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STEEL

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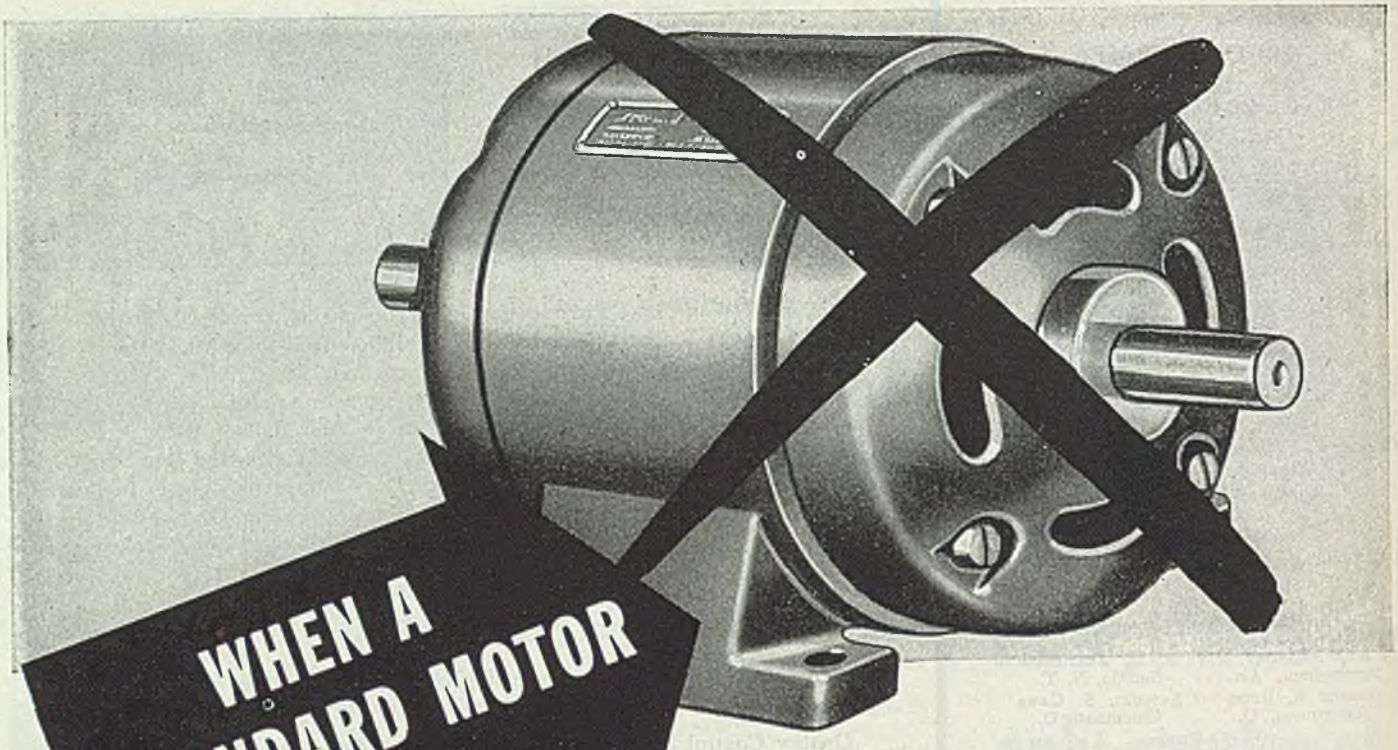

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STEEL
February 26, 1945

Confusion in Manpower

In view of the great confusion prevalent regarding manpower, it would appear that it is high time that somebody in the executive department of the government should get into this problem with both feet, sift the facts from the fallacies and move toward a prompt correction of what rapidly is becoming an unmanageable situation.

We have yet to encounter a competent industrial engineer or experienced employer who really believes that the present reported shortages are as acute as represented. Many contend that the nation has a sufficient number of workers to carry on all essential work, providing that this working force is distributed properly and is permitted to work without restraint.

If one considers, in addition to this expert testimony, the scores of examples of manpower wastage that come to attention daily, one is forced to conclude that the nation is suffering keenly from inefficiency in its administration of manpower controls and of policies affecting working conditions.

This inefficiency runs from the top to the bottom of our manpower bureaucracy and it probably is caused more by improper organization, overlapping and conflicting authorities and just plain officious red-tape than by any other factor. At a time when the situation is crying aloud for simplification and co-ordination, the national policy seems to be veering in the opposite direction.

For example, although hundreds of hard-working WMC, USES and other officials are striving desperately to relieve shortages, they are doing it independently of national policy. In Allentown one plan is being tried, in Cleveland a different plan and in Chicago still another plan. Each has its merits and its faults and, to be absolutely fair about it, these experiments doubtless were authorized with the idea that if somebody hit upon an outstandingly good plan, it later on could be adopted on a national scale.

However, the practical effect of this experimentation is to impose temporary hardships on different groups in different localities and to create complicated local systems which will be subject to frequent changes. It tends to complicate and confuse at a time when simplification and clarification should be the order of the day.

Certainly sufficient experience has been gained in manpower matters since 1941 to afford the proper officials a basis for sound, understandable policy. Why isn't it possible for them to define this policy and adopt it on a broad scale so as to put an early end to unnecessary confusion, delay and waste?

BRIDGES OF SHIPS: Of the 13,000,000 deadweight tons of merchant ships scheduled to be built in 1945, about 9,000,000 tons are expected to be completed during the first half of the year. As the program begins to taper off in the summer months, about 100,000 employes will be released from building. All of these and more will be needed for ship repair work, but unfortunately many who are engaged in shipbuilding do not possess the skills required in repairing.

With a shift in emphasis from new construction to repair and maintenance in sight, it is interesting to note that the peak of steel demand for shipbuilding occurred in 1943, when the yards took 11,459,122 net tons of steel mill products. Consumption in 1944 totaled 10,422,687 tons. Unless present schedules are revised upward sharply, shipments to shipbuilders in 1945 will fall below that figure.

From 1936 through 1944 American yards turned out 4553 vessels with an aggregate rating of 46,384,000 deadweight tons. This wonderful achievement, which reflects great credit upon the shipyards

(OVER)

and upon the structural steel fabricators who worked with them, will afford this nation a merchant fleet at the end of the war that will constitute roughly two-thirds of all the shipping in the world. —p. 54

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ARBITRATION IN STEEL: An interesting outcome of the negotiations between the United Steelworkers of America and the steel producing subsidiaries of the United States Steel Corp. is agreement on the establishment of a permanent arbitration board of three members. One member will be designated by the union, one by the company and the third, who will serve as chairman, will be designated by mutual agreement by both parties.

When company and union cannot settle an issue through ordinary grievance machinery, the problem can be submitted to the board for final and binding settlement. The board, by unanimous decision, may refer an issue to a single impartial arbitrator in the locality where the grievance originated.

Voluntary arbitration is being employed quietly and with more success than is generally realized in a number of industries—particularly textiles and motion pictures. Its trial in steel circles will be watched closely. Success in this field would enhance the prestige of arbitration tremendously.

—p. 49

° ° °

INVITES TRICKERY: Bill H. R. 97, now being considered by the House Judiciary Committee, provides that a patent holder be deprived of his rights whenever it can be proved that he has used the patent in restraint of trade.

We question seriously the soundness of this proposal because there is so much confusion as to what actually constitutes restraint of trade. Most industrialists would like to see effective curbs against monopolistic practices, but recent experiences indicate that attacks against restraint of trade and monopoly more often are dictated by personal whim than by law.

It is a sad commentary on justice that this nation, failing to convict a man on a fairly obvious charge of murder, will resort to a charge of violation of the income tax laws in order to punish him. H. R. 97 might tempt prosecutors to rig interpretations of the anti-trust laws to persecute a patent holder for real or imagined wrongdoings far removed from his ownership of a patent. —p. 60

PERTINENT CURRENTLY: Sweden's trade agreement with Germany for 1944 provided that the latter would furnish the former 280,000 tons of steel in that year. Most of this was delivered, but the almost complete stoppage of trade between the countries now compels Sweden to increase her domestic production. Imports from Germany accounted for about a quarter of Sweden's requirements. In increasing production to overcome this deficiency, Sweden will reverse its proportion of commercial steels to high-grade steels. Normally her output of high-grade steels constituted more than half of total production. Now Sweden faces the prospect of producing 60 per cent commercial steel and 40 per cent high-quality steel.

—p. 57

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PYROMETER FOR MOLTEN STEEL: Metallurgical engineers have developed a platinum thermocouple pyrometer which measures the temperature of a steel bath in the melting furnace. The reading is recorded automatically by an electronic instrument so promptly that the entire operation requires only 45 seconds. This permits submerging the immersion head in metal at temperatures as high as 3200 degrees Fahr., obtaining the reading and withdrawing the unit before the heat damages it. Cost per reading is slightly above $1. —p. 100

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CALL IN DOCTORS FOR CMP: When WPB was matching steel allocations against the tonnage available on a short-term basis, the Controlled Material Plan worked quite satisfactorily. Now procurement officers are requesting long-term specifying. This, in conjunction with increasing manpower shortages, is placing a terrific strain upon CMP and it may have to be modified to meet the new conditions. —p. 52

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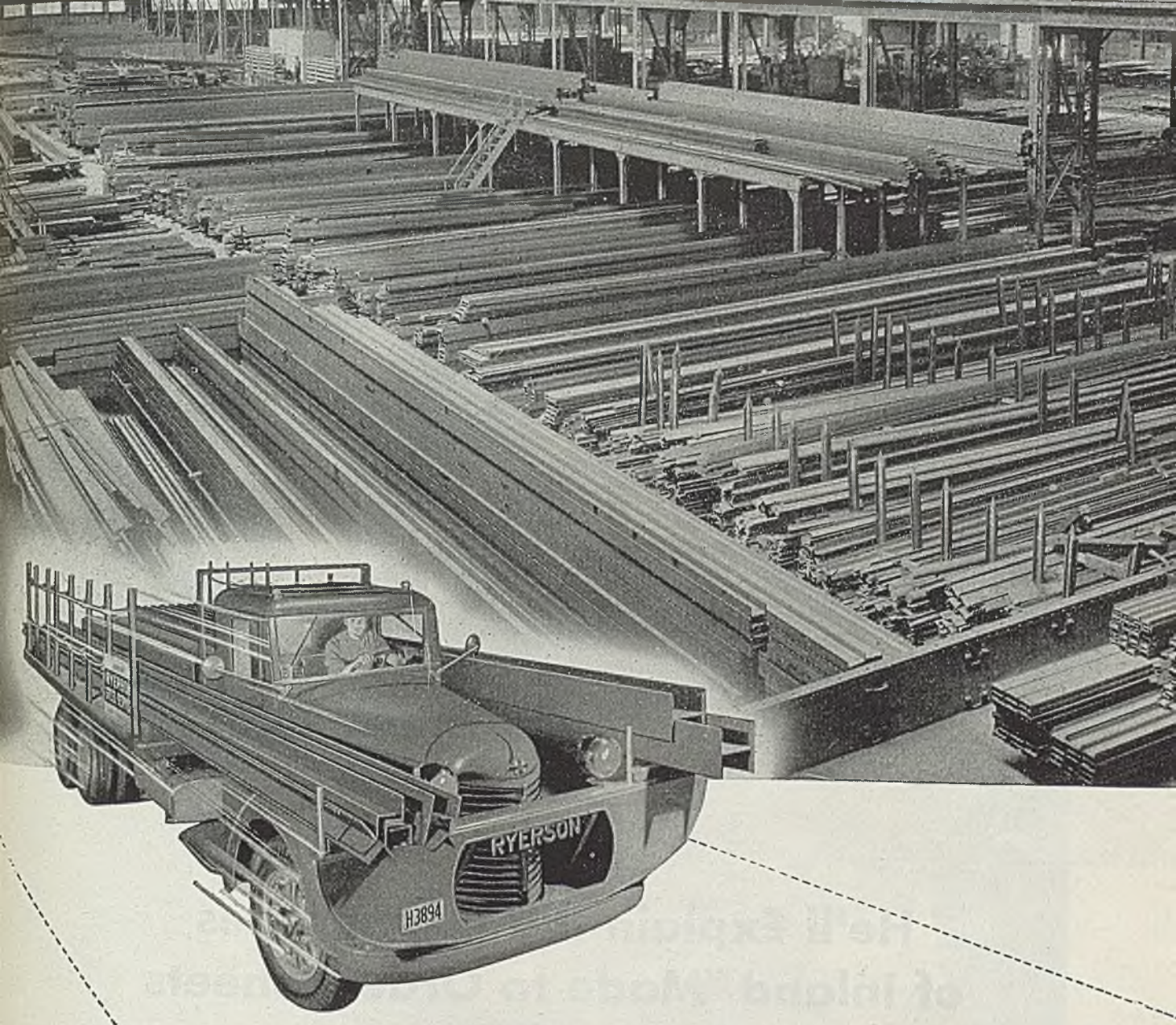
CAPACITY UP 17% IN WAR: Since early 1940 when the national defense program started, American steelmaking capacity has been increased by nearly 14,000,000 tons or 17 per cent. Official annual capacity as of Jan. 1, 1945, for steel ingots and castings is 95,505,280 tons and for pig iron and ferroalloys 67,313,890 tons. —p. 51

° ° °

E. L. Shaner

EDITOR-IN-CHIEF



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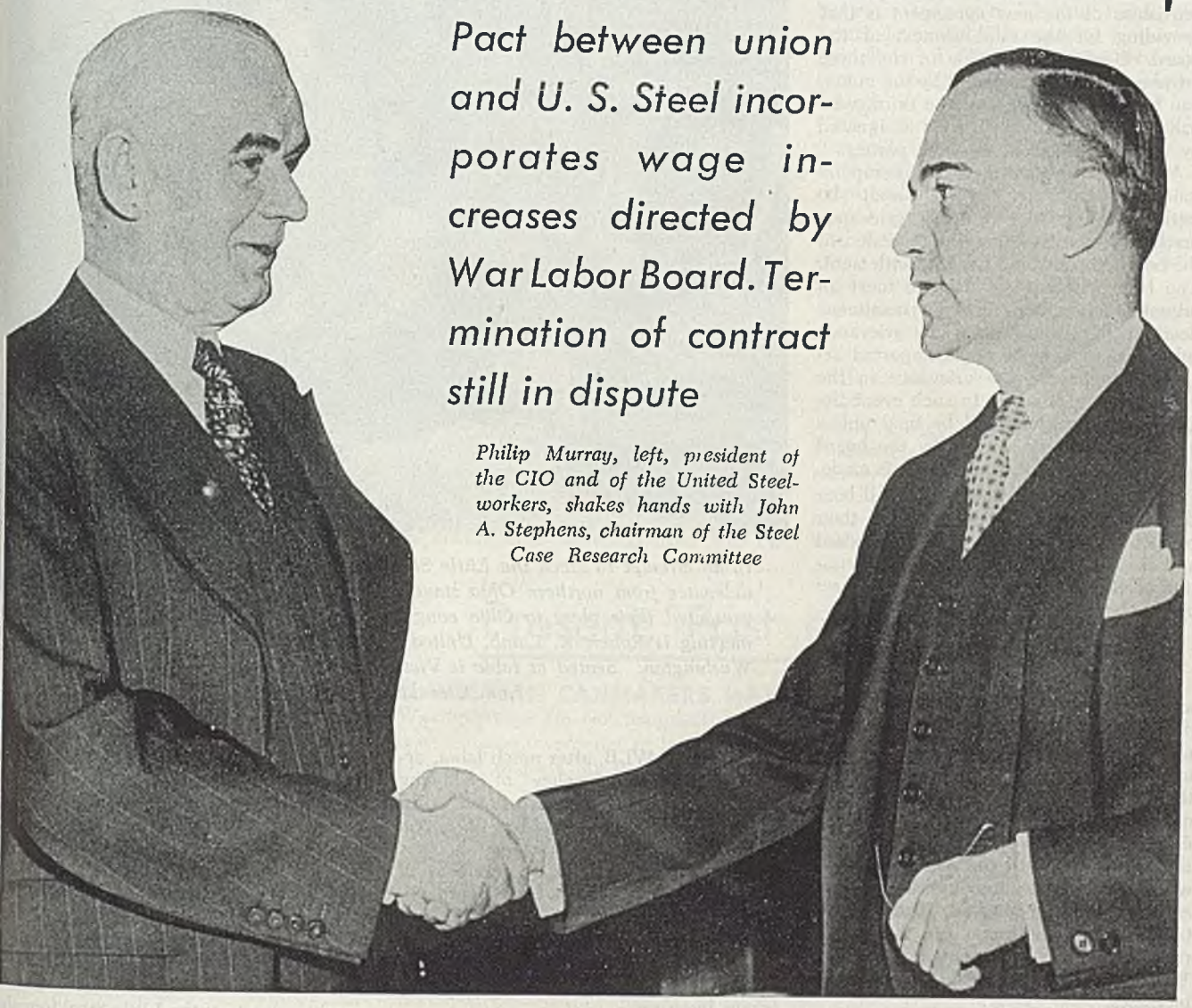
Permanent Arbitration Board Set Up

Pact between union and U. S. Steel incorporates wage increases directed by War Labor Board. Termination of contract still in dispute



Philip Murray, left, president of the CIO and of the United Steelworkers, shakes hands with John A. Stephens, chairman of the Steel Case Research Committee

NEGOTIATIONS for new labor agreements incorporating the "fringe" wage advances ordered last November by the War Labor Board and providing for the establishment of a permanent three-man board of arbitration have been completed between the United Steelworkers of America and the steel producing subsidiaries of the United States Steel Corp.

The contract drawn between Big Steel and the union is expected to serve as a pattern for agreements with other basic steel producers. Arrangements for negotiations between these companies and the union have been or soon will be made.

Negotiations between the union and Republic Steel Corp. opened in Cleveland Feb. 22, while negotiations between Youngstown Sheet & Tube Co. and the union were scheduled to start Feb. 26.

Only unsettled point in the agreement is the term of the contract. This will be determined by the WLB which held a hearing on the issue Feb. 23. The union has asked for a fixed term contract running to the fall of 1946, freezing all provisions of the agreement, with the exception of wages, for a period of nearly two years. The companies' position is that the termination clause should be the same as in prior agreements, subject to reopening by either party at any time. The producers accepted certain provisions in the agreement, such as maintenance of membership and the check-off, under government pressure for the duration of the emergency. They hold they should not be bound to these war-imposed conditions after the emergency ceases.

Aside from the provisions directed by the WLB and the arbitration board there are but minor changes over the 1942 agreement. In the minor changes, however, the union appears to have made some inroads into the functions of management. One steel spokesman likens the establishment of the arbitration board as setting up a judiciary over a "common law" in labor relations, much of which has evolved under wartime conditions and under the aegis of a labor government.

The concessions ordered by the WLB, and approved by Economic Stabilizer Fred M. Vinson, include shift differentials, liberalized vacation pay, more holidays, and the establishment of guide posts for the determination and correction of alleged "intraplant wage rate inequities."

The shift differentials provide for a 4-cent-an-hour premium for the second shift and a 6-cent premium for the third.

The vacation clause affords one week's vacation with pay for workers with one year's service and two weeks vacation for employes with five years' service. Vacation pay may be given in lieu of vacation from jobs.

Recognized holidays include Jan. 1, Memorial Day, July 4, Labor Day, Thanksgiving Day and Christmas Day. By local arrangement another day may be chosen in place of Memorial Day.

War rate inequalities are to be settled by a commission (not to be confused with the board of arbitration) as provided in the WLB directive order.

The contract includes the WLB's statement of principle regarding severance pay; details will be worked out later by mutual agreement between the companies and the union.

Maintenance of membership and the

checkoff are again incorporated in the agreement as ordered by the WLB.

Considered one of the most important provisions of the new agreement is that providing for the establishment of the board of arbitration. One of the three members will be designated by the union, one by the company, and the third, who will serve as chairman, will be designated by mutual agreement by both parties.

Whenever the union or the company conclude that any issue cannot be settled through the ordinary grievance machinery, the issue may be appealed to the board for final and binding settlement. The board, because of need to meet an urgent situation, may refer, by unanimous decision, the disposition of any grievance submitted to it by a single impartial arbitrator to handle the grievance in the locality where it arose. In such event the arbitrator's decision shall be final unless either party asks a review by the board within ten days after the decision is made.

The company and the union shall bear the expenses and compensation of their respective representatives on the board and shall share equally in the compensation of the chairman and other expenses of the board.

WLB To Pass on Termination

The agreements will be signed formally after the WLB has passed on the matter of termination, and will settle for the present the steel wage case which was instituted in December, 1943, dragged through prolonged hearings before a panel of the WLB during 1944 until the board issued its directive order on Nov. 25, then hung fire until the end of the year when the board's directives were finally approved by Mr. Vinson. The negotiations between the union and the leading producer were started soon after Mr. Vinson had given his blessing to the wage increases.

The increases will be retroactive to around the end of 1943 or the beginning of 1944, depending on the expiration of the earlier contracts. In the case of the leading producer, the increases are retroactive to Jan. 4, 1944. The United States Steel Corp. in reporting 1944 earnings noted that $30 million had been set aside to provide for the retroactive wage increases.

The steel wage case was generally expected to set the pattern and establish a policy for the settlement of other major wage cases which long have been pending before the WLB. The circuitous approach, the lengthy hearings and the extraordinary reasoning by which the board granted a wage increase while pretending not to apparently have satisfied no one. Industry is not satisfied with a policy which raises labor costs, retroactive for a year or more, while stabilization officials refuse to permit prices to rise. Organized labor is openly attacking the WLB for not granting greater increases and charges the board with deliberate stalling on its wage demands.

Stabilization officials have their own battle among the various agencies concerned. The WLB, after much labor, arrived at a misty policy of allowing "fringe" wage increases. Economic stabilizer Vinson, whose approval is necessary before these increases can become effective, has asked for a statement of policy and suggested that the board obtain opinions from the Office of Price Administration as to whether or not contemplated wage increases would necessitate price increases before directing fringe increases.

In an attempt to crack the Little Steel wage formula "once and for all," CIO delegates from northern Ohio staged a "march on Washington," where they presented their pleas to Ohio congressmen. Pictured above speaking at the meeting is Robert K. Lamb, United Steelworkers' legislative representative in Washington. Seated at table is Victor Decavitch, a spokesman for the union from Cleveland. NEA photo

Members Want Free Hand

Members of the WLB insist they cannot function as they wish under such a policy, that they should be free to decide each case "on its merits" without regard to its effect on prices. What the board means by the "merits" of a case is a little difficult to understand in light of the avowed purpose of the stabilization program to prevent price increases.

However, the board apparently wants authority to grant fringe increases with the hope of winning labor's favor for the board's good intentions. If these must be disapproved, they would like Mr. Vinson to shoulder the onus. But Mr. Vinson prefers to pass responsibility along to OPA.

Pressing against this uncertain stabilization policy are the demands of large segments of organized labor whose demands have not yet been settled. Last week the WLB moved to grant fringe increases to the meat packing workers and the textile workers. Demands from other powerful unions still are pending.

Meanwhile, organized labor continues its campaign for outright scrapping of the Little Steel wage formula, and delegations of CIO members have been traveling to Washington to bring pressure to bear on the government.

A powerful threat to the entire stabilization program is expected to develop when the United Mine Workers present their demands to the coal mine operators when their contract expires March 31. While the miners' demands have not yet been made public they are expected to call for substantial wage increases, beyond the limits of the Little Steel formula. Traditionally the miners have refused to work without a contract.

Interim Price Rise Seen Added to Base Quotations

Amendment No. 12 to revised steel price schedule No. 6 is expected to be issued within the next few days by the Office of Price Administration. The amendment, it was reported in Washington late last week, was ready for issuance except for the signature of the executive officer of OPA. The amendment, it is understood, clarifies the price situation in that it allows the interim price increases in amendment No. 11 to be added to mill base prices rather than to the delivered price.

Through amendment No. 12 the warehouses and exporters will be permitted under existing regulations to add the higher mill prices to their quoted prices to customers. This was prevented by regulations so long as the interim order specified that the price increases applied only to delivered and not base prices.

Ingot Capacity Raised Million And Half Tons Since Mid-1944

Steel plant rated at 95,505,280 ingot tons as of Jan. 1, 1945. Open-hearth and electric furnace facilities gain but bessemer capacity declines. Decline reported in pig iron and ferroalloy plant

PRODUCTIVE capacity of the United States steel industry has risen to 95,505,280 tons of ingots and castings per year, as of Jan. 1, 1945, the American Iron and Steel Institute reported last week.

That figure, marking virtual conclusion of the industry's huge wartime expansion program, is nearly 1,500,000 tons greater than the annual capacity of 94,054,550 tons reported in midyear 1944.

Since mid-1940 when the national defense program was started, close to 14,000,000 tons of new annual capacity have been added by the industry.

Annual capacity for production of pig iron and ferroalloys at the start of 1945 was 67,313,890 tons. This was a decline of 1,132,420 tons from the 68,446,310 tons reported July 1, 1944, and was caused largely by abandonment or dismantling of certain furnaces not now economical to operate.

The industry's annual capacity for production of by-product and beehive coke was 61,919,840 tons as of Jan. 1, 1945, an increase of 469,860 tons from the 61,449,980 tons reported Jan. 1, 1944. All of the increase was accounted for by new by-product coke ovens.

Open-hearth steel capacity was rated at 84,171,590 tons annually at the start of 1945, a gain of nearly 1,600,000 tons from the 82,604,600 tons reported last July 1.

The increase reflects chiefly enlargements of some furnaces and the decision on the part of certain companies to assign to steelmaking a few open-hearth furnaces that previously were used to melt down scrap and pig iron preparatory to final refining in electric furnaces.

Electric furnace capacity increased 83,440 tons from July 1, 1944, to January 1, 1945, annual capacity of these facilities now being rated at 5,455,890 tons. The capacity of bessemer steel production facilities was reduced by 200,000 tons to 5,774,000 tons annually as of Jan. 1, 1945. Capacity for making steel by the crucible process remained unchanged at 3800 tons.

Equipment for Chilean Steel Plant To Be Bought Here

Preliminary plans for an iron and steel plant at Concepcion, Chile, have been completed and some of the construction contracts are scheduled to be placed as soon as details of financing have been completed. The Chilean government's Corporacion de Fomento de la Produccion, 120 Broadway, New York, has applied to the Export-Import Bank, Washington, for a loan of $20,000,000, and the Chilean government is expected to advance an additional $20,000,000. All of the money advanced by the Export-Import Bank would be spent in the United States for equipment and engineering services.

Initially the plant will include one blast furnace with annual capacity to produce 250,000 metric tons of pig iron. It would operate on high-grade Chilean iron ore, on coking coal mined nearby, and on limestone brought in by sea from northern Chile.

Plans for steelmaking facilities call for bessemer converters, electric and open-hearth furnaces with capacity to permit production of 80,000 to 100,000 metric tons of finished rolled steel annually, enough for substantially one-half of Chile's normal needs. The preliminary plan calls for three mills, a rail and structural shape mill, a merchant mill and a sheet mill. Products are to include rails, shapes, merchant bars, concrete reinforcing bars, wire and wire products, black sheets and, later on, galvanized sheets, welded tubing and tin plate.

Surplus pig iron is to be used in making cast iron pipe and in producing miscellaneous iron and steel castings in two small foundries which are part of the project.

The Corporacion de Fomento de la Produccion also has plans for a copper refinery with annual capacity for 30,000 tons of electrolytic copper which would be consumed by Chile's expanding metalworking industries.

Present, Past and Pending

WESTERN CANMAKERS MAY RAISE TIN PLATE STOCKS

WASHINGTON—Tin can manufacturers in California, Oregon, Washington and Utah may increase inventories of tin plate to 90-day requirements during the period from March 31 to Sept. 30. Present limit is 60 days.

E. J. POOLE JR., CARPENTER STEEL OFFICIAL, DIES

READING, PA.—Ernest J. Poole Jr., 48, vice president in charge of manufacture and a director of the Carpenter Steel Co., died Feb. 19 in this city. He was a graduate of the U. S. Naval Academy at Annapolis, and entered the employ of the company in 1922. He succeeded his father, E. J. Poole Sr., as vice president upon the latter's death in 1937.

LABOR SHORTAGE CUTS SCREW MACHINE PRODUCTS OUTPUT

WASHINGTON—Serious shortage of set-up men in the automatic screw machine products industry, now operating at only 60 per cent of capacity, is endangering production of artillery and mortar ammunition and bomb programs, War Production Board said last week. Several hundred additional men are needed to fill these essential jobs.

PENALTY FOR OVERSTATING SETTLEMENT CLAIMS MODIFIED

WASHINGTON—Office of Contract Settlement has issued regulation 13, dealing with the suspension or modification of the penalty for overstating claims in connection with interim financing.

SEEKS BIDS FOR 24 DIESEL-POWERED TANKERS

WASHINGTON—Invitations for sealed bids for construction of 24 new single screw diesel-powered tankers were announced last week by the United States Maritime Commission. This constitutes the largest single invitation since 1941.

NAVY AWARDS KAISER CONTRACT FOR 8 ESCORT CARRIERS

WASHINGTON—Navy has awarded Henry Kaiser Inc., Vancouver, Wash., a contract for construction of eight aircraft escort carriers to cost about $88 million.

DOUGLAS AIRCRAFT GETS ORDERS FOR 2000 WAR PLANES

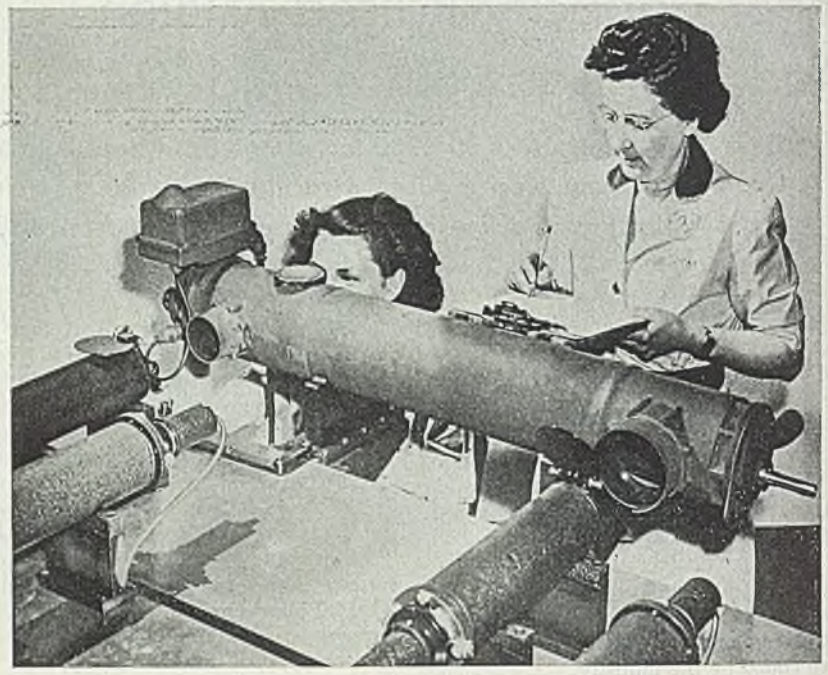
SANTA MONICA, CALIF.—Douglas Aircraft Co. has received orders since Feb. 5 for nearly 2000 war planes, aggregating around $32 million on the basis of unit costs of previous contracts.

WPB MODIFIES CERTIFICATION OF USED RAIL SALES

WASHINGTON—It is now necessary to secure certification on sales of used rail only for relaying track, as provided in the amended WPB order L-88. No control over transfer or sale of relaying rail when used for that purpose is established by the amendment.

Situation In Steel Tightening

Manpower shortage prevents maximum utilization of steel-making facilities to meet increasing pressure from Army and Navy to fulfill materiel requirements



INCREASES ACK-ACK ACCURACY: Utilizing new optical principles, this M-10 range finder is expected to increase the accuracy of American antiaircraft fire and may even have an application in defense against robot bombs. Two employes of the Eastman Kodak Co., Rochester, N. Y., originators of the new range finder, check the M-10, which is to be mounted on directors that control the fire of 40-millimeter antiaircraft guns. NEA photo

WITH the war demand load upon the steel mills increasing under accelerated pressure from the Army and Navy to meet critical materiel needs, concerted efforts are being made to prevent the piling up of tonnage on steel mills to threaten smooth and equitable distribution of available supply under the Controlled Materials Plan.

Manpower shortage, for one thing, is preventing maximum utilization of steel-making facilities. Indicative of the problem is the case of the Carnegie-Illinois Steel Corp. at its Gary and East Chicago plants. Because of progressive manpower shortage at these plants, the corporation estimates that currently it is losing 10,500 net tons of steel ingot production every week. Of this, 7500 tons are at Gary, and 3000 tons at South Chicago. Contributing heavily to the lowered output is the longer time required to reline furnaces because of insufficient workers.

Operated at 98 Per Cent Capacity

Despite this handicap, however, the corporation's plants in 1944 produced approximately 10,000,000 tons of ingots, which represented operations at 98 per cent of capacity. Total loss over this period, since manpower surveys were first started, aggregates 310,000 tons. Manpower needs at the moment are for 2100 additional workers, 1100 at Gary and 1000 at South Chicago.

The steel manpower problem was discussed at a meeting of the Steel Industry Advisory Committee in Washington last Friday.

Within the past several weeks a number of prominent steel executives who had resigned from the Steel Division, War Production Board, and returned to their companies, have been recalled to government service with a view to straightening out a scheduling "mess" which is reported to have arisen. Those recalled include: Norman Foy, Republic Steel Corp., Cleveland; A. A. Wagner, Jones & Laughlin Steel Corp., Pittsburgh; Walter Wiewel, National Tube Co., Pittsburgh; Thomas Ford, Electro Metallurgical Co., New York; L. E. Creighton, Rotary Electric Steel Co., Detroit, and J. K. Kilmer, Bethlehem Steel Co., Bethlehem, Pa.

As originally conceived the Controlled Materials Plan was designed to control the flow of critical materials into war consumption so as to insure maximum production of war products and essential civilian products within the limits of available materials and facilities. Basically, the plan is divided into two major important phases: 1, matching the use of materials to the supply of materials; and 2, controlling the flow of materials so that available materials reach the right place at the right time in the proper quantities.

Almost immediately upon its adoption in November, 1943, the plan worked. The scheduling and delivery mess which had resulted from the piling of priorities upon priorities disappeared quickly. However, the smooth functioning of CMP largely was due to the fact it was designed to operate for the short-term, it being necessary for consumers to specify their needs well in advance of allocation for a quarter.

Currently, however, the distribution system has been thrown somewhat out of gear by a trend toward long-term specifying which has been developing for some months past. Early in February this trend was further stimulated by a request which went out from the government procurement agencies to war contractors requesting that they get required tonnage on mill books as far ahead as a year. This move was intended to make it possible for manufacturers and their subcontractors to "pull out the stops" and drive ahead for the year's production goals, fortified by a realistic picture of the year's requirements. This departure from the former practice of ordering only for three months ahead, it is said, is tending to complicate orderly distribution procedure. Some observers in the steel trade see in this new ordering policy possible return of the disjointed distribution which prevailed prior to the adoption of CMP.

Carbon Steel Requirements Up

Second quarter carbon steel requirements of 17,457,000 net tons are about one million tons over those for the initial three months of this year. Recent lag in steel production which forced a substantial increase in the carryover tonnage of allotted carbon steel products, and the substantial rise in a number of war program schedules, are the chief factors behind the enlarged second quarter steel needs. Steel required for the ammunition program alone has been increased 450,000 tons for the period.

Overall steel allocations for second quarter are reported to have been scaled down at least 3 million tons from the claimant agencies' stated requirements of 17,475,000 tons for the period. Even after this screening it is reported stated

allotments are in excess of probable production for the quarter.

Office of Defense Transportation as claimant agency for the transportation industry has been allotted 1,065,000 tons of carbon steel for second quarter requirements. It had asked for 1,527,000 tons. In the first quarter the railroads were allotted 1,254,000 tons.

Indicative of the tightness in steel for second quarter also is the fact that while the roads had asked for 250,000 tons of steel to build 13,500 freight cars they were allotted only sufficient to build 7500 cars. Also, the roads' request for 600,000 tons of rails was scaled down to 417,000, and a request for 150,000 tons of steel for replacement auto parts was whittled to 130,000 tons.

WPB officials point out that the carryover from fourth quarter of 1944 of allotted carbon steel products into first quarter was about 1.5 million tons, and is expected to reach 2.5 million by March 31, because of the extremely unfavorable circumstances hampering steel output. In addition to shortage of labor, gas supply has been acute through most of the current quarter, which combined with the coal shortage and the transportation tie-ups, forced a substantial reduction in steel production since the first of the year.

Second Quarter Requirements Firmer

First quarter carbon steel requirements of 16,406,000 net tons were screened down to actual allotment of 16,125,000 tons. However, requirements for the coming quarter are firmer, due to more intensive pre-screening by claimant agencies. WPB is expected to allot less steel, percentagewise, in relation to supply for second quarter than has been the case in the past periods.

Stated carbon steel requirements of the claimant agencies for the second quarter (before final screening) compared with first quarter stated requirements follow:

Army, increased from 3,761,000 net tons in first quarter to 4,521,000; Navy, up from 1,272,000 to 1,308,000; Maritime Commission, up from 960,000 to 969,000; Foreign Economic Administration, up from 1,157,000 to 1,368,000; War Food Administration, down from 1,172,000 to 1,063,000; Petroleum Administration for War, up from 397,000 to 436,000; Office of Defense Transportation, down from 1,585,000 to 1,527,000; and the Office of the Operations Vice Chairman, (which represents the large number of B products and components, capital equipment and various segments of the civilian production) up from 3,407,000 to 3,657,000 net tons.

There is only one remedy for the situation facing the steel industry in the second quarter and that is more production. However, practically every accomplishment in this direction has been offset by adverse developments. All the factors, negative and positive, in getting out more steel production, were discussed recently by steel operating men and WPB

(*Concluded on Page* 162)

Allentown's Modified Labor Draft Reported Working Satisfactorily

Shifting of workers from nonessential to essential plants under "voluntary" plan proving successful. Other tight labor areas are adopting similar programs. Some 26,300 workers in district subject to war work "draft"

THE ALLENTOWN, PA., plan for the "voluntary shifting" of less essential workers into high priority war jobs appears to be working out satisfactorily, with certain other areas now taking up the same program.

Launched Jan. 24, the program as of Feb. 10 accounted for the shifting of 338 men from the first three nonessential industries approached and, with a survey of others under way and likely to be concluded soon, this figure is expected to jump shortly. Approximately 1000 will be required, according to manpower officials, to get them "over the hump" on the more critical requirements, although 1900 men are needed to meet the demands of the critical and somewhat lesser essential industries.

The program is being first tried out in an area found to have the most highly diversified war essential industries in the United States.

Plan Covers 110,000 Workers

This area, it was developed, had 110,000 workers (including women), with 81,000 engaged in essential industries, thus leaving 29,000 in nonessential occupations. Of these 29,000, 2700 were occupied in very small establishments, which the manpower commission decided not to take into account in any proposed shift, leaving 26,300, of which 13,500 were women and 12,800 men, of whom, interestingly, 555 were World War II veterans.

The manpower commission started the development of its program by first singling out three nonessential industries, with a view to shifting a number of the male employes into critical work. These three nonessential industries were the brewery industry, which comprised nine plants; the cement industry, 18 plants; and the bottling industry, seven plants.

Following an inventory by WMC of the companies involved, "selective ceilings" were set on the number of employes these firms might have. These nonessential companies then made available to the manpower agency a list of employes whom they agreed to release in order to reduce their employment to the ceilings established. They provided data as to names, ages, draft status and previous work experience of these employes. The United States Employment Service was then given the job of handling the placement of the workers.

If, for any valid reason, the agency can not use a released worker the company, under the program, is supposed to take him back and offer another prospective war plant worker in return. Unions and management have been co-operating in the program, and, according to Dr. Frank Maguire, WMC director for the Allentown area, men transferred do not have to join any unions in the plants to which they are transferred.

Of the three nonessential industries first surveyed, an assessment of 460 workers was finally made. Of this number, 413 were actually considered up to Feb. 10, with 365 finally sent to USES for placement (28 were withheld due primarily to physical disqualifications). Of the 365 sent to the employment agency 338 were placed, with 27 referred back to the War Manpower Commission for further consideration. Of the 338 placed, 290 were transferred to 10 war plants, each taking five or more men, with the remaining 48 sent to other important plants, each taking less than five men.

Incidentally, in addition to the 338 which were placed under the program as of Feb. 10, 409 male workers have left nonessential industries since Jan. 1 to engage in critical war work. Thus, with these 409 additional workers, there has been a total of 747 male employes to enter war plants in the period from Jan. 1 to Feb. 10.

Metalworking Needs Predominate

The requirements of the steel and metalworking industries are the heaviest among the more critical industries, with the needs of the Bethlehem Steel Co. the largest for any single company in the area. In January, it is said, Bethlehem's manpower situation showed a "plus" for the first in some time.

Work in the Allentown area has encouraged other areas to try out similar programs.

Whether the Allentown plan is the answer to the nation's manpower problem is debatable. In Washington certain important figures in Congress view the results in Allentown as so satisfactory they would enforce it nationally through legislation. In Allentown proper, however, opinion is divided, though publicly, as a general thing, both management and labor have endorsed the plan. Some employers appear enthusiastic about it, especially those benefitted by the referral of workers to their plants. Union leaders are inclined to be critical about the whole thing. They charge workers are being referred to war plants and compelled to take pay cuts in some cases averaging as much as 30 cents an hour.

Breakdown of Steel Mill Product Shipments to the Shipbuilding

(Net Tons)

Products	1944*	1943	1942	1941	1940	1939	1938	1937
Semifinished (ingots, blooms, billets, slabs, tube rounds, sheet and tin bars)	211,000	118,144	76,815	32,344	8,177	.....	.....	.....
Structural shapes and sheet piling	1,620,000	1,820,127	1,667,100	442,066	143,324	79,058	50,343	51,841
Plates (universal and sheared)	7,100,000	7,503,124	6,064,447	1,565,528	568,574	330,106	226,052	231,750
Rails—60 lbs. and over	185	1,133	1,811	1,937	.....	.....	.....	.....
All other rails	115	72	461	374	.....	.....	.....	.....
Total rails	300	1,205	2,272	2,311	968	480	103	118
Tie plates and track accessories (incl. track spikes)	325	175	590	353	247	204	59	84
Hot-rolled bars (carbon, incl. hoops and bands)	475,000	621,670	504,033	190,154	58,626	.....	.....	.....
Concrete reinforcing bars	15,000	75,996	55,395	2,113	192	796	396	225
Alloy bars	78,000	53,690	36,443	19,038	6,527	.....	.....	.....
Cold finished (carbon and alloy)	42,500	37,114	34,390	15,687	.....	.....	.....	.....
Total bars	610,500	788,470	630,261	126,992	65,345	36,422	22,187	42,271
Pipe and tubes	275,000	338,406	260,072	97,848	19,668	146,722	14,304	7,784
Wire rods	1,500	2,211	5,133	1,406	840	.....	.....	.....
Wire and wire products (incl. fence posts)	47,000	73,925	56,191	15,253	1,951	8,890	4,846	9,695
Black plate	575	483	.....	25	94	144	112	93
Tin and terne plate (hot and cold-reduced)	962	478	638	247	.....	.....	.....	.....
Sheets and strip:								
Hot-rolled	376,500	383,041	291,353	95,287	18,468	.....	.....	.....
Cold-reduced	61,000	34,916	24,198	9,998	7,535	.....	.....	.....
Galvanized	115,300	116,874	91,864	35,015	8,777	3,672	2,126	3,160
All other	.....	1,706	2,608	4,316	2,084	.....	.....	.....
Total sheets, strip	552,800	536,537	410,023	144,616	36,864	27,927	7,045	9,346
Tool steel bars	1,050	877	1,660	1,556	603	.....	.....	.....
Wheels and axles	400	1,958	1,111	1,152	.....	.....	.....	.....
Forgings	.....	221,256	180,144	172,851	.....	.....	.....	.....
Steel castings	.....	37,845	30,328	12,485	.....	.....	.....	.....
All other steel products	975	13,901	12,621	5,317	93,469	29,982	20,414	5,543
Grand Total	10,422,687	11,459,122	9,399,406	2,722,350	940,124	659,935	345,465	358,915

*Estimated. Figures for 1926-39 compiled by STEEL; for 1940-43 by American Iron and Steel Institute.

Shipbuilding To Hold Close to Peak Through First Half of 1945

SHIPBUILDING activity is scheduled at near record levels throughout the first half of 1945, to be followed by a tapering in construction through the balance of the year. Deliveries of ships are currently at a peak for the war period to date.

Of the 13 million deadweight tons of merchant ships to be constructed in 1945, present schedules call for about 9 million tons in first half. The Maritime Commission's stated second quarter carbon steel requirements have been revised upward 9000 tons to 969,000 tons.

Every effort is being made to work into the shipbuilding program all available surplus materials. Greater utilization of existing inventories, it is hoped, will relieve pressure for prompt deliveries on some steel items and reduce to a minimum surplus materials that otherwise would be on hand when the program is completed.

During the coming summer months about 100,000 workers are expected to be released from shipbuilding. However, all of these and more will be needed in ship repair. Unfortunately all those released will not be familiar with the type of tasks involved in ship repairing, so there will be some dislocation when the shipbuilding program is adjusted downward and repair activity moves up in the latter half of this year.

Peak in shipment of steel for shipbuilding occurred in 1943, when 11,459,122 net tons of steel mill products were purchased by the industry. In 1944 purchases totaled an estimated 10,422,687 tons; while in 1942, 1941 and 1940 they amounted to 9,399,406, 2,722,350 and 940,124 tons, respectively.

Percentagewise the shipbuilding industry purchased 17.1 per cent of total steel mill product shipments last year, compared with 18.9 per cent in 1943 and 16 per cent in 1942.

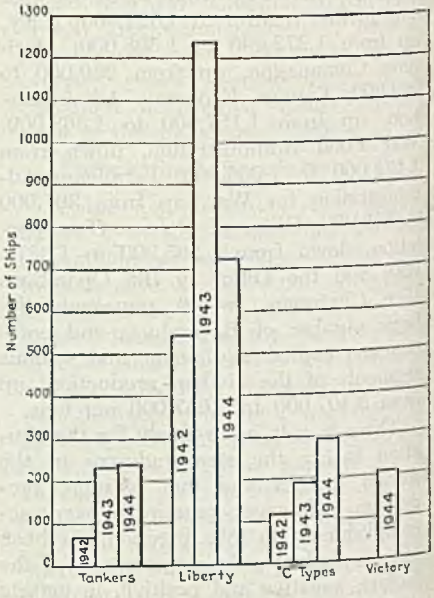
The industry's purchases of plates and shapes—two major tonnage items—were also off during the past year, totaling 7.1 and 1.6 million tons, respectively. In 1943 the comparable figures were 7.5 and 1.8 million tons.

In contrast with the trend in most steel products, the industry purchased more cold-rolled sheets and strip, alloy and cold-finished (carbon and alloy) bars last year than in 1943.

Although the output of merchant shipping in 1944 fell below the 1943 total, the shipbuilding industry established a new record last year by installing a total of 7,448,950 horsepower main propelling machinery in 1463 seagoing merchant ships—an aggregate of propulsion machinery nearly twice as great as that of our entire merchant marine prior to Pearl Harbor.

Phenomenal growth in shipbuilding activity in recent years is indicated by the fact that in the 13 prewar years the industry's annual steel purchases averaged only 232,000 tons.

War needs have determined the type of vessels the merchant marine has built in recent years. Thus, although the merchant fleet available for postwar operations will be unprecedented in number of vessels and tonnage—constituting perhaps more than two-thirds of all



Construction of "C" type vessels continues upward trend. Liberty ship output cut sharply

dustry by Product Classification from 1926 Through 1944

(Net Tons)

1936	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
40,693	30,389	30,349	14,517	15,866	46,434	71,329	58,882	38,048	39,848	51,989
174,496	103,070	105,095	67,119	55,324	115,303	215,165	209,011	92,312	149,277	131,872
.....	.....	.....	.....	.....	.....	.....	.....	3	.....	2
.....	.....	.....	.....	.....	.....	.....	.....	2	.....	2
78	105	105	29	.....	1	465	.....	5	.....	4
78	55	12	22	.....	.....	15	.....	.....	4	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
152	90	85	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
24,830	20.771	22,726	11,688	10,923	25,599	31,852	31,548	15,666	36,411	25,303
3,168	9,507	6,615	2,210	1,509	2,612	3,268	7,843	6,064	4,002	2,448
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1,953	2,139	4,633	1,569	2,661	2,210	4,386	6,726	2,588	3,285	1,566
624	3	.....	.....	59	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1,584	1,459	1,308	821	1,045	1,893	1,230	6,306	1,590	22	.....
7,138	8,270	3,680	2,700	2,119	7,061	12,093	16,024	10,092	2,265	1,930
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
6,382	1,408	196	209	748	1,464	6,937	2,107	3,618	10,989	4,369
259,441	175,717	173,412	100,065	89,208	200,683	345,510	332,140	168,394	246,083	219,482

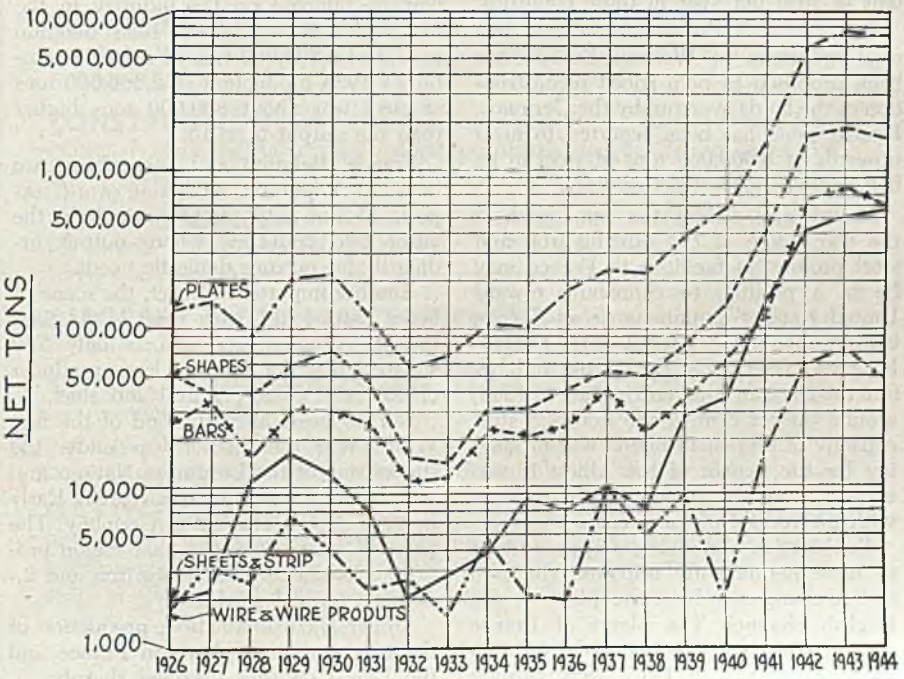
the shipping in the world—there is question as to what proportion will be suitable for postwar commercial service.

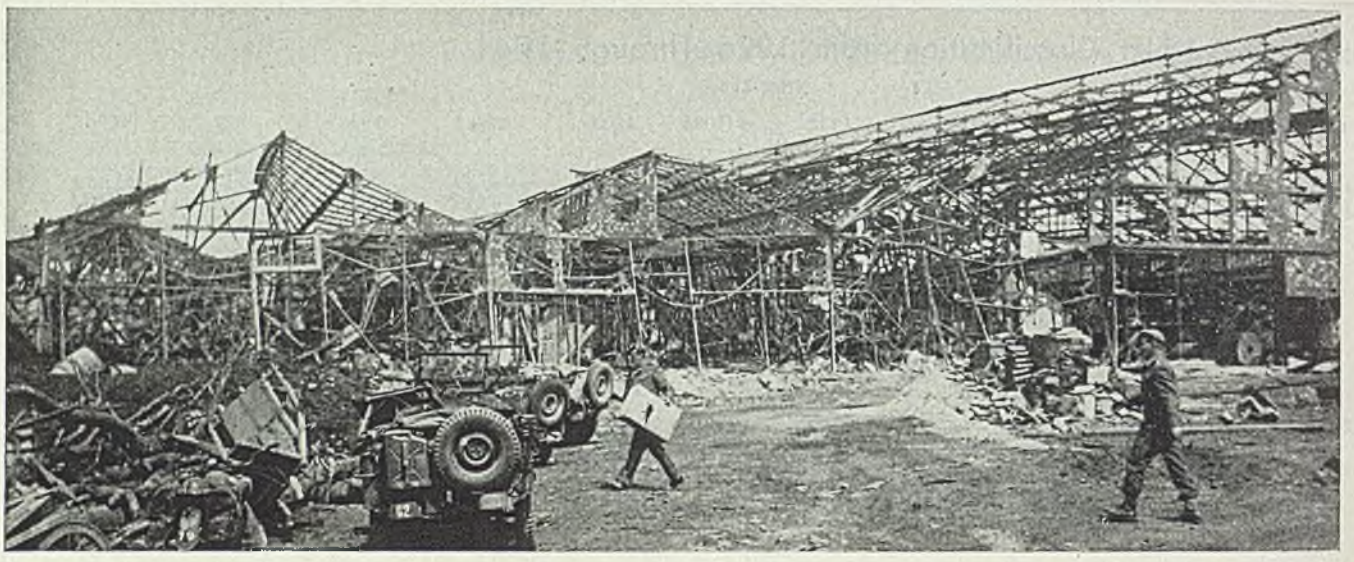
Construction of merchant ships in the years 1936 through 1944 totaled 4553 vessels, of 46,384,000 deadweight tons. A breakdown of 4504 of these vessels by types shows that 2502 are Liberty ships, generally looked upon as expendables of war. The Maritime Commission contemplates disposal of these vessels so that they will not "hang over the market" in the postwar period. Some 533 vessels, or 11.6 per cent, are C-type ships, of which an unknown number have been built as, or converted to, military types. Another 522, or 11.8 per cent, represent high-speed, quality tankers. About 2.3 per cent, or 104 vessels constitute Victory ships (exclusive of those Victorys converted to war purposes). Some 365 ships, or 8.1 per cent, are considered special or military type. However, in 1944 alone, about 580 merchant ships built during the year were turned over to the Army and Navy for military use. How many of these later can be converted to peacetime service is unknown. The remaining 478, or 10.6 per cent, comprise coastal vessels, emergency tankers, concrete vessels and other types, some of which have good prospects of postwar usefulness.

Losses at sea, obsolescence and the vast amount of shipbuilding which has been designed especially for war needs will considerably reduce the postwar potentialities of our war-built fleet. The final outcome depends on such factors as shipbuilding costs, prices of government-built ships to operators, international agreements and other imponderables.

While the merchant fleet has quadrupled in size during the war period, the fleets of other maritime powers have shrunk to 50 per cent or less of their prewar strength. Thus, in the immediate postwar years, this country will have the advantage of unquestioned maritime supremacy. In the early stages of the postwar period it will be the chief carrier of the world's commerce, and will have a modern shipbuilding and ship repair industry second to none in the world. About 2000 good quality competitive ships will be available from the government's huge accumulation for shipowners seeking to augment their postwar merchant fleet. In addition to this shipping leadership, there will be a need for postwar building of special types of ships for specific services.

SHIPBUILDING INDUSTRY TAKES LESS STEEL IN 1944





Twisted steel framework is all that remains of this armament plant at Lebisey, near Caen, France. Similar devastation is to be found in many French industrial areas, indicating the magnitude of the reconstruction. NEA photo

Prompt Rebuilding of French Steel Plants Expected After War

Enlargement and modernization of facilities followed World War 1, American Iron and Steel Institute points out. Prewar ingot capacity of France and the Low Countries was 18 million net tons

RECONSTRUCTION era which followed World War I resulted in enlargement and modernization of the iron and steel plants of France and the Low Countries, states the American Iron and Steel Institute, declaring that if history is repeated, after the present war in Europe there may be a similar expansion over the prewar capacity of about 18,000,000 net tons of steel per year in those countries.

Restoration of the important iron and steel industries in Western Europe has been proposed to help speed reconstruction of the lands over-run by the Germans. France alone has been reported to need upwards of 8,000,000 tons of steel in its first postwar reconstruction year.

Meanwhile, during the remainder of the war, some of the existing iron and steel production facilities in France may be in a position to contribute toward United Nations' munitions needs if coke can be obtained. Six weeks after Luxemburg was freed from the Nazis, and before the German counterdrive late in 1944, around 30 per cent of the iron and steel capacity of that small nation was producing for the benefit of the Allies. It was expected that the amount would increase with the receipt of more coke.

Subjugation and changes appear never to have permanently impaired the iron and steel industry from the Rhine to the English channel. The plants of France proper, which produced around 5,000,000 net tons of steel in 1913, were turning out approximately the same amount per year by 1925 after declining to around 1,985,000 tons in 1918. The mills of Alsace-Lorraine, returned to France in 1919, added about 2,899,000 tons of production to the 1925 figure above.

Belgium's production of around 2,719,000 net tons of steel in 1913 dropped to 11,619 tons in 1918 following the severe damage inflicted on the industry in the first World War. But in 1925 Belgium produced 2,809,000 tons of steel. Luxemburg's 1925 production of 2,300,000 tons of steel was about 800,000 tons higher than the output of 1913.

France, Belgium and Luxemburg are normally important factors in world exports of iron and steel, particularly the latter two countries where output ordinarily far outruns domestic needs.

Another important district, the scene of fierce battles early this year, is the Saar region. Although its area is only 750 square miles, the Saar is a large producer of coal and coke, pig iron and steel.

For 15 years after the end of the first World War the district was under the supervision of the League of Nations and within the French Customs area. Early in 1935 it was returned to Germany. The previous year, 1934, the Saar region produced 2,012,000 tons of pig iron and 2,150,000 tons of steel.

Under Nazi domination, production of the iron and steel plants in France and the Low Countries declined sharply.

Production of iron and steel products in France, the country's chief industry, is at a minimum. Her largest iron mines, in Lorraine, are still immediately behind the battle lines, and the strangulation of the coal industry and transportation also affects the industry adversely, according to the Office of War Administration.

Some steel plants are in operation, however, and it is expected that the Allies will put the maximum effort into rehabilitating this industry as quickly as possible. In 1938, France produced 6,049,000 metric tons of pig iron and 6,174,000 tons of steel ingots and castings. Renewal of this rate of production is dependent currently upon repair of the transportation system.

France is requesting importation of 300,000 tons of partly fabricated iron and steel products to assist in this repair, and to provide emergency housing until such time as the steel and iron industry can be got into heavy production again. This request likely will be granted as soon as possible in line with the Allies' determination to assist France in her rehabilitation, especially if it will hasten the defeat of Germany.

France's total industrial plant withstood war damage with an incapacitation of only about 15 per cent. Nevertheless, because of shortages of raw materials and fuel, and because of transportation difficulties, many factories have closed.

Substantial shipments of supplies already have been made into France, including the following to restore transportation facilities: Steel rails, 125,000 tons; structural steel and iron, 30,000 tons; bridge equipment (including 400 railway, 200 highway, and 130 Bailey bridges), 150,000 tons; construction equipment (including 4000 tractors, 650 road graders, 3000 air compressors, 500 cranes, and 20,000 other items), 1,000,000 tons.

Shipments of civilian supplies to France during January totaled 46,000 tons.

Swedish Steel Industry Expansion Spurred By Cutting Off Imports from Germany

ONE effect of the stoppage of Sweden's trade with Germany is an increasing strain on the Swedish iron and steel situation. According to the trade treaty for 1944, German deliveries of iron and steel were to total 280,000 tons, representing about one-fourth of Sweden's consumption. When the Swedish-German trade was practically halted last fall the bulk of this quantity had been received, but at present Sweden is entirely cut off from such imports.

This development was foreseen, however, and when it happened much had already been done to increase Sweden's own iron and steel production. Many expansions had been made at the steel mills, and much existing equipment modernized. It had also become necessary to divert high-grade steel facilities to production of commercial grades. Commercial steel now constitutes about 60 per cent of total Swedish output, while in prewar years production of high-grade steel exceeded that of commercial grades.

Present plans aim at increasing production of rolled iron, which in 1943 mounted to 885,000 tons, to at least 1 million tons.

Since Sweden's supply of scrap is limited, expansion of steel production must be based exclusively on pig iron. As fuel, domestic charcoal must be used as much as possible. Stocks of coke will be reserved primarily for Domnarvet, Sweden's largest iron works. At present this plant accounts for about one-fourth of Sweden's total iron production and about one-third of the output of commercial steel. It is said to use less coke per ton of pig iron than any steel mill in the world.

The Swedish output of pig iron, which in 1938 amounted to about 670,000 tons, was stepped up to 780,000 tons in 1943. In 1944 it probably was well over 800,000 tons, having reached 440,000 tons during the first half of the year.

The new pig iron plant near Lulea, in the far north, which is financed by the government, began operations during 1944. It has a capacity of 60,000 tons per year, using two electric furnaces, with coke as reducing agent. A third furnace, which will raise capacity to 90,000 tons, is being planned. It will be completed early in 1946.

Freight Rates on Armor Steel Called Unreasonable

Rates on steel armor plate and shapes when shipped in carloads in designated freight areas, were found to be unreasonable in a tentative report filed with the Interstate Commerce Commission last week.

The finding supported the complaint of the Navy Department, with the War Department, Maritime Commission, and others as interested parties, that the interstate rates on steel armor plate and shapes in carloads, were unreasonable in all except southern-classification territory, and held that rates on shipments out of that area and into other sections, were likewise unreasonable.

Complaints were filed by the Navy with the ICC after months of negotiation with the carriers, and alleged that the rates were in many instances, "strikingly" in excess of rates charged on the general run of iron and steel articles.

The principal movement during the past four years, it was stated, was from about a dozen producing points as far east as Fitchburg, Mass., and west to Indianapolis, Ind., principally to Navy yards and shipyards.

Industry Must Recognize Postwar Social Problems

Activities of the iron, steel and metalworking industries after the war will be tied in more closely than ever before with the social problems of the nation and of the world. If industry is to retain the high respect of the public which it has earned through its achievements during the war, it must show the man-in-the-street it recognizes and understands this closer relationship between industry and social problems. This was the admonition of E. L. Shaner, editor-in-chief of STEEL, addressing the Milwaukee chapter, American Society for Metals, Feb. 20.

Speaking on "Postwar Metallurgy," Mr. Shaner asserted that under the pressure of war, technological developments have been pushed ahead a decade or more. As a result, the industry has gained tremendous courage and confidence which will prove an asset for the future. Currently, the job is to let nothing interfere with winning of the war, but along with this assignment industry must back peace efforts and seek a better understanding of how it ties in with world needs.

With the return of competition, one of industry's major problems will be to provide the most goods at the lowest price for the greatest number of people possible. To this end, metallurgy's job will be to effect greater economy of materials and higher efficiency of manufacturing processes. During war, natural resources have been consumed at an alarming rate, and wasteful production of arms sometimes has been condoned because of military expediency.

POSTWAR PREVIEWS

INGOT CAPACITY—Virtual completion of the wartime steel expansion program has raised this country's capacity to 95,505,280 tons annually, about 14 million tons more than when the program was started in the middle of 1940. See page 51.

CHILEAN STEEL—Equipment for a new steel plant at Concepcion, Chile, will be purchased in the United States. See page 51.

EUROPEAN STEEL—Expansion in France and the low countries expected to follow termination of war. Needs for reconstruction will be heavy See page 56.

CONSTRUCTION—Plan for stabilizing postwar building advanced by National Planning Association. First peacetime decade should see $15.4 billion in new construction and $21 billion in maintenance. See page 58.

DIESEL ENGINES—New discoveries indicate new postwar applications for diesels. Now burn oil, gasoline or natural gas. West Coast manufacturers receiving inquiries from foreign countries. See pages 65, 71.

AIRCRAFT ELECTRICAL EQUIPMENT—Advances in design and recommendations for progress reviewed at AIEE meeting. See page 72.

CONTROLLING ENAMELING STEELS—To maintain quality, protect customers and lower manufacturing costs by reducing defective workmanship, Westinghouse each quarter grades suppliers' steels. Efficacy of program indicates continued use of quality controls after the war. See page 82.

GAS WELDED TUBING—Trend toward use of larger coils in streamlined tubing mills indicate possibilities for future use of this method. Electronic controls compensate for variations in material on unit which handles strip in 2500-pound coils, and still larger coils will be processed when available. See page 84.

Plan Suggested for Stabilizing Postwar Construction Industry

Annual volume of building necessary to maintain high employment level in first decade after war placed at $15 billion for new structures and $21 billion for maintenance in report prepared for National Planning Association

ANNUAL volume of construction appropriate to general high employment for the first postwar decade will not be less than $15.4 billion for all types of new construction, both public and private, and $21 billion for all construction maintenance, Miles L. Colean estimates in a report entitled "Stabilizing the Construction Industry," and published by the National Planning Association in co-operation with the association's committees made up of representatives of agriculture, labor and business.

"We cannot hope for a long-continued period of prosperity while insecurity is chronic in so vital an element of the economy as the construction industry," he says. The construction industry, he declares, averaging approximately 11 per cent of the nation's total income, has in the past repeatedly imperiled a large part of the nation's investment and added to the intensity of booms and depressions.

Mr. Colean's findings aim at demonstrating that "cataclysmic variations in activity" can be sharply modified by regulating the volume of public work. The experience of the 1930's has clearly demonstrated, he says, that public works alone cannot stabilize the entire economy. On the other hand, an approach in this direction can be made by the creation of machinery that we do not now have.

Comprehensive Information Needed

"Of the machinery needed for achieving conditions prerequisite to stabilization, probably none is more vital than the provision of competent and comprehensive information," he declares. "Adequate data in the construction field is essential to an understanding of the forces affecting the construction cycle and to the development of the means for guiding those forces in the interest of a more even flow of construction activity. To date, information in the construction field has been notoriously inadequate.

"There should be established in the Department of Commerce or some other appropriate agency a Bureau of Construction Economics, which would assemble, maintain and publish regularly an adequate series of data to serve as a barometer of construction activity. It would be desirable for the federal government to assume the task of initiating and directing this service, but that some sharing of the burden by local government should be anticipated.

"To help meet the country's construction needs on the broadest and most economical basis, an extensive program of technical and industrial research is necessary. The facilities for operating this program should be patterned along the lines of the National Advisory Committee for Aeronautics.

"In the past, lack of advance planning and appropriate timing has often caused public construction to increase rather than moderate the violence of the construction cycle. To provide for the use of public works as an effective instrument of stabilization, the following recommendations are made:

"1—The federal agencies concerned with construction should be authorized and provided with appropriations for planning and acquiring sites for public works in advance of determining the time of their construction, so that a backlog of planned public works may be maintained ready for contract, to supplement private construction as conditions may warrant.

"2—The policy of making loans to states and local governments, as provided in the War Mobilization and Reconversion Act of 1944 should be continued as a means of encouraging co-ordination of local and federal public works programs.

"3—A Federal Public Works Control Authority should be established to determine the timing of all federal construction and to co-operate with the states in carrying out concurrent policies.

"4—Such federal and local public works as are now definitely planned, or as may be speedily prepared for contract, should be undertaken at the earliest date consistent with the prosecution of the war, but that preparation be made to taper off operations in case of later labor shortages and cost increases which may result from an over-rapid expansion of private construction."

While no rigid control or programming of private construction is entertained, he says, there are possibilities of aiding private initiative that seem worthy of exploration. Among these are:

"1—Creation of a National Commission on Tax Integration to study the problem of the equitable allocation of tax sources to remedy present tax provisions which are deterrent to private construction.

"2—Provision of adequate credit for new construction and maintenance operations through expansion of the Reconstruction Finance Corp. loan facilities.

"3—Regulation of land subdivision by local government as a means of influencing the timing of construction as well as the character of platting and the type or cost of building.

"4—Removal of trade barriers and restrictions so that, through competition, every possible opening might be allowed for the introduction of improved techniques and for the expansion of the industry into the most stable sections of the market.

"5—Removal of obsolete structures which place a limit on the amount of new construction that the economy might absorb."

Maintenance operations will be of major importance to a stabilization pro-

ASKS LEND-LEASE EXTENSION: Henry L. Stimson, left, secretary of war, confers with Rep. Sol Bloom, chairman of the House Foreign Affairs Committee. Secretary Stimson called for an extension of the Lend-Lease act with its full effectiveness and "without delay." NEA photo

$1140.

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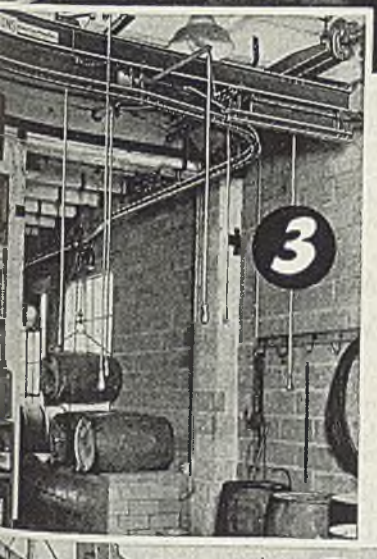
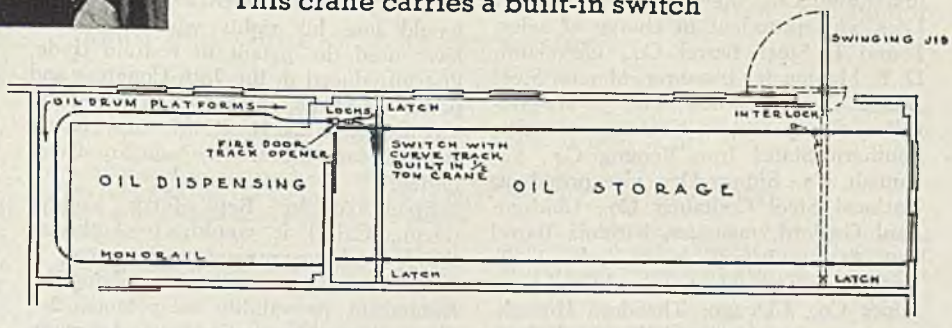
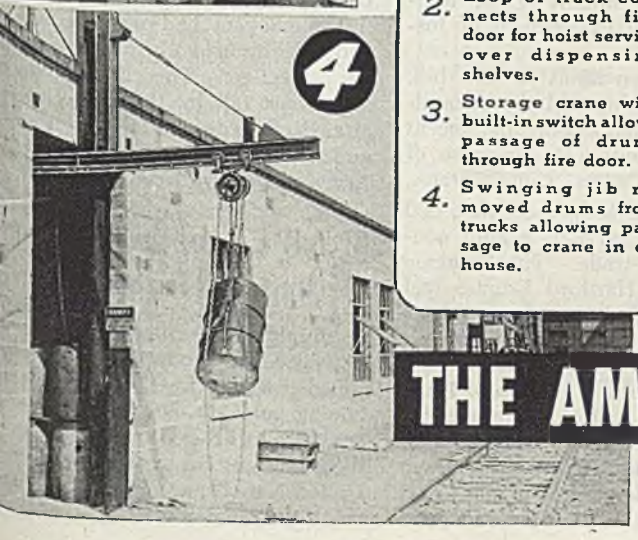
This installation represents only a small investment. At a cost of only $1140 the system includes a standard jib crane which interlocks with a special bridge crane inside the oil house. This crane carries a built-in switch







1. Special crane carries drums across switch to track in dispensing room.
2. Loop of track connects through fire door for hoist service over dispensing shelves.
3. Storage crane with built-in switch allows passage of drums through fire door.
4. Swinging jib removed drums from trucks allowing passage to crane in oil house.

permitting passage of hoist to a curve connecting through the fire door to the single track loop of MonoRail around the dispensing room.

Here is another example of a low price system furnishing low cost operation of American MonoRail equipment. Let an American MonoRail engineer show you the answer to your troublesome handling problems at no cost to you.

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gram, says Mr. Colean, because of the volume of work involved and because this work usually can be initiated with minimum time lag. "It is evident from the response to credit facilities provided through FHA and the Home Owners' Loan Corp. that government stimulus can be helpful in increasing the volume of maintenance work, especially on residential buildings. FHA insurance of home repairs, therefore, should be maintained as a standby facility for credit expansion in times of emergency."

The task ahead, says Mr. Colean, will call for the co-operation of all participants in the construction industry, manufacturers, distributors, designers, contractors and labor, as well as government. However, he says, the goal is not insurmountable.

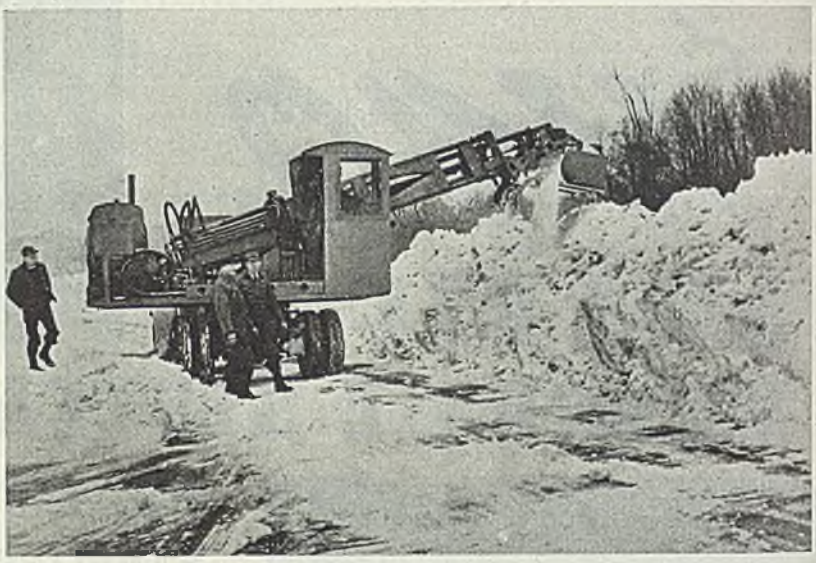
New Steel Drum Industry Advisory Group Organized

A New Steel Drum Industry Advisory committee has been established, Office of Price Administration has announced. Members of the committee are:

F. H. Alger, manager of sales, Stevens Metal Products Co., Niles, O.; R. L. Brammer, manager of sales, Wheeling Corrugating Co., Wheeling, W. Va.; J. A. Connelly, vice president, U. S. Steel Products Co., Sharon, Pa.; C. B. Coons, general manager of sales, Rheem Manufacturing Co., New York; Harry W. Lees, vice president in charge of sales, J and L Steel Barrel Co., Cleveland; D. F. Manion Jr., treasurer, Manion Steel Barrel Co., Rouseville, Pa.; J. W. McIntire, vice president in charge of sales, Southern States Iron Roofing Co., Savannah, Ga.; Sidney Dry, vice president, National Steel Container Co., Chicago; Paul Gaylord, manager, Virginia Barrel Co., Staten Island, New York; J. T. Gossett, vice president, Inland Steel Container Co., Chicago; Theodore Humphrey, manager of sales, Niles Steel Products Division, Republic Steel Corp., Niles, O.; George A. Sexton, vice president, Sexton Can Co., Everett, Mass.; Thomas M. Stinson, manager, Steel Drum Division, National Enameling & Stamping Co., Granite City, Ill.; H. P. Thelen, manager, Continental Can Co., New York.

Contract Settlement Guide Issued by Training Group

Contract Settlement Advisory Board's committee on training has published a guide to prepare war contractors for handling contract settlements. The booklet is designed to provide basic information for termination co-ordination committees, which have charge of local contractor training programs. It gives the contractors actual practice in filling out settlement proposal forms and solving practical problems dealing with such subjects as termination inventories, scrap disposal, etc.



ARC-WELDED ICE FIGHTER: This arc-welded, hydraulically-operated scoop quickly removes four to five feet of packed snow and ice which previously had defied standard-type bulldozers and plows. Photo from Lincoln Electric Co.

New Bill Would Deny Patent Holder Rights When Patent Is Used To Restrain Trade

A BILL under which a patent holder would lose his rights when found to have used the patent to restrain trade, first introduced in the 78th Congress and permitted to die, and just reintroduced in this Congress as H. R. 97, now is actively before the House Judiciary Committee.

Sponsored by Rep. Jerry Voorhis (Dem., Calif.) it would: 1—Authorize the federal government to intervene in federal court proceedings involving infringement or validity of patents; 2—require registration of patent agreements with the attorney general; 3—render unenforceable patents illegally used to restrain trade or commerce; 4—permit determination of the validity and scope of patents in antitrust proceedings. The bill has the active support of the antitrust division of the Department of Justice.

Need for the provisions of the bill, Representative Voorhis told the committee, has been emphasized by the recent Supreme Court decision in the case of Hartford Empire Co. vs. United States.

"In that case," he said, "more than 600 patents have been used in a joint conspiracy to restrain trade. The Supreme Court found that Hartford Empire had grossly violated the antitrust laws. Nevertheless, the majority of four judges felt it did not have the power under the existing antitrust statutes to keep Hartford Empire from enforcing in the future the patents which it had acquired for the very purpose of misusing them in restraint of trade. The Supreme Court referred to the fact that the Congress had failed to pass supporting legislatio providing imposition of a penalty as t patents used in violation of the anti trust laws . . . The Supreme Court di not think it had the power to grant thi public relief. If that is so, Congres should make it clear that the courts hav such power."

Motion That Suit Against WLB Be Dropped Is Denied

A government motion to dismiss a sui of the Farrell-Cheek Steel Co., Sandusky O., to void a War Labor Board order o maintenance of membership and wag provisions was denied by Judge Daniel W O'Donoghue of the district court of th District of Columbia recently.

The company had contended the boar had failed to hold a hearing before issuin the directive. The firm's plant wa seized last fall by the War Departmen after the firm did not follow a board orde and a work stoppage had resulted. Th Army still controls the plant.

Brazil Establishes System Of Import License Control

An import license control system cover ing specified products has been estab lished in Brazil for the purpose of main taining and developing the productiv activities of the country and to mak them more useful to the objectives of th United Nations, according to the Depart ment of Commerce.

OPRD Projects Make Important Contributions to Larger Output

WPB's Office of Production Research and Development co-ordinates projects. Results in development of successful substitutes for scarce materials and of valuable industrial processes, including improvements in blast furnace operation

RESEARCH projects that have been co-ordinated and expedited by the Office of Production Research and Development of the War Production Board in the last year have made important contributions to increased war production, WPB reported recently.

The actual research work has been and is being done by academic and industrial research groups employing thousands of experts. In addition to evaluating and initiating projects, OPRD also supplies necessary funds where research is not of immediate commercial value but which is necessary to the prosecution of the war.

Improvements developed in blast furnace operation, resulting in an increase of more than 10 per cent in production in the test furnace from the previous 1200 tons to 1400 tons a day, was one of the important projects sponsored last year by OPRD. This increase in production was accomplished with no increase in manpower or large scale equipment.

Some of the other special projects carried on with OPRD sponsorship included the following: Steel castings have been studied as a substitute for forgings in aircraft with excellent results and a reduction in manpower.

Because of the threatened shortage of high grade bauxite for airplane aluminum early in the war due to enemy submarine action, processes for the production of alumina from clays and other minerals were developed. West Coast plants utilizing these processes are expected to be in operation this year and will supply western aluminum plants.

Researches on the substitution of lead for tin in solders has resulted in an estimated saving of tin amounting to about 15,000 tons a year. A spectograph has been developed which permits direct readings of the analysis of metals and alloys, instead of requiring inspection by the photograph method. This will result in saving thousands of feet of critical photographic film and an additional large saving to smelters through better control of melts.

A fluoroscope has been developed which permits the inspection of small castings for defects while the castings move past the instrument on a carrier instead of inspection for X-ray photographs of each casting in three different positions. This fluoroscope will eliminate the necessity for employing X-ray specialists for inspection and will also save thousands of feet of critical X-ray film a year. It also will speed up inspection, particularly of aircraft parts.

As a result of research, existing coking methods were modified so that midwestern coals can be utilized for coke and thousands of car-miles saved in transportation of coal from the East.

An extensive research program has been set up to correlate technical information on the many variables which confront users of milling machines. Information in the form of data sheets is sent directly to users of the machines in order to help them operate at highest efficiency and improve the quality of their products.

A gasket-making machine has been perfected to the point where it can produce 40 gaskets per minute. It has been turned over to the quartermaster general for his guidance in the procurement of round section gaskets. These gaskets with a round cross-section have marked operational advantages over gaskets with a rectangular cross-section.

The need for large magnesium forgings in the aircraft industry, where light weight and great strength are desired, prompted new research. The results have been so promising the government has ordered an 18,000-ton press which will permit the production of magnesium forgings as large as those now made in Britain, Germany and Japan.

Due to the scarcity of tin, aluminum foil has been developed as a substitute. A new method was developed for welding aluminum foil for the lead wires in radio condensers.

Projects being carried on at present include a study to eliminate flaws in steel artillery shells, and development of a coating for wirebound radio and radar resistors. Continued co-ordination and expediting of research projects by the OPRD are expected to make additional important contributions to increased war production during 1945.

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

CHAIN: Within specified percentage of 1940 or 1941 production, chain manufacturers have been instructed to disregard preference ratings (other than AAA) to the extent necessary to fill orders for farm chain from suppliers and dealers serving the farm trade.

ENAMELED WARE: Enameled ware manufacturers have been granted permission to use sufficient iron and steel to make half as many cold pack canners for the 1945 home canning season as they made in the year ended June 30, 1941, or about 500,000 enameled canners. Any manufacturer who now has additional facilities available for production under direction 2 of L-30-b should file a letter with WPB, specifying the number of canners he wishes to make, the facilities he has for this purpose, and should be accompanied by form CMP-4-b for any additional steel needed and by form WPB-3820 (manpower clearance form).

INDEX OF ORDER REVISIONS

Subject	Designations
Lead Products	M-63
Mowers, Lawn	L-67
Scrap, Tin Plate	M-325
Price Regulations	
Dry Batteries	No. 576

L ORDERS

LAWN MOWERS: Exemption clause in order L-67, permitting manufacturers to fill orders of certain government agencies for gang lawn mowers, has been broadened to cover all types of lawn mowers other than hand mowers and to include the Veterans Administration among those agencies. (L-67)

M ORDERS

TIN PLATE SCRAP: Used tin can collection provisions of order M-325 now apply to all areas of the continental United States. All refuse collectors now must collect segregated prepared used tin cans and deliver them to or for the account of an official salvage committee, a detinning plant, a smelter engaged in recovery of tin, a shredding plant, or a plant engaged in the precipitation of copper. Packers using tin cans must deliver all "spoiled" or nonreusable tin cans to or for the account of a detinning plant, shredding plant, or official salvage committee.

On and after May 1, 1945, no person who generates tin plate scrap in the course of his manufacturing operations shall keep in his possession for more than 30 days a quantity of tin plate scrap that exceeds 60,000 pounds or a minimum carload lot, whichever is greater. (M-325)

LEAD PRODUCTS: Collapsible tubes (manufactured in whole or in part of lead or lead alloy), storage batteries (lead acid type), and foil (manufactured in whole or in part of lead or lead alloy) have been placed under import control, effective as of Feb. 14. (M-63)

PRICE REGULATIONS

DRY BATTERIES: Dollar-and-cent maximum prices for wholesale and retail sales of dry batteries have been established, based on those prevailing in March, 1942. They cover the following four general types: Flashlight, radio, hearing-aid, and those classified as miscellaneous. Batteries are covered in the new regulation by a detailed list of those offered for sale by each manufacturer, including the model number, description and applicable maximum price. (No. 576)

Intensive Promotion Program Helps Ste

Prospective workers see National Tube products, talk to company personnel, see pictures of workers on job in "downtown" employment office located in one of McKeesport's largest food stores, above. At right, Col. R. C. Downie, district chief, Pittsburgh Ordnance district, talks to prospects outside of employment office

PROPER sales approach and a continuing campaign can obtain manpower even from areas where the most severe shortages exist, one large steel producer has demonstrated in recent months. Using the same overall technique it used in peacetime to sell tubular goods to consuming industries, U. S. Steel's National Tube Co., Pittsburgh, has succeeded in keeping its established plants manned and, in addition, has recruited a large working force for a new plant exclusively engaged in war production.

Early in the war National Tube found itself in the position of all other employers in that its best men were being siphoned away by Selective Service and there were few if any replacement workers presenting themselves at plant gates for hire. The usual sources of classified advertising and employment agencies were used without much success. It became apparent that the workers just weren't to be had by ordinary means.

The company operates plants in McKeesport and Ellwood City, Pa., in Gary, Ind., and in Lorain, O. Most of these municipalities are small cities and in each the plants of National Tube Co. are important factors in community life.

A study showed that in a large majority of instances, wage rates paid by the company were at least equal to and sometimes higher than most wage levels in the area. The largest available source of labor was women, and for that reason, particularly in the Christy Park plant, which was reactivated to produce bombs, shells and other munition components, intensive campaigns were launched to bring in women workers. By the early months of 1944 it became apparent that employment levels at the Christy Park works and at the National works, both in McKeesport, could not be maintained by methods of recruiting workers then being used, so plans were made for an intensive campaign to recruit new employes.

After considerable behind-the-scenes planning and preparations, the first public evidence of the new plan broke on July 19, 1944. At the principal intersection in McKeesport there is a large supermarket-type food store. In this store the company leased space and installed an employment office. This was no ordinary employment office. It featured a puppet show, exhibits of the bombs and shells which were being made by McKeesport people. Attendants wore large buttons inviting "Ask me about a job." A representative from the United States Employment Service was on hand to supply proper referrals on the spot.

The plan worked. In ten weeks the two plants had gained 447 workers from this source alone. In addition to the downtown employment office, nearly 200 workers were recruited by means of a coupon plan whereby any worker in the company's plants who filled out a coupon with his own name and the name of a potential worker would be paid a bonus of $3 if that potential worker were hired and stayed through two pay periods or 30 days. If the new worker stayed 60 days, the bonus was upped to $5.

However, this program reached its saturation point in September and was dropped in favor of a new idea which

Producer Keep War Plants Manned

National Tube Co. aggressively seeks prospective workers. Opens employment offices—with entertainment—in shopping centers within reasonable transportation distances of plants. Solicits farmers for temporary employment by direct mail. Newspapers and radio carry appeal to potential employes

would expand the territory from McKeesport proper and its immediate vicinity to the only other labor market available, that of the surrounding territory within commuting distance of the plants. Since the entire area was listed as a shortage district by WMC and since industrial demand for workers had resulted in constant appeals from all types of manufacturing, it appeared the best bet for obtaining new workers was to attract those people whose normal occupations were seasonal in that fall and winter months represented an off-peak period. The new program was aimed at these people, including farmers, bricklayers, carpenters, and other workers whose normal activities were outdoor, good weather occupations.

At about the same time new government munitions buying programs resulted in a sudden need for a thousand new workers at the Christy Park plant and an increase at National works which supplied steel for the shell, bomb and rocket programs. Housing conditions in McKeesport were such that it was impossible to persuade workers to move to McKeesport to be near their jobs. The employment people decided to take the job to the prospect. "We literally had to take our employment office with us," says one member of the employment staff, "and we also had to bring the worker to the job."

USES offices in four counties around the plants were contacted. The first step was to send out a staff of research men to all towns and villages in the area to verify the number of available workers and survey the transportation problem. For this job men familiar with the local territory in which they worked were used. After these men had laid the groundwork, promotion crews were sent out. In connection with the promotion work, advertising was placed in weekly and daily newspapers in the territory to be covered by the promotion crew. All radio stations in the area carried one-minute commercials in as many spots as were available during the day. Placards were put in store windows, barber shops and offices throughout the territory and the promotion crews would set up shop at some central point and make advance dates for the recruiting crews which were to follow. In some cases volunteer fire department stations were used as headquarters, but drug stores, police stations, physicians' offices, and in fact any rural meeting place which might be available were used.

The promotion people dropped in at the local hotel and talked to the room clerk; they talked to the bartender, the doctor and dentist; they called on the chief of police, and other public figures and explained the need for workers at National Tube, and the advantages of working there.

Following the promotion men, came recruiting crews who rang door bells, set up employment offices of National Tube and branch offices of USES in every hamlet. They traveled through the countryside in automobiles and brought in potential workers to make it as easy as possible to sign up for a job.

The next step after recruiting these workers was to arrange for transportation to the plant. To do this eight bus lines were established covering the four-county area like spokes in a giant wheel. Operating on the "school bus" system, these lines picked up workers, brought them to the plant at every change of shift, and took the preceding shift's workers back home again.

Another activity which was highly important during the fall months was contact with the Granges. Through the USES, arrangements were made for representatives of National Tube Co. to attend Grange meetings and show films on the war, as well as on war production at the National Tube plants. Since the farmers at that time had completed their harvest, they were attending Grange meetings regularly and attendance was

(*Concluded on Page* 162)

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

ARMY E NAVY

MOLYBDIC OXIDE, BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

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By A. H. ALLEN Detroit Editor, STEEL

MIRRORS of MOTORDOM

New discoveries in diesel engines continue; now burn oil, gasoline or natural gas. Automotive Council for War Production blames inefficiency in manpower utilization to interference of labor unions and government agencies

DETROIT

AS INTERNAL combustion engine research plods along its way, some strange things are being discovered in the field of diesels. Less than a year ago General Motors diesel specialists found they could take one of their conventional compression-ignition units and switch the fuel from oil to gasoline with no impairment of operation and with comparable economy on a per-gallon basis. It has been reasoned that the diesel, with its 16 to 1 compression ratio against 6 to 1 for the spark ignition gasoline engine, would pre-ignite the fuel and generally mess up its operating cycle, but the reverse was found to be true—gasoline ignition took place more slowly than when diesel fuel was injected.

A couple of experimental tanks powered by diesel units were fitted with double fuel reservoirs, one containing gasoline and the other diesel fuel, arranged so that one or the other could be cut in at will. Test runs showed economy of 14 miles to the gallon with the diesel engine using gasoline, against 16 miles per gallon on straight diesel fuel, and 10 miles per gallon with a spark ignition engine and gasoline fuel.

Ordnance Officials Rejected Diesels

These tests seemed to point the way to more widespread use of diesels in tanks and other ordnance vehicles, since if they could operate on either fuel the problems of supply in the field would be much simplified. In addition, the diesel permitted greater range of operation with the same volume of fuel, and was believed to present less of a fire hazard in combat. However, it was ruled otherwise by ordnance officials, and the special Ford V-8 and V-12 gasoline engines became standard equipment for tanks.

There is much popular misconception of the nature of diesel fuel. It is not, as many think, comparable to thick lubricating oil but rather is a distillate of the color and consistency of kerosene. Anything thicker would quickly plug up injector units which have microbored holes on the order of several ten thousandths of an inch in diameter. In fact, the mechanic aboard one of the large railroad passenger engine diesel units in the East told this writer the fuel was rated at around 50 octane, and is filtered several times before it is admitted to the high pressure injectors. In view of this, it does not appear too surprising gasoline can be substituted for the conventional diesel fuel.

Now comes the Cooper-Bessemer Corp. with the announcement it has developed a method for switching a conventional large-size stationary diesel engine from diesel fuel to natural gas (STEEL, Feb. 19, pp. 92, 126, 127), retaining the 35 per cent thermal efficiency of the oil-burning diesel when it is operating on natural gas, or well beyond the efficiency of natural gas engines with spark ignition.

Basically, what engineers here believe was done was to take a standard 6-cylinder 9-inch bore stationary diesel and mount a 1½-inch pipe directly under and the full length of the air intake manifold on one side of the engine. From this line, opposite each cylinder head, were run smaller, say ⅜-inch, pipes, up into the air manifold, with probably an elbow and extension inside the manifold to effect a sort of jet centrally located in the air intake for each cylinder. Natural gas at normal line pressure of around 8 ounces was fed into the 1½-inch manifold line and thence to the cylinders, whereupon the engine, operating at full load on oil, started to increase in speed. At this point, the governor naturally cut back on the oil supply and thus allowed the natural gas to "take over," with just enough oil still admitted to fire the gas.

Mean effective pressure increased and of course the engine pulled an additional load.

This week the plenary sessions of the Mead War Investigating Committee of the Senate will be under way, after a preliminary ten days of activity by investigators taking testimony on the matter of manpower utilization. An attempt to review concisely the case for industry was made by the Manpower Division of the Automotive Council for War Production, and a special statement was forwarded to the committee, the gist of which was that most automotive workers cannot answer the question, "Who is boss?" Because of the confusion, they do not know whether they are responsible for their work and plant activities to management, union representatives or government representatives.

Strikes and work stoppages in the motor industry are five times as numerous as in prewar years, and whereas before the war few strikes and work stoppages involved cases of discipline or individual worker, job or plant productivity, today these are the principal causes of such interruptions. Union policy continues as before the war, to prosecute any grievance, manufactured or otherwise, and government policy supports the unions with the result some workers and union representatives have developed the attitude "labor can do no wrong." They are supported in this malicious attitude by government agencies which as a rule will not back the application of sound managerial practices that might involve the application of disciplinary measures objected to by unions. Result: Management has been forced to be far too lenient in application of sound policies and practices.

For each case of actual strike or recorded work stoppage, there are literally hundreds of other instances where

SUPPLYING PACIFIC FRONTS: Outstanding cargo-carrying combination in the campaign to win back the Philippines is the LST landing ship and military trucks. This photo from Leyte island shows the magnitude of the job. Photo from General Motors

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FIRE FIGHTER: Bell Aircraft Corp.'s new 24-ton airport fire truck subdues a raging fire caused by the lighting of 300 gallons of contaminated gasoline and 100 gallons of unsalvagable oil in 55 seconds at a demonstration near the company's Niagara Falls, N. Y., plant. The truck, manufactured by Cardox Corp., Chicago, can discharge its entire extinguishing load of 6000 pounds of low-pressure liquid carbon dioxide and 500 gallons of foam in approximately one minute. Several hundred are being used by the Army Air Forces

production is affected adversely or where the safety or welfare of other employes is endangered by irresponsible action, disregard of shop rules and "horsey" conduct. Too, there are many cases involving infractions of plant rules and regulations, such as excessive time spent in washrooms, smoking, loafing, gambling, reporting to work late, leaving the job before the shift ends, "fraternizing" with women employes, etc.

It is probably true the majority of employes in most plants are not guilty of such infractions and really want to produce, but the actions of a few hotheads can disrupt normal shop discipline to the point where it becomes a joke to the entire working force, and the management is powerless to take corrective steps.

The industry cites as one of the most dangerous illusions in the country today, often accepted in high government ranks, the idea that union representatives can assist management in the maintenance of good managerial practices, particularly those involving discipline. There have been a few exceptional cases, but almost invariably they have resulted in partisan efforts to replace these exceptional and responsible union representatives who have co-operated with management.

A tabulation of work stoppages of one large automobile company over the past six years shows a total of 354 separate stoppages, 109 of them last year. They involved a total of over 6,000,000 man-hours lost and nearly $6,500,000 in wages. Striking feature of the tabulation is the high number of stoppages last year resulting from disciplinary actions—a total of 57, or over half of all stoppages. Of these 12, or 11 per cent, resulted from refusal to meet production standards.

The UAW-CIO lost no time in replying to the council's statement but could only resort to the same old tactics of claiming the statement another attempt to "smear" labor. The union is making a number of proposals to the Mead Committee, including (1) a request for an effective checkup by the WMC on labor hoarding and labor utilization; (2) a system of voluntary transfers without loss of seniority or income so that the right man or woman may be placed on the right job within the area at the right time; (3) no further placement of men on jobs that unemployed women are able to handle; (4) equitable wage adjustments to assure that wage inequalities will not interfere with the flow of labor to critical war jobs.

The union also dragged out the old red herring of labor hoarding on cost-plus contracts, which is utterly ridiculous because there is practically none of this type contract now in force, nearly all being fixed-price contracts. Say what it will, the UAW cannot erase its record of strikes and work stoppages.

There are five contributory causes for the lack of proper control and full utilization of manpower, about which little has been said and to correct which little apparently can be done. They are:

1. Necessity of employing workers of a lower quality both physically and mentally.

2. Problems relating to morals due to the employment of a larger number of women.

3. Irresponsibility of employes about to be inducted into the services.

4. Independent attitudes caused by the abundance of jobs available.

5. Inability of management to offer a consistent reward through promotions for merit, by reason of rigid seniority rules.

Complaints of the motoring public over excessive knocking in engines produced by lowering of octane rating of gasoline, do not appear borne out by analyses made by the Bureau of Mines in various areas last summer. Survey of 21 districts shows a decline of 4.1 in octane rating of premium grades, from 79.1 to 75.0 in a year's time, and a drop of only 0.9, or from 72.0 to 71.1 in octane rating of regular grades. While the figures appear authoritative, they certainly do not confirm the experience of the average driver.

K. T. Keller, president of Chrysler, told a Boston press conference his company had no plans regarding possible postwar activities in the aviation field, adding "We want to see what is done by jet-propelled airplanes in the postwar period."

To meet complaints over the ill effects of fumes arising from special coolants used on grinders handling aircraft engine parts, one of the local automotive plants has installed Westinghouse precipitrons, one for each two grinding machines, which appear to have removed harmful particles from the atmosphere around the machines, thereby having a soothing effect on operators' nasal and bronchial membranes.

German and Jap Metals Discussed in New Booklet

Germany is pinched for copper, nickel, molybdenum, vanadium, tungsten, chromium, and manganese, in about that order while Japan appears to have substantial stockpiles of alloying elements, according to a survey by J. R. Cady, H. W. Gillett, and L. H. Grenell, Battelle Memorial Institute, Columbus, for the War Metallurgy Committee, and presented in a booklet by the American Society for Metals, Cleveland.

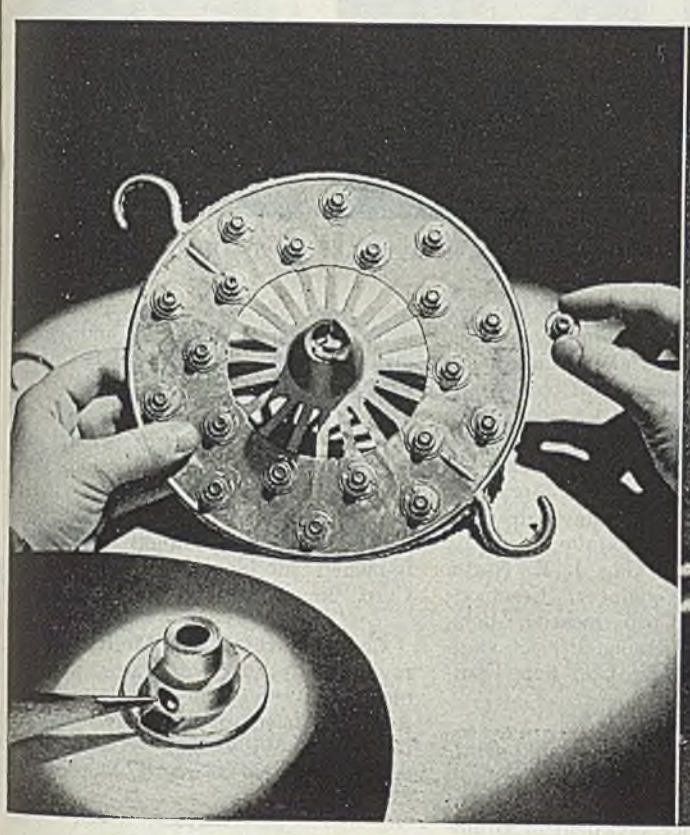
The report is based on studies of captured materiel to determine proper defense and to learn any useful kinks in design, methods of manufacture or materials used, that might be applicable to improving quality or increasing production of Allied weapons.

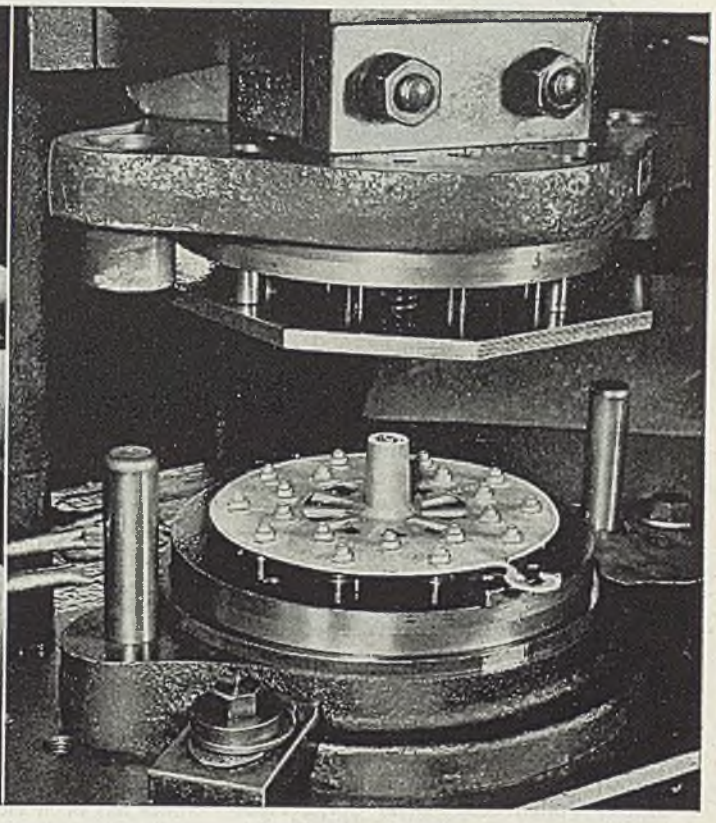
Integral Bus Production Quotas Cut to 9413 Units

Quotas for production of integral buses during 1945 have been reduced by 979 units to a total of 9413. The reduction will occur in the last six months of the year.

SHORT CUTS!

—MACHINING PROBLEMS SIMPLIFIED WITH ZINC ALLOY DIE CASTINGS





Zinc alloy die castings are often produced so close to finished dimensions that little or no machining is required. When machining *is* called for, however, the free-cutting zinc alloys insure easy, rapid metal removal —with long tool life.

This short-cut factor is illustrated in the high speed production of a shell fuse casting (see inset in photograph directly above.) 20 of these fuse parts are cast on a circular gate in one shot—and this gate has hooks cast on its outer edge for ease of conveying from the casting machine. Two locating pins are also cast on the underside of the gate for accurate and rapid positioning in a trimming die (right) where, in one punch, the 20 individual fuse castings are removed. The remaining gate is remelted and reused.

The free-cutting quality of zinc alloys facilitates the subsequent drilling of a hole (see inset) in each casting and thus, **in just three operations—casting, trimming and drilling—the vitally needed shell fuse castings are rapidly produced.** It is the combination of high speed production and excellent physical characteristics which have made die castings of zinc alloy the most widely used. *Every die casting company is equipped to make zinc alloy die castings,* and will be glad to discuss their advantages with you—or write to The New Jersey Zinc Company, 160 Front Street, New York 7, N. Y.

ZINC

FOR DIE CASTING ALLOYS

The Research was done, the Alloys were developed, and most Die Castings are specified with

HORSE HEAD SPECIAL (99.99+% Uniform Quality) ZINC

MEN of INDUSTRY

ROBERT FRANKLIN MEHL

E. CHESTER WRIGHT

CARL GUSTAVE HOGBERG

WILLIAM MARSH BALDWIN JR.

American Institute of Mining and Metallurgical Engineers has announced the following as recipients of 1945 awards: **Robert Franklin Mehl**, director of metals research laboratory and head of the department of metallurgical engineering, Carnegie Institute of Technology, Pittsburgh, sixteenth James Douglas Gold Medal in recognition of "distinguished achievement in physics and physical metallurgy"; **E. Chester Wright**, chief metallurgist and assistant to the president, National Tube Co., Pittsburgh, Robert Hunt Silver Medal and Certificate for the improvement in the success of making bessemer steel as described in the paper, "The Manufacture and Properties of Killed Bessemer Steel,"; **Carl Gustave Hogberg**, assistant to the chairman of the blast furnace committee, United States Steel Corp., Pittsburgh, L. E. Johnson Jr. Award "for his contributions to the science and art of smelting iron ores in the blast furnace", and **William Marsh Baldwin Jr.**, chief metallurgist, Chase Brass & Copper Co., Euclid, O., Institute of Metals Division 1945 Award for research work leading to the improvement of methods of making brass cartridge cases.

Walter Hull Aldridge, president, Texas Gulf Sulphur Co. Inc., New York, and **Walter Curran Mendenhall**, retired director of the United States Geological Survey, have been named honorary members of the Institute.

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Allen Robinson has been appointed head electrical engineer, American Steel & Wire Co., Cleveland, and **Clare L. Becker** has been named assistant electrical engineer.

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Nominees for the offices of American Institute of Electrical Engineers becoming vacant Aug. 1 are: President, **W. E. Wickenden**, president, Case School of Applied Science, Cleveland; vice presidents, middle eastern district, **Ernest S. Fields**, vice president, Cincinnati Gas & Electric Co., Cincinnati; southern district, **Herman B. Wolf**, superintendent of maintenance, Duke Power Co., Charlotte, N. C.; north central district, **L. M. Robertson**, transmission and station engineer, Public Service Co. of Colorado, Denver; Pacific district, **F. F. Evenson**, consulting engineer, San Diego, Calif.; Canada district, **F. L. Lawton**, assistant chief engineer, Aluminum Co. of Canada, Montreal; national treasurer, **W. I. Slichter**, professor emeritus of electrical engineering, Columbia University, New York, and for directors, **John M. Flanigen**, distribution engineer, plant accounting, Georgia Power Co., Atlanta, Ga.; **J. R. North**, asistant electrical engineer, Commonwealth & Southern Corp., Jackson, Mich., and **W. C. Smith**, Pacific district engineer, General Electric Co., San Francisco.

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B. A. Gillies has been appointed assistant to **Claude Ryan**, president, Ryan Aeronautical Co., San Diego, Calif. Mr. Gillies has been vice president of Grumman Aircraft Engineering Corp., Bethpage, N. Y., for the past ten years.

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Charles Eisler, owner and director, Eisler Engineering Co., Newark, N. J., has been elected president of the Resistance Welder Manufacturers' Association, succeeding **Floyd E. Taylor**, president, Swift Electric Welder Co., Detroit. Co-vice presidents are **David Sciaky**, Sciaky Bros., Chicago, and **H. V. Beronius**, Welding Machines Mfg. Co., Detroit.

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Arthur B. Sonneborn has been appointed district manager in charge of Michigan-Ohio sales and service, National Electric Welding Machines Co., Bay City, Mich., with headquarters in Detroit. Also on the Detroit office staff will be **C. H. Armstrong, Richard V. Anderson** and **Frank H. Holland.**

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Frederick E. Burnham has resigned as general accountant for United Aircraft Corp., New York.

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Ernest Kanzler of Detroit and **M. P. Ferguson** of South Bend, Ind., have been elected to the board of Bendix Aviation Corp., South Bend. Mr. Kanzler is chairman of Universal C. I. T. Credit Corp. and president of Universal Credit Corp., and Mr. Ferguson is a vice president of Bendix Aviation and general manager of the Bendix Products Division, South Bend.

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A. E. Snyder, formerly general sales manager of the Lamp Division, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has been elected president of Polorized Products Corp., wholly-owned subsidiary of Noma Electric Corp., New York.

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Capt. Marcel F. de Muller, recently reverted to inactive status after 32 months of service in the United States Army, has been appointed divisional sales manager of Willys-Export Corp., subsidiary of Willys-Overland Motors Inc., Toledo, O.

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William F. Clark, formerly lubricating and hydraulic engineer, United Engineering & Foundry Co., Pittsburgh, has joined Weinman Pump & Supply Co., Pittsburgh, as chief engineer. Mr. Clark succeeds **M. C. Wemple**, who has resigned to enter business on the West Coast.

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Rupert P. Esser has been made assistant general manager and chief engineer, Gerotor May Corp., Logansport, Ind. Formerly Mr. Esser was chief engineer, Logansport Machine Co., same city.

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R. G. Pauley has been appointed district manager in Pittsburgh for the Mechanical Goods Division, Goodyear Tire & Rubber Co., Akron, O.

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W. E. Olds has joined American Car & Foundry Co., New York, as sales agent, with headquarters in the company's Chicago office. Until recently Mr. Olds has served as western manager, Railway Division, Elastic Stop Nut Corp., Union, N. J.

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Richard J. Flickinger has been appointed purchasing agent, Kennametal Inc., Latrobe, Pa.

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William L. Wilson has been elected vice president, Kellett Aircraft Corp.,

Upper Darby, Pa. He has been assistant to the president since 1943, and prior to the war was in charge of public relations activities.

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H. O. Bates Jr. has been appointed general manager, Caterpillar Tractor Co.'s San Leandro, Calif., plant. Previously he was vice president, Caterpillar Military Engine Co., Decatur, Ill.

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William H. Welsh, assistant traffic manager, Youngstown Sheet & Tube Co., Youngstown, O., retired Dec. 31 after 36 years of continuous service with the company.

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Philip E. Furlong has retired as head of the production department, Texrope Division, Allis-Chalmers Mfg. Co., Milwaukee.

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John W. Thomas, chairman, Firestone Tire & Rubber Co., Akron, O., has been named recipient of the Gold Medal of the American Institute of Chemists for his work in rubber research and in the development and production of synthetic rubber.

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John G. MacKenty, vice president and general manager, Radiomarine Corp. of America, has been appointed managing director of the new R.C.A. International Division, Radio Corp. of America, New York.

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Jack Gardner, formerly associated with B. F. Goodrich Co., Akron, O., and **Horace H. Silliman,** formerly European manager of A. C. Gilbert Co., New Haven, Conn., have been appointed district managers of Bendix Radio Division, Bendix Aviation Corp., South Bend, Ind.

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Paul R. Davis has been appointed general sales manager, Studebaker Corp., South Bend, Ind.; **William H. Stevens** becomes regional manager in Atlanta, Ga., succeeding Mr. Stevens, and **R. B. Bender** has been named acting regional manager at Cleveland.

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James F. Pedder has been named advertising manager, Frigidaire Division, General Motors Corp., Dayton, O., and **Ellsworth Gilbert** has been appointed sales promotion manager.

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Joseph C. Jones and **Leonard A. Yoder** head the firm of Jones & Yoder which has been organized as engineering and sales representatives of machinery manufacturers, with offices in Cleveland, New York and Philadelphia.

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J. L. Barrett has been appointed director of the Trade Association Division, the Committee for Economic Development.

—o—

Courtleigh W. Eliason has been named assistant to **George Romney,** managing director, Automotive Council for War Production, Detroit. For the past two and one-half years Mr. Eliason has been regional industrial adviser, United States Maritime Commission, Oakland, Calif.

ELLIS E. DOHERTY

DONALD PRICE

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Ellis E. Doherty has been appointed director of purchasing and expediting, Marion Electrical Instrument Co., Manchester, N. H.

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Harry E. Dunham has been appointed manager of the patent department, General Electric Co., Schenectady, N. Y. **Harry R. Mayers** succeeds Mr. Dunham as assistant manager of the department. Responsibility for media in the advertising of General Electric's apparatus department products has been assigned to **G. W. N. Riddle. Lawrence Jennings** has been named assistant to **E. O. Shreve,** vice president in charge of customer relations.

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T. W. Pettus has been appointed president of National Bearing Division, American Brake Shoe Co., New York.

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Order of Merit has been bestowed upon the following employes of the Sharon Transformer Division, Westinghouse Electric & Mfg. Co.: **Franklin Lloyd Snyder,** engineer, Ordnance Division; **John Hunter Chiles Jr.,** engineer, Instrument and Regulator Division, and **James J. Neil,** general foreman of the tool department, Sharon, Pa., plant.

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Herbert Hampson has been elected vice president, Standard Cap & Seal Corp., Chicago.

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Major M. Poole, since 1940 director of purchases and member of the board, E. C. Atkins & Co., Indianapolis, has completed his 45th year of continuous employment with the company.

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George A. Highberg, vice president, Cushman Chuck Co., Hartford, Conn., has been elected chairman of the Hartford chapter, American Society of Tool Engineers.

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Robert Wallach has been appointed executive director, Associated Engineering & Research Companies, New York, an organization of inventors, engineers, research men and market analysts. **Walter Drey** has joined the organization as associate director in charge of public relations, promotion and service.

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Dr. Donald Price has been appointed technical director, Oakite Products Inc., New York.

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H. H. Jaynes, since 1931 associated with the Boston office of Jenkins Bros., New York, has been made assistant manager of the Boston branch.

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Ray P. Tennes has been elected president of Shafer Bearing Corp., Chicago; **J. F. Ditzell** is executive vice president and general manager; **M. J. Tennes Jr.** becomes vice president; **A. H. Williams** is vice president in charge of engineering; **I. B. Lipson,** secretary; **A. L. Gray,** assistant secretary and treasurer, and **E. H. Ferguson,** assistant treasurer. The following have been elected directors: **Ray P. Tennes, J. F. Ditzell, W. P. Cagney, J. F. Griswold,** and **J. F. Tennes.**

—o—

Robert P. Smith has been appointed general farm sales manager, Westinghouse Electric Supply Co., New York, and **Eric Hall** has been named New Jersey Division manager with offices in Newark, N. J. Two new managers in the North Pacific district are **Earl W. McBratney,** sales promotion manager, and **Arthur F. Sheean,** lamp manager.

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Dr. Herluf P. Nielsen, previously chief metallurgist, Kinney Aluminum Co., Los Angeles, has joined the staff of Battelle Memorial Institute, Columbus, O., and is assigned to its division of nonferrous metallurgy.

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Henry T. Chandler, formerly assistant to president, has been elected a vice president of Vanadium Corp. of America, New York. **Benton H. Grant,** also former assistant to president, has been appointed assistant vice president.

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William Wagner has been named New York district sales manager, Reading-Pratt & Cady Division, American Chain

& Cable Co. Inc., Bridgeport, Conn., succeeding **E. Coit Magens**, who becomes manager of the Valve Division, Export Department.

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Organizational changes within the New York district of General Electric Co., Schenectady, N. Y., are announced as follows: **G. H. Reid** is assistant district manager. **W. E. Brown** has relinquished his position as manager, Central Station Division, but will remain to handle special assignments. **H. H. Sliter** becomes district manager of the Central Station Division, and **R. M. Darrin**, assistant district manager. **Horace Zimmer** has been appointed district manager, Industrial Division, in addition to his duties as district manager of the Transportation Division, and **H. M. Bardin** has been named manager of sales, federal and marine section, which has been transferred from the Transportation to the Industrial Division. **R. B. Ransom** has become manager of the New Haven, Conn., office, and **J. J. Pascher** manages the Hartford, Conn., office.

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Harold N. Blount, formerly associated with Curtiss-Wright Corp., Buffalo, has joined the staff of Buffalo Bolt Co., North Tonawanda, N. Y., and is in charge of market and product research.

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Nick Koppi has been appointed manager, Calco Machinery Co., Philadelphia, which is the agent for R. K. LeBlond Machine Tool Co., Cincinnati, in the District of Columbia, Delaware, Maryland, southern New Jersey and eastern Pennsylvania.

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Robert Santini has been appointed district manager of the new office opened by Sciaky Bros., Chicago, at 1775 Broadway, New York.

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Muriel Arbus, formerly head of the Machine Tool Unit, War Production Board in New York, has opened an office at 55 West Forty-second street, that city, to locate machine tools and equipment for war and essential civilian manufacturing plants.

OBITUARIES . . .

Frederick C. Chandler, 71, one of the great executives of the automobile industry in its first 25 years of production, and president of Chandler Products Corp., Cleveland, died Feb. 18 in that city. Mr. Chandler was one of the founders of Chandler Motor Car Co. in 1913, and six years later he formed Cleveland Automobile Co. Some time later the two companies merged to become Chandler-Cleveland Motors Corp., operating under this name until bought by Hupmobile in 1928. Following the reorganization of Chandler-Cleveland Motors under Mr. Hupp, Mr. Chandler turned his interest toward his son's company, Chandler Products, and upon the younger Mr. Chandler's death in 1942 the father became head of the company.

—o—

Russell Vincent Banta, 56, vice president and chief engineer, Lockwood Greene Engines Inc., New York, died Feb. 18 in Mt. Vernon, N. Y. Mr. Banta was a specialist in the engineering problems involved in the design of buildings to house huge presses.

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Charles S. Thomas, 76, pioneer in the Mahoning Valley steel industry who organized Empire Iron & Steel Co. and DeForest Sheet & Tin Plate Co., died recently in Youngstown, O.

—o—

Dr. Charles Frederick Burgess, 72, founder, C. F. Burgess Laboratories Inc., and Burgess Battery Co., Madison, Wis., died Feb. 13 in Chicago. He invented the process for electrolytic purification of iron. His paper on "Electrolytic Iron" was presented in 1904 and brought him a Carnegie grant of $10,000 to continue his work. Holder of more than 400 patents on various processes and inventions, Dr. Burgess received the Octave Chanute Medal of the Western Society of Engineers in 1911, and the Perkin Medal of the American Section, Society of Chemical Industry, in 1932. In the same year he was awarded an honorary life membership in the Electrochemical Society, of which he had been president in 1908. In 1942 he received the society's Edward Goodrich Acheson Medal and $1000 prize. Dr. Burgess resigned as president of Burgess Laboratories in 1935 to become board chairman.

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Horatio Hearne Adams, 73, for 25 years Washington representative of General Electric Co., Schenectady, N. Y., died Feb. 13 in Washington.

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William Clifford Young, 67, a member of the rolls sales staff of Lewis Foundry & Machine Division, Blaw-Knox Co., Pittsburgh, died Feb. 5 in Youngstown, O.

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Frank J. Fahey, an organizer and former executive officer of the Gillette Safety Razor Co., Boston, died Feb. 19 in Brookline, Mass.

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David Nye McBrier, 88, president of Erie Steam Shovel Co., Erie, Pa., prior to its merger with Bucyrus-Erie Co., died recently in Erie.

—o—

Edward Hamilton Caterson, 50, sales agent in the New York district for Van Huffel Tube Corp., Warren, O., and Elliott Bros. Steel Co., New Castle, Pa., and agent in New England for Michigan Seamless Tube Co., South Lyon, Mich., died Feb. 17 in New York.

—o—

Lyle H. Dayhoff, 59, founder and chairman, Republic Coal & Coke Co., Chicago, and president, Mariah Hill Super Block Coal Co., Mariah Hill, Ind., died Feb. 16 in Miami Beach, Fla.

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James C. Patterson, 63, a member of the rails section, Steel Division, War Production Board, Washington, and formerly chief engineer of maintenance of way, Erie railroad, died Feb. 18 in Orange, N. J.

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Frank D. Egan, 61, superintendent, electrical department, Bethlehem Steel Co.'s Lackawanna, N. Y., plant for 20 years prior to his retirement in 1943, died Feb. 17. He was a former president of the Association of Iron and Steel Electrical Engineers.

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William R. Martin, 63, since 1905 president, W. R. Martin Machine Co., Louisville, Ky., died Feb. 8 in that city.

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Karl C. Krebser, 57, vice president, Kingston Products Corp., Kokomo, Ind., died recently in Ann Arbor, Mich.

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James Joseph Wilson, owner of the Wilson Pipe & Wire Rope Co., Los Angeles, died recently.

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Paul C. Meyer, 52, personnel manager, Universal Foundry Co., Oshkosh, Wis., died Feb. 16 in that city.

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Horatio G. Shumway, 79, president, C. W. Shumway & Sons, Batavia, Ill., died Feb. 15 in Geneva, Ill. He was a past president of the Chicago Foundrymen's Association.

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John Robert Hagemann, 44, manager of engineering in the steam turbine department, Allis-Chalmers Mfg. Co., Milwaukee, died there Feb. 15.

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Charles Gordon Adams, 43, operations manager, Basic Refractories Inc., Cleveland, died Feb. 12 in Tiffin, O.

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Iver O. Mossberg, 50, president, O. F. Mossberg & Sons Inc., New Haven, Conn., died Feb. 18.

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Chester W. Thordarson, 88, founder, Thordarson Electric Mfg. Co., Chicago, died Feb. 6 in that city.

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Harold F. Browne, 55, secretary and director of the Research Management Division, National Industrial Conference Board, New York, died there Feb. 15.

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Wilbert G. Wise, president of the Wise Furnace Co., Akron, O., died there Feb. 5.

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Carroll B. Mershon has been appointed assistant to the president, Pennsylvania Industrial Engineers, Pittsburgh.

Promising Future Seen for Western Diesel Industry

Engineering schools to co-operate in training technicians. Many inquiries being received from foreign nations

SAN FRANCISCO

"FUTURE of the diesel engine manufacturing industry in the West, 98 per cent of which is located in the San Francisco bay area, is extremely bright," E. B. Scott, sales manager of the Enterprise Engine & Foundry Co., told a group of 25 professors from western colleges and university schools of engineering here recently.

"We receive inquiries every month from Central and South American countries, Australia and New Zealand," Mr. Scott said, adding that stationary diesels will be more important in the West's postwar period than the marine type engine now being manufactured by Enterprise for the Army, Navy and Maritime Commission.

As a climax to a four-month nation-wide symposium series conducted by the Diesel Engine Manufacturers Association to bring about greater co-operation between the industry and engineering colleges, the professors toured the plants of the $50 million bay area industry. Previous groups went through the Worthington Pump & Machinery Corp. plant at Buffalo; the Nordberg Mfg. Co. plant at Milwaukee; and the Baldwin Locomotive Works at Philadelphia. Meetings were also held at New York, Chicago and Raleigh, N. C., under the direction of Harvey T. Hill, DEMA's executive director, and Prof. Robert B. Rice, director of diesel engineering at the North Carolina State College at Raleigh.

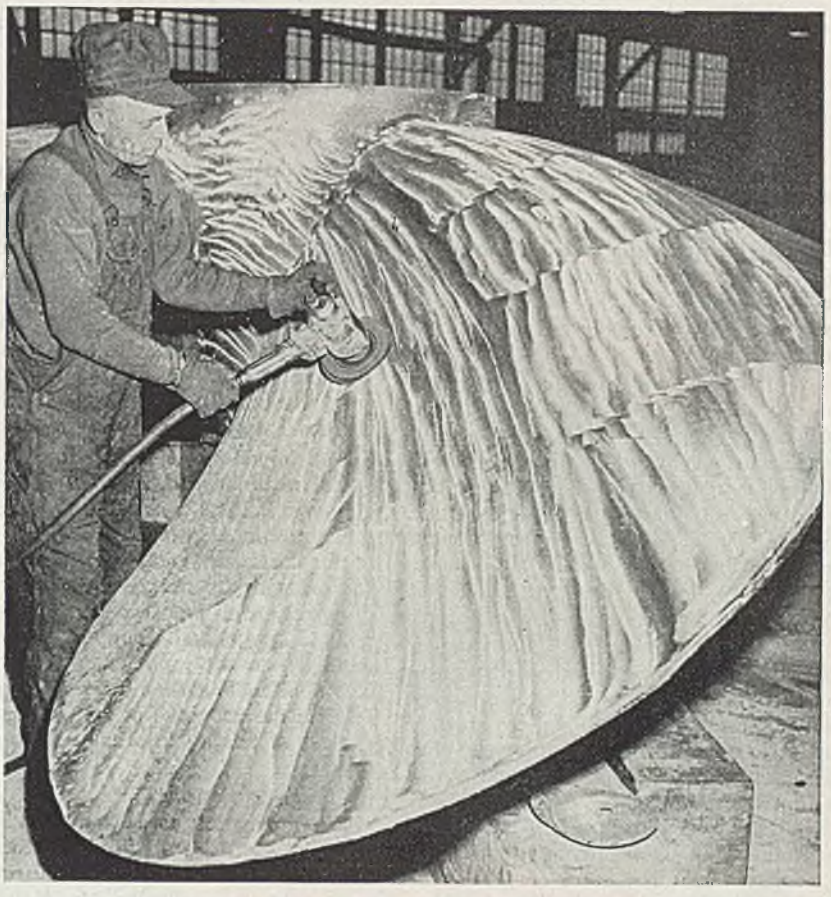
Fuel Availability Aids West

Application of diesel engines in the West is greatly enhanced by fuel availability, F. H. Kilberry, president of Atlas Imperial Diesel Engine Co., Oakland, said at the DEMA tour luncheon. A pent-up business has accumulated during the war for fishing boat engines, in agriculture for pumps, irrigation machinery, tractors and lighting plants, in highway construction, in logging operations and in yachting, automotive and railroad fields, he said.

Stressing that college engineering students should receive a broad engineering background before specialization in diesels, the industry representatives suggested students spend part of their educational period working in a factory or foundry for practical experience. Sales, maintenance and engineering departments especially, will need college-trained technicians after the war, they pointed out.

"Colleges should co-operate with the diesel industry, especially for research," Roy Hundley, chief engineer, Enterprise Engine Co., proposed. Manufacturers urged the college professors to sponsor an advanced diesel engineering graduate school in this area and to seize this opportunity of equipping laboratories with surplus diesel engines to be sold by the government after the war.

Dean M. P. O'Brien, University of California, revealed graduate research in diesel engineering would be expanded on the Berkley campus. The department is building another unit which will double space, he said, and wants to arrange with manufacturers for students and instructors to spend one term out of three working in factories. On the Los Angeles campus, plans are being formed to institute a strong diesel engineering extension service to exchange research information and practical techniques between industry and the university.



PROPELLER FROM SCRAP SHELLS: Reclaimed shell cases form the basis for manganese-bronze ingots from which this 23-ton Liberty ship propeller was cast at Doran Co. foundry in Seattle. Photo shows worker finish grinding the prop. NEA photo

High-Octane Gas Plant Dedicated in California

Tide Water Associated Oil Co. recently dedicated its huge fluid catalytic cracking plant to producing essentials of 100-octane aviation gasoline at its Avon, Calif., refinery.

Employment in Shipyards To Drop Sharply This Year

PORTLAND, OREG.

Manpower officials state of the 112,000 workers in the Portland, Oreg., area shipyards, only 25,000 will be retained by the end of the year. Director L. C. Stoll added that unless new contracts develop, employment will drop to 100,000 by August and taper off 20,000 monthly during the fall. This forecast is based on a survey of ship production schedules of procurement agencies.

Mr. Stoll added shipyard repair work at Portland will require only 10,000 workers, as much of this will be diverted to other Pacific ports. The Albina shipyard which employed 4359 last December will be reduced to 615 hands by August. Many of the released workers will find employment at Puget Sound navy yard and at the Todd-Pacific yards in Tacoma and Seattle. Others will be sent to Honolulu where much repair work is being handled and skilled mechanics are needed.

WING TIPS

Advances in design of electrical equipment for aircraft reviewed at AIEE meeting. Recommendations for further improvements through co-operation and establishment of new standards advanced by GE engineers

ADVANCES in design of electric equipment for aircraft were reviewed and recommendations for further progress through co-operation and establishment of standards were advanced at the winter technical meeting of the American Institute of Electrical Engineers in New York recently.

Results of an investigation of the failure of aircraft ignition cables and connectors at high altitudes, along with several means by which the life of the ignition system may be extended appreciably, were presented in a paper by H. H. Race, General Electric Co. research engineer of Schenectady, and A. M. Ross Jr., chemist in the company's Bridgeport works laboratory.

The authors described a simulated-altitude test equipment devised especially for the investigation, declaring that it exposed weaknesses not so readily understood or remedied otherwise. Superiority of neoprene-sheathed over lacquered-braid cables was conclusively demonstrated by the tests. The authors attributed the superiority to three major factors: First, elimination of the cotton braid common to lacquered-braid cables; second, inherent heat and ozone resistance of neoprene; and third, construction of the neoprene-sheathed cable is better suited to proper sealing of the spark plug well, a necessity revealed by the tests.

Development of new insulating materials or new cable or connector constructions can be accelerated through simulated-altitude testing, according to the authors. However, they cautioned that it should not be regarded as a substitute for acceptance or manufacturing control, but rather as an adjunct to them. Its most valuable function is to give information on newly designed assemblies in advance of actual engine tests, they said.

An improved terminal construction which materially reduces the number of arc-over failures was described as another result of the investigation. The terminal is designed for 5-millimeter cables, with its neoprene adaptor boot, grommet, and mycalex terminal sleeve molded integrally. A copper ring washer molded into the grommet provides good electrical contact for radio shielding and relieves the neoprene of abuse caused by cycling of temperature or inspection and servicing.

Design standards for aircraft devices were emphasized as an imperative need by F. W. Hottenroth, of General Electric's industrial control division. Discussing aircraft control specifically, Mr. Hottenroth proposed that standards covering such equipment be established by AIEE and National Electrical Manufacturers Association. He described design features offering advantages for aircraft operation, and presented some sample standards for consideration.

Pointing out that 50,000-foot service ceilings are just around the corner, Mr. Hottenroth proposed that altitude as standard for designing purposes. He said that the greatest effect of altitude on electric control devices is upon the electrical rating of their contacts, due to the increased difficulty of extinguishing an arc at the low pressures encountered at high altitudes.

"Devices should operate satisfactorily under any conditions of vibration encountered on an airplane," Mr. Hottenroth said. "But there is still no definite figure to express accurately the maximum vibration conditions actually encountered on all types of planes."

Balanced construction is the key to the vibration problem according to Mr. Hottenroth. He said tests have demonstrated the importance of equal masses on each side of the pivot and rigid yet light parts.

Temperatures encountered by aircraft require designing for a total range of 265 degrees, from −65 Fahr. to 200 Fahr., Mr. Hottenroth pointed out. He stressed the importance of proper choice of materials for correct operation over this wide range.

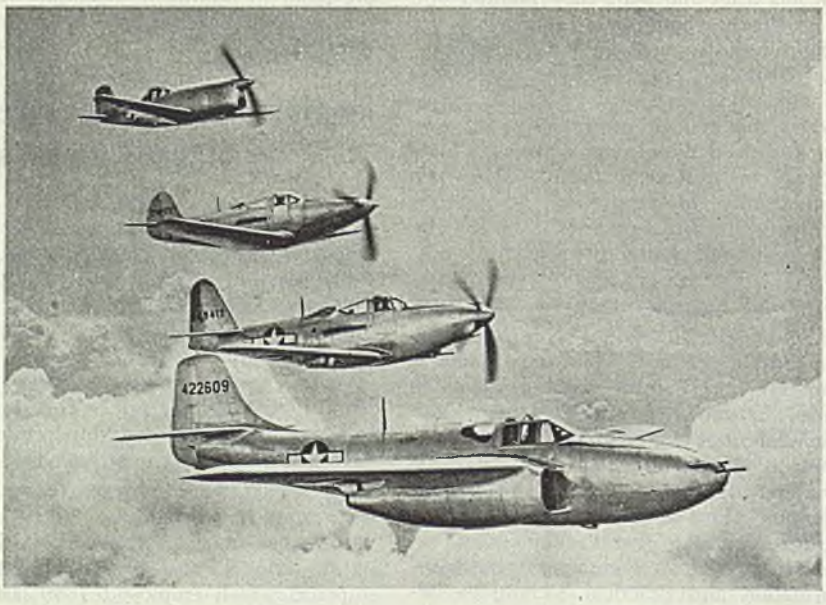
Must Avoid Variations in Operation

"The kinds of material used should be chosen carefully to avoid variations in operation," he said. "For example, a one-inch long piece of aluminum will shrink two thousandths of an inch more than a one-inch long piece of iron in going from 200 Fahr. to −65 Fahr. Tests on pressure switches with rubber diaphragms showed differentials 20 to 30 times greater at low temperatures than at normal."

Discussing the 200-hour salt spray test commonly accepted as standard, Mr. Hottenroth recommended that it should be permissible to clean the salt from the device before checking its operation. He said cleaning appeared justified in view of the fact that the primary purpose of the salt spray test was to prove that the device will not corrode and become inoperable for that reason.

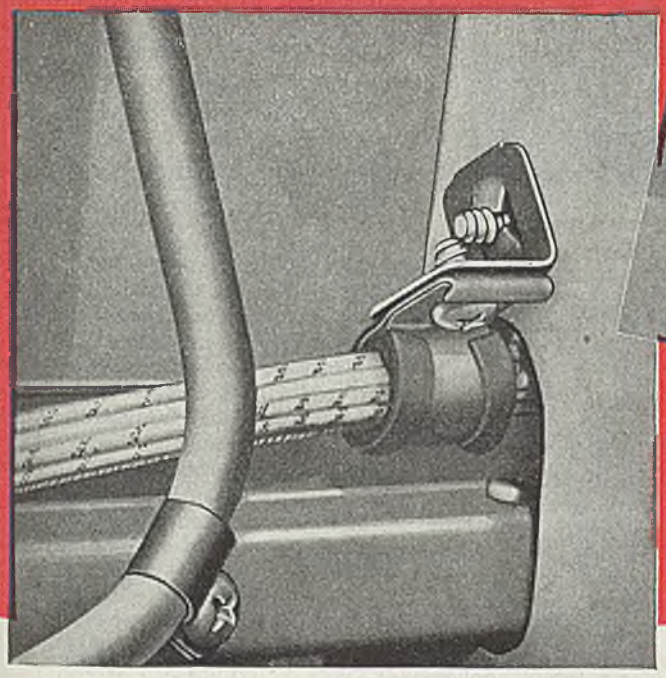
The speakers listed three major considerations in designing devices for satisfactory operation in corrosive atmosphere and high humidity: First, when dissimilar metals are used close together they must be properly chosen; second, steel parts, unless stainless, must be plated with a corrosion-resisting plating; and third, care must be exercised in the use of molded parts wherever dimensional stability is essential.

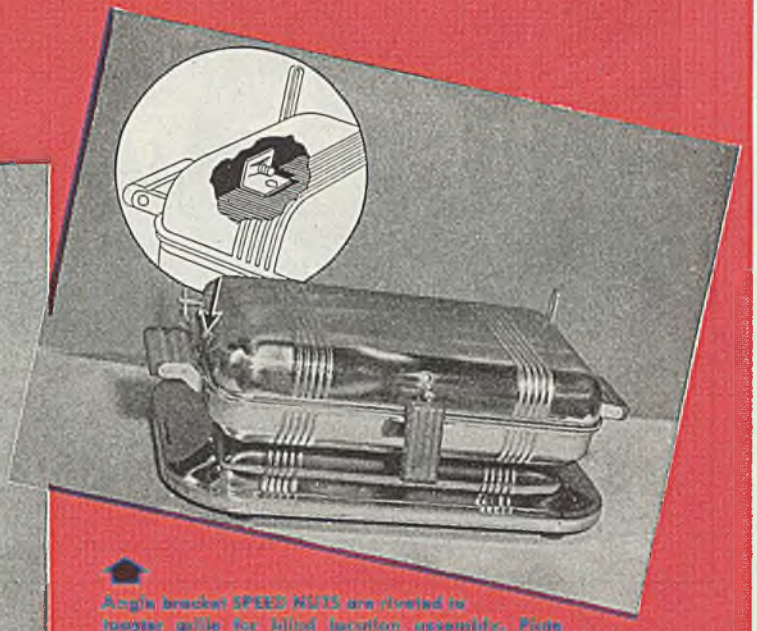
L. A. Zahorsky of the GE fractional horsepower motor engineering division presented a paper devoted to the amplidyne generator for speed-controlled electric gun turrets. According to Mr. Zahorsky, the purpose of the paper was "to explain the action of a particular type of amplidyne generator in terms of its relationship to the turret performance and attempt to separate its characteristics



LIGHTWEIGHT: Bell Aircraft Corp., Buffalo, has produced a small, light, all-wood fighter plane, XP-77, which is 22 feet 10½ inches long and has a wing span of 27½ feet. Shown at top in photo, it is contrasted with the P-39 Airacobra, the P-63 Kingcobra and the P-59 Airacomet, first jet-propelled plane. The all-wood body is not intended for use in combat planes

ANOTHER ASSEMBLY *Cost Cutter...*





Angle bracket SPEED NUTS are riveted to toaster grille for blind location assembly. Plate is positioned and screws tightened from outside.

Angle bracket SPEED NUT mounted on airplane fuselage frame to support a wire harness clamp, simplifying and reducing weight of attachment.

ANGLE BRACKET AND SPEED NUT COMBINED

If your product requires brackets for assembly, why not use brackets with self-locking nuts *built right in* them? Why fumble around with separate lock washers and threaded nuts and use a wrench besides to keep them from turning? Why handle 9 parts (bracket, 2 screws, 2 lock washers, 2 nuts, screw driver, and wrench), when 4 parts will do a better job? (SPEED NUT, 2 screws, and screw driver.) Think of the savings in manhours and material this could mean in your plant!

These SPEED NUTS lock with a firm spring tension that permanently prevents vibration loosening. They reduce weight, speed up assembly, and strengthen the structure. And since they are produced on high speed automatic machines, these self-locking brackets are not expensive.

Hundreds of manufacturers have improved both their products and assembly methods by changing over to Tinnerman angle brackets. Write for samples.

THE BASIC PRINCIPLE
of Spring-Tension Lock is
Embodied in all Speed Nut Designs

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FASTEST THING IN FASTENINGS

FIGHTER-BOMBER COMMENDED: After completing 100 missions against the Japanese, Corsair 122, a fighter-bomber plane, was commended in ceremonies at Chance Vought Aircraft, Stratford, Conn., before more than 21,000 employes and their families. Shown above, left to right: Maj. Gen. Field Harris, director of Marine Corps Aviation; Rex B. Beisel, general manager of Chance Vought; and Col. T. B. Millard, USMC, Bureau of Aeronautics representative at Vought

from those of the turret." He explained that heretofore it has been expedient to define the characteristics of the turret control system only as a whole; knowledge of the requirements of the amplidyne generator, developed concurrently with the war, was incomplete. As a result, difficulties were encountered in applying the amplidyne to other systems. Ability to define the amplidyne characteristics independently now overcomes this problem, he said.

The amplidyne was described as part of a motor-generator set driven from the electrical system of the airplane. It makes available readily controlled power to operate the turret motor. By varying the adjustment of certain potentiometers connected in the control field circuit of the amplidyne, its output, and hence the performance of the turret, can be controlled by the gunner. Most turrets using amplidynes are powered in both elevation and azimuth by means of two separate control systems, each consisting of a turret motor, an amplidyne, and a control circuit.

A paper by C. P. Hayes and L. L. Ray, of the GE fractional horsepower motor engineering division, outlined some of the problems in the design of suitable inverters for 400-cycle aircraft electrical systems and offered suggestions for improvement by careful co-ordination among designers of planes, auxiliary equipment, and auxiliary power supplies. The authors stated that of the many types of inverters available for obtaining alternating current from direct current, the motor alternator offered the most advantages for aircraft application. They displayed a widely used inverter of this type, pointing out that addition of frequency control with a suitable driving motor would make the device conform to future requirements. They conceded that for future applications on aircraft with a-c power supplies, it may still be necessary to isolate "fussy" loads from the main system.

A method of calculating the effect of altitude on temperature rise of various designs of aircraft transformers was presented by V. M. Montsinger of General Electric's transformer engineering division. According to Mr. Montsinger, the effect of altitude on temperature rise of a simple piece of apparatus like a self-cooled transformer can vary as much as 2.5:1 depending on the per cent of loss of heat by radiation and by convection. Only the loss by convection is affected by altitude, which is the reason no two types of apparatus are affected alike by altitude, he said.

Anti-Exposure Suit For Airmen Developed

Working on the problem of forced landings at sea, technicians of the Personal Equipment laboratory at the Air Technical Service Command headquarters, Wright Field, O., have come up with a new "anti-exposure" suit.

They gave it a severe test recently, chopping through a foot of ice, and then proceeding to "dunk" a couple of technicians, garbed in the new suit, in the freezing water. For an hour, encased in the protective cloth of the suit which covers everything but the face, two officers of the laboratory's clothing branch lay in the water.

Thermocouples attached to the suits recorded the temperatures of the two officers during the test, throughout which no point of their anatomy was registered lower than a few degrees of normal.

The anti-exposure suit is made of nylon coated with a substance rendering it both water-tight and air-tight, it is claimed.

The suit is not so bulky as to prevent the ditched airman from climbing into his life-raft, as was demonstrated during the test. Following an hour in the water, the two officers climbed into a life raft and remained there for an additional two hours while the test continued.

New Air Position Indicator Guides Planes Raiding Japan

A revolutionary air position indicator has been helping chart the sky route of B-29 Superfortresses making raids on Japan.

The air position indicator gives continuous readings of latitude and longitude and was developed by Bendix Aviation Corp., Detroit, in its Eclipse-Pioneer division in co-operation with the Army and Navy air forces.

The air position indicator automatically performs all of its computing, calculating and indicating functions within a single self-contained device.

ATSC Develops Light Aluminum Gas Drum

As result of a joint project between the Air Technical Service Command and the Air Transport Command, the Army Air Forces has obtained a new light weight aluminum 55-gallon gasoline drum which is 31 pounds lighter than the usual steel drum.

American Propeller Corp. Receives New Contracts

American Propeller Corp., Toledo, O., has received contracts for additional hollow steel propeller blades for army and navy planes, insuring operation of the plant well into 1946.

One contract covers blades for the Bell P-63 Kingcobra fighter, and volume production was scheduled to start Feb. 15. The other contract involves blades for use on two of the Navy's latest designs—a new fighter and a Curtiss scout plane.

Immediate stepping up of plant personnel is necessary, and employes affected by a recent layoff are being called back to work.

FOR *Increased* OUTPUT AT LOWER COST

There is no substitute for Ex-Cell-O's wide experience in designing and building special machines!

YOU have a substantial background of experience to draw from when you bring to Ex-Cell-O your problem in the *precision* machining of metal parts on a high production basis. The more economical production of accurate metal parts necessitates single-purpose machines of improved efficiency, capable of giving greater output and reducing unit cost. For years Ex-Cell-O has been an acknowledged leader in the field of special-purpose machines . . . *precision* machines with exclusive features that represent the utmost in accuracy, production, operating ease, rigidity, and durability. Every special machine made by Ex-Cell-O is designed to give the most practical results on the job for which it is built —improvement in work quality, direct savings in time and money, and maximum service in the machine itself.

This is why you should utilize Ex-Cell-O's experienced engineering and manufacturing facilities. Ex-Cell-O has representatives in all principal manufacturing centers. Consult the one nearest you, or write to Ex-Cell-O Head Office in Detroit.

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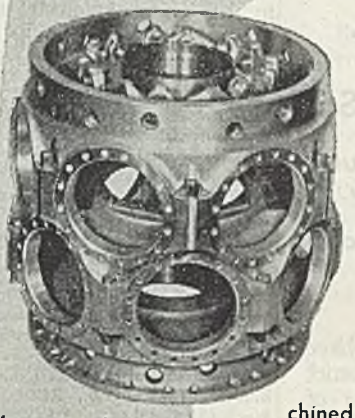
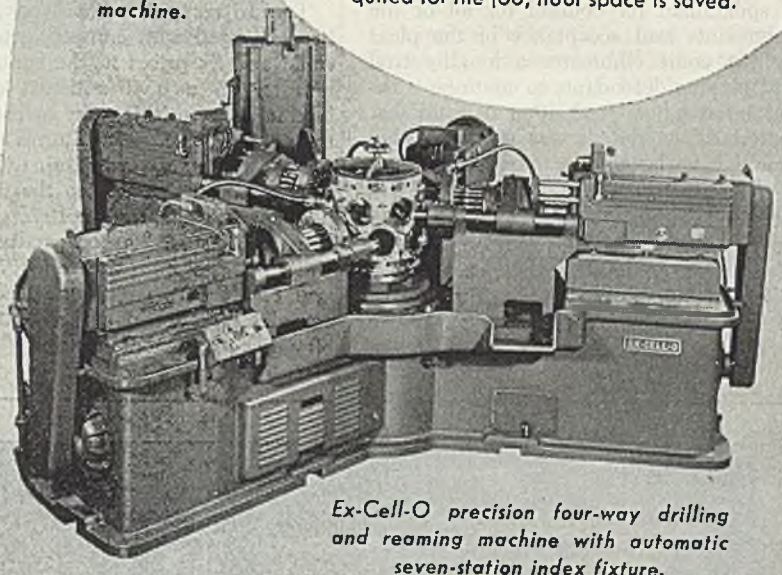


Increased production attained in precision machining this aircraft crankcase on Ex-Cell-O special-purpose machine.

On this Ex-Cell-O special-purpose machine, aircraft crankcase sub-assembly of aluminum alloy is *precision* machined automatically except for loading and unloading. Part is loaded from top over center post to assure rigidity. "Start Cycle" button is pressed, and machine drills, reams, spot-faces and chamfers 16 stud holes in each of 14 deck pads (total of 224 holes, two operations per hole), then stops, ready for operator to unload and repeat the cycle. This part was formerly machined one bank at a time. Now, with this Ex-Cell-O machine, handling and operation time is exactly one-half what it was; error between banks of holes, radially and vertically (due to reloading of part), is eliminated; also, by one machine only now being required for the job, floor space is saved.



Ex-Cell-O precision four-way drilling and reaming machine with automatic seven-station index fixture.

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EX-CELL-O *makes* Special Multiple Way-Type Precision Boring Machines • Special Multiple Precision Drilling Machines • Precision Thread Grinding, Boring and Lapping Machines Broaches and Broach Sharpening Machines • Hydraulic Power Units • Grinding Spindles • Drill Jig Bushings • Continental Cutting Tools • Tool Grinders • Fuel Injection Equipment • R. R. Pins and Bushings • Pure-Pak Paper Milk Bottle Machines • Aircraft and Miscellaneous Production Parts

Steel Companies Assessed Fines In Stainless Case

18 firms and six individuals enter pleas of "no contest" on charges of fixing prices; civil suit pending

TWENTY-FOUR defendants have been fined $10,000 each in U. S. District Court, Trenton, N. J., on charges of unlawfully fixing non-competitive prices for stainless steel.

The fines were imposed on 18 companies and six individuals after Judge Philip Forman had accepted pleas of "no contest" from all of the defendants. A spokesman for counsel for all of the defendants said acceptance of the pleas by the court eliminates a lengthy trial and permits defendants to continue without interruption production of vital war materials. A trial, it was said, probably would have lasted four months.

A. W. Storms, special assistant to Attorney General Francis Biddle, said the government urged acceptance of the pleas and recommended that each of the defendants be given the maximum fine of $5000 on each of two counts listed in an indictment returned by a federal grand jury in Trenton last November. The indictment charging the antitrust law violations alleged that the conspiracy began in 1934 and involved use of German patents for chrome nickel steel acquired from the alien property custodian after World War I.

Those fined are: Republic Steel Corp., Cleveland, and Martin H. Schmid, sales manager of its Alloy Sales Division; Allegheny Ludlum Steel Corp., Brackenridge, Pa., and Russell M. Allen, Pittsburgh, vice president; Carnegie-Illinois Steel Corp., Pittsburgh, and Paul F. Voight Jr., manager of Stainless Steel Division; Carpenter Steel Co., Reading, Pa., and J. Heber Parker, president; Crucible Steel Co. of America, New York, and R. E. Christie, vice president; Eastern Stainless Steel Corp., Baltimore, and T. F. McLaughlin, president; Rustless Iron & Steel Corp., Baltimore.

American Rolling Mill Co., Middletown, O.; Bethlehem Steel Co., Bethlehem, Pa.; Sharon Steel Corp., Sharon, Pa.; Firth Sterling Steel Co., McKeesport, Pa.; Jessop Steel Co., Washington, Pa.; Latrobe Electric Steel Co., Latrobe, Pa.; Superior Steel Corp., Carnegie, Pa.; Timken Roller Bearing Co., Canton, O.; Universal-Cyclops Steel Corp., Bridgeville, Pa.; Midvale Co., Philadelphia, and Pittsburgh Steel Co., Pittsburgh.

The 18 companies involved also have been charged with conspiring to restrain trade and fix prices in the stainless steel industry in a civil antitrust complaint filed in Trenton in January by the Department of Justice. Mr. Storms said that the firms have requested an extension of time to file an answer to the civil complaint which said that in 1942 gross sales of stainless steel finished products in the United States approximated $175 million and that the corporations named in the complaint produced and sold more than 90 per cent of that amount.

RUSSIAN VISITORS: Shown inspecting equipment at the Bailey Meter Co. plant, Cleveland, are two Russian technical experts. In the foreground, left to right, are L. A. Charikhov, open hearth expert, and V. V. Vorobei, instrument engineer. In the background are R. R. Swain, Bailey sponsor engineer for the steel industry, and E. H. Wright, Bailey product engineer for oxygen and combustibles recorders. They are observing the company's oxygen-combustibles analyzer

American Can Co. Output Establishes All-Time Record

Increasingly important service to the country and a new high in production of military, lend-lease and essential consumer goods by American Can Co., New York, during the past year are revealed in the firm's report covering 1944 operations.

Despite shifting requirements, scarcity of conventional materials, short labor supply, increased costs and displacement of normal distribution of work between the company's various plants, total sales of the products of the can factories and machine shops amounted to $227,528,760, compared with $191,086,606 in 1943, D. W. Figgis, president, said.

This total of sales has been exceeded only once in the company's history, in 1941, the last full year of unrestricted use of metals for manufacture of civilian goods. Total production in 1944, he pointed out, was the highest ever, since the term "sales" does not include shipments of the special wartime subsidiaries manufacturing torpedoes and fiber artillery ammunition containers.

Analyzing the year's income, Mr. Figgis said the higher volume resulted from a number of factors, chief of which were the greater number of cans required for the year's large packs of many types of foods, much of which went to meet heavy requirements of the armed forces and lend-lease, and increased production of special containers and other Army and Navy equipment.

"Indications are," Mr. Figgis said, "that return to metal cans of goods now packaged in substitute containers and the normal growth of many of the company's newer lines, arrested by the war, will call not only for capacity production in all of its present plants, but for additional manufacturing facilities and expansion of personnel."

Tool Company Observes Twentieth Anniversary

Snyder Tool & Engineering Co., Detroit, observed recently the twentieth anniversary of its founding.

The occasion was marked by a dinner and entertainment for personnel and presentation of service emblems by Clarence Snyder, founder and president.

Railroads Making Progress In Restoring Normal Service

Continuation of favorable weather will help railroads make further rapid progress toward normal operating conditions, G. Metzman, chairman of the Eastern Railroad Presidents Conference, announced. The accumulation of freight cars in snow and icebound yards is fast being reduced and traffic disrupted by the emergency restored to normal channels, he said.

ALUMINUM BOX CAR: First of 30 specially built aluminum box cars constructed by Mt. Vernon Car Mfg. Co., Mt. Vernon, Ill., division of H. K. Porter Co. Inc., is shown above. Cars were built in conjunction with Reynolds Metals Co. for use by the Rock Island railroad, Minneapolis & St. Paul railway and the Alton railroad

BRIEFS . . . .

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

National Bearing Metals Corp., St. Louis, has been merged into the American Brake Shoe Co., New York, and will be known as the National Bearing Division of the parent company.

—o—

The Cooper-Bessemer Corp., Mt. Vernon, O., has appointed Simson-Maxwell Ltd., Vancouver, B. C., as British Columbia representative.

—o—

Advance Pressure Castings Inc., Brooklyn, N. Y., has purchased a building adjoining its present plant and will use it to meet increasing demands of the armed forces for castings.

—o—

Gar Wood Industries Inc., Detroit, has formed a veterans' department and on a scientific basis will place veterans in jobs that they can best perform.

—o—

American Can Co., New York, reports its production of Navy bomb-fuse containers will be more than doubled in 1945.

—o—

Trico Products Corp., Buffalo, has purchased the old Ford Motor Co. plant there and will use it in postwar production.

—o—

Industrial Materials Co., Los Angeles, a new warehouse, is starting operations with $4 million in Douglas Aircraft Corp. surplus stock.

—o—

Perfect Circle Co., Hagerstown, Ind., announced its employes have received approximately $104,000 in group insurance benefits during the first six months of the present policy year.

—o—

Grapho Products Inc., and **L-C Products Co.**, both of Indianapolis, have completely separated. The Grapho company had sold its ordnance plant to L-C Products and assisted the latter firm during the first 11 months of operations of the plant.

—o—

U. S. Maritime Commission reports 14 Great Lakes shipyards in the period May, 1942 to Feb. 1, 1945 produced 184 vessels and 200 knocked-down barges valued at $241,122,132.

—o—

Allegheny Ludlum Steel Corp., Brackenridge, Pa., has issued new catalogs on mill treated, high-speed steel, tool holder bits; Carmet carbide tipped tools; and carbon and high-speed steel drill rods and cold-drawn tool steels.

—o—

Goodyear Tire & Rubber Co., Akron, O., soon will start construction of a $1,500,000 chemical plant at Natrium, W. Va., to manufacture a wide variety of new rubberlike plastics.

—o—

Rust Engineering Co., Pittsburgh, has been awarded War Department contract to expand the Kentucky Ordnance Works, Paducah, Ky., and the Weldon Springs, Mo., Ordnance Works.

—o—

Copper and Brass Research Association, New York, has canceled its annual meeting scheduled for May 17 to comply with the federal wartime ban on conventions.

—o—

Mead Specialties Co., Chicago, now is occupying its new, streamlined factory at 4114 North Knox avenue, Chicago.

—o—

Buffalo Arms Corp., Buffalo, which has stopped machine gun production, has received permission from the Army's Ordnance Department to utilize part of the plant for manufacture of ordnance parts.

—o—

Virginia Bridge Co.'s plant at Birmingham, Ala., operated 1,156,296 man hours in 1944 with only 16 lost time injuries, no fatalities, and no injury sufficient to cause permanent disability.

—o—

Hoffman Supply, with offices at Albuquerque, N. Mex., and Abilene, Tex., has been appointed representative for the Standard Transformer Co., Warren, O.

—o—

Barber-Colman Co., Rockford, Ill., has appointed Garrett Supply Co., Los Angeles, as distributor of hobs, milling cutters, and reamers. Barber-Colman also has opened a divisional machine tool engineering and sales office in Los Angeles.

—o—

Day-Washburne Tool Co., Chicago, is now known as the Day Co., following dissolution of a limited partnership.

—o—

Fall Creek Ordnance Plant, Indianapolis, is to be equipped for production of 155-millimeter artillery shells.

—o—

Aerovox Corp., New Bedford, Mass., has been sold to a group of industrialists headed by W. Myron Owen, vice president, Detroit Harvester Co., Detroit.

—o—

American Foundry Equipment Co., Mishawaka, Ind., has issued a revised bulletin incorporating new developments in metal washing machines.

—o—

San Francisco Chamber of Commerce, Industrial Development Committee, has formed an iron and steel section, with Edward L. Soule, president, Soule Steel Co., chairman.

—o—

M. V. M. Co., 109 West Twenty-sixth street, New York, is now conducting the business of the former Heyman Co. Operators of M. V. M. Co. are A. Miller, H. Vallen, and H. Milstein, who previously were with Heyman Co.

THE BUSINESS TREND

Industrial Production Scores Slight Increase

INDUSTRIAL production has turned slightly upward, recovering from recent declines due to weather and transportation tie-ups. However, manpower shortages in the steel and nonferrous metal industries continue to retard the output of vitally needed raw materials and indirectly prevent many war plants from meeting projected munitions production schedules.

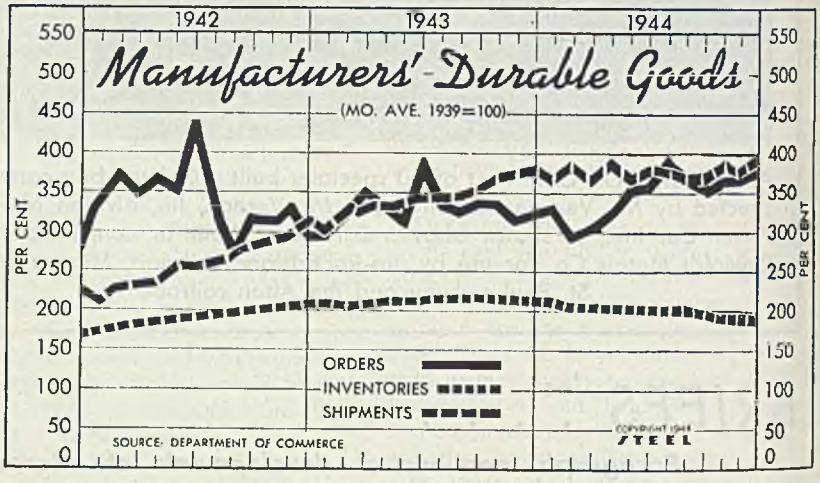
The national steel rate has gained about five points during the past two weeks, from the low point reached early in February. However, steel industry officials state that if projected second quarter steel requirements are to be met an additional 100,000 employes must be recruited.

Encouraging gains during the latest period were recorded in bituminous coal production, engineering construction awards, and revenue freight carloadings.

MANUFACTURERS' INVENTORIES—Gradual liquidation of manufacturers' inventories continued in December. Manufacturers' stocks on Dec. 31 last were estimated at $16.7 billion, a decline of 2 per cent from the November level. It is noteworthy that raw material inventories, which declined steadily most of last year, were stabilized in the last quarter and in December registered a slight gain. On the other hand, goods in process and finished goods were reduced 4 and 2 per cent, respectively, during December.

Daily average shipments for all the durable goods industries, except stone, clay and glass products, increased during December. The most notable shipment gains in the durable group were those of the iron and steel, electrical machinery and automotive industries.

RECONVERSION—There is a strong possibility that nondurable civilian goods production will be curtailed still further because of the growing manpower and raw material shortages. It is possible that production schedules in a number of essential durable goods plants, such as railroad and farm equipment, also will be adjusted downward due to the inability to obtain needed steel requirements. However, WPB continues to work on a blueprint to guide reconversion when military demands slacken. It is said to provide for giving advance notice to management and labor on cutbacks in military contracts, and to give local area committees a larger voice in deciding which plants will first return to civilian production. The closer we get to V-E Day, the grimmer become reports about the prospect for civilian goods output between then and the ending of the war in the Far East. The fact the Pacific war is far ahead of schedule and the decision to produce in this country most of the war goods required to finish the military job in the Pacific, are major reasons for lower estimates of the probable cutbacks in war contracts following the end of the European war. These estimates now range between 10 and 17 per cent.



Index of Manufacturers' Durable Goods

(Mo. Ave. 1939 = 100)

	Orders		Shipments		Inventories	
	1944	1943	1944	1943	1944	1943
January	331.5	293.5	365	208	212.0	211.3
February	294.4	326.6	384	337	208.6	209.6
March	309.7	349.2	369	330	207.2	210.7
April	325.0	329.8	387	338	204.9	213.5
May	351.6	313.0	369	338	204.9	213.5
June	358.9	392.7	378	343	203.6	212.5
July	392.7	338.7	375	346	201.9	211.4
August	366.9	319.4	368	354	200.9	213.4
September	350.0	339.5	370	356	198.8	214.9
October	366.9	339.5	381	382	197.1	214.0
November	371.8	316.1	376	376	194.6	213.3
December	377.4	324.2	392	393	191.7	212.8
Average	349.7	332.3	376	342	202.1	212.7

FIGURES THIS WEEK

INDUSTRY	Latest Period*	Prior Week	Month Ago	Year Ago
Steel Ingot Output (per cent of capacity)	93	89.5	93.5	98.5
Electric Power Distributed (million kilowatt hours)	4,472	4,505	4,588	4,512
Bituminous Coal Production (daily av.—1000 tons)	2,025	1,893	2,008	2,158
Petroleum Production (daily av.—1000 bbls.)	4,730†	4,729	4,734	4,385
Construction Volume (ENR—unit $1,000,000)	$43.9	$20.6	$27.7	$37.0
Automobile and Truck Output (Ward's—number units)	20,010	20,960	20,720	19,610

*Dates on request.

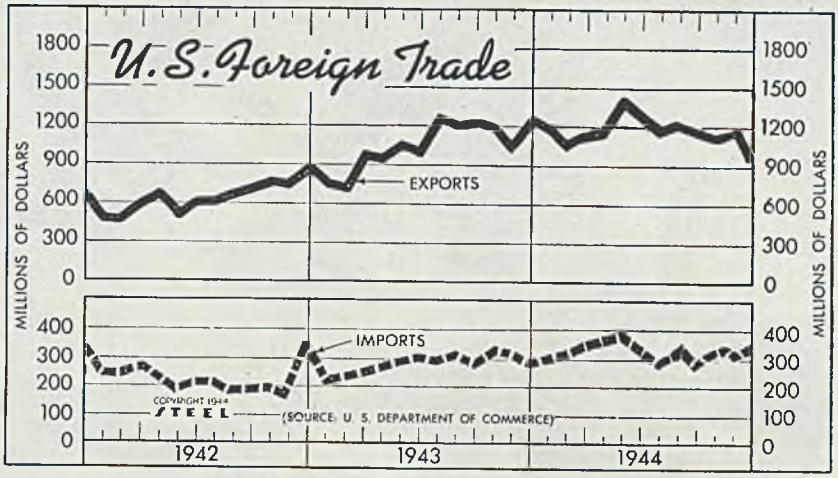
TRADE				
Freight Carloadings (unit—1000 cars)	760†	755	777	776
Business Failures (Dun & Bradstreet, number)	23	14	16	25
Money in Circulation (in millions of dollars)‡	$25,533	$25,411	$25,209	$20,610
Department Store Sales (change from like week a year ago)‡	+11%	+17%	+2%	+2%

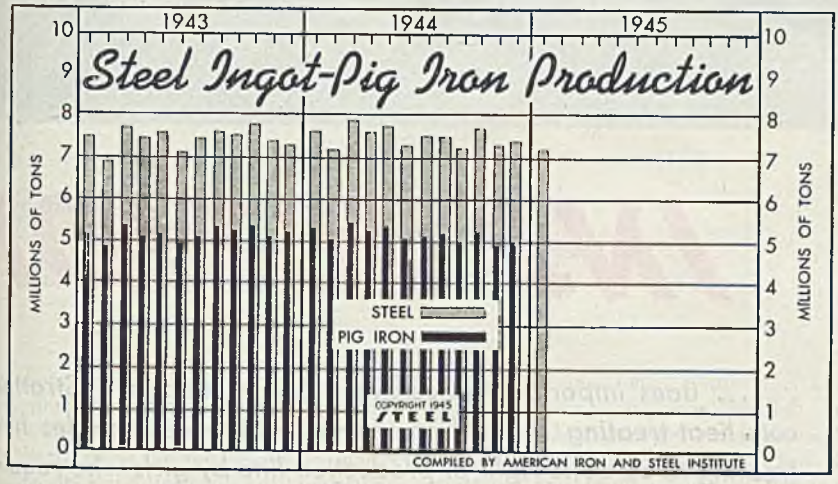
†Preliminary. ‡Federal Reserve Board.

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.	1,140	1,195	802	327	329	200
Nov.	1,185	1,074	787	322	317	168
Dec	948	1,244	873	336	281	358
Total	14,185	12,716	8,035	3,907	3,369	2,742





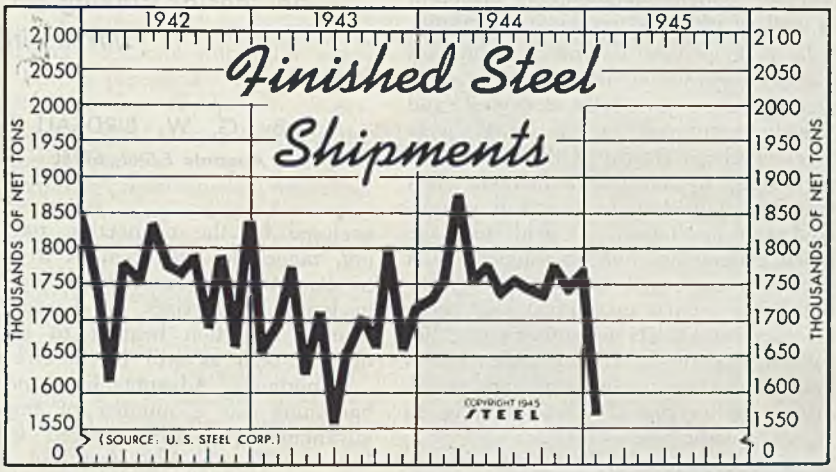
Iron, Steel Production
(Net tons—000 omitted)

	Steel Ingots			Pig Iron	
	1945	1944	1943	1944	1943
Jan.	7,178	7,587	7,425	5,276	5,194
Feb.	....	7,188	6,825	5,083	4,766
Mar.	....	7,820	7,675	5,434	5,314
Apr.	....	7,588	7,374	5,243	5,035
May	....	7,697	7,550	5,343	5,173
June	....	7,229	7,039	5,057	4,836
July	....	7,493	7,408	5,157	5,023
Aug.	....	7,493	7,586	5,210	5,316
Sept.	....	7,230	7,514	4,988	5,226
Oct.	....	7,616	7,814	5,200	5,324
Nov.	....	7,274	7,374	4,904	5,096
Dec.	....	7,361	7,266	4,999	5,213
Total	....	89,576	88,873	61,894	61,777

Finished Steel Shipments
Net Tons

	1945	1944	1943	1942
Jan.	1,569,115	1,730,787	1,658,992	1,738,893
Feb.	.....	1,755,772	1,691,592	1,616,587
Mar.	.....	1,874,795	1,772,397	1,780,938
Apr.	.....	1,756,797	1,630,828	1,758,894
May	.....	1,776,934	1,706,543	1,834,127
June	.....	1,737,769	1,552,663	1,774,068
July	.....	1,754,525	1,660,762	1,765,749
Aug.	.....	1,743,485	1,704,289	1,788,650
Sept.	.....	1,733,602	1,664,577	1,703,570
Oct.	.....	1,774,969	1,794,968	1,787,501
Nov.	.....	1,743,753	1,660,594	1,665,545
Dec.	.....	1,767,600	1,719,624	1,849,635
Total	.....	21,150,788	20,244,830	21,064,157
Adjustment	.....	.....	°97,214	°449,020
Total	.....	.....	20,147,616	20,615,137

°Decrease.



FINANCE

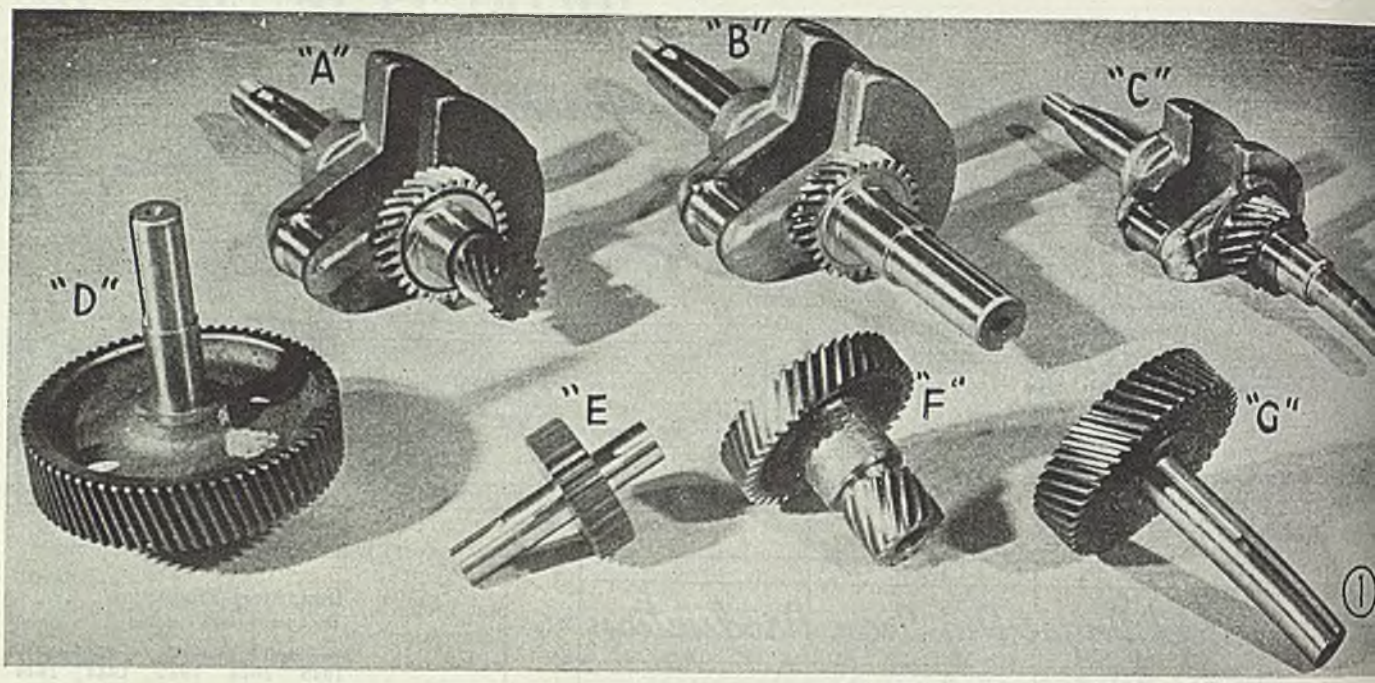
	Latest Period°	Prior Week	Month Ago	Year Ago
Bank Clearings (Dun & Bradstreet—millions)	$9,450	$11,016	$11,371	$9,268
Federal Gross Debt (billions)	$234.2	$233.9	$233.1	$185.5
Bond Volume, NYSE (millions)	$46.6	$48.5	$68.7	$80.4
Stocks Sales, NYSE (thousands)	8,320	8,112	9,124	4,336
Loans and Investments (millions)†	$59.0	$59.2	$59.6	$53.3
United States Government Obligations Held (millions)†	$44,219	$44,257	$44,138	$38,902

†Member banks, Federal Reserve System.

PRICES

STEEL's composite finished steel price average	$57.55	$57.55	$57.55	$56.73
All Commodities†	104.9	104.7	104.7	103.1
Industrial Raw Materials†	116.0	115.3	115.6	112.4
Manufactured Products†	101.6	101.6	101.4	100.6

†Bureau of Labor's Index, 1926 = 100.



INDUCTION

. . . . does important processing work at Briggs & Stratton; cuts heat-treating cycles from hours to seconds; enables heat treating to be done right at production line by girls who require no special training for the work; combines heat treating with shrink fitting on certain assemblies

By G. W. BIRDSALL
Associate Editor, STEEL

WHEREVER a small but dependable engine is needed, there you will usually find a single-cylinder 4-cycle air-cooled unit built by Briggs & Stratton Corp., Milwaukee, said to be the world's largest maker of such equipment.

And the plant which in 1908 consisted of a few feet of floor space in a machine shop now fills several large multi-storied buildings at two different locations. There the visitor sees the latest types of modern metalworking machines as well as advanced production methods.

In fact, certain improved techniques that are regarded as innovations by some manufacturers are fully accepted and already employed on a broad scale here. Perhaps typical of these advances is heating by electric induction. Not long ago, induction heating was considered too specialized a field to have much general use but for some time it has been employed at Briggs & Stratton in the regular production heat treatment of crankshafts and other parts. Results of experimental work indicate several advantageous brazing and shrink fitting applications also will soon be in regular production.

Many Applications: Some 30 or more applications have already been developed by Briggs & Stratton engineers and more than 20 are in use at the present time. Most of these are for developing high surface hardness on certain portions of the crankshaft to resist wear. Others include hardening of gear teeth, cams and similar parts while one application combines induction hardening with shrink fitting.

Fig. 1 indicates some of the applications of induction heating here. The most important use is in hardening the wearing surface of the crankpin on all sizes of crankshafts, from the small crankshaft for 2/3-horsepower engine at C, Fig. 1, to the large crankshaft for the 6-horsepower engine at B, Fig. 1. The crankpin, that portion of the crankshaft enclosed by the connecting rod bearing, ranges in size from ¾ to 1 inch in diameter and from ⅞ to 1⅛ inches in length. All sizes are hardened by electric induction heating to a depth of 3/32-inch as will be described.

Important Advantages: Induction hardening has a number of important advantages that have proved valuable here. Not only is it fast and subject to precise control but only the particular surfaces where the hardness is wanted need be treated. And this means economy in heating. Too, it means that the operators can handle the work in and out of the machine without using tongs or asbestos gloves.

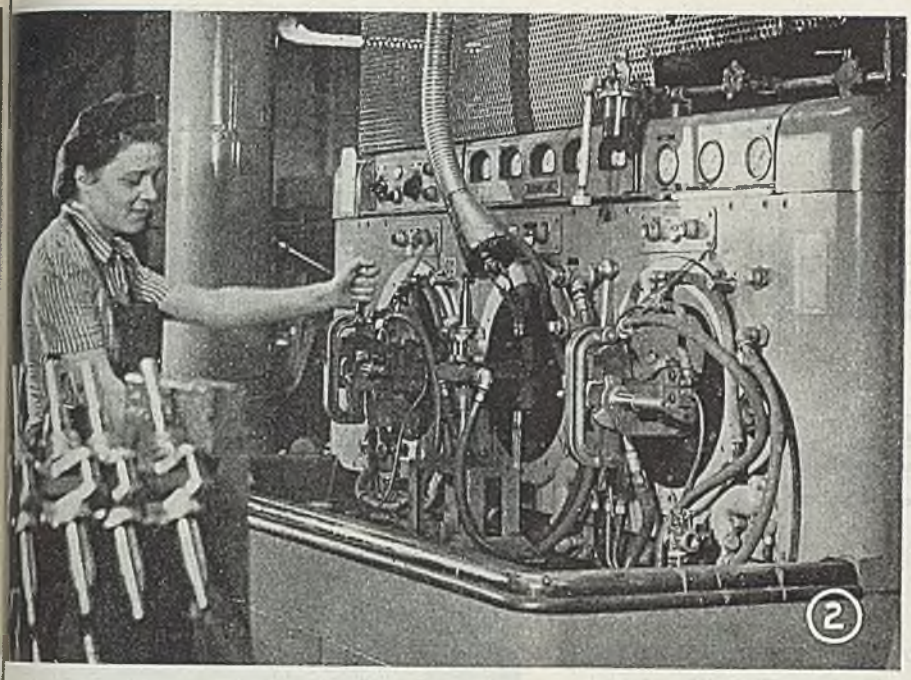
High Production: Induction hardening is truly a high production operation for the work goes through a complete cycle in a matter of seconds, instead of hours as in usual furnace treatment. A typical cycle involves a total of 5 seconds, 2 for heating, 3 for quenching.

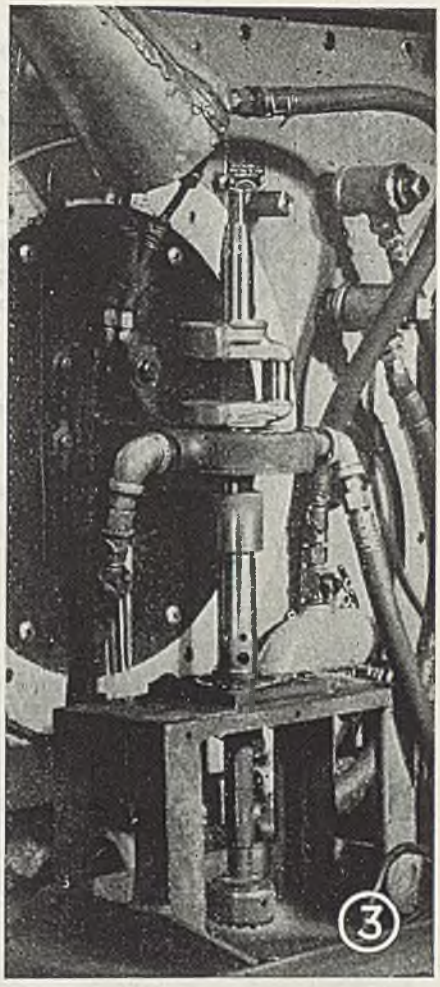
This 5-second cycle is so fast an operator is kept busy unloading and reloading a single fixture. But where somewhat longer cycles are used, one operator unloads and reloads two fixtures alternately. In fact, the standard Tocco induction hardening machine used here is equipped with three work stations so work can be going through all three if desired. The automatic controls are so arranged that current is drawn by only one station at a time. Thus the power equipment need be no larger than required by a single station; and using two or three stations in rapid sequence puts a higher load factor on the equipment and thus makes for more efficient overall operation where enough work is available.

No Scaling: This great speed is important from another angle. Because the work is at heat for only a matter of a few seconds, it has no time to form scale since production of scale depends on oxidizing the surface, a chemical reaction that requires a much longer period of time than a few seconds.

No Decarburization: The extremely short heating cycle also precludes any possibility of decarburizing the work, for this too is a chemical reaction that requires a comparatively long period of time. Thus work comes from the induction heating operation with the surface in the original chemical condition.

Localized Heating: In induction hardening, the treatment is confined to those surfaces it is desired to harden because induction heating is a localized





HEATING

operation. Only that portion of the work immediately adjacent to the electrical inductors and in the magnetic field they produce is heated. The inductors can be designed to heat any particular portion of the work desired. This highly localized heat pattern makes it possible to preserve the original physical properties of the adjoining sections.

No Distortion: Equally important, distortion effects are greatly minimized. This follows from the fact that only a portion of the work is heated and that this portion is not heated throughout its entire cross section but only at the surface. Thus the unheated core is always there to retain the original shape.

How It Works: A brief explanation of the principle of electric induction heating will help to understand these points. By placing around the work to be heated an electrical conductor carrying a large alternating current, a powerful magnetic field is created. Since the work is positioned within this field, it is magnetized in one direction, immediately demagnetized and remagnetized in the opposite direction. But this continual and rapid change of the magnetic state of the steel involves a certain amount of "friction" in rearranging the magnetic elements within the steel, so that heat is produced. This effect is called heating by "hysteresis" losses.

As soon as the temperature of the steel rises above the critical point, or when handling nonmagnetic materials, none of the heating comes from the above phenomenon but here heating is caused solely by another effect.

The rapidly changing electromagnetic field induces electric currents in the work. But since the metal part is a conductor of electricity, these currents are short-circuited within the part itself, resulting in rapid heating from these "eddy current" losses, as they are called. This

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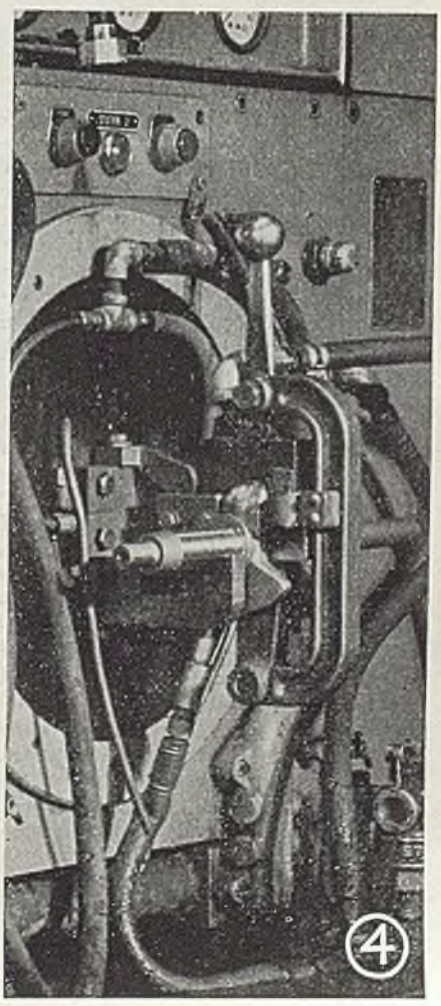


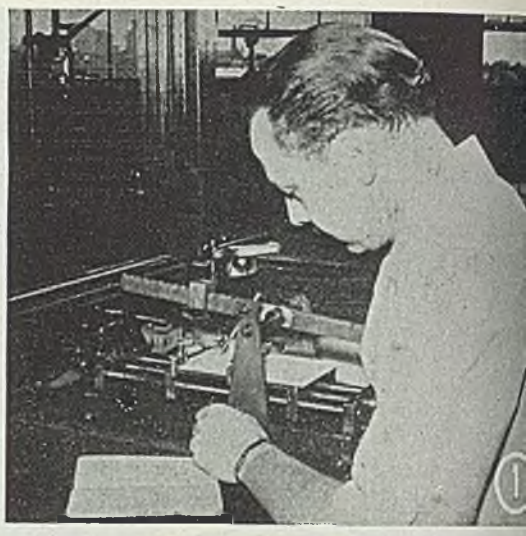
Fig. 1—*These typical parts are induction hardened at Briggs & Stratton: A crankshaft for 6-horsepower engine, with extra helical gear on near end for power take-off; B standard crankshaft; C crankshaft for 2 3-horsepower unit; D, E, F and G are gears used at various points*

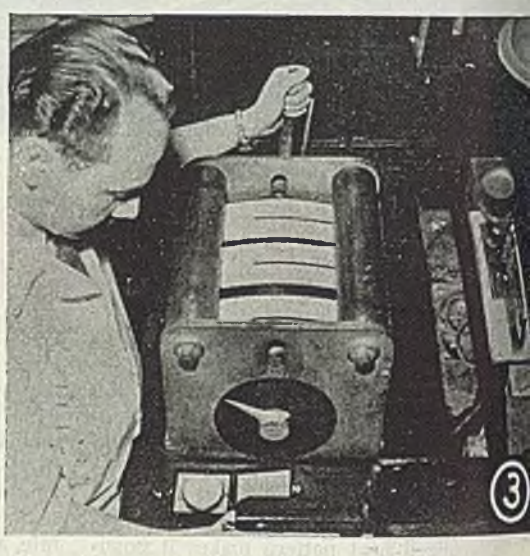
Fig. 2—*Overall view of Tocco 50-kilovolt-ampere electric induction heating unit equipped with automatic timers for control of heating and quenching cycles. Photos by Birdsall*

Fig. 3—*Closeup of simple single-turn inductor block with built-in water jets for quenching. This type of inductor block is used to induction harden integral gears as at A, B and C in Fig.* 1, *as well as separate gears*

Fig. 4—*Hinged type of inductor block and work fixtures, required for hardening crankpins. Pulling down handle swings upper half of inductor out of way to permit unloading and reloading fixture. Contact faces of separable inductor block are silver plated to assure minimum resistance to current flow*

Quality Control of ENAMELING STEELS





Suppliers of steels graded quarterly to reduce trouble in processing and expedite production. Classifications arrived at by evaluating actual performance, receiving department tests and laboratory reports. Vitamin A plays part

By R. F. BISBEE
Manager, Quality Control
Westinghouse Electric & Mfg. Co.

QUALITY CONTROL of any product is carried on for two purposes: (1) To maintain the quality and thus protect the customer, and (2) to reduce the cost by reducing the amount of defective workmanship. Control of quality works as the customer's representative and management's guardian, but it should be remembered that quality cannot be inspected into the product, it must be built into it.

Adequate control of the quality of materials bought outside assures a product that will give maximum life free from trouble. It also reduces trouble in processing and expedites production.

Every 3 months, each supplier of enamel steels is graded. This grading is arrived at by evaluating actual performance, receiving department tests and reports and laboratory results. A committee, composed of the superintendent of the enamel division and the manager of quality control, grades the suppliers and sends a report to the purchasing department together with a performance chart. The chart grading is based on the following symbols:

AA—Very satisfactory (above commercial)
A—Satisfactory (commercial)
B—Satisfactory, but not as good as A
F—Failure

A supplier falling into the F class for 2 consecutive months is placed on the unapproved list of suppliers. It then is necessary for that company to send a satisfactory sample shipment before it again is placed on the approved list.

Accurate steel performance records are very important for maintaining adequate control over enameling steel as well as giving important information to suppliers. We keep accurate monthly records which are given to suppliers during their monthly visits. They cover: Average gage; per cent scrap (both punch and enamel shops); sag performance; and enameling performance. Each quarter the committee submits a complete report to the purchasing agent, based on the monthly performance of each supplier.

Benefits: The benefits gained are, first, reduced manufacturing costs which are based on the actual quality performance of recommended suppliers; second, specialized processes made possible by recommending certain suppliers for definite applications; and third, uninterrupted production and increased quality providing No. 1 and No. 2 recommendations are carried out.

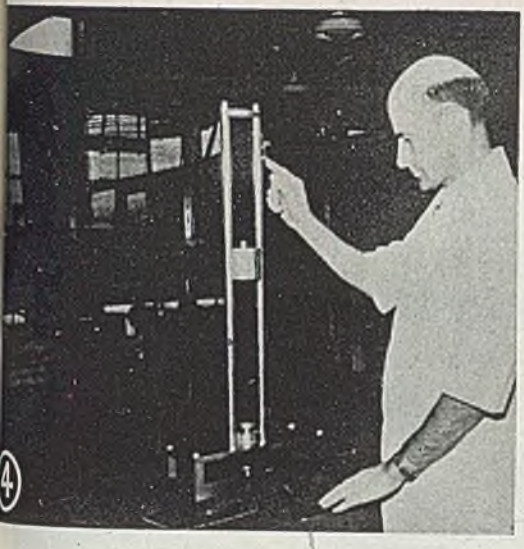
In addition to detailed information on each supplier, plus our recommendation of certain suppliers for definite applications, we attach charts which show last year's average performance of sag and enameling performance for each supplier as well as the quarterly performance of the current year. In this manner, the purchasing department has all the facts which enable them to purchase (based on quality performance) steel that will give the best quality performance.

Details of Steel Control

The most important checks are surface and gage, drawing qualities, bond adhesion, and sag test.

As the steel is received, enough sheets are checked to determine if they are free from damage — that is, dings, scratches, etc. At the same time, the sheets are checked for gage. A record showing average gage, weights and estimated weight of each shipment is kept. Representative samples then are selected and sent to our control laboratories for testing.

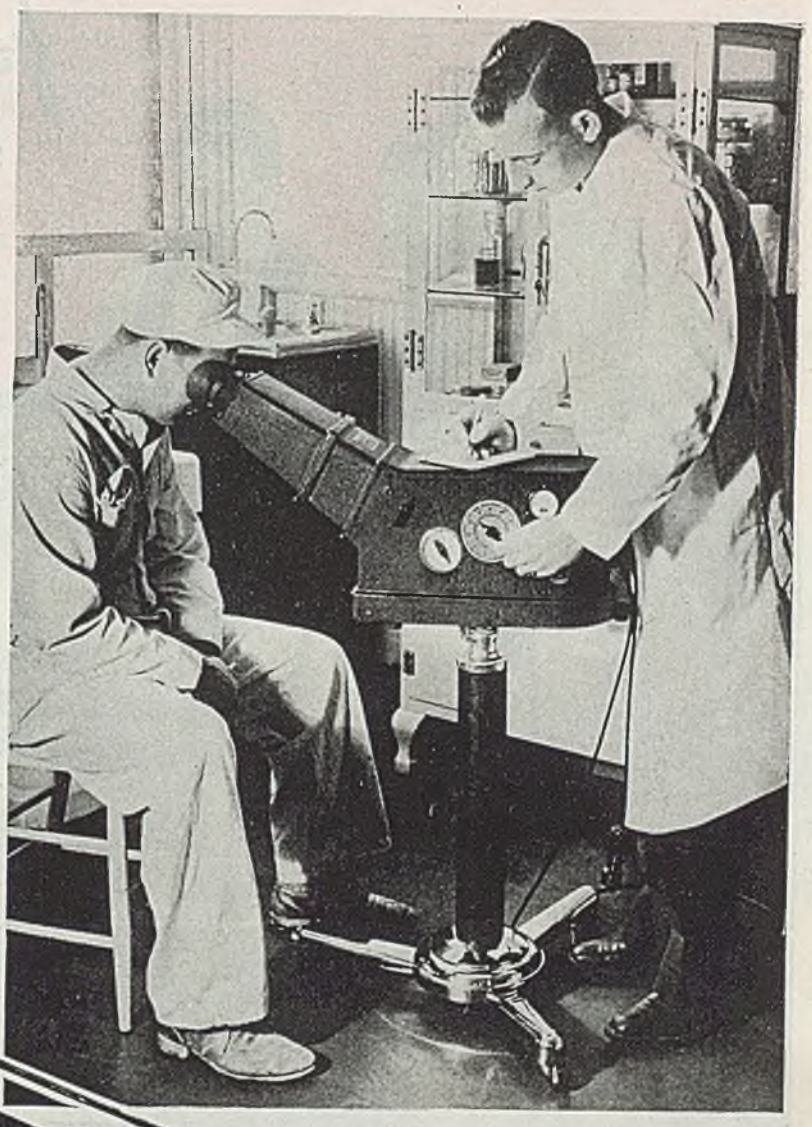
On all difficult drawing jobs, samples are tested before acceptance for three physical properties. Tests include the cup test on testing machine to determine ductility, rockwell hardness tests to determine surface hardness, and elongation on test machine to determine elasticity. Over the years, limits have been determined from the results of these three tests that tell, without setting the dies, whether or not the material will do the job for which it was purchased. While suppliers are kept informed of the physical limits of our tests, we instruct them to make steel for the application. In any case, where tests indicate the steel

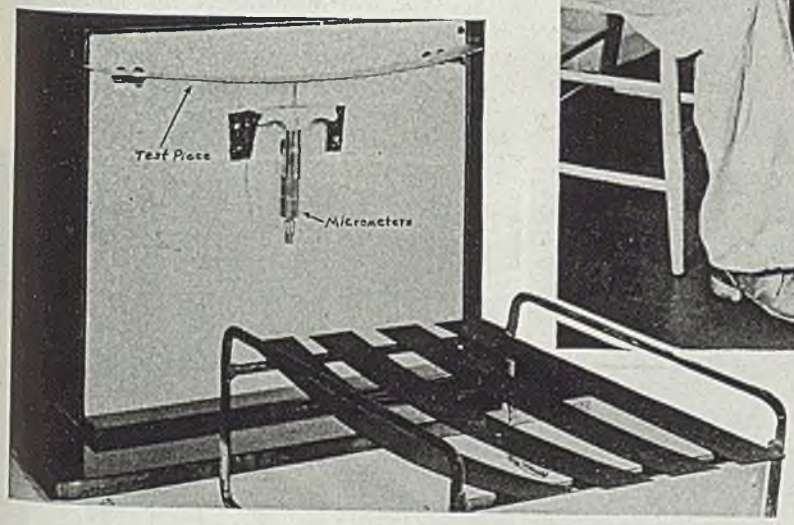


Left, below—A typical sag test set-up, used to compare various steel samples. Results are used in grading suppliers

Directly below—The bio-photometer determines if men responsible for checking color are deficient in vitamin A, a condition which prevents accurate visual analysis of color variation

Left—Numerous tests are performed on finished samples. (1) Enamel hardness test for vitreous finishes; (2) Impact resistivity test for vitreous enamel; (3) Cross bend test for vitreous enamel; (4) Test for adhesion of enamel to steel





is questionable, it is not rejected until we first set our dies and actually try out the material.

Following the regular physical test, a sample is sent to the laboratory where it is given a thickness controlled ground coat of enamel. It is then tested in a regular impact tester, after which the percentage of steel with enamel still adhering is determined. Limits can be set up so that decisions can be made whether the steel is satisfactory for bond adhesion. The height of drop of a 5-pound weight varies according to the thickness of the steel.

Sag tests are conducted in line with tentative specifications established through the Porcelain Enameling Institute. The samples tested are 1 x 12 inches, placed on a nickel chromium rack ¼-inch in diameter with 10-inch centers. The entire unit is placed in the center of a furnace which has been heated to 1600 degrees (plus or minus 5 degrees) Fahr. The samples remain in this temperature for 10 minutes, after which they are removed and allowed to cool to room temperature. Sag from horizontal is then measured. The results obtained are of a comparison type and are used in grading our suppliers.

In general, the regular feeder section inspection is the foreman's responsibility. In the machine shop an inspector with a toolmaker's training checks the first and last piece; that is, when the die setter sets the die in the press and runs the first piece, he obtains the release before operating the press. The last piece is also checked against the first piece and if found defective, it is the responsibility of the foreman and the operator to inspect the entire lot in detail. This puts

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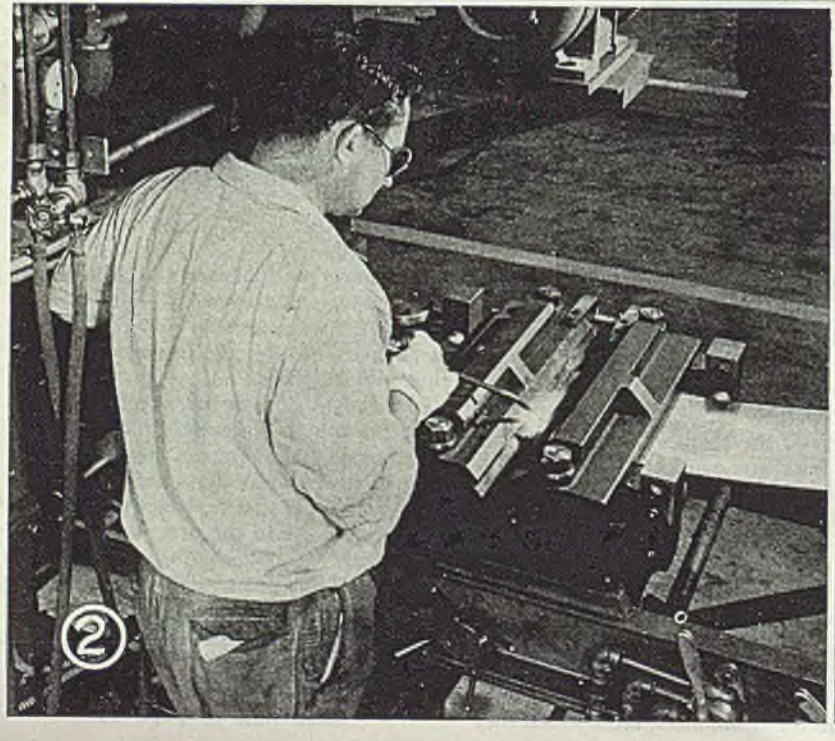
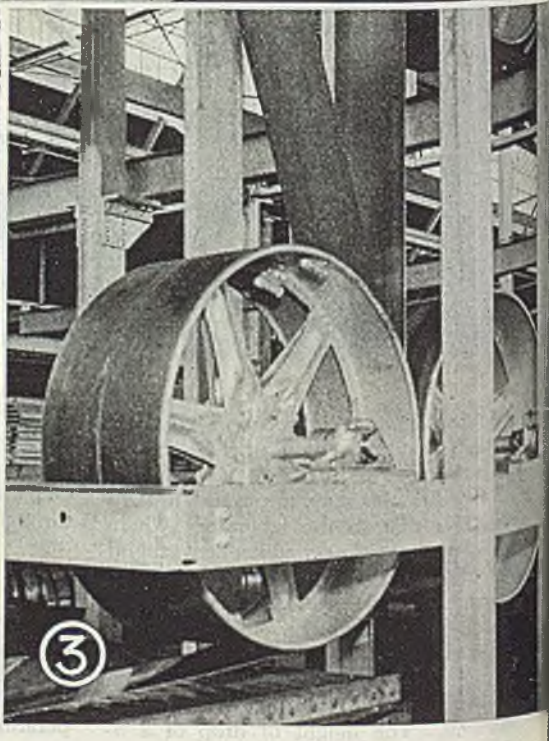
Producing GAS WELDED TUBING from 2500 pound coils of Strip





Steel in transit from strip mill to tube plant is prevented from shifting by careful banding and packing. Compensation for variations in skelp thickness, analysis and condition is effected by changing speed of strip going through mill rather than altering pressure of oxygen and acetylene. Electronic control widely employed. Looping system provides for joining of coil ends without interrupting welding operation

By J. N. BOHANNON
Plant Manager
Spicer Mfg. Corp.
Pottstown, Pa.
and
F. JUDELSOHN
Engineering Supervisor
Air Reduction Sales Co.
Philadelphia

HARD-PRESSED to meet urgent Army-Navy demands for high-quality welded power-transmission tubing for aircraft, tanks, trucks, and other mobile units, Spicer Mfg. Corp., Pottstown, Pa., turned to the unprecedented expedient of planning and building an entire plant for production of such tubing. Already in operation for over a year, the brand-new streamlined tube mill—probably the world's first plant annex erected exclusively for tube welding—is turning out many miles of badly needed tubing on two large continuous units and one small unit. Twenty-four hours a day, seven days a week, finished propeller shafts roll off the production line.

Welded tubing is especially suited to use in parts which must rotate at high speeds without whipping, and support heavy loads without buckling. For automotive shafts and similar uses, high speeds require accurate balancing in the tubing; out-of-balance creates whipping. Therefore welded tubing which utilizes flat strip in which uniform thickness is maintained, is generally desirable, especially for high-speed drives.

The new plant is designed to incorporate the most advantageous and up-to-date features of welded tubing manufacture everywhere—including several new company developments.

The building is large enough to house all of the forming, welding, and testing machinery without crowding and still leave sufficient storage space and room for expansion—46,125 square feet of floor space in all, enough for three times present production. A high ceiling and special ventilating features guarantee proper ventilation without any sort of draft. The entire building is as nearly moisture-proof as possible to prevent rust-

(*Please turn to Page* 102)

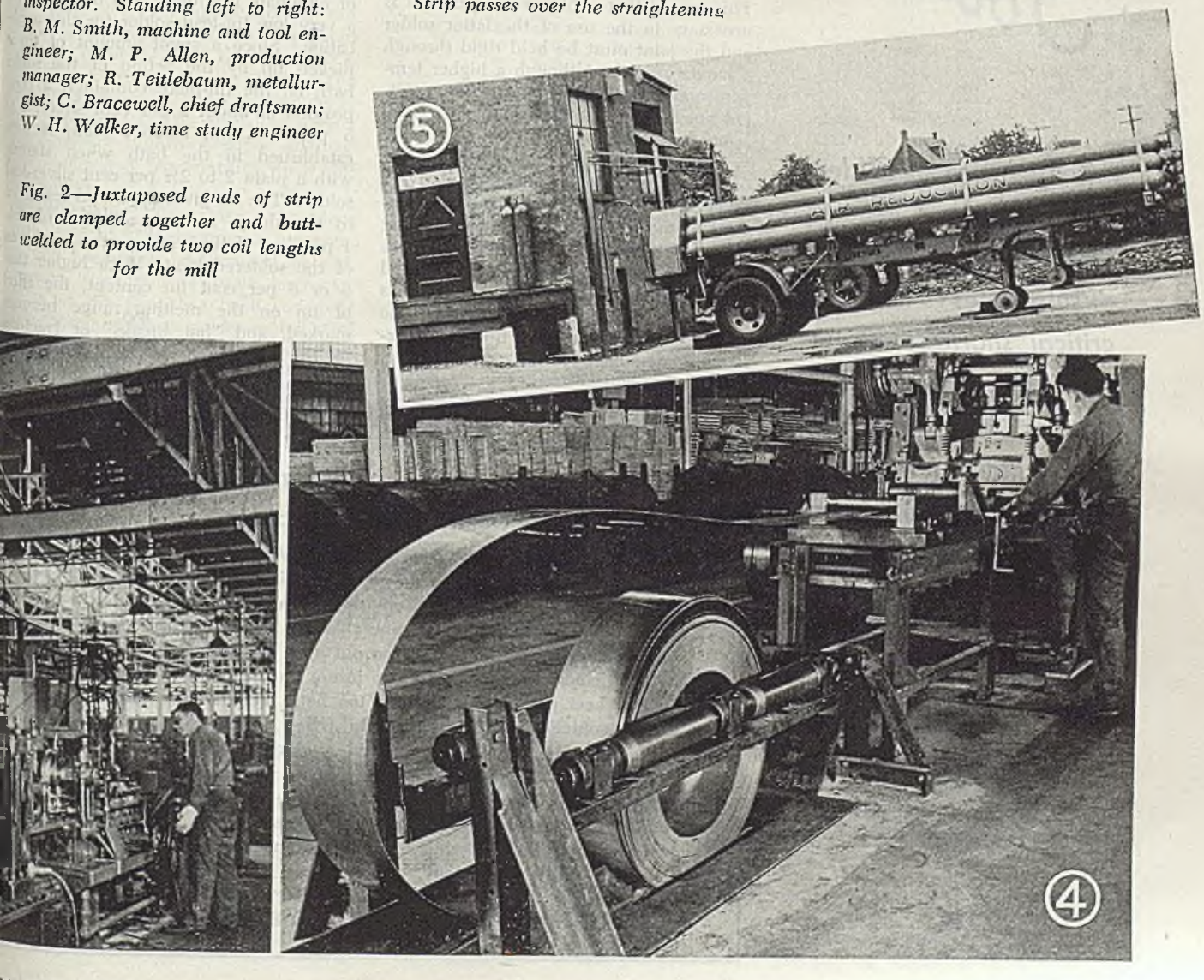
Fig. 1—Engineering and production personnel who planned the welding mill; seated left to right: C. M. Shaner, production superintendent; J. N. Bohannon, plant manager; G. H. Burdan, foreman tubing department; R. Hoel, chief inspector. Standing left to right: B. M. Smith, machine and tool engineer; M. P. Allen, production manager; R. Teitlebaum, metallurgist; C. Bracewell, chief draftsman; W. H. Walker, time study engineer

Fig. 2—Juxtaposed ends of strip are clamped together and butt-welded to provide two coil lengths for the mill

Fig. 3—Strip from compensator system is guided into first vertical breakdown rolls which impart a shallow U-shape

Fig. 4—Coil in the guide stand is supported on leather-faced rollers. Strip passes over the straightening table and is then trimmed for butt-welding

Fig. 5—Control house for oxygen and acetylene. Both gases are piped to regulators alongside individual welding and forming units



TIN-FREE and LOW-TIN Solders

Extensive use of solders for joining has necessitated the development of substitutes to meet the critical shortage of tin. Physical properties, limitations and modes of application of alternate types worked out for the War Metallurgy Committee are presented

By
C. A. REICHELDERFER
and
B. W. GONSER
Battelle Memorial Institute
Columbus, O.

SINCE the most acceptable substitutes for tin-lead solders, particularly those containing cadmium, have been on the scarce or critical list, the development and use of low-tin solders and lead-base solders containing no tin was necessary. To some extent, the change in properties caused by the low tin contents has been offset by additions of minor amounts of antimony, bismuth, arsenic, and silver; but changes in soldering technique have been far more effective in compensating for the lower tin content.

Solders: Before World War II, soft solders in this country were of rather simple composition, consisting mainly of lead and tin with occasional additions of antimony in amounts of 2 per cent or less. Cadmium-base solders and tin-antimony solders were used for special applications. Since war started, however, many variations have been developed.

Present low-tin solders generally have higher melting points and longer freezing ranges, requiring a different technique in use than with the high tin-lead solders. Whereas, for example, a 50-50 tin-lead solder is completely melted at 421 degrees Fahr. and has a freezing range of 50 degrees Fahr., a 20 per cent tin solder containing one per cent of antimony and 0.5 per cent silver is not completely melted until 511 degrees Fahr. and has a freezing range of 155 degrees Fahr. This means that a higher temperature is necessary in the use of the latter solder and the joint must be held rigid through a longer period. Although a higher temperature is required, it is just as important not to overheat; hence, closer control is needed.

The compositions and freezing ranges of some of the more common solders are given in Table I. Emergency specifications of the American Society for Testing Materials covering this general field are given in Table IV. Just as the normal tin-lead solders have different properties suiting them for various applications, so also do the low-tin and tin-free emergency solders have specific properties that fit them for particular uses.

Lead-Silver Solders: The greatest conservation of tin in solders can be made, of course, by eliminating the tin entirely. Lead alone is being used successfully in coating steel parts by hot dipping[1] after thorough cleaning and fluxing; but, with the exception of a very few applications, it does not have the requisite wetting tendency, flowability, or strength for a successful solder. By adding a little silver, however, solderability is markedly increased and the melting range is lowered somewhat. This forms the basis for a series of tin-free solders which has gained wide usage.

A 2.5 per cent silver addition gives the eutectic or lowest melting point of this group, and this composition is much used for general soldering. Addition of 0.25 per cent copper is optional. It is thought to give better wetting, a slightly stronger joint, and higher creep resistance in electrical work. The silver content is sometimes raised to 5 per cent for greater assurance of solderability, but for the sake of economy the tendency has been to drop silver to 2 per cent, or even 1 per cent, if tests showed such change to produce the desired joint properties.

Probably the most important commercial substitution of silver-lead for high tin-lead solder has been in the soldering of side seams on tin cans, although recently the trend has been to reduce the silver content to only 1 per cent or so, or eliminate it entirely and depend upon a very low tin-lead solder for this application. Since a small amount of tin is picked up by the action of the solder bath on the tin-plate container, a composition of about 2 per cent silver, 3 to 5 per cent tin, balance lead, is soon established in the bath when starting with a plain 2 to 2½ per cent silver-lead solder. The tin gives improved resistance to tarnishing; in fact, addition of only 1 per cent of tin improves the brightness of the soldered joint. With higher than 5 or 6 per cent tin content, the effect of tin on the melting range becomes marked, and "hot breaks" or fractures in the joint may occur from cooling strains while the solder is not entirely solidified. The aid silver has given to

Precautions To Be Taken in Using Low-Tin Solders

1. Use a tin-lead solder free from antimony. Avoid any antimony-containing solder when soldering zinc or galvanized iron.
2. Use a flux high in ammonium chloride, such as one of 28 parts by weight ammonium chloride, 72 parts zinc chloride, and 400 parts water.
3. In case zinc coating is dull, as on old used material, add a little free hydrochloric acid to flux in item 2 to insure removal of zinc carbonate.
4. Do not heat parts to be soldered too hot. Temperature just hot enough to flow solder is all that is needed. (High temperatures oxidize the galvanized surface forming oxychlorides which cause solder to "ball up" or fail to wet the sheet. Low-tin solders, however, require higher temperatures than high-tin solders). As in the soldering of any metal, possibility of using different heating methods should be considered. Metals heated rapidly to soldering temperatures have less time to oxidize and therefore solder more easily.
5. Wash finished joints thoroughly with water or very dilute hydrochloric acid, followed by water to remove excess flux.

TABLE I
COMPOSITION AND FREEZING RANGE OF SOME TIN-LEAD AND MODIFIED LEAD-BASE SOLDERS

Tin	Lead	Antimony	Silver	Copper	Temperature, Degrees Fahr. Solidus	Liquidus	Freezing Range
15	85				437	543	106
30	80				361	523	162
50	70				361	486	125
40	60				361	453	92
50	50				361	421	60
60	40				361	372	11
63	37				361	361	0
			Modified Solders*				
...	99	...	1	....	579	604	25
...	97.25	...	2.5	0.25	576	590	14
...	97.5	...	2.5	....	579	579	0
2.25	95.25	2.0	0.25	....	457	577	120
5	94	...	1.00	....	561	572	11
19	80	1.0	...	....	365	523	158
20	79.58	...	0.42	....	352	523	171
20	79.25	...	0.75	....	351	523	172
20	78.5	...	1.5	....	350	517	167
20	78.57	1.0	0.43	....	356	511	155
20	77.50	2.0	0.5	....	363	505	142
20	77.25	1.5	1.25	....	354	504	150

*D. L. Colwell and W. C. Lang, Conservation of Tin in Soft Solders, Preprint 35 ASTM, 1943.

TABLE II
HIGH BISMUTH SOLDERS

Composition, Per Cent Bismuth	Tin	Lead	Melting Range Degrees Fahr.
67	17	16	300-203
56	22	22	220-203
52.5	15.5	32	203 (eutectic)
33.3	33.3	33.4	290-203
14	43	43	325-290

TABLE III
SUBSTITUTE SOLDERS COMMONLY USED IN THE ELECTRICAL INDUSTRY

	Nominal Composition	Softening Point, Degrees Fahr.	Fluid Point, Degrees Fahr.
1.	97.5 Pb, 2.50 Ag	519	579
2.	90.0 Pb, 10 Sn	527	566
3.	84 Pb, 15 Sn, 1 Ag	...	...
4.	77.75 Pb, 20 Sn, 1.25 Ag, 1.50 Sb	352	503
5.	66.75 Pb, 30 Sn, 2 Sb, 1.25 Ag	...	...

the solderability of lead has encouraged the addition of small amounts to 20 per cent tin-lead solders, as shown in Table 1, but there is some divergence of opinion concerning the advantage of silver with tin contents of 20 per cent or more.

In general, the silver-lead solders are fitted for applications where a relatively high temperature of application is not a serious handicap, and where strong acid fluxes can be used. With tinned surfaces, noncorrosive fluxes can be used. The short freezing range is an advantage in many applications. The silver-lead solders as a class are slightly stronger, particularly at elevated temperatures, than tin-lead solders.

Resistance of this solder to outdoor weathering and underground corrosion has not been fully determined as yet. Excessive formation of basic lead carbonate at the joint has been reported[2] in one instance where solder-coated steel covers were soldered to antimonial-lead cases. In another application where lead parts were joined to lead, complete disintegration of the solder occurred within 2 years[2]. Caution, therefore, should be observed in using this solder for permanent installation underground or when fully exposed to outdoor corrosion. Addition of a few per cent of tin should be helpful in retarding corrosion.

Antimony Additions: Antimony has frequently been added to tin-lead solders in the past for increased strength and for economy. One per cent antimony is considered to replace 2 per cent tin, but there is a limit to the extent of such substitution. About 6 per cent antimony is soluble in tin; hence, antimony to the extent of 6 per cent of the tin content remains in solution and gives no particular trouble. Above this amount, crystals of a high-melting antimony-tin compound are formed, which not only embrittle the solder, but make it sluggish and rough. Small amounts of antimony, with or without silver additions, are consequently used in some of the modified solders shown in Table 1 to lower the melting range, give a stronger solder, and aid resistance to creep or slow movement under continued pressure.

The addition of antimony is definitely harmful when soldering zinc or galvanized parts and Nightingale[3] has found antimony deleterious in low-tin solders for use in soldering steel because of

TABLE IV
SOFT SOLDERS, ASTM EMERGENCY SPECIFICATIONS*

Nominal Composition, Per Cent Tin	Antimony	Lead	Bismuth	Silver	°F.	°C.	°F.	°C.
30	0 to 0.4	Remainder	.....	....	361	183	494	257
28	1.5 to 2.0	Remainder	.....	....	361	183	484	251
25	0 to 0.4	Remainder	.....	....	361	183	511	266
25	1.25 to 1.75	Remainder	.....	....	361	183	502	261
20	0 to 0.4	Remainder	.....	....	361	183	525	274
20	1.25 to 1.75	Remainder	.....	....	361	183	518	270
15	0 to 0.4	Remainder	.....	....	361	183	543	284
15	0.4 to 2.75	Remainder	.....	....	361	183	532–541	278–283
20	0 to 0.5	Remainder	0 to 0.75	1.25	356	180	518	270
(20	0 to 0.5	Remainder	5†	1.25	333	167	486	252)
15	0 to 0.5	Remainder	0 to 0.75	1.25	358	181	532	278
(15	0 to 0.5	Remainder	5†	1.25	333	167	503	262)
10	0 to 0.5	Remainder	0 to 0.75	1.50	352	178	554	290
	0 to 0.5	Remainder	.....	2.50	579	304	579	304
0.65 to 0.85	0 to 0.5	Remainder	.....	0.25	579	304	608	320

*These solders are the same as the SAE emergency solders 3 to 6, A and B, and E-01 to E-08 as listed in the 1943 SAE Handbook.

†The solders containing 5 per cent bismuth, E-02 and E-04, have been removed from the list of SAE emergency solders.

TABLE V
FLUXES

Flux	Characteristics	Use
Rosin	Noncorrosive, nonconducting, nonhygroscopic	Electrical
Tallow	Very mildly corrosive	Lead, brass, clean copper
Olive oil or Gallipoli oil	Very mildly corrosive	Pewter, block tin
Stearic acid	Mildly corrosive, almost nonconductive	Electrical, lead
Aniline phosphate or Aniline chloride	Mildly corrosive	Electrical
Lactic acid	Almost nonconductive	
Phthalic acid	Mildly corrosive	
Phosphoric acid	Slightly conductive	
Zinc chloride		Electrical
Mixed with tallow, rosin, etc.	Corrosive	Iron, steel zinc, copper, brass, bronze, terne, and lead plate
Zinc chloride and HCl	Corrosive	Stainless steel, nickel, and Monel
Zinc chloride plus HF	Corrosive	Brasses and bronzes containing aluminum, silicon, and manganese
Numerous proprietary pastes usually containing zinc chloride	Corrosive	
Zinc chloride and ammonium chloride	Corrosive	Iron, zinc, copper, brass, bronze
Dilute hydrochloric acid	Corrosive	Dirty zinc
Fused salts of zinc chloride and ammonium chloride	Corrosive	On dip pots

BLACK LIGHT FOR BOMBERS: Emitting invisible rays which illuminate fluorescent instrument dials, charts, and other treated equipment, these Westinghouse 4-watt bulbs maintain dark-adapted pilot vision. Machine inserts cathode and anode and bulb is sealed by gas flame at top

decreased joint strength. Experience in the soldering of steel in this country does not substantiate this contention, however, since additions of up to 5 per cent frequently have been found advantageous. For example, the joint strength of a 5-tin, 5-antimony solder has been found to be fully equal to that of a plain 10 per cent tin-lead solder.[4] Antimony is a particularly useful addition where increased resistance to creep at elevated room temperature is needed.

A lead-base high-antimony solder containing zero to 5 per cent tin and 4 to 8 per cent antimony has been suggested.[4, 5] At first this high antimony content seems excessive since in high tin solders an effort has always been made to keep a low ratio between antimony and tin, but since the tin content is low (well within the solid solution limits), it is probable that objectionable antimony-tin compound crystals would not form. This solder has been tried successfully in several applications.

Bismuth-Containing Alloys: Bismuth greatly lowers the melting range of the tin-lead solders and was a natural selection when additions for substitute solders were first suggested. The high bismuth-containing solders are used for special applications where a low melting point is essential and where the increased cost or poor availability is not too important. Such high bismuth alloys expand during and after solidification, which can be a disadvantage in some joints and an advantage in giving a tighter fit in others. Since the temperature of soldering is so low for these alloys, there is much less alloying, and fluxing is more difficult. The strength of joints made with these solders, consequently, is apt to be low. In general, bismuth in a solder is like lead and, except for lowering the melting point, is more a substitute for lead than for tin.

In some applications, the use of intermediate bismuth solders with low tin has been satisfactory. The long solidification range of the low tin solders, which may be amplified in this case by producing a small amount of a very low melting ternary eutectic, gives a weak joint or one that is "hot short" throughout a large portion of the cooling time. Frequently the increased cost and care needed to prevent strain during the cooling period do not compensate for the lowered soldering temperature. Scarcity of bismuth is also a factor. Additions of up to 1 per cent are frequently and advantageously made, however, because of their effect in lowering the soldering temperature.

Miscellaneous Solders: Some of the cadmium-containing solders are excellent, but must be disregarded because of the need for using cadmium in other applications. A 90 lead, 8 cadmium, 2 zinc alloy is probably the most promising substitute because of the relatively small amount of cadmium used. It is particularly useful in soldering zinc and galvanized parts. The melting range of about 410-530 degrees Fahr. is but slightly more than the melting range for low tin-lead solders.

Indium has been said[6] to give improved solderability to silver-lead solders when added in amounts of 1 or 2 per cent. The high cost of indium has discouraged its use.

Preparation of Work

The formation of a good joint by soldering depends fundamentally on the wetting of the surfaces to be joined by the soldering alloy. Most metals are wet only with difficulty by lead, but are wet easily by tin. High-tin alloys, therefore, have been preferred for ease of wetting. With careful preparation and attention to soldering technique, however, satisfactory joints also can be obtained with low-tin alloys in most cases.

Metals to be soldered must be clean and free from scale. Dirt, grease, oxide, and other foreign material must be removed either mechanically or chemically. Files, scrapers, emery paper, steel wool, sand blasting, or other mechanical means can be used. Commercial solvents and pickle liquors at times are more economical and more efficient than mechanical methods.

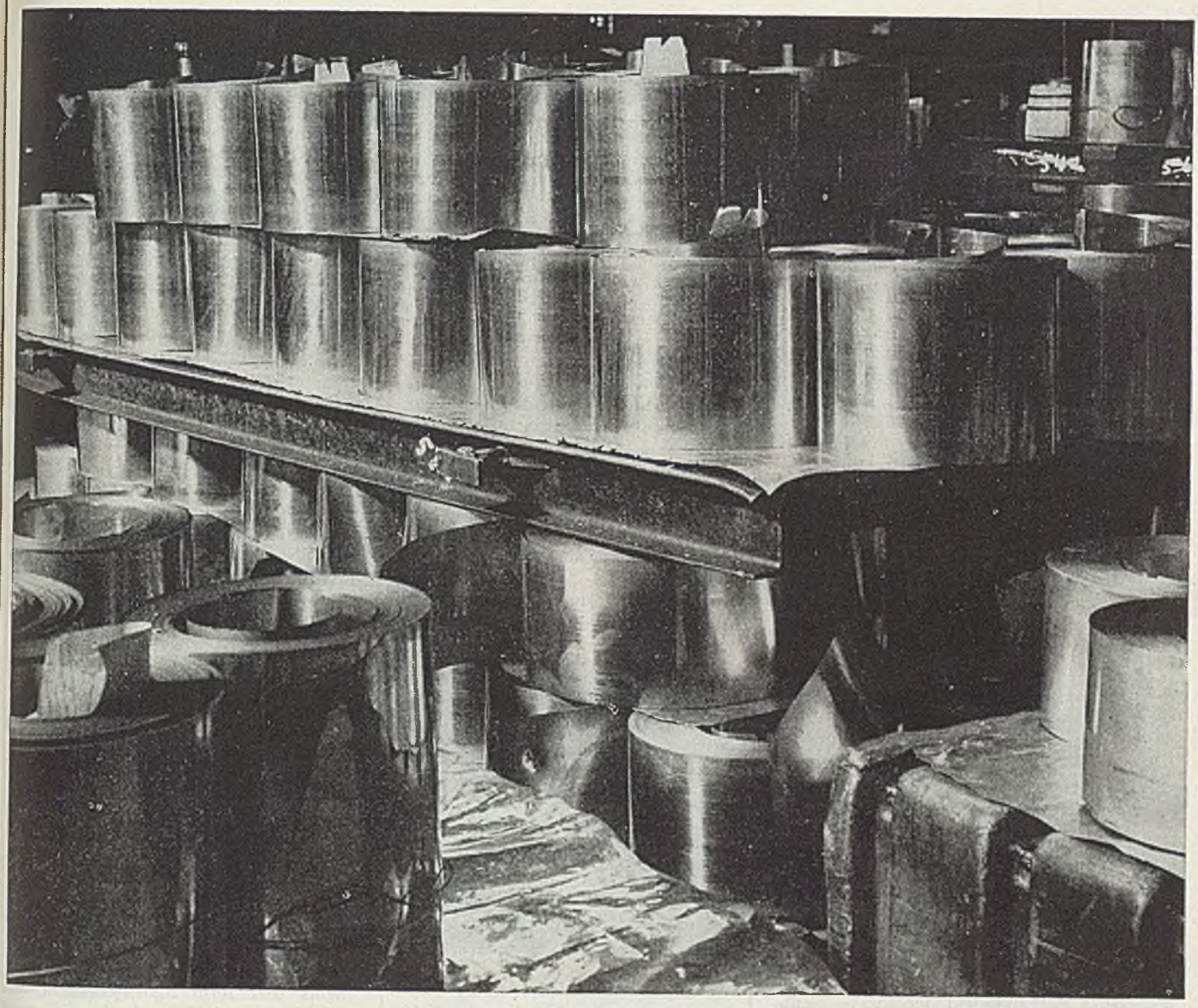
Tinplate and Tin-Coated Metals: Tin, because of its resistance to oxidation in the atmosphere and the ease with which it alloys with lead, is one of the easiest metals to wet with tin-lead solders. Tinplate and tin-coated metals can be joined readily by soldering and little, if any, preparation is needed other than fluxing. For this reason, metals to be soldered frequently are tinned.

Tinplate is usually coated with a film of palm oil, which not only protects the surface, keeping the metal bright, but also has fluxing properties that aid in soldering. Occasionally, however, oil, lacquer, or other materials which seriously interfere with soldering are used on tinplate. Almost any of the commercial solvents such as trichloroethylene, benzene, carbon tetrachloride, etc., will serve to remove these coatings, leaving a clean surface for soldering.

Copper and Copper Alloys: Copper when clean also soldered easily, and frequently is applied by electroplating or displacement coating to prepare other metals for soldering. Oxidized copper, on the other hand, is difficult to solder and must be cleaned. Mechanical cleaning can be used, but often pickling is more practical. Immersion for 5 to 15 minutes in 10 to 15 per cent sulphuric acid at about 150 degrees Fahr., followed by a water rinse, is usually sufficient for copper and such copper-base alloys as bronzes and brasses. A 10 to 15 per cent nitric acid solution frequently is used, especially when trouble is encountered in soldering after the sulphuric acid pickle.

Iron, Steel, and Galvanized Iron: Black plate, cast iron, galvanized iron, and other steel parts are much more difficult to solder than copper and tin and require more careful preparation. Again, abrasion will often produce a clean, solderable surface. Ordinary steels can be cleaned from oxide and scale by pickling in 5 to 15 per cent sulphuric or muriatic acid at 150 degrees Fahr. Tinning previous to soldering is the solution to some difficult soldering problems.

Cast iron, because of flake graphite and



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silicon, requires special preparation. Mechanical means of removing the casting skin by shot blasting, grinding, filing, etc., usually are insufficient preparation because of the graphite present. Coating such cleaned parts with pure iron, or with a relatively heavy coating of copper by electrodeposition is effective, but requires considerable time, equipment, and specialized attention. A more practical method is to remove the surface graphite by dipping the parts to be joined in a hot molten bath of equal parts sodium nitrate and potassium nitrate. This must be followed by washing and by a brief pickling treatment, as in a cold 5 per cent hydrofluoric acid solution, however, to remove the oxidized film produced. Alternately, a second fused salt bath may be used[7]. A proprietary flux[8] is also satisfactory for this second treatment.

Clean galvanized iron and zinc need no preparation, but can be soldered by using an active flux such as zinc chloride-ammonium chloride, preferably containing free hydrochloric acid. Dirty or oxidized zinc, however, should be cleaned with a solution of hydrochloric acid and washed with water before an attempt is made to apply solder.

As with tinplate, copper, and steel, other metals can be prepared for soldering by removing surface films mechanically by degreasing and suitable pickling. Thus stainless steel and high-chromium steels are best cleaned with hydrochloric acid. Lead and lead alloy are readily scraped clean. Malleable iron may be treated like cast iron if simpler cleaning operations are ineffective. Nickel and its alloys may be best cleaned with nitric acid.

Fluxes

It is not sufficient merely to clean a surface to be soldered, for that surface must be kept clean and free from oxide until it is coated with the solder. All common metals on contact with air form a thin oxide film which, if not removed would prevent the perfect metal-to-metal contact needed for adhesion or alloying. This oxide coating must be removed and precautions taken to prevent its reforming. Fluxes, therefore, must perform two operations: (1) Remove light oxide films, and (2) prevent them from reforming until the solder has come into intimate contact with the base metal.

In addition to these two requirements, fluxes must (1) have a melting point below that of the solder so that inclusions will not be entrapped in the solder or between the solder and the surface being soldered; (2) be capable of withstanding the heat without breaking down at soldering temperatures, or evaporating too rapidly, charring, or decomposing to leave a residue; and (3) aid the solder in wetting and flowing over the surface, and cover the surface until completely displaced by the solder.

A number of substances possess these properties in varying degrees. They may be divided into two groups, corrosive and relatively noncorrosive. Since tin-free and low-tin solders are higher melting and alloy more slowly than those of prewar type, stronger fluxes or better preparation of the joints are usually necessary. When acid fluxes or fused salt baths can be used, there has been much less difficulty in changing to low-tin solders.

Corrosive or Acid Fluxes: Most of the corrosive or acid fluxes contain zinc chloride. The one most commonly used for ordinary work is normally prepared by the plumber or tinsmith by adding an excess of zinc to hydrochloric (muriatic) acid. Because of the unpleasant and irritating fumes, and the unpredictable strength of flux prepared in this manner it is preferable to dissolve an ounce of zinc chloride in the form of flakes or sticks in 4 ounces of water. This is an active and efficient flux which, on application to the work being heated, evaporates and leaves a deposit of fine crystals of zinc chloride. As these crystals melt, oxide films are dissolved and the work is protected from further oxidation. However, since the melting point of these crystals is 500 degrees Fahr. (262 degrees Cent.), and the final solidifying temperature of solders containing over 20 per cent of tin is 361 degrees Fahr. (183 degrees Cent.), flux particles are apt to be entrapped, preventing the solder from adhering to the base metal and thus weakening the joint.

Ammonium chloride (sal ammoniac) added to zinc chloride in the ratio of one part of ammonium chloride to three parts of zinc chloride form a low-melting eutectic that is molten above 356 degrees Fahr. (180 degrees Cent.) Better results are obtained, however, by using nine parts of zinc chloride to one part of ammonium chloride. The eutectic formed by mixing nine parts of zinc chloride with two parts of sodium chloride also forms an active low-melting flux which is said to have properties superior to certain respects to the zinc chloride-ammonium chloride mixtures, especially for use in dip soldering or as a fused salt flux. These same salts are the basis for many proprietary fluxes which are sold under various trade names. Paste fluxes usually contain zinc chloride or other active flux in vaseline.

Difficult Soldering

Some metals such as nickel, Monel, stainless steel, and dirty galvanized iron are difficult to solder even with the zinc chloride-base fluxes. The addition of up to 50 per cent of hydrochloric acid aids in fluxing these metals.

Alloys containing readily-oxidized elements that form light, coherent films (such as aluminum and silicon) present a special problem. The zinc chloride-hydrochloric acid fluxes will not dissolve aluminum oxide or silicon oxide films. However, the addition of up to 5 per cent of hydrofluoric acid forms a flux that removes the oxide film and makes soldering these alloys possible.

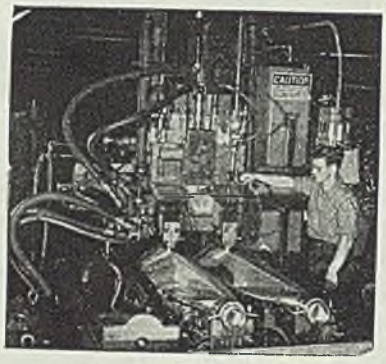
Another interesting development in fluxes is the use of "wetting agents." Fluxes, to serve their purpose, must reach the surfaces to be soldered, but often, because of grease or oil, the solution will not wet the metal and will not penetrate joints. The addition of a small amount of a wetting agent frequently overcomes this condition. Since alcohol is itself a wetting agent, such additives are not needed in alcoholic solutions. Inhibitors sometimes are added to acid fluxes, also to decrease corrosion, but they are not always effective in practice.

Residual acid flux should be removed from the joint after soldering by thorough washing. Since insoluble zinc oxychloride is readily formed by the action of water alone on zinc chloride, a preliminary wash with a dilute (1 or 2 per cent) muriatic acid solution is desirable before flushing freely with water.

Relatively Noncorrosive Fluxes: Fluxes are commonly classed as corrosive or non-

Planer Attachment

Airplane propeller blades now can be machined faster through use of a product known as the Turchan Hydraulic Follower Attachment, made by Turchan Follower Machine Co., Detroit, making it possible to step up wartime production. Formerly machining of propeller blades was a hand job, similar to large and complex die sinking, involving three slow operations—milling, rough grinding and hand finishing. This new attachment is said to have converted the process into a simple machine job



of duplicating blade contours with a planer, performing the operation in 1/20 the time.

The attachment, shown in the accompanying illustration, is planing the irregular contours on a forged member of a 2-piece brazed propeller blade, finishing it to a tolerance of close limits. On this operation the tolerance requirements are within 0.008-inch per inch measured transversely against a master template from a cut made in 4340 SAE steel at a speed of 40 feet per minute. On other similar operations, such as planing turbine blades and cams of irregular shapes, lower tolerances may be held.

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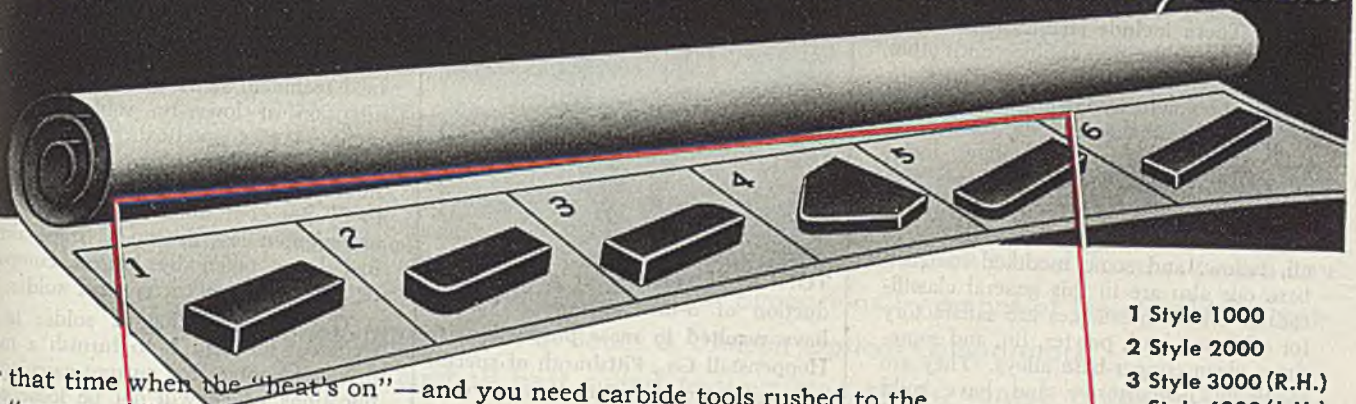

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corrosive, depending on the action at room temperature of the residue left after soldering. To be of value as a flux, however, a substance must be capable of exerting some positive oxide dissolving action at soldering temperatures.

The fluxes just discussed are corrosive at room temperatures and leave residues that are corrosive, hygroscopic, and conductive. They are unsuitable, therefore, for most electrical work and other applications where residues cannot be removed by washing, and corrosive action cannot be tolerated.

Rosin or rosin in alcohol has long been accepted as the only noncorrosive flux suitable for use in the electrical industry. The corrosive action of the residues left from soldering with rosin flux is very slow, and long periods of time are required for any attack to be noticeable. Residues are nonhygroscopic and nonconducting. In general, rosin also is the least destructive of all soldering fluxes at soldering temperatures. For this reason, it is preferred for the soldering of fine copper wires and other intricate work.

Much effort has been expended in the search for a flux that would be noncorrosive, nonconductive, and nonhygroscopic, and yet have better fluxing action than rosin. As a result, many mixtures have been developed that are not so corrosive as the zinc chloride-base fluxes and approach the desirable properties or rosin. These include stearic acid, naphthalene tetrachloride, aniline, and other nitrogenous compounds (sometimes in combination with hydrochloric acid) and lactic acid, phthalic acid, or phosphoric acid, alone or mixed with tallow, rosin, or petroleum jelly. Various amines and amides also have been proposed.

Such materials as Gallipoli oil, olive oil, tallow, and some modified mineral-base oils also are in this general classification. These substances are satisfactory for soldering lead, pewter, tin, and sometimes clean copper-base alloys. They are relatively noncorrosive and have mild fluxing action. Unfortunately, many of these less corrosive fluxes decompose too rapidly at the temperatures needed where using low-tin solders, or their action is too mild; hence, as a class, they are less important under present conditions than inorganic acid or salt fluxes. When using readily solderable materials such as tinplate, even the mild fluxes are effective with low-tin solder, however.

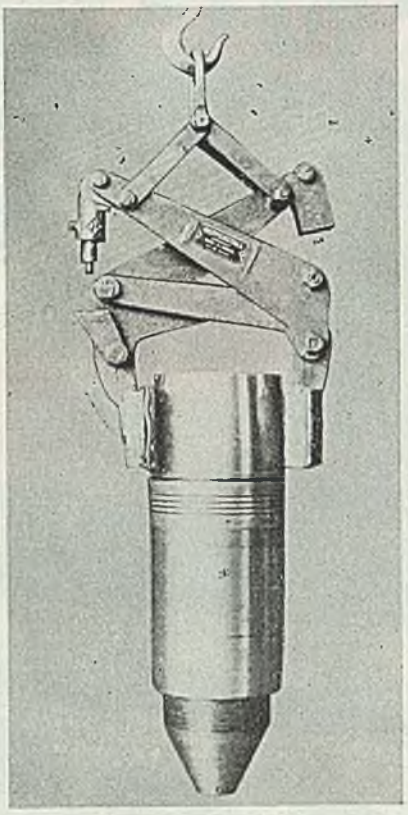
Salt Baths: Fused salt baths have come into use recently for the preparation of such metals as cast iron, malleable iron, and others that are difficult to tin or solder. These usually consist of zinc chloride to which has been added one or more salts such as sodium, potassium and ammonium chloride in amounts up to 10 per cent each.

Design of Joints

A full discussion of joint design would require far more space than can be allotted here, but a few fundamentals warrant mention. It has been demonstrated repeatedly that joints have the greatest strength when the solder film is between 0.003-inch and 0.005-inch in thickness. More space between the parts to be joined not only decreases the strength, but also wastes solder. On the other hand, joints must allow sufficient space so that the solder can flow between the surfaces. Heavy fillets add little strength and waste solder.

Since solder is almost always weaker than the metals being joined, it is advisable, whenever possible, to design joints with lock seams or rolled joints, or to tack braze, spot weld, rivet, or use the special type of screws designed for joining sheet metal. Solder then can be used to seal the joint, and frequently, since strength is not required from solder, an appreciable saving is realized.

It must be remembered that the low-tin and tin-free solders require a markedly higher heat than the formerly used tin-lead solders. This demands much more of soldering irons, both in wear and in frequency of reheating. Although this means of soldering is still effective, other means of heating should be considered when using the low-tin solders.



TONGS: Demands for greater production of 8-inch, 250-pound shells have resulted in mass production by Heppenstall Co., Pittsburgh of special automatic tongs designed to serve as assembly tools. Their adoption has solved production difficulties such as inverting and repositioning the shell for shot-blasting. A variety of sizes is made, largest of which has lifting capacity of 60,000 pounds

Solders are used in such diverse applications that it is impractical to cover even the important uses. From the general characteristics of the solders, fluxes and means of soldering which have been discussed, the choice of materials for a given application should not be too difficult. Some industries have converted quickly and effectively to substitute solders, as exemplified in the use of silver-lead solder by the canmaking industry. Others have had difficulties.

Industrial Practice

As examples of industrial applications, practice in the electrical industry has been selected because of its importance and of the different conditions which must be met. The soldering of galvanized material is briefly discussed because it represents a widely scattered application where poor practice in using low-tin solder and substitution carried too far can do more harm than good. Surveys have been made recently of soldering practice in these industries.

Electrical Industry: The amount of soft solder used in the various divisions of the electrical industry is not large for each application, but the number of applications is so great that the total amount of solder used is quite important. Fortunately for purposes of consumption control, most of the electrical equipment manufacture is in the hands of companies sufficiently large to support well-organized technical staffs which can supervise adoption of lower-tin solders wherever such usage is practical. Thus, industry noticeably felt the effect of first tin conservation order, but a recent restriction to 20 per cent tin in solder for general use seemed less drastic as steps already had been taken by largest companies to use minimum tin content solder.

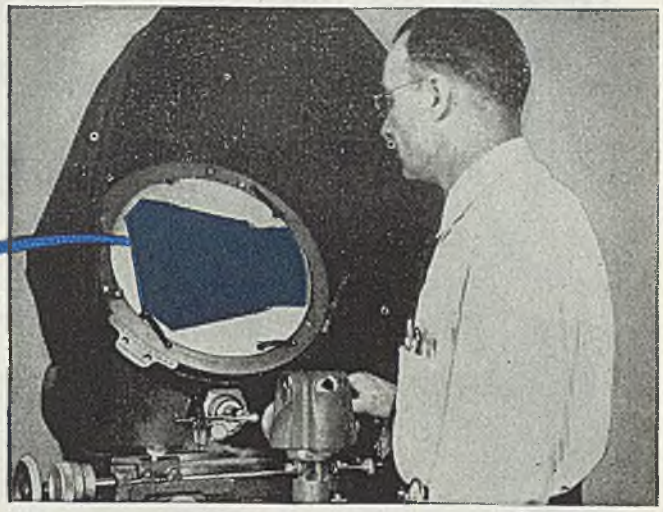
The chief function of solder in the electrical industry is to furnish a metal-to-metal contact for current-carrying applications which will not be loosened or affected by vibration, and which will prevent formation of oxide films or corrosion films that cause poor contact. Secondary functions are to form mechanical joints and to form a protective layer on some metal surfaces.

Electrical Manufacturing: In the past, pure tin, 60 tin-40 lead, and 40 tin-60 lead solders have been widely used. Recently these have been largely replaced by solders similar to those listed in Table III.

Solder No. 1, appearing in this table, is recommended chiefly for application where high rupture strength is required at elevated temperatures. This solder does not flow or wet so well as pure tin, but can be used effectively with corrosive fluxes. If surfaces to be soldered are pretinned or cadmium plated, rosin flux can be used. A major use is in soldering rotor binding bands. A small amount of copper, as 0.25 per cent, is sometimes added, but it is not essential.

Solder No. 2 is used for pretinning or

(*Please turn to Page* 132)



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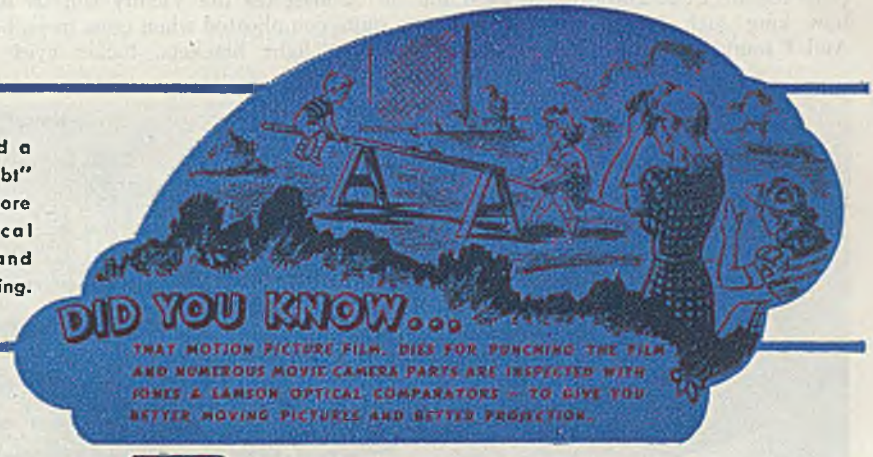
This book "Beyond a Shadow of a Doubt" will tell you more about our Optical Comparators and what they are doing.



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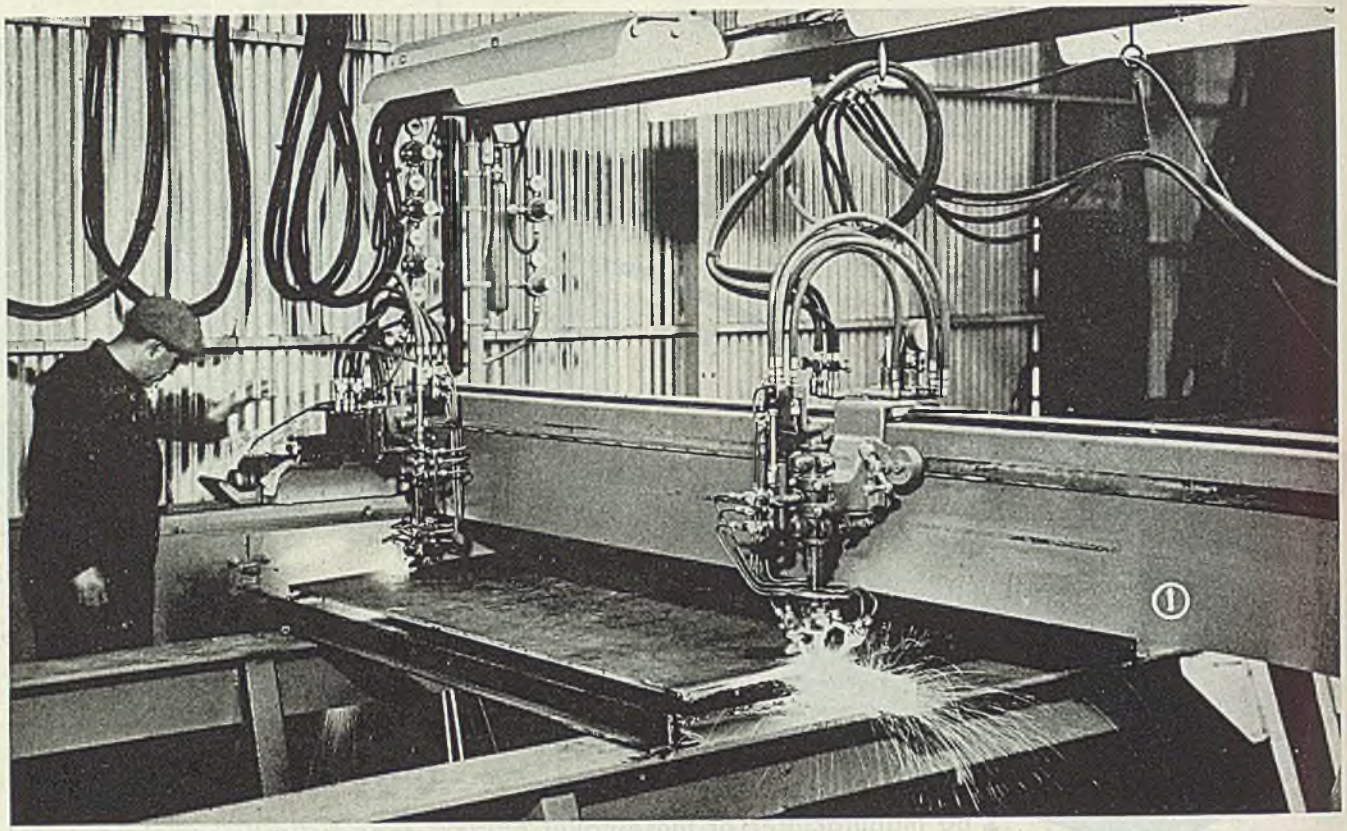


By G. ELDRIDGE STEDMAN

Special Setups Speed Automatic Welding of...

MASTS and KINGPOSTS

EVER SO OFTEN, all of us are brought up short with astonishment at the modern speeds of production. Recently, I had been reading about the difficulties of finding and preparing masts for the ships of the Clipper days of American history; particularly of one Hezekiah Daniels, a shipbuilder at New Brunswick, who spent two years hunting the forest for a tree of the girth and size and straightness, plus waiting a year for it to cure properly to withstand the riotous storms of the Atlantic.

That prompted me to visit Southwest Welding & Mfg. Co. at Alhambra, Calif., prominent producers of masts and kingposts for the U. S. Maritime, to ascertain how long such fabrication took them. And I found that they produce the requirements of four to five ships weekly, and have been doing so for nearly two years.

When the U. S. Maritime decentralized its purchasing early in the war, it began to take Pacific Coast bids for structural appurtenances for the AP2, AP3, and AP5 type ships; these being of the Victory and Attack transport classifications. Southwest Welding received a contract for a large number of shipsworth, the total eventually nearing 1000 masts and kingposts.

A mast for the Victory ship is really quite complicated when cross trees, boom steps, light brackets, tackle eyes and blocks, top mast and radio mast and other rigging are finally assembled. Southwest prefabricates as much as possible, and the outfitting is by other contractors.

The maximum single unit in this mast and kingpost fabrication involves a 20-ton steel section, 51 inches outside diameter by 61 feet long, made from single plates 1½ inches thick by 13 feet long and of various widths. The masts, by the way, are anchored two decks down when installed. They are of telescope type construction, consisting of courses or sections which are lapped or butt welded to lighter plate and smaller diameters as the assembly proceeds toward the small or top end. The masts are 1½ inches ABS hull steel plate at the base or butt end, and about 1-inch plate at the top course, being 61 feet tall.

The kingposts are made from 15/16-inch plate at the base and 13/16-inch

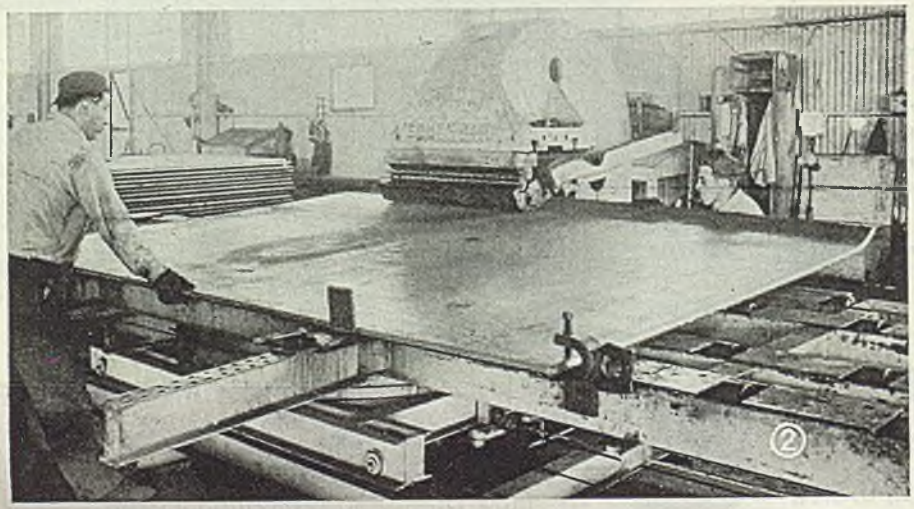
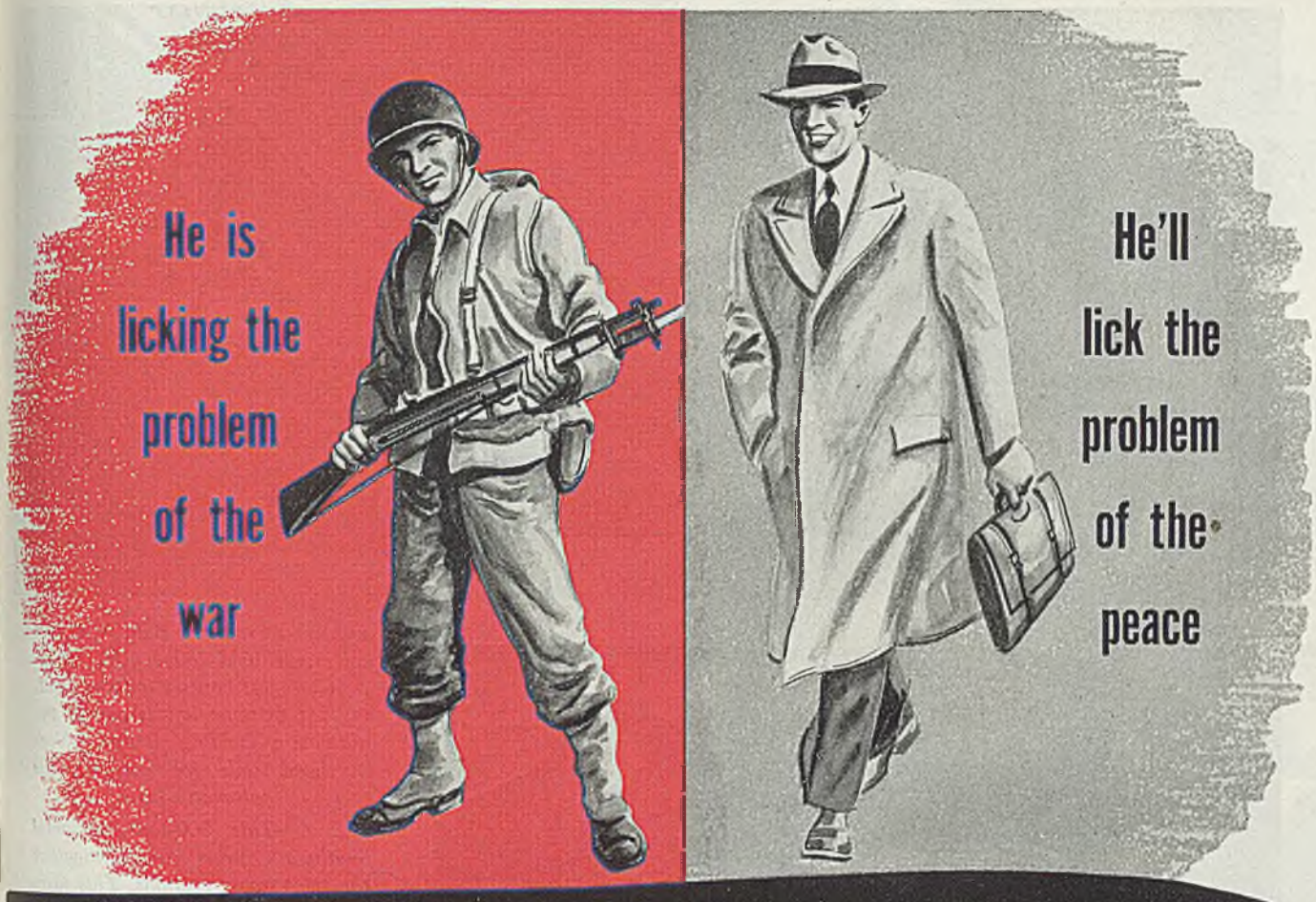


Fig. 1—Flame planer squares up plate edges and bevels them in single operation. This is first step in making masts and kingposts since no previous layout is required

Fig. 2—Southwark press brake crimps edges of 1½-inch plate to proper radius before rolling. Beveled plate is stacked at the left as this is second station in the processing line



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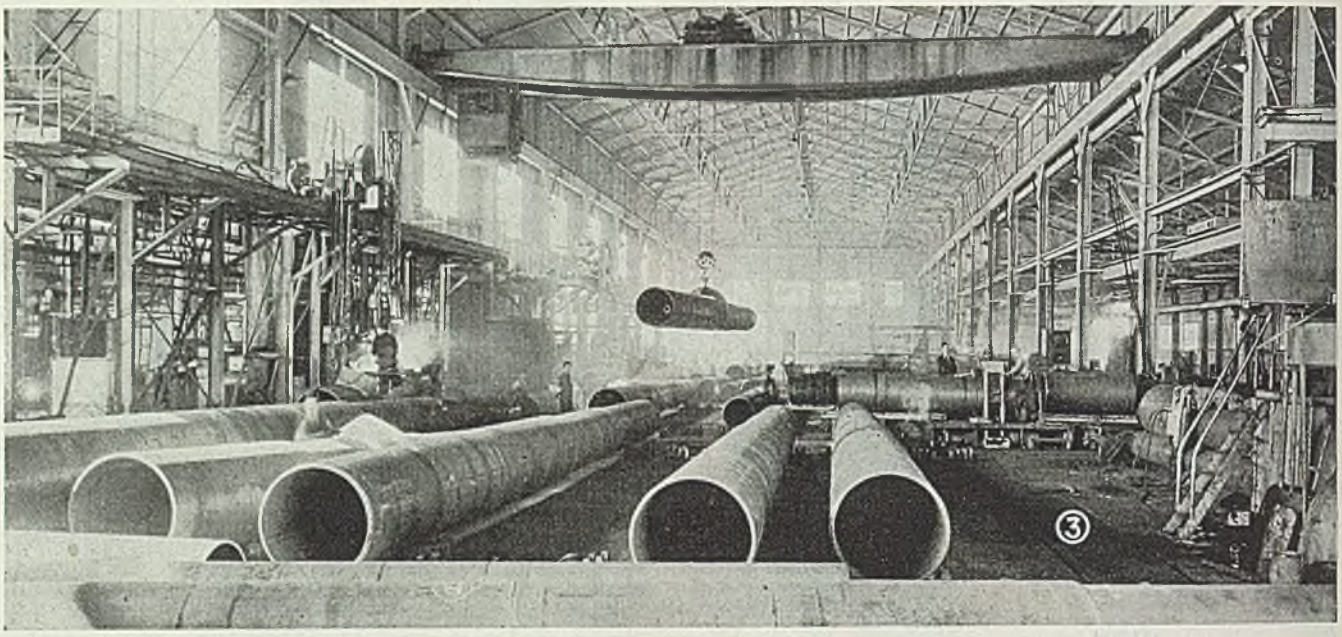


Fig. 3—At extreme right is 30-foot roll with hold-down yoke which rolls heaviest courses without heating. At extreme left is one of the automatic welding setups. Note overhead rails for carrying the automatic head

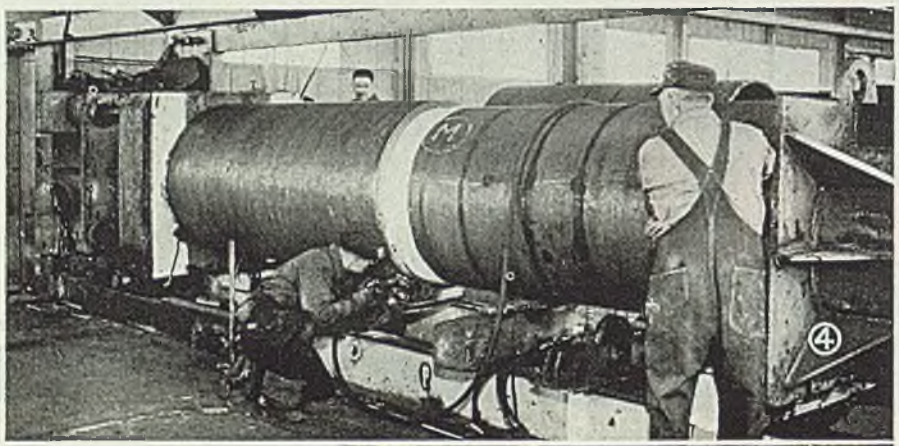


Fig. 4—This 300-ton horizontal Southwark press forces together the telescoping sections. This fitup is so tight that feather edge must be chipped off sections before they can be joined

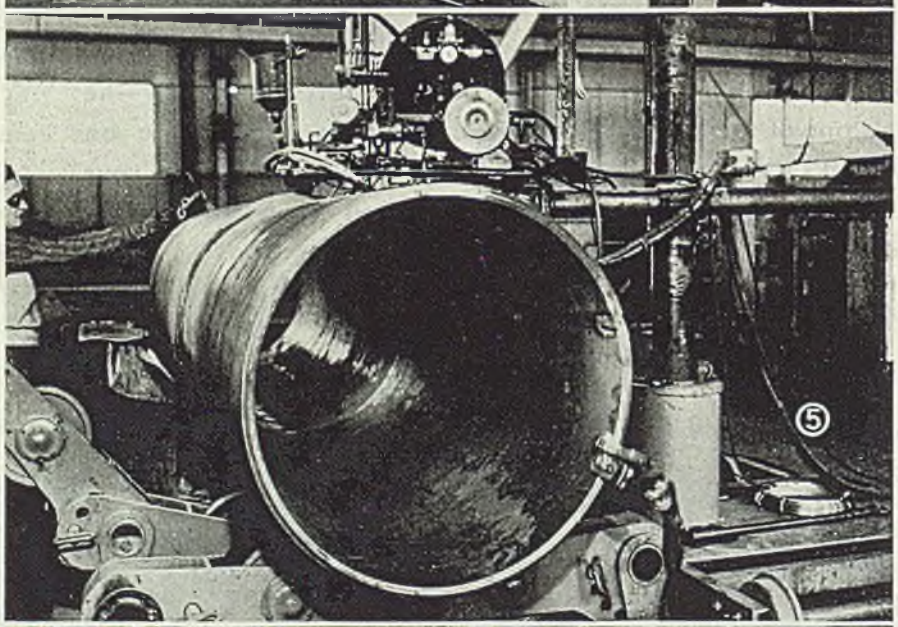


Fig. 5—This setup for automatically welding circumferential joint in a telescoped assembly. The special positioners accommodate masts and kingposts varying widely in diameter

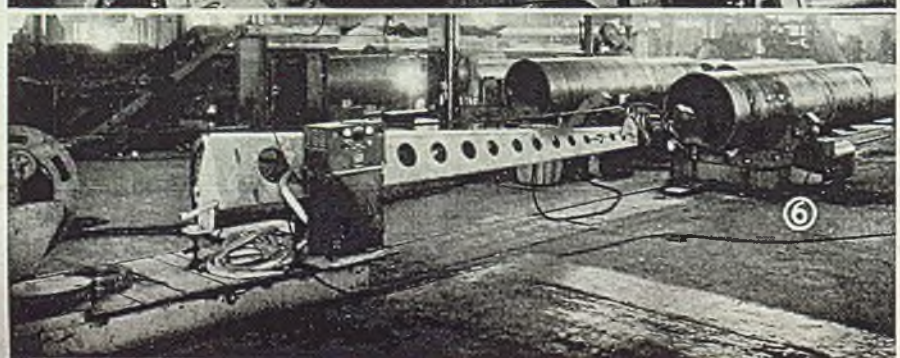
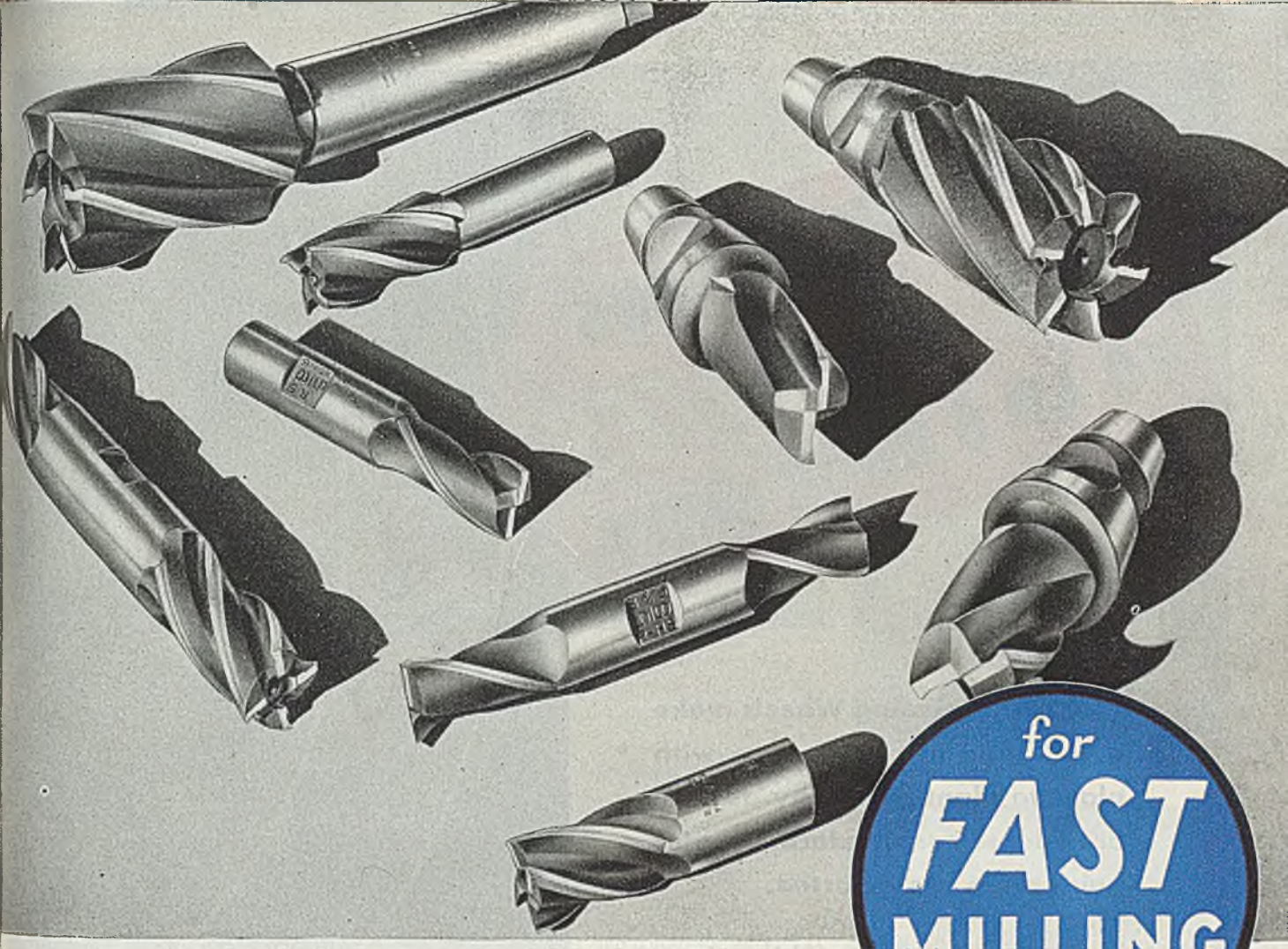


Fig. 6—Special boom carries automatic welding head inside long sections to make girth seams. Mounted on mobile car, boom is easily positioned to allow head to work at any point

plate at the top, being 50 feet high. ABS hull steel has higher tensile strength than ordinary structural plate. The masts, rather than being tapered in a continuous flow as formerly, are now fabricated in three or more telescoped sections with the smaller diameters naturally at the top. There are intermediate butt welds of sections having uniform diameter between the telescoped lap welds of the courses in the construction.

Southwest Welding & Mfg. Co. has given considerable attention to the improvement of fabrication technique and several special setups for handling this heavy plate have been developed. The company is widely known for its production of heavy gage welded steel vessels, particularly in the oil refining, chemical and marine fields. It also manufactures a line of construction equipment, such as bulldozers, earthmovers, 4-wheel scrapers, power winches, rippers, rock



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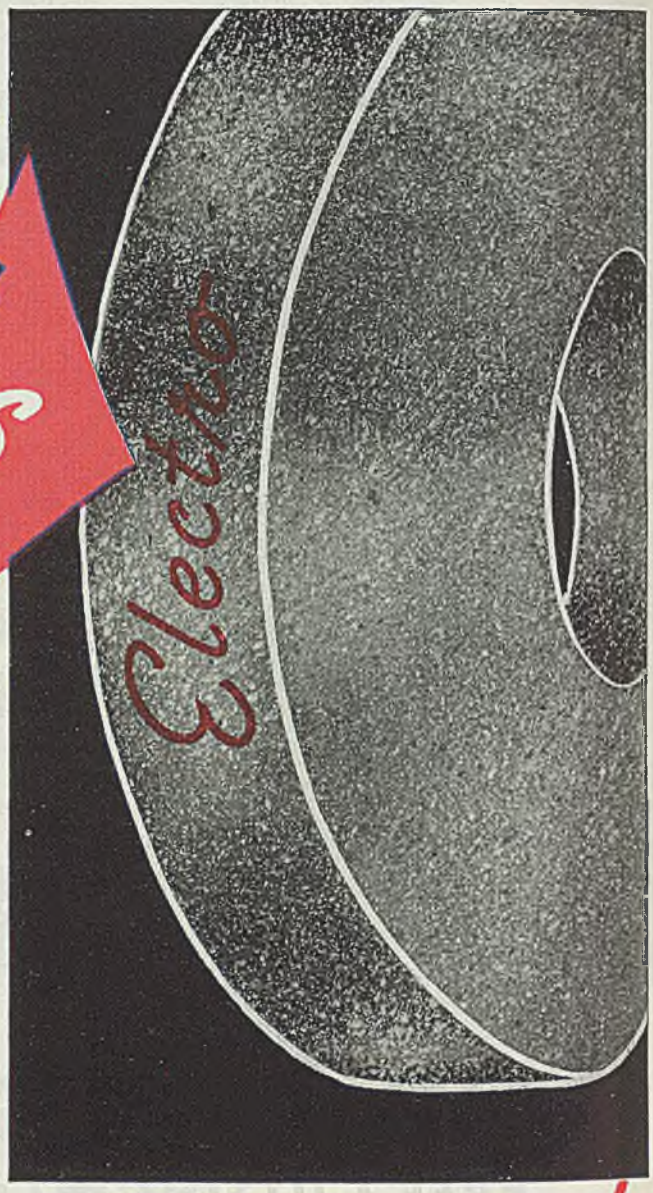

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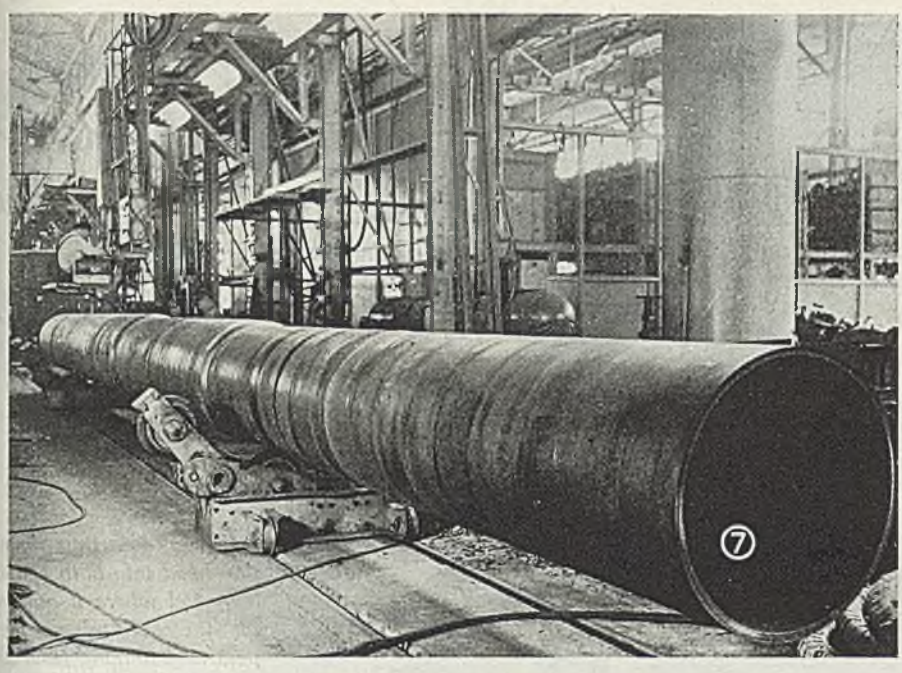


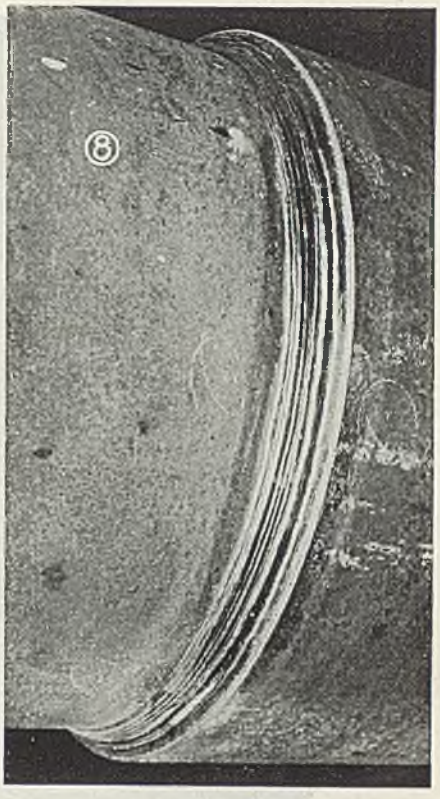
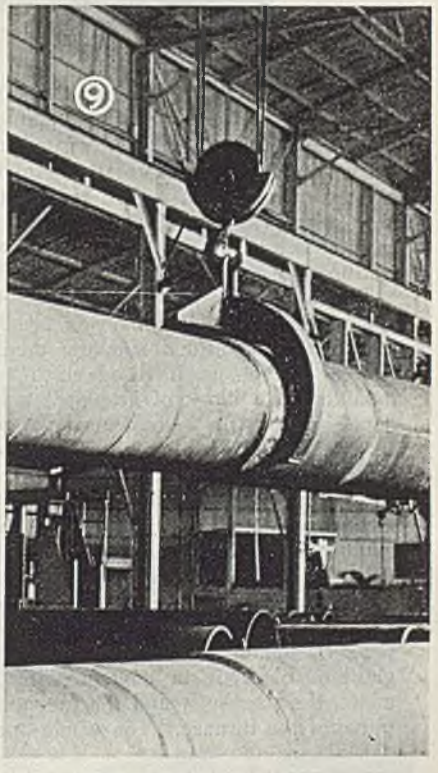


Fig. 7—Here telescoped assemblies are being welded together automatically as trunnions synchronized with welder revolve entire mast

Fig. 8—Closeup of lap welded multi-pass welded girth joint at juncture of telescoped sections

Fig. 9—Special lifting "clamp" is not clamped at all, is slipped over end, placed at balance point

Fig. 10—Final clean-up and pointing is done outdoors. The stiff-leg crane loads gondolas



crushers, tampers, sprinkler tanks, special bodies, brush cutters and tractor cranes in its 30-year peace time activity.

Mast and kingpost steel is received by Southwest from Kaiser Inc., Iron & Steel Division, Fontana, Calif., and from U. S. Steel Corp., Gary, Ind. It is stored in piles adjacent to a spur track at plant site. It then proceeds to the multiple tip flame planers. These, Fig. 1, have special Southwest fixtures using Linde heads. The setup is noteworthy because of the traveling bridges. The planers flame cut both long sides simultaneously, producing parallel edges for butt welding without requiring tedious layout or any squaring of the plate.

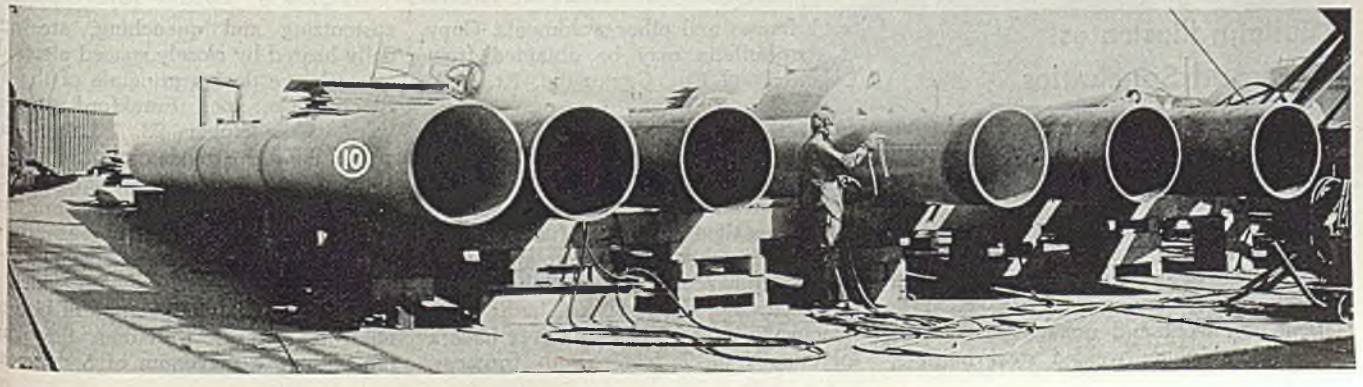
A secondary bridge carries a traveling cutting head which prepares the double bevel on each end of the plate. The capacity of these flame planers is 12 x 40 feet. They are capable of neatly handling all plate sizes involved in mast fabrication.

There are a considerable number of sizes and thicknesses involved in a shipsworth of masts and kingposts, there being from two to three masts and four kingposts per ship, with a variety of lapped courses and intermediate butt welds. This variety of plates is stockpiled by size and thickness between the planers and the brake.

The second general operation in the routing is the crimping of the longitudinal edges to the proper curvature in preparation for rolling to the form of a cylinder in the plate roll. This crimping of the edge is accomplished on a 150-ton Southwark vertical press shown in Fig. 2. This press was incapable of cold braking material over 1-inch in thickness until Southwest devised a "pressure intensifier" to step up press capacity. Since then no difficulty of any kind has been encountered in cold braking 1½-inch plate thicknesses.

The next work proceeds to the 30-foot plate roll of the drop housing type shown

(*Please turn to Page* 128)



New Device Measures Temperature of Molten Steel

Operator inserting immersion head into bath of stainless steel where it remained for 45 seconds to record temperatures ranging from 2200 to 3300 degrees Fahr.

METALLURGICAL engineers of the Rustless Iron & Steel Corp., Baltimore, have devised a platinum thermocouple pyrometer which measures the temperature of a steel bath before the heat is tapped from the melting furnace, the reading being recorded by an electronic instrument.

The pyrometer consists of two interchangeable ports, an immersion head (a platinum and platinum-rhodium thermocouple encased in a fused silica tube mounted in a block of graphite) and a handle which is a 12-foot insulated pipe containing wires leading to an electronic recorder.

The operator simply manipulates the immersion head, mounted on the pipe handle, through the door of the electric furnace and dips it into the steel bath. The exposed tip of the silica tube, which contains the platinum thermocouple wires, is immersed in the bath and the graphite block is in contact with the metal, the slag layer and the hot atmosphere of the furnace. The whole operation, which is automatically recorded, takes about 45 seconds.

The instrument by which the measured temperature is recorded is equipped with a large pointer and dial calibrated in degrees Fahr. The recording device is mounted conveniently near the furnace where it is easily visible to the melter responsible for the manufacture of the steel and to the man operating the thermocouple.

Hitherto, the measurement of the temperature of molten steel has depended almost entirely upon the experienced eye of the melter judging the appearance of a small sample of the molten metal withdrawn from the melting furnace. One of the first requirements of the control of any technical operation such as modern steelmaking is the measurement of the variables of the process.

The Rustless thermocouple, making possible the accurate measurement of steel temperature, today provides the steel melter with the means of accurate control of one of the most important variables in the manufacture of steel. The practicability of the device, working as it does at temperature so high that most materials are either softened or completely destroyed, lies in the speed with which the equipment measures and records the molten steel temperature. The electronic instrument responds so quickly to the temperature of the thermocouple that it is possible to immerse the unit into the molten steel, at temperatures as great as 3200 degrees Fahr., obtain a reading of the temperature and remove the equipment from the melting furnace before the device is destroyed or melted by the intense heat.

Although platinum wire, an expensive material, is used, it has been found that an individual reading costs little more than $1. The design of the equipment and its operation is such that the platinum wire and the other materials used in its construction are not destroyed.

The thermocouple was developed by L. F. Weitzenkorn and G. C. Klingel, metallurgical engineers at Rustless.

Bulletin Illustrates Railroad Specialties

Railroad specialties produced by Lukens Steel Co., By-Products Steel Corp. and Lukenweld Inc. are illustrated in a bulletin which pictures applications of boiler and firebox steel plates in carbon steels, alloy steels and Lukens nickel-clad steel; steel plates sheared to sketch, steel plate pressings; punched, blanked, bent, flame-cut and pressed parts made from steel plate; welded steel bolsters, truck frames and other weldments. Copy of the bulletin may be obtained from Lukens Steel Co., Coatesville, Pa.

Deep Salt Baths Have Internal Heating

Two electric salt bath furnaces, recently installed in a large midwestern plant for isothermal heat treatment of special ordnance parts, are claimed to represent the deepest salt baths constructed to date. These furnaces have a salt depth of 7 feet. Both furnaces, austenizing and quenching, are internally heated by closely spaced electrodes, an exclusive design principle of the Ajax Electric Co. Inc., Frankford at Delaware, Philadelphia 23. Large baths of this kind are made practical only by internal heating, as localized overheating and premature pot failures are eliminated. Electromagnetic forces are developed by close electrode spacing, creating a vigorous stirring action which results in immediate circulation of heat and holds temperature variations throughout the bath to a maximum of 5 degrees.

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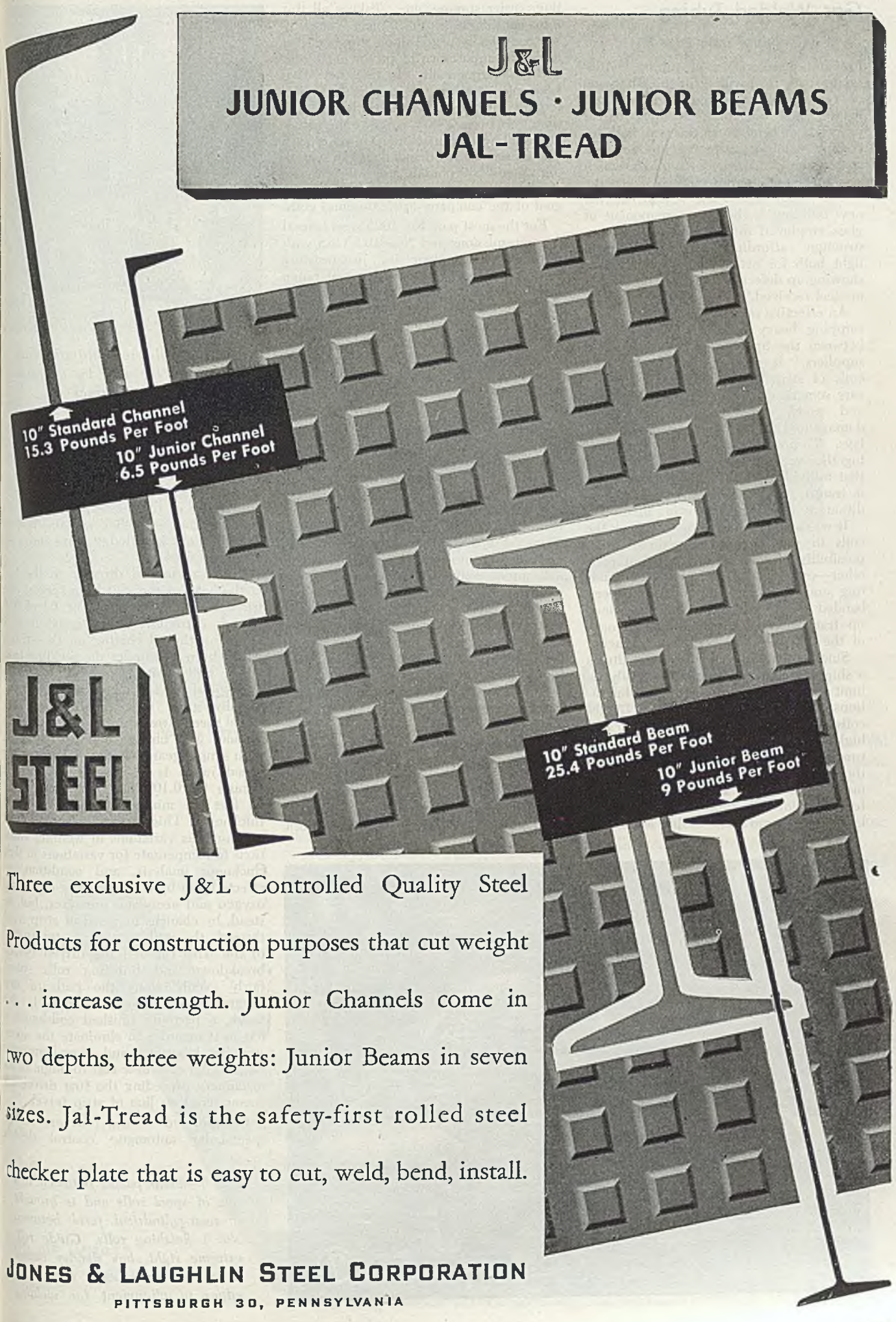

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Gas Welded Tubing

(*Continued from Page* 85)

ing and discoloration of tubing. Adequate space is provided for the admission of two spur tracks into the building; loading and unloading facilities are at proper floor height. In this way both incoming steel and outgoing products are spared the chilling and dampness which accompany outdoor loadings.

One other significant feature of the new building is the large component of glass employed in wall and ceiling construction, affording maximum natural light both for actual operations and for showing up defects which may be present in steel received.

An effective solution to the problem of shipping heavy coils has been evolved between the Spicer plant and principal suppliers. It was soon discovered that coils of strip packed loosely in freight cars sometimes broke through the floors and walls, occasionally doing serious damage and always causing expensive delays. To prevent this the coils are bound together securely in rows in such a way that individual coils cannot rock or sway in transit; and only cars in excellent condition are used for transporting them.

It was also found necessary to pack the coils in such a way that there is no possibility of their rubbing against each other—or against anything else—and marring smooth-finished edges. Coils, steel-banded to prevent unraveling, are lined up transversely in rows running length of the car, which is loaded to capacity.

Since coil weight no longer constitutes a shipping problem, there is virtually no limit on coil size short of practical limitations imposed by car size, etc. Larger coils mean more efficient production and higher output as, every time a new coil is run through a forming and welding unit, the buttweld joining it to the coil ahead must be scrapped and, with it, several feet of finished tubing. In addition larger coils mean considerably less handling, easier storage, etc. Taking all this into consideration the Spicer company has continually urged upon supplier steel mills the importance of producing larger and still larger coils. In this they have been pioneers and, in response to their request suppliers have rolled larger coils than ever before, even going to the extent of installing new machinery to cope with this unprecedented demand. Coils weighing up to 2500 pounds now roll onto the receiving platform regularly. Ultimate goal of the company is 7500-pound coils.

For the most part No. 1025 steel is used for transmissions and No. 1015 CRS with high copper content for rust-resisting products. The coils of strip steel range from 3-7/16 inches wide by 0.062-inch thick for 1-1/8-inch diameter tubing, to approximately 11 inches by 0.095-inch thick for 3½-inch diameter tubing. Each coil and heat is catalogued with an individual numbering system and sample, which is sent to the laboratory for testing for hardness, physicals, width, thickness, and camber.

As machine gas welding was the method selected for closing the seam in the tubing, ample storage space had to be provided for large quantities of oxygen and acetylene. This was accomplished by erecting a separate control house (Fig. 5) apart from the main building and divided into two rooms separated by a fireproof wall. The larger of the two rooms contains two 500-pound double-rated acetylene generators. In the smaller room a large-capacity oxygen regulator moderates the flow of oxygen from high-pressure trailers. From here the oxygen and acetylene are piped into the building to regulator panels standing beside each welding and forming unit.

The bulk of the work—most of the larger-diameter tubing—is produced on one ultra-modern unit developed especially for the mill after the latter had been built. Two other units parallel to it represent intermediate stages in the development of high-speed tube welding. Both

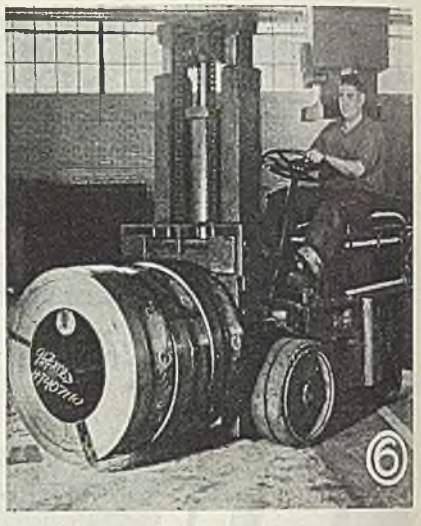


Fig. 6—Coils are transferred from storage to the unit by a special handling truck

are still in excellent condition, the smaller being used in the main to turn out smaller diameter tubing, which is required in smaller quantities. The new unit is one of the most-up-to-date in the country and embodies certain features which, to our knowledge, have never before been used.

Coils are moved directly to the feed at the head of the unit by a special electric coil-handling truck (Fig. 6) of 6000 pounds capacity. There is no need of removing the oil coating on the strip as it will burn free under the welding head.

The mill (unit) is powered by a variable-speed electric motor with an exceptionally great range, permitting strip-travel speeds from 5 to 25 feet per minute without gear change and up to 65 feet with simple gear changes. The operating speed range is at present 12 feet per minute for 0.109-inch wall thickness to 35 feet per minute for 0.065-inch wall thickness. This is especially important inasmuch as variations in welding conditions to compensate for variations in skelp thickness, analysis, and condition, are effected, not by corresponding changes in oxygen and acetylene pressures, but, instead, by changes in speed of strip travel through the mill. Power is transmitted to the strip through the driven vertical breakdown and finishing rolls spaced fairly evenly along the path of strip progress. Whenever the mill is shut down, a partially finished coil-length is left in it in order to eliminate the necessity for laborious and time-consuming rethreading of a new coil through all the machinery preceding the first driven roll encountered on line of strip travel.

Incorporated in the mill are several spectacular automatic control devices

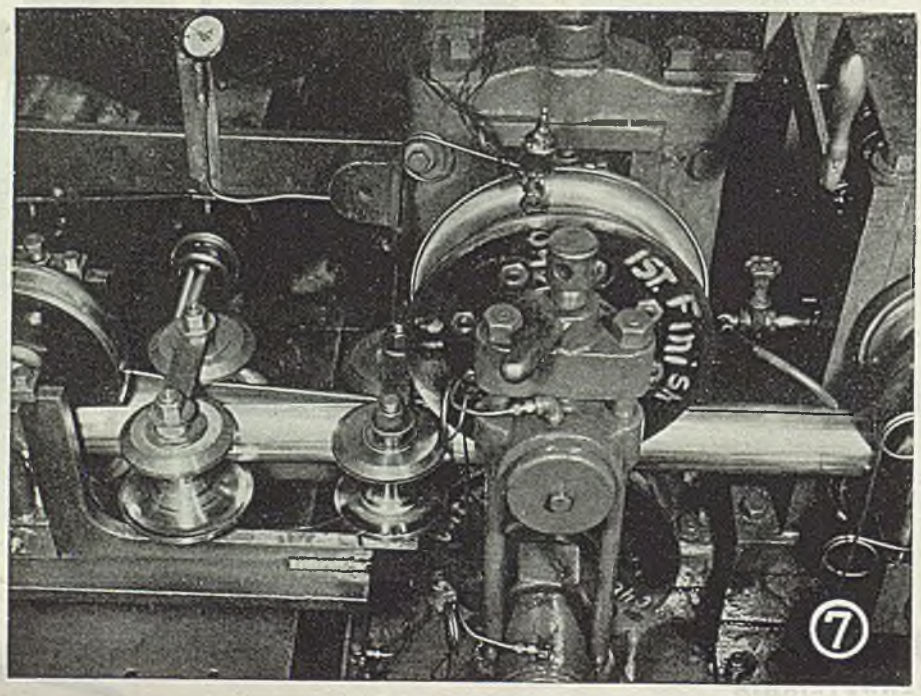
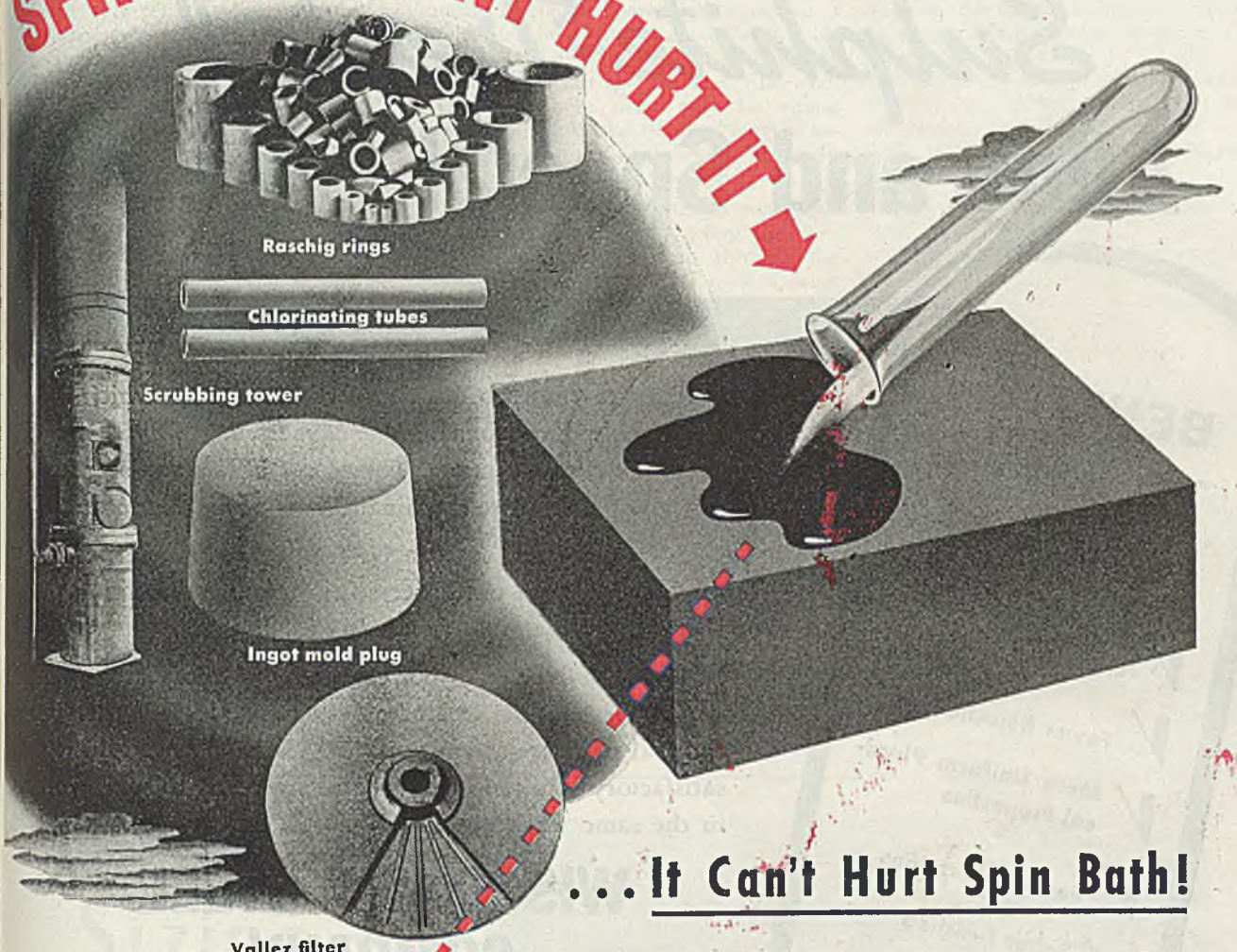


Fig. 7—Strip passes between two sets of spool rolls and is brought to near-cylindrical form between No. 1 finishing rolls. Guide roll, extreme right, has slender center fin which parts seam and holds edges in alignment for welding

SPIN BATH CAN'T HURT IT



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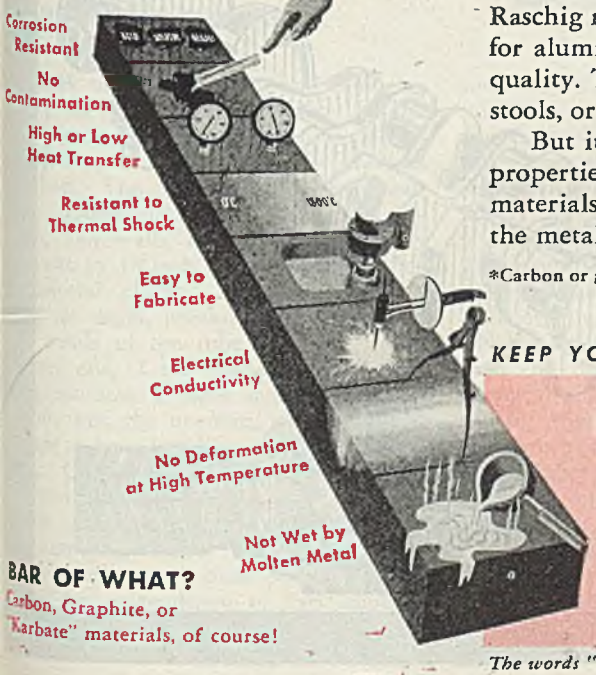
*Carbon or graphite made impervious to fluids under pressure.



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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.

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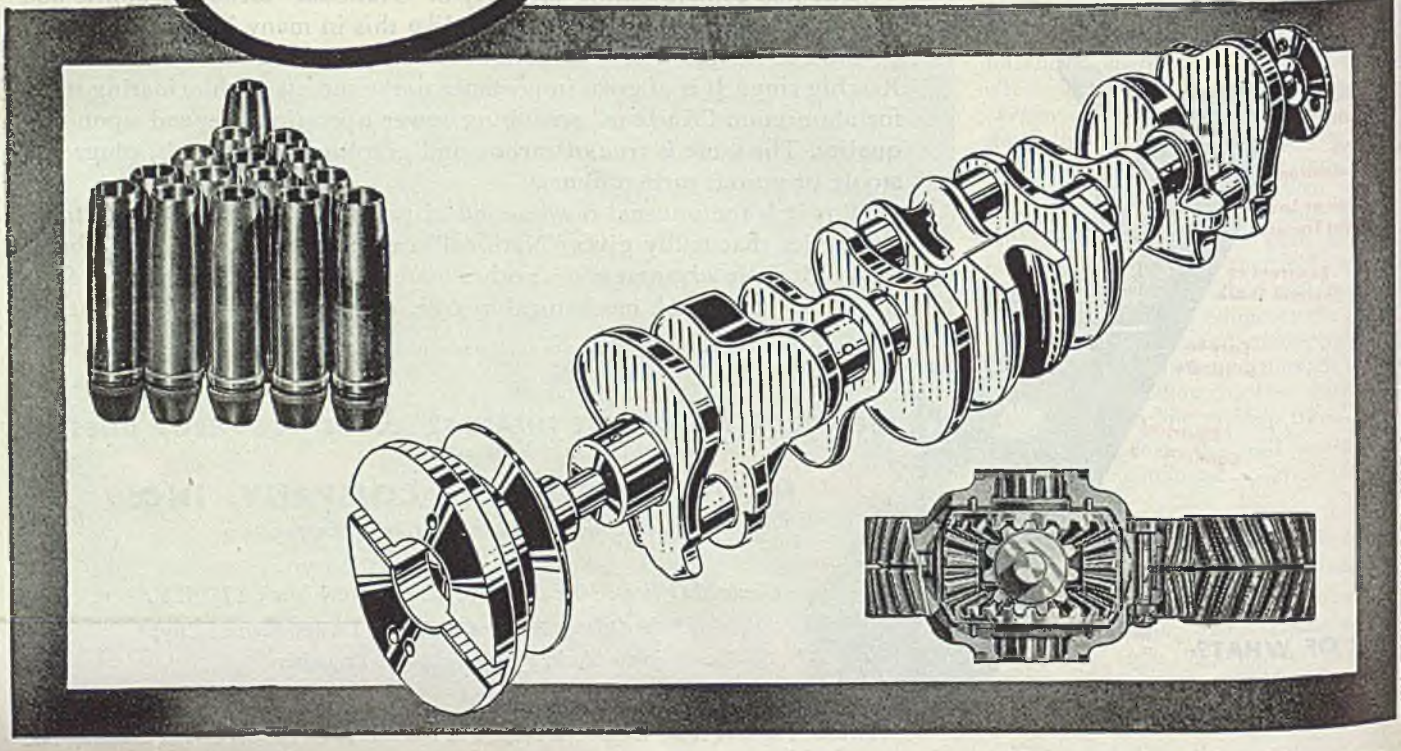


which stop the machine immediately whenever optimum welding conditions are impaired by failure of oxygen or acetylene pressure, by failure of the water pressure in the torch-cooling system, or by unsatisfactory performance of the rotary cut-off at the end of the mill. The effect of these devices in improving the safety factor of mill operation is too obvious to require more than passing mention here. Torches, regulators, water cooling system, etc. are all co-ordinated by electronic control.

In the guide stand at the head of the unit (Fig. 4) the coils, supported on 10-inch diameter roller-bearings leather-faced to prevent slipping, unwind smoothly and evenly. Six-inch guide rolls, also leather-faced, are located on either side of the coil to prevent the strip from unwinding and entering the mill askew. It is extremely important, also, that the strip be centered properly before beginning its progress through the mill, because maintaining alignment at strip edges is essential for a perfect weld.

Passing through two sets of horizontally positioned guide rolls which eliminate camber and remove the effects of coiling, the strip travels across a straightening table where the edges may be flattened if there is any bend in them. Next, passing through right and left squaring guides adjusted by a hand-turned screw, pinion and gear arrangement, the strip runs under an electric-powered shear operated by a foot treadle, which squares ends of each coil-length of strip for buttwelding.

This is accomplished (Fig. 2) by means of clamps operated by compressed air which hold the juxtaposed strip ends in place while a quick manual buttweld is made without the use of a filler rod. The joint here need only be strong enough to hold the two coil-lengths together during passage through the mill. It is cut out later and scrapped.

In order to prevent this necessary halt in coil feed from interrupting the continuous progress of strip through the mill, the strip is run up over a large compensator loop system consisting of two series of pulleys, suspended between which is a 160-foot slack loop controlled by the set of valves next to the operator in Fig. 2. This provides over 300 feet of slack for the continuation of welding and forming opereations. The strip then passes up over two elevator pulleys, out to a trolley-mounted pulley, back down over two more pulleys, and is on its way again through the mill. When coil feed is halted the mill draws on the strip strung over the long compensator loop. This pull, instead of tightening the strip, simply draws the trolley-mounted pulley toward the front end of the compensator system.

After leaving the compensator system the strip goes through horizontal guides on a table to the first vertical breakdown rolls just to the right of the last pulley in Fig. 3. Here it is given a shallow U-shape as the first step in its gradual shaping into cylindrical form. From here on, the transition from flat to round is accomplished in easy stages in order to prevent any stretching of the metal and consequent bowing of the tubing. Second pair of breakdown rolls, dimly discernible behind first, follows closely after pair of conductor rolls not shown in photo.

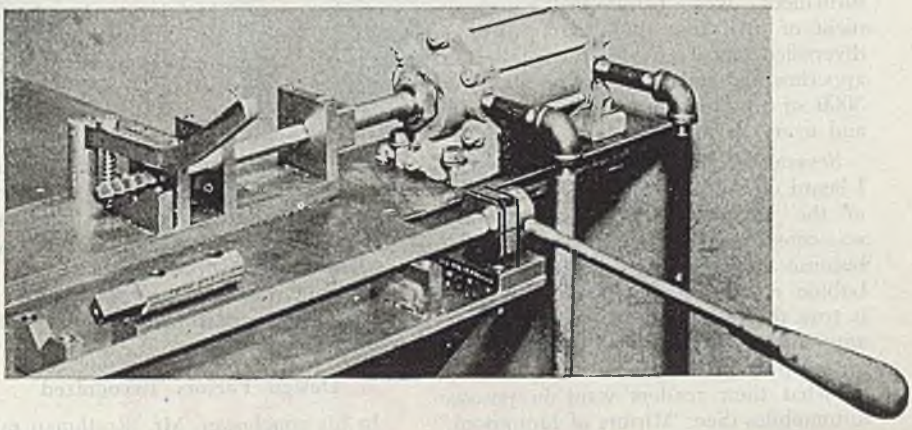
Proceeding next (Fig. 7) through a novel set of three conductor rolls (two small horizontal and one large vertical) and two sets of horizontally positioned spool rolls, the strip is brought to near-cylindrical form between the first pair of finish rolls. The set of guide rolls on the far right prepares the tubing for its tour under the welding head. A slender fin in the center of the upper roll parts the seam and holds the edges in proper alignment for welding.

There is some danger here that the seam may be prematurely closed at the leading edge of each coil length where it is expanded by buttwelding to the one directly preceding it. This would cause fouling of the strip at this point with the center fin. To prevent that, the operator at the head of the mill trims the corners of each leading edge with a pair of hand shears before the coil is fed into mill.

(*Continued in next week's issue*)

Broaching— Sizing— Gaging—

Square Tubular Steel Frame Members



NEW method of sizing and removing burrs on the inside of square tubular steel frame members is said to do a better job much faster than any previous method. The frame members have outside dimensions of approximately ½-inch, and walls 1/32-inch thick. They are cut in 19-inch lengths, then drilled in several places. The drill causes a burr at each break-through point on the inside of the tube.

One end of the frame member must accommodate a steel shank which fits snugly into the opening, and at a point where a burr has been set up by drilling. Consequently, this burr, which is located approximately ½-inch from the open end of the frame members, must be removed. Also, the opening must be properly sized since square tubular stock has a tendency to vary slightly.

Considerable difficulty was experienced with the former method both in removing the burrs and in sizing the tube, the operations being rather slow and expensive. In the new method of processing these frame members, devised at General Electric Co.'s Schenectady Works, V-blocks, in which the part is placed, are mounted on a steel table. These position the piece in such a way as to facilitate sliding the open end over a broach (also mounted on the table) which is approximately 1/16-inch smaller than the opening. The piece is held firmly in place by a hand-operated lever which, when depressed brings pressure to bear against the frame member from above (where the burr is located), wedging that portion of the piece against the broach.

The broach then is withdrawn rapidly from the piece, its cutting edge shearing off the burr as it passes over them. The broach is powered by air, regulated by a two-way pneumatic cylinder which, in turn, is controlled by a foot-treadle-operated valve.

Another set of V-blocks mounted on the table positions the frame member for sliding over a gage (also mounted on the table) which checks the size of the open end of the piece. A third set of V-blocks accommodates the part for sizing if found undersize. The sizing device is a cam-type expansion device operated by a hand lever which, when fully depressed, will cause this tool to expand to the required inside dimensions of the frame member. The piece is positioned over this tool in the same manner as it is placed over the above-mentioned broach and gage. This method has resulted in more uniform quality as well as faster and better operation.

Accompanying illustration is rear-view close-up of broaching, gaging and sizing apparatus showing frame member over sizing fixture.

By GUY HUBBARD
Machine Tool Editor, STEEL

We take a Look at the Record of the SAE MEETING

While engineering emphasis throughout 1945 annual convention in Detroit was almost entirely on problems involved in winning war on land, on the sea and in the air, many of these things have deep significance as far as the future of transportation is concerned

A MEETING of such great size and broad scope as the recent annual convention of the Society of Automotive Engineers at Detroit (STEEL, Jan. 15, 1945. pp. 46 and 47) can well be said to be "all things to all men." Therefore, this brief engineering roundup represents only what it was to the writer, who naturally is more at ease in sessions devoted to metalworking problems than in those concerned with the thermodynamics involved with high octane fuels or the theory underlying helicopter performances. It is a tribute to the management of SAE that the program was so diversified that it satisfied the intellectual appetites and mental digestive ability of 3000 of us diversified listeners, all day and every day for six days.

Several people have asked me what I heard of the "dream car of the future" at the Detroit meeting. That vehicle was conspicuous by its absence—possibly because the dream was punctured like a bubble at the meeting a year ago. It is true that at the 1945 meeting several automotive editors of nationally known newspapers presented results of surveys of what their readers want in postwar automobiles (See "Mirrors of Motordom," STEEL, Jan. 15, 1945). However, those reports are about as down-to-earth and sensible as are Harold Johnson's findings as to what General Motors wants in postwar machine tools.

Morris Sanders, industrial consultant, did hint at the possibilities of nonmetallic materials in body construction when he said: "Many of you are following the growing use of low pressure molding in the aircraft field. You have noted the development of new and improved thermosetting resins. You have seen pressures required in their processing drop from thousands of pounds, to hundreds of pounds, to pounds, and finally to mere contact.

"You also have noticed the low cost of molds required, and the simplicity and almost unlimited size of the low pressure molded products. To wood veneer, the pioneer filler material in this field, there have been added high strength papers, sisal mats, and organic and fiberglas fabrics. Fuselages, fairings and a host of other light weight functional airplane parts are being made today by the Vidal method, as well as by various other low pressure molding techniques."

On the other hand, E. P. Strothman, engineering consultant, A. O. Smith Corp., forecast a bright future for steel in the aircraft industry, documenting his case with such details as the B-29 bomber nose frame, the C-47 cargo plane landing gear truss and the B-29 landing gear trunnion. My impression is that skillful "tooling up" for the mass production of these items by welding shares honors with better steels and improved welding technique in the economic and engineering success of these steel elements. Here is one more field in which the tool engineering profession is winning deserved recognition by mechanizing the gripping, positioning and manipulation of work-in-process and in many cases the guidance and control of the flame or arc which is the "working tool."

Design Factors Recognized

In his conclusion, Mr. Strothman said: "Our partiality for any one material or process may influence our selection, but it still should not alter recognition of design facts. Charles F. Kettering stated his belief that he would see the all-steel airplane in common use before the advent of the all-aluminum automobile. I am convinced that this was based on his faith in engineers and in their understanding that each material and process has its proper application and furthermore that when coupled with ingenuity in design, low alloy steel provides many favorable characteristics which should arouse increased interest in that material.

"Some of the competitive practices employed in marketing premium priced materials should serve as a lesson for the steel industry. Selection of such materials often follows reconsideration and reconception of design, a condition of things which affords an excellent opportunity for a switch in materials. Steel purveyors on the whole have been tonnage-minded and not design-minded. They should give more serious consideration to the redesign approach. Yesterday's material selections are liable nowadays to be revoked as the result of a call by some progressive purveyor of some other kind of material."

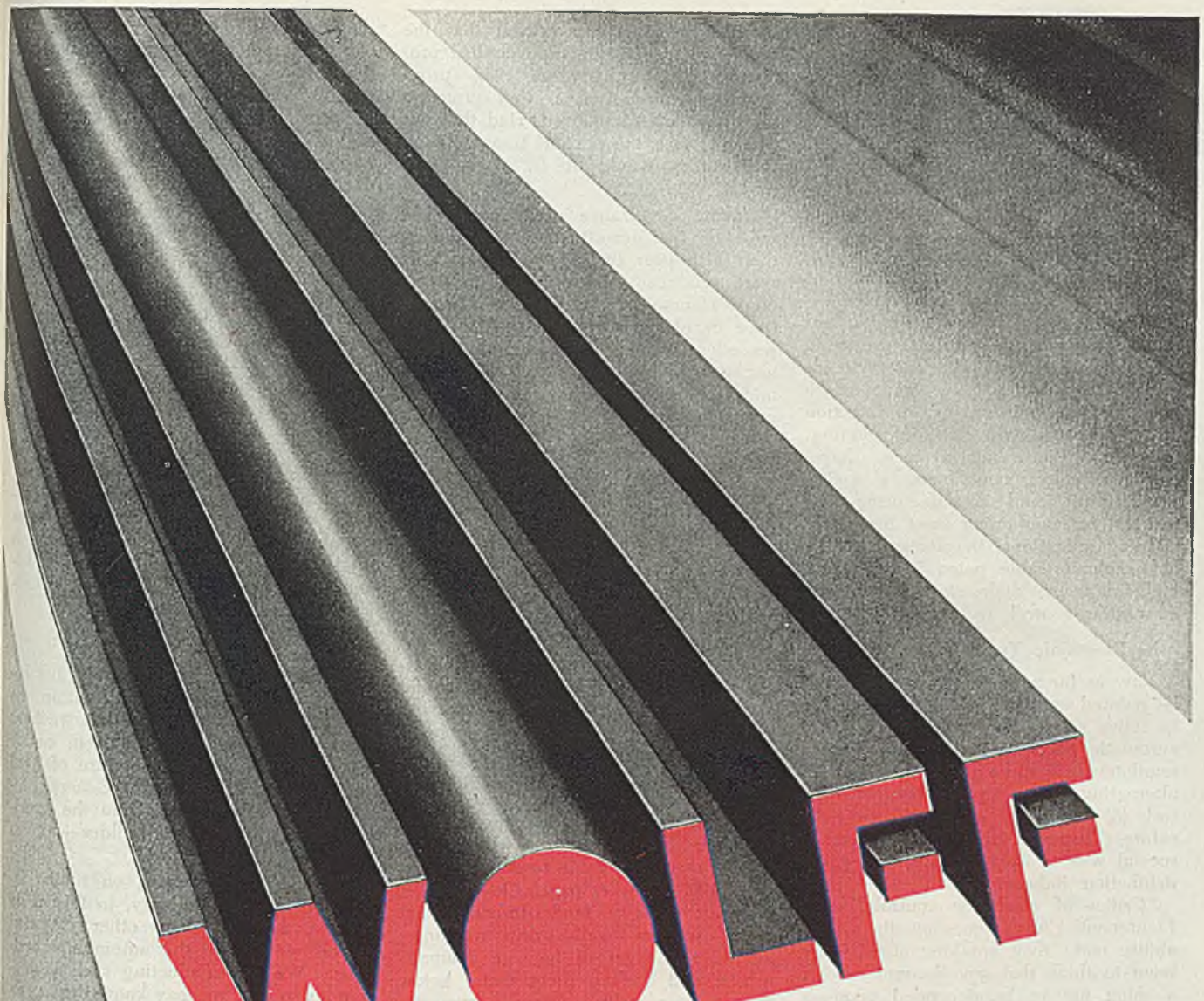
In discussing the future of SAE automobile standards, J. H. Hunt, director, New Devices Section, General Motors Corp., likewise intimated that in this industry "nothing is permanent but *change*."

"In the American automobile industry, as in American industry in general," he said, "most standards are used voluntarily, simply to obtain economic advantages. Whenever any change in conditions makes it advantageous to change the standard, the old one immediately will become obsolete."

Arthur Nutt, director of engineering, Aircraft Engine Division, Packard Motor Car Co., said practically the same thing in regard to the future of standardization in the aeronautical industry. He put it this way: "No standard promulgated by SAE is compulsory. In fact, so-called 'mandatory standards' for the most part do not work. Voluntary standards dictated by practical and economic conditions are the only real standards in the final analysis. Any standard which is attempted but which is not based on all the important aspects involved is doomed to early death if it ever lives at all."

The foregoing testimony is presented with the deliberate intention of jolting the complacency of anyone who has the idea that his material or technique or type of design or manufacturing equipment or whatnot, has any artificial lease on life as far as the postwar future is concerned. To live on in that era, "it's got to be good", mighty good. And make no mistake about this, your competition is going to turn up with some things which will surprise you.

One of the things which is meeting with considerable skepticism among conservative builders of machine tools and other heavy machinery is electronic control. The idea of mixing in "radio tubes" with the sort of rugged mechanisms with which they are concerned doesn't appeal to them as being practical. It wasn't so many years ago that these same people were skeptical



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Many hundreds of Midwest buyers rely on Wolff for bars for two good reasons. Reason No. 1 is quality. All stock is arrow straight, clean, with a tight adhering scale, made by outstanding mill sources, and backed by chemical analysis that can be furnished on request. Reason No. 2 is Wolff Service. It's not the ordinary garden variety of take-it-or-leave-it service you've come to expect from ordinary sources of supply. Rather, Wolff Service is based on the complete, co-ordinated cooperation of everyone from the time your order is received, through any required cutting, sawing or galvanizing of stock. It's the kind of service that gets things done for you and gets them done right, so that you can do your work better and faster. Call Wolff for bar stock.

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of other forms of electrification which now are taken for granted.

I believe that I heard something at the SAE meeting in Detroit which these people should think over in connection with their own business. Lieut. R. J. Colin, Jr., Equipment Laboratory Engineering Division, Air Technical Service Command, was the speaker to whom I have reference. His paper was on electronic controls in aircraft.

He mentioned first that while most of the feats we now hear of are those involving electronic tubes in radio and radar equipment, these tubes have made several years of successful history in industrial applications. He went on to mention their industrial use in detection of pin holes in strip steel; in counting; in grading according to size, shape, hardness, color, smoothness, elasticity, conductivity, and manufacturing tolerances; in maintaining exact tension in winding operations; in precise spiraling of telephone cable pairs; in induction, high-frequency, dielectric heating; and in welding control.

Electronic Tubes In Service

Now as far as aircraft are concerned, he pointed out that electronic tubes are in active service in connection with (1) automatic pilots, (2) turbo supercharger regulators, (3) radio compass loops, (4) alternating current power system control, (5) fuel level gages, (6) ice indicators, (7) special gun controls, (8) other special weapon controls, and (9) engine detonation indicators.

"Critics of electronic controls," said Lieutenant Colin, "question their reliability more than anything else. They seem to think that any vacuum tube is a thing not to be depended upon—a temperamental and mysterious device, if you please.

"Fortunately, we of the Air Service now have sufficient field experience, particularly that in the European war theatre, to enable us to answer such criticism. Reports emanating from Europe show conclusively that electronic controls in aircraft have proved to be both practical and reliable. Development now is going forward on use of electronic means of manipulating flight control surfaces and other functions of primary importance.

"I believe that it should be emphasized that the types of vacuum tubes thus far used in our applications are of ordinary commercial receiving tube grade. Since it is possible for tubes like those designed for home radio receivers to turn in such satisfactory performance records, tubes specially designed and built for control service should have great possibilities."

Testing to destruction long has been a method followed in the automobile industry as a means of discovering weak features of design. One by one these weak features have been eliminated throughout the years. While the industry never claimed that it was aiming at achieving the durability of Dr. Oliver Wendell Holmes' famous "one-hoss chaise", the war has proved that the builders had—by the time civilian production ceased early in 1942—progressed much further in that direction than anyone had realized. Had that not been the case, the wartime transportation crisis today would be far worse than it is.

Taking cognizance of the fact that most of the newest cars now are in their fifth year (very few 1942 models were produced), John Oswald presented a resume of the difficulties which have developed as a result of this unprecedented long-time ownership of one automobile by the average motorist, under conditions of unusual severity in many respects.

Bodies Show Deterioration

As far as engine, clutch, brakes, chassis, steering mechanism and even the much over-loaded electrical system are concerned, he has found the record to be remarkably good. As far as bodies are concerned, however, he finds the record not so good. Here, in brief, are his conclusions.

"Deterioration caused by corrosion always has existed in automobiles and other metal products exposed to the elements. In the case of automobiles, however, these difficulties have increased in the last few years, especially in certain areas. This is true of all makes of cars without exception.

"Some of the places which have proved most vulnerable to corrosion are: Body sills or rocker panels; lower edges of door panels; fender-to-body joint areas; window wells; drip moldings; around the edges of luggage compartments; and on the sheet metal below the radiator grills. Other points susceptible to deterioration by corrosion are: Around the edges of fender parking lamps; around tail lamps; and behind applied moldings, especially along the lower edges of bodies and fenders.

"A number of theories have been advanced to account for this excessive corrosion, the general opinion being that the major reason is retention of moisture at the areas affected. When this moisture is combined with salt or calcium chloride, the corroding action is correspondingly increased.

"As a matter of fact, rusting away of body sills and lower edges of door panels is due largely to inadequate drainage and insufficient ventilation. It is significant that these conditions were brought about by the correction of another fault. Car manufacturers plugged all holes and sealed all joints in their efforts to keep dust out of car interiors —the better to please their customers. They did such a good sealing job that the moisture which inevitably collects, is retained and so corrosion has gained. Very seldom does the automobile industry get into difficulty trying to please car owners—but in this instance such was the case."

Machine tool builders please note. In your current efforts to change the design of your machines to meet the suggestions and to satisfy the demands of the automobile industry, make sure that you are not doing what the automobile industry did in this case, that is, introducing new difficulties by correcting old ones. Something of that kind happened in Biblical times, when one devil was cast out, only to have seven worse than the original one move in.

Charles F. Kettering, who heads up the research activities of General Motors Corp., invariably can be counted upon to evaluate conditions and signs and portents in a few well-chosen words. He did so at the recent SAE meeting in the following statement:

"The combustion chamber is the place where fuel and engine meet. The mechanism of what occurs there is what we are striving to utilize to the best advantage. Future development of automobile, aircraft and diesel engines will depend upon how well those people in positions of management—as well as engineers and chemists—understand the fundamentals of the relationship between fuels and engines.

Field Is Opening

"I believe that we have only just begun to open up this field within the last few years. I believe that we have yet a long way to go both in engine design and in the manufacture of good fuels at low cost. We at General Motors are studying fuels from the standpoint of the engine builder—not as fuel producers.

"We also are carrying on similar investigations in metallurgy, in fabrics, in rubber, and in many other materials which we use in the automobile business. We are conducting such investigations so that we may know their practical limitations, and so will not ask our suppliers to do things which are outside the bounds of technical and commercial practicability.

"This program also helps us to determine the road which our future research should take, because what may be technically and commercially impractical today, may easily be made an everyday product in the not too distant future."

Fasteners Combine Lock Washer and Screw

A new bulletin describes Sems fastener units, pre-assembled lock washer and screw, manufactured by Shakeproof Inc., 2501 North Keeler, Chicago 39. As lock washer is on screw, it cannot come off. Both fastenings are delivered as a single unit; therefore, no time is wasted putting lock washer and screw together. Fasteners permit easier handling and faster driving and facilitate fastening hard-to-reach parts. They are said to increase production efficiency and to provide tight, strong fastenings that resist extreme vibration. According to the company, these fasteners may be used wherever screws or lock washers are specified.

use TRU-LAY preformed

Some machines, of necessity, are designed with critical diameter sheaves. And many of these machines are put to rough-going. It is on such jobs that American Cable TRU-LAY PREFORMED really shows its superiority. Thanks to the preforming process, TRU-LAY can take the torture of small sheaves—resists squirming or rotating in the grooves. The preforming process also makes TRU-LAY resist kinking or snarling; broken outer wires lie flat and in place, thus making it safer and easier to handle. For your next wire rope, specify American Cable TRU-LAY PREFORMED.

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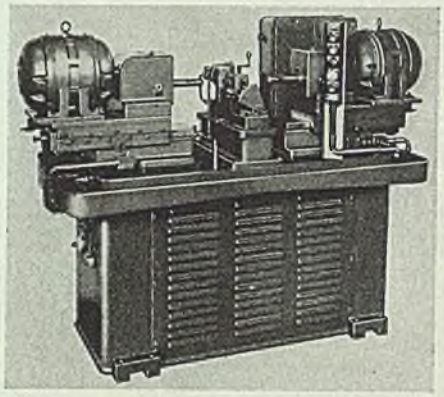
INDUSTRIAL EQUIPMENT

Drilling and Reaming Unit

A small two-way machine which can be used in a wide variety of drilling and reaming operations is offered by Snyder Tool & Engineering Co., 3400 East Lafayette, Detroit 7. The machine slides are way-type and individually fed by hydraulic cylinders. A single-spin-

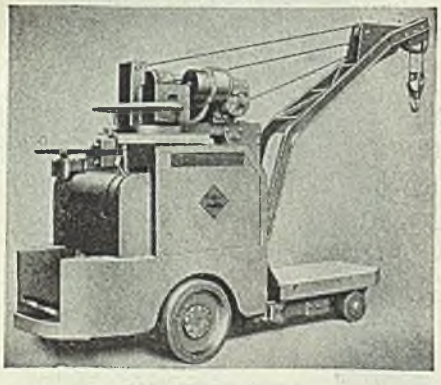


dle drill head and drive motor are installed on a dove-tail sub-slide which is provided to permit adjustment of tools and the exchange of tools. The hydraulic feed on the unit is approximately 4 inches. The fixture on the machine is quick-acting, air-clamping type. The base is welded steel and contains the hydraulic equipment for operating the slides.

On parts running into high production, where the operation is not complicated, this machine can be equipped with hopper or magazine to feed the parts into the fixture. The spindle head on each unit can take up to six spindles.

Combination Crane Truck

The new model L-11C combination crane truck announced by Elwell-Parker Electric Co., 4205 St. Clair avenue, Cleveland 14, has improved operating

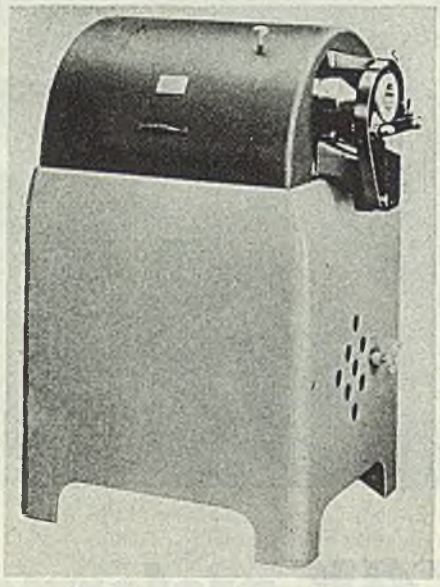


characteristics due to the addition of a separate motor for raising and lowering the boom.

It is a four way truck, serving as a lift-truck, a load carrier, crane and tractor. It loads itself either by picking up skid loads with the lift platform, or by lifting heavy parts and placing them on a platform for transport. As a tractor it pulls trailer cars, which may be loaded by means of the crane. The crane may be made available for heavy lifting at points where there are no overhead cranes. This model has a capacity of 6000 pounds on the platform, 200 pounds on the hook at 42-inch radius and 1000 pounds on the hook at 84-inch radius. It will travel at 6 miles per hour with no load and 5 miles per hour with full load under normal conditions. The platform is deeply flanged to insure rigidity and has three point positive support for load stability at all times.

Automatic Tube Former

For squaring, burring, flaring and beading ferrous and nonferrous tubing, sizes ⅜ to 3 inches outside diameter, Leonard Precision Products Co., Garden Grove, Calif., offers a new completely automatic Tube Master. The operator places the tube in position and presses

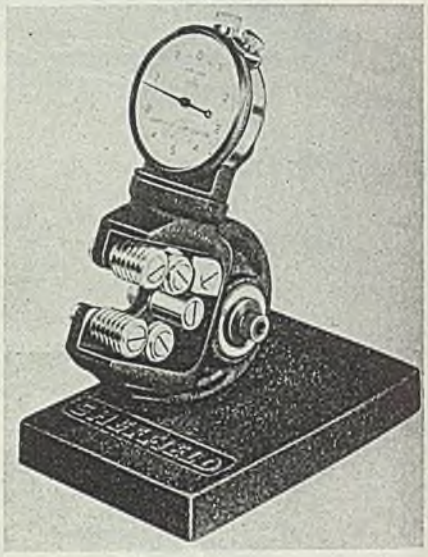


the control button. It automatically completes the cycle of squaring and burring, flaring or beading ferrous or nonferrous tubing. Uniformity of finish can be maintained indefinitely to exact predetermined specifications.

Gaging Instrument

Known as Thredchek, Sheffield Corp., Dayton, O., offers a new instrument for a more complete check of threaded parts which incorporates the scientific principles of the indicator snap and thread roll-snap gage. It has a standard balanced type large indicator graduated in 0.0001-inch mounted on it. The instrument employs the same "go" and "no go" rolls as a thread roll-snap gage. However the top no go roll is not fixed and its movement is registered on the indicator, showing how low or high is the pitch diameter. A free rotating backstop enables the part to be properly located when presented to the no go rolls.

If a part passes the go rolls, the lead, thread angle and pitch diameter are shown to be within maximum tolerance limits, and the part will assemble. The indication of the pitch diameter when the part is presented to the no go rolls separates the check of pitch diameter from the check of the lead. If the pitch diameter is correct, then it is known that the lead is correct. Correctness of the



form or angle can be checked visually as the work is passed through the full thread form ribs of the go roll. When the part is rotated in contact with the no go rolls, the indicator shows any out-of-round condition. The instrument can be placed in the standard thread roll-snap stand and used at the bench.

Power Brush

A new power brush for removing burrs, preparing metal surfaces, work on rubber parts and other applications is announced by Osborn Mfg. Co., 5401 Hamilton avenue, Cleveland. Designated as monitor brush No. 1409-S-22, it is a 12-inch monitor section filled with

0.005-inch power brush wire and has 1¼-inch arbor hole. It is specially suited to aluminum, brass and other ductile metals for removing burrs without damaging adjacent surfaces of the part and also will find extensive application on hardened and unhardened steel parts.

Uniform cutting ability is maintained throughout the life of the brush which makes it suitable for rubber parts and similar applications where there is considerable resistance to the fill-wire.

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

To Aim Tin Fish more accurately

They used to fire torpedoes one at a time. This war changed that. They now fire tin-fish in squads of two, three, four and even five, blanketing enemy vessels. To train those multiple torpedo tubes, gears have to operate with the smoothness of watch mechanisms yet be able to swing the heavy loaded torpedo turrets rapidly into line. There must be no measurable backlash to spoil the aim. We are proud that many of these training mechanisms are powered with 60 to 80 P. D. Cone-Drive gears and of the job they did in helping our Navy obtain mastery of the seas—East and West. That kind of service should enable Cone-Drive gearing to do a real job tomorrow in improving the design of many peace-time products such as heavy mining machinery, boom hoists, mine hoists, and large indexing drives.

What is more, Cone-Drive gearing saves space and weight. Cone-Drives weigh only 1/3 as much, require only 2/3 the room of conventional gearing of the same load capacity.

Ask for the following manuals:
CW-41B (for Executives)
CW-41A (for Design Engineers)

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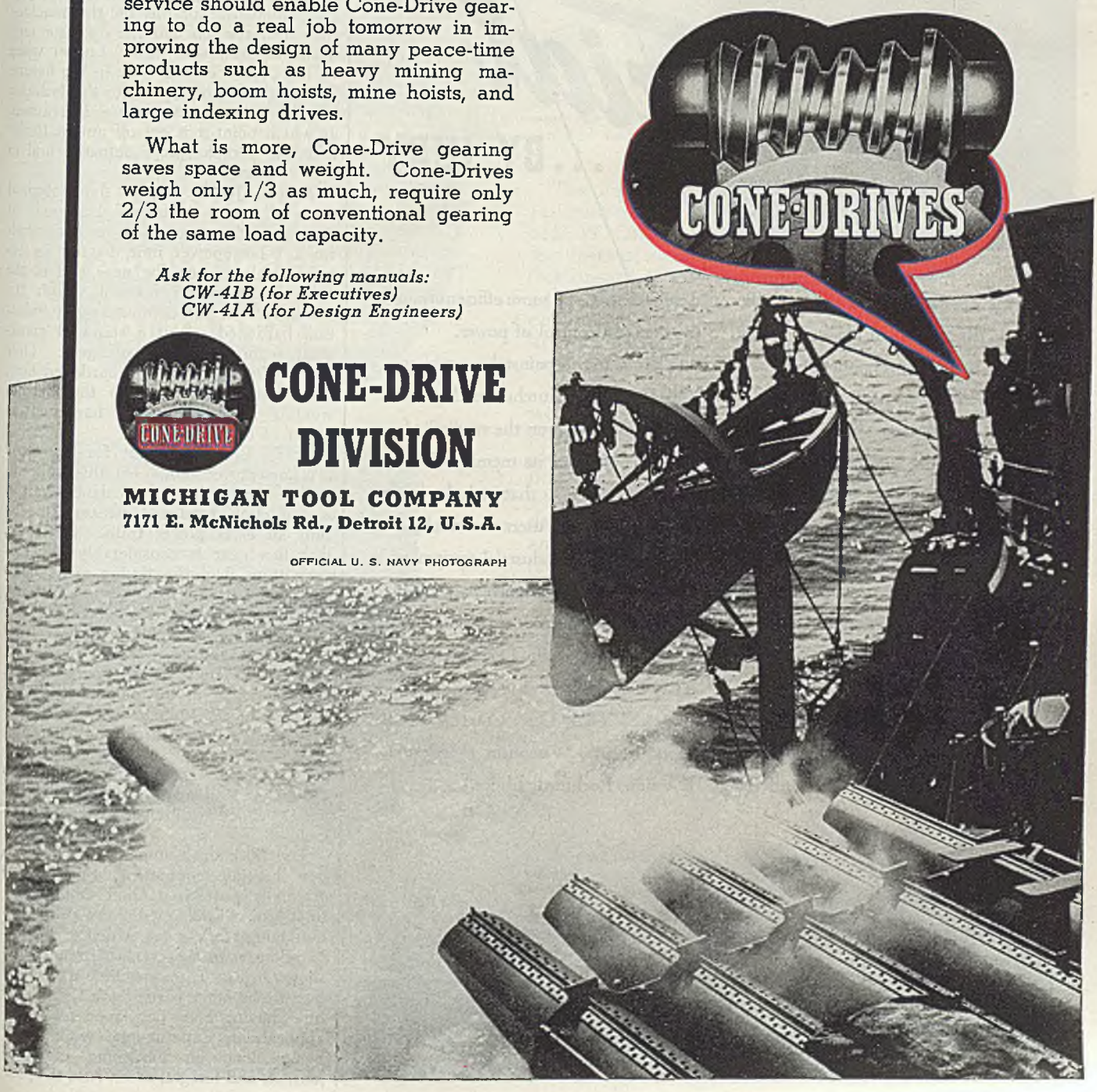


OFFICIAL U. S. NAVY PHOTOGRAPH

Trial ...BY JURY

It's the courtroom drama . . . exhibit "A"... the woman in black or red or green... that gets the banner headlines.

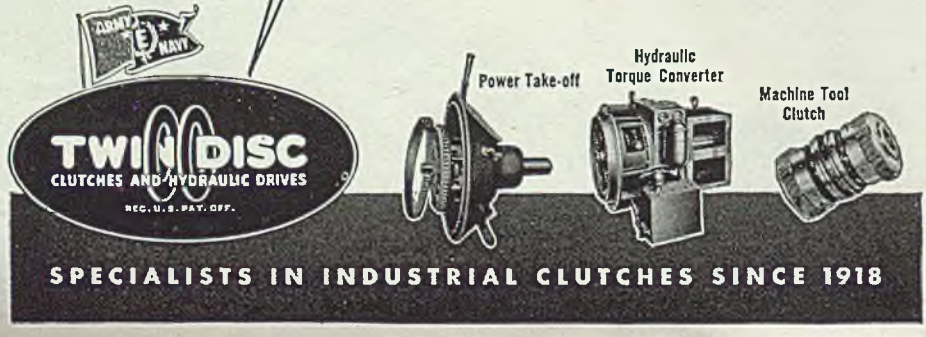
But it's the dreary, backstage drudgery . . . the endless sifting of every shred of evidence... that wins the case.

It's pretty much the same story with modern *power links,* too. Endless investigation and research into design, manufacture, application and service must precede production.

For more than 26 years now, Twin Disc engineers have been digging out the facts . . . probing every possibility that stands the remotest chance of contributing to better clutches and hydraulic drives... to more efficient transmission and control of power.

Thanks to this painstaking preparation, Twin Disc Clutches and Hydraulic Drives have "won the verdict" of a jury that numbers its members in the thousands... a jury that includes both manufacturers and users of virtually all types of powered industrial equipment.

If your product involves a problem of power transmission and control, why not take it to Twin Disc engineers? They may have the clue that will solve the case. TWIN DISC CLUTCH COMPANY, Racine, Wisconsin (Hydraulic Division, Rockford, Illinois).



Induction Heating

(*Continued from Page* 81)

effect has been likened to a transformer where the inductor is the primary and the work the secondary. The heating results from the I^2R losses from the induced currents flowing through the work itself.

"Dual" Hardening: In order to improve the physical properties of the crankshaft, Briggs & Stratton subject it to a through hardening treatment and a subsequent draw before surface hardening the crankpin.

This preliminary heat treatment of the entire shaft, however, does not influence the process of surface hardening, nor does the surface hardening affect the physical properties of the heat treated crankshaft anywhere but at the crankpin surface.

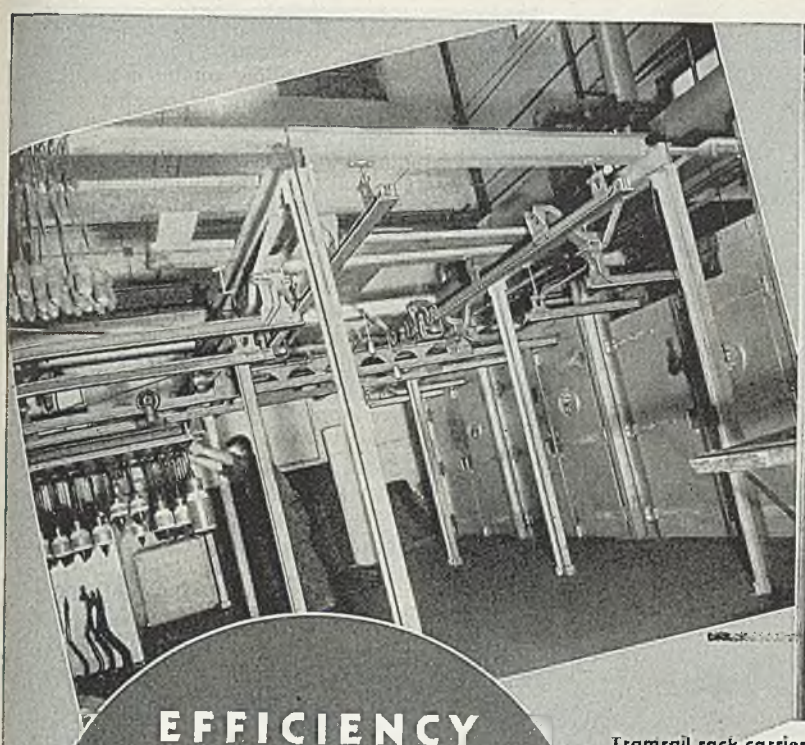
With heating periods established, precise automatic controls on the machine take over the job and the operator only needs to push the "Start" button when he has positioned the work in the fixture. Timers then apply power to the inductor till the desired temperature is reached, at which point it is cut off automatically and the quench sprays actuated and in turn shut off.

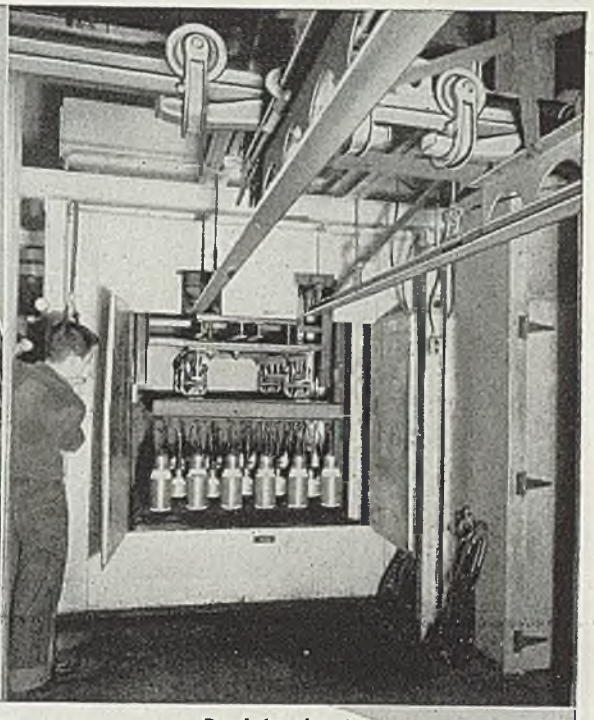
Typical Jobs: Fig. 1 shows typical parts that are induction hardened at Briggs & Stratton. A is a chankshaft for a 6-horsepower unit, having an extra helical gear on the near end of the shaft for a power take-off. Both the crankpin and this extra gear are induction hardened. B is a standard crankshaft without the take-off gear. Only the crankpin is induction hardened here. The timing gear next to the balance weights is not induction hardened on either of these units.

At C, is a crankshaft for the small 2/3-horsepower unit. On this unit, the timing gear next to the balance weights is induction hardened because it also runs an extra power train. Note, too, that this gear is considerably wider in proportion than the timing gears on A and B. Looking closely, one can see the heat marks where heat has "run" back into the adjoining material of the balance weight.

D, E, F, and G are gears used at various points in the engines and their speed reducers. Induction heating is used to harden every tooth through its entire cross section and also a small portion of the base. These gears range from 1¼ inches in diameter for E to 4 inches for D. Face widths vary from ½ to ¾-inch.

The 50-kilovolt-ampere Tocco induction heating equipment, Fig. 2, was originally purchased from Ohio Crankshaft Co., Cleveland, for the purpose of hardening teeth, a job which it did well. In addition to the crankshafts and gears shown in Fig. 1, the machine is also used on various other parts, more than 30 fixtures having been developed for various applications. Experimental work is now being done on hardening crankshaft journals and integral cams. Also the possi-





Tramrail rack carriers handle up to 72 armatures per load through the varnish dip tank, bake oven and cooling chamber.

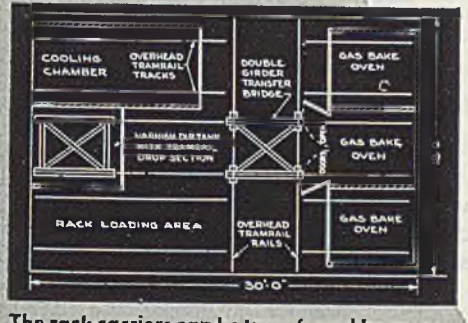
Rack loads of armatures are dipped into the varnish tank with the tramrail drop section.

EFFICIENCY AND CLEANLINESS INTRODUCED IN VARNISH INSULATING DEPARTMENT

The installation of a simple Cleveland Tramrail system in the varnish insulating department of D. W. Onan & Sons, Minneapolis, large manufacturers of electric generating plants, has made this one of the most compact and efficient departments of its kind. Complete insulation applications are given to the large production of armatures, stators and field coils in a space only 18 by 30 feet.

Prior to installation of the tramrail system, work in this department was hot, sticky and unpleasant. Workers had to wear long heavy gloves and protective aprons. After a time the floor racks, then used, would become coated with varnish several inches thick. Today the department is spic and span. The work is clean and easy. No hand handling is required until the varnish treatment is complete and the parts dry.

The tramrail system has eliminated a tremendous amount of rehandling and thereby saved time, speeded production and cut costs.



The rack carriers can be transferred by means of the double-girder transfer bridge to any of the six runways shown.

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THE CLEVELAND CRANE & ENGINEERING CO.
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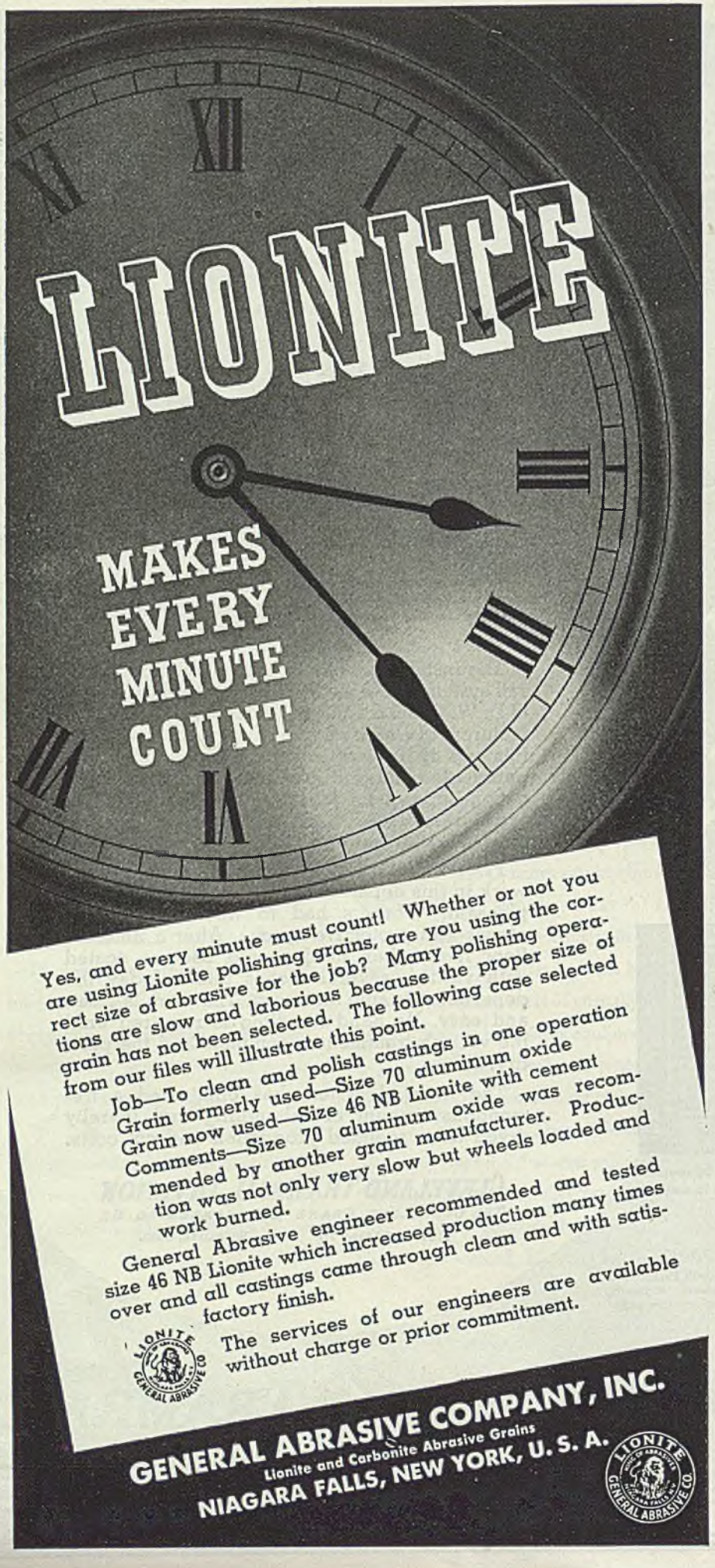


bilities of brass and copper brazing are being investigated. Some applications promise to allow combination operations such as simultaneous brazing and hardening.

Simultaneous Heat Treat, Shrink Fit: One of the rather unusual jobs of this type now in successful production is the making of a shrink fit at the same time the part is hardened. E in Fig. 1 has a gear pressed over the shaft. It was suggested that a fixture could be made to insert the shaft in the gear after it had been heated by electric induction and before the quench had been applied. This was tried and found to work well.

Now the shaft is inserted in the gear after it has been heated, then the quench is applied and the gear shrunk onto the shaft at the same time the teeth are hardened.

Work Fixtures: Figs. 3 and 4 are closeup views of two types of fixtures used by Briggs & Stratton. Fig. 3 is the type used in hardening the integral take-off gear shown next to the balance weight at C in Fig. 1. The work is positioned in the fixture by inserting it with the gear end down into the lower support which locates it centrally within the single-turn inductor.

Power is fed this inductor at a frequency of 9600 cycles per second from a special motor-generator set built in the lower portion of the machine. Air ducts to and from this housing assure a supply of clean cool air. One of these ducts appears at the operator's left in Fig. 2.

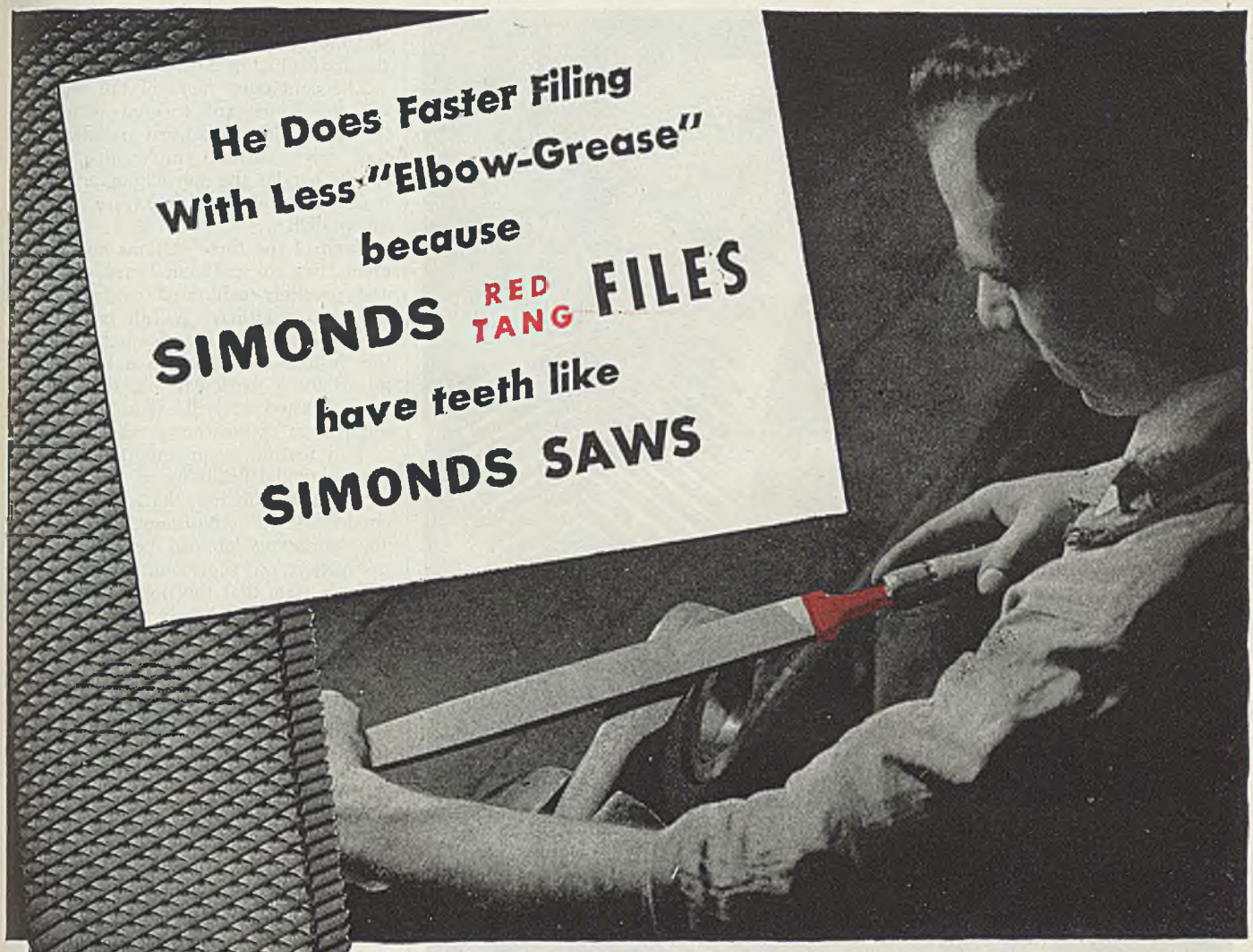
The inductor is fed through a transformer which provides a current of several thousand amperes, setting up the powerful magnetic field that does the heating.

Quenching is done by water which is sprayed through a large number of small openings in the inductor ring. Hose connections to and from the quenching circuit can be seen in Fig. 3. Another water circuit cools the inductor itself. The collector hood of an exhaust system is also visible in Fig. 3 just above the work where it takes away the steam produced as the sprays strike the hot metal.

Since the upper portion of the crankshaft does not become heated, the operator can unload and reload the fixture without use of tongs or asbestos gloves, facilitating production.

In Fig. 4 is shown the hinged type of fixture required for hardening the crankpins. Due to the offset location of the crankpin, the fixture here must be split so it can be opened for insertion of the work. The lower half of the fixture is stationary and is bolted to the faceplate on the machine work station.

To load this fixture, the operator grasps the handle seen extending vertically at top of fixture and swings it toward her. This action lifts off the upper half of the inductor block and swings it out of the way so the crankshaft can be positioned between locating blocks which have hardened inserted contact faces to prevent wear. Then the operator closes



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PRODUCTION TOOLS FOR CUTTING METAL, WOOD, PAPER, PLASTICS

the fixture, pushes the "start" button, and the machine takes the work through the hardening cycle automatically.

The contacting faces of the separable inductor block are covered with silver to assure low electrical resistance to the heavy current employed. Built-in sprays handle the quenching as in Fig. 3 and the inductor blocks are also water cooled.

Each of the three stations on the machine has an individual set of timers and precisely calibrated controls which facilitate resetting. A full complement of electrical meters is also helpful. Once the desired conditions have been determined for a particular job, they can be re-established at will, assuring accurate duplication of previous work.

This feature is an important point in increasing the flexibility of the machine, for once the fixtures have been developed and the adjustments determined, any hardening job can be put back in production on short notice. Company officials state that the possibilities of the equipment have barely been touched. Much expansion in the near future is indicated.

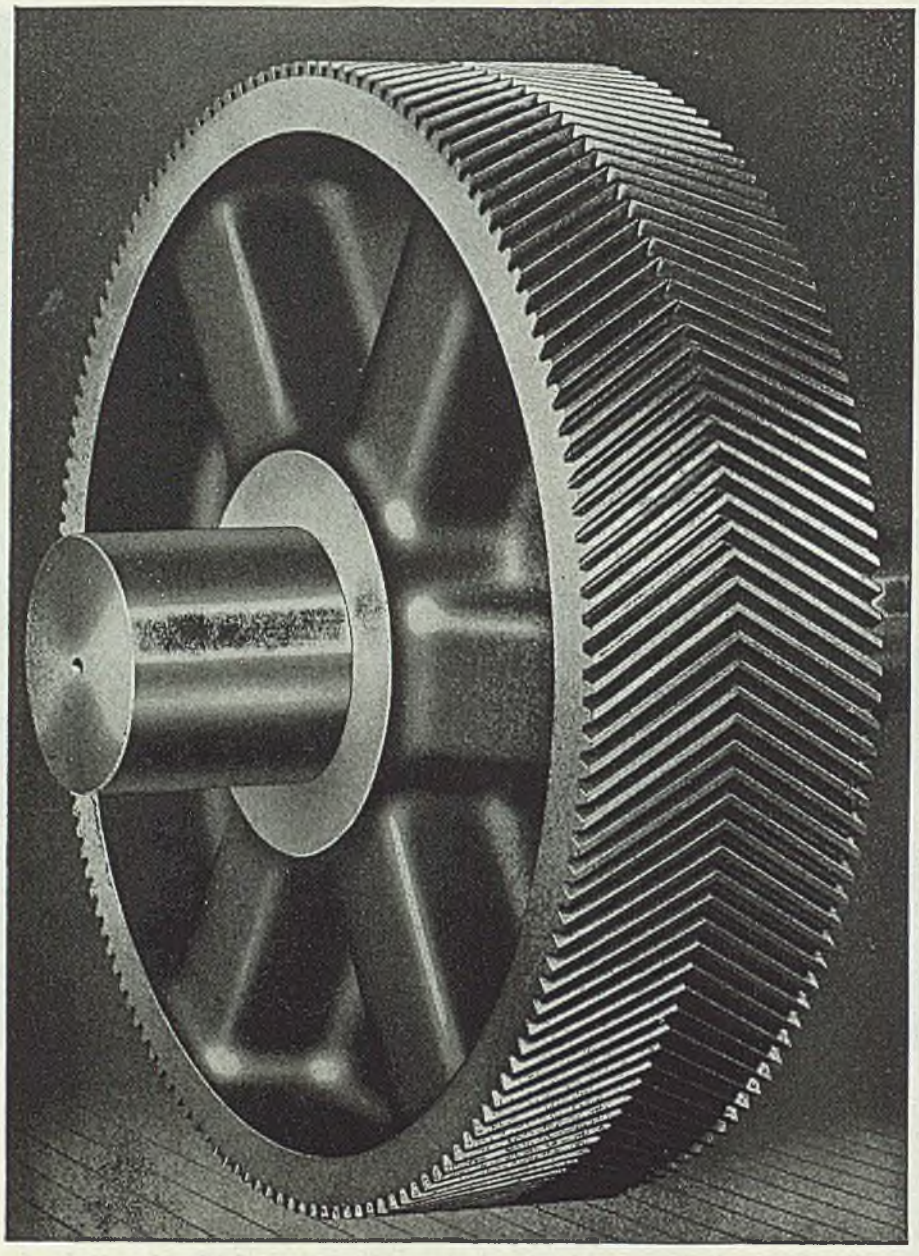
Research Projected on Electrolytic Corrosion

To combat ravages of electrolytic corrosion on insulating materials in the tropics, tests were conducted by General Electric Co., Schenectady. Many failures caused by moisture in apparatus containing fine wire are said to be due to electrolytic corrosion. Destructive effect occurs when moisture absorption produces leakage currents which electrolytically decompose the conductor and result in open rather than in shorted windings.

No class of materials has been found which is completetly noncorrosive, according to the company. Also, corrosive nature of various insulating materials differs widely, and in some cases a single class of materials may possess a wide range of corrosion-inducing characteristics.

Even in temperate climates moisture condensation may occur on apparatus chilled during aircraft flight at high altitudes. This water may even be forced into electrical windings by pressure changes resulting from subsequent changes in altitude. Serious damage may occur if this absorbed water freezes and cracks the insulation.

Three types of tests made were a visual test, a corrosion current test, and a water extract test. A large refrigerator box was tipped back so that it would hold water in the bottom and at the same time permit condensed water to run off the ceiling surface without dripping. Box was located in a room held at 25 plus 1 degree Cent., and sufficient heat was applied at a constant rate to the water to maintain an air temperature of 35 degrees Cent. Laboratory condition adopted for tests was 100 per cent relative humidity, plus a dew point of 35 degrees Cent. (95 degrees Fahr.).



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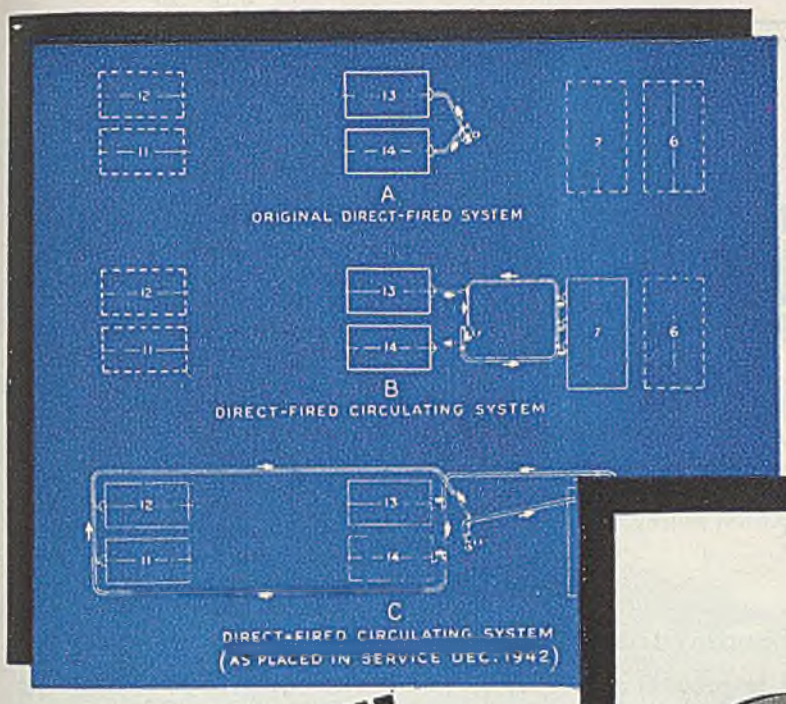

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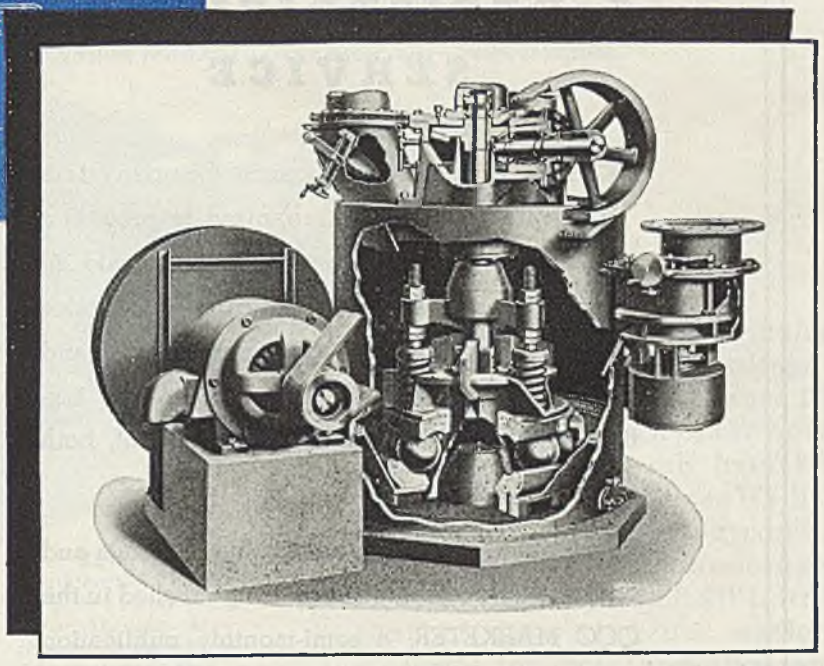

Cutaway view of B&W Type B Pulverizer

Substantial savings in installation, operating, and maintenance costs over other methods of firing metallurgical furnaces are made possible by the B&W Direct-Firing Pulverized-Coal Circulating System. A single pipe looped overhead and around several furnaces supplies air-borne pulverized coal of proper fineness to as many burners as are required for the service. Automatic control provides the same flexibility as obtained with oil or gas. With this method of firing, only ONE pulverizer is needed. It can be set where convenient; saving floor space and eliminating interference with product handling at the furnaces.

With this system you save fuel, reduce heating cycle time, and increase production. These savings begin at the heart of the system—the B&W Type B Pulverizer. Fuel distribution and capacity of the system, whether for single or multiple furnace operations, is assured because the Type B Pulverizer is built to stay on the job and to pulverize its rated capacity in coal to the fineness necessary for the specific requirements of each installation. This pulverizer is of the same type as that widely used for firing boilers and cement kilns, where sustained fineness and capacity of product and continuous low-cost operation are governing factors. They assure the same dependable service in this simplified method of firing metallurgical furnaces.

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Enameling Steel

(*Continued from Page* 83)

the responsibility directly on the foreman and operator.

Enameling Quality Control

Main points of interest in the enameling quality control procedure are laboratory control, enamel standards, details of inspection, and color matching.

Laboratory Control: Daily samples of production pieces are taken to the quality control laboratory and checked. In certain tests where production pieces cannot be used, special test panels are made duplicating as nearly as possible the actual conditions.

Test Panels:

Test panels are made from 4x12-inch, 20-gage (0.0375) enameling stock. The edges of the pieces are brushed back ⅛-inch and a ⅛x6-inch strip is brushed down the center.

Enamel Weights:

Dry weight per square foot.

Ground coat — 18-20 grams per square foot (one side).

One coat white—35-40 grams per square foot.

Two coats white—(first coat) 28-33 grams per square foot and (second coat) 20-25 grams per square foot.

Procedure of Tests

Thermal Shock: Place panels in oven at 550 degrees Fahr. and drop water from suitable apparatus at rate of 25 drops per minute for 12 minutes. Rub ink or lamp black on surface—presence of lines indicates failure.

Impacts: Beginning at height of 1 inch, drop steel weight, weighing 135 grams, on face of test piece firmly supported. Increase height 1 inch for each succeeding drop. Continue to drop weight until ground coat is exposed. Record height in inches necessary to cause failure. Compare results to standards established for each application.

Cross Bend: Place three test pieces in cross bend machine and make zero reading when each piece is tight. Bend until fracture occurs across entire width of piece and record dial reading necessary to cause failure. Move two divisions every 2 minutes for the first 10 minutes, then one division every minute for remainder of test. Results are compared to established standards.

Adhesion: Drop a 5-pound weight on test piece from height of 13 inches. Weight is arranged to strike a plunger, which in turn strikes steel ball ½-inch in diameter. Allow test pieces to stand for at least 1 day before recording results. To test cover coat adhesion, strike on ground coat side of panel; to test ground coat adhesion, strike on cover coat side. Results are compared to established standards.

Cold Test: Heat panels in oven to 550 degrees Fahr. When hot, remove and place immediately in ice water for 1 minute. Rub ink or lamp black on surface to show failure.

Scratch Hardness Test: Test panel is

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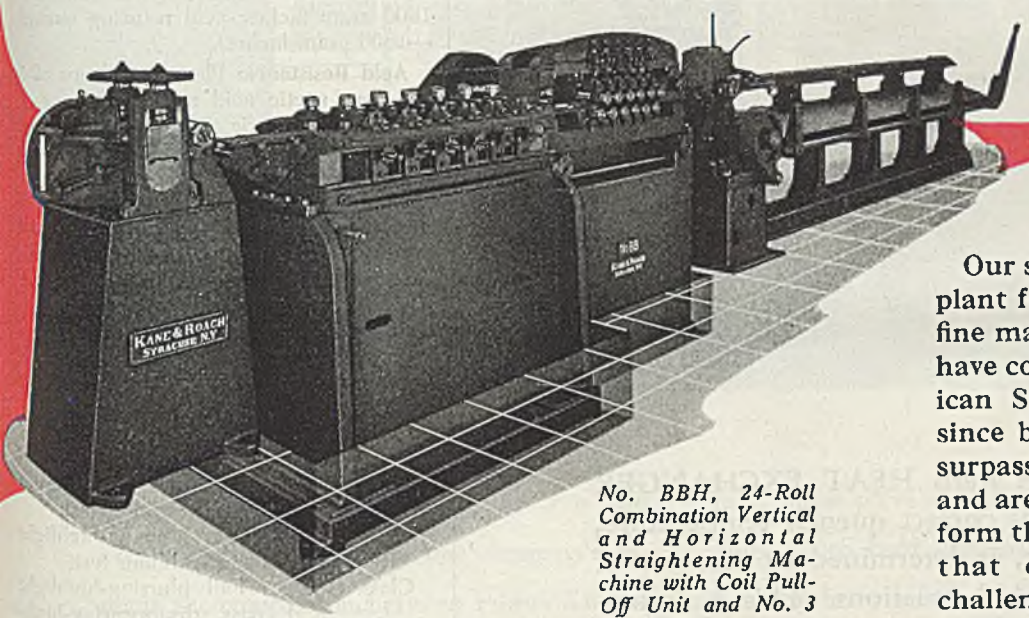
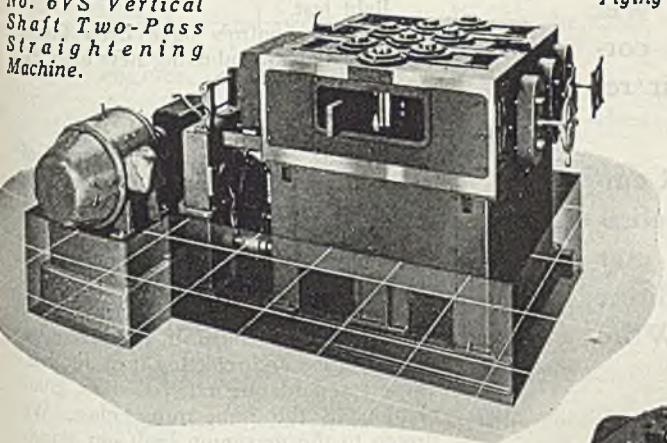
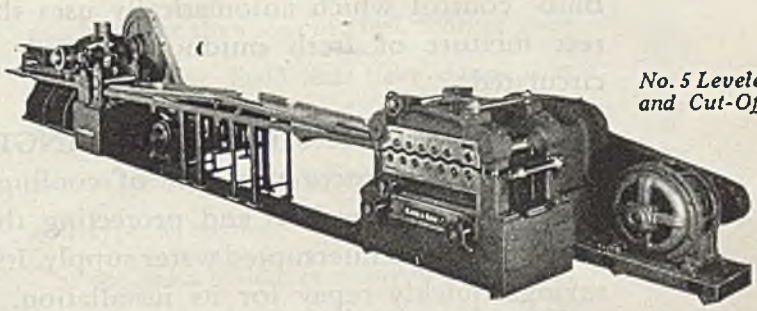


No. BBH, 24-Roll Combination Vertical and Horizontal Straightening Machine with Coil Pull-Off Unit and No. 3 Flying Shear.

Our skilled workers . . . our unique plant facilities . . . our knowledge of fine machining . . . which since 1887 have contributed much to the American Steel Industry—all have long since been called to arms. We have surpassed all our previous records... and are now doing our utmost to perform the biggest job in K&R history, that of answering our nation's challenge for *more*, and then *some MORE*, material for our armed forces.

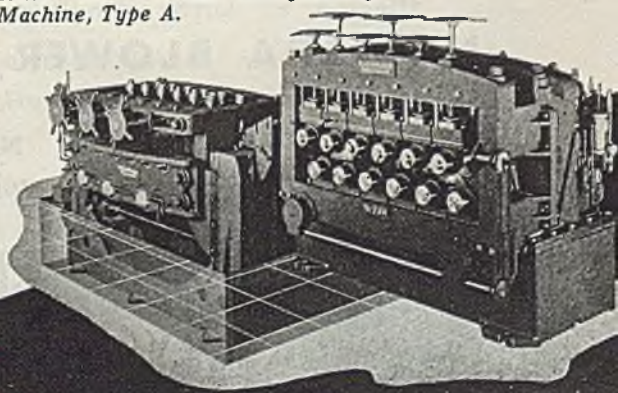
No. 6VS Vertical Shaft Two-Pass Straightening Machine.

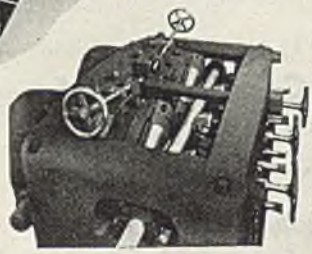




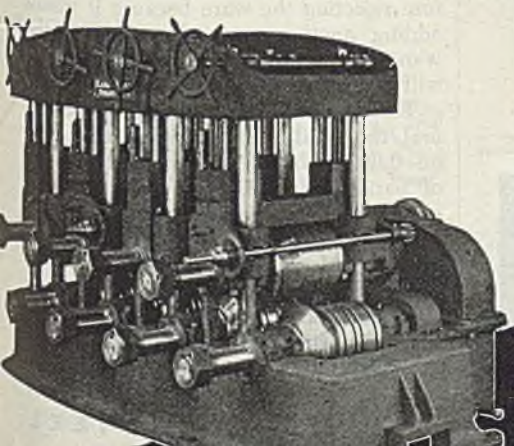
No. 5 Leveler and Cut-Off.

No. 2AH, 24-Roll Combination Horizontal and Vertical Straightening Machine, Type A.





No. 5250B, 5-Roll Rotary Straightening Machine.



No. 6 Standard 8-Roll Straightener.

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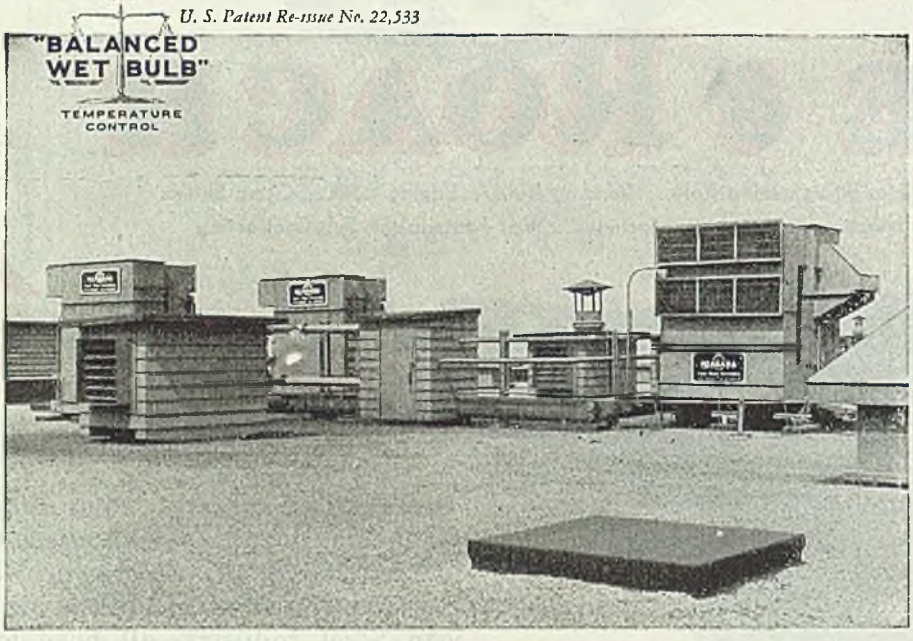

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clamped to motor-driven platform. Each of four corners of panel is scratched seven or eight times using constant-hardness victrola needle. New needle is used for each corner of test sample. Pressure on needle is varied by sliding 227-gram weight along lever arm. When enamel is not scratched by 227 gram weight, at farthest distance from fulcrum, additional weight of 200 grams is added, making total of 427 grams. A predetermined scratch, plainly visible when rubbed with carbon paper, is used as standard. When scratch is made, it is evaluated by multiplying weight in grams by distance of weight from fulcrum in inches. Result is expressed in gram inches. Minimum limits are determined on basis of ultimate use and type of enamel used (regular enamel—1400 gram inches; acid resisting enamel—1800 gram inches).

Acid Resistance: Place five drops of 5 per cent acetic acid and five drops of 10 per cent citric acid at number of places on surface to be tested. Test areas should be spaced to give a representative test, and distributed at different points over all significant surfaces of part. Small pools of acid must be covered immediately with 1-inch inverted watch glass. After 15 minutes of treatment, acid is rinsed from surface. Surface is dried and checked for appearance. Rate as follows, according to Porcelain Enameling Institute:

Class AA . . . No visible stain, and pass dry-rubbing test.
Class A . . . Pass blurring-highlight test, and pass wet-rubbing test.
Class B . . . Pass blurring-highlight test, and fail wet-rubbing test.
Class C . . . Fail blurring-highlight test and pass disappearing-highlight test.

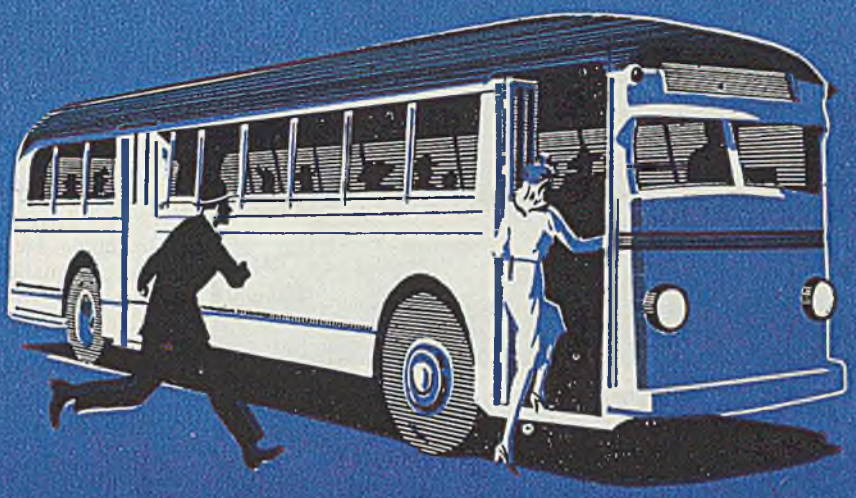
Foregoing controls have been found very essential in evaluating new enameling materials.

Enamel Standards

Standards exemplifying each type of maximum passable enameling defects are placed in a glass enclosed case. The case is kept before the inspector at all times. A duplicate set is placed on the assembly line at the inspection station. This procedure not only eliminates guessing, but precludes the chance of passing ware at one station and rejecting it at another. These standards are set, based on competition in the same price class. We stretch to the maximum limit our standards on slight finish imperfections before rejecting the ware because it means adding another coat of enamel if the ware is rejected. How important this is will be shown.

Thickness vs. Chippage: We made several thousand tests of enameled pieces on 0.037-inch thick steel, with enamel of various thicknesses to determine the critical point of enamel thickness versus chippage. These tests proved beyond doubt that losses (on enamel parts caused from chippage) with thickness over 0.022-inch are nearly six times greater than with thickness below 0.022-inch. As a result of this check, our management

Cylinder life multiplied by 5



Cylinder life that is multiplied by 5 is the experience of a large city bus company who made the comparison between PORUS-KROME cylinders and ordinary cylinders in the same engines.

The reason that cylinders last longer when they have been treated with PORUS-KROME, applied by the Van der Horst process, is that it resists wear and corrosion better than any other known cylinder material.

PORUS-KROME is pure, hard chromium which has been processed so that there are myriads of tiny pores and channels in its surface. These pores and channels serve as reservoirs which hold lubricating oil and feed it back to the cylinder surface as needed. Better lubrication, plus the fact that chromium is so much harder than iron or steel, reduces wear to a minimum. Field tests have shown that PORUS-KROME multiplies cylinder life from four to twenty times . . . depending on the size and type of engine.

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Expert Euclid hoist design, plus an efficient clam shell bucket, make this a very compact and useful unit for loading, unloading and conveying coal, ashes and other materials.

This trolley is built to handle a single line bucket and travels along the overhead beam during each cycle of operations. The photo shows the trip line in front of operator. A pull on this line opens the bucket.

Euclid convenience of control and facility of operation contribute greatly to its high efficiency and comparatively low cost of operation.

In addition to the building of cranes and hoists Euclid experience embraces the designing of equipment to handle various types of related equipment, grabs, slings, etc., for handling unusual kinds and shapes of material.

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set up our inspection to gage thickness of every piece of vitreous enamel produced and to scrap any pieces where the enamel was over 0.022-inch. Many pieces perfect in appearance are scrapped if over gage limit. It is far better to accept a minute defect in surface finish rather than to apply another coat which greatly increases chippage hazard both in transportation and actual service.

Details of Inspection: All finish coat ware, when ready for inspection, is run through our tunnel of light inspection booth where it is checked as follows:

Quality of enamel finish based on commercial standards.

Thickness of enamel. (Any pieces exceeding the maximum limits are scrapped).

Color matched and stamped with one of three color classifications.

Color Matching

We have gradually built up color matching facilities to improve the efficiency, quality, and lower cost of color matching white finish for ranges, refrigerators and laundry equipment. In the early days, the method used by the industry was crude. As a result, many complaints were received because there was too much difference in the shades of white used on the same product.

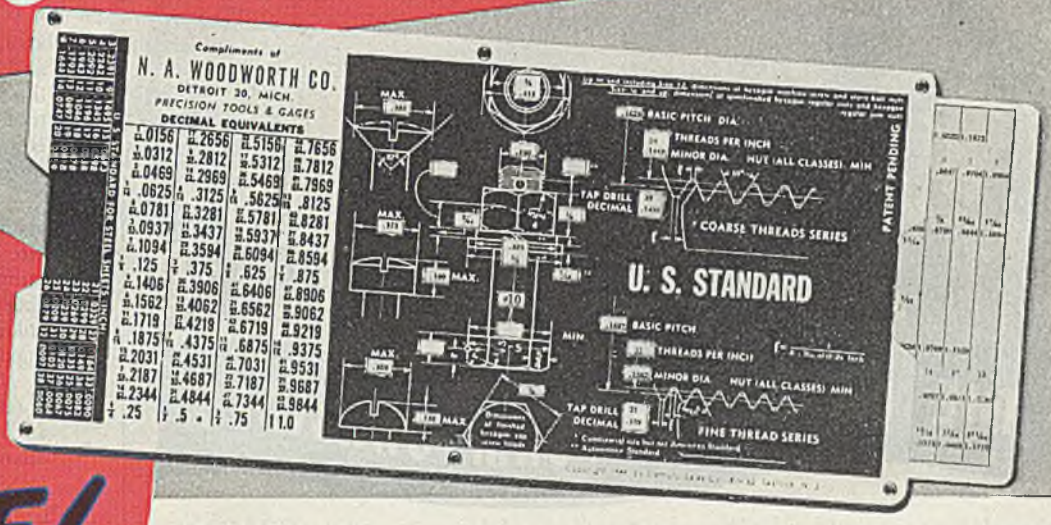
Along with improvement in color matching, rapid improvements have been made in enameling frits and processes. This has made it possible to do a better color matching job because of fewer variables in the materials and processes.

Our research department was one of the first to experiment with photoelectric color matchers. Considerable experimenting was carried on using the reflectometer in the hope that a satisfactory method could be found that would eliminate the personal equation. To date, we have found they are not satisfactory inasmuch as this method only checks opacity or reflectance and not shade of color. Inasmuch as different enamels and types of enamels vary somewhat in the shade of white, this method was not dependable. Another reason is that even though it would give dependable results, the instrument checks only a small area. Reflectometer is valuable in checking test panels and batches of frits in laboratory.

The next problem was to work out the most efficient shadowless lighting for enamel inspection. It was found that optical illusion, caused by shadows of poor lighting, was one of the greatest enemies in attempting to match a white enamel. Our engineers finally introduced a new system of artificial lighting which eliminated all uncertainty. Visible variation from the most exacting standards are magnified by unadulterated daylight, artificially produced and constantly maintained. This light tunnel has no shadows to conceal imperfections and distortions. The light intensity was increased to 50 times the average light found in schoolrooms, 25 times average light found in stores and offices, and ten times average light found in industrial inspection.

Lighting is a mixture of mercury va-

Saving Time-Saves Costs



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MANUFACTURING CONTROL

THE KEY TO UNIFORM CARBIDES

THE art of manufacturing uniform cemented carbides requires the same "exceeding care" exercised by the talented research men who established the fundamental principles and practices of this highly specialized branch of metallurgical science. That is why Kennametal is subjected to precise control throughout every stage of its manufacture, by means of scientific instruments in the hands of skilled technicians. The objective of the chemical and metallurgical checks of processing is three-fold:

First, *to produce cemented carbides that will exactly suit predetermined requirements of differing character.*

Second, *to assure that the desired characteristics of finished products are uniformly maintained.*

Third, *to form the basis for continued research looking to still further improvement in the properties and applicability of Kennametal.*

● The invention and development of Kennametal—a scientific achievement—has led to corresponding useful arts. Kennametal's ability to cut hard metals with sustained accuracy, at greatly increased speed, has made major contribution to the technique of high production machining and milling. Its unique wear-resistant properties have created opportunity which many manufacturers have seized upon to give their products greater serviceability.

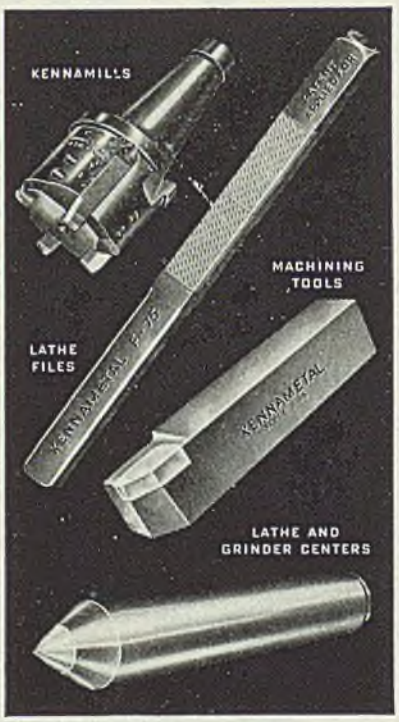
The technological advancements that accompany the use of Kennametal serve to suggest the tremendous potential benefits to society that are always inherent in a system under which inventive genius is granted the rights, and given the means, to encourage full utilization of its talent.

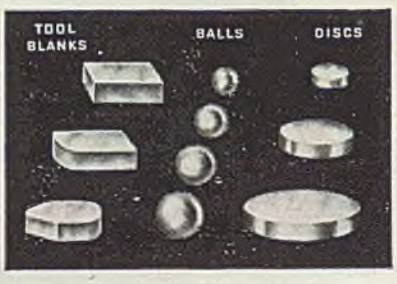
KENNAMETAL

SUPERIOR CEMENTED CARBIDES

KENNAMETAL *Inc.*, LATROBE, PA.

Typical **KENNAMETAL** *Products*





por and incandescent lamps placed in a color-matching tunnel, the interior of which has been finished in egg-shell white.

Color Matching System: In color matching we have three classifications. The inspector places standard panels on ware to be matched and checks are made as follows:

Classification 1. (Use Panels No. 1 and No. 2)—Minimum for the darkest shade of enamel acceptable on one product. If the color is darker than No. 1, the piece is rejected. If the ware is between Nos. 1 and 2, it is stamped No. 1.

Classification 2. (Use Panels No. 2 and Minimum No. 3)—Minimum for the medium shade of enamel acceptable on one product. If the color is whiter than No. 2 and is darker than minimum No. 3, it is stamped No. 2.

Classification 3 (Use Panels Minimum No. 3 and Maximum No. 3)—Minimum and maximum shade of enamel acceptable on one product. If the color is between the minimum and maximum No. 3, it is stamped No. 3. If it is beyond the maximum No. 3 on the yellow side, it is rejected. In most cases, it will be found enamel over No. 3 will also be rejected as being too heavy.

All ware is color matched in the tunnel of light booth, stamped according to procedure described, and is sent to stock ready for assembly. The assembly line assembles the same color-number enamel ware on the same appliance.

Preparation of Matching Panels: Color standards for each color classification are on file in the laboratory, along with such pertinent information as type of enamel applied, weight of application, thickness of coating, and green, blue and amber reflectometer readings. Periodically, it becomes necessary to make up new sets of color matching plates for inspectors to replace those damaged due to continued use. Experience has shown that in order to duplicate the standard color plates, the same type of enamel must be used as that on the color standards. Different enamels, while giving the same opacity or reflectance readings when using the green filter, often vary considerably from the standard when comparing with blue and amber reflectances. In order to remove as many variables as possible, all color plates are fired in the continuous production furnace along with regular production. The following table shows approximate thickness and reflectance reading for the various test color matching panels:

Panel No. 1—Thickness of enamel—0.011-inch (approximate).
Reflectance—Amber—68.5
Blue—71.7
Green—69.3

Panel No. 2—Thickness of enamel—0.014-inch (approximate).
Reflectance—Amber—74.0
Blue—76.0
Green—74.6

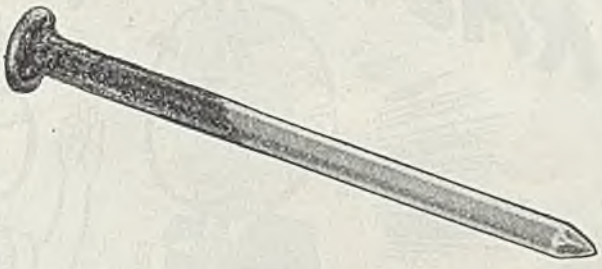
Panel No. 3—Minimum thickness of

What to do about Rust?

Make this Test

Immerse any rusty nail in a small quantity of Cities Service Rust Remover. If badly rusted, allow to remain for several minutes. You can actually see the rust dissolve.

See the Results



Remove nail and wipe dry with cloth or tissue. Note the complete absence of rust and the way the original surface reappears.

CITIES SERVICE RUST REMOVER has been tested for four years throughout a small, highly industrialized area in the East, where it has earned a unique reputation for performance. RUST REMOVER is a clean, clear liquid, practically odorless, non-inflammable, easily applied, and harmless to handle by those not allergic to specific chemicals. It is fast-acting, and, although heating somewhat accelerates results, general application is recommended at normal temperature (60°-90°F.). RUST REMOVER is effective on chromium, copper, aluminum, steel and iron.

5 Big Advantages

1. Non-Inflammable
2. Harmless to Normal Skin
3. Makes Metals Chemically Clean
4. Removes Rust by Chemical Action
5. Free from Muriatic, Sulphuric, Nitric and Oxalic Acids or Cyanide.

See a Free Demonstration of Rust Remover on Your Own Equipment.

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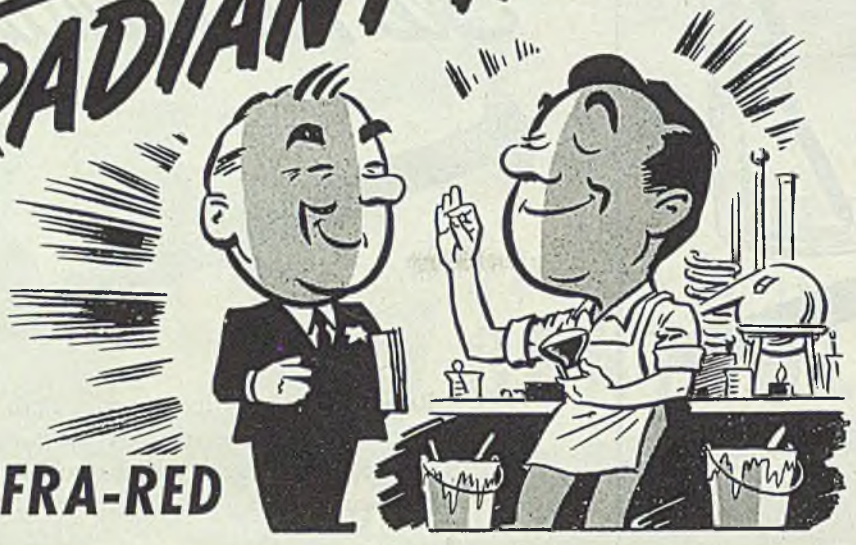


INFRA-RED

EQUIPMENT MANUFACTURERS and PAINT MAKERS CAN AGREE ON PENETRAY

No longer is "passing-the-buck" a game to be played by paint men versus equipment men. No longer is the "buyer" in the middle as to whether paint or equipment is responsible for unsatisfactory results.

Penetray's exclusive ceramic coating improves wavelength, producing more intensive color, thorough curing and superior polymerization on metals. In addition, insect attraction is minimum because glare is reduced and improved uniformity of energy distribution results. Prove these points. Make your own tests for color and gloss; for corrosion and abrasives.

SALES ENGINEERS WILL CALL or DETAILS on REQUEST

LEARN TO SAY PENETRAY

VERD-A-RAY CORPORATION :: TOLEDO 5, OHIO

enamel — 0.017-inch (approximate).
Reflectance—Amber—79.3
Blue—80.0
Green—79.4

Panel No. 3—Maximum thickness of enamel — 0.020-inch (approximate).
Reflectance—Amber—82.8
Blue—82.7
Green—83.0

Vitamin A As An Aid In Color Matching: Completion of the most modern and efficient improvements of shadowless lighting resulted in reducing rejects on the assembly line from an average of over 3 per cent to an average of 1.7 per cent. Feeling the rejects could be further reduced, we made another review in 1937. As our equipment was as modern as any in the industry, it became evident that the personal equation played a vital part in the problem. The company doctor and a local oculist specialist were consulted. They started an immediate investigation which led first to the Cleveland Clinic and then to the American Medical Association, where valuable data and recommendations were obtained.

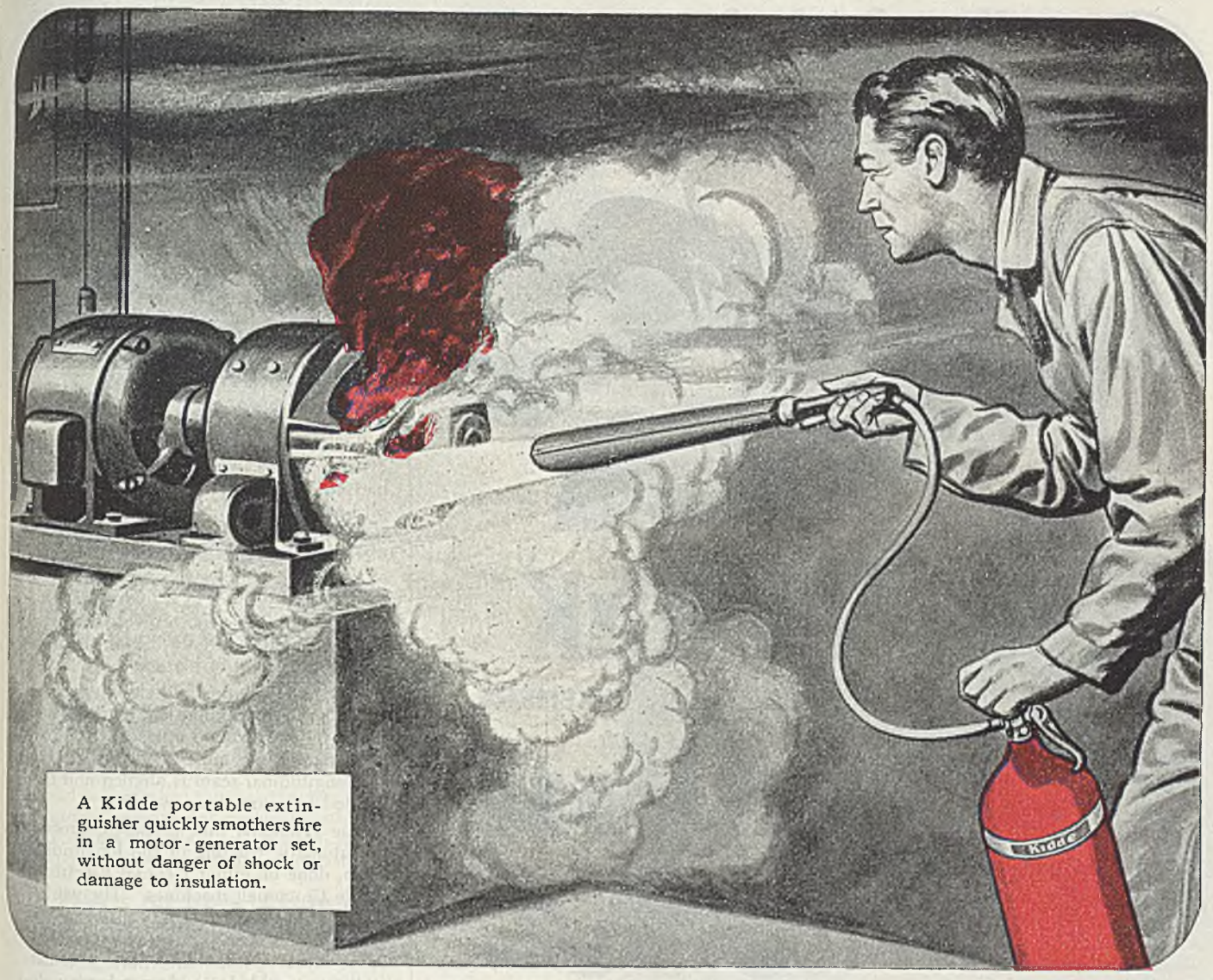
ELECTRIC RANGE ENAMEL PERFORMANCE

	1930 Per Cent	1941 Per Cent
Enamel chippage in the field	18	Less than 1
Off-color complaints	10	0
Enamel shop losses, per sq. ft. (scrap including fabrication costs)	$0.02	$0.002

Studies disclosed that color matchers were all young men, chosen with great care and checked periodically for visual defects and color blindness. It became evident that some were suffering from eye fatigue that could not be detected in the regular eye tests. An instrument known as the bio-photometer was recommended to us to determine if our color matchers were deficient in vitamin A.

The bio-photometer measures the ability to see light and response of a patient not only to dark adaptation but to adaptation to light. Even mild vitamin A deficiency affects the light thresholds under various conditions of light and darkness. The bio-photometer is an especially designed instrument which measures the rate and regeneration of visual purple by means of obtaining light thresholds under standard conditions. If this rate of regeneration of visual purple (a conjugated protein stored in the retina) is below normal, the use of vitamin therapy in almost every instance will bring this up to a normal or higher than normal level.

A large percentage of our color matchers were brought up to optimum level (above normal) by vitamin therapy, or by a balanced diet. After recovery, rejects on the assembly line reduced from an average of 1.7 per cent to an average of 0.3 of 1 per cent over a 4-year period. It has been the means of increasing the



A Kidde portable extinguisher quickly smothers fire in a motor-generator set, without danger of shock or damage to insulation.

KIDDE EQUIPMENT HITS THE HOT SPOTS to put tough fires out!

Even a small blaze in electrical equipment — or flammable liquids — may quickly flare into a serious fire...unless the *right* extinguisher gets to work fast.

Ordinary water-type extinguishers cannot stop these tough Class C and Class B fires. But a Kidde portable — approved by both Underwriters' and Factory Mutual Laboratories — chokes them off quickly and safely.

If a blaze breaks out in *electrical equipment,* non-conducting carbon dioxide keeps the operator safe from the danger of shock, while it swirls around corners and penetrates crevices to extinguish every flicker of flame. Dry and inert, the gas does not damage the equipment or rot the insulation.

When *liquids* catch fire, a cloud of carbon dioxide gas from the Kidde nozzle forms a thick blanket that smothers the flames . . . then evaporates to leave valuable materials uncontaminated.

Safe, clean, fast — Kidde extinguishing equipment is ready to take on the job of guarding *every* tough-fire area in your plant. Check the accompanying list of hazardous locations — then ask a Kidde representative to show you how best to protect them.

KIDDE KILLS TOUGH FIRES

MG Sets
Process Rooms
Ovens
Spreaders
Motors
Storage Rooms
Mixers
Coaters
Transformers
Dip Tanks
Agitators
Washing Trays
Control Panels

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Walter Kidde & Company, Inc. • 140 Cedar Street, New York 6, N. Y.

You Can't Squeeze the Life out of These . . .

KANTLINK* TRADE MARK

STEEL SPRING WASHERS

made with

KEYSTONE Wire

TIGHT—the Kantlink Steel Spring Washer exerts constant pressure . . . keeps nut from loosening.

STILL TIGHT. Though the nut never turned, the other parts wore and stretched. Kantlink's expanding spring action continues to hold nut securely in place.

Steel in spring washers is subjected to extreme pressure. Here sustained resiliency, toughness and "bite" under terrific force are "musts". Special Keystone heat-treated high carbon steel wire supplies these qualities in good measure . . . as proved by the satisfactory performance of Kantlink steel spring washers in a wide variety of applications. Kantlink steel spring washers are more widely used than any other kind . . . evidence of their sterling ability to "stand the gaff".

Regardless of the performance demanded in wire products, Keystone has been able to supply the materials that meet the most exacting engineering requirements.

KEYSTONE STEEL & WIRE CO.
Peoria 7, Illinois

**The National Lock Washer Company, Milwaukee, Wisconsin*

Special Analysis Wire for All Industrial Uses

SAMSON SPRING WIRE — KEYSTONE STEEL & WIRE CO. PEORIA, ILL.

Coppered, Tinned, Annealed, Galvanized

quality of Westinghouse products and almost eliminating customer complaints of nonuniform color. Tangible savings of over $6000 a year were made on ranges alone. This savings was made by reducing the number of off-color parts it was necessary to change on the ranges after assembly.

In conclusion, while some of our controls might seem unusual, in the final analysis, we are only interested in ultimate results. A good example of this is the performance record of one product, the electric range, tabulated elsewhere in this article.

Masts and Kingposts

(*Continued from Page* 99)

at extreme right, Fig. 3. To roll 1¼ and 1½-inch plate, the plate rolling machine had to be stiffened. This was accomplished by an ingenious yoke which essentially divides the roll into two 15-foot sections. Yoke is fitted with a number of rollers to contact the top roll. It is held against the roll by a hydraulic cylinder. This stiffens the top roll so that it is easily capable of cold rolling the maximum thicknesses of plate involved.

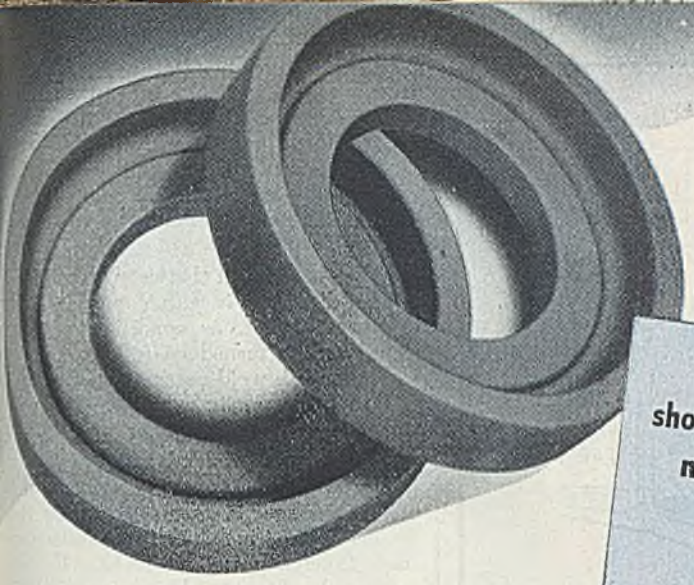
After rolling the individual sections into complete cylinders, they proceed directly by conveyor to a special clamping jig designed by company engineers. Here the longitudinal seam is aligned and tack welded by manual arc welding.

The cylinders, thus prepared, proceed to automatic welding of the longitudinal seam, done on either General Electric or Linde Unionmelt machines. The work is interchangeable on these and the rigging is again special. Inside and outside longitudinal passes are here automatically arc welded, Southwest having designed much special fixturing to accomplish all of the welding automatically. These welders are seen at extreme left in Fig. 3. Note extensive framework supporting automatic welding head and a seat for the operator so he can ride along with the machine as it travels the length of the cylindrical section.

After this longitudinal welding has been completed, the production line splits into two phases: (1) Those sections to become adjacent parts of a telescoped and lapped joint proceed to the hydraulic presses for assembly and then on to the automatic girth welding setup, (2) the remaining cylinder, composing the sections of the kingpost or mast of uniform diameters, go directly to the automatic weld setup made for girth butt joints.

In this fabrication, a difficult problem was encountered in the development of means for pushing the telescoping courses together. This is accomplished on a 300-ton Southwark horizontal hydraulic press, Fig. 4, where the right press fit necessary for the telescoped joint is accomplished by forcing the inner cylinder into the larger for a distance of 8 inches.

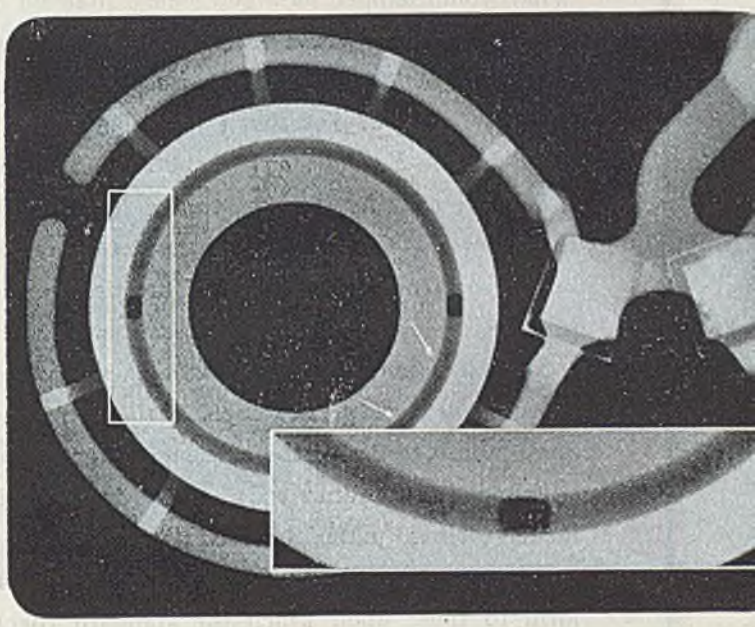
The lap joint of these telescoped courses employs both outside and inside fillet welds made automatically on a Unionmelt machine. Outside weld is be-



What will it cost to machine these gear blanks?

The answer may show you how to lower machining costs—beat postwar competition.

THE gear blanks shown above were cast with a peripheral runner. This foundry practice resulted in serious internal shrinkage in the web as shown in the radiograph at the right (note enlarged inset). Fourteen per cent of 50,000 castings in this lot were scrapped and sent back to the foundry when irregularities were uncovered during machining.

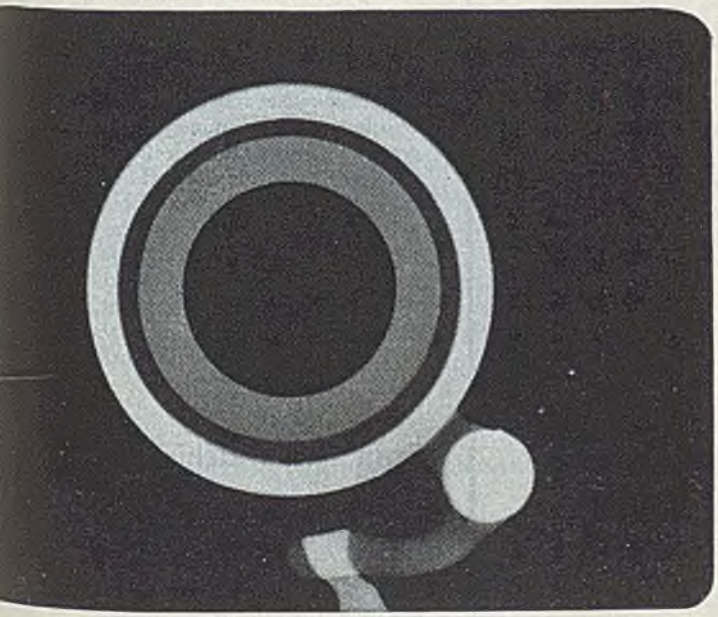


X-ray shows change is needed

Study of the radiograph by the foundry showed what caused the shrinkage. Various systems of gates and risers were tried and radiographed for analysis. As a result, a greatly improved casting technic was developed—the shrinkage disappeared. The final procedure, as shown in the radiograph below, was approved and a second run of castings was released.

Rejects cut from 14% to 1.2%

After production got under way on the second lot, of 75,000 castings, it was found that rejects from machining were cut to the remarkably low level of 1.2%. With the help of x-ray the foundry had improved an important product . . . simplified its casting practice . . . paved the way for substantial savings in machining costs, increased productive machine time, and lengthened cutting tool life.



There's a place for X-ray in your business

MORE and more the metals industry is relying upon radiography to analyze, inspect, correct, and improve. X-ray inspection of castings, welded assemblies, fabricated parts and similar products, is the quick, sure, non-destructive method for proving soundness or unsoundness.

Even more important is the way radiography points out ways to simplify design, improve production practices. Often, careful study of radiographs indicates changes in manufacturing technic that eliminate the possible occurrence of defects due to inefficient production methods. Again, this same sort of study permits the designer to reduce wall thicknesses safely, trim down, streamline, refine, make important savings in man-hours and materials.

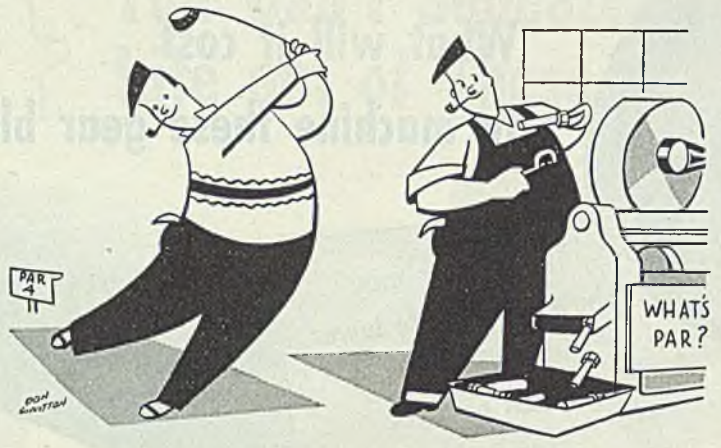
All these factors will make radiography increasingly important and valuable in postwar, competitive markets. Eastman Kodak Company, X-ray Division, Rochester 4, N. Y.

Kodak Makes Industrial X-ray Films to Meet Every Industrial Requirement

RADIOGRAPHY...one of photography's aids to industry

Analyzes...Instructs...Corrects...Improves

Kodak



WHAT'S PAR?

What would happen on a golf course that did not have any par? Each player would probably set one of his own.

Without a "par", can you imagine what kind of golf would be played? Yet that's just about what's happening these days in a good many of the Nation's plants.

We buy steel by the ton, tubing by the foot, power by the kilowatt. We use rules, micrometers, calipers, scales—but have no factual measure of the time it should take to perform each manufacturing operation.

Standards in the factory can and should be set on the basis of *reasonable* performance, by the average worker. They serve as a measure of the efficiency of operations.

Failure to meet standards requires investigation of equipment, tooling, material availability, training—in fact all management functions. Until all operating conditions conform to those upon which the standard (par) is set, the worker cannot be blamed for falling down.

This is simply another way of stating what I have said many times during the last 30 years—"*Labor is just as efficient as management plans for it and gives it the tools with which to work.*"

Geo. D. Trundle Jr.
President

THE TRUNDLE ENGINEERING COMPANY

Brings to Industry and Business

26 Years **OF MANAGEMENT ENGINEERING EXPERIENCE**

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ing made in Fig. 5; inside weld is not as easy to make. Here Southwest has developed a very clever portable boom that supports the welding head while making the inner weld, as shown in Fig. 6. Fig. 8 shows the multi-pass weld made on such a joint.

The butt weld between sections of same diameter is either on a GE or Unionmelt unit, as conditions warrant. The work is turned on rolls to accomplish the girth weld automatically. Fig. 7 shows this work in progress.

Finally, the telescoped and straight courses are all welded and the mast or kingpost stands assembled. It receives an ABS inspection for straightness (tolerance is 0.01-inch per foot) and roundness (tolerance is 3/16-inch). In cases where the fit-up and welding result in deviation from tolerances, the tubes are straightened by flame heating and quenching.

After inspection, the masts and kingposts are transferred outdoors to the very large storage yard and are placed on skids for spray painting. This station, Fig. 10, is adjacent to one of the spur tracks where, after spraying and drying, the work is loaded onto flat cars for shipment.

A number of noteworthy lifting devices and slings have been developed for lifting these tubes weighing up to 21 tons when complete. One consists of a single clamp and cable. Another shown in Fig. 9, is simply slipped over end of the tube, the design allowing clearance of the tube supports to permit positioning the clamp at any point on the tube without lifting it off the roller supports. Of course the clamp, being rigid (welded steel plate construction) can be used only on a narrow diameter range. But a number of clamps easily handle the several diameters of sections.

Production involves from five to seven tubes per ship, and since from four to five shipsworth are produced per week, the total output is around 400 tons per week. There are no hot forming operations of any kind in this fabrication.

Perhaps the most newsworthy of all Southwest developments involved is a complete new fixture designed and built to facilitate both inside and outside course weldments and longitudinal seams. This accommodates Unionmelt heads. Previously, two operating positions were required. This new automatic welding fixture has universal application for it can accomplish inside and outside welds in both longitudinal and girth seams of any diameter or length.

Spin Test Machine

A spin test machine which simulates action of a projectile in flight is being used in primer and fuse division of Willys-Overland Motors to determine whether the fuse is "arming" at the proper moment. Since installation of this machine, inspection approvals on the intricate precision fuses are said to be running as high as 97 per cent.

The time-and-cost cutting trio

"Car loading time cut from 20 man-hours to 1½ hours" . . . "unloading costs cut from $1.37 to $0.113 per ton" . . . "128 man-hours per day saved in unloading and storing!" Such are the time-and-cost cutting reports that tell of the economies resulting from palletization and battery-powered electric Industrial trucks.

Exide Batteries are in use throughout the country, powering thousands of the electric trucks engaged in handling materials by this modern method. Exides have ample reserves to meet every power need, and to keep trucks moving at sustained speeds throughout the day. You can always count on Exides for dependability, long-life and ease of maintenance.

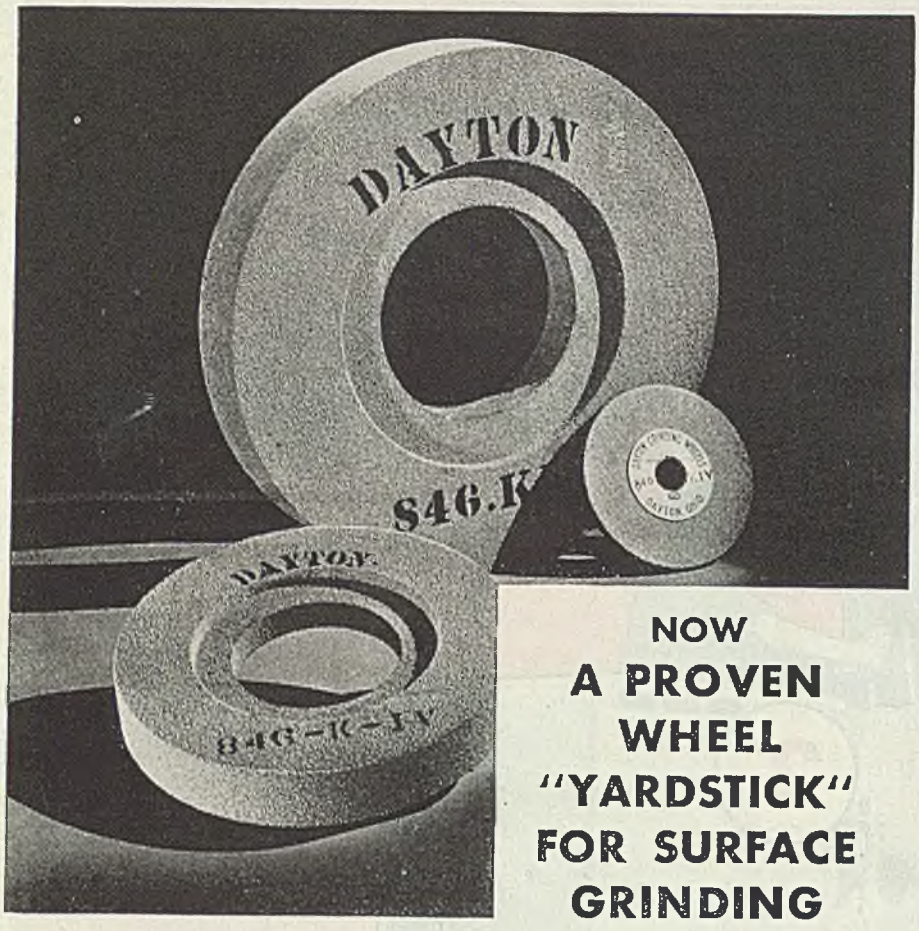
Write us for a FREE copy of the bulletin "Unit Loads," prepared by The Electric Industrial Truck Association. It tells how to cut handling costs up to 50% . . . covers latest developments in materials handling . . . and includes actual case histories.

THE ELECTRIC STORAGE BATTERY CO., Philadelphia 32

Exide Batteries of Canada, Limited, Toronto

ARMY E NAVY

Exide
BATTERIES



NOW
A PROVEN WHEEL "YARDSTICK" FOR SURFACE GRINDING

Do you have a surfacing job that you are not now satisfied with? Does the wheel you are using tend to burn the work and fill up too quickly? Remove metal too slowly? Or does it wear too fast? Or leave a finish below your requirements?

If so, why not do what so many have done to find the best wheel for the job? Use the 846 K-1-V Dayton as your surface grinding "yardstick."

It cuts cool and fast. Gives an excellent finish. Wears at just about the right rate for topmost efficiency. Indeed, it's an even bet you will want to standardize on this 846 K-1-V Dayton. Short of that, it provides such a close measure of the important performance factors that repeated guesswork in wheel selection is usually eliminated.

The 846 K-1-V Dayton is made in a wide range of sizes—with trial wheels shipped from stock. Write, wire or phone.

SIMONDS WORDEN WHITE CO.
714 NEGLEY PLACE, DAYTON, OHIO

DAYTON CENTERLESS WHEELS

THE DAYTON WHEEL LINE
SURFACING
CENTERLESS
CYLINDRICAL
INTERNAL
SNAGGING

DAYTON GRINDING WHEELS

Tin-Free Solders

(*Continued from Page 92*)

dip soldering in solder pots. Corrosive zinc-chloride type fluxes and careful washing to remove the flux after soldering are recommended.

In a few applications, particularly where higher temperatures are involved and more corrosive fluxes are not objectionable, solder No. 3 can be used, but only where there is no danger of burning insulation, and softening of copper is not critical.

For a general all-purpose solder to replace 40 to 50 per cent tin solders, the No. 4 solder is recommended. It can be used with noncorrosive fluxes, such as rosin or aniline phosphate, on bare or precoated copper, but a corrosive flux is usually required for bare steel. Rupture strength at elevated temperatures was found to be better than for 40 to 50 per cent tin-lead solders. This solder can be used in wire form, rosin cored, or solid, for the majority of electrical connections which formerly were made with the 40-60 to 60-40 tin-lead solders.

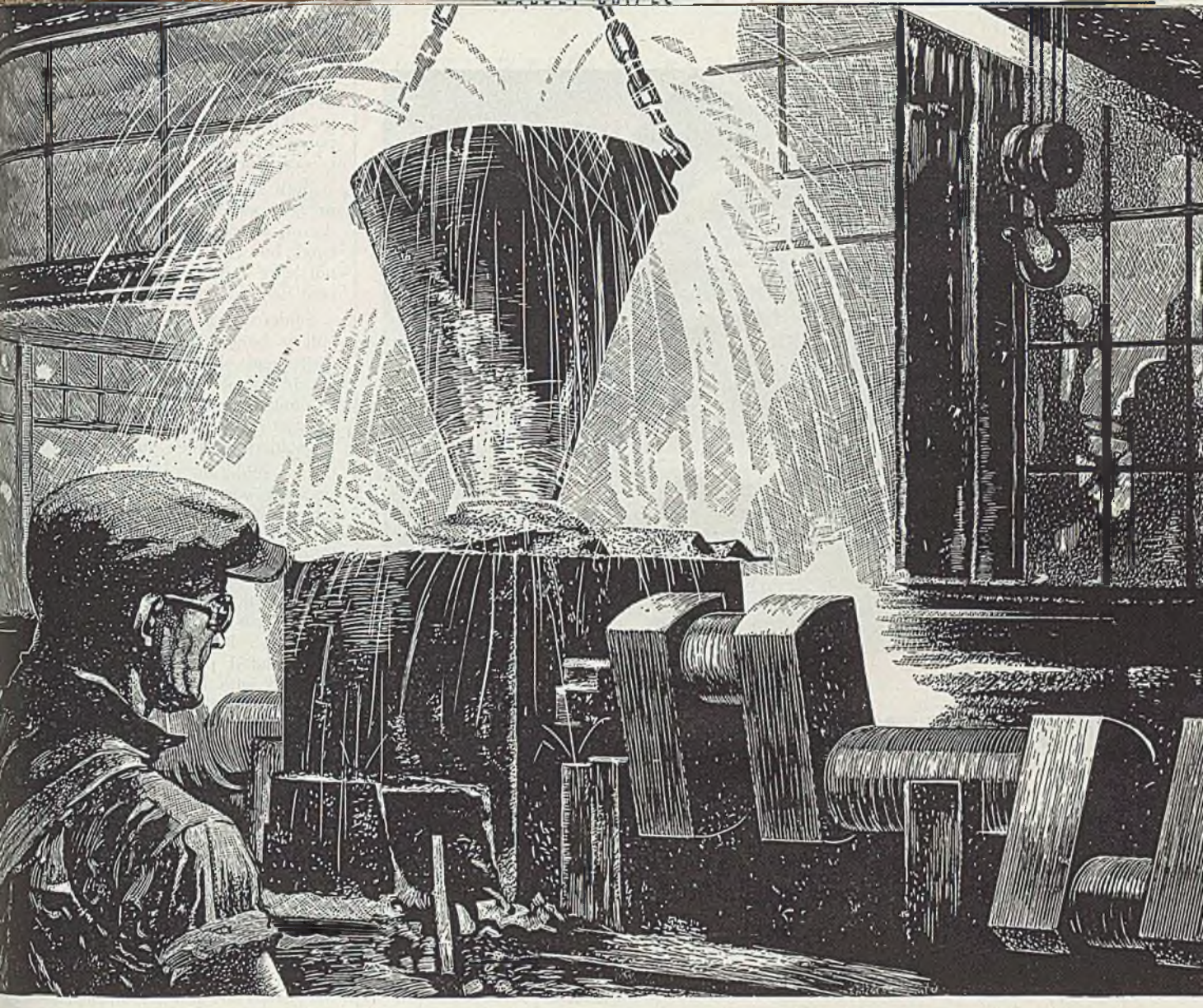
Since the 20 per cent tin solder melts at a temperature about 35 degrees Cent. higher than the 40 per cent tin solder, it has been found necessary to use hotter soldering iron; that is, a 100-watt iron is needed where an 80-watt iron formerly sufficed. This higher temperature increases the oxidation of the copper, but is offset to some extent by the slower erosion or alloying of the copper with the tin in the low-tin solders. This solder is also used in larger soldering pots in place of 40-60 solder for soldering armatures. Recently, the composition of this solder has been changed slightly, and specifications now require 19.5 to 20.5 tin, 1.15 to 1.35 silver, 1.25 to 1.75 antimony, 0.75 maximum bismuth, 0.005 maximum aluminum, 0.005 maximum zinc, and balance lead.

Solder No. 5 is used for wiped joints. It handles well, but is more susceptible to porosity than 40 tin-60 lead solder.

Much progress has been made with brazed joints, particularly for commutator riser joints and armature winding joints using copper-silver-phosphorous or copper-phosphorous alloy. This development, of course, eliminates the use of all tin for such joints. Unfortunately, however, not all commutator joints can be brazed because of space limitations and inability, with the present development of brazing tongs, to satisfactorily heat the joint.

Using Other Combinations

Tin-base solders containing 60 per cent tin are used in the making of lock and lap seams. The 20 per cent maximum solders have been tried, but results have not been too satisfactory because leaks are apt to form in the seams, and on capacitor cans, one small leak is enough to change characteristics and spoil the capacitor. A 60-40 solder is being used on this job, but work on other com-



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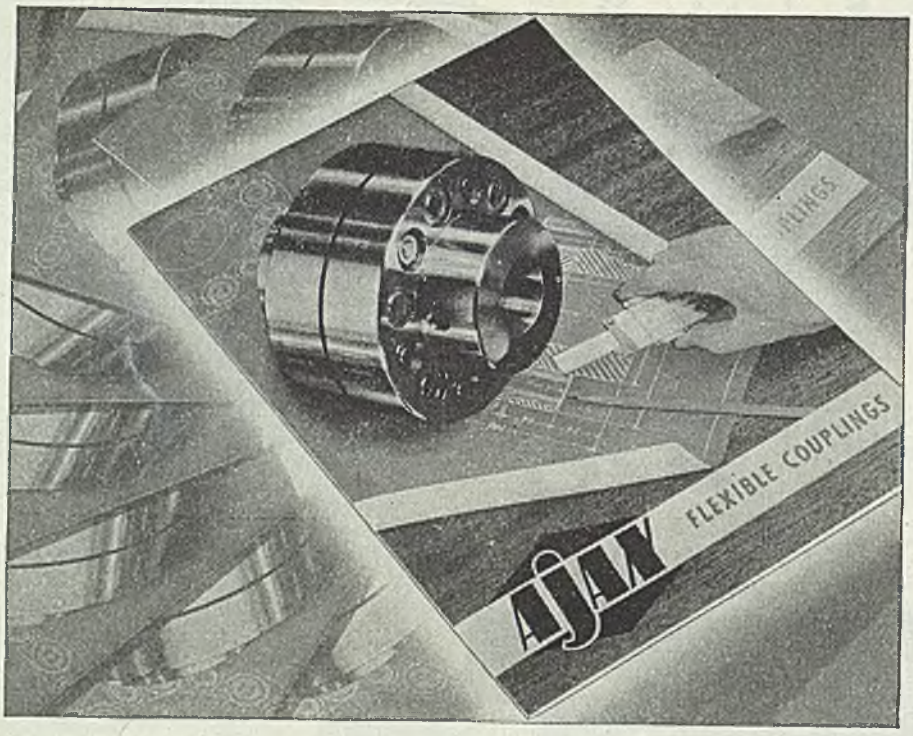

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positions in combination with special processes, such as high-frequency heating, is in progress. In some cases where porcelain is involved, the eutectic solder is desirable.

Both 40-60 and 60-40 solders are used in the production of transformer cans. Again, 20 per cent tin solder has been tried, but close production schedules do not leave sufficient time to sweat 20 per cent tin solder into seams or joints.

Solder containing 40 to 60 per cent tin still is being used by makers of small instruments, but work is very fine, joints are pin-point size, and only very small amounts of solder are used. It would be impractical, if not impossible, to use low-tin solders on such applications.

The soldering of zinc-coated articles requires corrosive fluxes regardless of tin content in the solder. Sometime ago it was requested that cadmium-plated parts be zinc plated in order to relieve the situation on cadmium, but corrosive fluxes could not be used and therefore cadmium is being used where plating is necessary. It has been found that cadmium-plated parts can be satisfactorily soldered with low-tin solder using rosin flux provided the parts are not stored for long periods.

High-tin solder (38 per cent tin) is still used for wiping the ends of oil- and gas-filled cables. Tin conservation is accomplished by using wipes requiring much less material than formerly, but the 38 tin solder is deemed necessary to eliminate any possibility of defective cables, since one small leak could ruin the entire cable. Some companies are using successfully solders containing only 32 per cent tin for wiping certain types of cables.

Work on Solderless Joints

Aside from the effort put forth in the field of soldering, the possibilities of redesign, completey eliminating the use of solder should not be overlooked. One idea which has been actively developed by one company is the use of a drawn metal container with a mechanically double seamed cover, similar to that used in the food packing industry, for a capacitor casing. All solder used in building the usual can would thus be eliminated. While it is difficult to introduce radical changes in manufacturing procedures during times when the major objective is to deliver finished apparatus, it has been possible, slowly but diligently, to prosecute the development of a double seamed type of capacitor container which might be the forerunner to subsequent changes in the design and manufacture of capacitors. Another example is development of a solderless type joint for electrical connections. Redesigning in many cases might result not only in saving of solder, but also in a better product.

Soldering Galvanized or Zinc-Coated Material: The soldering of zinc-coated material is much more difficult than the soldering of such metals as copper and iron. However, with sufficient care and attention to soldering technique, even low-

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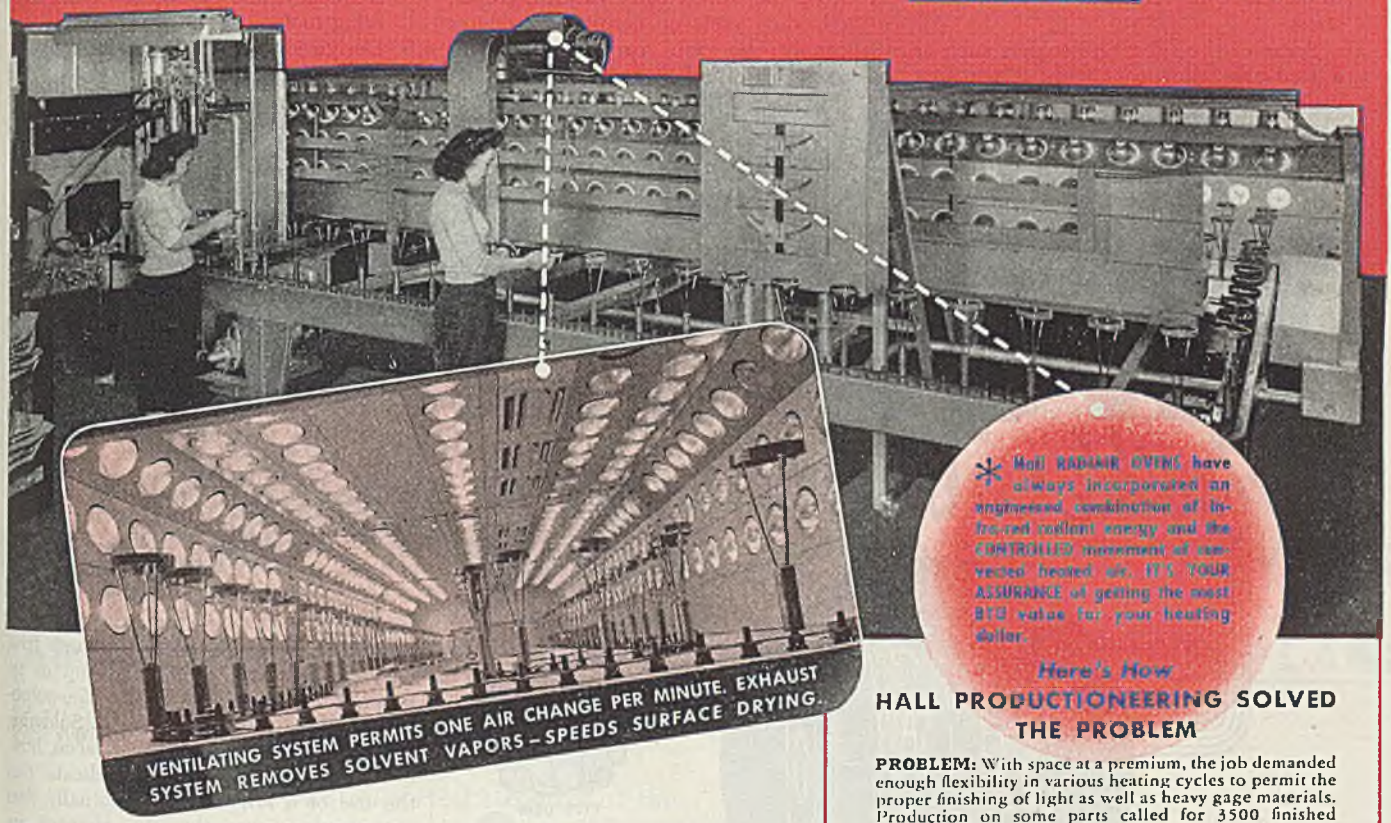

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ANSWER: The automatic spraying operation was made an in-line part of the overall oven layout. The materials handling system was designed to permit work to pass directly from spray booth into oven for three passes under infra-red radiant heating lamps.

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For example, not long ago a war producer was faced with the job of drying and baking large quantities of miscellaneous parts ranging from plastic, rubber-coated rocket rings, to "windshields" for 105 mm and 75 mm shells. It was thought at first that a simple automatic spray operation, plus a run through any low temperature oven would answer the problem. But, there was a catch! The entire operation has to be handled in a space not much larger than an average good sized living room, with provisions made for a 3500 piece per hour capacity.

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tin solders can be used successfully, although more time is required.

Wherever joints must be leakproof, solder containing 40 per cent or more tin is much more reliable. Nevertheless, it must be remembered that high tin alone will not insure good joints. Antimony in any solder brings disaster when zinc-coated materials are being soldered. Such joints made with antimony-containing solder are brittle, have no resistance to shock and very little resistance to stress.

Some of the substitute solders such as a lead-base alloy containing 8 per cent cadmium and 2 per cent zinc are being used successfully on zinc, especially in Germany, but the shortage of cadmium limits its use in solders in this country.

Precautions with Low-tin and Tin-free Soft Solders: The successful use of low-tin solders, or for that matter any solder, has been found to depend on close attention to technique. The following points have been stressed[9] as of the utmost importance in effecting a change to a low-tin or tinless solder because greater care is needed to obtain satisfactory results with them:

1. Keep the work clean. Varnish, grease, oil, dirt, rust, or corrosion products cannot be too carefully guarded against. Any of these will prevent the flux from acting and will prevent solder from alloying with parent metal.
2. Keep in mind that the purpose of the soldering iron or torch is not to melt the solder, but to heat the work until the solder will flow when applied to the work.
3. Keep the soldering iron clean. Design the tip to fit actually against the work to get the quickest possible heat transfer from the iron to the work.
4. Investigate different methods available for doing the work, i. e., hotter electric iron, gas-operated irons, high frequency, and carbon resistance soldering tools.
5. Design joints to have 0.003- to 0.005-inch solder thickness, and so that the two parts overlap each other. Lap- or seam-type joints are better than butt-type joints. Have the solder fill the seam completely. Heavy fillets add little strength to the joints and are a waste of solder.
6. Don't hand a substitute solder, a flux, and a soldering job to a workman and expect a perfect job the first time. Give him a chance to get the feel of the new material. Don't give up a substitute solder after one unsuccessful trial—chances are your technique is not what it should be for that particular solder.

It is important to remember that the object of using low-tin solders is to save tin. If so much low-tin solder is used for a given joint that the actual tin content is greater than that of a higher tin solder for the same application, obviously, no saving is made. If, after thorough trial, calculations show that no saving of tin is being made, or a loss results, the substitute solder should be discarded. Soldering technique improves with experience, however, and if early results indicate that the use of a low-tin solder actually does not require more tin, the chances are good that a marked economy will develop with continued use.

In all industries there are a few companies with research organizations or enterprising individuals who will try out new ideas or methods or materials. Those who have worked with the low-tin and tin-free solders and have made them work are almost always glad to share their knowledge. Where trouble in soldering with substitute solders is encountered, it is an excellent plan to do some experimental work first to find the difficulties and advantages, then discuss the work with someone who is successfully doing a similar soldering job.

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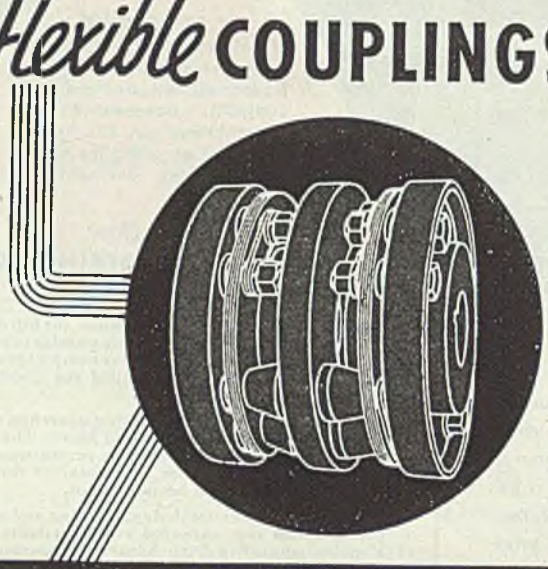

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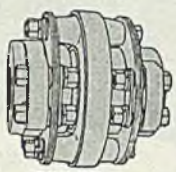
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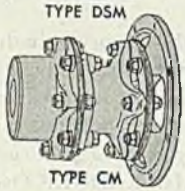
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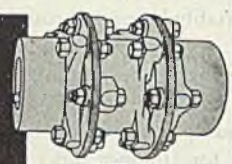
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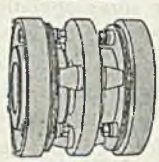
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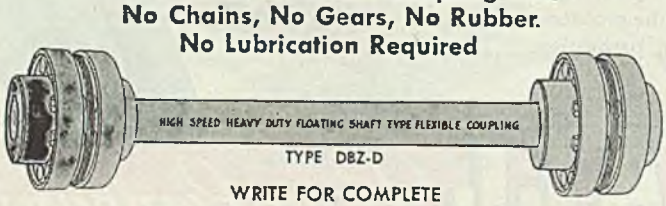

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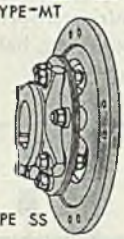
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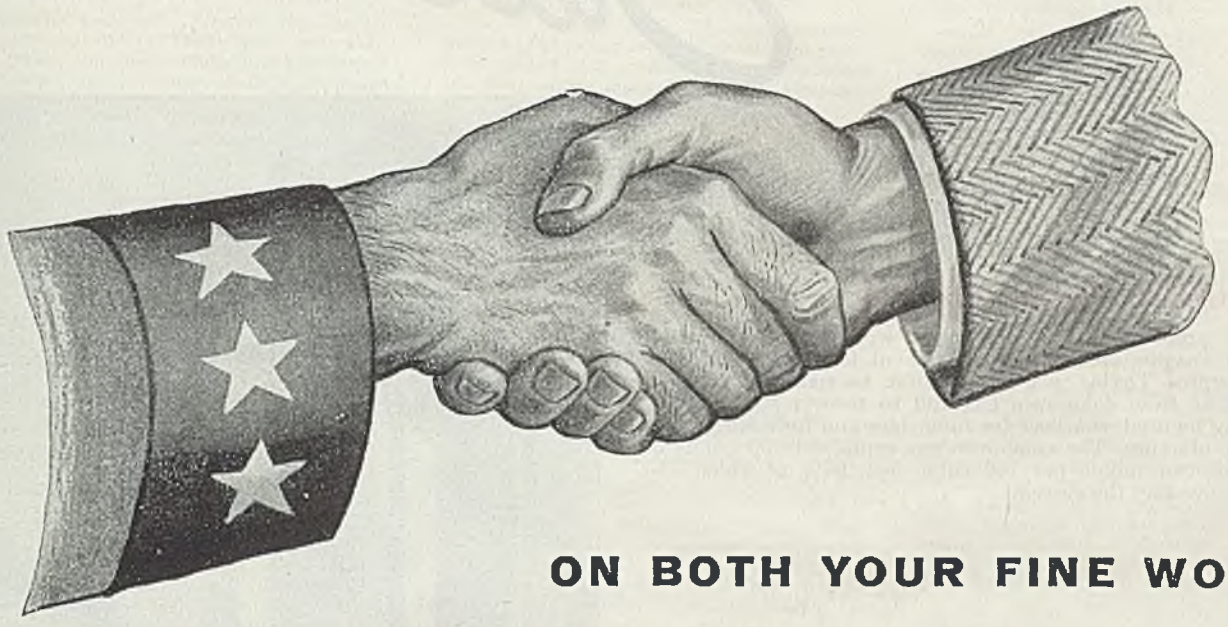

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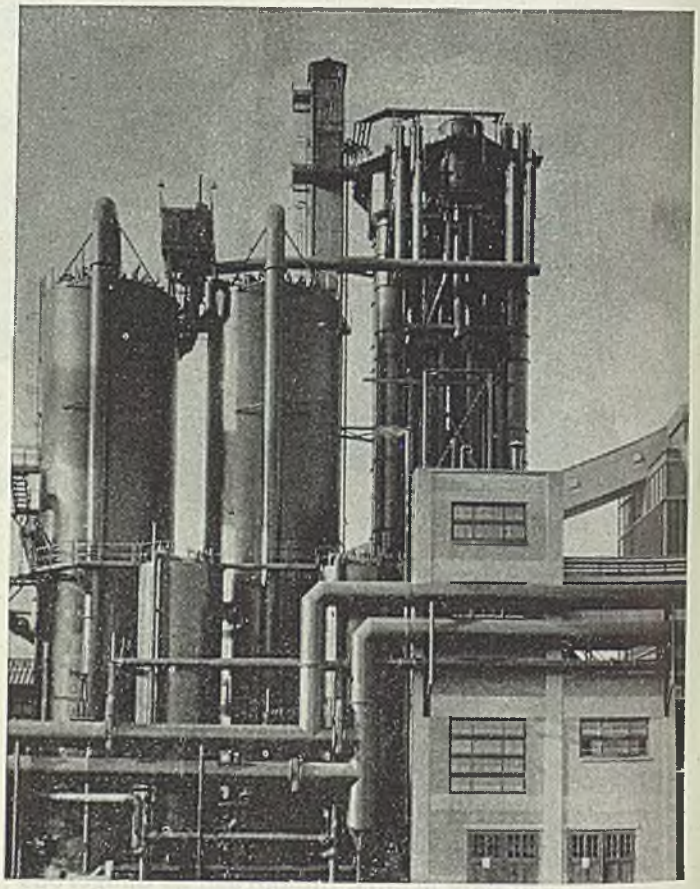

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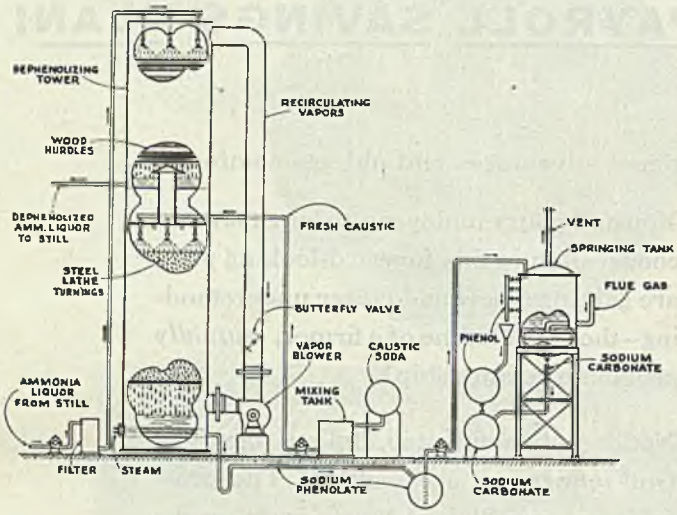

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Pressed Steel Car Co.—12-page illustrated catalog No. 72-G describes complete line of Steelcar self-discharge cars which are available in wide range of sizes and capacities for operation on standard or special gage tracks. Capacities range from 36 cubic feet up to railroad hopper cars rated at 70 tons or ore cars holding 80 tons.

30. Heat Resistant Coatings

Preferred Utilities Mfg. Corp.—2-page illustrated bulletin No. 925 outlines advantages, applications and protection afforded by White Hot and Pyro-Chrome heat resistant coatings which may be used in temperatures of 2840 and 4000 degrees Fahr., respectively. These coatings protect finishes against corrosion, oxidation and heat.

31. Alloy Castings

Meehanite Research Institute of America, Inc.—12-page illustrated bulletin No. 15 is entitled "Meehanite Castings in War Work." Properties of various types of Meehanite metals are tabulated and typical applications of this material in manufacture of aircraft, guns, shell, machine tools, radio equipment and other ordnance equipment are shown.

32. X-Ray Diffraction

North American Philips Co.—12-page illustrated bulletin on "Norelco X-Ray Diffraction Apparatus" describes equipment for identifying, comparing and analyzing materials. Diagrams, typical diffraction films and several tabulations are included. Interpretation of diffraction films is explained.

33. Speed Reducers

Philadelphia Gear Works, Inc.—56-page illustrated bulletin No. 200 contains descriptions and covers design features, lubrication, selection, load characteristics, service factors, arrangement of shafts and rotations, horsepower ratings and other data on complete line of spiral bevel speed reducers for all types of power transmission applications.

34. Induction Heating

Ohio Crankshaft Co., Tocco Div.—20-page illustrated bulletin No. 17 is entitled "Research for Results with Induction Heating." Typical parts processed by induction heating are shown and machines which are available for induction heat treating are described.

35. Arc Welding

C. E. Phillips & Co.—16-page illustrated handbook of engineering data is entitled "Arc Welding in the Maintenance and Construction of Tools and Dies." Such subjects as deposit characteristics, heat treatment, physical properties and application procedures are given on Crucible Arc electrodes which are specifically designed for welding tool and die steels.

36. Cleaning Materials

Oakite Products, Inc.—12-page bulletin entitled "Production Cleaning of Die Castings" is digest on cleaning materials and methods for surface preparation of die castings before application of chemical, organic or electro-plated finishes.

37. Clutch Control

Pesco Products Co., Automotive Div.—4-page illustrated bulletin No. 6 describes Hydrolease hydraulic clutch actuator for trucks, buses, heavy duty motor vehicles and industrial power clutches. This unit reduces pedal pressures as much as 50 per cent and reduces shock to clutch parts.

38. Production Facilities

Oiljak Mfg. Co.—4-page illustrated bulletin describes machining, stamping, welding, assembling and finishing facilities of this company which are available for production of wide range of mechanical and electrical parts and equipment.

39. Cutting Tools

Putnam Tool Co.—92-page illustrated catalog No. 44 lists full specifications, prices and other data on 1023 items in line which includes end mills, chucking reamers, continuous pilot counterbores, holders and other standard and special tools. Engineering data are included for cutting tool users.

40. Counting Devices

Production Instrument Co.—4-page illustrated bulletin No. 50 describes stroke and revolution counters, high speed coil winding counters, electric counters and actuating switches, timing and recording devices, and pre-determined electric counters. Suggested applications for these devices are included.

41. Splicing & Banding

Punch-Lok Co.—6-page illustrated bulletin No. 108 outlines electrical applications of Punch-Lok method for making flexible cable line taps, solid wire line taps, clamping of guy wire guards and anchors, splicing electric welding cable, repairing splits in cross-arms, reclaiming ladders and similar uses.

42. Annealing Equipment

Pressed Steel Co.—4-page illustrated bulletin "Annealing Equipment to Your Specifications" describes covers and tubes available for making new installations or for replacement units. Also described are welded alloy retorts and other annealing equipment.

43. Wire Rope

Preformed Wire Rope Information Bureau—32-page illustrated book "Speaking of Preformed in Mechanized Warfare" shows important role preformed wire rope has played in combat service. Army and Navy photographs show actual battle scenes on various fronts.

STEEL *Readers' Service Dept.*

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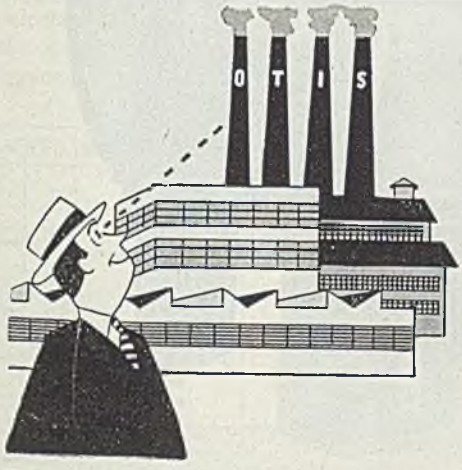

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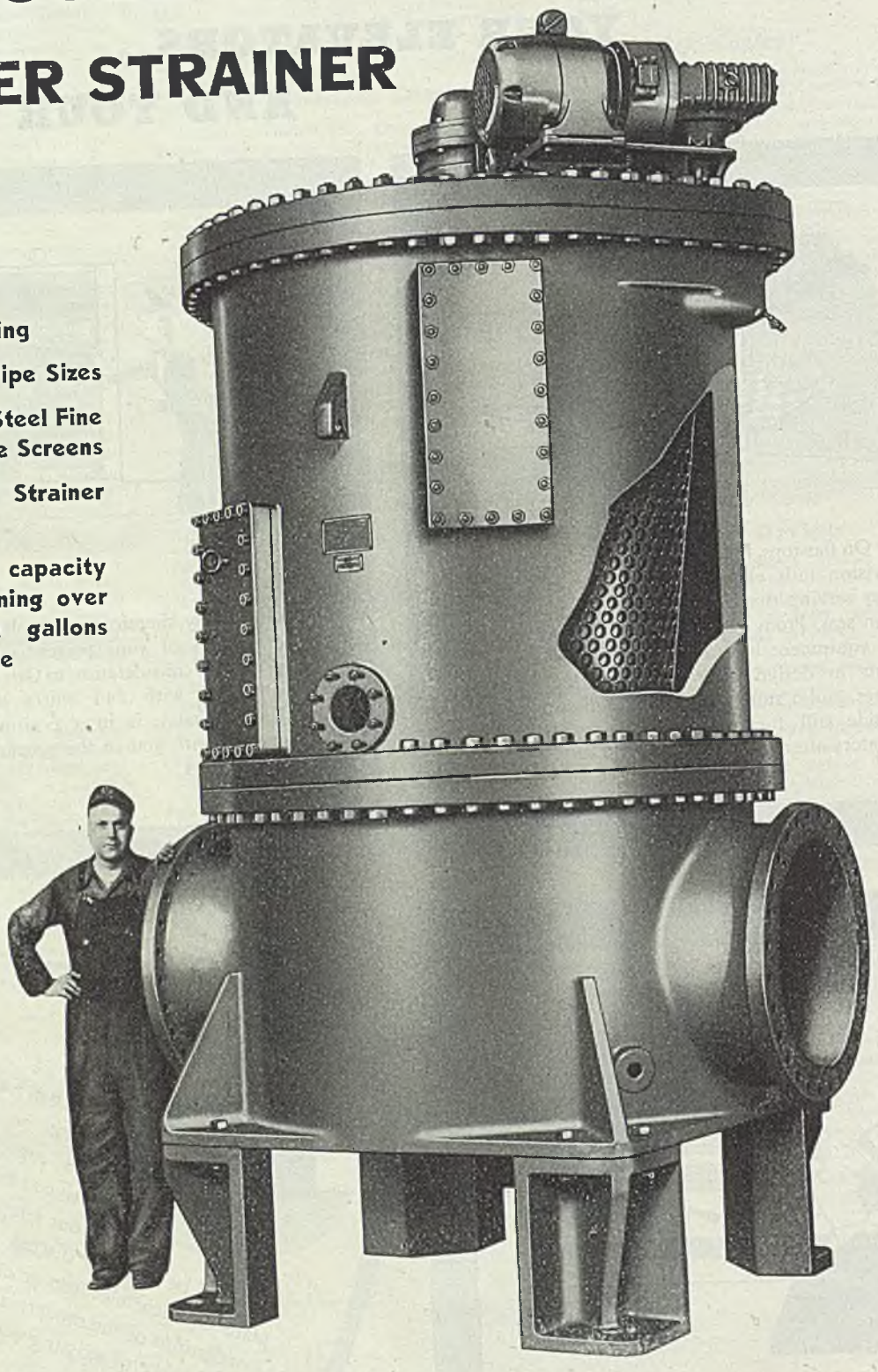

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MARKET SUMMARY

Steel War Needs Surpass Mill Ability To Produce

Closer control of directives to reduce confusion in schedules. . . CMP tonnage being crowded far back. . . Operations advance

WITH steel mills booked far ahead with orders for essential material for war purposes there still is heavy pressure to place tonnage on books for nearby and second quarter rolling.

Directives have been issued for so much tonnage that a great deal of Controlled Materials Plan steel has been pushed far back in rolling schedules, much of it also essential. Great confusion has prevailed as a result of this procedure and use of directives is being reduced by Washington to lessen the disorder. Directives now are being issued only after severest scrutiny as to need for the tonnage for which special action is sought.

Under greatest pressure is steel for guns and ammunition, for rockets in particular. Signal Corps equipment, involving various types of sheets and wire, also is being pushed insistently. Mobile gun mounts and combat tanks call for high priority also. However, the ship program appears to be approaching its peak, with probability that March production of plates will be heaviest in several months. April and entire second quarter should witness high plate production, with the trend slightly downward, notwithstanding increasing requirements from locomotive builders, now beginning to place tonnage for export orders recently booked. Some platemakers can give delivery in May but most are booked into June for entire production.

Claimant agencies are asking over 17 million tons of carbon steel for second quarter needs, while production possibilities are estimated at not more than about 14 million tons. Effort will be made by WPB to reduce the requests by close screening, to match with possible output. Manpower is a large factor in holding production down.

Steelworks operations last week made further gain from the recent low point, advancing 3 points to 96 per cent of capacity.

DISTRICT STEEL RATES

Percentage of Ingot Capacity Engaged in Leading Districts

	Week Ended Feb. 24	Change	Same Week 1944	Same Week 1943
Pittsburgh	88	+4	92	98.5
Chicago	99.5	None	102	101.5
Eastern Pa.	91	None	94	95
Youngstown	92	+3	95	97
Wheeling	97.5	None	93	83.5
Cleveland	90.5	+4	93.5	93.5
Buffalo	90.5	None	90.5	93
Birmingham	95	None	95	100
New England	90	None	89	95
Cincinnati	87	—9	92	91
St. Louis	80	None	82	91
Detroit	88	None	86	91
Estimated national rate	96	+3	*97.5	*99.5

*Based on steelmaking capacities as of these dates.

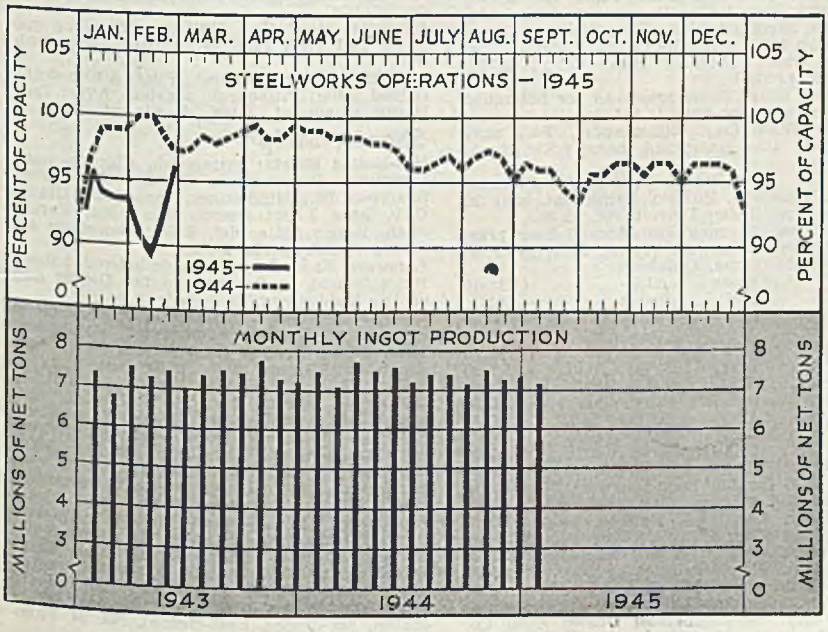
Pittsburgh increased activity 4 points, to 88 per cent, Cleveland 4 points to 90½ per cent and Youngstown 3 points to 92. Cincinnati showed the only decline, 9 points, to 87 per cent, because of repair on two open hearths. Rates were unchanged as follows: New England 90; Chicago 99½; St. Louis 80; Buffalo 90½; Wheeling 97½; Birmingham 95; eastern Pennsylvania 91; Detroit 88.

Pig iron supply is much improved over the past few weeks as transportation approaches normal and delayed material is reaching destination. Many melters are close to the bottom of their supply and in some cases melt has been curtailed. In most cases inventory is much below the 30-day supply allowed by WPB. Books will be opened soon for second quarter and indications are buying will be about the same as for first quarter. No action has been taken on proposed relighting of idle stacks, manpower lack being a deterrent, although the recent advance of $1 per ton for iron would have made this possible in some cases.

Scrap is still tight as a result of slow movement during the period of heavy snows, which prevented collection, preparation and shipment. During this period reserves were reduced and some tonnage still is being taken from stocks, but the situation is improving. Enlargement of the shell program is causing a larger offering of turnings, which are weaker in price but are being consumed at a fair rate.

Consumption of Lake Superior iron ore in January was below average, as had been indicated by lower pig iron production. The total was 6,982,619 gross tons, compared with 7,481,653 tons in the corresponding month last year. Stocks at furnaces and Lake Erie ports Feb. 1 were 30,888,619 tons, compared with 36,059,302 tons at the same date in 1944. This is sufficient for needs until the 1945 season opens.

Average composite prices of steel and iron products show no change from levels of the past few weeks, held steady by ceilings. Finished steel composite is $57.55, semifinished steel $36, steelmaking pig iron $24.05, steelmaking scrap $19.17.



COMPOSITE MARKET AVERAGES

	Feb. 24	Feb. 17	Feb. 10	One Month Ago Jan., 1945	Three Months Ago Nov., 1944	One Year Ago Feb., 1944	Five Years Ago Feb., 1940
Finished Steel	$57.55	$57.55	$57.55	$57.22	$56.73	$56.73	$56.73
Semifinished Steel	36.00	36.00	36.00	36.00	36.00	36.00	36.00
Steelmaking Pig Iron	24.05	23.05	23.05	23.05	23.05	23.05	22.05
Steelmaking Scrap	19.17	19.17	19.17	19.17	19.17	19.17	17.10

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

	Feb. 24, 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	2.15	2.10	2.10
Plates, Philadelphia	2.25	2.225	2.15	2.15
Plates, Chicago	2.20	2.15	2.10	2.10
Sheets, hot-rolled, Pittsburgh	2.20	2.15	2.10	2.10
Sheets, cold-rolled, Pittsburgh	3.05	3.05	3.05	3.05
Sheets, No. 24 galv., Pittsburgh	3.65	3.60	3.50	3.50
Sheets, hot-rolled, Gary	2.20	2.15	2.10	2.10
Sheets, cold-rolled, Gary	3.05	3.05	3.05	3.05
Sheets, No. 24 galv., Gary	3.65	3.60	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	2.70	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 ⅜-inch, Pitts.	2.00	2.00	2.00	2.00

Pig Iron

	Feb. 24, 1945	Dec., 1944	Oct., 1944	Jan., 1944
Bessemer, del. Pittsburgh	$26.19	$25.19	$25.19	$25.19
Basic, Valley	24.50	23.50	23.50	23.50
Basic, eastern del. Philadelphia	26.84	25.34	25.34	25.34
No. 2 fdry., del. Pitts., N.&S. Sides	25.69	24.69	24.69	24.69
No. 2 foundry, Chicago	25.00	24.00	24.00	24.00
Southern No. 2, Birmingham	21.38	20.38	20.38	20.38
Southern No. 2 del. Cincinnati	25.30	24.30	24.30	24.30
No. 2 fdry., del. Phila.	26.84	25.84	25.84	25.84
Malleable, Valley	25.00	24.00	24.00	24.00
Malleable, Chicago	25.00	24.00	24.00	24.00
Lake Sup., charcoal, del. Chicago	37.34	37.34	37.34	37.34
Gray forge, del. Pittsburgh	25.19	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	$20.00	$17.15	$20.00
Heavy melt. steel, No. 2, E. Pa.	18.75	18.75	15.50	18.75
Heavy melting steel, Chicago	18.75	18.75	16.70	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	$7.00
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. Finished steel quoted in cents per pound.

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 (bil) $36; Pac. Ports, (bil) $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. $36 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. bil. 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., excl., $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—⅜ in. inclusive, per 100 lbs., $2. Do., over ⅜—41/64-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

Finished steel quoted in cents per pound.

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	0.35
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 2.55c.

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, 3.15c; 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 rod 67c
Base column
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

In.	Steel Blk.	Steel Galv.	In.	Iron Blk.	Iron 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

In.	Steel Blk.	Steel Galv.	In.	Iron Blk.	Iron 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
2¼"	12	16.01	18.45	15.16	.....
2½"	12	17.54	20.21	16.58	26.57
2¾"	12	18.59	21.42	17.54	29.00
3"	12	19.50	22.48	18.35	31.28
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., ⅝ 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
½-1-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
⅞-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
Wise county, furnace	6.75- 7.25

By-Product Foundry

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[13]	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[13]	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]	5.860[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[13]	4.40[19]	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[13]	4.30[19]	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[13]	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[13]	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[13]	4.500[24]	3.800[21]	4.659	5.93[23]	5.93[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[13]	.....	.....	.....
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[19]	.....	.....	.....	.....	.....
Cincinnati	3.611[1]	6.391[1]	3.661[1]	5.291[1]	3.425[1]	3.675[1]	3.675[1]	4.825[13]	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[23]	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[5]	4.065[5]	5.78[5]	3.965[5]	4.215[5]	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[13]	4.852[24]	4.54	5.215	.....	.....
New Orleans (city)	4.10[4]	3.90[4]	3.90[4]	5.85[4]	4.058[4]	4.20[4]	4.20[4]	5.25[30]	5.079[16]	4.60[21]	5.429	.....	.....
Houston, Tex.	3.75[3]	4.25[3]	4.25[3]	5.50[3]	3.763[3]	4.313[3]	4.313[3]	5.313[26]	4.10[19]	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[13]	7.20[6]	5.583[26]	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[1]	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	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 8612	.10-.15	.70-.90	.20-.35	.40-.60	.40-.70	.15-.25	$0.65	$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 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	.80-1.20	.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
NE 9722	.20-.25	.50-.80	.20-.35	.10-.25	.40-.70	.15-.25	.65	13.00	1.15	23.00
NE 9830	.28-.33	.70-.90	.20-.35	.70-.90	.85-1.15	.20-.30	1.30	26.00	1.80	36.00
NE 9912	.10-.15	.50-.70	.20-.35	.40-.60	1.00-1.30	.20-.30	1.20	24.00	1.55	31.00
NE 9920	.18-.23	.50-.70	.20-.35	.40-.60	1.00-1.30	.20-.30	1.20	24.00	1.55	31.00

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, amended Feb. 14, 1945. Exceptions indicated in footnotes. 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	$26.00	$25.50	$27.00	$26.50
Newark, N. J., del.	27.53	27.03	28.53	28.03
Brooklyn, N. Y., del.	28.50	.....	.....	29.00
Birdsboro, Pa., base	26.00	25.50	27.00	26.50
Birmingham, base	†21.38	†20.00	26.00	.....
Baltimore, del.	26.61	.....	.....	.....
Boston, del.	26.12	.....	.....	.....
Chicago, del.	25.22	.....	.....	.....
Cincinnati, del.	25.06	23.68	.....	.....
Cleveland, del.	25.12	24.24	.....	.....
Newark, N. J., del.	27.15	.....	.....	.....
Philadelphia, del.	26.46	25.96	.....	.....
St. Louis, del.	25.12	24.24	.....	.....
Buffalo, base	25.00	24.00	26.00	25.50
Boston, del.	26.50	26.00	27.50	27.00
Rochester, del.	26.53	.....	27.53	27.03
Syracuse, del.	27.08	.....	28.08	27.58
Chicago, base	25.00	24.50	25.50	25.00
Milwaukee, del.	26.10	25.60	26.60	26.10
Muskegon, Mich., del.	28.19	.....	.....	28.19
Cleveland, base	25.00	24.50	25.50	25.00
Akron, Canton, O., del.	26.39	25.89	26.89	26.39
Detroit, base	25.00	24.50	25.50	25.00
Saginaw, Mich., del.	27.31	26.81	27.81	27.31
Duluth, base	25.50	25.00	26.00	25.50
St. Paul, del.	27.63	27.13	28.13	27.63
Erie, Pa., base	25.00	24.50	26.00	25.50
Everett, Mass., base	26.00	25.50	27.00	26.50
Boston, del.	26.50	26.00	27.50	27.00
Granite City, Ill., base	25.00	24.50	25.50	25.00
St. Louis, del.	25.50	25.00	.....	25.50
Hamilton, O., base	25.00	24.50	.....	25.00
Cincinnati, del.	25.44	25.61	.....	26.11
Neville Island, Pa., base	25.00	24.50	25.50	25.00
§Pittsburgh, del. No. & So. sides	25.69	25.19	26.19	25.69
Provo, Utah, base	23.00	22.50	.....	.....
Sharpsville, Pa., base	25.00	24.50	25.50	25.00
Sparrows Point, base	26.00	25.50	.....	.....
Baltimore, del.	26.99	.....	.....	.....
Steelton, Pa., base	.....	25.50	.....	26.50
Swedeland, Pa., base	26.00	25.50	27.00	26.50
Philadelphia, del.	26.84	26.34	.....	27.34
Toledo, O., base	25.00	24.50	25.50	25.00
Youngstown, O., base	25.00	24.50	25.50	25.00
Mansfield, O., del.	26.94	26.44	27.44	26.94

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)	$30.50		
6.51-7.00	$31.50	9.01- 9.50	36.50
7.01-7.50	32.50	9.51-10.00	37.50
7.51-8.00	33.50	10.01-10.50	38.50
8.01-8.50	34.50	10.51-11.00	39.50
8.51-9.00	35.50	11.01-11.50	40.50

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 Furnace $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. $24.50
Valley base 24.50

Low Phosphorus

Basing points: Birdsboro, Pa., $30.50; Steelton, Pa., and Buffalo, N. Y., $30.50 base; $31.74, del., Philadelphia. Intermediate phos., Central Furnace, Cleveland, $27.50.

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: 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, Everet, 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. $66.55

First Quality

Pa., Ill., Md., Mo., Ky. 52.85
Alabama, Georgia 52.85
New Jersey 57.70
Ohio 46.35

Second Quality

Pa., Ill., Md., Mo., Ky. 47.90
Alabama, Georgia 39.15
New Jersey 50.50
Ohio 37.10

Malleable Bung Brick

All bases 61.65

Silica Brick

Pennsylvania 52.85
Joliet, E. Chicago 60.65
Birmingham, Ala. 52.85

Ladle Brick

(Pa., O., W. Va., Mo.)

Dry press 31.95
Wire cut 29.90

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 13.95c, 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. 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 ¼ cent higher.

Simanal: (Approx. 20% each Si., Mn., Al.) Contract, frt. all. not over St. Louis rate, per lb. alloy; carlots 8c; ton lots 8.75c; less ton lots 9.25c.

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. Quotations are on gross tons.

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	11.50-12.00
Short Shovel Turnings	13.50-14.00
Mixed Borings, Turnings	11.50-12.00
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	13.06*
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; Boston switching district price 99 cents 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	14.00
Short Shovel, Turnings	16.00
Mixed Borings, Turnings	14.00
No. 1 Cupola Cast	20.00
Heavy Breakable Cast	16.50
Cast Iron Borings	16.00
Billet, Bloom Crops	25.00
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	13.00
Cast Iron Borings	16.00
Machine Shop Turnings	14.00-15.00
Low Phos. Plate	21.00-22.00

MANSFIELD, O.:

(Delivered consumer's plant)

Machine Shop Turnings	11.00-12.00

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
Mix. Borings, Sht. Turn.	9.50-10.00
Machine Turnings	9.00- 9.50
Short Shovel Turnings	10.50-11.00
Cast Iron Borings	9.50-10.00
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	9.00- 9.50
Cast Iron Borings	10.00-10.50
Short Turnings	11.00-11.50
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	17.00
Machine Turnings	9.50-10.00
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	22.00
Breakable Cast	16.50
Stove Plate	19.00
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	7.50- 8.00
Shoveling Turnings	9.50-10.00
Cast Iron Borings	9.50-10.00
Mixed Borings, Turnings	8.50- 9.00
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. 18X, 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 36.00c 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; $170 to $172 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	4.6
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 144

Pressure for sheets and strip for war needs has been so heavy that directives were issued in a volume that threatened chaos in mill schedules and WPB now apparently has recognized the situation and has lessened the number. Most deliveries on current orders are in third quarter, with an occasional exception. Galvanized sheets may be obtained as early as September but most makers quote fourth quarter.

New York — While approximately 600 tons of cold-rolled sheets have recently been placed in this district under directive for March delivery for work required by the Chemical Warfare Division, there are fewer directives than previously noted, indicating that efforts on the part of WPB to restrict the number of these special orders are becoming effective. For a period special directives issued in strip and sheets and other products as well, threatened to get out of hand, in the opinion of some trade interests.

One large tonnage of drum stock (approximately 100,000 tons) which came up for special attention for shipment to France, may not be the subject of a directive, as recently proposed. The inquiry was approved by the Petroleum Administration for War and called for a large percentage of cold-rolled sheets, as some especially light gages were involved. However, it appears now that no directive action will be taken by the War Production Board, certainly not on the full quantity specified. This tonnage is in addition to a list of items which the French have specified for urgent need in connection with military and rehabilitation activities. Billets and pig iron are among other items now being sought.

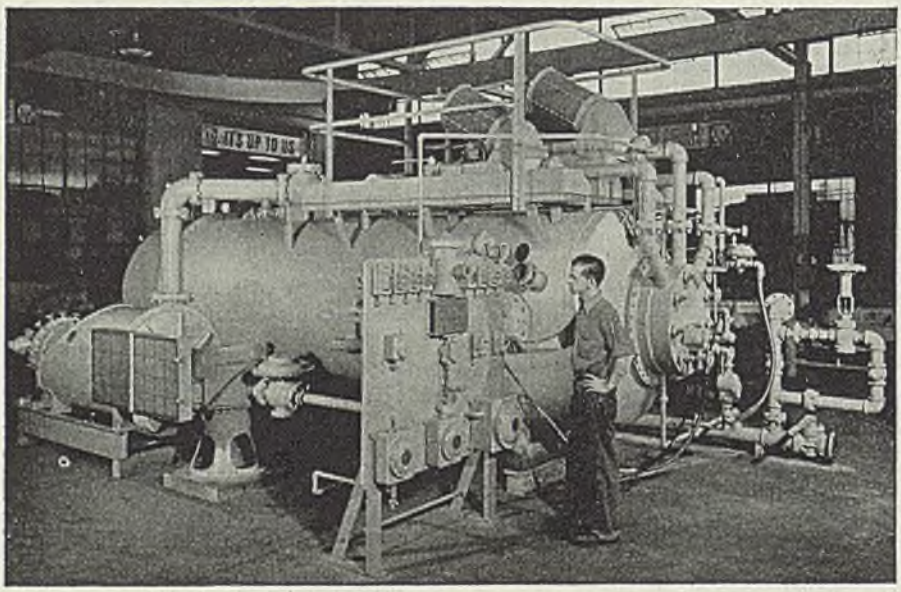
While mills are still able to make deliveries earlier than third quarter, most sellers have little to offer before September in either hot-rolled or cold-rolled sheets. In galvanized some tonnage is available in September, but most deliveries fall in fourth quarter and in some cases beyond. Stainless steel sheets are available in June and silicon in late July and August.

Boston — Enough new contracts for assembly of war products maintain a brisk demand for sheets, but buying is off some; fabricators have covered against most requirements for earlier placements. For the first time general purpose bombs will be made in this area, 500-pounders. Until now, only bomb components have been fabricated. Assembly, starting in two weeks, means steel delivery will be by directive. Relatively small capacity is open for hot and cold-rolled sheets in late third quarter and August schedules are about closed on narrow cold strip, demand for which has eased slightly. More tonnage is on order for ammunition containers; Vermont Marble Co., Proctor, Vt., 75-mm.; Albert & J. M. Anderson Co., Boston, 105-mm. cartridge cases and Heywood-Wakefield Co., Gardner, Mass., 75-mm. containers, have new or increased contracts. Normally making furniture and baby carriages, versatility of industry under war pressure is demonstrated by Heywood-Wakefield, now producing in addition to containers, 20-mm. shells, shell fuzes, bomb nose fuzes, dummy cartridges, ship fenders, navy ready-room chairs, truck bodies, wave guides and bomb-sight control boxes for aircraft and confidential radar equipment. Other contracts not previously announced: Imperial Knife Co., Providence, bayonet knives, and Fay & Scott, Dexter, Me., grenade launchers.

Cincinnati — Sheet mills are booked solidly on most grades into fourth quarter and despite extended delivery fabricators seek coverage of distant needs, especially when these reflect contracts. Aggravated manpower conditions add to tightness as mill interests appear restive lest tonnage not meet 1944 levels.

St. Louis — Sheets continue tight with hot-rolled deliveries extended to September and later and cold-rolled to November and beyond. Pent-up demand is heavy and the shift of all available sheet capacity to plates has made the outlook worse. The labor situation is likewise getting worse, with a manpower deficit of at least 25 per cent reported. Moreover there is slight hope for relief, since the St. Louis area is not rated as critical.

Cleveland — Delivery situation in sheets is the tightest of any steel product, and at the rate directives continue to upset mill rolling schedules there is little likelihood the situation will soon improve, barring early termination of the European war. Some steel producers report production schedules filled solidly through the balance of this year on galvanized sheets and into fourth quarter on all other grades. One seller states overall order backlogs are the



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KEMP of BALTIMORE

largest for the war period to date, and the monthly carryover tonnage in sheets and bars is the greatest so far.

Flood of directives forced upon mills in recent weeks has badly disorganized mill production schedules, and threatens to force a breakdown in CMP procedure. Many mill customers failed to receive tonnage promised them in January, and a few are still waiting.

Baltimore — Bids are being asked for approximately 9000 tons of hot-rolled pickled sheets and strip for an Orange, Va., company engaged in fabricating portable hospital units. Approximately 2400 tons of light-gage angles also are required. A local fabricator of gun mounts and similar equipment is inquiring for 5000 tons of plates and other flat-rolled products.

The material for Orange ranges from 12 to 24-gage with deliveries calling for shipments from April to October. It is understood that a directive has been obtained to insure the earlier shipments.

Philadelphia — While the peak of the current buying movement in sheets appears over orders for most mills still are greater than shipments and delivery schedules continue to expand. Some plain hot-rolled sheets still are available in August and September but little hot-rolled pickled can be had before October, with some producers booked solidly into November. Cold-rolled shipments run into September and beyond, while those on galvanized range from late August to February. Stainless sheets are available in June and July and silicon sheets in July and August.

Narrow hot strip deliveries cover a wide range, depending on mill and specification. One large producer quotes November on widths up to and including two inches, August on wider, up to and including 4⅛ inches, April, 1945, on wider sizes up to nine inches and for October, this year, on still wider.

Chicago — Sheets are tightest of all steel products. Deliveries range into fourth quarter, and it is understood WPB has been unable to place some 140,000 tons needed in the war program. Understanding is that the ammunition container program runs only through second quarter, but indications are it will be carried on at the same level. Report has it that Army and Navy will require 100,000 tons of sheets for drums for first half for fabrication in French drum plants. Orders for this material, which involves 65 to 70 per cent cold-rolled, have been placed under a series of directives. Domestic drum industry will be asked to return a portion of its first quarter allotments.

Steel Bars . . .

Bar Prices, Page 144

Indications are that bar buying has reached a practical peak and that bar mill backlogs will not increase from now on. The shell program is the cause of the present heavy load. On large rounds delivery is delayed and considerable tonnage scheduled for this month will be carried over into March. Deliveries are deferred to third quarter, with large rounds late in that period.

Pittsburgh — Some sources here believe peak buying has again passed and backlogs are now as high as they will be for some months. Certainly there is little possibility of any easing in the bar situation for the remainder of this year unless cancellations occur, and the opinion here is that there will be few on the shell program, which provides the backbone of present bar mill operations. Deliveries are fairly well integrated on smaller bars and cold-drawn items, but the delivery situation in large rounds is bad and there will be a substantial carryover into March, due principally to the weather, which through fuel shortages and freight troubles has cut operations well below capacity on many bar mills.

New York — Bar demand is fairly sustained and increasingly diversified. Few outstanding lists are noted. Meanwhile deliveries on carbon bars are moving further into third quarter, with little tonnage available in large rounds before late August or September. Deliveries on cold-drawn bars, ranging from 1/16-inch and larger, are also running late in third quarter. Much of this tonnage is going into rockets, fuzes and small caliber shells.

Boston — With most new contracts covered, frequently tied to directives, placement of shell steel, carbon and alloy bars has slackened; pressure for tonnage is strong, notably from warehouses and forge shops. Bolt and nut makers have increased specifications; several Rhode Island shops have taken on additional volume. Sharp upturn in alloy buying is maintained in slightly better ratio than for carbon, strong demand for rifle blanks at Springfield armory being a contributing factor, also aircraft and anti-friction bearing plants. Delivery

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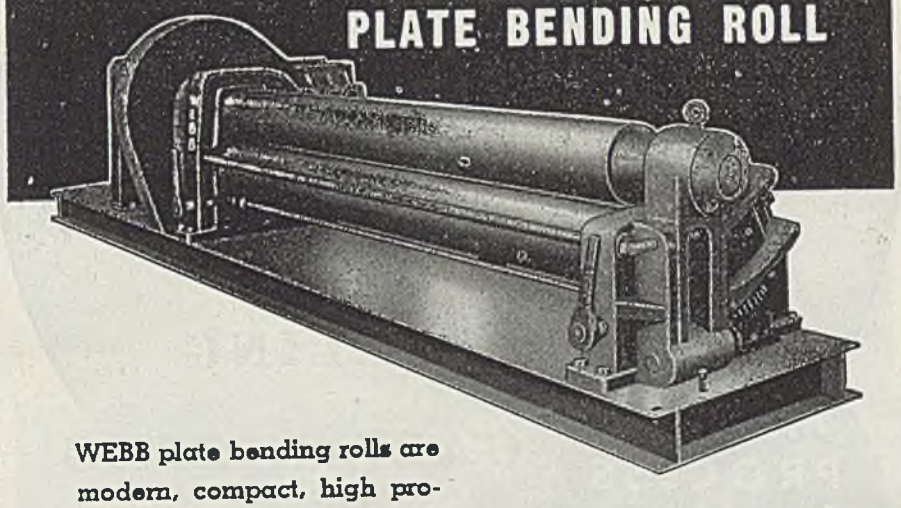

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range on alloys is wide, from June to August, depending on grade and size. Excel Foundry & Machine Co., Fall River, Mass., 81-mm. mortars, also anti-tank mine fuze parts, and Pantex Pressing Machine Co., Central Falls, R. I., 20-mm. shot, have shell contracts in addition to those previously announced. Besides a 105-mm. shell contract, United Shoe Machinery Corp., Beverly, Mass., has one for spare parts, fuze setter rammers. Others include: Keystone Mfg. Co., Boston, fuze bomb noses; Wright Machine Co., Worcester, adapter boosters; Automatic Machine Co., Attleboro, primers; American Watch Case Co., Providence, bomb fuzes; Independent Lock Co., Fitchburg, adapter boosters and fuzes.

Seattle — Bar producers are trying to reduce order backlogs but are handicapped by labor shortage which cuts heavily into capacity output. Merchant bars are in heavy demand but reinforcing material is slack.

St. Louis — Demand for merchant bars continues heavy, augmented by awarding of several new contracts for bomb racks. Reinforcement bars and building products are easier. No relief is in sight for merchant bars, since demand stems from shell, tank and truck manufacturers. Shipbuilders also are taking bars in large quantities.

Baltimore — Approximately 6000 tons of 2-inch rounds are being sought for delivery beginning April by a North Carolina manufacturer of shells and gun components. Substantial tonnages have been placed recently by Baltimore manufacturers participating in the rocket program.

Philadelphia — Carbon bar producers generally are booked through third quarter on smaller specifications and in some cases through to fourth quarter on larger rounds, which are in particular demand for shells. One large seller is booked solidly into December on larger sizes. A little electric alloy steel is available in May but most producers quote June on electric and all are into July or August on open-hearth alloy steel.

Chicago — WPB anticipates that demand for spring steel will increase. Manpower shortage is holding down production currently, and the overall supply will be insufficient to meet combined military and civilian demand. Consequently, WPB is recommending maintenance of present use of metal springs at the rate of 50 per cent by weight of 1941 use.

Cleveland — Orders for shell billet steel are still increasing, with overall requirements for second quarter scheduled to increase 450,000 tons. Several shell steel producers are unable to give delivery dates until late fourth quarter. Forge shops and cold-rollers are particularly active, with order backlogs at the highest level in months. Demand for alloy steel bars continues to increase; mill deliveries are extended into August.

Steel Plates . . .

Plate Prices, Page 145

Plate demand continues to shrink though mills are sold for several weeks ahead. With shipbuilding requiring less material as contracts are completed miscellaneous demand fails to make up the shrinkage. Steel formerly going to plate mills now can be diverted to sheets and other products. A leading plate maker recently able to take orders for April now quotes May on sheared plates while others can do no better than June. Locomotive orders for export promise to add considerable tonnage for plate mills.

New York — Plate specifications have tapered somewhat although jobbers, who comprise one of the largest buying groups, are still pressing for tonnage. Inquiries are beginning to appear also for plates and sheets for the 500 Russian locomotives recently noted as being distributed equally between American Locomotive Co. and Baldwin Locomotive Works. While inquiries have been issued for wheels, no lists have yet been noted on the rolled material for the French locomotives, and this is ascribed to the fact that not all details of design have yet been settled. The mobile gun mount program is leading to some inquiry for standard plates, but major requirements are in other lines.

One leading plate producer, recently in April, is now in May on sheared plates while offerings of most other producers fall in June.

St. Louis — Carbon steel plates are scheduled to July and August. Pressure is still heavy, due to the new shipbuilding program, despite transfer of considerable sheet capacity to plates. However, completion of that program, probably in May or June, is expected to ease matters somewhat in June or July.

Boston — Plate inventories generally have been reduced and placement of new tonnage continues well below peak although directives still cover considerable ship volume. On the other hand warehouse stocks are better balanced than on most flat-rolled products, permitting prompt delivery for fill-in mainly for repairs. Miscellaneous buying for war equipment is not taking up the

slack resulting from decline in ship requirements, which is less apparent for naval vessels, destroyers or heavier. Industrial inquiry is fairly well sustained, but the last wave of new contracts involved less plates than sheets, strip and bars. Walsh-Kaiser six-way yard, Providence, R. I., building combat-cargo ships, continues on a higher schedule than most privately operated yards, one building navy vessels excepted, and, at the last launching, workers were warned they must maintain production.

No additional contracts are expected for the South Portland, Me., yard; Maritime commission has awarded contracts for as many Victory, C-type and tanker ships as can be completed this year with turbine propulsion machinery available. Capacity at yards building the latter types is ample for new contracts. Bethlehem-Hingham has 40 LST's and APD's to complete by late summer. Political pressure for continuance of operations at both yards has developed and most official reaction has been of a noncommittal political nature.

Seattle — Several projects involving steel plates are pending or under consideration in this area. Seattle opened bids Feb. 21 for a replacement project requiring 1510 feet of 36-inch and 1530 feet of 24-inch steel pipe. Steel Tank & Pipe Co., Portland, Oreg., is low for 3660 feet of 30 and 58-inch steel pipe and specials and has a contract with Port Townsend, Wash., for two miles of 30-inch steel pipe replacements.

Tubular Goods . . .

Tubular Goods Prices, Page 143

Seattle — Cast iron pipe dealers are handicapped by slow deliveries. Demand is fairly active and some important projects await priorities. Several Seattle projects are pending, Crane Co. being low for supplying 6000 feet of 12-inch bell and spigot. Bonneville Power Administration will take bids Feb. 28 for 4000 feet of black wrought iron pipe.

Wire . . .

Wire Prices, Page 145

New York — Wire orders continue to pour into mills in excess of capacity and shipment for numerous products. There is only slight slackening in orders, due in part in some cases to the inability of producers to take additional volume for delivery when wanted. With the heavy-duty tire production being greatly expanded, additional space is sought for bead wire; mills have been asked to take on more of this volume. Continuing directives for rope and signal corps wire are sustained. More volume, some urgent and highly rated, has been pushed out of schedule and into third quarter.

Boston — Wire mills partially dependent on Buffalo for rods, including one rope plant, are getting back to schedule as delayed shipments arrive. Production schedules are subject to constant revision, however, due to new and supplemental directives. Bookings have eased only slightly and are well ahead of shipments with most mills. Substantial part of backlogs is concentrated in relatively few large tonnage war items and any relaxation or cutbacks in these would soon be reflected in numerous important products, some CMP allocations, which are now out of schedule. There is no indication, however, the services will ease demand in the immediate future. Carry-overs this month will be heavy again and will include considerable CMP spring wire. Rods are tight and one integrated Buffalo mill is trying to buy semifinished.

Tin Plate . . .

Tin Plate Prices, Page 145

Chicago — No delivery changes in tin plate are observed, May being the first month in which material can be supplied in any quantity. WPB is anxious to increase production, but is unable to arrange for it both because manpower is lacking and shortage of black plate. Carnegie-Illinois Steel Corp., which has been handicapped by lack of cars to ship its product, finds some improvements, but is still many cars short.

St. Louis — Overall demand for tin plate has been unchanged for some weeks. Moderate open tonnage in May is reported but makers do not yet know second quarter allocations. Increased lend-lease calls reported imminent are expected to revise production schedules here.

Rails, Cars . . .

Track Material Prices, Page 145

New York — Car buying has slowed with little being figured here at the mo-

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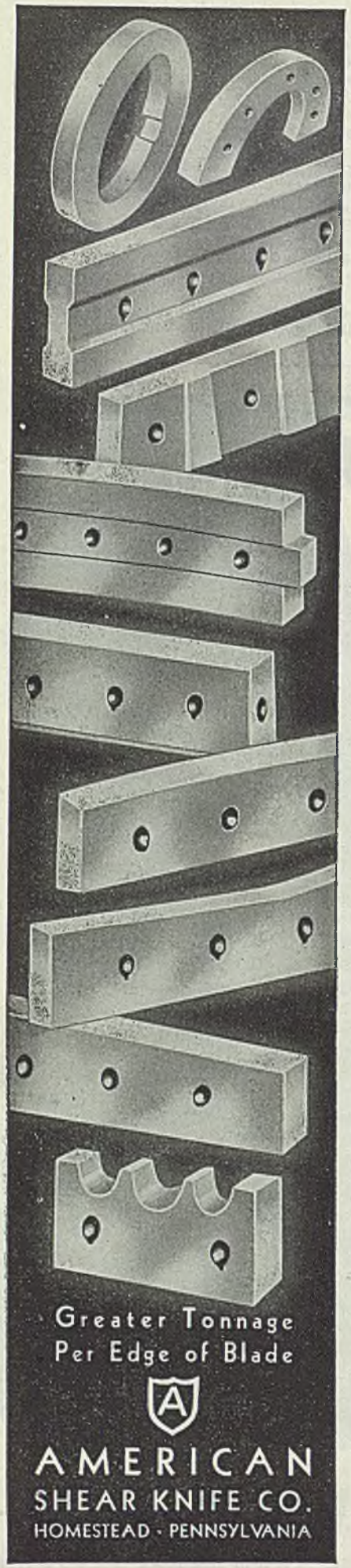

ment. Brazil Ministry of Transport and Public Works has placed three 4-8-4 type steam freight locomotives with Baldwin Locomotive Works, these being in addition to seven placed last fall.

Chicago — An important car builder in this area predicts that 90 per cent of the 30,000 passenger cars in service today will have to be replaced as soon as the war is over, consequently plans to modernize its plants to handle the business. British competition for car wheel business has reappeared. A wheel maker in this area had an order for 200 wheels for the Canadian Car & Foundry Co. canceled because better deliveries could be obtained from England. Chicago Rapid Transit Co. has given contracts to Pullman-Standard Car Mfg. Co., Worcester, Mass., and St. Louis Car Co., St. Louis, for two units each consisting of three-car articulated trains for the elevated lines.

Structural Shapes . . .

Structural Shape Prices, Page 145

New York — F. H. McGraw Co., general contractor, New York, has placed 3200 tons for a veterans' hospital at Dearborn, Mich., with Bethlehem Steel Co. Contracts otherwise are light with relatively little being figured.

New York City will figure in the $800 million postwar federal-state highway program to the extent of $60 million, it was revealed. Actual plans and construction will be done by the New York State Department of Public Works, except in special cases which may require that the design be undertaken either by the city or by private engineers.

Seattle—Fabricators generally are engaged in war work and there is no demand of consequence from private sources. Most fabricating shops have contracts from shipyards and airplane plants and are operating to capacity.

Philadelphia — Shape producers quote June on standard sections, with one into July on wide flange. Ship and shell work continue major factors in the extended position of mills, although a little more building construction tonnage is being booked than for sometime.

Reinforcing Bars . . .

Reinforcing Bar Prices, Page 145

Pittsburgh — New projects are virtually absent this week, and shipments against existing contracts are cutting into available stocks of new billet steel held by distributors, with little immediate hope of replenishment. Rail mills report new business is light, except for some export tonnage, which is building up backlogs.

New York — While considerable reinforcing bar tonnage is pending for export, with second quarter quota likely to be on a parity with that of first, domestic activity in this district is light. Both orders and inquiry appear to be confined to carload lots or less.

Pig Iron . . .

Pig Iron Prices, Page 147

Improved transportation conditions have eased the pig iron situation in areas where snow had caused delivery delays and melters are receiving more material. Labor is the limiting factor in foundry operation and production is hampered. Many foundries have con-

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siderably less inventory than the 30-day supply allowed by WPB.

New York — As a result of improved transportation pig iron is now arriving at some plants faster than manpower is available for unloading. This is in sharp contrast with a fortnight or so ago. Reflecting the freer flow of iron, operations have picked up at several points, with labor the major limiting factor. Inquiry for iron is still brisk, however, with the ratio of pig iron to scrap consumed as high as at any time in months. This condition may change, as scrap also is beginning to flow somewhat more easily, but not, where cast scrap is involved, in the same degree, because this grade of material is fundamentally scarce and will likely continue so until the war emergency eases.

Pittsburgh — Supply situation remains tight with shipping facilities bad and coke supplies weaker in many cases. Carnegie-Illinois Steel Corp. reports approximately four days' coal supply at the Clairton coke works, supplying all blast furnaces operated by the company as well as other United States Steel Corp. subsidiaries here. Stocks of coke at furnaces are well below normal. Merchant iron is becoming increasingly tight, and there is no apparent move yet to reactivate idle stacks here. The trouble seems to be manpower shortage rather than economic factors, because the $1 increase in iron prices has had no effect on the furnace situation here.

Boston — Although eased slightly, pig iron supply continues tight, with numerous consumers having less than 30-day inventories. Melt in the New England area, estimated at around 23,500 tons a month, fluctuates only slightly, but deliveries this month will be slightly higher, partly due to delayed January shipments. Heavy influx of war orders has affected foundries to a less degree than other metalworking plants; with manpower still short any substantial increase in melt would appear doubtful. Eventual lifting of war controls will actually result in much heavier consumption among larger users in textile and paper mill equipment shops. Since announcement by a large textile machinery builders that war work, other than textile mill equipment, would be completed in about one month, the situation has changed somewhat, but in other departments more than in foundry divisions.

Firm orders for new textile machinery are not being taken because of uncertainty in delivery and prices, but are tentatively booked in sequence. Preparing, however, for a volume 50 per cent over good prewar years, several shops are increasing potential capacity for castings; Draper Corp., Hopedale, Mass., is installing additional automatic molding equipment and has machinery on order to meet strong demand for textile mill equipment.

St. Louis—Supplies are reported adequate currently with large users having little difficulty, although no surplus exists. The manpower shortage is the greatest handicap. Demand continues high and some foundries have as little as one or two weeks' reserve on hand.

Buffalo — While cars for pig iron shipment still are scarce conditions are better and shipments en route are being delivered, easing shortages in New England and the East. Some time will be needed for accumulation of the 30-day inventory allowed by WPB. Books for second quarter open next week with

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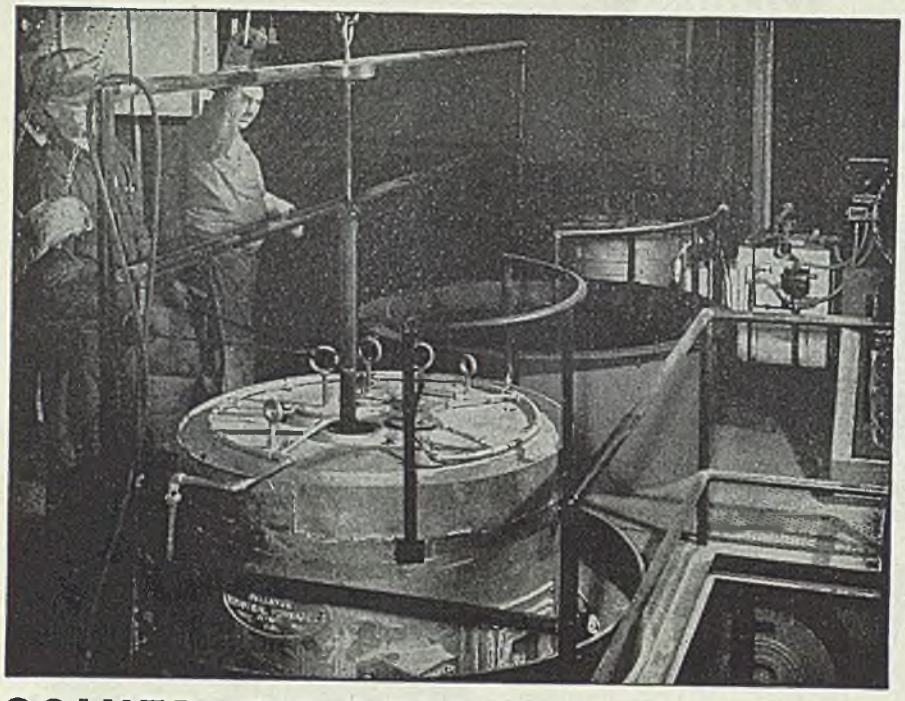

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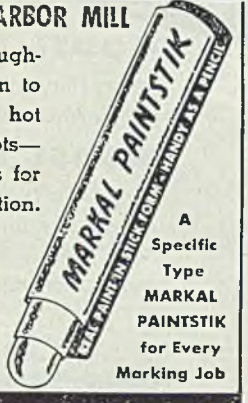

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little change expected in bookings.

Cincinnati — Announcement of the $1 increase in pig iron was taken in stride, melters apparently being concerned more with delivery. Shipments continue laggard. So far shutdowns have been avoided, but often supplies of pig iron are close to exhaustion before new tonnage arrives. Beehive coke is tight, partly on account of transportation difficulties but by-product foundry coke appears adequate.

Philadelphia — While pig iron is moving somewhat more freely at least three basic consumers in the Philadelphia district are operating on virtually a day to day basis with question whether they will be able to maintain production at the current rate. Return to government allocations appears unlikely.

Cleveland — More moderate weather and lifting of the rail embargo has materially eased the coal supply situation at steel plants. With coke oven operations back to normal, the output of pig iron is again close to capacity, 12 out of 14 units pouring iron. Republic's DPC furnace has been idle for some weeks now, but this is not due to lack of coking coal. Foundry operations have improved somewhat, reflecting freer movement of cast scrap and pig iron.

Scrap . . .

Scrap Prices, Page 148

While some shortages exist in scrap supply, notably in cast grades, the situation is better as railroad movement improves. As the shell program increases more turnings are offered, further weakening the price. Steelmakers continue to use material from reserves as deliveries lag. Lack of labor in yards is a prime cause of scarcities, dealers in many cases having accumulations they cannot prepare promptly.

Pittsburgh — Market continues steady except for turnings, which are actually nominal in many instances. An official quotation of $14 for machine shop turnings and $16 for short shoveling turnings does not portray the real picture, as these grades admittedly could be bought at almost any reasonable price. Some turnings are coming in on old orders, however, at higher levels, which tends to give strength to the market where none really exists. Other grades are moving slowly. Yards have a fair quantity of material on hand, but it cannot be moved because of labor shortage and bad weather. A recent survey of yards in this area and adjacent Ohio territory reveals that almost every yard has a small tonnage available but no means of preparing and shipping it.

New York — Scrap is moving more freely as a result of improved weather and transportation conditions. There is still a dearth of cast scrap, however, as little of this is being developed, due to light demolition activities. Prices are generally unchanged at ceiling levels.

St. Louis — Demand remains extremely high and supply low. A return of bad weather, plus a greater labor shortage, brought on a tight situation, although dealers look for an improvement by April. Mill reserves were aided somewhat by the brief weather respite, now averaging four to five weeks as compared to the two-month stockpile most like to keep. Dealers claim they are 25 to 35 per cent undermanned and some have stopped shipping, with the result that broker pressure on the re-

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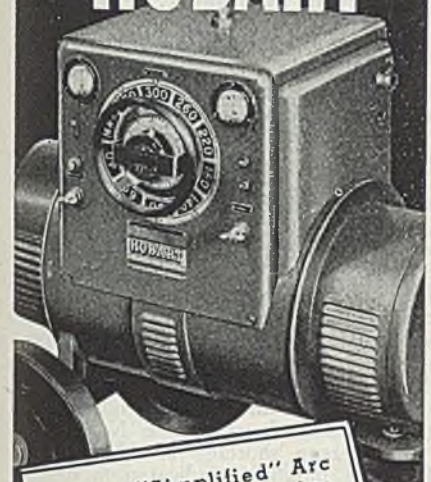

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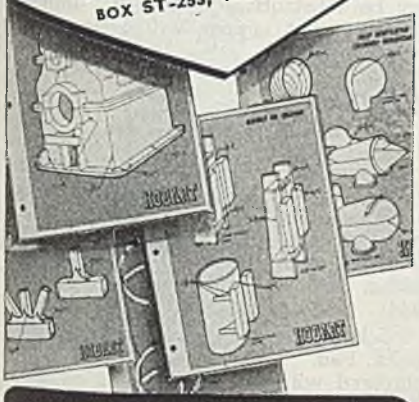

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mainder is increasing. Cast grades are scarce. With the exception of machine turnings, all grades remain at ceiling.

Boston — Unbalanced supply, cast and heavy melting grades scarce, with lighter industrial material ample, notably machine shop and shoveling turnings, mark trends in scrap, contributing to softening in the latter. This further emphasizes increase in orders for ordnance, probably picking up momentum with development of the shell program. Need of cast and short steel scrap by some foundry consumers is acute, with prospects of early relief uncertain. While not as acute, volume of alloy-free heavy steel is limited. Shipyard scrap volume also tends downward gradually. Offered at the Boston navy yard Feb. 21 of close to 1000 tons, including 500 tons unprepared heavy melting steel, 300 tons light iron and 150 tons steel flashings, has been awarded.

Cincinnati — Activity in iron and steel scrap is greater, on a reaction from severe weather conditions, but work in yards has been slowed seriously. Supply of rails, which are in good demand, is better in this district, at least temporarily. Melters are also avid for good low phos and cast. Turnings continue weak. Mills are taking tonnages freely on contracts but show little interest in new commitments.

Seattle — Scrap supply is sufficient for current needs and some material is being shipped to the East, particularly from the Portland area. Seattle consumers are receiving shipments from shipyards at Vancouver, B. C., and the local supply is ample.

Buffalo — Although no sales have been reported of turnings below ceiling the market shows definite signs of weakness. Large offerings of this grade reflect increase in shell production and some rejections are being made because of high nickel content. Mills are drawing on reserve for solid material to balance turnings in the melt. Quality steelmaking grades continue scarce.

Philadelphia — Interest in scrap still is centered on movement of material on order, with flow a little improved but far from adequate. In heavy melting steel this is ascribed to continued difficulty in getting cars and limited manpower for preparation. Turnings, requiring little preparation and which are coming out in increasing volume from shell lines, are moving best. Prices on turnings continue at ceilings despite freer flow and weakness in other districts. When melting steel becomes adequate weakening in turnings is expected. Low phos scrap is in somewhat less demand.

Cleveland — Scrap supply has made substantial improvement the past ten days. Stocks at steelworks in this district are down considerably from the turn of the year, but are not low enough to cause alarm. Considerable tonnage of good open-hearth grades and turnings are still moving into the Youngstown district from here. Cast scrap supply remains scarce, although some improvement has developed.

Chicago — Although mill receipts of scrap are somewhat heavier than recently because of better weather, new buying continues low as principal consumers remain out of the market. Principal grades for open hearths and electric furnaces hold ceiling price level, but turnings and borings, chiefly blast furnace grades, show new weakness.

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Warehouse . . .

Warehouse Prices, Page 146

Chicago — Buying from warehouses continues heavy and some sellers are forced to limit quantities. Some also are doubtful that present volume can be maintained because of shrinking inventories. Effective April 1, load directives are reinstated. Not only will this put a ceiling on material which can be taken in, but actual mill shipments will be insufficient to meet demand.

New York — Demand for steel from warehouse is heavy and unabated. An increasing volume, including larger orders, is due to extended mill deliveries on most products. Inquiry for alloys has improved further; with some jobbers alloys are among the most active. Drain on warehouse stocks is heavy and inventories are more unbalanced. This is emphasized by lagging shipments to distributors who have more tonnage in mill carry-overs. Nails and sheets are among the tightest products.

Los Angeles — Warehousemen believe that within 60 days their stocks will have reached the critical stage of depletion. Mill orders are being delayed by as much as six months because of competitive demand from consumers who, after exhausting current warehouse materials, are themselves ordering direct from mills. Sudden changes in design on war materiel have brought unprecedented need for sizes and shapes unforeseen even a few weeks ago.

Philadelphia — While warehouse allotments on shapes and plates again are being set up, effective April 1, warehouses will not benefit much before the end of second quarter on shapes as most mills already are well booked for that period. As for plates they will be unable to get tonnage under allotment before May and from only a few producers. Warehouse allotments on bars and hot and cold-rolled sheets were restored a short time tgo. On the so-called merchant products, such as galvanized sheet and wire, allotments had continued in effect.

Cleveland — Warehouse steel stocks are moderately below a year ago and there is a strong indication that a further decline in distributors' inventories will occur over the next few months, as mill warehouse load directives are expected to be cut to make steel available for expanding munitions programs. Both the volume and size of orders placed with distributors have been larger in recent weeks, as many steel consumers have been forced to rely on warehouse stocks to tide them over until their mill orders are shipped.

Cincinnati — Sales volume of steel jobbers has been maintained this month at expense, in part, of their inventories. Mill shipments tend to less tonnage, not meeting the demand, which is heavy and broad. Most warehouses are beset by labor scarcity, and shipments, especially where preparation is necessary, are slowed.

Semifinished Steel . . .

Semifinished Prices, Page 144

Pittsburgh — Rounds for seamless tubing, which must compete with shell rounds and billets, as well as rail in some cases, for time on the primary mills, are runninig behind delivery schedules at the moment. All products in this category will have a carryover into March and with the exception of ingots and slabs at some points, all semifinished steel is in much the same situation. Skelp and wire rods are causing difficulties, particularly the latter, while non-integrated sheet mills have been hampered by a declining supply of sheet bars. Much of this difficulty can be traced, as in other products, to the fuel shortage and the freight delays.

Nonferrous Metals . . .

Nonferrous Prices, Page 149

New York — Tightening controls on distribution and use of major nonferrous metals again bring zinc under allocation. Copper stockpile will be under 300,000 tons by April 1 after an expected peak demand next month, probably lowering the reserve in that metal by close to 75,000 tons during first quarter. Restrictions imposed on lead recently to conserve other than war use are having an effect in somewhat more even distribution. Conservation measures applying to tin have not been relaxed. Copper and zinc deliveries will be heavy in March. Domestic production has declined steadily and use of foreign copper has increased sharply since November.

An average shortage of 18,000 tons of zinc a month is indicated, a deficit of near 208,000 tons for the year. Tin-lead-zinc division estimates 1,078,000 tons of slab zinc will be required this year with indicated production, including imports, 870,000 tons. For galvanizing 270,000 tons will be needed while brass mills want 480,000 tons. Ingot producers, die-casters and rolling mills account for the balance. Production of zinc concentrates are also downward, 660,000 tons in terms of recoverable zinc being estimated this year against 715,000 tons, 1944. Available imports are 340,000 tons, but only half of this has been definitely tabbed.

Demand for field wire has contributed to a suspension order which virtually bars copper wire in the civilian market. Under CMP, revised upward for this year, a deficit of 4000 tons of refined copper is indicated, and, unless more adequate labor is available to mines, mills, smelters and refiners, this estimate may be substantially increased. Indications are that copper will become increasingly tight.

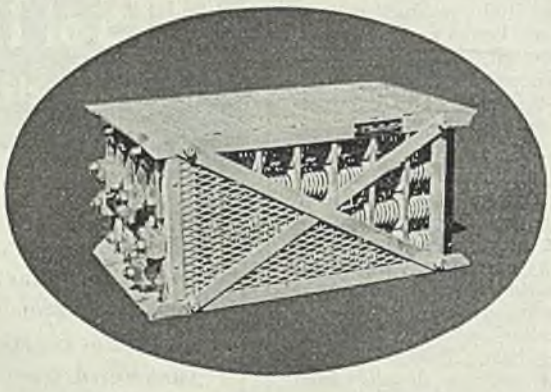
Iron Ore . . .

Iron Ore Prices, Page 146

Consumption of Lake Superior iron ore in January totaled 6,982,619 gross tons, according to the Lake Superior Iron Ore Association, Cleveland. This compares with 7,090,174 tons in December and 7,481,653 tons in January, 1944.

Stocks at furnaces and on Lake Erie docks Feb. 1 were 30,888,956 tons, compared with 37,823,876 tons on Jan. 1 and 36,059,302 tons Feb. 1, 1944. Furnaces in blast Feb. 1 numbered 170, the same as a month earlier. As of Feb. 1, 1944, active furnaces numbered 182. During January two furnaces were abandoned for dismantling, that of Antrim Iron Co., Mancelona, Mich., idle since 1943, and that of Delta Chemical & Iron Co., Wells, Mich., idle since 1942.

Iron ore production in the United States in 1944 is estimated by the Bureau of Mines at 94,622,000 gross tons, com-



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has become the standard of high quality in resistance units, demanded by plant engineers who know and want the best. G.M.C. Resistances are built of helical coils of alloy resistance wire, supported by an external frame for complete protection. Ohmic resistance and carrying capacity is clearly labeled on each unit so that plant engineers may complete installation easily and efficiently to fit any requirements. Write today for complete information!

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LOGAN, W. VA.

No. C CUTTERS

FOR CUTTING

○ 3/4" Rods

▭ 3" x 1/4" Flat Bars

⊛ 1-1/4" Wire Rope

└ 2" x 2" x 1/4" Angles

(With four sets of blades.)

This hand operated, lever action bench cutter was designed by men long experienced in the metal working fields. They knew the industries' need for a sturdy, portable cutter and they met that need. Over fifty years of continuous production tells how well they succeeded.

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Immediate shipment from New York stock. Send for our catalog #8 on other hand powered cutters, benders, punches.

T. H. LEWTHWAITE MACHINE CO.

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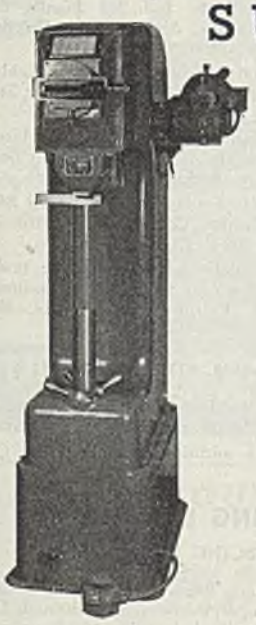

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ILLUMINATED PROJECTOR

Operator can rapidly determine results of test on screen, which is graduated in mms. Machine is fully mechanical, motor operated, and is calibrated for 500, 1000, 1500, 2000, 2500 and 3000 Kg. loads. It is designed to make Brinell tests without the use of microscope or indicator. Details and prices furnished on request.

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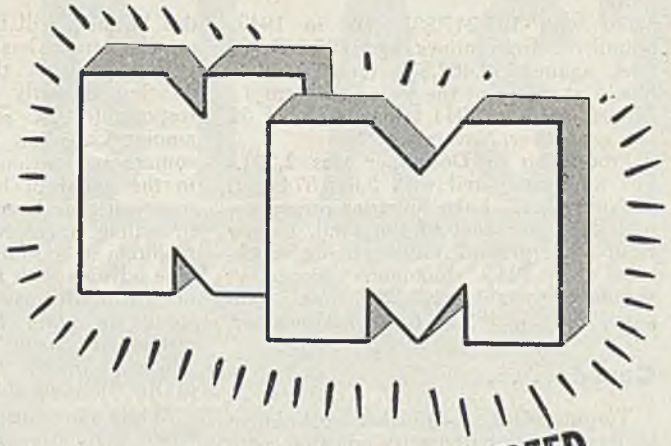

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PRODUCTION ECONOMY
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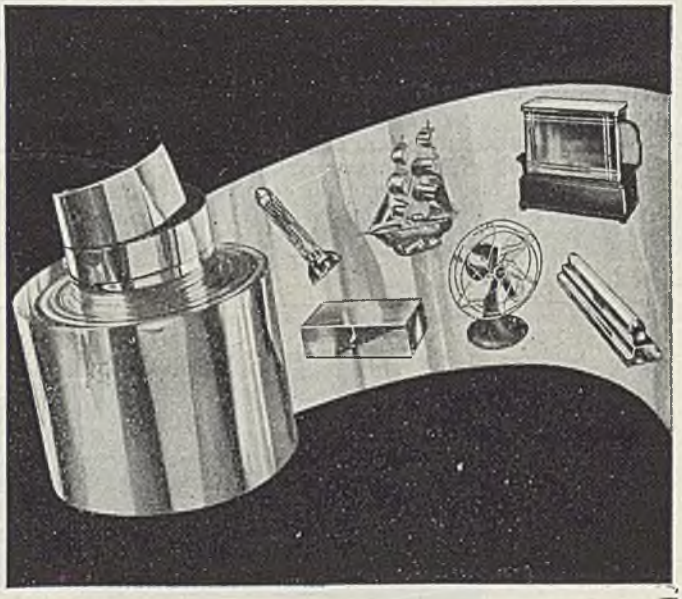

• **Lessons learned in wartime manufacturing have made it easier for us to tell you about Nickeloid Metals. One wartime lesson was that costly basic metals could be eliminated and less expensive ones used if the surface were electroplated with a durable, corrosion-resistant coating such as chromium, nickel, copper or brass. *Another wartime lesson* that proved our case was simplification of manufacturing procedure . . . eliminating operations, and thus reducing costs while speeding production. Nickeloid Metals are tailor-made for high-speed, automatic fabrication. Production experts recommend them. Write us for more information.**

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ALSO LACQUERED COLORS
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OLDEST AND LARGEST PRODUCERS OF PRE-PLATED METALS

AMERICAN NICKELOID COMPANY

Established 1898

PERU, ILLINOIS

pared with 101,247,835 tons in 1943. Shipments from mines were 95,532,000 tons, against 99,462,850 tons in 1943. Stocks at mines at the year end were 4,775,048 tons in 1944, an increase of 32 per cent over November.

Production in December was 2,391,714 tons, compared with 5,073,874 tons in November. Lake Superior ore represented 52 per cent of the total, mainly from underground mines, being stockpiled for 1945 shipment. December shipments were 1,265,087 tons, compared with 5,046,194 tons in November.

Canada . . .

Toronto, Ont. — Further curtailment in less essential items is indicated with announcement this week that DeHavilland Aircraft Co. is laying off several hundred workers. Similar announcements were made by Victory Aircraft at Malton and McDonald Aircraft at Winnipeg several weeks ago. However, C. D. Howe, minister of munitions and supply, announced that some $3,000,000 in aircraft contracts have just been awarded to the McDonald company but it is understood this business is chiefly associated with nonwar activities. Several other companies that have been producing various other types of war equipment including radio, small arms, etc., also have reduced working staffs in the past two or three weeks, and it is stated that more drastic cuts are in contemplation as a result of British war contract cancellations. Shell and munitions production for the United States and Canada, however, are being maintained at virtual capacity and it is not expected this business will be affected until fighting in Europe has ceased.

Reports from the United States indicating an early rise in steel prices is responsible for considerable discussion among Canadian producers while consumers are anxious as to their position in the event of higher prices. Government officials have intimated no change in ceiling prices for steel but producers maintain a position whereby they can take advantage in the event they are permitted to advance prices. All orders for steel, including backlogs and current orders, are being accepted on a basis whereby prices will be made known at the time of delivery.

While new business continues steady, fresh commitments are much smaller than at the beginning of the year. However, producers continue to report backlogs sufficient to absorb production facilities until early third quarter.

Sheet buying is piling up backlogs and delivery dates against new orders extend well into third quarter. There was some improvement in sheet orders for the week as civilian consumers commenced a new buying move in the hope that there may be some war contract cancellations which would make available additional supplies for nonwar users. While any sharp jump in civilian production depends largely on the war, a more optimistic sentiment is developing. Galvanized sheets are particularly tight, with delivery dates against new orders indefinite.

Bar mills are filled with orders for delivery during first half and some report bookings extending well into third quarter. Demand is equally heavy for carbon and alloy bars. Car and locomotive builders and farm equipment makers have been placing heavy orders for bars and are obtaining fair deliveries, with most bar mill output going to shell makers and other war industries.

Merchant pig iron sales held at approximately 6000 tons for the week, with melters buying in lots of 100 to 200 tons. Improvement in weather and road conditions has brought deliveries back to normal and melters now have no difficulty in getting in supplies.

Minor improvement is developing in scrap and dealers again are making regular shipments, but these are running only about 25 per cent of requirements. Cast scrap and stove plate are scarce without sufficient tonnages to meet consumer demand.

Steel in Europe . . .

London — (*By Radio*) — Steel production in Great Britain is below the peak of war years but there has been slight improvement in recent weeks. Light foundries are more active on war work. Sheetmakers are heavily booked for months ahead. Demand for heavy structurals is slow.

STRUCTURAL SHAPES . . .

STRUCTURAL STEEL PLACED

12,000 tons, MZ piling, for U. S. Engineers, Columbus, O., to Carnegie-Illinois Steel Corp., Pittsburgh.

3200 tons, veterans' hospital, Dearborn, Mich., awarded through F. H. McGraw Co., general contractor, New York, to Bethlehem Steel Co., Bethlehem, Pa.

2200 tons, plant building for Kelly-Springfield Tire & Rubber Co., Houston, Tex., to Mosher Steel Co., Houston.

1600 tons, plant addition for Indiana Ordnance Works, Charlestown, Ind., to Ingalls Iron Works, Birmingham, Ala., through Du Pont interests, Wilmington, Del.

1500 to 2000 tons, addition, Southern Acid & Sulphur Co., Houston, Tex., to Mosher Steel Co., Houston, Tex.

1000 tons, alterations to Plant No. 2, Jacobs Aircraft Engine Co., Pottstown, Pa., to Bethlehem Steel Co., Bethlehem, Pa.

290 tons, four highway bridges, Costa Rica, to American Bridge Co., Pittsburgh, through United States Steel Export Co.

220 tons, deck plate girder spans for bridge 425.03, Colorado, for Union Pacific railroad, to Paxton & Vierling Iron Works, East Omaha, Neb.

STRUCTURAL STEEL PENDING

750 tons, seven buildings, Fort Belvoir, Va., for Washington district engineers, U. S. Army.

200 tons, plant addition, Heintz Mfg. Co., Philadelphia.

REINFORCING BARS . . .

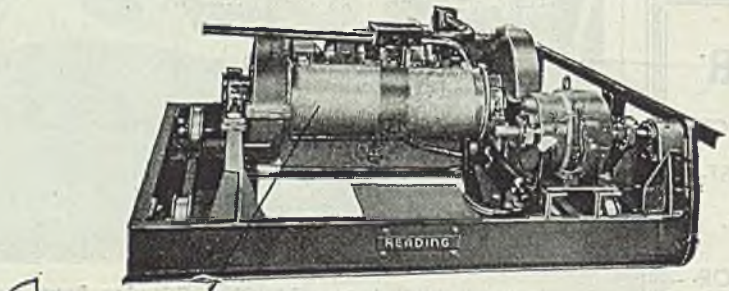
REINFORCING BARS PLACED

200 tons, Reading Briqueting Co., to Bethlehem Steel Co., Bethlehem, Pa., through Day & Zimmerman, Philadelphia; 100 tons each for plants at Locust Summit and Nicholas, Pa.

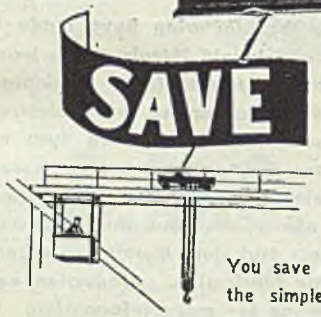
150 tons, expansion, truck tire plant, Lake Shore Tire & Rubber Co., Des Moines, Iowa, to Des Moines Steel Co., Des Moines, Iowa.

131 tons, additional concrete platforms, Iowa Ordnance Plant, Burlington, Iowa, for Day & Zimmermann, to Bethlehem Steel Co., Bethlehem, Pa.; bids Feb. 9.

120 tons, water treatment plant, Rock Island Arsenal, Rock Island, Ill., to Olney J. Dean Steel Co., Chicago; W. E. O'Neil Construction Co., Chicago, contractor; bids Feb. 7.



SAVE ON MAINTENANCE WITH READING CRANES



You save on maintenance costs with Reading Cranes because of the simple, easily accessible unit design. This permits easy removal from the hoist assembly of individual motors, drums or gear housings without disturbing other units or changing their alignment.

Other low maintenance features are: split gear cases to simplify maintenance, long life anti-friction bearings throughout, machined grooves on the drum to save cable wear and replacement. For full information on the long trouble-free performance of Reading Cranes, write for your copy of "The Why and How of Faster Production at Less Cost."

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READING CHAIN & BLOCK CORP. 2102 ADAMS ST., READING, PA.

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Total War Demands 100% Production!

"CLEANBLAST" maintains production in the cleaning of castings, forgings, heat treated metal parts, shells, bombs and armor plate in plants all over the country. A Cleanblast Engineer is always available to help solve your blast problems. Write for complete information.

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The Product of Many Years Specialization
MADE BY TOOLMAKERS

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MILLING CUTTERS AND
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COWLES TOOL COMPANY
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YOU'LL NEVER NEED TO REPLACE

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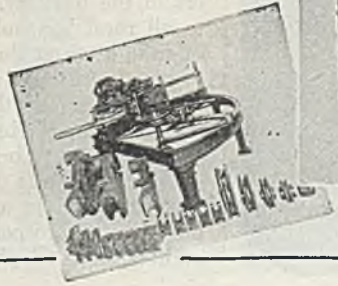
Bridge-builders, shipyards, engineering firms—busy with war work—depend on these machines! They'll speed peace-time conversion, too. *Twelve types:* hand operated capacities from ¼ to 6" inclusive; motor operated, ½ to 8" inclusive.



A Few Of Our More Than 12,000 Customers: Bureau of Ships, Wash., D. C.; Henry J. Kaiser Co., Calif.; Pacific Bridge Co.; Bethlehem-Hingham Shipyards; Hercules Powder Co.; Stone & Webster; E. I. Du Pont de Nemours & Co.; Crane Co.

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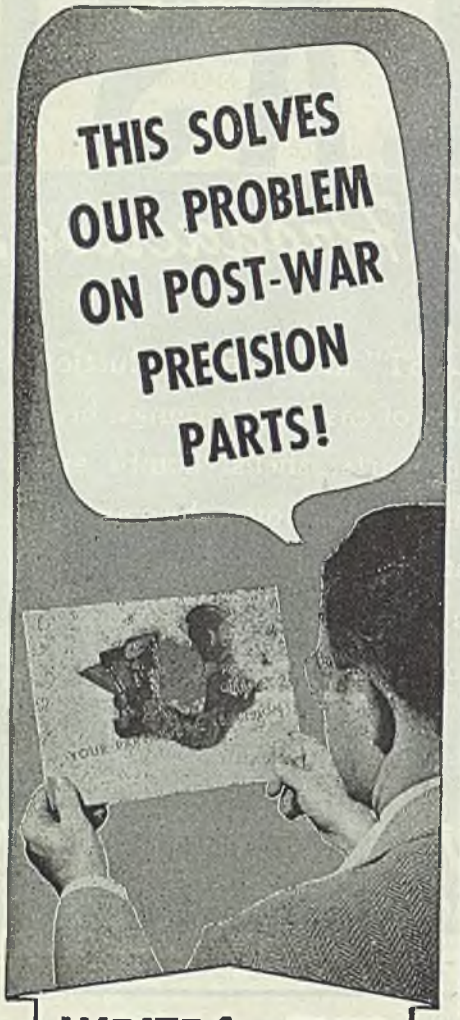

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PLATES . . .

PLATES PLACED

Unstated, two miles 30-inch water pipe for Port Townsend, Wash., to Steel Tank & Pipe Co., Portland, Oreg.

PLATES PENDING

Unstated, 3660 feet 30 and 58-inch pipe and specials, Tacoma, Wash.; Steel Tank & Pipe Co., Portland, Oreg., low at $52,635.

Unstated, 1510 feet 36-inch and 1530 feet 24-inch water pipe for Seattle; bids Feb. 21.

PIPE . . .

CAST IRON PIPE PENDING

Unstated, 6000 feet 12-inch class 150, for Seattle; Crane Co. low.

RAILS, CARS . . .

RAILS PENDING

400 tons or more, Tacoma Belt Line extension; Woodworth & McCarthy, Tacoma, low at $37,165.

LOCOMOTIVES PLACED

Brazil Ministry of Transport and Public Works, three 4-8-4 freight locomotives, to Baldwin Locomotive Works, Eddystone, Pa.; in addition to seven placed last fall.

Promotion Program Helps Keep Steel Plants Manned

(*Concluded from Page 63*)

high. During this period advertising campaigns through the area continued, and although the intensive organizational work has now been completed, the company maintains its advertising campaigns and also maintains offices with representatives at central points, as well as floating representatives who regularly contact minor population centers in the area.

The program works. There is no doubt of that. Figures on employment show how well it works in that on Oct. 1 National works had 6292 employes, while by Feb. 1 the total had risen to 6938. Christy Park works on Oct. 1 had 5456, and by Feb. 1 had boosted its total to 6744. During the same period National works lost 732 workers to the draft or through quits or transfers, while Christy Park works lost 1159 workers for the same reasons, and these losses were made up by the program.

A similar campaign began at the company's Lorain, O., works about Dec. 1, and in the first 60 days net employment gain in the plant was 379 workers from a total of 8982 to 9361. An interesting feature of the campaign at Lorain works which is now in progress is a job of direct mail selling to the farmers in the territory. Folders are mailed to all rural box holders in the territory, offering a job at the National Tube Co.'s Lorain works and featuring quotations from workers at the plant telling how they like their jobs and how important the work is. Complete procedure for obtaining a job is outlined in the folder. Also enclosed is a business reply card on which a prospect can list his name, address and telephone number, and a representative of the company will call on him and explain the situation and answer any questions. This campaign was supported in local papers throughout the Lorain area. Although this campaign is of recent origin, it has begun to show good results.

Both Lorain and National works are primarily steel plants whose product tonnage is fairly stable and depends on the capacity of its equipment. Christy Park works, on the other hand, is a fabricating plant producing bomb, shell and rocket parts and its production is largely a function of manpower plus volume of orders. The pressure for new employes therefore is heaviest at Christy Park works, but the campaigns have proved that it is possible to recruit workers without having the glamour of a war material production line to help pull them in. According to the National Tube people, the plan was a success and will continue to be a success because it makes it easy and convenient for a worker to get a job and to get to that job and home again.

Steel Supply Situation Is Reported Unusually Tight

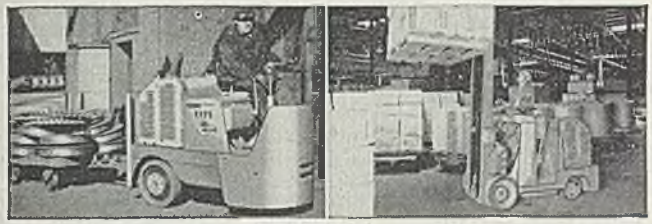
(*Concluded from Page 53*)

officials at a meeting in New York.

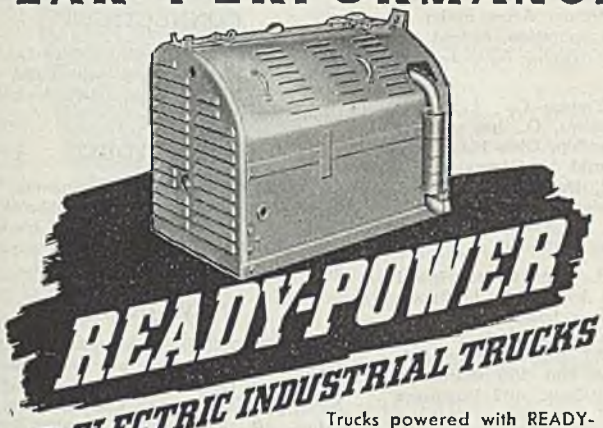
The negative factors included the prospect of a critical fuel shortage, particularly coal; possibility of heavy floods in the Ohio river area in the spring; and loss of a substantial number of men in the industry from 26 to 29 years of age who will be taken in the new draft.

On the positive side are included the recent placing of the entire steel industry on the National Production Urgency list as a must program, which gives steel producers an equal priority on labor recruitment with the very top military programs. Each of the major steel companies has placed personnel in the United States Employment Service offices to do a more effective job of recruiting. The entire industry is loaning operating facilities to help work out the best pooling of steel production facilities.

The basic factor behind the inability of the steel industry to meet sharply increased steel requirements for the various war programs is the gradual decline in industry's manpower since late 1943 through December last year. The Bureau of Labor Statistics' figures on employment show that in that one year the number employed in blast furnaces, steelworks and rolling mills dropped from 524,000 to 474,000; in the steel castings industry, from 86,000 to 72,000; wire products, from 37,300 to 32,000; steel forgings, from 41,000 to 35,000; gray iron and malleable castings, from 104,000 to 98,000; and iron ore mining, from 30,000 to 25,000. Steel industry officials state that if present war steel requirements are to be met an additional 100,000 men must be employed in the mills.



PEAK PERFORMANCE



Trucks powered with READY-POWER gasoline-electric units are ready to go when you want them. Constant source of power permits unlimited hours of operation.

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Does some part of the product you make present an unusual problem? You are under no obligation when you ask our consultant service for help. Our engineering thinking and our machines are both adapted to doing the unusual. And chances are that a cold-forged part will be more economical for you.

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CONSTRUCTION AND ENTERPRISE

OHIO

AKRON, O.—Interstate Welding Service Inc., 914 Miami street, formerly operated by G. A. McLean, has been incorporated with $150,000 capital.

AKRON, O.—Firestone Steel Products Co., subsidiary of Firestone Tire & Rubber Co., will occupy part of the army engineers subdepot at Cambridge, O., where more than $4 million will be spent for improvement and equipment, including boiler plant, cranes, etc. Plant will manufacture steel rims for army motorized equipment.

BARBERTON, O.—G. I. Machine Co., 50 East Springfield road, has been incorporated with $500 capital and 500 shares no par value to operate a general machine shop, by John C. Stuver, 2183 Twenty-fifth street, Akron, O., and associates.

CANTON, O.—Hoover Co., care M. R. Streeby, will install equipment for manufacture of ordnance items at cost of about $97,000, for which priorities have been granted.

CLEVELAND—Electric Products Co., 1725 Clarkstone road, will build a one-story addition 21 x 44 feet, costing about $9300.

CLEVELAND—National Refining Co., A. L. List, president, Hanna building, care Louis S. Pierce, vice president, will make additions and improvements to its refinery at Findlay, O., at cost of $180,000.

CLEVELAND—J. & L. Steel Barrel Co., 8606 Crane avenue, is having plans drawn for a new galvanizing plant, replacing its one-story 60 x 120-foot plant recently burned. Cost is estimated at $20,000.

CLEVELAND—National Advisory Committee for Aeronautics, Washington, has received WPB authorization for installation of equipment for the compressor and turbine research wing and engine research building at Cleveland airport, to cost about $3,493,535, expiring Feb. 28, 1946.

CLEVELAND—Acme Boiler Co., 3726 West Seventy-third street, has been incorporated with $20,000 capital and 250 shares no par value to operate the former Acme Boiler & Welding Co. as a corporation instead of partnership. Philip Novitch, 359 Leader building, is agent.

CLEVELAND—Taylor Tractor Co., 222 East Sycamore street, Columbus, O., has sold its assets to a new partnership, Ohio Machinery Co., composed of Harold N. Graves, Glenn A. Bailey, Charles M. Daniels and Forrest J. Clemens, all formerly connected with La Plant-Choate Mfg. Co. Present manufacturing activities will be continued.

CLEVELAND—Joseph J. Bauer Sheet Metal Co. has been formed by Joseph J. Bauer, president, to manufacture hotel and kitchen accessories and other sheet metal work. Plant will be located at 937 East Seventy-ninth street. Capital is $500 and 250 shares no par value. Henry A. Pollack, 402 Engineers building, is agent.

SANDUSKY, O.—General Motors Corp., Frederick G. Hughes, western division manager, 7-123 General Motors building, Detroit, will build a plant on a site of 142 acres for manufacture of ball bearings, construction to be as early as war conditions permit.

WARREN, O.—Warren City Mfg. Co., 390 Griswold avenue, manufacturer of tank lighters, diesel engines, etc., will install rails for craneways at cost of $30,000.

WARREN, O.—Reconstruction Finance Corp Washington, has received WPB approval f construction of three warehouse units Wardwell yards for surplus machinery sto age. to cost $231,000, expiring May 3 1945.

WARREN, O.—Superior Metal Products C has been incorporated with $500 capital an 250 shares no par value to manufactur metal lath and other metal building materia by Arden O. Lea, agent, 331 Central park way, and associates.

CONNECTICUT

WINSTED, CONN.—Hudson Wire Co., O. F Bitzer, general manager, will build a one story brick factory 70 x 140 feet, costing about $40,000.

NEW YORK

BUFFALO—Public service commission has ordered reconstruction of the Babcock street bridge over Pennsylvania railroad tracks. Cost will be about $200,000, railroad paying half and city and county a quarter each.

NEW JERSEY

PAULSBORO, N. J.—Socony-Vacuum Oil Co., Paulsboro, has let contract to Skinner, Cook & Babcock Inc., 60 East Forty-second street, New York, for a one and two-story lubricating oil pilot plant laboratory, to cost about $75,000. F. G. Frost, 144 East Thirtieth street, New York, is architect.

MICHIGAN

ANN ARBOR, MICH.—King-Seeley Corp. has let contract to W. E. Wood Co., 4649 Humboldt avenue, Detroit, for a press shop addition estimated to cost $50,000. Giffels & Vallet, 1000 Marquette building, Detroit, are engineers.

COLDWATER, MICH.—Graff Mfg. Co., 28 Balfour drive, has been incorporated with $10,000 capital to manufacture metal products, by Henry Graff, same address.

GRAND RAPIDS, MICH.—Smith Industries Inc., 4 Alten street NE, has been incorporated with $50,000 capital to manufacture metal and plastic moldings, by Harvey Smith, same address.

HAMTRAMCK, MICH.—Champion Spark Plug Co., 8525 Butler street, Detroit, has let contract to Barton Malow Co., 2631 Woodward avenue, for two fan houses estimated to cost about $45,000. Giffels & Vallet, 1000 Marquette building, Detroit, are engineers.

TEMPERANCE, MICH.—Allan Tube Bending & Mfg. Co. has been incorporated with 500 shares no par value to manufacture and fabricate tubing, by Rose H. Glimpse, 3549 Bowen road, Toledo, O.

ILLINOIS

CHICAGO—Clearing Machine Corp., 6499 West Sixty-fifth street, will build a one-story 67 x 187-foot and 67 x 340-foot hydraulic press building addition, costing over $40,000.

CHICAGO—Amco Mfg. Co., 2319 North Springfield avenue, has plans by S. Klefstad, architect, 3600 West Fullerton avenue, for a one-story 59 x 105-foot plant at 6549 George street.

CHICAGO—Illinois Gage Co., 7810 West Addison street, has plans by S. Klefstad, 3900 West Fullerton avenue, for a 100 x 150-foot plant addition.

ALABAMA

BIRMINGHAM, ALA.—Rheem Mfg. Co., W. E. Curran, vice president in charge of production, Birmingham, plans expenditure of $1,500,000 for opening a second plant and expansion of plant at North Birmingham.

MISSOURI

LEBANON, MO.—City, City Hall, plans a sewage disposal plant costing $25,000 to $30,000 and has applied for FWA funds.

ERIE BUCKETS

General Purpose
Dredging and Hard Digging
Dragline
Material Handlers
Hook-on Type
Ore Handling
Coal and Coke
4-Rope
Barge Type
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Above types built in weights and capacities to suit your crane and job requirements.

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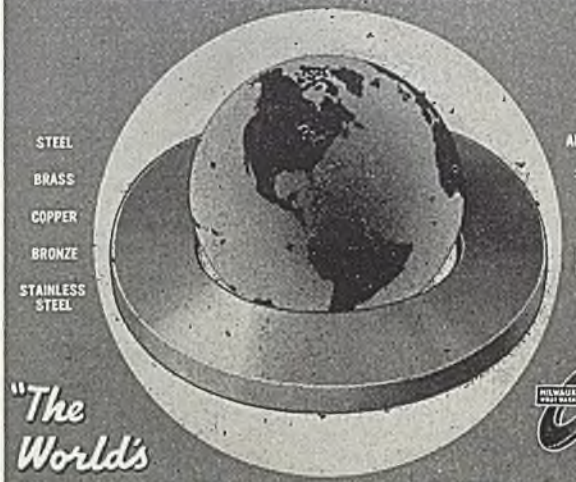

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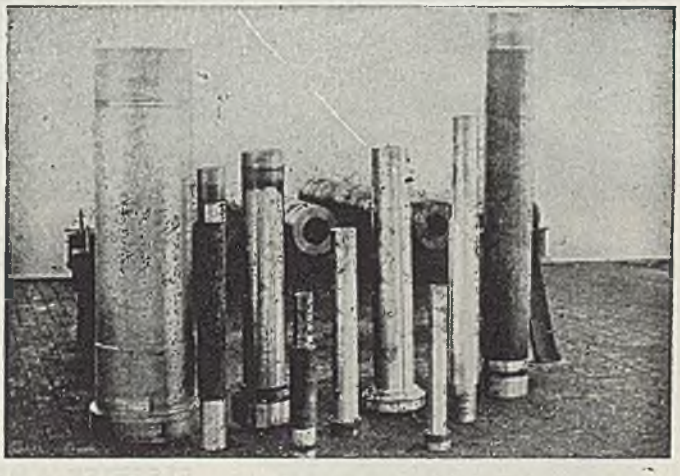

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Burns & McDonnell, 107 Linwood boulevard, Kansas City, Mo., are consulting engineers.

ST. LOUIS—Fruehauf Trailer Co., 2122 Chouteau avenue, has bought a site 351 x 628 feet for a trailer plant to cost about $250,000.

ST. LOUIS—Mallinckrodt Chemical Works, 3600 North Second street, has let contract to Dickie Construction Co., Louderman building, 317 North Eleventh street, for alterations and improvements at 3500 North Second street, to cost about $50,000.

WISCONSIN

PORT WASHINGTON, WIS.—Wisconsin Electric Power Co., 231 West Michigan street, Milwaukee 3, has plans by F. Luber Jr., care owner, for a powerplant addition, third unit, and 80,000-kw. generating unit, costing about $7 million.

CALIFORNIA

ALHAMBRA, CALIF.—Wintroath Pumps Inc. has plans by M. J. Gabrielson, structural engineer, 6362 Hollywood boulevard, Hollywood, Calif., for a shop addition 25 x 80 feet.

GLENDALE, CALIF.—Psenner-Pauff Automotive Parts Inc., 620 South Brand boulevard, has let contract to Myers Bros., 307 San Fernando road, for a machine shop and parts building at 112 East Maple avenue, 75 x 155 feet, one and part two stories, to cost about $50,000. Plans by Adrian Wilson, architect, 607 Architects' building, Los Angeles.

LONG BEACH, CALIF.—City has let contract to Stacy Bros. Gas Construction Co., Cincinnati, at $632,000, for five-million cubic foot telescopic gas storage holder.

LOS ANGELES—Alcorn Fence Co., 3340 San Fernando road, will build a shop and office building 30 x 105 feet, to cost $6500.

LOS ANGELES—Westland Drawn Steel Co., 2451 East Twenty-third street, has building permit for plant addition 27 x 95 feet, to cost $2500.

LOS ANGELES—Mechanical Development Co., 1000 North Orange drive, will build a machine shop addition 30 x 147 feet, to cost about $12,000.

WASHINGTON

SEATTLE—Sternoff Metals & Iron Works will build a boiler plant and machine shop at present plant, 6431 Airport Way.

CANADA

BRANTFORD, ONT.—Massey-Harris Co. Ltd., 915 King street West, Toronto, has given general contract to A. W. Robertson Ltd., 57 Bloor street West, Toronto, for addition to its Market street plant here, to cost $600,000. Dominion Bridge Co. Ltd., 1139 Shaw street, Toronto, has structural steel contract and Dominion Structural Steel Ltd., 57 Bloor street West, Toronto, will supply reinforcing steel.

HAMILTON, ONT.—Perga Containers Ltd., 1581 Main street West, has called bids for plant addition and installation of equipment to cost about $32,000. Prack & Prack, 36 James street South, are architects.

LONG BRANCH, ONT.—Sully Brass Foundry Ltd., 7 Wabash avenue, Toronto, will erect foundry plant here, estimated to cost with equipment about $50,000. E. I. Davidson, Excelsior Life building, architect.

TORONTO, ONT.—Aro Cast Mfg. Co. Ltd., 12 Queen street East, has started preliminary work on a plant here, to cost about $30,000. Clare C. Maclean, 85 Vaughan road, is architect.

TORONTO, ONT.—National Screw Products Corp., 629 Northcliffe boulevard, is having plans prepared for a plant estimated to cost with equipment about $25,000.

TORONTO, ONT.—Coulter Mfg. Co., 2358 Gerrard street East, has had plans prepared for a plant addition here to cost about $20,000. E. O. Ewing, 25 Parkwood avenue, is engineer.

TORONTO, ONT.—Watson Spring Co. Ltd., 191 Parliament street, has given general contract to James Bodie Construction Co. Ltd., 456 Pape avenue, for a one-story building, estimated to cost with equipment about $35,000.

WESTON, ONT.—Moffatt's Ltd., 23 Dennison avenue, stoves, etc., has given general contract to J. Robert Page, 18 Toronto street, Toronto, for a plant addition here, estimated to cost with equipment about $60,000.

WINDSOR, ONT.—Auto Specialties Mfg. Co. (Canada) Ltd., 614 Tecumseh road East, has given general contract to Dinsmore-McIntyre Ltd., Security building, and structural steel contract to Canadian Bridge Co. Ltd., 1219 Walker road, for plant building to cost about $20,000, equipment extra.

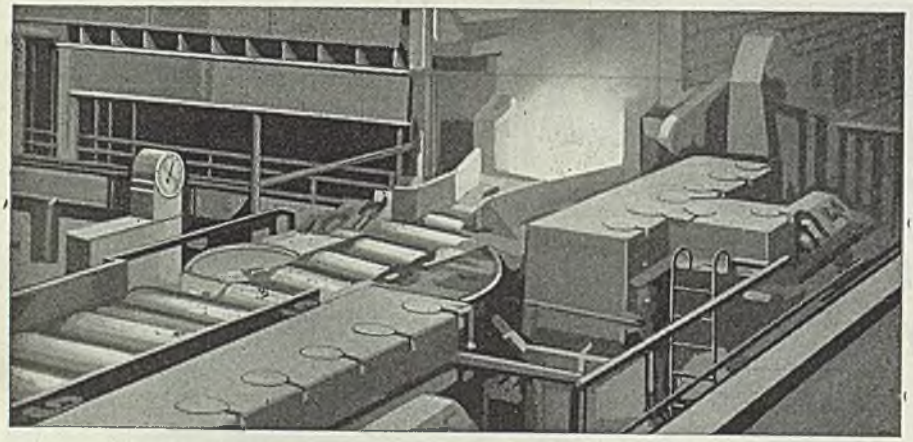
LACHINE, QUE.—Steel Co. of Canada Ltd., 75 St. Joseph street, has received tenders and will let contracts immediately for demolishing No. 4 plant building here and new building to cost approximately $50,000.

MONTREAL, QUE.—City Wire & Iron Products Co., 1590 Laurier avenue East, plans a plant building to cost about $25,000.

MONTREAL, QUE.—Canadian Industries Ltd., 1135 Beaver Hall Hill, will call tenders soon and plans to start work about April 1st on a new plant building estimated to cost with equipment about $110,000.

MONTREAL, QUE.—Dominion Lock Co. Ltd., 3830 St. Ambroise street, Sam Zion, president, is having plans revised and new tenders will be called by architect Harold J. Doran, 4700 Cote des Neiges road, for plant estimated to cost about $40,000.

SUTTON, QUE.—Sutton Silk Mills Ltd., plans addition to silk plant here, to cost about $100,000.



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DPC Authorizes Plant Expansion, Equipment

Defense Plant Corp. has authorized the following expansions and equipment purchases (figures are approximate):

Aviation Corp., New York, $600,000 to provide equipment at a plant at Williamsport, Pa.

General Electric Co., Schenectady, N. Y., $50,000 increase in contract to provide additional equipment at a plant at Bridgeport, Conn., making overall commitment $140,000.

Cornelius Co., Minneapolis, $70,000 increase in contract, making overall commitment $265,000.

Goodyear Aircraft Corp., Akron, O., $500,000 increase in contract, making overall commitment $9,750,000.

Hayden Chemical Corp., New York, $120,000 increase in contract to provide additional plant facilities at Princeton, N. J., making overall commitment $2,800,000.

Kellett Aircraft Corp., Philadelphia, $70,000 increase in contract, making overall commitment $500,000.

Pacific Tire & Rubber Mfg. Co., Oakland, Calif., $1,000,000 for material and equipment for expansion of plant facilities.

Pharis Tire & Rubber Co., Newark, O., $1,000,000 for expansion of a tire plant at Newark.

Red Star Yeast & Products Co., Milwaukee, $220,000 for additional machinery and equipment.

Textile Rubber Co. Inc., Bowdon, Ga., $250,000 for material and equipment for plant expansion.

Wright Aeronautical Corp., Paterson, N. J., $2,500,000 increase in contract to provide facilities at Woodridge, N. J., making overall commitment $70,000,000.

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MANAGEMENT COUNSEL

Mr. Richardson is counselor on foundry practices, equipment, facilities and standardization of alloys for specific applications. He is a registered, licensed, professional engineer with a B.S. degree in administrative engineering from Yale University. He also studied at Rutgers University and Stevens Institute. He was formerly foundry engineer with nationally known steel companies and foundry superintendent and production manager with ferrous and non-ferrous foundries.

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