Design of blanking dies reduces scrap loss in manufacture of farmers' forks. Page 98

STEEL

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NEWS

TECHNICAL

FEATURES

MARKETS

Stainless Steel Lined Polymerization Reactors in Synthetic Rubber Plant

Equipment of Stainless Steel, Nickel and Monel meets many specialized requirements

Chemical engineers have met America's wartime challenge.

They opened the gates to a mighty flood of products going to war...strategic raw materials, synthetic substitutes, and entirely new substances having advantages all their own.

A factor in this production success is the wide use of stainless steel, Monel, and other corrosion-resistant alloys containing Nickel.

For in the chemical industry corrosion is a large-scale menace.

To wage war on this enemy, chemical engineers enlisted the aid of Nickel, because Nickel imparts to other metals strength and resistance to corrosion and wear. In the chemical field, as in many others, a little Nickel goes a long way to keep equipment producing.

It prolongs the life of processing apparatus, and protects the purity, color, and uniformity of the product.

Hence, stainless and Nickel alloys are specified widely for acid heaters and caustic coolers, for high-pressure autoclaves and vacuum evaporators, for cracking towers and polymerization reactors, for shipping drums and tank cars, for pumps, piping and storage tanks, for agitators and settlers, for stills and digestors—for every type of equipment that converts laboratory experiments into full-scale chemical operations.

For years we have enjoyed the privilege of cooperating with technical men of the chemical industry...and of many others. Whatever your industry may be ...if you want help in the selection, fabrication, and heat treatment of alloys... we offer you counsel and data.

New Catalog Index

New Catalog C makes it easy for you to get Nickel literature. It gives you capsule synopses of booklets and bulletins on a wide variety of subjects—from industrial applications to metallurgical data and working instructions. Why not send for your copy of Catalog C today?

* Nickel *

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

STEEL
May 8, 1944

Square Deal for Veterans

In paid advertisements appearing in certain newspapers and magazines, the International Harvester Co. reproduces excerpts from an address delivered by its president, Fowler McCormick, to company executives at a recent meeting in Chicago. The address is pertinent because it states clearly the attitude of an important company on the re-employment of former employes who have been in the armed services.

Mr. McCormick specifies three points in the company's attitude toward returning veterans. First is that the company and all of its people sincerely welcome the return of service men and women. He lays strong emphasis on the point that this welcome shall be natural, human, healthy, warm and realistic. No trace of charity or sentimentality shall be permitted to enter into it.

The second point is that company personnel shall be understanding of the returned one's problem. His foreman and superintendent should study his previous record with the company, learn as much as possible of his record in the service, find out what he wants to do and study what he is best fitted to do.

Third is the delicate problem of placing the returned employe in the most appropriate job—once all of the available information on his fitness has been obtained.

Indicative of the sincerity behind this program is Mr. McCormick's recital of two hypothetical cases. One is the Harvester man who, holding a modest job before the war, has "clicked" in the army. He has received special training, acquired new abilities and risen to the rank of captain, major or even lieutenant colonel. Certainly it would be unfair to put this man back on his old job.

At the other extreme is the man, possibly a young foreman or office manager, who has fared unfortunately in the service. He has not "clicked." He comes back not as good a man as when he left. How is this man to be handled?

The Harvester attitude is one that every American industrial employer should emulate. A number of large companies already are far along on constructive re-employment programs. Bethelehem Steel, for instance (p. 74, Feb. 14 issue), has inaugurated a comprehensive plan to give returning Bethlehem veterans a square deal.

More companies should be devoting primary attention to this problem. The attitude of all employers should be so uniformly constructive that there will be no danger that industry as a whole can be justly charged with having evaded its responsibility to its former employes.

SECOND SICK CHICKEN? It is not easy to appraise the real significance of the Montgomery Ward seizure. Almost every fair-minded citizen agrees that the action of the government in using troops was unnecessary and unwise. Similarly, the pretense by which Attorney General Francis Biddle linked Montgomery Ward activities with the war effort was rather feeble. The effect of the entire episode was to deny the company a right guaranteed it by the Constitution.

The surprising thing is that the administration would place itself in such a compromising position —not to aid the war effort—but merely to try to further entrench the principle of maintenance of membership. Why is the administration so eager to establish this highly dangerous clause?

Fortunately, Congress is looking into the matter and the industry members of WLB are demanding

(OVER)

a court test of the board's authority to grant unions maintenance of membership clauses in their contracts.

If the Montgomery Ward case, coupled with the minority demand for a judicial test, should succeed in arousing a thorough airing of the government's stand on the maintenance of membership, the eviction of Sewell Avery may prove to be to WLB labor policy what the sick chicken case was to NRA.

—pp. 72, 73

* * *

OUTPUT PEAK AHEAD? Many competent authorities have expressed the conviction that 1943 may prove to be the peak year of production for this war. This view probably is based upon the assumption that if the invasion succeeds, munitions output will be cut back sharply and the total for 1944 will fall behind that of 1943.

However, the WPB report for March brings out several points which make one wonder whether 1944 output will fall below 1943 output. For one thing, the munitions index is definitely on the rise, after set-backs in January and February. In fact, the preliminary index number for March, 660, is only 2 points short of the record high of 662 recorded last December.

Also munitions programs now scheduled to increase account for four-fifths of the total production goal for 1944. Programs accounting for only one-fifth now are scheduled to be cut back. In short, if WPB's present work chart remains unchanged, output in 1944 will exceed that of 1943. —pp. 96, 97

* * *

STEEL FOR HOUSING: Announcement by President Benjamin F. Fairless that the United States Steel Corp. has acquired a substantial interest in the Gunnison Housing Corp. of New Albany, Ind., lends emphasis to the keen interest in prefabricated houses which has been evidenced unofficially by U. S. Steel officials during the past few years. On several occasions, Mr. Fairless and other executives, when questioned about postwar developments, have displayed to interviewers a knowledge of housing which indicated that they were exceedingly well informed on the subject.

The Gunnison organization has broad experience in the housing field. Inasmuch as most of its activity has been in connection with houses constructed chiefly of wood or plywood, it may be assumed that U. S. Steel is interested primarily in Gunnison's familiarity with the problems of the field and that the new alignment is intended to facilitate the development of new markets for steel. —p. 67

NEEDS INDEPENDENCE: Looking forward to the time when an easing in the demand for war goods will permit the diversion of materials and manpower for civilian goods, some members of a Senate special committee on the problems of small plants are proposing that the government engage in "block buying" to facilitate the flow of materials to small manufacturers.

We are not surprised that a number of representatives of "small business" oppose this idea. Granting that the conditions of wartime regulation have imposed unusual hardships upon smaller companies and that they sorely need assistance in getting back to a sound peacetime basis, assistance in the form of federal "block purchasing", subsidies or anything else which will keep the hand of government in business indefinitely may do the small businessman more harm than good.

We think the better approach is to see what can be done to afford the small company freedom of opportunity—independence—to work out its own problems. —p. 75

* * *

INGENIOUS "KNOW HOW": In this age of extreme mechanization in production it is always interesting to note how manufacturers develop methods for making articles which, for various reasons, lend themselves only partially to machine operations.

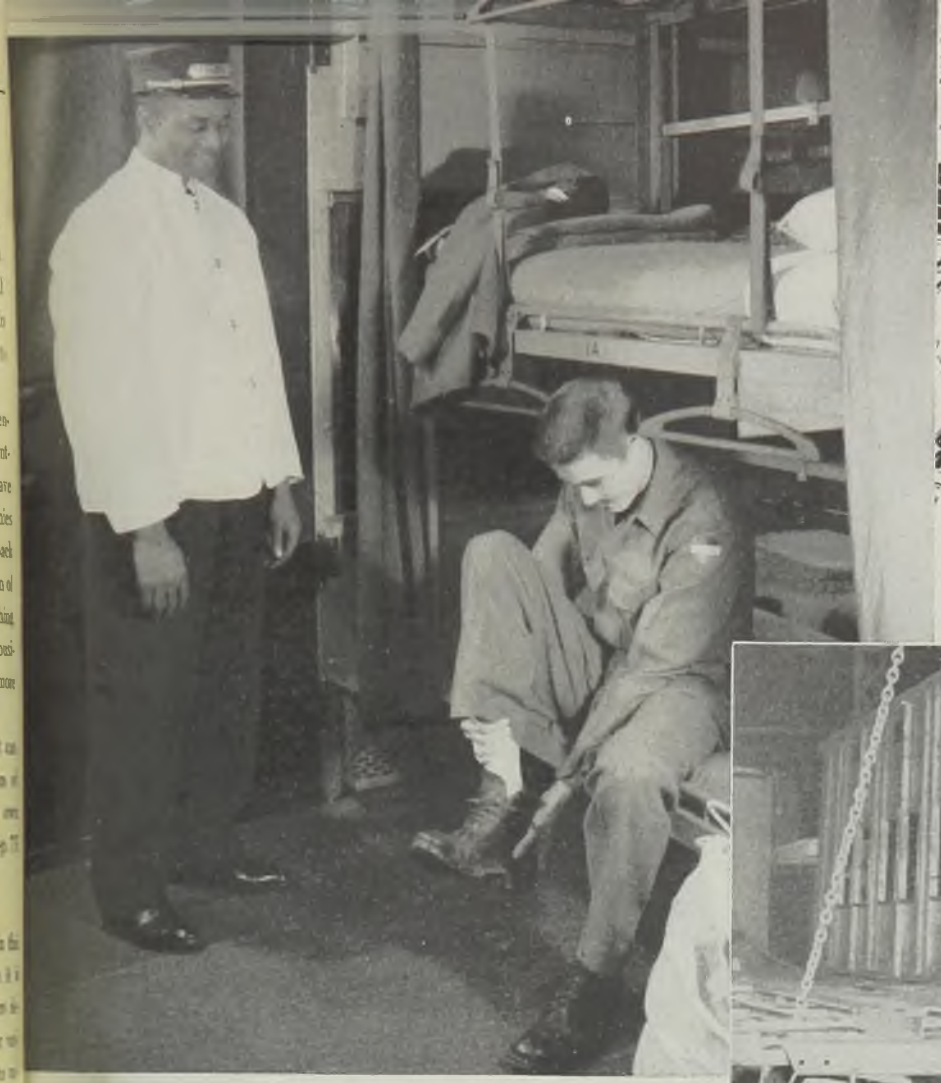
A good illustration is the manufacture of the standard 10-tine ensilage fork used by American farmers. Comb-shaped blanks are pressed from ½ x 5-inch bars. Each blank is doubled back so that one stub or "tooth of the comb" stands alone and can be inserted by a skilled workman in the tine-forging grooves of roll dies. After all 10 tines are forged in this manner, the backbone is straightened, the shank aligned and the fork pressed to horizontal shape in a bulldozer. Next the tines are bent to proper curvature in an ingenious "leaf drop." After a final hand straightening, the forks are heat treated.

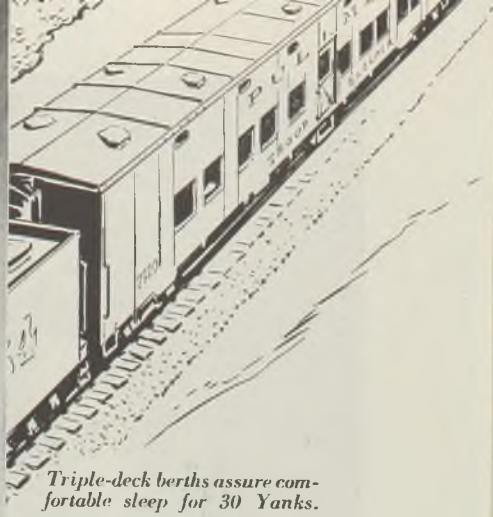
This combination of manual and machine operations, in which the skill of workmen plays an important part, is highly efficient. It is typical of a technique which in times of peace or war gives American manufacturing a high rating for resourcefulness.

—p. 98

E. L. Shaner

EDITOR-IN-CHIEF





Triple-deck berths assure comfortable sleep for 30 Yanks.

Sub-assemblies speed up the job of building 1,200 new troop sleepers.

Victory Special

Thousands of tons of steel sheets, bars, plates, and shapes, rolled at the great Indiana Harbor Works of Inland Steel Co., are being used by the Pullman-Standard Car Manufacturing Co. in building 1,200 new triple-deck sleepers for the Army.

Each car has 30 berths arranged in tiers. The triple width seats are grouped in sections on one side of the car. For daytime use the top berths remain fixed. The back of the wide, comfortable seat is raised into position for the second berth, and the seat itself forms the lower berth. Each car will have its porter, and a full complement of standard steel bed springs, mattresses, warm blankets, sheets, etc.

These new troop sleepers are another example of the wartime use of steel from Inland—an example of how Inland is helping to bring Victory closer, so that we may again satisfy the peacetime needs of our country.

Sheets · Strip · Tin Plate · Bars · Plates · Floor Plate · Structurals · Piling · Rails · Track Accessories · Reinforcing Bars

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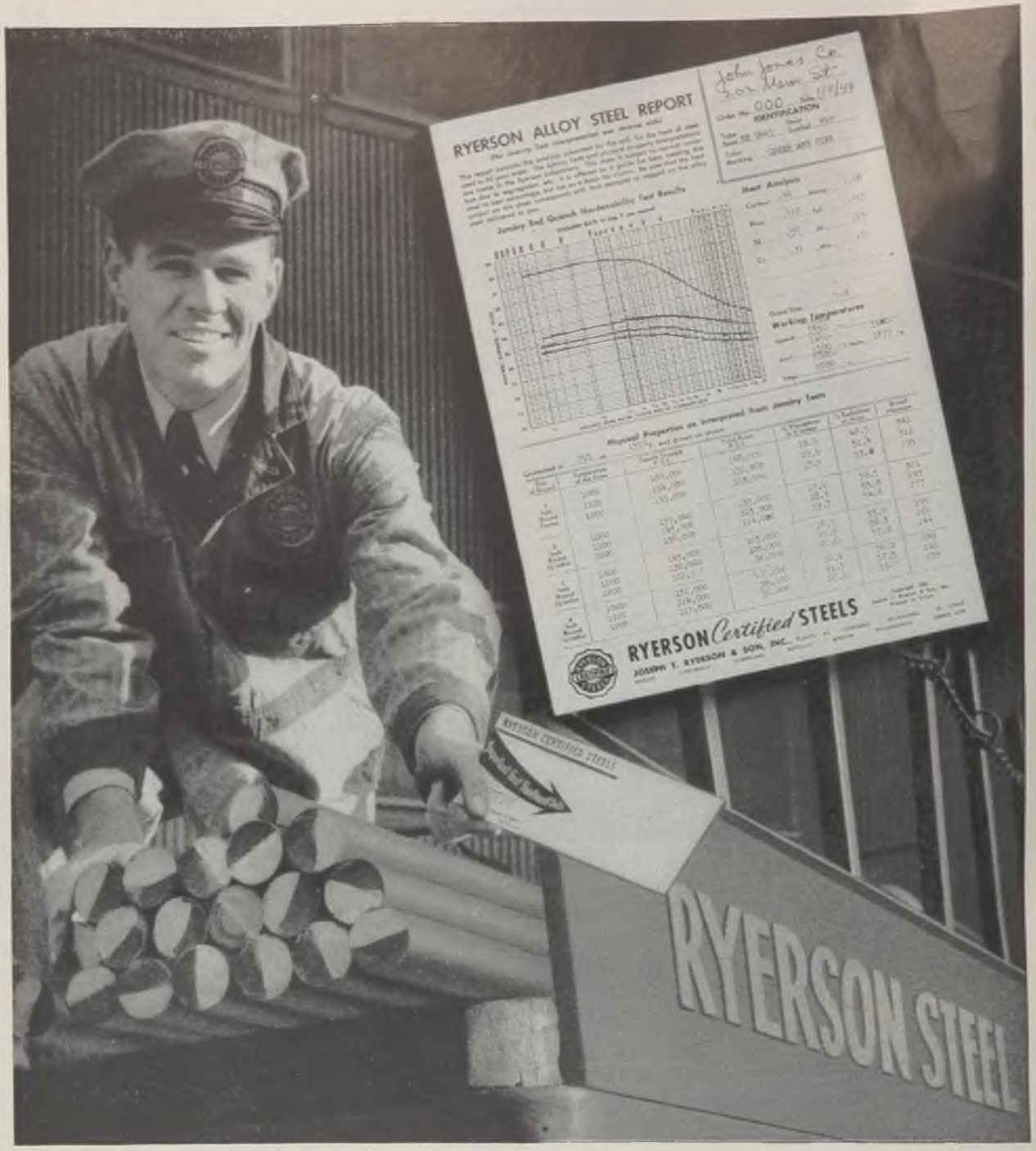


New Data With Alloy Shipments

When you buy alloy steel from Ryerson you receive helpful information on the heat-treating characteristics of the steel with each shipment. This time and money-saving information is included in the individualized Ryerson Alloy Steel Report which gives you more complete data than has ever before been furnished with steels shipped from stock.

A separate report sheet is supplied for each heat, and all heats are easily identified through color markings and heat symbols.

From large and complete alloy steel stocks at Ryerson you can select the steel best suited to your needs. A wide range of analyses and sizes in carburizing, medium hardening and high hardening grades are available in hot rolled, cold finished and heat-treated form.

Call your nearby Ryerson Plant for quick action on steels of any kind . . . and for a special service on alloys.

JOSEPH T. RYERSON & SON, INC.

Steel Service Plants at: Chicago, Milwaukee, St. Louis, Detroit, Cleveland, Cincinnati, Buffalo, Boston, Pittsburgh, Philadelphia, Jersey City

Profit Trend Continues To Decline

First quarter net falls 54 per cent below corresponding figure in 1941. Rising costs and shift in demand from alloys and special steels to cheaper grades large factors in narrowing profit margin. Lower tax provisions reflect decreased earnings

FIRST 16 leading steel producers, representing 85 per cent of the industry's ingot capacity, to issue financial statements for the initial three months of this year had an aggregate net profit of $38,864,459.

This represents a decline of 54 per cent from the $82,798,268 earned by practically the same group of companies in like 1941 quarter; while in corresponding 1942 and 1943 periods this group reported net income of $55,718,780 and $41,263,754, respectively.

The same profit trend in earnings is also noted among those steel companies having finishing capacity only. All three finishing companies listed in the table below had lower net earnings in the latest period compared with a year ago.

Among the pig iron interests a sharp drop in earnings was recorded by Interlake Iron Corp. and Sloss-Sheffield Steel & Iron Co. Woodward Iron Co.'s profits registered a slight gain.

In sharp contrast with the earnings' trend the industry's steel ingot production has risen steadily since the war started, reaching a new record of 22,588,388 net tons in the first three months this year or 11.4 per cent over the 20,276,709 tons produced in the comparable 1941 quarter. In terms of net sales the increase is even greater, exceeding 100 per cent.

Shift in demand from alloys and special steels to more common grades of basic steel last quarter compared with a year ago, combined with constantly rising costs of labor, materials and supplies with fixed ceiling prices, are chief factors in the lower profit showing during the latest period. Because of these rising costs, together with somewhat lower operations probable this summer because of the manpower shortage and inability to work current long hours, a further decline in earnings is indicated over the remainder of the year.

Payroll Costs Up

Rising labor costs are illustrated in the latest report of the United States Steel Corp. Average number of employes of the corporation totaled 323,938 during the first quarter, or 11,930 below same period a year ago, while total payrolls were up $26,000,000.

In connection with the change in types of steel being produced, Sharon Steel Corp. reports a decline of 60 per cent compared with last year in output of alloys and special steel.

INDUSTRIAL EARNINGS

Industrial Groups	Net Income First Quarter 1943	1944	Per Cent Change
	(In Thousands of Dollars)		
Steel	$43,511	$40,311	— 7.4
Electrical	18,994	19,352	+ 1.9
Machinery	6,862	8,033	+17.1
Autos	43,553	52,520	+20.6
Metal products	31,526	30,100	— 4.5
Stone	5,144	7,510	+46.0
Food	18,125	17,737	— 2.1
Textiles	3,705	3,423	— 7.6
Paper	3,060	3,205	+ 4.7
Chemicals	27,369	23,852	—12.9
Petroleum	21,214	31,147	+46.8
Misc. Mfg.	14,671	16,471	+12.3
Total Mfg.	237,734	253,661	+ 6.7
Mining	13,397*	13,228*	— 1.3
Trade	4,638	3,871	—16.5
Service	2,822	3,272	+15.9
Total	$258,591	$274,032	+ 6.0

*Before certain charges.

Substantial increase in costs have more than offset steadily rising sales volume in recent years, resulting in a substantial reduction in estimated federal income tax provisions. First quarter tax provisions for 14 steel producers totaled $113,451,959 in 1942, compared with $107,112,204 and $69,864,320 in the corresponding 1943 and 1944 periods.

Due to capacity operations the industry has been able to absorb the increased

Comparison of Steel Producers' Earnings, Taxes

	Net Profits First Quarter			Income Taxes First Quarter		
	1944	1943	1942	1944	1943	1942
United States Steel Corp.	$17,027,616	$15,406,597	$27,921,534	$15,200,000	$28,100,000	$39,755,482
Bethlehem Steel Corp.	6,432,538	6,228,693	6,140,688	24,310,000	28,880,000	24,190,000
Republic Steel Corp.	2,216,611	3,666,557	4,716,962	9,725,000	17,450,000	18,000,000
Jones & Laughlin Steel Corp.	1,708,352	2,399,369	2,491,718	2,417,000	6,398,050	5,420,000
Youngstown Sheet & Tube Co.	1,636,369	2,147,027	2,576,579	4,222,000	6,761,000	7,700,000
National Steel Corp.	2,550,143	2,680,850	2,675,837	4,850,000	6,325,000	4,825,000
Inland Steel Co.	2,512,396	2,796,321	2,689,090	4,503,000	5,100,000	6,386,000
American Rolling Mill Co.	1,229,035	1,535,205	1,731,635	NA	NA	NA
Wheeling Steel Corp.	992,945	961,391	1,200,090	1,205.000	1,658,000	2,625,000
Colorado Fuel & Iron Corp.	663,225	416,389	823,273	628,220	618,200	723,600
Pittsburgh Steel Co.	114,939	600,121	645,334	95,600	1,755,300	1,290,300
Granite City Steel Co.	102,115	121,560	77,657	50,000	76,000	55,000
Sharon Steel Corp.	166,512	445,564	250,302	595,000	1,593,000	625,000
Allegheny Ludlum Steel Corp.	800,110	936,135	915,644	*2,696,930	NA	*3,164,900
Keystone Steel & Wire Co.	269,600	220,854	364,083	619,500	253,654	405,577
Rustless Iron & Steel Corp.	544,068	822,681	576,011	1,494,000	2,220,000	1,506,000
Totals	$38,864,459	$41,263,754	$55,718,780	$69,864,320	$107,112,204	$113,451,959
FINISHING CAPACITY ONLY						
Superior Steel Corp.	$ 123,612	$ 151,015	$ 121,786	$ 845,175	$1,953,925	$ 564,789
Eastern Rolling Mill Co.	98,151	123,226	190,331	253,514	451,706	160,944
Acme Steel Co.	420,987	422,316	516,678	1,683,947	1,045,072	NA
PIG IRON CAPACITY ONLY						
Interlake Iron Corp.	$182,573	$260,430	$444,762	$302,000	$446,000	$598,000
Woodward Iron Co.	252,728	251,815	397,337	6,357	261,758	350,756
Sloss-Sheffield Steel & Iron Co.	170,522	354,367	277,741	NA	NA	NA

NA—Not Available. *Not included in totals

costs during the war period. However, most observers hold that even a moderate decline in operations would change the industry's modest profit into a deficit.

Present labor union wage increase and other demands now pending settlement before the War Labor Board panel would, if granted, wipe out the industry's ability to earn even a small profit, much less build up a reserve with which to ease unemployment and keep operating facilities intact during depressions.

A tabulation (see table at top of p. 65) of 295 leading industrial corporations for the first quarter, compiled by the National City Bank of New York, shows a combined net income during the first quarter this year of $274 million. This represents a gain of 6 per cent over the $259 million recorded in like 1943 period, but is 19 per cent below the first quarter 1941 showing.

The 25 companies representing the iron and steel group in the bank's tabulation showed a decline of 7.4 per cent in earnings last quarter compared with a year ago.

Higher Wages Mean Higher Prices, Olds Tells U. S. Steel Meeting

DECLARING that present labor demands upon the steel industry were a highly important matter not only for the United States Steel Corp. and the steel industry, but also for the entire public, Irving S. Olds, chairman, told U. S. Steel stockholders at their forty-third annual meeting in Hoboken, N. J., May 1, that meeting such demands would inevitably result in higher wages in all industries and in higher prices for almost everything.

He pointed to a continued decline in the corporation's profits, despite an all-time record as to gross income. Last year's profits, available for dividends, of $63,448,546, compared with $71,248,569 in 1942 and $116,171,075 in 1941.

Corporation's 1943 net income, plus interest on long-term debt, represented a return of 3.97 per cent on net assets, compared with 4.48 per cent in 1942. This relatively small profit for 1943, despite near capacity operations, reflects the inevitable outcome of higher costs pressing against government-imposed price ceilings, Mr. Olds said.

Under the circumstances, he declared the corporation was financially unable to absorb such higher employment costs, as are represented in the present labor demands, without an increase in its present prices for steel products.

Increase in wages of 17 cents an hour, as demanded by the union, would amount to more than $81,000,000 annually for the corporation's five steel producing subsidiaries. An additional cost to these five companies, estimated at $85,000,000 annually, would result from the granting of the additional demands, other than a guaranteed annual wage, severance pay and a fund for steelworkers in the armed services.

About $89 million were expended during the last year for additions to and betterments of the properties of subsidiary companies. On March 31 last, the unexpended balance for property additions and replacements amounted to around $57,600,000.

Stockholder Proposes Resolution

Sewell L. Avery, Philip R. Clarke, B. F. Fairless, William A. Irvin and Enders M. Voorhees were re-elected members of the board of directors for a 3-year period.

A resolution was proposed by a stockholder and passed by those present to the effect that "stockholders of the United States Steel Corp. are proud to number among our directors Sewell L. Avery."

Another resolution, adopted by stockholders present and proposed from the floor, opposed federal taxation of dividends to stockholders of corporations, where incomes from which such dividends are paid already have been subject to corporate income taxes. It held such "double taxation is unfair and impedes the use of risk capital to aid full employment and to improve our standard of living."

A third resolution, assailing the anti-trust laws, was tabled.

Mr. Olds revealed that the steel corporation and the General Motors Corp. had been asked by the late Secretary of the Navy Knox to aid in the solution of the problems involved in the distribution of combat equipment for effective use against the enemy.

Thirteen of the 14 subsidiary companies, subject to federal contract renegotiation, were found to have realized no excessive income up to Dec. 31, 1942. The Federal Shipbuilding & Dry Dock Co. was considered separately as

Irving S. Olds, chairman, United States Steel Corp., seated, discusses a problem with Stockholder Morris Steinberg at the corporation's forty-third annual meeting. Behind them is Benjamin Fairless, U. S. Steel president, conversing with another stockholder, Mrs. Allan De Cazenove

a member of the shipbuilding industry, and renegotiation of its contracts resulted in a reduction of $3,000,000 in the selling prices of its deliveries under the Navy Department contracts up to Dec. 31, 1942. After federal taxes, this amounted to a refund of $570,000, Mr. Olds said.

Allegheny Ludlum Has Net Profit of $800,110

First quarter net profit of Allegheny Ludlum Steel Corp., Pittsburgh, totaled $800,110, equal to 59 cents a common share, compared with $936,135, or 70 cents a share, in like 1943 period. Tax provisions last quarter amounted to $2,696,930; no figures for comparable 1943 period are available. In like 1942 period the company's income tax provisions amounted to $3,164,900.

National Steel's First Quarter Net Is $2,550,143

Net income of National Steel Corp., Pittsburgh, amounted to $2,550,143 during the March quarter, equivalent to $1.15 per share on capital stock. In like 1943 period company earned $2,680,850, or $1.21 a share. Tax provisions amounted to $4,850,000 and $6,325,000 in the first quarter 1944 and 1943, respectively.

Republic Steel Reports Net of $2,216,611

Republic Steel Corp., Cleveland, had first quarter net profit of $2,216,611, or 30 cents a common share. This compares with $3,666,557, equal to 56 cents a share in like period a year ago. Tax provisions in the initial three months this year totaled $9,725,000, compared with $17,450,000 in the corresponding 1943 period.

Granite City Reports Net Income of $102,115

Granite City Steel Co., Granite City, Ill., reports first quarter net profit of $102,115, equal to 27 cents per share on capital stock, compared with $121,560, or 32 cents a share, in like 1943 period. Tax provisions amounted to $50,000 and $76,000 in both periods, respectively.

Colorado Fuel & Iron Has Profit of $663,224

First quarter net income of Colorado Fuel & Iron Corp., Denver, totaled $663,224, compared with $416,389 in same period last year. Income tax provisions amounted to $628,220 in latest period, against $618,200 for like 1943 quarter.

U. S. Steel Buys Into Gunnison Corp.

Acquisition seen giving impetus to use of more steel in homes in postwar period. Mass production methods expected to lower unit costs

SIGNIFICANT development in the prefabricated steel housing field is the acquisition of a substantial interest in the Gunnison Housing Corp., New Albany, Ind., by the United States Steel Corp., announced last week by Benjamin F. Fairless, president of the steel corporation.

The move, according to Mr. Fairless, will provide the corporation with research facilities and the experience of an established organization serving prefabricated home buyers. It is particularly significant in view of the fact the Gunnison corporation in the past has for the most part built houses almost entirely of wood and plywood. Shift in ownership to the steel corporation is believed certain to give

(*Please turn to Page* 186)

Present, Past and Pending

■ STEEL INDUSTRY EARNS 5.1% ON INVESTMENT IN 1943

NEW YORK—Steel industry's net earnings in 1943 dropped to a new wartime low, representing a return of 5.1 per cent on investment and 2.8 per cent on sales volume, the American Iron and Steel Institute states. Net income last year was about $20 million under the $221,230,000 reported in 1942.

■ APRIL AIRCRAFT PRODUCTION DECLINES SLIGHTLY

WASHINGTON—Aircraft production in April dropped to 8343 planes, compared with 9118 in March. WPB Vice Chairman C. E. Wilson explained decline was due to the fewer working days in April and greater concentration on types most urgently in demand.

■ BOSSES TO DON OVERALLS TO LICK LABOR SHORTAGE

CLEVELAND—Fifty junior executives at the Cleveland Graphite Bronze Co. have expressed their willingness to don overalls and work in the factory for a 48-hour shift to overcome the manpower shortage. They would work another two hours a day at their office jobs and each would have a woman administrative assistant to carry on routine matters.

■ ALUMINUM COMPANY TO CLOSE DOWN TWO LINES

QUEENS, N. Y.—The Aluminum Co. of America has been ordered by the War Production Board to close down two production lines at the government-owned plant here. Move was taken to bring production in line with consumption which is running lower than expected.

■ SEES BACKLOG OF 1,250,000 TRUCK SALES

NEW YORK—A backlog of 1,250,000 truck sales already has been built up since the war started and the total still is growing, according to C. T. Ruhf, president, Mack Trucks Inc.

■ ASKS FURTHER TESTS FOR TRIPLE-ALLOY SCREWS

WASHINGTON—Use of triple-alloy steel instead of single-alloy steel for recessed-head screws has not yet been sufficiently tested, according to WPB officials following a meeting of the Machine, Wood and Sheet Metal Industry Advisory Committee. Products made with triple-alloy steel must be subjected to use tests before final conclusions can be arrived at, industry members said.

■ APRIL PLATE SHIPMENTS TOP YEAR AGO

WASHINGTON—April shipments of plates totaled 1,141,947 tons compared with 1,121,647 in the like month last year, according to the War Production Board.

■ DOHERTY LEAVING WPB SCRAP POST

WASHINGTON—William J. Doherty, who has been allocating scrap for WPB, is leaving that post after two years service to go with the Buffalo Steel Co. as sales agent in charge of the New York area.

■ TWO OFFICIALS OF AMERICAN CHAIN DIE

BRIDGEPORT, CONN.—W. M. Wheeler, 72, secretary, American Chain & Cable Co. Inc., died in this city, April 29. He had been secretary and director of the company since its organization in 1912. Clark P. Lane Jr., secretary to W. B. Lashar, chairman of the American Chain & Cable Co., died suddenly at Stratford, Conn., May 1.

Emphasis on Postwar Planning at Pittsburgh Machine Tool Forum

More than 500, to whom Westinghouse Electric & Mfg. Co. was host, spend two days studying engineering and economic trends which will assure lively demands for American metalworking machinery after the war ends

By GUY HUBBARD
Machine Tool Editor, STEEL

WHEN a small group of machine tool men and business paper editors—of which this writer was one—met with some of the Westinghouse electrification experts in a conference room at the plant in East Pittsburgh in the spring of 1936, none of us realized that an institution of industry-wide importance just then was being established. Certainly none of us had any idea that nine years later this annual Machine Tool Electrification Forum would have developed to such an extent that the entire seventeenth floor of one of this country's largest hotels would be required to handle it.

Neither did we foresee that the "give and take" between the machine tool industry and the electrical industry at that and subsequent forums would play a very important part in helping the machine tool builders effectively to meet the unprecedented demands of a great war and to plan effectively to meet the new conditions and new demands which will follow that war.

Twenty-seven Authorities Speak

While no one among the 27 authorities who addressed the ninth forum at the William Penn hotel, Pittsburgh, May 1-2, minimized the war job which the machine tool industry still has to do —and while several of them emphasized that instead of having to furnish $350,000,000 worth of machines this year, it now looks as though the industry would have to turn out $450,000,000 worth—the emphasis definitely was on postwar planning, or "long-term planning" as Vice President F. D. Newbury of Westinghouse prefers to call it.

Of the future, Mr. Newbury had this to say: "Our overall guess (it is well to repeat that it is only a guess) of our postwar sales is roughly 60 per cent of the 1944 peak war billings. This may seem low until it is remembered that this represents 175 per cent of the company's maximum prewar production and billing. These figures, characterized only as 'postwar', represent our estimate of the maximum year's billings during a fairly long period following the end of the war. We look forward to a continuation of those year-to-year fluctuations in the volume of business which we know of as the 'business cycle'. We foresee no new factor strong enough to level them off. However, we do hope and expect that their recent violence can be mitigated."

In his review of future business possibilities, Col. Willard T. Chevalier, publisher of *Business Week*, predicted that bold, adventurous forward thinking, aimed at (1) finding new users, (2) stimulating replacement of worn out units, (3) obsoleting of current models, and (4) development of entirely new products for entirely new functions, will cause certain companies in the machine tool industry to stand out above the general level after the war. He predicted that men will return to industry from the armed services "sold" on the idea of the value of intensive training in the advancement of the individual.

Several speakers, including Tell Berna, general manager, National Machine Tool Builders' Association, mentioned the desirability of "unfreezing" the restrictions affecting machine tool builders so that they immediately can begin not only to design but also to build machines and tools for reconversion of the automotive industry to postwar production. The need for such "unfreezing" was emphasized by the General Motors-Machine Tool Builders conference at Detroit on April 27 and 28 (STEEL, May 1, 1944, Pages 85 and 86). At that time General Motors went on record as being in the market for at least 45,000 machine tools —$250,000,000 worth—in the postwar years.

The machine tool industry must get going at once on this equipment if there is not to be a serious gap between termination of war work and resumption of civilian automobile production. Under existing restrictions, materials and parts cannot be diverted to this great and important undertaking unless the government lifts its restrictions.

Mr. Berna does not believe that the used machinery problem can be solved by governmental ukase. That he feels only would serve to hold them behind a weak dam which later would burst and allow them to flood the market at a time when they would do much more harm than would their liquidation in the prosperous period of industrial rehabilitation immediately after the war. Obsolete them, and let nature take its course, is his advice.

The main speaker at the forum dinner this year was Frederick S. Blackall Jr., president and treasurer, Taft-Peirce Mfg. Co., Woonsocket, R. I. Of the forum itself, Mr. Blackall said: "That

This 40-foot horiontal boring mill is shown in the process of being set up to machine a welded steel waterwheel generator stator frame weighing 73,000 pounds. This electrically driven and electrically controlled giant is typical of what can and is being accomplished through close co-operation between American machine tool builders and the electrical industry. Westinghouse photo

representatives of concerns which in many cases are competing vigorously with each other, will sit down together and swap ideas is—in a sense—vindication of our economic system and proof that the 'profit motive' does engender constructive effort for the benefit of all. That the Westinghouse company should sponsor such a gathering annually and make it the success that the presence of hundreds of you here attests, is a most commendable illustration of that 'enlightened selfishness' which seems to flourish in the American industrial atmosphere and which comes to full flower and fruition in such fields as that of pure research—the benefits of which are made available to all and sundry throughout our industry.

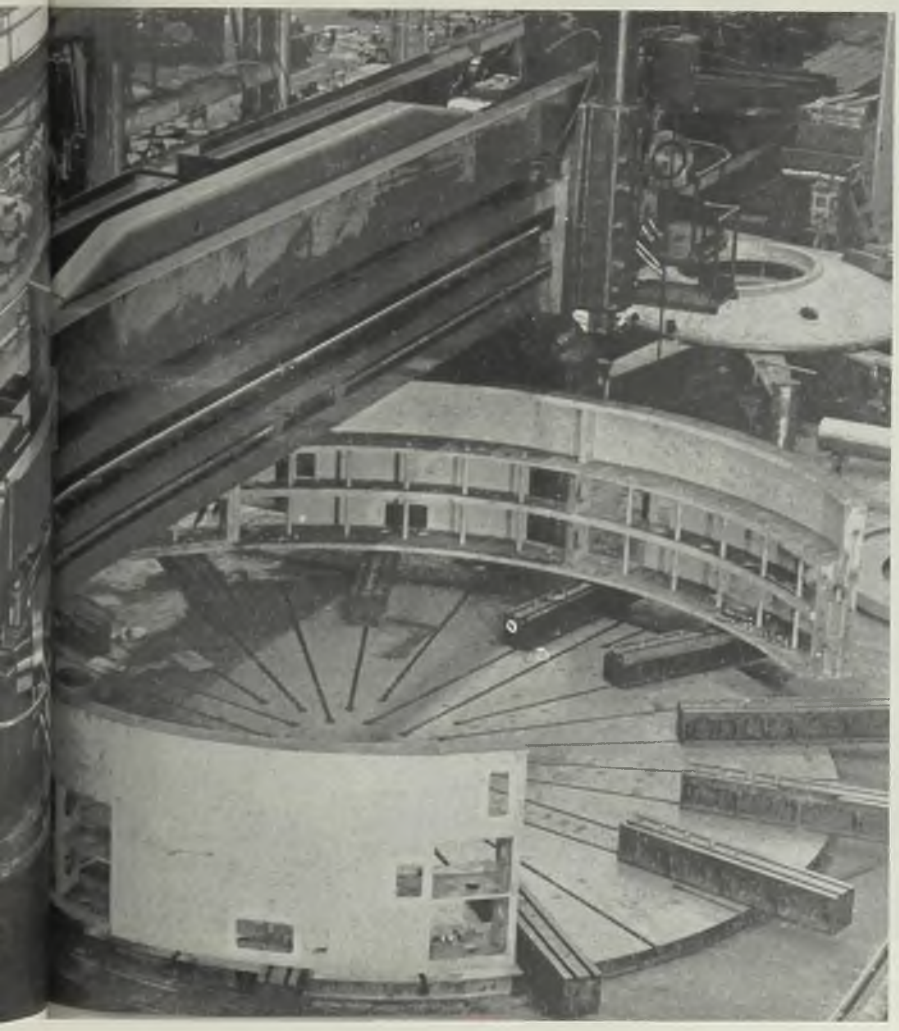
"We should cherish these things. They do not happen everywhere—nor do they just happen here. They are among the characteristics which distinguish the American industrial scene and set it apart from those of other countries where intra-industry suspicion and the close drawing of shades about each company's activities is the rule rather than the exception. In America—thank God—we believe that when we part the curtains, we let in more light than we let out.

"The significance of the exchange of information which has been going on here in the two days of this forum never was greater than it is right now. The machine tool industry is on the threshold of new adventures. Many are prophesying its doom. I don't subscribe to that theory. However, there is no question but what our industry must exercise its wits to the utmost in the period immediately ahead if it is to avoid the elements of disaster. You engineers and administrators must begin right now to exert your special talents to their limit—in order to render obsolete every machine tool in existence. You must develop new and improved mechanisms which will perform operations quicker and make products better and cheaper than ever before has been the case. If existing machine tools are allowed to represent the ultimate in American ingenuity, then indeed we are in dire straits, for there are enough of them in existence to last for 20 years. If—on the other hand—you can, for example, announce on Victory day, or even before, a milling machine which will outmill, a drill which will outdrill, a lathe which will outturn anything now available, have no fear—there will be a ready market for your product."

Development of New Tools To Cut Unit Costs Still Further Advocated

REDUCTION in unit costs by the use of highly specialized machinery has been the basis on which America has built her prosperity and again is coming into style.

This was the message delivered by J. Y. Scott, president, National Machine Tool Builders Association, and president, the Van Norman Co., Springfield, Mass., speaking before a joint meeting of General Motors master mechanics and plant engineers and a group of machine tool builders at the Statler Hotel, Detroit, April 27.



Advocating the development of new machine tools that will enable unit costs to be still further reduced, Mr. Scott asked the builders: "Are we going to continue indefinitely to sell to American manufacturers the same types and models of machine tools that we have been selling them ever since 1939?"

"To a great degree the designs of machine tools of that period have been frozen. They of necessity had to be frozen in order to increase production of these units to fill the tremendous demand created by the war, and our own basic unpreparedness for what that war meant.

Seeks Reduction of Costs

"All through the war we have seen developments arise and we should immediately take steps to permit the machine tool industry to apply all these technological processes to the reduction of costs both in the wartime and in the postwar markets to follow.

"Some of you are wondering why anyone should stand and appeal for cost reduction and new machine tool designs at a time like this. Sometimes I feel that we have been living in a 10 per cent economy.

"A great many of our hardboiled business men have been lulled to sleep by this 10 per cent economy as far as their costs are concerned, with the net result that they do not realize what has happened in their plants—namely, that even though the cost per unit of product has been reduced through the tremendous increase in volume, the actual cost of producing that unit on the basis of their 1937 or 1939 production volume has actually increased tremendously and that the company, if it had to manufacture and build that unit on the basis of 1939 sales prices, would go broke in a very short period of time."

On Program of American Iron and Steel Institute

WALTER S. TOWER
President, American Iron and Steel Institute

ATTENDANCE at sessions of the fifty-third general meeting of the American Iron and Steel Institute, to be held May 25 at the Waldorf-Astoria, New York, will be restricted to individual members. Walter S. Tower, president, will speak at the general session, which will open at 10 a.m. Also on the morning program will be Leo Wolman, professor of economics, Columbia University.

The afternoon will be devoted to a technical session with H. G. Batcheller, president of Allegheny Ludlum Steel Corp., presiding. Speakers at this session will include: Col. John H. Frye, War Department; Lieut. Comm. R. A. O'Brien, Navy; H. C. Boardman, Chicago Bridge & Iron Co.; Prof. Wendell F. Hess, Rensselaer Polytechnic Institute; L. L. Ferrall, Rotary Electric Steel Co.; Wilbur Bischoff, Timken Roller Bearing Co.; Charles Hart, Delaware River Steel Co.; and W. A. Irvin, National Safety Council.

H. G. BATCHELLER
President, Allegheny Ludlum Steel Corp.

W. A. IRVIN
Chairman, board of trustees, National Safety Council

H. C. BOARDMAN
Director of Research, Chicago Bridge & Iron Co.

CHARLES HART
President, Delaware River Steel Co.

WENDELL F. HESS
Professor, Rensselaer Polytechnic Institute

LEO WOLMAN
Professor of economics, Columbia University

LIEUT. COMM. R. A. O'BRIEN
Research and Standards Branch, Bureau of Ships, Navy Department

COL. JOHN H. FRYE
Office of Chief of Ordnance, War Department

WILBUR BISCHOFF
Metallurgical engineer, Timken Roller Bearing Co.

Strikes Cut Production At Detroit

At least twenty-one plants in the area seriously affected by walkouts. Close to 25,000 workers idle at midweek

AS OF Wednesday last week, labor disturbances in 17 Detroit plants, and in four Windsor, Ont., plants of the Ford Motor Co., had grown to crucial proportions, with production at a stop in many of them. Close to 25,000 men were idle.

In ten Detroit plants, the trouble sprang from walkouts by foremen seeking to force recognition of their union, the Foremen's Association of America, an independent group directed by 32-year old Robert H. Keys. Six plants of Briggs Mfg. Co., three of Hudson Motor Car Co. and one plant of Murray Corp. of America were affected, and there were indications the trouble would spread.

Plants managements generally have taken the stand that unionization of foremen cannot be condoned, since foremen are the only contact which management has with working forces and as such are management representatives. However, this has simply made the position of foremen more difficult in the face of the steadily growing power and trucculence of union labor as represented by the UAW-CIO.

In some plants foremen are actually a "lost generation," with men working under them often earning more money for fewer hours of work, and foremen's authority relinquished to union stewards.

The Ford strike in Canada followed union protests over settlement of an earlier dispute which had kept the plant idle a week. Production had been resumed for two days, but again was stopped. The UAW-CIO charged it had been double-crossed by a ruling on grievance procedure by the Canadian National Wartime Labor Relations Board. Last week 1000 office workers joined 14,000 striking production employes, and the tieup was spreading rapidly to feeder plants furnishing materials and parts to Ford of Canada.

Seven other Detroit plants were closed because of such minor difficulties as the dismissal of a union steward, and the job reclassification of six employes. In all cases, leaders of local unions and officials of the International Union disclaim responsibility for the walkouts, and say they have "ordered" the men back to work. Failure of men to resume work demonstrates the complete lack of authority of union officials.

UNION BEFORE WAR: Fourteen thousand factory workers at the Windsor, Ont., plant of the Ford Motor Co. last week were joined by 1000 office workers in a strike protesting a ruling by the Canadian Wartime Labor Relations Board. NEA photo

Screw Machine Products Leader Urges Aid for Small Businesses

ORRIN B. WERNTZ, executive secretary, National Screw Machine Products Association, Cleveland, told the Complaints Subcommittee of the Senate Small Business Committee last week there are two kinds of small business, the first group making end products the public consumes, and the second group making components the public never can buy or consume until they are assembled into something bigger, such as automobiles, refrigerators, stoves, etc.

The second group is on war production and in peacetime is dependent on big business which manufactures and distributes the end product.

"Today they need us," said Mr. Werntz. "Our worry is will they need us after the war."

When cutbacks become large, he said, there will be surplus available machinery capacity in all the large plants which will have the duty of reabsorbing returning military personnel and keeping as many present employes as possible. Therefore, these large companies could easily determine to use these expanded facilities to do their own subcontracting and in this way utilize their own working forces, but it would cause many small companies to close their doors or lay off large numbers of employes.

While the enterprising American does not like quota systems, this situation requires special attention and Mr. Werntz recommended: "First, that regulations be issued to prevent any one engaging in civilian production if not so engaged in 1940; second, that there be an allocation of material for resumed peacetime production on the basis that no company may consume more material than it did in 1940." He said these regulations should be lifted the moment the war and war production come to an end.

To prevent unduly high prices during the period when demand far exceeds supply, he would allocate to producers of end products who would guarantee certain sales prices to the public, and he at the same time would have sufficiently high priorities for materials for partsmakers to make it necessary for end products producers to buy from partsmakers on competitive price basis.

Mr. Werntz recommended liberalization of the tax system to encourage risk capital. He also deplored bypassing of trade associations by the War Production Board which works with industry advisory committees and he thought reconversion could be better accomplished by utilizing statistics and other information compiled by trade associations. Mr. Werntz quoted from the recent study by STEEL on "What's Ahead for the Metalworking Industry" to show 75 per cent of companies can reconvert at once, while 15 per cent can convert in one month; also 80 per cent of companies will make the same products they made before the war.

CIO President Carries Guaranteed Wage Demand to Senate Committee

Steel industry expected to flatly reject union annual wage demand when hearings are resumed before War Labor Board panel May 16. Unions may make issue a factor in this year's political campaigns

GENERATION of congressional pressure to encourage industry to adopt a general policy of guaranteed minimum weekly, monthly or annual wages lies immediately ahead, it was indicated by Philip Murray, CIO president, who appeared before the War Contracts Subcommittee of the Senate Military Affairs Committee, April 28, to discuss legislation for controlling the postwar economy.

Sen. Walter F. George (Dem., Ga.), sitting with the subcommittee by invitation, declared: "I personally feel that the principle for which you are contending might well be declared in our earliest legislation, even if we cannot in one single legislative measure do it, because of parliamentary and political difficulties involved."

The annual wage is not new or unique, said Mr. Murray, and it is not original in this country. Only a few weeks ago, he pointed out, the British government, in collaboration with the owners of the coal mining industry, perfected an arrangement to guarantee a weekly and annual income to the coal miners of Great Britain over a 4-year period. He expressed the belief that the basic industries in this country could, if they desired, plan their production in such fashion as to enable them to introduce a system of annual wages.

"Of course," he said, "we do not want compulsory legislation to that effect. We are asking the Congress to issue a declaration of policy to encourage American industry and American labor to react, through the exercise of the collective bargaining processes, to arrive at a minimum guaranteed standard."

The principle of guaranteed income is not new in this country. Congress, recognizing the needs of the American farmer, said Mr. Murray, has passed laws and developed procedures which give the farmers guarantees, "beginning with the present guarantee of parity plus and the further guarantee under the provisions of the Emergency Price Control act, so that their standards shall never drop below the so-called 90 per cent of parity."

At the same time, he said, corporations, under the so-called carry-back, carry-forward provisions of the present tax law, are entitled to refunds from the federal treasury "to protect their financial structure against all possible danger that may confront them during any 2-year period, either during the war or at the end of the war.

Mr. Murray bolstered his argument by quoting from a report which Prentice-Hall Inc. issued to its clients on Jan. 31, 1944. This told of a machine tool builder who had planned to close its shop "forever" when he receives notice of the termination of his last war contract but who changed his mind when his accountant informed him what the carry-back, carry-forward provisions would do for him. He learned that he could start in a new field—a durable household item, for example—and that 81 per cent of the cost of needed equipment for the new line would be paid for out of refunds of wartime taxes.

Develop Unanswerable Argument

When the hearings before the War Labor Board Steel Panel are resumed on May 16, it is learned, the demand for a guaranteed annual wage in the steel industry will be flatly rejected. Steel industry attorneys have developed what they believe to be an unanswerable argument on this point. They will point out that the steel companies can produce steel only after it has been ordered and the specifications have become known. Even were it possible to produce steel at a uniform rate from one year's end to the other, they will point out that steel deteriorates in storage, and that storage would necessitate a considerable price increase to cover storage and handling costs.

They will point out that such a system of storage would necessitate considerably more working capital in the hands of steel producers. They will point out that the steel industry would find it impossible to guarantee annual minimum wages until such a time as its customers had found ways and means of establishing minimum annual wages. They will break down the whole picture of steel consumption to show how formidable such a task would be.

Attorneys for the steel industry also will charge that the War Labor Board has no authority whatever for ordering the establishment of a guaranteed annual wage.

USA-CIO attorneys are well aware of this situation and while they will go through all the motions at the panel hearings they know in advance that they will not win acceptance of their request for a guaranteed annual wage system. But that will not be the end of the matter. CIO leaders who head new unions know that if there is any one thing that surely will hold their unions together after the war it is a victory in forcing adoption of guaranteed wage systems in their respective industries. They know that there is no other such popular appeal from the workers' standpoint as that for guaranteed annual wages. They propose to keep on hammering away in this campaign and count on developing enough popular acclaim for this demand to force employers, in the end, to grant it.

If the CIO leaders have their way, the demand for guaranteed minimum wages will be a mighty factor in this year's election results.

CREATE NEW PANELS

The War Labor Board has adopted recommendations of its steel panel to create two new panels for hearing disputes between the United Steelworkers of America-CIO and 400 companies not included in the basic steel industry. One panel will hear the cases of 44 iron ore companies in the Lake Superior region. They will be heard concurrently with the basic steel case as requested by the companies and the panel's report will be submitted with that of the basic steel companies. The third panel will handle the cases of the fabricating and miscellaneous companies and will submit its findings after the conclusion of the basic steel and iron ore hearings.

SEWELL L. AVERY

Chairman of the board of Montgomery Ward & Co., which was seized by the government after company officials refused to abide by an order of the War Labor Board, Mr. Avery last week was re-elected to the board of the United States Steel Corp. Meanwhile, the Montgomery Ward case was scheduled to undergo investigations in both the House and the Senate.

Industry Members of WLB Ask for Judicial Test of Security Issue

Sharp dissenting opinion charges majority's policy tends toward labor monopoly, destruction of ideals for which war is being fought, loss of prestige and stabilizing influence among all the regional boards

INDUSTRY members of the National War Labor Board, in one of their bitterest dissenting opinions, have taken sharp issue with public and labor members on the question of ordering maintenance of membership clauses in union-company contracts. The industry members called for a court test of the board's authority to grant the unions such maintenance clauses.

The dispute over the union-maintenance issue has been growing in intensity during the past several months. It came to a head in a case involving the Humble Oil & Refining Co., Ingleside, Tex., and the Oil Workers International Union-CIO. This was a major issue also in the Montgomery Ward case.

The majority opinion of the board, written by Dr. Frank P. Graham, a public member, held that the granting of union-maintenance clauses has been made common practice by the board over the past two years and is now national policy.

The industry members responded with a "frank and forthright" statement in which it was held:

"We are confronted with a theory of finality in the decision of this governmental agency, without provision for judicial review, with which we cannot subscribe. We find expressed in the majority opinion a flood of idealistic declamations, but a dearth of demonstration. We assert that the philosophy expounded by the majority leads inevitably to the denial of the very ideals for which our country is fighting the present war.

Undemocratic Restriction of Rights

"We condemn the majority-proposed policy on union maintenance because, in our opinion, its application contemplates widespread undemocratic restriction of the rights of workers and employers; because it would spread more or less indiscriminately in industry a device unproved as an aid to production; and because it would constitute a potent threat to harmonious industrial relations so necessary now and in the postwar period."

Listing more specific reasons for their dissent, the industry members said:

"1. It is contrary to the principles of democratic government for this, or any other governmental agency, to make union membership a condition of employment.

"2. After more than two years of contention by the majority that union maintenance helps production, we are offered no demonstration, but, on the contrary, find that in many cases the reverse has, unfortunately, been true.

"3. So-called union maintenance, now to be a board policy, has permitted the use of a worker's money, dues and assessments, for political purposes contrary to the worker's personal choice and ideals.

"4. It is an affront to the patriotism of American workers for an agency of this government to offer material reward for a no-strike pledge in time of war.

"5. Union discipline, whether made possible by a union shop or by union maintenance, can be and has been used to halt production and to force action by the government, including this board. The majority policy contains no provision against repetition.

"6. The majority policy, even if otherwise unobjectionable, is no guaranty of alert and responsible union leadership.

"7. We believe that the national board's action in this case will result in a loss of prestige and of stabilizing influence among all the regional boards.

"8. The board, in effect, is legislating and thereby undertaking what is the function solely of Congress.

"9. The board's proposed policy tends inevitably toward a labor monopoly.

"10. There is no connection, as the majority opinion suggests, between union maintenance and the wage stabilization policy. The record of the board proves that wage adjustments occur regardless of union maintenance. All workers, whether organized or unorganized, are subject to the same rules of stabilization.

"11. To order union maintenance in a situation where evidence indicates that it will disturb existing amicable relationships between employer and employes, as is the case here, is contrary to the duty of this board, which is to settle, not to cause, labor disputes.

"12. In this case, the majority has reversed its own precedent established in the H. D. Hudson Mfg. Co. case."

The industry members signing the dissent were George H. Mead, Reuben B. Robertson, Horace B. Horton, Frederick S. Fales, George K. Batt, John McWilliams, Walter T. Margetts and James Tanham.

POSTWAR PREVIEWS

PREFABRICATED HOUSING—Acquisition by U. S. Steel of substantial interest in Gunnison Housing Corp. expected to give impetus to use of steel in prefabricated homes when war ends. See page 67.

MACHINE TOOLS—"Unfreezing" of restrictions on builders to permit them to design and begin manufacture of tools for reconversion recommended at Westinghouse electrification forum. See page 68.

GUARANTEED WAGE—Labor expected to continue to press for guaranteed minimum wage, even though it probably will not be won in steel case. May become political issue. See page 72.

INLAND WATERWAYS—Proponents of Lake Erie-Ohio river canal urge project as postwar activity to provide employment and lower freight costs to steel and other industries in Mahoning Valley. See page 80.

AIRCRAFT—Leading planemakers ask early formulation of postwar policy on air force. Suggest adequate fleet to maintain the peace. See page 86.

HELICOPTERS—Manufacturer develops stabilizer, promising increased simplification of operation. Warns widespread use still some years in the future. See page 86.

"SHORT CIRCUIT" WELDING—Sheet-metal fabricators who will employ spot welding for assembling consumer products of complex design should find the hand-positioned "short circuiting" welding gun now used to install baffles in droppable fuel tanks of considerable merit. See page 100.

FORGING FORKS—Unique arrangement of roll dies, conventional dies and bulldozer action combine to help press operator finish forge 10-tine ensilage forks in a blanking operation so unusual that it may remain in a class by itself. See page 106.

Plenty of Protests

THE MONTGOMERY Ward seizure brought to Congress one of the greatest floods of protests in history. Telegrams contained such sentiments as: "Terrified by this action;" "Most high-handed piece of dictatorship ever forced on the American people;" "A Democrat for 25 years, this outrage is more than I can stomach;" "Such procedure is unthinkable in America;" "The President should not be permitted to use troops to give aid and comfort to a CIO strike;" "Is the CIO or Congress running our country?"

Surplus Property News

Disposition of government surplus property recently has attracted a number of specialists into the function of advising their clients about these surpluses, their kinds, where located and how obtainable. Now comes a new weekly publication, *Surplus War Property Newsletter*, intended to provide practical and satisfactory answers to persons or corporations seeking to keep abreast of the rapidly changing picture on surplus war goods. The purpose is to enable readers to know what action they may and can take on surplus goods. The editor is Vincent Callahan, for many years a Washington newspaper man and radio executive, and for the past three years director of the Treasury Department's war bond promotion.

Coal Research Pushed

Looking toward "new miracles in coal utilization," the National Coal Association announces an expanded research program for the next five years. Pledges of financial support now in hand, according to H. N. Eavenson, president of Bituminous Coal Research Inc., an affiliate of the association, have passed the $2,000,000 mark, insuring full underwriting of the program and effectuating various participating agreements that had been contingent on raising this amount. The laboratories of various universities and industrial research foundations will be utilized.

Another Investigation

An investigation is under way by the Senate Small Business Committee to learn why the War Production Board failed to approve a suggestion recently submitted by Col. C. R. Baxter, director of the WPB Redistribution Division. About two months ago Colonel Baxter reported a plan under which the Redistribution Division's regional representatives would be authorized to study lists of surpluses in conjunction with small business, in order to find uses for many small lots of surplus materials in which the larger contractors are not interested. The plan, as he proposed it, would allow sale of these materials to small shops that employ no more than 50 people in Nos. 3 and 4 areas, no more than 25 people in No. 2 areas and no more than 5 people in No. 1 areas. Colonel Baxter was told the plan had not been approved but was not informed as to the reasons for rejection, nor who made the decision. Questions asked by Sen. Kenneth S. Wherry (Rep., Neb.) indicated that the latter would need a thorough explanation before he was prepared to accept the decision as final.

SPONGE IRON

Sponge iron, long a subject of controversy, has a definite place in the metallurgical scheme of things, according to Walter A. Janssen, chief, Metals and Minerals Unit, Bureau of Foreign and Domestic Commerce. He states that of the hundreds of letters patent, both foreign and domestic, dealing with direct production of iron and steel, none of the processes covered have been able to produce in competition with the blast furnace. Nevertheless, he declares that because sponge iron is a virgin metal of high quality it has a definite function as a base material for the production of special grades of steel, both carbon and alloy.

According to Mr. Janssen, while it is difficult to estimate the tonnage of sponge iron which will be required per year when peace comes, the amounts needed will be sufficient to afford producers an opportunity to distribute a quality product at a quality price in amounts comparable with tonnages of ferroalloys.

Increasingly Important

While the work for which the Redistribution Division, WPB, originally was organized, that of redistributing frozen inventories, has been largely completed, the work now being done, that of redistributing inventories resulting from terminations and cutbacks, is increasingly important. During the four months from Dec. 1 through March the WPB issued 278 amendments which relaxed controls; at the same time it issued 111 amendments which tightened controls. While this indicates a decided trend toward relaxation, he said, the relaxations do not permit the manufacture of new products. As of March 31 the division had listed in its 13 regional offices roughly about 300,000 tons of unsold steel. During the previous two weeks about 50,000 tons had been sold and about 70,000 tons had been added to the lists. These figures are typical and indicate the need for continued redistribution activities by this important WPB division.

Plan for Postwar Taxes

At the invitation of Chairman Daniel A. Reed (Rep., N. Y.) of the newly organized House Republican Postwar Tax Committee, nine Republican members of the House Ways and Means Committee will form subcommittees that will conduct studies aimed at adoption of sound tax policies after the war. Mr. Reed estimated that the federal budget will approximate $20,000,000,000 during the first postwar years and said that his committee hopes to draft a bill which will yield approximately the government's requirements but so put together as "to invite the flow of investment funds into industrial and commercial activities and away from tax-exempt securities."

Favor Extending Coverage

Immediate action to guarantee a minimum flow of incomes through an effective social security system is as much in the interest of business as of labor, in the opinion of the Agriculture, Business and Labor Committees on National Policy of the National Planning Association. They favor extending coverage to those ineligible under the present Social Security System—agricultural workers, domestic workers, employes of nonprofit corporations, the self-employed and the owners of small business. They favor also a strengthened employment service and expanded curative and preventive health services. Their proposals are incorporated in Planning Pamphlet No. 33 and copies may be had from the association, 800 Twenty-first street, N. W., Washington 6, D. C., at 25 cents.

Difference of Opinion

Impatience over suspected failure of the War Production Board to do all it can for small business is mounting in Congress and the following colloquy during a recent hearing of the Senate Small Business Committee is typical of a number of such instances of late:

Sen. Kenneth S. Wherry (Rep., Neb.): "I have a feeling that they (the Smaller War Plants Corp.) would be better off if they were completely divorced from the WPB."

Donald M. Nelson, chairman, War Production Board: "That is because you do not know anything about the working of our organization."

Senator Wherry: "I believe I have had a lot of experience with it."

Mr. Nelson: "Not as much as I have had."

Senator Wherry: "I do not imagine I have but I am convinced of this fact, that if the SWPC were a separate entity running its own business, we would get more business for small business than we have to date."

Mr. Nelson: "Well sir, I do not believe that. That is what makes horse races."

Senator Wherry: "That is right."

"Block Buying" Proposals Studied

Government purchasing opposed by representatives of small business. Pressure for materials and manpower expected to ease by fourth quarter as Ordnance procurement drops

WASHINGTON

SEVERAL proposals under which the government would engage in "block buying" of materials to supply small business are under joint study by the Senate Special Committee to Study and Survey Problems of Small Business Enterprises and the Smaller War Plants Corp. These proposals are based on the expectation that in the relatively near future there will be a slight relaxation in war needs for materials and manpower, so that it then will be possible to provide materials to be used by small plants in manufacturing civilian goods.

The committee believes there will be some relaxation in the pressure for materials in the fourth quarter. When Under Secretary Robert P. Patterson appeared before the committee recently he said that the schedule of the Ordnance Department calls for procurement in the fourth quarter in the amount of $2,601,000,000. This compares with $3,306,000,000 in the peak period, the third quarter of 1943. Procurement of the Signal Corps in the fourth quarter will be in the neighborhood of $762,000,000 compared with $972,000,000 in the peak period, the fourth quarter of 1943.

Foresee Numerous Cutbacks

Navy and Army Air Forces procurement will be higher in the fourth quarter of 1944 than at any time in the past.

In this situation the Small Business committee foresees numerous cutbacks in war contracts and it envisions the likelihood that plants and manpower will be available here and there that will need to be put on civilian production in order to prevent unemployment and bankruptcy of small companies.

"A very small amount of material will go a long way in enabling these plants to make civilian goods," a committee spokesman told STEEL. "The trouble is that the individual needs will be so small that the manufacturers cannot schedule them economically. Take steel, for example; a few thousand tons of steel sheets will go a long way in taking care of needs of small plants. Yet each plant will want a different gage or width. The problem is to make those small quantities available."

This spokesman said no method had been definitely worked out by the Small Business committee or the SWPC, but that evidently the key to unlocking the problem would be to make sure that the warehouses at strategic locations throughout the country were sufficiently provided with stocks of all needed steel products to meet the requirements of small business. "Block purchases" could be made by the warehouses in order to fit into mill rolling schedules. If necessary, STEEL was informed, the Smaller War Plants Corp. could order this steel, or the warehouses could buy the steel and the SWPC would lend financial aid if necessary.

NOEL SARGENT
Secretary, National Association of Manufacturers

"It must be recognized that the only way to get funds or credit for new enterprises is to have a situation in which some people lose money, but have the opportunity of making it up with larger profits elsewhere. If you do not have such a system, then you provide that old companies shall stay in business and that new companies cannot start."

In the meantime, the committee has sounded out two representatives of small business on this subject. One is Norman D. MacLeod, president, Abrasive Machine Tool Co., East Providence, R. I., and the other F. F. Sommers, president, Rainfair Inc., Racine, Wis. Both emphatically opposed the idea of "block purchasing" and said they did not want the government standing between them and their sources of supply. This, they said, would make for red tape and delay.

Mr. Sommers could not see any benefit whatever from such government purchasing, even in any brief transitory period. "That would be dynamite," he said. "Let me go to the suppliers and work out my own salvation."

Mr. MacLeod presented answers to six questions submitted to him by the Small Business committee. These answers, he said, represented the composite opinion of a number of small businessmen with whom he had discussed the matter. The answers:

1. If an agency similar to the Smaller War Plants Corp. is to be continued it should be made a claimant agency and set up as a division of the War Production Board as long as the latter exists.

2. The greatest problems in reconversion will be in the metalworking plants and will consist largely of cleaning up claims on terminated contracts, taxes, renegotiation and financing.

Favor Retention of Competitive System

3. If the small business agency can be set up within the WPB, the quota system can be equitably formulated and controlled, and quotas should be based on the 3-year average of 1939, 1940 and 1941, also the former competitive system should be retained.

4. We do not fear that small business will experience difficulty in obtaining materials provided there is some reasonable control which need not be complicated or rigid.

5. We do not favor block purchasing of materials by the small business division.

6. We favor only such allocations of materials as will provide equitable treatment for all concerned.

Mr. MacLeod also submitted the following points as representing the ideas of small business:

1. Small business does not want to be coddled.

2. It does not fear or distrust so-called "big business."

3. It does not want any fences built between "big business" and "small business."

4. It wants free markets as soon as possible.

5. It wants equitable treatment and will stand or fall on the basis of its own competitive efforts.

6. It wants an opportunity to lay aside a little cash.

7. It dislikes restrictive rules and regulations just as much as anyone else, and wants them removed at earliest moment.

8. It wants the path cleaned now so that claims against terminated contracts can be paid quickly.

Noel Sargent, secretary of the National Association of Manufacturers, another witness, said the NAM favors maintenance of the free enterprise system.

"At the same time free enterprise cannot exist 100 per cent during and immediately after this war," he said." "It would be unfair to let somebody else make surface grinders, for example, while Mr. MacLeod is in war production. He should have some sort of protection against loss of his normal business."

Milling UPHILL *and* DOWN!

WITH TRACER CONTROLLED HYDROMATICS

CINCINNATI

The profiles milled by these machines may be straight lines or curves, or a combination of the two. Even external box-shaped profiles can be handled in two operations. The table feed is automatically varied to obtain maximum efficiency of metal removal. Four possibilities of Tracer Controlled milling are shown here.

1

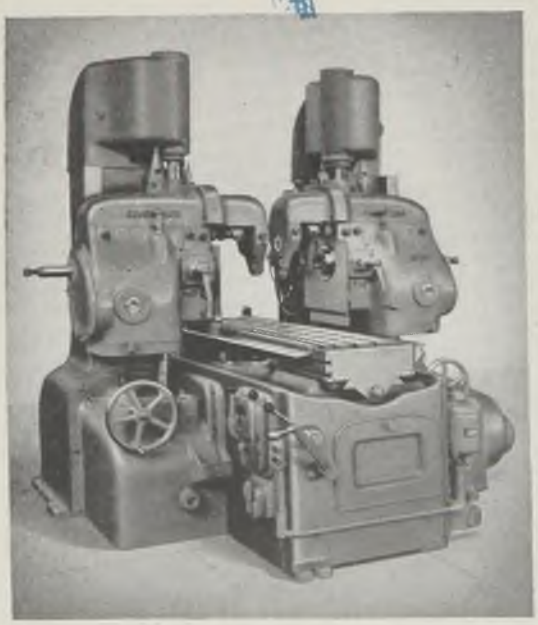
Steepness of vertical walls must not exceed 80°, and part milled on external surface only.

2

Straight lines and curves, similar to aircraft engine connecting rods, master rods, crankshaft, etc.

3

Arc of circle must not exceed 160° starting with 10° inclination from horizontal.

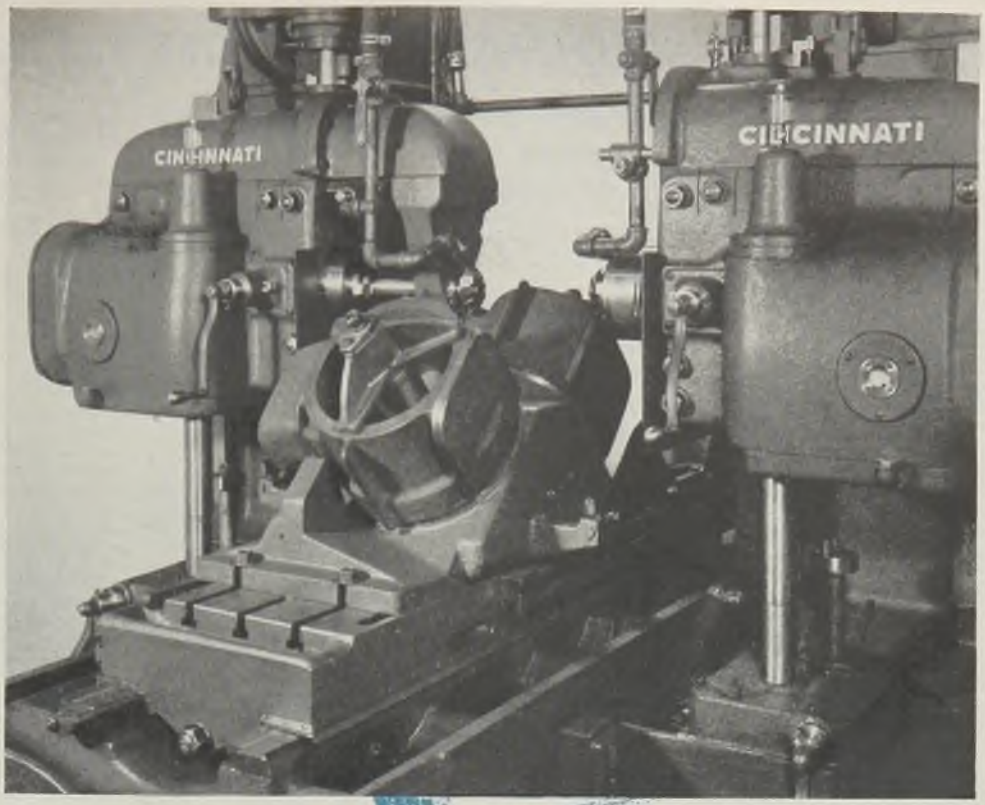


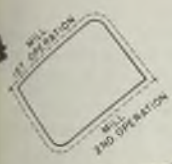
Illustrated at the left is the CINCINNATI *Tracer Controlled Hydromatic Milling Machine (Duplex model). Both the Plain and Duplex models are available in 12 sizes. Catalog M-1295 gives complete information and specifications. Sweet's Catalog File for Mechanical Industries contains a brief description of these machines.*

Keep on buying WAR BONDS

THE CINCINNATI

MILLING MACHINES





Box-shaped contour (male member). Two opposing corners can be rounded, but the other two must be square.

Tracer Controlled Hydromatics, an outgrowth of standard CINCINNATI Hydromatics, offer new possibilities in production milling which may be applied NOW in retooling for more economical operation. And today's application of the tracer method of milling will suggest better machining methods when the manufacture of peacetime products is resumed, and you must find a way to produce new things that will provide needed jobs. ¶ Basically, Tracer Controlled Hydromatics accurately mill uphill and down, within the angle of inclination indicated in the line drawing marked 1. The longitudinal table feed and vertical feed of the spindle carrier are actuated hydraulically and synchronized through a tracer valve mechanism which contacts a master template attached to the fixture. ¶ After the war, design changes and increased production are bound to require new methods and more efficient ways of handling certain milling operations. Tracer Controlled Hydromatics may be the answer to these new requirements. Their possibilities surely warrant your serious consideration NOW, and in your postwar methods planning. The engineers here at Milling Headquarters will be glad to discuss the adaptation of Tracer Controlled Hydromatics to fit in with your plans.

MILLING MACHINE CO. CINCINNATI 9, OHIO, U. S. A.

BROACHING MACHINES • CUTTER SHARPENING MACHINES

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

TRACTORS AND CONSTRUCTION MACHINERY: All applications after May 12 for authorization to acquire wheel-type tractors and construction machinery attachments for other than farm use must be filed only on form WPB-1319 with the regional WPB office located in the area in which the equipment is to be used.

VEHICLE REPLACEMENT PARTS: Army orders for vehicle replacement parts must be filled by distributors only from inventories available for immediate delivery. The parts must be on hand at the time the order is received from the Army. It is not sufficient that such parts are in inventory immediately prior to delivery.

L ORDERS

ALARM EQUIPMENT: Restrictions have been eased on use of materials in manufacture of fire protective, signal and alarm equipment. Restrictions on alloy steel have been removed but control over special alloys (other than NE triple alloy) is exercised by the WPB Steel Division. Cadmium may be used to the extent permitted by M-65. Mercury and zinc no longer are restricted.

Aluminum, formerly permitted only in specified parts of certain equipment, now may be used to the extent where copper, copper-base alloy or aluminum was used in commercial production in 1939-41. Chromium, formerly permitted only for plating specified parts and as a component of stainless steel (for permitted stainless steel uses) now may be used in alloy steel for any part and for any plating, except brightwork. Restrictions on use of copper, tin, nickel, bismuth, monel metal, asbestos and rubber remain unchanged. Manufacture of soda-acid fire extinguishers is specifically prohibited. (L-39)

LIGHTING FIXTURES: Provisions of order L-78 are applicable to nonindustrial as well as industrial portable or attachable overhead suspended fluorescent lighting fixtures. (L-78).

PLUMBING, HEATING EQUIPMENT: Unrestricted sale is now permitted of the following types of direct hand-fired hot water heaters, used to a great extent in dairies: Bucket-a-day stoves, dome-type water heaters, and service and tank heaters. Sump pumps are not controlled by provisions of order L-79. An installer of gas cooking equipment now may use an AA-3 rating for purchase of materials such as gas valves, needed to connect up the equipment.

Steel low-pressure heating boilers, furnace fans and hot water circulating pumps, and force draft blowers have been added to list A of the order, requiring no rating for delivery if the equipment is to be used for necessary replacement of existing equipment. (L-79)

SAFETY EQUIPMENT: Restrictions have been removed on use of aluminum, alloy steel, and certain other materials from the order controlling the manufacture of safety equipment. Aluminum now may be used to the extent permitted by order M-1-i and alloy steel may be used for any safety equipment, but special alloy steels (other than NE triple alloy) are still controlled by the WPB Steel Division. Chromium is permitted in alloy steels and in plating of safety equipment where the plating has a functional purpose.

Former restrictions on the use of copper, nickel and tin remain unchanged. Order M-1-i permits the use of aluminum in equipment where copper, copper-base alloy or aluminum was used in commercial production in 1939-41. (L-114)

BUSWAYS: Restrictions have been lifted on the use of aluminum and zinc in nuts, bolts, washers and name and identification plates in the fabrication of busways. Aluminum, but not zinc, may be used for finishing or plating of cases. Unlimited manufacture of busways not exceeding 100 feet in length is permitted for repair, extension or rearrangement of existing systems. (L-273)

M ORDERS

INVENTORIES: Diatomaceous earth has been added to the items to which inventory restrictions of priorities regulation No. 1 do not apply. Bentonite, feldspar and pyrophyllite have been removed from the list of items exempted from inventory restrictions. Administrative jurisdiction over the order has been transferred to the Inventory Control Branch of the Redistribution Division from the Miscellaneous Minerals Division. (M-161)

IRON CASTINGS: Inventory restrictions on malleable iron castings have been modified. An exception to the previous limitation to an overall 45-day supply provides that a receiver now may accept up to 2000 pounds of castings of any one pattern or mold or a minimum production run, even if receipt of the shipment raises his inventory above a 45-day supply. Authority to accept the latter is contingent upon the impracticability of obtaining the smaller quantities that the customer actually needs at the time. (M-21-i)

GENERAL SCHEDULING: Class X product shipping schedules as filed with WPB must cover shipment to be made on and after the first of the month following the date of filing. Shipping schedules become frozen on the date they are filed. The manufacturer need include in his schedule only those orders that were received up to a date that he may choose prior to the date he has to file his schedule with WPB.

All products previously designated as "Y" or "Z" items have been reclassified as undesignated or "X" products. The new list excludes water distilling plants from the classification of heat exchangers and eliminates an exception for orders on repairs and spare parts under $1000 for high pressure blowers and the exemption for certain types of blowers below 20 horsepower. (M-293)

ABRASIVE GRAIN: Persons who require a total of more than $350 worth of new fine grit silicon carbide abrasive grain in any two-month allocation period must apply for the grain on form WPB-2781 (formerly PD-886). Quantity which may be delivered for experimental purposes in an allocation period without authorization has been reduced to not more than 25 pounds in any one grit size; all such shipments being deducted from the producer's quota for small orders.

No application need be filed for grain in grit sizes coarser than 280. Producers must file production schedules for all types of manufactured abrasive grain on form WPB-2780 (formerly PD-887), although production reports for manufactured crude abrasive no longer are required.

Inventories of manufactured abrasive grain of all types and sizes are still subject to the 60-day inventory limitation. With this exception, use and delivery of manufactured crude abrasive and grain (other than fine grit silicon carbide) are governed by priorities regulation 1 and other applicable WPB regulations. Deliveries of fine grit silicon carbide continue to be made without regard to preference ratings, in the sequence best suited to maximum production and customers' needs. (M-319)

INDEX OF ORDER REVISIONS

Subject	Designations
Abrasive Grain	M-319
Busways	L-273
Castings, Iron	M-21-i
Inventories	M-161
Lighting Fixtures	L-78
Plumbing, Heating Equipment	L-79
Preference Ratings	PR No. 3
Scheduling, General	M-293

Price Regulations

Scrap	No. 4
Alarm Equipment	**L-39**
Safety Equipment	**L-114**
Screen Goods	**No. 381**

PRIORITIES REGULATIONS

PREFERENCE RATINGS: Preference ratings for production materials may be applied or extended to obtain containers to package the products, if such application or extension may be made under WPB container orders. Persons who receive the certification that is provided in priorities regulation No. 3 for use in applying or extending preference ratings may rely on it as a representation of the buyer unless he knows or has reason to know that the certification is false.

Alarm clocks, waste paper, water, and container board, as defined in order M-290, may be delivered without regard to WPB preference ratings. Blanket maintenance, repair and operating supplies preference ratings may not be used to purchase new industrial air circulators and electrical appliances, as defined in order L-65.

New interpretations explain rules that govern the use of preference ratings for leasing machinery; deal with identification of blanket MRO preference ratings; and deal with record-keeping requirements of exporters. (PR No. 3)

PRICE REGULATIONS

SCRAP: Imported iron and steel scrap has been brought under the maximum prices in effect for domestic scrap, f.o.b. port or point of entry. American Association of Railroads specifications for rerolling rails have been adopted, eliminating from the rerolling classification types of rails unsuited for rerolling and not normally used by the rerolling industry. (No. 4)

SCREEN GOODS: Several changes in price ceilings for stock screen goods have been made, including establishment of maximum prices for certain sizes of 16-mesh galvanized and black wire extension window screens. Typical of the new prices for 16-mesh galvanized wire extension window screens is that of $6.23 per dozen for sales of 15-inch by 45-inch size screens to jobbers and special dealers. (No. 381)

WPB Grants Additional Electric Flat Iron Quotas

Authorizations to produce an additional 193,625 electric flat irons in 1944 have been granted by the War Production Board as follows: Westinghouse Electric & Mfg. Co., Mansfield, O., 157,000; Dominion Electrical Mfg. Co. Inc., Mansfield, O., 35,000; and New York Pressing Machine Co., New York, 1625. Total authorized production now stands at about 395,000 electric irons. The authorized 1944 program calls for production of 2,000,000 electric irons.

New Price Policy Covers All Unused Materials on Contractors' Premises

Action by Surplus Property Administrator is designed to expedite movement back into production of property left over from termination of war contracts; to avoid overburdening storage facilities; and to arrest inflationary trends

MAJOR price policy, designed to expedite the movement back into production of property left over from termination of war contracts, has been announced by W. L. Clayton, surplus war property administrator.

Such property, already amounting to several hundred millions of dollars, and increasing daily, consists of raw materials, semifinished goods, and scrap, coming to the government from manufacturers whose war contracts are being terminated. Virtually all the materials to be disposed of are usable only for manufacturing purposes.

Mr. Clayton emphasized that the policy covers materials which are in some cases the property of the contractor, in other cases the property of the government, but in all cases still on the premises of the contractor and not yet moved into government storage.

The policy is not designed to cover property declared as surplus by the procuring or owning agencies of the government. Such property will be disposed of by the disposal agencies under regulations to be announced later.

Aggressive action is necessary to move this material back into war production for civilian use. It is now accumulating faster than officers can dispose of it.

The government's paramount interest is the continuous use of this material in war production, or for essential civilian purposes, avoiding overburdening storage facilities, arresting inflationary trends, and reducing the volume of surpluses which will be hanging over the market after the war.

The basic policy is designed to give contracting officers courage to act boldly in the sale of these materials, within the limits prescribed.

The policies established rest on the following basic principles:

1. Quick clearance of plants for resumption of war production or essential civilian production is imperative.

2. Sales to the contractors or other buyers who will consume the property in production are desirable.

3. Sales to speculators for holding or quick profits must be discouraged.

4. No goods must be sold without an adequate test of the market.

Some of the essential elements in the basic pricing policy are:

1. **Small terminations and small quantities:** Materials of any type may be sold at the best price obtainable if left over from a contract or subcontract where the claim against the government is below $10,000. Similarly, small quantities of materials, regardless of the size of the termination claim, may also be disposed of at the best price obtainable, where the cost of all substantially similar items at any one location does not exceed $1000. In exercising this discretion, however, the contracting officer must make a reasonable test of the market as a basis for his price decision.

2. **Raw Materials:** Crude or simple raw materials not covered by paragraph 1 are to be sold at the going market price if in commercial lots, where there is a clearly established and readily ascertainable market price. If a sale at the going market price cannot be made, the property will then be turned over to a disposal agency for sale. Disposal agencies are the Reconstruction Finance Corp., handling capital and producer's goods, the Treasury Procurement Division, handling consumer goods, the War Food Administration, handling food, and the U. S. Maritime Commission, handling ships and maritime equipment.

3. **Other Materials:** Usable property not covered by paragraph 1, other than raw materials, may be sold to any buyer whether or not he is a consumer at the best price obtainable in excess of 75 per cent of either cost or the price which that buyer would have to pay if he bought an equivalent quantity from a normal source of supply, whichever is lower. If a sale cannot be made on this basis within a reasonable time, the property may be sold at the best price obtainable to a buyer who will consume it in the United States for manufacture or maintenance or repair purposes, and who will agree if he does not consume it not to resell it at a profit.

4. **Scrap: Some** semifinished material is not usable in any manufacturing operation and can be sold only as scrap. The responsibility for determining what is scrap is on the procuring agency. Where the amount of property to be scrapped exceeds $50,000, the final determination to scrap will be subject to a reviewing authority composed of local, regional, or departmental boards of review, or another officer appointed by the procuring agency. The surplus war property administrator will shortly authorize disposal agencies to set up a system of regional or local consultants upon whom the contracting officer, review boards, or other procuring agency representatives can call for assistance and guidance on such questions.

Scrap not covered by paragraph 1 may be sold at the going price for the type of grade of material involved, as ascertained by the contracting officer by reference to published trade indicators or by inquiry among government agencies, dealers, or other informed sources, taking into account transportation costs and sundry other charges. If such going price for scrap cannot be realized, the contracting officer will arrange for bids, reserving the right to reject all bids, if in his judgment an adequate price is not offered. The Surplus War Property Administration will subsequently issue regulations providing for reports of scrap sales to disposal agencies and for a mechanism for stopping sales in any area where prices drop to unsatisfactory levels.

5. **WPB and OPA:** All sales are subject to applicable regulations of the WPB and OPA.

The entire policy is subject to immediate change by the Surplus War Property Administrator if experience demonstrates that changes are desirable.

Filing of Renegotiation Reports Simplified by WPB

Simplification of the mandatory filing requirements for certain war contractors and subcontractors subject to the renegotiation statute has been provided for by a ruling released by the War Contracts Price Adjustment Board. It provides that parent and subsidiary companies may satisfy the requirements for filing mandatory form of report by doing so on a consolidated basis. Subsidiaries having renegotiable business must file the Standard Form of Contractor's Report but may complete the report simply by writing on it a statement that the information called for is contained in the consolidated report filed by the parent company.

No special forms will be prepared on which to make application for exemption of standard commercial articles from the provisions of the renegotiation statute. Similarly, no form will be prepared for filing of applications for refunds under the retroactive application of the statute's provision exempting from renegotiation so-called excess inventory profits.

Appointments-Resignations

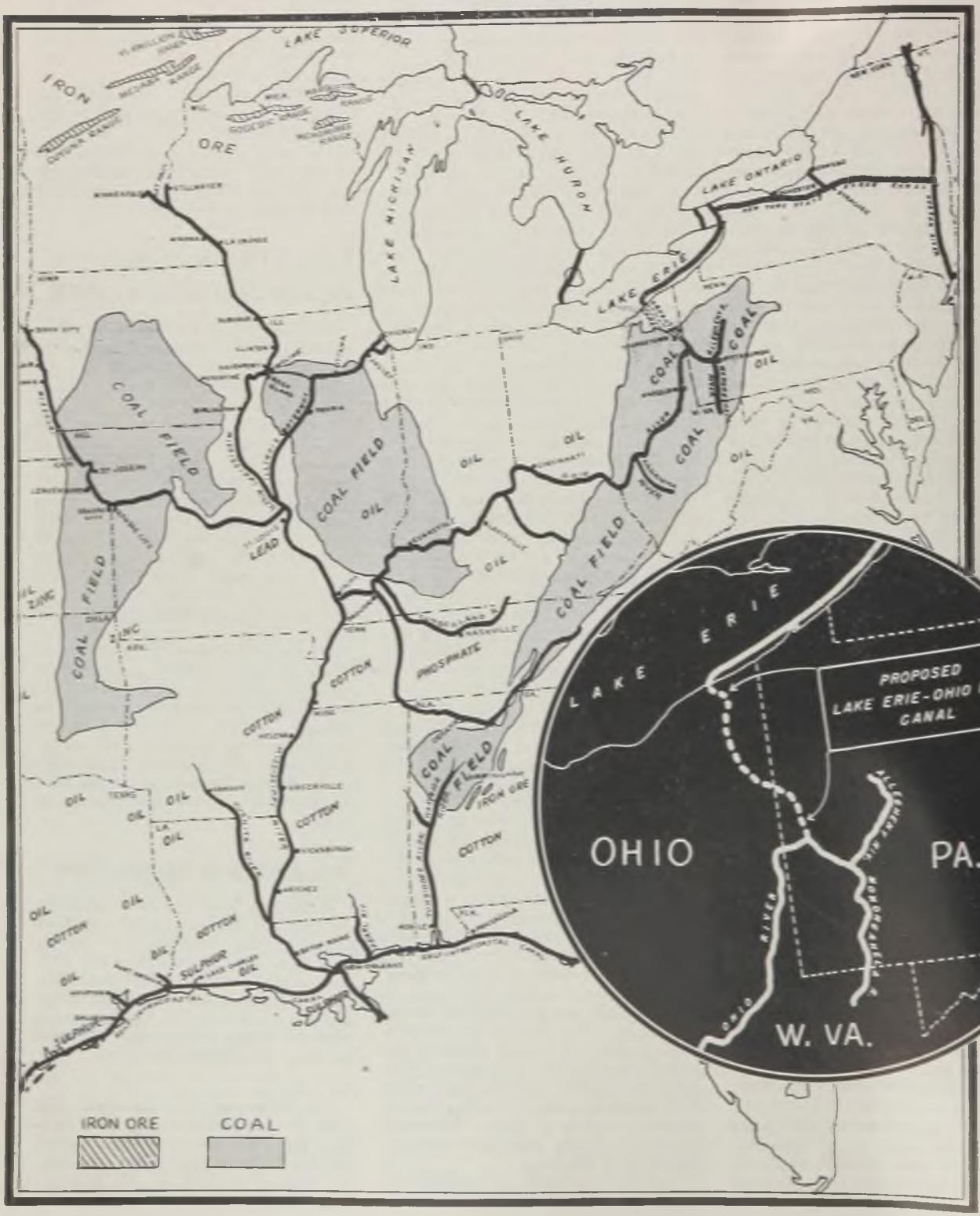
William B. Todd has been appointed assistant deputy director of the Steel Division, WPB. He has been serving recently as a representative of the division on the staff of the American Mission in London; has had extensive experience in the industry; and has served with the Union Drawn Steel Co. and the Jones & Laughlin Steel Corp.

° ° °

Alex Miller has been appointed chief of the Raw Materials Branch, Steel Division, WPB, succeeding William Kerber who has resigned. Mr. Miller will retain his position as chief of the division's Scrap Section.

Lake Erie-Ohio River Canal Urged

Proponents see it as missing link in system to connect great iron ore, coal and steel producing districts by water transportation. Army engineers' estimates on traffic indicate canal would be one of three most important waterways in United States



Postwar Project

By JOSEPH M. KURTZ
Assistant Editor, STEEL

YOUNGSTOWN district steel executives are pointing to the long-proposed Lake Erie-Ohio river waterway, which has been studied and approved by the United States Army engineers, as one of the nation's worthier postwar projects inasmuch as the welfare of about 800,000 people and industrial investments totaling $1,000,000,000 in Ohio's Mahoning Valley will be affected by its construction.

With the expectation that the federal government will spend great sums of money for postwar projects to provide employment, Youngstown industrialists are uniting their interests to obtain congressional approval of the canal. It has been considered since the days of the Revolution and was first urged by Col. George Washington in a letter to Thomas Jefferson. The first survey was made in 1881. And the fight for its approval continues.

Supporters of the proposed canal claim that 50,000,000 people from 19 states in the north, northwest, south and southwest stand to benefit from the canal's construction. It would link Lake Erie with the Ohio and Mississippi rivers at a cost to the government of $207,000,000 and to other interests of $12,000,000. The canal would provide a waterway transportation route for the ore of the north to inland consumers at Youngstown, Warren, O., Pittsburgh, Johnstown, Pa., Sharon, Pa., Wheeling, W. Va., Steubenville, O., and other steel producing centers. At the same time the coal from Pennsylvania and West Virginia mines could be shipped northward at considerably less cost.

Estimate Large Yearly Savings

Army engineers, after an intensive study of the proposed waterway, estimated that the minimum annual savings which would result during its first year of operation would be about $20,000,000. They predicted that 28,000,000 tons of ore, coal, limestone, grain, etc., would pass through the canal's 14 locks during the first year.

Construction of the waterway would make it one of the three most important and most heavily used inland waterways in the nation, according to Army engineers' estimates. During 1937, an good peacetime year, the Mississippi river traffic totaled about 28,000,000 tons, the Monongahela about 25,000,000 tons, and the Ohio river traffic about 23,500,000 tons. The Army engineers estimate that the traffic on the proposed Lake Erie-Ohio river waterway would be equal to that of the Mississippi and greater than the traffic on either the Monongahela or Ohio rivers. It also would be twice as great as the combined traffic on the New York barge canal, Illinois, Allegheny and Missouri rivers.

Statistics recently released by the War Department regarding traffic in 1942 on the inland waterways of the nation reveal it is at the highest level in history. A tremendous increase has been recorded on the Mississippi river which carried 92,100,000 tons in 1942, a 26 per cent increase over 1940 and a 328 per cent increase of the typical peacetime year of 1937. The 1942 figure does not include lend-lease or strategic materials shipments.

But the overall average of waterway shipments totaled about a 14 per cent increase over the 1940 and 1941 period, according to the Commerce Department. The Board of Transportation Investigation and Research, a government agency, estimated that traffic in 1939 on the various transport systems of the country were as follows: Railroads, 51 per cent; highways, 19 per cent; pipelines, 10 per cent; inland waterways, 8 per cent; Great Lakes shipping, 6 per cent, and coastal and intercoastal water movement about 6 per cent.

At present the Youngstown district is flourishing through the impetus of the war accelerated demand for steel but district's steel officials declare the mills in the Valley will be handicapped during a critical economic period because of the lack of cheap transport.

Proponents of the waterway contend the project would alleviate unemployment during the postwar period by providing jobs for 5000 workers for a period of six years. Army engineers estimate that about 70 per cent of the canal's cost could be paid directly or indirectly to labor. Thus, about $154,000,000 of the $219,000,000 would go to labor. Additional jobs would be provided for the maintenance of the canal which the engineers estimated would require an annual expenditure of $1,700,000.

After studying four possible routes for the canal, the army engineers concluded the shortest possible route and most feasible was to begin construction at the junction of the Ohio and Beaver rivers some 25 miles below Pittsburgh, near Rochester, Pa. Following the Beaver river northward to its head and then continuing northwestward up the Mahoning river to Warren, O., a man-made channel would have to be cut between the low divides of the Ohio and St. Lawrence rivers to the Grand river. At the hamlet of Harpersfield, O., the

(*Please turn to Page* 188)

Beaver-Mahoning Canal Project Argued

Senate Commerce subcommittee hears opponents, proponents of first leg of Lake Erie-Ohio River waterway. Cost estimated at $38,500,000

STRUGGLE between proponents and opponents of the Beaver-Mahoning canal, first leg of the long proposed Lake Erie-Ohio river waterway, broke out again in Congress last week in hearings of a Senate Commerce subcommittee.

In 1941 Congress passed a Rivers and Harbors bill with authorization to construct the Beaver-Mahoning canal. However, the authorization was stymied by Sen. Joseph Guffey (Dem., Pa.) through an amendment making it mandatory to construct the canal as part of an Ohio river-Lake Erie waterway. This would make it necessary to acquire property rights and make arrangements to relocate railroad tracks, rebuild bridges and involve other work over the entire route.

To clarify this amendment, Sen. Harold Burton (Rep., O.) introduced an amendment in this year's Rivers and Harbors bill which would authorize construction of the so-called stub-end of the canal from either Rochester or Beaver on the Ohio river to Struthers, O., and which would be binding to state, county and local interests only to that extent without holding them responsible for the proposed waterway beyond Struthers. Engineers estimate that this would cost the federal government $38,500,000 at present costs.

The project is being advanced by Senator Burton as a postwar activity for the reason it would not fit into the immediate war production program. A Youngstown, O., delegation, led by Frank Purnell, president, Youngstown Sheet & Tube Co., and including numerous labor and civic leaders, pointed out to the subcommittee that the project is badly needed and would help the whole Youngstown area, particularly the steel industry there.

Pittsburgh officials, union officials and several congressmen from western Pennsylvania districts declared their opposition to the proposal on the ground this federal expenditure is unwarranted because it would not help the national economy in general but only that of one small section and at Pittsburgh's expense.

Several other waterway projects are to be considered by the subcommittee and it will be several weeks before it goes into executive session and decides what recommendations to make to the full committee.

The Tractor that Brushes off a Jungle!

WHEN THE MARINES LAND . . . so do the Seabees armed with tractor bulldozers, *their favorite combat weapon.* To clear beach-heads for attack troops. To carve air-strips out of jungles. To lay roads over mountains. To drain swamps and build bridges. Yes, *sometimes even to fight!*

Like that time during a South Pacific landing . . . when strong Jap machine-gun fire held back everything except one man with a bulldozer, who charged in and with one sweep of the blade, cleaned out the nest and buried a dozen Japs.

Of such stuff are Seabees and their bulldozers made. And, like the men who man them, these blade-wielding tractors are built to "take it," where the going is tough. "Take it" they do, too, when they crack into rocks, butt into trees, bite into dirt, dive under water into mud and sand . . . or head into enemy fire.

Helping them stand up under the punishing shocks of load and impact are the husky, smooth rolling Hyatt bearings into which we build great stamina and capacity while holding them true to required precision tolerances.

Hyatts are liberally used to protect the vital operating parts of these ponderous machines of modern war. Tomorrow, these same high quality bearings will help you build better machines and hold competitive advantages in the post-war markets.

HYATT BEARINGS

DIVISION OF

GENERAL MOTORS

HARRISON, N. J.

By A. H. ALLEN Detroit Editor, STEEL

MIRRORS of MOTORDOM

First 1944 model commercial trucks roll off assembly line at Dodge. Basically of same design as 1942 models, with some improvements permitted under WPB material allotments. Studebaker "dust bowl" laboratory tests military trucks

DETROIT

FIRST contingent of new 1944 model commercial trucks has rolled off assembly lines at the Dodge Truck division, side by side with Army trucks, their shiny black fenders contrasting sharply with the olive drab of the military units. Three models are available in the 1944 line—1½-ton conventional, 1½-ton cab-over-engine and 2-ton conventional, with a choice of two wheelbases in the first model. All three will be available in chassis and cab; in addition, a 12-foot stake body will be available on the 1½-ton 160-inch wheelbase job.

Basically the new trucks are of the same design as 1942 prewar models, but a number of improvements, permissible under WPB material allotments, have been introduced, such as a heavier transmission, universal joint and propeller shaft; increased braking area; addition of several accessories as standard equipment; changed position of the steering column to provide more room in the cab, etc.

Capacity of the oil bath air cleaner has been doubled. The speedometer cable now is on the inside of the instrument panel to reduce possibility of breakage. Frame reinforcements or fishplates are provided on most models. All steering wheels are of Tenite plastic. There are double wrapped eyes in the springs of all conventional models. Deluxe features include dome light, arm rest and two rear vision mirrors.

Chrysler Corp. has drawn up plans and built scale models, complete with equipment and conveyor systems for a large new gear and axle plant to be built after the war and to supply gears and axles for all the Chrysler divisions. Several million dollars worth of machine tool equipment, welders and tube forming machinery will be required, orders for which doubtless will be placed in the near future. In the past these components have been supplied by several of the corporation's plants such as the Newcastle, Ind., division, Dodge and Chrysler Jefferson here in Detroit.

Manufacture of 0.45 and 0.30-caliber carbine ammunition at Chrysler's Evansville, Ind., ordnance plant ground to a stop last week, but the plant will remain open to re-package cartridges already completed. About 2000 employes will remain on the job, with 2500 to be laid off. The plant has an impressive record in the field of small arms ammunition, having produced in the neighborhood of three billion rounds.

Originally, the Evansville plant was an assembly point for Plymouth cars, and by June, 1942, had been converted to the manufacture of brass cartridge cases and ammunition. When brass was no longer available, experiments were rushed to develop a steel case and in four successful tests were concluded, while two months later full production was under way.

Studebaker's "dust bowl" is an unusual type of laboratory for service testing military trucks under desert conditions. Almost any wind velocity and dust intensity can be churned up in the test room through a series of air induction jets and miniature windmills. Although zero visibility is equivalent to 0.04-gram of dust per cubic foot of air, the test room has been charged with as high as 0.07 gram per cubic foot.

Use Remote Control

Since engineers can enter the dust chamber only when wearing respirators and cumbersome protective clothing, the vehicle under test is handled by remote controls. Faced by dials which indicate speed and temperatures, the "driver" sits in a sealed booth, through the windows of which he can observe the truck. Steering, clutch, brake and accelerator controls at his bench permit him to start and stop the wheels of the test vehicle. The truck wheels are fitted with four-bladed paddles, eccentrically weighted to force them to bob up and down as they rotate.

Thoroughness of the research even extends to the sand and dust used in the tests. In an effort to obtain material of the most abrasive character, barrels of dust have been shipped in from the Mohave desert. Most of these fine particles measure around 0.00004-inch in size and often require two hours to settle after they have been suspended in the atmosphere.

Use of two torque tension control deep-hole drilling machines has appreciably reduced the time necessary to drill front and rear crankcase sections of airplane engines being produced by Ford at the Rouge plant. Built to Ford specifications, the machines drill 18 holes in 3 minutes, an operation requiring 15 minutes on a conventional drill press. The new machines are said to be the first to incorporate torque tension control at the drill, thus reducing drill breakage to a minimum. The principle is the amplification by electronics of the torque load variations of an electric motor.

Torque control is incorporated into each of the machine's six heads. Each operates independently, advancing until an excessive torque force is applied to the drill either by undue pressure or accumulation of chips in the drill flutes. The unit then operates a relay which in turn actuates a solenoid-operated hydraulic valve, causing the head to return to the starting position. From this point it returns in rapid traverse to the position at which it encountered the excessive torque.

Incidentally, Ford engineering methods have reduced the cost of manufacturing turbosuperchargers by over two-thirds in the last 18 months. Something like 30,000 of these units have already been built by Ford, most of them being installed on the B-24 Liberator bomber engines at Willow Run. The supercharger is the type designed by Dr. Sanford A. Moss of General Electric.

A number of design changes have been worked out by Ford engineers. One is the compressor box which originally was specified to be cast aluminum and

MILITARY AND CIVILIAN MODELS: The first new 1944 commercial truck, a 1½-ton chassis and cab, is coming off the assembly line alongside two Dodge army trucks. Scenes like this now are typical at the Dodge truck plant in Chicago

was redesigned in low-carbon steel stampings spot and seam welded into a compact assembly. Another is the substitution of electric butt end welding in place of three bolts formerly used to fasten the bucket wheel to the shaft.

Deliveries of war products by General Motors in the first quarter of this year exceeded all previous records for three months, totaling $1,148,456,895, or an indicated annual rate of over 4 billions, and a daily rate in excess of 12 millions. The total was 37 per cent ahead of the comparable period last year. Net profit after taxes for the quarter amounted to $41,060,455, equivalent to 88 cents per common share. While a provision of $34,307,000 was made for price and other adjustments which may arise in connection with renegotiation of contracts, there was no amount earmarked for postwar contingencies since it was felt that present reserves of $76,051,805 for this purpose are adequate at present.

Average employment for the three-month period was 494,307, compared with 405,894 a year ago. Both accounts receivable and value of inventories as of March 31 exceeded half a billion dollars.

Profit margin of all automotive companies on total sales has been cut in half over the past four years, from 8.3 per cent in 1940, to 6.7 per cent in 1941, to 5.2 per cent in 1942, and 4.1 per cent in 1943. Also last year, total taxes paid by automotive companies were more than twice net earnings after federal taxes. These general conclusions are drawn by the Automotive Council for War Production from a study of annual reports of 21 parts companies and 15 motor vehicle manufacturers.

Recall Forerunner of NE Steels

Metallurgists at Great Lakes Steel Corp. here have recalled with justifiable pride that it was just seven years ago this month when the first heat of low-alloy high-tensile steel was poured. It was heat No. 8766A and in a sense was the forerunner of the NE steels of today. First samples of the steel were tried out in truck and passenger car wheel webs and it proved to have high fatigue life and good workability. Later it was tried in bodies, cross sills and hoppers of railroad cars, and in tanks for truck trailers. In 1939, the steel was proposed for use in gun carriages, tank framing and demolition bombs. Since that time, applications have expanded widely in war products and production has mounted steadily.

Reclaiming of scrap rubber is an important industry, and over the years chemists and engineers have worked diligently in the perfection of processing details. One rubber reclaiming plant has processed better than 172,000,000 pounds since Pearl Harbor, and has stepped up its capacity by more than 50 per cent over the peacetime level. Reclamation processes have been developed and refined by the Naugatuck Chemical division of United States Rubber Co. since 1892, using the sulphuric acid method principally until a few years ago when it was discarded. Then the war emergency put the pressure on all reclamation methods and the sulphuric acid method was brought back into use.

Here briefly is how an old tire is reclaimed: First it is put through a debeader machine, which strips off the tire bead and its wire center. Stripped of the beading, the carcass is conveyed to chopping machines, where whirling blades reduce all the stock to fragments. These chopped pieces then are flowed into large milling machines where they are ground up into fines. Next, the ground stock is screened and passed through a magnetic separator where all iron and steel particles are removed. Swelling and binding agents, liquid caustic and water are added to the scrap and the mixture fed into 10,000-pound digesters where fabric and other foreign material is removed. Steam then is applied to bring temperature up to 400 degrees and pressure to around 250 pounds per square inch. The digested material then is piped to open tanks where the material is thoroughly washed and then squeezed to remove most of the water. Next the reclaimed stock is fed through a continuous dryer and conveyed to storage bins where it is held until it is blended and made ready for finishing and re-use.

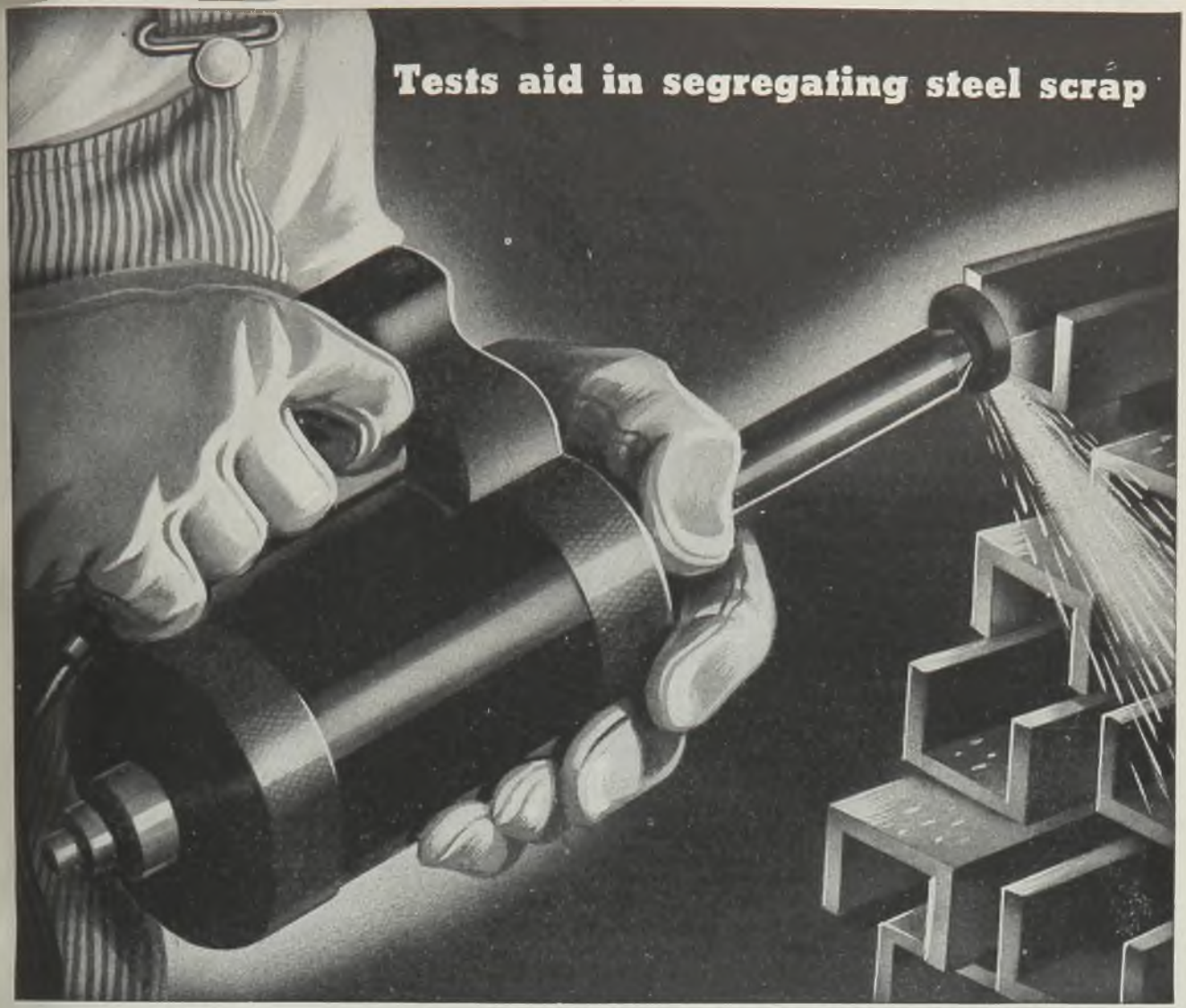
Reclaimed rubber can be cured in less time than natural rubber, and is less absorbent of solvents such as oil and grease.

CONVERTED TRAILER: To afford transportation for workers in the Brown Shipbuilding Co. yards from Houston, Tex., 25 miles away, a Houston Chevrolet dealer, Harry Pollard, converted a fleet of abandoned automobile "haul-away' trailers into passenger buses, now operates a fleet of 17. Shown above is the interior of one of the buses

Pool Promotes Export of Small Plants' Products

Plans to promote the sale of over 40 different products in Africa, Asia and Europe in order to provide small manufacturers with postwar outlets are being laid by sponsors of the Greater New York Manufacturers' Pool, New York, George H. Salmon, export manager, International Banding Machine Co., New York, reports.

The pool, established in 1942, has obtained several million dollars worth of contracts for small plants which otherwise would have been idle. The organization is composed of 128 manufacturers, chiefly machine shops. It will market such items as electrical supplies, household and building hardware, radios, etc.



The loss of recoverable alloys in steel scrap has been a major problem confronting the various conservation agencies. Proper segregation of scrap is one effective answer.

Segregation of scrap at the source is comparatively simple. The difficulty comes in preventing mix-ups in subsequent handlings. They can be prevented or remedied by applying two simple tests—spark and spot.

The presence of molybdenum, or nickel, or both, is readily detected by spark testing. Molybdenum causes an easily recognized secondary burst at the end of the spark stream resembling a spearpoint. Nickel produces a spot of intensely white light in the stream near the grinding wheel.

Both elements have a tendency, in the higher contents, to suppress the supplemental bursts characteristic of carbon steels.

Several spot tests for molybdenum have been developed. The simpler ones depend on the red color produced by either potassium ethyl xanthogenate or sodium thiocyanate added to a molybdate obtained from the etched surface of the steel. The dimethyl glyoxime test for nickel also depends on a red coloration. Many of these tests are approximately quantitative.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

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WING TIPS

Planemakers ask early formulation of United States policy on postwar air force. Suggest power adequate to win war, keep peace. Would acquire bases and preserve strong manufacturing industry. . . Aviation Corp. to make appliances

HEADS of 15 of the country's larger aircraft companies, sitting in Los Angeles as the board of governors of the Aeronautical Chamber of Commerce, recently asked for the early drafting of an American airpower policy and advanced a set of principles to guide it.

Eugene E. Wilson, vice chairman, United Aircraft Corp., who headed a committee to draw up "an estimate of American aviation" and a recommendation for an airpower policy, described the conference as one of the turning points in the history of aviation.

In a resolution unanimously adopted by the board and copies of which were sent to interested government officials, the board recommended early formulation of an airpower policy under these guiding principles:

"The United States should maintain an airpower sufficient (in conjunction with other forces) not only to win this war but also to keep the peace.

"1. By maintaining adequate air forces of such strength and in such state of readiness as to preclude a successful assault upon our country or its possessions.

"2. By acquiring and maintaining air bases essential to our security and that of overseas trade.

"3. By facilitating the orderly and economic expansion of domestic and international air transport and of private flying.

"4. By preserving a strong aircraft manufacturing industry."

The board also asked for the re-establishment of the office of assistant secretary for air in the Department of Commerce.

While the aircraft industry seeks a statement now on the postwar plans and policies of the government in maintaining an air force, individual companies are quietly making plans for other products to supplement their aircraft products in utilizing their vast facilities when demand for planes dwindles.

One of these, Aviation Corp., has announced its intention of entering the home appliance field and plans to produce ranges, heaters, deep-freezers, wheel goods and electronic devices. It will continue to make diversified aircraft products, including engines, propellers and precision parts.

To direct the distribution program for its household appliances, the company has appointed Col. Philip J. Reilly, managing director of the Associated Merchandising Corp. Colonel Reilly will take charge of the development program July 1.

In making the announcement, William F. Wise, executive vice president of the company, said:

"The household appliance manufacturing plan will supplement the corporation's overall aircraft parts production and will broadly diversify postwar operations."

Dr. A. J. Snow, former technical director for Sears, Roebuck & Co., was retained by Aviation Corp. last year to investigate markets for postwar consumer goods. He will continue development work in co-operation with Colonel Reilly.

AVIATION LEADERS: Executives of the nation's airplane plants are shown assembled for a conference at Los Angeles to discuss the industry's problems. They are, left to right, seated: J. H. Kindelberger, North American Aviation Inc.; P. G. Johnson, Boeing Aircraft Co.; L. C. Goad, General Motors and Eastern Aircraft division; Harry Woodhead, Consolidated-Vultee Aircraft Corp.; LaMotte T. Cohu, Northrop Aircraft Inc., and Guy W. Vaughn, Curtiss-Wright Corp. Standing, left to right, are: Alfred Marchev, Republic Aviation Corp.; J. Carlton Ward, Fairchild Aviation Corp.; Glenn L. Martin, Glenn L. Martin Co.; T. Claude Ryan, Ryan Aeronautical Co.; L. D. Bell, Bell Aircraft Corp.; Robert E. Gross, Lockheed Aircraft Corp.; Eugene E. Wilson, United Aircraft Corp.; Ernest R. Breech, Bendix Aviation Corp., and Reginald E. Gillmor, Sperry Gyroscope Co. NEA photo

Bell Develops Helicopter Stabilizing System

Bell Aircraft Corp., Buffalo, has announced the development of a new helicopter incorporating important principles which make for stability in flight and for precision control. Bell helicopters have been flying for more than a year.

The helicopter is one of the products which Bell expects to manufacture for both commercial and private use after the war. At present, however, the emphasis is on the potential military uses involved, and no work will be done on postwar models until the war is ended.

The stability principle incorporated in the craft was developed after years of research by Arthur M. Young, who heads the helicopter program for Bell. Mr. Young had worked with scale models for more than 12 years before he came with Bell in 1941.

Stability in helicopters—both relative to the ground and relative to their own axes—had long been a problem, and much of the research carried on by Mr. Young was aimed at solving this particular question.

The result of all this work was the development of a stabilizing system. In Bell's craft the rotor is rendered independent of the mast by the stabilizing device and the rotor tends to remain in a horizontal plane. This stability promises increased simplification of controls when such craft can be made available for the general public.

The two-bladed rotor used on these helicopters also makes possible a simplified hub design.

The Bell machine uses a conventional antitorque propeller on the tail and has a three wheel landing gear. The Franklin engine, rated at 160 horsepower, is of the horizontally opposed air-cooled type, and is mounted vertically directly aft of the pilot's compartment. The closed cabin model utilizes generous sections of transparent plastic with the cabin design affording maximum vision.

Rotor, mast transmission and engine are mounted integrally, and are set in

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In flight over the Bell Aircraft Corp.'s administration building, the helicopter exhibits its ability to operate in restricted areas. The unit is a two-place cabin craft with a single two-bladed rotor and a conventional antitorque propeller

the fuselage in soft rubber mounts in order to reduce vibration.

The span of the rotor is 33 feet, and the diameter of the antitorque propeller is about 5 feet. The main rotor blades are of solid wood construction, with a steel insert in the leading edge, to aid in mass balancing, and for added strength. The antitorque propeller is two-bladed, variable pitch, also with solid wood blades. It is driven by a tubular shaft, and is controlled by a cable and pulleys.

Regarding the future of helicopters as private craft, Bell says:

"Although the controls of the helicopters today are continually being revised and simplified, operation of such a craft still requires a high degree of skill and technical knowledge. Some time will elapse before the operation of the helicopter can be simplified to a degree that the average automobile driver can operate one. Such a time will come, of course, but it is still a few years off.

"Eventually, helicopters will be operated as pleasure craft and by sportsmen, and at some time they will begin to become generally available in the mass market, but this will be after considerable research and development. Bell Aircraft Corp. feels that the future of the helicopter can only be impaired if it is over sold and if too much is expected of it. The helicopter is still in its early stage of development."

Electronic Blind Landing Instrument Guides Pilots

An electronic blind landing instrument, which guides pilots back to their home airfields and enables them to hit runways "on the nose" even when they are blacked out by war or weather, is in production at the Westinghouse Meter division, Westinghouse Electric & Mfg. Co., Newark, N. J.

Four separate radio transmitting stations and two antenna systems at and near the airport comprise the ground radio equipment. They shoot beams which first indicate the pilot's approach to the field and then mark the field's boundary, establish the invisible glide path which leads to the runway and signal directions for keeping the glide to the field neither too shallow nor too steep.

Vertical guidance—to maintain the position of the plane in relation to the runway—is provided by three of these transmitters. If the plane wanders to the left or right of its course, one of the pointers on the instrument immediately indicates the error.

Buick To Manufacture Two New P&W Engines

Buick Motor Division of General Motors is retooling its Flint, Mich., and Melrose Park, Ill., plants to manufacture two additional types of Pratt & Whitney aircraft engines for four-engine B-24 bombers and C-54 transport planes. The new engines are the R-1830-75 and R-2000-9, of different dimensions and developing greater horsepower than the current R-1830-43 type.

Two new supply contracts have been signed with the AAF Materiel Command, involving upwards of $60,000,000 for initial delivery of a specified quantity of both types and a manufacturing program has been launched involving extensive retooling and machinery procurement to meet proposed schedules.

At the same time, production of current engines which the Division is now producing for the Liberator bomber program and C-47 cargo planes will be carried on without reduction in volume. On the contrary, schedules will increase as the program advances.

To accomplish this, "stand-in" machinery will be placed in the plants which will begin production of the new engines while the present machines and equipment continue on the current types.

Buick already has delivered to the AAF approximately 45,000 engines, all of which are being used in Liberator bombers. Schedules for the calendar year, 1944, are 22 per cent higher than the output of 1943.

Thunderbolt Fighters Being Sent to Russia

Thunderbolt fighter planes now are being delivered to Russia under lend-lease from the plants of Republic Aviation Corp. at Farmingdale, Long Island, N. Y., and Evansville, Ind.

Alexander Kartveli, Russian-born chief engineer of Republic, is the designer of the Thunderbolt.

Republic's deliveries of Thunderbolts to the Army Air Forces now has passed the 6500 mark, representing a total engine power in excess of 13,000,000 horsepower and fire power of more than 50,000 machine guns of 0.50-caliber.

Glenn L. Martin Builds New Testing Facility

A new flying boat facility designed to speed the testing and delivery of PBM Mariner and JRM Mars flying boats is being built at the Glenn L. Martin Co., Baltimore, and will be placed in operation soon. Located on Strawberry Point adjacent to the Martin Airport, to which it will be connected by a concrete taxiway, the new base will be fully equipped to handle the inspection, packing, testing, operation and servicing of the big flying boats, and will relieve much of the congestion due to new and increased contracts on the present seaplane ramp in the manufacturing area.

Physical facilities of the new base will include a permanent, steel-construction, daylight hangar, a two-story building to provide office and storage space, a concrete ramp, concrete apron and concrete compass compensating area, and docks for service boats. The hangar will have a 200-foot clear entrance with doors at either end, and will be capable of holding 6 PBM or 3 JRM flying boats. Many additional boats can be accommodated on the large concrete apron.

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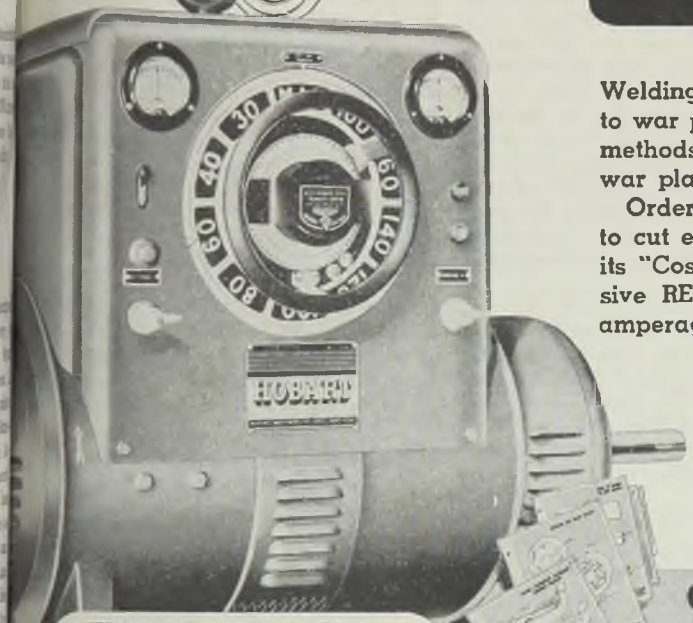

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MORE BONDS!

EUGENE J. REARDON

JAMES A. ROWAN

AINSLIE Y. SAWYER

Eugene J. Reardon has been appointed chief engineer, American Steel & Wire Co., Cleveland, succeeding **George H. Rose**, who has been named assistant to vice president.

—o—

L. A. Saunders, purchasing agent, New Process Gear Corp., Syracuse, N. Y., has been elected president of the Purchasing Agents Association of Syracuse and Central New York.

—o—

Charles C. Tallman has been appointed controller of Western Cartridge Co., East Alton, Ill.

—o—

Dr. Laurence C. Hicks has been appointed metallurgical engineer and associate director of research in the Magnetic Products division, Allegheny Ludlum Steel Corp., Pittsburgh. **R. H. Thielemann**, formerly associated with the research laboratory of General Electric Co., Schenectady, N. Y., has been named development engineer for Allegheny Ludlum.

—o—

J. Ralph Patterson, vice president in charge of sales, Mackintosh-Hemphill Co., Pittsburgh, and **C. Howard Paul**, treasurer and assistant to the president, have been elected to the board of directors.

—o—

B. W. Thompson has been appointed director of engineering for General American Transportation Corp., Chicago, and its subsidiaries and divisions. Mr. Thompson, formerly chief engineer, has been connected with the corporation 24 years.

—o—

George F. Eglinton has been elected president of Lincoln Park Industries, Lincoln Park, Mich. Formerly vice president and general manager, Mr. Eglinton succeeds **Albert A. Robinson**, who becomes chairman of the board.

—o—

Robert S. Peare, manager of publicity and broadcasting, General Electric Co., Schenectady, N. Y., and chairman of the company's general advertising committee, has been elected a vice president. **H. V. Erben**, since 1941 manager of the company's Central Station divisions, has been elected a commercial vice president.

—o—

James A. Rowan, recently special assistant to the director of the WPB Steel Division, and formerly news and market editor of *The Iron Age*, has been appointed director of public relations and advertising, Great Lakes Steel Corp., Detroit.

—o—

Eugene W. Wasielewski has been appointed chief engineer, McCulloch Engineering Corp., Milwaukee.

—o—

Leo J. Mason has been elected vice president, Tubular Alloy Steel Corp., Gary, Ind., succeeding **E. N. Sanders**, who resumes his position as vice president in charge of operations, National Tube Co., Pittsburgh, after 20 months as vice president in organizing the new Tubular Alloy Steel Corp. plant at Gary, Ind. Both men will serve as directors of their companies.

—o—

Andrew Mitchell, tool supervisor at the metal stamping department, East Pittsburgh, Pa., works of Westinghouse Electric & Mfg. Co., has received the "Safety Ace" award of the National Safety Council for his "outstanding achievements" in industrial accident prevention.

—o—

Herbert A. White has become associated with Smeeth-Harwood Co., Chicago, as manager. Previously, Mr. White had been with National Bearing Metals Corp., Pittsburgh, as Pittsburgh district sales manager.

—o—

Lewis S. Hunt, former secretary-treasurer, Simmonds & Simmonds Inc., Chicago, has been appointed advertising manager, Signode Steel Strapping Co., Chicago, to succeed **E. C. Hamm**, resigned.

—o—

Newly-elected directors of United States Rubber Co., New York, are: **George P. Edmonds**, president, Bond Crown & Cork Co., Wilmington, Del.; **George M. Tisdale**, director of purchases, United States Rubber Co.; **Willard H. Cobb**, general manager of the rubber company's mechanical goods division, and **Harry S. Lewis**, president of J. P. Lewis Co., and president and director of Lutex Fiber Industries, Inc.

—o—

Ainslie Y. Sawyer, assistant to president, Joseph T. Ryerson & Son Inc., Chicago, has been elected vice president and will continue at Chicago in general charge of purchases. Mr. Sawyer recently returned from Washington, where he served as deputy chief, Warehouse Steel Branch, WPB. **Harold B. Ressler**, vice president, who has been located at the Ryerson New York plant, will move to the Chicago headquarters, where he will be in general charge of sales in all territories. **Harry W. Treleaven** has been appointed manager of the New York plant, and **Thomas Z. Hayward** has been made assistant general manager of sales for the company.

—o—

W. Herschell Skinner has been appointed assistant purchasing agent, Perfect Circle Co., Hagerstown, Ind., and **Robert Van Winkle** succeeds Mr. Skinner as purchasing agent for the company's

JOHN AVERY

Who has been appointed manager, Blower and Compressor department, Allis-Chalmers Mfg. Co., Milwaukee, noted in STEEL, April 24, p. 87.

HAROLD B. RESSLER

C. R. W. THOMAS

O. J. LEONE

W. B. PIERCE

Richmond, Ind., plant. **Stanley Murray** has been made manager of the warehouse of the Hagerstown plant.

—o—

C. R. W. Thomas has been appointed to the technical staff of sales and service engineers, Standard Varnish Works, New York, and will be in charge of the Baltimore territory.

—o—

Neil A. Sargent has been named assistant research director, Merrimac division, Monsanto Chemical Co., St. Louis. Mr. Sargent will share administrative and supervisory responsibilities with **A. H. Bump**, also an assistant research director, under **W. S. Wilson**, director of research. **Dr. Robert D. Swisher** has been appointed group leader in charge of organic chemical research for the Merrimac division.

—o—

O. J. Leone has been appointed Pittsburgh regional manager, Steel Mill division, The Bristol Co., Waterbury, Conn.

—o—

Stanley G. Disque, formerly assistant district sales manager of the Indianapolis office of Republic Steel Corp., Cleveland, has been appointed sales agent for the state of Indiana, Follansbee Steel Corp., Pittsburgh. Mr. Disque will make his headquarters at 420 Board of Trade building, Indianapolis.

PAUL P. HUFFARD

Who has been elected a director of Union Carbide & Carbon Corp., New York, as announced in STEEL, May 1, p. 92.

—o—

Alexander S. Basil has been named assistant factory manager of the Lowell, Mass., plant of United States Rubber Co., New York.

—o—

W. H. Henson has been appointed refractories field engineer by Norton Co., Worcester, Mass., and will make his headquarters in Worcester. **Eugene A. Fischer** has been made New England refractories engineer, to succeed Mr. Hanson.

—o—

J. E. Tweeddale, until recently on special leave of absence from Bell Telephone Laboratories, New York, to Columbia University's War Research division, has taken over co-ordination and production programming of thermistors, varistors, glass-sealed switches and carbon-deposited resistors in the Radio division of Western Electric Co., New York.

—o—

D. B. Gooch, formerly a sales engineer with the Blaw-Knox division, Blaw-Knox Co., Pittsburgh, has been appointed sales manager, C. M. Kemp Mfg. Co., Baltimore.

—o—

Andrew G. Nelsen has been named manager of the middle western district, Lamp division, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

—o—

C. F. Norberg has been elected vice president in charge of manufacturing, Electric Storage Battery Co., Philadelphia, and **D. N. Smith** has been elected comptroller.

—o—

H. S. Hubbard has been appointed assistant engineer in the Power Transformer Engineering division at General Electric Co.'s Pittsfield, Mass., works. He succeeds **A. B. Hendricks Jr.**, who has retired after 43 years with the company. In 1941 Mr. Hubbard received the Coffin Award for the development and design of a 1,400,000-volt direct-current generator for the United States Bureau of Standards.

—o—

W. B. Pierce has been appointed manager of the newly-formed Market Development division, Rustless Iron & Steel Corp., Baltimore. Associated with Mr. Pierce will be **Stanley P. Watkins,** manager of the sales engineering department, and **J. L. Cotsworth,** head of the advertising department.

—o—

H. C. Hopkins, formerly manager of the Enameling and Decorating division of American Can Co., New York, has been appointed general manager of purchases for the company, and **Jesse H. Hamilton** has been made assistant manager of sales, Pacific division, with headquarters in San Francisco.

—o—

Jesse H. Eilar has been appointed to the statistical staff, Perfect Circle Co., Hagerstown, Ind.

—o—

John M. Spence, for the past 25 years chief auditor, Barber-Greene Co., Aurora, Ill., has been elected secretary and a director. He succeeds **D. C. McIllwraith,** who has retired after 27 years with the company.

—o—

William Davey, former general manager of Curtiss-Wright Corp.'s Buffalo plants, has been named assistant works manager, Niagara Frontier division, Bell Aircraft Corp., Buffalo.

—o—

Walter H. Ferguson, previously comptroller, National Mfg. Corp., Tonawanda, N. Y., has been elected vice president and director of sales. **Leo E. Taylor,** for 12 years assistant to the late John J. Flanagan, vice president and sales manager, has been appointed sales manager of the corporation.

—o—

H. F. Maxon has been appointed general sales manager, Boston Woven Hose & Rubber Co., Cambridge, Mass., and **W. I. Lewis** has been named assistant general sales manager. **W. F. Carroll** has been made district sales manager of the New York and Pennsylvania

E. E. CLARK

ARTHUR J. MILLER

districts, succeeding Mr. Maxon. **A. C. Kingston,** vice president and general manager, has been obliged to relinquish a large part of his duties due to ill health and has been named consultant to the president on matters of sales policy.

—o—

E. E. Clark has been named president of American Screw Co., Providence, R. I., and **V. J. Roddy** has been advanced to the vice presidency of that company.

—o—

John P. Larkin, chief of the stainless steel and lend-lease section of the WPB Alloy Steel Division, has returned to the position he held with Crucible Steel Co., New York, before joining WPB in August, 1942.

—o—

Roy M. Jacobs, president, Standard Brass Works, Milwaukee, has been elected president of the Non-Ferrous Founders' Society for the coming year.

Edwin W. Horlebein, president, Gibson & Kirk Co., Baltimore, is vice president, and **Richard M. McClure,** Chicago, is secretary-treasurer.

—o—

Arthur J. Miller, treasurer and in charge of manufacturing operations for Chicago Wheel & Mfg. Co., Chicago, since 1926, has been elected president, succeeding his father and founder of the company, the late Henry E. Miller. Associated with Mr. Miller are: **Irving Danielson,** vice president in charge of purchases; **A. J. Miller Jr.,** treasurer and manager of engineering developments, and **Arthur T. Dalton,** secretary and sales manager.

—o—

Lincoln E. Walker has been appointed general manager, Murchey Machine & Tool Co., Detroit, succeeding **A. J. Prance,** who continues as president and director. Mr. Walker also has been named acting sales manager, pending appointment of a successor to **W. C. Buechner,** who has resigned to establish his own sales organization. **J. H. Coyle,** in addition to directing the service department, has been named assistant sales manager.

—o—

William H. Lake has been made vice president in charge of operations, Empire Steel Corp., Mansfield, O., and **Oliver C. Henkel** has been named vice president and secretary-treasurer.

—o—

Clarence B. Randall, vice president in charge of raw materials, Inland Steel Co., Chicago, has been named to head the 1944 campaign of the Community and War Fund of metropolitan Chicago.

—o—

Albert T. Huizinga has been elected vice president and treasurer of National Supply Co., Pittsburgh. Mr. Huizinga joined the company as treasurer in July, 1943.

—o—

W. O. Everling has been appointed director of research, American Steel & Wire Co., Cleveland, succeeding the late J. S. Richards, and **R. H. Barnes** has been named assistant director of research to succeed Mr. Everling.

—o—

Paul T. Farrell, previously director of purchases, Great Lakes Steel Corp., Detroit, has been appointed to the newly-created position of assistant to the president, Stran-Steel division.

—o—

John B. DeWolf has been appointed vice president in charge of sales, Woodward Iron Co., Birmingham, Ala., with offices at 1515 First National building, Birmingham 3.

OBITUARIES . . .

John C. Brooks, 58, vice president and a director of Monsanto Chemical Co., St. Louis, and general manager of the company's Plastics division at Springfield, Mass., died April 26 on a train en route from St. Louis to New York. Mr. Brooks had entered the plastics industry in 1922 as general manager of the Fiberloid Corp., later becoming its president. When Fiberloid Corp. became the nucleus of Monsanto's Plastics division, Mr. Brooks was appointed to the posts he held at the time of his death. He also was president of an affiliated company, Shawinigan Resins Corp., Springfield.

—o—

Rudolph Lensch, 64, retired owner of the Art Metal Co., Los Angeles, died April 22 in Glendale, Calif.

—o—

William H. Fitzell, secretary and purchasing agent, Berlin Construction Co. Inc., Berlin, Conn., died recently.

—o—

William J. Mielziner, 53, manager of the Hudson plant, American Can Co., Jersey City, N. J., died April 27 in New York. Mr. Mielziner joined the company in 1915, and had been manager of the Jersey City plant since 1936.

—o—

Floyd M. Wills, 62, former vice president and general manager, Buffalo Copper & Brass Rolling Mill, Buffalo, and later manager of the Buffalo Steel Car Co., Buffalo, died there April 28.

—o—

Charles A. Clarke, 89, vice president, Universal Boring Machine Co., Hudson, Mass., died April 27 in Watertown, Mass. Mr. Clarke was a former president of Hill, Clarke Co., Boston machinery dealers.

—o—

William H. Krukemeyer, 45, vice president, Atlas Foundry Co., Cleveland, and associated with the company for more than 27 years, died April 28 in Cleveland.

—o—

Allen J. Dunham, 33, president, Electric Motor Co., Racine, Wis., was killed in a plane crash April 26.

—o—

Francis M. Garretson, who retired in 1941 as sales service engineer for Westinghouse Electrical Mfg. Co., New York, died April 27 in East Orange, N. J. During World War I Mr. Garretson had supervised construction of a tin smelting plant in Penang, British Malaya.

—o—

Adolph F. Wagner, 85, former president of the A. F. Wagner Iron Works, Milwaukee, died April 24 in that city.

—o—

John Aylward, 72, former vice president of Aylward Sons Co., Neenah, Wis., died April 21 in that city.

—o—

Bernard F. Kilroy, 56, general sales manager, C. G. Hussey & Co., Pittsburgh, died there April 25. He had been identified with the company for 42 years.

—o—

Michel Nigro, 62, inventor and mechanical engineer, well known in the machine and wire spring industries, who retired five years ago because of ill health, died April 21 in Worcester, Mass.

—o—

Leslie C. Cuningham, 46, assistant regional director for Canada, United States Steel Export Co., New York, died in New York April 27.

Dominion Shellmakers Planning To Resume Production on Large Scale

Many plants that have been converting to different work will reinstall machinery to care for large artillery shell orders to be placed by Department of Munitions. Government salvage agency being liquidated

TORONTO, ONT.

CANADIAN war industries are planning to resume shell production on a large scale, according to word from government sources. For several months past output of practically all types of shells and explosives has been gradually tapering and many plants that were engaged in this type of work have dismantled equipment and have been preparing to enter upon new manufactures with a good percentage swinging over to civilian goods.

According to government advices, large contracts will be let immediately for artillery shells through the Department of Munitions and Supply. It was announced two weeks ago that the United States had placed shell orders with a Fort William company, which will provide work for between 10 and 15 plants in Canada and give employment to between 10,000 and 15,000 workers.

One difficulty that faces companies that will resume shell production is that it will require the re-equipping of some plants where dismantling of machinery and production lines already had taken place.

Official announcement has been made that Wartime Prices and Trade Board will close down the Wartime Salvage Ltd., in Toronto and the charter will be surrendered. The company was organized in 1942 as a fiscal agency co-operating with Department of Munitions and Supply in the handling of scrap iron and steel, metals, etc., and as a merchandising agency for the distribution of these products. Function of the company has subsided with recent easing of the scrap situation. Wartime Salvage Ltd. is the first of the Crown companies to be disbanded.

J. H. Berry, director general, Automotive and Tank Production Branch, Department of Munitions and Supply, has been appointed chairman of the Crown Assets Allocation Committee, established to advise the government on the disposal of all surplus assets of the Crown. A. S. Tisdale has been appointed comptroller and treasurer, War Assets Corp. Ltd.

J. A. H. Paterson, mining executive, has been appointed as Canadian representative on the copper committee of the Combined Production and Resources Board and the Combined Raw Materials Board of the United States, Great Britain and Canada.

Ross H. McMaster, president, Steel Co. of Canada Ltd. reports that over the first quarter of 1944 ingot steel production of the company increased almost 7 per cent compared with the like period of 1943. Consumption of purchased steel, however, was somewhat lower. March sales were the highest for a single month, and those for the quarter compared closely with the record quarterly figures of recent years. Net profit, however, was restricted to 70 per cent of the "standard" prewar figures now permitted.

Shortage of manpower still persists in the Canadian steel industry and labor turnover has retarded production at some finishing plants. Employes of the Steel Co. of Canada now include 1200 women.

Steel production for the first four years of World War II is 272 per cent greater than in four years of World War I, said Mr. McMaster.

Continental Can Co. of Canada Ltd., Montreal, has completed arrangements for an expansion program which will affect both war and peacetime activities of the company. Announcement has been made that the company had purchased at approximately $2,500,000 the plant of Macdonald Mfg. Co., in Toronto, subsidiary of General Steel Wares Ltd.

Steel Co. of Canada Plans Construction of New Mill

Plans for the construction of a new strip mill with an annual capacity of 250,000 to 300,000 tons annually are being made by the Steel Co. of Canada Ltd., Hamilton, Ontario. The project will cost about $2,775,000.

The company set a new all-time production record during March with its plate mill producing 26,889 tons, compared with the previous high made in July, 1943, of 21,305 tons.

Lewis Foundry To Produce Large Caliber Shells

Lewis Foundry & Machine division, Blaw-Knox Co., Pittsburgh, has signed a contract with the Navy to produce large caliber explosive shells.

The plant will need an additional 100 to 150 machinists to carry on the operations. With installation of necessary equipment and new tools, which already has been started, the plant is expected to go into shell production by late summer. Finished shells will be shipped to naval arsenals.

They Say:

"We shall have been criminally negligent if during these times we fail to plan for the job beyond. In my opinion any assumption is unsafe and dangerous, that we will just automatically have full employment because of the combination of scarcity of goods and high purchasing power." —**Howard E. Blood,** president, Norge division, Borg-Warner Corp., Detroit.

* * *

"Corporate enterprise could bear even heavier taxes than it is now being required to pay and any idea that we shall go back to the taxes of the 'twenties after the war is a beautiful pipe dream. . . . We shall doubtless need high taxes not only in the transition period but in peacetime as well, for our revenue needs will continue to be great."—**Randolph Paul,** former general counsel of the Treasury.

* * *

"The contract termination problem is not of the future, but of the present, and growing larger every day. . . . Industry planning for postwar production can only be partially completed until certain definite policies are laid down by the government, and industry reconversion can only be realized speedily and effectively if these policies take cognizance of the physical factors entering into the problem." —**A. M. Wibel,** vice president, Nash-Kelvinator Corp., Detroit.

* * *

"The government will have to exercise some control over postwar production and prices to prevent inflation by means of broad legislation of a limited nature. Economic maladjustments and depressions following World War I resulted from lack of planning and control of various phases of business. It was almost suicide. It may be suicide now if some sort of control is not exercised."—**Arthur D. Whiteside,** president, Dun & Bradstreet Inc., New York.

Jessop Steel Co. Opens Three Branch Outlets

Company establishes warehouse at Montreal, Canada, and branch offices at Birmingham, Ala., and St. Louis

ONE WAREHOUSE and two additional branch offices have been added to the sales and service organization of the Jessop Steel Co., Washington, Pa., T. W. Pennington, vice president, announced last week.

The warehouse, established in Montreal, Canada, is handling the usual diversified line of the company's specialty steels and is set up to give prompt delivery to the Montreal district. J. W. Henderson has been appointed to manage the warehouse.

Two additional branch offices are located at Birmingham, Ala., and St. Louis. J. R. Chitwood is managing the former office and J. C. Schonhardt the latter. The addition of these three branch outlets brings to 18 the number of branch offices and warehouses maintained by the company.

Association of Engineering Companies Organized

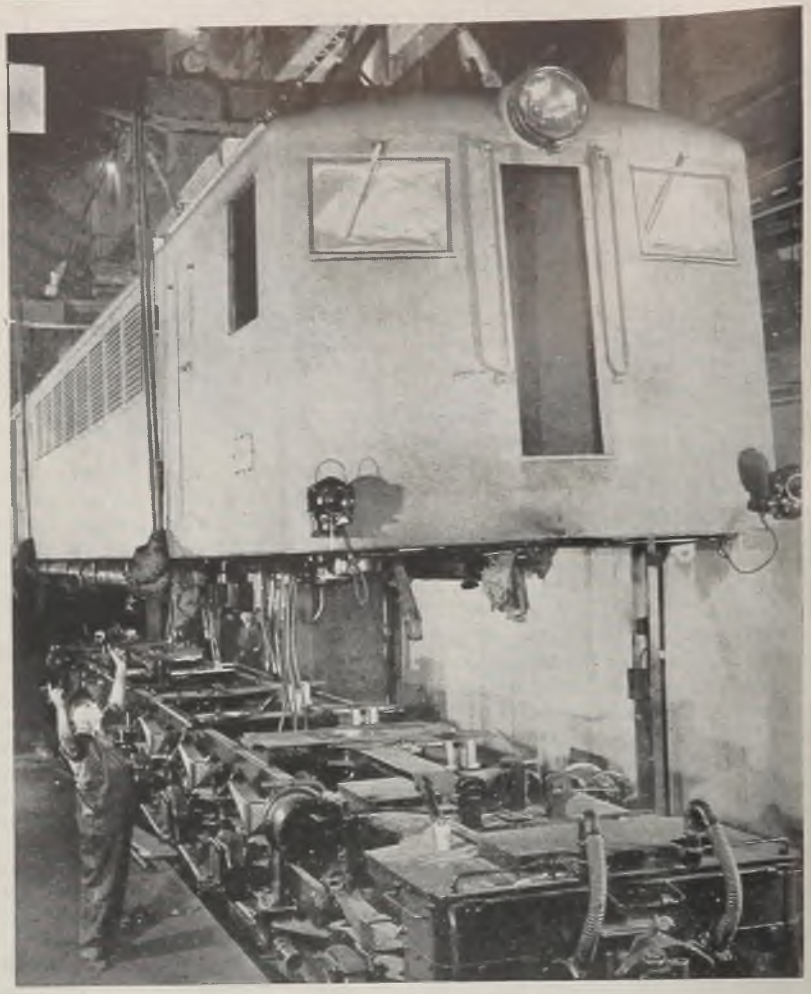
Formation of the Association of Engineering Companies, 226 Boulevard building, Detroit 2, has been announced by Gerald R. Marshall, executive secretary of the association.

Mr. Marshall states the association is a non-profit Michigan corporation organized for the "advancement, regulation and general good of the tool and product engineering profession." Honorary officers are: President, Marcel Atlas, president, Mechanical Engineering Service Co., Detroit; vice president, L. E. Allen, president, Allen Engineering Co., Detroit, and treasurer, George T. Koch, president, Engineering Service Inc., Detroit.

Chicago Ordnance District Terminates 1038 Contracts

Chicago Ordnance district so far has completed 1038 war contract terminations involving a total value of $440,000,000, and is prepared to process from 500 to 600 contracts a month at the war's end.

Contractors are helping substantially in settlements, according to Brig. Gen. Thomas S. Hammond, with 40 to 50 per cent of terminations going through without change. He said efforts of contractors in transferring inventories to other war work is commendable.



PULLING POWER: Being assembled at the East Pittsburgh, Pa., plant of Westinghouse Electric & Mfg. Co. is this big locomotive which has 140 tons of electric pulling power. With six electric motors supplying a total of almost 2000 horsepower, the locomotive will see service on the Sorocabana railway running through the rich ore regions around Sao Paulo, Brazil

BRIEFS . . . .

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

Ramtite Co., division of S. Obermayer Co., Chicago, has published a new bulletin explaining and illustrating how significant economy can be effected by proper design.

—o—

Blaw-Knox Co., Camden, N. J., reports that its current volume of war output continues at about the same level as that which enabled the company during 1943 to set an all time net sales record of $113,295,659.

—o—

Phelps Can Co., Baltimore, recently sold its Baltimore plant to the Wirtz Mfg. Co.

—o—

Atlas Car & Mfg. Co., Cleveland, recently shipped a self-propelled diesel-electric ore transfer car to an eastern steel plant, believed to be the first of its type to go into service anywhere.

—o—

H. G. Mueller & Associates, Pittsburgh, announce the opening of offices at 649 Hilltop road, Erie, Pa., to provide a new engineering service to manufacturers.

—o—

American Marietta Co., Chicago, recently purchased the Sewall Paint & Varnish Co. with plants at Kansas City, Kans., and Dallas, Tex.

—o—

British Iron and Steel Federation, London, England, recently approved the formation of the British Iron and Steel Research Association, which will take

over the work of the Iron and Steel Industrial Research Council.

—o—

American Cooperage & Steel Drum Co., Baltimore, has begun operations in its new plant at Fairmount avenue and Janney street.

—o—

Carpenter Steel Co., Reading, Pa., has published a chart for the identification of stainless steels which it produces.

—o—

Revere Copper & Brass Inc., New York, has opened a new office at 1225 Circle Tower, Indianapolis, headed by P. H. Anderson.

—o—

Perfect Circle Co., Tipton, Ind., has completed 7 years without a lost-time accident.

—o—

Lyon Metal Products Inc., Aurora, Ill., has prepared a manual which is of value to companies facing termination of contracts.

—o—

Aluminum Ladder Co., Worthington, Pa., has been granted allotments of aluminum by the government and now is able to manufacture a limited number of ladders for civilian purposes.

—o—

American Standards Association, New York, established plans for national unification of standards for ball and roller bearings at a recent conference.

—o—

Yale & Towne Mfg. Co., New York, recently purchased the scale business of the Kron Co., Bridgeport, Conn.

—o—

Link-Belt Co., San Francisco, has opened a sales office and warehouse at 151 Lincoln street, Spokane.

—o—

Manco Mfg. Co. Bradley, Ill., has purchased the Carolus line of bolt and wire cutters, end cutters, and nut splitters.

—o—

Carnegie-Illinois Steel Corp., Clairton Works, recently completed 2,614,100 man-hours of working time without a single lost-time accident.

—o—

Department of Interior, Washington, has made a preliminary report on the quicksilver deposits in the Cinnabar Creek area, Georgetown and Akiak districts, Alaska.

—o—

Macwhyte Co., Kenosha, Wis., recently presented 59 of its employes with service awards.

—o—

Allen-Bradley Co., Milwaukee, announces removal of its New York offices to 155 East Forty-fourth street.

—o—

Fairbanks, Morse & Co., Chicago, recently opened a new office at 1335 Hunt building, Tulsa, Okla., under the management of Frank D. Ratcliffe.

—o—

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., through a company-wide campaign to speed the loading and unloading of railroad cars made available 1000 extra car days a month to other wartime shippers during 1943.

—o—

Aluminum Research Institute, Chicago, has reprinted a second edition of "Standard Methods for the Sampling and Analyzing of Aluminum and Certain Aluminum Alloys".

—o—

Gould Coupler Works, Depew, N. Y., announces it is practically reconverted to its regular lines of railway equipment with enough orders on hand to keep the plant operating at capacity for the remainder of the year.

—o—

Sprague Specialties Co., North Adams, Mass., has changed its corporate name to Sprague Electric Co.

—o—

Bristol Co., Waterbury, Conn., announces a new bulletin describing its new line of electronic controllers.

—o—

International Business Machines Corp., New York, recently announced postwar plans for reorganizing its foreign business and similar plans for postwar domestic expansion based on 84 engineering projects.

—o—

Goodyear Tire & Rubber Co., Akron, O., recently created a plastics and chemical sales division, headed by Herman R. Thies.

—o—

Pesco Products Co., Cleveland, disclosed at a recent meeting a new development which simplifies and lightens the hydraulic control system for actuation of wing flaps, landing wheels, and other mechanisms of planes.

Sterling Tool Announces 100% Distributor Plan

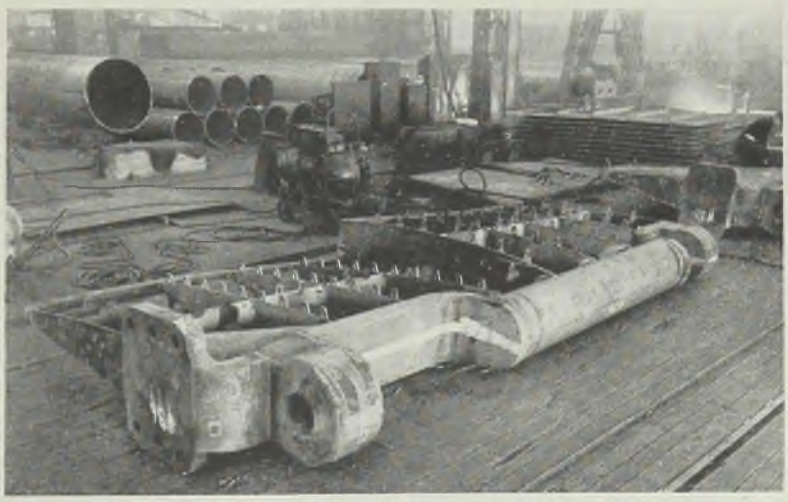
In the future its products will be handled through selected mill supply and automotive distributors and jobbers

NEW sales plans were announced to a group of company and advertising agency officials for the Sterling Tool Products Co., Chicago, by J. A. Proven, general sales manager, at a recent luncheon at the Medinah Club, Chicago.

Predicting a year of intensified and increased sales and manufacturing activity, Mr. Proven said plans for the present and postwar years call for 100 per cent distribution through selected mill supply and automotive distributors and jobbers. To effectuate these plans, R. D. Wyly, former advertising executive, has been appointed to direct the company's advertising and sales promotion and William L. O'Bryne, formerly with Continental Laboratories, will be in charge of distributor correspondence.

The company manufactures electric and air-driven portable sanding machines for use on wood, metal and plastics.

Also present at the luncheon were S. A. Crosby, president of Sterling Tool Products Co., and J. M. Warnimont, assistant sales manager of the company.



VICTORY SHIP'S RUDDER: This rudder for a Victory ship is of the streamlined, unbalanced, contra guide type. The weldments, connecting tube and diaphragms can be seen. From March, 1941, to the present, Bethlehem Steel Co. has completed or has under construction over 4000 rudders of various types, using about 30,000 tons of steel. Construction is carried out at six of the company's fabricating works for various types of combat and military vessels

THE BUSINESS TREND

Munitions Output Reverses Recent Downward Trend

MUNITIONS output rose 3 per cent during March, reversing the downward trend in the initial two months this year. From March onward the overall schedule rises throughout the summer.

A challenging aspect of future munitions schedule is that output of the most critical munitions items—as represented by the rising programs—is scheduled to increase 25 per cent by the close of this year.

Meeting the goal that lies ahead is going to tax the resourcefulness of management and labor, as indicated by the fact that actual output in the critical uptrending programs during March was 2 per cent behind schedule.

To meet the future schedules of these rising programs, workers released as a result of order cutbacks and cancellations in the declining war programs must shift to plants working on the critical expanding programs. Similarly, management and labor must continue to improve industrial efficiency.

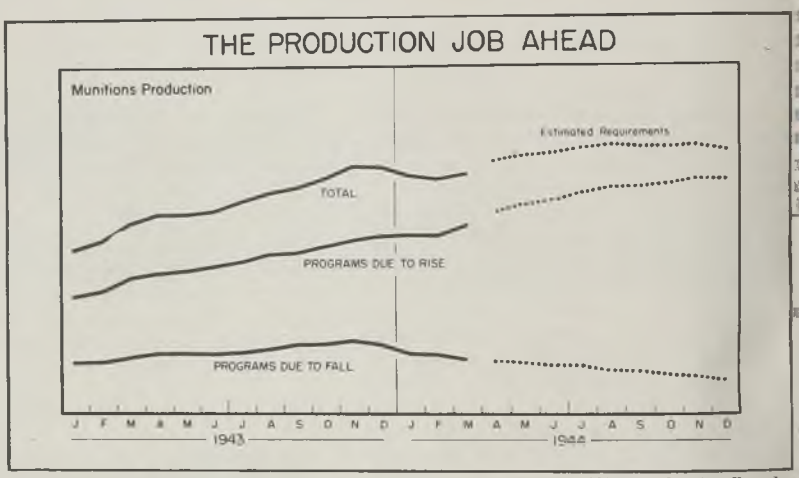
A breakdown of production trends in key munition programs as reported by the War Production Board for March and the indicated outlook for the coming months is as follows.

ORDNANCE—Output of guns, ammunition and vehicles for the ground Army during March was 3 per cent below the February level, in contrast with a scheduled decline of 7 per cent. The largest types of trucks are still in acute demand. Output of these trucks was up 13 per cent and ran ahead of schedule for the second successive month. Combat vehicle output was up 9 per cent, somewhat above schedule because of the large gain in tank production. Tractors are another accelerating program, with March output matching schedules. Stated military tractor requirements are expected to exceed supply for some time.

SIGNAL EQUIPMENT—Communication and electronic equipment output met the rising schedule by gaining 1 per cent over the February production. Chief difficulty in the electronics production program is the shortage of transformers. Program calls for nearly doubling output by June to meet sharply expanded needs of airborne electronics equipment.

SHIPBUILDING—Construction of Maritime ships totaled 1,538,357 deadweight tons during March; representing a gain of 12 per cent over February, 28 per cent above January, and 2 per cent over the schedule. Navy shipbuilding held on an even keel during March with deliveries totaling 210,798 displacement tons. This was 5 per cent over the February showing, but remains 18.5 per cent behind schedule. However, landing craft was 26 per cent over February construction. Important developments lie immediately ahead in the Navy shipbuilding program, with deliveries to show an 80 per cent jump over the March level by the end of May.

WPB's MUNITIONS INDEX—Recorded a gain of 17 points during March to an index figure of 660; November, 1941 representing 100. The March index figure is still below the December peak of 662, but compares favorably with 647 and 643 registered during January and February respectively. A year ago the index stood at 518. The overall munitions program calls for further gains to new record levels throughout the summer.



Source: War Production Board.

Munitions programs still due to rise account for four-fifths of the 1944 schedules. Types of war materiel for which there is an increasing demand include: Aircraft, airborne electronics equipment, large trucks, most types of Naval combatant ships, landing craft and heavy artillery. Declining programs include: Most ground Army items, destroyer escort vessels, Liberty ships and radios.

FIGURES THIS WEEK

INDUSTRY	Latest Period*	Prior Week	Month Ago	Year Ago
Steel Ingot Output (per cent of capacity)	99.5	98.5	98.0	99.5
Electric Power Distributed (million kilowatt hours)	4,336	4,344	4,400	3,867
Bituminous Coal Production (daily av.—1000 tons)	2,038	1,955	2,038	1,941
Petroleum Production (daily av.—1000 bbls.)	4,436	4,415	4,385	3,919
Construction Volume (ENR—unit $1,000,000)	$26.7	$51.4	$29.4	$47.1
Automobile and Truck Output (Ward's—number units)	16,345	16,905	17,810	18,990

*Dates on request.

TRADE				
Freight Carloadings (unit—1000 cars)	835†	840	786	789
Business Failures (Dun & Bradstreet, number)	4,431	4,415	4,385	3,919
Money in Circulation (in millions of dollars)‡	$21,396	$21,334	$21,006	$16,593
Department Store Sales (change from like week a year ago)‡	−11%	+23%	+17%	+15%

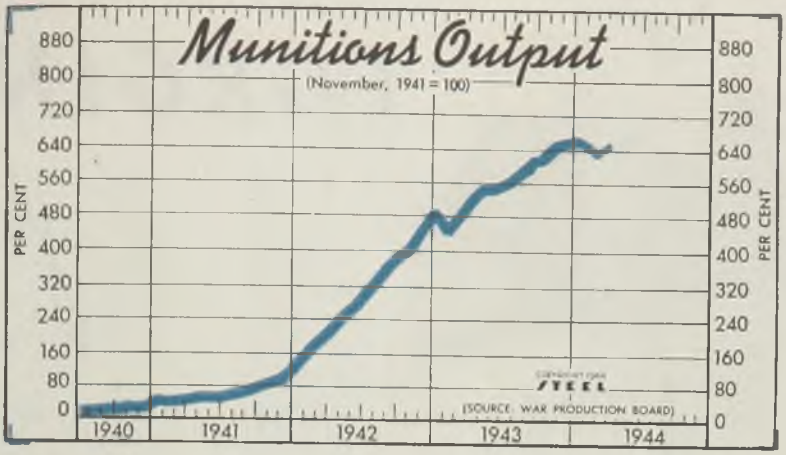
†Preliminary. ‡Federal Reserve Board.

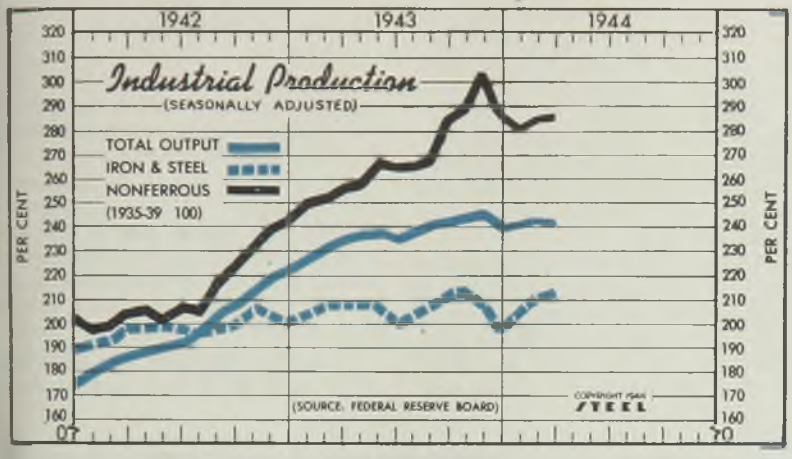
WPB's Munitions Index

(November, 1941 = 100)

Month	1944	1943	1942	1941	1940
Jan.	647	453	166	41	..
Feb.	643	476	182	45	..
March	660°	518	213	52	..
April	...	547	247	60	..
May	...	548	276	57	..
June	...	560	309	59	..
July	...	587	339	64	23
Aug.	...	609	372	72	22
Sept.	...	611	387	83	22
Oct.	...	644	403	91	27
Nov.	...	661	448	100	34
Dec.	...	662	497	133	50

°Preliminary.





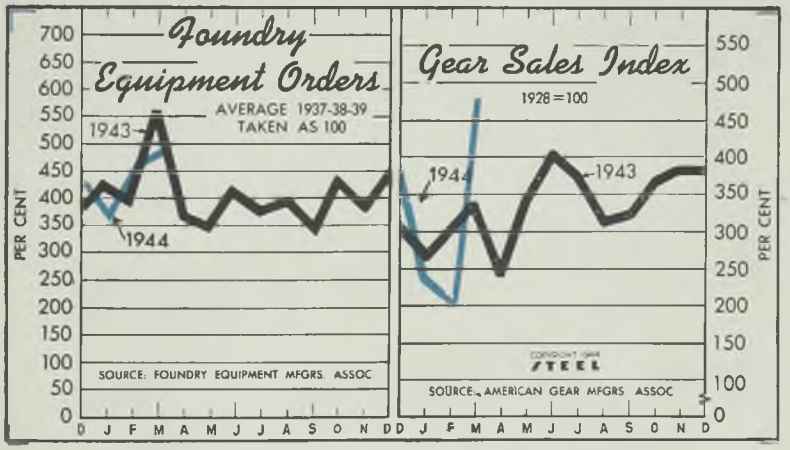
Federal Reserve Board's Production Indices

(1935-1939 = 100)

	Total Production		Iron, Steel		Nonferrous	
	1944	1943	1944	1943	1944	1943
Jan.	242	227	208	204	281	250
Feb.	244	232	212	208	285	252
Mar.	242	235	214	210	286	256
Apr.	...	237	...	209	...	257
May	...	238	...	208	...	266
June	...	236	...	201	...	264
July	...	239	...	203	...	264
Aug.	...	242	...	209	...	267
Sept.	...	243	...	213	...	284
Oct.	...	247	...	214	...	289
Nov.	...	247	...	209	...	304
Dec.	...	241	...	200	...	286
Avg.	...	239	...	207	...	270

Foundry Equipment and Gear Sales

	Monthly Average (1937-38-39=100)			Index (1928=100)		
	1944	1943	1942	1944	1943	1942
Jan.	378.3	429.8	532.7	246	268	288
Feb.	456.8	399.5	567.9	214	303	353
Mar.	498.4	562.7	1122.4	485	334	455
Apr.	.....	362.7	1089.3	...	240	378
May	.....	348.9	653.6	...	342	421
June	.....	413.6	774.0	...	401	373
July	.....	379.4	800.8	...	374	344
Aug.	.....	390.4	510.8	...	312	380
Sept.	.....	346.6	446.4	...	320	351
Oct.	.....	436.6	540.6	...	368	263
Nov.	.....	388.0	338.8	...	387	359
Dec.	.....	442.8	382.5	...	387	300
Avg.	.....	440.3	646.7	...	336	355



FINANCE

	Latest Period°	Prior Week	Month Ago	Year Ago
Bank Clearings (Dun & Bradstreet—millions)	$9,001	$9,135	$9,028	$8,421
Federal Gross Debt (billions)	$187.0	$187.0	$187.4	$132.2
Bond Volume, NYSE (millions)	$44.0	$51.4	$56.9	$107.4
Stocks Sales, NYSE (thousands)	3,060	3,909	7,484	6,377
Loans and Investments (millions)†	$51,563	$51,596	$52,903	$44,127
United States Government Obligations Held (millions)†	$38,110	$38,089	$38,522	$30,487

†Member banks, Federal Reserve System.

PRICES

STEEL's composite finished steel price average	$56.73	$56.73	$56.73	$56.73
Spot Commodity Index (Moody's, 15 items)†	249.5	249.7	251.5	246.1
Industrial Raw Materials (Bureau of Labor index)‡	113.0	113.9	113.3	112.5
Manufactured Products (Bureau of Labor index)‡	100.9	100.9	100.6	100.8

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

FORGING FORKS for Farmers

. . . . involves unusual combination of hand and mechanical methods

By W. K. COWDERY
Manager, Ashtabula Works
American Fork & Hoe Co.
Ashtabula, O.

VISITORS at the Ashtabula, O., Works of American Fork & Hoe Co. are usually intrigued by the interesting and highly efficient combination of hand and mechanical methods employed in the forging of various types of forks made for farm use. Due to inevitable wear and breakage, manufacture of an adequate supply of "pitch" forks and other similar items to help farmers "maintain maximum production" is just as essential in the winning of the war as production of shells and guns.

So American Fork & Hoe continues to make many different kinds and types of forks in addition to such wartime products as bayonets for Army service rifles. Possibly one of the most interesting forks from the standpoint of the forging techniques employed is the large 10-tine ensilage fork whose manufacture is illustrated and described here.

Fig. 1 shows bar stock from which they are made. This steel is 0.90 to 1.00 per cent carbon, 0.40 to 0.50 manganese, 0.08 to 0.12 silicon with sulphur limited to 0.05 and phosphorus to 0.04 per cent. Bars are ½-inch thick, 5 inches wide, 12 to 14 feet long.

To facilitate blanking, bars are brought to red heat in oil-fired furnace shown.

Note rollers located on stands around furnace to facilitate handling of the bars when feeding them to furnace and placing them in blanking press just to the right here.

Fig. 2 reveals dies and unloading side of 750-ton blanking press. Very little scrap is produced in blanking due to the interlocking design of the blanks which permits two identical blanks to be produced at each stroke of the press.

Fig. 3 shows details of the blanking dies employed. Both halves of die are identical, each weighing 800 pounds and measuring 8 x 17 inches overall. Workman is looking at bottom die.

In **Fig. 4,** workman is folding the piece together with the short stubs outward, leaving one stub extending from the end for forging. Of course, piece has been reheated to a temperature where it works easily before this is attempted. Anvil upon which this forming operation is done is equipped with a vertical double-pronged rest which helps hold the one portion while making the bend with a double-pronged hand tool that engages the work.

Figs. 5 and 6 show the method employed to forge out the individual tines from the short stubs on the blank. After folding the piece as in Fig. 4 so one of the stubs extends from the end, Fig. 5, the operator inserts the stub in the extreme left groove of the two forming rolls or roll dies.

Each of these roll dies contains a series of ten depressions or grooves, starting with a wide one, ending with a narrow one.

The roll dies are revolving continuously in a direction such that work placed between them is pushed toward the operator. Since the roll dies are not true rolls but extend for a little less than 180 degrees around the circumference, there is a period during each revolution when the die halves are at top and bottom of the upper and lower rolls respectively, with a good sized opening between the rolls. It is during this period of each revolution that the operator is inserting the work between the rolls so when the dies come on around, they grip the piece and work it down.

Each depression or groove in the roll dies is wider where it first engages the work, becoming narrower as it turns. Now when

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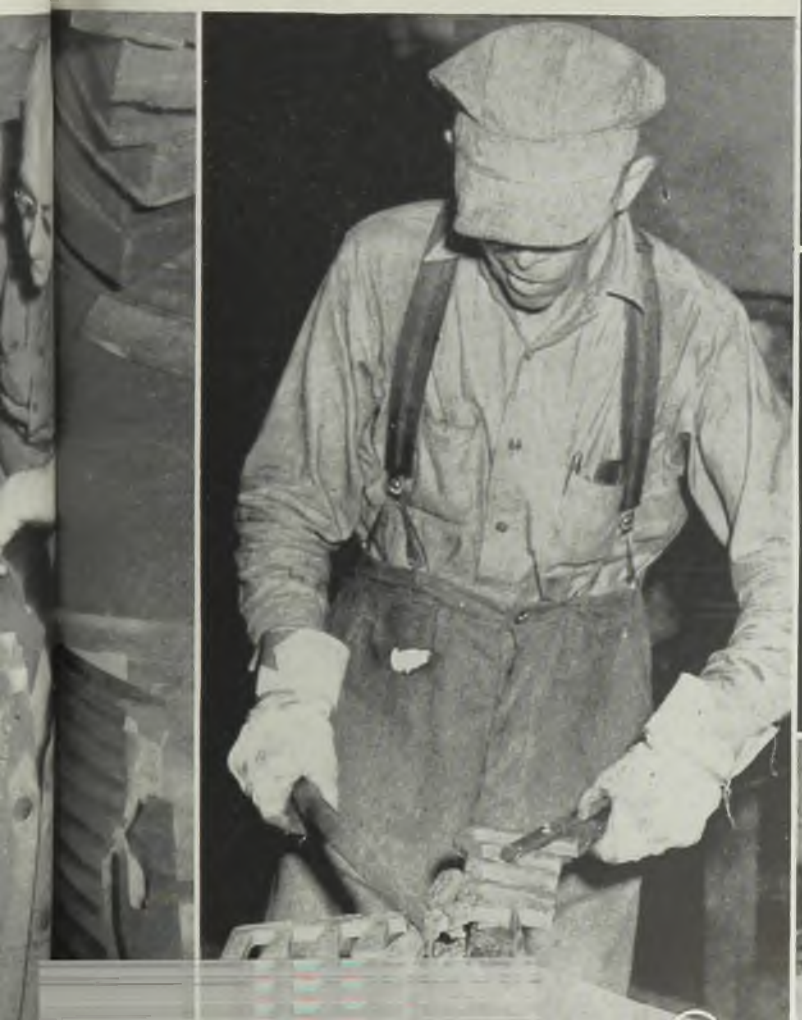

"Short-Circuit" Welding

... licks difficult fabricating job in assembling droppable fuel tanks

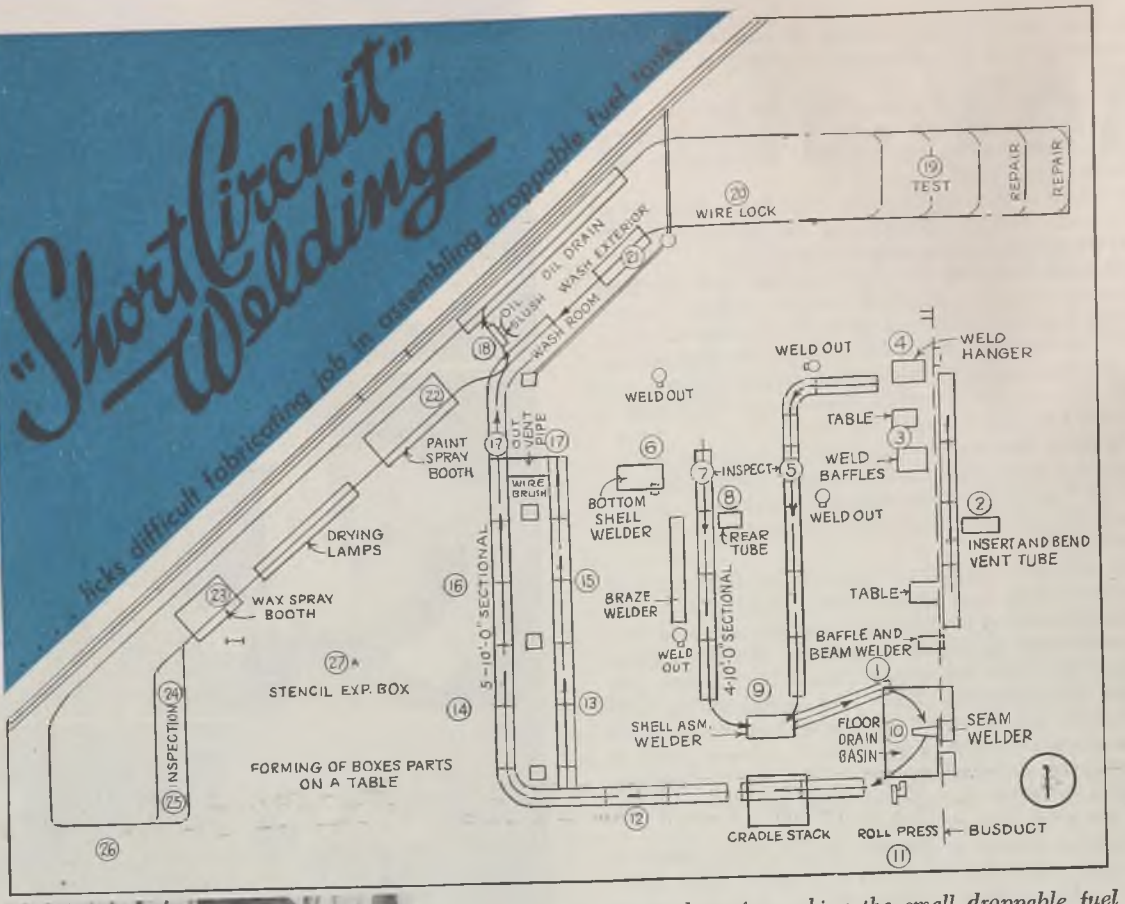

Fig. 1—Layout of lines for making the small droppable fuel tank. Station numbers coincide with operation numbers in text. Progress down roller conveyor lines is indicated by arrows

Fig. 2—To resist huge inertia forces during catapult launching, tank must be reinforced by heavy sheet-metal V-beam welded between the two baffles that go in the upper half-shell. This fixture is for spot welding the subassembly that consists of V-beam and two baffles. Note eight hold-downs operated together from one air cylinder through multiple distributor arm in lower portion of fixture. Welding is done with "pinch" type suspended gun

Fig. 3—Toughest job of all—"short-circuit" spot welding the hangar plate (on outside of upper half-shell) to the shell and the shell to the V-beam and baffle subassembly inside of it. Note air-operated hold-down toggle clamps in foreground gripping shell flange, large air cylinder under fixture for working main fixture heads. Welding is done by "short-circuiting" gun

By G. ELDRIDGE STEDMAN

NERVE center of a transportation network, reaching all corners of the United States, which embraces every mode of travel from air to river steamer and includes 1900 miles of railway trackage within its own industrial area, St. Louis employs upwards of 126,000 men and women in 2500 industries which produce more than 283 different products.

Prominent among these industries is the American Stove Co., a leading prewar producer of gas, coal, wood and oil ranges; whose "know-how" in sheet-metal fabrication has resulted in such notable contributions to the war effort as the original design and production of auxiliary droppable fuel tanks, widely used by the Navy. This achievement is felt to have definite bearing on post-war sheet metal fabrication methods.

Auxiliary droppable fuel tanks are fabricated in three sizes, each separately engineered for efficient production. Manufacture of the smallest type will be described because it presented most difficult operations. This tank is made of 24-gage terne plate, lead-coated steel. The deepest draw is 10.75 inches; it has an elliptical and tear-drop shape, so it is produced in two half-shells which are seam welded to form the complete droppable tank. Auxiliaries include discharge tubes, vent pipes and drain plugs.

This tank is unique in design, having only one hanger. In combat, the tank may be carried by planes which can catapult from supply ships and carriers. The shock of catapulting sets up strains, distributed sharply through the plane to the tanks, which must be able to absorb the stresses thus created. To do this, it was necessary to design a backbone

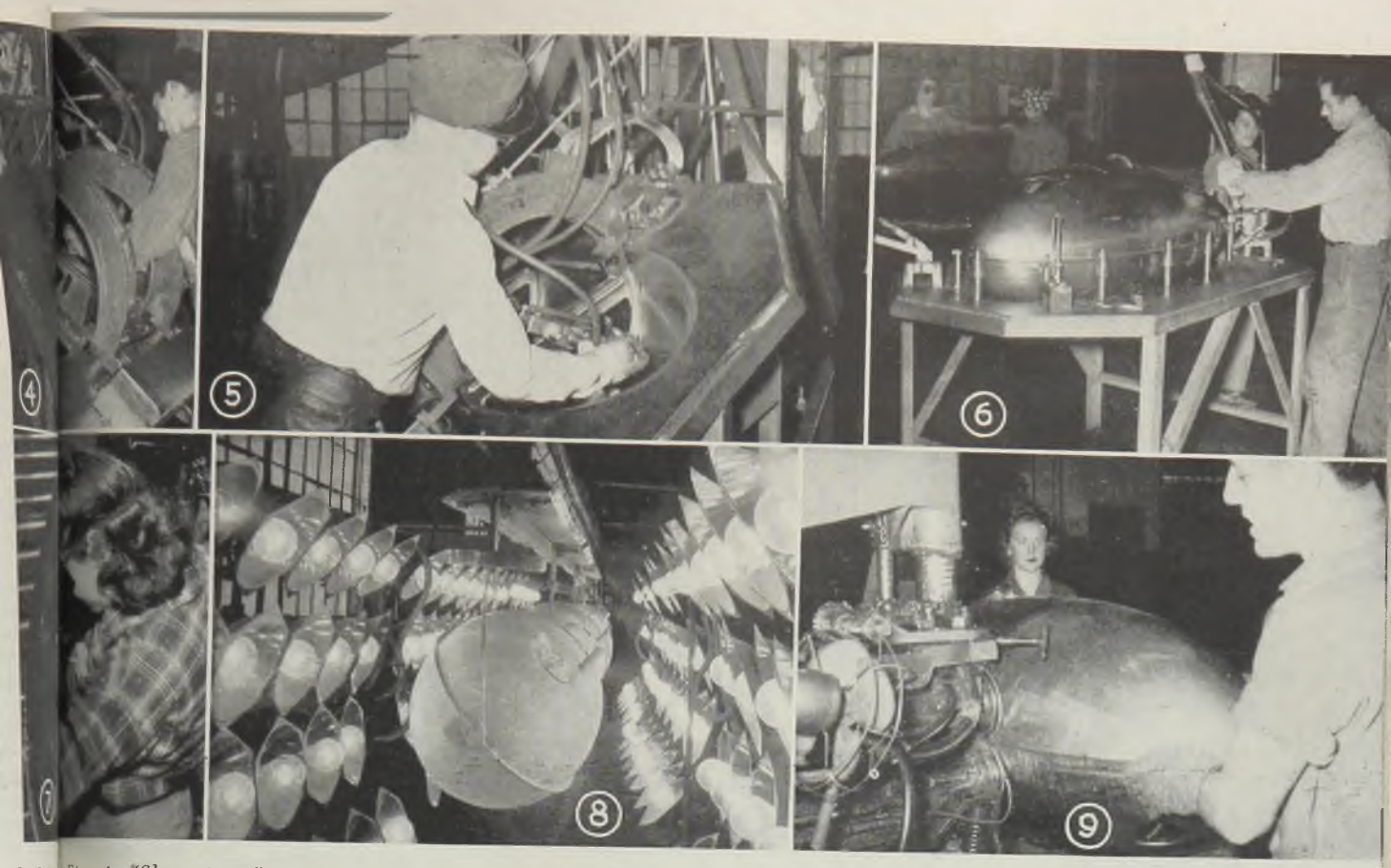

Fig. 4—"Short-circuit" spot welding the two baffle plates into the lower half-shell

Fig. 5—View of other end of the setup for "short-circuit" spot welding baffle plates into the lower half-shell

Fig. 6—Two finished half-shells are positioned in this fixture for tack-welding together, operator using "pinch" type spot welding gun suspended from overhead

Fig. 7—Silver-soldering front discharge tube in place. A good view of the hangar plate is also provided here. This and all welding views show the small droppable tank

Fig. 8—Bank of infra-red lamps used in drying completed tanks

Fig. 9—Two half-shells are sealed together by seam welding the flanges as shown here

Fig. 10—Schematic diagram showing connections and arrangement of work for "short-circuit" spot welding. Location of spots is controlled by hand-positioned "short-circuiting" gun

assembly to distribute the load stresses throughout the skin of the tank. This involves vertical inside baffles. The Navy provided American Stove engineers with only ideas on general contour, hanger position and capacity; asking the company to work out detailed design. "Catapult-strain" can not be calculated, is found only by trial and error.

Experience as a leading fabricator of sheet metal gave American Stove much engineering "know-how" that was put to good use in solving this difficult problem. Its methods have now become government specification for this critical fabrication.

G. P. Eichelsbach, chief engineer of American Stove Co., prefers to state that the achievement was the result of "many men's work." It is certainly a neat job of forming and welding, with many applications to postwar sheet-metal design and fabrication. Phenomenally, with all this engineering and trial-error testing, American Stove was in initial production on droppable fuel tanks within four months of contract date; within two weeks thereafter, daily production was on quota.

The 24-gage terne plate is received in flat sheets and trimmed to the shape required for draw, largely a matter of corner notching. The draw is on 400-ton triple-action hydraulic press; one half-shell being drawn complete and then trimmed in two operations on a modified press.

The smallest-size tank is harder to draw because of width-length ratios which create wrinkle hazards. The deep draw of 10.75 inches is something in itself. But that stamping is not as difficult from the deep-draw standpoint, according to the A-S engineers, as the holding of side wrinkles inherent in the peculiarities of tear-drop design. The strains set up in the sheet cause vibrations which give audible evidence of the increased hazard in this type of steel drawing. The press moves by interval-impact rather than in smooth continued stroke, as in aluminum.

The problem created because of width-length ratio hazard in wrinkle formation was whipped by clever draw bead technique and by fitting dies into the machine by cut-and-try. Stove manufacturers, accustomed to difficult stamping jobs are aware of techniques to provide proper draft in all directions. Dies for this A-S drawing operation were too large to fit the presses. This necessitates horizontal placement so that dies overhang the press bed.

Half shells, drawn in this manner, are received in the tank assembly department for welding and other operations. The flow chart of production shows top shell and bottom shell, prop-

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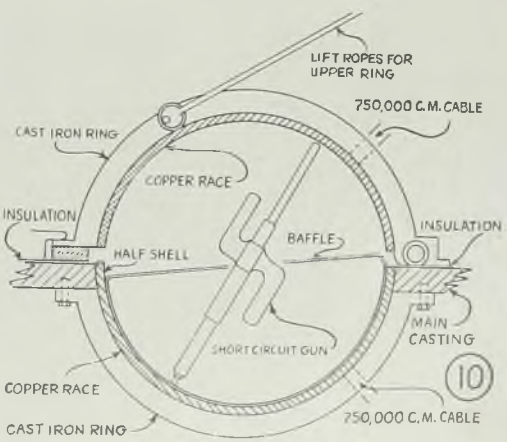


STEPS UP PRODUCTION 12-FOLD

On Many Items

Relatively small plant making highly specialized equipment employs many shortcuts that increase output to meet unprecedented demands. Redesigns take care of material shortages, permit use of faster production methods

By G. W. BIRDSALL
Associate Editor, STEEL

WITH ONLY a small addition to its production facilities, Kelley-Koett Mfg. Co., maker of X-ray equipment in Covington, Ky., has been able to increase its production efficiency to a point where it now produces a greater quantity of certain items in one month than it formerly made in a year. These items include cassettes, illuminators, stereoscopes and even large radiographic units. How this is done makes an interesting story for it involves a number of production shortcuts and some ingenious redesign work that made these shortcuts possible.

Starting to make X-ray equipment in 1900, the Kelley-Koett company has made nothing but that line since. And during this entire period, the company has been under the continuous management of the same people. Responsibility for the successful multiplication of output called for by the war has rested largely upon the shoulders of A. H. Feibel president, and Lester Stork, plant manager, ably assisted by an excellent staff of "old-timers". Most employes have been with the company for many, many years.

Increased facilities needed for certain items were obtained by subcontracting a large amount of work. For example, practically no stamping or forming of parts is done in the "Keleket" plant, these parts being purchased from outside sources and then joined with other parts during assembly into the final product in the "Keleket" plant. In fact, Mr. Feibel attributes a good share of the successful production stepup to this extended use of subcontractors' facilities, for this leaves the assembly in the hands

Fig. 7—Fabricating an enclosing panel by spot welding a section of expanded steel over panel opening, using 15-kilovolt-ampere welder

of the old-timers in the main plant—proper assembly and co-ordination of many portions of the highly complicated and specialized X-ray equipments being the critical phase of their production.

Not All Assembly: However, from this it should not be implied that the plant is devoted solely to assembly operations, for a goodly amount of production work is also handled there—up to the limit of the facilities available. Over that limit, work is done by outside companies on a subcontracting basis.

This method of operation, combined with the redesign of many parts to simplify their production (as will be described below), is perhaps the key to the successful increase in plant output to where its monthly production is now equivalent to that formerly made in an entire year, on many items.

In the plant are found departments devoted to sheet metal work, coil winding, transformer assembly, instrument and control assembly, machining, joining and welding, final assembly, and testing. A well equipped development and engineering laboratory is also maintained for new and special equipments.

Make All Electric Equipment: To better understand what is involved in manufacturing operations in this plant, let's digress for a moment to see what goes into a typical X-ray unit as made here.

First, electrical sheet for transformer cores is blanked out and assembled. In winding department, primary and high-voltage secondary coils are carefully wound on special machines, layer upon layer. In addition to the main high-voltage transformers with secondary ratings up to 400,000 volts at 10 milliam-

Top to bottom, to left:

Fig. 1 — Tube adapter for X-ray unit redesigned as a steel stamping has simplified one production problem for the Kelley-Koett Mfg. Co. Photos by Birdsall

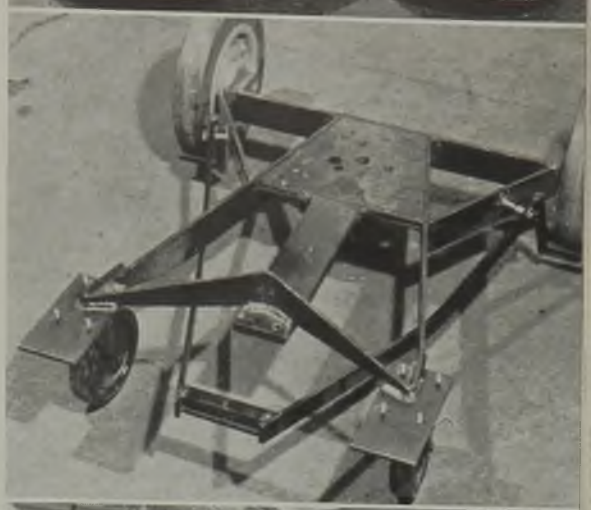
Fig. 2—Base structure for mobile X-ray unit features triangular self-bracing design easily made from welded steel plate and bar stock

Fig. 3—Unique X-ray machine employs built-up base and tilt-table of welded construction. Entire unit is self-contained, transformer being used as a balance weight in near end of table. Note traversing mechanism at upper left used to move X-ray tube lengthwise and crosswise table to exact point desired

Fig. 4—Bottom right: Conduit box being ground and polished here is built up from steel stampings

Fig. 5—Directly below: The 35-kilovolt-ampere spot welder is being employed to assemble housings of sheet steel

Fig. 6—Castings often afford best means of obtaining most efficient distribution of strength and weight. Typical is this base pedestal of a tube stand being milled on a Brown & Sharpe machine



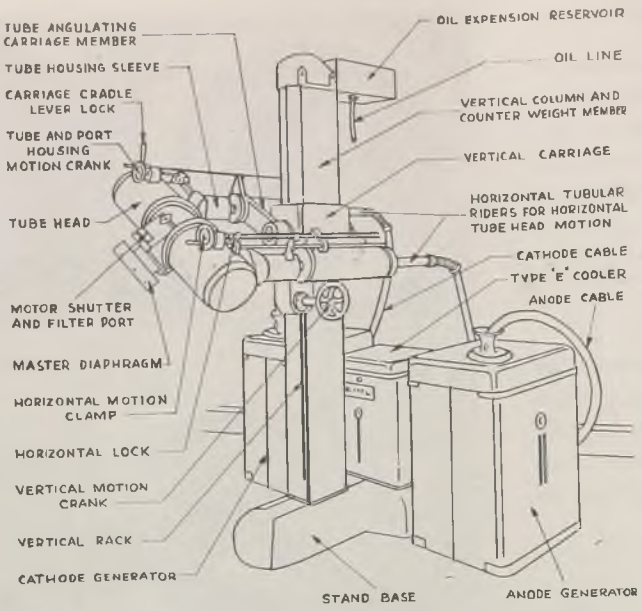


Diagram A, at left: This 400-kilovolt Keleket industrial X-ray unit includes two high-voltage generators of 200 kilovolts each. Note provision for vertical, horizontal and angular positioning of X-ray tube housing. This drawing affords an idea of the mechanical equipment involved

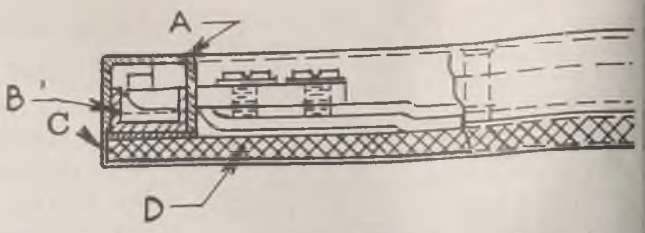
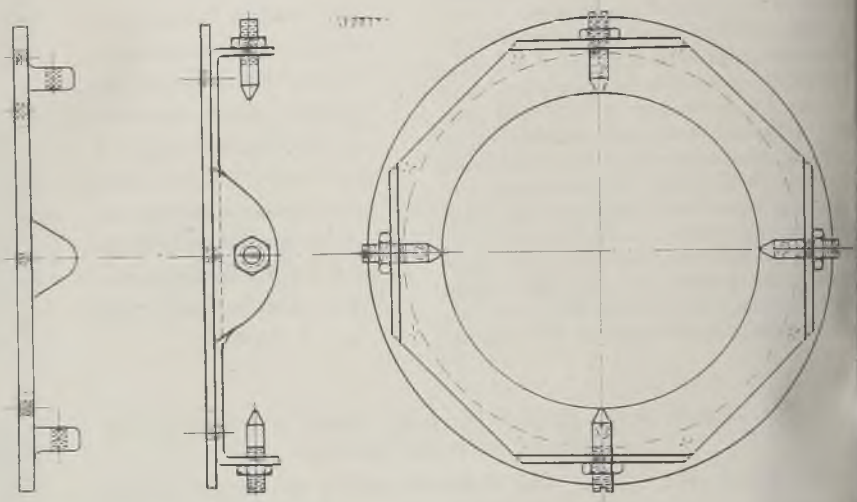


Diagram B, above: Cross section through redesigned cassette: A and B are inverted U-stampings of steel that form the frame; C is retainer for the bakelite back. D. Cover hinge mechanism is also shown. Retainer strip lets back "float" slightly, providing better contact between assembled film and screens, assuring better X-ray records



Diagram, C, at right: Adapter ring assembly, as previously designed (extreme left), and as made from formed sheet steel (center and right)

peres, other smaller transformers for lighting filaments of rectifier and X-ray tubes are also made. Complete transformer complement is then assembled into a tank with mountings for rectifier tubes, tank filled with oil and sealed. The rectifier tubes operate under oil which helps keep them cool.

Electric controls include an autotransformer, also made in the plant. This allows adjustment of voltage input to main transformer and thus controls the high voltage applied to the X-ray tube. Various models are made with one, two or four rectifier tubes to work X-ray tubes at potentials up to 400,000 volts. Obviously, equipment to operate at such high voltages must be made with extreme care if maximum reliability is to result.

Electric meters, vacuum tubes and high-voltage condensers are purchased. Most other units including switchgear, panel mounts, and the like are made in the plant.

While electrical equipment is being made, mechanical mounts for the X-ray tube and for positioning it are being built in the welding and machine shops. This involves production of many types of mounts, stands and work tables, all of this equipment being specially designed for a particular type of X-ray examination.

Accessories include cassettes for holding film, illuminator units for examining the film after it has been developed, and other miscellaneous items.

Requirements of War: X-ray units needed by the services and industry to meet war requirements are essentially the same as prewar designs. However, certain new units were developed to meet specific applications such as the compact and highly portable units for front-line work as well as for Navy use in auxiliary aircraft carriers, and bedside units that can be moved from bed to bed in the hospital.

Moreover, instead of building the various models in small lots, single orders ran into the hundreds. This of course greatly changed manufacturing problems. Too, material restrictions entered to complicate the situation, for although X-ray equipment carried highest priority ratings, the manufacturer was not allowed to use aluminum, stainless steel and certain other critical materials.

Cassettes: Typical of how these problems were attacked is the cassette or case for holding the film during the exposure. This is a light-tight flat box with provision for holding the film firmly against the screen of calcium tungstate energized by the X-rays. Standard size is a rectangular frame measuring approximately 15½ by 18½ inches and ¾-inch thick. In the bottom of this frame is a bakelite back sheet against which the calcium tungstate screen is positioned with the film. A cover with clamps and a second screen completes the assembly.

Formerly this frame was made from a solid piece, machined to take the bakelite sheet and hinges. Outside surfaces were ground and polished all over. Thus considerable work was involved in finishing these units.

When it became necessary to go to steel, a design was worked out that permitted assembly of the frame from steel strips. Blanked and formed by subcontractors, these were assembled by spot welding in the Keleket plant.

Better Product: The redesigned frame as shown in diagram "B" is made of top and bottom pieces formed to a U-shaped cross section and of such a size that one nests within the "U" of the other. To the bottom section, another strip is spot welded to furnish a retainer for the bakelite back.

This redesigned cassette is far from being a temporary makeshift and cost has been reduced about one-half. Its construction lends itself to manufacture by high production methods and final assembly of frame, back, hinges, cover and

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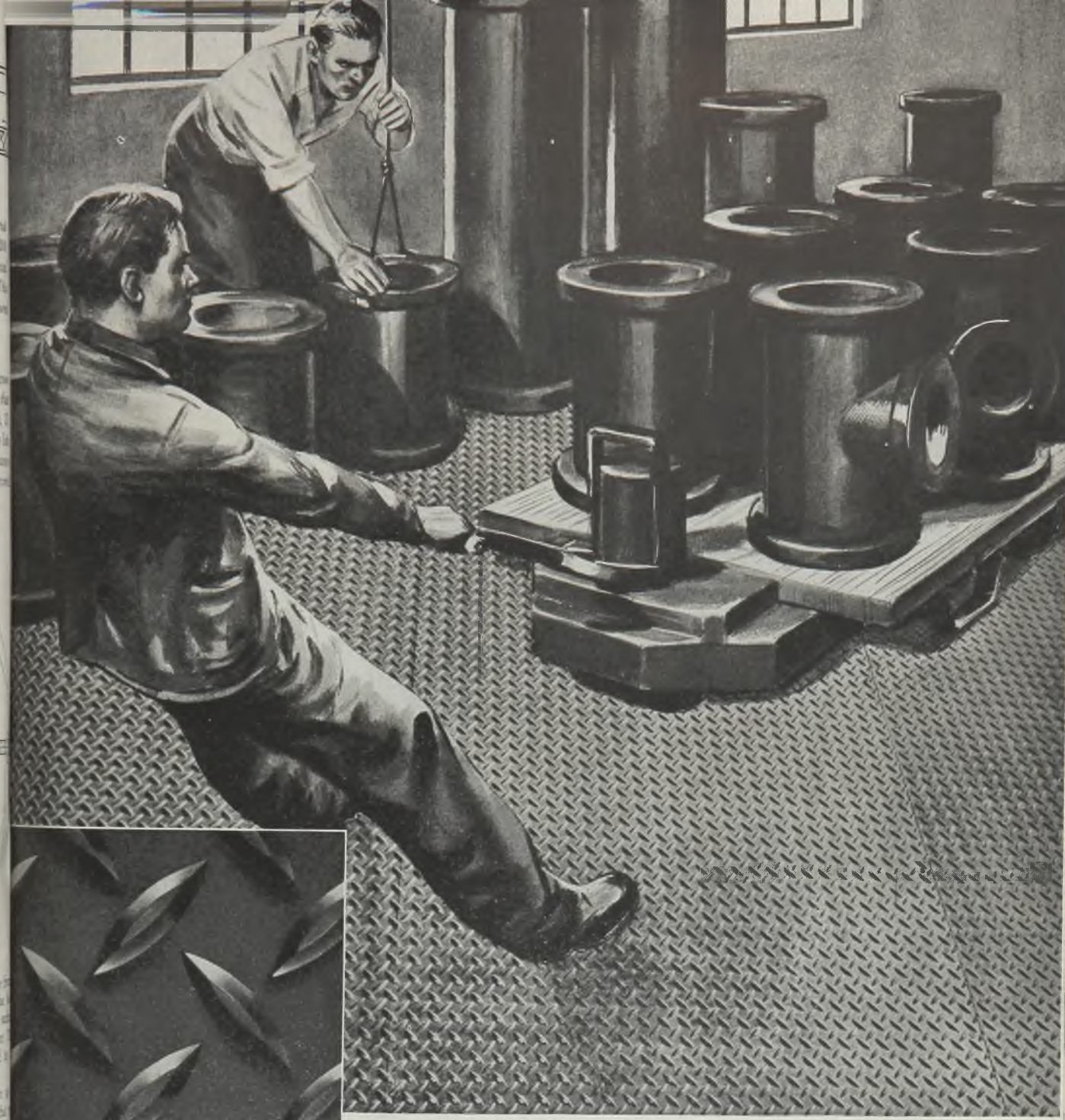

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Forging Forks

(*Concluded from Page 99*)

the operator puts the stub in each successive groove, the stub is worked down to a point where it just enters the next groove. So after traversing the full length of each groove in succession, a long narrow tine is produced, with all the desired grain flow lengthwise the tine. The hot working is continued to where the metal becomes quite cool, producing excellent physical properties.

After the center tine has been worked to shape, the piece is reheated in a nearby furnace and refolded as in Fig. 4 to where a new stub is presented for working down. This is continued until all tines have been formed.

Fig. 6 shows operator working down the tenth tine, finishing up that particular fork. The stub is inserted into each groove several times in working down the metal, and each time the operator rotates the stub slightly so that the end result is a *round* tine, the original square section disappearing completely.

Skill Required: It is in this phase of the forging that skill is required, for the roll dies revolve at a good rate and the operator has little time to insert the tine for the next stroke. In fact the casual observer looks on in amazement at the great skill with which these operators rapidly traverse the work in and out of the various die grooves—all the time turning the piece to work it uniformly.

Fig. 7: As the fork comes from the roll dies, Fig. 6, it has various humps and irregularities remaining in the "head" or backbone of the fork. Next step is to flatten out all these humps on both inside and outside of the head and also to align the shank by which [illegible] be attached to the handle. This work is done after reheating by placing the fork in the set of bulldozer dies shown in Fig. 7. Tripping the bulldozer then brings the ram up against the stationary die, straightening out the head of the fork and giving the smooth uniform contour desired.

Fig. 8: After being reheated, the correct concave shape of the tines is produced in the "leaf drop" as illustrated in Fig. 8. Here the tines are straightened also, requiring great skill on the part of the workman as this straightening is done entirely by eye and hand.

The fork is positioned in the lower die of the crunch by hooking it onto two pins. This lower die is simply a flat surface having the desired curve in it. Operator pulls on trip seen grasped in his right hand, causing top half of die to swing down on the fork, the impact forcing the fork to take the shape of the dies since the metal is reheated whenever necessary so it is hot enough to be quite plastic during all these forming operations.

Tines are now aligned and the upper die dropped on the fork again to correct any out-of-shape that may have been produced during the aligning operations.

Heat Treating: After concaving, the sides or side tines are bent up slightly by hand while still hot to form roughly the shape of a "scoop". After tines are trimmed to correct length, the fork is ready for heat treatment. This consists in heating the piece to about 1600 degrees Fahr., followed by quenching it in oil to harden it. Then it is drawn by reheating to about 780 degrees and allowing to cool slowly in air.

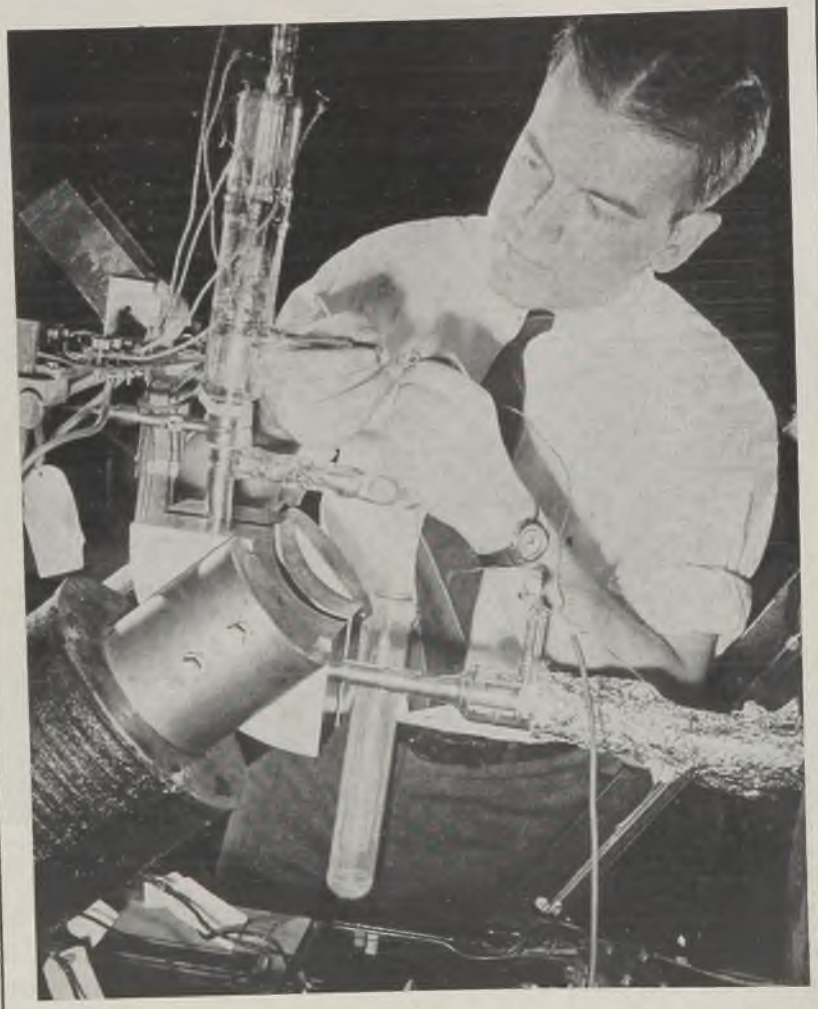
Final fork combines excellent strength, good grain flow to prevent breakage, high hardness to prevent excessive wear. Because of the forging technique, the flow lines assure the highest combination of physical properties.

Before fork heads are okayed as being suitable for assembly into a completed tool, they must pass two routine tests.

First is an impact test wherein each fork tine is struck a sharp blow while lying on an anvil. Defective tines will either crack or break in two when so treated.

After passing the impact test, the forks are spread tested. In this process, the fork tines are mechanically deformed beyond normal working limits and then are released. The recovery position of each tine is then checked against selected gages. Soft tines are evidenced by the permanent set of the defective tines.

Fig. 9, Assembling: Final assembly of the fork consists of placing it and the handle in the special machine shown in Fig. 9. First the end of the handle which is to take the fork shank is sheathed by pressing on a close-fitting metal tube. Now when the shank of the fork is pressed into the hole in the open end of the handle, the wood of the handle is forced against the outer sheath, making a permanently tight assembly of fork and handle.



ELECTRONIC "CHEMIST"—Speedy and practical, a new mass spectrometer which will determine the constituents of any gas as to kind and proportion has been developed at Westinghouse Research Laboratories. It will simplify production testing in synthetic rubber and high-octane gasoline by ionizing a small quantity of gas through impact of electrons from a hot filament in the evacuated glass tube. An electromagnet tugs at the charged molecules moving down the tube so that only those having a certain mass or weight go around the tube's curve and hit a target. Here they are collected and their charges counted by meters. The instrument may serve to check gases in protective-atmosphere furnaces and completeness of evacuation processes

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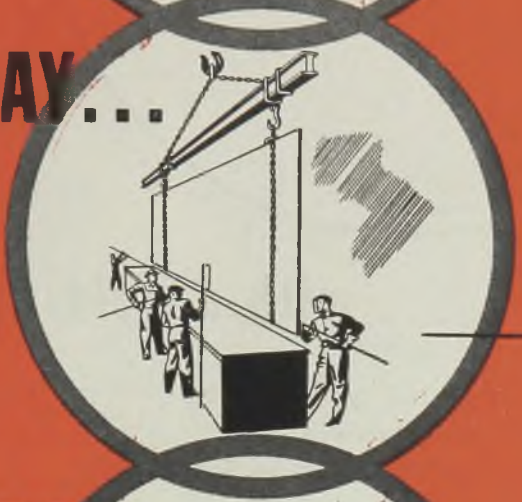

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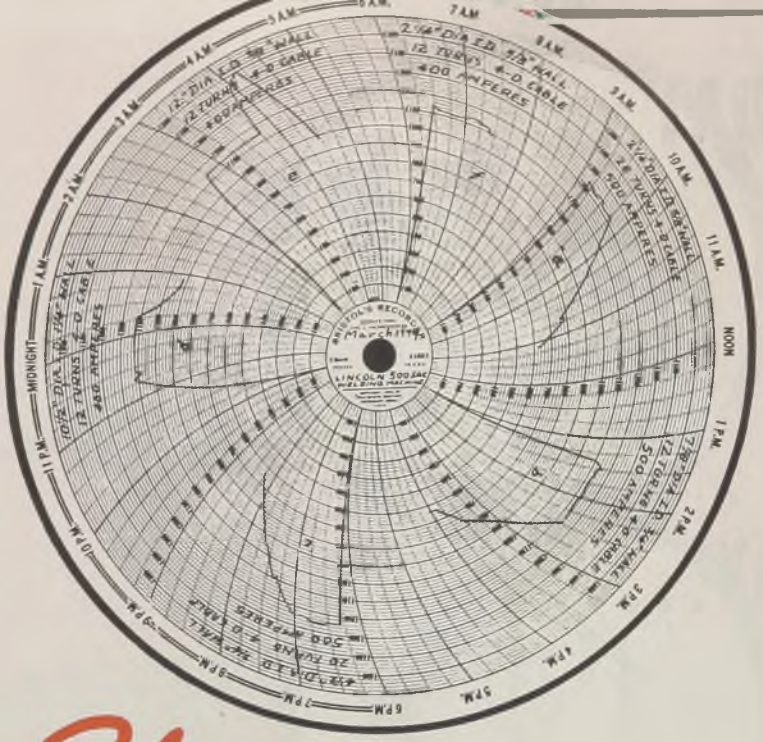

Fig. 1—Typical temperature curves show heating cycles that can be obtained with the setup described. Curve "e" indicates maximum temperatures are well above those required for annealing

Stress Relieving... with a welding machine

Here is detailed recommended practice and typical results obtainable by use of a standard 240-cycle alternating-current welding machine as power source for electric induction heating

HEAT IS merely the outward evidence of molecular vibration. Since an alternating current through its changing magnetic field causes such vibration in an iron core, you would expect the core to get hot. This is exactly what happens. With high frequency current and sufficient amperage iron or steel or nickel can be heated very quickly. Furthermore, the heating effect is very uniform since the magnetic field penetrates clear through the body of the metal and heats at the center just as much as at the outside at low frequencies. At high frequencies, 1000 to 100,000 cycles per second, heating is confined to surface of the metal.

Primarily the amount of heat produced in a given pipe length depends on three things. The amount of current in the circuit, the number of turns of the conductor around the pipe and the frequency of the current. For the purpose of this explanation all of these vary directly, which means that the amount of heat induced in a given joint is ampere-turns times frequency. For example: 100 amperes x 10 turns x 240 cycles is equal in effect to 400 amperes x 10 turns x 60 cycles. The higher frequency equipment, however, permits higher ultimate temperatures than does the standard power-line frequency of 60 cycles. Therefore a 240-cycle alternating-current motor-generator type welding set is used.

It must be remembered that such things as mass or thickness, size of pipe and atmospheric conduction or radiation have an effect on both the rate of heating and the pipe size which can be stress relieved with one machine. These details will not be discussed here.

Procedure: A procedure for stress relieving a given welded joint follows:

1. Place the thermo-couple on the pipe on or near the welded joint and connect the recording device.

2. Wrap the pipe with asbestos or other suitable non-inflammable insulating material over the thermo-couple and also considerably beyond the part you desire to stress relieve. This reduces heat loss by radiation. Insulating the inside of the pipe is desirable but seldom practicable.

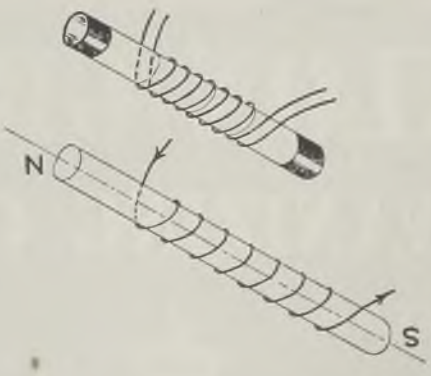

Fig. 2—Showing method of winding around pipe using either single or double cable. All information from paper entered in Lincoln $200,000 award contest

3. Close at least one end of the pipe so there will not be free passage of air through it.

4. Wrap a sufficient number of turns of the asbestos covered cable around the pipe to load the welding machine to between 20 and 40 volts when the circuit is completed. Diameter of pipe and thickness of wall will be principal factors in determining this. The total length of pipe covered by the coil should be somewhat greater than the length of the part to be stress relieved. If two parallel cables are used, they should be wound from end to end as shown in Fig. 2. Do not cover these cables with asbestos or insulating material.

5. Finally, connect the leads of the welding machine to the coil and start the recording equipment.

6. Adjust the machine so there will be just sufficient current to bring the temperature of the pipe up at desired rate.

7. When the desired temperature is reached, reduce the current to the amount necessary to maintain this temperature.

Advantages: There are several advantages that accrue from this type of annealing. They can be summarized briefly as follows:

1. Cost of primary current supply is low as a standard Lincoln 180 or 240-cycle alternating-current welding set is used.

2. This machine can be used for arc welding when not used for stress welding.

3. The load is a balanced one as

One purpose . . .

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DROP FORGINGS

THE STEEL IMPROVEMENT & FORGE CO.

942 East 64th Street CLEVELAND, OHIO

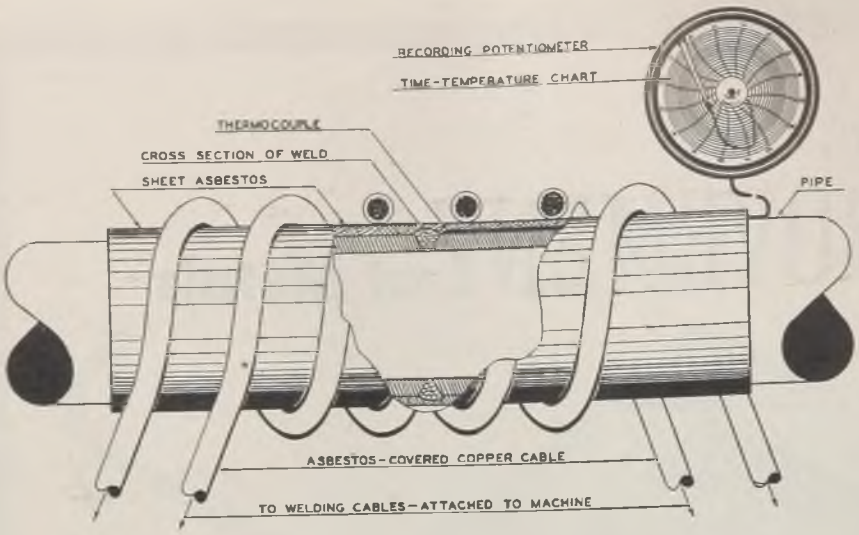


Fig. 3—Schematic of typical setup for annealing with the 240-cycle welder

power is taken from a 3-phase line and the equipment can be used where any welding machine can be operated without special power lines.

4. The higher frequency requires less current and smaller cable in the induction coil, permits higher ultimate temperatures in the pipe and stress relieves low magnetic material.

5. Low up-keep cost.

6. The joint is heated by induction, not conduction. This permits low radiation losses and even distribution of heat.

7. The equipment is easy to set up, simple to operate, with uniform results.

8. Additional units can be added to handle a job of any size.

9. Portability of equipment is a distinct asset.

10. The operating cost is very low being about 30 per cent of that experienced with 60-cycle equipment.

Explanation of Temperature - Time Chart: The operation of the Lincoln SAC 240-cycle machine for this work can be understood from a study of the temperature-time chart, Fig. 1. This is given for the purpose of comparison only, and not as an example of good practice. Temperatures shown are degrees Fahr.

Curves "a", "b" and "c" indicate various diameters and wall thicknesses of pipe as well as various numbers of turns, all at 500 amperes. They show the temperature-rise possibilities, how a desired temperature can be maintained and how the heat may be tapered off.

Curves "d", "e" and "f" show the results with 400 amperes and 12 turns of cable. The curve "d" shows a temperature rise of 1000 degrees Fahr. in 65 minutes on a 10½-inch diameter pipe with 1¼-inch wall. This is about the minimum time allowable. The curve "e" for a 12-inch diameter and ⅜-inch wall pipe shows a 1000-degree Fahr. rise in 33 minutes. To get the proper rate of temperature rise for best results, considerably less current would be used, possibly about 275 amperes.

Comparing curves "a" and "f", both with 2¼-inch diameter and ⅜-inch wall pipe, it is seen that "a" shows 500 amperes and 20 turns gave a temperature rise of 1000 degrees Fahr. in about 7 minutes. Curve "f" shows 400 amperes and 12 turns gave a rise of 1000 degrees Fahr. in about 23 minutes.

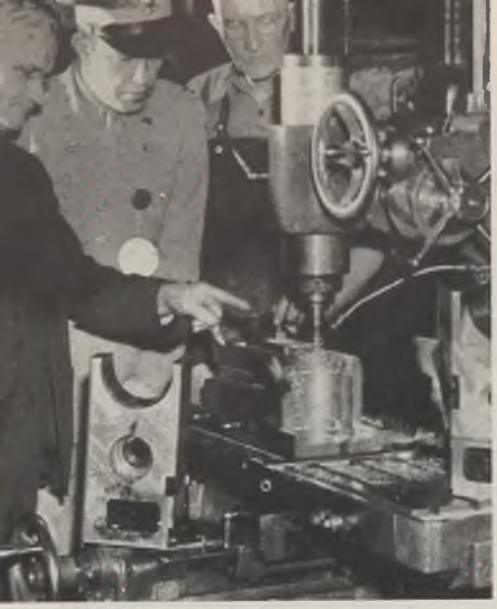
Refer also to curve "e". After the temperature was held at 1140 degrees Fahr. for an hour, the current was increased to 450 amperes with a resulting temperature rise to 1500 degrees Fahr. in 25 minutes. This shows the ability of the equipment to carry the temperature well through the stress relieving range.

In conclusion, the use of this equipment for such stress relieving, in its simplicity, effectiveness and low cost (combined with the fact that the machine can be also used as a welder) gives the user a number of distinct advantages.

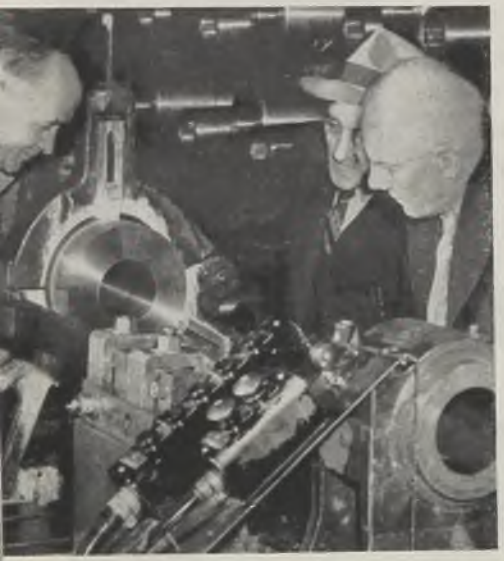
PLASTIC FOR STRESS-STUDY PROBLEMS: Three-dimensional models for photo-elastic stress studies are made from a new plastic developed in laboratories at Westinghouse. After transparent material is stressed in a realistic manner, the stress lines show up as different colors when observed under polarized light. Heretofore, suitable plastic for models could only be obtained in small sheets measuring less than 100 square inches and ¾-inch thick. Several months to a year were required to cure it satisfactorily.

The new plastic can be made in large pieces—already it has been produced in sheets measuring 600 inches square by 3 inches thick—and it can be cured in two days. Larger and thicker pieces of the photo-elastic product will permit stress analysis of large full-scale models. In addition, studies can be made at lower cost than was previously possible.

Illustrated is a transparent plastic model of a crane-hook photographed by means of polarized light which vibrates in a single plane instead of scattering like ordinary light. Refracted by the stress lines in the model, the light produces interference bands showing the points where greatest load is borne by the hook.



Drilling a breech block for a 105-millimeter howitzer



(Above)—Examining breech end of a 105-millimeter howitzer reaming machine

(Below) — Tested, painted and packed in Cosmoline, the finished gun is cased for shipment. Recoil mechanism and mount to be added

Revamps Old Shop

. . . . to mass produce precision parts

By GEORGE R. REISS

A PEACETIME producer of steel mill equipment, forging presses and rolls, United Engineering & Foundry Co. was selected by the U. S. Army Ordnance Department as a gun maker back in October, 1940 and continued to load it up with orders for more and more guns.

United had an old shop at its Youngstown plant that it had planned to dismantle. Instead, it was fitted up with the finest precision machinery, skilled mechanics called in, and began turning out guns. Since then, it has made thousands—each one as accurately made and delicately balanced as a fine watch, each so powerful that it can lob 33-pound projectiles at high speed five or six miles and so accurately that it can drop them into a barrel.

And making them is a mass production job, so simplified and accurate that all parts of the guns are interchangeable, even with parts of similar guns made by other manufacturers.

The plant receives the gun barrels as thick-walled tubes, each with an outside diameter at one end slightly larger than at the other end, although the diameter of the hole is the same at both ends. At an army arsenal, the barrels have been centrifugally cast of high-quality alloy steel, then have been forged and heat treated. A few barrels made of seamless tubing have been used, but the centrifugally cast barrels are best.

The first operation is a tell-tale examination of each barrel to determine that the bore is straight and true or that it can be straightened. Then the barrel goes to a boring lathe, where it is given a rough boring with wood-packed reamers.

The next step is to an auto sizing lathe, with a tungsten carbide cutting head, where it is given a rough turning so that it begins to resemble a gun barrel. It's next step is to a lathe where, with a wood-packed reamer, it is given its finish bore; finally the powder chamber is machined by the wood-packed reamer method. Next the interior is given a mirror-like finish on a honing machine. An auto sizing lathe then gives it its finish turning.

The heavy barrel goes next to an engine lathe which cuts in the spacing shoulder, and a cylindrical grinder gives the exterior a mirror-finish.

The gun then is ready for the 20-inch rifling machine. By the broaching method, all grooves are cut simultaneously. The long ram with its cutting head being forced slowly through the gum, turning slowly while a powerful stream of oil is sprayed on the head.

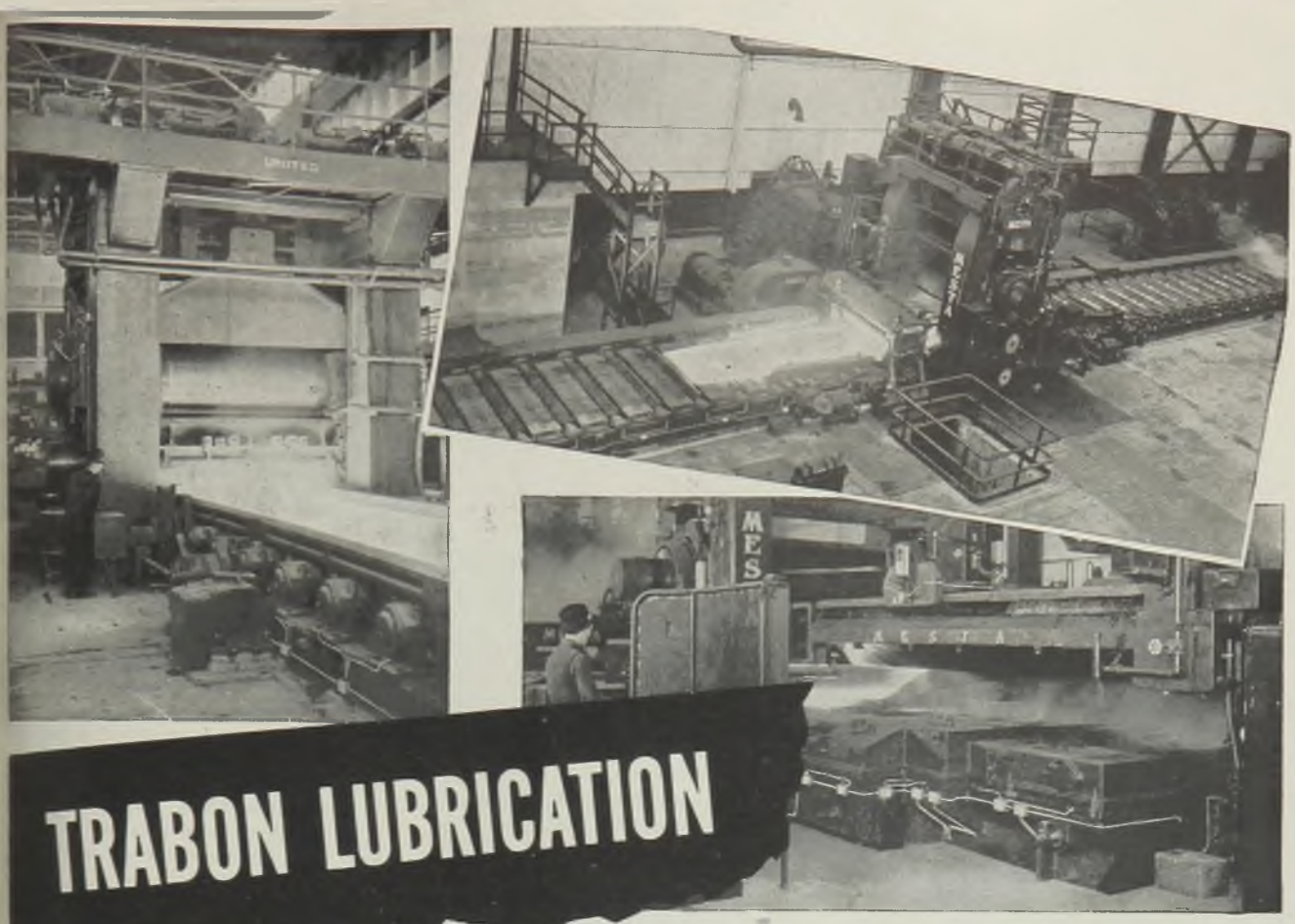
A thread then is cut on the breech-end with thread miller, and a similar machine then cuts the threads on the recoil seat. A horizontal milling machine cuts the extractor pocket. A honing machine then removes the rifling burrs by honing, and finally the muzzle end of the tube is cut to length and radius with an engine lathe.

Alloy steel for the breech blocks and rings which contain the firing mechanism arrives at the plant in billet form, is sawed into short lengths and is given a sequence machining operation. To make them withstand the terrific recoil of the charge and to prevent them from nicking or breaking easily under the constant battering, these parts must be hardened. Accordingly they are carburized to a Shore reading of 80 to 90. The block then is ground to restore its precision bearing surfaces.

The breech ring starts through the shop as a 21-inch rippled ingot, and it is forged down in a 750-ton hydraulic press. Next it is rough machined and heat treated and further machined.

Finally all components are ready for assembly, done on a production line basis, sub-assemblies having come from separate nearby lines and some small component parts from subcontractors.

Completed guns are tested with a dummy shell. A press of the trigger and the empty shell comes flying out of the suddenly unlocked breech, just as would a real shell.



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Tool Life Increased by...

By JAS. SORENSON
Metallurgist
Four Wheel Drive Auto Co.
Clintonville, Wis.

Improved Annealing Procedure

Microstructure produced by heat treatment No. 2 on SAE-4340 steel after normalizing and reheating, shoun at 750 diameters

AN INVESTIGATION was made to compare effective tool life on a turning operation between two different annealing procedures applied to SAE-4340 steel, these annealing procedures or heat treatments being as follows:

Heat treatment No. 1 which has been a conventional annealing procedure for SAE-4340 steel: Normalize at 1600 degrees Fahr.; heat to 1525 degrees Fahr.; hold for 25 hours; cool in furnace. This produced a normal structure of ferrite and pearlite having a hardness of 217 brinell.

Heat treatment No. 2 which is a somewhat later development, and is now in daily use in annealing SAE-4340 steel, is as follows: Normalize at 1650 degrees Fahr.; reheat to 1385 degrees Fahr.; cool to 1210 degrees Fahr.; hold for 24 hours; air cool. This sequence produced a structure similar to the accompanying micrograph. Hardness shown to be 192 brinell.

The above annealing treatments were applied to regular production runs on axle drive shafts made from SAE-4340 steel. These shafts were turned on a Lo-Swing lathe under normal operating conditions, the machine operator in this case having been on this particular operation for the past several years; hence, his judgment of effective tool life was accepted as being fairly reliable for all practical purposes.

Tool Life Prolonged

The tools used were 18-4-1 high-speed steel hardened to a value of 61 to 62 rockwell C.

The relative effective life tests which were conducted on the shafts which were annealed according to heat treatment No. 1 possessing the normal structure of ferrite and lamellar pearlite were turned on the Lo-Swing lathe at 85 revolutions per minute or 44.5 surface feet and a 0.187-inch depth of cut and 0.011-inch feed per revolution which gave an effective tool life of 259 minutes, based on a run of 12 shafts with actual cutting time for each shaft of 21.6 minutes. A second run on these same shafts was made at 127 revolutions per minute or 66.5 surface feet with an effective tool life of 129.6 minutes based on 6 shafts with cutting time of 21.6 minutes for each shaft.

The effective tool life tests of shafts which were annealed according to heat treatment No. 2 possessing the spheroidized structure similar to that shown in the micrograph were turned by the same operator on the same Lo-Swing lathe at 85 revolutions per minute or 44.5 surface feet; 15 shafts were machined, giving a tool life of 324 minutes or a cutting time of 21.6 minutes for each shaft. A second run at 127 revolutions per minute of 66.5 surface feet was also made on these same shafts with an effective tool life of 172.8 minutes based on eight shafts which would give a cutting time of 21.6 minutes per shaft.

These effective tool life values were further checked on long production runs of these same SAE-4340 steel shafts with similar results to those arrived at in the above mentioned test runs. The chart illustrates relative slopes plotted to show the increase in values in effective tool life of the two procedures of annealing or heat treating, producing a spheroidized structure as compared with a normal structure of ferrite and lamellar pearlite.

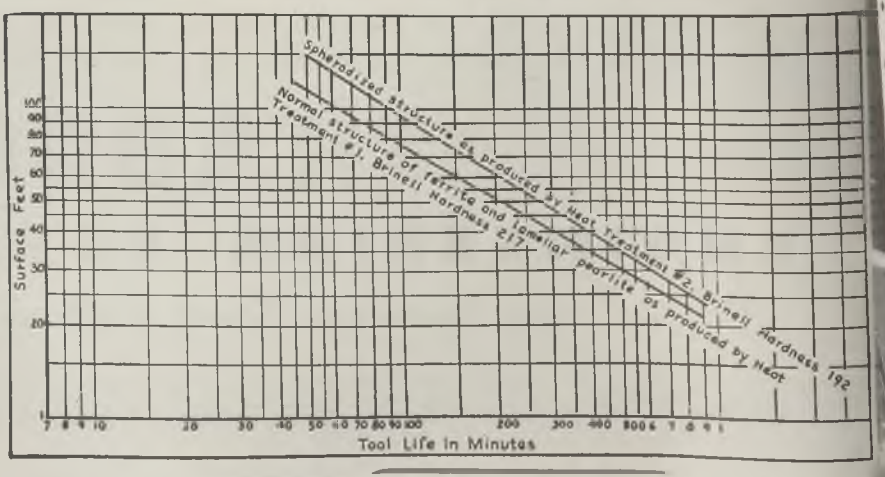
From the foregoing it is evident that a definite increase in effective tool life on SAE-4340 steel can be obtained by annealing this material according to heat treatment procedure No. 2, producing a spheroidized structure as compared with heat treatment No. 1 producing a normal structure of ferrite and lamellar pearlite.

Careful Temperature Control

A little more care may be required in the temperature control of annealing treatment No. 2 as compared with annealing treatment No. 1. However, this additional care is easily compensated for by the advantage gained in greater tool life.

A saving in furnace time can also be expected by the use of heat treatment No. 2 as compared with heat treatment No. 1 which requires a furnace cool, thus increasing the total furnace time required for annealing.

Chart showing relative tool life in machining SAE 4340, steel with the two different annealing techniques. Cuts were made with 18-4-1 high speed tool steel with average depth of cut of 0.187-inch and 0.011-inch feed per revolution. Speed in surface feet per minute plotted against tool life in minutes

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Here are good reasons why you should make Northwest part of your future plans. Let us show you how a Northwest can be profitably fitted into your operations.
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Let's get acquainted INVESTIGATE THIS Different CRAWLER CRANE
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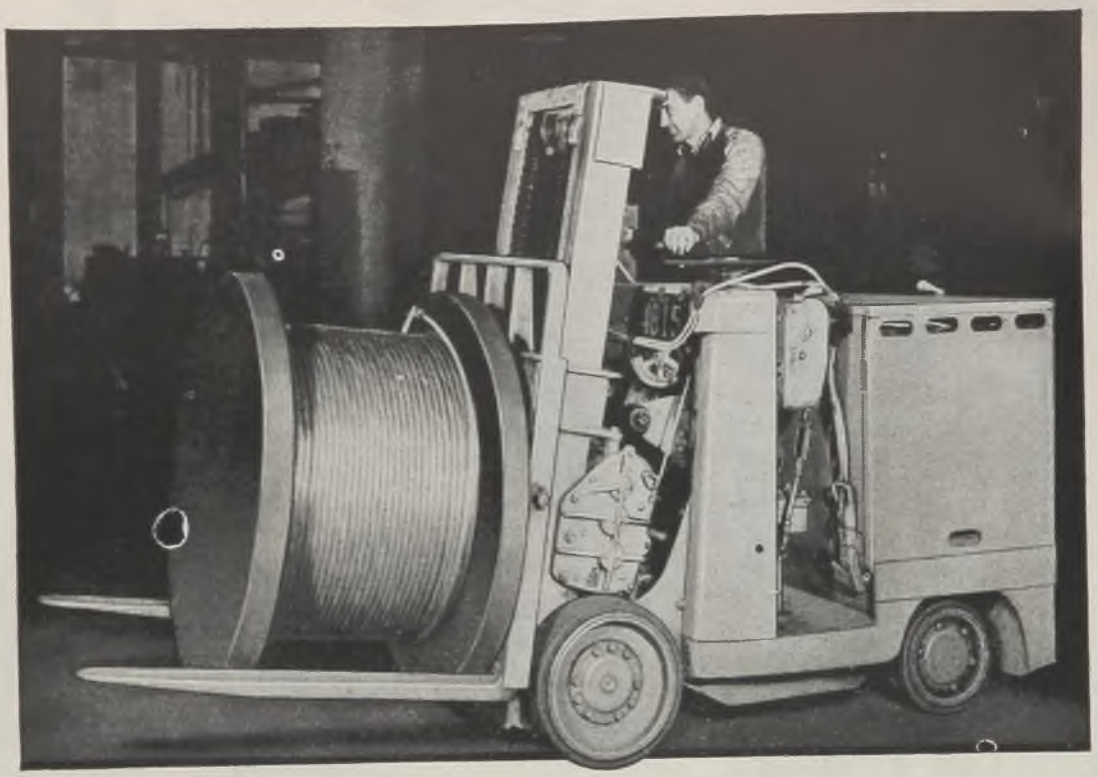
STOP AND GO



Modern, center-control fork trucks handle palletized unit loads; can also pick up and carry many types of loads without the use of any kind of dunnage. With batteries exchanged once or twice a day, they operate 24 hours a day with maximum dependability. Articles describing modern handling methods appear regularly in STORAGE BATTERY POWER. Write for sample copy if you do not already receive it.

In replacing a loaded skid box with an empty beside a machine, an industrial truck will make an average of approximately 14 moves forward, backward, up and down. A battery industrial truck has a natural advantage in this kind of stop-and-go service because it gets the necessary surges of power instantly from its battery, yet consumes no power during the stops. Thus it is not only economical of power, but the electricity used for charging its batteries is low-cost power.

Its electric-motor drive operates quietly, without vibration, and thus with well-nigh negligible repair requirements. With batteries exchanged two or three times per 24 hour day, it is continuously supplied with power and, since one battery is charged while the other works, the truck need not stop work for servicing of its power unit.

For 24 hour-a-day material-handling work, therefore, a battery industrial truck is an inherently dependable and economical machine, especially when powered by Edison Alkaline batteries. With steel cell construction, a solution that is a natural preservative of steel, and a foolproof electrochemical principle of operation, they are the longest-lived, most durable, and most trouble-free batteries. *Edison Storage Battery Division of Thomas A. Edison, Inc., West Orange, New Jersey.*

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ALKALINE BATTERIES

Fig. 1—Tiering sheets in the main storage area of the Solar-Sturges Mfg. Co. plant at Melrose Park, Ill. Note additional storage area provided by high tiering. All photos courtesy Mercury Mfg. Co., Chicago

Fig. 2—A unit load of sheets is shown here being loaded on a "Trackless Train" trailer for transportation to another building for stamping into ammunition holders

Fork truck-tractor train combination works well in

HANDLING STEEL SHEETS

PLANTS processing large volumes of flat rolled steel products in these days of accelerated production schedules often are faced with the problem of handling the material to the best advantage. This is for the reason that manufacturers often find it necessary to process quantities of material in excess of normal plant capacity and storage space also is likely to be at a premium.

A great deal has been learned about improved materials handling during the course of the war in new plants as well as others which have been in existence for many years. Completely engineered handling systems in new plants have made it possible to produce a given volume of finished products in a fraction of the usual floor space. And, the Navy's campaign for adoption of standardized pallets for handling products from factory to the fighting fronts is likely to have a decided effect on peacetime methods for delivering goods.

Plants already in existence often have largely solved storage problems through better handling methods and at the same time have contributed to increased manufacturing efficiency by providing a more even flow of material to the machines, thus reducing idle time.

The procedure adopted by the Solar-Sturges Mfg. Co., Melrose Park, Ill., may be cited as an excellent example of the way in which better handling has aided many companies hard-pressed to get out deliveries against war contracts. The Solar-Sturges Mfg. Co. has been known for some time as one of the leading makers of milk cans but since the advent of hostilities has turned a major portion of its facilities over to the production of ammunition holders for which a very substantial inventory of steel sheets must be maintained at all times.

The company has found that a com-

Fig. 3—Solar-Sturges finds the combination of fork trucks and "Trackless Trains" works well in handling sheets. This train is on its way from primary storage to the manufacturing section

Fig. 4—This fork truck is unloading sheets from a "Trackless Train" for storage in the manufacturing building near the press department

bination of fork trucks and tractor trains provides a flexible arrangement for handling incoming material and keeping it flowing at the correct rate to the stamping presses. This "combination" in effect serves four points, namely, the unloading, a large, primary storage area in the central bay of the adjacent building, a secondary storage area in the manufacturing department and the presses themselves.

The sheets arrive in open cars in packages ranging in weight from 4000 to 6000 pounds. Because of an exceptionally narrow loading dock, an electrically operated hoist is used to remove the individual packages from the cars, transport them approximately 50 feet and stack them in a temporary storage bay of the primary storage area.

From this temporary storage the packages are removed by a fork lift truck and either transported and stacked in the regular storage area, or if scheduled to go directly into production the fork truck loads them on trailers of a "Trackless Train", and the train hauls them to the manufacturing departments located in another building.

Fig. 1 shows the method of tiering sheets in the main storage area. It will be noted that the high lift truck permits tiering of 7 to 8 packages or units in stacks 8 to 9 feet high which means doubling or tripling the usual amount of effective storage area. Scrap wood separators between the packages permit easy entrance and exit of the truck forks, an arrangement which permits rapid handling.

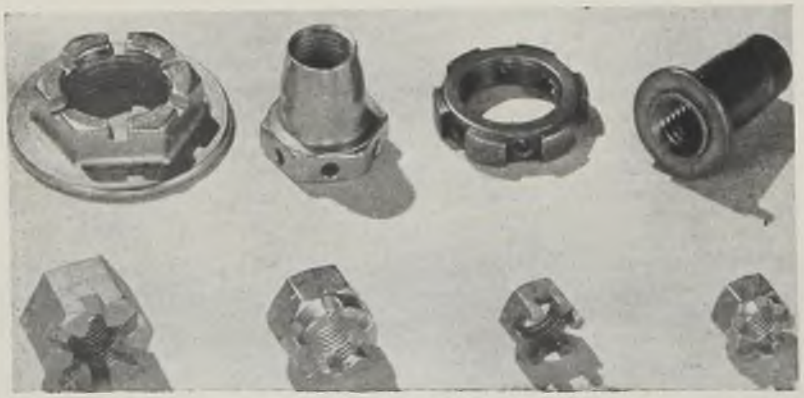
In Fig. 2, a unit of sheets is being loaded on a trailer for movement to the secondary storage area in the manufacturing section or directly to a press, depending upon the requirement of the moment. Of course, only one unit is loaded on each trailer since a second could not be readily balanced and overloading also would result. Sheets scheduled to go quickly into production are unwrapped, while those which may be held somewhat longer are left in their original packages to prevent oxidation.

A trackless train is shown in Fig. 3 on its way from primary storage to the secondary storage area in the manufacturing section. In this particular instance, the operator found it convenient to haul two trailers but one or two others could have been added were it advisable.

Method of unloading in the secondary storage area is shown in Fig. 4. The truck has just picked up a package of sheets from the trailer. In a moment the trailer will be pulled out of the way by the tractor in the background and the package will be deposited on the wood separators to form the third tier in the foremost stack.

Executives of the Solar-Sturges Mfg. Co. find that the method worked out in effect provides a "float" of material which keeps the stamping presses constantly supplied and at the same time solves the problem of storing a large inventory in limited space.

PRECISION TAPPING . . . required for aircraft nuts



WARTIME demands have increased the variety of special nuts required by aircraft manufacturers and have established stricter standards of precision, particularly in tapping.

As a result, precision machines have come to the fore in aircraft nut production. For instance, the 12 special nuts (8 being shown in the above illustration) made by the Aircraft Nut Corp., Cleveland, are tapped on Cleveland lead screw tapping machines. This machine was developed for work of this and similar types.

Most of the nuts shown are tapped to a class 3 fit, and the thread is required to run 90 degrees to the face ±0.001-inch. Both of these specifications are met and the nuts tapped on a production basis. The Aircraft Nut Corp. found in the past that rejects can run as high as 30 per cent on some jobs when using manually operated equipment. This company's present reject rate on all jobs with present practice is between 1 and 3 per cent.

Many aircraft nuts are tapped after heat treating, and the cutting of hardened steel materially reduces both tap life and production speed. However, the Aircraft Nut Corp. reports satisfactory tap wear in spite of the fact that many nuts are hardened as high as 36 rockwell C before tapping. Production rates on the nuts shown here range from 200 to 500 per hour.

The company found through experience that most abnormal tap wear results from taps running under pressure. When a tap is controlled by a lead screw which determines the feed at all times, it performs only the cutting action for which it was designed, exerting no pressure upon the work.

Many broken taps result from hitting the bottom of a blind hole, and in this connection the weld pin in the upper right hand corner of the illustration is an interesting case. This piece is tapped by a machine with automatic tap reversal within close tolerances and both rejects and tap breakage are low.

Will your products be on the Salesfloors of the better Dealers tomorrow?

What will your †† future I.P. be?

This is the Fifth of a series of advertisements presenting "Industrial Par" and its importance to your company in all future planning. Save this and succeeding I.P. advertisements as the basis for discussion and as a guide to your planning program.

. . Your Company's I.P. May Be The Deciding Factor

THE return to peacetime production won't be accomplished without industrial "casualties"—every realistic business thinker knows that some mortality is inevitable in such adjustment.

Farsighted planning now will enable many companies to carry on and through — they will re-establish and hold places for their products on sales floors of the better dealers tomorrow.

Such planning recognizes that there will be many problems beyond the control of management — to be met as they arise with immediate resourcefulness. Well-conceived, thorough postwar plans of action concern themselves properly with the known factors—the anticipated trends of the peacetime future.

It is a certainty that even well-known, long established industrial firms will encounter new competition — new, aggressive organizations, unfettered by any traditional methods of manufacturing and marketing, who are determined to challenge the places which older, prewar companies believe they hold in the industrial world.

And it is another certainty that buyers in the postwar world won't differ materially in their usual habits — they will want values for their dollars, not mediocre products at de luxe prices. Those manufacturers, whether entrenched or newcomers in a given market, who are best equipped to provide better products at attractive prices can expect to fare best in the coming battle of competitive production. To make better products—at lower cost—will demand production-engineering skill implemented with the best modern machine tools.

Such production has its roots in man-hour output. Only by maintaining or excelling our expected national *industrial par* can we attain security of jobs and wages for the greatest number of workers. The vital significance of *industrial par* to industry is summarized in the panel headed "Spotlight Facts for Your Future I.P. Planning."

In the new competition — postwar — the farsighted manufacturer will look to the most modern and advanced machine tools as the most effective means of maintaining *industrial par* and its benefits in terms of employment — better production at lower cost.

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

* Production methods — developed in wartime —increase man-hour output; pent-up buying power — released in peacetime — demands increased production.
* The rate of 2½% increase per year output per man-hour, established by a 12 year record of industrial production, can be expected to reach at least 4% per year — compounded.
* Manufacturers must set a goal of 50% increased output per man-hour every 10 years — to maintain a high level of national prosperity and achieve its benefits in terms of security of jobs and wages for the greatest number of workers and the volume production of more goods for more people at lowest cost.
* Machine tools — the most modern, most efficient — are recognized as the most effective implements of mass production and increased output at lowest cost — but only continual replacements with the newest and finest machine tools assures full productive capacity. *Such replacements yearly should be equal to 10% of the total machine tool investment — in keeping with increased output.*
* The cost of machine tools is insignificant in terms of their productive power . . . from 1927 to 1937, according to census reports, American manufacturers had only a total of about 2% invested yearly in machine tools in ratio to a total volume of 9 billion dollars' worth of production annually.

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

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Milwaukee Machine Tools

Procedure Followed in HEARTH CONSTRUCTION

Construction of blast furnace hearth at plant in Pittsburgh district includes subhearth cooling facilities extending 6 feet below regular hearth cooling plates. Details of hearth installation are presented. Combination primary and secondary gas washer designed to clean 18,000 cubic feet of gas per minute provides fuel with cleanliness of 0.025-grain per cubic foot for stoves lined with 2¾-inch checkers

By H. O. JOHNSON
Superintendent Blast Furnaces
American Steel & Wire Co.
Donora, Pa.

PRIOR to 1941 the standard hearth construction of the Donora stacks was as follows: On a relining the salamander was removed by blasting. All brick showing signs of disintegration were removed; in some cases this went down to the concrete pad. Starting at the top of the concrete foundation pad, river brick were laid to a thickness of 3 feet, 8½ inches. On top of this 7½ inches of firebrick were laid. This course formed the foundation for the start of the hearth block section, which consisted of seven rows of hearth block (18 inches high by 9 inches wide by 4½ inches thick) to a total height of 10 feet 6 inches, each course, after skutching, being rotated alternately 45 and 90 degrees, breaking each joint. The best grade of finely ground fire clay is used for the bond, making the joints as thin as possible.

Details of Hearth

The entire hearth is enclosed in a 1½-inch steel plate shell, 9 feet 2 inches high and 24 feet 7 inches diameter. Wood packing strips, 9 feet x 2 inches x ½-inch, are used between the shell and the cooling plates. After hearth plates are bricked in, the strips are removed and clay grout poured in to form an expansion joint. Cast-iron cooling plates, 9 feet 2 inches long and 3¼ inches thick, have one continuous 1¼-inch pipe coil, one discharge and eight plates to one common feed. The entire hearth jacket is further reinforced with two steel bands 1 x 8 inches. The outside of the hearth is built solid with common river or ladle brick with cement as a bond.

On the last relining of No. 1 stack the construction in general was the same as described except that subhearth cooling was installed. This consists of 12 additional cast-iron cooling plates, 6 feet long x 5 inches thick x 5 feet 10⅝ inches wide, having a radius of 10 feet 11½ inches inside; 11 feet 4½ inches outside and using 1½-inch extra-heavy pipe for the cooling coils. These plates are set below and about 6 inches inside the regular hearth cooling plates thus extending the cooling down an additional 6 feet to cover an additional 4 rows of hearth block.

These plates, machined and bolted together to form a perfect circle, are held in place with bands at the top and bottom. Hearth block is laid tightly around the cooling plates. High acid water conditions make it necessary to use special alloy fittings for feed and discharge in all hearth and subhearth cooling plates. One subhearth and two hearth cooling plates are connected in series to a common feed.

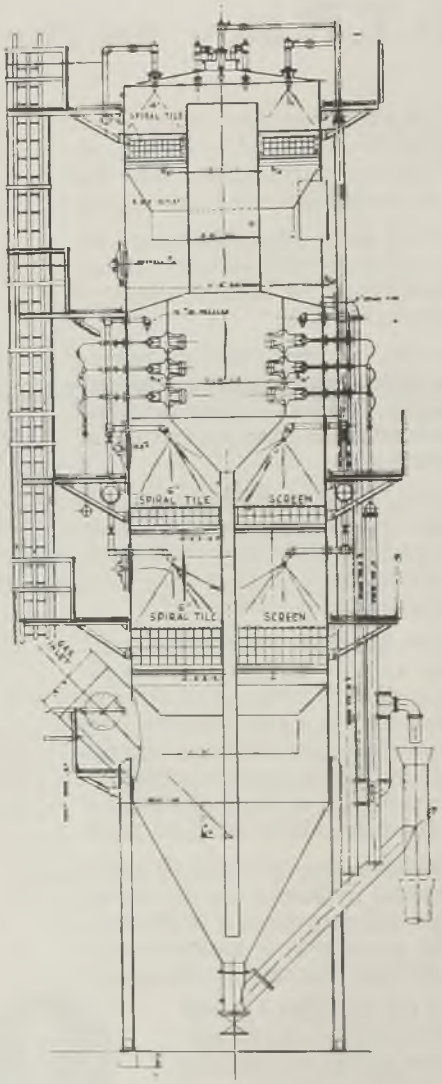

Fig. 1—Combined and secondary gas washer serving Pittsburgh district stack

During the relining of No. 1 Donora stack in January 1941, a 3-stage gas washer of the Brassert type was installed (Fig. 1.) This has a shell 8½ feet diameter and approximately 53 feet high. Gas enters at the bottom and passes through two banks of tile, the lower bank consisting of four layers of 6-inch hexagonal straight tile 24 inches long and the second bank of two rows of 6 x 6-inch spiral tile. Each of these banks has a set of six sprays designed to operate at a water pressure of 10 pounds per square inch. These banks of tile, complete with the sprays, are considered as the primary part of the gas washer and should clean the gas to approximately 0.25-grain of dust per cubic foot.

Built with Venturi Throat

Gas then passes through the stationary disintegrator located near the top of the washer. The disintegrator (Fig. 2) consists of a stainless steel casting designed with a venturi throat and equipped with a high-pressure spray nozzle at one end and a deflector cap at the other. The finely divided spray of water has the ability to intimately mix with the gas and wet the fine particles of dust. When the disintegrating nozzle is set in the washer, the deflector cap is placed in front of the venturi tube so that the spray impinges directly on the cap. This impingement involves a change in direction of the gas, dust and water particles and a further intimate contact between the water and dust. The deflector cap is adjusted so that any desired pressure drop can be obtained for a given flow of gas. The final cleanliness of the gas is proportional to the pressure drop. Six sprays located immediately above the disintegrator units keep the gas inlet of the disintegrator clean.

After the gas has passed through the disintegrators, it flows through the 3-foot inside diameter internal pipe to the eliminator section. The eliminator consists of a layer of 4 x 12-inch spiral tile, which is periodically flushed by the seven sprays. The gas then passes downward through the spiral tile and, through the whirling action imparted to it by the tile, loses any entrained water which it may contain.

The washer is designed to clean

From a paper presented before a recent meeting of the Eastern States Blast Furnace and Coke Oven Association, Pittsburgh.

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	K Factor*
At mean temp. of 500 F.	0.69
At " " " 1000 F.	0.95
At " " " 1500 F.	1.23

*Btu. per sq. ft. per hr. per deg. F per inch, as determined under ASTM Method C-182-43T.

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NEW YORK CATASAUQUA, PA. CHICAGO TULSA

18,000 cubic feet of gas per minute for three stoves (two on gas at one time) lined with 3¾-inch basket weave checkers. The gas has an average cleanliness of 0.025-grain per cubic foot with a pressure drop through the washer of approximately 22 inches as shown in the accompanying table.

Approximately 800 gallons per minute of waste water from the furnace bosh is repumped for the low and high-pressure sprays. The amount of high-pressure water needed for clearing the gas in this washer is equal to 12 gallons per thousand cubic feet. The low-pressure water used in the primary cleaning section is equal to 18 to 20 gallons per thousand cubic feet. In addition, water is required for the eliminator flushing sprays which are designed to operate at a pressure of 10 pounds per square inch and supply 12.5 gallons per minute per thousand cubic feet of gas, for a three or four minute period once every hour. Automatic flushing is controlled by a 4-inch gate valve with a time switch.

At present accumulation of dust on the checker walls has been small. The short mains between the gas inlet and the combustion chamber on all three stoves have been cleaned once because of an accumulation of 2 or 3 inches of hard, fused dust on the bottom of the main, and in the bottom of the combustion chamber. This was caused mainly by dust being drawn in from the atmosphere by the burner fans and observation doors; the dust catcher outlets are only about 15 feet away.

Tops of Nos. 1 and 2 stoves, have been examined through the domes; no noticeable accumulation of dust could be observed. The only accumulation noticed in the bottoms of the stoves was a small amount of white powder-like substance. Installation of a similar unit on No. 2 furnace for 30,000 cubic feet of gas per minute is being contemplated.

Test run on 3-stage gas washer—May 19-25, 1943

All gas volumes corrected to standard conditions at 60 degrees Fahr. and 29.92 inches of mercury.

Average analysis of inlet gas equals 2.65 grains of dust per cubic feet at standard conditions.

Test No.	Gas temp. Inlet °F.	Gas temp. Outlet °F.	Gas vol. cu. ft. per min.	Blast vol. cu. ft. per min.	Dust Analysis gr. per cu. ft.
1	380	81	17,000	40,000	0.0373
2	360	87	16,000	40,000	.0107
3	350	86	17,000	40,000	.0317
4	360	76	17,000	40,000	.0340
5	370	78	16,500	40,000	.0189
6	380	75	16,500	40,000	.0302
7	390	71	16,000	40,000	.0165
8	340	76	17,000	40,000	.0244
Average	366	79	16,700	40,000	.0254

Inlet water temperature to washer as of 5/20/43: 81 degrees Fahr.
Outlet water temperature from washer as of 5/20/43: 106 degrees Fahr.
Inlet gas pressure to water — 33.00 inches of water. (5/21/43)
Outlet gas pressure from washer — 11.00 inches of water. (5/21/43)

Pressure drop through washer — 22.00 inches of water.

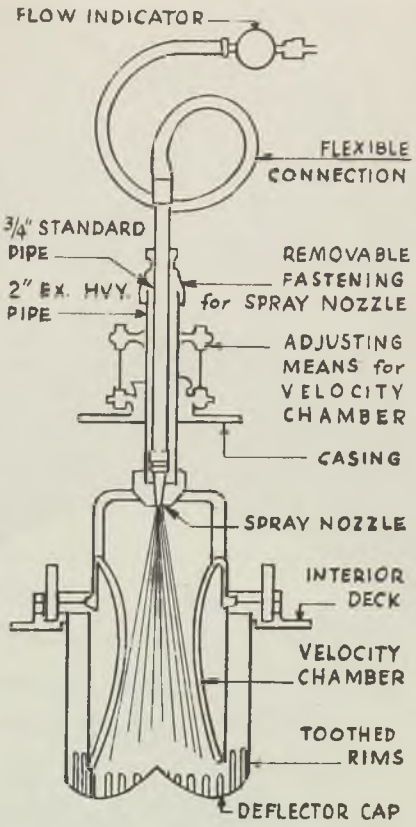


Fig. 2—Detail of stationary disintegrator

Revised Encyclopedia Of Welding Technique

Welding Encyclopedia, edited by T. B. Jefferson, fabrikoid, 976 pages, 5½ x 8¾ inches; eleventh edition, 1943; published by Welding Engineer Publishing Co., 506 South Wabash avenue, Chicago, for $6.

Its first edition appearing 22 years ago, the encyclopedia has seen great advancement in this industry. Prior editions were expanded to take into account the new developments and finally it was deemed necessary to revise completely and rewrite it. Not only has the material been rewritten but also rearranged to group subject matter conveniently. As in a dictionary, subjects have been arranged alphabetically. Additional aids are presented by cross references and a complete index, a new feature.

Many of the alterations and additions have been suggested by criticisms and requests for information from students, welders, supervisors and engineers and the reader may expect to find almost anything he desires about this growing industry.

Among recent developments many are military secrets and cannot be presented at this time. Recognizing the changing trends the editor has expanded material on metallurgy and various welding processes, as well as discussion of various welding applications.

Electrolytic Process Removes Broken Tools

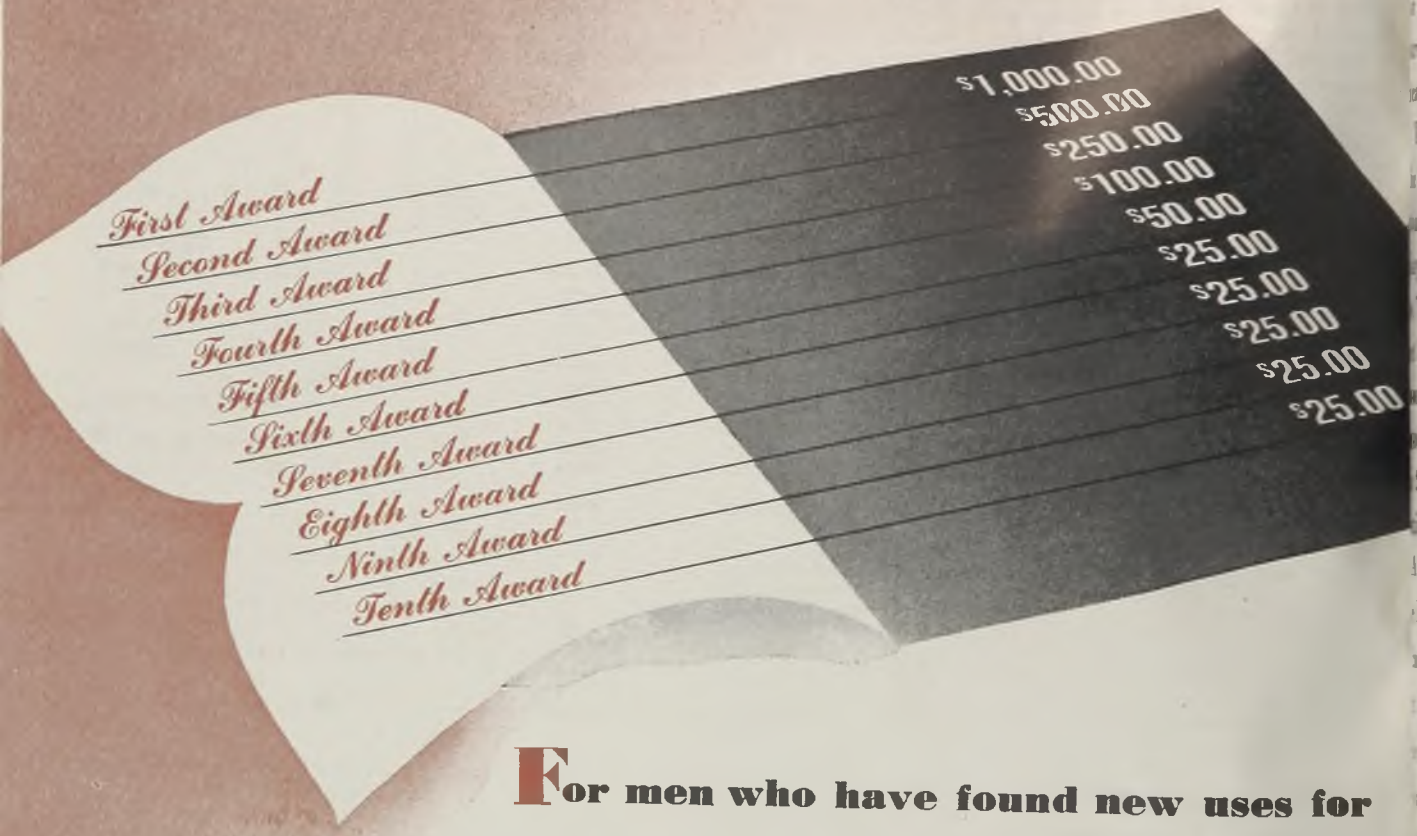
An electrolytic process which disintegrates and dissolves the fragments of taps or drills which break off during machining and become embedded in the work has been announced by Mechemel Engineering & Sales Co., 4313 Lincoln avenue, Chicago 18. The new method is described as effective in salvaging practically 100 per cent on large and small parts made of aluminum, brass, bronze, copper or stainless steel castings. Certain blocking agents in the solutions prevent electrolytic attack upon nonferrous metals and alloys so that there is no change in hole or thread dimensions when the fragment has been removed and piece is ready for additional machining.

Especially designed electronic unit operating on 110 volts, alternating current, controls the process. Time required for the operation varies from a few minutes to several hours, depending upon size and length of the broken tool and the metal in which it is embedded. One unskilled workman can remove up to three dozen taps at one time without constant attendance on the operation. Solutions made up on special formulas are provided for each nonferrous metal or alloy in use today. The right formula is obtained by specifying SAE number of metal involved.

Modern Surface Condenser Subject of New Movie

Allis-Chalmers Mfg. Co., Milwaukee, has released a new movie "The Surface Condenser" which shows the step by-step construction and operation of the modern surface condenser. The condenser's part in the steam cycle of a power plant is explained by diagram, cutaway view and animation. Shop scenes show construction of the condenser from installation of the inlet and welding of the condenser shell to assembling of the water boxes.

Announcing the



For men who have found new uses for Shafer Self-Aligning Bearings or who can suggest improvements in their Design, Manufacture, Application or Service.

In its drive for Victory, America has made tremendous technological progress. Mechanical improvements that ordinarily would take years to evolve have come as a flood in *months*. These improvements have come not only from the manufacturers' own engineering staffs but from men in the field who use, operate and service machines and equipment.

Such has been true in the case of Shafer Concavex Self-Aligning Roller Bearings as well. As the search for maximum efficiency, reliability, and economy of weight and space has focused more and more attention on the unique Shafer bearing principle, many important Shafer Self-Aligning Bearing applications have been made of which we have no record. Furthermore, many of the thousands of engineers, technicians and others now intimately familiar with Shafer

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Shafer Achievement Awards

Bearings have ideas for their extended use or for the improvement of the design, construction, installation or service of these bearings.

That such ideas and uses may be vital to the welfare of the nation must be apparent to any thinking man who envisions the role played by bearings in a nation increasingly on "wheels" . . . not only in transportation but all the machines of industry and domestic activity. It is with the intention that these ideas be not lost to the nation that the Shafer Achievement Awards have been instituted.

Awards as stated above will be made on the basis of the merit in whatever ideas are submitted as valuable contributions to the art of design, manufacture, application or use of Shafer Self-Aligning Bearings. The opinion of the judges will alone determine the relative merits of any ideas submitted and all decisions of the judges will be final. In the event of any ties, identical or duplicate awards will be made. The Shafer Bearing Corporation reserves the right to adopt or make use of any ideas submitted.

Any and all persons shall be eligible for participation in Shafer Achievement Awards and there are no restrictions as to the number of entries which any person may make. There are no limitations as to the form in which ideas may be submitted, providing only that the ideas or suggestions are set forth in a clear and understandable manner. All entries received at the headquarters offices of Shafer Bearing Corporation, 1418 W. Washington Blvd., Chicago 7, Illinois, on or before September 1, 1944 will be eligible. Awards will be made as soon as possible thereafter and award winners notified by mail and through announcements in magazines of national circulation.

The Basic Shafer Idea. Shafer Concavex Self-Aligning Bearings . . . neither ball nor roller bearings . . . combine the advantages of both. A Shafer Bearing utilizes the effective contact *area* of a ball many times its size . . . yet it eliminates such a ball's ineffective *mass* . . . providing automatic self-alignment, high radial load capacity, automatic end-thrust absorption, superior shock resistance and long life.

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JOHN J. SCHOMMER, Professor of Industrial Chemistry, Illinois Institute of Technology. Nationally recognized authority on industrial processes and engineering design.

PHILLIP C. HUNTLEY, Formerly Head of Mechanical Engineering Department, now Head of Civil Engineering Department, Illinois Institute of Technology. Widely known engineering consultant.

CHARLES A. NASH, Associate Professor Electrical Engineering, Illinois Institute of Technology. An authority of broad practical experience in Electrical and Mechanical Engineering.

ARTHUR H. WILLIAMS, Vice-President, in charge of Engineering, Shafer Bearing Corporation.

Address all entries to the
Shafer Achievement Awards Committee

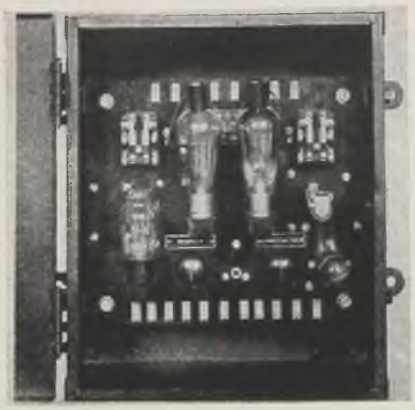
Shafer Bearing Corporation

1418 West Washington Blvd., Chicago 7, Illinois

Fundamentals of INDUSTRIAL ELECTRONICS

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

In his sixth article, Mr. Chute discusses the high-speed photoelectric relay which can operate on changes in light lasting only one-thousandth of a second and is useful for such applications as fast, precision cutoff machines. Control of welder heat was covered in the previous installment



The photoelectric register control panel is shown at right, above

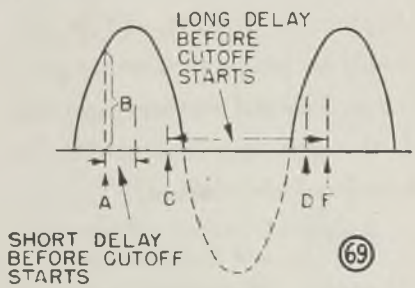


Fig. 69 — Limited accuracy of operation of an alternating current electronic relay

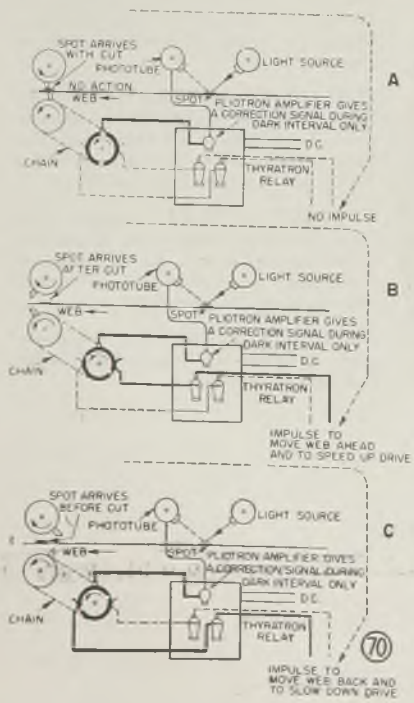


Fig. 70—Action of the phototube, register mark and selector switch in cut-off register control

THE SPEED of operation of any device is of great importance. You may recall that the photoelectric relay discussed in Part 3 cannot respond to light changes any shorter than one-fifth of a second. There are numerous applications where this speed of response is sufficient. However, there are many applications which require high-speed photoelectric relays which can be operated by very rapid changes in light, lasting perhaps one-thousandth of a second.

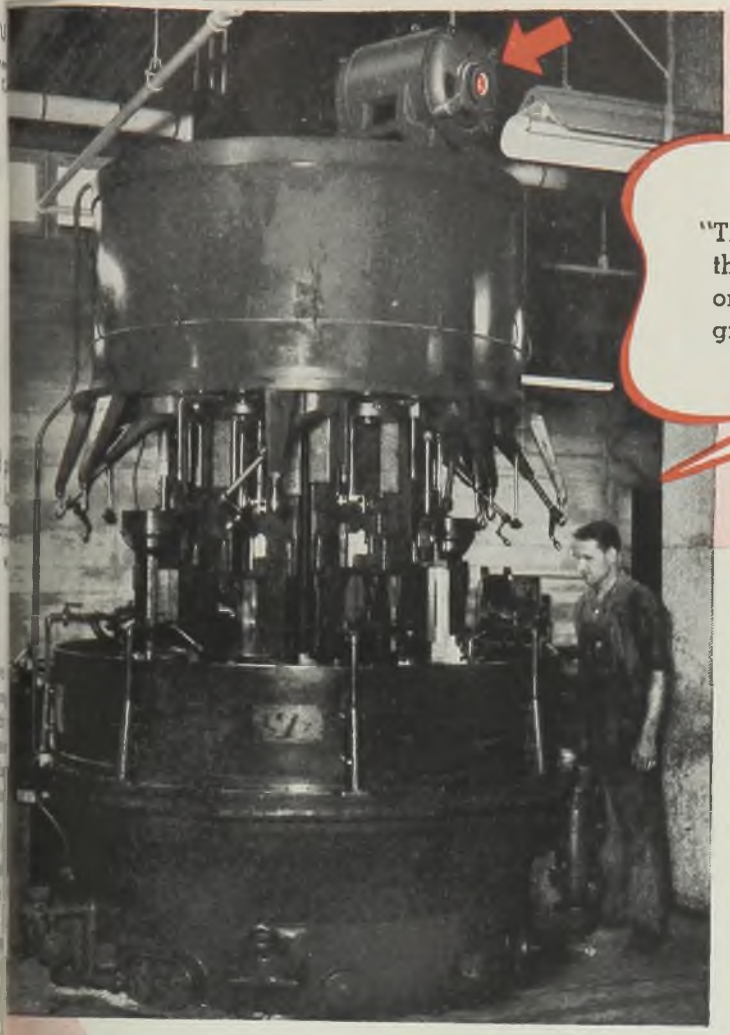
Let us analyze an example and see why a high-speed photoelectric relay is required and why a phototube used in an alternating current circuit cannot be used for high-speed operation. Suppose a bar of soft metal comes out of a forming machine at a rate of 5 feet per second (60 inches per second) and is to be cut into 5-foot lengths with an accuracy of ⅛ of an inch. The bar moves along a conveyor, under the cutter and to a photoelectric relay located accurately 5 feet from the cutter. When the bar intercepts the narrow beam of light between the light source and photoelectric relay, the cutter operates. Can we obtain the desired accuracy if the cutoff is operated by an alternating current solenoid and controlled by the fastest alternating current photoelectric relay, which responds in 1/20 to 1/60 of a second? We see that the bar moves 60 inches a second, and 1/60 x 60 = 1 inch. This indicates the nearest accuracy that might be obtained is 1 inch, which is far from the ⅛-inch accuracy required.

Before we discuss the use of a high-speed relay, let us see why we cannot obtain high-speed operation as long as we supply alternating current directly to the tubes and the solenoids. Fig. 69 shows the voltage for 1½ cycle of a 60-cycle supply source. If the beam of light is interrupted at the instant shown at point A, there is enough voltage available (B) at that part of the sine wave to start the cutoff operation almost instantly. However, if the light beam is interrupted at point C, there is too little supply voltage until point D, so the cutoff operation may not start until perhaps at E. During this longer delay the metal bar moves an extra quarter or half inch which is outside the desired accuracy of ⅛-inch cutoff.

Extremely high-speed response is also needed in the pinhole detector, a device which can "see" holes as small as fifteen thousandths of an inch across, in a strip of "tinplate" steel moving past at high speed. This steel is used in making tin cans, so any portion containing a hole must be marked or rejected. To do this, an intense beam of light shines on one side of the steel strip, while a row of phototubes on the opposite side stands guard ready to catch the short flash of light through any hole, a flash that may last only one thousandth of a second.

To make sure there is always enough voltage to let the tube equipment respond instantly to this light flash, the incoming alternating current power is rectified by tubes as described below. The pinhole detector also makes use of the "trigger action" of a thyratron operating on direct current (similar to the action of the cutoff register control next described), to permit marking the location of the hole along the edge of the steel strip, or to reject this defective portion.

Greater accuracy is similarly required in high-speed handling of printed paper such as is used for wrapping commercial cartons. In such wrapping operations or in paper bag making, there is a very noticeable trend toward greater use of a unit design on the wrapper or bag. This unit design replaces a so-called "over-all"



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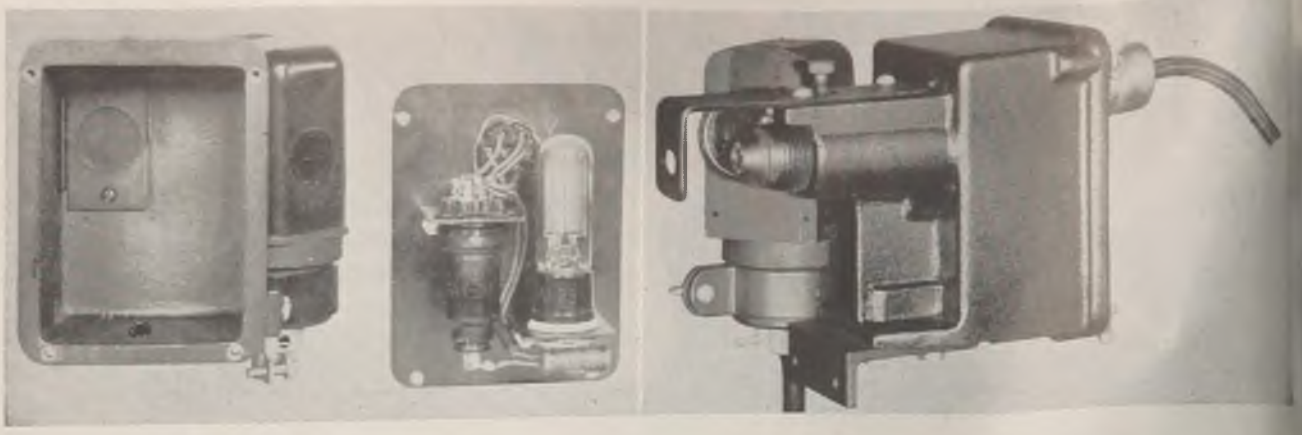


Two views of the scanning head, with light source

design commonly used in the past.

When a unit design is used, it is much less expensive to print on a continuous web of paper than on individual pre-cut sheets; the handling difficulties of certain stocks, such as cellophane, make web printing quite necessary. When a printed web is run into a bag-making or a packaging machine, the printed design must be kept in register with the cutter. Therefore, the feed of the web must be controlled so that the paper web is cut always at the desired spot. Since the web has been printed and then wound on a roll, to be fed later into the packaging or bag-making machine, there is no definite relationship between the timing of the printed design and the timing of the drive roll which feeds the web into the machine. Therefore, if the feed-roll travel (per machine revolution) differs slightly from the spacing of the printing on the web, the knife will soon cut through the printed design. Even though the error of each cut may be only 1/100-inch or 1/10 of 1 per cent, after cutting 500 sheets the cut will occur in the middle of the printed design rather than at the end—and it requires only a very short time to make 500 cuts on a high-speed packaging machine.

It is difficult to accomplish this register even by using the exact calculated gear ratio between the cutter and the feed roll because of several variable factors, such as the slippage, the tension applied to the paper, and the stretch or shrinkage of the paper due to varying moisture conditions in the atmosphere. These variables may be cumulative so that each successive cut is made with a greater error. To reduce these spoilages and produce a more uniform product and also increase production by allowing higher machine speeds, the photoelectric web-register control is used.

Alignment Is Controlled

A packaging or bag-making machine equipped for handling a printed web should therefore have some provision for varying the speed of the feed roll, as compared to the speed of the rotating knife which cuts the web. There must also be some means for determining whether the printed design is in exact register with the operation of the cutting knife. This can be done efficiently by using a photoelectric tube to "see" the printing and to compare its relative position with that of the cutter.

With the aid of Fig. 70, let us see how one kind of high-speed photoelectric relay is used with a mechanical arrangement to operate as a web-register or cut-off-register control. Paper from a large roll is fed into the wrapping and cutoff machine at high speed. The design previously printed on the paper must be made to line up (usually within ⅛-inch to 1/64-inch) with the edge of the carton or with the cutoff device; this is done by the photoelectric register control, while the printed web moves past. This photoelectric equipment, whose circuit is discussed later, must respond to a printed spot perhaps ⅛-inch (measured in the direction of travel) by ½-inch wide, moving past the "electric eye" (phototube) at speeds from 150 feet to 1000 feet per minute. To "see" this spot which passes in approximately 1/1600 of a second, the photoelectric relay must be able to respond to these extremely rapid changes of light. Let us see how the phototube uses these rapid changes of light and makes the equipment give the necessary correction.

Figure 70A shows the paper with its printed register spots moving beneath the phototube and light source to a pair of cutters, rotating at constant speed. To one of these cutters is coupled a two-circuit rotary selector switch, which is accurately aligned with the position of the cutter. The light changes received by the phototube operate a pliotron amplifier which gives a correction signal during the dark intervals only. To cause a correction, this signal must also pass through the selector switch. The selector switch has the choice of firing either one of two thyratrons. One thyratron relay (by external

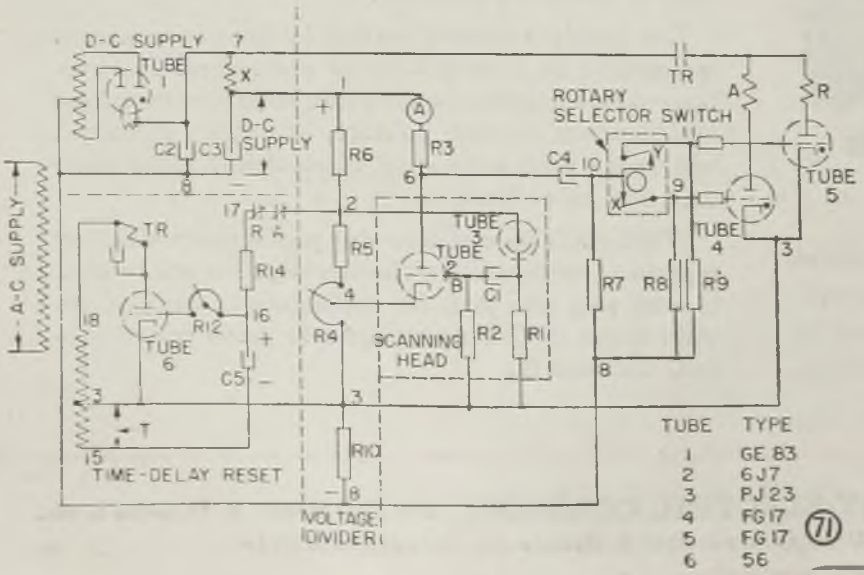
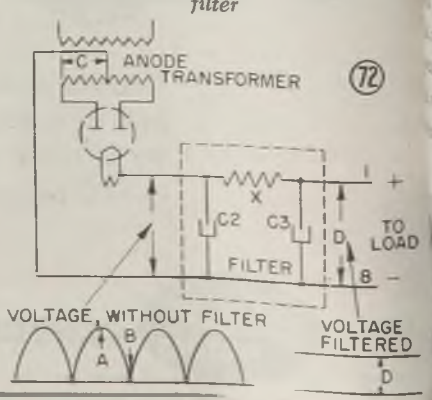


Fig. 71—The photoelectric register control circuit

Fig. 72—An electronic rectifier and filter



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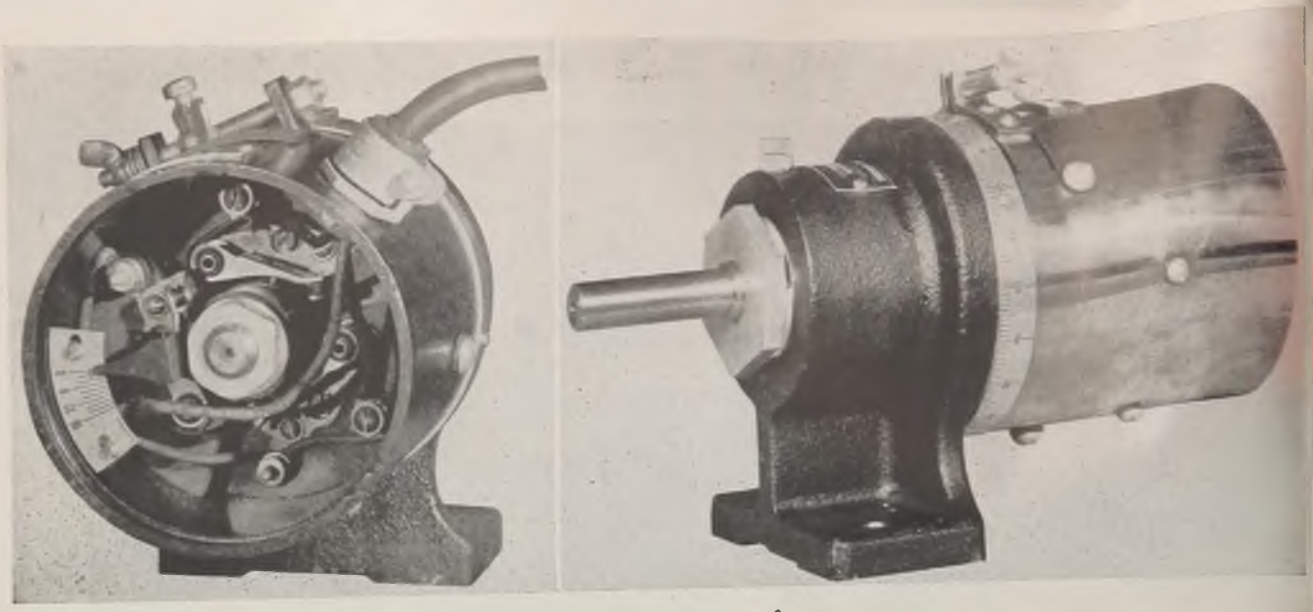


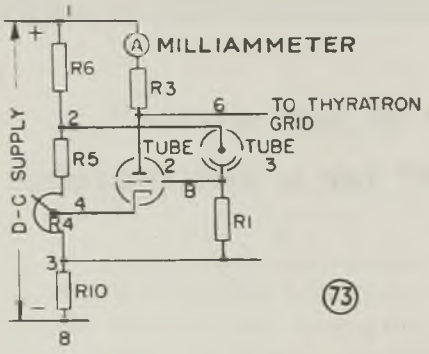
Two views of the rotary selector switch

circuits not shown) increases the web speed for correction and the other thyratron relay decreases the web speed for correction.

In Fig. 70A we see that neither correction is applied, for here the cutter is cutting the paper at the proper intervals and no correction is needed. Note that the amplifier tube still gives its signal but causes no correction, for the rotary selector switch is in an open-circuit position and neither thyratron relay is energized. Fig. 70B shows the condition when the register spot arrives late at the cutter. Notice that the signal from the amplifier now passes through the selector switch so as to fire one of the thyratron tubes. This tube closes its relay, causing a correction which moves the web ahead and increases the speed of the feed roll. This correction continues until the spot and the cutter are in register, and the conditions become similar to those shown in Fig. 70A. Figure 70C shows the conditions when the spot arrives before the cutter is ready. Here we see that the other thyratron is fired, and its relay causes a correction which moves the web back and decreases the speed of the feed roll, until the desired condition of Fig. 70A is again obtained. Remember that the paper and the cutters and the selector switch are moving at high speed.

Now that we have seen how rapid light impulses are used in high-speed photoelectric relay applications we are ready to study the complete electronic circuit of the photoelectric register control which is shown in Fig. 71. This circuit appears to be quite complex, but it really consists of several circuits which we have already discussed, combined into one complete circuit. For analysis we have divided the circuit in Fig. 71 into several sections. Briefly inspecting this circuit we find that this equipment furnishes its own direct current supply (upper left). The scanning head with the phototube and amplifier is shown in the center. TR is an adjustable vacuum-tube time-delay relay (lower left) somewhat similar to the one studied in Part 2.

Let us pull the circuit apart and see what makes it "tick." We learned earlier that an alternating current supply cannot be used directly on tubes or solenoids to give the speed of response which we have here found necessary. So, while this register equipment takes its power from a single-phase alternating-current line, it first converts part of this alternating current into direct current for internal use. This direct current is supplied at points 1 and 8 in Fig. 71. In electronic circuits, we frequently find such "built-in" supplies of direct current. The motor-control



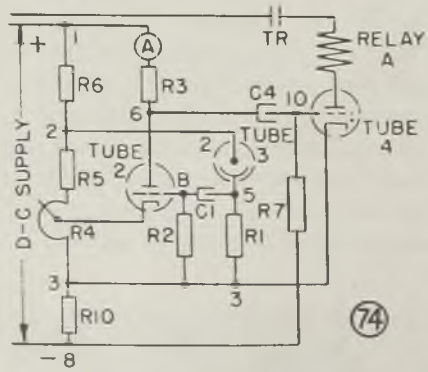


Fig. 73—The direct-connected amplifier

Fig. 74 — The capacitor-coupled circuit

circuit of our next article uses such a direct current supply produced internally. It is well to learn to recognize this electronic direct current supply circuit just as you have learned to know a motor-generator set.

The circuit producing this direct current is shown again in Fig. 72. Here we find a full-wave rectifier tube 1 (previously met in Fig. 10 of Part 1) and its center-tapped anode transformer, which convert alternating current into a pulsating direct current voltage. This pulsating voltage is not yet suitable for our purpose, as the ripples or variations must be filtered or smoothed so as to produce a steady supply of voltage available at any instant during each second. This filtering is done by the combination of capacitors C2 and C3 together with reactor X. The capacitors become charged during moments of maximum voltage such as A. The energy thus stored in the capacitors is used to furnish voltage to the load during the valley B. At the same time, the flow of load current stores energy in reactor X, and X acts (like a flywheel) to maintain a steadier flow of current. As a rough figure, a direct current voltmeter across the load at D reads about the same number of volts as an alternating current voltmeter connected at C (across one-half of the anode transformer).

Now that we have obtained a direct current supply for the operation of this high-speed photoelectric relay, we next divide this direct current voltage into usable parts, by means of a voltage divider consisting of R6, R5, R4, and R10 in Fig. 71. For our purposes here, we do not need to know the amount of voltage between points 1 and 4,, or between 2 and 3, etc.; we merely keep in mind that point 1 is more positive than 4 and 8 is more negative than 3, etc.

Now we come to the circuit of phototube 3 and amplifier tube 2, shown in Fig. 71 and mounted together in the "scanning head" enclosure, which is located close to the moving web of paper whose printed spots are to be kept in proper register. Let us first study a simplified form of this circuit, shown in Fig.

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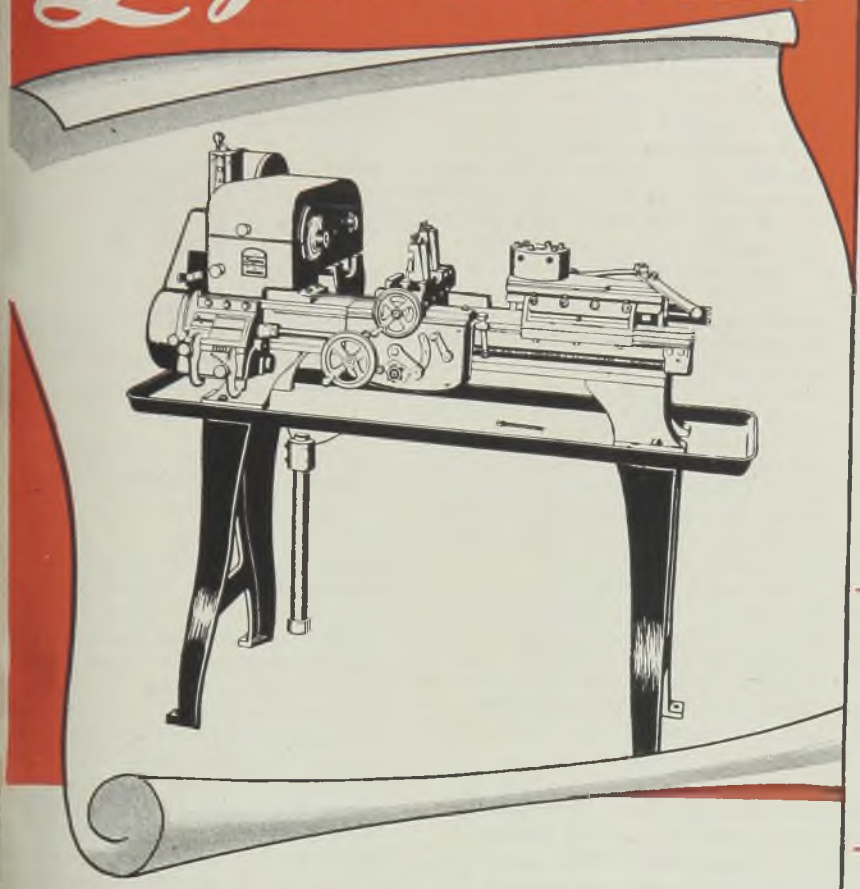

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73. When amplifier tube 2 passes anode current, this current flows from point 1 through the milliammeter and R3, through tube 2 to point 4. Of course, the amount of this current flow depends on the control grid of tube 2, which is at the potential of point B, somewhere between points 2 and 3 on the voltage divider.

If much light shines on phototube 3, it permits current to flow from point 2, through the phototube and R1, to point 3. This current causes so much voltage drop across R1 that the potential at B (grid of tube 2) is raised above point 3 and close to point 4, the cathode of tube 2. This causes tube 2 to pass current which is shown by the milliammeter A. Notice that, if the light on phototube 3 remains constant so that the grid potential at B does not change, we can still adjust the amount of current in tube 2 by moving potentiometer R4. If R4 is turned clockwise to a higher potential, it reduces the tube 2 current as effectively as if the grid potential were lowered. (R4 is usually left at a setting which permits tube 2 to pass about 1 milliampere while phototube 3 is illuminated). While tube 2 is passing about 1 milliampere this current causes a large voltage drop across R3, so that point 6 is at a potential far below point 1.

If phototube 3 is now darkened, the current decreases through the phototube and R1. This reduces the voltage drop across R1 so point B drops closer to point 3. This lowering of the grid potential of tube 2 decreases the amount of current flowing through tube 2 and R3. This reduces the voltage drop across R3, so the potential of point 6 rises. To summarize this circuit operation, let us merely say that as each dark spot passes and momentarily darkens the phototube, the resulting dip in tube-2 current causes the potential of point 6 to rise; this rise may be applied to the grid of a thyratron to cause it to fire.

At this point, we admit that amplifier tube 2 is actually a pentode—a five-element tube with three grids. We have shown and used only the control grid in our explanation.

In the abbreviated circuit shown in Fig. 73 note that a slow decrease of light causes a correspondingly slow decrease of tube-2 current, and a slow rise of potential at point 6; as long as phototube 3 remains dark, point 6 remains at a raised potential. These features may be objectionable, since such a circuit responds not only to the dark spot on the paper, but also responds to any gradual change in the light reflected from the rest of the paper web. Instead, this high-speed register control will give more positive or definite action if we modify its circuit so that it will respond only to *sudden* changes of light, so it will not be affected by slow light changes caused by dirt accumulation on the lens or phototube, or by the substitution of a roll of darker paper. The relay of Fig. 71 responds only to *sudden* changes of light, so let's see how we can modify Fig. 73 so as to include this feature.

The modified circuit is shown in Fig. 74, where we have added C1 and R2 in the tube-2 grid circuit. Figure 74 also includes one of the thyratrons (tube 4) so that we may see how point 6 is connected to the grid of this thyratron, by means of capacitor C4. (By the introduction of capacitors C1 and C4, these tube circuits become "capacity-coupled." Now let's see how this circuit behaves.

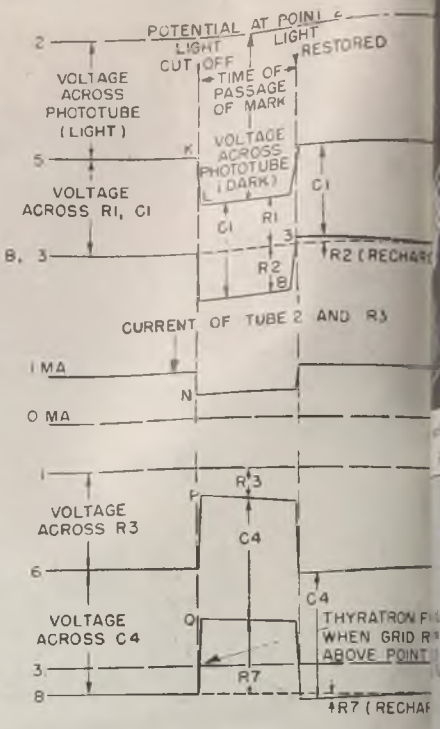

Fig. 75—Changes of voltage and current when register mark passes the phototube

When a constant or steady light fall on phototube 3 in Fig. 74, the phototub current causes a voltage drop across R (the same as in Fig. 73). However, notic that capacitor C1 is charged to this sam voltage (the drop across R1). Curren flows through R2 only while C1 is charg ing or discharging. In the steady state there is no voltage drop across R2, so th tube-2 grid B is at the same potentia as point 3. By moving R4 counterclock wise, we lower the tube-2 cathode po tential (which is equivalent to raising th grid potential) and thereby increase th current flow through tube 2 to the de sired steady amount of about 1 milli ampere.

If the amount of light on phototube now slowly decreases, the current de creases through the phototube and R1 gradually reducing the voltage dro across R1. However, while this voltag across R1 slowly decreases, C1 discharge to this reduced voltage by forcing very small current to flow through R2 During this process, the tube-2 grid at I is not affected appreciably. Regardless o how much or how little light shine steadily on phototube 3, capacitor C1 ha charged to the voltage across R1, and I is still at the same potential as point 3 the tube-2 current is unchanged fron its steady value of 1 milliampere; ther is no change in the potential at point 6.

If a register mark passes, causing sudden reduction in the amount of ligh reaching phototube 3, the current throug phototube 3 and R1 decreases abruptly and suddenly reduces the voltage dro

(*Please turn to Page* 163)

Pin-hole detector mounted on an electrolytic tin plate line. Shown are the scanning head for detector, supporting stand with side guides, mechanical marker in background and thickness gage in foreground. Side guides are manually operated and have air-operated pressure blocks for maintaining the strip on proper pass line. The scanning head is ventilated with compressed air