



Crushing of alundum molds is first step in new salvage process. Page 72

STEEL

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THIS

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Does This Make Sense?

An interesting feature of the annual reports of United States Steel in recent years has been a tabulation of its financial history from 1902 to date. The forty-second annual report, just issued, affords an opportunity to compare disposition of the corporation's revenue in the peak war years of 1918 and 1943. The figures, in terms of disbursements per dollar of revenue, are as follows:

	1943	1918
Products and services sold	\$1.000	\$1.000
Employment costs	.462	.337
Products and services bought	.369	.252
Wear and exhaustion	.068	.073
Annual interest paid	.003 .902	.023 .685
Income before taxes	.098	.315
Yearly taxes accrued	.066	.222
Income	.032	.093
Dividends on preferred stock	.013	.019
Dividends on common stock	.017 .030	.053 .072
For future needs	.002	.021

The table shows clearly the differences in policies of the federal government in the two war years. Employees in 1943 received 46.2 cents of the sales dollar as against 33.7 in 1918. Products and services bought accounted for 36.9 cents in 1943 and 25.2 cents in 1918. Total expense before taxes was 90.2 cents in 1943 compared with 68.5 in 1918.

Income before taxes was only 9.8 cents in 1943, whereas it was 31.5 cents in 1918. Provision for taxes in 1943 was 6.6 cents of the sales dollar, compared with 22.2 cents in 1918. After dividends, the corporation in 1943 had only 2 mills for future needs, as against 2.1 cents in 1918.

This means that current government policy affords liberal returns to employees at expense of taxes for the federal treasury and of reserves for the inevitable rainy day—to say nothing of diminishing returns to the owners.

Two questions arise. Is it good policy to increase expenses arbitrarily so that the public treasury receives 6.6 cents instead of 22.2 cents of the sales dollar? Secondly, is it good for the nation to restrict industry so that only 2 mills of the sales dollar are left for future contingencies?

WHY WAIT FOR WAR? Edwin W. Ely, chief of the Division of Simplified Practice of the Bureau of Standards, has made a plea that some of the limitations on the number of sizes, kinds, varieties, grades, etc. of products put into effect during the war be continued on a voluntary basis during the postwar period.

Most industrialists will applaud this suggestion

because many of them feel that in the ordinary course of events far too many sizes, styles and grades of manufactured articles become entrenched in the customs of trade. For our part, we endorse Mr. Ely's proposal wholeheartedly, but we are somewhat reluctant to agree that simplification is something that is practiced only under the stress of war.

We recall a rather worthwhile simplification in

(OVER)

reinforcing bars which was accomplished in peacetime. There was a reduction in the varieties of structural shapes in peacetime. Several drives for reducing the number of agricultural shapes and special ship shapes have occurred when the nation was not at war.

Would it not be well to consider that limiting the number of varieties to common sense dictates is a valid objective at any time? Why wait for a war to clean house of outmoded varieties? —p. 61

MORE LIGHT ON TAXES: Because the majority leadership in the House has failed to act on Bernard M. Baruch's suggestion that postwar taxing policies be formulated now to prevent last-minute confusion, the minority leadership has appointed a committee of 25 to conduct a thorough research of the tax field and to report with specific recommendations.

This is good news to industry because the tax situation is far out of hand. If you think otherwise, investigate the conditions in your own community. We venture to predict you have more federal employes in your own locality than local or state employes. Here is the count for our own county, as compiled by the Cleveland Press: Federal employes, 17,703; city, 14,378; city schools, 6839; state, 1055; county, 2590; suburban cities, towns and villages, 3479.

One dollar of every ten dollars we pay in income taxes goes for salaries of public officials in our own county. This may be true of your income taxes. We are overdue for a drastic tax reform. —p. 61

STILL RELY UPON WIRE: Sometimes the most modern devices, while practical for many purposes, are obliged to give way to older methods under the punishing circumstances of war. This has proved true in the field of communications in the Italian campaign.

Radio was used extensively by the Army in Sicily and on the mainland of Italy, but wire communication remains the basic medium in this zone. According to War Department reports, the Signal Corps has rehabilitated 950 pole miles of lines in Sicily alone, involving 49,176 wire miles and 34,588 circuit miles of communications.

Wire communication in combat zones has the advantage of a certain degree of security not enjoyed by radio. For this and other reasons the demand for wire for field communications will continue heavy until the wars in both major zones are won.

—p. 58

MORE FIGHTING MEN: No layman can presume to know all of the ins and outs of the manpower situation. Military authorities in Washington must be credited with knowing what is required. Apparently they, in consultation with other responsible officials, have decided that manpower in the armed services now is more important than key manpower in production at home. As a result, the highest decision seems to be that more men under 26 years are to be inducted, even if it causes a reduction in the output of war goods.

A rough calculation indicates that in the heavy industries about 5 per cent of the working force consists of men 26 years old or younger who are subject to induction. If all of them are called to the colors, the resultant drop in production may be as much as 10 per cent.

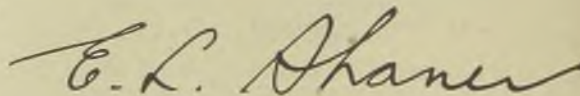
No one can quarrel with this decision—especially until the outcome of invasion is decided. In the meantime, however, the situation cries for a more effective use of manpower. —p. 49

PRECISION CONTOURING: Engineers of a company engaged in the manufacture of meters and control apparatus for steam plants and process industries have developed an attachment for machine tools which enables them to do precision contouring automatically. It applies the principle of the air measuring gage to the actuation of the tool slides on the machine.

A spring loaded tracer follows the outline of a template. Any movement of the tracer increases or decreases the air loading pressure in an air control system which acts upon the outside of a flexible metal bellows. A hydraulic circuit, in turn controlled by a valve attached to the free end of the bellows which responds to every change in the air loading pressure, controls the movement of a piston which moves the cross slide of the machine tool. Another hydraulic circuit similarly controls the longitudinal feed of the machine.

Demonstration of the attachment on a standard 12-inch lathe indicates that the process has broad possibilities in the machine tool field. It is a far cry from the old taper-turning attachment for lathes—the contouring device of a generation ago.

—p. 90



EDITOR-IN-CHIEF

Read this Shocking Truth!

Nearly 9,000,000 men and women have been killed, maimed or injured on and off the job since America went to war. Preliminary estimates for 1943 alone indicate that 4,300,000 war workers were killed or injured on or off the job—of this number 45,000 lost their lives. And, to make matters worse, non-fatal industrial accidents are increasing.

Here Is What You Can Do About It!

Study the safety organization within your own plant. Review its record. Find out whether or not it is inadequate, or has been outmoded, and cannot successfully cope with the hazards of new manufacturing methods, or greatly increased wartime employment. Satisfy yourself that it is being encouraged and equipped to perform at top efficiency. Check its program to determine whether or not employes are trained in safety for their protection when off the job as well as when on the job.

Utilize the information and opportunities for safety training offered by national agencies. Send your foremen

and supervisors to the free safety engineering short courses offered at leading colleges.

If your community has a safety council, take an active interest in it. If such a council does not exist, become the leader and see that one is organized, bringing together industrialists, merchants, professional persons, civic leaders, and police, fire, city and school authorities—all the people who have the greatest interest in the accident costs of the community.

Take action today! Help conserve manpower for maximum war production—for an earlier Victory.

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RYERSON

New Draft Rules Threaten Heavy Production Losses In Critical Industries

Steel, aircraft, chemical, synthetic rubber and aviation gasoline companies to be adversely affected. Younger men often have mastered newer techniques. Military leaders reconciled to reduction in output

DISPROPORTIONATE loss in production in the steel and metalworking, aircraft, chemical, synthetic rubber, aviation gasoline and other critical war industries will be caused by the greater inroads by Selective Service in the 18-26 age group of workers.

This situation will result, industry spokesmen say, because many of the younger men have been especially trained in the newer technologies and their removal from the production force will cause—percentagewise—a greater reduction in output than would be indicated by the number of men removed.

For example, a large steel producer reports that about 4 per cent of its employes are in the 18-26 age bracket. If they are drawn into the armed services as indicated by the new Selective Service policy, the company's production will be reduced by about 15 per cent.

For the steel producing industry as a whole, about 5 per cent of employes are in the 18-26 group. Their induction, according to industry estimates, would cause overall steel output to drop about

10 per cent or possibly a little more.

This situation was aired recently at conferences between representatives of the industry and government officials. Donald M. Nelson, War Production Board chairman, and Maj. Gen. Lewis B. Hershey, director of Selective Service, told the producers that the Army and Navy need men and that they must get the men, even if it means losing production. The industry representatives were given little hope for deferments for any but the most essential employes in the younger age group. It was indicated that only 40,000 deferments could be expected in all industries; approximately 375,000 are in the 18-26 group in industry.

Members of the Steel Industry Advisory Committee expressed fear over the consequences of losing additional men. Reports submitted by the industry re-

New Selective Service policy will draw thousands of skilled young workers from critical war industries into the armed services



MAJ. GEN. LEWIS B. HERSHEY

vealed that production already is falling off due to labor shortages and, with the arrival of warm weather, these shortages are expected to grow more serious.

One company reported an anticipated shortage of 11,000 workers although it already is employing 15,000 women. In this company "thousands of men are working 16-hour shifts, seven days a week, obviously a condition which can't keep up much longer." There are now 42,000 fewer men working in steel plants than two months ago, and the decline is accelerating.

In the Youngstown district, steel plants have lost 18,000 men to the armed serv-



ices and plants there are considering the suspension of minor departments to obtain additional manpower for essential operations.

At Buffalo, the shortage of workers has slowed down essential maintenance work, and one company reports that twice as long is required for the repair of open hearths and blast furnaces as formerly.

The steel industry's manpower problem will be taken up again by the industry advisory committee and government officials March 30 at a conference in Washington.

Affected even more seriously than the steel industry are the aircraft, chemical, synthetic rubber and aviation gasoline industries. In these the technologies are new and many of the key men are youths only recently graduated from colleges and possessing the latest scientific education.

A survey of seven major West Coast aircraft producers—Boeing, Consolidated, Douglas, Lockheed, North American, Northrop and Ryan—reveals that 10 per cent of the male employes are in the 22-25 age bracket. These young engineers, foremen and expeditors, are what the industry calls its "skilled nucleus". Many of them guide the work of women, handicapped and part-time workers who now comprise 60 per cent of all employes.

In the synthetic rubber industry, practically all the research laboratory workers are young chemists under 26 years of age. In the new synthetic rubber plants, an estimated 40 per cent of the workers are under 26, while in the older established rubber factories the 18-26 bracket represents about 10 per cent of the total.

Col. Bradley Dewey, rubber director, says the success of the synthetic rubber program is being jeopardized by the more stringent draft policy. Hundreds of chemists, engineers and other key men are likely to be called into the service, he said. Colonel Dewey said he had spoken with every responsible official about the danger to the program but had received little satisfaction.

"I can not conceive that a mechanism will not be found, but as yet none has been found and irreplaceable men are being lost."

The American Chemical Society predicts "a disastrous decline in our production, constituting a direct threat to the success of Allied arms" as a result of indiscriminate drafting of chemists, chemical engineers and other technically trained professional workers. The society points out that both "our enemies and our allies are deferring technically trained men, despite an unquestioned drain on their manpower."

The society charges that "at least 3000 chemists and chemical engineers are in the Army and Navy serving as though they had received no scientific education and training whatever."

The petroleum industry, faced with the task of expanding 100-octane produc-

tion by 50 per cent between now and the end of the year, fears the new draft rules will have a serious impact on gasoline output. In a report to General Hershey, the Petroleum Administration for War pointed out that 12 per cent of all technical employes are under 26 years of age, and in certain particularly critical occupations, such as chemists and chemical engineers, the men in this age group account for about 20 per cent of the total.

While these and other critical industries are protesting against the indiscriminate drafting of the highly-skilled younger men, reports emanating from Washington indicate that the age limit might be lifted further—possibly to 30.

Many employers believe the impact of the tightened draft rules is being intensified by the manner in which they were made public. Following the President's statement urging tighter job deferments, a series of conflicting and confusing statements came from the War Manpower Commission, Selective Service and other sources. Employers charge that local draft boards became all messed up in these statements and that many were taking the President's statement as authority to cancel all deferments, draft key workers indiscriminately and unnecessarily threaten production.

WLB Panel To Hear CIO Demands To Abandon Little Steel Formula

OVER the protests of its industry members, the National War Labor Board last week authorized its steel panel to hear the demand of the United Steelworkers of America-CIO for a general wage increase of 17 cents an hour above the Little Steel wage formula ceiling. The demand, if granted, would breach the wage formula and the stabilization program.

The board emphasized it is required to apply the wage formula as defined in the past. It has no authority itself to change the formula but can only recommend a change if in its judgment the formula is operating to create gross inequities and if the board is satisfied that the changes are consistent with the stabilization program.

The board stated that "the fact the board is prepared to consider evidence submitted to the panel on demands which would involve modification of the formula" should not be taken as an indication of any present decision on the part of the board as to whether it will or will not eventually seek a change in the formula.

The industry members, including Reuben Robertson, George K. Batt, Frederick S. Fales and Vincent Ahearn, said the "matter is one for Congress to consider. Congress even now is exercising its function in the hearings being conducted before the Senate Banking Com-

Automakers View Policy With Mixed Sentiments

DETROIT

Mixed sentiments prevail among units of the automotive industry over the imminent drafting of all physically fit men in the 18-26 age group. A leading statistician points out the problem is entirely up to the armed services in determining whether they want to maintain present levels of production and current activity in experimental fields or prefer to enroll engineers and technicians in the armed forces. He adds that some companies now in the midst of comprehensive research programs are considerably disturbed over the prospect of losing key technical men; others are now "over the engineering hump" and are resigned to the fact that younger men must be replaced by women, older men or 4-Fs. Statistical breakdown of the total number of workmen in the 18-26 age group would be meaningless, since obviously only those with special technical qualifications can expect to be retained in jobs, and this proportion varies with each individual company, the type of work it is doing, contracts now in process and contracts which are being undertaken.



DAVID L. COLE

Chairman of the War Labor Board panel which will consider the steel wage case

mittee. Labor's case for a change in the law should be presented there."

The industry members insisted that as far as wage matters are concerned the board is an administrative body acting under definite restrictions of authority and "is not the correct agency to conduct investigations to determine whether the stabilization policies imposed on it should be changed."

Utah Plant Begins Rolling Plates

Largest integrated steel plant west of Mississippi begins plate mill operations less than two years after ground was broken. Culminates series of operating steps over past few months

LESS than two years after ground was broken on 1600 acres of farmland, the plate mill of the government's new \$180,000,000 Geneva Steel plant near Provo, Utah, went into operation last week when the first trial rolling of plates was made. Geneva Works, largest integrated steel plant west of the Mississippi river, is being operated by Geneva Steel Co., United States Steel Corp. subsidiary,

under contract with the Defense Plant Corp. for the war period.

First rolling of plates for the Pacific coast shipbuilding industry culminates a series of operating steps over the past few months which began with the charging of the first battery of coke ovens on Dec. 13, 1943. Two of four batteries of by-product coke ovens, two of three blast furnaces, three of nine open hearth

furnaces, the slabbing mill and auxiliary facilities are now in regular production.

In April, 1942, U. S. Steel's West Coast subsidiary, Columbia Steel Co., began clearing the plant site of small farmsteads which dotted the area. Today an entirely new and complete source of steel production, with an annual ingot capacity of 1,280,000 tons, has been created.

To build the plant it was necessary to move 3,000,000 cubic yards of dirt, pour 550,000 cubic yards of concrete, erect 85,000 tons of structural steel, lay 70 miles of railroad track, and 15 miles of roadway.

To supply coal for the new mill, the new Geneva mine was developed in historic Horse Canyon, 130 miles southeast of the plant. In full operation, it will produce 8500 tons daily.

Iron ore is supplied from the open pit mine of Columbia Iron Mining Co., a subsidiary of Columbia Steel, located in southwestern Utah, approximately 250 miles from the Geneva Steel plant. The iron mining operation has been greatly expanded to take care of Geneva's needs.

Present, Past and Pending

■ HONEYCUTT RESIGNS POST IN WPB STEEL DIVISION

WASHINGTON—J. V. Honeycutt, assistant director for production, Steel Division, War Production Board, has resigned and returned to his position with Bethlehem Steel Co. Thomas S. Fitch has resigned his position as special assistant to J. L. Block, assistant director, and has returned to his position with Jessop Steel Co.

■ ALLOY STEEL OUTPUT DECLINES TO 905,131 TONS

NEW YORK—Production of alloy steels during February declined to 905,131 tons, about 13 per cent of total steel output for that month, according to American Iron and Steel Institute. This compares with 919,017 tons produced in January and 1,168,592 tons in February, 1943. Of last month's total, 584,167 tons were produced in open-hearth and 320,964 in electric furnaces.

■ FEBRUARY PIG IRON OUTPUT AT 96.3 PER CENT RATE

NEW YORK—Pig iron production in February totaled 5,083,013 net tons, compared with 5,275,852 tons in January and 4,766,001 tons in February, 1943. Although February tonnage was below January, output was at 96.3 per cent of capacity against 93.4 per cent in January.

■ U. S. CONTINUES TO BUY CUBAN COPPER AT 13.9 CENTS

HAVANA—Matahambre, Cuba, mine will continue to sell 1600 tons of copper monthly to the United States government through June at 13.9 cents a pound. Development of this mine was financed by this government.

■ AA-5 PREFERENCE RATING FLOOR ESTABLISHED

WASHINGTON—All defense orders in the future will be rated at least AA-5 compared with the previous rating floor of AA-10. No ratings lower than AA-5 will be assigned in the future by the War Production Board.

■ CANADIAN MINERAL PRODUCTION DROPS 7.5 PER CENT

TORONTO, ONT.—Canada's mineral output in 1943 was valued at \$523,940,810, or 7.5 per cent lower than in 1942, according to the Dominion Bureau of Statistics. Nickel output rose 17 per cent to 287,763,825 pounds while zinc production rose 5 per cent to 608,568,434 pounds. Other 1943 totals included 641,294 tons of iron ore, 813,268 tons of molybdenite concentrates, 30,085 tons of chromite, 578,981,467 pounds of copper, and 444,354,772 pounds of lead.

■ URGES PREPARATION OF POSTWAR BUILDING PLANS

NEW YORK—R. T. Brooks, executive vice president, American Institute of Steel Construction, urges that architects and engineers be put to work immediately preparing plans and specifications for the postwar building program of necessary bridges, highways, industrial structures and homes. The structural steel industry is prepared to meet the stiffest war-recovery demands the nation can make, he said.

■ EASTERN ROAD CONTRACTS FOR 42 DIESEL ENGINES

NEW YORK—New York, New Haven & Hartford railroad has placed orders for 42 diesel locomotives, of which 32 will be built by the American Locomotive Co. and 10 by General Electric Co. The orders are subject to court approval while amortization provisions are subject to approval by the War Production Board.

Seeks Judicial Ruling on Renegotiation Amendment

Warner & Swasey Co., Cleveland, filed suit in the District Court of the United States for the District of Columbia recently under the Federal Declaratory Judgment act, to obtain a judicial ruling as to the proper construction of an amendment to the renegotiation law.

"The original renegotiation law, which went into effect as of April 28, 1942," L. D. McDonald, vice president of the company, said, "did not include sales to the Defense Plant Corp. as being subject to renegotiation.

"Over a year later, effective as of July 1, 1943, Congress amended the renegotiation law so as to include, for the first time, Defense Plant Corp. business; and this provision has been interpreted by the armed services as being retroactive to April 28, 1942. The question we want the courts to decide is whether or not Congress intended to make this provision retroactive, and if so, whether or not the retroactive feature of the amendment is constitutional," he said.

Blast Furnace, Open Hearth Groups To Meet

The twenty-seventh annual conference of the National Open Hearth Steel Committee and the Blast Furnace and Raw Materials Committee of the Iron and Steel Division, American Institute of Mining and Metallurgical Engineers is scheduled for April 20 and 21 at Hotel William Penn, Pittsburgh. More than 1000 are expected to participate in the twelve technical sessions which will be concerned principally with the problems in operation and maintenance.

Steel Corp.'s Output Higher, Income Lower

Rising labor costs pushing against steel price ceilings are absorbing company's payments to owners, government

UNITED States Steel Corp.'s 1943 net income of \$63,448,546 was 11 per cent below the preceding year although total sales volume was up 6 per cent, Irving S. Olds, chairman of the board, said in his review of the year contained in the corporation's forty-second annual report.

Relatively small sum of \$3,415,861 from 1943 operations carried forward to the surplus account was about one-third the amount so carried forward in 1942, and was equivalent to one-sixth of 1 per cent of that received from customers in 1943. The corporation's annual report comments that this sum would cover costs at current operating rates for less than one day.

During 1943, strikes and work stoppages in the corporation's operating subsidiaries were four-fold those of 1942. Estimated steel production lost as a result was 318,000 tons, compared with 53,000 in 1942. The estimated loss of coal output in 1943 due to four separate strikes was 2,600,000 tons, against 32,000 so lost in preceding year. Man-hours lost by work stoppages last year totaled 4,845,000, a 17-fold increase over the 267,000 similarly lost in 1942 and represented 0.6 per cent of the total man-hours.

It is apparent that rising labor costs pushing against price ceilings are absorbing the payments to both government and owners. Substantial increases in wages could reduce them to nothing, Mr. Olds states.

Since 1929 the corporation has spent or authorized for expenditure about \$1,050,000,000 of its own funds for additions, improvements and replacements to meet the nation's needs for steel.

For the three-year period, 1941-1943, the corporation produced 89,500,000 tons of steel ingots, exceeding the 1916-1918 production by 21,500,000 or 32 per cent. Production of steel plates topped by 11 per cent the 1942 record of 4,000,000 tons, and represented one-third of the nation's output.

The corporation's steel ingot capacity, some of which belongs to the government, will amount to 33,800,000 tons upon completion of the expansion program this year.

The annual report outlines the disposition made of the \$1,976,844,751 received by the corporation for products and services sold during 1943 with comparisons with 1942, as shown in the table.



More than one-third of the nation's ship plates produced in 1943 came from the mills of the United States Steel Corp. This photo from the corporation's annual report shows a workman turning a slab broadside preparatory to further rolling on a 140-inch sheared plate mill

U. S. STEEL'S INCOME STATEMENT

	Year 1943	Year 1942	Per Cent Change
PRODUCTS AND SERVICES SOLD	\$1,976,844,751	\$1,862,951,692†	+ 6.1
COSTS			
Employment costs			
Wages and salaries	853,266,896	725,750,899	
Social security taxes	26,012,577	24,245,901	
Payments for pensions	33,650,490	32,664,901	
	912,929,963	782,661,701	+ 16.6
Products and services bought	706,763,355	648,401,343	+ 9.0
Wear and exhaustion of facilities:			
Depletion and depreciation	85,163,300	91,765,371	
Amortization of emergency facilities	43,652,882	31,962,146	
Loss on sales of plant and equipment	5,192,125	4,434,013	
	134,008,307	128,161,530	+ 4.6
War costs included above applicable to and provided for in prior years	1,123,261		
Estimated additional cost applicable to this period arising out of war	25,000,000	25,000,000	
Interest and other costs on long-term debt	6,251,462	6,153,392	+ 1.6
State, local and miscellaneous taxes	41,566,379	48,255,157	-13.9
Estimated Federal taxes on income	88,000,000	153,070,000†	-42.5
Total	1,913,396,205	1,791,703,123†	+ 6.8
Income	63,448,546	71,248,569†	-10.9
DIVIDENDS—On cumulative preferred stock (\$7.00 per share)			
	25,219,677	25,219,677	
On common stock (\$4.00 per share)			
	34,813,008	34,813,008	
CARRIED FORWARD FOR FUTURE NEEDS	\$ 3,415,861	\$ 11,215,884†	-69.5

†After adjustment for renegotiation of contracts.

Cost Increase Reflected in 1943 Profits

Tabulation of 730 companies shows combined income gain of 2 per cent. More companies report decreases

ANNUAL reports of leading manufacturing companies for 1943 reflect rising industrial costs at a time when the rate of production increase was tapering toward the close of last year.

Earnings tabulation of 730 companies for full year, by the National City Bank of New York, indicate a combined net income for the group after taxes and reserves of about \$1,137 millions. This represents an increase of 2 per cent over the 1942 showing for these companies, compared with an increase of 13 per cent recorded in the first nine months over the corresponding 1942 period.

Practically all companies experienced advances in costs last year, but those still having large increases in sales volume were able to offset these additional charges. Many firms reported actual curtailment in sales volume, due to changing needs of the war effort and to effect of priorities and scarcities of materials.

While earnings on a consolidated basis were slightly in excess of 1942, the number of companies showing decreases exceeded those recording gains in the ratio of about four to three.

Receivables and inventories, which had risen sharply between 1940 and 1942, were little changed last year despite the further expansion in sales volume, indicating more rapid turnover of merchandise and prompter collection of accounts, the bank states.

No one can accurately forecast just what should be the size of corporate reserves against the liquidation of wartime expansion, the bank's statement continues. Many companies prominent in the last war were unable to survive the liquidation that followed, and the extent to which industry has been transformed and expanded is much greater during this war. Conditions justify unusual precautions in building a backlog of reserves.

The steel industry presents an outstanding example of the effects of rising costs against ceiling prices last year, the bank says. There was an increase of 3 per cent in ingot production to a new high, an increase of 12 per cent in wages and salaries paid, and a decrease of 7 per cent in the net income of 30 leading companies.

Other important groups showing lower net income last year included food products, cotton goods, paper and paint, while those showing increases included distilled beverages, rubber products and petroleum refining.

EARNINGS . . .

Granite City Steel Co., Granite City, Ill., reports 1943 net profit of \$554,270, equal to \$1.45 a share on capital stock. This compares with \$616,275, of \$1.61 a share, in 1942.

American Rolling Mill Co., Middletown, O., has 1943 net profit of \$6,098,074, equal to \$1.42 a common share. This compares with \$7,780,988, or \$2.01 a share, earned during 1942.

Net sales last year amounted to \$199,266,466, compared with \$180,978,867 in 1942.

Wickwire Spencer Steel Co., New York, had 1943 net income of \$1,516,613, equal to \$3.30 per common share, compared with \$1,599,004, or \$3.48 a share, reported in 1942.

Net income of Midvale Co., Philadelphia (controlled by Baldwin Locomotive Works), totaled \$2,046,658, equal to \$3.41 a share, during last year. In 1942 company earned \$2,582,941, or \$4.30 a share, after renegotiation.

Net profit reported by M. A. Hanna Co., Cleveland, for 1943 totaled \$4,341,200, equal to \$3.64 a common share. This compares with \$4,254,663, or \$3.55 a share, earned in 1942.

Earnings Comparisons by Industrial Groups for 1943 and 1942

Net Income is Shown after Depreciation, Interest, Taxes, and Other Charges and Reserves, but before Dividends.—Net Worth Includes Book Value of Outstanding Preferred and Common Stock and Surplus Account at Beginning of Each Year.

No. of Cos.	Industrial Groups	Net Income, Years		Per Cent Change	Net Worth January 1		Per Cent Return	
		1942	1943		1942	1943	1942	1943
30	Iron and steel	\$195,502	\$181,499	- 7.2	\$3,207,408	\$3,275,222	6.1	5.5
8	Agricultural implements	14,515	15,671	+ 8.0	138,214	143,074	10.5	11.0
21	Building equipment	13,602	13,798	+ 1.4	151,758	163,280	9.0	8.5
27	Electrical equipment	84,325	91,972	+ 9.1	688,014	713,721	12.3	12.9
22	Hardware and tools	13,533	13,962	+ 3.2	62,967	71,681	21.5	19.5
11	Household equipment	4,436	4,236	- 4.5	31,504	31,914	14.1	13.3
66	Machinery	48,595	47,593	- 2.1	266,892	292,775	18.2	16.3
8	Office equipment	13,483	9,451	-29.9	83,319	90,142	16.2	10.5
9	Nonferrous metals	11,632	13,881	+19.3	165,937	155,933	7.0	8.9
30	Misc. metal products	31,370	36,729	+17.1	331,892	344,164	9.5	10.7
41	Autos and equipment	32,657	38,028	+16.4	214,077	230,555	15.3	16.5
12	Railway equipment	17,403	16,813	- 3.4	184,925	190,988	9.4	8.8
13	Baking	21,742	21,987	+ 1.1	240,360	232,379	9.0	9.5
12	Meat packing	50,552	48,794	- 3.5	595,152	618,353	8.5	7.9
62	Misc. food products	54,878	49,243	-10.3	497,882	522,189	11.0	9.4
14	Soft drinks	8,163	7,282	-10.8	51,476	58,683	15.9	12.4
18	Brewing	5,523	6,072	+ 9.9	44,833	46,832	12.3	13.0
9	Distilling	28,373	34,012	+19.9	224,332	230,158	12.6	14.3
12	Tobacco products	51,912	49,562	- 4.5	462,163	483,018	11.2	10.3
33	Cotton goods	24,482	20,810	-15.0	231,113	242,022	10.6	8.6
5	Woolen goods	7,875	7,788	- 1.1	85,314	89,322	9.2	8.7
11	Knitted goods	3,881	3,832	- 1.3	42,789	43,701	9.1	8.8
29	Misc. textile products	20,773	21,630	+ 4.1	214,958	224,155	9.7	9.6
18	Clothing and apparel	10,037	10,043	+	90,258	94,441	11.1	10.6
5	Leather tanning	4,237	3,674	-13.3	35,918	36,390	11.8	10.1
15	Shoes, etc.	15,371	14,839	- 3.5	169,770	173,916	9.1	8.5
17	Rubber products	41,569	57,617	+38.6	416,021	435,369	10.0	13.2
15	Lumber	7,574	5,935	-21.6	71,387	74,387	10.6	8.0
4	Furniture, wood products	3,568	2,976	-16.6	53,991	60,342	6.0	4.9
29	Paper products	31,751	28,450	-10.4	391,363	394,599	8.1	7.2
32	Chemicals—industrial, etc.	110,910	115,407	+ 4.1	1,081,902	1,123,465	10.3	10.3
9	Drugs, soap, etc.	32,231	32,768	+ 1.7	193,511	202,862	16.2	16.2
10	Paint and varnish	10,136	8,725	-13.9	114,937	119,042	8.8	7.0
11	Petroleum Products	36,425	45,722	+25.5	549,472	564,105	6.6	8.1
12	Cement, gypsum, etc.	14,819	11,260	-24.0	192,713	199,208	7.7	5.7
17	Other stone, clay and glass	26,410	24,726	- 6.4	250,335	261,612	10.5	9.5
33	Misc. manufacturing	15,243	21,012	+37.8	87,128	99,374	17.5	21.1
730	Total manufacturing	\$1,119,488	\$1,137,349	+ 1.6	\$11,925,985	\$12,333,375	9.4	9.2

Proposes Nation Plan Future Economy Now

Senate War Contracts Subcommittee predicts 8,000,000 unemployed after war unless program is prepared

PROPOSAL that the nation plan now for a \$200,000,000,000 postwar production program as insurance for a sound economy and employment for all was made by the Senate War Contracts Subcommittee which declared that 8,000,000 workers would be among the unemployed ranks when war production ceases.

The subcommittee, headed by Sen. James E. Murray (Dem., Mont.), and including Senators Truman (Dem., Mo.) and Revercomb (Rep., W. Va.), also declared that excess supplies in the hands of the government after the war would total at least \$50,000,000,000. Besides this, they pointed out that more than 2500 government plants, built at an estimated cost of \$15,000,000,000, would be released.

"It is clear that the only thing to take the place of war contracts is the purchasing power of the people and of our fellow nations throughout the world," the subcommittee said. "To put it another way, all programs intended to adjust our economy to the removal of war contracts, upon which it now rests in large part, must be aimed at developing domestic and foreign markets to a level that has never before been known or dreamed of."

The subcommittee believes that it is possible for the demobilization program to be planned in such a way that our total output of goods and services during the transition period falls to no less than \$135,000,000,000 a year. And, they further declared that it is entirely feasible for the nation to aim at \$200,000,000,000 a year or more within five years after the end of the war.

Severely criticizing the government for "inefficient and unsatisfactory" handling of terminated contract settlements, the subcommittee report revealed that not more than 10 per cent of the sums estimated on termination claims submitted to date has been paid. They further charged that an increasingly large volume of claims has been pending for over six months and many claims have remained unsettled for over a year.

The report predicted that the present wave of cutbacks would be followed by an avalanche of cutbacks when the Germans surrender and another when the Japanese admit defeat. The subcommittee contends that the pending Murray-George contracts-termination bill is a comprehensive approach to the problem and that the bill puts its primary em-



MEASURING FOR COMFORT: Boston & Maine railroad plans to set up this "test chair" in Boston's North station concourse to measure 3000 adult passengers in an effort to determine how best to build seats for postwar rail coaches. It is working in co-operation with the department of anthropology at Harvard University and will make its findings available to all American railroads. NEA photo

phasis upon helping both the war effort and reconversion by insuring to prime contractors and subcontractors "speedy and equitable final settlement and adequate interim financing until such final settlement."

Sees Future As Challenge To Tool, Die Manufacturers

Decline of war orders will not spell the virtual folding up of the tool and die industry because tooling will be required to produce the postwar products now being planned by many companies and will prove one of the greatest opportunities ever offered to the industry, L. A. Sommers, president, National Tool and Die Manufacturers Association, predicted recently.

He expressed the belief that competitive conditions would inevitably begin to push prices downward with the result that manufacturers will be on the lookout for methods of lowering costs. This will offer a distinct challenge to the ingenuity and versatility upon which the industry was founded.

Forecasts Postwar Demand For 10,000,000 New Homes

A vast building program is in store for the nation's contractors who will have to supply approximately 10,000,000 new homes, 1,000,000 each year, during the

ten years following the war, according to a housing survey recently completed by the Twentieth Century Fund.

The survey also concluded that approximately 6 per cent of a postwar national income of \$100,000,000,000, or \$6,000,000,000 annually, will be spent for housing construction. The research organization predicted that housing requirements would bring employment and production in the home-construction and related fields to a level beyond anything achieved prior to the war.

Housing stock is in a badly deteriorated condition, the report pointed out, with more than 23 per cent of all dwellings in urban areas having no private bath in 1940 and over 10 per cent are in need of major repairs. Major repairs also are required in 4,300,000 rural homes. Minimum potential demand for non-farm units a year was estimated at 820,000 in the decade after the war.

Predicts Extensive Use of Welding on Postwar Box Cars

Welding will be used extensively after the war to build light-weight box cars, Wallace N. Barker, vice president, Pullman-Standard Car Mfg. Co., Chicago, predicted recently.

He said it would take many years to replace the railroads' 1,700,000 over-age heavy-weight freight cars but that such a program is expected to begin immediately after the arrival of peace.

Government Goods To Be Sold Promptly at Best Possible Price

Administrator Clayton recognizes difficulties in liquidating materials without undue shocks to economy. Believes special legislation will be necessary in some cases. Baruch-Hancock recommendations to be followed

WASHINGTON

DESPITE exercise of utmost prudence, it is going to be a difficult chore to liquidate the huge and diversified government-owned surpluses without undue shocks to the economy, according to Will L. Clayton, Surplus War Property Administrator. The vast operation, he said, is one which cannot be carried out without impinging to at least some degree on the interests of manufacturers, distributors and many other types of businessmen.

"The most difficult decision to make," he said, "will be the one involving protection of the producers whose market potentialities will be reduced by the sale of surplus products. We will have pressure groups with us all the time—those on the one hand who want us to sell and those on the other who want us not to sell. It will be a matter of determining how best to balance the whole picture—how to make decisions that are fair to the Treasury Department, the general public, the taxpayers, the manufacturers and labor. The problem is still more difficult when you consider that we will have to make decisions quickly.

Rapid Liquidation Now

"The problem will not be very serious while the war still is on; it will become serious only after the war is over or until the war production burden is materially reduced. In the meantime it is our policy to sell surplus goods as rapidly as possible, and at the best possible price. We certainly are not going to say to a man needing a truck now, when trucks are hard to get: 'To protect the truck industry and its market two years from now you cannot today have a truck that you need now.'"

Surplus War Property Administration, Mr. Clayton said, will function only at the policy level. Its policy board is composed of representatives of 14 government procurement agencies. The board meets weekly to discuss surplus disposal problems and formulate rules of policy. Pending formulation of these rules, the agencies have been directed to continue to dispose of surpluses in accordance with their present practices. They have been cautioned to test the market carefully and thoroughly so that they may get the best prices for surplus goods.

Mr. Clayton did not think there would be any repetition of certain sales last year on the basis of a few cents on the dollar, sales which assumed scandalous proportions when aired by Congress.

Mr. Clayton believed also that there would not be many more instances of one agency buying goods at full market prices while another agency was selling the very same goods at bargain prices. The various agencies now are preparing inventories of their surpluses and these will be assembled into a master inventory at Washington where it will be available to all of the agencies.

Theoretically, he said, the Surplus War Property Administration assumes responsi-

ORDERLY LIQUIDATION

The government has laid sound foundations for the orderly liquidation of surplus plants, equipment, and goods, Benjamin Schwartz, chief, Scrap Metals Section, Foreign Economic Administration, said recently.

Estimating that it would take ten years for the orderly distribution of approximately \$75,000,000,000 worth of "surplus" after the war, he said that the objectives to be realized are to get the largest possible financial return for taxpayers, to assure largest possible re-employment of labor, and to assure the widest markets for all items offered in a free market.

Mr. Schwartz urged the formation of a central council or federation of the various segments comprising the secondary raw materials industry in order to make available the united experience and advice of this industry.

bility for disposition of surplus property as soon as an agency certifies that it has surpluses. However, he was not sure whether this would be true in all instances. For instance, the Commodity Credit Corp. is buying wool at ceiling prices from domestic producers at a time when the Foreign Economic Administration is selling stocks of Australian wool at auction. For the reason that the CCC is buying wool for the purpose of stabilizing the domestic wool market, Mr. Clayton was not sure whether he had the power of instructing the FEA to sell its surplus wool to the CCC. This is a problem, he said, requiring attention both by the executive branch and by Congress. Involved in it, he pointed out, is the interest of the State Department in main-

taining the "good neighbor" policy, buying wool from Australia in this particular instance.

Theoretically also, the Surplus War Property Administration is responsible for disposition of government-owned surpluses abroad. Actually, the State Department, the Foreign Economic Administration and the United Nations Relief and Rehabilitation Administration all might be very much interested in the disposition of these surpluses.

There is another angle to which attention is being given, said Mr. Clayton. That is the desirability of selling surplus goods on credit terms in many cases. It is possible that some legislation is needed to permit this.

Another angle of uncertainty, said Mr. Clayton, concerns the authority of the Surplus War Property Administration, an administrative agency, over disposing of surpluses held by an agency created by Congress. Before the SWPA could supervise disposition of surplus metals held by the Metals Reserve Corp., for example, it might be necessary for Congress to revise the charter of the MRC.

Disposition of surplus aircraft will be a bothersome problem, he said, since there is much controversy and diversity of opinion. This is a problem he said, that will have to be worked out in conversations with people informed on it and concerned with it.

Preferential Treatment to Veterans

Asked whether any attention was being given to the matter of giving preferential treatment, through credits and financial assistance, to help discharged service men get into businesses of their own, Mr. Clayton said some thought had been given by the Reconstruction Finance Corp. It was his belief that preferential treatment to veterans would require special legislation.

Careful thought will have to be devoted to disposal of goods that have value only for waging war, said Mr. Clayton.

"Recently an Army officer mentioned a certain shell which costs around \$600 to produce. He said it would cost more than that to disassemble the shell and convert it to usable scrap. Yet if it were not disassembled the shell ought to be dumped into the ocean for safety reasons. I did not argue with him about the safety hazard," said Mr. Clayton, "but I told him that on the matter of determining the cost of converting the shell into usable scrap I would want to have a thorough investigation made before I would order the shell dumped into the ocean."

Mr. Clayton said that he did not contemplate building a large organization. He said, however, that he did propose to obtain advice from the best informed men with respect to machine tools, aircraft and other surpluses.

The Surplus War Property Administration, said Mr. Clayton, will follow all of the suggestions contained in the Baruch-Hancock report. It would authorize sales not to speculators, but through established trade channels. It would authorize sales in small as well as large lots.

New Orders Exceed Expectations

Builders report substantial purchasing of both standard and special purpose tools. Overall trend in demand still is downward with backlogs shrinking

NET new machine tool orders the past few months have held up better than anticipated by most tool builders.

Electrical equipment manufacturers have been purchasing a considerable number of precision machine tools of both standard and special types, including race grinders, for the manufacture of antifriction bearings in their own plants.

Substantial number of tools have been purchased for the machining of propulsion equipment for the landing barge program. Tool builders are also being pushed for delivery on subcontract work involved in the barge program. In some instances this work has been scheduled ahead of aircraft parts.

Sudden rush of orders for certain types of tooling equipment, however, does not necessarily indicate any material change in the downward trend of overall tool requirements over coming months.

Although increased production of heavier sizes and types of antifriction bearings will be necessary to meet urgent military programs, overall output lately has recorded improvement. Representatives of the armed services recently outlined to the antifriction bearing industry advisory committee the bearing needs for immediate war programs, including the requirements for maintenance of equipment in the field. The industry's problems are unusual since they require 25,000 different sizes of ball bearings to meet current war schedules.

Critical supply situation in antifriction bearings and fractional horsepower motors pushes back still further the possibility of making test models of machine tools designed for civilian use.

Rising tide of interest in high-speed milling on the part of tool builders as a possible cause for extensive redesign of milling machines for the postwar market is indicated by inclusion of papers and discussions on this subject in the program of the annual meeting of the American Society of Tool Engineers to be held in Philadelphia, March 26-28.

Recent severe reprimands administered to certain military personnel in the Detroit area who allowed disposal at ridiculously low figures of new and unused machine tools, and the recovery by the government of a considerable number of these machines, indicate an effort on part of the government toward stricter control over the disposal of such equipment.

To effect an efficient redistribution of idle tools, WPB has inaugurated a compulsory monthly report on idle government-owned machine tools. The reports will be made on a monthly basis, the first to be filed by April 1, on form WPB-3475. More detailed data on this

subject are expected to materially aid some tool builders in locating available facilities for subcontract work.

Trend in idle tool hours, based on figures previously obtained by WPB on a voluntary basis, has shown little change in recent weeks. The WPB Fifth region reports less idle tool hours for the week ended March 11 than recorded in the like 1943 period.

Extent that cancellations have reduced order backlogs, which in turn reflect the fact that war plants for the most part have been adequately equipped with tools and also the decline in export requirements, is indicated in the War Production Board's January machine tool report which shows order backlogs off 13.8 per cent compared with the preceding month to \$181,548,000. This represents slightly more than three months' production at the January rate, and compares with the peak of \$1,392,803,000.

Machines and Parts Sellers Granted Price Adjustments

Sellers of industrial machines and parts, whose costs have risen because their suppliers' prices have advanced under the automatic adjustment provision of maximum price regulation No. 136, may apply to the Office of Price Administration for permission to pass on the resulting increase when the article is sold to another buyer.

The automatic adjustment provision

has been changed also to make special provision for resellers who used the price lists of another to compute selling prices. Such resellers now may adjust their prices by using the price list that such other person either had in effect on the base date, or put into effect in accordance with the automatic adjustment provision.

A change in the provision of the regulation governing maximum prices for sales by the War and Navy departments and the Defense Plant Corp. of second-hand machines or parts acquired for the purpose of rental was announced also last week by OPA.

The price now can be determined under the special pricing provision formerly governing such sales, or by the method provided in the general pricing provision for second-hand machines and parts, whichever is higher.

ASME Spring Convention at Birmingham April 3-5

Spring convention of the American Society of Mechanical Engineers will be held at Birmingham, Ala., April 3-5. Arrangements are under way to combine it with the annual conference of the American Society of Mechanical Engineers' student members of the engineering colleges of the Southeast.

The evening sessions on April 3 will be held under the auspices of the aviation, power, hydraulic and management divisions. Morning session on April 4 will be directed by the metals engineering, aviation, fuels and hydraulic divisions. Monday afternoon sessions will cover the fields of power, hydraulics, management and metal cutting. On April 5, the sessions will be devoted to discussion of papers dealing with fuels, industrial instruments and heat transfer.



NAVY'S "EDISON": Nicknamed "Edison" by the Navy, Joseph M. Cooper, a civilian aviation mechanic at a naval air station at Jacksonville, Fla., is shown holding the "three-way lifting eye" which he invented to lift airplane engines on the chain hoist. Lying on the table are the three individual eyes formerly used in the operation. The invention saves metal by eliminating the necessity for the three eyes

Transition Can Be Shortened If Rules Are Established Now

General Motors president tells house committee emphasis should be placed on speed rather than prevention of fraud. Urges release of machine tools and small quantities of alloy steels to manufacturers for experimental use

IN CURRENT thinking about what sort of law should be drafted to govern contract termination procedure too much emphasis is being placed on preventing fraud against government, Charles E.

Wilson, president, General Motors Corp., told the House Postwar Planning Committee last week. He recommended assumption that most contractors are honest and that cash settlements should be made

POSTWAR PRELIMINARIES

FUTURE ECONOMY—Senate War Contracts Subcommittee proposes that the nation plan now for a \$200,000,000,000 postwar program as insurance for a sound economy and employment for all when peace arrives. See page 54.

NEW HOMES—A survey completed by the Twentieth Century Fund forecasts a demand for 10,000,000 new homes during the ten years following the war. It estimates that \$6,000,000,000 annually will be spent for housing construction. See page 54.

SURPLUS PROPERTY—Liquidation of the huge and diversified government-owned surpluses without undue shock to the nation's economy is seen as an extremely difficult job. See page 55.

CONTRACT TERMINATIONS—Suggestions to Congress on termination of contracts by John M. Hancock will incorporate many of the provisions of the Murray-George bill recently introduced in the Senate. Prompt payments, immediate removal of government equipment from contractors' plants, and provisions for providing industry with machine tools and materials for peacetime production are primary aims. See page 60.

SIMPLIFICATION—Simplification is seen as the manufacturers' solution for keeping down postwar production costs. Industry warned against overdiversification of its peacetime products. See page 61.

AUTOS—Controlling factor in the price of peacetime automobiles is expected to be wages. Least that can be anticipated is a 25 per cent increase in the selling price. See page 65.

SALVAGE—Successful reclamation of materials program at Thompson Aircraft Products Co., Cleveland, presages continuance of the salvage departments in the postwar era. See page 72.

PIERCE BLANK TEMPLATE—A designation given the steel punch and Kirksite die assembly designed and utilized for stamping flat aircraft parts from aluminum alloy sheet or strip. Manufactured in one-tenth the time required to make a conventional and piercing die, with standard materials, it is a "natural" for production line methods, now and in the future. See page 84.

AUTOMATIC CONTOURING—Unique lathe attachment for automatic precision machining will be watched closely by postwar-planning machine tool builders and users. Following mathematical curves such as parabolas, device "scans" template, steplessly guides tool slides. See page 90.

GAS PICKLING—Initial installation of gas pickling and coating equipment to prepare cold-reduced steel strip for coating shows record of blister-free surfaces and improved adherence of coating. Two years of achievement argue for continuance here and wider application elsewhere. See page 102.

with them with the greatest speed.

After arrangements had been made for speedy settlements he would begin thinking about catching crooks. "It would be better to lose one hundred million dollars than to have delays in reconverting. Loss of a single month in getting industry in general reconverted might cost three and one-half billions."

He also said it would be very unfortunate if the Comptroller General would have power to nullify cash settlements made by procurement agencies since that would make procurement officers jittery and would have a bad psychological effect on manufacturers who remember all too clearly the bad record of the government over the years in postponing cash settlements.

He said time is about here where machine tools can be manufactured or sold out of surpluses and where sample lots of materials like alloy steels can be spared to manufacturers for experimental use in planning their postwar products. "We figure it will cost us five hundred millions to reconvert. A huge amount of paper work will be necessary to control and time the reconversion inasmuch as thousands of transactions will be involved. Hence we will save time if we order needed tools now instead of later."

Opposed To Paying Idle Workers

Pointing out that setting up the first production is the most difficult phase of reconversion, he declared that reconversion on at least small scale should be permitted in every war plant at the earliest possible moment. He thought that if the rules were set up now and industry knew now what it could do and what was expected of it the reconversion transition period would be short and the country would have little difficulty in getting through it in an orderly way.

Asked whether during transition period idle workers should receive compensation Wilson said he opposes paying people for not doing anything and if reconversion is accomplished speedily there will be no need of it.

When Wilson said there is no responsible government agency to which General Motors could at this time submit its reconversion program and from which it could obtain necessary co-operation and assistance he was asked to submit the General Motors program to the committee which will study it and possibly make recommendations to Congress.

"One of our problems is union seniority rules approved by government under which returning veterans not previously employed by us are denied job opportunities. We think industry should not be thus bound but should have the right to employ the best qualified people for the work."

Paul M. Snyder Dies

Paul M. Snyder, sales manager for Climax Molybdenum Co., New York, died March 23 in Canton, O.

Construction Needs Heavy

BECAUSE much of this war is being fought in areas where there are no roads, ports, storage, hospital and other facilities, construction operations on a vast scale, demanding huge quantities of materials and equipment, will continue over an indefinite period ahead, according to Brig. Gen. C. D. Sturdevant, assistant chief, Army Engineers for War Plans.

"Many thousands of 4 and 6-inch pipe-lines will be laid," he said, adding that they will accompany fuel storage tanks and auxiliary equipment.

"The bulldozer," he added, "has become so essential to military operations in all theatres that we still are producing them to limit of our manufacturing facilities. The steel landing mat is an outstanding development of the war. A 6000-foot mat can be laid in two days under favorable labor conditions."

Wire Predominates

Although radio was widely used during military operations in Sicily, wire remains the basic medium of combat communications, according to a War Department report from the field. It is estimated that Signal Corps units in Sicily rehabilitated 950 pole line miles, a total of 49,176 wire miles, and 34,588 circuit miles of communications. In addition, more than 1800 miles of spiral cable was laid. Through these lines wire communications were conducted with accuracy and security.

Conserve High-Octane Gas

Under a new directive, the Army permits use of 80-octane, all-purpose, all-weather gasoline in the United States only in those of its vehicles intended for combat purposes abroad. This is to make it possible for troops to familiarize themselves with the powers and limitations of their vehicles under the same operating conditions they will encounter in combat. All other Army vehicles in the United States will use 72-octane motor fuel, specifications for which are met by most commercial gasolines.

Flame Thrower Effective

Effectiveness of the Army's flame thrower in putting enemy pillboxes out of action with minimum casualties on our side promises a greater use of steel in this application. Developed by the Chemical Warfare Service, the flame thrower consists of fuel and pressure tanks strapped to the operator's back like an infantry pack and connected by a short hose to a rodlike discharge piece carried in the hands like a rifle. The pair of steel tanks holds heavy oil and an attached cylinder contains compressed air or nitrogen. In addition there is a small cylinder fixed to the flamegun containing hydrogen, which is used to ignite

the fuel oil, much as a pilot-light starts a kitchen stove. Just before the flame thrower goes into action, valves on each of these tanks are opened. As the operator approaches his target, he presses a button which releases a stream of hydrogen from the brass nozzle and, at the same time, actuates a spark plug to ignite the hydrogen. Within range of the target, the operator fires by squeezing

MESS KITS OF SCRAP

A substantial part of the Army's metal mess equipment is being obtained from scrap metal left over from the manufacture of other articles, and from "off-heat" or rejected ingots of stainless steel originally intended for other military purposes.

Because of technical difficulties, the steelmaking industry ordinarily does not remelt stainless steel ingots which have been rejected, but attempts to find other uses for the metal in fabrication of articles which do not require precise metallurgical qualities.

The manufacture of valves for internal combustion engines from a high-tungsten stainless steel, for instance, produced a large amount of scrap which was useless for most military purposes. As a result, a large amount of rejected steel ingots and valve scrap piled up until the Quartermaster Corps found in this metal a solution to its problem of finding suitable material for table flatware and mess equipment.

a trigger valve at the rear of the flame-gun. The valve allows the fuel oil to spurt through the nozzle, catching fire as it mixes with the hydrogen flame.

"All-American Airline"

An "All-American-flag airline", in which "every carrier now doing business, either domestically or in foreign commerce, may participate, but which will have the sole sanction of the federal government and which will receive the sole support financially of the federal government," is proposed in S. 1790, introduced in the Senate last week by Sen. Pat McCarran (Dem., Nev.).

"By the bill," declared Mr. McCarran, "we will create no monopoly. We leave the road wide open for those who would venture their own fortunes in foreign commerce by air, but we put behind the proposed instrumentality the power and force of the government of the United States. We have been more or less a laughing stock to foreign countries because we have no defined foreign policy as regards commercial aviation. It is high time that a foreign policy be established."

Soldier Gets Patent

Army Ordnance Department has obtained an inventor's patent for Sgt. Ernest Simpson, Gettysburg, Pa., an Ordnance mechanic who, in his spare time, developed a control governor for use on air compressor units, employed by the Army in large numbers in the United States and in all overseas theatres. It reduces the speed of the engine when the compressor is not under load. It not only reduces gasoline consumption by 11½ to 15 per cent, depending on the size of the compressor, but prolongs life of the compressors and reduces maintenance and repairs.

Renegotiation Manual

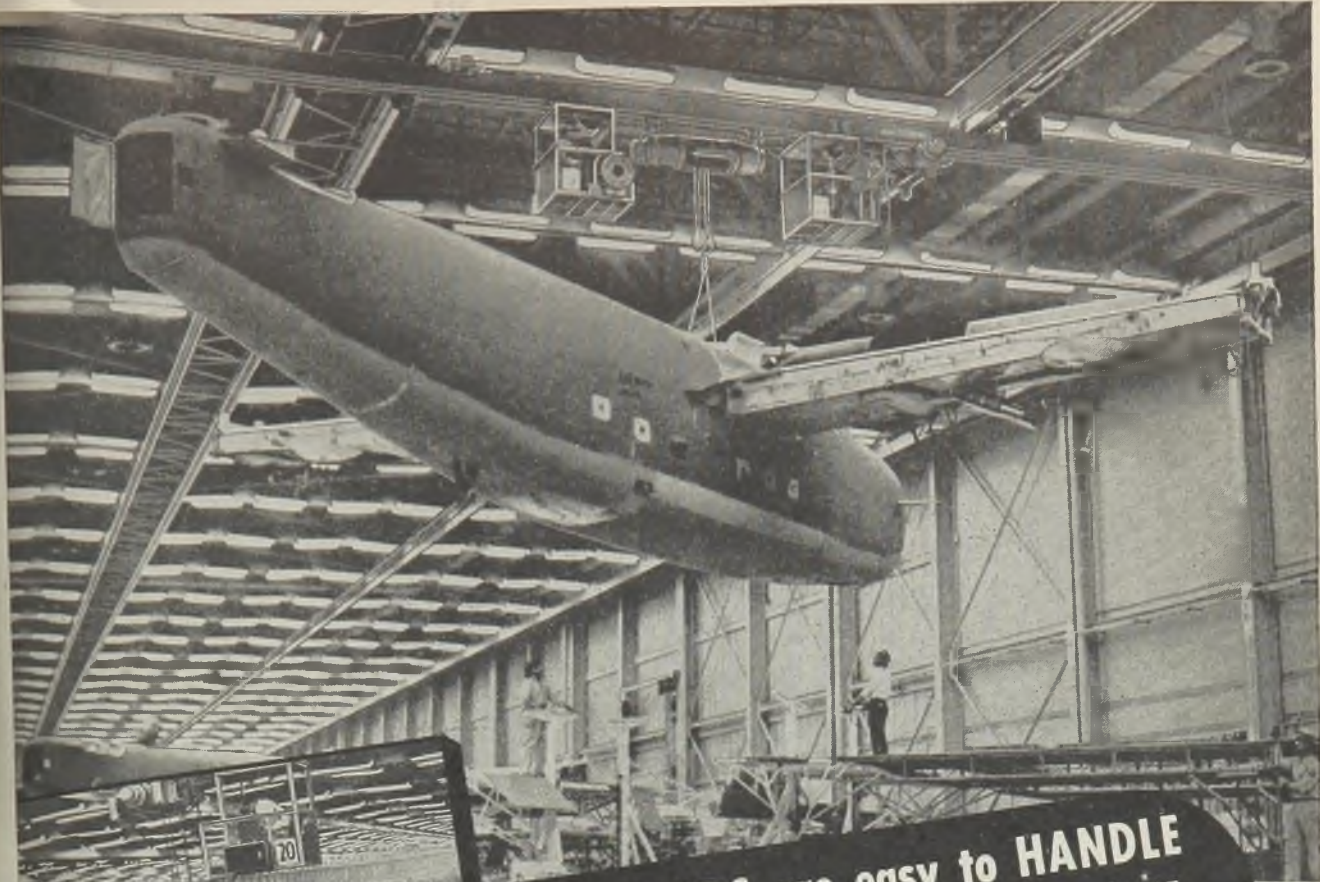
War Contracts Price Adjustment Board, created under the revised Contracts Renegotiation act to direct renegotiation policies and procedure of the various government procurement agencies, is writing a "Renegotiation Manual" for the guidance of war contractors. It is expected the book will come from the printer early in April. Copies may be obtained from the War Contracts Price Adjustment Board, Pentagon building, Washington 25, D. C.

Tank Destroyers Better

Principal reason for the cutbacks in contracts for heavy tanks, the Ordnance Department reveals, is its development of three weapons which can outmaneuver, out-shoot and destroy the German Mark VI tank. They are the M-10 tank destroyer, the "Priest", 105-millimeter howitzer with motor carriage M-7, and the 90-millimeter all-purpose gun. None are new weapons but until recent battle experience their superiority over the prized 62-ton tank of German armorers was not fully appreciated. The M-10 mounts a 3-inch, high-velocity gun in an open turret and one shell is enough to destroy a Mark VI tank. The "Priest" has proven a rugged, trustworthy tank destroyer and an excellent mobile field piece; it is larger than the similar German 88-millimeter gun and fires a heavier shell with a greater bursting charge. The 90-millimeter gun, less complicated in manufacture and operation than the German 88, fires a heavier projectile a greater distance at a faster rate and with more accuracy than any Mark VI weapon. The 90 is used both in antitank and antiaircraft combat. To achieve the necessary mobility, these tank destroyers are lightly armored and depend on ambush, based on sound reconnaissance, for effectiveness.

South American Note

The Fifth Pan-American Highways Congress is scheduled to be held in Lima, Peru, during the latter half of July, and is expected to reflect growing interest in construction of modern highways all through Latin America.



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Hancock To Make Recommendations For Law To Govern Settlements

Bill will incorporate many provisions of the Murray-George proposal recently introduced. Baruch's assistant believes government should deal with prime contractors, who in turn should settle with their suppliers

JOHN M. HANCOCK, executive assistant of the Office of War Mobilization's Advisory Unit for War and Postwar Adjustment, and chairman, Joint Contract Termination Board, has informed the House Special Committee on Postwar Economic Policy and Planning that he hopes in about a week to make final recommendations to Congress as to legislation to govern final settlement of terminated contracts.

In general, he said, the bill he will propose will incorporate many of the provisions of the Murray-George bill recently introduced in the Senate.

First requirement in termination should be prompt payment. The second is to clear contractors' plants so they may convert to peacetime operations with minimum delay, he said. These are fundamental objectives of the Murray-George bill. In addition, said Mr. Hancock, arrangements should be made in advance of termination to provide the contractors with machine tools and materials for peacetime production. They should be given, as soon as it is possible to do so, materials they require for experimental purposes in planning for the reconversion period.

Instead of approving immediate cash payment of 90 per cent of the contractors' claims, as provided in the Murray-George bill, Mr. Hancock favored lending them 90 per cent of the claim as approved by appraisers of the procurement agencies. He favored having contractors and subcontractors go to their local banks for these loans where the banks are willing to assume 10 per cent of the risk. That is in line with normal business procedure and is particularly desirable for the reason that these business concerns will do business with the banks regularly after the war. He also believed that when doing business with banks, the contractors will be extra careful to supply correct information.

He thought the banks could take care of 90 to 95 per cent of all the termination loans, so that the government would not have to go into the loan business on more than 5 to 10 per cent of the terminations.

Some thought has been given to a provision under which there would be a 12 per cent penalty on contractors on the amount of excess compensation they claimed, said Mr. Hancock, but this may not be desirable since any contractor is likely to claim all he can, in the honest belief it is coming to him. This provision may be retained, applying it to

contractors who "knowingly" claim more than they should.

Under the executive machinery that has been set up in the absence of adequate laws, said Mr. Hancock, the government takes the attitude that it should settle the prime contracts and depend on the prime contractors to settle with the subcontractors. "If we sought to settle directly with the hundreds of thousands of subs and sub-subs and sub-sub-subs," he said, "we would find it difficult to find enough people to do the job, and the process would be delayed to a dangerous degree. As it is, we will need good people in large numbers to handle termination. We hope to get a lot of them out of the Army and Navy after the war is over. We estimate that somewhere between 4000 and 10,000 will be required—scattered all over the country. If we try to do this thing from Washington we will never get it done."

Will Protect Subcontractors

Under existing laws, Mr. Hancock went on, the government has no right to intervene between prime and subcontractors—and the government does not want to step in between them. There will be many cases, however, where the contractor may go broke, in which event the government should have the right to step in and see that the subcontractor suffers no loss. "We take the attitude that we want to deal directly with the primes only—but we need the right to deal with the subcontractor when that is necessary to protect the latter."

Mr. Hancock made it clear that his group does not think it is necessary or desirable to make provision for financing future operations of the terminated contractor. "We are not trying to give future working capital to contractors," he said. "All we want to do is pay them what is coming to them. We are not in favor of paying the contractor what he would have received if he completed the contract. Our attitude is that we owe him for materials assembled and work done, plus a profit up to 6 per cent. On work he has not done, on material he has not purchased, we pay him nothing."

In reply to questions, Mr. Hancock was dubious as to how far the government should go in reimbursing the contractor for expenditures for facilities not covered by prior arrangement. He said this matter was subject to further consideration but, in general, he was opposed to giving contractors "blank checks."



JOHN M. HANCOCK

The co-author of the Baruch report is shown as he appeared and testified before the House Special Committee on Postwar Economic Policy and Planning on contract terminations

Asked for his recommendations as to what disposition to make of Defense Plant Corp. magnesium, aluminum, steel, rubber and high-octane gasoline plants, he said that was a matter for Congress to determine. Pressed for a more suggestive answer he said he "would get the best advice from the industry and from the users of those products and reach a decision based on the facts."

The Surplus War Property Board, said Mr. Hancock, has a very practical policy; it proposes to move surplus goods anywhere they can be moved on a sound basis. This includes such angles as selling through established trade channels, not to speculators. The board, he said, proposed to dispose of the surpluses through the agencies best qualified to handle them. Capital goods and producers' goods would be sold through the Reconstruction Finance Corp.; ships, lighters, etc., through the Maritime Commission; consumers' goods through the Treasury Department Procurement Division; food through the War Food Administration. Will L. Clayton, the board's chairman, he said, proposes to act with the advice of industry advisory committees, many of which already are well established.

The end of the war, Mr. Hancock said, should not bring automatic termination of all war contracts. "Many contracts cover development work that should be pushed to completion. We want to have government men in the various plants who can recommend whether contracts or portions of contracts should be continued."

Many Wartime Limitation Orders Susceptible to Peacetime Uses

Overdiversification of sizes, varieties, colors of manufactured products tends to increase costs, necessitates large inventories. Bureau of Standards division chief advocates periodic house-cleaning to remove "shelf warmers" from producers' lists

MANUFACTURERS will be faced with the need to keep down postwar production costs, and it should be obvious to them that this cannot be done if they slip back into the slough of prewar overdiversification as to sizes, kinds, varieties, and so on, of manufactured products, according to Edwin W. Ely, chief, Division of Simplified Practice, National Bureau of Standards, writing in the March issue of *Domestic Commerce*.

While many of the wartime limitation orders necessarily are drastic, and are not suitable for peacetime practice, all are susceptible of revision and adaptation, on a voluntary basis, to postwar uses.

"It is known to the division," he says, "that certain industries, now governed by mandatory orders that involve simplification, desire to retain the benefits of simplification after the war. Each of these industries wishes for a transition from some particular mandatory order to a postwar voluntary Simplified Practice Recommendation which will preserve those features of the order that merit peacetime adaptation—benefits which the industry could lose if no plan is ready to fill the place of the order when it is revoked."

Manufacturers in some fields, Mr. Ely admits, are skeptical about the wisdom of entering the postwar period with simplified lines. "They might say, 'In the postwar period there will probably be more applications of our articles to new uses than ever before, thus creating the need for additional sizes, types, and models, instead of a fewer number.'"

Assuming there may be some basis for this viewpoint, Mr. Ely holds "it does not follow necessarily that additional varieties must come into being, willy-nilly. Surely those manufacturers will desire products that are better rather than just different. They certainly do not want variety for its own sake! Or do they?"

There is nothing about simplification that can arrest development in the art of designing superfine articles of any description. Indeed, employed sensibly, simplification should actually stimulate development. Simplification is a green light, not a red one, he contends.

"Simplification is not a preventive," he says. "It is exclusively a curative. An industry tries out everything in the way of design and, by trial and error, prospers. In the process, the industry becomes loaded down with varieties that, in the course of time, prove to have been ephemeral instead of classic. This litter of overdiversification could be swept

aside, hurting no one and providing elbow room and a certain amount of released invested capital."

With respect to varieties of a specific article that are produced for stock, Mr. Ely declares it is not the intent of a Simplified Practice Recommendation, and never has been, to remove from the reach of users anything they might need on special occasions.

Exact Differentiation Intended

It is the intent and purpose to differentiate between: (a) The sizes, types and varieties which may be made in large

quantities, for stock purposes, because of a known demand for them; and (b) those sizes, types and varieties which cannot be produced in large quantities economically (because the demand is meager and sporadic) and which, "if manufactured in tens of thousands instead of dozens, will run the risk of becoming expensive shelf-warmers."

After sweeping away the deadwood created by overdiversification of sizes, types and varieties, he continues, the wise industry will concentrate on producing the retained items in better quality, bidding for wider consumer acceptance. It is only natural that in course of time he again will enlarge his number of sizes, types and varieties. Then must come another weeding-out operation in the interest of efficiency and business prosperity.

In any industry, he says, the "Standing committee of representative manufacturers, distributors and users in whose care the maintenance of the Simplified Practice Recommendation had been placed is the best judge as to the timing of such a revision."

Plan Thorough Research of Tax Field

Minority Leader Martin appoints 25-member committee for study of taxation and preparation of recommendations for benefit of Republican members of Congress

FAILURE of the House majority leadership to act on Bernard M. Baruch's suggestion that postwar policies of taxation be formulated now to prevent postwar fumbling, Minority Leader Joseph W. Martin (Rep., Mass.) has appointed a 25-member committee "to make a thorough research of the tax field and prepare recommendations for the benefit of the Republican members of Congress."

Rep. Daniel A. Reed (Rep., N. Y.) is chairman. Other members, all Republicans, are Representatives Allen T. Treadway (Mass.), Harold Knutson (Minn.), Roy O. Woodruff (Mich.), Thomas A. Jenkins (Ohio), Donald H. McLean (N. J.), Bertrand W. Gearhart (Calif.), Frank Carlson (Kans.), Richard M. Simpson (Pa.), Charles S. Dewey (Ill.), Hubert S. Ellis (W. Va.), John M. Robsion (Ky.), Noah M. Mason (Ill.), Robert Hale (Me.), Paul Cunningham (Ia.), Forest A. Harness (Ind.), Ross Rizley (Okla.), Carl T. Curtis (Neb.), J. Edgar Chenoweth (Colo.), Hal Holmes (Wash.), Robert W. Kean (N. J.), Max Schwabe (Mo.), Christian A. Herter (Mass.), Frank A. Barrett (Wyo.) and Joseph E. Talbot (Conn.).

Anticipating a possible government postwar budget of \$20,000,000,000 or more, Martin said that the postwar tax policy "must be grounded on the realization of maximum revenue consistent with maximum encouragement to individual and business enterprise.

"Excessive taxes operate as a brake on our economy," he said. "We learned

during the 20s that reasonable-rates produce more revenue than extreme rates.

"Our present federal tax system is hopelessly impossible as a basis for a postwar tax program. Aside from the fact that it is now wholly geared to the urgent necessities of a wartime economy, it has for years been in need of a thorough overhauling, including drastic simplification and a return to sound tax principles. Particularly since 1933 new tax measures have been piled one on top of the other without attempting to set up a well-balanced, integrated tax system. What we have is a crazy-quilt patchwork. Moreover, in recent years the taxing power has, too often, been used for punitive and other nonrevenue purposes.

"The streamlining, simplification and forward-looking revision of the entire federal revenue system is one of our most pressing national problems. Upon its satisfactory solution hinges the ability of business and industry—small and large—to provide well-paying postwar jobs to our returning servicemen as well as the millions of our citizens now engaged in war production, who must be afforded peacetime employment opportunities," Representative Martin declared.

"In the same manner, the nature of our postwar tax policy holds the key to whether the many potential new industries arising out of the war are to be permitted to develop, which can only come about through offering definite encouragement to the investment of so-called risk capital."

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

L ORDERS

PIPE: Production of extra heavy cast iron soil pipe is now permitted. Output had been prohibited since June 1, 1942, only a "Victory weight" having been permitted since that date. (L-42)

BEDSPRINGS: Permission has been granted to increase production of bedsprings and box springs by 25 per cent and to improve the quality of those items by using more steel per unit. Manufacturers may produce 50 per cent as many bedsprings and box springs per year as they produced in the year ended June 30, 1941. Maximum permitted metal content for double deck coil bedsprings is 68 pounds and for the single deck coil type it is 57 pounds compared with the previous maximum of 45 pounds for both types; for flat and fabric springs, unchanged at 43 pounds; and box springs, 23 pounds, an increase of 5 pounds.

Permitted production of metal cots, bunks, and rollaway cots is at the rate of 50 per cent of the base year output. Each cot and rollaway cot (including springs) may contain as much as 42 pounds of iron and steel and each bunk as much as 101 pounds. Crib springs may be made at 112 per cent of the base year rate with a maximum metal content per unit of 16 pounds.

Studio couches, sofa beds and other types of dual sleeping equipment may be made at 36 per cent of the base year rate. Each studio couch may contain up to 60 pounds of iron and steel, while each sofa bed, lounge and chair bed may weigh up to 35 pounds.

Increased production will not be permitted in bedding plants located in group I or II labor areas. (L-49)

CASKETS: Manufacturers now may use a total of 10 pounds of iron and steel per casket and 7 pounds per shipping case. The previous maximums were 3½ pounds for caskets and 5½ pounds for shipping cases. Of the 10-pound total for each casket, not more than 7 pounds may be used for handles. Of the 7-pound total for shipping cases, not more than 5 pounds may be used for handles. The previous maximum for handle hardware was 3½ pounds and for joining hardware, 2 pounds. Handles now may be attached to the ends of caskets. (L-64)

TRUCKS: Restrictions have been lifted on the use of steel plates for battery boxes, lead for counterweights, and synthetic rubber for anti-motor-vibration plates for industrial power trucks. Appeals for provisions of the order now must be filed at the nearest WPB field office. (L-112)

HAND TOOLS: Restrictions have been lifted on the use of alloy steel in hand-operated wood and special purpose saws, including crosscut and rip; mitre, cabinet and backsaws; compass, keyhole and nests of saws; pruning saws, butcher saws; buck, cordwood and pulpwood saws; one and two-man cross cut saws; ice saws; and special purpose saws, including plumber's, plasterer's veneer, cable, etc. (L-157)

BINDER PARTS: Use of zinc for the purpose of applying a protective coating or plating for metal parts of binders is now permitted. No metal other than iron, steel, or zinc may be used in fabricating metal parts or units for binders. Limitations on the use of iron and steel in black plates and metal rings for binders also have been eliminated.

Allotment of new iron and steel up to 75 per cent of 1941 usage is continued for 1944. (L-188)

FENCE: Restrictions on the manufacture of barbed wire and woven wire fence have

been removed. Manufacture of heavier gages and a return to standard weights of zinc coating are provided. (L-211)

LIGHTING FIXTURES: Restrictions on the use of metals in industrial type incandescent lighting fixtures have been removed and metal restrictions on residential types of fixtures have been relaxed.

Sale of industrial and utility fixtures is limited to purchase orders bearing preference ratings of AA-5 or better. However, purchase orders with lower ratings assigned prior to March 15 may be filled. For utility fixtures,

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restrictions on the diameters of the canopy and globe holder have been removed.

Restrictions on residential type fixtures have been eased to the extent that 12 ounces of metal now may be used for a ceiling type fixture and an additional 8 ounces of metal may be used for the chain or stem of a suspended type fixture. (L-212)

VICES: Restrictions on the use of alloy steel in the manufacture of vises have been removed. Permission to use carbon steel or cast or malleable iron in their manufacture is continued. (L-216)

CONSTRUCTION MACHINERY: Restrictions of the use of alloy steel in scrapers, angle-dozer or trailbuilders and bulldozers have been removed. Restrictions have been removed also on the use of metal for specified parts of truck mixer-agitators, although those on sizes and types remain unchanged. (L-217)

COOKING EQUIPMENT AND DISHWASHERS: Applications for authorization to make or accept delivery of commercial cooking, food and plate warming equipment or commercial dishwashing equipment must be made on form WPB-1319 and must be sent to the Plumbing and Heating Division, Washington. Appeals from the provisions of order L-182 or L-248 should be filed on WPB form 1477 (formerly PD-500) with local WPB field offices. These orders and all transactions affected by them have been made subject to all applicable provisions of all the regulations of the WPB. (L-182, 248)

PHOTOGRAPHIC EQUIPMENT: Controls over production and distribution of restricted photographic equipment, accessories and parts for nonmilitary orders have been relaxed slightly to permit increased production of specified items and to facilitate distribution. In making equipment, accessories and parts to fill nonmilitary orders, each manufacturer is limited, per quarter, to 12 per cent of the average amount by weight of iron, steel, aluminum, zinc, copper and copper-base alloy which he used quarterly in 1941. This limitation now is inapplicable with regard to

critical materials used to produce photographic lenses in mounts, photographic shutters (other than built-in shutters), film reels and cans, photo copy equipment, identification equipment, or microfilming equipment for non-military orders.

All production of restricted photographic equipment and accessories, including items excepted from the percentage restriction, is still subject to specific approval by WPB. Individual production quotas will continue to be assigned by WPB on form WPB-3038, to be filed each quarter by manufacturers.

Delivery of new restricted photographic equipment and accessories now can be made on orders bearing ratings of AA-5 or better, assigned to those persons who are eligible under the terms of regulations CMP 5 and CMP 5-A or the various P orders. Previously, these restricted items could be delivered only subject to WPB approval of applications filed on form WPB-1319. Equipment or accessories having a manufacturer's list price of \$10 or less may be sold with specific WPB authorization. Repair and replacement parts also may be sold without restriction, as may parts to be delivered among manufacturers of photographic equipment and accessories. (L-267)

FOOD PROCESSING MACHINERY: Production of brewery, winery, beverage and ice cream making machinery may be resumed, although actual percentages of permitted production, based on the average annual tonnage of controlled materials used by manufacturers during the period 1939, 1940, and 1941, will be small. That of brewhouse machinery and syrup mixing and handling equipment will be 10 per cent; bottling line equipment, 25 per cent. The schedule does not include refrigeration machinery and equipment.

Ice cream making machinery is permitted a 25 per cent allocation, based on the average annual number of units produced by each manufacturer during the base period. Special authorization must be obtained from WPB for purchase of these items of machinery and equipment.

Value of new food handling machinery that may be purchased by processors under CMP regulation No. 5 has been increased from \$250 to \$500, provided such machinery is for replacement purposes only.

Restrictions have been removed covering the use of copper, copper-base alloys and aluminum. An additional 13,000 pounds of aluminum per quarter and 35,000 pounds of copper and copper-base alloys have been allocated for this purpose. Restrictions on the use of other metals in short supply, such as alloy steel, tin, chromium, etc., will continue in force, with allowances only for the utilization of such metals in contact parts or corrosive points.

The amended order includes quota schedules for new dairy equipment, covering the period from Oct. 1, 1943, to Sept. 30, 1944. (L-292)

P ORDERS

PETROLEUM PRODUCERS: PAW form 35 has been eliminated from provisions of preference rating order P-98-b. No approval is required on controlled materials delivery orders costing less than \$2500 and having no single item costing more than \$500. Prior approval must be obtained on a controlled materials delivery order with a total cost of more than \$2500 or having one or more items costing over \$500. (P-98-b)

Appointments-Resignations

Arthur J. Wilson, former chief of the Production Control Branch, War Production Board's Radio and Radar Division, has been appointed director of the board's Production Scheduling Division. Mr. Wilson replaces Robert M. Hatfield, Lakewood, O., who has resigned his post to accept a commission in the Navy. Stuart S. Lowe, Cincinnati, has been appointed

deputy director of the Production Scheduling Division.

W. F. Twombly has been appointed assistant director of the Chemicals Bureau in charge of the Drugs and Cosmetics, Protective Coatings and Plastics sections, War Production Board.

Robert R. R. Brooks has been appointed executive assistant to Price Administrator Chester Bowles, Office of Price Administration.

Edward Falck has been appointed executive director of the Combined Production and Resources Board, succeeding William M. Black who resigned recently. He will continue as deputy director of the Office of War Utilities.

Magnesium Production Reduced at Five Plants

War Production Board has ordered reductions in magnesium production at five plants located in various parts of the country. The reduction will amount to about 34,000,000 pounds per year, or less than 6 per cent of the country's annual capacity of 586,000,000 pounds.

Production was ordered curtailed at this time for several reasons. In the first place, production currently is running between eight and ten million pounds per month in excess of requirements. This large surplus production is due primarily to the fact that the armed services have not consumed the quantity stated in their requirements. Surplus stocks of magnesium now total more than the amount required for two months at the rate of current consumption, WPB revealed. Furthermore, this action will result in savings of coal, gas, and labor.

The plants affected and the reductions in production in relation to rated capacity are: Electro Metallurgical Co., Spokane, Wash., 50 per cent; Permanente Metals Corp., Manteca, Calif., 50 per cent; Ford Motor Co., Dearborn, Mich., 100 per cent; Mathieson Alkali Works Inc., Lake Charles, La., 100 per cent; and Amco Magnesium Corp., Wingdale, N. Y., 35 per cent.

Only one of these plants, the Permanente Metals Corp., has been operating at capacity. Therefore, the curtailments will be very much less drastic than appears from the rated-capacity figures. In the case of Electro Met, for example, the order will merely freeze production at 50 per cent of rated capacity or slightly more than present rate.

Magnesium is being released by WPB for all possible military requirements and for essential civilian needs. Greater utilization of magnesium products by the military has been encouraged by WPB for some time. It is felt that restrictions for all civilian purposes cannot be removed at this time because magnesium fabricating facilities such as foundries, are not adequate for other than essential demands.

Foundry Equipment and Melting Furnace Manufacture Expands

Results in increased production of vital war goods, including castings for trucks and engines for landing craft. Output of foundry molding machines being increased to reduce five to eight-month backlog of unfilled orders

EXPANSION of foundry equipment and electric metal melting furnace manufacture, accomplished in recent months, has made possible increased production of castings for trucks, engine parts for landing craft and other war goods to meet additional military programs, the Tools Division, WPB, said last week.

Speeding up of delivery of component parts and materials for foundry equipment and melting furnaces has assisted in this expansion.

Production of foundry molding machines, on which there is a backlog of unfilled orders equivalent to five to eight months production, also is being increased, the Tools Division said. Additional subcontracting is contributing to this increase. Supplies of steel blast grit for finishing surfaces of war material have been stepped up recently.

Shipments of electric metal melting furnaces for 1943 were valued at \$11,494,000 and orders at \$9,975,000, according to foundry statistics for 1943 which were just released by WPB. Shipments valued at \$1,370,000 in May and \$1,470,000 in September were peaks for 1943 while the low point was in November at only \$387,000. At the end of the year, unfilled orders were valued at \$7,037,000.

Statistics on foundry equipment show that the trend of orders rose from about \$2,000,000 in September to about \$3,500,000 in October, November and December, largely as a result of the accelerated truck program.

Shipments of foundry equipment in 1943 were about 70 per cent higher than

orders, totaling \$52,656,000 and \$32,094,000, respectively. The overall backlog of unfilled orders has been reduced from nearly four months production at the end of January, 1943, to about two months production at the end of the year.

These data are based on the reports of about 90 companies and represent approximately 95 per cent of the industry. Repairs and replacements were about 7 per cent of shipments in the case of electric metal melting furnaces and slightly over 24.5 per cent in the case of foundry equipment on the basis of reports for 1943. Repairs are not reflected in unfilled orders.

Galvanized Product Makers Allotted More Iron and Steel

Each manufacturer of galvanized pails, buckets, wash tubs, wash boilers, funnels, fire shovels, and storage cans for petroleum products has been granted a supplementary quota of iron and steel for use in the second quarter of 1944.

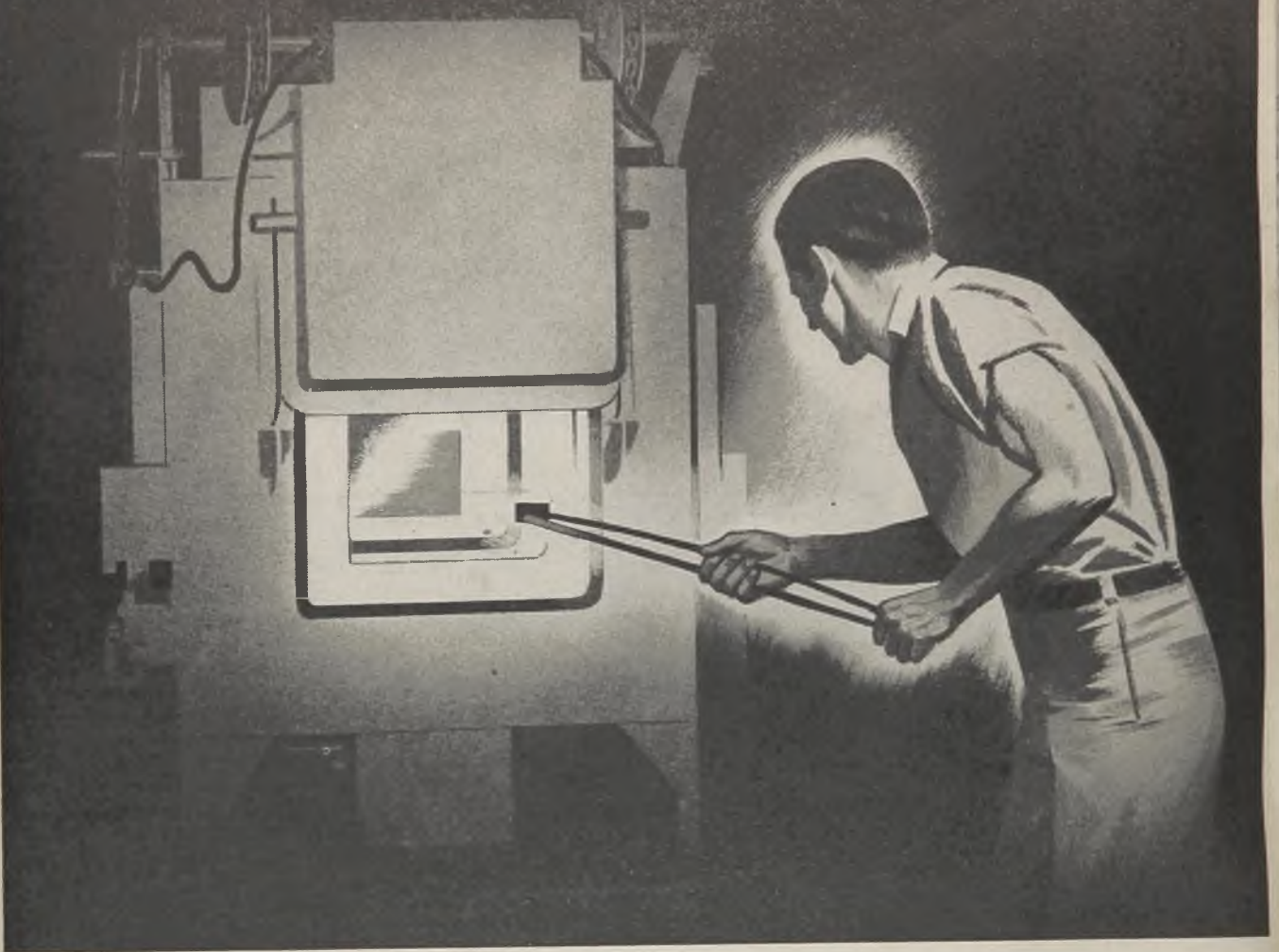
This will permit manufacturers to continue to use iron and steel at the same rate as in the first quarter of this year, when they were given supplementary quotas which brought their permitted rate of usage from 50 to 92½ per cent of the quarterly average for the year ended June 30, 1941.

Whether production will reach permitted rate will be contingent upon ability of manufacturers to obtain material from rolling mills, to the extent of their allotments, and upon the labor situation.

MONTHLY SHIPMENTS, NEW AND UNFILLED ORDERS

	ELEC. METAL MELTING FURNACES			FDRY. EQUIP. & SUPPLIES		
		(000 dollars)			(000 dollars)	
	Shipments	Orders Received	Unfilled Orders	Shipments	Orders Received	Unfilled Orders
1943						
Jan.	1,092	532	7,093	4,949	2,788	18,759
Feb.	1,050	504	6,518	4,953	2,551	16,535
March	899	1,680	7,421	5,863	2,913	14,899
April	748	415	7,091	5,365	2,676	12,904
May	1,370	606	6,384	4,718	1,774	10,513
June	1,021	199	5,830	4,825	2,319	9,017
July	831	1,656	6,744	4,017	2,405	8,345
Aug.	1,122	831	6,594	3,513	1,989	7,429
Sept.	1,470	1,485	6,741	3,881	2,070	6,930
Oct.	822	379	6,363	3,792	3,401	7,092
Nov.	387	1,041	6,975	3,563	3,422	7,076
Dec.	682	67	7,037	3,217	3,786	7,731
Total	11,494	9,975		52,656	32,094	

Proper Identification of High Speed Steels Saves Time



Plants using both tungsten and molybdenum types of high speed steels should give serious consideration to the establishment of an efficient identification system—one that will keep the steels separated from bar stock to finished tool.

The danger of spoilage is particularly acute when mixed lots get into the heat treaters' hands.

The recommended hardening temperatures for tungsten types are 100° to 200°F. higher than those for the molybdenum types. Treating the latter so far above recommended temperatures

will spoil them for cutting tool service. Treating the tungsten types that far below recommended hardening temperatures will not develop the required red hardness.

Heat treaters sometimes use the "sweating" of tungsten types as an indication that the steel is up to proper hardening temperature. ***THIS DOES NOT HOLD WITH MOLYBDENUM TYPES.*** In their case, a pyrometer should always be used to determine when the steel is at the recommended hardening temperature.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.



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

Climax Molybdenum Company

500 Fifth Avenue • New York City

Wage rates will be predominant factor in price of postwar automobile, accounting for more than 40 per cent of retail selling figure. Weekly earnings in motor car and parts plants now are 53 per cent above prewar levels

DETROIT

WHEN asked his opinion as to how much higher retail prices of automobiles would be when production is resumed, the president of one of the leading companies here replied substantially as follows, "If you will tell me how much higher the price of steel is going to be after the war, I will tell you how much higher car prices will be."

Actually, the price of steel has little to do with the price tags on automobiles, and this can be demonstrated easily. A 3400-pound car requires a gross weight of 3400 pounds of steel and 700 pounds of iron in its construction, net weights in the finished car being 2400 and 550 pounds respectively. At present prices, virtually on the same level as in prewar days, the cost of such iron and steel would approximate \$93, or only 7.75 per cent of the retail cost of a \$1200 model. Thus, even a 10 per cent boost in the price of iron and steel would mean only a fraction of 1 per cent increase in retail price.

Iron and steel comprise less than one-half of the total cost of raw materials used in the typical motor car, which amounts to about \$190. The balance of the \$1200 price includes \$240 for the dealer; \$270 for manufacturer's overhead, administrative and selling costs, profit, plant facilities, etc.; and \$500 for labor. The latter figure is not only direct labor but the man-hour costs of all suppliers and subcontractors furnishing fabricated parts and assemblies. Direct labor cost of the motor plant is probably only about one-fourth of the total labor bill.

It is easy to see that labor costs are the determining factor on probable car prices in the future. Compare the average weekly earnings figure in the motor and allied industries of \$39.69 in 1941 with the figure of \$60.80 in 1943 and you see a neat 53 per cent increase in labor's take. Apply this percentage to the labor cost involved in building an automobile and an increase of \$265 is indicated. Figure in the effect of added taxes and scattered increases in materials, and it appears that a 25 per cent increase in selling price is the least that can be expected. Some predictions range all the way up to a 40 per cent increase, but this figure seems overly pessimistic.

A further factor having a bearing on prices, difficult to estimate but still a vitally important consideration, is the decline in labor efficiency. Even though labor is being paid 53 per cent higher wages than in 1941, productivity is lower, so the net increase in labor cost is far beyond 53 per cent. This produc-

tivity drop is largely explained by a deliberate slowing down on the part of union labor, dating back to the troubled days of 1937. Management appears powerless to combat it, and until supervisory forces can outdistance union leaders in cultivating and maintaining the support of working forces, productivity will continue to slip.

Envision Wage Incentive Systems

When manufacturers have to return to building a product at a specified cost, which in war production is about the last consideration, the vicious effect of dwindling productivity will be felt more seriously than it is now. The principal corrective which management now envisions is the broadscale application of wage incentive systems, but the unions are fighting them tooth and nail.

There is another basic approach to the problem which General Motors, for one, is exploring, and that is the application of "humanics" in labor relations. Ralph L. Lee, the principal exponent of this relatively new philosophy, explains it this way:

"In the past our most frequent production bottlenecks were caused by mechanical failures. That made mechanical talent, experience, knowledge, skill and ingenuity the supervisor's greatest assets—so great, in fact, that supervisors frequently have been chosen solely on the basis of their mechanical ability.

"Today, however, most production bottlenecks are caused by the human element, and not by mechanical elements. Consequently, conditions beyond our control as individuals have forced us to concentrate upon group relationships with employees. Frequently this has been at the expense of person-to-person relationships.

"Under our very noses we have seen people, some of whom we have known for years, gather into groups and separate from us in a body. Hence, we have been so busy with group negotiations, contracts and all the procedures and red tape involved in them that we have lost sight of one all-important elementary fact: No two individuals in these groups are alike; no two have the same needs, wants and ambitions; each has his own personal peculiarities, likes and dislikes, feelings, virtues and shortcomings.

"The supervisor's greatest opportunity for progress and advancement today lies in his improving his ability to meet on some common ground with each individual in the group for which he is re-



PRODUCTION FRONT: This workman taps 15 bolt holes simultaneously in the transfer case for 6 x 6 military trucks in the Toledo, O., transmission plant of the Chevrolet Motor Division, General Motors Corp.

sponsible. In learning to know the individual inside and out, he must keep close enough to him to know the changes which affect him, and then deal with him, man-to-man on the job.

"While we all realize the influence social, economic, political and governmental changes have had on the relationship of industrial employes with their employers, regardless of what supervisors personally think of these changes they cannot do much about them as individuals.

It is true labor unions are coming of age and are gradually more inclined to accept responsibility for the actions of their members, but there is a long difficult road to travel before good labor relations are an accepted fact in the automotive industry. Even under the whip of war, there is a continuous foment in many plants with groups ready to walk out at the drop of a hat. In recent weeks the problem has been critical in Ford plants, particularly in the aircraft engine division. Walkouts, arguments, bickering, even destruction of property have been daily occurrences, resulting finally in the dismissal of a score or more of troublemakers, with the approval of the UAW-CIO. But even in the ranks of the union there is bitterness and dissent.

Two of the motor companies, Cadillac and Nash-Kelvinator, are reporting some interesting results on aircraft engine parts finished by a vapor blast liquid honing method which makes use of a high-pressure stream of water and natural rock abrasive to clean and polish machined surfaces. The mixture of finely ground abrasive and water is discharged by compressed air against the metal surface at the rate of 3200 feet per second tip velocity from the nozzle. The blast has considerable tendency to remove metal, particularly if the flow from the nozzle is directed at an angle to the part. The process also is adaptable to cleaning castings of sand, cores, etc.,

and also might be suitable for smoothing up die castings preparatory to plating, eliminating the buffing operation.

Troublesome questions involved in the reconversion of automobile plants to car production will come in for a thorough airing at the April 17 conference in Washington, when top executives of the motor companies and their operating officials will meet with the WPB and high officers of the Army and Navy. Purely exploratory in nature, the conference will examine such matters as: How long will it take the industry to tool up for automobiles? What help does the industry think it will need in policy and regulations in getting government-owned machinery and tools out of its plants? How long in advance of production must the plants move in their own machinery? What does the industry consider a fair allocation of materials, tools and plants? What manpower problems are involved?

Pays Tribute to PT Boats

High tribute to the Packard marine engines powering PT boats was paid by Lieut. Commander John D. Bulkeley whose PT boat evacuation of General MacArthur and President Quezon from the Philippines was an early epic of the war. Commander Bulkeley was a recent visitor to the Packard plant here and regaled newsmen with some of his choicer adventures. Principal complaint made by the officer was that there were not enough spare engines and spare parts available in the New Guinea campaign, but this has doubtless been remedied by now. Result was that the Packard engine was given punishing treatment and kept in service three or four times its normal service life of 300 hours before a rebuild.

Three of the 1500-horsepower 12-cylinder engines are used in each PT boat, giving top speed of around 40 knots and burning up gas at the rate of some 470 gallons per hour. While it might be thought this terrific power would be

more than enough for the PT boat squadrons, the Navy feels the need is for more power and higher speed. The Japs have nothing approaching the PT boats, but do operate a few small boats powered with Thornycroft engines, far inferior in power and speed.

The Packard engine has an unusual welding job on the stainless steel water jackets fastened over the forged steel cylinders. The jacket is only 0.031-inch material and has to be welded to the cylinder around the top and bottom as well as being welded vertically at the seam. The welds must be water tight and considerable difficulty was experienced with the material buckling under welding heat. At first a battery of expensive electric seam welders was installed for the job, but they had to be discarded in favor of gas welding by hand, with the jacket and cylinder pre-heated and located in special jigs.

One of the engines has been sectioned and specially painted up for a display piece, similar to the sectioned engines which used to be displayed at automobile shows. According to George Christopher, Packard president, it cost a neat \$20,000 just to cut the engine apart and do the special painting, plating and lighting.

New system of vacuum power braking known as Hydrovac, already installed on more than 500,000 military vehicles since Pearl Harbor, has been announced by Bendix Aviation Corp. To be available for early postwar applications, the system combines all the elements of vacuum power braking into a single self-contained moving assembly, eliminating all external moving parts, levers and linkages. Hydraulic lines connect the system with the brake pedal and wheels.

Better than 300,000 military trucks have been built by the Dodge Division of Chrysler Corp. Four basic types are now in production—ambulance, command-reconnaissance car, weapons carrier, and troop and cargo carrier.

They Say:

"A postwar era of unprecedented prosperity lasting 25 years is before us. . . Normal inventories have become non-existent during the war and the postwar period will involve tens of billions of dollars of production and distribution. . . Credit facilities such as our people have never known in the past will be developed."—George W. Bacon, chairman, Ford, Bacon & Davis, New York.

"To achieve better transportation, the railroads will have to adopt a program to rehabilitate and modernize their plant, taking advantage of the modern improvements developed during the war and those that will be developed in the future. In other words, our engineering thinking will have to be just as modern as the service we shall have to provide after the war."—James M. Symes, vice president, Pennsylvania railroad.

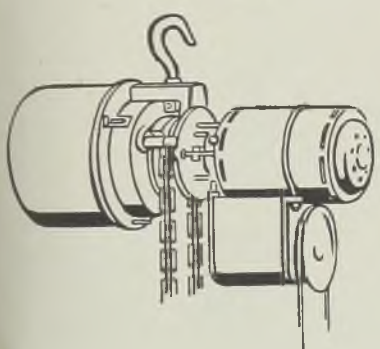
"The reconversion and postwar problem is the job, not

of government legislation, which, however, may assist, but of the officers and executives of each company. That goes for surplus and contract terminations too. The time to start was the day before yesterday, but certainly not later than tomorrow. Go full speed on war production, engineering, purchasing and finance—set to throw the switch without a blowout."—George A. Renard, executive secretary, National Association of Purchasing Agents.

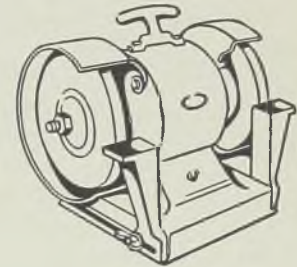
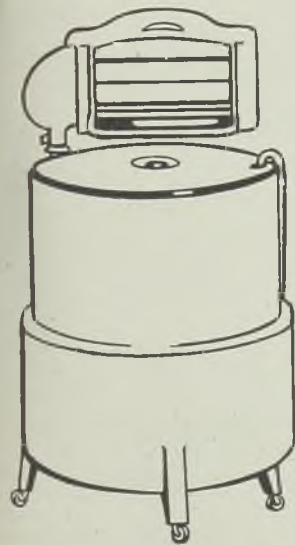
"Television will be a postwar billion dollar industry that should be helped to get under way directly after the cessation of hostilities. Television not only can help bring about increased employment but a higher level of prosperity throughout the nation as well. Within ten years of commercialization, television should be available to approximately 112,000,000 people and it is a potential source of 4,600,000 jobs."—Thomas F. Joyce, Radio Corp. of America, New York.



**WAR
PRODUCTION BOARD
PERMITS
REPAIR PARTS TO REPLACE SIMILAR
PARTS IN ZINC**



This ruling appears in the W.P.B. Conservation Order M-11-b as amended January 1, 1944. If you used zinc alloy die castings in your pre-war products, and replacement parts are now needed to keep these products in service, we would suggest that you consult your die caster since zinc is now permitted for such parts. The New Jersey Zinc Company, 160 Front Street, New York 7, New York.

ZINC
FOR DIE CASTING ALLOYS



The Research was done, the Alloys were developed, and most Die Castings are specified with
HORSE HEAD SPECIAL ($99.99 + \%$ Uniform Quality) **ZINC**

Truman committee commends aircraft industry. . . Report outlines various changes in plane production and difficulties encountered by manufacturers. . . Plan cancellation of Kaiser-Hughes cargo plane contract

GENERAL commendation of the entire aircraft manufacturing industry is contained in the third annual report of the Truman Senate investigating committee, along with information on changes being effected in the aircraft program which hitherto have not been made public.

In respect to heavy bombers, the committee notes progress has not been as great as originally planned because of the necessity of overcoming a number of serious difficulties in order to produce a superlative plane and the engines necessary for its operation. In this category is the Boeing B-29 Superfortress and "several other types of heavy multi-engine bombers on which work is progressing."

Two models in the dive bomber classification—the A-25 or Army version of the Curtiss Helldiver and the A-35 Vultee Vengeance, originally produced for the British—are being eliminated by the AAF and will go out of production this year.

Future production, as planned at present, of Army single-engine fighter planes, will emphasize the Republic P-47 Thunderbolt, the North American P-51 Mustang and a greatly improved version of the Bell Airacobra, which is now beginning to come into substantial production. Likewise, further improvements are being developed for both the Thunderbolt and Mustang.

Manufacture of four-engine flying boats as patrol bombers for the Navy will be discontinued and the few remaining on schedules will be modified as cargo planes. In the future the Navy's four engine patrol bomber will be a land-based plane, the PB4Y, Navy version of the Consolidated B-24 Liberator.

Four types of two-engine flying boats are being supplied the Navy, all in relatively small numbers, according to the Truman report. They are the Martin PBM Mariner, the Consolidated Vultee PB5Y-5 Catalina, the Naval Aircraft Factory PBN (a modified Catalina), and the Boeing PB2B, which is built at Vancouver. In addition, the Navy has contracted with Vickers at Montreal, for a quantity of such planes for the AAF to be used in reconnaissance work. The present program points toward only the PBM and the PB5Y-5 being produced after this year. Present schedules also call for replacement of the Navy's Lockheed PV-1 Ventura bomber with a greatly improved model in the next few months. Various models of this craft have been in production since 1941 when the first version was built for the British.

Principal production of dive bombers for the Navy has been the Douglas SBD Dauntless, an old model on which pro-

duction was speeded principally because of delays in the Curtiss SB2C Helldiver program, now largely corrected. The SBD is being replaced by an improved Douglas plane, the BTD, a radically refined model for carrier operation.

The Navy as yet has no two-engine fighter planes, like the Army's P-38 Lockheed, but shortly will have one in the Grumman F7F which is scheduled for early production. Meanwhile, production will be continued on the Grumman F4F Wildcat, the Chance-Vought F4U Corsair, and the Grumman F6F Hellcat.

Engineering Board Studies Project

The committee report goes to some length to explain developments in connection with the proposed Kaiser-Hughes supersonic cargo plane, contract for three of which was placed in September, 1942, and calling for expenditure of \$18,000,000. The first was to be finished and ready for delivery in December, 1943, the second in May, 1944, and the third in October, 1944. By October of last year, it had become apparent that the plane, as it was being built, would greatly exceed its design weight and consequently would be much less efficient as a cargo carrier. The WPB, therefore, directed the whole project be restudied and designated an engineering board for the work. Two months ago the board made its report, reaching three principal conclusions:

1. The plane would be considerably

less efficient than other already proved cargo planes.

2. The wooden construction was excessively heavy and very unreliable.

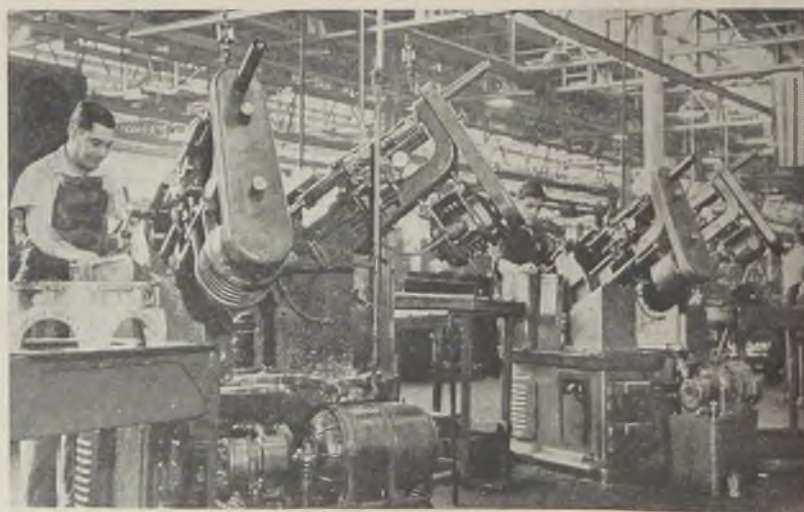
3. The design was fundamentally sound in its main aerodynamic and hydrodynamic fundamentals if it could be successfully built in metal and might be of value to the war effort if it could be so built.

In view of these conclusions, the WPB instructed the DPC to cancel the existing contract with Kaiser-Hughes, with the further request that the company be invited to submit a proposal for development of a design in metal.

Meanwhile, the Navy decided that a modified version of the Martin Mars flying boat was the most efficient airplane to carry large loads and bulky equipment over long distances and that it could be made available in numbers at least a year earlier than any other design. Hence, it issued a letter of intent to Martin, contemplating the purchase of 20 of the flying boats on a fixed-price basis, deliveries to begin early in 1945.

Production is scheduled for the Army on several outside cargo planes, including the well-known Lockheed C-69 Constellation and two new planes of a size comparable to the Mars, which are to be built by Douglas and Boeing respectively. Doubtless, the latter might be a cargo version of the B-29 Superfortress. These programs may be some distance away, for it is known that work on the Lockheed Constellation has been suspended in favor of concentrating on the P-38 Lightning fighter.

In the medium transport field, the Navy has contracted for a substantial number of the Budd RB-1 plane, of which several hundred are to be allocated to the AAF. This plane, to be produced at Philadelphia, was originally de-



POINTING SKYWARD: These two-way, dual-spindle drilling machines are aiming at production goals. They were especially designed to drill oil holes connecting valve tappet guides in a Chevrolet plant machining crankcase sections for Pratt & Whitney aircraft engines for bombers and cargo planes

NOW

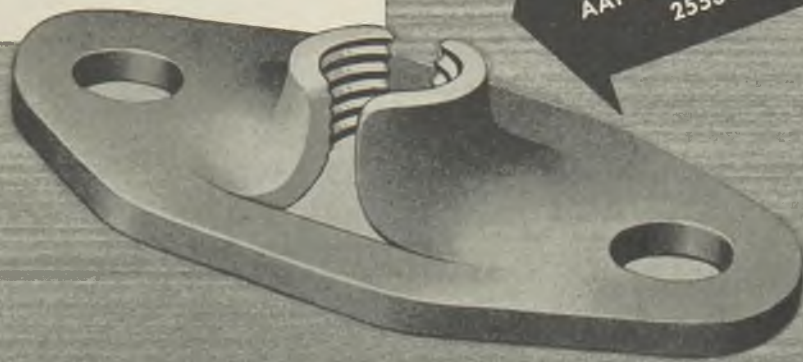
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HIGH TEMPERATURE APPLICATIONS

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Speed Nuts

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A6103H-1032
CONFORMS TO
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25531

in all Structures

• The new "Hi-Stress" SPEED NUT conforms to AAF specification No. 25531 and has been granted engineering approval by the Army Air Forces. It is interchangeable with nut plate AN362, for high temperature applications in all structures.

This new SPEED NUT is a lighter weight, one-piece integral unit. Because of its unusually low installation torque, it allows more rapid insertion of bolts or screws. Even after many removals under service conditions, this new SPEED NUT still retains its self-locking torque. Identify by SPEED NUT No. A6103H-1032.

TINNERMAN PRODUCTS, INC.

2039 FULTON ROAD

CLEVELAND 13, OHIO

In Canada: Wallace Barnes Co., Ltd., Hamilton, Ontario

In England: Simmonds Aerocessories, Ltd., London

* TRADE MARK REG.
U. S. Patent Office

SPEED NUTS - THE FASTEST THING IN FASTENING



signed as a combination passenger and cargo plane for operation under conditions prevailing in the Latin Americas. Comparable in size to the two-engine Douglas C-47 Skytrain, the Budd design is of stainless steel construction, all shot welded, and is scheduled to be in production in the very near future.

There have been numerous difficult production situations in some of the aircraft companies, such as those experienced by Curtiss-Wright in perfecting quantity production of heavy engines and the C-46 Commando cargo plane, the latter now believed to be the most efficient cargo plane of two-engine type available. But recognition must be given to the fact Curtiss-Wright in the past four years has expanded its plant area with all necessary tools and facilities by 13 times, its employes by 22 times, and its production even more. Problem of training labor was immense, and labor turnover in 1943 alone was more than 12 times the prewar employment of the entire corporation.

Guy Vaughan, president of the corporation, cites some of the steps taken to surmount production problems. Experienced executives were brought in to aid in plant management. They include:

G. M. Williams, senior vice president, formerly assistant to the chairman of the board of Consolidated Vultee; R. J. Lindquist, vice president and controller, formerly director and vice president of Reynolds Metal; Frank H. Harrison, vice president, formerly manager of manufacturing for International Harvester; E. J. Harrington, vice president, formerly coordinator of planning, production and material for Lockheed, and John M. Demarest, manager of Paterson plants, formerly associated with International Business Machines.

Engine Division Reorganized

A major reorganization was worked out in the engine division of Curtiss-Wright, now being broken down into three complete and nearly autonomous units at Paterson, N. J., Wood-Ridge, N. J., and Cincinnati. How well these plants are now functioning is seen from January figures which show output of over 7,000,000 horsepower or roughly 20 per cent of the industry-wide total of 36,098,000 horsepower. The Wright figure, incidentally, compares with 270,000 horsepower for a typical month in 1939.

Recent announcement from Curtiss-Wright at Buffalo indicates production

schedules for the Curtiss C-46 Commando plane have been boosted 250 per cent over 1943, and also production of the P-40 Warhawk fighter plane, which the AAF at one time announced as being discontinued, has been resumed. This marks the first appearance of the P-40N model—weighing 9000 pounds, wing span 37 feet 4 inches, length 33 feet 4 inches, height 10 feet 7 inches, top speed around 350 m.p.h., ceiling 30,000 feet, range 1000 miles, armament three .50-caliber machine guns in each wing panel plus a variety of possible bomb loads. Engine is an improved Allison design.

Curtiss operations in Buffalo are the most extensive of any aircraft plant in the district. The company operates two large plants of its own, now being expanded in many departments, and also leases nearly 1,000,000 square feet in outside facilities. Rather complete conveyerization of assembly lines for both the C-46 and the P-40 has been effected. The P-40 line, for example, is a single straight drag chain, carrying assemblies forward at a speed of 30 feet an hour. The C-46 line has three main sections in S-shape, with a large turntable arrangement to turn the plane as it moves from one section to the next.

Concentrated efforts to control absenteeism at C-W plants have resulted in the absentee rate falling from a range of 8-13 per cent a year ago to 4½-5½ per cent currently. If a worker is absent twice without a satisfactory excuse, a red card is placed in his time clock space. Three times absent without excuse is grounds for dismissal.

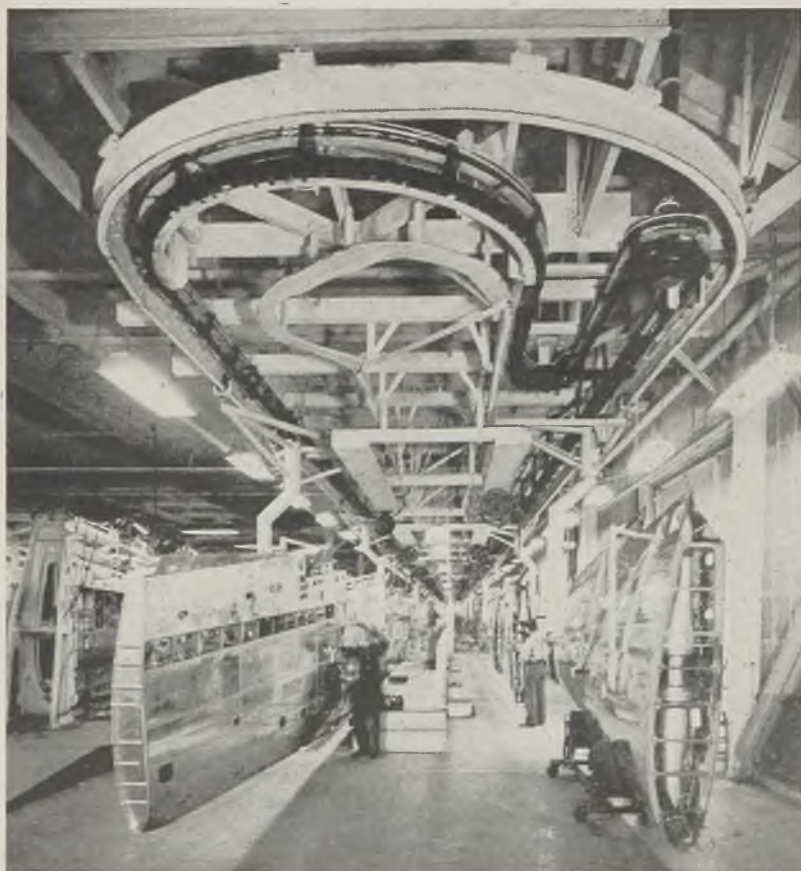
U. S. Plane Production Attains 350 Per Day Rate

United States aircraft industry is producing at the rate of 350 planes per day, according to Charles E. Wilson, chairman of the Aircraft Production Board of WPB. Total output during the past three years was 153,061 planes of which 105,126 were combat planes. Of this total more than 122,000 planes have been retained by this country and about 28,000 have been sent to our allies. Britain had produced 90,000 planes through 1943.

Willow Run Provides Spare Parts for B-24 Bombers

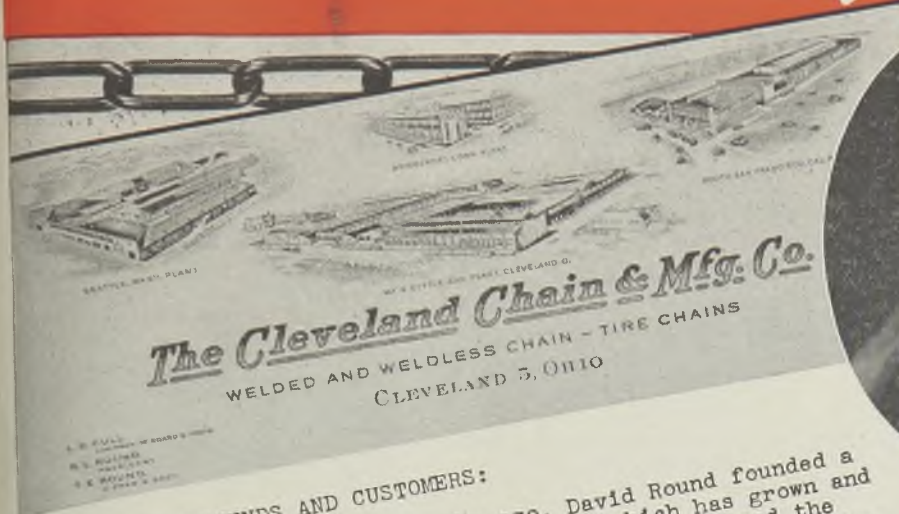
The Willow Run bomber plant of Ford Motor Co. now is supplying 80 per cent of all emergency shipments of spare parts, and more than 50 per cent of all spare parts used on B-24 Liberator bombers. Ninety per cent of the parts used on all models are interchangeable.

As many as 800 emergency orders have been handled at Willow Run in a single day. Parts, ranging from small assembly units to huge tail sections, flaps, ailerons and fuselage sections, can be flown to any point on the globe in a matter of hours.



SPEED UP ASSEMBLY: Close inspection reveals the three separate overhead rails on which the triangular shaped trolleys travel as they move wing sections for B-25 Mitchell bombers around this conveyor line toward the final assembly floor at North American Aviation Inc., Inglewood, Calif. Note the unusual looping of the two inside tracks at the turn

CLEVELAND CHAIN passes another milestone of service...



TO OUR FRIENDS AND CUSTOMERS:

Seventy-five years ago, David Round founded a Chain and Hoist-making organization, which has grown and prospered. The seventy-five years have witnessed the coming of the industrial age in this country and the development of The Cleveland Chain & Mfg. Co. as one of the foremost Chain-making organizations of the world.

This 75th Anniversary would be an occasion for celebration in ordinary times. But these are not ordinary times. Right now, the first obligation of The Cleveland Chain & Mfg. Co., as of everyone else, is to our fighting men, and our factories are producing chain items that will aid the war program. No one would want us to do otherwise.

With our product being used on all the battle fronts, we like to believe that The Cleveland Chain organization has contributed greatly in the march to Victory. While producing chain for Defense, we are not unmindful of the patience and tolerant understanding of the good friends we serve in normal times. We are working toward the day when we may again have the pleasure of supplying them CLEVELAND CHAIN promptly and in any quantity.

Cordially yours,

THE CLEVELAND CHAIN & MFG. CO.

David Gemmell
Vice Pres. Charge of Sales

David J. Gemmell:d1j



● After the war American industry must produce and distribute more merchandise than ever before. Postwar planning in this direction by The Cleveland Chain & Mfg. Company calls for product refinements, new packaging and merchandising developments.

The Cleveland Chain & Mfg. Co. Cleveland, Ohio

Associated: THE BRIDGEPORT CHAIN & MFG. CO., BRIDGEPORT, CONN.
SEATTLE CHAIN & MFG. CO., SEATTLE, WASH.

ROUND CALIFORNIA CHAIN CORP., LTD., 50, SAN FRANCISCO, CALIF.
ROUND CALIFORNIA CHAIN CORP., LTD., LOS ANGELES, CALIF.

Materials Reclamation Avoids Acute Shortages

Program at Thompson Aircraft Products Co. pays off in dividends amounting to thousands of dollars annually. . . Recover such products as valves, tools, silcocks, polishing belts, radiac wheels, etc.

By JOSEPH M. KURTZ
Assistant Editor, STEEL

SALVAGE programs, necessitated by wartime shortages of materials, have proved so profitable in many war plants that they will be continued when peace comes again.

Before the war, these reclamation programs were more or less haphazard in many plants. The acute materials shortages which accompanied the demand for more and more production made mandatory the organization of this work on a scientific basis with the result that a large quantity of "waste" materials were rechanneled into the war effort and unsuspected savings in dollars were realized.

Besides paying off in dividends amounting to thousands of dollars annually, the salvage department at Thompson Aircraft Products Co., Euclid, O., recovered enough "waste" materials last year to eliminate critical shortages which threatened to hamper production of high priority aircraft parts.

Supplies Reclaiming Department at the Thompson company carries the largest burden of the salvage jobs. It handles recovery of such waste products as liquid gate valves, silcocks, tools, polishing belts, radiac wheels, as well as many others. On eight materials alone the company was saved about \$112,000 last year.

The largest saving effected by the Supplies Reclaiming Department was on asbestos tubes used to protect nitrided valve stems before the lead bath or tip hardening on the valves. The old process was winding asbestos tape $\frac{3}{4}$ of an inch wide spirally over the length of the valve stem. The valve was then immersed in molten lead for five minutes. The asbestos prevented the nitrided stem from becoming pitted by the lead bath. Cost of the material for each valve was 4 cents and labor for winding about 2 cents. But now by putting an asbestos tube over the stem the cost for each valve is about $\frac{1}{2}$ cent. Thus, the cost was reduced by over 90 per cent, at a saving to the company of \$90,000 in one year. Previously the tape had to be unwound from the valve stem by hand after the lead bath, adding

to the production cost of each valve. Now the tube is pulled off with a twist of the wrist.

Before the war, engineers believed it was impossible to reclaim alundum cement. But salvage engineers at Thompson's disproved this theory by developing a process for recovering much of the alundum cement with savings which averaged about \$40 a day or approximately \$13,500 in 1943. By crushing the alundum molds and then placing them through a 100 mesh screen, virtually all of the old product is reclaimed merely by adding 40 per cent of new cement. This development eliminated one of the plant's most critical shortages last year. The alundum molds are used to hold the valves on the automatic stellite machines for applying stellite. These molds are either fractured or burned after being used on about 10 to 12 valves.

Shortages Plague Purchasing Department

The purchasing department was being plagued by the unavailability of shotblast grit. It couldn't be bought at any price. The company's engineers were put to work on the salvage possibilities of shotblast grit. They came up with the answer and for the last three months the workers have been using nothing but reclaimed grit. Previously it was sold as a waste metal. But by placing the waste grit through a six-surface vibrating screen, the salvage department recovered 44 tons of the material in a 44-day period at a net saving of \$3476.

Grinding wheels, which once were discarded, are found fit for re-use on special jobs by changing the hole sizes with a special machine. Others which are not suitable are sold for \$18 per ton. Last year about 93 tons were sold, netting the company about \$1674. In one three month period, 48 tons were accumulated by the company's "scavengers."

Radiac cutoff wheels when they become under-sized are scrapped and re-sold at approximately 35 cents each. Their original cost was 90 cents. The



This workman is crushing salvaged alundum molds. Prior to the shortage of alundum, these molds were scrapped but now practically all of them are salvaged by adding 40 per cent of new cement

These women are recoating polishing belts at a cost of between 3 and 4 cents each. Approximately half of the 52,000 belts used by Thompson Aircraft Products Co. are salvaged and recoated with a mixture of glue and aluminum oxide

salvage department turned \$2475 over to the accounting department from sales of these scrap wheels in 1943.

Engineers have set up equipment in the plant to re-size and pre-form grinding wheels which have worn down. Sintered carbide is reclaimed by removing the tips and crushing them under a hammer. The carbide is placed through a 325 mesh screen and then paraffin and trichloroethylene are added. It is molded into any desired shape by pressing at about 10,000 pounds pressure per square inch. Then it is pre-centered in a globar furnace at 1600 degrees Fahr. and then hardened at 2600 degrees Fahr. Salvage of sintered carbide does not save the company money but more important than that at the moment is that it assures the production departments of a supply. This reclamation process will be dropped after the war or whenever the supply situation eases on this particular material.

Salvage Half of Polishing Belts

Approximately 52,000 polishing belts were formerly bought by the company each month. About 12 valves were polished with each belt before scrapping. Today approximately half of the 52,000 belts are salvaged by recoating with a mixture of glue and aluminum oxide. The life of each belt is doubled and sometimes quadrupled. Cost of recoating is between 3 and 4 cents each. During a four month period last year, about 24,000 belts were recoated each month at a saving to the company of \$2400.

David MacLuckie, economy engineer, pointed out that they use approximately 5000 special blueprint reamers per month. Out of that total about 30 per cent are reworked into the next detail for about 20 per cent of the original cost. Another 40 per cent can be reworked for about 60 per cent of the original cost and the remaining 30 per cent which generally has been chipped, bent, badly centered or fractured, is beyond recovery. Approximately 14,000 new reamers and 6000 obsolete reamers were salvaged during the

past year. Some of the reamers were worked as many as three times into different details.

From pans beneath machine tools, about 40,000 gallons of oil are recovered and sold at a good market price each month. This waste oil, prior to the war, cost the company money to have it hauled away. But now it is cleaned of all waste material and resold as fuel oil. Salvaging of miscellaneous chips of light steel which were mixed in oil saved the company another \$700 last year.

One of the largest users of abrasives in the Cleveland area, Thompson's engineers now are salvaging a great amount of the abrasives at a tremendous saving to the company. Each month about 10 tons of grit are recovered and sold to abrasive manufacturers at anywhere between \$60 and \$100 per ton. The waste cloth is also sold and brings an additional return of about \$30 for each ton.

A separate tool salvage division inspects all broken, worn out and obsolete tools for reclaiming and re-use. Milling cutters, drills, boring bars, taps, welding pads, gages, tool bits and many other vital materials are salvaged.

Salvage within the plant is not limited to merely metals and tools. Scrapped tabulating cards are worth \$40 a ton and netted the company \$1480 last year. During the same period the company was paid \$12 a ton for 96 tons of corrugated cardboard which was discarded. Salvage activities extend even as far as the plant's incinerator where 40 cases of bottles are recovered daily.

The war has imposed many demands upon industry. Necessity is the mother of hundreds of salvaging departments. But today they have established their usefulness and value in management's eyes and will continue to operate in the post-war period. A saving of thousands of dollars by a salvage department may mean the difference between success and failure in tomorrow's highly competitive world when the dove of peace returns to roost.



MEN of INDUSTRY



JOSEPH DUFFY



E. W. POTRATZ



HAROLD P. ACKERMAN

Joseph Duffy has been appointed sales manager, Irving Subway Grating Co., Long Island City, N. Y. Before joining the company two years ago, Mr. Duffy was New York district sales manager for Meneely Bell Co., Troy, N. Y.

E. W. Potratz, since 1942 acting sales manager, Hoist and Trav-Lift Sales division, Harnischfeger Corp., Milwaukee, has been appointed manager.

H. C. Josephson, previously vice president, Smith & Davis Mfg. Co., St. Louis, has been elected president, succeeding William E. Hoblitzelle, who died recently. G. W. Froemke was elected vice president of the company, and R. W. Waterman was made treasurer. Newly-elected directors are Henry T. Ferris and J. S. Trittle.

Clyde Williams, director of the Battelle Memorial Institute, Columbus, O., has been engaged by the Association of American Railroads as technical consultant, with headquarters at 59 East Van Buren street, Chicago. Mr. Williams will make a study of the railroads' technical problems.

John Heronymus has been elected president of American Hydraulics Inc., Fond du Lac, Wis., and William H. Pauly has been elected board chairman. Other officers elected were: Felix T. Pauly, executive vice president; Chester H. Schmidt, vice president; Lon L. Grier, secretary, and William H. Schmidt, treasurer and general manager. Newly-elected directors include all of the new officers, and E. H. Clemens, Roland H. Hanke, and Albert J. Kempfert.

Samuel L. Case, formerly technical advisor, Jones & Laughlin Steel Corp., Pittsburgh, is now associated with Battelle Memorial Institute, Columbus, O., as research metallurgist. Nicolas Baklanoff, engineer and linguist, also has joined the staff of Battelle Institute, to serve as a translator of technical literature and patents and to conduct literature research in foreign languages. Until recently Mr. Baklanoff had been head of

the translation unit for the Air Service Command, Patterson field, Dayton, O. Mr. Case, who received his technical education at the Polytechnic School of Kiev, Russia, is a member of the American Society for Metals, the American Institute of Mining and Metallurgical Engineers, and the British Institute of Metals.

Harold P. Ackerman, who has been with the valve department of American Car & Foundry Co., New York, since 1933, has been appointed assistant manager of the valve department. Mr. Ackerman will have charge of sales promotion in the eastern states and will be concerned with development of new types of valves.

C. E. Pappas, chief of the Aerodynamics division, Engineering department, Republic Aviation Corp., Farmingdale, N. Y., will be awarded the Wright Brothers Medal by the Society of Automotive Engineers at the society's national aeronautic meeting scheduled for the early part of April.

Reed R. Smith, who for many years was associated with Pittsburgh Steel Co., has become manager of sales for Master Wire Die Corp., New York.

Richard J. Ruff has been appointed sales manager, Young Bros. Co., Detroit, succeeding Robert B. Reed, who has resigned. Mr. Reed has been associated with the company since 1914, and was responsible for organization of the company's oven department and development of the engineering department.

Alva W. Phelps, formerly assistant vice president of General Motors Corp., Detroit, has been elected president and a director of Oliver Farm Equipment Co., Chicago, succeeding Cal Sivright, who has been elected chairman of the board and chief executive officer. Under Vice President E. F. Johnson of General Motors, Mr. Phelps had been in charge of engineering and manufacturing divisions of that company, including the Frigidaire, Delco Products and Eastern Air-

craft divisions. He also served as assistant general manager of the Electro-Motive division, and as general manager of the Saginaw Steering Gear division at Saginaw, Mich., where he built and operated the General Motors machine gun plant.

Fred E. Laig has been appointed to the staff of Edward G. Budd Jr., executive vice president, Edward G. Budd Mfg. Co., Philadelphia, and will be concerned with production of the company's cargo plane. Douglas Craig has been named to a similar position pertaining to cargo plane costs. John Fetcher has been made head of the methods and equipment department, succeeding Mr. Laig, and Robert Phair succeeds Mr. Fetcher as chief electrical and welding engineer.

Charles A. Frankenhoff, chairman and director, Dicalite Co., Los Angeles, has resigned. Mr. Frankenhoff organized the company and was its president and general manager for 14 years.

John F. Robb, who in 1935 joined Climax Molybdenum Co., New York, as a member of the technical staff of the Pittsburgh office, has been appointed Pittsburgh district manager.

Robert J. Berry has been elected president of Electric Products Co., Cleveland.

Robert L. McIlvaine, manager of engineering sales, National Engineering Co., Chicago, has been named a vice president and general sales manager. Before joining National Engineering Co. in 1941, Mr. McIlvaine was chief engineer and sales manager of Swayne-Robinson Co., Richmond, Ind.

Charles S. Powell has been elected vice president and director of Graybar Electric Co. Inc., New York. Mr. Powell, who has been associated with the company 30 years, continues to head all sales activities in communications and merchandising. George T. Bryant has



NEIL C. HURLEY JR.

Who has been elected president, Independent Pneumatic Tool Co., Chicago, as reported in STEEL, March 20, p. 65.

been appointed hearing aid sales manager. Prior to two years service in Washington with OPA, Lend-Lease, and the Foreign Economic Administration, Mr. Bryant had been merchandise manager for Graybar Electric Co.'s Houston, Tex., house.

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Dar Johnson has been appointed sales promotion and advertising manager, Willamette Hyster Co., Portland, Oreg., and Peoria, Ill. Previously, Mr. Johnson had been public relations and industrial promotion manager for the Peoria Journal-Transcript.

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Allan Barringer Hendricks Jr., assistant engineer on high-voltage testing apparatus, Power Transformer Engineering division, General Electric Co., Schenectady, N. Y., has retired after 43 years of service with the company. Mr. Hendricks designed the first million-volt testing transformer equipment used in General Electric's Pittsfield works.

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R. P. Exten, formerly production engineer with Mechanics Universal Joint and Rockford Drilling Machine divisions, Borg-Warner Corp., Rockford, Ill., has joined Young Radiator Co., Racine, Wis., as executive assistant to the president. Mr. Exten will devote his time particularly to production matters.

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John K. Colgate, for the past three years vice president and treasurer of Tyson Bearing Corp., Massillon, O., has been elected president, to succeed Ralph Maxson, who resigned recently. Mr. Colgate is a director of Colgate-Palmolive-Peet Co., and treasurer and secretary of Van Strum & Towne Inc., New York investment counsel firm.

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Henry E. Hermann, formerly plant engineer, John Deere Plow Works, Moline, Ill., has been appointed works manager, Bear Mfg. Co., Rock Island, Ill., and will be in charge of all production. L. B. Arp, who has served as production manager in addition to



J. H. WOOD

handling purchasing and personnel, will now devote his entire time to his duties as director of purchases and personnel.

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J. H. Wood has joined the sales staff of the Hydraulic Press division of A. B. Farquhar Co., York, Pa. Mr. Wood, who has had a great deal of experience in manufacture of hydraulic press equipment, will handle sales in the central coastline states and will make his headquarters at Room 1033D, Broad Street Suburban Station building, Philadelphia.

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Frederick P. Culbert, recently resigned American vice-consul at Casablanca and for many years French representative for United Aircraft Corp., has been appointed general manager, Al-Fin Corp., a wholly-owned subsidiary of Fairchild Engine & Airplane Corp., New York.

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Oscar Seidel, previously general superintendent of the Hull division at the Ambridge, Pa., shipyards of American Bridge Co., United States Steel Corp. subsidiary, has been appointed manager of the Structural Fabricating division at the company's plant in Ambridge, Pa.

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William F. Barrett has resigned as a director and a vice president of Union Carbide & Carbon Corp., New York. He will continue with the corporation as a general consultant.

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Elmer C. Cook, formerly sales manager, American Gas Furnace Co., Elizabeth, N. J., has become associated with the J. E. vonMaur Co., Columbus, O., to assist in the selling of furnaces and industrial equipment in the Cleveland area. Mr. Cook will maintain offices at 715 Prospect avenue, Cleveland.

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The Chemical Fire Extinguisher Association has elected the following officers for 1944: president, Arthur G. Sullivan, general sales manager, Buffalo Fire Appliance Corp., Buffalo; vice president, J. O. Binford, general sales manager, American-La France-Foamite Corp., Elmira, N. Y.; treasurer, Herman W. Diener, secretary, George W. Diener Mfg. Co., Chicago, and commissioner,



JOHN P. BERNARD

W. J. Parker, W. J. Parker Inc., New York. Newly-elected directors, in addition to the above, are George H. Boucher, general sales manager, Pyrene Mfg. Co., Newark, N. J., and E. A. Warren, vice president, General Detroit Corp., Detroit.

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John P. Bernard has been appointed vice president and general manager of the Sheffield Corp., Dayton, O. Prior to joining Sheffield Corp. in 1942, Mr. Bernard was associated with Dyer Co. Inc., Cleveland, for 17 years, being executive vice president in charge of operations at the time of his resignation.

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Donald E. Jenkins, formerly manager, sales promotion department, Lighting division, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has been appointed supervisor of industrial relations at the Cleveland Lighting division.

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Bruno R. Neumann, until recently senior economist with the Planning Division, WPB, has joined the National Foremen's Institute Inc., Deep River, Conn., as labor economist and editorial director. Mr. Neumann will make his headquarters at the institute's editorial office in New York city.

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L. P. Jackson, vice president in charge of engineering, Mid-West Abrasive Co., Detroit, has been elected a director of the company, and Carlton M. Higbie, Detroit investment banker, also was named a member of the board.

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Vincent Manka, formerly a member of the advertising staff of Colgate-Palmolive-Peet Co., has been appointed assistant to the president, Claud S. Gordon Co., Chicago, industrial engineers.

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Abraham M. Heinowitz, Eastern Metal Co., Newark, N. J., has been elected to his second term as president of Salvagers and Re-Distributors Inc., New York. Mauray I. Cohen, Harry Harris Inc., Kearney, N. J., has been elected vice president of the association; Joseph B. Brown, Erie Steel Co., Philadelphia, is secretary, and William Fabrikant, Dulien



W. LYLE RICHESON

Who has been appointed assistant vice president, American Car & Foundry Co., New York, reported in STEEL, March 20, p. 64.



CHARLES SWARZLER

Who has been named manager of the export department, Foxboro Co., Foxboro, Mass., as announced in *STEEL*, March 20, p. 65.



GEORGE I. DAVIS

Who has joined Carnegie-Illinois Steel Corp., Pittsburgh, as general staff manager, sales, noted in *STEEL*, March 20, p. 65.



GERALD A. LUX

Who has joined the technical staff of Oakite Products Inc., New York, as announced in *STEEL*, March 20, p. 64.

Steel Products Co., New York, is treasurer. Elected to the board of directors were: Louis Goodwin, Eastern Steel & Metal Co., New Haven, Conn.; Harry Jacobson, Mark and Harry Jacobson, Detroit, and Adolph Simons, Simons Steel Products Co., New York.

Russell E. Ebersole has been appointed lamp sales manager, Lamp division, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Walter J. Maytham Jr., has been named industrial manager for the company's north-western district with headquarters in Chicago. He suc-

ceeds R. L. Irvin, who has been named to a post at the Westinghouse Lima, O. plant. William W. Sproul Jr. has been named manager of the application department, Sharon works, Sharon, Pa., and Grant Fitch has been appointed head of the Milwaukee sales office.

OBITUARIES . . .

Gustave A. Hassel, 78, member of the board and a former president of Pittsburgh Steel Foundry Corp., Glassport, Pa., died March 13 in McKeesport, Pa., following a short illness. In 1899 Mr. Hassel helped build the plant of the Pittsburgh Steel Foundry Co., as it was known then. He became assistant superintendent, later general superintendent, and in 1925 when the company was reorganized he was elected president. Mr. Hassel served in that capacity until 1939, when he was elected board chairman. In 1942 he retired, continuing as a member of the board.

Harry C. Bow, 74, who had been associated with the steel industry for more than 35 years, and who retired in 1940 as manager of sheet sales, Reeves Steel & Mfg. Co., Dover, O., died March 20 in Delaware, O. Mr. Bow also had been affiliated with Berger Mfg. Co., Canton, O., as general manager of sales, and he had held a similar position with Milwaukee Rolling Mill Co. From 1927 until 1938 he was sales manager for Superior Sheet Steel Co., Louisville, O.

Joseph B. Eastman, 61, director of the Office of Defense Transportation since December, 1941, died March 15 in Washington after a month's illness. For the past 25 years Mr. Eastman served as a member of the Interstate Commerce Commission.

C. O. Weissenburger, 62, president, Marietta Mfg. Co., Point Pleasant, W. Va., died there recently. He had been

president of Marietta Mfg. Co. since 1930 and was formerly associated with United States Steel Corp. and with Youngstown Sheet & Tube Co.

John J. Sammon, 75, who was superintendent of the Hanna Furnace Corp., Lackawanna, N. Y. until his retirement five years ago, and who was nationally recognized as an authority on blast furnaces, died March 14 in Buffalo.

Franklin Alfred Errington, 77, founder of the Errington Mechanical Laboratory, Staten Island, N. Y. died there March 18. Mr. Errington had built his own laboratory for the manufacture of screw-cutting devices in 1907.

Heber B. Hires, 51, president of the Hires-Clark Corp., Freeport, N. Y., died there March 17. Mr. Hires was a founder of the New York Institute of Mechanics Inc.

Edward Mahan Sr., proprietor of the Mahan Boiler Works, Syracuse, N. Y., died recently in that city.

J. J. Tomalis, 45, director of research for American Screw Co., Providence, R. I., and associated with that company for ten years, died March 13 in a Boston hospital. Prior to his work with American Screw Co., Mr. Tomalis was in charge of header operations for Ford Motor Co., Detroit.

Matthew O. Troy, 71, engineer and official of General Electric Co., Schenectady, N. Y., for 47 years, died March

13 aboard a train. Mr. Troy was made manager of General Electric Co.'s central station department in 1928 and later became commercial vice president. He held more than 30 patents covering many of the products he handled. Mr. Troy had been a member of the Institute of Electrical Engineers.

Lawrence James Patton, 49, head of the electric annealing departments of the Cuyahoga Works, American Steel & Wire Co., Cleveland, died March 16 in that city. Mr. Patton had been associated with the company for more than 30 years.

Loren B. Gaskill, 50, an electrical engineer with the Western Electric Co., Kearney, N. J., for 26 years, died recently in Westfield, N. J.

Charles F. Hutchins, 55, special representative for the vice president and sales manager of New England Coke Co., Boston, died March 10 in Newton, Mass. Mr. Hutchins had been associated with the company nearly 25 years.

Calvin Lester Day, 57, engineer with Robins Conveyors Inc., Passaic, N. J., died March 13 in Montclair, N. J.

Joseph E. Somers, 69, for the past 28 years treasurer, Somers Brass Co., Waterbury, Conn., died March 10 in that city.

John P. Carlson, 57, president, Arrow Plating Co., Chicago, died March 11 in St. Petersburg, Fla. Mr. Carlson had headed the company for the past 35 years.

Lake Superior Ore Shipments in 1943 Made by 178 Mines

SHIPMENTS of Lake Superior iron ore in 1943 came from 178 mines, two more than in the preceding year. Hull-Rust mine led with 9,715,811 gross tons, with Sellers mine second, 8,118,010 tons, Rouchleau third, 3,806,468 tons and Mountain Iron, fourth, 2,897,201 tons.

All these mines are in the Mesabi range, which also contained the Hill Annex, Mahoning and Adams Spruce,

all loading more than two million tons each and seven others with shipments exceeding one million.

Considerable Lake Superior ore was beneficiated during 1943, total of 15,453,783 tons of Minnesota ore being processed, which was 22.09 per cent of Minnesota shipments and 17.88 per cent of Lake Superior loadings. Of this total 12,872,892 tons were washed, the re-

mainder being jigged, sintered, dried or rendered hi-density.

Total shipment of United States mines in the Lake Superior district in 1942, as reported by the Lake Superior Iron Ore Association, Cleveland, was 85,962,168 gross tons. Helen mine on the Michipicoten range in Canada shipped 450,973 tons, making a total for the area 86,413,141 gross tons.

MESABI RANGE

Mine	1943	1942	Mine	1943	1942	Mine	1943	1942	Mine	1943	1942
Adams Spruce Group	2,750,129	4,114,771	Draper	75,471	181,010	Lamberton	124,302	508	Patrick-Ann.		43,300
Agnew	239,567	246,005	Draper Annex	355,664		La Rue	24,046	55,384	Penobscot	1,001,096	960,960
Alan		50,090	Dunwoody	404,352	413,875	Leonard-Burt	1,127,079	865,932	Prindle	261,041	364,456
Albany	455,290	530,722	Fayal No. 2	62,655	123,022	Leonard-Glen	309,935	759,103	Quinn	9,599	19,734
Alice	230,528	200,885	Fraser	709,922	1,566,441	Leonidas	52,552	221,279	Rouchleau	3,806,468	1,049,958
Alpena	6,009	1,845,951	Galbraith	252,841	597,484	Lone Jack	3,956	61,098	Rouchleau (Stockpile)		2,920
Alpena (stockpile)	728,658		Genoa-Sparta		29,669	Mace No. 2	7,902		St. Paul-Day	277,170	312,240
Arcturus	514,852	819,662	Gilbert (Schley Trsp.)		21,843	Mahoning	2,517,601	4,046,153	Sargent	147,788	134,733
Argonne	451,617	613,930	Godfrey (Burt)	602,333	568,226	Mahoning-Rust		21,336	Sauntry		418,777
Aromac	252,940	199,012	Godfrey (Glen)	71,693	66,778	Majorca	143,797	469,258	Schley	484,136	884,630
Atkins	520,160		Grant	270,173	622,757	Margaret	49,106		Scranton	1,283,629	1,643,158
Barbara	220,204	252,871	Greenway	214,470	196,262	Mesabi Chief	47,808	261,370	Sellers	8,118,010	10,331,860
Bennett	857,867	1,213,556	Greenway Wash		75,339	Minnewas	53,617	18	Shada		205,876
Biwabik	330,865	552,363	Gross-Marble	702,469	280,896	Minroca		16,750	Sharon		379,382
Bradford		19,300	Harrison	272,720	648,010	Missabe Mountain	993,899		Shenango		125,205
Bray		92,855	Harrison and Patrick concentrat.*	161,457	340,660	Mississippi No. 1	871,050	247,489	Silver		12,981
Buckeye	167,470		Hartley	929,051	433,186	Moose	573	16,203	Smith		4,241
Burns	20,820		Hartley-Burt	20,499	22,280	Morris	1,325,529	1,496,671	South Long-year (Weg-sum Trsp.)		59,630
Burt-Pool-Day	586,432	1,019,008	Hawkins	573,982	562,530	Morrison	16,135	878,154	Stein		11,777
Canisteo	543,259	800,576	Helen	19,028		Mountain Iron	2,897,201		Stevenson		375,586
Canton	68,949		Hill Annex (Exp)	2,769,716	3,477,560	Niles (Doug-las Trsp.)		8,096	Susquehanna		887,559
Carol	410,724	53,345	Hill Annex (Trsp.)	2,219	2,219	Norpac (Hull-Rust Trsp.)	126,527	136,024	Union		2,940
Cavour	8,267		Hill Trumbull Hoadey	1,035,765	1,338,415	North Harrison	9,383	91,804	Wabigon		556,987
Columbia	10,659		Holman-Cliffs	1,058,826	1,028,143	North Harrison Annex	11,234		Virginia		283,694
Columbia (Miss. Mt. Trsp.)	101,782		Hull-Nelson	1,123	1,152,652	North Harrison G.N.	2,141	2,037	Wacootah		251,708
Commodore	26,558	70,873	Hull-Rust	9,715,811	9,089,295	North Uno			Walker		782,652
Coons	850	768	Iron Chief	171,308	42,914	North Uno N.P.	37,207	84,265	Warren		279,581
Corsica	425,967	793,031	Judd		167,108	Pacific		56,419	Webb		782,155
Cyprus		15,504	Julia Annex	133,282					Wegsum		274,652
D'Autremont	1,082,353	383,754	Kerr		127				York		111,252
Dale	3,459	921	Kevin	724,668	1,310,079				Total	64,906,280	70,280,087
Danube	616,271	844,600									
Douglas	405,404	186,505									

MENOMINEE RANGE

Mine	1943	1942	Mine	1943	1942	Mine	1943	1942	Mine	1943	1942
Baltic	34,738	5,959	Davidson			Hiawatha			Rogers		38,951
Bates	148,813	185,888	Group	334,069	335,933	Hiawatha No. 2	191,390	283,093	Sherwood	271,345	
Bengal	367,790	521,961	Forbes (Stockpile)	3,415		Homer	231,497	324,787	Tobin-Columbia	374,140	348,067
Berkshire	39,179	3,947	Fogarty		12,722	James	505,227	450,148	Virgil	115,024	193,470
Beta			Globe-Cornell	39,820	50,192	Mastodon		21,607	Wauseca	262,287	142,155
Book	288,447		Hiawatha No. 1	316,332	355,014	Mattilda		2,825	Zimmerman	105,050	155,459
Bradley	39,765	40,554				Penn Mines	463,896	875,562			
Buck	630,033	501,499				Ravenna-Prickett	118,422	66,528	Total	4,902,556	4,930,434
Commonwealth (Stockpile)	21,877										

MARQUETTE RANGE

Mine	1943	1942	Mine	1943	1942	Mine	1943	1942	Mine	1943	1942
Archibald		29,009	Cliffs Shaft	604,622	747,564	Maas	723,669	901,698	Princeton	165,733	123,193
Athens	521,846	672,225	Greenwood	134,116	121,809	Mary Charlotte	353,666	357,439	Richmond	213,151	234,153
Blueberry	307,803	326,049	Lake Superior			Mather	1,797		Tilden	152,477	241,537
Camhria-Jackson	234,890	327,733	Champion		58,305	Morris	442,199	396,772	Volunteer	209,109	179,371
			Holmes	66,295	151,288	Negaunee	897,534	1,091,729	Total	5,601,418	6,540,731
			Lloyd	572,511	580,857						

GOGEBIC RANGE

Mine	1943	1942	Mine	1943	1942	Mine	1943	1942	Mine	1943	1942
Anvil	195,026	281,636	Geneva	694,255	310,723	Palms	216,256	147,391	Wakefield	201,385	201,127
Cary	359,653	433,511	Keewenaw	91,664	186,881	Penokee Group	438,036	611,241	West Davis	94,152	389,867
Eureka-Asteroid	449,684	720,473	Montreal	1,032,543	1,112,443	Plymouth	605,090	689,250	Total	5,486,918	6,237,894
			Newport	493,492	576,679	Sunday Lake	615,682	576,672			

CUYUNA RANGE

Mine	1943	1942	Mine	1943	1942
Aldstead Group	211,486	141,513	Maroco	74,113	104,155
Armour No. 1	320,760	251,903	Merritt Group	114,891	138,127
Evergreen	238,165	254,301	Pennington		159,717
Huntington	6,832	86,123	Portsmouth	292,263	250,103
Hopkins		40,628	Sagamore	444,443	508,823
Louise	186,162	261,367	South Hillcrest	417,939	176
Louise (Stockpile)	18,862		Wearne	59,400	194,053
Mahnomen	680,239	644,543	Total	3,065,555	3,035,532

VERMILION RANGE

Mine	1943	1942	Mine	1943	1942
North Chandler		58,229	Fillmore County, Minn.		
Pioneer	486,607	574,239	Weebing	220,427	59,171
Sibley	242,353	223,446	Michipicoten Range		
Soudan	217,439	257,948	Helen	450,973	486,666
South Chandler		47,638	Total	86,413,141	93,495,392
Zenith	832,585	763,377			
Total	1,779,014	1,924,877			

*Tonnage not allocated to individual mines.

Graphite Bronze Co. Celebrates 25th Birthday

Cleveland concern has produced \$50,000,000 in aircraft bearings since Pearl Harbor

CLEVELAND Graphite Bronze Co., Cleveland, on March 22 observed the twenty-fifth anniversary of its founding. The four men who founded the company—Ben F. Hopkins, J. J. McIntyre, James L. Myers and Carl W. Johnson—are still its executive managers.

The company with "20 employes and no working capital" in 1919 ventured to enter the automobile parts business with a line of graphited bronze bushings. During its first 13 years the company was principally a manufacturer of these bushings used by the motor car industry and in a lesser degree by other industries. During the bottom of the depression it introduced its "thin-wall" type of main and connecting rod bearings for auto engines which quickly supplanted the old-fashioned heavy bearings and now are almost universally used. While the automotive industry has been its largest peacetime customer, its bearings also are used by railroads, public utilities, in diesel and marine engines, domestic appliances, farm equipment, electrical products and other machinery.

With the beginning of the armament program, Cleveland Graphite was given the assignment of pioneering the large-scale production of lined bearings for aircraft engines. Developing its own processes, the company since Pearl Harbor has turned out more than \$50,000,000 of these parts, which are made to tolerances of but a few millionths of an inch and to x-ray standards of metallurgy.

Frick-Reid Supply Corp. Changes Corporate Name

Formation of the Jones & Laughlin Supply Co., Tulsa, Okla., to succeed the Frick-Reid Supply Corp., wholly owned Jones & Laughlin Steel Corp., subsidiary was announced recently. The change in name was made to more clearly identify the supply company's activities and its relationship to the corporation.

The new company is exclusive distributor of Jones & Laughlin oil country tubular products east of the Rocky mountains. J. Shakely, who has been with Frick-Reid for more than 30 years and president since 1938, has been elected president of the new company. Other officers are: Robert McCoy Jr., executive president; H. H. Wilson, vice president, and P. R. Warner, treasurer.

ORGANIZE OHIO STAINLESS STEEL CO.



PAUL KELLER



E. B. FARRIS

The Ohio Stainless Steel Co. has been organized by Paul Keller and E. B. Farris with offices in the Union Commerce Building, Cleveland, to specialize in all types of stainless steel products, including bars, plates, special shapes, strip, sheets, wire and tubing. The company also will handle stainless-clad sheets and plate, as well as stainless and heat-resistant castings.

A number of companies producing stainless steel will be represented by the Ohio company in the Central West including the Jessop Steel Co., Washington, Pa., the Joslyn Mfg. & Supply Co., Chicago, Babcock & Wilcox Tube Co., Beaver Falls, Pa., and other companies.

Mr. Keller formerly was associated with the Copperweld Steel Co., Warren, O., as sales manager of tool, stainless and special steels. Before joining the Copperweld company, he represented the Bethlehem Steel Co. at Cleveland in a sales capacity for a number of years. Mr. Farris was assistant district sales manager at Cleveland for Copperweld and previously had been associated with Edgar T. Ward's Sons Co.

AWARDS

Additional war plants honored with Army-Navy-Maritime emblems for outstanding achievement in the production of war materials

- Handy & Harman Co., Bridgeport, Conn.
- Mercer Tube & Mfg. Co., Sharon, Pa., adds second gold star to Maritime pennant.
- John Nooter Boiler Works Co., St. Louis.
- Jones & Laughlin Steel Corp., Pittsburgh, receives white star.
- Wellman Engineering Co., Cleveland, awarded third star.
- P. R. Mallory & Co. Inc., Indianapolis, receives fourth star.
- Air Control Products Corp., Coopersville, Mich.
- American Radiator & Standard Sanitary Corp., Richmond, Calif.
- Clarke Aero-Hydraulics Inc., Pasadena, Calif.
- Allen B. Dumont Laboratories Inc., Pas-saic, N. J.
- Eastern Etching & Mfg. Co., Chicopee, Mass.
- Fayette Mfg. Co., Fayette, O.
- Firestone Tire & Rubber Co., Gastonia, N. C.
- George A. Fuller Co., Russellville, Ala.
- Rockwood Alabama Stone Co., Rockwood, Ala.
- General Chemical Co., River Rouge, Mich.
- General Motors Corp., Brown-Lipe-Chapin division, Syracuse, N. Y.
- Gibson Inc., Kalamazoo, Mich.
- Hammond Instrument Co., Chicago.

- Heyden Chemical Corp., plants at Fords, N. J., and Garfield, N. J.
- Kay-Fries Chemicals Inc., West Haver-straw, N. Y.
- Madison-Kipp Corp., Madison, Wis.
- Muehlhausen Spring Co., Logansport, Ind.
- Nineteen Hundred Corp., St. Joseph, Mich.
- Southern Mfg. Co., Nashville, Tenn.
- Tung-Sol Lamp Works Inc., Newark, N. J.
- Edward Valve & Mfg. Co. Inc., East Chi-cago, Ind., awarded second gold star.
- Lempco Products Co., Cleveland, adds white star.
- Shenango-Penn Mold Co., Dover, O., granted renewal.
- Philco Corp., Storage Battery division, Trenton, N. J., received fourth star.
- Admiral Corp., Chicago.
- Brewer-Titchener Corp., Forging division, Cortland, N. Y.
- Bristol Brass Corp., Bristol, Conn.
- Bryant Electric Co., Bridgeport, Conn.
- Cleveland Welding Co., Cleveland.
- Detroit Gasket & Mfg. Co., Marine City, Mich.
- Douglas & Lomason Co., Detroit.
- Hercules Powder Co., Ishpeming, Mich.
- International Silver Co., Meriden, Conn.
- A. Johnson Machine Works, Brooklyn, N. Y.

Steel Shipping Container Group Is Organized

New institute plans to cooperate with government in handling of steel and production of steel containers

STEEL Shipping Container Institute Inc., New York, comprising representatives of 45 companies in the field, was organized recently with plans to cooperate with the government and particularly the War Production Board in the handling of steel and the production of steel containers of all types.

Livingston B. Keplinger, vice president, Rheem Mfg. Co., was elected president. Vice presidents elected were: H. V. Lees, president, Draper Mfg. Co., Cleveland; John Hauerwaas, president, U. S. Steel Products Co., New York, and E. C. Gardner, vice president, National Enameling & Stamping Co., Granite City, Ill.

The new organization plans to make its statistical data and other information on industry available to the government and other agencies in the hope that it will prove valuable in the preparedness for peacetime production. Purpose of the new institute is to foster the advancement of industry and to carry on research for its members.

BRIEFS . . .

Pennsylvania Transformer Co., Pittsburgh, announces appointment of J. J. Costello Co. as sales representative in the New England territory with offices in Boston and New Haven, Conn., and appointment of J. F. Joyce as district sales representative with offices in Cleveland.

Electric Service Mfg. Co., Philadelphia, is the new name of the Electric Service Supplies Co.

Eagle Lock Co., Terryville, Conn., has been purchased for \$2,000,000 by S. F. Bowser & Co., Ft. Wayne, Ind. Purchase is subject to approval of stockholders.

Ford, Bacon & Davis Inc., New York, celebrated its fiftieth anniversary on March 12.

Edison General Electric Appliance Co., Chicago, is mailing to 14,500 retailers monthly a news release on its retailing study, "Planned Electrical Merchandising."

Cadillac Motor Car division, General Motors Corp., Detroit, reports that fac-

tory officials and 50 district managers and parts and service representatives recently discussed immediate and post-war sales and service plans at Detroit.

Pangborn Corp., Hagerstown, Md., was presented recently with the National Security Award Certificate and Flag.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., is preparing to put into effect a new retirement annuity plan for employees.

Stauss & Haas Inc., New Orleans, La., is the new name of the Oliver H. Van Horn Co. Inc.

Minneapolis - Honeywell Regulator Co., Minneapolis, is preparing to introduce, after the war, improved systems for the control of domestic heating.

Winfield H. Smith Inc., Springville, N. Y., has published a 24-page booklet revealing the importance of speed reducers in the war effort.

Duff-Norton Mfg. Co., Pittsburgh, have removed its eastern district offices from the Empire State building to 250 Park avenue, New York.

Pemco Corp., Baltimore, has completed the entire renovation of its research facilities.

Allen B. Du Mont Laboratories Inc., Passaic, N. J., will demonstrate its cyclograph at the convention of the American Foundrymen's Association at Buffalo, April 25-28.

Detroit Steel, Reliance Steel Plan Merger

Directors' agreement subject to approval of stockholders of both companies. . . Plan special meeting to vote on issue

DIRECTORS of the Detroit Steel Corp., Detroit, and the Reliance Steel Corp., Cleveland, announce the execution of a merger agreement between the two companies. The merger is subject to approval of two-thirds vote of the stockholders of the companies who will be called to special meetings in the near future.

Under the merger plan, there will be issued debentures and common stock to the stockholders of each of the companies. Detroit Steel stockholders will receive \$10 in principal amount of debentures and one new share of common stock in exchange for each share of common stock which they now hold. Reliance Steel stockholders will receive \$3.333 in principal amount of debentures and 85/100ths of a share of new common stock for each share of Reliance stock.

In the event that the merger is approved, there will be outstanding approximately 419,000 shares of common stock and about \$2,860,000 in debentures.



BIG SCOOP: One of the largest shovels in the world, built at Marion, O., is shown in operation at the Hanna Coal Co.'s strip mine at Georgetown, O. It weighs 16,000 tons. The dipper has 35 cubic yards capacity, and will carry 20 per cent more. Tractor treads are 6 feet high, and the whole structure is more than three stories in height. NEA photo

THE BUSINESS TREND

Record War Expenditures Sustaining Production

RECORD war expenditures during February are sustaining industrial activity well above the pace recorded this time a year ago and only slightly below peak output registered during the closing months of last year. The new high in monthly expenditures was reached during February despite continued shifts in war production emphasis which helped cause an additional recession in factory employment. Delivery schedules are again beginning to lengthen in many industrial lines, as the volume of new orders continues to increase, particularly in the steel industry.

During this period of intensive preparation for military invasion and until the victory is assured there is expected to develop a steady increase of pressure on the civilian economy. Output of some key war industries may also have to be curtailed, to permit the drafting of younger men now holding deferments based on their essentiality to the war effort.

SMALL PLANTS—There are more than 500,000 American concerns that have ceased to function since 1941, bringing a significant decline to the proportion of the nation's economy in the hands of small business, the United States Department of Commerce states. This total represents about one-sixth of the number of enterprises in the country.

FREIGHT TRAFFIC—Volume of freight hauled, measured in ton-miles of revenue freight, is estimated to have approximated 60 billion tons during February, or 10.5 per cent greater than any corresponding month on record. The Office of Defense Transportation has asked the War Production Board to allocate 2.2 million tons of rails to the railroads during 1944, in contrast with 1,538,984 tons received by the carriers last year, to make possible the handling of the expected further increase in traffic. To maintain rolling stock in best shape possible under present war conditions and reflecting the somewhat easier steel supply situation the Class I railroads on March 1 last had 33,012 new freight

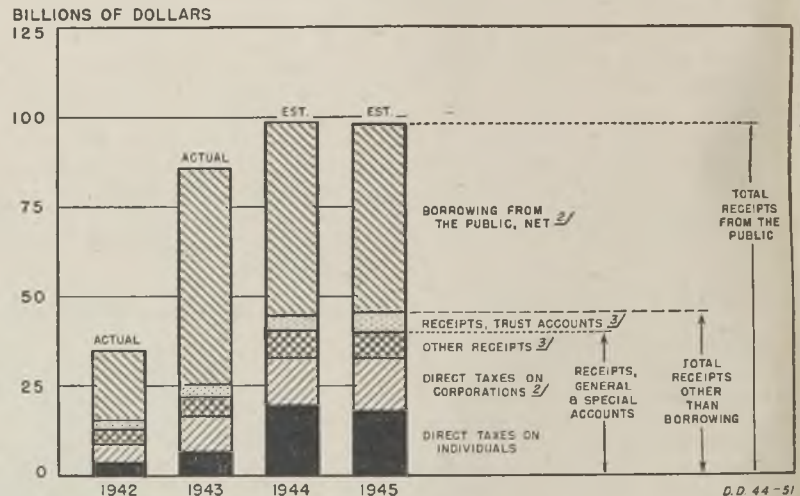
cars on order, against 19,329 the same date a year ago. The carriers also had 779 locomotives on order on March 1 last compared with 499 on the corresponding date a year ago.

Bolstered by an award of 5000 hopper cars for the Chesapeake & Ohio railroad, freight car awards during February totaled 12,340 or the best monthly showing since June, 1941, when freight car awards amounted to 32,749 units.

PEACE TRANSITION—The national output of goods and services can be held at \$135 billion yearly during the transition from war to peace, Senate Military Affairs Committee believes. It proposed plans be laid now for production of \$200 billion annually within five years after the end of the war to provide "a sound economy and full employment".

CONSTRUCTION—Total valuation of building awards during February, as compiled by F. W. Dodge Corp. for the 37 eastern states, totaled \$137.2 million compared with \$159.2 million reported for January. Little improvement in construction awards is indicated until material is released for unessential work. In February, 1943 construction awards amounted to \$393.4 million, or 186.7 per cent above that recorded during the latest period.

Total Receipts From the Public, Including Borrowing, by Fiscal Years.¹



¹ Data exclude major intergovernmental transactions.
² Estimated post-war credits for excess profits taxes refundable in the post-war period included in "borrowing from the public (net)," but excluded from "direct taxes on corporations."
³ Net appropriations to Federal old-age and survivors insurance trust fund excluded from "other receipts," but included as trust account receipts.

Source: The Budget of the United States Government.

FIGURES THIS WEEK

INDUSTRY

	Latest Period*	Prior Week	Month Ago	Year Ago
Steel Ingot Output (per cent of capacity)	98.0	98.5	98.5	99.5
Electric Power Distributed (million kilowatt hours)	4,400	4,426	4,512	3,947
Bituminous Coal Production (daily av.—1000 tons)	2,038	2,008	2,158	2,087
Petroleum Production (daily av.—1000 bbls.)	4,385	4,381	4,384	3,904
Construction Volume (ENR—unit \$1,000,000)	\$29.4	\$44.6	\$37.0	\$55.6
Automobile and Truck Output (Ward's—number units)	17,810	17,605	18,110	18,010

*Dates on request.

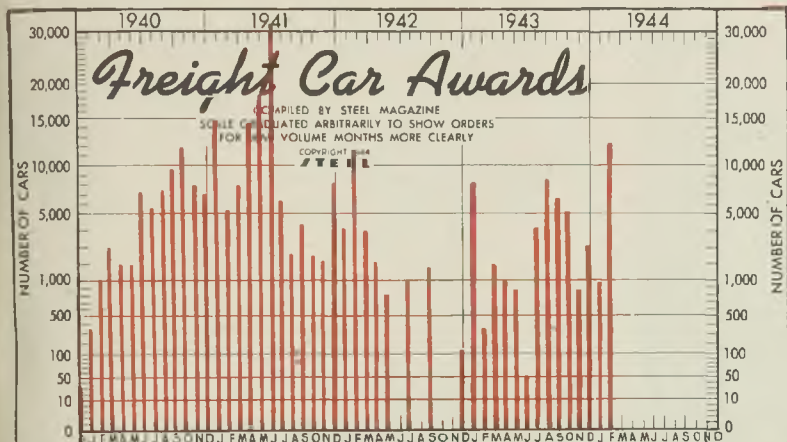
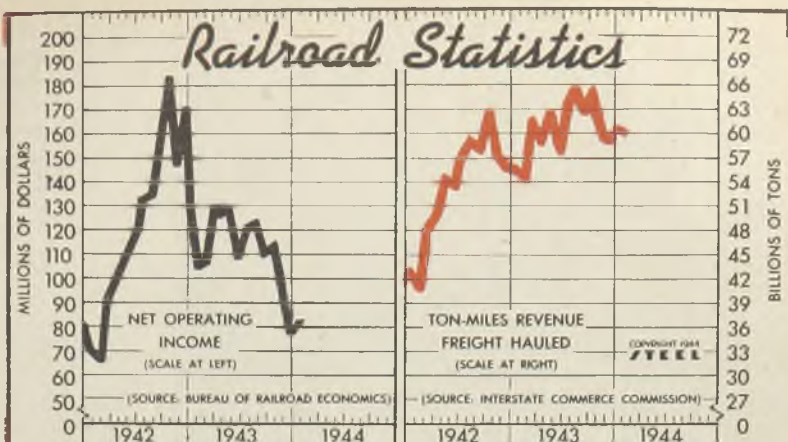
TRADE

	Latest	Prior	Month	Year
Freight Carloadings (unit—1000 cars)	781†	782	776	768
Business Failures (Dun & Bradstreet, number)	29	17	25	97
Money in Circulation (in millions of dollars)†	\$21,006	\$20,963	\$20,610	\$16,115
Department Store Sales (change from like week a year ago)†	+1%	-10%	+2%	+14%

†Preliminary. †Federal Reserve Board.

Statistics of Class I Railroads

	Net Operating Income		Ton-Miles Revenue Freight	
	1944	1943	1944	1943
	(millions)		(billions)	
Jan.	\$82.8	\$105.1	\$66.8	59.8
Feb.	106.1	64.4	54.4	40.8
Mar.	129.6	90.6	61.2	48.3
Apr.	127.1	101.6	59.1	50.0
May	128.2	109.7	62.1	54.2
June	109.7	118.7	58.0	53.9
July	120.6	133.6	63.7	57.0
Aug.	124.6	135.9	65.1	58.6
Sept.	110.2	154.6	62.5	58.2
Oct.	113.1	184.7	65.0	62.2
Nov.	96.4	148.9	59.6	57.0
Dec.	77.2	170.9	59.4	55.0
Avg.	\$113.5	\$122.9	60.5	53.2



Freight Car Awards

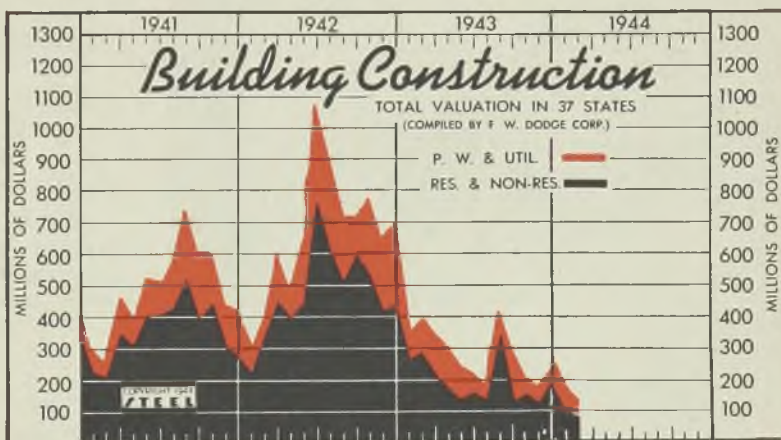
	1944	1943*	1942	1941
Jan.	920	8,365	4,253	15,169
Feb.	12,340	350	11,725	5,508
March	1,935	4,080	8,074	
April	1,000	2,125	14,645	
May	870	822	18,630	
June	50	0	32,749	
July	4,190	1,025	6,459	
Aug.	8,747	0	2,688	
Sept.	6,820	1,863	4,470	
Oct.	5,258	0	2,499	
Nov.	870	0	2,222	
Dec.	2,919	135	8,406	
Total	41,355	26,028	121,499	

*Including reinstatements.

Construction Valuation In 37 States

(Unit—\$1,000,000)

	Public Works-Utilities		Residential-Non-Res.	
	1944	1943	1944	1943
Jan.	159.2	50.3	85.8	108.9
Feb.	137.2	55.1	112.9	82.1
Mar.			123.0	216.7
April			127.7	175.6
May			95.8	138.6
June			73.3	156.3
July			50.0	133.7
Aug.			73.4	340.3
Sept.			175.1	125.0
Oct.			63.5	150.0
Nov.			59.0	125.4
Dec.			67.4	184.9
Total		1,106.9		2,106.4



FINANCE

	Latest Period*	Prior Week	Month Ago	Year Ago
Bank Clearings (Dun & Bradstreet—millions)	\$9,013	\$9,084	\$8,927	\$8,827
Federal Cross Debt (billions)	\$187.4	\$187.4	\$185.5	\$120.4
Bond Volume, NYSE (millions)	\$56.9	\$54.0	\$107.1	\$104.8
Stocks Sales, NYSE (thousands)	7,484	6,413	4,365	6,076
Loans and Investments (millions)†	\$52,903	\$53,290	\$53,256	\$41,861
United States Government Obligations Held (millions)†	\$38,522	\$38,898	\$38,902	\$29,108

†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)†	251.5	250.3	249.3	247.7
Industrial Raw Materials (Bureau of Labor index)†	113.3	113.2	112.4	112.1
Manufactured Products (Bureau of Labor index)†	100.6	100.6	100.6	100.6

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

Advanced Heat Treating

... employed by Bendix

By ROBERT C. GIBBONS

Plant Metallurgist
Eclipse-Pioneer Division, Bendix Aviation Corp.
Teterboro, N. J.

USE OF controlled atmosphere continuous furnaces and specially developed induction hardening coils have stepped up heat treating volume more than tenfold during the past four years at the Eclipse-Pioneer division of Bendix Aviation Corp., Teterboro, N. J.

In order to meet rigid Army and Navy standards for precision aircraft equipment and at the same time increase production to unprecedented levels, numerous innovations and improvements over previously used methods were devised by the corporation's engineers.

As a result of these developments and improvements, annealing, hardening and tempering of alloy steel parts has been placed on a record mass production basis and military requirements for increased uniformity and perfection achieved.

In the production of precision aviation equipment it is ex-



Fig. 1—Control instruments for heat treating furnaces are centralized on a balcony so they are fully visible from the floor. A worker can check as many as 19 furnaces simultaneously

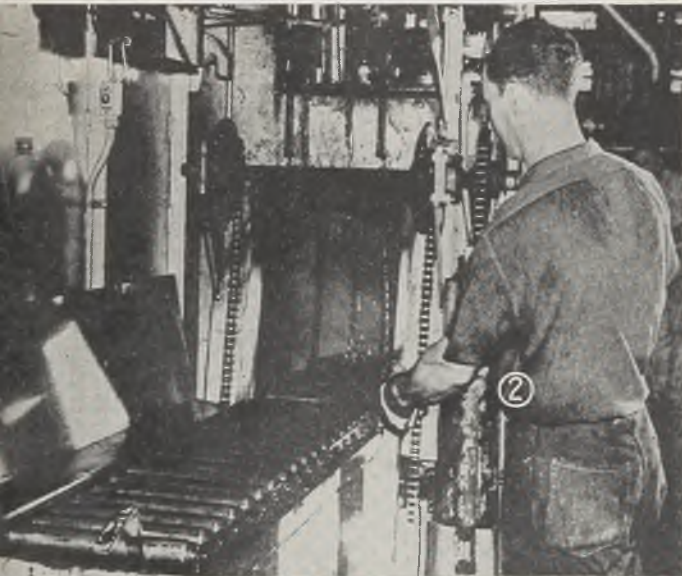


Fig. 2—Exit end of the pusher-type furnace shown in Fig. 5. Quenching elevator has just returned to level of the unloading conveyor

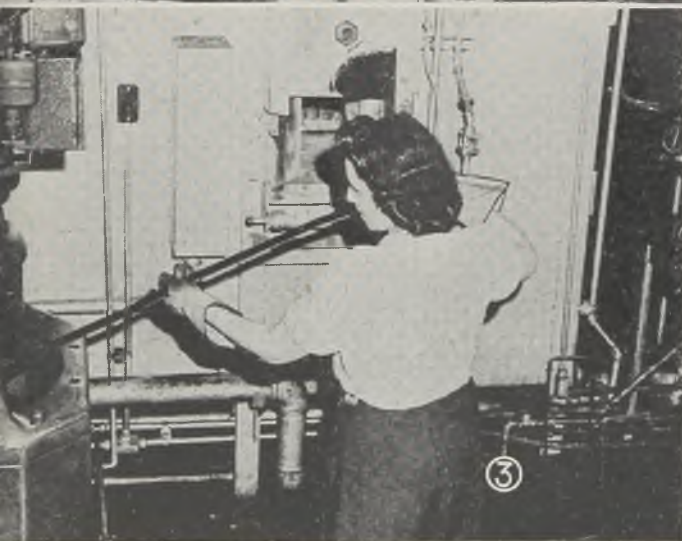


Fig. 3—Distortion of some aircraft parts is prevented through use of this press which lowers them into an agitated oil quench

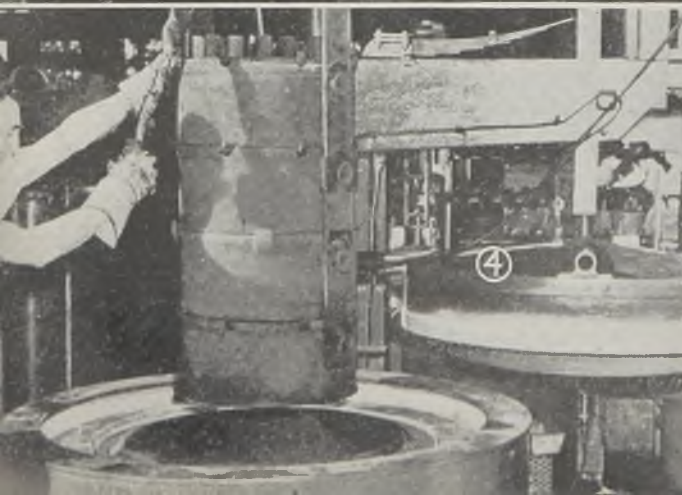
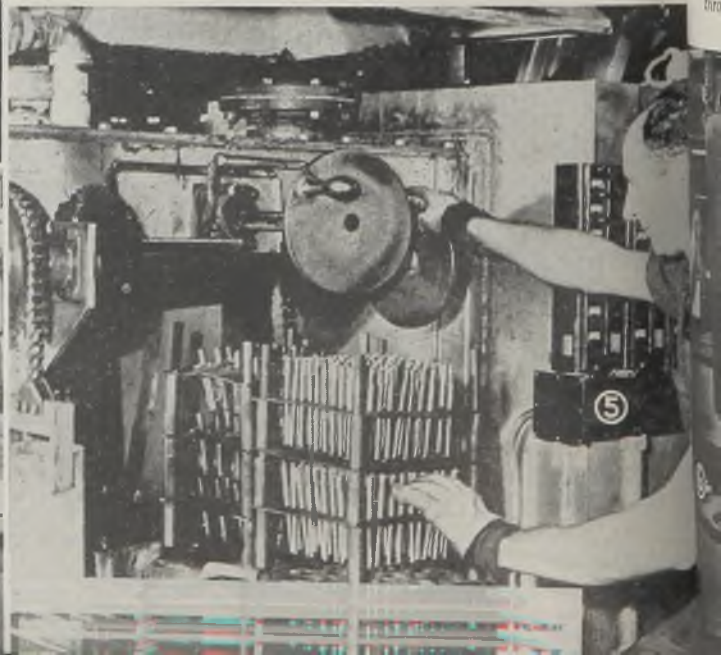


Fig. 4—Bendix prefers batch type gas carburizing furnaces for treating precision parts of high alloy steel which must cool slowly, such as spline shafts for starters

Fig. 5—Worker here is shown loading meshing rods for aircraft starters into a pusher-type furnace. Parts are charged at about 1300 degrees Fahr., brought up to required quenching temperature and, after soaking at temperature, are quenched automatically by being lowered into an oil bath on an elevator located near the discharge end of the furnace

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Heat Treating Techniques

Turning out aircraft parts on volume basis

It is extremely important that weight be held down, and, as a result, light alloy steels were selected. Moreover, both the Army and Navy set a very narrow working margin for the heat treating of the parts, and demanded uniformity in such aircraft equipment that would have been unnecessary in a great many other industries totally engaged in the war effort.

The controlled atmosphere continuous furnaces, both the conveyor and pusher types, and induction hardening proved to be the two factors for increased production and uniformity.

Both types of continuous furnaces have automatic quenching equipment. Previously, quenching in the oil bath has been done by hand. The new method permits the aircraft parts to move directly from the hardening to the quench without coming in contact with air.

However, the continuous furnace was not practical for the hardening of hundreds of different types of small parts such as pinions which required localized hardening. For this type of heat treating, induction hardening was adapted and it is estimated that it is

(Please turn to Page 124)

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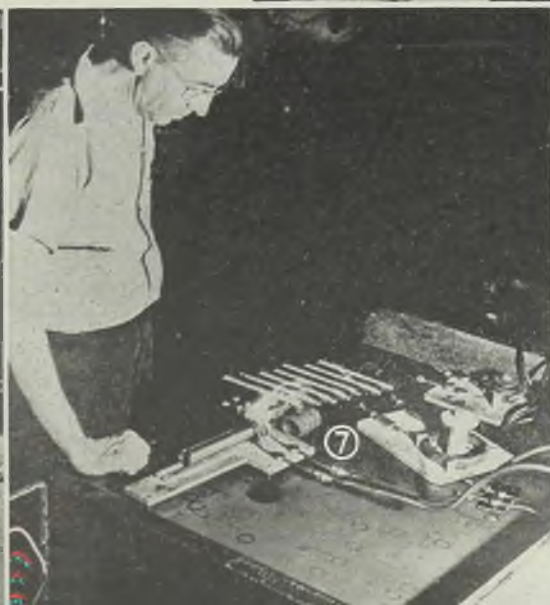
Fig. 6—Small lots of parts requiring normalizing are handled in batch furnace of the pit type as shown

Fig. 7—Localized hardening of parts such as the pinions shown here is accomplished by the induction process. The pinions are heated in the coil at the average rate of six per minute and quenched in the oil bath

Fig. 8—Small instrument parts are treated in this hydrizing furnace. After being brought up to proper temperature, the parts are dropped into an oil quench by tilting the furnace hearth

Fig. 9—High temperature electric furnaces are used for hardening high alloy steel aircraft parts. Furnaces are loaded and unloaded manually. Worker in foreground is quenching part in oil bath

Fig. 10—Continuous conveyor type furnaces work well in treating parts such as the starter housings shown being placed on hearth. Parts, after heating, move through a quench automatically



A Production Line Method for Making . . .

PUNCH PRESS DIES

By S. W. BOWER
Douglas Aircraft Co. Inc.
Santa Monica, Calif.

THE PBT, or Pierce Blank Template, as manufactured at the Douglas Aircraft Co. Inc., is used in the shop as a punch press die for stamping flat parts from aluminum alloy sheet or strip material. It can be made in about one-tenth the time required to make a conventional piercing and blanking die; no tool makers are required in its manufacture; materials used are easily obtainable, commercial grade, and in sheet form. No heat treating is required, except for the piercing pins, other materials are used in their natural condition.

The completed PBT, Fig. 1, consists of the punch assembly and the die assembly, not mounted on a die set, but interchangeable with any PBT die set of the correct size.

Plow Steel Punch

The punch assembly, at left, is composed of a suitable piece of rolled "A" Kirksite, of approximately 0.45 per cent carbon, SAE-1045 20 to 30 rockwell C, 1/8-inch thick, made to the shape of the production part desired and mounted usually by rivets on a suitable backing plate made from low grade hot-rolled steel 1/4-inch thick.

The die assembly, above, is composed of a suitable piece of rolled "A" Kirksite, a zinc alloy sheet checking 70 to 80 rockwell B, 5/32 or 1/4-inch thick, hollowed out to the shape of the punch and mounted on a 1/8-inch backing plate identical in size to the punch assembly plate. Perforation pins are installed in the die assembly backing plate; matching holes in the punch.

The punch and die assembly are accurately co-ordinated by means of dowel holes in the backing plates. These dowel holes are drilled in sets from a

master drill jig which, in turn, is co-ordinated to dowel pins in the universal PBT die sets.

The different sizes of PBT's are determined by the sizes of parts required, the punch presses available, and the number of die sets to be made. Twelve sizes ranging from 5 x 6 inches to 47 x 88 inches are employed with several PBT die sets of each size. Standardization of sizes results in a more efficient procedure for several reasons—the number of different size die sets is kept to a minimum, the backing plates can be pre-cut, and the storage problems are simplified.

The PBT lends itself remarkably well to the line production method of manufacture, owing to the ease with which the procedure can be broken down into definite and progressive operations — which remain constant for all sizes of PBT's. The adoption of a line production method is unique in the manufacture of such aircraft tools, and one which we believe has very interesting possibilities.

A job analysis breakdown will reveal that at least 26 individual operations, or five group operations are necessary in the fabrication of the PBT. The five group operations broken down into their 26 individual operations are in Table I.

Machinery and benches can be laid out to form a production line. The number of machines and work benches required for each operation must, of course, be balanced to the production ratio of the particular job so that work will flow along the line in a steady stream. These production ratios can be determined both for equipment and labor by making a time analysis of each operation. The sample production line described here has a capacity of approximately 100 PBT's per 24-hour day.

The first group makes the plow steel
(Please turn to Page 128)

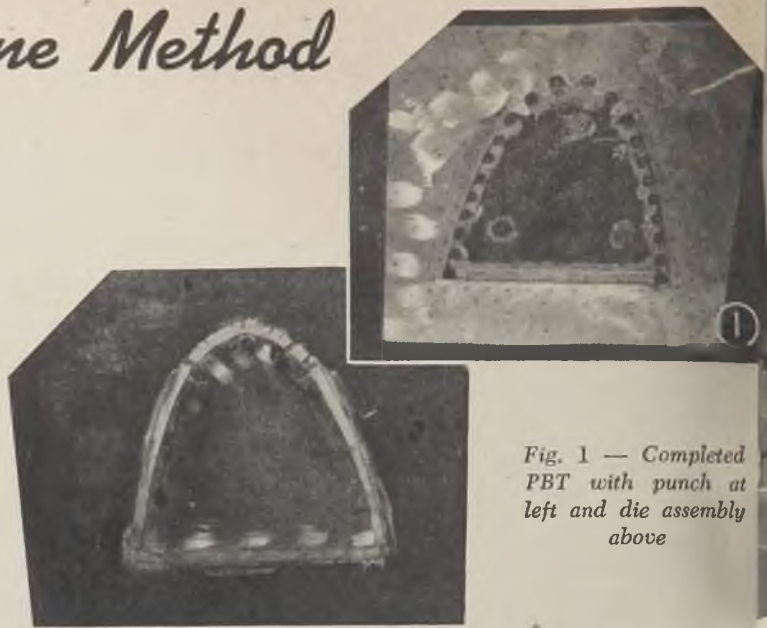


Fig. 1 — Completed PBT with punch at left and die assembly above

TABLE I—STEPS IN MANUFACTURE

Group A—Make Punch

- 1—Layout punch from template
- 2—Drill holes
- 3—Saw
- 4—File or grind
- 5—Check punch

Group B—Make Die

- 1—Layout on Kirksite
- 2—Saw
- 3—Route

Group C—Mounting Punch and Die

- 1—Drill backing plates from punch and die
- 2—Countersink for rivets
- 3—Install and press rivets
- 4—Grind heads flush
- 5—Stamp identification
- 6—Broach

Group D—Pinning and Rubbing

- 1—Remove shavings
- 2—Press assemblies together
- 3—Back drill piercing pin holes
- 4—Install pins
- 5—Stake pins
- 6—Check line-up of piercing pins
- 7—Install ejection rubber
- 8—Make sample stamping

Group E—Completion

- 1—Check sample part to master
- 2—Check pins and rubber
- 3—Make template for shop reference
- 4—Determine stock size
- 5—Send job to inspection



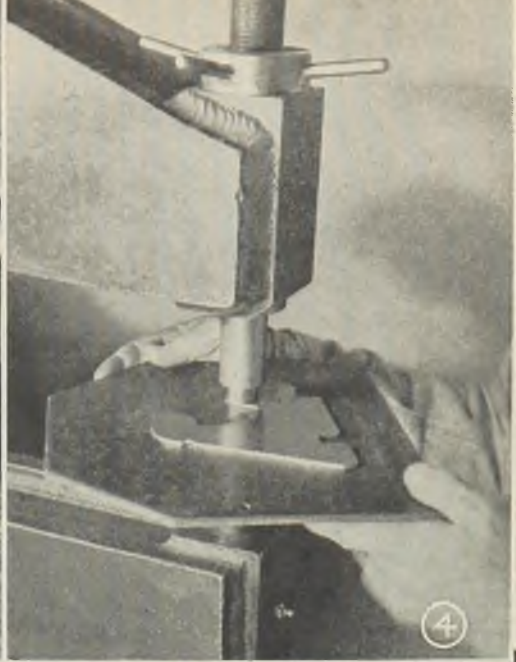


Fig. 2—Routing the Kirksite die

Fig. 3—Routing rivet holes and co-ordinating the punch and die assemblies

Fig. 4—Riveting the punch assembly

Fig. 5—The broach shaving removed in one piece from the Kirksite die

Fig. 6—Parts made by PBT process. Instrument panel, lower right, of 0.125-inch magnesium alloy took 6 hours each when made with hand tools. The PBT which took only 65 hours to make, now stamps out 15 parts every minute

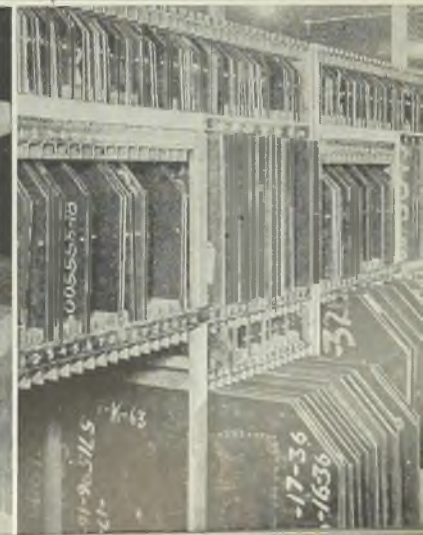
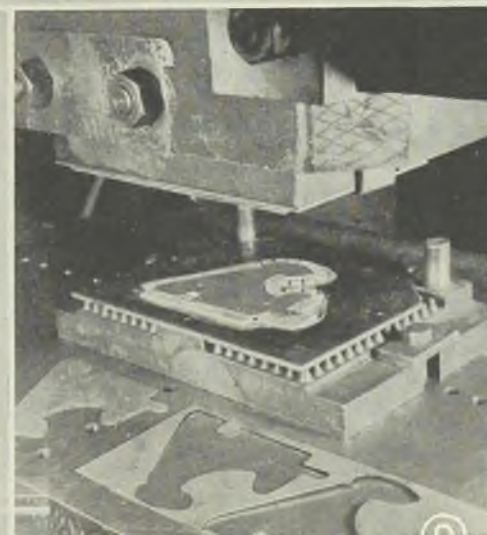
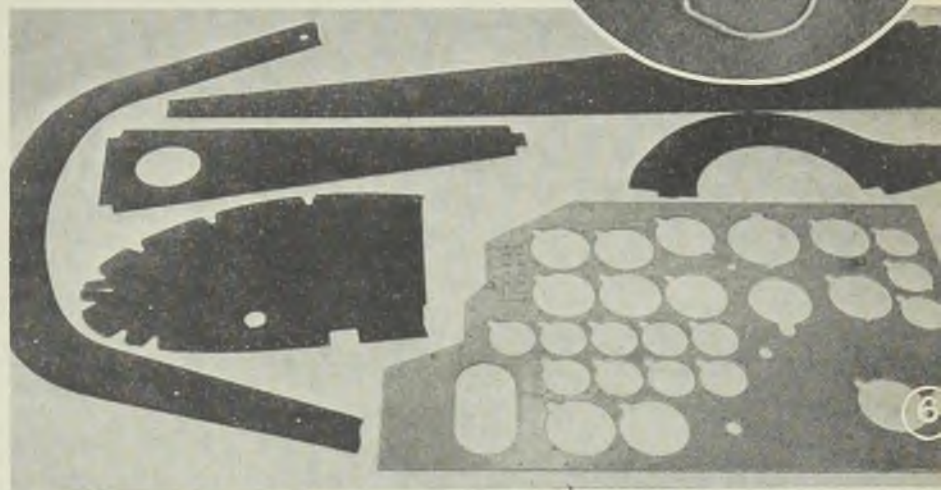


Fig. 7—Staking the pins to secure them in the die

Fig. 8—Rubber sections are placed on both punch and die to act as strippers

Fig. 9—Typical PBT mounted in die set showing the part produced, the strip material and nesting possibilities. Slugs from holes punched fall down between pins of grid plate

Fig. 10—Standardization of PBT sizes simplifies storage. This rack, 48 inches wide, 52 inches deep, 6 feet high, accommodates 168 PBT's of six different sizes. Note nesting of plates



Speed, mobility, loading conditions and operator experience vital factors in designing electrical controls for cab-operated

Monorail Cranes in Aircraft Manufacture

By LLOYD G. DAY
Electrical Engineer
Lockheed Aircraft Corp.
Burbank, Calif.

AIRCRAFT manufacture requires specialized types of materials handling equipment, due to use of light weight metals and to relatively large sizes of components handled in assembling bigger ships. The newness of the industry also has made it possible to pioneer original production procedures different from those of older industries.

Cab-operated monorail bridge cranes have proved ideally suited to many requirements of airplane manufacture, especially for assembly and fabrication purposes. Certain features of this kind of equipment, such as moderate size, flexibility, and speed, have made this style of crane more or less universally accepted by the industry.

Operating experience has shown that refinements in the electrical control apparatus of these cranes would be desirable when such equipment is used for aircraft assembly, while in straight pick up and carry applications the conventional control is entirely adequate. Where cranes are used for mating fuselage and wing sections of larger ships, or for removing sections from jigs and conveyor lines, conventional control equipment has proved inadequate.

It is the purpose of this article to make constructive suggestions for electrical control facilities suited to aircraft needs. Through contacts with engineering and maintenance personnel in aircraft plants

throughout the country, we have found that there is a startling unanimity of opinion on this subject.

At one time, airplanes were built in the same manner as custom-built automobiles. Wartime production requirements have revolutionized manufacturing methods, and "line" assembly methods have become standard practice in larger plants. Due to rapid expansion and the influx of untrained workers, crane operators often are made overnight with a minimum of instruction. Women have been recruited to the ranks of operators. Very few of these operators have handled such machinery previously. At the same time, the uses of cranes have become more complex. Problems arising from all these factors have created a demand for electrical control equipment suited to the changed requirements. Mechanical features in many cases are ahead of electrical equipment used on this machinery, due to a lack of application of available apparatus to crane uses; consequently, nearly every large plant has been forced to make changes in the control apparatus used by their cranes, or are anticipating such changes. The plants have handled the problem by various methods, but the fundamentals of the proposition are basic throughout the industry.

Further analysis shows no particular group can be blamed for this condition, which has resulted from a combination

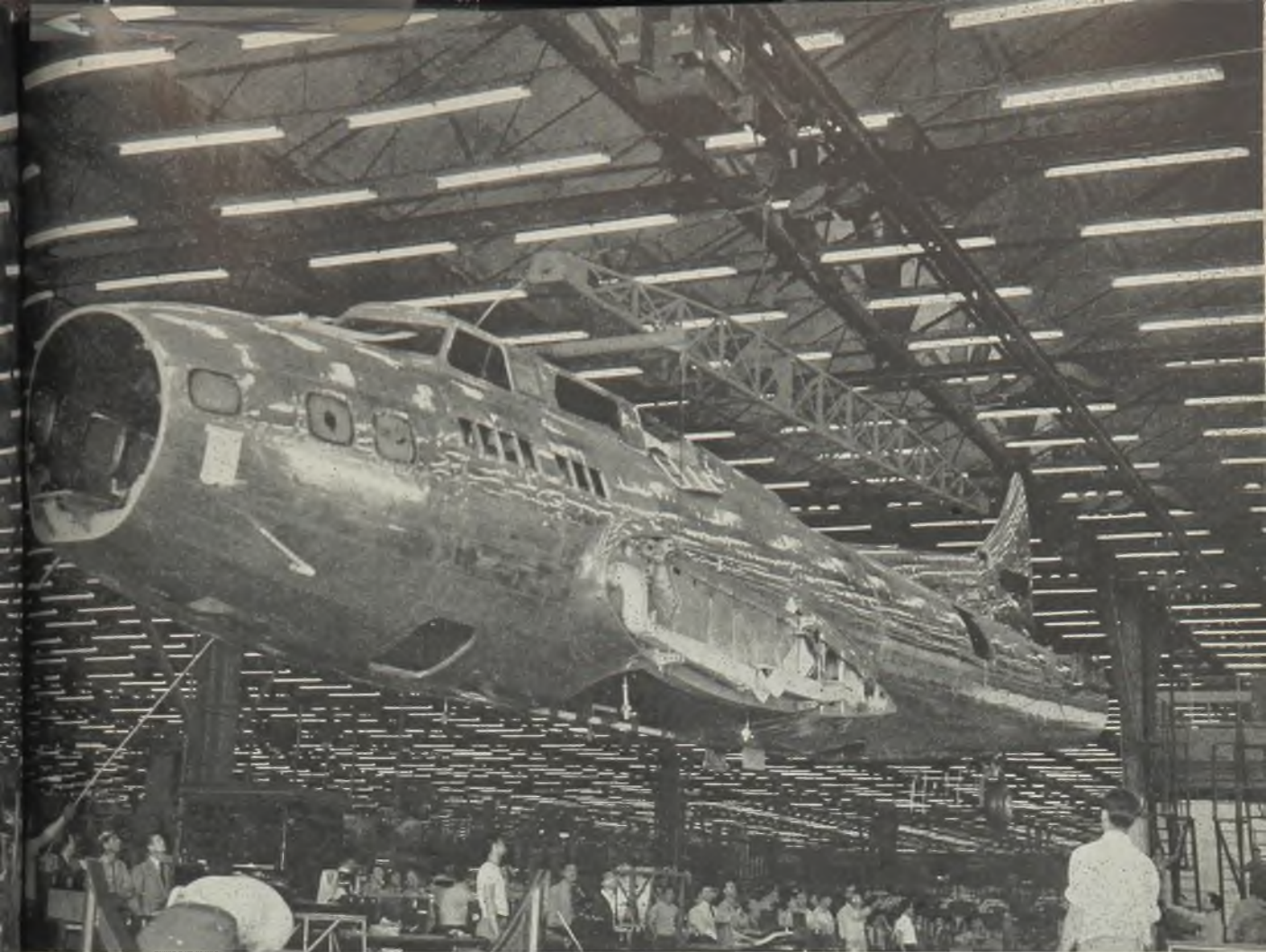
Fig. 1 — Fuselage of B-17 bomber, suspended from box-girder spreader bar, is lifted from assembly floor by crane for its trip to the mating jig where wings are added. All photos courtesy of Lockheed Aircraft Corp.



of causes. In the past, monorail cranes were principally used in smaller applications where extreme accuracy was not necessary, and they were operated mainly by skilled personnel. Manufacturers of this type of equipment built the kind of cranes suited to the needs of the largest number of users, and met the competition offered by other makers. In the period of rapid expansion in aircraft and related industries, it was necessary to purchase and install equipment which was immediately available, rather than wait for specially built machinery.

Factories were laid out by the "cut and try" method, because the airplane producer was pioneering in new and un-





familiar channels, and rapid changes in the kind and type of aircraft manufactured were frequent. These conditions made it necessary to order by catalog rather than by specification, as it was considered best to use standard equipment for the sake of convenience in installation, interchangeability, and faster delivery by the vendor.

During the past few months there has been a gradual stabilization of production requirements and a standardization of manufacturing procedure. It is now possible to predict with reasonable certainty the manufacturing methods which will be used. The airplane industry has become sufficiently acquainted with the

uses of this type of crane equipment to determine the kind of control apparatus which best fits its needs. Stress is being laid on the operation of all existing machinery and equipment in a manner that will produce the maximum output and utmost efficiency, and increased production with decreased cost is the new order of the day.

In contrast with cranes used in the railroad, shipbuilding, steel and other heavy manufacturing industries, aircraft methods require smaller size and compactness, necessitating the use of control apparatus different from that used on larger cranes. Functionally, there is a similarity to the apparatus used in larger

cranes, but from there on all resemblance ceases. The extreme mobility of mono-rail equipment is a deciding factor in designing control apparatus, while the higher operating speeds used are also a determining factor. Vital, however, is the fact there are wide extremes in loading conditions. One of these cranes may pick up a wing assembly weighing more than 10,000 pounds and move it a distance of several hundred feet through several bridge bays, maneuver it into position, and lower the wing section into position for assembly on the main fuselage; then, after completing the delicate operation of this assembly, the crane may make a trip to an entirely different section of the factory area with a partially completed component weighing not more than seventy-five pounds. Both loads must be handled with extreme care because jars and swaying can cause serious damage. Extreme variations of loading on a single hook cab unit operating over a network of bridges requires a smooth, stepless, wide range of control on all motions.

The human element of control operation must be given consideration. In the past it was possible to train a crane operator thoroughly in his duties before he was allowed to operate a crane alone, and cranes were almost all operated by men. Now, a new operator may be given a few hours of instruction, and from there he is on his own. Women have taken the

Fig. 2 (Extreme left)—Extreme variations of loading on a single hook cab unit require wide range of control on all motions. This heavy wing assembly, on its way to the mating jig, may be replaced by a 75-pound component on the return trip

Fig. 3 (Left)—Dependability in control apparatus is imperative. A 15-minute interruption of production caused by tardy response of controls while crane maneuvers large section in congested area can mean loss of hundreds of hours of productive labor



Fig. 4—Many inexperienced women are replacing men operators in the crane cabs, necessitating use of control equipment which is rugged, simple in action and easily replaceable

place of men in crane cabs. Inexperience of the operators necessitates the use of simple, easy to operate, semiautomatic control equipment.

Maintenance is another serious problem. Operating on a continuous duty cycle, with the lack of trained maintenance and repair personnel, the control equipment has to be extremely rugged and simple in action. Apparatus which requires delicate and critical adjustments must be avoided. All control equipment should be easily accessible and readily replaceable, so that it will not be necessary to tie up production while making repairs. Parts which are subject to wear should be made interchangeable with other similar parts so that a mini-

mum stock of spare parts is required. Often a 15 minute interruption of production caused by crane trouble can mean a loss of several hours manufacturing time and many hundred hours of productive labor.

With large areas over balconies, jigs, and other places where trackage and conductors are close to working spaces, bare electrical feeder and control bars are undesirable. Enclosed bus type conductors have proved the best form of distributing energy for cranes, and they comply with all industrial accident codes. While the first cost of this distribution of energy is higher than bare bars and trolleys, the lowered maintenance costs and increased safety to personnel have shown a superiority in cost and operating advantages in many plants. With this type of distribution, shoe-type collectors have proved to be more advantageous than roller-type, from a maintenance standpoint, due to the relatively short life of the latter form when given the hard usage of crane service.

To Prevent Short Circuits

Another advantage of the shoe-type collector and enclosed conductors over open trolleys is an interesting fact brought out as the result of our contacts with the personnel of other plants. Short circuits in open conductors with roller trolleys invariably necessitate cleaning and polishing of both the trolley roller and the conductor bars at the place where the short circuit occurs. The burning action is caused by the small amount of contact surface between the trolley and conductor and the natural accumulation of a small amount of dirt, producing increased resistance at this point under short circuit conditions. Wide contact area and the self cleaning action of the sliding contact of the shoe type collector eliminates cleaning and polishing even after repeated and severe short circuits.

An indirect bridge control, using reversing and time limit contactors in an enclosure mounted on the bridge, has not proved satisfactory for this kind of service, although it has been satisfactory in some other applications. Lack of direct speed control by the operator, the large amount of inching which is required in normal operation, and the speed variation under different loads, are the chief causes of complaint. Service requirements due to inching and on and off operation to maintain lowered speeds result in heavy duties being imposed upon this equipment, causing frequent and expensive maintenance. Several plants have reported that since they changed to direct cab control by using additional collector bars and a controller mounted in the cab, there has been a considerable decrease in maintenance costs, as well as an appreciable increase in the efficiency and flexibility of operation and a smaller number of equipment failures.

Another highly advantageous feature is the ability to control two bridges simultaneously from one cab, and at the same time have remote control of an adjoining bridge. This control permits the

cab to move through the system and add additional cabs to line up bridges ahead on its line of travel. This system also employs electrically operated transfer point interlocks with safety limit switches. Increased safety, lowered maintenance of equipment, and improved efficiency and speed of operation, together with a reduction in the equipment used to effect a move, are advantages.

Several plants report the use of three-phase alternating current with one phase solidly grounded and bonded to the rails, and insulating or isolating transformers.

Opinion is divided regarding the use of alternating current versus direct current for this type of crane, and respective advantages of each drew some interesting comment as to the particular points in favor of each.

Due to the network or system character of these installations, some form of dispatching is required. Three plants are using carrier current telephone equipment for this purpose with highly satisfactory results. Two other plants use crane telephone stations at different locations connected to a dispatching point. These telephones are located at two levels so that they are used by both groundmen and the crane operators at the same time.

Small Master-Type Preferred

There is a decided preference for small master type controls in the cab. Conventional drum-type controller with five or six points are not considered satisfactory. This small number of control points does not provide smooth control with the wide variation of load experienced in this service. Ten or twelve points in either direction with time limit acceleration to the point selected is best suited for this service, and the operating personnel available. This master type of control requires practically no physical effort by the operator, and has certain inherent safety features such as a spring return to the off position when the operator's hand is removed from the control handle. Electric bells operated by a foot switch are preferable to hand-operated warning bells.

Switch enclosures with doors opening outward on the side of the cab are reported as the most desirable arrangement. There is a decided preference for circuit breakers rather than fuses. It has been suggested that the main switch operating handle and the circuit breaker handles be placed on the inside of enclosures so that they are readily operated from within the cab. Some plants use a double-throw main switch which grounds the cab equipment when in the off position. Accelerating relays should be a thermal-time delay type, rather than motor operated or dash-pot type, due to the rugged character and the simple adjustment of the former.

While many more suggestions were advanced through the contacts made, this article should highlight to those interested the most important phases considered by everyone concerned. It is hoped that this information will prove valuable to those interested in crane controls for use in aircraft production.



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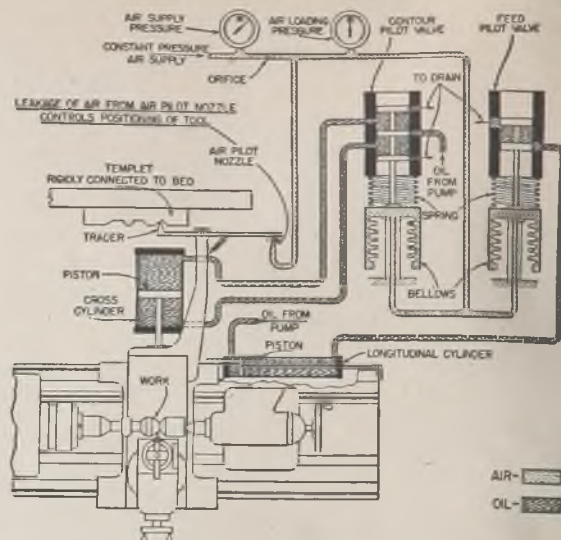
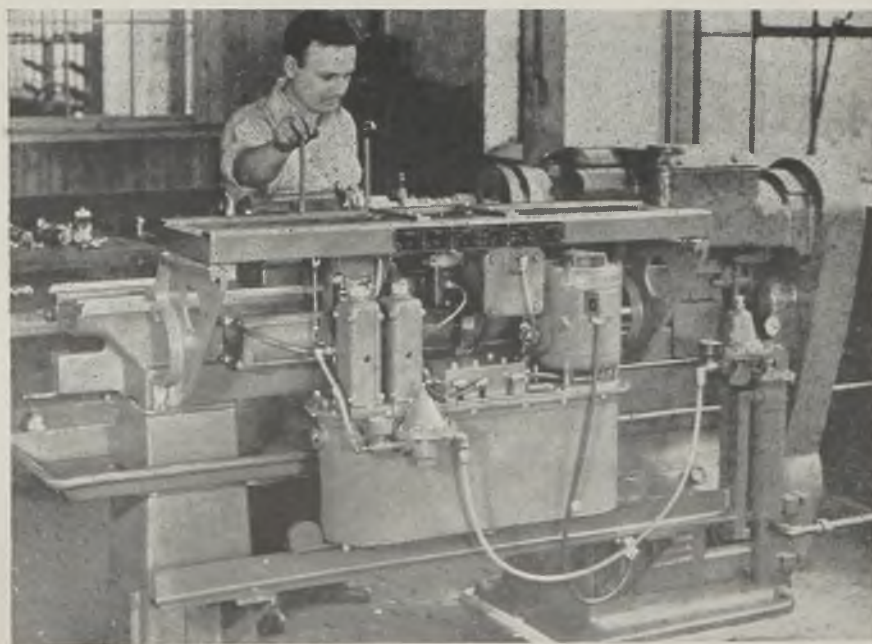
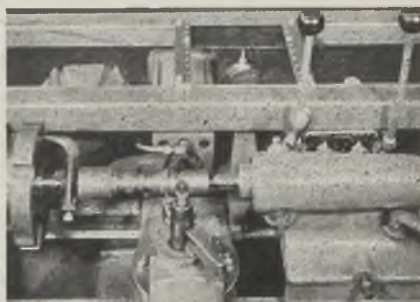
IS DONE AUTOMATICALLY

By GUY HUBBARD
Machine Tool Editor, STEEL

SEVERAL years ago the writer was present at a demonstration of cycle control through instruments which operated "in reverse", so to speak. Instead of these instruments drawing a graph of a manually controlled process simply as a matter of record, they translated ideal graphs of time and temperature conditions back to the process itself, thus effecting automatic control of the process. At that time I raised the question as to whether some system similar to this eventually might be applied to the control of machine tools. The general opinion then was that no ordinary apparatus of this nature would be quick enough, or accurate enough to meet such exacting demands, and even though it was, it would be too delicate to stand the gaff of machine shop service.

In more than 30 years of observation of metalworking processes, I have learned to prick up my ears and keep

my eyes open whenever any one group of specialists rate something as being impractical or impossible. That—I have found—is very apt to be a forewarning that some other group of specialists not bound by traditions, soon will succeed in accomplishing that so-called impractical or impossible achievement. Therefore, it was no great surprise to me a



few days ago to be invited out to the plant of the Bailey Meter Co., Cleveland, to witness the demonstration of a contour control which applies the basic principle of the air measuring gage to the automatic actuation of machine tools.

What did surprise me, however, was the fact that a company whose long experience has been in development and manufacture of meters and control systems for steam plants and process industries (equipment involving primarily time, temperature, flow and pressure) has succeeded within a relatively brief period in developing a compact, rugged and practical machine tool unit of such remarkable operational accuracy. When I state that the unit has sufficient stamina and "push" to rough out complicated steel shapes in a manufacturing type of lathe or vertical boring mill, and at the same time sufficient "delicacy of touch" to finish these shapes at the same setup within dimensional limits of 0.0002-inch and to 60 microinches of surface quality—under regular manufacturing conditions, with relatively unskilled operators, including girls—my surprise becomes quite understandable.

In connection with manufacture of flow meters and related industrial control instruments, there are various parts (See Fig. 5) on which mathematical curves, such as parabolas, must be ex-

Fig. 1 (Above, in heading)—Schematic diagram of pneumato-hydraulic contouring control as applied to standard engine lathe

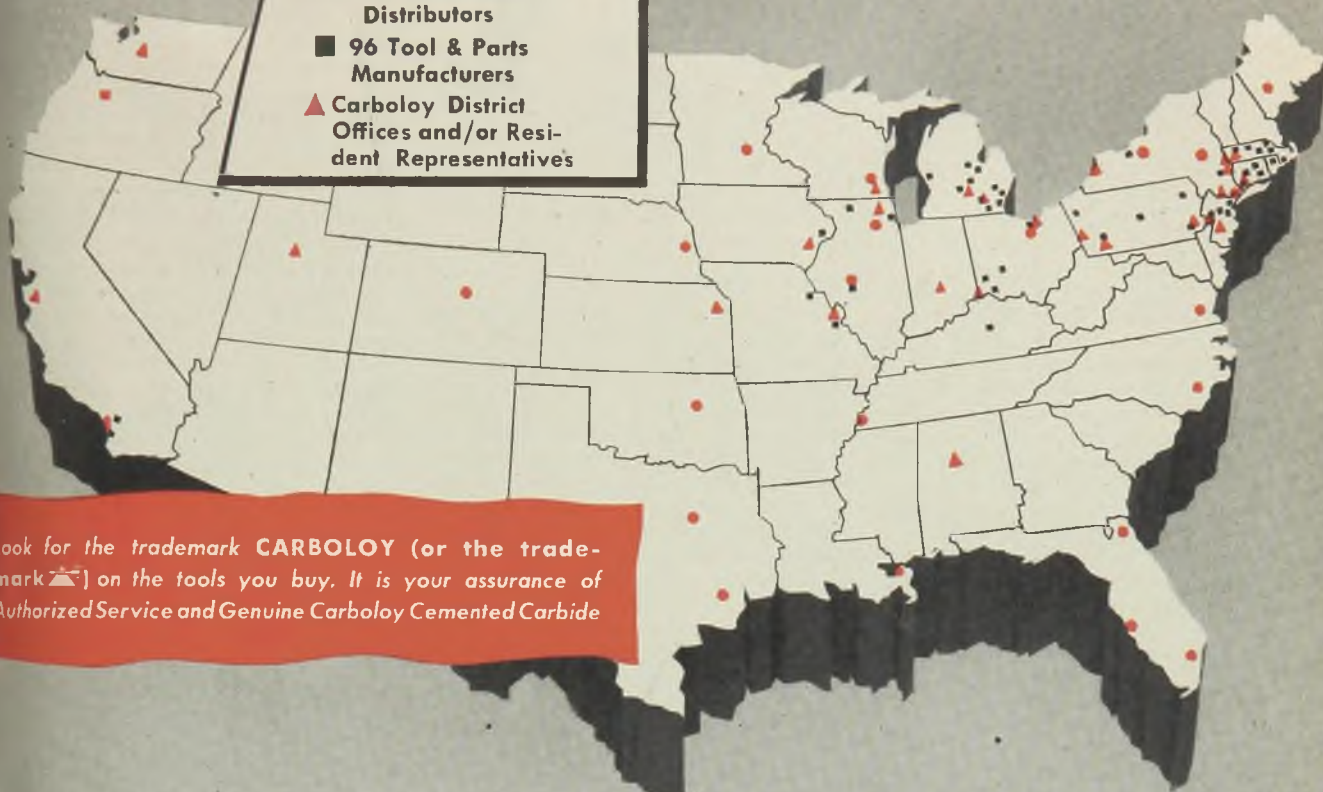
Fig. 2 (Upper left)—"Operator's eye-view" of template, tracer, hand control levers, adjustment knobs, work-in-process and cutting tool


Fig. 3 (Lower left)—Rear view of contouring control in operation. It is mounted on a 12-inch Hendeby lathe

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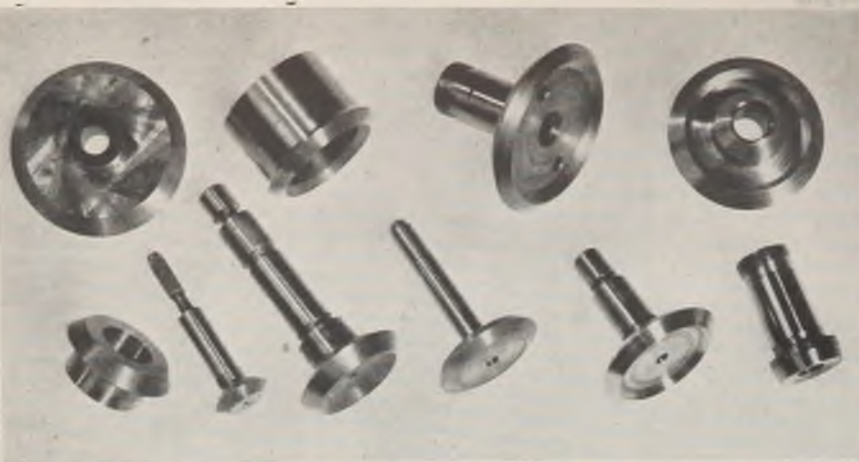


Fig. 4—Beveled perimeters and multidiameter stems here illustrated were done automatically by template-guided tools

actly reproduced. In the past these have involved slow turning and boring to fine, carefully micrometered steps along the curve, or the use of expensive forming tools and contoured reamers—skilled mechanics being required in either case. About three years ago, engineers at the Bailey Meter Co. conceived and developed the idea that through combination of air and hydraulic circuits a pilot finger could be made to feel its way along an accurately ground and honed sheet metal templet, thus automatically and “steplessly” actuating the longitudinal and cross slides of a lathe so as to reproduce exactly in the work all curves, angles, dimensions and surface quality of the templet.

Possibilities Are Broad

The unique but relatively simple means through which this has been accomplished in a compact attachment which thoroughly is in keeping with modern machine tool engineering, is shown in the schematic diagram (Fig. 1) in the heading of this article and in photographs, Figs. 2 and 3. While in the diagram and in these photographs, the attachment is shown in combination with a standard 12-inch Hendey lathe, and while thus far its actual shop applications have been limited to turning, boring and facing in engine lathes, turret lathes and vertical boring mills, its possibilities in connection with many other types of machine tools will be self-evident from material presented herewith.

The following explanation of the system is based on the running account given to me by the Bailey engineers as I stood beside the Hendey lathe installation, watching its smooth automatic performance on straightaways, square shoulders with sharp corners, curves and slow and fast tapers on a piece similar to that shown in Figs. 1, 2 and 3. With the help of the diagram, I hope that it will be reasonably understandable.

As the spring loaded tracer begins to “scan” the templet, even the most minute change in the templet’s contour tends to increase or decrease the air loading pres-

sure in the air control system, by changing the rate of flow from the air pilot nozzle. Air is supplied to the apparatus through standard dryer and filter units from a constant pressure source (which can be the regular shop compressed air supply), through an orifice of such size as to maintain loading pressure of 35 pounds per square inch when the tracer is in neutral position. It is this pressure which controls the contour pilot valve and also the feed pilot valve.

In the case of the contour pilot valve, air loading pressure acts on the outside of a flexible metal bellows. As this contracts, its housing compresses a spring to a point where equilibrium is reached. The bellows “breathes” during air pressure variations, always balancing in a position determined by the air loading pressure. Being attached to the free

end of the bellows, the oil pilot stem likewise at any given instant is in a position corresponding to the air loading pressure.

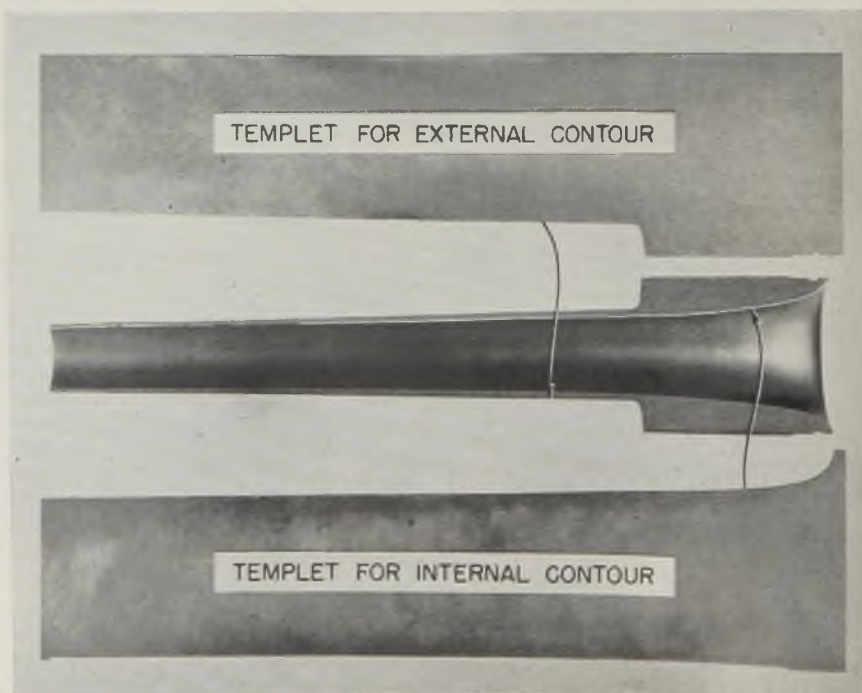
When the unit is put into operation with the cutting tool out of contact with the work, here is what happens. Flow from the air pilot nozzle is decreased by the tracer, while air loading pressure rises about its neutral value of 35 pounds per square inch. The contour pilot valve of the hydraulic system moves upward, thus opening the rear chamber of the cross cylinder to drain. Hydraulic pressure in the front chamber thereupon forces the piston back, thus traversing cross slide, cutting tool and tracer inward. This brings the tracer into contact with the templet, increasing the flow of air from the air pilot nozzle.

As soon as the air loading pressure reaches its neutral 35 pounds per square inch, the cross slide stops. At this same neutral pressure, the contour pilot valve returns to its neutral position as shown in the diagram. Here it locks the cross slide in fixed position by applying hydraulic pressure equally on both sides of its actuating piston. Under operating conditions, air loading pressure varies hardly at all from its 35-pound neutral, because the slightest change causes practically instantaneous traverse of the cross slide in the direction which re-establishes the neutral pressure.

Longitudinal feed rate is controlled by the pilot feed valve. In effect, this valve throttles the oil drain from the longitudinal power cylinder according to variations in air loading pressure. Maximum oil drainage from this cylinder, resulting in maximum longitudinal feed, exists

(Please turn to Page 120)

Fig. 5—Turning and boring of this tubular part—shown in section—were accomplished under contour control from the thin metal templates shown herewith





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Electronic Motor Controls . . .

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THE increasing use of variable speed machine drives, combined with the growing popularity of electronics as applied to the speed control of electric motors, has placed on the market a number of electronic motor controls for the purpose of obtaining wide speed ranges from the available types of alternating current power lines.

These electronic tube units all depend on supplying a controlled direct voltage to the armature of a direct-current motor, while the field supply is held normal or adjustable, as the case may be.

There are definite requirements which must be met if the electronic motor control is to come into general use. They are: (1) Weight of the unit must be kept low; (2) it must have only small copper requirements; (3) it must be long lasting and low in maintenance; (4) it should have straight-line direct-current output to the armature and be able to be combined with motors of standard temperature ratings; (5) it should use inexpensive tubes that are available on short notice under normal circumstances; (6) it should have regulation equal to or better than an induction motor without expensive tubes to bring about this regulation.

With electronic controls now on the market, a 1750-revolutions per minute standard direct-current motor will develop full torque at around 80 revolu-

By DUDLEY B. CLARK
Design Engineer
Electron Equipment Corp.
Palm Springs, Calif.

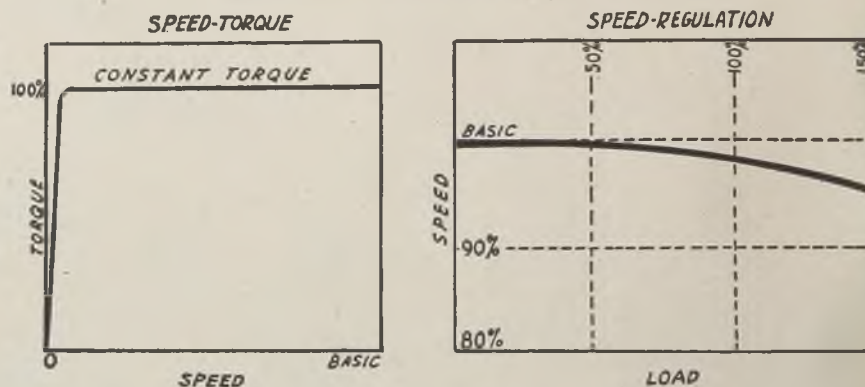
tions per minute and this will remain constant up to the basic speed and then the field may be weakened to attain still higher speeds, or a combination of the two methods may be used. Speed ratios as high as 100 to 1 are possible. Efficiency is high due to the fact there is less transformer copper and iron used, making for less core and iron losses. Per-

formance curves shown in the accompanying charts show (at left) speed torque relations up to basic speed; (at right) regulation up to a point of 50 per cent overload.

Many other features such as dynamic braking, inching, high-speed and continuous reversing and high-speed acceleration are available on any size from 1 to 200 horsepower. All units provide stepless control and may be preset. All units of 1 horsepower and over are for 3-phase input.

In addition to the usual industrial applications, these units also are available for marine controls, 400-cycle input aviation applications to accompany the new 400-cycle 3-phase transport generators and for use as automatic voltage controlled exciters, in laboratory testing and other purposes.

PERFORMANCE CURVES (Typical 5 H.P. Size)



Pratt & Whitney Yearbook Records 1943 Achievements

To give all employes of Pratt & Whitney, Division Niles-Bement-Pond Co., West Hartford, Conn., a clear idea of the accomplishments of their company during 1943—its 83rd year—a 32-page 9½ x 12¾-inch pictorial yearbook is being mailed to all the workers' homes and to all those in the armed services—the latter now numbering about 1000.

Forewords are by the recently appointed president and general manager, Charles W. Deeds, and by Clayton R. Burt, now chairman of the board of directors. They point out that because a lesser percentage of 1943 shipments were by outside subcontractors, 1943 shipments from the Pratt & Whitney plant itself actually were greater than ever before in history.

Regarding the acquisition of the Chandler-Evans Corp. of South Meriden, Conn. (aircraft engine carburetors and fuel pumps), the following prediction is made: "After the war the combination of Chandler-Evans engineering and Pratt & Whitney precision manufacturing will make a team that should go far in the mammoth aviation industry-to-come."

The doings of the several thousand

men and women employes, in the shop, in the engineering department, in the offices, in conferences, in patriotic rallies and other public gatherings such as the annual field day, are told in more than 200 action photographs with terse captions.

A limited number of these yearbooks will be distributed to executives of some outside industries. Others who are interested may be able to get copies by writing to E. C. Shultz at the West Hartford, Conn., plant, identifying themselves on their companies' letterheads.

New Thread Design

A new thread design based on the American National thread with the Dardelet thread principle incorporated has been developed by Dardelet Threadlock Corp., 2832 East Grand boulevard, Detroit 11. This thread design takes the interference at the root of the screw thread and flows the metal into the voids at the flanks, which places all contacting metal under initial pressure due to cold working of the surfaces. As a result, the entire thread engagement is sealed against fretting and fatigue life is improved.

It is also claimed that the screw is stronger in tension and torsion because

of the larger root diameter. It can be driven into a receiving material, already tapped American National after the threads have been truncated with a straight reamer.

The receiving member is tapped with a standard A.N. tap, then the hole is reamed to a predetermined dimension and when the screw is driven in, it burnishes the truncated threads to form the 6-degree taper.

For assembly, the important dimension is the reamed hole which is held to plus or minus 0.0005-inch. Lead areas are not important and any standard tap is satisfactory. The threads on the screw can be chased, rolled or ground. Gaging is done by the ordinary method.

Postwar Uses Seen for Plated Piston Rings

Chromium-plated piston rings developed for aircraft engines will be available for truck, bus, tractor and farm equipment after the war, according to P. E. Chamberlain, vice president and general manager, American Hammered Piston Ring Division, Koppers Co., Baltimore. Bronze sealing rings developed during the war also are expected to find applications in the automotive, diesel and other transportation fields.

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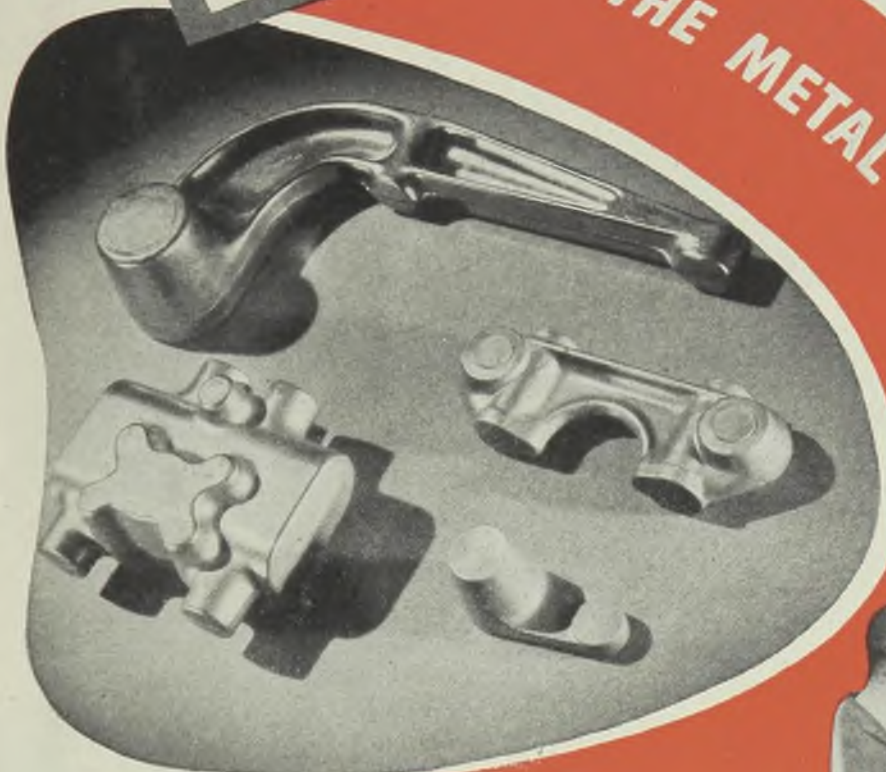
Investigate the possibilities of the many new magnesium alloys and Dow forging service. They may be the answer to your forging problems.

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FINE DRAWN wire without a coating of copper, tin or zinc is playing a very important part in winning the war since such large quantities of it are now being used for wire rope and aircraft control cables, and to a lesser degree in balloon barrage work. To draw a fine steel wire the three most important things are:

- Cleaning
- Lubrication
- The Dies Themselves

Practice to be described here is in production of 0.036-inch wire which has been properly patented in a conventional type of patenting furnace. For best results the wire must be free from all scratches before receiving final patenting and must have a uniform carbon content. A number of factors controlling the economic drawing of fine uncoated steel wire are affected by patenting methods and equipment. One is that—if large quantities of wire are to be drawn—it is always good practice to send through pilot lots from each heat inasmuch as different heats of steel of identical analysis often work differently.

After patenting, the wire must be cleaned thoroughly. Good practice is to clean the wire first with muriatic acid and then with sulphuric acid. If conditions are right, one may do the job. Muriatic acid is actually the better cleaning agent, but is also the more expensive. Sulphuric acid slightly etches the wire, making lime stick better.

The wire must be well spread out on the yokes before immersing in the acid baths because cleaning must remove all traces of scale. If the scale proves too tight, the wire must either be left longer in the acid or else the atmosphere of the patenting furnace will have to be re-adjusted to give a heavier, looser scale which will come off more readily. Readjusting the furnace is more satisfactory than letting the wire soak in acid. In patenting, one strives to get the kind of scale which can be most easily removed by the existing cleaning setup.

Muriatic acid should be used cold. Sulphuric, however, works best between 120 and 130 degrees Fahr. The acid must not be allowed to get too hot, nor the wire permitted to remain too long in the bath. Either condition may result in pitting the surface of the wire, or may even start acid embrittlement in the steel. It is good practice to remove the wire bundles from the acid when about half cleaned, rinse them with water to remove the scale already loosened, turn the bundles, then return them to the acid bath.

The cleaned wire must be well rinsed while still on the yoke. A tub partially filled with running water supplied from high pressure sprays on the sides works

well. The wire is dipped up and down in the tub through the spray.

After rinsing, the wire should be examined to see if any bits of scale still cling to it. Where the scale is thin and therefore difficult to detect, the wire can be bent a little to make any remaining scale pop off.

As the wire comes from the rinse, it should be bright and free from all smudge. If acid smudge is permitted to

remain on the wire, it may form an abrasive material that will scratch both wire and dies. Too, smudge comes off easily and—after liming—will carry the lime away with it.

Properly cleaned and rinsed wire is ready for liming. Characteristics of the lime itself are of major importance since lime must neutralize the acid, act as a lubricant carrier and keep the wire from rusting. A reputable lime dealer will recommend the grade most satisfactory for drawing fine uncoated steel wire. Air slaked lime is undesirable for any kind of wire drawing which requires more than two drafts. The lime must be free from grit.

After the lime has been slaked, it is desirable to age it in putty form for from 30 to 60 days before using it. Two lime vats, each capable of holding a 60 to 90-day supply, can be used alternately.

For liming, it has been found best to take the lime in putty form, put it into a steel tube, and thin with water to between 8 and 10 per cent by titration. A rather heavy lime works well in drawing fine uncoated steel wire.

The lime solution should be kept around 180 degrees Fahr. Four to six dips of the wire in this generally gives optimum results. The stock should be turned over between each separate dip so that every strand gets thoroughly covered with lime. Too heavy a coating of lime on the wire will cause it to flake off.

Subsequent baking dries the lime on the wire and also prevents any tendency towards acid embrittlement. Apparently the most successful baking method yet introduced is the tunnel type of baking, with temperatures held between 300 and 350 degrees Fahr.

Baking time depends to a large extent on type of oven. Older types may require 8 hours. From 1 to 2 hours is enough for newer circulating bakers. Unless the wire

is baked sufficiently, the lime will come off during drawing.

All wire must be inspected for rust after leaving the baker and before delivery to the draw benches. Rust present after liming will come through the lime coating during baking and show up then. If baked wire exhibits this condition, the wire must be returned to stock and cleaned again.

After baking, the wire should be stored no longer than from 8 to 16 hours prior to drawing. If left lying around longer

than that, the lime coating will soften and rust will form on the steel, causing difficulties in drawing.

End of one wire coil is butt welded to beginning of next coil for continuous drawing.

Weld flash is removed with a file. Remaining burrs are removed with emery cloth, and the bare wire at the weld lubricated with hard soap. Ordinarily laundry soap is excellent. Diameter of the wire at the weld must be slightly under normal wire size to prevent fracture in drawing.

Either too much or too little welding heat may cause breaks during drawing. A little intelligent experimenting with the welder should enable the operator to turn out good welds. Use a magnifying glass to check the condition of the wire at the welds.

The first draft—when the wire passes through the box on the outside of the machine—should be a skin draw, done dry. Very fine soap or soap flour can be used. Soap should be periodically “freshened” to prevent excessive contamination by the lime. First draw should reduce the wire just enough to form a coating on the uncoated wire—not more than 0.002-inch thick. A heavier draft will scrape off so much of the lime that there won't be enough left to carry the lubricant through the remaining wet dies in the machine. After the first draft, a reduction of about 25 per cent has been found satisfactory.

It is good practice for the die on the first draft to have a 30-degree entering angle blended into a light 12-degree approach angle. The bearing length should be a minimum of 75 per cent of the wire diameter. The stock should enter the remainder of the dies on a 12-degree angle and with a 75 per cent bearing length.

A good finish and polish must be maintained in dies for drawing fine uncoated wire. It is also well to remember that a smoothly polished carbide die—aside from improving quality—will also last far longer in service between polishings. First sign of wear in a carbide die used for any kind of wire drawing is the formation of a light ring at the approach angle. If this ring is permitted to become too

(Please turn to Page 132)

DRAWING FINE UNCOATED STEEL WIRE

By R. R. PRESTON

Engineer
Carboloy Co. Inc.
Pittsburgh

From a paper presented before the Wire Association, fall Pacific Coast meeting, San Francisco, 1943.

BOTH THE E6010 and the E6011 electrode types previously discussed (see STEEL, March 13 and 20) deposited the highest quality weld metal for all-position welding. E6010, a direct-current reverse-polarity electrode, and E6011, its alternating-current counterpart, were designed to satisfy the specifications of the Bureau of Ships. In this description of weld deposit qualities, the best possible values of strength and ductility were outlined. Rightly enough, the Navy has always been a stickler for outstanding physical properties in its *matériel*.

But a need was early recognized among welding fabricators for a different type of electrode. The harsh, digging arc of the E6010 electrode was all right in many places. But the old timers felt that bare wire welding had offered some advantages not to be found with the heavily coated cellulosic product. A "colder" deposit would be mighty useful here and there.

So the welding electrode manufacturers back-tracked a little. From the laboratory came a "cold" electrode. Like bare wire it worked best with direct current, straight polarity. Like bare wire, it was "cold" and built up a high, even bead. Like bare wire, it had to be operated with a short arc. *But unlike bare wire, it was a coated electrode and possessed good physical properties.*

E6012 electrodes, excellent coated electrodes exhibiting the good functions of bare electrodes, have been called "poor-fit-up" or "general purpose" electrodes. In fact, 3 of the 23 manufacturers listed in Table I have symbols or names to support this contention. Harnischfeger's "PF" very likely stands for poor fit-up; Westinghouse's "FP" could be fit-up poor; and Metal & Thermit's "genex" suggests general purpose.

As usual, the rest of the names give no clue as to their intended application. Thus the existence of the AWS-ASTM classification system described in STEEL, March 6, 1944, proves to be quite valuable. Likewise the existence of the NEMA two-color identification plan discussed in the same article will tend to force the producers of arc welding electrodes to select the one AWS-ASTM classification for which their product is best suited instead of attempting to cover several types with a single electrode as has been done in the past. All of these standardization programs serve to make a rather complex subject readily understandable to the users of electrodes.

Getting back to the terms "poor fit-up" and "general purpose" for a moment, what is the meaning of these expressions? Poor fit-up means just what it describes. All too often, more so in the past than

today, wide gaps will be found in structures that have been tacked together preparatory to welding. These gaps must be bridged. But welding along an unsupported edge, particularly in relatively thin steel, is troublesome because most electrodes under these circumstances will melt away as much metal as they deposit. The E6012 elec-

trode is but 17 per cent minimum while the E6010 and E6011 types exceed 22 per cent, there are hundreds of thousands of applications where no more than 17 per cent elongation is needed. For this work the major advantages of the E6012 electrode must not be overlooked.

There is little spatter from E6012 electrodes. Careful tests have disclosed that there is less spatter from this group than from any of the other electrodes in the E60xx bracket. Actual data reveals from 4 to 8 per cent of the coating is lost as spatter from the bare electrodes in the E60xx bracket. About 6 to 12 per cent is lost with E6010 electrodes whereas from 8 to 10 per cent may be lost with the E6011 product. Spatter is worth considering because many jobs must be painted after welding. If little spatter accompanies the welding, much cleaning need be done before painting.

Frequently the steel alongside the joints to be welded is protected with a compound that prevents the spatter from sticking. Preparations of this sort allow the light spatter from E6012 electrodes to be removed with a wire brush either manually or mechanically driven. *This point might well be filed along with other suggestions for cutting costs connection with the manufacture of postwar products that must sell for a price in a highly competitive market.*

Wherever single-pass horizontal fillets are specified, E6012 electrodes ought to be used. Of course some specifications demand a different class of weld metal. But every weld that is not governed by limiting specifications ought to be done with the E6012 group. Without a shadow of a doubt the best appearing horizontal fillets are made with this electrode. There is no undercut; there is almost no spatter; and the slag, once it has cooled, separates cleanly.

In addition large diameter electrodes at high currents and fast rates of travel are most satisfactory. Nowhere else can 1/8-inch electrodes be used with 1/4-inch steel plates to produce an acceptable weld. Naturally this is an extreme example. Yet more than one production superintendent has been amazed at the labor savings made possible by an intelligent matching of the E6012 type of electrode with the many jobs for which it is well adapted.

Shop fabrication of structural steel is another use to which E6012 electrodes are put. Here, too, the economy of an electrode that can withstand high currents when welding light sections is appreciated. Another advantage comes from the fact that unskilled welders can

METALLIC ARC WELDING ELECTRODES

—Class E6012

This is Section IV in a series on metallic arc welding electrodes, their characteristics and most important applications. First article, March 6, was devoted to an explanation of the AWS-ASTM electrode classification system. Section II, March 13, covered class E6010 electrodes; Section III, March 20, class E6011 rods

By HAROLD LAWRENCE

Metallurgist and
Welding Engineer

trode is a notable exception and has been widely applied to structures where fit-up has been poor. The "cold", molasses-like weld metal coupled with a shallow penetrating arc works wonders in what would otherwise be a trying situation.

The term "cold" is applied because the molten metal from the rod is stiff and of high consistency. It acts like the molten metal was "colder" in that it does not run or flow freely.

As for the words "general purpose", they mean what they say. Every maintenance department in a large plant has learned to rely on E6012 electrodes for a wide variety of welding jobs. A new safety guard is needed for an exposed portion of a moving machine. In a jiffy the maintenance department welds up a protective screen with the general purpose electrodes. Or a new attachment is needed. The part is fabricated and welded in place, flat, vertical, overhead or horizontal, it makes no difference to the all-position general-purpose electrode.

E6012 electrodes are *fast*. Production work goes very rapidly when this type of electrode can be used. Although the

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work with E6012 electrodes turning out good quality work while gaining the confidence and experience so essential in a welder's make-up.

This group of electrodes, as originally developed, operates to best advantage with direct current, straight polarity. Wherever the welding conditions permit, this combination of current and polarity ought to be used. If magnetic blow is

not a factor, and there are welded joints where blow is nonexistent, direct current with straight polarity will deposit the greatest amount of weld metal of any possible combination of current and polarity. With the same number of amperes, direct current with reverse polarity will deposit the second greatest amount of weld metal; and at the same amperage, alternating current will deposit the smallest amount of weld metal.

Other considerations may be more important, however, and these should be kept in mind. Use direct current with straight polarity for the utmost refinement in operating practice. If magnetic blow raises its ugly head, use alternating current and note with agreeable surprise, perhaps, that the better E6012 electrodes work quite well with alternating current. Or if, as may be the case in a shipyard, constant potential generators are setup for direct current with reverse polarity, use that combination.

Shallow Penetration a Characteristic

Shallow penetration characterizes this electrode group. The arc does not have the digging action associated with E6010 electrodes. Yet penetration is deep enough. It is the feature of shallow penetration that allows the E6012 group to be used for the welding of sheet metal where the $\frac{3}{32}$ and $\frac{1}{8}$ -inch diameters are especially good. The best welding is accomplished at relatively high currents for such small diameter electrodes with the work so positioned as to permit the welder to travel downhill.

Slight variations in fit-up will give no trouble because of the outstanding bridging qualities of the weld metal. The "cold" deposit is not as susceptible to burning through as happens sometimes when E6010 electrodes are tried for this kind of fabrication. Better appearance may be achieved because the slag coverage of the E6012 electrodes is better than that of the E6011 and E6010 grades.

In some ways the E6012 electrodes are between the E6010 and the E6020 type. Particularly is this true of the slag factors. E6010 products have the least slag, next come the E6012 and, finally, the E6020 electrodes with the most slag. Matching these slag conditions are the ripples of flat beads produced with each variety. E6010 deposit ripple is the coarsest; E6012 ripples are much finer; and E6020 ripples are still finer. When the appearance of a welded unit must be just so for maximum sales appeal,

fineness of ripples deserves attention.

Vertical welding characteristics of E6012 electrodes are different from those of E6010. Because of their shallow penetration, more abundant slag and less fluid weld metal, more skill is needed for vertical up welding with E6012 rods. At best the layers will be more widely spaced with the weld showing appreciably more convexity when small fillets are being made. Wide welds, though, will present a most pleasing appearance when deposited with E6012 electrodes. Freedom from undercut makes vertical and overhead welding easier with this electrode classification than with either of the two groups discussed in the preceding articles.

Most of the special properties demonstrated by E6012 electrodes come from the titanium dioxide in the coating. Almost always this material is in the form of rutile although small amounts of the pigment grade of TiO_2 may be used as well. The rutile serves a dual

TABLE I—MANUFACTURERS AND TRADE NAMES OF AWS-ASTM E6012 ELECTRODES

(Primary Color—None; Secondary Color—White)	
Air Reduction Sales Co.	Airco 87
60 East 42nd street New York 17	
Allied Weld-Craft Inc.	Arc-craft 70
401 West South street Indianapolis	Arc-craft 70W
American Agile Corp.	Red-White
5806 Hough avenue Cleveland 3	
Anthony Carlin Co.	P60
2717 East 75th street Cleveland	P61
Champion Rivet Co.	Gray Devil
East 108th and Harvard Cleveland 5	
Electric Arc Inc.	Newarc No. 5
152-162 Jelliff avenue Newark, N. J.	
General Electric Co.	W20
Schenectady, N. Y.	W30
Harnischfeger Corp.	PF
4400 West National avenue Milwaukee 14	
Hobart Brothers Co.	Hobart 77
Troy, O.	
Hollup Corp.	Sureweld "N"
4700 West 19th street Chicago	
Lincoln Electric Co.	Fleetweld 7
12818 Coit road Cleveland 1	Fleetweld 37
Marquette Mfg. Co. Inc.	Type 25 ADS
401-419 Johnson street, N. E. Minneapolis	Type 151
McKay Co.	17
York, Pa.	116
Metal & Thermit Corp.	Genex
120 Broadway New York 5.	
Page Steel & Wire Division American Chain & Cable Co. Monessen, Pa.	Hi-Tensile "F"
Reid-Avery Co.	Raco 8
Dundalk, Md.	
Joseph T. Ryerson & Son	No. 217
Chicago.	
A. O. Smith Corp.	SW-11
Milwaukee.	
Standard Steel & Wire Co.	Greyhound
Bolivar, Pa.	Type S
United States Steel Supply Co. . .	Scully 70
1319 Wabansia avenue Chicago 90.	
Universal Power Corp.	Hevikoat SP-2
4300 Euclid avenue Cleveland 3.	
Westinghouse Electric & Mfg. Co.	FP
East Pittsburgh, Pa.	
Wilson Welder & Metals Co. . . .	107
60 East 42nd Street New York 17.	

TABLE II—DEPOSIT ANALYSES PRODUCED BY E6012 ELECTRODES

	Carbon	Manganese	Phosphorus	Sulphur	Silicon	Molybdenum	Nickel
Min., %	0.05	0.25			0.08		
Max., %	0.15	0.55	0.03	0.035	0.12	0.025	0.025

TABLE III—PHYSICAL PROPERTIES OF DEPOSITS MADE WITH E6012 ELECTRODES

Property	Stress Relieved	Non-Stress Relieved
Yield point, psi	47-64,000	50-65,000
Ultimate strength, psi	64-81,000	65-82,000
Elongation, % in 2 in.	22-28	17-25
Reduction in Area, %	40-60	30-50
Izod Impact Resistance, ft.-lbs.		25-50
Fatigue Resistance, psi		25-30,000
Specific Gravity	7.80-7.85	

TABLE IV—CURRENT AND VOLTAGE RANGES FOR E6012 ELECTRODE APPLICATIONS

Size of Electrode Inch	Recommended Amperes	Recommended Volts
$\frac{3}{32}$	25-90	16-20
$\frac{7}{32}$	55-140	20-25
$\frac{9}{32}$	90-200	21-28
$\frac{11}{32}$	110-275	22-32
$\frac{1}{4}$	140-325	23-35
$\frac{5}{16}$	175-500	24-40
$\frac{3}{8}$	240-625	26-42
$\frac{1}{2}$	300-750	28-45

function by providing much of the slag and by contributing largely to arc stabilization. Titanium dioxide is the largest single ingredient in E6012 electrode coatings.

Feldspar, aluminum silicates, magnesium silicates and calcium carbonate are added to the coating to secure the exact slag performance desired by the electrode designer. The calcium carbonate is believed to provide additional arc stabilization for straight polarity welding.

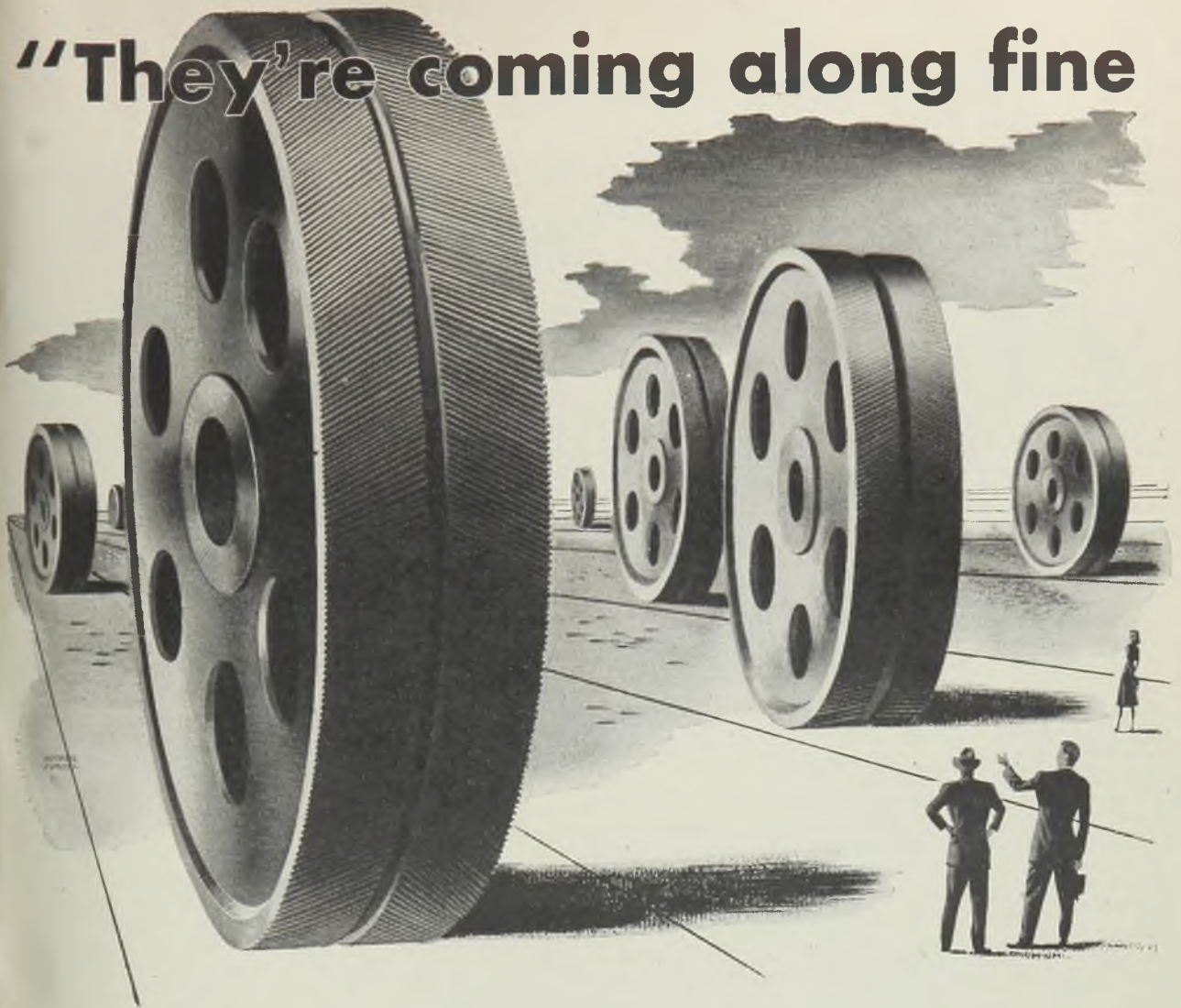
As is true of almost all electrode coatings, ferromanganese is included as a degasifier. Notwithstanding this addition, the deposit contains appreciable porosity. Quite likely this gas does not have a chance to escape from the molten pool because of the quick-solidifying nature of E6012 weld deposits.

Although the general-purpose electrodes are fundamentally of the mineral shielded types, some coatings are known to contain organic materials such as cellulose or lignin to provide an extra measure of gas shielding. As usual the coating materials are bound together with sodium silicate which also serves to bind the coating to the core wire.

Table II reports the deposit analyses of the weld metal from poor fit-up electrodes. This range in elements is smaller than those previously shown. Manganese is lower and silicon is lower, yet the strengths of weld metal are higher than

(Please turn to Page 136)

"They're coming along fine



... but a light frost would ruin the whole crop!"

There's one critical period in the manufacture of huge herringbone gears for U.S. cruisers and destroyers when any marked change in temperature—whether heat wave or light frost—might send them to the scrap pile instead of into the fight.

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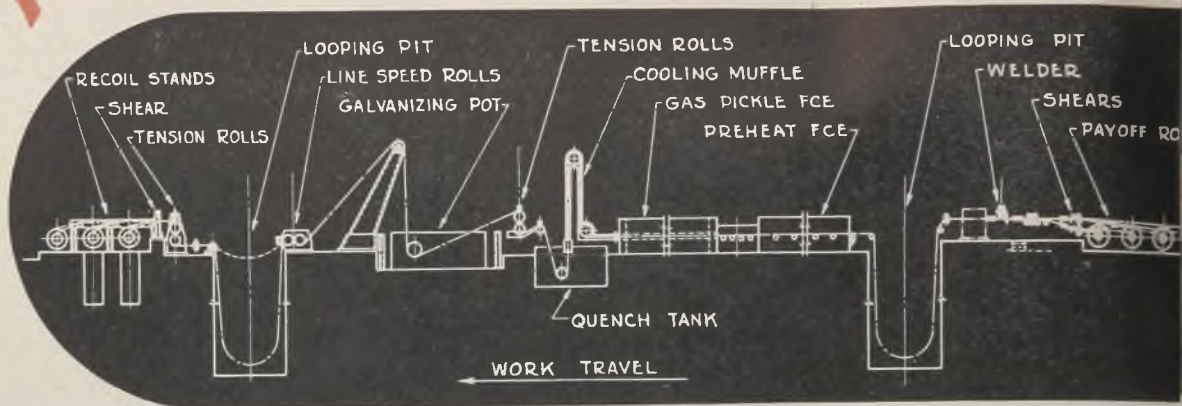
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GAS PICKLING and COATING



By R. F. RENKIN

Operating Manager, Coated Products
Sharon Steel Corp.
Sharon, Pa.

Pickling steel strip of rimming quality or wire in a mixture of neutral flue gas and hydrogen chloride gas leaves the surface free from blisters and improves adherence of coating. Initial production line employing this method is now in commercial operation at a strip mill in the Shenango Valley. Various steps of process described in sequence

FIRST commercial application of the Surface Combustion gas pickling process to prepare cold-reduced steel strip for subsequent coating was made by Sharon Steel Corp., Sharon, Pa. A production line, installed in 1940, has been turning out galvanized steel strip continuously for approximately two years. The product has found a ready acceptance in the market.

A small pilot plant, incorporating a miniature galvanizing pot, was constructed at the Sharon plant to handle strip up to 3 inches wide, and also steel wire, at speeds up to approximately 15 feet per minute. The work of operating this unit on an experimental basis, and modifying equipment to secure improved results, occupied a period of over a year. This work demonstrated that, not only was it possible to galvanize cold-reduced rimmed steel strip or wire continuously by this method, but the resultant product was completely free from the blisters ordinarily following acid pickling. Pilot operation also demonstrated that the adherence of the coating was drastically improved.

The pilot unit was constructed and operated jointly by Sharon Steel Corp. and Surface Combustion Corp., Toledo, O.

Based on experience with the pilot line, specifications were drawn up for a production unit to handle either two parallel strips, each 4 to 8 inches wide by 0.050 to 0.125-inch thick, at speeds of 10 to 20 feet per minute; or a single strip up to 24 inches wide by 0.010 to 0.035-inch thick, at speeds up to 100 feet per minute. After equipment was installed, electrical modifications were made to permit higher speeds on light-gage material, since it was discovered that the processing time could be further re-

duced below the limits established in the experimental operation.

The processing equipment, including a preheating furnace, gas pickling furnace, pickling gas generating unit, and galvanizing pot setting, was designed and installed by Surface Combustion Corp. Mechanical equipment was designed and furnished by United Engineering & Foundry Co., Pittsburgh, and the electric equipment by the General Electric Co., Schenectady, N. Y.

Some modifications of the equipment, as originally installed, were found necessary to suit the requirements of continuous production operation.

As now operated, the unit will process cold-reduced rimmed steel strip approximately 20 inches wide by 0.015-inch thick at a speed of approximately 125 feet per minute. It is believed that future modifications will permit further increases in processing speed, to permit production rates considerably in excess of those originally contemplated in the design of the equipment.

The general arrangement of the production line is shown in Fig. 1. The principal items of equipment, taken in order from the loading end, are as follows:

Uncoiling Stands. Two equipped with long mandrels to be used in running double or single strip, and two with shorter mandrels for running narrow strip only, are provided at the charge end of the line. Uncoilers are equipped with motor-driven expanding mandrels and hydraulic positioning equipment, so that material can be processed from one or two stands while the others are being

loaded, with the operator remaining on one side of the line.

Shears. Uncoiled strip passes through a set of pullup rolls and shears which square the ends for welding.

Welder. This is a rotary wheel type adapted to make a continuous weld or spot weld across the width of the strip. Two parallel welds are made simultaneously, about 4 inches apart, on the lapped ends of adjoining coils.

Looping Pit. The strip passes into the



of COLD-ROLLED STRIP

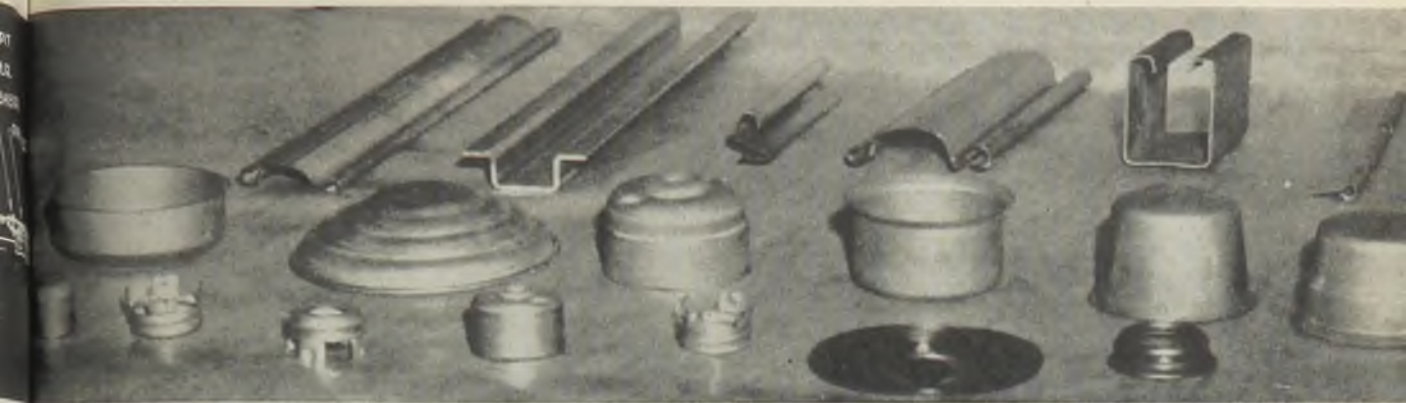


Fig. 1 (Left, opposite page)—Plan view of production line showing sequence of operation

Fig. 2 (Above)—Products made from the galvanized strip showing drastic forming and deep draws possible

Fig. 3 (Lower left)—Discharge end of gas pickling furnace at right; inlet to cooling tower at left; hydrogen chloride combustion unit in background. Connection from gas generator to muffle made through swinging joint to accommodate muffle expansion

Fig. 4 (Lower right)—Galvanizing pot in foreground, cooling tower at right, coated strip passing over elevated drum at left

charge end looping pit through divided feeder pinch rolls, which are either synchronized with the line or speeded up to fill the pit after making a weld. In leaving the looping pit the strip passes over a collar guide roll which holds the lateral alignment.

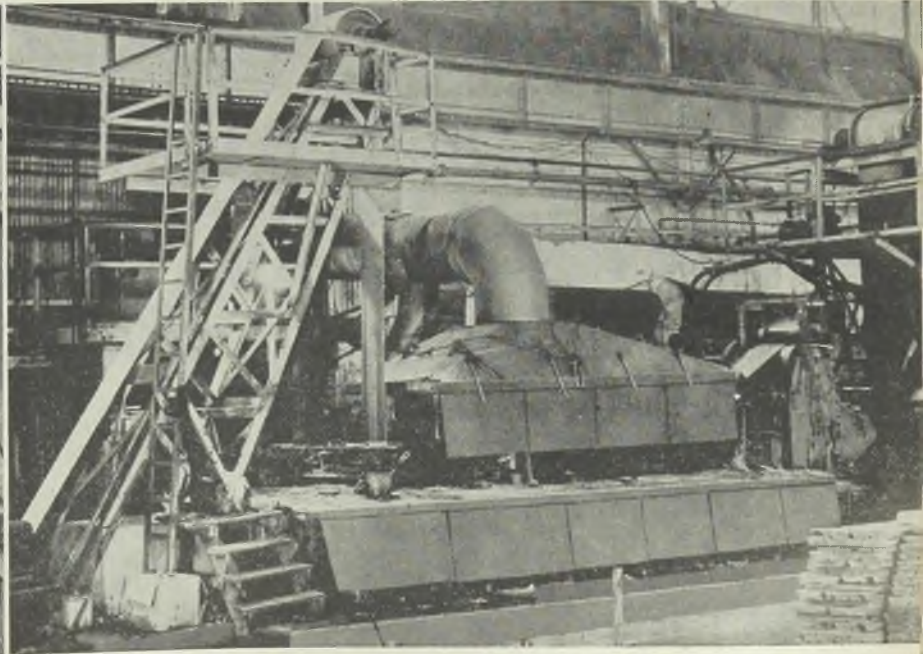
Preheat Furnace. This unit is approximately 50 feet long by 4 feet wide inside, and is heated by direct-firing gas burners. The material is supported in the preheat furnace on heat-resisting alloy rolls which normally turn with the strip, but which continue to rotate at minimum speed if the strip stops. At the discharge end of the preheat furnace is an open space approximately 8 feet long in which the temperature of the strip may be reduced by natural cooling or increased by supplementary heating to secure any desired difference between annealing and pickling temperatures.

Gas Pickling Furnace. This is a heat-

resisting alloy muffle of sectional construction, approximately 30 inches inside width by 50 feet long, externally heated by burners mounted in the furnace enclosure. Strip passing through the muffle is suspended at about the center of the cross section by spaced supporting bars, allowing the pickling gas to act upon both the upper and lower surfaces. Pick-

ling gas enters the muffle at the work discharge end of the furnace, and is withdrawn from the muffle at the work charge end, passing from there to a water scrubbing tower in which chlorides and residual pickling gas are absorbed.

Gas Generators. The pickling gas supplied to the muffle is generated by separate combustion of a natural flue gas



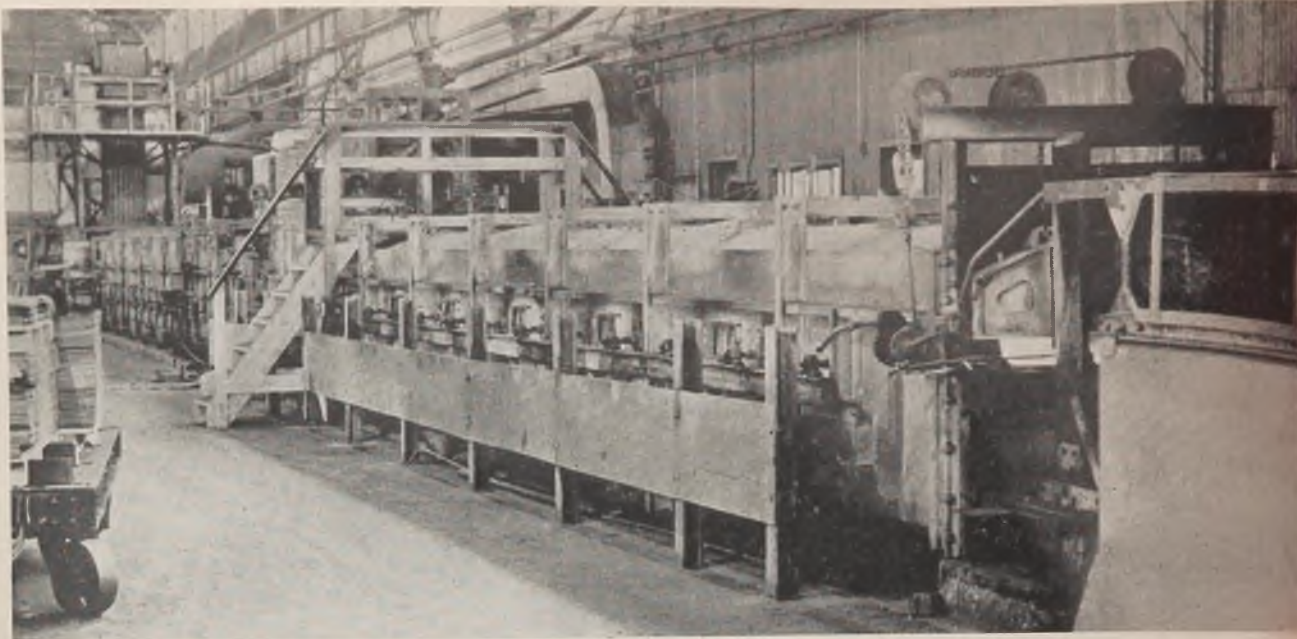


Fig 5—Line beyond charge end looping pit. Preheat furnace in foreground; gas pickling furnace and cooling tower in distance

and of a hydrogen chloride gas which are mixed in proper proportions and fed through the muffle inlet pipe. The pickling gas atmosphere equipment includes automatically proportioning devices which maintain continuity of flow and analysis.

Cooling Tower. Strip leaving the muffle furnace passes through a cooling tower, in which the strip temperature is reduced sufficiently to permit water quenching at the exit end. The tank in which the strip is quenched also serves as the exit seal on the cooling muffle. Any steam generated by quenching is withdrawn through a condensing tower, and is not allowed to flow back to the muffle.

Tension Rolls. After quenching, the wet strip passes through a liquid flux and around a set of tension control rolls which ordinarily serve to produce additional tension in the strip being coated. These rolls are electrically synchronized with the other driven rolls of the line, with provision for accurately controlling differential torque.

Galvanizing Pot. This unit is 15 feet

Fig. 6—Coiling end of line. Looping pits at right, main tension rolls opposite control pulpit



long, 5 feet wide, and 5½ feet deep, and is heated with multiple gas burners. Temperature control is of the automatic proportioning type. Strip may leave the galvanizing bath in a vertical path, either through exit rolls for a spangled finish or through a set of wiping pads for a dull finish. The strip travels vertically until the zinc coating has thoroughly solidified, and then passes over a drum which may be water-cooled.

Line Speed Rolls. Before entering the discharge end looping pit, the strip passes between tension rolls which furnish the primary motive power for moving the strip between the two looping pits. These rolls determine the speed of the line. Other roll drives are synchronized to this speed by a Ward-Leonard control system. The discharge end looping pit provides for forming a loop while changing coils at the discharge end. At other times the strip is kept pulled up out of the pit.

Coilers. The coiling unit consists of three stands equipped with hydraulic strippers. Material to be coiled passes first through a set of back tension rolls,

which govern the coiling tension. Between these rolls and the coiling stands a shear is provided to cut out welds. The shear is laterally movable to cut either one of the two strips when running too wide.

The control of line and tension is centered in a control near the discharge end. Atmosphere proportions and flows are indicated on a panel near the atmosphere generating unit, on which automatic control equipment is also mounted. The furnace temperature control equipment is connected to indicating and recording controllers grouped near the center of the two furnaces.

Houghton's Metallurgy In Revised Edition

Practical Metallurgy for Engineers, 1943 revised edition; cloth, 479 pages, 5½ x 8½ inches; published by E. F. Houghton & Co., Philadelphia, for \$3.

The fourth edition of this work, which followed the earlier volumes on *Steel and Its Treatment*, this book is completely revised to meet needs of the tremendous expansion of the metalworking industry. It reflects the greatly improved standards of measurement and testing. Work of revision has been painstaking, to give a thorough and up to the minute treatment of metallurgy.

While dealing mainly with fundamentals and established practices the volume also covers those expedients which have been tentatively adopted in the war emergency, some of which probably will become standard.

Purpose of the work is a contribution to metalworkers and engineers of the cumulative knowledge of metallurgy gained by the Houghton research staff during its 78 years of existence. Tables of reference data and an index assist the reader in supplementing the text.



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Effect of

Stretching Clad 24S Aluminum

By EARL R. WEIHER
Chief Metallurgist
Consolidated Vultee Aircraft Corp.
Fort Worth, Tex.

IN HEAT TREATING Alclad aluminum alloy for use in aircraft, distortion of the metal takes place as a natural consequence. However, in the process of straightening the material, it also is stretched, thus developing a higher yield strength. At Consolidated Vultee it has been found that by increasing the percentage of stretch beyond that required to straighten the material, the initial loss in strength of structural sections used in compression could be regained with a resultant increase in yield strength.

There are a number of applications in aircraft for stringers in the shape of "hat" or "Z" sections. These sections are made in lengths up to 20 feet. Fig. 4 shows the rolling operation in use for the production of such parts from Alclad 24S-O material. Since the sections are formed from annealed alloy, they must be given a solution heat treatment at 910 to 930 degrees Fahr. in order to obtain optimum physical properties. These sections undergo considerable distortion in the heat-treat operation. Upon removal from the quench, they must be straightened before they may be used.

Under the circumstances of their manufacture they cannot be straightened expediently by re-rolling as in the original forming operation. Therefore, it has been necessary to resort to a stretching operation, as shown in Fig. 3, to effect the straightening. Straightening itself requires stretching these parts only until a small amount of permanent set has been obtained. However, it is the practice of aircraft manufacturers to investigate their processes thoroughly in order to determine the existence of any unforeseen results. In this case it was necessary for engineers to determine definitely the effect of the stretching operation on the physical properties of the material. The process, therefore, was investigated fully by stretching various amounts and then testing the material in tension and compression to determine the effects.

In tests, it was found that while small amounts of permanent set caused some increase in the tensile yield, there also occurred a slight decrease in the compression to determine the effects.

sive yield strength. However, when the material was subjected to a stretch resulting in as much as 3½ per cent permanent set, it regained its original compressive yield while maintaining the increase in tensile yield. As a result of investigations, Convair stretches many of its structural sections to 3½ per cent permanent set, and designates the material so fabricated as 24-RT.

Fig. 1 presents curves showing the physical properties of Alclad 24S-T after stretching various amounts. These curves are typical of an average lot of material but should not be construed as the minimum physical properties obtainable by stretching. However, the stretching operation results in an unusual uniformity of mechanical properties which makes possible the use of such typical properties in design. Structural parts are tested thoroughly prior to use, and the allowable stresses based on a sufficient number of tests to establish the frequency with which these stresses can be expected.

The benefits of stretching are utilized further in a conditioning operation for structural parts which are subsequently artificially aged by a secondary precipitation heat treatment. Stretching causes an acceleration and enhancing of this subsequent aging. This may be seen readily in Fig. 2 which shows the physical properties of Alclad 24S-T, after various amounts of permanent set, both before and after aging for 8 hours at 365 degrees Fahr. These curves again show typical values, not minimum figures.

Alclad 24S-O, when heat treated and aged, is known as Clad 24S-T80 and has minimum physical properties as follows: Tensile yield of 46,000 pounds per square inch, tensile ultimate of 62,000 pounds per square inch, compressive yield of 48,000 pounds per square inch, and elongation of 10 per cent in 2 inches.

Clad 24S-O, when heat treated, stretched 3½ per cent permanent set and aged, is known as Clad 24S-T84 and has minimum physical properties as follows: Tensile yield of 63,000 pounds per square inch, tensile ultimate of 67,000 pounds per square inch, compressive yield of 64,000 pounds per square inch and

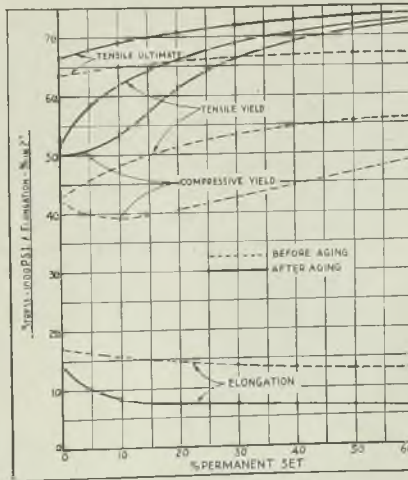
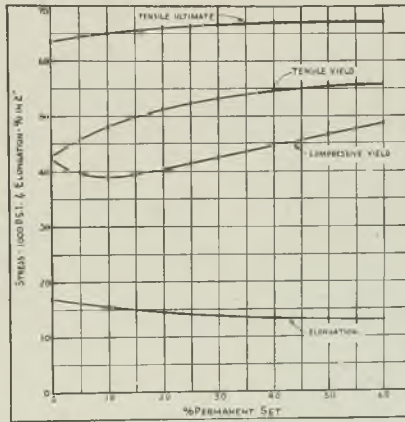


Fig. 1 (Above right)—Physical properties of clad 24S-T after stretching various amounts

Fig. 2 (Right)—Physical properties of clad 24S-T before aging (dotted) and after aging (solid lines) at 365 degrees Fahr. for 8 hours

Fig. 3 (Below)—Stretching clad 24S-T to straighten it after heat treating and to increase its physical properties



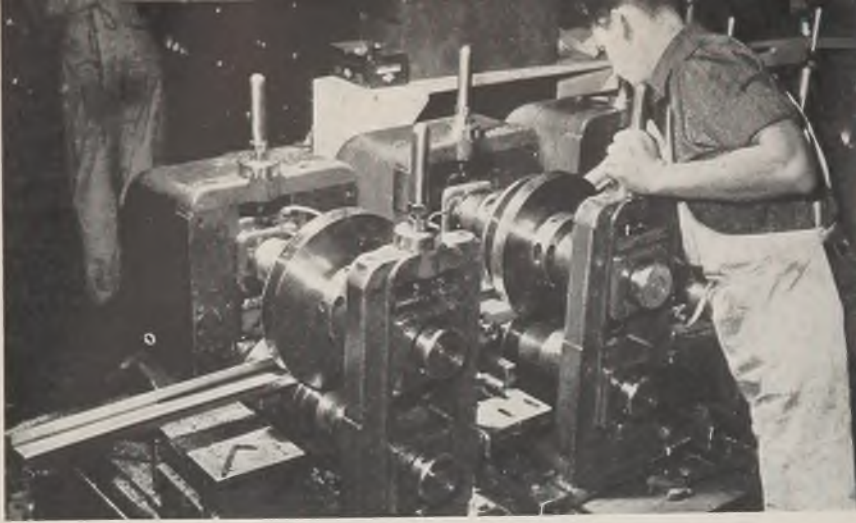


Fig. 4—Rolling clad 24S-O into standard Z-section stringers for use in Liberator bombers and transports. Lengths up to 20 feet are handled

elongation of 6 per cent in 2 inches.

The stretching operation is limited only by the available equipment. While Consolidated Vultec uses the operation only on "hat" or "Z" sections in long lengths, it may be used on strip stock and other shapes provided they lend themselves to deformation in one direction. For special applications, stretching has been applied to sheet material and parts having different shapes from the aforementioned with completely consistent and satisfactory results.

A number of points pertinent to the stretching operation should be made clear:

—An allowance for springback of $\frac{1}{2}$ per cent must be made in stretching. Thus if a section is stretched $3\frac{1}{2}$ per cent under load, the total deformation upon removal of the load will amount to only 3 per cent. While this is only approximate, it will suffice to give satisfactory results.

—When processing to the Clad 24S-T84 condition, the stretch must be controlled to $3\frac{1}{2}$ per cent plus 0.5 per cent

minus 0.0 per cent permanent set.

—In stretching to straighten only, the permanent set must be at least 3 per cent if the original compressive yield is to be realized.

—Stretching causes a slight decrease in elongation.

—Stretching and aging causes a considerable decrease in elongation.

—The physical properties cited above were obtained from material stretched with the grain and tested parallel to the direction of stretching. Material tested perpendicular to the direction of stretching will display only the properties of the original unstretched material unless it is aged for 8 hours at 365 degrees. If this operation is used, the stretched material will have the properties of Clad 24S-T84 regardless of whether it is tested parallel or perpendicular to the direction of stretching. The above criterion applies identically to material that is stretched perpendicular to the direction of the grain.

Single and Double Shear Data on High-Nickel Alloys from Recent Tests

GOOD shear strength is a requisite for bolts, rivets, pinions, taper pins or keys. This property can be measured by test or estimated from the tensile strength of the material. However, if actual tests are to be made, methods of producing single and double shear results in high-nickel alloys are recommended by the International Nickel Co.'s *Process Industries Quarterly*, with the following distinctions:

Action of pulling apart a single-lap, riveted joint involves single shear. Where there is a double-lap riveted joint, double shear is involved. For practical purposes, double shear strength is twice that of the single, the amount of energy being supplied to shear a unit volume of metal increasing as tensile strength of the material being deformed increases.

Any convenient jig which will hold securely one end of the specimen will do for single shear tests. The cutter, rectangular tool-steel blade fastened to the movable head of the tensile machine, is pressed vertically upon the protruding end of the specimen. Clearance between plate and cutter should be small, for example, 0.005-inch. Beam of tensile machine is balanced so as to determine the load at fracture. Assuming the load required to make a single shear cut in a $\frac{1}{4}$ x 1-inch bar (area 0.25 square inch) is approximately 12,300 pounds per square inch, the corresponding shear strength in single shear

is the latter figure divided by the area, or 49,200 pounds per square inch.

In tests for double shear, the test block should have a longitudinal groove and two cover plates which, when screwed down, hold the specimen at each end but leave the center portion athwart the groove exposed to the cutter blade. Here, also, clearance is close. As in the other test, assembly is placed on the table of a tensile machine and submitted to action of the cutter. Again

the beam is balanced to show load.

For estimating purposes, assume a unit load of 24,600 pounds is required to make the double shear cuts in the specimen. The area sheared (two sides) equals 0.50 square inch. The shear strength of the material in double shear then equals the unit load divided by the area, or 49,200 pounds per square inch.

Table below gives the double shear strength of five Inco nickel alloys, each having different degrees of strength and hardness. It will be noted that values for shearing strengths are 52 to 77 per cent of ultimate tensile strengths and these are comparable to similar ratios for mild and alloy steels, which range from about 60 to 80 per cent.

Shear Strength of High-Nickel Alloys

Material	Condition	Shear Strength psi. ^a	Tensile Strength psi.	Hardness Rockwell	Ratio Shear
					Tensile Strength
Monel	Soft	49,200	69,800	61B	0.7
	Half-hard	54,700	76,800	89B	0.71
	Hard	65,200	116,100	100B	0.56
Nickel	Soft	52,300	68,000	46B	0.77
	Half-hard	57,550	78,800	89B	0.73
	Hard	75,300	120,500	100B	0.63
Inconel	Soft	60,800	85,000	71B	0.71
	Half-hard	66,250	98,800	98B	0.67
	Hard	82,400	152,200	31C	0.54
"K" Monel	Soft	65,300	97,500	1C	0.67
	Soft, age-hardened	96,475	147,200	29C	0.65
	Half-hard	71,000	122,000	25C	0.58
	Half-hard, age-hardened	98,750	155,600	31C	0.64
	Full-hard	89,500	151,500	33C	0.59
	Full-hard, age-hardened	98,450	168,500	37C	0.58
"Z" Nickel	Soft	67,500	105,000	15C	0.64
	Soft, age-hardened	116,000	184,000	40C	0.63
	Half-hard	89,000	160,000	30C	0.55
	Half-hard, age-hardened	104,000	198,500	41C	0.52
	Full-hard	100,000	192,000	37C	0.5
	Full-hard, age-hardened	111,000	211,000	45C	0.53

^aTaken in double shear.

Tests conducted by The Stevens Institute of Technology, Hoboken, N. J.

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Since its modest beginning in 1900, the growth of The Youngstown Sheet and Tube Company has been stimulated by flexibility in management . . . a flexibility conceivable only under Free Enterprise. Constant alertness to the nation's steel needs and exercise of sound judgment in equipping promptly to supply those needs built Youngstown from a \$600,000 start to its present size, with assets of \$260,000,000.

In its infancy, the company quickly sensed the growing importance of steel pipe--and prepared to serve exceptionally well such major markets as oil, gas, power construction and electric conduit. In these four decades likewise came the automobile, electric refrigerator, range, washer, and other mass-produced items of fabricated steel...made possible by mass production of steel sheets, strip, bars and other related products. In these advances, Youngstown has been at the forefront--striving always to provide more modern facilities, and up-to-date methods -- to make better steel.

Corollary to this growth -- *all important* now in time of national emergency -- the company's success enabled it to have up-to-date plants and equipment, well trained and experienced employees, and alert, courageous and resourceful management. Pearl Harbor brought no period of indecision or delay. The coming need for steel for war had been anticipated. Immediately, Youngstown could place its facilities, materials and manpower squarely behind the war effort.

America can thank Free Enterprise for its industrial strength. Only by keeping enterprise free can this nation have industries that stay healthy and vigorous, able to anticipate peacetime trends and at the same time capable of springing to its defense in hours of desperate need.

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INDUSTRIAL EQUIPMENT

Inspection Gage

A new model 1141 thread-lead inspection gage is announced by Federal Products Corp., 1144 Eddy street, Providence 1. The gage is adjustable both for thread lead and diameter. The sensitive



contact point is free to float laterally with the axis of the thread and so set itself positively between the sides of the thread itself. This contact is so mounted that it transfers its motion to the dial indicator through a very sensitive mechanism, thus insuring the accuracy of the inspection operation. The gage is set with a master.

The dial indicator is graduated to read in 0.0001-inch and the capacity of the gage will take care of threads up to 1½ inches in diameter, a maximum distance between points of 2 11/16 inches and a minimum distance of 3/16-inch. With a special attachment a minimum distance of 0.156-inch can be checked. This gage makes a satisfactory complement to the company's 45B type of thread pitch diameter gages for checking pitch diameters.

Friction Clutch

The new rolling-grip friction clutch, introduced by Dodge Mfg. Corp., Mishawaka, Ind., is a compact, rugged and easy to operate disk clutch for use where power requirements are relatively small. Its field of application includes packaging machinery, floor scrubbing, paper handling and many other types of equipment.

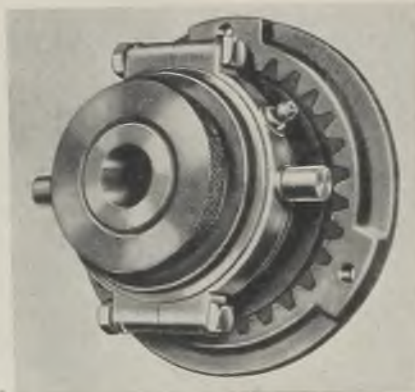
There are no toggles in the clutch, but instead a number of highly polished hardened steel balls are forced into a V-shaped groove by a hardened steel cam. Forcing the balls toward the center of the shaft widens the V-shaped groove. This application of the basic principle of the inclined plane or wedge produces a heavy power transmitting pressure on the friction surface. There are no links, pins, cot-

ters or other highly stressed mechanical parts to break or wear out.

Adjustment is controlled by a threaded collar locked in place by two husky setscrews, and is simple. With the clutch engaged the two setscrews are loosened and the adjusting nut is tightened up as firmly as possible by hand. The clutch is then disengaged and the adjusting nut is tightened a small fraction of a turn, the correct amount being determined by experience. The setscrews are then tightened to lock the adjustment.

The clutch may be adapted to any required operating condition. It may be provided with a gear tooth friction disk and drive ring or with bolted friction disk, either type suitable for operation under dry conditions. If required to operate in oil, the asbestos fiber friction disks may be replaced with a number of thin metal disks. The cam and thrust ring contours may be altered to change the clutch characteristics; for example, if the clutch is not to stay engaged but is to be engaged and disengaged constantly, the locking angle can be removed from the cam.

There are no exposed operating parts, and smoothly finished die castings are used for the slip ring and drive ring. Other parts are accurately made and hardened where necessary for long life. The



clutch is made with a 3½-inch diameter disk, rated at ½-horsepower at 100 revolutions per minute, or with a 4½-inch diameter disk, rated at 1 horsepower at 100 revolutions per minute.

Fire Extinguisher

Wheeled fire extinguisher, model 100, with a nonconducting plastic nozzle shield, developed by Walter Kidde & Co. Inc., Belleville, N. J., combines the mobility of portable units with the fire-fighting power of 100 pounds of highly compressed carbon dioxide. Designed to protect larger hazards than hand portable extinguishers can handle, these units provide fast action, heavy duty extinguishing.

The shielded nozzle is equipped with a long handle-grip and a shut-off valve which permits conservation of the gas during changes of fire-fighting position.

The model 100 is Underwriters' Laboratory approved, bearing their B and C

rating as suitable for all flammable liquid and electrical fires. They protect special oil and electrical hazards in power plants as well as oil pumping stations, garages and large storage spaces.

Dial Indicator Snap Gage

The improved line of dial indicator adjustable snap gages made by Sheffield Corp., Dayton, O., is available in twelve models, covering a range up to 12 inches, with larger sizes supplied to customers' specifications. One important application of dial indicator snap gages is checking work as it is being brought down to size. Being portable, an operator can make a comparator type of check without removing work from the machine. It also is used frequently for inspecting a finished part at the bench and for classifying parts of such size or weight as cannot be checked with other types of comparators.

This dial indicator snap gage has a large, shock-proof dial indicator 2¼ inches in diameter, graduated in 0.0001-inch. It is of the balanced type, plus and minus 0.005-inch and range per revolution of the hand is 0.010-inch. When properly set the hand will make 1¼-inch revolution in either direction, the total range of the indicator being 0.025-inch.

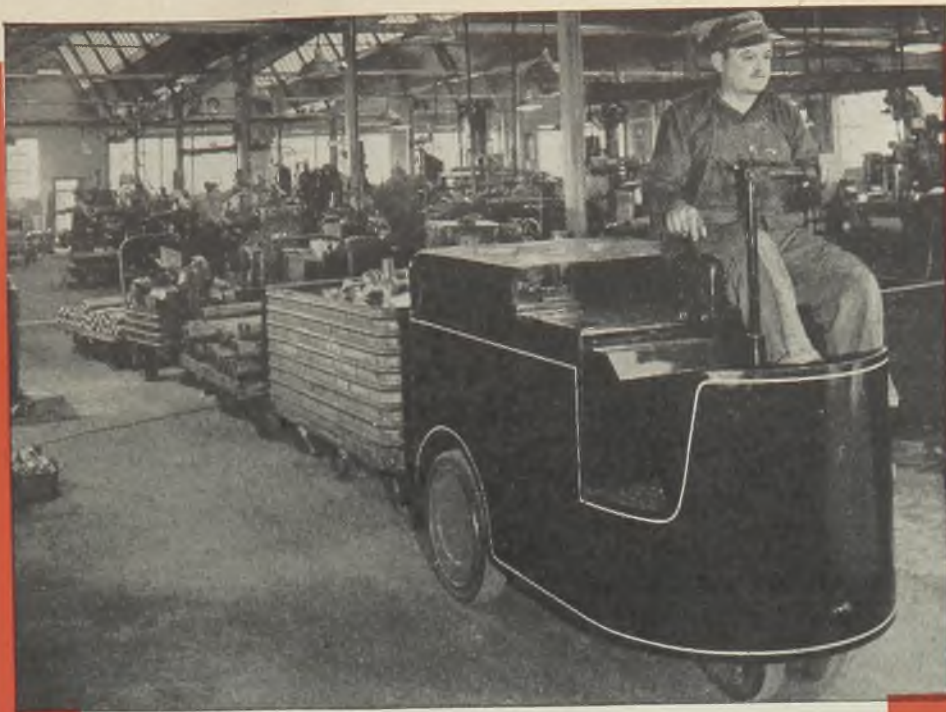
The anvils are ground and lapped to a close gagemaker's tolerance and the movable anvil is spring-urged and operates independently of the indicator spindle with a constant pressure further assuring the accuracy of the gage. The bearing is sufficiently long to assure continuous alignment.

The gage frame is light in weight but is adequately rigid and free from stresses. The handhold has been formed at the proper point in the frame to assure a comfortable grip and reduce fatigue to a minimum. Serrated, plastic grips on each side of the gage frame also facilitate its use and insulate the gage against temperature of the operator's hands for more accurate performance.

In operation, the normal position of



the indicator is at the lower end of the gage frame, permitting the weight to be carried on the stationary anvil instead of the gaging anvil. This results in a check



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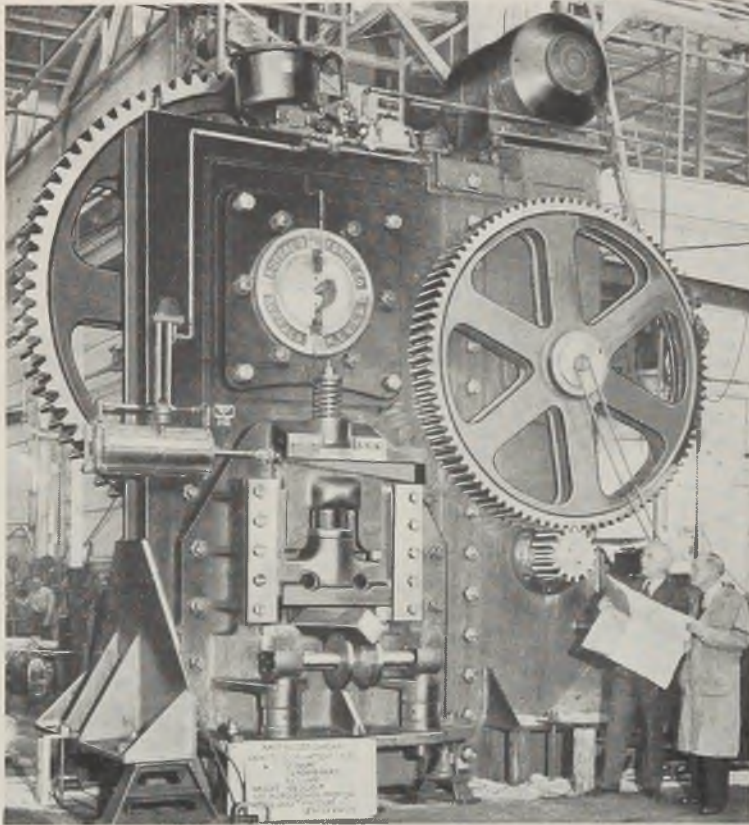
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"Buffalo" BILLET SHEARS

of maximum accuracy. Where the gage cannot be used in a normal position because of interference, it can be reversed with the indicator on top without impairing the accuracy of the reading. The operator then adjusts the position of the indicator radially to meet this requirement and exerts a slight upward pressure on the gage so as to locate from the stationary anvil, leaving the movable anvil free from weight.

The adjustable anvil has a maximum range of 1 inch, enabling the gage to be used on different size work parts. The backstop is formed with a cylindrical radius permitting the gage to be presented to the work at angles other than 90 degrees to the axis of the part without impairing the accuracy of the reading. The backstop is adjustable to a varied degree on each size gage.

Torque Wrench

A lightweight wrench for work on light assemblies and delicate products requiring accurate, low torque readings is announced by Apco Mossberg Co., 118 Lamb street, Attleboro, Mass. The new torque wrench is available in four sizes to measure tension in ranges of 0 to 100 inch-ounces and 0 to 30, 0 to 50 or 0 to 100 inch-pounds.

Designed to give unusually accurate torque readings, this wrench measures



torque by the spread between two of several bars in the shank, giving a direct reading on a sturdy brass scale near the handle. In work with soft, light metals or plastics which can be damaged from too much tension, the proper degree of tightening can be obtained. The wrench is being used for accurate assembly work on radios, magnetos, carburetors and fuel lines in aircraft.

Equally accurate with left or right-hand threads, the torque wrench fits standard socket and can be furnished in any square drive required. It has an aluminum handle and weighs 6 ounces.

Powder Metallurgy Press

The Hydraulic Press Mfg. Co., Mount Gilead, O., recently designed and built the largest hydraulic press ever constructed for briquetting powdered carbides of tungsten, titanium or tantalum for carbide cutting tools, dies and inspection gages. It also is suited to other powdered metal forming which requires the application of high pressure from two different points.

The press illustrated will exert a 1500-ton downward acting force and a 1000-ton horizontal acting force. It is completely self-contained equipped with two radial hydraulic pumps which generate the operating pressure. These are connected directly through flexible couplings to a 30-horsepower double-end shaft electric motor. Fastraverse prefill valves provide direct communication be-

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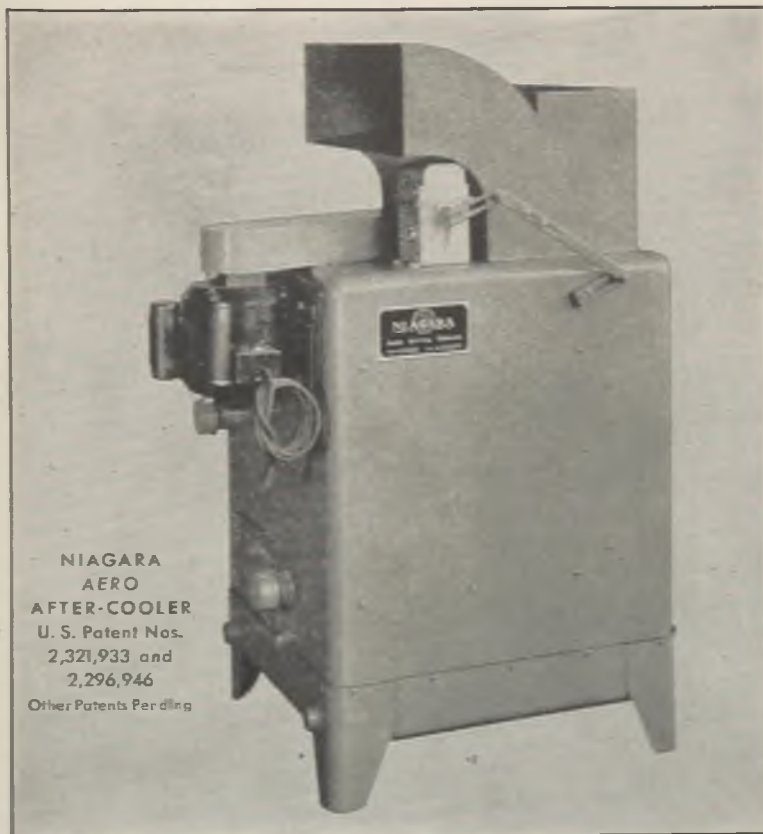
Mechanical, Hydraulic, or Electric Drive

THE WHITCOMB LOCOMOTIVE CO.

ROCHELLE, ILLINOIS

SUBSIDIARY OF THE BALDWIN LOCOMOTIVE WORKS

Keeping Water and Oil Out of COMPRESSED AIR



NIAGARA
AERO
AFTER-COOLER
U. S. Patent Nos.
2,321,933 and
2,296,946
Other Patents Pending

● Controlled temperature cooling with the NIAGARA AERO AFTER-COOLER has been the answer to excess water and oil in compressed air lines, preventing spoilage of material when compressed air is used in process and preventing damage to pneumatic tools. No refrigeration is required.

The NIAGARA AERO AFTER-COOLER both condenses the moisture before it gets into the lines and also provides jacket water of the proper temperature to prevent condensation in the compressor, washing out the lubricating oil.

It helps produce compressed air containing only $\frac{1}{2}$ to $\frac{3}{4}$ as much moisture as air cooled by conventional equipment. At the same time it saves 95% of the cost of cooling water, pays for itself in a short time. Write for complete information.

NIAGARA BLOWER COMPANY

"25 Years of Service in Air Engineering"

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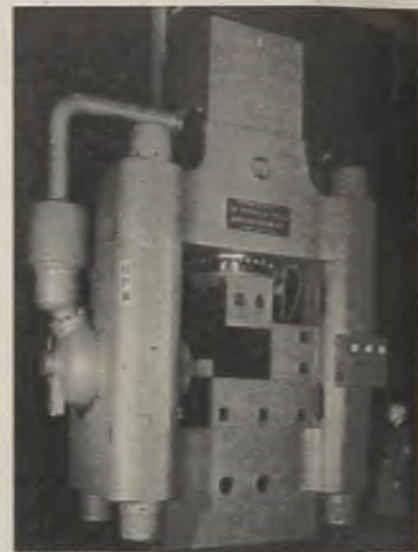
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**INDUSTRIAL COOLING • HEATING • DRYING
HUMIDIFYING • AIR ENGINEERING EQUIPMENT**

tween the overhead oil tank and the two pressure cylinders. As the press rams advance, the cylinders are filled with oil by gravity, thus eliminating the need for large capacity hydraulic pumps.

As soon as the press rams meet resistance, pump pressure quickly builds up on the work. The press embodies a



standard hydraulic operating system permitting control over all press movements, both as to speed and pressure. Press operation is automatic, with electric pushbutton starting and automatic predetermined pressure reversal.

The press frame consists of a head and bed spaced by a pair of uprights. Two preloaded tie rods passing through each upright lock the assembly together as one unit. The uprights are mortised into the head and bed to maintain accurate alignment and are designed to carry the full load of the 1000-ton side force. The vertical ram has a maximum travel of 18 inches while the horizontal ram stroke is 6 inches.

Gear Chuck

A revolutionary gear chuck designed to give greater accuracy to holes bored or ground in gears by its unique gripping method, is announced by LeMaire Tool & Mfg. Co., Dearborn, Mich. Called the Match-It gear chuck, its construction is based on the fundamental principle of the gear itself. Just as the teeth of gears are made to contact those of the mating gears—across the tooth face on a line which is in the plane of action—so do the grippers of the chuck follow this same principle in its design and construction.

The force holding the gear is in the same direction as that normally exerted toward the mating gears. Since pressure is always through the cross section of the tooth and not through the center of gear, distortion on delicate gears will not occur as easily as it will in chucking across the diameter. The chuck is designed to accommodate both helical and