inc., East Alton, Ill., as announced in STEEL, Jan. 15, p. 65.

OBITUARIES . . .

John Hinkens, 72, president, Omaha Semi-Steel Foundry Co., Omaha, Neb., which company he established 23 years ago, and vice president, Butler Street Foundry & Iron Co., Chicago, died in Omaha Jan. 8.

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Martin R. Carpenter, 74, inventor, engineer and pioneer in the refrigerating industry, died Jan. 13 in Cleveland. He formerly was chief engineer for Brunswick Ice Machine Co., New Brunswick, N. J., and the Triumph Ice Machine Co., Cincinnati.

—o—

Charles T. Winegar, 66, personnel director, Chrysler Corp., Detroit, died Jan. 13 in Grosse Pointe, Mich. Mr. Winegar joined Dodge Bros. in 1915, and when that firm merged with Chrysler in 1929 he was named personnel director.

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Charles E. Brown, 78, executive vice president, Okonite Co. and its Hazard Insulated Wire Works Division, Chicago, and vice president, Okonite-Callender Cable Co., Chicago, died Jan. 13 in that city.

—o—

William H. Parker, 61, superintendent No. 3 plant, Continental Foundry & Machine Co., East Chicago, Ind., died Jan. 10. Previously he was with American Steel Foundries, East Chicago, Ind., 42 years.

—o—

Thomas Gresham, 77, president, Richmond Structural Steel Co., Richmond, Va., died there Jan. 14.

—o—

Howard S. Welch, 51, export sales manager, Sperry Gyroscope Co., New York, died Jan. 11 in Montreal of injuries suffered in an automobile accident. Formerly Mr. Welch was export manager of Studebaker Co., South Bend, Ind.; president, Studebaker-Pierce Arrow Export Corp.; chief of the Automotive-Aeronautics Trade Division, Bureau of Foreign and Domestic Commerce; vice president and general manager, Bendix Aviation Export Corp., New York, and president of Eisenmann Magneto Corp. and Airward Corp.

—o—

Charles W. Appleton, 70, retired vice president, General Electric Co., Schenectady, N. Y., and a former assistant district attorney and magistrate of New York city, died Jan. 10 in Greenwich, Conn. As GE vice president Mr. Appleton had been in charge of general relations with public utilities.

—o—

Morgan T. Williams, 70, managing director, Bond Foundry & Machine Co., Manheim, Pa., for 39 years, and vice president, Bond Engineering Works Ltd., Toronto, died Jan. 2 in Manheim.

—o—

Seymour Austin Potter, 65, veteran steel salesman in Cleveland, died there Jan. 11. Mr. Potter began his sales career more than 40 years ago with Bourne-Fuller Co., now a part of Republic Steel Corp. For the past eight years he has been associated with the sales department of United States Steel Supply Co., United States Steel Corp. subsidiary.

—o—

Andrew F. Schubert, 58, for the past 25 years superintendent of the Bovaird & Seyfang Co., now a division of Dresser Industries Inc., Cleveland, died recently in Bradford, Pa.

—o—

James B. Bennett, 75, who retired 12 years ago as a machine inspector for General Electric Co., Bloomfield, N. J., died Jan. 12 in East Orange, N. J.

—o—

Clarence E. Bilton, 70, a former sales engineer for E. W. Bliss Co., Brooklyn, N. Y., died Jan. 10 in Morris Plains, N. J. During World War I Mr. Bilton was president of the Manufacturers Association of Bridgeport, Conn., where he operated a machinery manufacturing plant. He retired in 1943.

—o—

U. S. Rogers, 79, for many years identified with the Jacobson Machine Co., Warren Gear Products Co. and the Cable Agency, died Jan. 10 in Warren, Pa.

—o—

William T. Angus, 54, for a number of years treasurer of National Smelting Co., Cleveland, died there Jan. 16.

—o—

Orville Kirk Dyer, 65, manager of the small-blowers department of Buffalo Forge Co., Buffalo, died there Jan. 4.

—o—

Benton S. Hopkins, an inspector at Warner & Swasey Co., Cleveland, and former advertising manager, H. K. Ferguson Co., Cleveland, died Jan. 12 in that city.

—o—

C. W. Heppenstall, 72, chairman, Heppenstall Co., Pittsburgh, died recently. Associated with the company for 51 years, Mr. Heppenstall has been successively since 1898 superintendent, general manager, president and board chairman.

—o—

J. Bernard McCabe, 54, for six years sales engineer, North American Refractories Co., Cleveland, died Jan. 10 in that city.

—o—

Henry L. Ebsen, 76, chief engineer for 50 years of W. & A. Fletcher Co., shipbuilder in Hoboken, N. J., died Jan. 11 in Englewood, N. J.

—o—

Abe Zaltsberg, partner in the steel brokerage of Levy & Zaltsberg, Kokomo, Ind., died recently in that city.

—o—

Oliver J. Hall, 57, for the past 17 years vice president, Harshaw Chemical Co., Cleveland, died there Jan. 11.

Kaiser Plants Awarded Large Shell Orders

Projectiles being produced at Fontana with finishing at Denver works. About 700 tons of steel will be used daily

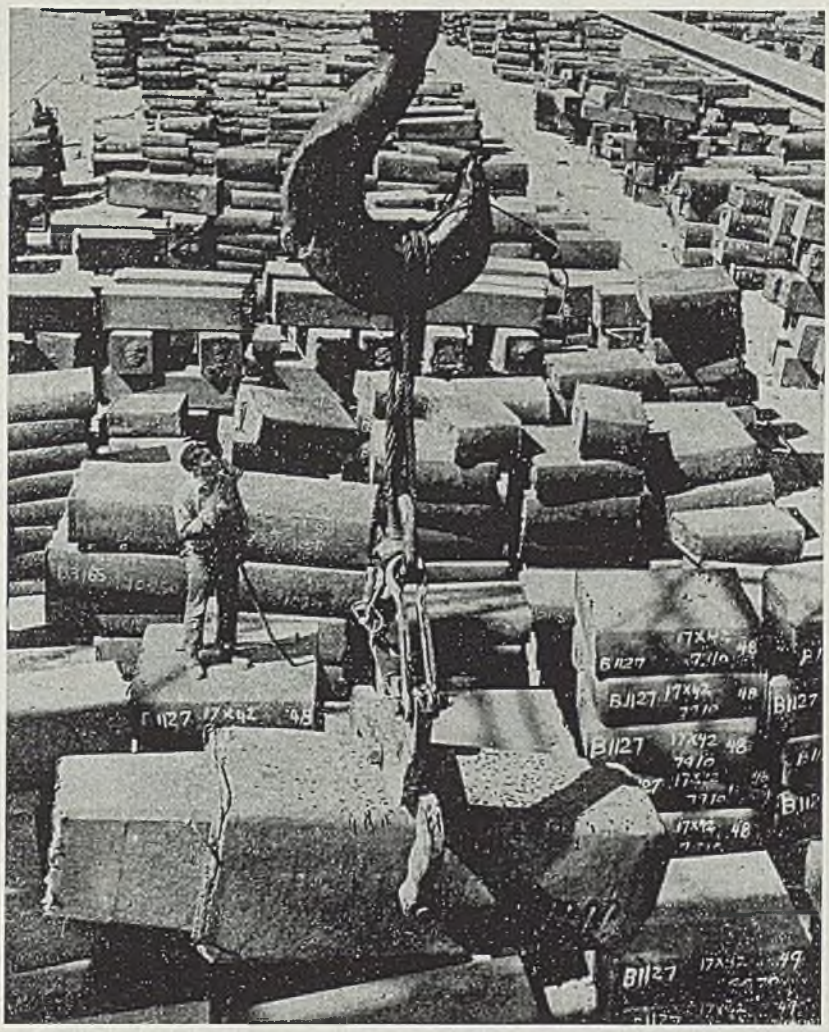
SAN FRANCISCO

RECENT expansion of ordnance operations in the Far West has focussed attention on this vital phase of the war production effort.

The tremendously rapid increase in production of projectiles was given a further boost when the San Francisco Army Ordnance District announced that Kaiser Industries Inc., had been awarded a $3,500,000 order for 90-millimeter shells in addition to contracts for 90- millimeter and 8-inch shells. The new contract will be handled at Kaiser's Denver plant. The larger size shells already are being produced at the Fontana plant in California in connection with the Fontana steel mill, and finishing work is being done at Denver.

Capacity production of the heavy artillery projectile plant at Fontana will be "far greater" than the known production of any other 155-millimeter shell plant in the world, according to Kaiser officials and military authorities.

Output figures of the plant, which is expected to be in full operation by the middle of February, cannot be revealed, but it is said that approximately 700 tons of steel from the Fontana steel mill will be used daily.



WESTERN STEEL: Ingots and slabs from the open hearths of Henry Kaiser's Fontana, Calif., steel mill are shown above being stacked, to await rolling into ship plates. Acme photo

Shell Plant Starts Operating

Construction of the shell plant at Fontana began about four months ago and now is nearing completion. Production operations have been started and a comparatively small output of shells has been attained in the last two months.

The plant's major bottleneck is the shortage of manpower and "green" help which must be trained in the "exact" work required. Company officials say another 500 workers, about half of them women, must be recruited to achieve maximum production of the projectiles. Present employment figures show about 1000 men and 400 women in the plant, working three shifts, six days a week. The Army also has assigned 60 experienced shell makers to the plant for 60 days to train personnel, many of whom have had no experience in shell making whatsoever.

To help relieve a serious housing shortage in the area, 200 units are being constructed to accommodate at least a part of the workers.

While the Kaiser plants are busy on war work, executives of the company are turning a worried eye to postwar prospects.

Discussing the outlook, Henry J. Kaiser Jr., vice president and manager of the Kaiser Industries' shell plants, said "we want very much to continue the postwar steel industry in the West, but we realize the capital structure of $100 million of this wartime constructed plant is too high." Mr. Kaiser indicated that war property disposal policy of the federal government largely will determine whether Kaiser Co. Inc., will operate its steel plant at Fontana after the war.

The plant, built with funds from the Reconstruction Finance Corp. and a "sizable chunk" of Kaiser money, will not be directly disposed of by the Surplus Properties Board. However, the policy taken by the board in disposing of other war plants is expected to largely influence the RFC on possible scaling down of the amount owed by the Kaiser interests after war production is completed. It is indicated that the plant cost about 25 per cent more than it would under normal conditions.

Notwithstanding present uncertainties, the company is going ahead with postwar planning on the assumption that the steel mill will become a permanent basic industry of Southern California. Among the plans under consideration are a housing project for company employes on nearby land where the "factory on the farm" idea could be carried out. It is probable that the housing units will be constructed of steel.

While these postwar problems remain to be solved, the Kaiser shipyards are experiencing a shift in operations to meet changing conditions of war. At the Richmond, Calif., yards, the transition from shipbuilding to ship repair and other work has begun.

"Shifts in wartime requirements," said Henry J. Kaiser, "have necessitated this change in the utilization of these Richmond facilities. Yards 1 and 2 have yet to build and deliver, under existing contracts, 96 ships.

"In addition to its current contract for C-4s, which will continue throughout 1945, Yard 3 also will take on very shortly an additional program of major ship repair."

Earlier purchasing by aircraft industry urged by Aircraft Scheduling Unit. Many materials and supplies have become critically short. Buyers accustomed to 30-day deliveries will have to allow 90 to 120 days for many items

CHANGES taking place in the supply of aircraft materials and components present a grave threat to maintenance of aircraft production schedules, unless purchasing procedures of the aircraft industry are altered to meet these changes, according to the Aircraft Scheduling Unit of the Aircraft Resources Control Office, Wright Field, O.

Expressing grave concern over critical shortages of aircraft materials and components caused by late ordering, officials pointed out that an over-cautious buying attitude on the part of some manufacturers in the industry does not take into account the rapid depletion of usable surplus material currently taking place.

Failure to meet aircraft schedules has rarely been traceable to the lack of aircraft materials or components. Credit for the establishment of this record belongs to contractor personnel, the co-operation and resourcefulness of the suppliers and producers of component parts, and the efforts of the services.

However, this record is now in danger, it is stated. The Aircraft Scheduling Unit reports an alarming increase in critical shortages of aircraft materials, caused largely by late ordering. In the past, orders placed late have been successfully filled by checking the surplus register of aircraft materials and components, by "horse trading" between users of the critical materials, by the issuance of a directive or a higher rating, and by substitution. However, under present conditions, these methods of filling late orders are becoming ineffective.

Col. E. W. Rawlings, administrator of the Aircraft Scheduling Unit, says the aircraft industry has made a determined and successful effort to use surplus aircraft material in production, while there is still a need for such material. "As a result," Colonel Rawlings says, "the usable surplus material is being rapidly depleted. A great many orders which have been filled in the past within 30 days because the material was available in surplus, will now require from 90 to 120 days to fill, since usable surpluses will no longer exist in the near future. Actual time will vary with the respective material or component, but this is the general picture."

The aircraft industry must take cognizance of this change, and adjust its purchase procedure accordingly, Colonel Rawlings says.

Ordering with Proper Flow Time

"Early ordering is the best insurance against critical shortages increasing on the production lines," he says. "In the critical months just ahead, placing with full consideration of the flow time cycle will mean the difference in many cases between prompt deliveries and failure to meet schedules. The Aircraft Scheduling Unit has just issued directive 41.1 on this subject of orders and deliveries, and it is made quite clear that the policy of ordering with proper flow time is entirely consistent with inventory regulations and will be taken into account in settlements for termination inventories."

In addition to depletion of surpluses, the reduction of inventories by the aircraft industry has greatly reduced the possibility of filling late orders by the "horse trading" procedure. While the advantages of a lower inventory position to both manufacturers and the services are recognized, the combination of shorter commitments and reduced inventories make late ordering increasingly less dependable.

Purchasing agents accustomed to 30-day delivery of supplies will have to adjust their buying habits and allow for 90 to 120 days for delivery. Many suppliers, especially "B" producers, are reducing their stocks of materials and parts to the level of "orders actually received." When the stocks of materials and parts are so reduced, the flow time will inevitably be increased by the additional time taken to procure raw materials.

The continuation of factors resulting in the present supply situation will make late orders increasingly difficult to fill in future months. Colonel Rawlings points out that already certain aircraft materials and components are in an extremely short supply position, and others will undoubtedly be added in the critical months ahead. He specifically outlined the present position in five important categories:

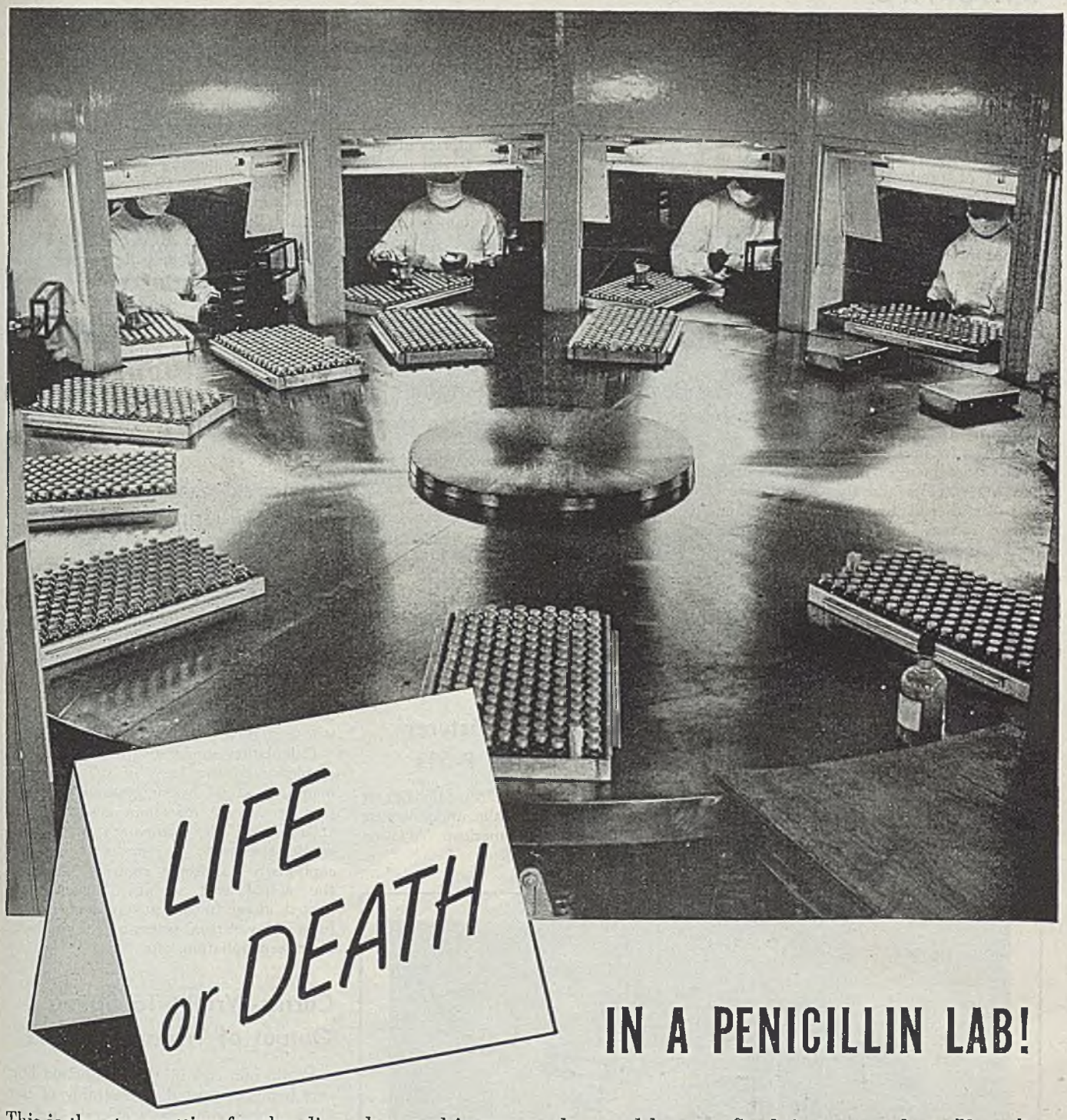
Steel Tubing—The supply situation in heavy wall tubing and all stainless steel tubing, especially ½ inch and smaller, is more critical now than at any time since 1942, with surplus practically nonexistent. The minimum flow time on this critical tubing is 120 to 150 days, and the only answer is to place orders early, allowing the mills the necessary time to make delivery. In general steel commodities, the supply situation is becoming progressively tighter, with little prospect for relief in the near future.

Aluminum Sheet—Extremely heavy order loads have been placed on the aluminum producers for the first quarter. It is apparent that a large percentage of this load cannot be produced during this period. The Aircraft Scheduling Unit and WPB is screening this order load thoroughly to eliminate or postpone all orders for material required for products that are not of the highest urgency. While the placing of advance orders is necessary to allow efficient planning to handle future loads, only the absolute minimum requirements necessary to maintain production should be placed on the mills. Orders required solely for the purpose of building up inventories will jeopardize production requirements and therefore cannot be manufactured.

Brass Mill Products, Copper Wire—The sudden expansion of small arms ammunition production has increased the load on brass mills for strip production, and this congestion of alloy melt facilities will obviously increase the lead time necessary in the procurement of all brass mill products. The following minimum lead times should be used in placing orders for the specified products:

Copper-alloy rod	100-130 days
Brass mill copper products	60-90 days

JET-PROPELLED HELICOPTER: The usual auxiliary rotor fixed at the tail of orthodox helicopters is omitted in this jet-propelled and jet-steered "Helicospeeder" invented by Antoine Gazda. More speed, weight-carrying capacity, stability and controllability are claimed for the craft. NEA photo



IN A PENICILLIN LAB!

This is the stage-setting for the climactic moment in a penicillin laboratory. White-robed, rubber-gloved and masked technicians work swiftly at a turntable. They are capping sterilized vials containing powder refined from this magic new life-saving mold.

Germs on the loose here might mean the difference between life and death for thousands of hopeful patients. Every precaution is taken. One of these is the turntable, made of ARMCO Stainless Steel. This rustless steel is easy to clean and keep clean. The dense, smooth, polished surface won't let harmful bacteria get a toe-hold. And there is no danger of rust particles forming on the surface.

Like many manufacturers in the food and drug industries, this maker of penicillin selected stainless steel for important processing equipment. It measured up to all requirements—and more.

There is a good chance you can profit by using ARMCO Stainless Steels in your products. If you have something in mind, we'd like to discuss the possibilities with you. Just write to The American Rolling Mill Company, 291 Curtis St., Middletown, Ohio.

EXPORT: THE ARMCO INTERNATIONAL CORPORATION

STAINLESS ARMCO STEEL

THE AMERICAN ROLLING MILL COMPANY

Alloy sheet and strip . . . 100-130 days
Other brass mill . . . . . 75-100 days
Electrical cable . . . . . 100-120 days

These orders can usually be canceled without a cancellation charge, it is pointed out, if the material is not in process of production, and material is seldom processed more than 30 days before shipment is required. This justifies the placement of orders calling for deliveries in accordance with monthly contractual requirements for an entire year, or for the life of a contract, or for lesser periods, possibly not less than 6 months. Placement of long term orders is urged.

Electrical Products—Circuit breakers fractional horsepower motors, relays and switches are also in a critically short supply position. Surpluses of these products are negligible, and producers are reducing raw material inventories to the level of orders received. It is expected that the services and the War Production Board will be reluctant to issue higher ratings and directives, as this would accentuate the already large backlog, and it is clear, therefore, that in many instances, later orders will not be filled. The following minimum lead times should be used by contractors in placing orders:

Fractional horsepower motors . . . . . 180 days
Circuit breakers . . . . . 110-140 days
Relays . . . . . 120-180 days
Switches . . . . . 80-110 days

Antifriction Bearings—The bearing industry reports that requests for shipment of antifriction bearings for the first quarter of 1945 total only 40 per cent of actual shipments made in the previous three months. These new orders are far below the stated requirements of the military services. Bearing manufacturers are reducing schedules, not replacing employes who leave, and reducing raw material inventories in line with decreased demands. It will not be possible to alleviate a serious bearing shortage by diverting shipments of spares from the services to production needs, as was done 18 months ago, as spares requirements are still at a minimum. Contractors must base procurement of antifriction bearings on a five to six months lead time if the aircraft production program is to be accomplished.

Reveal P-51 Can Attain Speed of 450 Miles an Hour

Secrecy surrounding the world's fastest propeller-driven airplane was lifted a bit more when the War Department permitted North American Aviation Inc., Inglewood, Calif., to reveal a speed of 450 miles an hour for its P-51 Mustang fighter.

Holder of the transcontinental speed record, the single-seat Mustang rates high in ceiling and range, with a publishable altitude of more than 40,000 feet and range of 2000 miles.

Australian Manufacturer Licensed To Build P-51s

Production of the P-51 Mustang fighter will be started in Australia under license granted by North American Aviation Inc., Inglewood, Calif.

Complete sets of component parts, subassemblies and accessories have been provided under the licensing arrangement enabling Australia to build its own speedy fighter planes for the war against Japan.

The material, along with detailed drawings and engineering photographs, has been furnished the Commonwealth Aircraft Corp. of Melbourne in accordance with the licensing terms worked out with the Commonwealth of Australia.

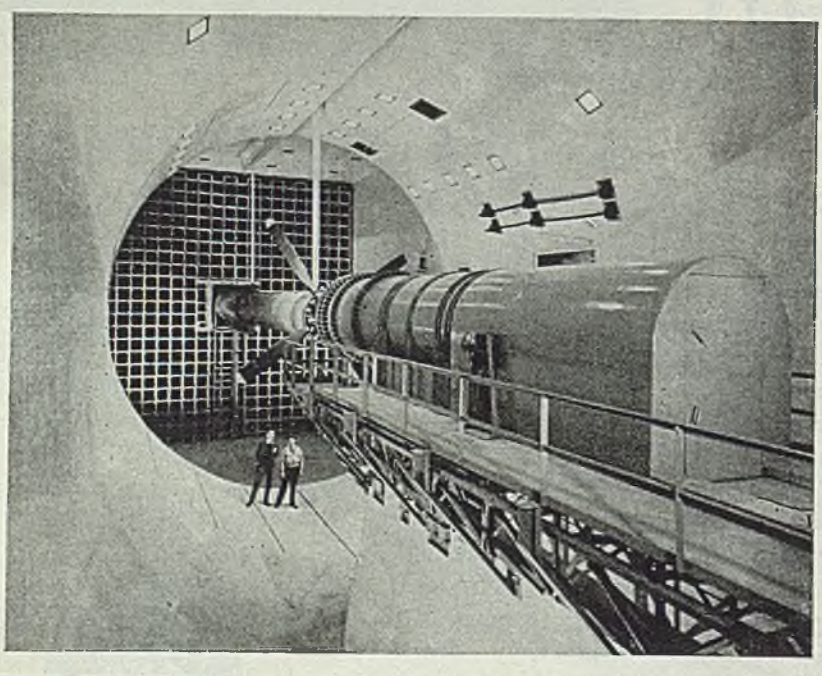
The company already is building, under license, North American's AT-6 Texan combat trainer, known as the Wirraway to Australian flyers. Australia is one of 28 nations using the famed trainer, which also is produced under license in Canada and Brazil.

The Mustang was used by the U. S. Army Air Force to establish a new transcontinental speed record last May.

Employes' Suggestions Save 16 Million Hours

Suggestions made by employes of Consolidated Vultee Aircraft Corp. to speed production saved the equivalent of 16,000,000 man-hours in 1944. Figures compiled from Convair's 13 divisions reveal that of 31,000 proposals submitted by employes, 8500 were adopted for use throughout the plants. Awards of $110,520 were given to the 3800 employes whose suggestions were accepted.

Calculation shows award payments to employes on the basis of 0.7 cent per man-hour saved by suggestions, and assuming average man-hour cost of labor at about $1 the company's investment would appear to be productive of exceptionally handsome returns. Much of the actual cost savings, however, is passed along to the government in the form of lower fixed prices on the product, taxes, renegotiation, etc.



TESTS 5000-HP ENGINES: Now devoted entirely to research projects to aid war production, this huge test cell will accommodate propellers up to 30 feet in length with engines up to 5000 horsepower, at Curtiss-Wright Corp.'s Propeller Division at Caldwell, N. J.

Curtiss-Wright To Speed Output of Transport Plane

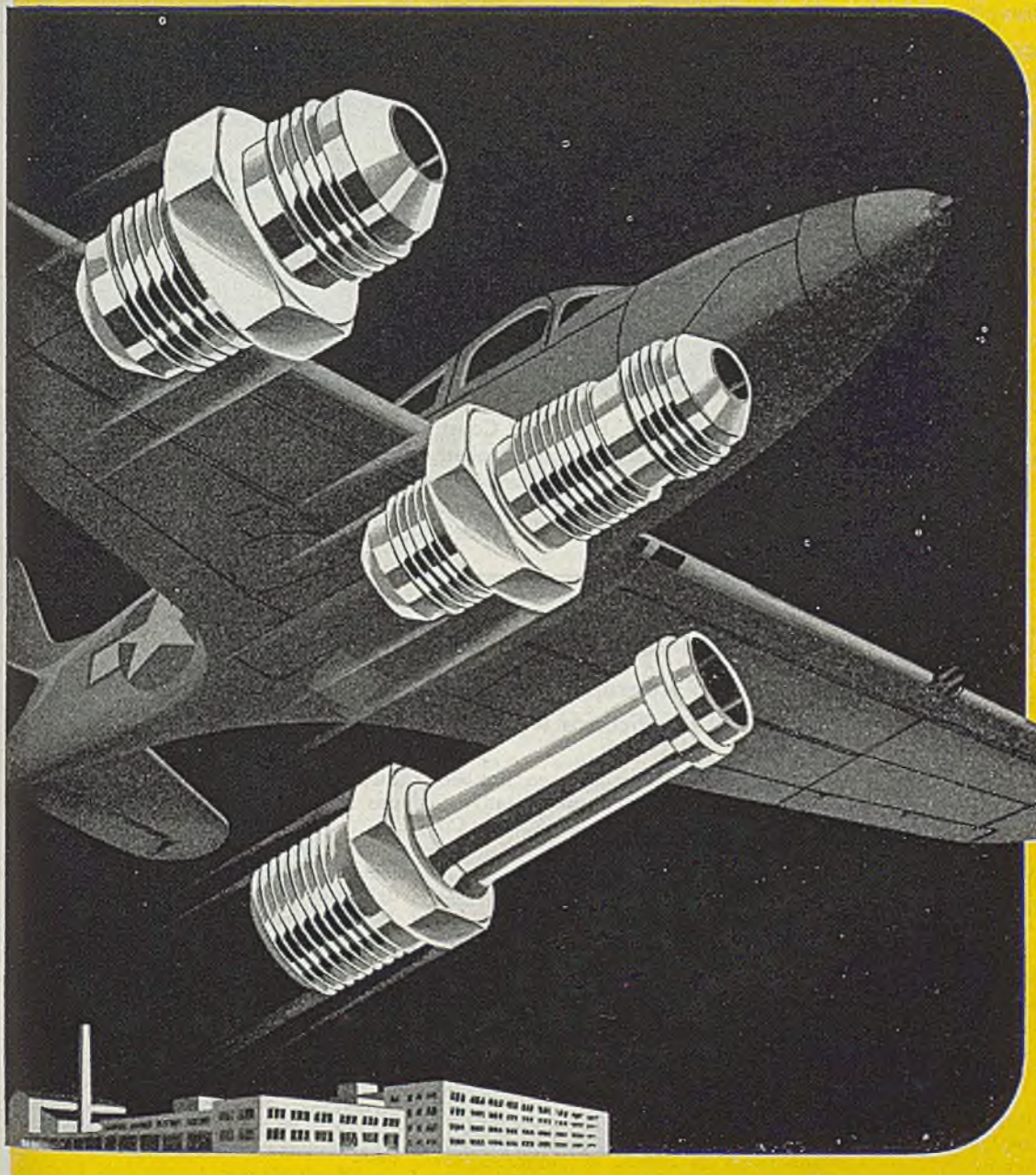
While one end of the production line was being converted to assembly of the C-46 Commando to accelerate output of the twin-engined Army Transport planes, the last P-40 built by Curtiss-Wright Corp. Airplane Division rolled off the other end at the Buffalo plant and was turned over to the AAF, recently.

This followed disclosure by Curtiss some time ago that total deliveries of P-40 fighters to the Allied air forces since the outbreak of World War II had exceeded 15,000.

A company spokesman emphasized that the plant space heretofore devoted to P-40 assembly will be utilized to expedite delivery of Commandos.

More C-46s are being produced than any other troop and cargo-carrying airplane, the company said, and four Curtiss plants are engaged in this line—two in Buffalo and one each at St. Louis and Louisville.

Improved AVIATION FITTINGS



In addition to a complete line of fittings, Weatherhead makes valves, industrial hose, hydraulic cylinders and other parts for these industries:

AUTOMOTIVE
★
REFRIGERATION
★
RAILROAD
★
MARINE
★
FARM EQUIPMENT
★
ROAD MACHINERY

DIESEL
★
L. P. GAS
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APPLIANCE MANUFACTURERS

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So tremendous have been the wartime productive capacities of the four Weatherhead plants that we now have available for *immediate delivery* the greatest assortment of *improved* A-N Fittings of all types and sizes that we have ever been able to offer during our long experience in the aviation field. Take advantage of this situation by writing for our newest Surplus AN Stock Catalog today.

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New Stainless Steel Predicted For Aircraft Use

One application would be substitution for duralumin; other uses would be in gas turbines and jet propelled planes

BELIEF that a new type of stainless steel which can be substituted for duralumin in aircraft will be perfected soon was expressed by A. L. Feild, director, Research Division, Rustless Iron & Steel Corp., Baltimore, in an address before the Muncie chapter of the American Society for Metals recently at Anderson, Ind.

This particular structural use of stainless steel must await full development of a precipitation-hardening type which can be readily formed and then hardened by heating to relatively low temperatures, but such a commercially accepted alloy is reasonably close to realization, Mr. Feild said.

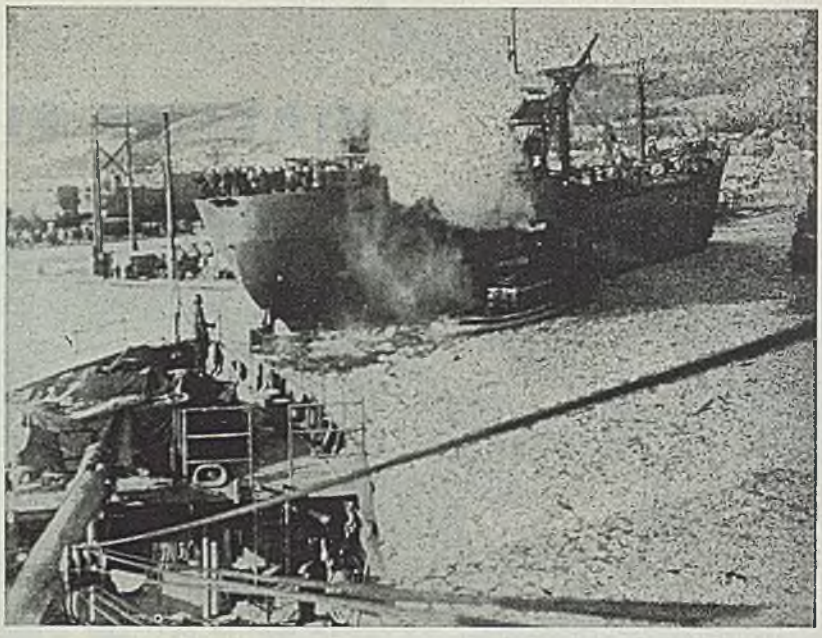
"The volume of research in stainless steel metallurgy is far greater today than ever before in the history of the industry, and while such researches now are almost entirely given over to war problems the results will be adapted to the peacetime economy very quickly after victory," Mr. Feild stated. "Looking further ahead, if there should be another world war there is every indication that the importance of stainless steel in such a struggle would be far greater than it is today.

An Essential War Material

"Stainless steel is an essential war material and since 1941 the entire production of stainless steel has been allocated to Army, Navy, Maritime, and Lend-Lease requirements. In hundreds of different applications stainless steel is specified where the conditions of service are so extreme with respect to temperature or corrosion that other available metals quickly would be destroyed or rendered useless. Many of these uses occur in the construction of aircraft.

"One of the most interesting aircraft applications is in the construction of the turbo supercharger, which draws in the rarefied atmosphere of the sub-stratosphere, compresses it and delivers it to the engines. Operating temperatures within the turbo supercharger may be as high as 1500 degrees Fahr., while that of the surrounding atmosphere may be —40 degrees Fahr. or lower.

"Other interesting applications of stainless steel lie in the field of gas turbines and jet propelled planes. During the war the technique of welding hardened armor plate with stainless steel electrodes to secure strength and toughness has made great strides."



CLEARING THE HARBOR: Coast Guard icebreaker WOODRUSH, left foreground, keeps the ice broken in Superior, Wis., harbor as a convoy of four cargo transports, one shown in center, prepares to leave for the sea. Temperature was 17 degrees below zero when this picture was made. NEA photo

BRIEFS . . . .

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

Luther & Pedersen, Chicago, has been named exclusive sales representative in Chicago territory for the G. A. Gray Co., Cincinnati.

—o—

Rockford Drilling Machine Division, Borg-Warner Corp., at Rockford, Ill., is now known as the Rockford Clutch Division.

—o—

Pittsburgh Foundrymen's Association, Pittsburgh, heard J. S. Vanick, New York metallurgist, speak recently on "New Horizons for Cast Iron."

—o—

The Lincoln Electric Co., Cleveland, announces its Peoria, Ill., office is now located in the Electrical building, 214 Second street.

—o—

Graham-Paige Motors Corp., Detroit, has started production on a new $25 million Navy contract for amphibious landing craft, and has received an award of approximately $10 million for additional craft.

—o—

Brown Instrument Co., Philadelphia, has added electronic strip chart and Moist-o-Graph instruments studies to its free courses in instrumentation.

—o—

Semlo Properties Inc. has purchased the foundry plant formerly operated near Buffalo by the Crane Co. and plans to use it for manufacturing furniture.

—o—

The Reliance Electric & Engineering Co., Cleveland, reports sales and deliveries in the year ended Oct. 31, 1944, reached the largest volume in the company's 39-year history.

—o—

Infilco Inc., Chicago, has for the third time been awarded the Army-Navy "E."

—o—

The Ingalls Shipbuilding Corp. at its Pascagoula, Miss., yard built its sixtieth 18,000-ton all-welded ship in its fleet for war without a single lost-time accident.

—o—

Bethlehem Steel Co.'s shipyard at Staten Island recently launched the cruiser-destroyer U. S. S. VOGELGESANG, largest and most powerful of its type in the world.

—o—

Thermoid Co., Trenton, N. J., will purchase Grizzly Mfg. Co., plant and equipment at Los Angeles.

—o—

Rheem Mfg. Co.'s plant at Danville, Pa., has won for the third successive time the semiannual safety contest in which 14 Rheem plants compete.

—o—

American Hammered Piston Ring Di-

vision, Koppers Co. Inc. presented service emblems at Baltimore to 400 employes who represented 5000 years of service.

—o—

Jessop Steel Co., Washington, Pa., is not required to repay to the government excess profits for 1943, a study by the War Contracts and Price Adjustment Board shows.

—o—

Briggs Clarifier Co., Washington, has received its third Army-Navy "E" award.

—o—

Westinghouse Electric & Mfg. Co. has transferred the headquarters of its radio receiver division from Baltimore to Sunbury, Pa.

—o—

The B. F. Goodrich Co., Akron, has established in its Aeronautical Division a department for developing new products of rubber, synthetic rubber, and plastics for aviation use.

—o—

The Thew Shovel Co., Lorain, O., has taken over the assets of the Lorain Castings Co., which has dissolved as a corporation.

—o—

Ferro Enamel Corp., Cleveland, has appropriated $350,000 for postwar improvements, including 12 smelters for producing porcelain enamel frit.

—o—

The Rust Engineering Co., Pittsburgh, has completed a large malleable iron foundry at Ashtabula, O., for Lake City Malleable Co.

—o—

Machlett Laboratories Inc., Springdale, Conn., has established a profit-sharing trust for its employes designed to increase production with commensurate rewards for results.

—o—

The Timken Roller Bearing Co., Canton, O., has built a dioramic display employing motion on land, on sea, and in the air, for the Museum of Science and Industry in Rockefeller Center, New York.

—o—

U. S. Gauge Co., Sellersville, Pa., has moved its Chicago office to the Monadnock block, 53 Jackson boulevard.

—o—

American Steel Dredge Co., Ft. Wayne, Ind., will produce hydraulic, dipper and clam-shell dredges of completely integrated and standardized design as soon as present commitments on barges for the Army will permit.

—o—

Illinois Gear & Machine Co., Chicago, has received a fourth Army-Navy "E" award.

—o—

Detroit Steel Products Co., Detroit, has established a new Fenestra building panel division which will produce and market a broad line of metal building panels for industrial, commercial and residential construction.

—o—

American Chemical Paint Co., Ambler, Pa., has appointed Bricker & Andes, Brooklyn, N. Y., as sales agents and distributors of inhibitors and metalworking chemicals.

—o—

Butler Bros. have moved their Cleveland office to 1703 Terminal Tower.

—o—

Farrel-Birmingham Co. Inc., Ansonia, Conn., has adopted a retirement pension plan for the employes of its plants at Ansonia and Derby, Conn., and Buffalo.

More Changes Are Effected By Luria Bros. & Co.

Luria Bros. & Co. Inc., Philadelphia, will open a branch office in St. Louis, in charge of J. L. Gordon, who formerly was located in St. Louis and is at present associated with the company in Houston, Tex.

The company, now has branches at Pittsburgh, Cleveland, Detroit, Chicago, Houston, New York, Boston and Reading, Pa.

Another change in the Luria Bros. organization is that involving the resignation of C. H. R. MacKenzie as the company's Detroit manager. He has been succeeded in that post by Gordon Skinner who has been assistant Detroit manager. Mr. MacKenzie will open an office for Luria Steel & Trading Co., New York, at 1807 Book building, Detroit, to handle iron and steel scrap brokerage. There is no connection between the two Luria companies, the latter having been organized several years ago to engage in steel exporting and manufacture. The Detroit district office is the first of its type to be opened and marks a new phase of the business of Luria Steel & Trading. The change is in part the outgrowth of a reshuffling of family personnel in the Luria Bros. organization.

Retiring Head of Hyman-Michaels Forms Own Firm

New company to engage in railway equipment and allied enterprises, in addition to general scrap business

HYMAN-MICHAELS Co., Chicago, last week announced the resignation of Sparrow E. Purdy, president of the company, as of Feb. 1. The company is one of the leading dealers in used railroad equipment, relaying rails and scrap.

Mr. Purdy has been with Hyman-Michaels 37 years. He was vice president and general manager for many years, assuming the presidency in 1942. Resigning concurrently with Mr. Purdy, are his son John P. Purdy, and his son-in-law John I. Duffy, vice presidents.

Simultaneously with his retirement as president and long time partner and employe of Hyman-Michaels, Mr. Purdy announced the formation of the Purdy Co., 122 South Michigan avenue, Chicago, to engage in a railway equipment business and allied enterprises, as well as a general scrap business. The new company is opening plants in the Chicago area, and as the business will be conducted on a nationwide basis, the opening of branch offices and plants is anticipated.

Associated with Mr. Purdy in the new company are J. P. Purdy, his son, John I. Duffy, his son-in-law and M. H. Barnes, all of whom have resigned as officers of the Hyman-Michaels Co.

HEAVY SHELLS: These 8-inch shells are receiving final inspection at the Edward G. Budd Mfg. Co.'s Bustleton, Pa., plant before being shipped to Army arsenals for loading. Budd has one of the largest heavy ammunition contracts ever awarded by the Army

Many Hurdles Ahead in Meeting War Schedules

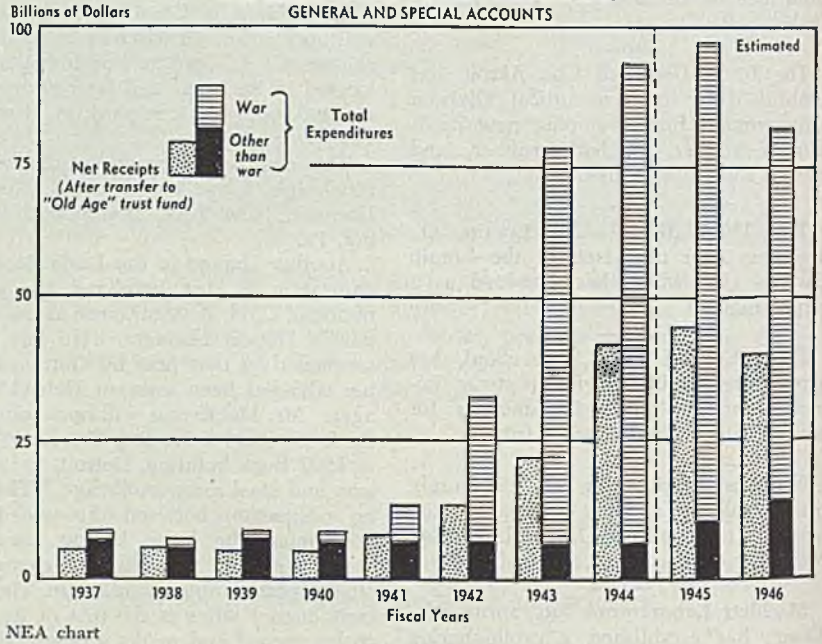
AN $8 BILLION upward revision in war production for 1945 is expected to tax industry to the limit because of the much needed repair to production facilities, growing manpower shortage and tightening supply situation in steel and other essential metals used in the fabrication of war equipment. On the basis of the augmented war materiel schedules and recent intensive effort to divert men from less essential activities to war plants, the trend in munitions production should tend upward over coming months.

Encouraging gains were recorded in bituminous coal production, electric power consumption, truck assemblies, petroleum production and revenue freight carloadings during the latest period. Reflecting primarily adverse weather conditions, steel ingot output declined 1.5 points to 94 per cent in the week ended Jan. 13. Unless the downward trend in coal and steel scrap stocks are reversed and the tight manpower situation soon eases, a shortage of steel supplies for some of the essential civilian needs during the second quarter may develop.

WAR EXPENDITURES—Of the $83,103,000,000 federal spending budgeted for the fiscal year ending June 30, 1946, that for direct war purposes is placed at $70 billion, against $89 billion for the current year. The drop in federal spending will bring a falling off in tax receipts. Net collections for the new fiscal year have been estimated at $41,255,000,000 against $45,730,000,000 this year. As a result of the excess of expenditures over receipts, $40.5 billion is expected to be added to the national debt, lifting it to $292.3 billion by June 30 next year. The statutory debt limit, now $260 billion, will have to be raised to accommodate this increase. Above budget figures are tentative and assume that the United States will be fighting a war on two fronts throughout the entire 1946 fiscal year.

STEEL EMPLOYMENT—The average number employed by the steel industry during November was virtually unchanged from the preceding month, amounting to 564,200 against 564,300 in October. In November, 1943 the total number of employes was 611,000, a figure not exactly comparable with the average number reported each month through 1944. Wage earning employes averaged 120.2 cents per hour in November, against 118.3 in October and 116.4 cents per hour in November, 1943. Average hours worked per week during November totaled 47.7, compared with 46.3 in October and 44.8 hours per week in corresponding month the preceding year.

NET RECEIPTS AND TOTAL EXPENDITURES
GENERAL AND SPECIAL ACCOUNTS



NEA chart

War Expenditures
(millions)

	1944 Monthly Expenditures	1944 Daily Rate	1943 Monthly Expenditures	1943 Daily Rate
January	$7,416	$285.2	$6,254	$240.5
February	7,808	312.3	6,081	253.4
March	7,948	294.4	7,112	263.4
April	7,493	299.7	7,290	280.4
May	7,918	293.3	7,873	283.6
June	7,957	306.0	7,688	295.7
July	7,355	282.9	6,746	249.9
August	7,798	288.8	7,529	289.6
September	7,104	273.2	7,212	277.4
October	7,447	286.4	7,105	273.3
November	7,095	272.9	7,794	299.8
December	....	....	6,951	267.3

FIGURES THIS WEEK

INDUSTRY	Latest Period°	Prior Week	Month Ago	Year Ago
Steel Ingot Output (per cent of capacity)	94	95.5	96.5	99
Electric Power Distributed (million kilowatt hours)	4,614	4,427	4,563	4,539
Bituminous Coal Production (daily av.—1000 tons)	1,767	1,385	1,988	2,041
Petroleum Production (daily av.—1000 bbls.)	4,723	4,679	4,696	4,373
Construction Volume (ENR—unit $1,000,000)	$22.9	$28.8	$31.8	$76.2
Automobile and Truck Output (Ward's—number units)	19,830	19,735	21,445	18,770

°Dates on request.

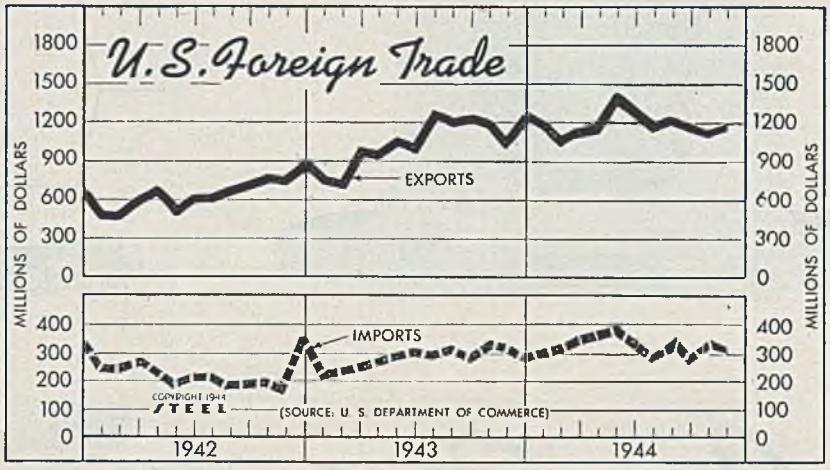
TRADE				
Freight Carloadings (unit—1000 cars)	740†	683	750	780
Business Failures (Dun & Bradstreet, number)	25	19	33	39
Money in Circulation (in millions of dollars)‡	$25,257	$25,326	$25,163	$20,436
Department Store Sales (change from like week a year ago)‡	+12%	+35%	+13%	−6%

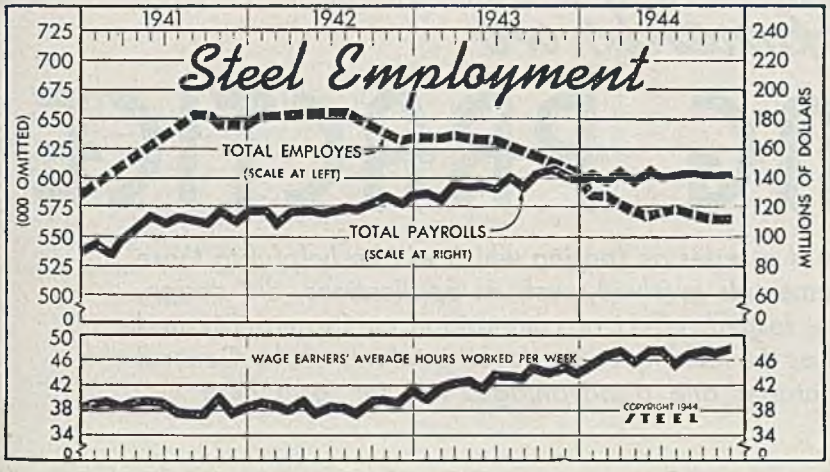
†Preliminary. ‡Federal Reserve Board.

Foreign Trade
Bureau of Foreign and Domestic Commerce

(Unit Value—$1,000,000)

	Exports			Imports		
	1944	1943	1942	1944	1943	1942
Jan.	1,192	730	481	300	228	254
Feb.	1,086	719	480	313	234	254
Mar.	1,158	988	628	359	249	272
Apr.	1,182	980	717	359	258	235
May	1,419	1,085	535	386	281	191
June	1,271	1,002	648	330	295	215
July	1,198	1,262	650	293	300	213
Aug.	1,207	1,204	703	302	315	186
Sept.	1,199	1,235	732	280	285	196
Oct.	1,138	1,195	802	327	329	200
Nov.	1,186	1,074	787	320	317	168
Dec.	....	1,241	873	...	278	358
Total	....	12,716	8,035	...	3,369	2,742





Steel Employment

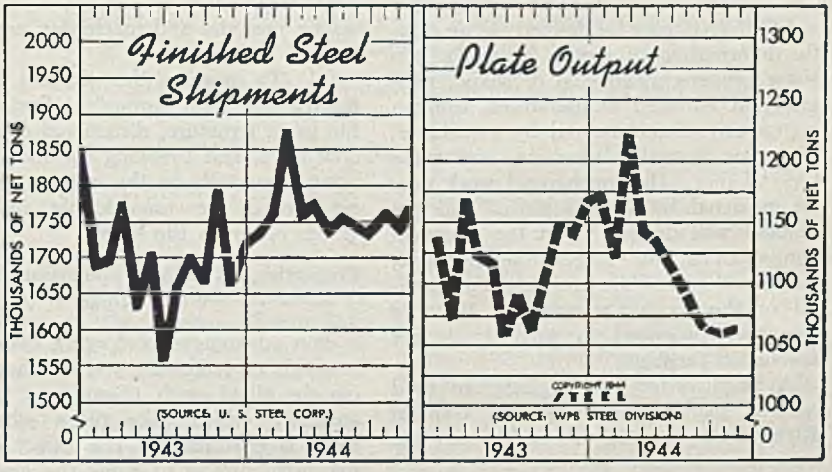
	Employes (000 omitted)			Total Payrolls (Unit—$1,000,000)		
	1944†	1943	1942	1944	1943	1942
Jan.	583	637	651	$141.8	$129.7	$118.8
Feb.	583	635	651	137.6	122.8	108.5
March	578	637	653	145.3	136.8	117.0
April	573	634	654	138.9	133.3	118.5
May	569	632	656	145.4	137.4	117.4
June	570	631	659	140.5	136.2	118.0
July	571	627	655	141.7	142.8	120.7
Aug.	569	625	647	143.9	139.9	118.7
Sept.	565	620	641	142.2	143.8	124.8
Oct.	564	615	635	141.7	144.9	126.6
Nov.	564	611	632	143.1	141.5	122.8
Dec.	...	605	633	....	140.2	129.3

†Monthly average; previous reports showed total number regardless of whether they worked one day or full month.

Steel Shipments—Plate Production
(Net tons: 000 omitted)

	Shipments		Plate Output	
	1944	1943	1944	1943
Jan.	1,731	1,686	1,173	1,135
Feb.	1,756	1,692	1,122	1,072
Mar.	1,875	1,772	1,223	1,168
Apr.	1,757	1,631	1,142	1,122
May	1,777	1,707	1,132	1,115
June	1,738	1,553	1,112	1,056
July	1,755	1,661	1,093	1,090
Aug.	1,743	1,705	1,067	1,061
Sept.	1,734	1,665	1,060	1,106
Oct.	1,775	1,795	1,064	1,147
Nov.	1,744	1,661	....	1,142
Dec.	1,768	1,720	....	1,169
Total	....	20,245	....	13,382

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



FINANCE

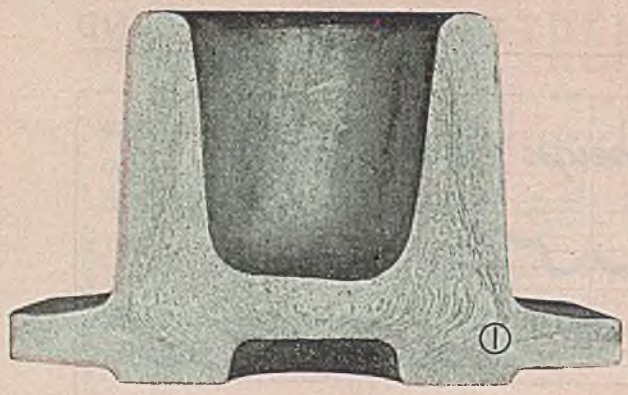
	Latest Period*	Prior Week	Month Ago	Year Ago
Bank Clearings (Dun & Bradstreet—millions)	$11,545	$11,374	$10,210	$9,328
Federal Gross Debt (billions)	$232.8	$232.4	$229.2	$170.3
Bond Volume, NYSE (millions)	$112.5	$79.7	$75.3	$97.2
Stocks Sales, NYSE (thousands)	11,099	7,873	8,328	4,698
Loans and Investments (millions)†	$59,887	$59,737	$58,603	$49,527
United States Government Obligations Held (millions)†	$44,323	$43,803	$43,066	$36,033

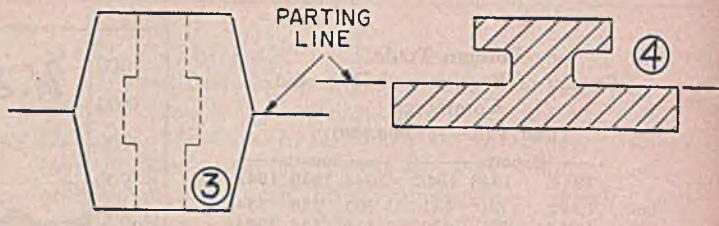
†Member banks, Federal Reserve System.

PRICES

STEEL's composite finished steel price average	$57.55	$56.73	$56.73	$56.73
All Commodities†	104.6	104.7	104.2	102.9
Industrial Raw Materials†	115.4	115.7	114.3	112.1
Manufactured Products†	101.3	101.3	101.3	100.4

†Bureau of Labor's Index, 1926 = 100.





Recent Developments in FORGING PRACTICE

STEEL presents the first of a series on forging which will be helpful to those interested in the fundamentals involved, such as applications, die design, materials which may be forged, effect of composition on forgeability and heat treatment, as well as the techniques employed in plants of the General Electric Co. Advantages and disadvantages are set forth here

FORGING may be defined as the plastic deformation of metals or alloys into some predetermined size or shape, generally at elevated temperatures, using a compressive force exerted by a hammer, press, or upsetting machine, and some type of die. The mechanical work may be imparted by various means and the amount will depend upon the chemical composition, the forging temperature, shape and size of the part, and the method of the forging operation. Parts or members produced in such a manner are called forgings.

A large variety of forgings are used and/or manufactured by the General Electric Co., ranging in weight from one ounce to 160,000 pounds, and in size from small, thimble-like shapes to shafts 60 feet in length and ring gears 16 feet in diameter.

Forgings are made from both ferrous and nonferrous alloys. Since most of the production is in the ferrous category, this article deals mainly with the discussion of carbon, low alloy, and high alloy steel forgings, although much of the discussion is applicable to the nonferrous materials as well. The latter part of this series of articles will be devoted mostly to small forgings.

Purposes of Forging

The purposes of forging are twofold:

(a) To reduce the block or slug of metal to approximately the finished dimensions of the article, or part, thereby saving material and machining costs and time.

(b) To improve the physical properties of the steel through refinement of the grain structure, directional control of flow lines, and breaking up and distributing, especially in the regions of highest stress, the unavoidable inclusions which occur in the steel.

Properties, Advantages and Disadvantages Of Forgings

The advantages of forging over other methods of producing specific shapes are closely allied with changes in internal structure which take place when hot work is performed. The effect on the microstructure is to refine the grain, the resulting grain size being controlled by the finish forging temperature. Increased physical properties are brought about both by this grain refinement and the increased density resulting from elimination of porosity.

The effect on the macrostructure of properly designed forgings is to direct the grain flow in such a manner as to give the forging maximum strength in that direction in which maximum stress is to be applied. This is accomplished through proper design of dies and careful forging technique.

The plastic deformation during forging produces a fibrous-like structure in the direction of working which is known as "forging fiber," "grain flow," "fiber structure," or "flow lines." Figs. 1 and 2, illustrating typical forging fiber, show a forged mounting flange which has been sectioned through the diameter and etched to bring out the flow lines. Fig. 1 was taken after upsetting of the lower flange, while Fig. 2 shows the effect on grain flow after upsetting of the upper flange of the same forging.

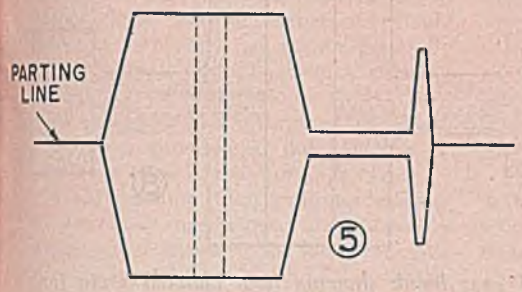
Flow lines are essentially concentrations of nonmetallic inclusions which have been caused to run parallel to the direction of the calculated operational stresses. It is the forging fiber which determines the superiority of forgings in certain physical properties over castings and machined parts, because of the optimum redistribution of stress-raisers or points of weakness. In fact, the positioning of the forging fiber with respect to service stresses of the part can determine the superiority of one type of forging over another.

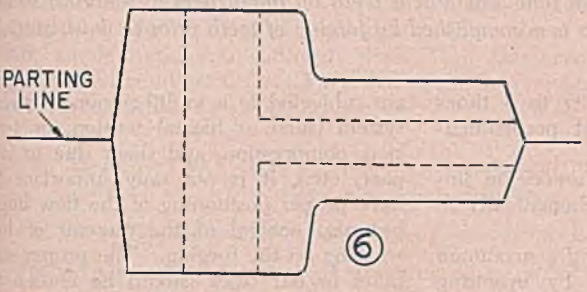
A—Advantages

Some of the advantages of forgings are as follows:

1—Strength plus toughness. A combination of the maximum tensile and torsional strengths in many parts is obtainable in forgings by the proper control of grain flow and distribution of material.

2—High Fatigue Strength. Forgings have a high fatigue strength or resistance to fatigue because the stress-raisers or discontinuities, such as inclusions, blowholes, interdendritic porosity, etc. found





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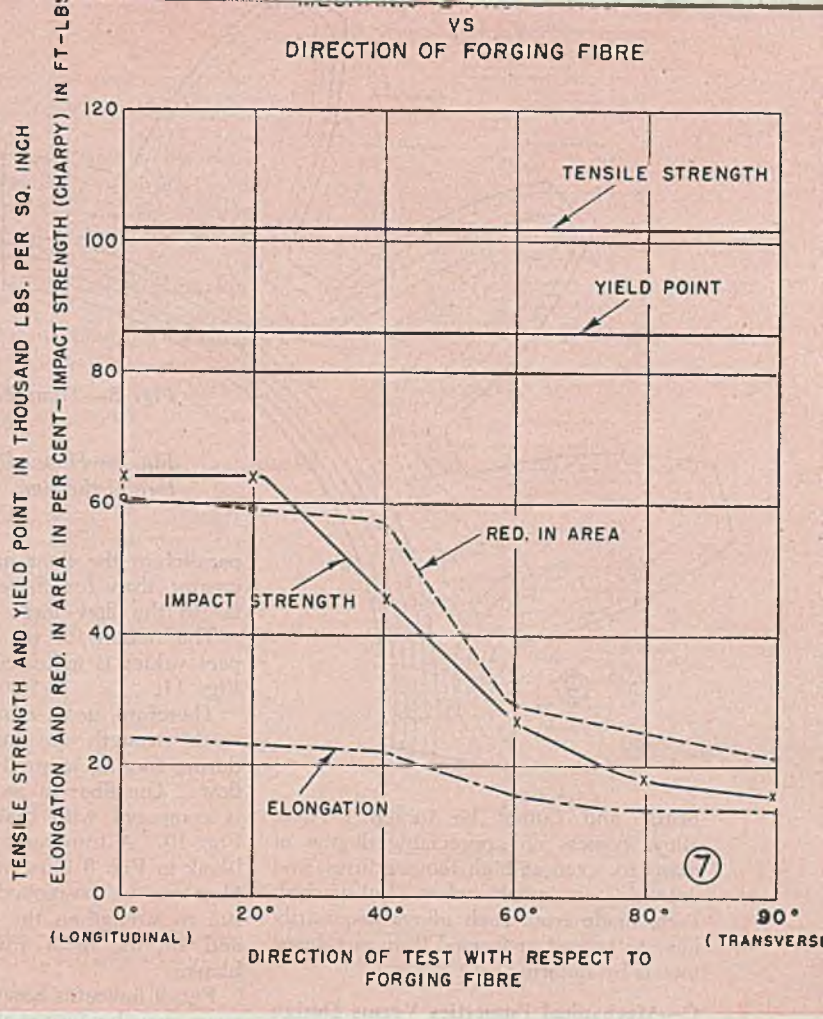


in the ingot are broken up and more evenly distributed, or eliminated, by "welding up" during the forging operations. Also, it is of interest to note that some recent data indicates that the resistance to fatigue of some forgings in the "as-forged" condition is greater than that of identical forgings in the "normalized and drawn" condition[1].

3—Reduction of Machining Time. Since forgings can be formed to close tolerances in closed dies, there is no great amount of excess metal to be removed, and a reduction of machining and finishing time and cost can be effected. Closed die forgings are generally forged ⅛ to ¼-inch over finished dimensions. However, in certain cases, it is possible to work more closely to finish dimensions.

Certain sections of forgings made at present are forged to tolerances of +0.010, −0.00-inch of finish dimensions, and are merely finished by hand on a grinding wheel.

4—Reduction of Dead Weight. Proper forging produces maximum strength in light sections, and thereby makes possible the use of lighter weight parts. Where the weight factor is important, the use of as low a safety factor as possible is mandatory. Therefore, quality is of prime importance.

This feature is especially of great value to the aircraft industry.

5—High Impact Strength. Proper forging increases the notch impact strength which indicates the toughness of the material. The impact strength is of function of the position of the flow lines, and data shows it is about three times greater for impact specimens taken in the longitudinal direction (with the forging fiber) over those in the transverse direction (across the forging fiber).

Fig. 1—Macroetched structure of sectioned, forged mounting flange showing forging fiber after upsetting of lower flange

Fig. 2—Same mounting flange as in Fig. 1, showing flow lines after upsetting of upper flange

Figs. 3, 4, 5, and 6—Illustrations of limitations on design of drop forgings

Fig. 7—Direction of test with respect to forging fiber

B—Disadvantages

Forgings usually present the following disadvantages:

1—High Die Cost. Because of the high die cost, closed-die forgings are not economical except for large production. Roughly, production in upwards of a thousand parts reduces the high initial cost to a reasonable "cost per part" figure. However, whenever production is to be small and the desired physical properties can be obtained by forging only, the high initial cost may have to be disregarded, or a rough forging may be made on a flat die, power hammer. In this latter case, it will not be possible to control the direction of the forging fiber and the dimensions as well as in closed dies. Such a flat-die forging is relatively inexpensive.

2—Limitation on Design. There are certain parts of various sizes and shapes which cannot be produced successfully by drop forging, as:

(a) Parts with re-entrant angles in the bore. This is illustrated in Fig. 3.

(b) Parts with re-entrant angles perpendicular to the parting line. See Fig. 4.

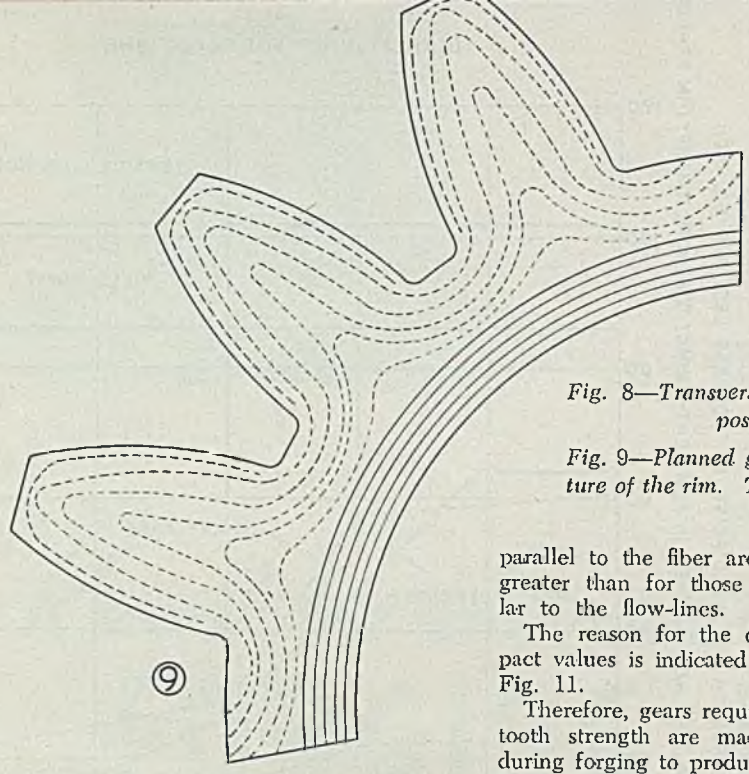
(c) Parts with a large variation in thickness or cross section of web or flanges, as shown in Fig. 5.

(d) Parts with extremely deep holes or long projections, as illustrated in Fig. 5.

(e) Parts with holes in two planes making removal of the forging from the dies impossible. This is illustrated in Fig. 6.

However, all of these obstacles may be circumvented by simplifying the design of the forging and producing the desired features later by machining.

3—Nonforgeable Alloys. Certain alloys such as babbitt and certain high temperature service alloys are hard and



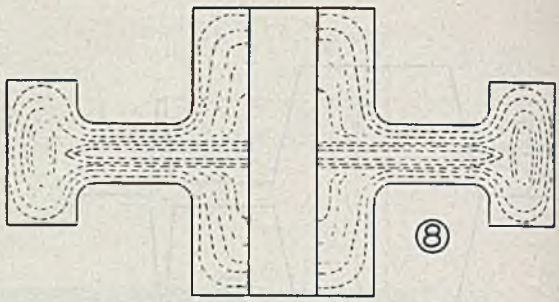


Fig. 8—Transverse section of gear blank showing how planned grain flow positions radial fiber in rim to strengthen the teeth

Fig. 9—Planned grain flow strengthens teeth by tying them into fibrous structure of the rim. This is accomplished by forging of teeth prior to finish cutting

brittle and cannot be forged. Those alloys possess no appreciable degree of plasticity even at high temperatures, and crumble or crack when hot-worked. Parts made from such alloys necessarily have to be cast or formed from powdered metals by sintering.

C—Mechanical Properties Versus Design

Flow-lines or forging fiber are the heart of the forging, and their positioning with respect to the operational stresses is of the greatest importance. The reason for this may be seen upon examination of Fig. 7.

Test coupons were cut from different forgings at various angles to the fiber, and the data obtained therefrom shows that certain mechanical properties are a function of the direction of the flow lines. Although the tensile and yield strengths are practically identical for longitudinal and transverse bars, it is readily seen that the longitudinal elongation is approximately double the transverse elongations, and similarly, the reduction in area and impact strength values of specimens cut parallel to the fiber are 2½ to 3 times greater than for those cut perpendicular to the flow-lines.

The reason for the difference in impact values is indicated schematically in Fig. 11.

Therefore, gears requiring a maximum tooth strength are made by upsetting during forging to produce a radial grain flow. The fiber in an upset gear blank is compared with that of bar stock in Fig. 10. A transverse section of a gear blank in Fig. 8 illustrates how the radial fiber can be positioned to flow into the rim to strengthen the teeth. In Fig. 8 and 10, the teeth are cut in the gear blank.

Fig. 9 indicates how the teeth of large gears may be forged prior to finish cutting whereby the teeth are further strengthened by tying them into the fibrous structure of the rim.

In addition to the variation with direction of testing, the mechanical properties in the longitudinal and transverse directions are a function of the reduction effected during forging. In Fig. 12, the transverse and longitudinal properties are plotted against the ratio of reduction A_i/A_f, where A_i is the initial cross-sectional area and A_f is the final cross-sectional area after forging. (The graph represents average values of data obtained by Milnes[2] and accumulated in the General Electric's Schenectady Works Laboratory.)

Therefore, in the case of parts which are subjected to a multicomponent stress system (such as biaxial tension, or tension, compression, and shear due to impact, etc.), it is not only important to have proper positioning of the flow lines, but also control of the amount of hot working on the forging. The proper size billet or bar stock should be chosen as raw material for the forging. Starting with a billet of the improper size, either too small or too large, may result in overworking and too great a degree of directionality in properties in one case, and an insufficient amount of work and less effective forging fiber in the other.

Furthermore, the direction of the fiber in the rolled or forged raw material should be considered with respect to the desired direction of fiber in the finished forging. In spite of the fact that this factor is quite important, it is generally overlooked. Its significance is immediately apparent when it is realized that the billets for reforging may have been hot rolled or press forged with various amounts of reduction from various sized ingots, and the fiber in the slug cut from the billet may be working against you instead of for you with respect to flow line positioning and directionality of properties.

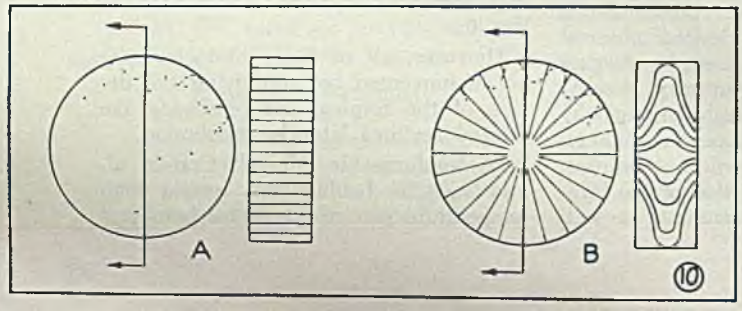
Moreover, these additional factors have to be considered:

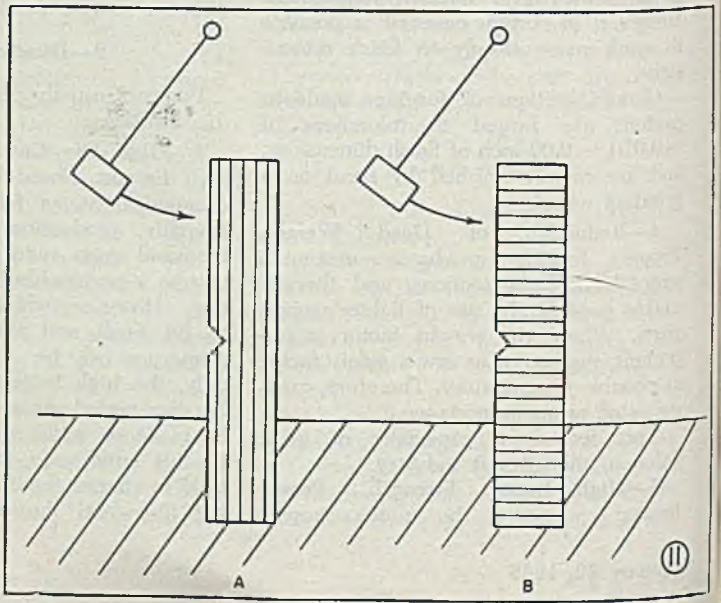
1—Soft or low carbon steels seem to possess better transverse properties than harder steels.

2—A fine-grained ingot should pro-

Fig. 10—Direction of forging fiber in gear blanks. (A)—Gear blank cut from bar stock. (B) An upset gear blank

Fig. 11—Izod impact bars showing direction of forging fiber. At "A" high stresses at notch are distributed by longitudinal fiber, resulting in much greater impact resistance, while at "B" the fibers tend to act as stress-raisers to concentrate stresses developed at the notch, causing early failure as impact is increased





duce forgings with better transverse properties than a coarse-grained ingot. Hence, high quality forgings are made from grain-refined steel ingots, generally of killed, ladle-deoxidized steel, showing a minimum of segregation.

3—Aluminum alloy forgings, as a rule, show more pronounced directionality of properties than ferrous forgings.

4—Magnesium alloy forgings possess an extremely pronounced directionality, which increases with the basic strength of the alloy. This is largely due to the directionality caused by preferred orientation of the grains superimposed upon the mechanical forging fiber.

In the design of forgings, adequate fillets, ample radii, and sufficient draft angles should be allowed for. These features are essential for a high rate of forging production, for prolonging die life, and reducing frequency of reworking the dies.

The following rules should be considered by the designing engineer when designing forgings with upset sections or heads such as bolts, studs, and other similar pieces:

Rule 1—The limiting length of unsupported stock that can be gathered or upset in one blow without harmful buckling is three times the diameter of the bar. The results of proper and improper design in this respect are shown in Figs. 13 and 14.

Rule 2—Lengths of stock more than three times the diameter of the bar can be successfully upset in a female die in one blow, provided the diameter

(*Please turn to Page* 124)

Fig. 12—*Effect of forging reduction on mechanical properties in longitudinal and transverse directions*

Fig. 13—*Proper design for upsetting in accordance with Rule* 1

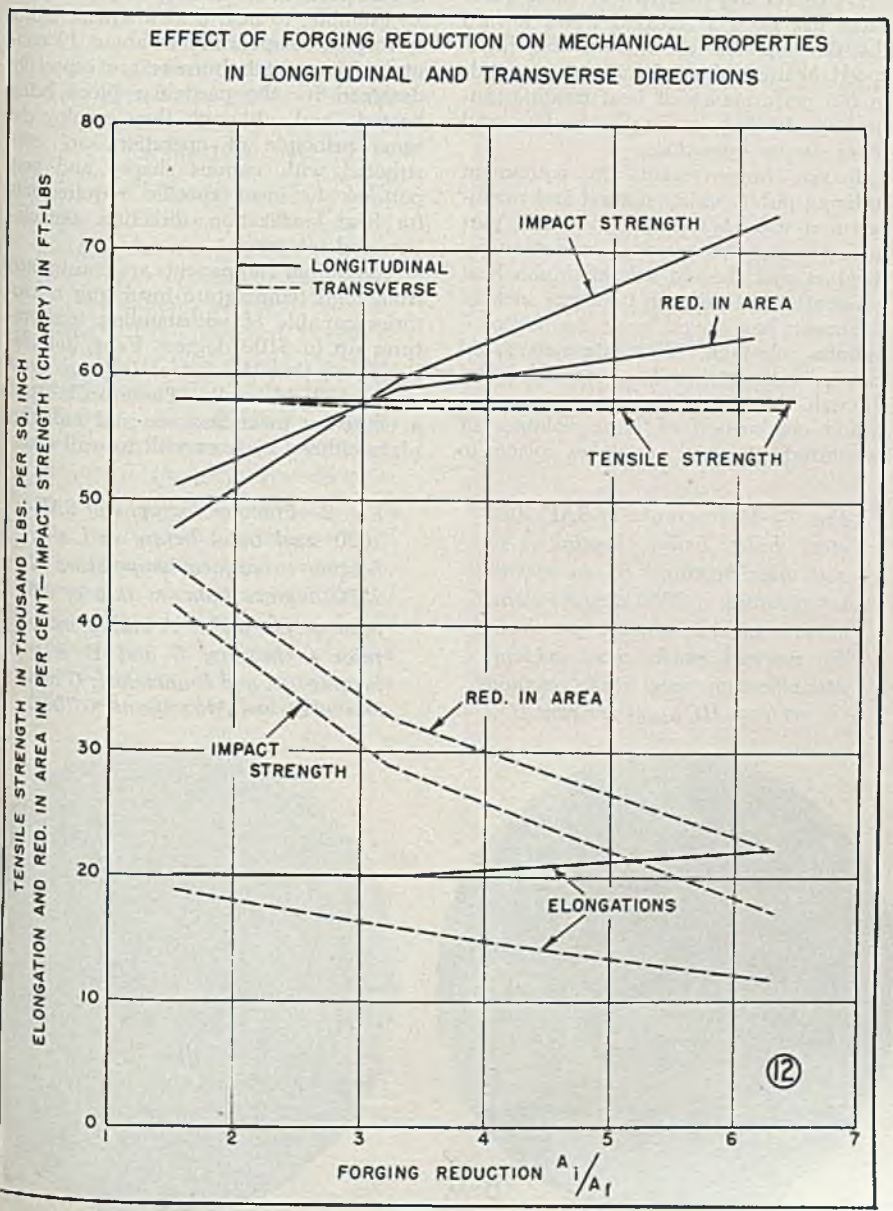
Fig. 14—*Result of violation of upsetting as specified in Rule* 1

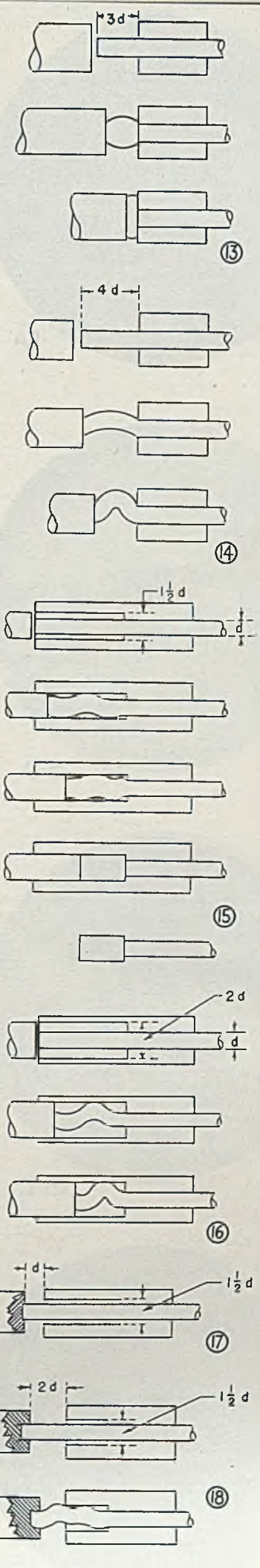
Fig. 15—*Result of conforming with upsetting in Rule* 2

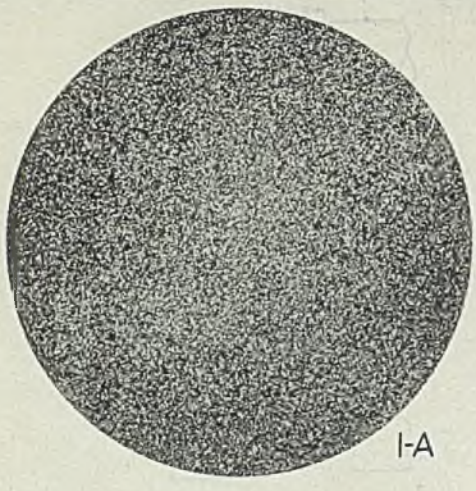
Fig. 16—*Illustration of harmful buckling due to violation of Rule* 2

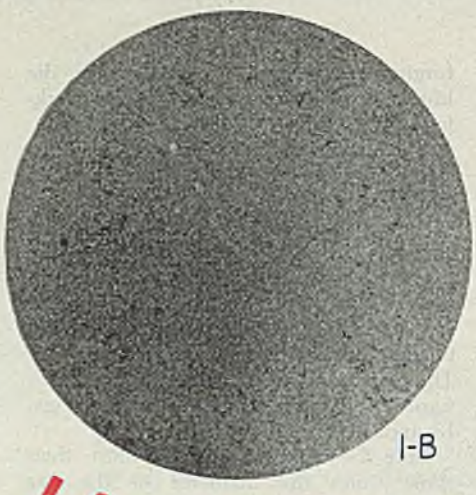
Fig. 17—*Proper upsetting design in conformance with Rule* 3

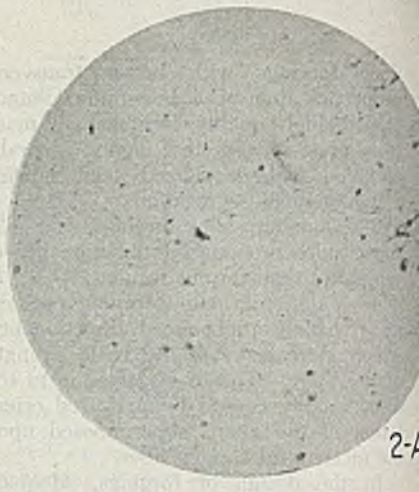
Fig. 18—*Violation of upsetting specified in Rule* 3





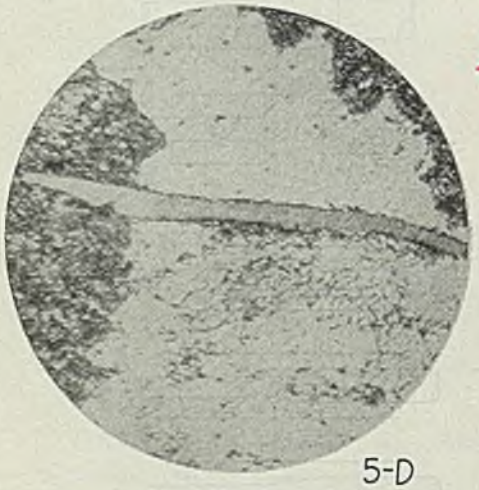


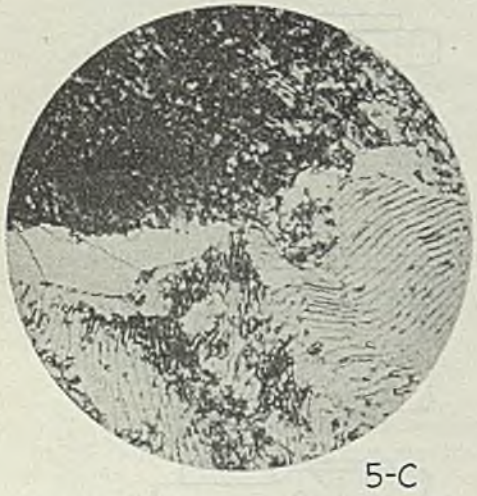




High Speed Heating

Recent improvements in equipment have forced the old rule-of-thumb heat penetration rate of 1 hour per inch of thickness to give way to 2 to 4 minutes per inch. Billets, bars, tubing and strip may be brought up to high temperature in a matter of minutes as part of automatic continuous operations





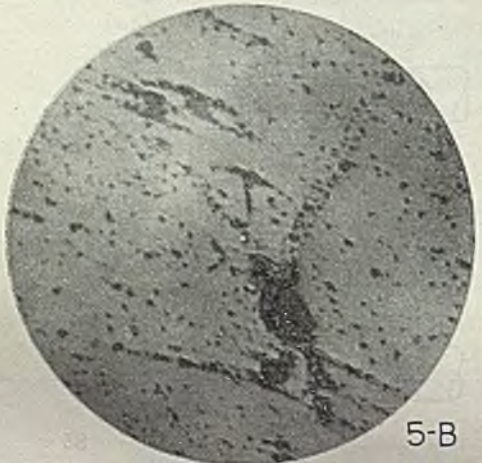
DURING the past two or three years there has been a decided trend toward the development of methods for high-speed heating of steel and other metals in the performance of heat treating, annealing, forging, rolling, extruding and other similar operations.

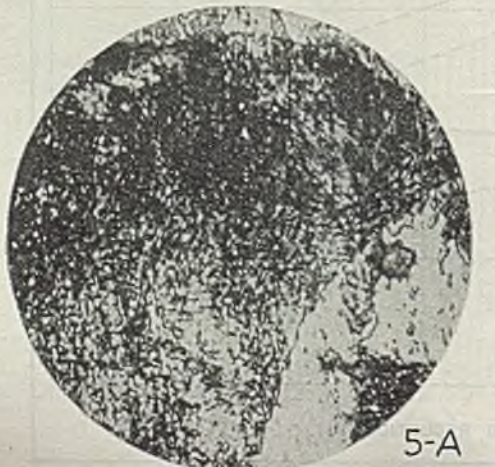
Recent improvements in equipment utilizing public utility natural and manufactured gas have played no small part in furthering this trend as evidenced by the fact that the old rule-of-thumb heat penetration rate of one hour per inch of thickness has given way to 2 to 4 minutes per inch. This extremely rapid rate of heating has been accomplished through the use of ceramic burners in which combustion of large volumes of pre-mixed gas and air takes place in a restricted area making it possible, as an example, to heat 6-inch square billets to forging temperature in about 13 minutes. Many such burners are especially designed for the particular piece being heated—and, although they employ the same principle of operation, are constructed with various shapes and port patterns to meet specific requirements for heat localization, direction, modulation and intensity.

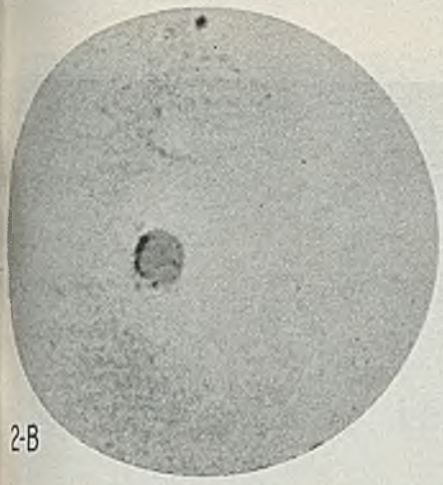
The burner components are constructed from high temperature insulating refractories capable of withstanding temperatures up to 3100 degrees Fahr. and designed so that the flames impinge upon corrugated side walls. These walls attain a white-hot incandescence and radiation plays either (1) from wall to wall across

Fig. 1—Macrographs of SAE-1020 steel billet before heating (A) and after heating (B) to surface temperature of 2350 degrees Fahr. at rate of 2.2 minutes per inch. No internal cracks were evident. Magnification was 1½X; etchant 50 per cent HCL, 50 per cent H,O

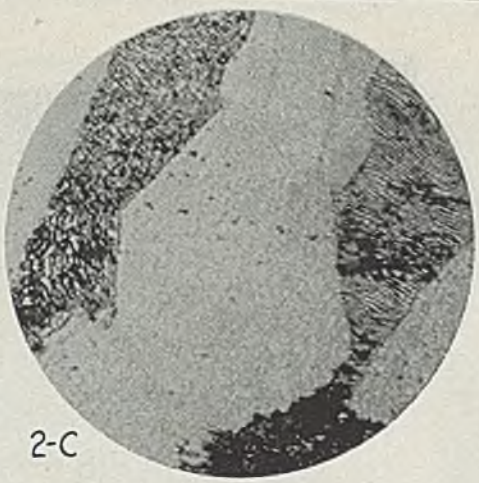
Fig. 2—Photomicrographs of SAE-1020 steel billet before and after heating to surface temperature of 2350 degrees Fahr. at rate of 2.2 minutes per inch. A and C made prior to heating; B and D after heating. A and B unetched; C and D nital etched. Magnification: 750X



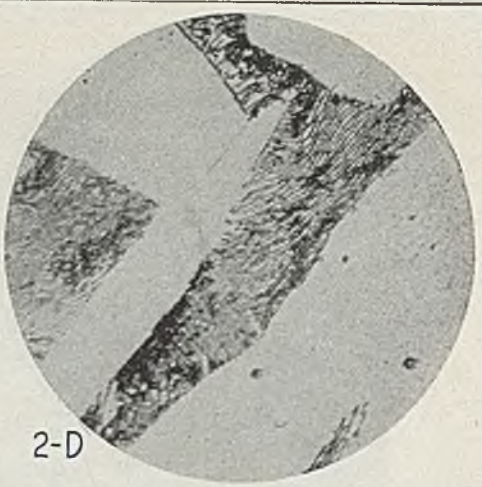




2-B



2-C



2-D

With Gas

the travel of the gases during their interreaction, or (2) at the work being heated. In either case the rate of combination of gas and air is accelerated.

In some cases the burner is closed in at the nose to form a slot or opening. All

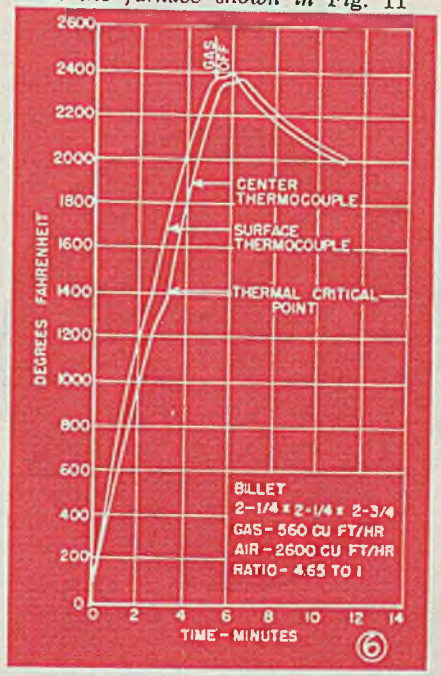
Fig. 3—Macrographs of SAE-1095 steel before heating (A) and after heating (B) to surface temperature of 2300 degrees Fahr. at rate of 2.44 minutes per inch. Note absence of cracks. Magnification and etchant were same as for the 1020 steel

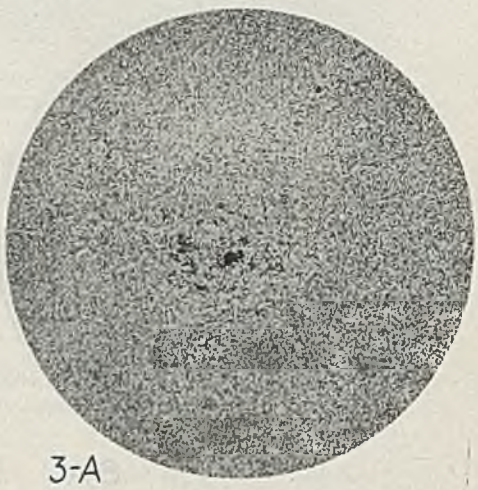
Fig. 4—Photomicrographs of SAE-1095 steel before heating (A, C) and after heating (B, D) to surface temperature of 2300 degrees Fahr. at 2.44 minutes per inch. Samples A and B were unetched, sample C and D were nital etched. Magnification was 705X. Note spheroidal structure in unheated sample; pearlitic structure with a little cementite in the grain boundaries in heated section

Fig. 5—Photomicrographs of SAE-4340 steel billet before and after heating to surface temperature of 2220 degrees Fahr. at rate of 3.64 minutes per inch. Sample A, nital etched, shows sorbitic structure as received indicating the cooling rate.

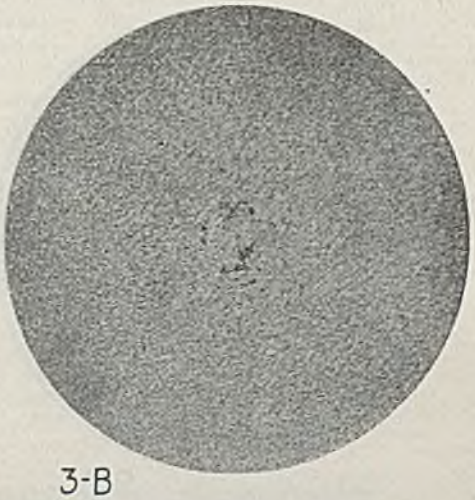
B, after heating, unetched, shows inclusions and pits from which inclusions were torn out on polishing. Sample after heating (C), etched, shows a pearlitic sorbitic structure indicating cooling was slightly slower than for sample A. Sample after heating (D), etched, has longitudinal section showing large inclusion elongated in direction of rolling. On micro-examination, this inclusion seemed to be a crack. Magnification: 750X, etchant: Nital

Fig. 6—Time-Temperature curves for SAE-1020 steel billet heating in the furnace shown in Fig. 11

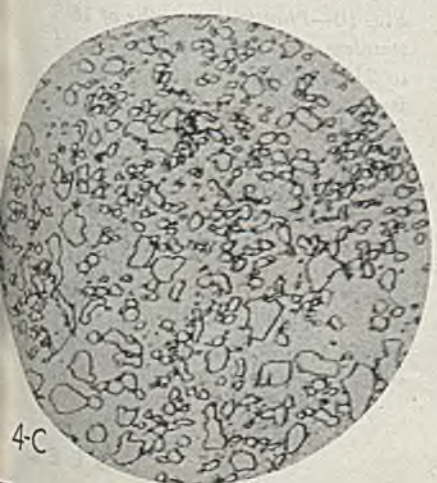




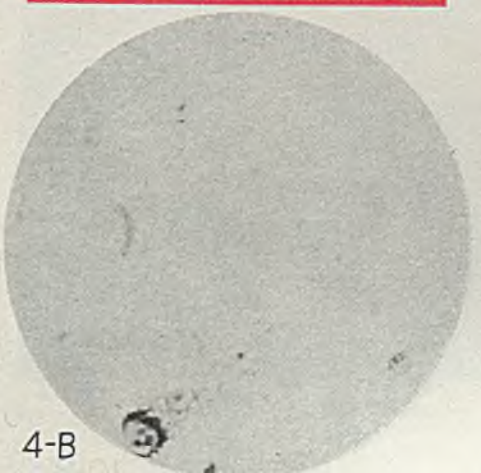
3-A



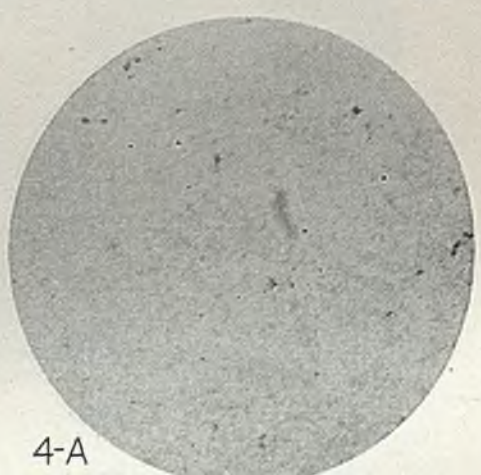
3-B



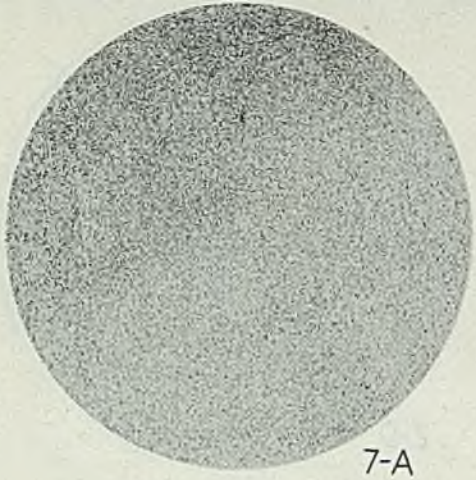
4-C



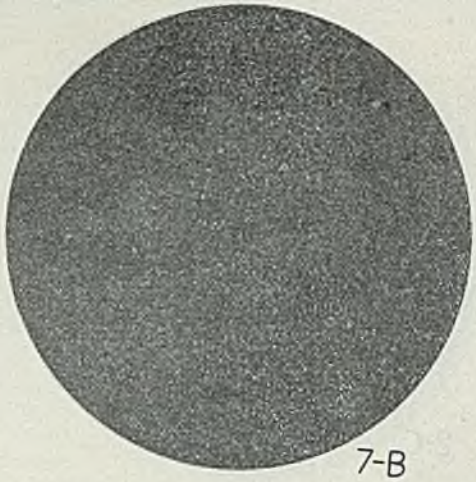
4-B



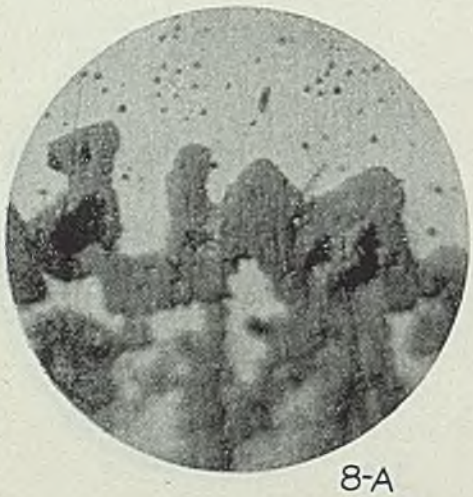
4-A



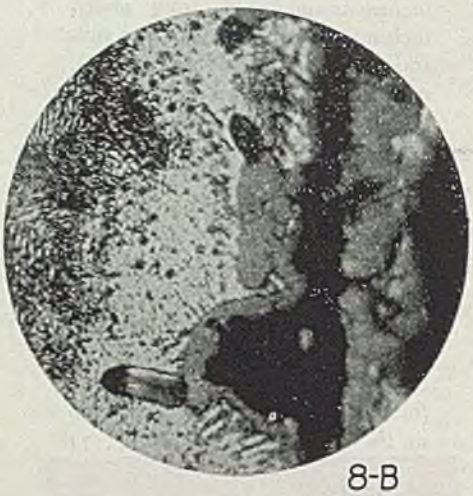
7-A



7-B



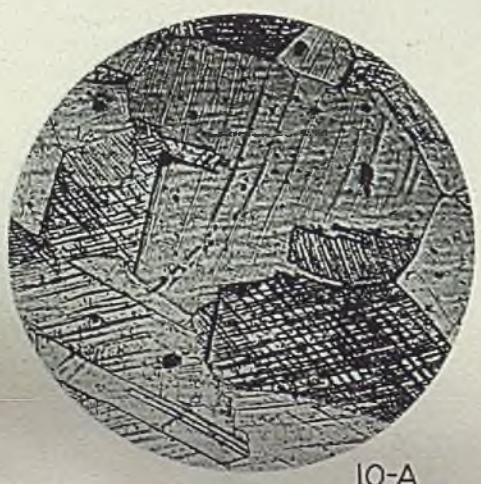
8-A



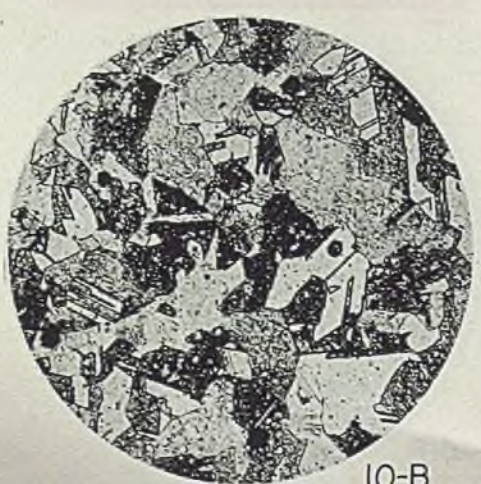
8-B

9-A

9-B



10-A



10-B

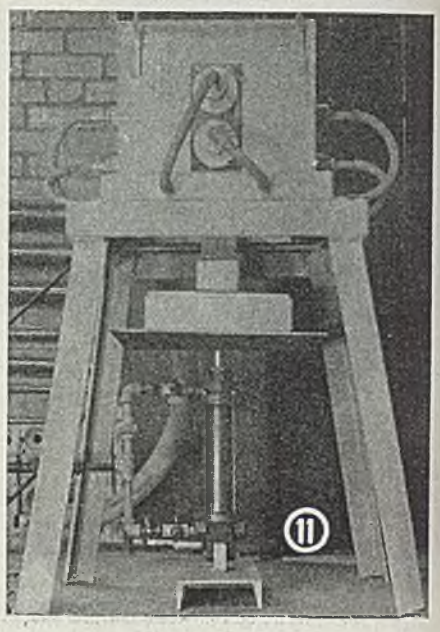


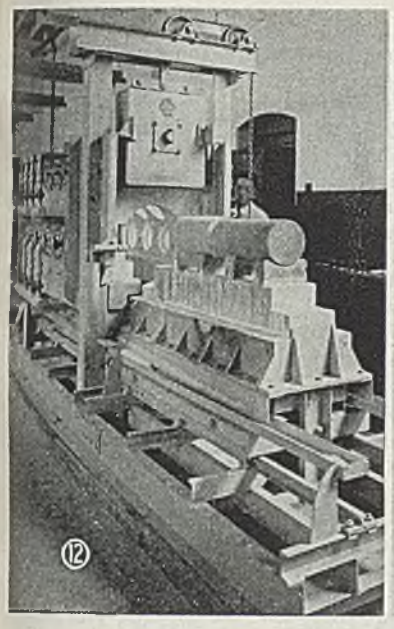
Fig. 7—Macrographs of SAE-4340 steel billet before heating (A) and after heating (B) to surface temperature of 2300 degrees Fahr. at rate of 3.64 minutes per inch. As in the case of 1020 and 1095 steels, no cracks were apparent. Magnification 2/3X, etchant 50 per cent HCL, 50 per cent H_2O

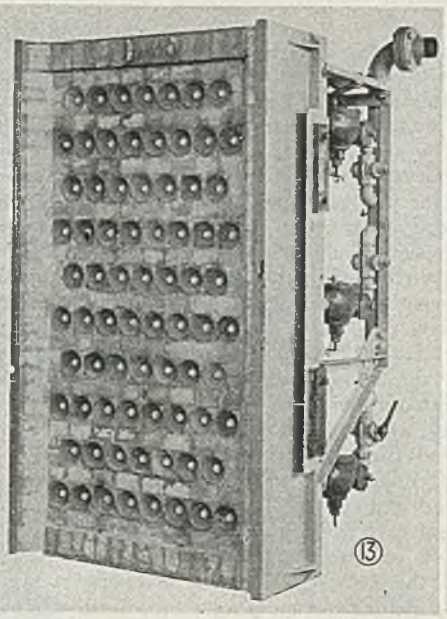
Fig. 8—Photomicrograph of edge of the same SAE-4340 steel covered in Figs. 5, 7, 18, showing extent of decarburization after heating. Sample A unetched, sample B etched. In sample B, note scale at right, decarburized zone in center and pearlitic structure at left. Decarburized zone was about 0.001-inch thick

Fig. 9—Photomicrographs of SAE-1035 steel billet heated to surface temperature of 1510 degrees Fahr. at rate of 2.25 minutes per inch. There is no apparent difference in grain size in the two samples other than that the pearlite on the edge of the specimen is finer than that in the center. This indicates the edge was cooled slightly faster than the center. Magnification: 750X; etchant: Nital

Fig. 10—Photomicrographs of 18-8 stainless steel finned tubing heated to 2100-2150 degrees Fahr. in the furnace shown in Fig. 19 at the rate of 5.3 feet per minute. Structure of the tube as received is shown in A and the annealed structure in B. Magnification: 250X; etchant: Aqua regia

Fig. 11—This extremely compact gas-fired furnace will heat a 2¼ x 2¼-inch billet to forging temperature in about 5 minutes. It is equipped with 8 burners





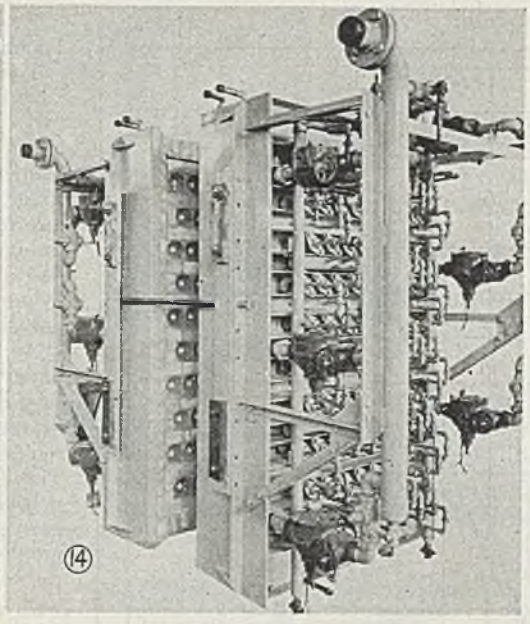


Fig. 12—Continuous billet-heating equipment of this type now is in operation in a New England brass mill. Brass billets are brought up to extrusion temperature of 1530 degrees in 15½ minutes

Fig. 13—One of the newest applications for high-speed gas heating is in the flow-brightening of electrolytic tin plate. After plating, the strip passes between two burner panels, one of which is shown here. Each panel is equipped with 75 gas burners

Fig. 14—Two gas burner panels for flow-brightening tin plate are shown here prior to installation in a midwestern steel mill

combustion is confined within the burner so that only a superheated blast issues from the slot and no open flame, therefore, is in contact with the work in process. Burners of this type permit delivery of heat to small areas at extremely high rates and thus are useful for localized annealing, hardening, brazing and the like. Larger areas may be heated by using burners in multiples, or by using cup-type units with large, open face burners and ceramic faces of corrugated sidewall construction.

Premixed gas and air are delivered to the burners in the ratio best suited to a given heating application by an accurate combustion controller which compensates for all three variables encountered—gas pressure, atmospheric pressure and demand. This controller has three principal parts, the mixer, the gas governor and the compressor.

Governor Is Automatic

The mixer is an accurate sleeve-valve consisting of a sleeve and a piston, with two square orifices, one for air and one for gas. Piston moves vertically for changes in fuel demand and may be rotated manually for adjustments in gas-air ratio.

The gas governor is an automatic disk-valve which regulates the pressure at which the gas is introduced into the mixer. A pipe connection runs from the air intake to the diaphragm which determines the position of gas inlet valve. Variations in air intake pressure are immediately transmitted to the diaphragm which changes the position of the gas inlet valve and the air-gas pressure thus are kept in balance. The mixer and the governor are operated by the suction from a compressor.

Burners and combustion controllers of the type described permit (1) the construction of extremely compact heating equipment at low cost; (2) short heating cycles which minimize harmful effects such as scale, decarburization and grain growth; (3) speeds making it possible to perform heating operations on a continuous line production basis and (4) varying the heat input to various parts of the same piece to obtain localized heat treatment and control distortion.

Fig. 11 shows an extremely compact unit for heating billets to forging temperature in a matter of minutes. This unit measures 12 x 12 inches and 11 inches high overall, the heating chamber being 3 x 3 x 6 inches and fitted with 8 radiant burners. Billets are charged into the furnace from the bottom by means of a vertical piston.

Test data were obtained for SAE-1020 and SAE-1095 billets using this compact furnace. In the first test, a ¼-inch transverse section was cut from a 2¼-inch square by 3-inch high billet, polished, etched in a 50 per cent HCL and 50 per cent H_2O solution and examined microscopically for internal cracks prior to heating. The remaining section 2¼ inches square and 2¾ inches high then was drilled for thermocouples located at the geometric center and ⅛-inch from the vertical edge midway between the top and bottom of the billet. Both thermocouple holes were drilled from the center of the bottom face. Two potentiometers were used for recording the temperatures. The burners were supplied with 530 B.t.u. manufactured gas at an air-gas ratio of 4.6 to 1 and pressure of 3 pounds. Heat transfer to the billet took place essentially through the four vertical sides since both top and bottom of the billet were protected by refractory material. The unit was vented through a

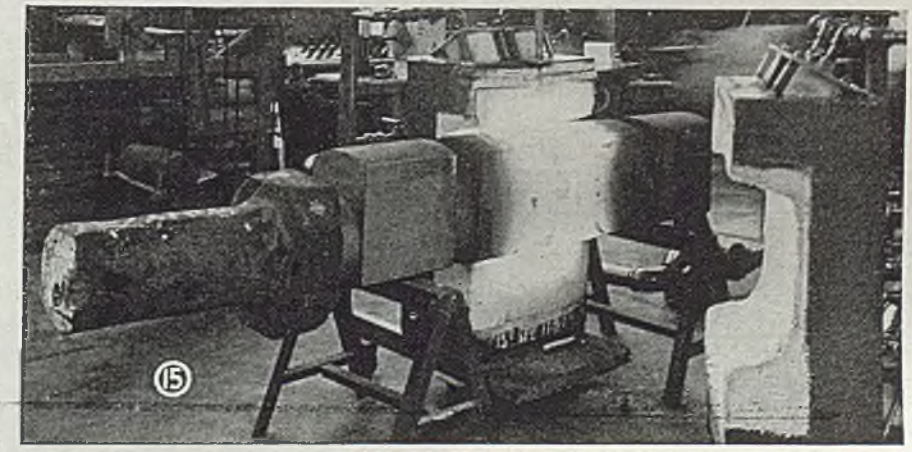
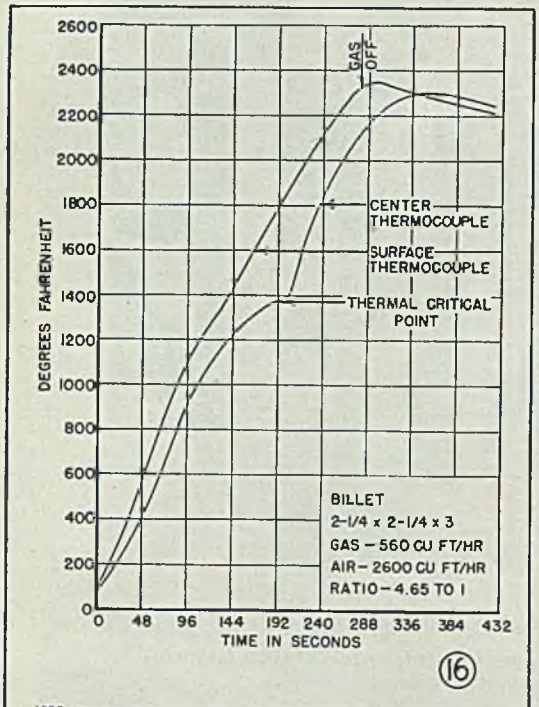
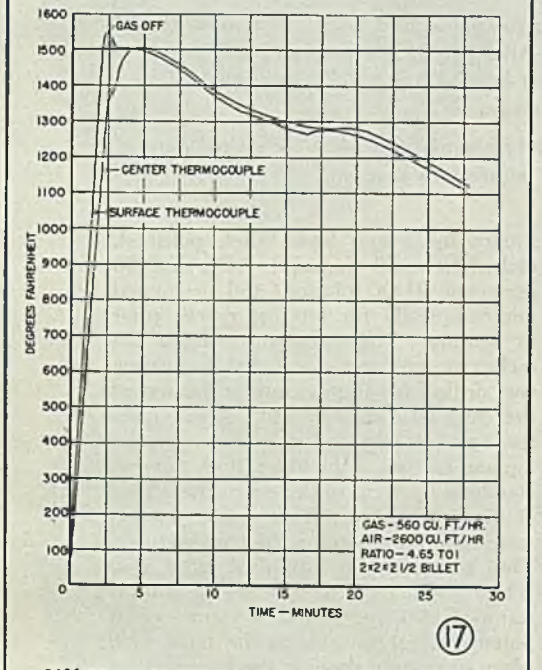
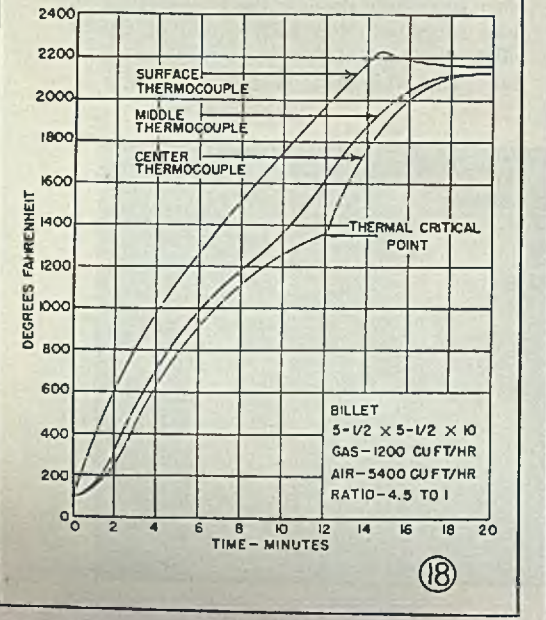


Fig. 15—Shown here is a setup for localized and rapid heating of a large crankshaft prior to hot working operation







1-inch diameter hole in the furnace top.

The time-temperature chart for SAE-1020 steel shown in Fig. 6 is based upon two simultaneous readings recorded every 30 seconds until the billet surface temperature reached 2385 degrees Fahr. when the gas was turned off. Temperature readings were continued until equilibrium conditions were obtained. The flue at the top of the furnace was covered to prevent excess air infiltration and permit slow cooling.

An identical test billet then was heated under duplicate conditions except that no thermocouple holes were made. After heating, a ¼-inch transverse section was removed from the center of the billet. The face adjacent to this section was polished and etched in a solution of 50 per cent each HCL and H_2O and photographed at 1½X magnification. Fig. 1 shows the etched section as compared with a similar section prior to the heating process.

The ¼-inch transverse section then was sectioned again and one face polished and photographed at 750X magnification. The section then was etched in Nital (2cc HNO_3—100cc alcohol) and photographed at 750X. The etched and unetched sections are shown in Fig. 2 and compared with sections prior to the heating operation.

An identical procedure was followed in checking the results for SAE-1095 except that in bringing the billet up to a surface temperature of 2350 degrees Fahr. readings were taken every 10 seconds instead of at 30-second intervals. Heating curve for this high carbon steel is shown in Fig. 16, the macrographs before and after heating in Fig. 3 and the comparative photomicrographs in Fig. 4.

Heating time for both the 1020 and the 1095 steels was 4½ minutes with additional time of ½ and 1 minute, respectively, required for the surface and center temperatures to equalize. Heating rate for the 1020 steel was 2.2 minutes per inch and for the 1095 steel 2.44 minutes. Temperature for the two steels at the time of surface-center equalization were respectively 2350 and 2300 degrees Fahr. within plus or minus 50 degrees Fahr.

Another test was conducted with an SAE-4340 steel billet measuring 5½ x 5½ x 10 inches high using a similar furnace with 8 burners. Clearance provided from the billet to the furnace walls and burners was 1 inch. Thermocouples were placed so as to record temperatures ¼-inch from the vertical outside surface, midway between the surface and the center and at the geometric center. All of the thermocouple beads were located on a horizontal plane through the center of the billet.

Three simultaneous temperature readings were recorded every 30 seconds until equilibrium conditions were obtained throughout the entire billet. The gas-air mixture was shut off at billet surface temperature of 2250 degrees Fahr. In this case total heating time was 14½ minutes or at the rate of 3.64 minutes per inch. Fig. 18 shows the time-temperature heating curve for this steel.

As in the case of the 1020 and 1095 steels, a second billet was heated under identical conditions for the purpose of

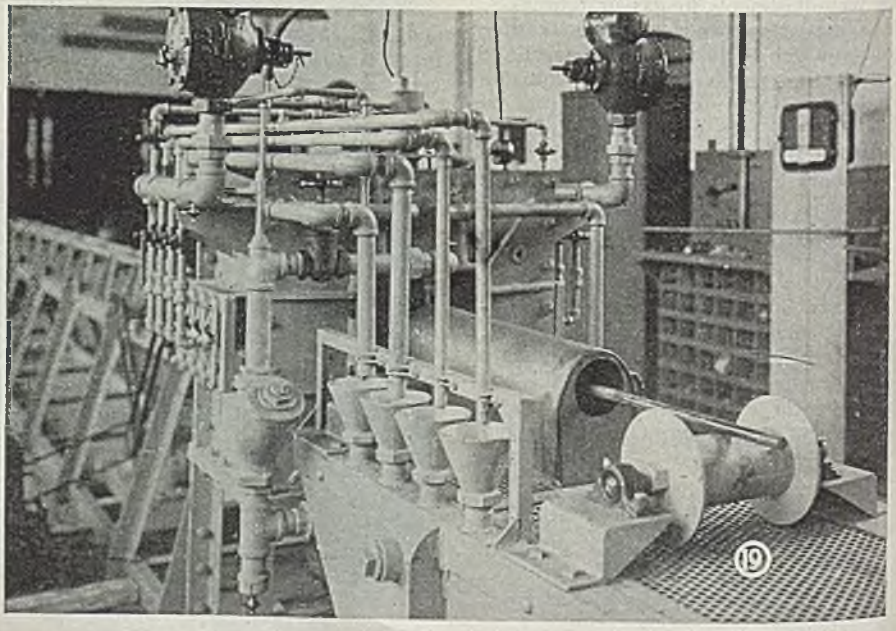
(*Please turn to Page* 129)

Fig. 16—*Time-temperature curves for SAE-1095 steel billet, also heated in the furnace shown in Fig.* 11

Fig. 17—*Time-temperature curves for SAE-1035 steel billet*

Fig. 18—*Time-temperature curves for SAE-4340 steel billet*

Fig. 19—*This high-speed gas furnace is used for annealing* 18-8 *stainless steel finned tubing on a continuous basis. The material is conveyed through the furnace, as well as the cylindrical quenching unit in the foreground, by means of water-cooled grooved feed rolls operated by a variable speed drive*



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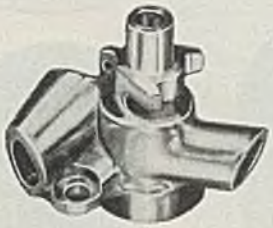

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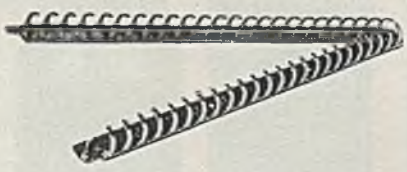

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Deep Drawing 0.67-inch Plate

Amazing press job forecasts important revisions in manufacturing many products

By GEORGE R. REISS

MANY "tricks" of the steel stamping industry, learned of wartime necessity, are going to be turned to making better peacetime products.

Those techniques, developed in doing those wartime steel stamping jobs "that couldn't be done"—for example, stamping steel mortar shells or steel cartridge cases for 105 millimeter howitzers or 3-inch antiaircraft guns—are going to be used to make those peacetime steel products that heretofore "couldn't be made by stamping" — those household appliances, truck and automobile parts, machine parts, building decorations and numerous other items.

And war-developed steel stamping methods will make these products cheaper, stronger, lighter in weight and with more "eye appeal" than ever before.

The stamping industry has learned many things as the result of war experience. The industry has learned how to work with much heavier and thicker metal than it was possible to handle with stamping methods before; how to draw it deeper and how to produce complicated shapes and designs, with less wrinkling and distortion.

The industry also has learned how to combine the best features of four separate processes—(1) stamping, (2) machining, (3) welding and (4) brazing.

All these new features—lower costs, lighter weight, greater strength, new intricate shapes, more eye appeal—will enable the steel stamping industry to capture many new markets it could not touch before, to develop many new products that will make for better living, to bring some heretofore high priced items down to the big mass markets.

One of the leaders in the steel stamping business is the Mullins Mfg. Corp. with plants in Warren and Salem, O., which has performed some of the most unusual stamping jobs, both before and during this war.

Busy with the war production, Mullins also is giving much thought to the coming peace, and its part in it. Its prewar products were kitchen sinks and kitchen cabinets, porcelain enameled steel bathroom "tile", and other porcelain enameled steel products, automobile radiator grills, truck and automobile bodies, fenders, fuel tanks, steel boats, washing machine tubs and wringers, tractor parts, truck and automobile brake drum, refrigerator evaporator units, and scores of other pressed steel items.

After the war, it plans to go back to all these items, but adding others, too; and its wartime products fit it ideally for the new as well as old business. It has many war products, turning out projectile windshields, airplane brake disks, auto and tractor parts, airplane droppable fuel tanks, shell tanks and many other items.

Shell Made By Stamping

Besides it has produced millions of cartridge cases, of both brass and steel; but probably its most spectacular achievement—and the one that perhaps has contributed most to the new techniques for making postwar products—is that of making the 60 millimeter mortar shells by stamping. It makes about 90 per cent of those produced in the United States by this method.

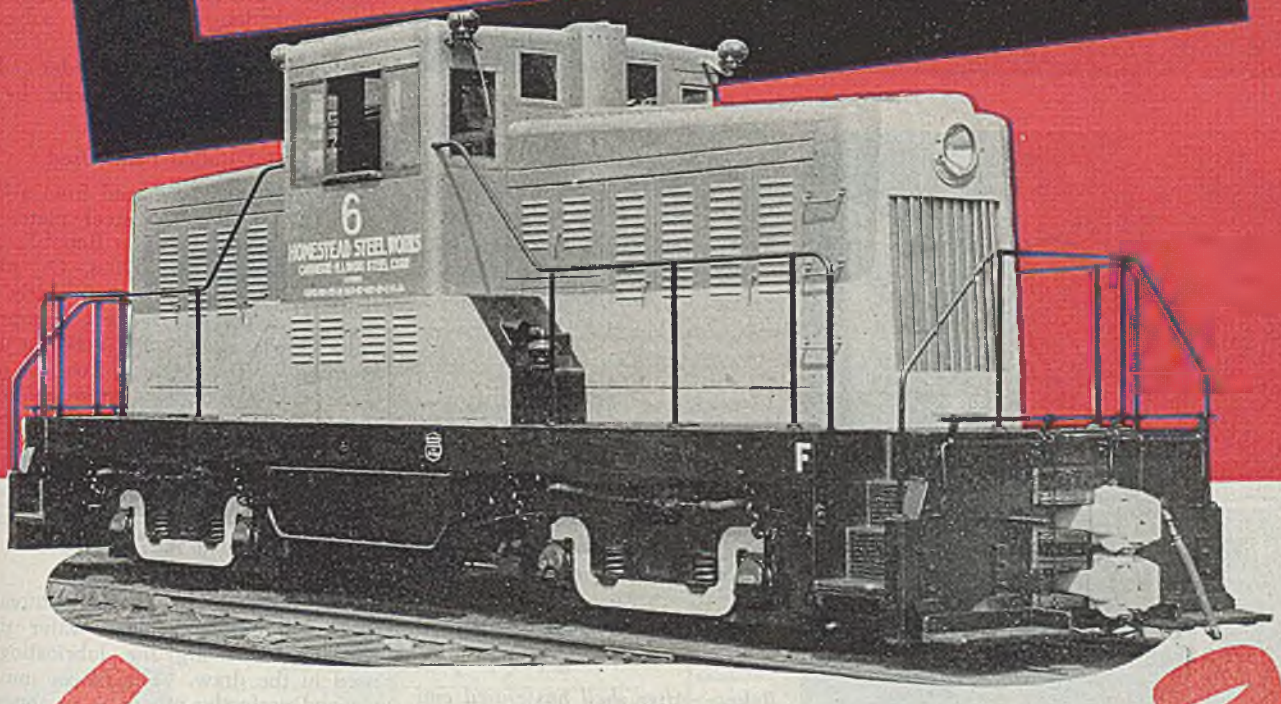
It was late in 1943 that United States Army ordnance officers called in a few steel stamping experts, explaining that the army needed more—many more—mortar shells for use principally in the Pacific theater of war. "Maybe," suggested one army officer, hopefully, "you could make them by stamping."

Mortar shell is of extremely difficult design. It is a little two-pound "pear" of steel; a fuse screws into its nose; it contains a charge of high explosive to burst it at the right split-second and its "tail" is a set of vanes, like an air bomb. Previously, these mortar shells had been forged or cast or made by a more recent method of stamping two steel sections and then welding them together.

Mullins agreed to tackle the job. Im-

Left—Sequence of operations indicates how metal is worked from flat blank into cup-shaped final form. Note finished shell with nose and tail fins added

Custom-Built PORTER DIESEL-ELECTRIC SWITCHERS



ONE LOCOMOTIVE DOES THE WORK OF TWO!

By the ingenious device of providing two sets of couplers instead of the conventional one, Porter engineers doubled the usefulness of a single locomotive. Twin couplers enable this Porter Diesel-Electric to handle either standard-height railroad cars or low-slung slag, industrial, mine, and quarry cars, thus eliminating the necessity of a separate power unit for each job.

This is but one example of the versatility of Porter Custom-Built Power. If you are considering the purchase of a switching locomotive, Porter engineers can save you money. Without obligation on your part, they will make a complete study of your switching requirements and submit an unbiased report on the type and size of unit designed to give you the most efficient and economical service.

ARMY E ★ NAVY

H. K. PORTER COMPANY, Inc.

PITTSBURGH 22, PENNSYLVANIA

FACTORIES: PITTSBURGH, PA. • BLAIRSVILLE, PA. • McKEESPORT, PA.
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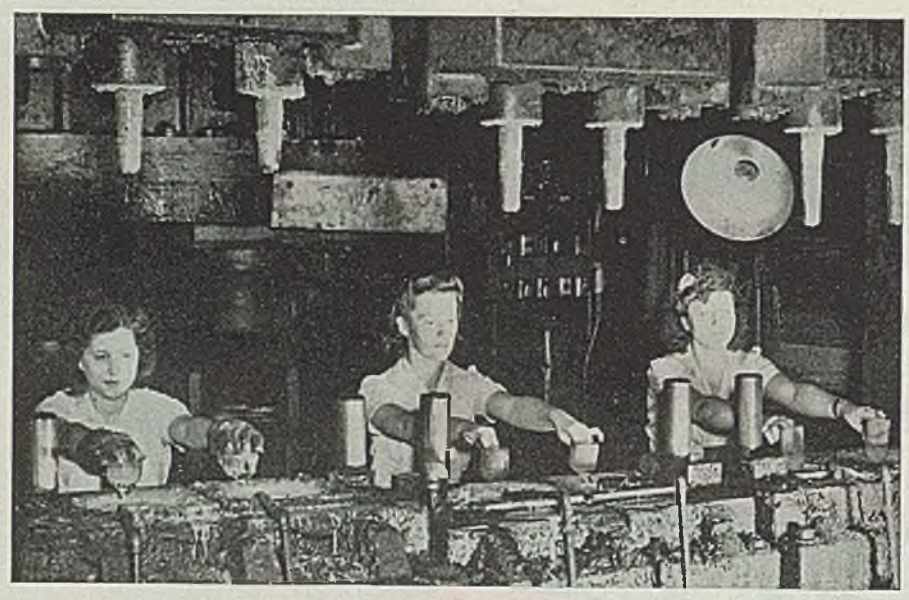
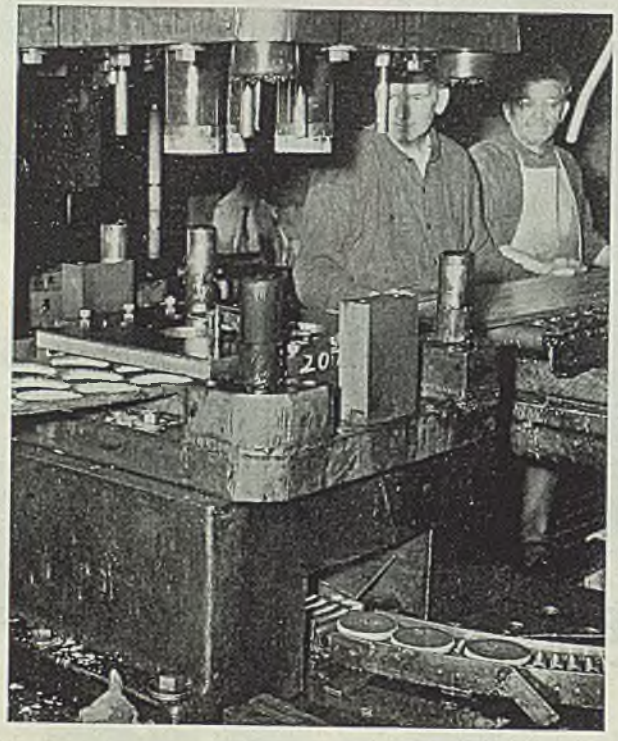
PORTER "Better Built" Equipment
Established 1866

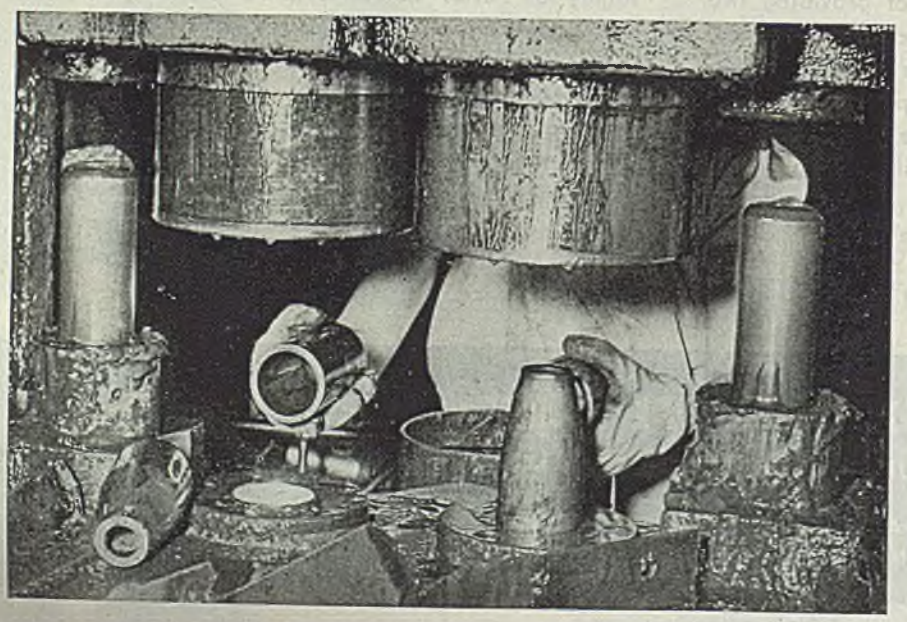




Above—This press works six shells at once, doing three different operations. Girl at left holds cup formed on another press; center worker receives from first draw; operator at right puts work through final draw

Left—Almost all operations are done in multiple. Here three blanks in three rows are cut simultaneously. Dies punch blank from each of two outside rows, the third or center being offset. See arrangement of punches

Below—After shell has closed end pierced, it is ready for tapering the open end in this press. Operator is holding untapered shells, knocking out tapered parts which roll down chute



mediately, Harry M. Heckathorn, vice president in charge of operations, Jacques Stanitz, engineer in charge of product development, and William A. Swertfager, chief engineer of the Warren works, put their heads together to devise a new production method.

They chose one method on which to concentrate—and then for days things hummed in the product development laboratory. While Swertfager was busy with his plans, he had a Cleveland firm rush a special batch of die steel; the tool room got out the dies in record time—and within nine days after Mullins was invited to take on the job, a complete set of sample mortar shells was in Washington, awaiting army approval. The army officers were astounded. They thought it was going to be a tough, time-consuming job—and it was solved in nine days!

Mullins received a large order and has been delivering mortar shells by the thousands since that time.

Hot Rolled Plate Used

The shells are produced from a killed SAE-1010 hot rolled steel plate, produced for Mullins at the Republic Steel Corp.'s Warren and Niles, O., plants. A 250-ton hydraulic press, formerly used to press automobile fenders, stamps circular blanks, each 4.503 inches in diameter and 0.670-inch thick, from the plate. Then a 1000-ton press cups the blanks, two at a time, forming cups 3.236 inches in diameter, 2¼ inches high, with wall thicknesses of 0.645-inch. The press moves with slow strokes to force the steel plate to "flow" into the desired shape rather than be crushed into that shape.

The cups then are washed automatically with sprays of hot water under pressure, removing the lubricating oil used in the draw. The pieces must be cleaned perfectly; otherwise in annealing any remaining oil would be converted into a carbon deposit adversely affecting further drawing. The pieces are annealed after every operation in a gas-fired conveyor type furnace at 1240 degrees Fahr., and then are given a pickling bath to remove scale.

Press Performs Draws

A 900-ton mechanical press, with three sets of double dies, so that six pieces can be handled simultaneously, performs the first, second and third draws. This press, formerly used for pressing kitchen sinks, is manned by four to six workers, and it has an intricate system of controls.

By now, the piece is a cylinder, 5.75 inches long, 2.50 inches in diameter and with a rounded end. The shell then is rough-trimmed to length in a small multi-tool lathe; then it goes through an operation that tapers the closed end and hardens the metal. The closed end is pierced on a 250-ton press.

The shell then proceeds into a Selas gas-fired conveyor-type furnace which anneals the first 2 inches of the open end of the shell at a temperature of 1100 degrees Fahr. After another pickling operation, the shell goes into a 200-ton

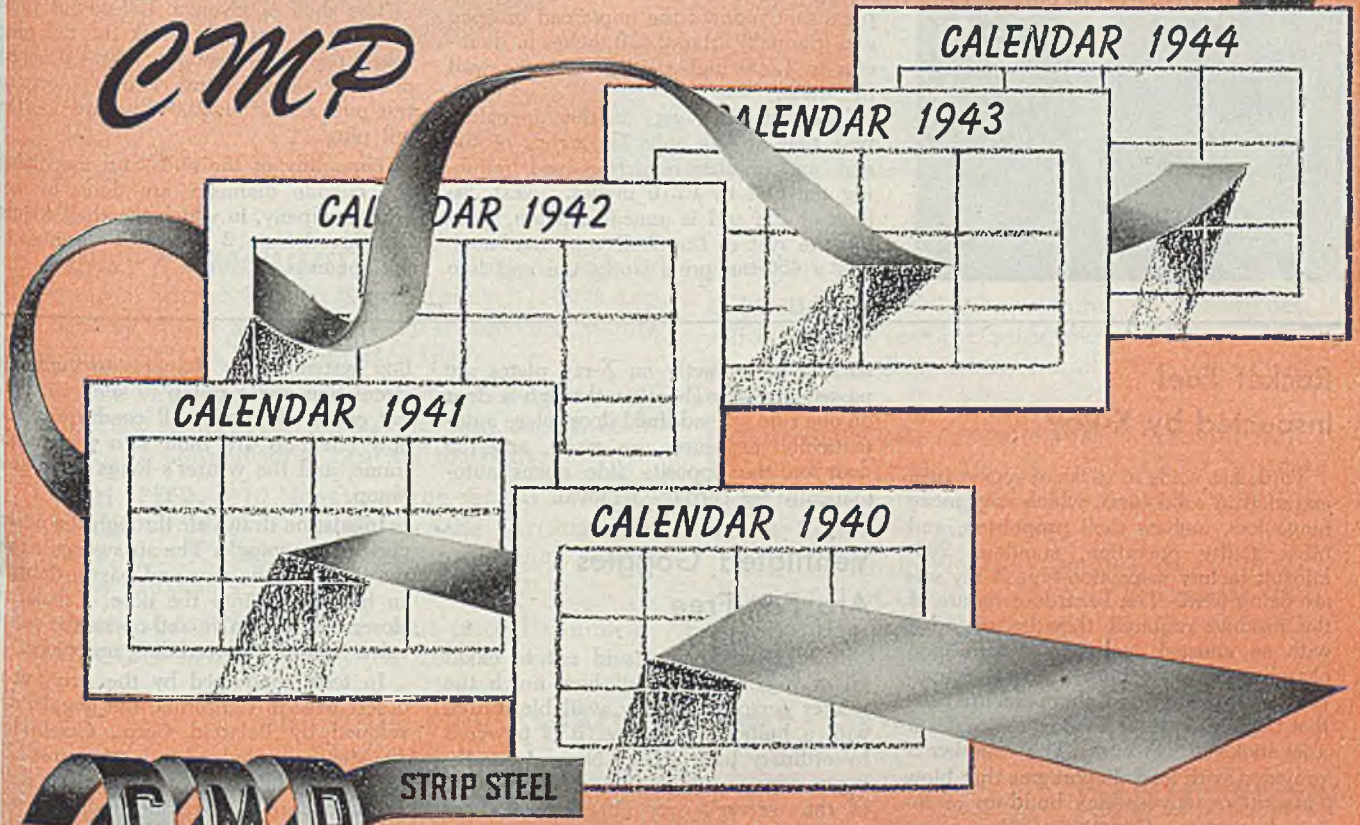
Tolerance Today .0002
in Cold Rolled Strip Steel

● Every year brings new achievements in CMP precision cold rolling of strip steel. Most recent and most remarkable of our precision operations is the rolling of miles of war-important steel strip with tolerance of .0002 in. Spurred by the urgency of the need, CMP undertook what authorities described as humanly impossible: to maintain a practically zero tolerance in cold rolled high tensile metal. Neither men nor machines were known able to "mike" unfailingly such extremely close tolerances. CMP is doing it with specially constructed equipment, and the armed forces now have one more precision aid to Victory.

CMP gets the call whenever absolute control of physicals and dimensions must be guaranteed. First to specialize in precision cold rolling, CMP now has experience and equipment with a potential of even greater accomplishment. CMP precision cold rolled strip steel, with its wide range of physicals, choice of finishes, tempers, grades, widths and gauges, gives greater yield of parts per ton and protects intricate dies and machinery because each shipment is tailored to a specific job. Write for a generous test sample.

PIONEERS OF PRECISION IN COLD-ROLLED STRIP STEEL

CMP



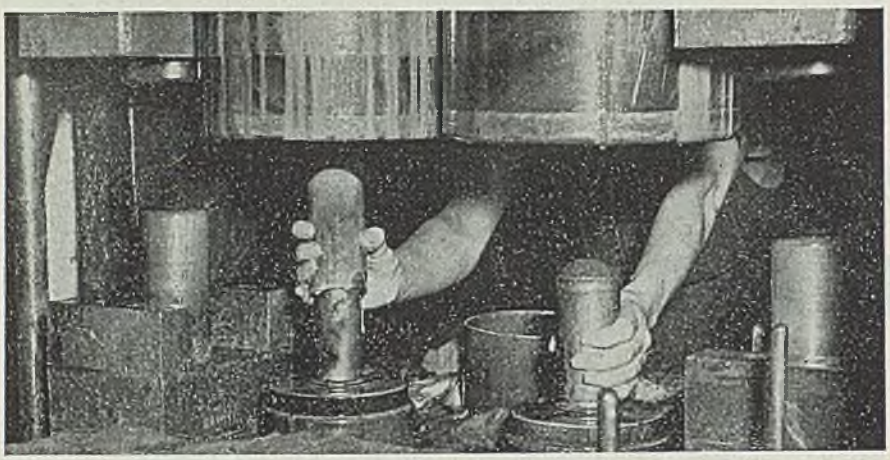
CMP STRIP STEEL
PRECISION COLD ROLLED

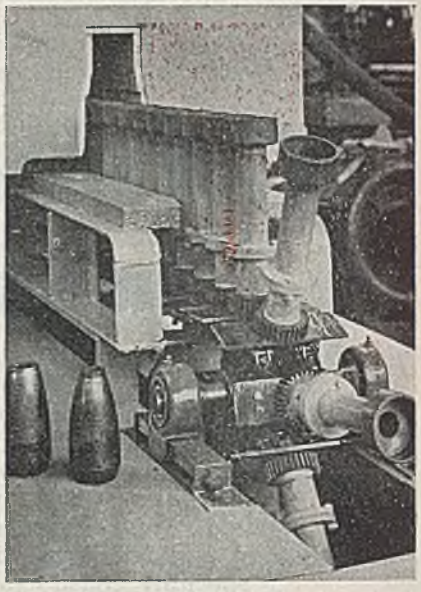
GIVES MAXIMUM PRODUCTION PER TON

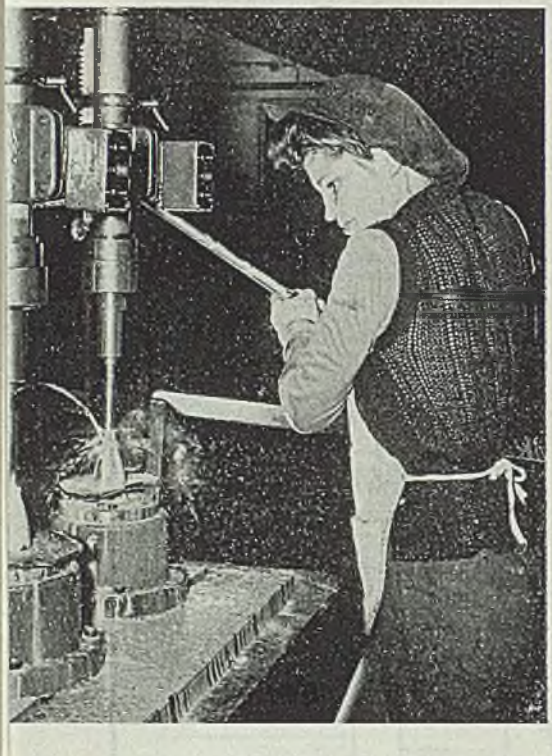
THE COLD METAL PRODUCTS CO.

Subsidiary of the Cold Metal Process Co.

YOUNGSTOWN, OHIO







Above—Heads are flattened two at a time on this press

Left — Conveyor type furnace where cases are heated by radiant gas burners as the cup-shaped fixtures carry the shell down the line. Note gears at base of fixtures to revolve the shell as they go past burners. Selas Corp. of America photo

Right—Reaming the ends of two shell in preparation for brazing in steel plugs

press that reduces the unpierced or open end gradually from 2.410 inches in diameter to 1.500 inches, increasing the wall thickness.

Then the shell gets another annealing pass that affects only 1½ inches of the end, and another reduction pass, reducing the end to 1.270 inches. Next, ¾-inch of the end is annealed again, leaving the rest of the shell work-hardened, and a 450-ton press works the end into a neck, 0.56-inch long, with a flat taper.

This neck is reamed and a plug with a silver solder ring around it is fitted into the opening. The unit then is silver brazed in an induction furnace.

The unit now is a pear-shaped shell, 5.156 inches long, 2.429 inches at its widest diameter and tapering to 1.980 inches at one end and 1.3 inches at the smaller end. Sidewalls are 0.2905-inch thick. Tolerances on outside diameters average 0.020-inch.

The shell is given a 150-pound pressure test in water to check the tail plug braze; then a 50-pound weight is dropped one foot on the plug, and a specimen test puts a load of 30,000 pounds on the tail plug.

Threading of the ends and machining the outside diameter are done by another company, in which the shell weight is reduced from 2 pounds 8½ ounces to 1.67 pounds.

Rocket Fuel Inspected by X-Ray

To detect voids in sticks of rocket fuel, extruded in solid form, which may mean range loss, uneven shell propulsion, and other faulty operation, standard 220-kilovolt factory inspection-type X-ray sets are being used. The hazardous nature of the product required they be provided with an unusual enclosure, a lead-lined chamber equipped with a sensitive temperature indicator and photo-electric tube that turns on a water flood from nozzles if a jet stick starts to burn. This chamber is provided with lead diaphragms that blow outward on any sudden build-up of internal pressure. Operator positions about the X-ray chambers are chosen to permit unrestricted escape through emergency exit doors of the building should an accident occur.

X-ray inspection of rocket fuel is essentially automatic, according to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Small carriages with the sticks lying directly on X-ray plates are passed into the chamber through a door on one side. Lead-lined doors close automatically, exposures are made, and the door on the opposite side opens automatically for carriage removal.

Ventilated Goggles Are Fog-Free

A fog free goggle, said not to cloud up or fog, regardless of how much the wearer perspires, is now available. Fitted with a bulbous nosepiece, it is powered by ordinary lung action. Normal breathing sweeps a change of fresh air in front of the wearer's eyes about once every second. This action removes moisture from within the goggle before there is enough of it to condense as fog on the plastic goggle lens, thus providing unblocked vision as well as eye protection against dust and protection against other flying particles.

The new goggle employs the basic two elements required in successful ventilation systems, flow channels to guide air circulation and a pump to keep air flowing constantly under all conditions. The flow channels are built into the goggle frame, and the wearer's lungs serve as a pump.

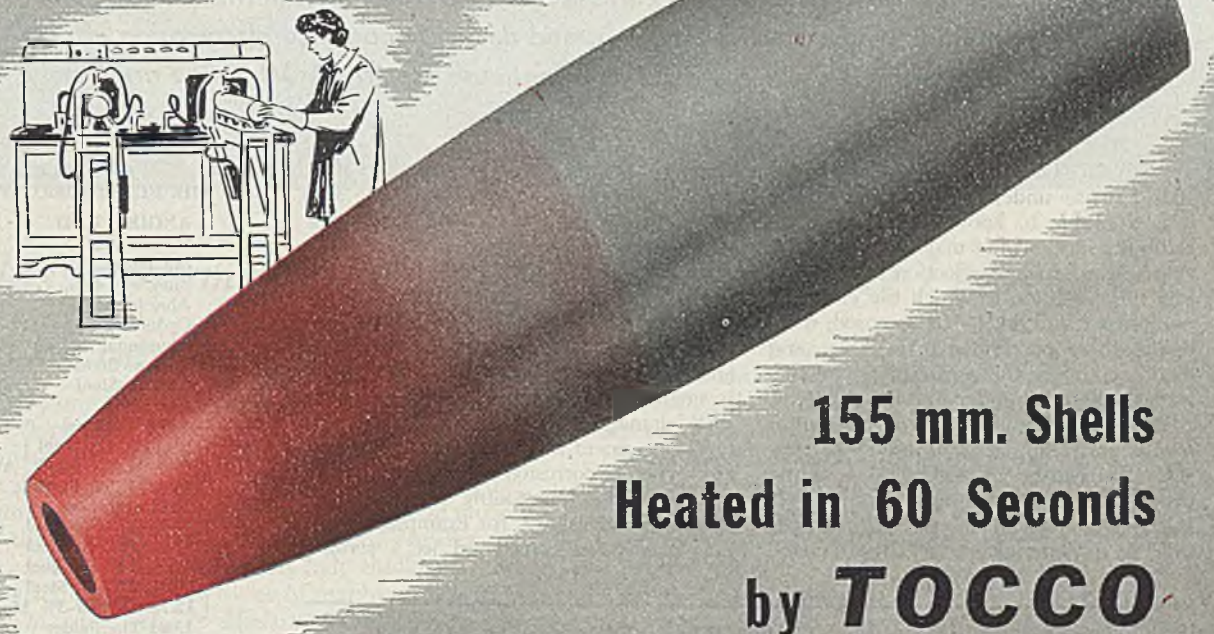
Inhalation draws air through the intake ports of the goggle. The air sweeps across the inside of the lens and passes through an inlet valve into the nose. Exhalation closes the inlet valve and opens the outlet valve in base of protruding nosepiece.

In tests conducted by the Army at a desert base in California, the goggle, developed by Polaroid Corp., Cambridge 39, Mass., was judged to be the most efficient for protecting eyes against dust. Tried out in a machine shop, it was credited with reducing eye accidents by about 50 per cent.

—o—

A chain, now being manufactured, will weigh 3000 tons and will be 1½ miles long. Links are each 53 feet long. The chain will be used to pull ships in drydocks at the Portland, Ore., Navy Yard.

HOTTEST thing in Ordnance



155 mm. Shells Heated in 60 Seconds by TOCCO

HEAVY AMMUNITION . . . highest priority product in the United States today . . . gets top heating speed and top quality in scores of plants with TOCCO Induction Heating.

One large producer reports these advantages of TOCCO heating for nosing 155 mm. shells, compared to conventional heating methods:

HIGH SPEED. A 10″ length of the shell is TOCCO-heated to 1800° F. in 60 seconds. Arranged in pairs, the TOCCO machines supply each nosing press 120 shells per hour.

HIGH QUALITY. Uniform, split-second timing of TOCCO heating, applied to an exact area, assures uniform nosing results for every shell.

DEPENDABLE. TOCCO machine is a compact, self-contained unit including motor-generator and all controls. Simple to install and reliable in operation.

GOOD WORKING CONDITIONS. No radiant heat. No smoke. Speedy, *localized* TOCCO heating permits easy handling of heated shells with gloved hands. Simple for girls to operate.

Call our Engineers for assistance in the application of TOCCO to *your* war production and postwar planning. A free copy of "Results with TOCCO" is yours for the asking.

THE OHIO CRANKSHAFT COMPANY · Cleveland 1, Ohio

TOCCO

INDUCTION

HARDENING . . BRAZING

ANNEALING . . HEATING

CORROSION RATINGS of Metals

Because of wide interest in corrosion and its prevention in the immense storage job incident to reconversion, and due to importance of corrosion effects in general, these data from Westinghouse Electric & Mfg. Co. are timely

AS A GUIDE to the selection of materials for use under corrosive conditions, it is desirable to know the relative corrodibility of available materials. The first step toward such a selection is to ascertain the condition to which the electrical equipment will likely be exposed; next define these conditions if possible; and finally, compare the corrodibilities of different materials under these conditions.

In comparing the corrodibilities of metals and alloys it is necessary to consider the pattern of the attack and the extent of damage to the equipment. If the corrosion occurs in the form of pitting, or intergranular attack, the damage is certain to be more serious than if it were uniformly distributed over the surface. The actual loss of metal, expressed in terms of weight loss per unit surface area, is therefore not necessarily a measure of the damage done. For example, the loss of metal resulting from the pitting of a tank, or the intergranular attack of a highly stressed airplane part, is negligible as compared with the possible damage.

The engineer is concerned chiefly with any type of corrosion which may interfere with the functioning of parts. On this basis, tarnishing, for example, would not usually be considered as a serious

TABLE II

CORROSION RATINGS OF COMMERCIAL ALLOYS OF ALUMINUM AND MAGNESIUM

(Data by courtesy of the Aluminum Co. of America)

Material	Alcoa Designation	Typical W. E. & M. Co. Material (P. D. Spec.)	General Outdoor Air—Rural	Urban	Marine
ALUMINUM & ALUMINUM ALLOYS					
99% Al	2S	7601	A	B	B
Al.-Mn	3S	7602	A	B	B
Al.-Cu-Mg-Mn	17S	7603	B	B	C
Al.-Cu-Mn-Mg	24S	8490	B	B	C
Al.-Cu-Mn-Mg	24C2	8538	A	B+	B+
Al.-Si	43	4458	A	B	B
Al.-Si	13	4257	A	B	B
Al.-Cu-Si	195	32°	B	B	C
Al.-Cu-Si	C113	5298	B	B	C
Al.-Cu-Fe-Zn	112	12	B	B	C
Al.-Si-Cu-Mg	355	40	A	B	B
Al.-Si-Mg-Cr	53ST	5859	A	B	B
Al.-Mg-Cr	52S	7250	A	B	B
Al.-Mg-Si-Cu-Cr	61S	....	A	B	B
MAGNESIUM & MAGNESIUM ALLOYS					
99.8% Mg	AM2S	3033–7751	C	D	D
98% Mg-1.5% Mn	AM35	....	B	C+	D+
95.8% Mg-3% Al.-10% Zn-0.2% Mn	AM52S	....	B	C+	D+
88.8% Mg-9% Al.-2% Zn-0.2% Mn	AM260	....	B	C	D
90.8% Mg-6% Al.-3% Zn-0.2% Mn	AM265	....	B	C	D

Aluminum alloys are used in ammonia and in hydrogen sulfide vapors but are not recommended for other corrosive atmospheres. These alloys may also be used in various concentrations of acetic, nitric and chromic acids. The scaling temperature of aluminum alloys is above their melting points. With the exception of zinc, aluminum and magnesium alloys should not be used in contact with other metals, if the contact is likely to get wet, unless an insulating coating be used to prevent galvanic corrosion. Magnesium alloys are not recommended for use in corrosive atmospheres. They are used in solutions of caustic alkalies, alkaline salts, and chromic acid. Magnesium alloys are not recommended for use above 400°F. because of effect of temperature on mechanical properties.

Plus and minus signs are used to permit a better differentiation between the corrosion-resistant qualities.

WESTINGHOUSE RECOMMENDATIONS

A & B—PROBABLY safe to use. C—Use only with CAUTION. D—Use should be avoided unless protected or unless appreciable corrosion can be tolerated, or provided for. E—Use should be AVOIDED.

TABLE I

THE ELECTROMOTIVE SERIES

	ANODIC END	
	Magnesium	
	Magnesium Alloys	
	Zinc	
	Aluminum 2S	
	Cadmium	
	Aluminum 17ST	
	Carbon Steel	
	Copper Steel	
	Cast Iron	
	4-6% Cr Steel	
A	12-14% Cr Steel	Active
A	16-18% Cr Steel	Active
A	23-30% Cr Steel	Active
	Ni-Resist	
B	7 Ni-17% Cr Steel	Active
B	8 Ni-18% Cr Steel	Active
B	14 Ni-23% Cr Steel	Active
B	20 Ni-25% Cr Steel	Active
B	12 Ni-18% Cr-3% Mo Steel	Active
	Lead-Tin Solder	
	Lead	
	Tin	
C	Nickel	Active
C	60 Ni-15% Cr	Active
C	Inconel	Active
C	80 Ni-20% Cr	Active
	Brasses	
	Copper	
	Bronzes	
	Nickel Silver	
	Copper Nickel	
	Monel	
C	Nickel	Passive
C	60 Ni-15% Cr	Passive
C	Inconel	Passive
C	80 Ni-20% Cr	Passive
A & B	12-14% Cr Steel	Passive
A & B	16-18% Cr Steel	Passive
A & B	7 Ni-17% Cr Steel	Passive
A & B	8 Ni-18% Cr Steel	Passive
A & B	14 Ni-23% Cr Steel	Passive
A & B	23-30% Cr Steel	Passive
A & B	20 Ni-25% Cr Steel	Passive
A & B	12 Ni-18% Cr-3% Mo Steel	Passive
	Silver	
	Graphite	
	CATHODIC END	

NOTE: The following should be avoided:

1. Combinations of materials from different subgroups.
2. Combinations from extreme ends of subgroups:
   (a) When the area of the metal higher in the list is smaller than that of the metal lower in the list. The higher metal will suffer accelerated corrosion to an extent determined by the corrosivity of the environment, the area of the more noble metal and the resistance of the electrical circuit.
   (b) When in doubt as to whether active-passive materials will be active or passive, assume that it will be active if its area is relatively small and passive if its area is relatively large.

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yet it has only 56 pages!"

All in this one handy 56-page booklet, you'll find...

How to pick the right leather belt for the job — a conveniently-organized section on what to expect from various tannages . . . tables on how to figure belt dimensions from horsepower and speed of motor . . . further aids on figuring drives not covered by tables . . . recommendations on belt thickness and pulley size, classified by types of machine drives.

How to select between Modern Group Drive and Automatic Tension Drive (pivoted motor base).

How to select between Multiple-V-Belt and Flat Leather Belt for Automatic Tension Drive.

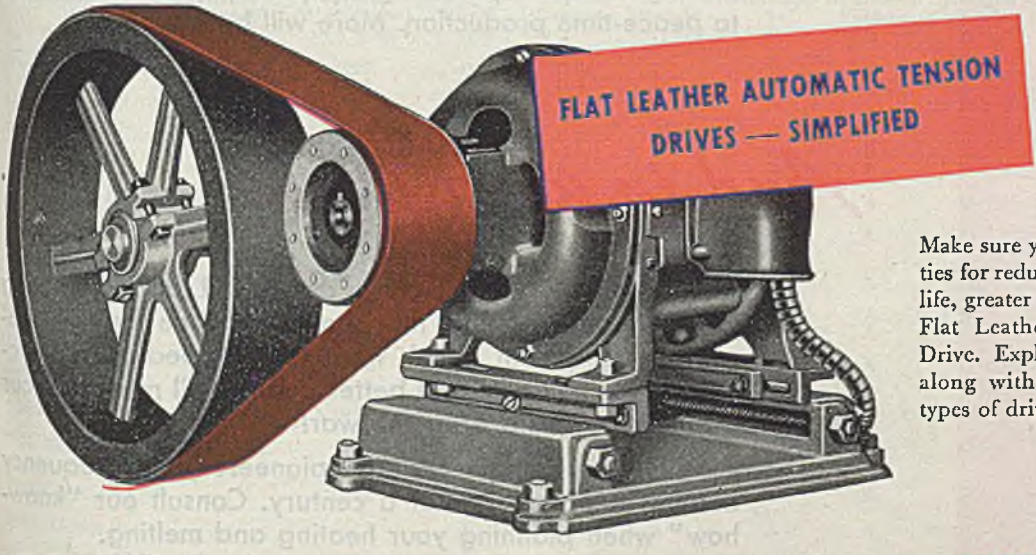
How to figure Flat Leather Automatic Tension Drives — useful short cuts.

How to figure prices — table on prices, another on pivoted motor base prices.

How to install your flat leather belt.

How to make your belts deliver more power and last longer.

This manual has been published for *your* convenience. Use the coupon—receive your copy by return mail. No obligation.



Make sure you know the opportunities for reduced maintenance, longer life, greater efficiency offered by the Flat Leather Automatic Tension Drive. Explained in the Manual — along with information on other types of drives.

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"2/3 OF OUR HEATING WILL BE SPEEDED BY HIGH FREQUENCY"

That statement by a prominent automotive engineer may have startled you six years ago.

Its enthusiasm was justified. It foresaw such jobs as heating 15-inch tubes at 100 per hour for spinning bombs — heating a bar every 30 seconds for nosing 5-inch shells — hardening bearings in 4 seconds — brazing adaptors in one-third the time. Yes, all these heating miracles are being done today with high frequency.

When these war jobs are finished, at least 90 percent of the high frequency heating equipment will be converted to peace-time production. More will be added.

Also:

Annealing
Heating Autoclaves
Vacuum Melting
Bonding Plywood
Die Heating
Drying
Shrink Fits
Sintering
Tin Reflowing
Laminating Rotors
— and many others

69

And in your plant:

The list at left and the pictures above will suggest heating jobs in your own plant that should be done by high frequency equipment. Think what the stepped-up production, lower unit cost and better quality will mean to your business now and after the war!

Ajax-Northrup engineers have pioneered high frequency heating for a quarter of a century. Consult our "know-how" when planning your heating and melting.

AJAX-NORTHRUP
HIGH-FREQUENCY
SINCE 1916
HEATING
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AJAX ELECTROTHERMIC CORPORATION • Ajax Park TRENTON 5, N. J.

ASSOCIATE COMPANIES . . . THE AJAX METAL COMPANY, Non-Ferrous Ingot Metals.
AJAX ELECTRIC FURNACE CORPORATION, Ajax-Wyatt Induction Furnaces.
AJAX ELECTRIC COMPANY, INC. Ajax-Hultgren Salt Bath Furnaces.
AJAX ENGINEERING CORPORATION, Aluminum Melting Furnaces.

type of corrosion, and it is ignored here.

In using the ratings given here it is important that consideration be given to the form in which the metal is to be used; that is, whether as a sheet, casting or forging and also that the engineer try to visualize the possible damage caused by the more vicious types of corrosion, such as deep pitting or intergranular attack. In connection with the latter form of corrosion, the engineer is warned that consideration should also be given to the possible serious effects of internal and applied stresses, particularly cyclic stresses on the fatigue strength of metals and alloys in corrosive atmospheres. That is, when fabrication or design produce such stresses in the material, necessary steps, such as proper annealing or a re-design, should be taken to reduce the possibility of damage.

It is not possible to include all these factors within the meaning of the following tabulated ratings and it is not so intended. The selection of a metal or alloy for a corrosive situation is largely a chemical engineer's problem. The ratings here given are intended as a guide to further investigation and not to final selection.

Definition of Conditions

In Chemical Solutions: Corrosion is an exceedingly complex process. The expression of an opinion on the probability of corrosion is similar to weather fore-

TABLE III

PROVISIONAL CORROSION RATINGS † OF COMMERCIAL ALLOYS OF ALUMINUM AND MAGNESIUM IN SEA WATER

Material	Alcoa Designation	Typical W. E. & M. Co. Material (P. D. Spec.)	Provisional Ratings† Sea Water
ALUMINUM & ALUMINUM ALLOYS			
99% Al	2S	7601	B
Al.-Mn	3S	7602	B
Al.-Cu-Mg-Mn	17S	7603	D
Al.-Cu-Mn-Mg	24S	8490	D
Al.-Cu-Mn-Mg	24C2	8538	B
Al.-Si	43	4458	B
Al.-Si	13	4257	B
Al.-Cu-Si	195	32°	D
Al.-Cu-Si	C113	5298	D
Al.-Cu-Fe-Zn	112	12	D
Al.-Si-Cu-Mg	355	40	C
Al.-Si-Mg-Cr	53ST	5859	B
Al.-Mg-Cr	52S	7250	B
Al.-Mg-Si-Cu-Cr	61S	....	B
MAGNESIUM & MAGNESIUM ALLOYS			
99.8% Mg	AM2S	3033, 7751	E
98% Mg-1.5% Mn	AM35	....	E
95.8% Mg-3% Al.-10% Zn-0.2% Mn	AM52S	....	D
88.8% Mg-9% Al.-2% Zn-0.2% Mn	AM260	....	E
90.8% Mg-6% Al.-3% Zn-0.2% Mn	AM265	....	E

LEGEND

A—Practically complete resistance, or the alloy is best of material within its class.

B—Good resistance as proven by being in common use. May replace materials given A rating to secure some other advantage.

C—Adequate resistance under favorable conditions which should be investigated beforehand.

D—Sufficient resistance if adequate precautions are taken to reduce effect of corrosive conditions, as by coatings, cathodic protection, re-design, etc., or where appearance is not important and appreciable corrosion may be provided for, or tolerated.

E—Poor resistance—use only if no better material is available.

°Not to be used without heat treatment.

†Corrosion ratings for metals in contact with sea water are subject to variations, depending upon harbor water pollution and flow. Ratings given for sea water applications shall be considered as a supplement to, rather than a replacement of, other means of arriving at a proper choice of material.

TABLE IV

CORROSION RATINGS OF COMMERCIAL ALLOYS OF IRON, NICKEL & CHROMIUM

(Data by courtesy of the International Nickel Co.)

Material	American Iron & Steel Institute Type Number	Typical W.E.&M. Co. Material (P. D. Spec.)	Outdoor Air			Specific Industrial Atmospheres (Wet)					Scaling Temp. Degrees Fahr. Note 1
			Rural	Urban	Marine	Ammonia	Hydrogen Sulfide	Hydrogen Chloride	Sulfur Dioxide	Chlorine	
Low Carbon Steel	—	1555-2084	D+	D	D	B	D	D	D	D	1000
Copper Bearing Steel	—	4225	D+	D+	D	B	D	D	D	D	1000
4-6% Cr Steel	502	6396	D+	D+	D+	B	D+	D	D	D	1150
12-14% Cr Steel	420	8213	B+	B	C—	A	C	D	D	D	1250
12-14% Cr 0.60% Mo	416	5161	B+	B	C—	A	C	D	D	D	1250
16-18% Cr	430	5284	A	B+	C	A	B	D	D	D	1550
23-30% Cr	446	6770	A	A	C+	A	A	D	B	D	2000
7% Ni-17% Cr	301	7670	A	A	B+	A	A	D	C	C	Not used for oxidation res.
8% Ni-18% Cr	302 303 304	4562 6478 5872	A	A	A—	A	A	D	B	C	1650
8% Ni-18% Cr 1% Cb	347	7968	A	A	A—	A	A	D	B	C	1650
8% Ni-18% Cr 0.5% Ti	321	—	A	A	A—	A	A	D	B	C	1650
14% Ni-23% Cr	309	5758	A	A	A	A	A	D	B	C	2000
12% Ni-18% Cr 3% Mo	316	8685	A	A+	A+	A	A	C	A	B	1650
20% Ni-25% Cr	310	—	A	A+	A+	A	A	D	B	C	2000
Nickel	—	1921	A	A—	A+	C-E Note 5	B	C-B	C	B	Note 2—1900 Note 3—1000 Note 4— 700
30% Ni-70% Cu	—	—	A	A—	A	C-E Note 5	C—	C+	B	C+	—
Monel	—	2718	A	A	A	C-E Note 5	B	B	C	B	Note 2—1000 Note 3—1000 Note 4— 650
80% Ni-20% Cr	—	3012	A	A	A+	A	A	B	B	B	2100
Inconel-80% Ni, 7% Fe-13% Cr	—	8153	A	A	A+	A	A	B	B	B	Note 2—2000 Note 3—1500 Note 4—1000

A—Practically complete resistance, or the alloy is the best of materials within its class. PROBABLY safe to use.

B—Good resistance, as proven by being in common use. May replace materials given A rating to secure some other advantage. PROBABLY safe to use.

C—Adequate resistance under favorable conditions which should be investigated beforehand. Use only with CAUTION.

D—Sufficient resistance if adequate precautions are taken to reduce effect of corrosive conditions, as by coatings, cathodic protection, re-design, etc., or where appearance is not important and appreciable corrosion may be provided for, or tolerated. Use should be avoided unless protected or unless appreciable corrosion can be tolerated, or provided for.

E—Poor resistance—use only if no better material is available. Use should be AVOIDED.

Plus and minus signs are used to permit a better differentiation between the corrosion-resistant qualities.

Notes:

1—Values assume substantially constant temperature operations—should be lowered for cyclic heating and cooling to an extent dependent upon the frequency and range of temperature fluctuations.

2—Scaling temperature in low-sulfur atmosphere.

3—Scaling temperature in high sulfur oxidizing atmosphere.

4—Scaling temperature in high sulfur reducing atmosphere.

5—Not recommended primarily to resist ammonia attack, but may be used where resistance to ammonia in low concentrations is an incidental requirement

casting. Having determined all apparent conditions, an intelligent opinion may be given; but if certain conditions are overlooked or varied in the meantime, the results may not be as predicted.

For example, when a metal is exposed to a chemical solution, we must consider the effects of many factors, viz., concentration, temperature, movement and aeration of the solution as well as stresses, surface conditions and purity of the metal. The selection of materials for use in chemical solutions is a specialized problem for the chemical engineer and can be made only on the basis of information available to him. The information required is usually too complex to allow putting into a table; and the tables herein must not be so used.

In Natural Waters: Fresh waters vary tremendously, in corrosivity, depending upon their natural source, whether lake, river, or underground, and upon contaminating sources such as mines, sewage, and industrial wastes. Since natural waters contain many impurities affecting their corrosivity, they should be considered in the same category as chemical solutions, and the selection of materials for use in contact with them is a chemical engineering problem.

Since water-cooling systems are common accesories to electrical equipment, the problem of selecting the least corrodible materials frequently arises; and can be intelligently made only on the basis of the information and experience available to the engineer. It is extremely important that the engineer interpret the analysis of the water and survey the possibilities of its contamination with corrosive agents, like acid mine water. This involves the question of water-treatment and the use of corrosion inhibitors.

In Various Atmospheres: In the case of equipment to be used in a certain atmosphere, the question of selecting materials is less complex than it is for handling chemical solutions. The suppliers have accumulated information on comparative corrosion resistance in typical outdoor air and also in certain chemical vapors commonly encountered in industrial processes; and have furnished studies of corrosion ratings under these conditions.

Under "general outdoor air" we have three general classes of atmosphere, namely rural, urban and marine. Frequently, it is difficult to classify an outdoor atmosphere. For example, the atmosphere in a city along the sea coast would have an "urban" or "marine" composition and the corrosion rating should be taken as the worse of the two.

While it is intended that comparisons in ratings should be made only in vertical columns, that is, for given conditions, the tendency toward making comparisons along horizontal lines is hard to resist. If we limit such horizontal comparisons to atmospheric conditions, it is believed that generally useful conclusions may be reached. For example, if a material has an AB rating in general outdoor city air, and it also has a lower rating in a certain "specific industrial atmosphere", it is very important that the engineer survey the possibilities of contamination of the air from the surroundings. This is particularly true of copper

TABLE V
CORROSION RATINGS OF COMMERCIAL COPPER AND COPPER ALLOYS

(Data by courtesy of the American Brass Co.)

Material	Typical W.E.&M. Co. Material (P. D. Spec.)	General Outdoor Air			Specific Industrial Atmospheres (Wet)				
		Rural	Urban	Marine	Ammonia	Hydrogen Sulfide	Hydrogen Chloride	Sulfur Dioxide	Chlorine
COPPERS									
Copper, Tough Pitch	2007	A	A—	A	E	C	C	B	C
Copper, Phosphorized	5536	A	A—	A	E	C	C	B	C
Copper, Oxygen Free	2003-3	A	A—	A	E	C	C	B	C
Cupaloy	7550	A	A—	A	E	C	C	B	C
Cadmium Copper	4623	A	A—	A	E	C	C	B	C
Beryllium Copper	7534	A	A—	A	E	C	C	B	C
Selenium Copper	8540	A	A—	A	E	C	C	B	C
BRASSES									
Gilding Metal (95-5)	—	A	A—	A	E	C	C	B	C
Commercial Bronze (90-10)	8012	A	A—	A	E	C	C	B	C
Red Brass (85-15)	7292-7790	A	A—	A	E	C	C	B	C
Low Brass (80-20)	7410	A	B +	A—	E	C+	E	C	E
High Brass (70-30)	8010	A	B	B+	E	B—	E	C—	E
High Brass (68-32)	2677	A	B	B+	E	B—	E	E	E
High Brass (66-34)	2411-2676	A	B—	B+	E	B—	E	E	E
Muntz Metal (60-40)	6811	A	B—	B+	E	B—	E	E	E
LEADED BRASSES									
Leaded Commercial Bronze 88-10-2%	—	A	A—	A	E	C	C	B	C
Hardware Bronze	7790	A	A—	A	E	C	C	B	C
Low-leaded Tube Brass	2430	A	B—	B+	E	B—	E	E	E
Low-leaded Brass	8182	A	B—	B+	E	B—	E	E	E
Medium-leaded Brass	7785	A	B—	B+	E	B—	E	E	E
High-leaded Brass	—	A	B—	B+	E	B—	E	E	E
Extra-high-leaded Brass	1523-2724	A	B—	B+	E	B—	E	E	E
Leaded Muntz Metal	6377-2840	A	B—	B+	E	B	E	E	E
Forging Brass	4907	A	B—	B+	E	B	E	E	E
Architectural Bronze	3134	A	B—	B+	E	B	E	E	E
BRONZES									
Phosphor Bronze 1¼%	7342-7413	A	A—	A	E	C	C	B	C
Phosphor Bronze 5%	2383-2709	A	A—	A	E	C	C	B	C
Phosphor Bronze 6%	—	A	A—	A	E	C	C	B	C
Phosphor Bronze 8%	4118	A	A—	A	E	C	C+	B	C
Phosphor Bronze 10%	3503-4121	A	A—	A	E	C	C+	B	C
Hard Bronze (88-4-4-4)	6014	A	A—	A	E	C	C	B	C
SPECIAL BRASSES									
Admiralty	7634	A	B	B+	E	B—	E	C	E
Naval Brass	2824	A	B	B+	E	B	E	E	E
Leaded Naval Brass (60-38-1.5%)	—	A	B	B+	E	B	E	E	E
Manganese Bronze	5184	A	B	B+	E	B	E	E	E
Aluminum Brass	6052	A	B	B+	E	B—	E	C	E
CUPRO-NICKELS									
Cupro-nickel (70% Cu-30% Ni)	—	A	A—	A	E	C—	C+	B	C+
Nickel Silver, Alloy A (18% Ni-65% Cu-17% Zn)	8130	A	A—	A	E	C—	C+	B	C+
*Nickel Silver (30% Ni-47% Cu-23% Zn)	1498	A	B	A	E	C	E	C	E
*Nickel Silver, Alloy B (18% Ni-55% Cu-27% Zn)	3296	A	B	A	E	C	E	C	E
SPECIAL BRONZES									
Silicon Bronze	7610	A	A—	A	E	C	C+	B	C+
Silicon Bronze	8308	A	A—	A	E	C	C+	B	C+
Silicon Bronze	4448	A	A—	A	E	C	C+	B	C+
Silicon Bronze	4788	A	A—	A	E	C	C+	B	C+
5% Aluminum Bronze	—	A	A—	A	E	C+	C	B	C
Al. Ni-Fe-Cu	6799	A	A—	A	E	C+	C	B	C

A—Practically complete resistance, or the alloy is the best of materials within its class. PROBABLY safe to use.
B—Good resistance, as proven by being in common use. May replace materials given A rating to secure some other advantage. PROBABLY safe to use.
C—Adequate resistance under favorable conditions which should be investigated beforehand. Use only with CAUTION.
D—Sufficient resistance if adequate precautions are taken to reduce effect of corrosive conditions, as by coatings, cathodic protection, re-design, etc., or where appearance is not important and appreciable corrosion may be provided for, or tolerated. Use should be avoided unless protected or unless appreciable corrosion can be tolerated, or provided for.
E—Poor resistance—use only if no better material is available. Use should be AVOIDED.
Plus and minus signs are used to permit a better differentiation between the corrosion-resistant qualities.
*—Used principally for electrical resistance properties.

Pouring a double Thermit weld in fabricating a ship stern frame.

A Lesson from a VICTORY SHIP

Thermit welding's speed and effectiveness have been utilized in fabricating separately cast sections of the huge stern frames of Victory ships built for the U. S. Maritime Commission.

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Write for a copy of "Thermit Welding" or consult Metal & Thermit Corporation, 120 Broadway, New York 5, N. Y., Albany, Chicago, Pittsburgh, So. San Francisco, Toronto.

Thermit Welding

TABLE VI

PROVISIONAL CORROSION RATINGS * OF COMMERCIAL COPPER AND COPPER ALLOYS IN SEA WATER

Material	Typical W.E.&M. Co. Material (P. D. Spec.)	Provisional Ratings* Sea Water
COPPERS		
Copper, Tough Pitch..	2007	B—
Copper, Phosphorized..	5536	B—
Copper, Oxygen Free..	2003-3	B—
Cupaloy.....	7550	B—
Cadmium Copper.....	4623	B—
Beryllium Copper.....	7534	B—
Selenium Copper.....	8540	B—
BRASSES		
Gilding Metal (95-5)..		B—
Commercial Bronze (90-10).....	8012	B—
Red Brass (85-15)....	7292-7790	B—
Low Brass (80-20).....	7410	C+
High Brass (70-30)....	8010	C
High Brass (68-32)....	2677	C
High Brass (66-34)....	2411-2676	C—
Muntz Metal (60-40)..	6811	C—
LEADED BRASSES		
Leaded Commercial Bronze 88-10-2%.....	—	B—
Hardware Bronze.....	7790	B—
Low-leaded Tube Brass	2430	C—
Low-leaded Brass	8182	C—
Medium-leaded Brass..	7785	C—
High-leaded Brass.....	—	C—
Extra-high-leaded Brass	1523-2724	C—
Leaded Muntz Metal..	6377-2840	C—
Forging Brass.....	4907	C—
Architectural Bronze..	3134	C—
BRONZES		
Phosphor Bronze 1¼%	7342-7413	B—
Phosphor Bronze 5%..	2383-2709	B—
Phosphor Bronze 6%..	—	B—
Phosphor Bronze 8%..	4118	B
Phosphor Bronze 10%.	3503-4121	B+
Hard Bronze (88-4-4-4)	6014	B
SPECIAL BRASSES		
Admiralty.....	7634	B+
Naval Brass.....	2824	B—
Leaded Naval Brass (60-38-1.5%).....	—	B—
Manganese Bronze....	5184	B—
Aluminum Brass.....	6052	A—
CUPRO-NICKELS		
Cupro-nickel (70% Cu-30% Ni)....	—	A
Nickel Silver, Alloy A (18% Ni-65% Cu-17% Zn).....	8130	B+
*Nickel Silver (30% Ni-47% Cu-23% Zn).....	1498	B
*Nickel Silver, Alloy B (18% Ni-55% Cu-27% Zn).....	3296	B
SPECIAL BRONZES		
Silicon Bronze.....	7610	B—
Silicon Bronze.....	8308	B—
Silicon Bronze.....	4448	B—
Silicon Bronze.....	4788	B—
5% Aluminum Bronze.	—	B+
Al.-Ni-Fe-Cu.....	6799	B+

A—Practically complete resistance, or the alloy is the best of materials within its class. PROBABLY safe to use.

B—Good resistance, as proven by being in common use. May replace materials given A rating to secure some other advantage. PROBABLY safe to use.

C—Adequate resistance under favorable conditions which should be investigated beforehand. Use only with CAUTION.

D—Sufficient resistance if adequate precautions are taken to reduce effect of corrosive conditions, as by coatings, cathodic protection, re-design, etc., or where appearance is not important and appreciable corrosion may be provided for, or tolerated.

Use should be avoided unless protected or unless appreciable corrosion can be tolerated, or provided for.

E—Poor resistance—use only if no better material is available. Use should be AVOIDED.

Plus and minus signs are used to permit a better differentiation between the corrosion-resistant qualities.

*—Corrosion ratings for metals in contact with salt water are subject to wide variations, depending upon geographical location, flow and cyclic heating. Ratings given for sea water applications shall be considered as a supplement to, rather than a replacement of, other means of arriving at a proper choice of material.

alloys, since they are adversely affected by many chemical vapors. Such precautions against corrosion as protective coatings and air conditioning may then be considered.

Corrosion Due to Galvanic Couples

(Data by courtesy of the International Nickel Co.) When two metals are in contact and this contact becomes wet with a conducting solution, there is an electric potential set up between them. For example, if magnesium touches silver, both being in an electrolyte, a difference in potential of more than a volt may exist between the two metals. Likewise, if different metals and alloys are successively brought into contact with silver or any other metal, they will exhibit a characteristic potential, and may be listed as in Table I. It is dangerous to use metals in the upper end (anodic end) of the list in contact with those in the lower (cathodic) and, without safeguarding such a contact by coating or other means, to keep it from being wet with a conducting solution.

For example, in sea water which is an electrolyte of high electrolytic conductivity galvanic potentials should generally be avoided. This is true especially with the alloys of aluminum and magnesium, iron, steel, and high-zinc brasses, in contact with copper. If, however, the area of corroding (anodic) metal is very large as compared with the cathodic copper, the corrosion will be spread over this large area, and the actual damage will be mitigated. For example, copper pipe is usually connected to steel tanks without serious results; but the connection of steel pipe to a copper tank would result in a different story. The anodic metal will suffer accelerated corrosion to an extent determined by the corrosivity of the environment, the area of the cathodic metal and the resistance of the galvanic circuit, which consists of the two metals and the solution.

Passivity Depends on Solution

Sometimes, galvanic couples do not result in corrosive attack of the anodic metal, as might be expected. The condition, which prevents the expected attack, has been named "passive" but has received no universally accepted explanation. Alloys containing chromium are most pronounced in their passivity which accounts for its wide use in corrosion-resistant alloys. Passivity also depends upon the nature of the solution. If the solution is one which destroys passivity, the alloy is then said to become "active" and will be attacked.

In Table I, these active-passive alloys are designated in three groups, A, B, and C, which under certain conditions become "active" and are placed higher in the list. It is obvious that the conditions of use must be investigated before a "passive" metal or alloy is recommended. When in doubt as to whether an active-passive material will be active or passive—assume that it will be active if its area is relatively small, and that it will be passive of its area is relatively large.

TABLE VII

PROVISIONAL CORROSION RATINGS OF COMERCIAL ALLOYS OF IRON, NICKEL AND CHROMIUM IN SEA WATER

Material	AISI Type Number	Typical W.E.&M. Co. (P.D. Spec.)	Provisional Ratings Sea Water*
Low Carbon Steel	—	1555, 2084	D+
Copper Bearing Steel.....	—	4225	D+
4-6% Cr Steel...	502	6396	D
12-14% Cr Steel.	420	8213	C— to E Note 1
12-14% Cr 0.60% Mo.....	416	5161	C— to E Note 1
16-18% Cr.....	430	5284	C— to E Note 1
23-30% Cr.....	446	6770	C to E Note 1
7% Ni-17% Cr..	301	7670	C to E Note 1
	302	4562	
8% Ni-18% Cr..	303	6478	C to E
	304	5872	Note 1
8% Ni-18% Cr 1% Cb.....	347	7968	C to E Note 1
8% Ni-18% Cr 0.5% Ti.....	321	—	C to E Note 1
14% Ni-23% Cr	309	5758	C+ to E Note 1
12% Ni-18% Cr 3% Mo.....	316	8685	C+ Note 1
20% Ni-25% Cr	310	—	C Note 1
Nickel.....	—	1921	C—
30% Ni-70% Cu	—	—	A Note 2
Monel.....	—	2718	A Note 2
80% Ni-20% Cr	—	3012	C—
Inconel-80% Ni, 7% Fe-13% Cr..	—	8153	C—

A—Practically complete resistance, or the alloy is best of material within its class.

B—Good resistance as proven by being in common use. May replace materials given A rating to secure some other advantage.

C—Adequate resistance under favorable conditions which should be investigated beforehand.
D—Sufficient resistance if adequate precautions are taken to reduce effect of corrosive conditions, as by coatings, cathodic protection, re-design, etc., or where appearance is not important and appreciable corrosion may be provided for, or tolerated.

E—Poor resistance—use only if no better material is available.

*—Corrosion ratings for metals in contact with salt water are subject to wide variations, depending upon geographical location, flow and cyclic heating. Ratings given for sea water applications shall be considered as a supplement to, rather than a replacement of, other means of arriving at a proper choice of material.

Notes:

1—With the stainless steels, the lower ratings refer to exposure to quiet, or slowly moving sea water, especially where marine organisms may become attached and induce pitting. The higher ratings refer to contact with sea water at high velocity, e.g. pump impellers for which the better stainless steels frequently give excellent service, especially in poluted harbor waters. The straight chromium stainless steels give their best performance when used at high velocity and in contact with ordinary steel, but should not be combined with bronzes.

2—The 70-30 copper nickel alloy is preferred for condenser tubes, salt water piping and boat sheathing. Monel provides high strength, excellent resistance to erosion, and a favorable galvanic relationship to bronzes. It is the preferred material for valve trim, shafting, and for vital parts of assemblies which include bronze components.

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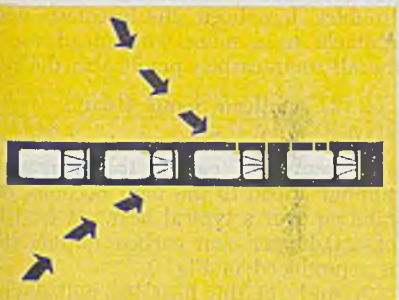

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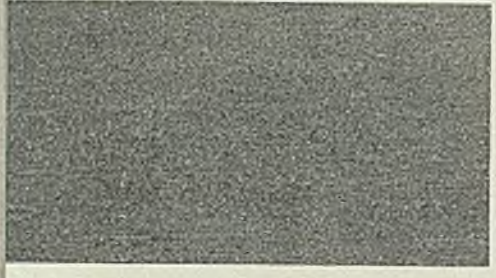
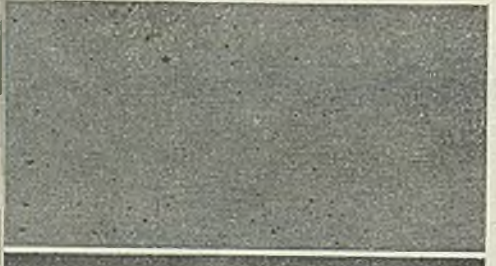
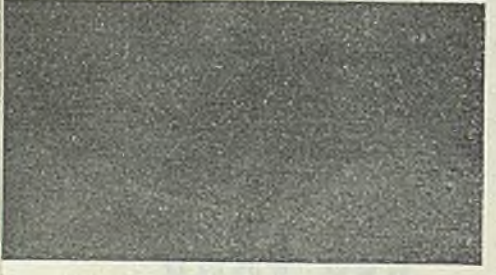






Practice in cold-iron shops particularly when cheap scrap is available affords low mix costs. Sulphur kept within bounds by the use of spiegel or the charging of high-manganese crops. Sequence of charging parallels conventional method. Control of shop operations similar to that applicable to pig-scrap charge

FIVE major types of charges are employed in the basic open hearth: The all hot metal, hot metal and blown iron from the bessemer, hot metal and cold scrap, cold pig iron and scrap, and the all-scrap carbon. The type of charge chosen for any particular plant is determined solely by the economic factors in that plant. This is true because with present-day knowledge of slag control and open-hearth operations, satisfactory quality can be made from any of these charges.

A steel plant with ample blast furnace capacity has a distinct advantage over the small cold metal shop. These advantages are: Lower iron cost, iron already molten, and smoothing out the variation in chemistry from cast to cast by blending in the mixer. The small cold iron shop has to purchase pig iron on the open market, use it as it comes without much opportunity to blend, and expend open-hearth time and fuel in melting it. The small shop can, however, take advantage of the fact that scrap sells at a lower price than pig and reduce the amount of pig used. The ultimate in this is the all-scrap-carbon charge. When properly used and controlled, this practice results in a material reduction of mix cost and in all probability the savings will become greater in the next few years.

The price of pig iron is governed not only by the law of supply and demand but also by the cost of operation of the blast furnace. As the demand for cold pig iron drops with reductions in steel and cast-iron production, more blast furnace iron is diverted to the open hearths as hot metal. Scrap on the other hand becomes increasingly abundant when steel production is large and this increased supply usually is reflected in lower prices. With cheap scrap the all scrap-carbon charge becomes attractive to the small shop. The economic balance of these two types of charges, a 40 per cent pig, 60 per cent scrap and an all scrap-carbon, available to the Toronto, O., plant of the Follansbee Steel Corp., are shown in Table 1.

Fundamentally this practice has the problem of sulphur to solve. The basic open-hearth process was not designed or intended to remove sulphur and it is an extremely difficult and costly operation when it becomes necessary. For this reason the sulphur content of all of the materials used in the open-hearth operation is of extreme importance. Scrap is usually materially higher in average sulphur content than pig iron. With the addition of still more scrap the sulphur content is increased and this fact must be considered. Failure to take adequate precautions against sulphur troubles has been the greatest single obstacle to a more widespread use of the all scrap-carbon practice in the past.

Silicon Scrap Used

When coal or by-product coke is used as a source of carbon the increase in sulphur added to the bath becomes prohibitive over a typical heat. A heat log of a 0.40 per cent carbon forging steel is reproduced in Fig. 2.

A study of this heat log will disclose the use of 1000 pounds of spiegel in the charge. Either this or high-manganese crops (1.80 to 2.00 per cent manganese) is used in order to insure a high-residual manganese in the melt to remove sulphur. This reaction is:

$$FeS + Mno = MnS + FeO$$

Also the use of silicon sheet scrap and silicon bar scrap will be noted. This is of home origin from the production of transformer steels and will average 3 per cent silicon. It is used as a substitute for the silicon which would be carried by the pig iron and aids materially in preventing a too rapid carbon elimination.

The furnace is charged with the carbon (graphite and petroleum coke) on the bottom, followed by the spiegel, if it is to be used, and covered with a layer of silicon sheet scrap. The burnt

Fig. 1 (Left)—Etch slices from top and bottom positions of first, middle and last ingots in heat

Fig. 2 (Right)—Log of a 0.40 per cent carbon forging steel heat

Open Hearth and Metallurgical Report

Follansbee Steel Corporation

Toronto Plant

HEAT NO. I532 SAE 1040 TYPE CUSTOMER SIZE 4X4 TURN 8/4 DATE 10/4/44

REFRACTORIES USED	WEIGHT
Dolomite Raw	100
Dolomite Burnt	3000
Chrome Ore	300
Sinkrite	70
Coke	
Ramix	
Graphite	50
Tar	
Mexaloy	15
Pitch	25

FLUX CHARGED		WEIGHT
Limestone	Bxs.	
Burnt Lime	Bxs.	6060

FLUX ADDED	TIME	WEIGHT
Limestone		
Burnt Lime	11:20	800
" "		
Fluor Spar	9:15	200
	9:25	200
	9:40	100
	9:55	100
	10:00	100
	11:05	100

MATERIAL USED	WEIGHT
Pig Iron	
Moulds & Stools	
Rolls	
Nickel Pig Iron	
Mex Graphite	2400
Coke	700
TOTAL IRON CHARGE	
No. 1 Heavy Melting	19840
No. 2 Heavy Melting	17400
Rails	
Regular Sheet Scrap	16540
Silicon Sheet 3 %	12260
Skulls & Pitt Scrap	3840
~~Ingot Butts~~ Spiegel	1000
Alloy Turnings	
" "	
Carbon Turnings	29720
Crops Cr. Mi. Mo.	5100
Annealing Box & Bottom	
Alloy Steel Scrap—Solids	
Sil. Skull (3%)	3000
TOTAL STEEL CHARGE	108700
Fce. Additions Time	
Ore—Kind	
" "	
Pig Iron-Reboil 10:35	1000
Spiegel	
Mex Graphite	100
Si Mn	
Si Pig 11:20	1200
Ferro Cr HC	
Ferro Cr LC	
Ferro Mn 80%	
Ferro Mn %	
Nickel	
"	
Moly	
"	
Copper	
Total Alloy Charge	11100
LADLE ADDITIONS	
Aluminum Kind Bar	15
" "	
Ferro Silicon 50%C	
" " 50%S	425
" " 95%	
Ferro Manganese 80 %	950
" " %	
Mex Graphite	130
MOULD ADDITIONS	
Aluminum	
Total Charge	115622

SLAG CONDITIONS

Time	FeO	Fe	V	Comments:
8:25				Lime started to rise Heavy boil
8:55				Lime still coming up
9:15				Spar used to cut slag which was starting to foam
9:25				More spar to cut foamy slag
9:50				Lime all up
9:55	13.2		2.3	SiO_2-16.0% CaO-40.2% MnO-6.5% P_2O_5-1.2%
10:45	10.0		2.4	SiO_2-12.2% CaO-44.2% MnO-6.0% P_2O_5-1.2%
11:05	8.2		2.5	SiO_2-16.0% CaO-43.3% MnO-5.6% P_2O_5-1.2%

CARBONANALYZER	
Time	Carbon
9:30	.47
9:50	.60
10:15	.47
10:20	.42
11:00	.37
11:10	.31

CARBON ADDITIONS	
Bath	264 %
Spiegel	%
Ferro Cr	%
Ferro Mn 80%	062 %
Mex Graphite	097 %
Total	423

ALLOY LOSSES			
		Mn	Cr.
Prelims	20		
Added	71		
Total	91		
Final	86		
Loss	05		

TIME OF HEAT	
Previous Heat Tapped	1:40P M.
Began Charging	2:30 PM.
Finl. Charging	6:05 PM.
Start Tap 11:50 P M.	Finl. Tap 11:55 P M.
Condition of Tap	Good
Ladle Pulled	11:56
Reladle 1st	2nd
Start Pour 11:58 P M.	Finl. Pour 12:25 P M.
Time of Heat	Chg. to Tap 10hr 10min
Next Heat Start Chg.	M.
Lost Time Tap To Chg.	Hrs.

MOULD CONDITIONS	
Bottoms & Plugs	Stream Cut& Fire Crack
Temp. of Moulds When Poured	275°
" " " " Sprayed	375°
Condition of Coating	Fair
Condition of Inner Surface	Some new, Ball. Fire cracked

TEMPERATURES	
Tapping Steel	2940
Pouring	
Ing. No. 4-	2800
" " 31-	2740
" "	

PIT PRACTICE	
Nozzle Size 1st Ladle	1 1/4
" " 2nd "	
" " 3rd "	
Pouring Time 1st	26 sec.
" " Mid. 15	30 sec.
" " Last 30	30 sec.

FUEL CONSUMPTION	
Meter @ Tap	
" Prev. Tap	
Gal. Used	
Gal. Per Ton	

POURING CONDITIONS Stream slanted some

Off Center

Over Fills none

Drip 1 thru 14 Leak None Run

Hot Top Boils none Seal Leaks 31 & 33

REMARKS 1/2 in. slag on ladle

ANALYSIS	Car.	Mn.	Phos.	Sul.	Si.	Ni.	Cr.	Mo.	Cu.
Ordered	41 / 45	80 / 90	.03 / Max	.03 / Max	15 / 25	.35 / Max	.30 / Max	.06 / Max	.25 / Max
Final Analysis									
1st	.42	.87	.016	.028	.21	.11	.10	.04	.06
Mid.									
Last	.42	.86							
Prelims									
(Time) 10:20				.042		.11	081	.04	.06
11:23	.275	.19							
11:30	.264	.20							

INGOT PRODUCTION

Ing.	Size	Length	Yield		Weight
35	15 Sq.	52	88.5	10	27225
Butts			1.7%		2040
Pit			1.6%		2000
Skull					
Oxidation			8.2%		8360

Melter Hissen Observer Ostrowski

Customer

Type 1040 Date 10/4/44 Heat No. 1532

T-557-10M-12-43

End-weld Studs Automatically!

Nelson studs are end-welded to metal. No drilling holes... no welding bolts.

Used by more than 500 shipbuilding and industrial plants.

Complete fusion between stud and plate in less than ½ second!

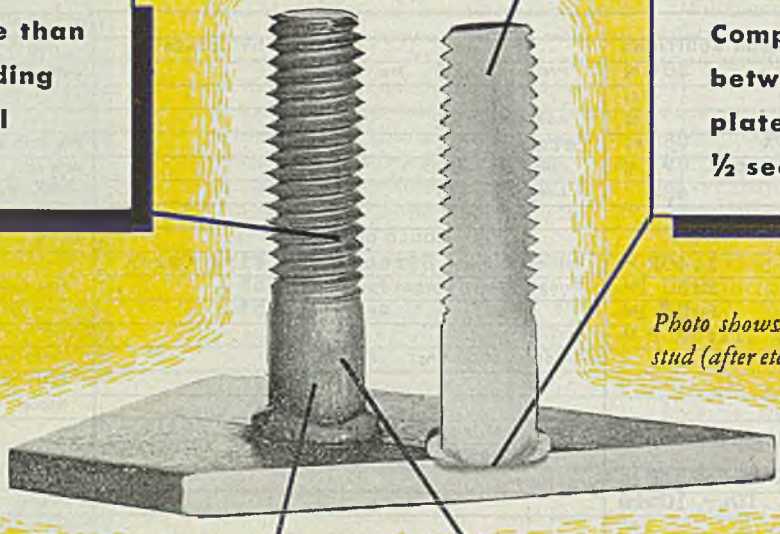
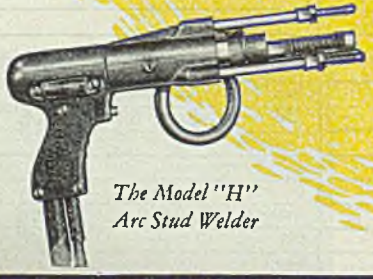


Photo shows cutaway view of stud (after etching with Nital).

Operators can weld 500 to 1000 studs a shift. Completely automatic operation.

Many diameters, lengths, and types, for securing parts of all kinds.



The Model "H" Arc Stud Welder

For complete details and catalog, write:

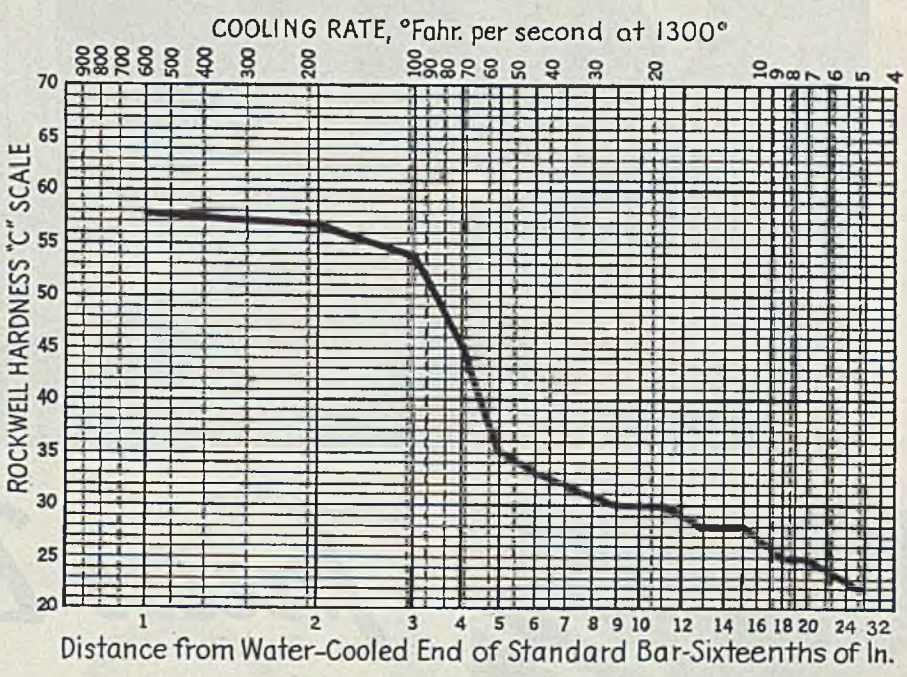
NELSON SPECIALTY WELDING EQUIPMENT CORPORATION

Dept. T, 440 Peralta Ave., San Leandro, Calif.

Eastern Representative: Camden Stud Welding Corp. Dept. 122, 1416 So. Sixth St., Camden, N. J.

NELSON STUD WELDERS & STUDS

Fig. 3 (Right)— The hardenability curve for the 0.40 per cent carbon steel heat



lime is charged next. We have made no reduction in the lime charge because of the silicon addition and the desire to maintain about the same slag volume as with the pig practice in order to carry as much sulphur as possible. The balance of the charge is made in the most advantageous way to keep the charging time to a minimum. The heats are melted, worked down, and the slag shaped up in the usual manner. We aim for a 2.5 V value and an FeO of 0.10 to 0.12 per cent.

The etch slices from this particular heat are shown in Fig. 1. Some scattered pin points will be noted in the bottom of No. 15 ingot. These are a result of an improperly cleaned mold rather than furnace practice.

Heat-treated physical results from forged 1-inch round normalized samples are given in Table II. These compare closely with the values obtained from this same grade of steel (No. 1043) produced by the pig-scrap practice as does the Jominy hardenability curve shown in Fig. 3. Analysis of the steel is as follows: 0.42 carbon, 0.86 manganese, 0.010 phosphorus, 0.034 sulphur, 0.21 silicon, 0.11 nickel, 0.10 chromium, 0.04 molybdenum and 0.06 copper. Steel was quenched at 1650 degrees Fahr.

This practice requires as close control over the open-hearth shop operations as the usual pig-scrap charge. Somewhat greater care has to be used in handling the scrap because analysis variations have a proportionately larger effect on the melt-down analysis. The weight of carbon charged has to be varied to compensate for the carbon variation in the scrap. Without the silicon addition the carbon drop is difficult to control, a small ore addition often "knocking the bottom out of the carbon;" with the silicon, however, the melt is reduced in carbon about like a pig scrap charge. Some foaming usually occurs as the carbon is exposed but this is not serious if the furnace is operated hot and can be controlled by proper manipulation of the flame i. e. cutting off the steam and throwing the furnace over when necessary.

In general the same supervision and operating control on this type of practice will result in similar melting conditions encountered in conventional practice. About the same number of soft melts, high melts, and raw slags which take time to shape up, are encountered. The big savings are the result of the lowering of mix costs.

TABLE I
ECONOMIC BALANCE OF TWO TYPES OF OPEN-HEARTH CHARGES
(Per net ton of cast ingots)

Materials	Pig—Scrap	Scrap—Carbon
Pig iron	0.43 ton—$10.53	
Scrap	0.03 ton— 10.08	1.06 tons—$16.96
Burnt lime	0.07 ton— 0.66	0.07 ton — 0.66
Carbon		0.025 ton— 1.42
Spiegel		0.01 ton — 0.36
Total	$21.27	$19.40

TABLE II
PHYSICAL RESULTS OBTAINED FROM 1-INCH ROUND NORMALIZED SAMPLES

Sample number	Yield	Ultimate	Elong. in 2 inches	Reduction of area	Brinell
1T	78,421	114,380	22.65	52.5	217
35B	72,927	105,894	22.65	53.5	217
	1575 °F. water quenches		1080 °F. Draw in 1" round		

Rivet Passer Operates Pneumatically

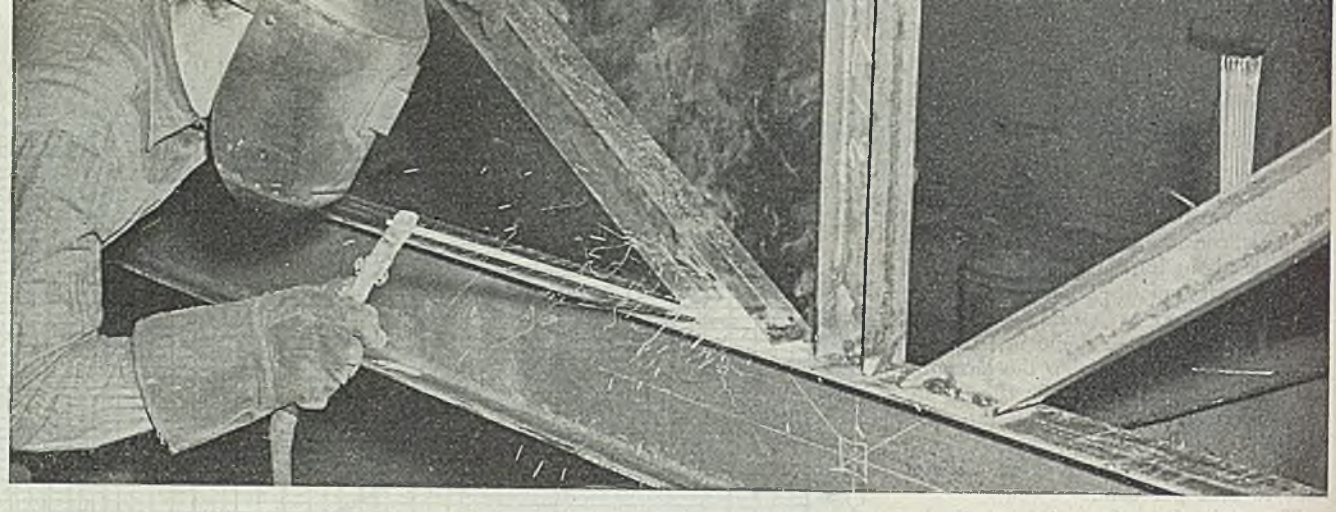
A new pneumatic rivet passer propels hot rivets from the forge quickly and with safety and accuracy up to 125 feet or more. The hot rivet is placed in a valve in the passer head and, by its own weight, opens the valve and drops through, the valve closing automatically behind it. Slight foot pressure on the treadle forces the rivet through the hose to the receiver with compressed air, where it is removed and placed in the work. The forge can be placed on the deck of the ship, or outside the vessel altogether.

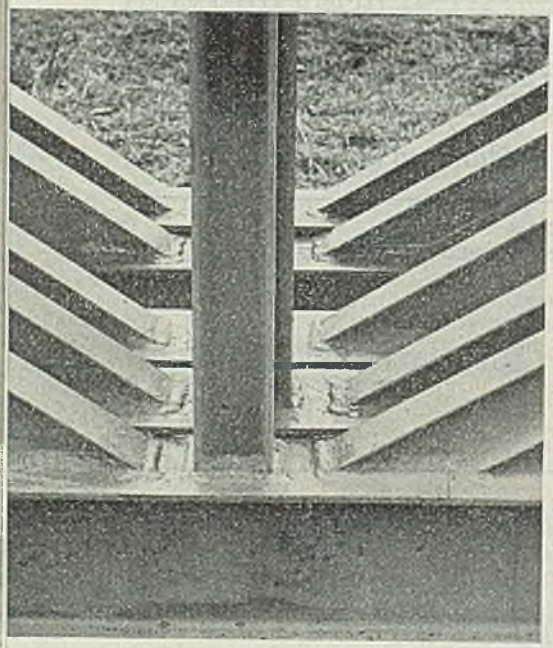
The Penflex pneumatic rivet passer has been used in constructing and repairing naval and merchant marine vessels, and in span type bridge construction, according to Pennsylvania Flexible Metallic Tubing Co., 7203 Powers Lane, Philadelphia 42. It is also said to be used extensively in new ship construction as well as in battle damage repairs here and in Canada.

Synthetic Resembles Chlorinated Rubber

A new synthetic, chlorinated isopol, available in metal primer formulations and in powder form, is said to be practically identical to chlorinated rubber in flame resistance, moisture resistance, chemical resistance, solubility, stability and compatibility with plasticizers. Among its applications are: As a primer for rubber-to-metal adhesion; as an ingredient in adhesives, paints, lacquers, inks, etc.; as an acid and alkali-resistant coating for metal, concrete and other surfaces; for fire-proofing or moisture-proofing fabrics and other materials; wherever sound and heat insulation qualities are desired; and as a plastic wherever inertness to chemicals and fire resistance are important.

Chlorinated isopol is the outgrowth of an original synthetic rubber formulation developed in the laboratories of Union Bay State Chemical Co., Rubber Chemicals Division, 50 Harvard street, Cambridge 42, Mass. Not yet standardized in viscosity range, the company states that chlorinated isopol production is sufficient at present to enable sampling and service of reasonably sized orders, but large quantity orders cannot be filled until expanded production facilities are in operation.





Truss Design

. . . puts all web members in vertical plane to eliminate gusset plates and facilitate assembly

A NEW DESIGN for welded trusses of standard 50, 60, 70 and 80-foot lengths has been adopted by the Austin Co., Cleveland. For the first time, H-sections with their webs in a vertical plane are used throughout without gusset plates.

This truss is readily adaptable to different loadings by simply changing the weights of the beams used for the various truss members, according to J. K. Gannett, Austin vice president and director of engineering. By keeping the depths of the individual members constant, these variations require no changes in shop details or fabricating jigs.

As the top chord is a wide flange beam it can carry purlins at a variety of spacings without regard to panel points, and is also adaptable to continuous uniform loading. Similarly, the bottom chord is capable of carrying loads at any point and can be used, itself as a monorail.

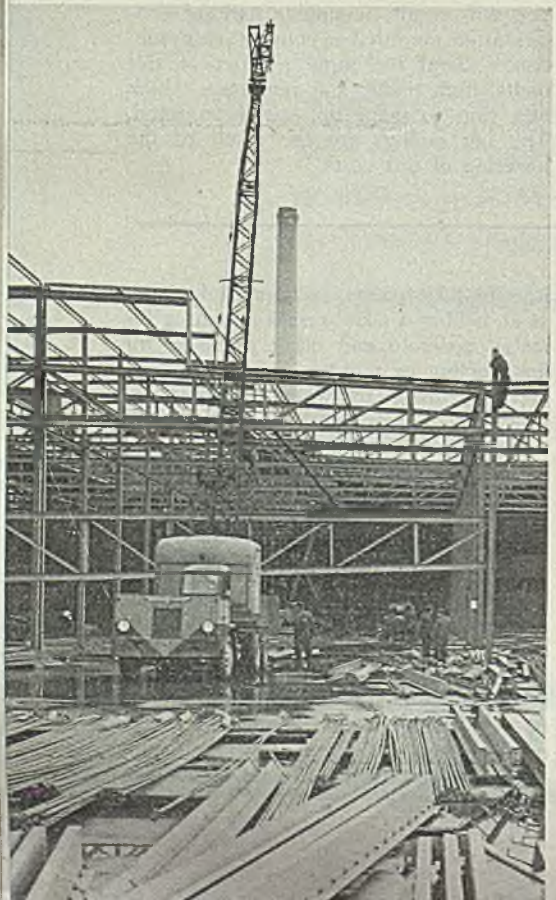
A "natural" for welding, shop fabrication on a 50-foot truss requires a total of 41 lineal feet of fillet weld, all of which is accomplished by down welding. The H-sections are assembled in a jig, tack-welded and welding is completed with the truss in a vertical position.

Because it is fabricated completely from rolled members which are simply cut to desired lengths, no splitting, blocking, slotting or chipping is necessary. The only raw cut edges are closed by the welds, so that only the smooth, hard, rolled surfaces are exposed, which gives the truss a maximum of corrosion resistance.

In full-size load tests on two 50-foot trusses of this new design made at the fabricating shops of the Austin Co., failure occurred under a load that was 253 per cent of the design load. An end vertical buckled. Despite the distortion of the truss when it collapsed, not a single welded connection failed in these tests.

The behavior of the truss under a heavy overload is impressive and is attributed in large part to the fact that the lines of action of all members lie in one plane, as well as to the concentricity and symmetry of the end connections of the truss members.

Following the tests, trusses conforming to the spans in widest use were designed and jigs set up for their manufacture. During the final quarter of 1944, trusses of this type were fabricated and shipped to plants in five widely separated localities, one of which

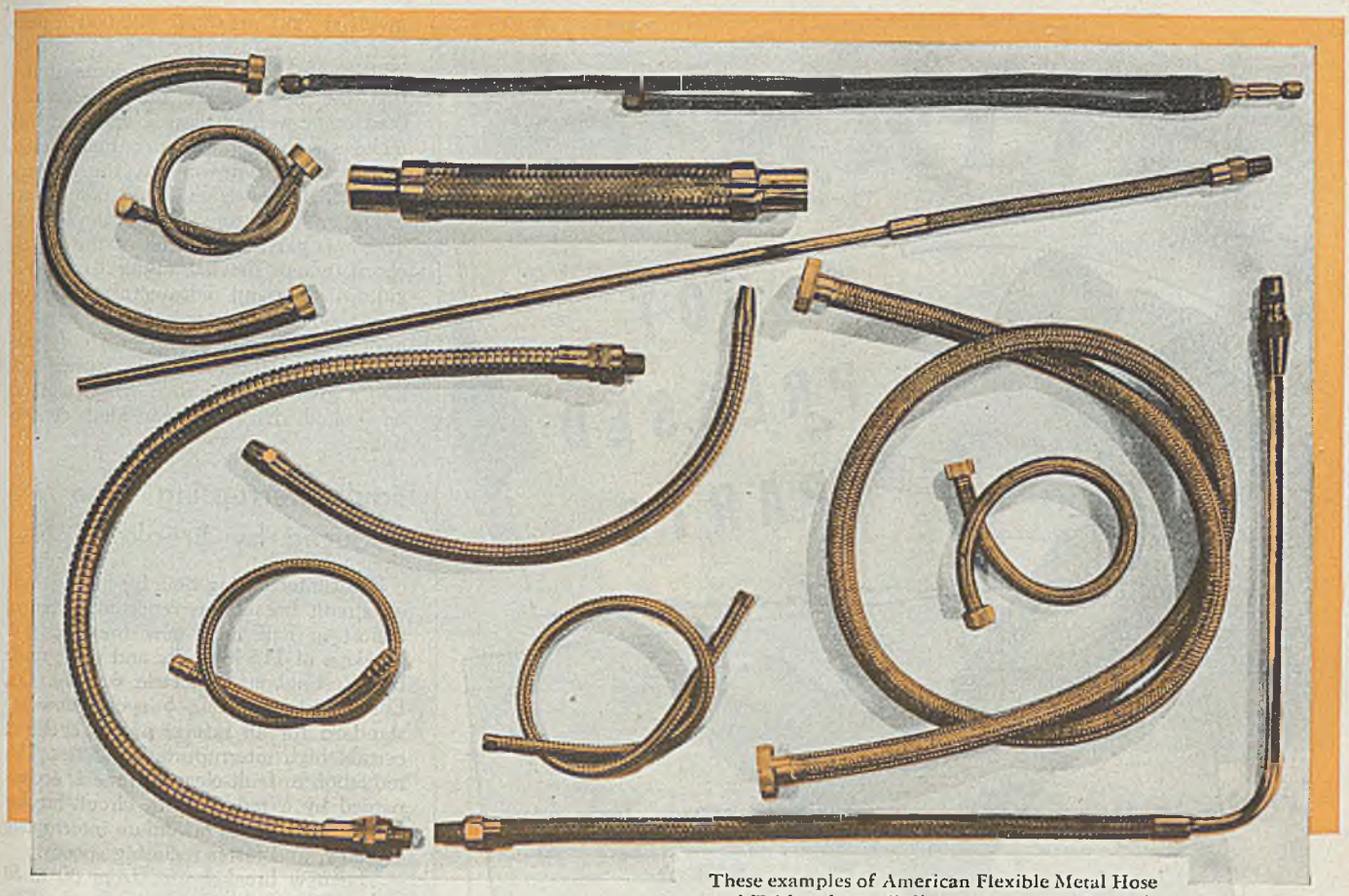


Top to Bottom—

Only rolled H and I beams are required for the Austin design of H-trusses. Connecting vertical and diagonal members are welded to flanges of beams forming top and bottom chords

This view of a stack of five trusses clearly shows how vertical and diagonal members are end-welded to flange of chord members. Splendid performance of trusses of this design is attributed to fact that lines of action of all members lie in same plane

Increased rigidity of the new trusses facilitates handling in the field. Here a crane is lifting a 50-foot truss into place in making a 100,000-square foot addition to diesel engine plant



These examples of American Flexible Metal Hose and Tubing, in small diameters, suggest the variety of assemblies available in factory-engineered and factory-assembled units.

Flexible...BUT RUGGED TOO!

WHEREVER a flexible conveyor is required, for gases, liquids or solids, under a wide range of temperatures and pressures, there's a type and size of American Flexible Metal Hose or Tubing for the purpose.

American Seamless Flexible Metal Tubing is as leakproof as the seamless bronze tube from which it is made, and flexible as garden hose. Its wire braided cover adds the strength needed for high pressure services. Standard sizes from ⅛″ to 4″ I.D.

American Metal Hose, manufactured from strip in four spirally wound types, is available in bronze, brass, aluminum, steel or any other workable metal. It is extensively used for carrying steam, water, oils, tar, asphalt, air, dust—and dozens of other agents under high and low pressures and for vacuum work. Sizes from ½″ to 12″ I.D.

Both types of "American" products can be fabricated completely with fittings and connections according to your specifications. Publication SS-50, giving complete information, will be sent on request. 46259

ANACONDA
from mine to consumer

American Metal Hose

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

BUY WAR BONDS . . . Buy all you can . . . Keep all you buy!

involved an area of 100,000 square feet.

Experience in the field demonstrated that the new trusses are much stiffer than other welded trusses, and that they make steel erection work much safer.

Structural iron workers, for instance, found that they could work much more easily on both top and bottom chords. This was particularly true of the bottom chord, where the flat upper flange provides a safer and more comfortable surface than the cut vertical edge found in most trusses. The flange not only provides an excellent walking surface but also a good seat for men while working on bolted, riveted or welded connections.

Fault-Interrupting Time Reduced by Breaker

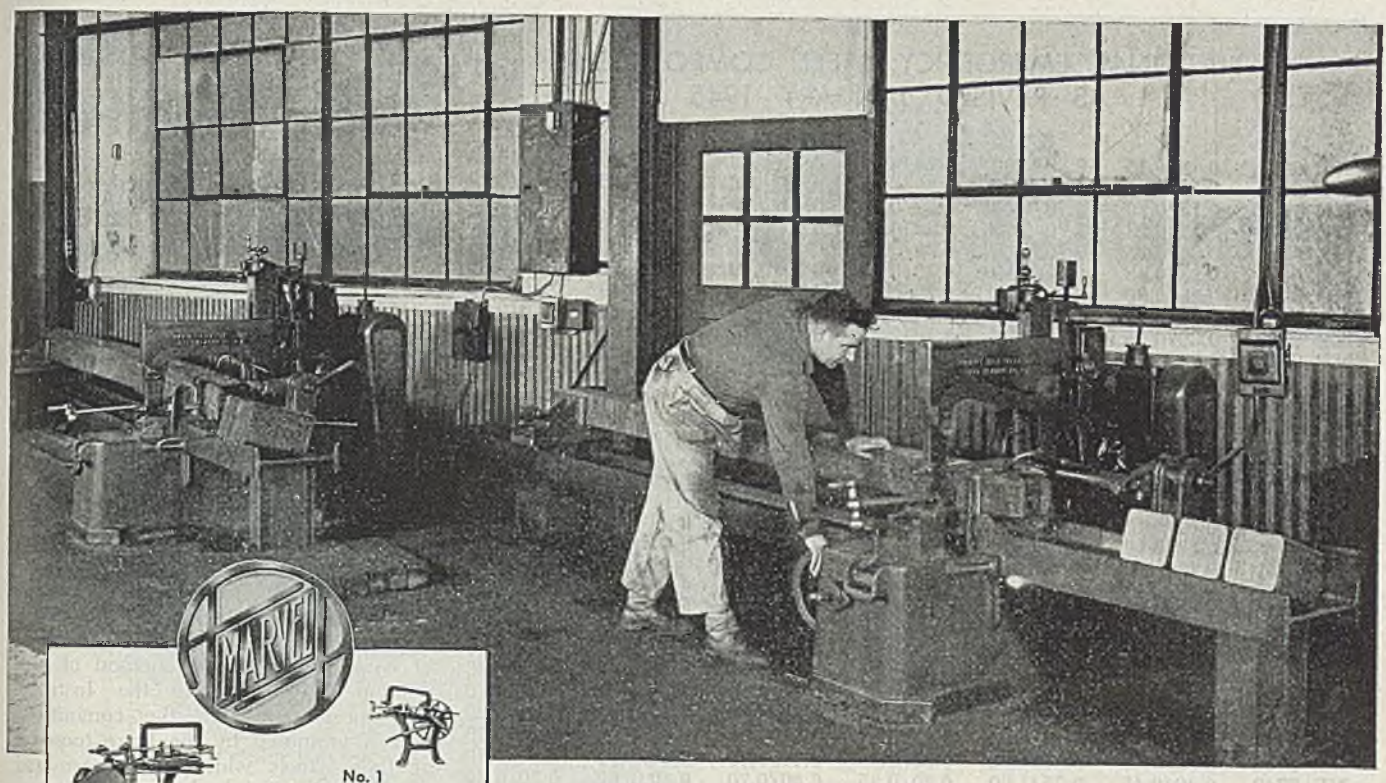
Fault-interrupting time for high-voltage oil circuit breakers is reported to be cut almost in half in a new breaker. For breakers of 115 kilovolts and over, made by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., 5 cycles now are standard for all ratings and 3 cycles at certain high interrupting capacities. This reduction in fault-clearing time is accompanied by a reduction in circuit-breaker size, an increase in maximum interrupting capacity, and faster reclosing speeds.

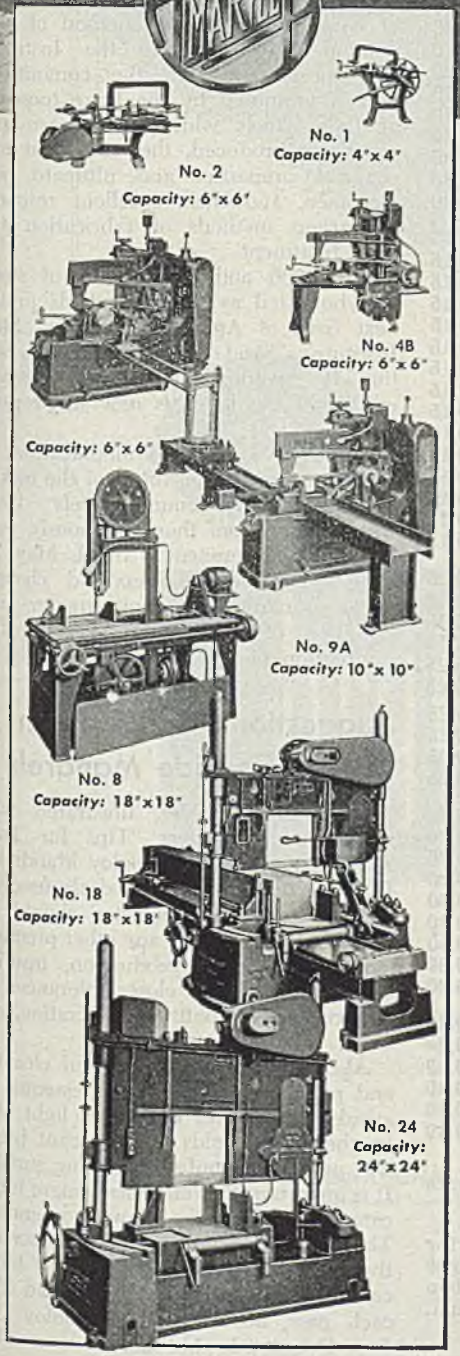
The new breaker uses from 30 to 50 per cent less oil. For example, the 230-kilovolt breaker requires only 8400 gallons of oil instead of 15,500. This means not only less investment in oil but less oil storage and handling facilities, and less oil-treating equipment. The total weight of the breakers is cut roughly in half, height reduced nearly 1/10 and required floor space by nearly 1/5.

This breaker is capable of clearing 3½ million kilovolt-amperes, a million more than formerly possible. This also is accomplished in smaller tanks, a tank only 84 inches in diameter being required for the 230 kilovolt size, in comparison to the 2½ million kilovolt breaker, which is 108 inches in diameter.

The principal engineering feature lying behind these improvements is a multi-flow grid in which oil is brought into contact with the arc as it is drawn. The same basic grid construction of a fibre laminated plate assembly is retained. However, structure is arranged so that as the contacts part first a short arc is drawn above the grid stack. This arc creates a gas pressure that squirts oil into the arc stream through a multiplicity of orifices in the grid. The cool oil surface in contact with the arc deionizes it at a rapid rate and results in its quick extinction. This rapid arc extinction mechanism means less oil is needed because arcing time is shorter and actual arc length is reduced. Arc voltage is so reduced that it is said to be difficult to find on many oscillograms.

In addition to the several advantages of a smaller breaker and less oil, the company claims the new breaker brings to power systems greater stability and less damage from arcs on lines and structures.





KEEP 7 STEAM HAMMERS SUPPLIED WITH FORGING STEEL

At the Cicero plant of the Atlas Forgings Company, two MARVEL No. 9 High Speed Hack Saws, equipped with heavy duty work handling equipment keep 7 steam hammers supplied with forging steel. The Atlas Forging Company (like most of the other leading forge plants of the country that have accepted MARVEL Saws as standard), have found that the hack saw method of cutting steel TO EXACT WEIGHTS is far more efficient and economical than with any other method formerly used by the industry.

With these two MARVEL High Speed Saws one operator can keep 7 hammers supplied with EXACT Size steel and still have time for other work. The initial investment is small—and the cost per cut is unbelievably low. Contrast this with the old method of cutting-off, not requiring an extra heat, frequently with a resultant greater loss of steel.

The MARVEL Saws shown above have found special favor with the forging industry and Machine Shops where heavy demands are put on hack sawing machines. This MARVEL Saw, with its rugged work handling equipment, will stand up under the heaviest punishment and for continuous 24 hour operation.

Write for Bulletins

ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 W. BLOOMINGDALE AVE. **CHICAGO 39, U. S. A.**

Eastern Sales Office: 225 Lafayette St., New York 12, N. Y.

MARVEL SAWS

NATIONAL EMERGENCY STEEL COMPOSITIONS AS REVISED JANUARY 1945

	C	*Mn*	*Si*	*Ni*	*Cr*	*Mo*
NE 8612	0.10/0.15	0.70/0.90	0.20/0.35	0.40/0.70	0.40/0.60	0.15/0.25
NE 8615	0.13/0.18	0.70/0.90	0.20/0.35	0.40/0.70	0.40/0.60	0.15/0.25
NE 8617	0.15/0.20	0.70/0.90	0.20/0.35	0.40/0.70	0.40/0.60	0.15/0.25
NE 8620	0.18/0.23	0.70/0.90	0.20/0.35	0.40/0.70	0.40/0.60	0.15/0.25
NE 8622	0.20/0.25	0.70/0.90	0.20/0.35	0.40/0.70	0.40/0.60	0.15/0.25
NE 8625	0.23/0.28	0.70/0.90	0.20/0.35	0.40/0.70	0.40/0.60	0.15/0.25
NE 8627	0.25/0.30	0.70/0.90	0.20/0.35	0.40/0.70	0.40/0.60	0.15/0.25
NE 8630	0.28/0.33	0.70/0.90	0.20/0.35	0.40/0.70	0.40/0.60	0.15/0.25
NE 8632	0.30/0.35	0.70/0.90	0.20/0.35	0.40/0.70	0.40/0.60	0.15/0.25
NE 8635	0.33/0.38	0.75/1.00	0.20/0.35	0.40/0.70	0.40/0.60	0.15/0.25
NE 8637	0.35/0.40	0.75/1.00	0.20/0.35	0.40/0.70	0.40/0.60	0.15/0.25
NE 8640	0.38/0.43	0.75/1.00	0.20/0.35	0.40/0.70	0.40/0.60	0.15/0.25
NE 8642	0.40/0.45	0.75/1.00	0.20/0.35	0.40/0.70	0.40/0.60	0.15/0.25
NE 8645	0.43/0.48	0.75/1.00	0.20/0.35	0.40/0.70	0.40/0.60	0.15/0.25
NE 8647	0.45/0.50	0.75/1.00	0.20/0.35	0.40/0.70	0.40/0.60	0.15/0.25
NE 8650	0.48/0.53	0.75/1.00	0.20/0.35	0.40/0.70	0.40/0.60	0.15/0.25
NE 8712	0.10/0.15	0.70/0.90	0.20/0.35	0.40/0.70	0.40/0.60	0.20/0.30
NE 8715	0.13/0.18	0.70/0.90	0.20/0.35	0.40/0.70	0.40/0.60	0.20/0.30
NE 8717	0.15/0.20	0.70/0.90	0.20/0.35	0.40/0.70	0.40/0.60	0.20/0.30
NE 8720	0.18/0.23	0.70/0.90	0.20/0.35	0.40/0.70	0.40/0.60	0.20/0.30
NE 8722	0.20/0.25	0.70/0.90	0.20/0.35	0.40/0.70	0.40/0.60	0.20/0.30
NE 8725	0.23/0.28	0.70/0.90	0.20/0.35	0.40/0.70	0.40/0.60	0.20/0.30
NE 8727	0.25/0.30	0.70/0.90	0.20/0.35	0.40/0.70	0.40/0.60	0.20/0.30
NE 8730	0.28/0.33	0.70/0.90	0.20/0.35	0.40/0.70	0.40/0.60	0.20/0.30
NE 8732	0.30/0.35	0.70/0.90	0.20/0.35	0.40/0.70	0.40/0.60	0.20/0.30
NE 8735	0.33/0.38	0.75/1.00	0.20/0.35	0.40/0.70	0.40/0.60	0.20/0.30
NE 8737	0.35/0.40	0.75/1.00	0.20/0.35	0.40/0.70	0.40/0.60	0.20/0.30
NE 8740	0.38/0.43	0.75/1.00	0.20/0.35	0.40/0.70	0.40/0.60	0.20/0.30
NE 8742	0.40/0.45	0.75/1.00	0.20/0.35	0.40/0.70	0.40/0.60	0.20/0.30
NE 8745	0.43/0.48	0.75/1.00	0.20/0.35	0.40/0.70	0.40/0.60	0.20/0.30
NE 8747	0.45/0.50	0.75/1.00	0.20/0.35	0.40/0.70	0.40/0.60	0.20/0.30
NE 8750	0.48/0.53	0.75/1.00	0.20/0.35	0.40/0.70	0.40/0.60	0.20/0.30
NE 9415	0.13/0.18	0.80/1.10	0.20/0.35	0.30/0.60	0.30/0.50	0.08/0.15
NE 9417	0.15/0.20	0.80/1.10	0.20/0.35	0.30/0.60	0.30/0.50	0.08/0.15
NE 9420	0.18/0.23	0.80/1.10	0.20/0.35	0.30/0.60	0.30/0.50	0.08/0.15
NE 9422	0.20/0.25	0.80/1.10	0.20/0.35	0.30/0.60	0.30/0.50	0.08/0.15
NE 9425	0.23/0.28	0.80/1.10	0.20/0.35	0.30/0.60	0.30/0.50	0.08/0.15
NE 9427	0.25/0.30	0.80/1.10	0.20/0.35	0.30/0.60	0.30/0.50	0.08/0.15
NE 9430	0.28/0.33	0.90/1.20	0.20/0.35	0.30/0.60	0.30/0.50	0.08/0.15
NE 9432	0.30/0.35	0.90/1.20	0.20/0.35	0.30/0.60	0.30/0.50	0.08/0.15
NE 9435	0.33/0.38	0.90/1.20	0.20/0.35	0.30/0.60	0.30/0.50	0.08/0.15
NE 9437	0.35/0.40	0.90/1.20	0.20/0.35	0.30/0.60	0.30/0.50	0.08/0.15
NE 9440	0.38/0.43	0.90/1.20	0.20/0.35	0.30/0.60	0.30/0.50	0.08/0.15
NE 9442	0.40/0.45	1.00/1.30	0.20/0.35	0.30/0.60	0.30/0.50	0.08/0.15
NE 9445	0.43/0.48	1.00/1.30	0.20/0.35	0.30/0.60	0.30/0.50	0.08/0.15
NE 9447	0.45/0.50	1.20/1.50	0.20/0.35	0.30/0.60	0.30/0.50	0.08/0.15
NE 9450	0.48/0.53	1.20/1.50	0.20/0.35	0.30/0.60	0.30/0.50	0.08/0.15
NE 9722	0.20/0.25	0.50/0.80	0.20/0.35	0.40/0.70	0.10/0.25	0.15/0.25
NE 9727	0.25/0.30	0.50/0.80	0.20/0.35	0.40/0.70	0.10/0.25	0.15/0.25
NE 9732	0.30/0.35	0.50/0.80	0.20/0.35	0.40/0.70	0.10/0.25	0.15/0.25
NE 9737	0.35/0.40	0.50/0.80	0.20/0.35	0.40/0.70	0.10/0.25	0.15/0.25
NE 9742	0.40/0.45	0.50/0.80	0.20/0.35	0.40/0.70	0.10/0.25	0.15/0.25
NE 9745	0.43/0.48	0.50/0.80	0.20/0.35	0.40/0.70	0.10/0.25	0.15/0.25
NE 9747	0.45/0.50	0.50/0.80	0.20/0.35	0.40/0.70	0.10/0.25	0.15/0.25
NE 9750	0.48/0.53	0.50/0.80	0.20/0.35	0.40/0.70	0.10/0.25	0.15/0.25
NE 9763	0.60/0.67	0.50/0.80	0.20/0.35	0.40/0.70	0.10/0.25	0.15/0.25
NE 9768	0.64/0.72	0.50/0.80	0.20/0.35	0.40/0.70	0.10/0.25	0.15/0.25
NE 9830	0.28/0.33	0.70/0.90	0.20/0.35	0.85/1.15	0.70/0.90	0.20/0.30
NE 9832	0.30/0.35	0.70/0.90	0.20/0.35	0.85/1.15	0.70/0.90	0.20/0.30
NE 9835	0.33/0.38	0.70/0.90	0.20/0.35	0.85/1.15	0.70/0.90	0.20/0.30
NE 9837	0.35/0.40	0.70/0.90	0.20/0.35	0.85/1.15	0.70/0.90	0.20/0.30
NE 9840	0.38/0.43	0.70/0.90	0.20/0.35	0.85/1.15	0.70/0.90	0.20/0.30
NE 9842	0.40/0.45	0.70/0.90	0.20/0.35	0.85/1.15	0.70/0.90	0.20/0.30
NE 9845	0.43/0.48	0.70/0.90	0.20/0.35	0.85/1.15	0.70/0.90	0.20/0.30
NE 9847	0.45/0.50	0.70/0.90	0.20/0.35	0.85/1.15	0.70/0.90	0.20/0.30
NE 9850	0.48/0.53	0.70/0.90	0.20/0.35	0.85/1.15	0.70/0.90	0.20/0.30
NE 9912	0.10/0.15	0.50/0.70	0.20/0.35	1.00/1.30	0.40/0.60	0.20/0.30
NE 9915	0.13/0.18	0.50/0.70	0.20/0.35	1.00/1.30	0.40/0.60	0.20/0.30
NE 9917	0.15/0.20	0.50/0.70	0.20/0.35	1.00/1.30	0.40/0.60	0.20/0.30
NE 9920	0.18/0.23	0.50/0.70	0.20/0.35	1.00/1.30	0.40/0.60	0.20/0.30
NE 9922	0.20/0.25	0.50/0.70	0.20/0.35	1.00/1.30	0.40/0.60	0.20/0.30
NE 9925	0.23/0.28	0.50/0.70	0.20/0.35	1.00/1.30	0.40/0.60	0.20/0.30

NOTE 1. When electric furnace steel is specified, phosphorus and sulphur contents are to be 0.025% maximum each.

NOTE 2. All National Emergency steels are subject to the conditions outlined for standard steels as listed in Steel Product Manual No. 10 covering alloy steels, pages 14 to 17 inclusive, and page 26. Large sizes are subject to modification of carbon content only to a range of 0.10 as outlined on pages 23 and 26 of the same Manual.

List of NE Steels Again Modified

Three series eliminated and 8600-8700 groups slated to become standard steels

MOST recent modification of the National Emergency steels announced by American Iron and Steel Institute is presented in the accompanying list.

The 1300, 9200 and 5200 series steels have been eliminated entirely as NE steels and returned to the standard steel list.

Included in this revised list are the 8600 and 8700 series steels bearing the prefix letters NE. However, the Institute's Technical Committee on Alloy Steel now considers these steels to be standard and subject to prefix letters A or E, according to the method of production. According to the Institute, this consideration on the committee's part is prompted by the large tonnages of those steels which have been and are being produced, their excellent mechanical properties and ultimate performance, and their excellent response to various methods of fabrication and heat treatment.

The 8600 and 8700 series of steels will be listed as standard steels in the next issue of American Iron and Steel Institute's "Steel Products Manual", section 10 covering alloy steels. A new edition of the latter is now in preparation.

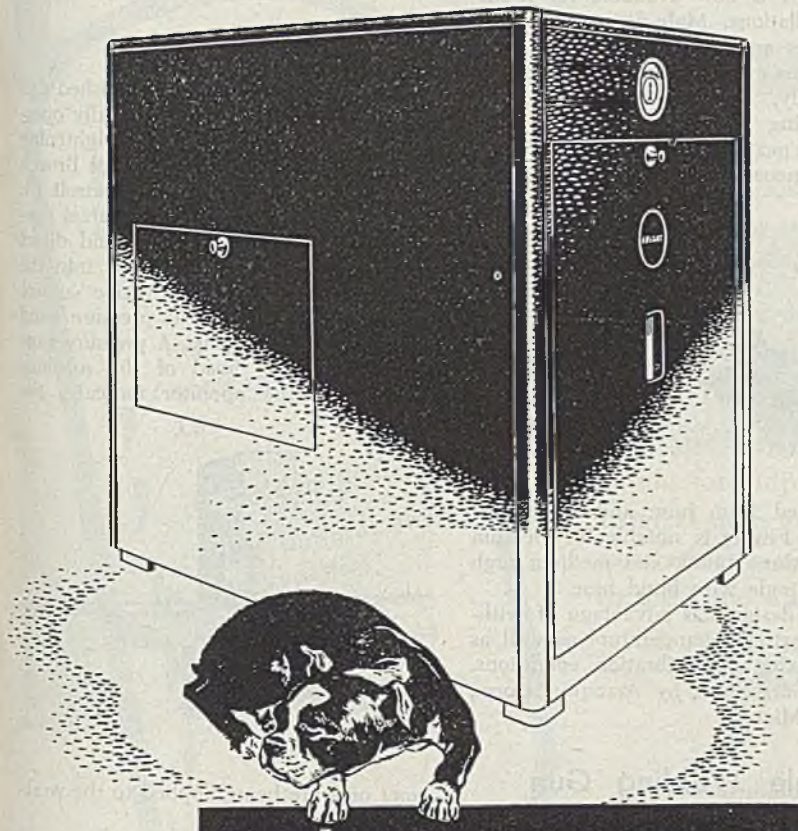
There have been no modifications in chemical composition limits of the nickel-chromium - molybdenum steels listed which differ from those previously published, but reference to Steel, May 29, 1944, p. 61, which reported changes made primarily to permit greater consumption of alloy scrap, permits full comparison of revisions.

Suggestions Offered On Use of Carbide Mandrels

A 20-page booklet, illustrated with many sketches, offers "Tips for Tube Mills on the Use of Carboloy Mandrels." It states that carbide mandrels used on modern tube draw-benches should be given the same care as any other precision tool used in mass production, insuring better inside finish, closer tolerances on long runs, more continuous operation, and fewer rejections.

Also, it explains why careful cleaning and pickling are said to be essential to avoid scratches on tubing. A light etch on the tubing holds the lubricant better and provides a uniform drawing surface. It is important that all tubes remain lubricated throughout the drawing operation. The mandrel may pick up and scratch the tubing if tubes are improperly lubricated. All tubes should be annealed after each pass, according to Carboloy Co., Inc., Detroit 32, publishers.

AN AUTOMATIC END TO FIRE WORSHIP



Think how long people have been tied to a fire pit. Centuries!

Only within recent years has a homeowner been able to touch a gadget on the wall, go away —for a month if he wants to—and know that come storm or blizzard, an automatic gas heating unit will hold the temperature in his home exactly where he wants it.

Bryant pioneered the compact, fully automatic gas boiler . . . since has followed with perfection of winter air conditioners, gravity furnaces and conversion burners. Bryant steadily brought the price down, with the conviction that even the smallest of homes is entitled to the convenience, comfort and cleanliness of modern, automatic heating . . . gas heating with fluid fuel, always on tap, never needing to be stored, shoveled or cleaned out afterwards.

"Let The Pup Be Furnace Man"—a suggestion to every homeowner in favor of more leisure from Bryant, one of the Dresser Industries.

THE PLUS OF DRESSER

Back of every Bryant product stands DRESSER INDUSTRIES —a central source of strength backing the independent managements within the Dresser group. Dresser Industries furnishes them a Plus—a double backing that is a solid foundation for progress; a double O.K. upon their products that is extra assurance of satisfaction to their customers.

bryant +D

ONE OF THE DRESSER INDUSTRIES

DRESSER Mfg. Division, Bradford, Pa.

THE BRYANT Heater Company, Cleveland, Ohio

CLARK Bros. Co., Inc., Olean, N. Y.

PACIFIC Pumps, Inc., Huntington Park, Calif.

INTERNATIONAL DERRICK & Equipment Co., Columbus and Marietta, Ohio; Beaumont, Texas; Torrance, Calif.

ROOTS-CONNERSVILLE Blower Corp., Connersville, Ind.

STACEY BROS. Gas Construction Co., Cincinnati, Ohio

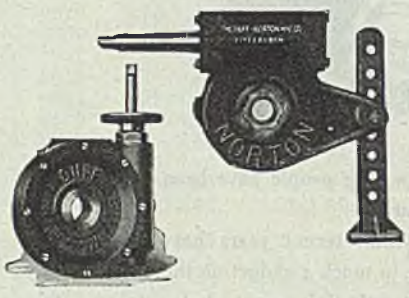
BOVAIRD & SEYFANG Mfg. Company, Bradford, Pa.

DRESSER Mfg. Co., Ltd., Toronto, Ont., Canada

VAN DER HORST Corp. of America, Olean, N. Y. and Cleveland, Ohio

Motor Attachments

Manually operated jacks can be converted for motor operation with motor attachments developed by Duff-Norton Mfg. Co., Pittsburgh 30. The attachments are made in two types and may be attached making possible the use of



DUFF TYPE NORTON TYPE

portable shop motors of 1½ to 2-inch drill size to power jacks for lifting, lowering, pushing or pulling.

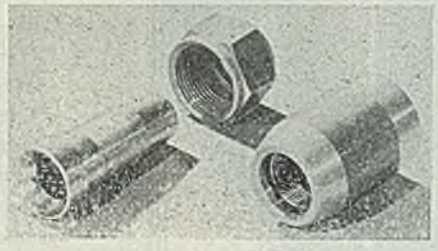
These devices are available in a temporary and permanent model. No. 4085 Duff attachment is designed for use with the company's governor-controlled jacks and may be attached or removed as desired. No. 4086 is a permanent model and is bolted to the job. Norton attachment, No. 571-MA is used with self-lowering speed-controlled jacks and may be slipped on the jack pinion shaft after removal of the ratchet case and gear.

Cover Plates

First designed for patching bullet holes in airplanes, applications of the new speed nut cover plates offered by Tinnerman Products Inc., 2039 Fulton road, Cleveland 13, now include removable covers for inspection doors, access holes and vent holes. They are also used for sealing up holes left after alterations or removal of equipment. Attached from one side by sliding one end of the speed nut into the hole, centering the cover plate over the hole and tightening the screw. The turned down tab on the cover plate prevents the speed nut from turning while the screw is tightened. To remove it the screw is loosened and the speed nut slipped out of the hole. Made of SAE 1060 steel, it is heat treated, Parkerized and coated with zinc chromate primer. Three sizes are available to fit a wide range of panel thicknesses and to cover holes 29/32, 1⅛ and 1⅜ diameter. Other sizes are made on order.

Detachable Hose Fitting

Originally used on combat airplanes, the detachable hose fitting for hydraulic installations is now available for industrial installations. Male fitting consists of two pieces and a swivel type fitting of three pieces each of which is replaceable individually. Assembly is accomplished by screwing nipple into socket. Once assembled no further tightening or servicing is necessary although fitting can

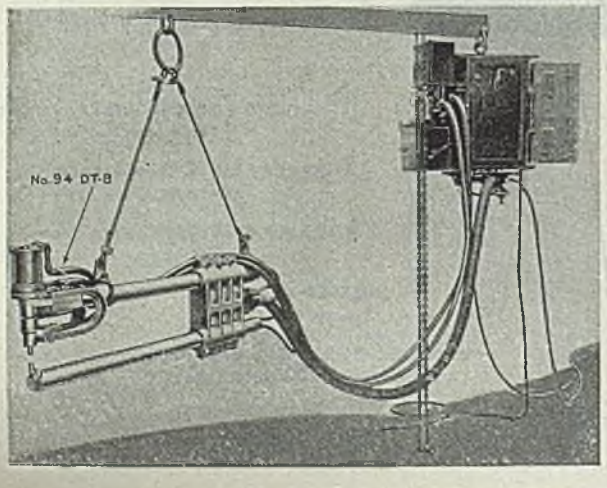


be removed from hose and reused repeatedly. Fitting is suitable for medium pressure, three braid, and medium high pressure single wire braid hose.

Fitting design has advantage of withstanding extreme temperature as well as severe flexing and vibration conditions. It is manufactured by Aeroquip Corp., Jackson, Mich.

Portable Welding Gun

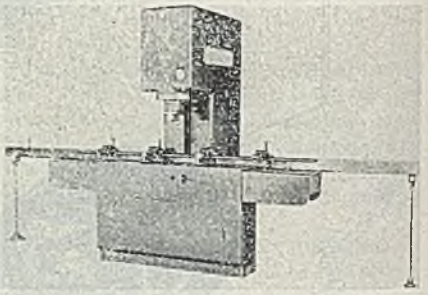
The new portable welding gun offered by Eisler Engineering Co., Newark 3, N. J., is a direct air operated welding machine, equipped with a double acting air cylinder and the necessary operating mechanism, fully or semiautomatic, depending on the choice of control. The power part consists of an air cooled transformer, with an 8 tap switch for heat regulation (seven on and one off position), a pneumatic or electronic actuated timer and a high speed mechanical or electronic contactor for accurately timing the weld in speed or automatic repeat of strokes. The weld cycle can be initiated by a foot switch or push button. The air system includes solenoid operated air valves, air filter, pressure regulator, gage and switch and an air line oiler.



The unit is self-contained. The base, separating and isolating the holding arms is a bronze casting and the horns are made from hard drawn copper. Flexible copper braids carry the power current to the movable electrode. The water cooled tapered welding tips are of high conductive heat and wear resisting alloy and are interchangeable. The welding gun is free swinging, attached to a beam, counter-balanced against the transformer and can be mounted horizontally or vertically, if necessary, fixed on a low base. These units are manufactured in sizes from 30 to 150 kilovolt-ampere.

Straightening Presses

Designed for straightening finished and rough work, a line of hydraulically operated and controllable straightening presses is announced by Colonial Broach Co., Box 37, Harper Station, Detroit 13. They are of reinforced welded steel construction with built-in motor and direct acting hydraulic cylinder built into the head of the machine. Sensitive control is provided through light pressure hand control and foot pedals. A pressure gage mounted on the head of the machine in front of the operator indicates the



exact pressure being applied to the workpiece.

Straightening fixtures are equipped with either center or roller type work supports, depending on whether finished or rough work is to be straightened. These supports are mounted on a long guide rail, particularly useful when long shafts are to be straightened. The supports are mounted on the guide rail through free action rollers, facilitating shifting to either side of the ram for supporting the work at intervals during straightening. These units are available in capacity ratings to 50 tons.

Induction Generators

In both base and frame mounted models, Electric Indicator Co., Stamford, Conn., announces new drag cup induction generators, Elinco, with housing of die-cast aluminum alloy anodized in accordance with Army and Navy specifications and finished with baked black synthetic enamel. They consist of laminator stator wound two phase, stationary steel pole, and aluminum cup on shaft rotating between stator and pole. With voltage applied to one of two stator phase

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

Sulphite-Treated
Alloy and Special Steels

BENEFITS TO USERS

- 25% Greater Machining Speed
- 200% Longer Tool Life
- Fewer Rejections
- More Uniform Physical Properties
- Fewer Operations
- Bettér Finished Product

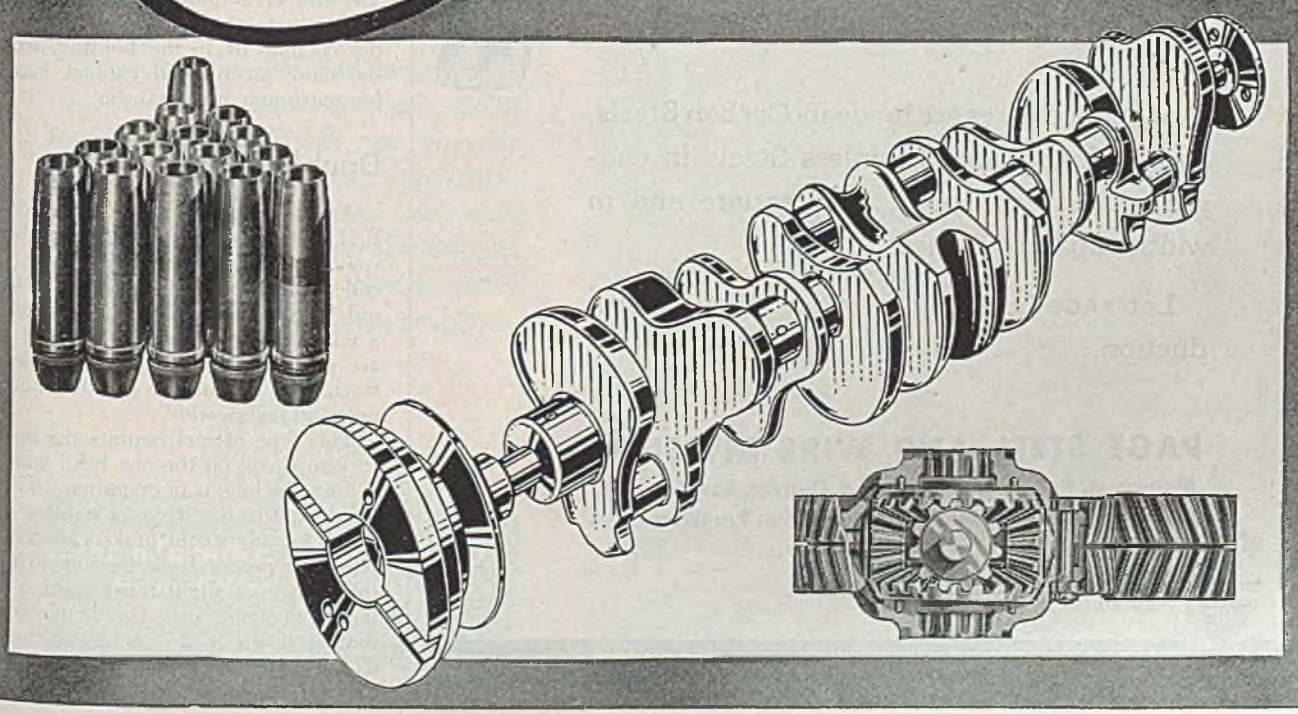
SULPHITE-TREATED alloy and special steels, which we have produced for a number of years, have solved many problems for steel users. They have been most satisfactorily applied where machinability is of first importance.

Sulphite treatment can be applied to most types of steel. It has been used successfully in the production of shells, crankshafts, camshafts, axles, and gears.

If you believe that your company may have an application for sulphite-treated steels, our sales and metallurgical staffs are at your service. We have accomplished satisfactory results for others and are ready to serve you in the same way.

WISCONSIN STEEL COMPANY

Affiliate of International Harvester Company
General Offices: 180 North Michigan Avenue, Chicago 1, Illinois

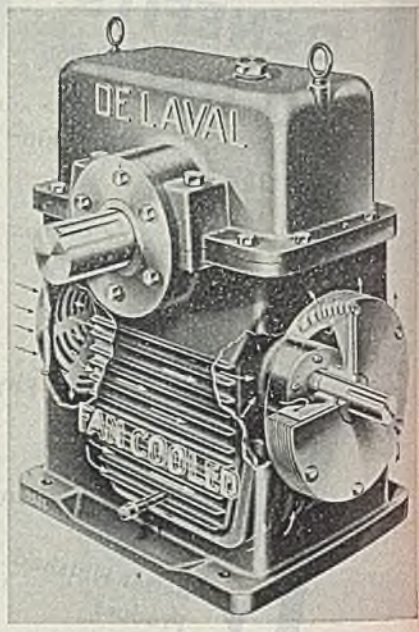


terminals, rotation of shaft and cup induces voltage at other terminal, voltage lineal with speed. Torque required for rotation is approximately 25 grains at 1-inch radius. For increased voltage where linearity is not important a copper cup may be used.

Fan-Cooled Worm Gear

De Laval Steam Turbine Co., Trenton 2, N. J., announces a new fan-cooled worm gear. It features forced air-cooling, which removes the heat so that the capacity of the gear is doubled for practically all ratios and sizes at 1750 revolutions per minute. This permits the use of smaller and lighter speed reducers.

A fan mounted on the worm shaft



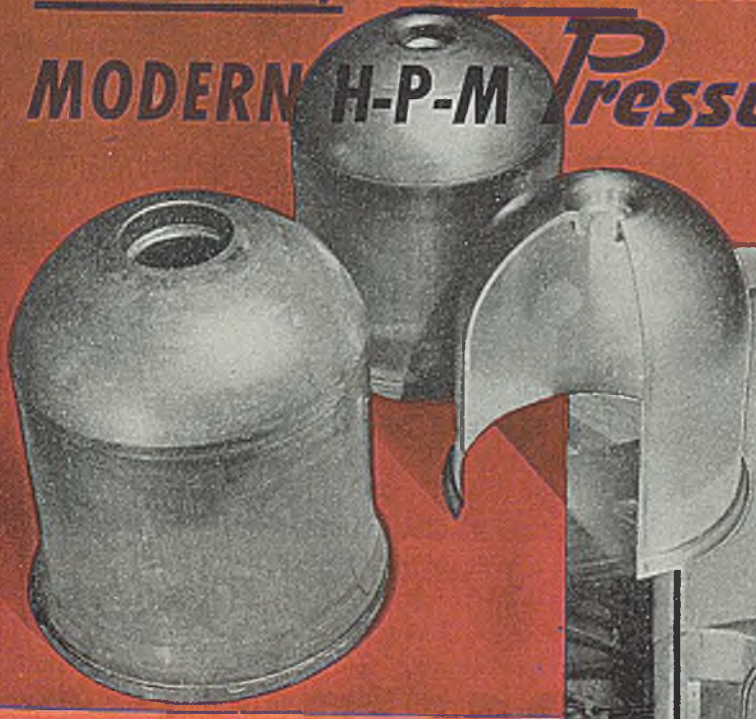
draws air at high velocity over and around heat dissipating ribs upon the air side of the oil reservoir housing the gearing. The use of a double wall increases the effectiveness of the cooling by confining the cooling air to the housing, securing the close air-to-metal contact necessary for maximum heat transfer.

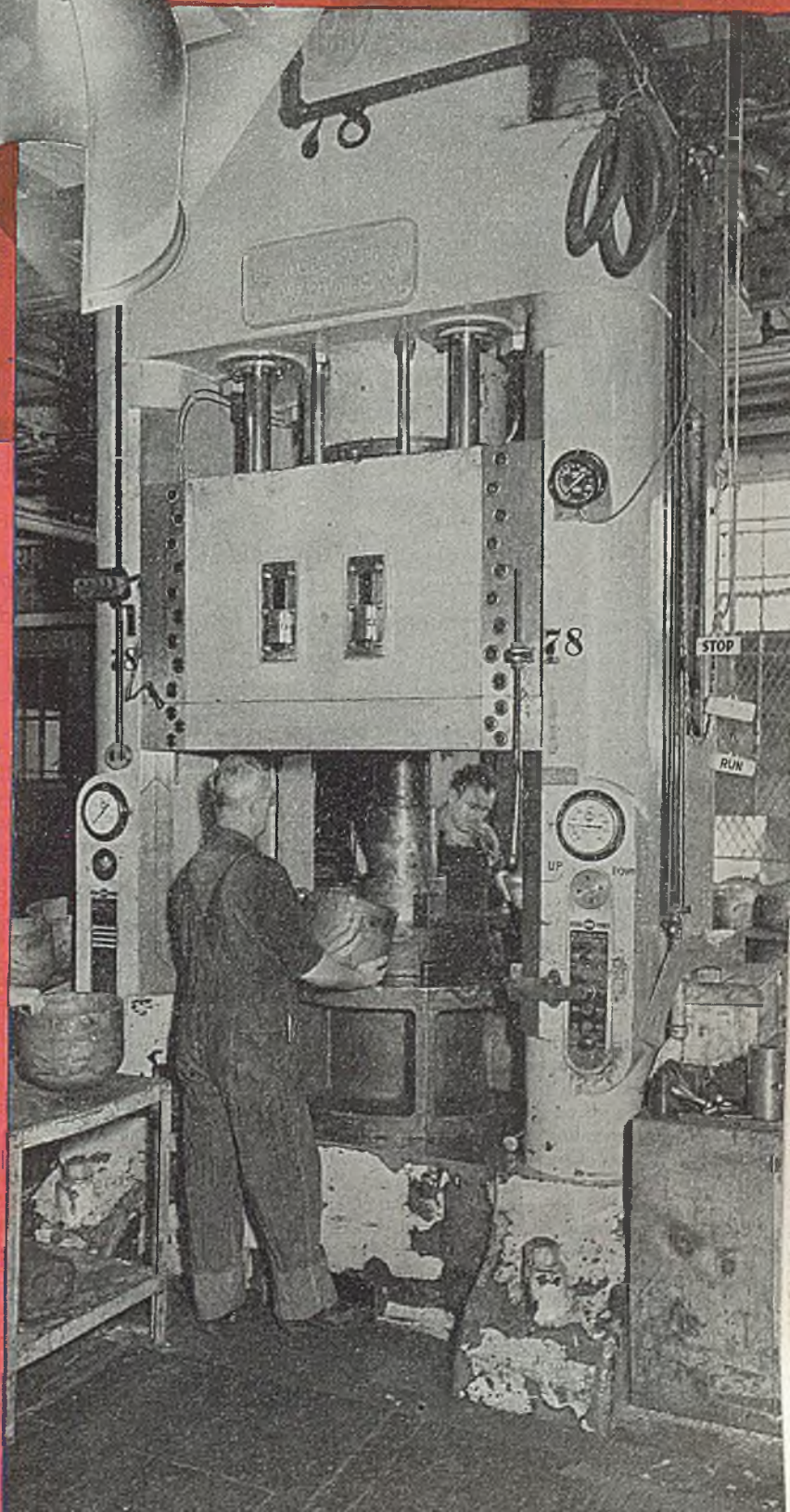
Double Reel

A new double reel is introduced by F. J. Littell Machine Co., 4165 Ravenswood avenue, Chicago 13, for handling coiled rod ½-inch in diameter. Coiled rod is taken from the reel and run into a wire coiling machine. The reel heads are inclined at an angle of 30 degrees. Each head will handle a 1500-pound coil up to 20 inches wide.

This type of reel permits the operator to load a coil on the one head while the coiling machine is in operation. The tool is adapted to the stress of holding coiled rod. An adjustable brake can be regulated for proper back tension. Holding drums have a slight taper starting at 16 inches diameter near the center and reducing down to 14 inches at the end. The reel spindles are mounted on Timken bearings.

PROPELLER HUB DOMES ARE MADE LIGHTER, BETTER and FASTER with MODERN H-P-M Pressure Processing



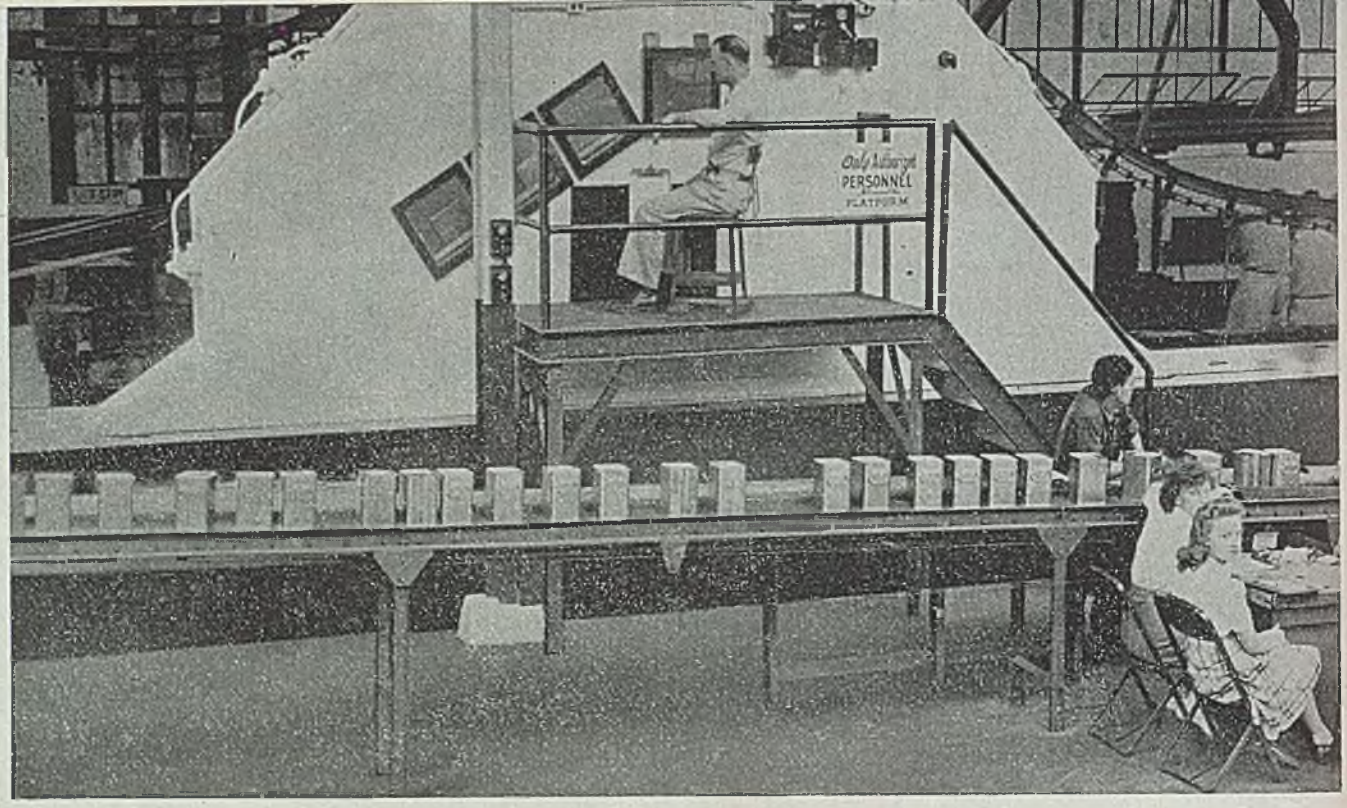


Worcester Pressed Steel Company employs this versatile H-P-M FASTRAVERSE press for drawing aircraft propeller hub domes from No. 61 aluminum alloy. Formerly a forging, these domes are now drawn "cold" with a material savings up to 16 pounds per dome in some sizes. They also have greater resistance to corrosion than the former product.

Have you investigated the possibilities of deep drawing metal parts hydraulically? You too can improve your product, and at the same time lower your manufacturing costs with modern H-P-M Pressure Processing. An H-P-M engineer will be glad to study your particular production problems.

HPM

THE HYDRAULIC PRESS MFG. CO.
Mount Gilead, Ohio, U. S. A.
Branch Offices—New York, Philadelphia, Detroit and Chicago.
Representatives in Principal Cities.



Vacuum Testing Machine

designed to permit continuous inspection for leaks in hermetically sealed ammunition cans has features recommending its use on food cans, radiator cores, floats, gas tanks and similar items

CONTINUOUS vacuum testing machine, which detects any leaks in hermetically sealed steel cartridge containers, has been devised by the engineering department of Chrysler Corp.'s Evansville, Ind., ordnance plant.

Known as the Vacuveyor, the machine is being used to detect leaks in metal cans in which 45-caliber and 30-caliber carbine cartridges are packed for shipment. The cans protect the ammunition from corrosion and other possible damage—a protection that was not possible with the original waxed cardboard containers in wooden shipping chest used in the early part of the war.

So successful has the test unit become in revealing imperfections, that the Office of Chief of Ordnance, Small Arms Division, Ammunition Branch, has requested all small arms plants engaged in packaging of hermetic containers to use a machine of this type. Ten of these machines are now being manufactured for this purpose and many are expected to be used in the postwar period by manufacturers of canned goods, radiator cores, floats, gas tanks, refrigerator condensers, and other similar items.

The Evansville plant had been using an ordinary glass bell jar to spotcheck the hermetically sealed cartridge cans. A vacuum was applied to water in the jar by means of a small vacuum pump and recorded on mercury U-tube. This action caused bubbles to emanate from an imperfect can. This check system covered only four cans out of each lot of 50 and some leaking containers therefore were bypassing the inspectors.

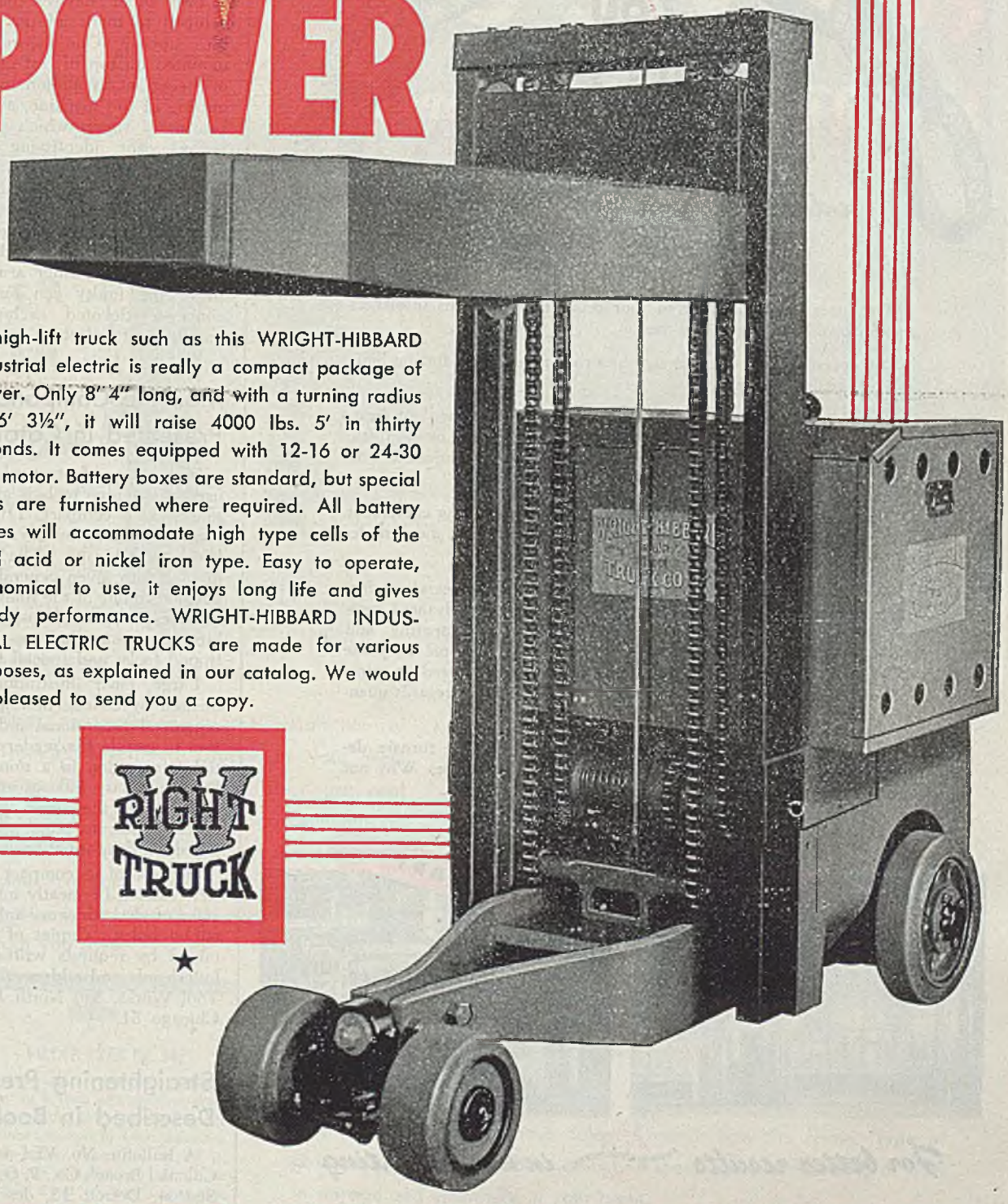
In conjunction with the spot check, the light-gage steel cans were passed through a tank in which water was heated by means of steam coils, but this idea was discarded because this method failed to produce the required amount of pressure inside the can.

R. H. Dickman, a company engineer, was presented with the problem of devising an infallible testing system. From a rough pencil sketch, the testing unit began to take shape. Made of heavy-gage steel plate, the machine is 45 feet long, 5 feet wide, and approximately 13 feet high. It will test 780 ammunition cans per hour, and with a few alterations, will accommodate 1200 cans per hour. The containers are placed on an electrically driven conveyor so that cans enter a lower water tank and travel upward into the vacuum area. Vacuum inside the test chamber is created by three exhaust pumps and necessitates the use of heavy plastic windows where the operator may visually inspect each container as he is doing in accompanying illustration.

If a container is imperfect, it will allow bubbles to be discharged rapidly upon entering test chamber because of the greater differential of pressure inside of can. Operator watches for the bubbles, and upon discovering them, places a notation on a small metal tag. The tag is placed on an outside declining wire and slides into position where it energizes a red light and rings a buzzer to attract attention of an operator at the discharge end of machine. The defective can, now traveling downward, emerges from an exit, and the operator removes the designated leaking can from the conveyor flight. This is the duty of operator shown in right foreground.

The machine is of relatively simple design, with few moving parts. A float control valve maintains a predetermined level in the lower water tank and a constant volume of liquid in the entire system. An automatic float valve control disconnects the vacuum pump system when the proper head of water and vacuum is reached in the upper test

p a c k a g e d
POWER



A high-lift truck such as this WRIGHT-HIBBARD industrial electric is really a compact package of power. Only 8' 4" long, and with a turning radius of 6' 3½", it will raise 4000 lbs. 5' in thirty seconds. It comes equipped with 12-16 or 24-30 volt motor. Battery boxes are standard, but special sizes are furnished where required. All battery boxes will accommodate high type cells of the lead acid or nickel iron type. Easy to operate, economical to use, it enjoys long life and gives steady performance. WRIGHT-HIBBARD INDUSTRIAL ELECTRIC TRUCKS are made for various purposes, as explained in our catalog. We would be pleased to send you a copy.

WRIGHT TRUCK

★

WRIGHT-HIBBARD
INDUSTRIAL ELECTRIC TRUCK CO.
INCORPORATED
PHELPS, NEW YORK

chamber. A small gearhead motor keeps the conveyor in motion and an overloading type of clutch acts as a safety device. Water in the lower tank is sealed automatically from the upper test chamber at the positions where the cans enter and leave the top section.

Two other devices have been developed to mark inferior cans as bubbles appear. One is an air cylinder mounted on top of test chamber which, on being set in motion by air valve on outside of the machine, actuates an arm bearing a stamp which marks the imperfect cans, identifying them for removal at the end of the test line. Another method involves the use of a photoelectric cell circuit which would pick up the action of the bubbles, disturb a beam of light and automatically set a solenoid pusher arm in action to shove the faulty can on to a second conveyor devoted exclusively to the handling of rejects.

Machine Components Presented in Catalog

Information of practical value to every user of machine tools is attractively presented in a compact, 116 page catalog recently released by the Lake Shore Tool Works of Chicago. The new catalog is divided into seven general sections, each devoted to one of the following products: milling cutters; hobs; gear cutters; broaches; miscellaneous tools; carbide tipped tools; and special tools.

Large, clear illustrations are supplemented by concise descriptions and well organized dimensional and price information to enable the reader to grasp essential information in a minimum of time. Supplementary indexes at the beginning of each of the seven general sections quickly indicate page numbers containing desired information.

Because of its compact pocket size the new catalog fits neatly into all types and sizes of desk drawers and files, or shop cubby holes. Copies of it may be obtained by requests written on company letterheads and addressed to Lake Shore Tool Works, 816 North Kostner avenue, Chicago 51.

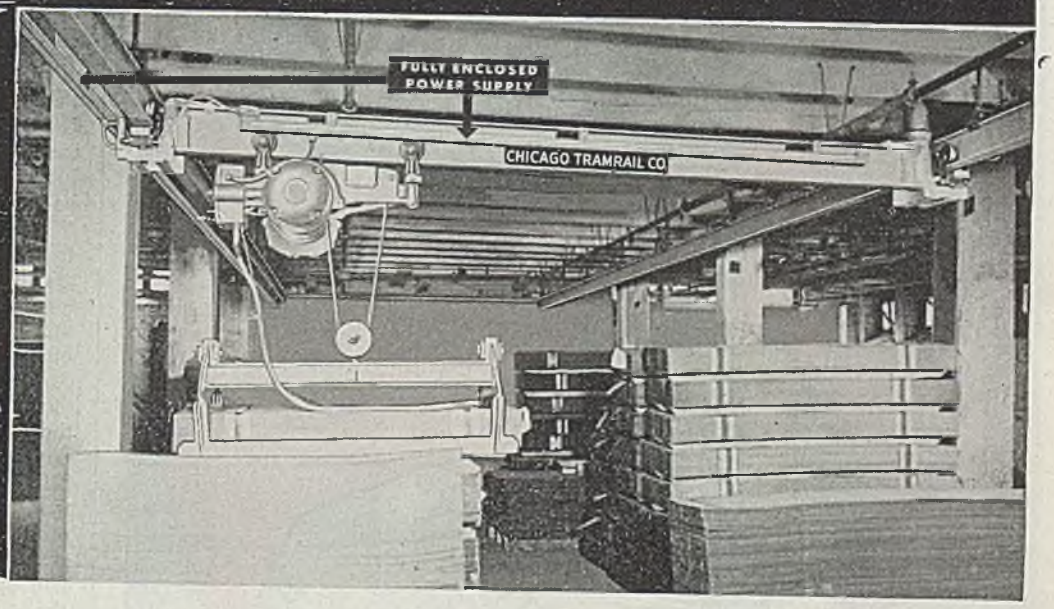
Straightening Presses Described in Booklet

A bulletin, No. VL1-44, published by Colonial Broach Co., P. O. Box 37, Harper Station, Detroit 13, describes a line of new hydraulic straightening presses, model VL-1, designed for handling both finished and rough work. These open side presses are of reinforced welded steel construction, with built-in motors. Rams are operated by direct-acting hydraulic cylinders in the head and are controlled through light-pressure combination hand control and foot pedal. It also lists standard and extra equipment and gives specifications on models ranging in capacity from 10 to 50 tons.

Stack up BIG $AVINGS

Handling STEEL STORAGE

FASTER
SAFER
at less cost!

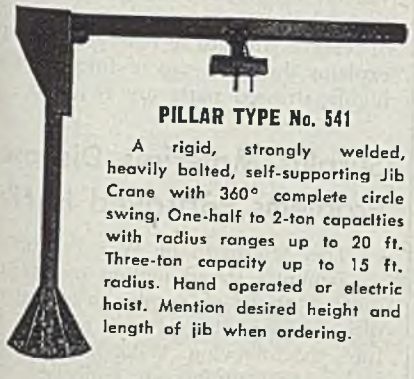


Unit shown is a single motor, Chicago Tramrail Underhung Crane with push-type trolley, electric hoist and Sheet-Grab. Also available in 2 and 3 motor types for automatic operation of longitudinal, lateral and vertical motions of crane.

Photo Courtesy M. Black & Sons, Chicago, Ill.

The savings accomplished by the installation of Chicago Tramrail Overhead Cranes in your steel storage rooms are not theoretical. They are real dollars and cents savings that show up prominently on your cost sheet. The above photograph shows a small, hand-operated overhead crane with sheet-grab handling sheet steel in bundles. It illustrates a few of the ways in which you save.

You *save* on installation costs—one crane does the job of many because it can operate throughout the room, the hoist being shifted from one bay to another at various transfer points along the runways. You *save* on labor: These easily operated cranes release large crews for other work. You *save* on accident costs—the fully enclosed conductors are a real safety feature where men are working on top of the bundles close to the hoist. You *save* space—the steel bundles in the photograph above are stacked more than 6½ ft. high in a ten-foot ceiling room.



PILLAR TYPE No. 541

A rigid, strongly welded, heavily bolted, self-supporting Jib Crane with 360° complete circle swing. One-half to 2-ton capacities with radius ranges up to 20 ft. Three-ton capacity up to 15 ft. radius. Hand operated or electric hoist. Mention desired height and length of jib when ordering.

We urge you—install Chicago Tramrail Overhead Cranes in your steel storage rooms without delay. Discover how the correct type of crane can save labor, reduce costs and speed up safer handling of steel in storage and elsewhere in your plant.

Write—ask us to submit specific recommendations. No obligation.

CHICAGO TRAMRAIL COMPANY

2912 CARROLL AVENUE **Phone KEDzie 7475** **CHICAGO 12, ILLINOIS**

Forging Practice

(*Concluded from Page 85*)

of the upset section is not more than 1½ times the diameter of the bar. The correct and incorrect ways are illustrated in Figs. 15 and 16.

Rule 3—In an upset where the stock is more than three diameters in length and the diameter of the upset section is 1½ times the diameter of the bar, the length of unsupported stock beyond the face of the die must not exceed one diameter of the stock. The results of conformation with this rule and its violation are shown schematically in Figs. 17 and 18.

It must be noted that upset sections of a size larger than is compatible with the upsetting rules can be produced. However, in such cases, the upsetting has to be done in two or more steps or blows, and the upsetting rules have to be conformed with during each step.

The above discussion clearly indicates that close co-operation between engineering departments, laboratories, and forge departments is a prime requisite for the design and production of high quality forgings. The engineering departments consult the laboratories for the purpose of obtaining information on the selection of the material, and typical physical properties that can be expected. This results in the design of a part so that maximum physical properties are produced in the sections of maximum stress. The engineering departments and laboratories then collaborate with the forge departments on dimensions and shape of the forging, so as to produce a suitable forging with minimum cost and optimum production.

It is only through consultation and close co-operation of this type, before the drawing is finished on the board, that the consistent production of high quality forgings and parts can be insured.

Summing up briefly, (1) the positioning of flow lines in parts subjected to impact, shock, vibration, stress concentration, or unexpected stresses is exceedingly important, and (2) the main advantage of properly designed forgings is their ability to supply the extra amount of reserve strength in emergencies. This explains the wide use of forgings where highly stressed parts are required.

Surplus Materials Disposal Problems Portrayed In Film

"The Aftermath of War Production," a 17-minute sound motion picture, presents a study of surplus war materials disposal in motion picture form. It portrays the following: What happens when large war contracts are cancelled; what problems confront aircraft producing companies; the aftermath of design changes; the decisions that must be made to avoid delay in disposing of surpluses; the salvage value of special tools; etc. Prints in 16 millimeter size may be obtained from Automotive Council for War Production, 320 New Center building, Detroit 2.

Brawn.. where brawn is needed

WHETHER it's a cam or a crankshaft—a steering knuckle or a shovel tooth—or any one of thousands of parts that must withstand the punishment of shock or strain . . . specify Forgings by Phoenix. It's your assurance of the strength and stamina to do the job without faltering—of unfailing service—and a high factor of safety.

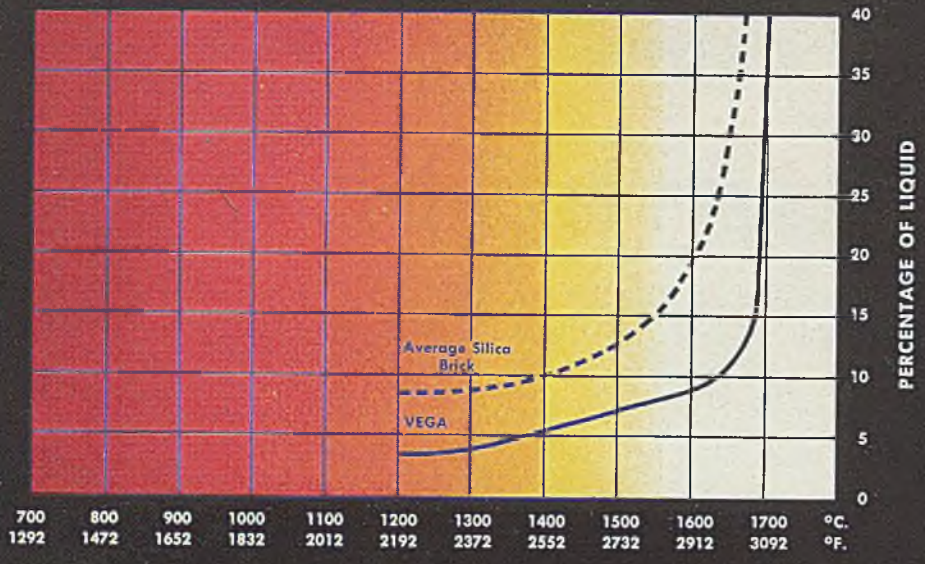
This photomicrograph shows the closely knit fibrous structure of a drop-forging and how the lines of flow follow the contour of the part. That's because the heated metal is actually kneaded into a sinewy mass under the repeated blows of the drop hammer and is forced into every part of the precision die.

And with this extra strength is economy, too . . . lower machining costs—no excess weight—no concealed defects—and welding adaptability. They're all factors which should be given consideration when planning your postwar product, and we'll be glad to discuss these plans with you without any obligation.

Forgings by **PHOENIX**

PHOENIX MANUFACTURING COMPANY

CATASAUQUA △ PENNSYLVANIA



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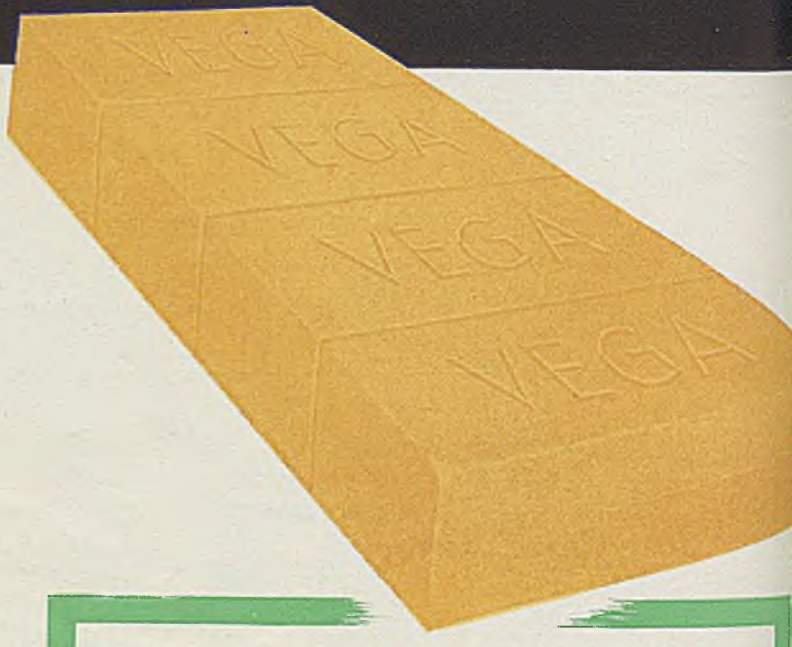
MELTING BEHAVIOR CHART BASED UPON HARBISON-WALKER RESEARCH AND PUBLISHED DATA

Note the melting behavior of a silica refractory with a total of 1.2% alumina, titania and alkalies, and 2% of lime. This silica brick — a fair average of commercially available silica refractories—becomes 10% liquid at 2550° F. (See broken line on chart.)

Contrast the melting behavior of VEGA Super-Duty Silica Brick, a refractory containing a total of only 0.4% alumina, titania and alkalies, and 2% of lime. Note that VEGA does not become 10% liquid until a temperature of 2970° F. is reached . . . more than 400° F. higher. (See solid line on chart.)

Note, too, that VEGA does not develop 30% liquid until a temperature of 3090° F. is reached, while the average silica brick reaches this stage of melting at 2990° F., a full one hundred degrees lower. These temperatures correspond closely to the maximum temperatures at which the brick will sustain heavy loads.



Important Notice!

LICENSING ARRANGEMENT

A definite contribution to longer furnace life and greater steel production, VEGA brick should be made available as soon as possible to the largest number of steel producers.

Harbison-Walker will, therefore, license other responsible producers of silica refractories to manufacture brick under the VEGA patents.

Super-duty silica refractories, made under the VEGA patents by other manufacturers, will carry this identifying symbol of plus quality + following the manufacturer's established brand name.

HARBISON-WALKER REFRACTORIES CO.

AND SUBSIDIARIES

World's Largest Producer of Refractories

GENERAL OFFICES . PITTSBURGH 30, PENNSYLVANIA

lb. per ton against 3.90

VEGA

SUPER-DUTY SILICA BRICK

shows saving of 23% in refractories

Here are some interesting facts and figures on a seventeen-months' operating test of Vega Super-Duty Silica Brick in 19 furnace roofs at a well-known open hearth plant:

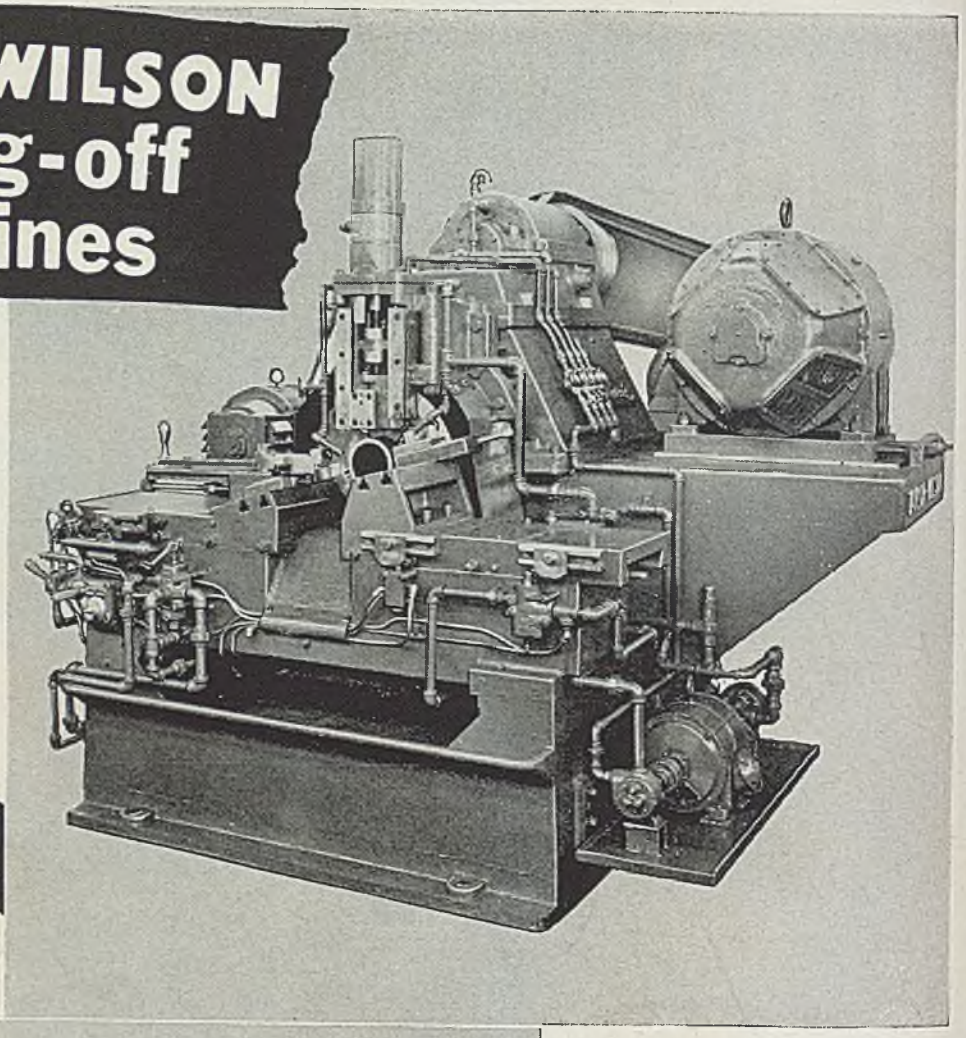
The roof of each furnace was divided from the front to the taphole . . . one half of the roof was laid with high quality silica brick . . . the other half with Vega Super-Duty Silica Brick.

Examination of the first six furnaces to come down showed that Vega Super-Duty Silica Brick sections did not have to be repaired through 184 heats . . . the other sections required repairs at 133 heats.

Consumption of the silica brick regularly used in these furnace roofs was 3.90 pounds per ton of steel . . . consumption of Vega Super-Duty Silica Brick was 3.01 pounds per ton — a saving of 23%.

Vega, *the first commercially available super-duty silica brick,* was developed by Harbison-Walker research to meet the demand for a silica refractory that would permit higher furnace temperatures, give longer life and reduce maintenance costs. Write for further data.

TAYLOR-WILSON Cutting-off Machines



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1" to 24" in Diameter

High production is normal performance for Taylor-Wilson machines. Their rugged, over-built construction and precise engineering enable them to meet increased schedules **on time**, and to stand up under continuous high speed without vibration or wearing strain.

Precision, accuracy and smooth operation at all speeds — Plenty of amazing case histories in crop-ending, cutting off pipe or tubing for coupling stock, roller bearing blanks, bomb blanks and other items in set lengths.

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WE ALSO MANUFACTURE

Straightening, Burnishing and Sizing Machines — Galvanizing Equipment for Pipe — Small Seamless Tube Mills, Butt Weld Pipe Mills, Tube Testing Machines, Test Benches, Complete line of Equipment for finishing of pipe.

TAYLOR-WILSON MFG. CO.

Thomson Ave. McKees Rocks, Pa.
(PITTSBURGH DISTRICT)

Heating with Gas

(*Continued from Page* 90)

obtaining sections for examination of the structure. Fig. 7 shows macrographs of the SAE-4340 steel before and after heating and Fig. 5 comparable photomicrographs. For the purpose of determining the extent of decarburization, photomicrographs (Fig. 8) also were made on the edge of the specimens and it will be noted that the light, decarburized zone was confined to about 0.001-inch.

As a means of checking the application of high speed heating to large sections, a special heating unit was constructed for heating the journal and one of the two adjacent crank throw bosses of a crankshaft weighing 3200 pounds. This shaft (Fig. 15) was about 9 feet long with 9-inch diameter journals and unmachined throws measuring 10 x 15½ x 12 inches axially. The journals, preparatory to twisting the crank throw angles to the proper degree, were brought up to a hot-working temperature of 1770 degrees Fahr. in 53 minutes or at the rate of 6 minutes per inch of diameter. The heating unit contained 16 radiant cup burners surrounded by a moldable refractory lining. The tested full input was 3350 cubic feet per hour city gas at complete mixture and 31 inches H_2O burner pressure.

Grain Size Differs

To determine the effects of rapid heating on the difference in grain size at the center and at the surface of steel, an SAE-1035 steel billet was heated to 1510 degrees Fahr. following the same procedure in bringing the SAE-1020 and 1095 up to forging temperature. Heating time was 2½ minutes and heating rate 2.25 minutes per inch. The heating curve for this steel is shown in Fig. 17.

As shown by the photomicrographs (Fig. 9) taken at the center and the edge of the specimen, there was no appreciable difference in grain size other than that the pearlite on the edge was finer than at the center. The edge apparently cooled slightly faster than the center.

A comparison of the photomicrographs of the several steels discussed and those of the same compositions heated by conventional methods showed no apparent differences. Grain size examinations also were favorable. Decarburization proved to be less because of the short time the steels were subjected to heat.

In the case of SAE-4340, decarburization was only 0.001 to 0.003-inch, which is negligible in commercial practice. A slight scale formation was noted after the billets were exposed to air. No scale formed during heating as the billets were bright and clean immediately upon removal.

In another check on grain size, a molybdenum-type high speed steel analyzing 0.80 C, 4.00 Cr, 4.25 Mo, 5.50 W and 1.50 V was heated to hardening temperature. Specimens used were lathe centers 5 inches long and with a maximum diameter of 1 inch. The centers were clamped in a chuck and mounted on a turntable. For high-velocity slot-type ceramic burners placed at 90 degrees and ¼-inch from the greatest diameter of the part were fired directly at the upper 1½ inches of the piece.

The pieces were brought up to 2200 degrees Fahr. in 75 seconds or at the rate of 1.25 minutes per inch, quenched in oil to 200 degrees Fahr. and reheated to 950 degrees and cooled in an insulated chamber to relieve stresses and avoid restressing on second cooling. The sample then was photographed to show amount of scale, sectioned, polished, etched and photomicrographed to determine structure, carburization, decarburization and grain size. Hardness tests also were made on a cross section ¾-inch from the point.

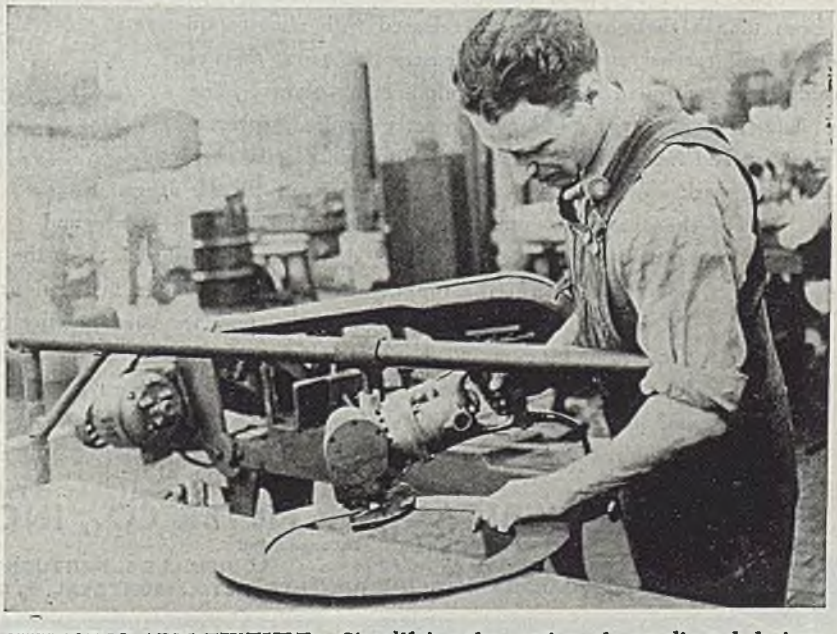
Examination of the photomicrographs indicated that no carburization had taken place. The amount of scale formed was less than in the case of SAE-4340, probably due to the quench immediately after heating. This demonstrates that most of the scale forms on cooling in air rather than on heating when rapid gas-air methods are used. Hardness at the wearing tip was actually 64 to 65 rockwell C although the steel was treated to obtain only 60 C or better.

Considerable study and research has been devoted recently to high speed processes for heat hardening or annealing wire, rod and tubing on a continuous basis. In Fig. 19 may be seen a continuous unit utilizing the same gas-air principles applied in making the studies already described. It comprises a variable speed drive, a heating unit and a quenching unit. The drive consists of a variable speed rear reduction unit connected to water-cooled grooved rolls which carry the material, end-to-end, through the heating area and the quench. The heating chamber measures only 3¼ x 3¼ x 13 inches long and was constructed with 10 radiant burners imbeded in a refractory lining. Four burners fire from each side and 2 from the top. The entire unit is encased in a cast iron shell. Fuel was 530 B.t.u. accurately premixed with air. The quench chamber is equipped with a doughnut spray with tiny holes on the inner periphery. Water is supplied under high pressure by a recirculating system.

Finned stainless steel tubes of the 18-8 type ¾-inch OD and 20 feet long were fed through the units at the rate of 5.3 feet per minute. Speed of the drive rolls may be adjusted so that the material will be in contact with the heat for a sufficient length of time to bring it up to proper heat. In the case of the ¾-inch stainless tubing, any given section was in the heating zone only 12.2 seconds, to bring it up to annealing temperature of 2200 to 2250 degrees Fahr. Heat of the material as it emerges from the furnace area may be readily checked through the use of an optical pyrometer.

Sections of the stainless tubing as received and after annealing were photomicrographed at a magnification of 250X and are shown in Fig. 10. The structure was fully annealed despite the rapid rate of heating and, in fact, the results exceeded expectations. Hardness of rockwell 72 B or lower was specified but 62 to 65 B was actually obtained.

High speed annealing of Telnic No. 49, a copper-tellurium-nickel alloy, also was carried on the same machine used in processing stainless steel tubing. Twenty-



SWINGING ARM FIXTURE: Simplifying the cutting of complicated designs with a portable hand shear from sheet metal stock having maximum thickness of 7/64-inch, this holding fixture was built at General Electric Co.'s Fitchburg plant. It provides easier operation and better control of work when cutting complicated designs

foot lengths ¾-inch in diameter were run at the rate of 2 feet 3 inches per minute to bring temperature up to 1500 degrees Fahr. Time under heat was only 28.9 seconds. In this case a hardness of rockwell 25 B or lower was desired and 12 B actually was obtained. As in the case of stainless steel, the nonferrous alloy was quenched in water as it emerged from the heating chamber.

Another adaption of high speed principles involved a furnace (Fig. 12) equipped with 16 open-face radiant burners and was used for bringing brass billets 15 inches long and 8 inches in diameter uniformly up to extrusion temperatures of 1530 degrees Fahr. in a total elapsed time of 15½ minutes. Equipment based on this test is being operated by a New England brass mill and it has been found that rapidly-heated billets require slightly less extrusion pressure. The experimental furnace had an inside diameter of 9 inches and a height of 20 inches. Four burners were arranged near the top of the unit and 4 near the bottom. Heating was at rate of 1.94 minutes per inch of diameter. Surface temperature when gas was turned off was 1565 degrees Fahr.

Time required for bringing a copper billet of the same dimensions to uniform temperature of 1670 degrees Fahr. was 16½ minutes or at the rate of 2.06 minutes per inch, and for heating a cupro-nickel billet to 1835 degrees 20½ minutes or 2.65 minutes per inch.

Flow-Brightening Technique

One of the newest and most spectacular high speed heating applications (Figs. 13, 14) is in the flow-brightening of the surface coating on electrolytic tin plate as it emerges from the plating bath. The strip moves downward between two water-cooled refractory lined panels, each of which is equipped with 75 radiant gas burners located on 10-inch centers. The burners consume 10,000 cubic feet of 250 B.t.u. coke oven gas or 60,000 cubic feet of carbureted gas-air per hour.

It is the purpose of these burners to melt the electroplated tin coating and cause it to alloy and thus become more adherent to the steel. No flame impinges directly upon the strip although the open faces of the burners are located only 4 inches from it. Complete combustion takes place within the burners themselves and only the hot gases strike the plate. The tin plate line operates at 600 feet per minute but burner pressure can be adjusted to heat the coating on strip moving at the rate of 1000 feet per minute. The final smoothing out of the coating is accomplished by means of a pair of variable ribbon burners located just below the large burner panel. The installation is reported providing economies in operation as compared with other types of flow-brightening.

All of the techniques discussed are developments of the Selas Corp. of America, Philadelphia, and the researches reported were conducted by that organization in behalf of the Committee on Industrial Gas Research of the American Gas Association.

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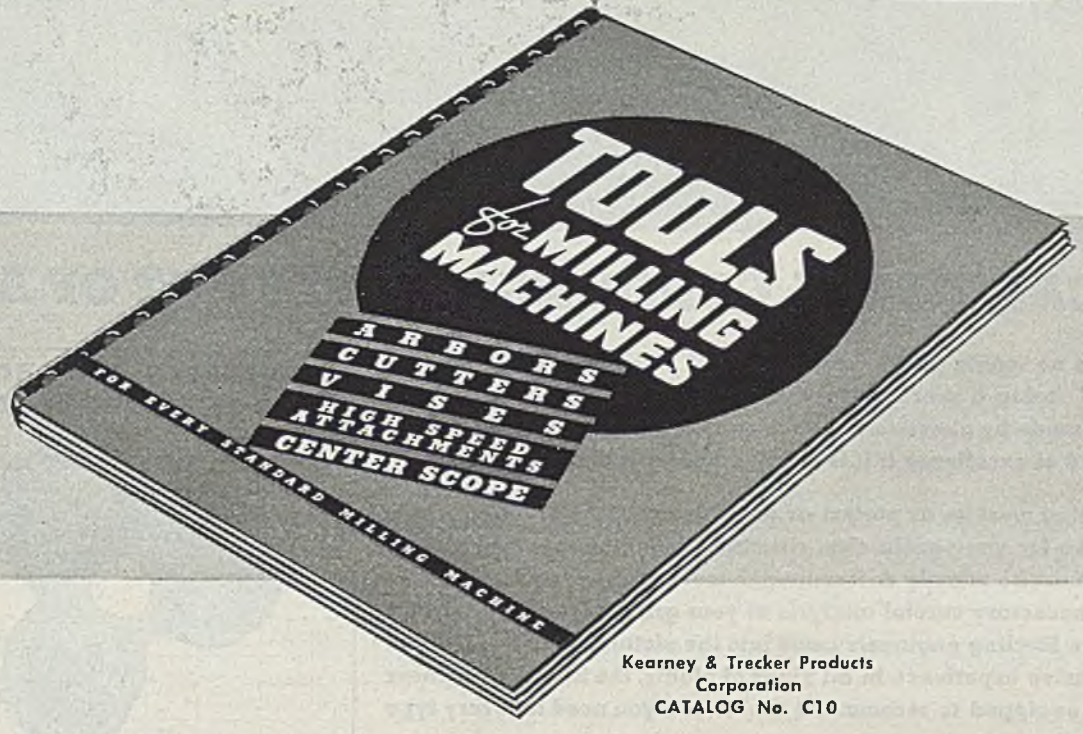

Kearney & Trecker Products Corporation
CATALOG No. C10

This new Catalog No. C10 is the last word in convenience when selecting milling tools. It's actually 5 catalogs in one, giving complete technical data on Arbors, Cutters, Vises, and other accessories and equipment. 50 pages of useful information—spirally bound in one book that opens flat and smooth for quick, easy reading—it's the type of catalog every machine-shop man wants to have around — handy! This bulletin would prove useful to your superintendent, master mechanic, tool and die men as well as your purchasing executives — send us your list on your company letterhead and we will be glad to mail copies to everyone interested in your organization. Would you tell us, please, the name of the magazine in which you saw this announcement.

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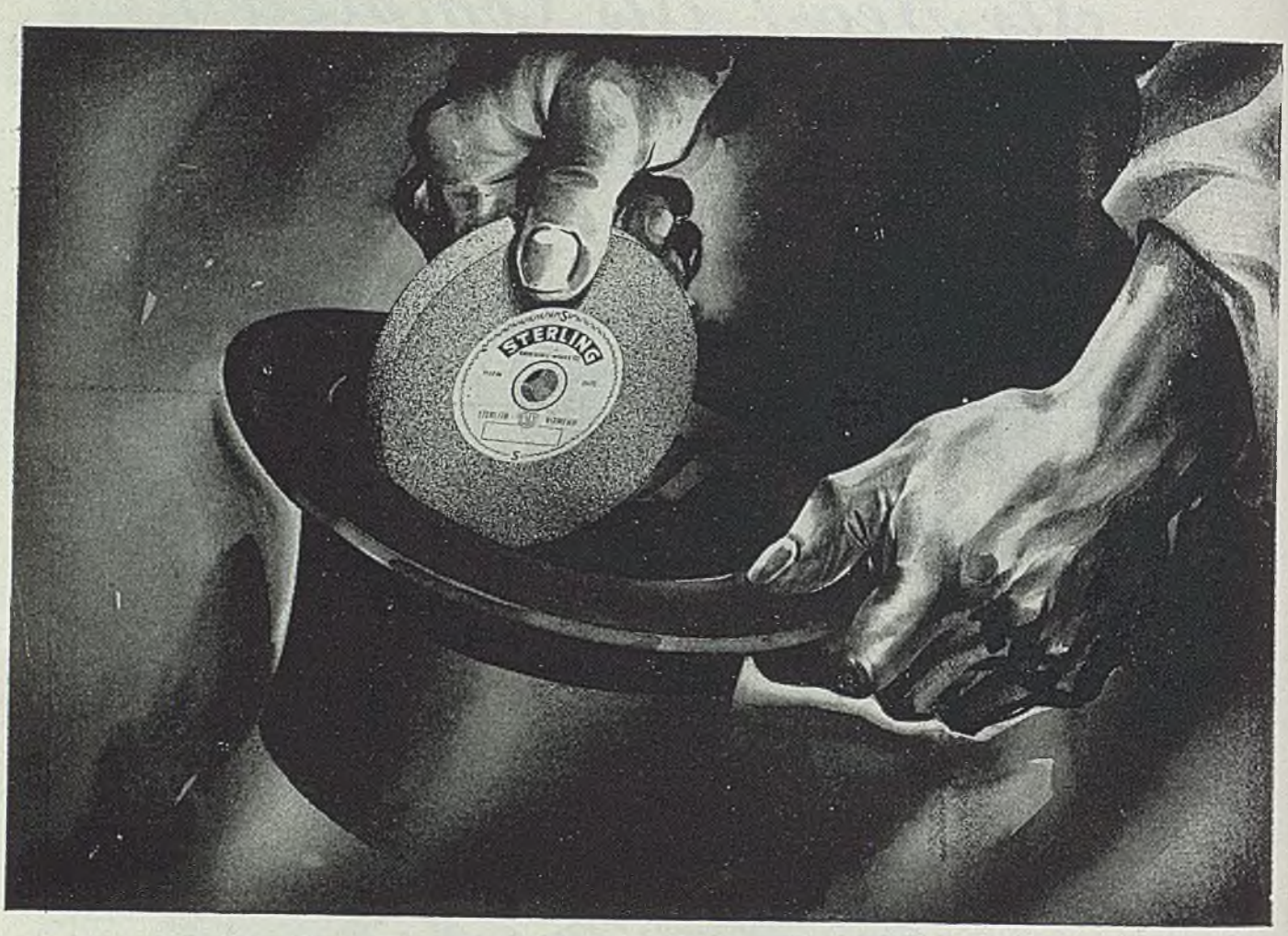

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There is no magic in the manufacture of Sterling's "Wheels of Industry." Being a precision instrument, Sterling Grinding Wheels are not made by guesswork . . each must be built to a predetermined standard of excellence if it is to solve your grinding problem.

Everything must be as perfect as possible about the grinding wheel we make for you—grain size, structure, bond, shape, and size of wheel must be exactly determined to meet your job demands. This makes necessary careful analysis of your grinding needs, and that is where Sterling engineers come into the picture. Backed by years of extensive experience in all kinds of plants, the Sterling engineer is well equipped to recommend the wheels you need for every type of operation.

Write us today . . we cannot wave a wand and produce the wheels you need, but you will be pleasantly surprised at the speed with which you receive them.

SOMETHING YOU SHOULD KNOW ABOUT BONDS

This magnified view shows the relationship between bond and grain in a Sterling Grinding Wheel. The more circles the hole, the stronger are the posts of bond between the grain, and the better the resulting wheel. Sterling's bonds all pass every test for quality and dependability, assure longer lasting wheels, and guarantee better grinding results.

• STERLING ABRASIVES •

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

THE WHEELS OF INDUSTRY

Mills Heavily Loaded as Manpower Problem Grows

Weather handicaps scrap and pig iron movement. . . Delivery dates pushed further back by full schedules. . . Wire needs grow

STEEL mill backlogs are increasing steadily as a result of heavier war requirements on the one hand and handicaps to production from inability to obtain sufficient manpower and interruption of raw material supplies by heavy snow on the other.

Deliveries have become further extended in all major products. Buying has increased rapidly since the turn of the year and is by far the larger factor in heavier order books. Weather conditions over much of the producing area have prevented attainment of higher operating rates, though they have not cut deeply into the existing high rate. In some districts car shortage and slow movement have been pronounced and have slowed steel deliveries, forcing consumers to turn to warehouses for material to meet schedules.

Scrap and pig iron movement have been most interrupted. Blast furnaces have continued production but at some important points they have been unable to ship their product and have been forced to pile it until cars are available. Scrap collection has been slowed or stopped and shipments have been interrupted to some degree. Since the scrap industry is not included in the list of essential industries the trend of labor is toward other employment, further handicapping processors.

With scrap tighter allocations have been used to relieve shortage. While considerable tonnages remain in yards because of inability to prepare them for market, much tonnage is snowbound in cars. Under these circumstances steelmakers have been using scrap from stockpile, believing it can be replaced when the tieup is relieved. Prices are firm and practically at ceilings in all areas.

Various disturbing factors have appeared since the establishment of interim advances in prices of several steel products and remedies are being sought for the resulting inequalities. In some instances long-established relations between products are disrupted and some producers are penalized as a result.

Deliveries of practically all steel products are further extended and the situation now gives war requirements the right of way to the extent that CMP tonnage on books is pushed far back and all civilian tonnage is practically unobtainable.

Plate deliveries are extended to May in the case of important producers. Carbon bars are sold into May and June and in some cases mills can not accept anything before third quarter. Sheet tonnage is available now in third quarter, except in specialties, such as stainless and silicon sheets, which can be booked for earlier shipment.

In spite of adverse weather, causing small production losses in several districts, the estimated national steel rate yielded only ½-point to 93½ per cent of capacity. Buffalo was the only area to show a gain, 7 points up from the revised rate of the prior week, to 77 per cent. Chicago declined ½-point to 98 per cent, Pittsburgh ½-point to 88½, Youngstown 3 points to 78, Wheeling 3½ points to 95, Detroit 1 point to 83, eastern Pennsylvania 1 point to 94 and Birmingham 5 points to 90 per cent. Rates were unchanged as follows: Cincinnati 92 per cent, St. Louis 75, New England 92 and Cleveland 86.

One of the tightest products is wire, scheduled requirements for war use being about 30 per cent higher than last year. Communications wire is most in demand but wire rope continues a heavy item and mills are loaded far ahead with pressing orders.

Warehouse demand continues strong and slow mill deliveries cause much emergency buying to meet production schedules by fabricators. Inventories in many cases are small.

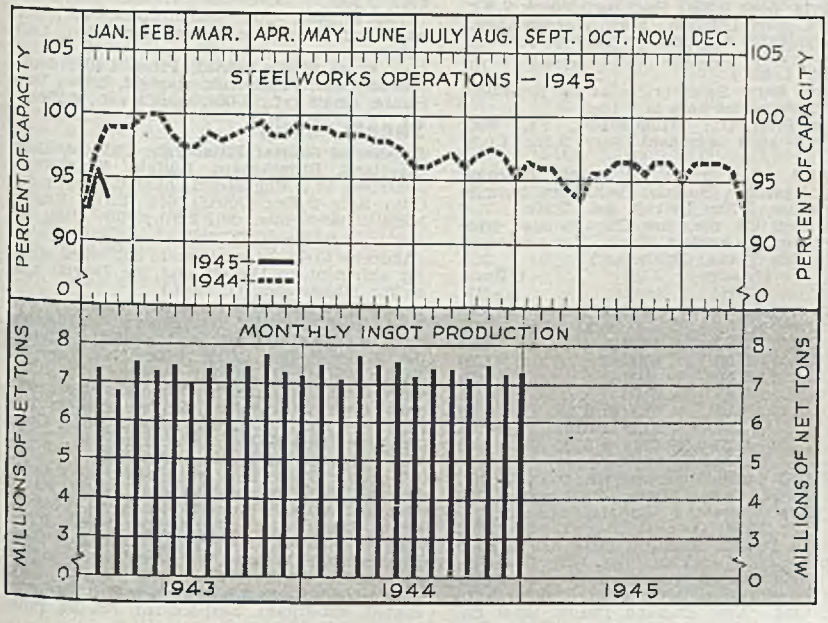
Average composite prices continue at the same level as last week, finished steel holding at $57.55, to which it rose as a result of higher prices on some items allowed by Office of Price Administration. Semifinished steel composite is $36, steelmaking pig iron $23.05 and steelmaking scrap $19.17.

DISTRICT STEEL RATES

Percentage of Ingot Capacity Engaged in Leading Districts

	Week Ended Jan.20	Change	Same Week 1944	Same Week 1943
Pittsburgh	88.5	—0.5	96	97.5
Chicago	98	—0.5	101.5	102.5
Eastern Pa.	94	—1	96	96
Youngstown	78	—3	94	97
Wheeling	95	—3.5	93	80
Cleveland	86	None	95	91
Buffalo	77	+7	90.5	93
Birmingham	90	—5	95	95
New England	92	None	95	95
Cincinnati	92	None	94	95
St. Louis	75	None	83	93
Detroit	83	—1	88	93
Estimated national rate	93.5	—0.5	°99	°99

°Based on steelmaking capacities as of these dates.



COMPOSITE MARKET AVERAGES

	Jan. 20	Jan. 13	Jan. 6	One Month Ago Dec., 1944	Three Months Ago Oct., 1944	One Year Ago Jan., 1944	Five Years Ago Jan., 1940
Finished Steel	$57.55	$57.55	$56.73	$56.73	$56.73	$56.73	$56.73
Semifinished Steel	36.00	36.00	36.00	36.00	36.00	36.00	36.15
Steelmaking Pig Iron	23.05	23.05	23.05	23.05	23.05	23.05	22.05
Steelmaking Scrap	19.17	19.17	19.17	16.40	19.17	19.17	17.60

Finished Steel Composite:—Average of industry-wide prices on sheets, strips, bars, plates, shapes, wire nails, tin plate, standard and line pipe. Semifinished Steel Composite:—Average of industry-wide prices on billets, slabs, sheet bars, skelp and wire rods. Steelmaking Pig Iron Composite:—Average of basic pig iron prices at Bethlehem, Birmingham, Buffalo, Chicago, Cleveland, Neville Island, Granite City and Youngstown. Steelworks Scrap Composite:—Average of No. 1 heavy melting steel prices at Pittsburgh, Chicago and eastern Pennsylvania. Finished steel, net tons; others, gross tons.

COMPARISON OF PRICES

Representative Market Figures for Current Week; Average for Last Month, Three Months and One Year Ago

Finished Material

	Jan. 20, 1945	Dec., 1944	Oct., 1944	Jan., 1944
Steel bars, Pittsburgh	2.15c	2.15c	2.15c	2.15c
Steel bars, Chicago	2.15	2.15	2.15	2.15
Steel bars, Philadelphia	2.47	2.47	2.47	2.47
Shapes, Pittsburgh	2.10	2.10	2.10	2.10
Shapes, Philadelphia	2.215	2.215	2.215	2.215
Shapes, Chicago	2.10	2.10	2.10	2.10
Plates, Pittsburgh	2.20	2.10	2.10	2.10
Plates, Philadelphia	2.25	2.15	2.15	2.15
Plates, Chicago	2.20	2.10	2.10	2.10
Sheets, hot-rolled, Pittsburgh	2.20	2.10	2.10	2.10
Sheets, cold-rolled, Pittsburgh	3.05	3.05	3.05	3.05
Sheets, No. 24 galv., Pittsburgh	3.65	3.50	3.50	3.50
Sheets, hot-rolled, Gary	2.20	2.10	2.10	2.10
Sheets, cold-rolled, Gary	3.05	3.05	3.05	3.05
Sheets, No. 24 galv., Gary	3.65	3.50	3.50	3.50
Bright bess., basic wire, Pittsburgh	2.60	2.60	2.60	2.60
Tin plate, per base box, Pittsburgh	$5.00	$5.00	$5.00	$5.00
Wire nails, Pittsburgh	2.80	2.55	2.55	2.55

Semifinished Material

Sheet bars, Pittsburgh, Chicago	$34.00	$34.00	$34.00	$34.00
Slabs, Pittsburgh, Chicago	34.00	34.00	34.00	34.00
Rerolling billets, Pittsburgh	34.00	34.00	34.00	34.00
Wire rods, No. 5 to $\frac{9}{32}$-inch, Pitts.	2.00	2.00	2.00	2.00

Pig Iron

	Jan. 20, 1945	Dec., 1944	Oct., 1944	Jan., 1944
Bessemer, del. Pittsburgh	$25.19	$25.19	$25.19	$25.19
Basic, Valley	23.50	23.50	23.50	23.50
Basic, eastern del. Philadelphia	25.34	25.34	25.34	25.34
No. 2 fdry., del. Pitts., N.&S. Sides	24.69	24.69	24.69	24.69
No. 2 foundry, Chicago	24.00	24.00	24.00	24.00
Southern No. 2, Birmingham	20.38	20.38	20.38	20.38
Southern No. 2 del. Cincinnati	24.30	24.30	24.30	24.30
No. 2 fdry., del. Phila.	25.84	25.84	25.84	25.84
Malleable, Valley	24.00	24.00	24.00	24.00
Malleable, Chicago	24.00	24.00	24.00	24.00
Lake Sup., charcoal, del. Chicago	37.34	37.34	37.34	37.34
Gray forge, del. Pittsburgh	24.19	24.19	24.19	24.19
Ferromanganese, del. Pittsburgh	140.33	140.33	140.33	140.33

Scrap

Heavy melting steel, No. 1 Pittsburgh	$20.00	$19.75	$16.95	$20.00
Heavy melt. steel, No. 2, E. Pa.	18.75	18.75	14.50	18.75
Heavy melting steel, Chicago	18.75	18.75	17.55	18.75
Rails for rolling, Chicago	22.25	22.25	22.25	22.25
No. 1 cast, Chicago	20.00	20.00	20.00	20.00

Coke

Connellsville, furnace, ovens	$7.00	$7.00	$7.00	$6.50
Connellsville, foundry ovens	7.75	7.75	7.75	7.75
Chicago, by-product fdry., del.	13.35	13.35	13.35	13.35

STEEL, IRON RAW MATERIAL, FUEL AND METALS PRICES

Following are maximum prices established by OPA Schedule No. 6 issued April 16, 1941, revised June 20, 1941 and Feb. 4, 1942. The schedule covers all iron or steel ingots, all semifinished iron or steel products, all finished hot-rolled, cold-rolled iron or steel products and any iron or steel product which is further finished by galvanizing, plating, coating, drawing, extruding, etc., although only principal established basing points for selected products are named specifically. Seconds and off-grade products are also covered. Exceptions applying to individual companies are noted in the table.

Semifinished Steel

Gross ton basis except wire rods, skelp.

Carbon Steel Ingots: F.o.b. mill base, rerolling qual., stand. analysis, $31.00.

(Empire Sheet & Tin Plate Co., Mansfield, O., may quote carbon steel ingots at $33 gross ton, f.o.b. mill. Kaiser Co. Inc. $43, f.o.b. Pacific ports.)

Alloy Steel Ingots: Pittsburgh, Chicago, Buffalo, Bethlehem, Canton, Massillon; uncrop., $45.

Rerolling Billets, Blooms, Slabs: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Sparrows Point, Birmingham, Youngstown, $34; Detroit, del. $36; Duluth (bll) $36; Pac. Ports, (bll) $46. (Andrews Steel Co., carbon slabs $41; Continental Steel Corp., billets $34, Kokomo, to Acme Steel Co.; Northwestern Steel & Wire Co., $41, Sterling, Ill.; Laclede Steel Co. $34, Alton or Madison, Ill.; Wheeling Steel Corp. $38 base, billets for lend-lease, $34, Portsmouth, O., on slabs on WPB directives. Granite City Steel Co. $47.50 gross ton slabs from D.P.C. mill. Geneva Steel Co., Kaiser Co. Inc., $58.64, Pac. Ports).

Forging Quality Blooms, Slabs, Billets: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Birmingham, Youngstown, $40. Detroit, del. $42; Duluth, billets, $42; forg. bll. f.o.b. Pac. Ports, $52.

(Andrews Steel Co. may quote carbon forging billets $50 gross ton at established basing points; Follansbee Steel Corp., $49.50 f.o.b. Toronto, O. Geneva Steel Co., Kaiser Co. Inc., $64.64, Pacific ports.)

Open Hearth Shell Steel: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Youngstown, Birmingham, base 1000 tons one size and section; 3-12 in., $52; 12-18 in., excel., $54.00; 18 in. and over $56. Add $2.00 del. Detroit; $3.00 del. Eastern Mich. (Kaiser Co. Inc., $76.64, f.o.b. Los Angeles.)

Alloy Billets, Slabs, Blooms: Pittsburgh, Chicago, Buffalo, Bethlehem, Canton, Massillon, $54; del. Detroit $56, Eastern Mich. $57.

Sheet Bars: Pittsburgh, Chicago, Cleveland, Buffalo, Canton, Sparrows Point, Youngstown, $34. (Wheeling Steel Corp. $37 on lend-lease sheet bars, $38 Portsmouth, O., on WPB directives; Empire Sheet & Tin Plate Co., Mansfield, O., carbon sheet bars, $39, f.o.b. mill.)

Skelp: Pittsburgh, Chicago, Sparrows Point, Youngstown, Coatesville, lb., 1.90c.

Wire Rods: Pittsburgh, Chicago, Cleveland, Birmingham, No. 5—$\frac{9}{32}$ in. inclusive, per 100 lbs., $2. Do., over $\frac{9}{32}$—$\frac{47}{64}$-in., incl., $2.15; Galveston, base, 2.25c and 2.40c, respectively. Worcester add $0.10; Pacific Ports $0.50. (Pittsburgh Steel Co., $0.20 higher.)

Bars

Hot-Rolled Carbon Bars and Bar-Size Shapes under 3": Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Birmingham, base 20 tons one size. 2.15c; Duluth, base 2.25c; Mahoning Valley 2.22½c; Detroit, del. 2.25c; Eastern Mich. 2.30c; New York del. 2.49c; Phila. del. 2.47c; Gulf Ports, dock 2.52c; Pac. ports, dock 2.80c. (Calumet Steel Division, Borg Warner Corp., and Joslyn Mfg. & Supply Co, may quote 2.35c, Chicago base; Sheffield Steel Corp., 2.75c, f.o.b. St. Louis.)

Rail Steel Bars: Same prices as for hot-rolled carbon bars except base is 5 tons.

(Sweet's Steel Co., Williamsport, Pa., may quote rail steel merchant bars 2.33c f.o.b. mill.)

Hot-Rolled Alloy Bars: Pittsburgh, Chicago, Canton, Massillon, Buffalo, Bethlehem, base 20 tons one size, 2.70c; Detroit, del., 2.80c.

(Texas Steel Co. may use Chicago base price as maximum f.o.b. Fort Worth, Tex., price on sales outside Texas, Oklahoma.)

AISI Series	(*Basic O-H)	AISI Series	(*Basic O-H)
1300	$0.10	4100 (.15-.25 Mo)	0.70
		(.20-.30 Mo)	0.75
2300	1.70	4300	1.70
2500	2.55	4600	1.20
3000	0.50	4800	2.15
3100	0.85	5100	0.85
3200	1.35	5130 or 5152	0.45
3400	3.20	6120 or 6152	0.95
4000	0.45-0.55	6145 or 6150	1.20

*Add 0.25 for acid open-hearth; 0.50 electric.

Cold-Finished Carbon Bars: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, base 20,000-39,999 lbs., 2.65c; Detroit 2.70c; Toledo 2.80c. (Keystone Drawn Steel Co. may sell outside its usual market area on Proc. Div., Treasury Dept. contracts at 2.65c, Spring City, Pa., plus freight on hot-rolled bars from Pittsburgh to Spring City. New England Drawn Steel Co. may sell outside New England on WPB directives at 2.65c, Mansfield, Mass., plus freight on hot-rolled bars from Buffalo to Mansfield.)

Cold-Finished Alloy Bars: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, base 3.35c; Detroit, del. 3.45c; Eastern Mich. 3.50c.

Reinforcing Bars (New Billet): Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Sparrows Point, Buffalo, Youngstown, base 2.15c; Detroit del. 2.25c; Eastern Mich. and Toledo 2.30c; Gulf ports, dock 2.50c; Pacific ports, dock 2.35c.

Reinforcing Bars (Rail Steel): Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Youngstown, Buffalo base 2.15c; Detroit, del. 2.25c; Eastern Mich. and Toledo 2.30c; Gulf ports, dock 2.50c.

(Sweet's Steel Co., Williamsport, Pa., may quote rail steel reinforcing bars 2.33c, f.o.b. mill.)

Iron Bars: Single refined, Pitts. 4.40c; double refined 5.40c; Pittsburgh, staybolt, 5.75c; Terre Haute, single ref., 5.00c, double ref., 6.25c.

Sheets, Strip

Hot-Rolled Sheets: Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Buffalo, Youngstown, Sparrows Pt., Middletown, base 2.20c; Granite City, base 2.30c; Detroit del. 2.30c; Eastern Mich. 2.35c; Phila. del. 2.37c; New York del. 2.44c; Pacific ports 2.75c.

(Andrews Steel Co. may quote hot-rolled sheets for shipment to Detroit and the Detroit area on the Middletown, O. base.)

Cold-Rolled Sheets: Pittsburgh, Chicago, Cleveland, Gary, Buffalo, Youngstown, Middletown, base, 3.05c; Granite City, base 3.15c; Detroit del. 3.15c; Eastern Mich. 3.20c; New York del. 3.39c; Phila. del. 3.37c; Pacific ports 3.70c.

Galvanized Sheets, No. 24: Pittsburgh, Chicago, Gary, Birmingham, Buffalo, Youngstown, Sparrows Point, Middletown, base 3.65c; Granite City, base 3.75c; New York del. 3.89c; Phila. del. 3.82c; Pacific ports 4.20c.

(Andrews Steel Co. may quote galvanized sheets 3.75c at established basing points.)

Corrugated Galv. Sheets: Pittsburgh, Chicago, Gary, Birmingham, 29 gage, per square 3.31c.

Culvert Sheets: Pittsburgh, Chicago, Gary, Birmingham, 16 gage, not corrugated, copper alloy 3.60c; Granite City 3.70c; Pacific Ports 4.25c; copper iron 3.90c, pure iron 3.95c; zinc-coated, hot-dipped, heat-treated, No. 24, Pittsburgh, 4.25c.

Enameling Sheets: 10-gage; Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Middletown, base, 2.75c; Granite City, base 2.85c; Detroit, del. 2.85c; eastern, Mich. 2.90c; Pacific ports 3.40c; 20-gage; Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Middletown, base 3.35c; Detroit del. 3.45c; eastern Mich. 3.50c; Pacific ports 4.00c.

Electrical Sheets No. 24:

	Pittsburgh Base	Pacific Ports	Granite City
Field grade	3.20c	3.95c	3.30c
Armature	3.55c	4.30c	3.65c
Electrical	4.05c	4.80c	4.15c
Motor	4.95c	5.70c	5.05c
Dynamo	5.65c	6.40c	5.75c
Transformer			
72	6.15c	6.90c	.....
65	7.15c	7.90c	.....
58	7.65c	8.40c	.....
52	8.45c	9.20c	.....

Hot-Rolled Strip: Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Youngstown, Middletown, base 1 ton and over, 12 inches wide and less 2.10c; Detroit del. 2.20c; Eastern Mich. 2.25c; Pacific ports 2.75c. (Joslyn Mfg. Co. may quote 2.30c, Chicago base.)

Cold Rolled Strip: Pittsburgh, Cleveland, Youngstown, 0.25 carbon and less 2.80c; Chicago, base 2.90c; Detroit, del. 2.90c; Eastern Mich. 2.95c; Worcester base 3.00c.

Commodity C. R. Strip: Pittsburgh, Cleveland, Youngstown, base 3 tons and over, 2.95c; Chicago 3.05c; Detroit del. 3.05c; Eastern Mich. 3.10c; Worcester base 3.35c.

Cold-Finished Spring Steel: Pittsburgh, Cleveland bases, add 20c for Worcester; .26-.50 Carb., 2.80c; .51-.75 Carb., 4.30c; .76-1.00 Carb., 6.15c; over 1.00 Carb., 8.35c.

Tin, Terne Plate

Tin Plate: Pittsburgh, Chicago, Gary, 100-lb. base box, $5.00; Granite City $5.10.

Electrolytic Tin Plate: Pittsburgh, Gary, 100-lb. base box, 0.50 lb. tin, $4.50; 0.75 lb. tin $4.65.

Tin Mill Black Plate: Pittsburgh, Chicago, Gary, base 29 gage and lighter, 3.05c; Granite City, 3.35c; Pacific ports, boxed 4.05c.

Long Ternes: Pittsburgh, Chicago, Gary, No. 24 unassorted 3.80c; Pacific ports 4.55c.

Manufacturing Ternes: (Special Coated) Pittsburgh, Chicago, Gary, 100-base box $4.30; Granite City $4.40.

Roofing Ternes: Pittsburgh base per package 112 sheets; 20 x 28 in., coating I.C. 8-lb. $12.00; 15-lb. $14.00; 20-lb. $15.00; 25-lb. $16; 30-lb. $17.25; 40-lb. $19.50.

Plates

Carbon Steel Plates: Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Youngstown, Sparrows Point, Coatesville, Claymont, 2.20c; New York, del. 2.39c; Phila., del. 2.25c; St. Louis, 2.44c; Boston, del. 2.52-77c; Pacific ports, 2.75c; Gulf Ports, 2.55c.

(Granite City Steel Co. may quote carbon plates 2.35c f.o.b. mill; 2.65c f.o.b. D.P.C. mill; Kaiser Co. Inc., 3.20c, f.o.b. Los Angeles. Central Iron & Steel Co. 2.50c f.o.b. basing points; Geneva Steel Co., Provo, Utah, 3.20c, f.o.b. Pac. ports.)

Floor Plates: Pittsburgh, Chicago, 3.35c; Pacific ports, 4.00c.

Open-Hearth Alloy Plates: Pittsburgh, Chicago, Coatesville, 3.50c; Gulf ports 3.95c; Pacific ports 4.15c.

Wrought Iron Plates: Pittsburgh, 3.80c.

Shapes

Structural Shapes: Pittsburgh, Chicago, Gary, Birmingham, Buffalo, Bethlehem, 2.10c; New York, del. 2.27c; Phila., del. 2.215c; Pacific ports, 2.75c.

(Phoenix Iron Co., Phoenixville, Pa., may quote carbon steel shapes at 2.35c at established basing points and 2.50c, Phoenixville, for export; Sheffield Steel Corp., 2.55c f.o.b. St. Louis. Geneva Steel Co., 3.25c, Pac. ports); Kaiser Co. Inc., 3.20c f.o.b. Los Angeles.)

Steel Sheet Piling: Pittsburgh, Chicago, Buffalo, 2.40c.

Wire Products, Nails

Wire: Pittsburgh, Chicago, Cleveland, Birmingham (except spring wire) to manufacturers in carloads (add $2 for Worcester, $1 for Duluth).

Bright basic, bessemer wire 2.60c
Spring wire 3.20c
(Pittsburgh Steel Co., 0.20c higher.)

Wire Products to the Trade:

Standard and Cement-coated wire nails, and staples, 100-lb. keg, Pittsburgh, Chicago, Birmingham, Cleveland, Duluth $2.80; galvanized, $2.55; Pac. ports $3.30 and $3.05.

Annealed fence wire, 100-lb., Pittsburgh, Chicago, Cleveland 3.05c
Galvanized fence wire, 100 lb., Pittsburgh, Chicago, Cleveland 3.40c
Woven fence, 15½ gage and heavier, per base column ..... .67c
Barbed wire, 80-rod spool, Pittsburgh, Chicago, Cleveland, Birmingham, column 70; twisted barbless wire, column 70.

Tubular Goods

Welded Pipe: Base price in carloads, threaded and coupled to consumers about $200 per net ton. Base discounts on steel pipe Pittsburgh and Lorain, O.; Gary, Ind. 2 points less on lap weld, 1 point less on butt weld. Pittsburgh base only on wrought iron pipe.

Butt Weld

Steel In.	Blk.	Galv.	Iron In.	Blk.	Galv.
⅛	56	33	½	24	3½
¼ & ⅜	59	40½	¾	30	10
½	63½	51	1-1¼	34	16
¾	66½	55	1½	38	18½
1-3	68½	57½	2	37½	18

Lap Weld

Steel In.	Blk.	Galv.	Iron In.	Blk.	Galv.
2	61	49½	1¼	23	3½
2½-3	64	52½	1½	28½	10
3½-6	66	54½	2	30½	12
7-8	65	52½	2½, 3½	31½	14½
9-19	64½	52	4	33½	18
11-12	63½	51	4½-8	32½	17
			9-12	28½	12

Boiler Tubes: Net base prices per 100 feet f.o.b. Pittsburgh in carload lots, minimum wall, cut lengths 4 to 24 feet, inclusive.

O.D. Sizes	B.W.G.	—Seamless— Hot Rolled	Cold Drawn	—Lap Weld— Steel	Charcoal Iron
1"	13	$ 7.82	$ 9.01	.....	.....
1¼"	13	9.26	10.67	.....	.....
1½"	13	10.23	11.72	$ 9.72	$23.71
1¾"	13	11.64	13.42	11.06	22.93
2"	13	13.04	15.03	12.38	19.35
2¼"	13	14.54	16.76	13.79	21.63
2½"	12	16.01	18.45	15.16	.....
2¾"	12	17.54	20.21	16.58	26.57
2¼"	12	18.59	21.42	17.54	29.00
3"	12	19.50	22.48	18.35	31.38
3½"	11	24.63	28.37	23.15	39.81
4"	10	30.54	35.20	28.66	49.90
4½"	10	37.35	43.04	35.22	.....
5"	9	46.87	54.01	44.25	73.93
6"	7	71.96	82.93	68.14	....

Rails, Supplies

Standard rails, over 60-lb., f.o.b. mill, gross ton, $43.00. Light rails (billet), Pittsburgh, Chicago, Birmingham, gross ton, $43.00.

*Relaying rails, 35 lbs. and over, f.o.b. railroad and basing points, $31-33.

Supplies: Track bolts, 4.75c; heat treated, 5.00c. Tie plates, $43 net ton, base, Standard spikes, 3.00c.

*Fixed by OPA Schedule No. 46, Dec. 15, 1941.

Tool Steels

Tool Steels: Pittsburgh, Bethlehem, Syracuse, base, cents per lb.; Reg. carbon 14.00c; extra carbon 18.00c; special carbon 22.00c; oil-hardening 24.00c; high car.-chr. 43.00c.

Tung	Chr.	Van.	Moly.	Pitts. base per lb.
18.00	4	1	...	67.00c
1.5	4	1	8.5	54.00c
.....	4	2	8	54.00c
5.50	4	1.50	4	57.50c
5.50	4.50	4	4.50	70.00c

Stainless Steels

Base, Cents per lb.—f.o.b. Pittsburgh

CHROMIUM NICKEL STEEL

Type	Bars	Plates	Sheets	H. R. Strip	C. R Strip
302	24.00c	27.00c	34.00c	21.50c	28.00c
303	26.00	29.00	36.00	27.00	33.00
304	25.00	29.00	36.00	23.50	30.00
308	29.00	34.00	41.00	28.50	35.00
309	36.00	40.00	47.00	37.00	47.00
310	49.00	52.00	53.00	48.75	56.00
312	36.00	40.00	49.00	.....	....
*316	40.00	44.00	48.00	40.00	48.00
†321	29.00	34.00	41.00	29.25	38.00
‡347	33.00	38.00	45.00	33.00	42.00
431	19.00	22.00	29.00	17.50	22.50

STRAIGHT CHROMIUM STEEL

403	21.50	24.50	29.50	21.25	27.00
**410	18.50	21.50	26.50	17.00	22.00
416	19.00	22.00	27.00	18.25	23.50
††420	24.00	28.50	33.50	23.75	36.50
430	19.00	22.00	29.00	17.50	22.50
‡‡430F	19.50	22.50	29.50	18.75	24.50
440A	24.00	28.50	33.50	23.75	36.50
442	22.50	25.50	32.50	24.00	32.00
443	22.50	25.50	32.50	24.00	32.00
446	27.50	30.50	36.50	35.00	52.00
501	8.00	12.00	15.75	12.00	17.00
502	9.00	13.00	16.75	13.00	18.00

STAINLESS CLAD STEEL (20%)

304	.....	§§18.00	19.00	.....	.....

*With 2-3% moly. †With titanium. ‡With columbium. **Plus machining agent. ††High carbon. ‡‡Free machining. §§Includes annealing and pickling.

Basing Point Prices are (1) those announced by U. S. Steel Corp. subsidiaries for first quarter of 1941 or in effect April 16, 1941 at designated basing points or (2) those prices announced or customarily quoted by other producers at the same designated points. Base prices under (2) cannot exceed those under (1) except to the extent prevailing in third quarter of 1940.

Extras mean additions or deductions from base prices in effect April 16, 1941.

Delivered prices applying to Detroit, Eastern Michigan, Gulf and Pacific Coast points are deemed basing points except in the case of the latter two areas when water transportation is not available, in which case nearest basing point price, plus all-rail freight may be charged.

Domestic Ceiling prices are the aggregate of (1) governing basing point price, (2) extras and (3) transportation charges to the point of delivery as customarily computed. Governing basing point is basing point nearest the consumer providing the lowest delivered price.

Seconds, maximum prices: flat-rolled rejects 75% of prime prices, wasters 75%, waste-wasters 65% except plates, which take waster prices; tin plate $2.80 per 100 lbs.; terne plate $2.25; semifinished 85% of primes; other grades limited to new material ceilings.

Export ceiling prices may be either the aggregate of (1) governing basing point or emergency basing point (2) export extras (3) export transportation charges provided they are the f.a.s. seaboard quotations of the U. S. Steel Export Co. on April 16, 1941.

Bolts, Nuts

F.o.b. Pittsburgh, Cleveland, Birmingham, Chicago. Discounts for carloads additional 5%, full containers, add 10%

Carriage and Machine

½ x 6 and smaller ..... 65½ off
Do., ⅜ and ⅝ x 6-in. and shorter .. 63½ off
Do., ¾ to 1 x 6-in. and shorter ..... 61 off
1⅛ and larger, all lengths ..... 59 off
All diameters, over 6-in. long ..... 59 off
Tire bolts ..... 50 off
Step bolts ..... 56 off
Plow bolts ..... 65 off

Stove Bolts

In packages with nuts separate 71-10 off; with nuts attached 71 off; bulk 80 off on 15,000 of 3-inch and shorter, or 5000 over 3-in.

Nuts

Semifinished hex	U.S.S.	S.A.E.
⅞-inch and less	62	64
1-1-inch	59	60
1⅛-1½-inch	57	58
1⅝ and larger	56	

Hexagon Cap Screws

Upset 1-in., smaller ..... 64 off
Milled 1-in., smaller ..... 60 off

Square Head Set Screws

Upset, 1-in., smaller ..... 71 off
Headless, ¼-in., larger ..... 60 off
No. 10, smaller ..... 70 off

Piling

Pittsburgh, Chicago, Buffalo 2.40c

Rivets, Washers

F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham

Structural 3.75c
½-inch and under ..... 65-5 off
Wrought Washers, Pittsburgh, Chicago, Philadelphia, to jobbers and large nut, bolt manufacturers l.c.l. ... $2.75-3.00 off

Metallurgical Coke

Price Per Net Ton

Beehive Ovens

Connellsville, furnace	*7.00
Connellsville, foundry	7.50- 8.00
Connellsville, prem. fdry.	7.75- 8.10
New River, foundry	8.50- 8.75
Wise county, foundry	7.25- 7.75

By-Product Foundry

Wise county, furnace	6.75- 7.25
Kearney, N. J., ovens	12.65
Chicago, outside delivered	12.60
Chicago, delivered	13.35
Terre Haute, delivered	13.10
Milwaukee, ovens	13.35
New England, delivered	14.25
St. Louis, delivered	†13.35
Birmingham, delivered	10.50
Indianapolis, delivered	13.10
Cincinnati, delivered	12.85
Cleveland, delivered	12.80
Buffalo, delivered	13.00
Detroit, delivered	13.35
Philadelphia, delivered	12.88

*Operators of hand-drawn ovens using trucked coal may charge $7.75, effective Nov. 29, 1943.
†13.85 from other than Ala., Mo., Tenn.

Coke By-Products

Spot, gal., freight allowed east of Omaha

Pure and 90% benzol	15.00c
Toluol, two degree	28.00c
Solvent naphtha	27.00c
Industrial xylol	27.00c

Per lb. f.o.b. works

Phenol (car lots, returnable drums)	12.50c
Do., less than car lots	13.25c
Do., tank cars	11.50c

Eastern Plants, per lb.

Naphthalene flakes, balls, bbls., to jobbers	8.00c

Per ton, bulk, f.o.b. port

Sulphate of ammonia	$29.20

WAREHOUSE STEEL PRICES

Base delivered price, cents per pound, for delivery within switching limits, subject to established extras.

	Hot rolled bars	Structural shapes	Plates	Floor plates	Hot rolled sheets (10 gage base)	Hot rolled bands (12 gage and heavier)	Hot rolled hoops (14 gage and lighter)	Galvanized flat sheets (24 gage base)	Cold-rolled sheets (17 gage base)	Cold finished bars	Cold-rolled strip	NE hot bars 8600 series	NE hot bars 9400 series
Boston	4.044[1]	3.912[1]	3.912[1]	5.727[1]	3.774[1]	4.106[1]	5.106[1]	5.224[14]	4.744[14]	4.144[11]	4.715	6.012[23]	6.012[23]
New York	3.853[1]	3.758[1]	3.768[1]	5.574[1]	3.590[1]	3.974[1]	3.974[1]	5.010[12]	4.613[14]	4.103[21]	4.774	.....	.....
Jersey City	3.853[1]	3.747[1]	3.768[1]	5.574[1]	3.590[1]	3.974[1]	3.974[1]	5.010[12]	4.613[14]	4.103[21]	4.774	.....	.....
Philadelphia	3.822[1]	3.666[1]	3.605[1]	5.272[1]	3.518[1]	3.922[1]	4.272[1]	5.018[15]	4.872[25]	4.072[21]	4.772	5.816[23]	5.866[23]
Baltimore	3.802[1]	3.759[1]	3.594[1]	5.252[1]	3.394[1]	3.902[1]	4.252[1]	4.894[1]	4.852[25]	4.052[21]	.....	.....	.....
Washington	3.941[1]	3.930[1]	3.796[1]	5.341[1]	3.596[1]	4.041[1]	4.391[1]	5.196[17]	4.841[20]	4.041[21]	.....	.....	.....
Norfolk, Va.	4.065[1]	4.002[1]	3.971[1]	5.465[1]	3.771[1]	4.165[1]	4.515[1]	5.371[17]	4.965[24]	4.165[21]	.....	.....	.....
Bethlehem, Pa.*	.....	3.45[1]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Claymont, Del.*	.....	.....	3.45[1]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Coatesville, Pa.*	.....	.....	3.45[1]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Buffalo (city)	3.35[1]	3.40[1]	3.63[1]	5.26[1]	3.35[1]	3.819[1]	3.819[1]	4.75[15]	4.40[10]	3.75[21]	4.669	5.60[23]	5.75[23]
Buffalo (country)	3.25[1]	3.30[1]	3.30[1]	4.90[1]	3.25[1]	3.81[1]	3.50[1]	4.65[15]	4.30[10]	3.65[21]	4.35	5.60[23]	5.75[23]
Pittsburgh (city)	3.35[1]	3.40[1]	3.40[1]	5.00[1]	3.35[1]	3.60[1]	3.60[1]	4.75[15]	4.40[24]	3.75[21]	.....	.....	.....
Pittsburgh (country)	3.25[1]	3.30[1]	3.30[1]	4.90[1]	3.25[1]	3.50[1]	3.50[1]	4.65[12]	4.30[24]	3.65[21]	.....	.....	.....
Cleveland (city)	3.35[1]	3.588[1]	3.40[1]	5.188[1]	3.35[1]	3.60[1]	3.60[1]	4.877[13]	4.40[24]	3.75[21]	4.45[21]	5.60[23]	5.65[23]
Cleveland (country)	3.25[1]	.	3.30[1]	.	3.25[1]	3.50[1]	3.50[1]	.....	4.30[24]	3.65[21]	4.35[21]	.....	.....
Detroit	3.450[1]	3.661[1]	3.609[1]	5.281[1]	3.450[1]	3.700[1]	3.700[1]	5.000[12]	4.500[24]	3.800[21]	4.659	5.98[23]	5.98[23]
Omaha (city, delivered)	4.115[1]	4.165[1]	4.165[1]	5.765[1]	3.865[1]	4.215[1]	4.215[1]	5.608[19]	5.443[24]	4.443[12]	.....	.....	.....
Omaha (country, base)	4.015[1]	4.065[1]	4.065[1]	5.665[1]	3.765[1]	4.115[1]	4.115[1]	5.508[10]	.....	.....	.....	.....	.....
Cincinnati	3.611[1]	6.391[1]	3.661[1]	5.291[1]	3.425[1]	3.675[1]	3.675[1]	4.825[10]	4.475[24]	4.011[21]	4.711	6.10	6.20
Youngstown, O.*	.....	.....	.....	.....	.....	.....	.....	4.40[13]	.....	.....	.....	.....	.....
Middletown, O.*	.....	.....	.....	.....	3.25[1]	3.50[1]	3.50[1]	4.65[16]	.....	.....	.....	.....	.....
Chicago (city)	3.50[1]	3.55[1]	3.55[1]	5.15[1]	3.25[1]	3.60[1]	3.60[1]	5.231[15]	4.20[24]	3.75[21]	4.65	5.75[23]	5.85[23]
Milwaukee	3.637[1]	3.687[1]	3.687[1]	5.287[1]	3.387[1]	3.737[1]	3.737[1]	5.272[15]	4.337[24]	3.887[21]	4.787	5.987[22]	6.087[23]
Indianapolis	3.58[1]	3.63[1]	3.63[1]	5.23[1]	3.518[1]	3.768[1]	3.768[1]	4.918[15]	4.568[24]	3.98[21]	4.78	6.08[23]	6.18[23]
St. Paul	3.76[2]	3.81[2]	3.81[2]	5.41[2]	3.51[2]	3.86[2]	3.86[2]	5.257[15]	4.46[24]	4.361[21]	5.102	6.09[23]	6.19[23]
St. Louis	3.647[1]	3.697[1]	3.697[1]	5.297[1]	3.397[1]	3.747[1]	3.747[1]	5.172[15]	4.347[24]	4.031[21]	4.931	6.131[23]	6.231[23]
Memphis, Tenn.	4.015[5]	4.065[6]	4.065[6]	5.78[5]	3.965[5]	4.215[6]	4.215[5]	5.265[15]	4.78[24]	4.33[21]	.....	.....	.....
Birmingham	3.50[1]	3.55[1]	3.55[1]	5.903[1]	3.45[1]	3.70[1]	3.70[1]	4.75[15]	4.852[24]	4.54	5.215	.....	.....
New Orleans (city)	4.10[4]	3.90[4]	3.90[4]	5.85[4]	4.058[1]	4.20[4]	4.20[4]	5.25[20]	5.079[10]	4.60[21]	5.429	.....	.....
Houston, Tex.	3.75[5]	4.25[8]	4.25[8]	5.50[9]	3.763[3]	4.313[3]	4.313[3]	5.313[20]	4.10[10]	3.65[22]	.	.	.
Los Angeles	4.40[4]	4.65[4]	4.95[4]	7.20[4]	5.00[4]	4.95[4]	6.75[4]	6.00[12]	7.20[8]	5.583[22]	5.613	5.85[23]	5.95[23]
San Francisco	4.15[7]	4.35[7]	4.65[7]	6.35[7]	4.55[7]	4.50[7]	5.75[7]	6.35[15]	7.30[15]	5.333[21]	7.333	8.304[23]	8.404[23]
Portland, Oreg.	4.45[27]	4.45[27]	4.75[27]	6.50[27]	4.65[27]	4.75[27]	6.30[27]	5.75[15]	6.60[15]	5.533[15]	.....	.....	.....
Tacoma	4.35[6]	4.45[6]	4.75[6]	6.50[6]	4.65[6]	4.25[6]	5.45[6]	5.95[15]	7.60[15]	5.783[21]	.....	.....	8.00[23]
Seattle	4.35[6]	4.45[6]	4.75[6]	6.50[6]	4.65[6]	4.25[6]	5.45[6]	5.95[15]	7.05[15]	5.783[21]	.....	.....	8.00[23]

*Basing point cities with quotations representing mill prices, plus warehouse spread.

NOTE—All prices fixed by Office of Price Administration in Amendments Nos. 10 to 18 to Revised Price Schedule No. 49. Deliveries outside above cities computed in accordance with regulations.

BASE QUANTITIES

[1]—400 to 1999 pounds; [2]—400 to 14,999 pounds; [3]—any quantity; [4]—300 to 1999 pounds; [5]—400 to 8999 pounds; [6]—300 to 9999 pounds; [7]—400 to 39,999 pounds; [8]—under 2000 pounds; [9]—under 4000 pounds; [10]—500 to 1499 pounds; [11]—one bundle to 39,999 pounds; [12]—150 to 2249 pounds; [13]—150 to 1499 pounds; [14]—three to 24 bundles; [15]—450 to 1499 pounds; [16]—one bundle to 1499 pounds; [17]—one to nine bundles; [18]—one to six bundles; [19]—100 to 749 pounds; [20]—300 to 1999 pounds; [21]—1500 to 39,999 pounds; [22]—1500 to 1999 pounds; [23]—1000 to 39,999 pounds; [24]—400 to 1499 pounds; [25]—1000 to 1999 pounds; [26]—under 25 bundles. Cold-rolled strip, 2000 to 39,999 pounds, base; [27]—300 to 4999 pounds.

Ores

Lake Superior Iron Ore

Gross ton, 51½% (Natural)

Lower Lake Ports

Old range bessemer	$4.75
Mesabi nonbessemer	4.45
High phosphorus	4.35
Mesabi bessemer	4.60
Old range nonbessemer	4.60

Eastern Local Ore

Cents, units, del. E. Pa.

Foundry and basic 56-63% contract	13.00

Foreign Ore

Cents per unit, c.i.f. Atlantic ports

Manganiferous ore, 45-55% Fe., 6-10% Mang.	Nom.
N. African low phos.	Nom.
Spanish, No. African basic, 50 to 60%	Nom.
Brazil iron ore, 68-69% f.o.b. Rio de Janeiro	7.50-8.00

Tungsten Ore

Chinese wolframite, per short ton unit, duty paid	$24.00

Chrome Ore

(Equivalent OPA schedules):

Gross ton f.o.b. cars, New York, Philadelphia, Baltimore, Charleston, S. C., Portland, Ore., or Tacoma, Wash.

(S/S paying for discharging; dry basis; subject to penalties if guarantees are not met.)

Indian and African	
48% 2.8:1	$41.00
48% 3:1	43.50
48% no ratio	31.00
South African (Transvaal)	
44% no ratio	$27.40
45% no ratio	28.30
48% no ratio	31.00
50% no ratio	32.80
Brazilian—nominal	
44% 2.5:1 lump	33.65
48% 3:1 lump	43.50
Rhodesian	
45% no ratio	28.30
48% no ratio	31.00
48% 3:1 lump	43.50
Domestic (seller's nearest rail)	
48% 3:1	52.80
less $7 freight allowance	

Manganese Ore

Sales prices of Metals Reserve Co., cents per gross ton unit, dry, 48%, at New York, Philadelphia, Baltimore, Norfolk, Mobile and New Orleans, 85.0c; Fontana, Calif., Provo, Utah, and Pueblo, Colo., 91.0c; prices include duty on imported ore and are subject to premiums, penalties and other provisions of amended M.P.R. No. 248, effective as of May 15. Price at basing points which are also points of discharge of imported manganese ore is f.o.b. cars, shipside, at dock most favorable to the buyer.

Molybdenum

Sulphide conc., lb., Mo. cont., mines	$0.75

NATIONAL EMERGENCY STEELS (Hot Rolled)

(Extras for alloy content)

Designation	Chemical Composition Limits, Per Cent — Carbon	Mn.	Si.	Cr.	Ni.	Mo.	Basic open-hearth Electric furnace Bars per 100 lb.	Billets per GT	Bars per 100 lb.	Billets per GT
NE 1330	.28-.33	1.60-1.90	.20-.35	.....	.....	.....	$ .10	$ 2.00	.....	.....
NE 8613	.12-.17	.70- .90	.20-.35	.40-.60	.40-.70	.15-.25	.65	13.00	1.15	23.00
NE 8720	.18-.23	.70- .90	.20-.35	.40-.60	.40-.70	.20-.30	.70	14.00	1.20	24.00
NE 9255	.50-.60	.70- .95	1.80-2.20	.....	.....	.....	.40	8.00	.....	.....
NE 9261	.55-.65	.70-1.00	1.80-2.20	.10-.25	.....	.....	.65	13.00	.....	.....
NE 9262	.55-.65	.70-1.00	1.80-2.20	.25-.40	.....	.....	.65	13.00	.....	.....
NE 9415	.13-.18	.80-1.10	.20-.35	.30-.50	.30-.60	.08-.15	.75	15.00	1.25	25.00
NE 9425	.23-.28	.90-1.20	.20-.35	.30-.50	.30-.60	.08-.15	.75	15.00	1.25	25.00
NE 9442	.40-.45	1.00-1.30	.20-.35	.30-.50	.30-.60	.08-.15	.80	16.00	1.30	26.00

Extras are in addition to a base price of 2.70c, per pound on finished products and $54 per gross ton on semifinished steel major basing points and are in cents per pound and dollars per gross ton. No prices quoted on vanadium alloy.

Pig Iron

Prices (in gross tons) are maximums fixed by OPA Price Schedule No. 10, effective June 10, 1941. Exceptions indicated in footnotes. Allocation regulations from WPB Order M-17, expiring Dec. 31, 1942. Base prices bold face, delivered light face. Federal tax on freight charges, effective Dec. 1, 1942, not included in following prices.

	Foundry	Basic	Bessemer	Malleable
Bethlehem, Pa., base	$25.00	$24.50	$26.00	$25.50
Newark, N. J., del.	26.53	26.03	27.53	27.03
Brooklyn, N. Y., del.	27.50	.....	.....	28.00
Birdsboro, Pa., base	25.00	24.50	26.00	25.50
Birmingham, base	†20.38	†19.00	25.00	.....
Baltimore, del.	25.61	.....	.....	.....
Boston, del.	25.12	.....	.....	.....
Chicago, del.	24.22	.....	.....	.....
Cincinnati, del.	24.06	22.68	.....	.....
Cleveland, del.	24.12	23.24	.....	.....
Newark, N. J., del.	26.15	.....	.....	.....
Philadelphia, del.	25.46	24.96	.....	.....
St. Louis, del.	24.12	23.24	.....	.....
Buffalo, base	24.00	23.00	25.00	24.50
Boston, del.	25.50	25.00	26.50	26.00
Rochester, del.	25.53	.....	26.53	26.03
Syracuse, del.	26.08	.....	27.08	26.58
Chicago, base	24.00	23.50	24.50	24.00
Milwaukee, del.	25.10	24.60	25.60	25.10
Muskegon, Mich., del.	27.19	.....	.....	27.19
Cleveland, base	24.00	23.50	24.50	24.00
Akron, Canton, O., del.	25.39	24.89	25.89	25.39
Detroit, base	24.00	23.50	24.50	24.00
Saginaw, Mich., del	26.31	25.81	26.81	26.31
Duluth, base	24.50	24.00	25.00	24.50
St. Paul, del.	26.63	26.13	27.13	26.63
Erie, Pa., base	24.00	23.50	25.00	24.50
Everett, Mass., base	25.00	24.50	26.00	25.50
Boston, del.	25.50	25.00	26.50	26.00
Granite City, Ill., base	24.00	23.50	24.50	24.00
St. Louis, del.	24.50	24.00	.....	24.50
Hamilton, O., base	24.00	23.50	.....	24.00
Cincinnati, del.	24.44	24.61	.....	25.11
Neville Island, Pa., base	24.00	23.50	24.50	24.00
§Pittsburgh, del.				
Baltimore, del.	25.99	.....	.....	.....
No. & So. sides	24.69	24.19	25.19	24.69
Provo, Utah, base	22.00	21.50	.....	.....
Sharpsville, Pa., base	24.00	23.50	24.50	24.00
Sparrows Point, base	25.00	24.50	.....	.....
Steelton, Pa., base	.....	24.50	.....	25.50
Swedeland, Pa., base	25.00	24.50	26.00	25.50
Philadelphia, del.	25.84	25.34	.....	26.34
Toledo, O., base	24.00	23.50	24.50	24.00
Youngstown, O., base	24.00	23.50	24.50	24.00
Mansfield, O., del.	25.94	25.44	25.44	25.94

Base grade, silicon 1.75-2.25%; add 50 cents for each additional 0.25% silicon, or portion thereof; deduct 50 cents for silicon below 1.75% on foundry iron. †For phosphorus 0.70% or over deduct 38 cents. §For McKees Rocks, Pa., add .55 to Neville Island base; Lawrenceville, Homestead, McKeesport, Ambridge, Monaca, Aliquippa, .84; Monessen, Monongahela City .97 (water); Oakmont, Verona 1.11; Brackenridge 1.24.

Note: Add 50 cents per ton for each 0.50% manganese or portion thereof over 1.00%.

Nickel differentials: Under 0.50%, no extra; 0.50% to 0.74% incl., $2 per ton; for each additional 0.25% nickel, $1 per ton.

High Silicon, Silvery

5.00-6.50 per cent (base).....$29.50

6.51-7.00	$30.50	9.01- 9.50	$35.50
7.01-7.50	31.50	9.51-10.00	36.50
7.51-8.00	32.50	10.01-10.50	37.50
8.01-8.50	33.50	10.51-11.00	38.50
8.51-9.00	34.50	11.01-11.50	39.50

F.o.b. Jackson county, O., per gross ton, Buffalo base prices are $1.25 higher. Prices subject to additional charge of 50 cents a ton for each 0.50% manganese in excess of 1.00%.

Bessemer Ferrosilicon

Prices same as for high silicon silvery iron, plus $1 per gross ton (For higher silicon irons a differential over and above the price of base grades is charged as well as for the hard chilling iron, Nos. 5 and 6.)

Charcoal Pig Iron

Northern

Lake Superior Furn. $34.00
Chicago, del. 37.34

Southern

Semi-cold blast, high phos., f.o.b. furnace, Lyles, Tenn. $28.50
Semi-cold blast, low phos., f.o.b. furnace, Lyles, Tenn. 33.00

Gray Forge

Neville Island, Pa. $23.50
Valley base 23.50

Low Phosphorus

Basing points: Birdsboro, Pa., $29.50; Steelton, Pa., and Buffalo, N. Y., $29.50 base; $30.74, del., Philadelphia. Intermediate phos., Central Furnace, Cleveland, $26.50.

Switching Charges: Basing point prices are subject to an additional charge for delivery within the switching limits of the respective districts.

Silicon Differentials: Basing point prices are subject to an additional charge not to exceed 50 cents a ton for each 0.25 silicon in excess of base grade (1.75 to 2.25%).

Phosphorus Differential: Basing point prices are subject to a reduction of 38 cents a ton for phosphorus content of 0.70% and over.

Manganese Differentials: Basing point prices subject to an additional charge not to exceed 50 cents a ton for each 0.50% manganese content in excess of 1.0%.

Ceiling Prices are the aggregate of (1) governing basing point (2) differentials (3) transportation charges from governing basing point to point of delivery as customarily computed. Governing basing point is the one resulting in the lowest delivered price for the consumer.

Exceptions to Ceiling Prices: Pittsburgh Coke & Iron Co., (Sharpsville, Pa. furnace only) and Struthers Iron & Steel Co. may charge 50 cents a ton in excess of basing point prices for No. 2 Foundry, Basic Bessemer and Malleable. Mystic Iron Works, Everett, Mass., may exceed basing point prices by $2 per ton, effective May 20, 1943. Chester, Pa., furnace of Pittsburgh Coke & Iron Co. may exceed basing point prices by $2.25 per ton, effective July 27, 1942. E. & G. Brooke Co., Birdsboro, Pa., allowed $1 above basing point.

Refractories

Per 1000 f.o.b. Works, Net Prices

Fire Clay Brick

Super Quality

Pa., Mo., Ky. $64.00

First Quality

Pa., Ill., Md., Mo., Ky.	51.30
Alabama, Georgia	51.30
New Jersey	56.00
Ohio	43.00

Second Quality

Pa., Ill., Md., Mo., Ky.	46.50
Alabama, Georgia	38.00
New Jersey	49.00
Ohio	36.00

Malleable Bung Brick

All bases $59.80

Silica Brick

Pennsylvania $51.30
Joliet, E. Chicago 58.90
Birmingham, Ala. 51.30

Ladle Brick

(Pa., O., W. Va., Mo.)

Dry press $31.00
Wire cut 29.00

Magnesite

Domestic dead-burned grains, net ton f.o.b. Chewelah, Wash., net ton, bulk 22.00
net ton, bags 26.00

Basic Brick

Net ton, f.o.b. Baltimore, Plymouth Meeting, Chester, Pa.

Chrome brick $54.00
Chem. bonded chrome 54.00
Magnesite brick 76.00
Chem. bonded magnesite 65.00

Fluorspar

Metallurgical grade, f.o.b. Ill., Ky., net ton, carloads CaF_2 content, 70% or more, $33; 65 but less than 70%, $32; 60 but less than 65% $31; less than 60%, $30. (After Aug. 29 base price any grade $30.)

Ferroalloy Prices

Ferromanganese (standard) 78-82% c.l. gross ton, duty paid, eastern, central and western zones, $135; add $6 for packed c.l., $10 for ton, $13.50 less-ton; f.o.b. cars, New Orleans, $1.70 for each 1%, or fraction contained manganese over 82% or under 78%; delivered Pittsburgh, $140.33.

Ferromanganese (Low and Medium Carbon); per lb. contained manganese; eastern zone, low carbon, bulk, c.l., 23c; 2000 lb. to c.l., 23.40c; medium, 14.50c and 15.20c; central, low carbon, bulk, c.l., 23.30c; 2000 lb. to c.l., 24.40c; medium, 14.80c and 16.20c; western, low carbon, bulk, c.l., 24.50c, 2000 lb. to c.l., 25.40c; medium, 15.75c and 17.20c; f.o.b. shipping point, freight allowed.

Spiegeleisen: 19-21% carlots per gross ton, Palmerton, Pa. $36; 16-19%, $35.

Electrolytic Manganese: 99.9% plus, less ton lots, per lb. 37.6 cents.

Chromium Metal: 97% min. chromium, max. .50% carbon, eastern zone, per lb. contained chromium bulk, c.l., 79.50c, 2000 lb. to c.l. 80c; central, 81c and 82.50c; western, 82.25c and 84.75c; f.o.b. shipping point, freight allowed.

Ferrocolumbium: 50-60%, per lb. contained columbium in gross ton lots, contract basis, R.R. freight allowed, eastern zone, $2.25; less-ton lots $2.30. Spot prices 10 cents per lb. higher.

Ferrochrome: High carbon, eastern zone, bulk, c.l., 13c, 2000 lb. to c.l., 13.90c; central, add .40c and .65c; western, add 1c and 1.85c—high nitrogen, high carbon ferrochrome: Add 5c to all high carbon ferrochrome prices; all zones; **low carbon** eastern, bulk, c.l., max. 0.06% carbon, 23c, 0.10% 22.50c, 0.15% 22c, 0.20% 21.50c, 0.50% 21c, 1.00% 20.50c, 2.00% 19.50c; 2000 lb. to c.l., 0.06% 24c, 0.10% 23.50c, 0.15% 23c, 0.20% 22.50c, 0.50% 22c, 1.00% 21.50c, 2.00% 20.50c; central, add .4c for bulk, c.l. and .65c for 2000 lb. to c.l.; western, add 1c for bulk, c.l. and 1.85c for 2000 lb. to c.l.; carload packed differential .45c; f.o.b. shipping point, freight allowed. Prices per lb. contained Cr high nitrogen, low carbon ferrochrome: Add 2c to low carbon ferrochrome prices; all zones. For higher nitrogen carbon add 2c for each .25% of nitrogen over 0.75%.

Special Foundry ferrochrome: (Chrom. 62-66%, car. approx. 5-7%) Contract, carload, bulk, 13.50c packed 13.85c, ton lots 14.40c, less, 14.90c, eastern, freight allowed, per pound contained chromium; 13.90c, 14.35c, 15.05c and 15.55c central; 14.50c, 14.95c, 16.25c and 16.75c, western; spot up .25c.

S.M. Ferrochrome, high carbon: (Chrom. 60-65%, sil. 4-6%, mang. 4-6% and carbon 4-6%.) Contract, carlot, bulk, 14.00c, packed, 14.45c. ton lots 14.90c, less 15.40c, eastern, freight allowed; 14.40c, 14.85c, 15.55c and 16.05c, central; 15.00c, 15.45c, 16.75c and 17.25c, western; spot up .25c; per pound contained chromium.

S.M. Ferrochrome, low carbon: (Chrom. 62-66%, sil. 4-6%, mang. 7%) Contract, carload, bulk, 13.50c, 4-6% and carbon 1.25% max.) Contract, carlot, bulk, 20.00c, packed 20.45c, ton lots 21.00c, less ton lots 22.00c, eastern, freight allowed, per pound contained chromium; 20.40c, 20.85c, 21.65c and 22.65c, central; 21.00c, 21.45c, 22.85c and 23.85c, western; spot up .25c.

SMZ Alloy: (Silicon 60-65%, Mang. 5-7%, zir. 5-7% and iron approx. 20%) per lb. of alloy contract carlots 11.50c, ton lots 12.00c, less 12.50c, eastern zone, freight allowed; 12.00c, 12.85c and 13.35c central zone; 14.05c, 14.60c and 15.10c, western; spot up .25c.

Silcaz Alloy: (Sil. 35-40%, cal. 9-11% alum. 6-8%, zir. 3-5%, tit. 9-11% and boron 0.55-0.75%), per lb. of alloy contract, carlots 25.00c, ton lots 26.00c, less ton lots 27.00c, eastern, freight allowed; 25.50c, 26.75c and 27.75c, central; 27.50c, 28.90c and 29.90c, western; spot up .25c.

Silvaz Alloy: (Sil. 35-40%, van. 9-11%, alum. 5-7%, zir. 5-7%, tit. 9-11% and boron 0.55-0.75%), per lb. of alloy. Contract, carlots 58.00c, ton lots 59.00c, less 60.00c, eastern, freight allowed; 58.50c, 59.75c and 60.75c, central; 60.50c, 61.90c and 62.90c, western; spot up ¼c.

CMSZ Alloy 4: (Chr. 45-49%, mang. 4-6%, sil. 18-21%, zir. 1.25-1.75%, and car. 3.00-4.50%). Contract, carlots, bulk, 11.00c and packed 11.50c; ton lots 12.00c; less 12.50c, eastern, freight allowed; 11.50c and 12.00c, 12.75c, 13.25c, central; 13.50c and 14.00c, 14.75c, 15.25c, western; spot up .25c.

CMSZ Alloy 5: (Chr. 50-56%, mang. 4-6%, sil. 13.50-16.00%, zir. .75-1.25%, car. 3.50-5.00%) per lb. of alloy. Contract, carlots, bulk, 10.75c, packed 11.25c, ton lots 11.75c, less 12.25c, eastern, freight allowed; 11.25c, 11.75c and 12.50c, central; 13.25c and 13.75c, 14.50c and 15.00c, western, spot up .25c.

Ferro-Boron: (Bor. 17.50% min., sil. 1.50% max., alum. 0.50% max. and car. 0.50% Max.) per lb. of alloy contract ton lots, $1.20, less ton lots $1.30, eastern, freight allowed; $1.2075 and $1.3075 central; $1.229 and $1.329, western; spot add 5c.

Manganese-Boron: (Mang. 75% approx., boron 15-20%, iron 5% max., sil. 1.50% max. and carbon 3% max.), per lb. of alloy. Contract, ton lots, $1.89, less, $2.01, eastern, freight allowed; $1.903 and $2.023 central, $1.935 and $2.055 western, spot up 5c.

Nickel-Boron: (Bor. 15-18%, alum. 1% max., sil. 1.50% max., car. 0.50% max., iron 3% max., nickel, balance), per lb. of alloy. Contract, 5 tons or more, $1.90, 1 ton to 5 tons, $2.00, less than ton $2.10, eastern, freight allowed; $1.9125, $2.0125 and $2.1125, central; $1.9445, $2.0445 and $2.1445, western; spot same as contract.

Chromium-Copper: (Chrom. 8-11%, cu. 88-90%, iron 1% max., sil. 0.50% max.) contract, any quantity, 45c, eastern, Niagara Falls, N. Y., basis, freight allowed to destination, except to points taking rate in excess of St. Louis rate, to which equivalent of St. Louis rate will be allowed; spot, up 2c.

Vanadium Oxide: (Fused: Vanadium oxide 85-88%, sodium oxide, approx. 10% and calcium oxide approx. 2%, or Red Cake: Vanadium oxide 85% approx., sodium oxide, approx. 9% and water approx.

2.5%) Contract, any quantity, $1.10 eastern, freight allowed, per pound vanadium oxide contained; contract, carlots, $1.105, less carlots, $1.108, central; $1.118 and $1.133, western; spot add 5c to contracts in all cases.

Calcium metal; cast: Contract, ton lots or more $1.80, less, $2.30, eastern zone, freight allowed, per pound of metal; $1.809 and $2.309, Central, $1.849 and $2.349, western; spot up 5c.

Calcium-Manganese-Silicon: (Cal. 16-20%, mang. 14-18% and sil. 53-59%), per lb. of alloy. Contract carlots, 15.50c, ton lots 16.50c and less 17.00c, eastern, freight allowed: 16.00c, 17.35c and 17.85c, central; 18.05c, 19.10c and 19.60c western; spot up .25c.

Calcium-Silicon: (Cal. 30-35%, sil. 60-65% and iron 3.00% max.), per lb. of alloy. Contract, carlot, lump 13.00c, ton lots 14.50c, less 15.50c, eastern, freight allowed; 13.50c, 15.25c and 16.25c central; 15.55c, 17.40c and 18.40c, western; spot up .25c.

Briquets, Ferromanganese: (Weight approx. 3 lbs. and containing exactly 2 lbs. mang.), per lb. of briquets. Contract; carlots, bulk .0605c, packed .063c, tons .0655c, less .068c, eastern, freight allowed; .063c, .0655c, .0755c and .078c, central; .066c, .0685c, .0855c and .088c, western; spot up .25c.

Briquets: Ferrochrome, containing exactly 2 lb. cr., eastern zone, bulk, c.l., 8.25c per lb. of briquets, 2000 lb. to c.l., 8.75c; central, add .3c for c.l. and .5c for 2000 lb. to c.l.; western, add .70c for c.l. and .2c for 2000 lb. to c.l.; **silicomanganese,** eastern, containing exactly 2 lb. manganese and approx. ½ lb. silicon, bulk, c.l., 5.80c, 2000 lbs. to c.l., 6.30c; central, add .25c for c.l. and 1c for 2000 lb. to c.l.; western, add .5c for c.l., and 2c for 2000 lb. to c.l.; **ferrosilicon,** eastern, approx. 5 lb., containing exactly 2 lb. silicon, or weighing approx. 2½ lb. and containing exactly 1 lb. of silicon, bulk, c.l., 3.35c, 2000 lb. to c.l., 3.80c; central, add 1.50c for c.l., and .40c for 2000 lb. to c.l.; western, add 3.0c for c.l. and .45c for 2000 to c.l.; f.o.b. shipping point, freight allowed.

Ferromolybdenum: 55-75% per lb. contained molybdenum, f.o.b. Langeloth and Washington, Pa., furnace, any quantity 95.00c.

Ferrophosphorus: 17-19%, based on 18% phosphorus content, with unitage of $3 for each 1% of phosphorus above or below the base; gross tons per carload f.o.b. sellers' works, with freight equalized with Rockdale, Tenn.; contract price $58.50, spot $62.25.

Ferrosilicon: Eastern zone, 90-95%, bulk, c.l., 11.05c, 2000 lb. to c.l., 12.30c; 80-90%, bulk c.l., 8.90c, 2000 lb. to c.l., 9.95c; 75%, bulk, c.l., 8.05c, 2000 lb. to c.l., 9.05c; 50%, bulk c.l., 6.65c and 2000 lb to c.l., 7.85c; central 90-95%, bulk, c.l., 11.20c, 2000 lb. to c.l., 12.80c; 80-90%, bulk, c.l., 9.05c, 2000 to c.l., 10.45c; 75%, bulk, c.l., 8.20c 2000 lb. to c.l., 9.65c; 50% bulk, c.l., 7.10c, 2000 lb. to c.l., 9.70c; western, 90-95%, bulk, c.l., 11.65c, 2000 lb. to c.l., 15.60c; 80-90%, bulk, c.l., 9.55c, 2000 lb. to c.l., 13.50c; 75%, bulk, c.l., 8.75c, 2000 to c.l., 13.10c; 50%, bulk, c.l., 7.25c, 2000 to c.l., 8.75c; f.o.b. shipping point, freight allowed. Prices per lb. contained silicon.

Silicon Metal: Min. 97% silicon and max. 1% iron, eastern zone, bulk, c.l., 12.90c, 2000 lb. to c.l., 13.45c; central, 13.20c and 13.90c; western, 13.85c and 16.80c; min. 96% silicon and max. 2% iron, eastern, bulk, c.l., 12.50c, 2000 lb. to c.l., 13.10c; central, 12.80c and 13.55c; western, 13.45c and 16.50c; f.o.b. shipping point, freight allowed. Prices per lb. contained silicon.

Manganese Metal: (96 to 98% manganese, max. 2% iron), per lb. of metal, eastern zone, bulk, c.l., 36c, 2000 lb. to c.l., 38c, central, 36.25c, and 39c; western, 36.55c and 41.05c; 95 to 97% manganese, max. 2.50% iron, eastern, bulk, c.l., 34c; 2000 c.l., 35c; central, 34.25c and 36c; western, 34.55c and 38.05c; f.o.b. shipping point, freight allowed.

Ferrotungsten: Carlots, per lb. contained tungsten, $1.90.

Tungsten Metal Powder: 98-99% per lb. any quantity $2.55-2.65.

Ferrotitanium: 40-45%, R.R. freight allowed, per lb. contained titanium; ton lots $1.23; less-ton lots $1.25; eastern. Spot up 5 cents per lb.

Ferrotitanium: 20-25%, 0.10 maximum carbon; per lb. contained titanium; ton lots $1.35; less-ton lots $1.40; eastern. Spot 5 cents per lb. higher.

High-Carbon Ferrotitanium: 15-20% contract basis, per gross ton, f.o.b. Niagara Falls, N. Y., freight allowed to destination east of Mississippi River and North of Baltimore and St. Louis, 6-8% carbon $142.50; 3-5% carbon $157.50.

Carbortam: Boron 0.90 to 1.15%, net ton to carload, 8c lb. F.O.B. Suspension Bridge, N. Y., frt. allowed same as high-carbon ferrotitanium.

Bortam: Boron 1.5-1.9%, ton lots 45c lb., less ton lots 50c lb.

Ferrovanadium: 35-55%, contract basis, per lb. contained vanadium, f.o.b. producers plant with usual freight allowances; open-hearth grade $2.70; special grade $2.80; highly-special grade $2.90.

Zirconium Alloys: 12-15%, per lb. of alloy, eastern, contract, carlots, bulk, 4.60c, packed 4.80c, ton lots 4.80c, less tons 5c, carloads bulk, per gross ton $102.50; packed $107.50; ton lots $108; less-ton lots $112.50. Spot ¼c per ton higher.

Zirconium Alloy: 35-40%, Eastern, contract basis, carloads in bulk or package, per lb. of alloy 14.00c; gross ton lots 15.00c; less-ton lots 16.00c. Spot ¼ cent higher.

Alsifer: (Approx. 20% aluminum, 40% silicon, 40% iron) contract basis f.o.b. Niagara Falls, N. Y., per lb. 5.75; ton lots 6.50c. Spot ½ cent higher.

Simanal: (Approx. 20% each silicon, manganese, aluminum) Contract basis, freight allowed, per lb. of alloy; carlots 8.75c; ton lots 9.25c, less ton lots, 9.75c.

Borosil: 3 to 4% boron, 40 to 45% Si., $6.25 lb. cont. Bo., f.o.b. Philo, O., freight not exceeding St. Louis rate allowed.

OPEN MARKET PRICES, IRON AND STEEL SCRAP

Following prices are quotations developed by editors of STEEL in the various centers. For complete OPA ceiling price schedule refer to page 156 of Sept. 4, 1944, issue of STEEL.

PHILADELPHIA:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$18.75
No. 2 Heavy Melt. Steel	18.75
No. 1 Bundles	18.75
No. 2 Bundles	18.75
No. 3 Bundles	16.75
Machine Shop Turnings	13.75
Mixed Borings, Turnings	13.75
Shoveling Turnings	15.75
No. 2 Busheling	15.50
Billet, Forge Crops	21.25
Bar Crops, Plate Scrap	21.25
Cast Steel	21.25
Punchings	21.25
Elec. Furnace Bundles	19.75
Heavy Turnings	18.25

Cast Grades

(F.o.b. Shipping Point)

Heavy Breakable Cast	16.50
Charging Box Cast	19.00
Cupola Cast	20.00
Unstripped Motor Blocks	17.50
Malleable	22.00
Chemical Borings	16.51

NEW YORK:

(Dealers' buying prices.)

No. 1 Heavy Melt. Steel	$15.33
No. 2 Heavy Melt. Steel	15.33
No. 2 Hyd. Bundles	15.33
No. 3 Hyd. Bundles	13.33
Chemical Borings	14.33
Machine Turning	10.33
Mixed Borings, Turnings	10.33
No. 1 Cupola	20.00
Charging Box	19.00
Heavy Breakable	16.50
Unstrip Motor Blocks	17.50
Stove Plate	19.00

CLEVELAND:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$19.50
No. 2 Heavy Melt. Steel	19.50
No. 1 Comp. Bundles	19.50
No. 2 Comp. Bundles	19.50
No. 1 Busheling	19.50
Mach. Shop Turnings	13.50-14.00
Mach. Shop Turnings	13.50-14.00
Short Shovel Turnings	15.50-16.00
Mixed Borings, Turnings	13.50-14.00
No. 1 Cupola Cast	20.00
Heavy Breakable Cast	16.50
Cast Iron Borings	15.50
Billet, Bloom Crops	24.50
Sheet Bar Crops	22.00
Plate Scrap, Punchings	22.00
Elec. Furnace Bundles	20.50

BOSTON:

(F.o.b. shipping points)

No. 1 Heavy Melt. Steel	$14.06*
No. 2 Heavy Melt. Steel	14.06*
No. 1 Bundles	14.06*
No. 2 Bundles	14.06*
No. 1 Busheling	14.06*
Machine Shop Turnings	9.06
Mixed Borings, Turnings	9.06
Short Shovel, Turnings	11.06
Chemical Borings	14.80
Low Phos. Clippings	16.56
No. 1 Cast	20.00
Clean Auto Cast	20.00
Stove Plate	19.00
Heavy Breakable Cast	16.50

*Inland base ceiling; at ports switching district price 99 cents, Boston, to $1.09, Providence, higher.

PITTSBURGH:

(Delivered consumer's plant)

Railroad Heavy Melting	$21.00
No. 1 Heavy Melt. Steel	20.00
No. 2 Heavy Melt. Steel	20.00
No. 1 Comp. Bundles	20.00
No. 2 Comp. Bundles	20.00
Mach. Shop Turnings	15.00
Short Shovel, Turnings	17.00
Mixed Borings, Turnings	15.00
No. 1 Cupola Cast	20.00
Heavy Breakable Cast	16.50
Cast Iron Borings	16.00
Billet, Bloom Crops	25
Sheet Bar Crops	22.50
Plate Scrap, Punchings	22.50
Railroad Specialties	24.50
Scrap Rail	21.50
Axles	26.00
Rail 3 ft. and under	23.50
Railroad Malleable	21.00

VALLEY:

(Delivered consumer's plant)

No. 1 R.R. Hvy. Melt.	$21.00
No. 1 Heavy Melt. Steel	20.00
No. 1 Comp. Bundles	20.00
Short Shovel Turnings	17.00
Cast Iron Borings	16.00
Machine Shop Turnings	15.00
Low Phos. Plate	21.00-22.00

MANSFIELD, O.:

(Delivered consumer's plant)

Machine Shop Turnings	11.00

BIRMINGHAM:

(Delivered consumer's plant)

Billet, Forge Crops	$22.00
Structural, Plate Scrap	19.00
Scrap Rails, Random	18.50
Rerolling Rails	20.50
Angle, Splice Bars	20.50
Solid Steel Axles	24.00
Cupola Cast	20.00
Stove Plate	19.00
Long Turnings	8.50- 9.00
Cast Iron Borings	8.50- 9.00
Iron Car Wheels	16.50-17.00

CHICAGO:

(Delivered consumer's plant)

No. 1 R.R. Hvy. Melt.	$19.75
No. 1 Heavy Melt. Steel	18.75
No. 2 Heavy Melt. Steel	18.75
No. 1 Ind. Bundles	18.75
No. 2 Dlr. Bundles	18.75
No. 3 Galv. Bundles	16.75
Machine Turnings	13.25-13.75
Mix. Borings, Sht. Turn.	13.25-13.75
Short Shovel Turnings	15.25-15.75
Cast Iron Borings	14.25-14.75
Scrap Rails	20.25
Cut Rails, 3 feet	22.25
Cut Rails, 18-inch	23.50
Angles, Splice Bars	22.25
Plate Scrap, Punchings	21.25
Railroad Specialties	22.75
No. 1 Cast	20.00
R.R. Malleable	22.00

(Cast grades f.o.b. shipping point, railroad grades f.o.b. tracks)

BUFFALO:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$19.25
No. 2 Heavy Melt. Steel	19.25
No. 1 Bundles	19.25
No. 2 Bundles	19.25
No. 1 Busheling	19.25
Machine Turnings	14.25
Short Shovel. Turnings	16.25
Mixed Borings, Turn.	14.25
Cast Iron Borings	13.25
Low Phos.	21.75

DETROIT:

(Dealers' buying prices)

Heavy Melting Steel	$17.32
No. 1 Busheling	17.32
Hydraulic Bundles	17.32
Flashings	17.32
Machine Turnings	10.50-11.00
Short Turnings	13.00-13.50
Cast Iron Borings	12.00-12.50
Low Phos Plate	19.82
No. 1 Cast	20.00
Heavy Breakable Cast	13.50-14.00

ST. LOUIS:

(Delivered consumer's plant)

Heavy Melting	$17.50
No. 1 Locomotive Tires	20.00
Misc. Rails	19.00
Railroad Springs	22.00
Bundled Sheets	17.50
Axle Turnings	16.75
Machine Turnings	10.00-10.50
Rerolling Rails	21.00
Steel Car Axles	21.50-22.00
Steel Rails, 3 ft.	21.50
Steel Angle Bars	21.00
Cast Iron Wheels	20.00
No. 1 Machinery Cast	20.00
Railroad Malleable	21.00-21.50
Breakable Cast	16.50
Stove Plate	18.00
Grate Bars	15.25
Brake Shoes	15.25

(Cast grades f.o.b. shipping point)

Stove Plate	18.00

CINCINNATI:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$18.50
No. 2 Heavy Melt. Steel	18.50
No. 1 Comp. Bundles	18.50
No. 2 Comp. Bundles	18.50
Machine Turnings	8.50- 9.00
Shoveling Turnings	10.50-11.00
Cast Iron Borings	10.50-11.00
Mixed Borings, Turnings	9.50-10.00
No. 1 Cupola Cast	20.00
Breakable Cast	16.50
Low Phosphorus	21.00-21.50
Scrap Rails	20.50-21.00
Stove Plate	16.00-16.50

LOS ANGELES:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$14.00
No. 2 Heavy Melt. Steel	13.00
No. 1, 2 Deal. Bundles	12.00
Machine Turnings	4.50
Mixed Borings, Turnings	4.00
No. 1 Cast	20.00

SAN FRANCISCO:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$15.50
No. 2 Heavy Melt. Steel	14.50
No. 1 Busheling	15.50
No. 1, No. 2 Bundles	13.50
No. 3 Bundles	9.00
Machine Turnings	6.90
Billet, Forge Crops	15.50
Bar Crops, Plate	15.50
Cast Steel	15.50
Cut Structural, Plate, 1", under	18.00
Alloy-free Turnings	7.50
Tin Can Bundles	14.50
No. 2 Steel Wheels	16.00
Iron, Steel Axles	23.00
No. 2 Cast Steel	15.00
Uncut Frogs, Switches	16.00
Scrap Rails	16.00
Locomotive Tires	16.00

NONFERROUS METAL PRICES

Copper: Electrolytic or Lake from producers in carlots 12.00c, Del. Conn., less carlots 12.12½c, refinery; dealers may add ¾c for 5000 lbs. to carload; 1000-4999 lbs. 1c; 500-999 1½c; 0-499 2c. Casting, 11.75c, refinery for 20,000 lbs., or more, 12.00c less than 20,000 lbs.

Brass Ingot: Carlot prices, including 25 cents per hundred freight allowance; add ¼c for less than 20 tons; 85-5-5-5 (No. 115) 13.00c; 88-10-2 (No. 215) 16.50c; 80-10-10 (No. 305) 15.75c; Navy G (No. 225) 16.75c; Navy M (No. 245) 14.75c; No. 1 yellow (No. 405) 10.00c; manganese bronze (No. 420) 12.75c.

Zinc: Prime western 8.25c, select 8.35c, brass special 8.50c, intermediate 8.75c, E. St. Louis, for carlots. For 20,000 lbs. to carlots add 0.15c; 10,000-20,000 0.25c; 2000-10,000 0.40c; under 2000 0.50c.

Lead: Common 6.35c, chemical, 6.40c, corroding, 6.45c, E. St. Louis for carloads; add 5 points for Chicago, Minneapolis-St. Paul, Milwaukee-Kenosha districts; add 15 points for Cleveland-Akron-Detroit area, New Jersey, New York state, Texas, Pacific Coast, Richmond, Indianapolis-Kokomo; add 20 points for Birmingham, Connecticut, Boston-Worcester-Springfield, New Hampshire, Rhode Island.

Primary Aluminum: 99% plus, ingots 15.00c del., pigs 14.00c del.; metallurgical 94% min. 13.50c del. Base 10,000 lbs. and over; add ½c 2000-9999 lbs.; 1c less than 2000 lbs.

Secondary Aluminum: All grades 12.50c per lb. except as follows: Low-grade piston alloy (No. 122 type) 10.50c; No. 12 foundry alloy (No. 2 grade) 10.50c; chemical warfare service ingot (92½% plus) 10.00c; steel deoxidizers in notch bars, granulated or shot, Grade 1 (95-97½%) 11.00c, Grade 2 (92-95%) 9.50c to 9.75c, Grade 3 (90-92%) 8.50c to 8.75c, Grade 4 (85-90%) 7.50c to 8.00c; any other ingot containing over 1% iron, except PM 754 and hardness, 12.00c. Above prices for 30,000 lb. or more; add ¼c 10,000-30,000 lb.; ½c 1000-10,000 lbs.; 1c less than 1000 lbs. Prices include freight at carload rate up to 75 cents per hundred.

Magnesium: Commercially pure (99.8%) standard ingots (4-notch, 17 lbs.), 20.50c lb., add 1c for special shapes and sizes. Alloy ingots, incendiary bomb alloy, 23.40c; 50-50 magnesium-aluminum, 23.75c; ASTM B93-41T, Nos. 2, 3, 4, 12, 13, 14, 17, 23.00c; Nos. 4X, 11, 13X, 17X, 25.00c; ASTM B107-41T, or B-90-41T, No. 8X, 23.00c; No. 18, 23.50c; No. 12X, 25.00c. Selected magnesium crystals, crowns, and muffs, including all packing screening, barrelling, handling, and other preparation charges, 23.50c. Prices for 100 lbs. or more; for 25-100 lbs., add 10c; for less than 25 lbs., 20c. Incendiary bomb alloy, f.o.b. plant, any quantity; carload freight allowed all other alloys for 500 lbs. or more.

Tin: Prices ex-dock, New York in 5-ton lots. Add 1 cent for 2240-11,199 lbs., 1½c 1000-2239, 2½c 500-999, 3c under 500. Grade A, 99.8% or higher (includes Straits), 52.00c; Grade B, 99.8% or higher, not meeting specifications for Grade A, with 0.05 per cent maximum arsenic, 51.87½c; Grade C, 99.65-99.79% incl. 51.62½c; Grade D, 99.50-99.64% incl., 51.50c; Grade E, 99-99.49% incl. 51.12½c; Grade F, below 99% (for tin content), 51.00c.

Antimony: American, bulk carlots f.o.b. Laredo, Tex., 99.0% to 99.8% and 99.8% and over but not meeting specifications below, 14.50c; 99.8% and over (arsenic, 0.05%, max. and other impurities, 0.1%, max.) 15.00c. On producers' sales add ¼c for less than carload to 10,000 lb.; ½c for 9999-224-lb.; and 2c for 223 lb. and less; on sales by dealers, distributors and jobbers add ½c, 1c, and 3c, respectively.

Nickel: Electrolytic cathodes, 99.5%, f.o.b. refinery 35.00c lb.; pig and shot produced from electrolytic cathodes 36.00c; "F" nickel shot or ingot for additions to cast iron, 34.00c; Monel shot 28.00c.

Mercury: OPA ceiling prices per 76-lb. flask f.o.b. point of shipment or entry. Domestic produced in Calif., Oreg., Wash., Idaho, Nev., Ariz., $191; produced in Texas, Ark. $193. Foreign, produced in Mexico, duty paid, $193. Open market, spot, New York, nominal for 50 to 100 flasks; $118 to $120 in smaller quantities.

Arsenic: Prime, white, 99%, carlots, 4.00c lb.

Beryllium-Copper: 3.75-4.25% Be., $17 lb. contained Be.

Cadmium: Bars, ingots, pencils, pigs, plates, rods, slabs, sticks and all other "regular" straight or flat forms 90.00c lb., del.; anodes, balls, discs and all other special or patented shapes 95.00c lb. del.

Cobalt: 97-99%, $1.50 lb. for 550 lb. (bbl.); $1.52 lb. for 100 lb. (case); $1.57 lb. under 100 lb.

Indium: 99.9%, $7.50 per troy ounce.

Gold: U. S. Treasury, $35 per ounce.

Silver: Open market, N. Y. 44.75c per ounce.

Platinum: $35 per ounce.

Iridium: $165 per troy ounce.

Palladium: $24 per troy ounce.

Rolled, Drawn, Extruded Products

(Copper and brass product prices based on 12.00c, Conn., for copper. Freight prepaid on 100 lbs. or more.)

Sheet: Copper 20.87c; yellow brass 19.48c; commercial bronze, 90% 21.07c, 95% 21.28c; red brass, 80% 20.15c, 85% 20.36c; phosphor bronze, Grades A and B 5% 36.25c; Everdur, Herculoy, Duronze or equiv. 26.00c; naval brass 24.50c; manganese bronze 28.00c; Muntz metal 22.75c; nickel silver 5% 26.50c.

Rods: Copper, hot-rolled 17.37c, cold-rolled 18.37c; yellow brass 15.01c; commercial bronze 90% 21.32c, 95% 21.53c; red brass 80% 20.40c, 85% 20.61c; phosphor bronze Grade A, B 5% 36.50c; Everdur, Herculoy, Duronze or equiv. 25.50c; Naval brass 19.12c; manganese bronze 22.50c; Muntz metal 18.87c; nickel silver 5% 26.50c.

Seamless Tubing: Copper 21.37c; yellow brass 22.23c; commercial bronze 90% 23.47c; red brass 80% 22.80c, 85% 23.01c.

Extruded Shapes: Copper 20.87c; architectural bronze 19.12c; manganese bronze 24.00c, Muntz metal 20.12c; Naval brass 20.37c.

Angles and Channels: Yellow brass 27.98c; commercial bronze 90% 29.57c, 95% 29.78c; red brass 80% 28.65c, 85% 28.86c.

Copper Wire: Soft, f.o.b. Eastern mills, carlots 15.37½c, less-carlots 15.87½c; weatherproof, f.o.b. Eastern mills, carlots 17.00c, less-carlots 17.50c; magnet, delivered, carlots 17.50c, 15,000 lbs. or more 17.75c, less carlots 18.25c.

Aluminum Sheets and Circles: 2s and 3s, flat, mill finish, base 30,000 lbs. or more; del.; sheet widths as indicated; circle diameters 9" and larger:

Gage	Width	Sheets	Circles
.249"-7	12"-48"	22.70c	25.20c
8-10	12"-48"	23.20c	25.70c
11-12	26"-48"	24.20c	27.00c
13-14	26"-48"	25.20c	28.50c
15-16	26"-48"	26.40c	30.40c
17-18	26"-48"	27.90c	32.90c
19-20	24"-42"	29.80c	35.30c
21-22	24"-42"	31.70c	37.20c
23-24	3"-24"	25.60c	29.20c

Lead Products: Prices to jobbers; full sheets 9.50c; cut sheets 9.75c; pipe 8.15c, New York; 8.25c, Philadelphia, Baltimore, Rochester and Buffalo; 8.75c, Chicago, Cleveland, Worcester, Boston.

Zinc Products: Sheet f.o.b. mill, 13.15c; 36,000 lbs. and over deduct 7%. Ribbon and strip 12.25c, 3000-lb. lots deduct 1%, 6000 lbs. 2% 9000 lbs. 3%, 18,000 lbs. 4%, carloads and over 7%. Boiler plate (not over 12") 3 tons and over 11.00c; 1-3 tons 12.00c; 500-2000 lbs. 12.50c; 100-500 lbs. 13.00c; under 100 lbs. 14.00c. Hull plate (over 12") add 1c to boiler plate prices.

Plating Materials

Chromic Acid: 99.75%, flake, del., carloads 16.25c; 5 tons and over 16.75c; 1-5 tons 17.25c; 400 lbs. to 1 ton 17.75c; under 400 lbs. 18.25c.

Copper Anodes: Base 2000-5000 lbs., del.; oval 17.62c; untrimmed 18.12c; electro-deposited 17.37c.

Copper Carbonate: 52-54% metallic cu, 250 lb. barrels 20.50c.

Copper Cyanide: 70-71% cu, 100-lb. kegs or bbls. 34.00c f.o.b. Niagara Falls.

Sodium Cyanide: 96%, 200-lb. drums 15.00c; 10,000-lb. lots 13.00c f.o.b. Niagara Falls.

Nickel Anodes: 500-2999 lb. lots; cast and rolled carbonized 47.00c; rolled, depolarized 48.00c.

Nickel Chloride: 100-lb. kegs or 275-lb. bbls. 18.00c lb., del.

Tin Anodes: 1000 lbs. and over 58.50c, del.; 500-999 59.00c; 200-499 59.50c; 100-199 61.00c.

Tin Crystals: 400 lb. bbls. 39.00c f.o.b. Grasselli, N. J.; 100-lb. kegs 39.50c.

Sodium Stannate: 100 or 300-lb. drums 36.50c, del.; ton lots 33.50c.

Zinc Cyanide: 100-lb. kegs or bbls. 33.00c, f.o.b. Niagara Falls.

Scrap Metals

Brass Mill Allowances: Prices for less than 15,000 lbs. f.o.b. shipping point. Add ⅝c for 15,000-40,000 lbs.; 1c for 40,000 lbs. or more.

	Clean Heavy	Rod Ends	Clean Turnings
Copper	10.250	10.250	9.500
Tinned Copper	9.625	9.625	9.375
Yellow Brass	8.625	8.375	7.875
Commercial bronze			
90%	9.375	9.125	8.625
95%	9.500	9.250	8.750
Red Brass, 85%	9.125	8.875	8.375
Red Brass, 80%	9.125	8.875	8.375
Muntz metal	8.000	7.750	7.250
Nickel Sil., 5%	9.250	9.000	4.625
Phos. br., A, B, 5%	11.000	10.750	9.750
Herculoy, Everdur or equivalent	10.250	10.000	9.250
Naval brass	8.250	8.000	7.500
Mang. bronze	8.250	3.000	7.500

Other than Brass Mill Scrap: Prices apply on material not meeting brass mill specifications and are f.o.b. shipping point; add ¾c for shipment of 60,000 lbs. of one group and ½c for 20,000 lbs. of second group shipped in same car. Typical prices follow:

(Group 1) No. 1 heavy copper and wire, No. 1 tinned copper, copper borings 9.75c; No. 2 copper wire and mixed heavy copper, copper tuyeres 8.75c.

(Group 2) soft red brass and borings, aluminum bronze 9.00c; copper-nickel and borings 9.25c; car boxes, cocks and faucets 7.75c; bell metal 15.50c; babbit-lined brass bushings 13.00c.

(Group 3) zincy bronze borings, Admiralty condenser tubes, brass pipe 7.50c; Muntz metal condenser tubes 7.00c; yellow brass 6.25c; manganese bronze (lead 0.00%-0.40%) 7.25c, (lead 0.41%-1.0%) 6.25c; manganese bronze borings (lead 0.00-0.40%) 6.50c, (lead 0.41-1.00%) 5.50c.

Aluminum Scrap: Prices f.o.b. point of shipment, respectively for lots of less than 1000 lbs.; 1000-20,000 lbs. and 20,000 lbs. or more, plant scrap only. Segregated solids: S-type alloys (2S, 3S, 17S, 18S, 24S, 32S, 52S) 9.00c, 10.00c, 10.50c; All other high grade alloys 8.50c, 9.50c, 10.00c; low grade alloys 8.00c, 9.00c, 9.50c. Segregated borings and turnings: Wrought alloys (17S, 18S, 32S, 52S) 7.50c, 8.50c, 9.00c; all other high grade alloys 7.00c, 8.00c, 8.50c; low grade alloys 6.50c, 7.50c, 8.00c. Mixed plant scrap, all solids, 7.50c, 8.50c, 9.00c; borings and turnings 5.50c, 6.50c, 7.00c.

Lead Scrap: Prices f.o.b. point of shipment. For soft and hard lead, including cable lead, deduct 0.55c from basing point prices for refined metal.

Zinc Scrap: New clippings, old zinc 7.25c f.o.b. point of shipment; add ½-cent for 10,000 lbs. or more: New die-cast scrap, radiator grilles 4.95c, add ½c 20,000 or more. Unsweated zinc dross, die cast slab 5.80c any quantity.

Nickel, Monel Scrap: Prices f.o.b. point of shipment; add ½c for 2000 lbs. or more of nickel or cupro-nickel shipped at one time and 20,000 lbs. or more of Monel. Converters (dealers) allowed 2c premium.

Nickel: 98% or more nickel and not over ½" copper 26.00c; 90-98% nickel, 26.00c per lb. nickel contained.

Cupro-nickel: 90% or more combined nickel and copper 26.00c per lb. contained nickel, plus 8.00c per lb. contained copper; less than 90% combined nickel and copper 26.00c for contained nickel only.

Monel: No. 1 castings, turnings 15.00c; new clipping 20.00c; soldered sheet 18.00c.

Sheets, Strip . . .

Sheet & Strip Prices, Page 134

Pressure for steel sheets for war purposes continues heavy and mills are unable to meet requirements within specified limits except under directives. Practically all producers are sold to mid-year, with few exceptions, and on galvanized sheets some orders have been booked for fourth quarter.

Pittsburgh — Inquiry is still active, although most of the heavier tonnage involved in military programs has now been booked and practically all producers are now sold through second quarter, and in most cases, well into third quarter. Galvanized sheets are booked solid through third quarter and mills here report substantial tonnages already taken for fourth quarter delivery. Producers concede that some additional tonnage may be taken for spot production as early as March. This attitude reflects uncertainty of present bookings and dependency of order books on the military situation. There is some confusion due to the price change and its effect on both integrated and nonintegrated producers.

Chicago — No means so far having been found to substitute hot-rolled sheets for hot-rolled pickled, demand for the latter continues tremendous and beyond ability of mills to roll in the period they are needed. Specifications of the armed forces are rigid, but it is understood the situation is being looked into. Galvanized sheets also are far short of demand. U. S. Engineers are in the process of awarding to various contractors 25,800 task force buildings which will require 78,000 tons of sheets and strip.

Boston — There is no abatement in heavy cold strip buying, with alloys running strong; high-carbon schedules for second quarter are generally closed. Fabricators are getting reinstatements on contracts cut back earlier and new contracts are going for small arms parts, aircraft, links, clips and ordnance components. No strip is available for anything outside war requirements. Increased war programs are also stimulating sheet buying; cold-rolled requirements for insecticide containers fabricated in the Springfield district are up sharply. Most stamping shop schedules are being expanded. Inquiry for special grades, including stainless and electrical sheets, tends upward. Delivery factor is a controlling influence in placement of sheet volume with much shopping on that basis. Only in spots are carbon sheets open for shipment in late second quarter.

Cincinnati — Demand for sheets is active, as represented by new buying and by pressure for shipments. Bookings for hot-rolled and cold-rolled reach into June, although some tonnage of long ternes is available in April. Shipping of outbound production has become a problem, severe weather hampering truck and freight facilities. Mills are resorting to storage until sheets can be moved in balance with output.

Cleveland—Sellers report a flood of new directive tonnage covering heavier requirements for the steel landing mat, heavy truck, aircraft, Army and Navy huts and barracks, drums, blitz cans and ammunition box programs. This has met a constant reshuffling of production schedules and more than one producer anticipates having a substantially larger

carryover tonnage of regular CMP orders on Feb. 1 than since last summer. To meet expanding programs many steel consumers need steel by early February and March but are unable to get on mill rolling schedules without a directive before June and July deliveries in most instances. Many consumers, anticipating a sharp reduction in war steel requirements toward the close of last year, let their inventories become depleted. Now they find themselves without adequate steel stocks.

The 10 cents per hundred pound price increase on hot-rolled carbon sheets and hot-rolled sheet specialty products which are priced as an extra over the hot-rolled sheet base price, alters the price relationship between hot-rolled pickled and cold-rolled sheets in gages 19 to 22 inclusive. This has placed small hand mills at a disadvantage pricewise for the hot-rolled sheet in this gage range is now higher in price than the more highly finished cold-rolled product. The hot-rolled sheet has definite advantages for rough painting and other coating operations, but most of the demand under the present set-up will naturally tend toward the smoother finished cold-rolled product.

Philadelphia — Relatively little sheet tonnage is available for first half, barring certain specialties, such as stainless steel and silicon grades, even these schedules being stepped up appreciably. Most sellers are into April on stainless and May and June on silicons.

Steel Bars . . .

Bar Prices, Page 134

Increasing demand for guns and ammunition are deferring bar deliveries further and current promises are extended to April and even to midyear on larger sizes. Development of the heavy shell program is adding to requirements for large bars and is scheduled to become even heavier.

Pittsburgh — Both new buying and inquiries are heavy and some quarters believe that the backlog on mill books by the end of first quarter will have reached record high levels. Most of the demand is in large bars and stems from the heavy shell program. However, there is a substantial increase in demand from other miscellaneous sources, all military and all top priority.

New York — Bar schedules are being pushed back steadily, primarily as a result of mounting orders for guns, shells and various other types of ammunition. Substantial orders for small ammunition are making themselves felt, and requirements for rockets are expanding rapidly. In general, little tonnage of any description in the carbon grades can now be had before late April and in the case of certain larger sizes, it is difficult to obtain promises of shipment before late in second quarer and early part of third quarter. Meanwhile, alloy bar deliveries are expanded, with some producers now having little to offer before April. This is ascribed not only to gun and ammunition work of certain types but to a spurt in specifications from aircraft manufacturers.

Boston — Instead of closing this spring as expected, Victory yard, Electric Boat Co., Groton, Conn., has a large contract for 105-mm. shells, making the fifth New England shop to make artillery ammunition under prime contracts. The Groton company, largest private submarine

builder in the country, will install more than $3,000,000 equipment, probably approaching peak production in June. This well reflects growing demand and tightness in bars which is affecting more sizes. Small arms bar needs are expanding rapidly; Springfield armory, striving to increase employment to over 10,000, will contribute heavily to 1,000,000 Garand rifles wanted this year. A like number of carbines is required. Plans to start heavier carbine production at the armory this year will give way to Garands. Carbines will be more widely distributed. Alloys are sharing the increased tempo in bars and the major heavier programs are filtering into subcontracting shops, involving fuzes and rocket parts, heavier aircraft buying, forge shops, bearing plants and miscellaneous fabricators.

Seattle — Merchant bar demand is steady, mainly for shipyards and warehouses. Mills are severely handicapped by labor shortage and are accepting no business except for war purposes. One mill reports that in 1944 it rolled 76 per cent merchant bars and 24 per cent reinforcing bars, an exact reversal of normal years when the latter formed the larger portion of tonnage.

Cleveland — Steel mill production schedules are in process of being reshuffled to accommodate the sharply expanded ammunition, aircraft parts and heavy truck programs. Shell steel production is expected to reach 400,000 tons monthly by the close of this year. A large part of the additional tonnage will be needed for the 105-millimeter and higher caliber shells. Increases in shell billets and other types of steel for the heavy program will cut into first quarter output of quality carbon bars, semifinished, rails and structural steel. Quality hot-topped steel will be in heavier demand for this program, which may reduce supplies of quality steel available for seamless pipe and tube mills. Operations at the 12-inch bar mill at Republic Steel Corp.'s Corrigan McKinney plant are now back to normal following a walkout recently because of a change in tonnage rate instituted when the mill was expanded to 30,000 tons monthly resulting from the installation of an additional furnace.

Chicago — Aside from increasing demand for bars for general use, expansion in shell output and revival of armor-piercing shot output, complicate the bar market. Another complicating factor is that many war contractors, who, in line with recent contract cutbacks, had been practicing close inventory control, are now having contracts restored and experience difficulty in obtaining required materials. Spring manufacturers are loaded to capacity, principally because of the army truck program.

Philadelphia — Carbon bar schedules continue to expand. In most sizes of flats and rounds one leading seller is sold out for first half and other producers have little to offer before May and June. Such tonnage as can be picked up in April is mainly in small sizes, including up to 1½-inch rounds. Alloy bar demand increases, reflected in delivery promises of April in some cases and later in others.

Steel Plates . . .

Plate Prices, Page 135

While plate requirements are somewhat less than a year ago they are much

heavier than had been expected for this period. Maritime requirements have been increased above expectations and some strip mills again are rolling plates instead of returning to sheet and strip production.

Philadelphia — Further releases, principally for maritime work, are forcing plate deliveries back to May, in the case of some important mills. Formal distribution among several mills has just been completed on 70,000 tons of plates for 20 tankers to be built by Sun Shipbuilding & Dry Dock Co., Chester, Pa., with deliveries beginning in March. Formal action has also been taken in placing 20,000 tons of shapes and bars for these ships. This yard has a program coming up later for ten C-4-type ships, requiring approximately 38,000 tons of plates, shapes and bars, principally plates. The Coatesville, Pa., producer will suspend production indefinitely on its 84-inch mill Jan. 28, an action considered for some time, due to lack of steel. This producer, which has greater finishing than ingot capacity, also plans to suspend operations on its universal mill a little later.

Cleveland—The supplemental Maritime Commission shipbuilding program is expected to hit plate mills hardest during second quarter. An increase in plate requirements of about one million tons over former estimates is now expected in meeting 1945 Maritime Commission requirements. Some strip mills, which recently have been partially reconverted to rolling sheets, soon are expected again to be operating nearly 100 per cent on plate production. Miscellaneous ship repair work in this area continues to absorb considerable tonnage of plates. Plate delivery schedules are now extended through March in many instances.

Boston—Plate deliveries are more extended; schedules have moved into May with some mills. Moderately heavier buying is contributing, but assignment to rolling schedules this quarter of additional pontoon and maritime ship tonnage is a dominating factor. Shipyard volume is larger, with some buying against new contracts; inventories have been adjusted at most yards. For navy ships, plate requirements are sustained, also flame-cutting shops, although the latter do not have as heavy backlogs. Miscellaneous buying is bolstering warehouse volume. Railroad inquiry is small and the average structural fabricating shop is taking less tonnage than several months back.

Tubular Goods . . .

Tubular Goods Prices, Page 135

New York — Tubing deliveries are expanding rapidly, with heavy orders from aircraft builders and directives now beginning to appear for boiler tubing for the new maritime program. Definite specifications for these ships have not yet been heavy but reservations are being made which will further extend deliveries. A spurt in ship repairs is also contributing to present backlogs of boiler tubing.

One leading producer is now quoting hot-finished boiler tubing for May, with cold-drawn tubing quoted in August. These promises represent an increase of several weeks, since the early part of this month.

Pipe deliveries also are extending with butt-weld quoted in April and May, lap-

weld from March to May. Mounting shell work is contributing materially to the more extended deliveries on pipe, especially lap-weld sizes.

Meanwhile, distributors of merchant pipe are not getting shipments as rapidly as they anticipated and are pressing hard for tonnage, declaring that they are not able to meet current demand. The peak of the heating season is over and there is relatively little new building construction; however, there is still substantial maintenance and repair work.

Seattle — Cast iron pipe deliveries are slow and contracts can not be accepted under 90 days. Potential demand for pipe in this area is strong but no major projects have come out for bids. Several small jobs are pending. Spokane, Wash., opened bids Jan. 11 for about 250 tons of 6 and 12-inch bell and spigot and accessories. H. D. Fowler Co., Seattle, has an award from Lewis county, Wash., for hydrants and fittings. Parker & Hill, Seattle, are preparing plans for a proposed $140,000 project in the Marietta district, near Bellingham, Wash. Lakewood water system, near Tacoma, Wash., will be taken over by that city if voters approve at an election Jan. 29. An extension costing $175,000 will be undertaken if the proposition carries.

Pittsburgh — Producers of oil country goods in this district report heavy demand, with production running substantially behind. There is a probability that production of oil country goods may be further restricted soon. Demand for steel on direct military buying has increased so substantially that oil country demands may go unsatisfied in order to maintain supplies of semifinished steel to the military production programs. This same situation will also have an effect on other tubular goods products, including line pipe, standard black pipe and all grades of tubing, which had been headed for civilian goods production. It is probable that the output of galvanized pipe will drop substantially because of the heavy increase in zinc demand on galvanized sheet and plate requirements. A heavy tonnage of galvanized tubing will be used in drainage and some temporary pipe line work but will primarily be filled from sheet quotas and will not be channeled through tubular goods markets.

Rails, Cars . . .

Track Material Prices, Page 135

New York — Domestic freight car awards in 1944, according to final returns involved 53,221 cars, against 41,355 in 1943. December total was 16,245, with a revision in the November figure to 1065. Domestic freight cars on order Jan. 1 totaled 37,244 units.

Wire . . .

Wire Prices, Page 135

Cleveland—Consumption of wire has been far beyond expectations. With scheduled 1945 requirements of assault, field and tactical communication wire running about 30 per cent above average monthly rate through 1944, these products are expected to continue on the critical list through most of this year. Production of wire rope and strand, another critical item, has shown improvement for three successive months and recently topped the previous 1944 peak output established in May. However, military demand for wire rope and strand is expected to keep these items on the critical list most of this year. Directives on manufacturing wire have been exceptionally heavy in recent weeks, reflecting larger requirements for aircraft and other key war programs. Demand for merchant wire items has receded slightly since the first of the year, with some seasonal tapering in requirements for fencing and to a less extent on nails. Trade report has it that WPB has authorized output of 200,000 tons of fence and netting per quarter through 1945. This would be substantially above prewar level.

Buffalo—An overall 30 per cent increase in orders for Army Signal Corps communications wire has been announced by the office here. To fill increased demand from consumers working on signal corps orders Wickwire Spencer Steel Co. will expand field wire production facilities about 50 per cent.

Pittsburgh—Total backlog of orders for wire products is up, reflecting considerable increase in demand for manufacturers' wire items. This increase offsets a decline in requirements for merchant wire cancellation of some manufacturers' wire business which had been booked for civilian goods production, primarily innerspring mattresses. Most of the Z-1 allotments which had been accepted by mills are still unfilled and will remain so. Demand for galvanized wire has increased sharply, and fine

wire for the wire rope program, as well as other applications, including motor and aircraft tires, represents a substantial percentage of the overall wire business in the market. Tightening supply of rods causes some difficulty among nonintegrated producers and it is apparent the difficulty will not be solved before second quarter, or possibly later.

Bolts, Nuts . . .

Bolt, Nut, Rivet Prices, Page 135

New York — Bolt and nut demand has taken a decided spurt, with deliveries expanding and with the situation being made more complicated by the fact that makers are having increasing difficulty in keeping their help. At present bolt and nut makers have secondary status and are petitioning Washington for a higher manpower priority rating.

Reinforcing Bars . . .

Reinforcing Bar Prices, Page 135

Chicago — Awards of important reinforcing steel tonnages in this district were totally lacking and no inquiry has developed. Possibly this indicates the pattern in the period ahead while all energy is directed toward heavier production of war goods. Bids went in Jan. 16 on 118 tons for a veterans' hospital at Dwight, Ill., the tonnage involved being smaller than originally anticipated.

Seattle — Reclamation Bureau will open bids Feb. 2 at Coeur d'Alene, Idaho, for a pumping plant and discharge line at Post Falls, Rathdrum Prairie project, Idaho, involving 46 tons of reinforcing steel and about 25 tons of miscellaneous metals and pumping units. The same bureau will open bids Jan. 27 for earthwork and structures for the Yakima ridge canal, involving 110 tons of reinforcing steel and other metals and at Bend, Oreg., Feb. 3 for a unit of the Deschutes project, requiring more than 50 tons of reinforcing. Puget Sound Bridge & Dredging Co., Seattle, will build a 2800-ton concrete dry dock at its local plant to accommodate ships up to 400 feet, for the Navy.

Pittsburgh — Tightness in overall steel requirements, plus a decline in volume of steel available at the billet level, have resulted in a situation requiring increasing pressure on concrete bar directives. As a result, a more substantial percentage of total volume will be shunted to rail bars in the next few months and the directive on new billet steel will be reduced. In order to decrease delivery pressure, it is understood that volume of steel for export will also be cut and it is probable that after first quarter available steel will amount to about 50 per cent of current levels if the program now contemplated is continued to completion. New domestic business is relatively light, most current shipments being for export through FEA.

Pig Iron . . .

Pig Iron Prices, Page 137

Storm conditions have delayed delivery of pig iron in many cases, causing melters with depleted stocks to cut down operations to some degree. Producers have been forced to pile considerable iron at furnaces because of shortage of cars for shipment. Some shifting of tonnage has been done to avoid distress in cases where war production has been

threatened by lack of iron.

New York — Delays in movement of pig iron, due to adverse weather conditions, is not only causing some melters in this district to reduce their rate of consumption but in some instances to suspend operations entirely. So far as can be learned, no highly critical war work has been affected, because of special measures being taken to supply iron to plants doing such work if not from the regular source of supply, from some other. However, further severe storms, especially inland, promise little immediate relief and some plants not yet affected may encounter difficulty shortly, as stocks are negligible.

Most furnaces supplying this district are able to keep in operation but find themselves confronted with a shortage of cars. Consequently sellers are being forced to pile iron, which indicates that once weather conditions become improved, shortages at various plants will speedily be taken care of. It is true, nevertheless, that some furnaces are turning out less iron as facilities become more worn. It would not prove surprising if certain furnaces may be forced to suspend production entirely for at least a limited period, so that repairs can be made.

Cleveland—Shortage of scrap has forced an increase in the proportion of pig iron used in open-hearths. This increased demand for basic pig iron will be difficult to meet because of the growing manpower shortage, blast furnace interests state. Larger war schedules have substantially increased the requirements for steel and malleable castings. There is plenty of blast furnace capacity but it is another matter to find the men to operate the 22 units now idle.

Boston — While for the moment not unduly alarming, tightening in melting materials is giving more consumers serious concern. With most basic and more foundry iron than usual bought from Buffalo furnaces, deliveries are sensitive to transportation delays, lack of cars and absence of supplies at Beacon. Some of these factors are slowing shipments. While melt shows only slight change, most inventories are in no shape to weather serious or prolonged transportation delays. Reserves at Everett, Mass., are such that heavier withdrawals of foundry grades might be made in an emergency, but slight support could be expected in any acute shortage involving basic.

Buffalo—Several foundries have been forced to curtail operations because of heavy snow which continues to delay pig iron shipments. Foundries further east using iron from local furnaces may be forced to seek other sources of supply. A local merchant iron producer reports 10,000 tons piled awaiting cars.

Philadelphia — Consumers are pressing hard for pig iron, because of delay in shipments, due to snow and cold and also because of scrap shortage from the same causes. Producers are forced to turn down some orders and some foundries have curtailed operations because of lack of iron. Basic consumers in this district have been able to sustain operations fairly well.

Ferroalloys . . .

Ferroalloy Prices, Page 137

New York—January specifications for leading ferroalloys are better than at any time during fourth quarter. This is due in part not only to increased demands but

to the fact that various consumers held up on their specifications last month for inventory purposes, specifications which they are now releasing.

While there has been some talk of a possible stringency in certain alloys later on, chrome being mentioned in particular, because of shortage of bottoms for bringing in the ore, leading ferrochrome producers assert that their stocks are currently in the best shape they have been in considerable time. With demands for alloys lagging somewhat over recent months, these producers have nevertheless been going ahead with maximum production, it is explained.

Scrap . . .

Scrap Prices, Page 138

While scrap shows considerable tightness, intensified by weather conditions in the Northeast, no severe pinch has been experienced for the most part. Allocations have been resorted to in some cases. Transportation has been slowed by snow and considerable material is snowbound. Lack of labor and weather has limited ability of yards to prepare their accumulations. Prices are almost entirely at ceilings.

Pittsburgh — All buyers in this area continue in the market and are taking whatever supplies are offered. There is no serious talk of a scrap shortage but there is no denying the fact that supplies are tight and that a considerable tonnage above current offerings would be purchased if it were available. Bad weather throughout the area continues to act as a deterrent to scrap yard activity.

Philadelphia — Severe weather and manpower shortage, made worse by shifting of labor to newly classified critical industries, are curtailing movement of scrap appreciably. Most prices are at OPA ceilings with springboards in use and consumers willing to absorb heavy freight on cast grades, as high as $7.50 freight having been paid recently on heavy breakable cast. Cast scrap continues scarce, with no relief in sight.

Boston—Supply of steelmaking grades of scrap have tightened materially, notably heavy melting, but consumers of foundry grades in some instances are in a serious position. Lacking tonnage, several have been aided by other melters, including a steel works consumer in one instance. Deliveries against allocations are behind schedule in spots and some tonnage allocated for delivery last month is still due. Steelmaking inventories are somewhat lower. Production of industrial scrap again tends upward, but until full force of new and reinstated metal fabricating contracts is reached the new peak is ahead. Alloys continue to firm and heavy solids have reached levels of carbon heavy melting.

Buffalo — Allocations of scrap from outside sources have offset an estimated 50 per cent shrinkage in collections and shipments during the past five weeks, resulting from storm and transportation conditions. Despite a sharp reduction in steel production, caused by the same reasons, considerable inroads have been made into reserves. Much scrap is marooned in snowbound cars and some days not a single car is received by leading consumers. Dealers have substantial orders but are unable to prepare it for shipment. All prices are at ceilings. Machine shop turnings are being accepted in unlimited quantities.

Cincinnati — Scrap iron and steel supplies have tightened, and prices on all grades except turnings are at ceilings or headed in that direction. Some district mills have not entered the market extensively in recent weeks but their reserves tend lower because of difficulties faced by brokers and dealers in maintaining a flow of scrap against commitments. Transportation and manpower difficulties, aggravated by cold weather, have slowed movement of material.

St. Louis — Further strength has appeared in the steel and iron scrap market as demand increases and supply decreases. Bundled sheets, axle turnings and steel angle bars have regained ceiling prices. It is estimated movement of scrap to this area is 50 per cent less than 30 days ago. Labor shortage is held responsible. Railroad and maritime scrap are back on an allocation basis.

Los Angeles — Increased war production has caused larger use of scrap from reserves, this, with continuing shipments of shipyard scrap to the Midwest, has reduced supply. In spite of this, dealers do not foresee sudden serious shortages.

New York—While an adequate supply of steel scrap is available collections have been poor, currently due to adverse weather and disposition of labor to get into other employment classified as critical. Cast scrap is tight and in this case actual supply is admittedly inadequate, particularly in view of the small amount of demolition work. Prices continue at ceilings.

Cleveland—Leading scrap consumers have again entered the market. All items, even turnings, are going at ceiling prices. With good heavy melting steel grades expected to remain relatively scarce. In a growing number of instances consumers are willing to pay a $1.50 and higher springboard resulting in considerable more cross hauling of scrap in recent weeks. Little scrap is yet moving through dealers' yards, but weather conditions have eased to the point where the railroads are again able to complete shipment of cars held up early in January to permit movement of perishable goods.

Chicago — Steelmakers are taking all the steel grades of scrap available and at ceiling prices. Material is none too plentiful, and shipments are delayed somewhat by slow transportation and heavy snowfall, which also have impeded preparation. Some confusion exists over turning and boring grades. Some transactions have taken full ceiling prices, others have been at some margin below.

Warehouse . . .

Warehouse Prices, Page 136

Note—For discussion of the warehouse situation following OPA action in raising mill prices see Page 51.

New York — With demand strong and diversified, warehouse inventories are less balanced on some sizes as mill deliveries become more extended on most products. Directives are crowding considerable warehouse tonnage at mills, notably in bars. Light gage black and galvanized sheet stocks are not sufficient to meet demand with many distributors. Plate inquiry has improved, some shipyards having re-entered the market, while shape buying continues heavy. Increase in nail and staple prices, other than galvanized, but including cement-coated, went into effect immediately with jobbers. Inventories are generally low. Under the interpretation by which these two items were increased, any advance in certain merchant wire products might be likewise invoked.

Cleveland—Since the recent upward revision in steel mill delivered prices on a few key items are changes in the delivered prices and not in the basing point base prices, the increases, with the exception of nails and staples, cannot be reflected in higher ceiling prices for sales out of warehouse. On nails and staples, other than galvanized, the distributor may add 25 per cent per hundred pounds to these items in stock for this is a customary industry practice. Roofing and siding are priced under appendix A Section (h) (4) of RPS 49, and the 15 cents per hundred pounds increase in cost may be passed on by distributors by using the 20 per cent formula under the price regulation. No price increase on sales of unwarehoused prime excess stocks, including sales by resellers, owners or government agencies is permitted because the price is based on mill base prices which are unchanged. Steel distributors are hopeful that OPA will revise the wording of the mill price increase in such a manner as to identify the increase at the basing point level. This course would automatically permit the distributors to increase the warehouse price spread accordingly.

Steel Warehouse Order M-21-b-3, Issued by WPB

Base tonnages and warehouses certificates on general steel products have been eliminated in a new steel warehouse order, M-21-b-3, effective Feb. 1, which supersedes orders M-21-b-1 and M-21-b-2. Other provisions of the two revoked orders are combined in the new order.

M-21-b-3 requires warehouses to set up an internal record of the replaceable tonnage sold from stock as compared with tonnage ordered. It also changes the endorsement required of distributors on their stock replacement orders, making it necessary for each order to be identified as a general steel product replacement order or as a merchant steel product replacement order. Certification must also include the standard endorsement in priorities regulation No. 7. A "steel distributor's declaration of intent" is also required.

Semifinished Steel . . .

Semifinished Prices, Page 134

Pittsburgh — As in earlier months of the war, the chief bottleneck in steel production at the moment revolves around semifinished steel. According to reports available here, the chief difficulty lies in billets. Although there will be heavy demand for all flat rolled products and both sheet and plate mills are expected to run virtually at capacity, it is understood here that the slab supply at all points will be adequate to meet the outsize dimensions of the flat-rolled program as it now stands. In billets, however, it has been necessary to cut back some end-use categories in order to provide an adequate supply of billets for the shell and transportation programs. Nonintegrated tube mills report their supply of skelp being delivered on schedule and up to the full limits of their directives.

New England Machine Tool Orders Substantial

Boston — Horsepower and other changes in aircraft account for substantial orders for machine tools. Increase in other war programs, including heavy ammunition, also contribute to volume which has declined much less than predicted earlier. Special purpose tools with more than usual fixtures are required for the most part. Orders for aircraft plants stand out. Inquiries for complete tooling jobs are few. Some machine tool builders who called in subcontracts and concentrated work in prime shops last year are again seeking equipment for farming out parts and components.

Steel in Europe . . .

London — (*By Radio*) — Heavy call for light sheets is being experienced in Great Britain and most producers are booked full to the end of March. Engineering foundries are quiet but more business is developing in light castings. Tin plate demand is fair.

STRUCTURAL SHAPES . . .

STRUCTURAL STEEL PLACED

1500 tons, new car shops, Brainerd, Minn., for Northern Pacific railroad, to Clinton Bridge Works, Clinton, Iowa; bids Dec. 27.

351 tons, bridge Z-882, Elberon, Iowa, for Chicago, Milwaukee, St. Paul & Pacific railroad, to Bethlehem Steel Co., Bethlehem, Pa.; bids Oct. 23.

STRUCTURAL STEEL PENDING

350 tons, bridge over Pee Dee river, for state highway department, Columbia, S. C.

200 tons, storage warehouses, Hammond, Ind., for DPC; bids Jan. 18.

REINFORCING BARS . . .

REINFORCING BARS PLACED

200 tons, reinforced concrete target slab, contract NOY-10759, Dahlgren, Va., to Bethlehem Steel Co., Bethlehem, Pa., through Industrial Engineering Co.

130 tons, nurses home, Billings, Mont.; bids Jan. 15.

118 tons, veterans hospital, Dwight, Ill., for U. S. Veterans Administration; bids Jan. 18.

100 tons, plant, E. I. du Pont de Nemours & Co., Charlestown, Ind., to Republic Steel Corp. through Colonial Supply Co., Louisville, Ky.

Southern railway, 9376 tons, 4911 tons to Tennessee Coal Iron & Railroad Co., Birmingham, Ala., and 4465 to Bethlehem Steel Co., Bethlehem, Pa.

REINFORCING BARS PENDING

265 tons, U. S. Navy Bureau of Yards and Docks, Davisville, R. I.

230 tons, hospital, George Washington university, Washington.

110 tons, bridge over Elk river, Grove, Okla.

RAILS, CARS . . .

RAILROAD CARS PLACED

Bangor & Aroostook, 100 forty-ton box cars, to Magor Car Corp., New York.

Milwaukee Electric Railways, 74 trolley coaches, to Pullman-Standard Car Mfg. Co., Chicago.

Missouri-Kansas-Texas, 225 forty-ton auto box cars and 75 fifty-ton auto box cars, to its own shops, Denison, Tex.

Northern Pacific, 1000 box cars, 500 to American Car & Foundry Co., New York, and 500 to Pullman-Standard Car Mfg. Co., Chicago.

Seattle Transit Commission, Seattle, 14 trolley coaches, to J. G. Brill Co., Philadelphia.

United States Army, 50 hospital cars, to American Car & Foundry Co., New York.

United States Navy, 50 hospital cars, to American Car & Foundry Co., New York.

RAILROAD CARS PENDING

Central of Georgia, stream-lined train of stainless steel or aluminum, consisting of a locomotive and four cars; permission for purchase requested of the federal district court, Savannah, Ga.

Denver & Rio Grande Western, 500 fifty-ton box cars, contemplated.

New York Central, 1000 seventy-ton gondolas, for the Pittsburgh & Lake Erie; bids asked.

Critical and Essential List Of Manpower Is Revised

(*Concluded from Page 59*)

duction of shoe and belting leather; industrial belting for transmission of power.

Production of Textiles: Production of cotton duck, tent twill, tire cord, including synthetic fibers, nylon cloth, netting (including rope netting), processing of all materials for rope and twine, rope making, production of wool tops, processing and spinning of worsted yarn.

Production of Apparel: (No critical listings).

Production of Sone, Clay and Glass Products: Scientific and industrial glass products, acid-proof brick, firebrick and other refractory products, abrasive wheels, stones, paper, cloth and related products, crucibles and retorts.

Production of Petroleum, Natural Gas and Petroleum and Coal Products: Drilling, rig building, production of petroleum, natural gas and gasoline and field service operations and petroleum refining. Production of liquefied petroleum gas.

Production of Finished Lumber Products: Wooden parts of aircraft, ships and other military equipment.

Production of Transportation Equipment: The production of motor vehicles, trucks, ambulances, fire engines, busses and military motorized units, essential parts and accessories of such motor vehicles, locomotives and parts, railroad and streetcars and equipment.

Transportation Services: Air transportation, line-haul railroad, switching and terminal, railway and air express, rail inspection, maintenance and repair of railroad equipment, right-of-way and rolling stock, over-the-road bus, offshore and intercoastal water transportation, including shore service such as stevedoring and harbor operations, pipe line transportation, transportation services on the inland waterways, Great Lakes, harbors, bays, sounds and waters connected with the sea, including shore service such as stevedoring, over-the-road trucking, warehousing of essential (perishable and nonperishable) commodities.

Production of Pulp, Paper and Materials for Packing and Shipping Products:

(a) Production of the following pulp, paper, paperboard and converted products: Pulp (made from pulpwood and other substances).

(b) Production of other materials for shipping and preserving essential products; cordage, rope.

Production of Communication Equipment: Radios and radio equipment, radar, telephone, telegraph, cable, television, signaling apparatus, electrical sound equipment.

Communication Services: Military, naval and technical charts and maps, instructional and technical manuals, radio communications (radio-telephone and radio-telegraph), cable service (land or submarine), telegraph, telephone.

Heating, Power, Water Supply and Illuminating Service: Electric light and power, water and gas utilities, steam-heating services, sewage systems.

Repair Services: In-plant maintenance and repair of industrial and mining machinery and equipment, repair of automobiles, busses, trucks, tractors and farm equipment, tires. (It is intended that consideration be given only to individuals qualified to render all-round repair services on the types of equipment specified herein).

Health and Welfare Services: Physicians, surgeons, dentists, oculists, osteopaths, sanitary engineers, and veterinarians (engaged in treatment of farm livestock), medical, dental and optical laboratories, pharmaceutical services, hospitals, nursing services, institutional care.

Educational Services: United States Maritime Service training program.

Governmental Services (no critical listings).

Technical, Scientific and Management Services (no critical listings).

Longer Work-Week Raises Output, Lowers Efficiency

(*Concluded from Page 63*)

or greater than was the case under longer hours. In a forge shop, where the work was both hot and heavy, a 52-hour week was found to be as productive as a 58-hour week. In a shell plant, in which morale was excellent and the work medium heavy, the lengthening of daily hours from 8 to 10 for the day shift and 11 for the night shift, and of weekly hours from 40 to 60 and 66, had such unsatisfactory results that the plant eventually changed to a 48-hour week. The average increase in output under the longer schedule was only about 7 per cent above that for the 40-hour week —a result which could have been achieved easily by increasing weekly hours from 40 to 43 or 44. The additional 20 hours were sheer waste of time.

"The experience of one plant which had operated extensively on Sundays under a 7-day weekly schedule demonstrated the undesirability of continued Sunday work. While remaining on the 8-hour day, this plant worked a 7-day week for over a year. It then dropped out every third Sunday, later every other Sunday, and finally every Sunday. The analysis of this plant's performance shows that efficiency was lowest during the 7-day week, and highest during the 6-day week when no Sundays were worked at all, and that efficiency mounted as additional Sundays were dropped. The data indicate that efficiency was about 36 per cent better and total output about 13 per cent greater during the shortest work schedule. In terms of this performance, the 7-day week amounted to 8 days' pay for 5 days' output. The 30 identical operators traced throughout the entire period involved in these changing schedules actually produced one more day's output during the straight 6-day week than they formerly produced during the 7-day week.

"The relationship between longer hours and absenteeism was found to be the same in nearly every instance: As hours increased—whether daily or weekly—absenteeism increased. In most cases the reason could not be determined from plant records. Some of the data suggest a higher incidence of illness. It some instances it was quite clear that workers wanted or required more time for leisure or to attend to personal matters. It is also likely that the strain of longer hours and the fact that the weekly pay envelope was higher than it had been for years combined to induce workers to pay more attention to their health and well-being. The fact that workers were limited in the items their money could buy was also cited by some plant executives as a reason why men took more time out, or why they absented themselves for reasons which they would not have heeded under shorter work schedules and with smaller earnings.

"As a rule, absenteeism was higher for the night shift than for the day shift under the longer work schedules. This was particularly true of women, whose absenteeism rates generally exceeded those of men.

"In the absence of effective safety programs, work injuries tended to occur relatively more frequently under longer hours. In one plant they occurred only one-third as frequently when the daily hours were reduced from 10 to 8. Where plants had good, active accident-prevention programs, the lengthening of hours did not bring about a disproportionate increase in work injuries.

"Women were found to be more efficient than men at light, repetitive and rhythmic operations requiring nimble fingers and little physical exertion. On the other hand, men were superior on machines which required close adjustments or which were complicated."

The merit of an incentive-wage system as a spur toward greater production was well observed in a foundry, says the report. It was found that the change from day-work to piece-work rates resulted in slight increases in output even when hours remained at 10 per day and 58 per week.

"The result was dramatic when the introduction of incentive coincided with a reduction in weekly workdays from 6 to 5, even though the 10-hour day was maintained. Output during the shorter work-week was 13 per cent greater than it formerly had been under the 6-day week. In terms of the production level which had prevailed during the longer work-week, the men—at piece rates—produced as much in 5 days as they formerly had in 7 days without a wage incentive."

CONSTRUCTION AND ENTERPRISE

MICHIGAN

BELLEVILLE, MICH.—S & B Machine Corp., 44052 Yost road, has been incorporated with $5000 capital to do a general manufacturing business, by Vadim Smyrnoff, same address.

BRITTON, MICH.—Britton Implement Co. has been incorporated with $35,000 capital to manufacture agricultural implements by Arthur C. Brockman, 12850 West Chicago avenue, Detroit.

DEARBORN, MICH.—Hydra Controls Corp., 13617 Eller avenue has been incorporated with $30,000 capital to manufacture machinery, by George F. Elliott, 6 East Buena Vista avenue, Highland Park, Mich.

DETROIT—Atlas Foundry Co., 131 South Livernois, has let contract to W. F. Demske, 633 Majestic building, for a foundry addition costing about $40,000.

DETROIT—United States Rubber Co., 6600 East Jefferson avenue, will let contract soon for a plant addition costing about $3,000,000. Lockwood Greene Engineers Inc., 10 Rockefeller Plaza, New York 20, are engineers.

DETROIT—American Smelting & Refining Co., Federated Metals division, 11630 Russell street, is preparing plans for a plant addi-

tion for chlorine rack house and dross room, to cost about $70,000.

DETROIT—American Thermal Industries Inc., 321 Stephenson building, has been incorporated with $150,000 to conduct the business of manufacturing, servicing and fabricating, by Emanuel Feinberg, 3359 Cortland street.

DETROIT—Improved Tool & Mfg. Co., 17113 West McNichols road, has been incorporated with $105,000 capital to manufacture tools, dies, jigs and gages, by Joseph J. Schwerak, 8868 Meyers, Detroit.

DETROIT—Secor Electric Service Co., 16594 Fairfield street, has been incorporated with $50,000 capital to manufacture and repair electric fixtures, by Milton S. Secor, at above address.

DETROIT—Johnson Piston Ring Co., 6010 Woodward avenue, has let contract to the Clausen Co., 15529 Woodrow Wilson avenue, for a manufacturing and office building.

FERNDALE, MICH.—DeVlieg Machine Co., 450 Fair avenue, has let contract to H. E. Rudy Co., 4181 Oakman boulevard, for a machine shop addition estimated to cost about $50,000.

JACKSON, MICH.—Calvin Machine Products Co., manufacturer of parts for Ford Motor Co., suffered damage estimated at $40,000 from an explosion and fire in its plant.

LANSING, MICH.—Abrams Instrument Corp., 606 East Shiawassee street, has been incorporated with $50,000 capital to manufacture aerial instruments and equipment, by Talbert Abrams, same address.

LITCHFIELD, MICH.—Litchfield Products Co., has been incorporated with $50,000 capital to design and manufacture mechanical devices, by K. E. Nelligan, Litchfield.

MONROE, MICH.—Monroe Tool Mfg. Co. is having plans drawn by Stephen M. Jokol, architect, Monroe, for a plant addition.

MT. MORRIS, MICH.—Erie Tool, Gage & Engineering Co., 8005 North Dort highway, has been incorporated with $50,000 capital to manufacture tools, gages, dies, jigs, by Clifford R. Gay, 1921 Barth street, Flint, Mich.

STURGIS, MICH.—Laughlin & Seger Mfg. Co., 303 West Chicago road, has been incorporated with $50,000 capital to manufacture mechanical parts and equipment, by F. M. Seger, 701 East Chicago road.

MASSACHUSETTS

LAWRENCE, MASS.—City has plans under way for a 175-ton incinerator costing about $185,000 as postwar project. F. A. Blackstock is city engineer.

NEW YORK

SYRACUSE, N. Y.—General Electric Co., 1 River road, Schenectady, N. Y., is preparing plans for a group of industrial buildings costing $500,000. Giffels & Vallet, 1000 Marquette building, Detroit, are architects.

NEW JERSEY

HILLSIDE, N. J.—H. Breen Iron Works Inc., 1450 Chestnut street, has let contract to D. & G. Construction Co., 178 Goodwin avenue, Newark, N. J., for a one-story 61 x 250-foot steel shop, to cost about $45,000.

PENNSYLVANIA

EASTON, PA.—Lehigh Foundries Inc. has been granted WPB permission to construct an addition containing 30,000 square feet floor space and install machinery and equipment for production of mortar shells, to cost $1,240,000, expiring June 30, 1945.

JEANETTE, PA.—Pennsylvania Rubber Co., P. C. Mathewson, vice president, Chambers avenue, has plans by Fletcher Thompson Inc., 211 State street, Bridgeport, Conn., and will take bids soon on a one-story 175 x 200-foot plant.

McKEES ROCKS, PA.—Continental Can Co., W. F. Lenhart, plant superintendent, has plans nearly completed and will take bids soon for a one-story forging plant costing about $100,000.

TITUSVILLE, PA. — Universal-Cyclops Steel Corp., is having plans prepared for a one-story plant costing about $45,000.

WARREN, PA.—Pennsylvania Electric Co., P. J. Harris, president, Johnstown, Pa., has plans for postwar construction of a 30,000-kw generating plant costing about $4,000,000.

OHIO

AKRON, O.—Firestone Tire & Rubber Co. has received WPB approval for additional equipment and facilities for production of fuel cell fabrics, etc., at Newcastle, Ind., including mixing equipment, rubber cutter, conveyors, to cost $770,490, expiring Oct. 1, 1945.

BUCYRUS, O.—Crawford Steel Foundry Co. has received WPB approval for addition of shakeout and sand-handling equipment, to cost $56,065, expiring June 30, 1945.

CLEVELAND—Baker Raulang Co., E. J. Bartlett, president, 2168 West Twenty-fifth street, has plans for postwar construction of a one and two-story plant addition costing about $100,000.

CLEVELAND—LaGanke Electric Co., 2400 Woodland avenue, has been purchased by Raymond G. Hathorn, 976 Union Commerce building and name will be changed to LaGanke Electric Mfg. Co. Concern manufactures panel boards for electric controls on submarines and naval craft.

CLEVELAND—International Power Machinery Co. has been incorporated with $10,000 capital, authorized to issue 250 shares of $100 par value. David M. Kaufman, 978 Union Commerce building, is agent.

CLEVELAND—Superior Foundry Co., 3542 East Seventy-first street, will build a one-story 30 x 103-foot foundry addition costing $6200, part of a WPB-approved project costing about $60,000, which includes a sand return system.

MIDDLETOWN, O.—American Rolling Mill Co. has received WPB approval for installation of an additional four-hole row of soaking pits and minor track changes, to cost $283,600, expiring June 30, 1945.

ILLINOIS

EAST ST. LOUIS, ILL.—General Chemical Co. plans construction of a plant to produce 35,000 tons of chemicals annually, to cost about $500,000, with equipment.

JACKSONVILLE, ILL.—Illinois College has had plans prepared by D. B. Hull, 77 West Washington street, Chicago, for a power plant building, with equipment, to cost about $40,000.

JACKSONVILLE, ILL.—Morgan Milling Co., 116 North East street, plans early construction of a 150,000-bushel soy bean mill and storage plant on Henry street, estimated to cost about $120,000.

MONSANTO, ILL.—Monsanto Chemical Co., 1700 South Second street, St. Louis 4, plans erection in this vicinity of a sulfuric acid plant to cost about $700,000, with equipment.

MISSISSIPPI

NATCHEZ, MISS.—Armstrong Tire & Rubber Co. is having plans drawn by James T. Canizaro, architect, Jackson, Miss., for a boiler room addition 35 x 65 feet, including wiring and heating, to cost about $12,500.

ARKANSAS

HELENA, ARK.—Delta Fertilizer Co-operative Association, E. T. Wells Sr, president, has acquired the old Helena oil mill and plans erection of a modern fertilizer mixing plant.