

"WE CAN JUNK IT OR RUN IT"

HOW THE HIGH-FLYING SIX COMPANIES "BOYS" OF THE WEST SALVAGED JOSHUA HENDY

*They can build them out in Egypt
And repair them in Japan —
The reciprocating engine
Is the greatest friend of man.*

AFTER October, when the keels go down for the Maritime Commission's new class of Victory ships, the U.S. logistical position on the oceans should begin to make sense. Thereafter our dependence upon the eleven-knot Liberty ship, known to contemptuous seamen as "the sitting duck," will progressively lessen. The Victory will haul as much cargo as the Liberty, and at sixteen knots will haul it almost half again as fast. These extra knots should help considerably to end the easy hunting of the submarine packs. And by quickening the turnaround they will compound the ton-miles.

Five hundred Victory ships are to be delivered in 1944. Way by way, yard by yard, they will oust the Liberty until,

by January, 1945, they will have supplanted it entirely. The change does not arise from any abrupt shift in maritime policy. It simply means that by the end of the second year of war, Rear Admiral Howard L. Vickery, production boss of the Maritime Commission, will have finally lined up the turbine capacity he needed for a fleet of sixteen-knotters. Vickery never wanted the eleven-knot ship. But he was stuck with the Liberty until he could break away from the triple-expansion, steam reciprocating engine.

Even a wiper, standing his first watch at sea and indulging in a landlubber's tentative surmises, would guess without being told that the reciprocating engine in the Liberty had no business in the war. Two stories high, weighing 137 tons, it produces only 2,500 horsepower. Practically the identical engine was used in the Hog Islanders in the last war. Until the twenties the "up-and-downer" was the prime mover on the seven seas. But with the development of the turbine and the Diesel its

ONE EVERY TWENTY-ONE HOURS

Only a thoughtful few would list the reciprocating engine (left, in the last stage of the final assembly)

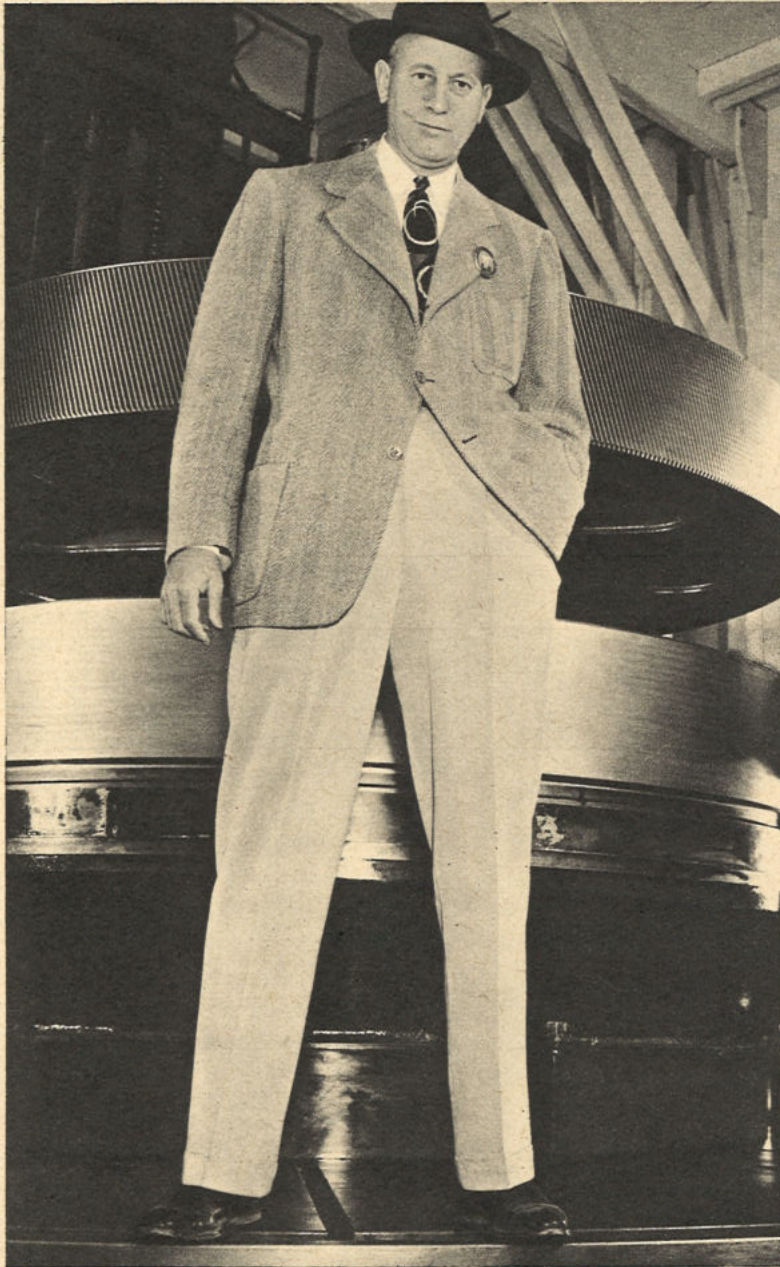
as one of the indispensable weapons of the war. And yet without it the British and ourselves might have been all but driven off the seas. It was the one engine that could be assembled as fast as the hull.

Joshua Hendy, Sunnyvale, California, was seven months building its first. Now it produces thirty-five a month, and alone supplies a third of all Liberty ships. Shown above is the crankshaft assembly.

prestige declined. It was hard on fuel—and slow. Only a few were built in this country between the wars. About the only good thing that could be said for the engine was that it could be built fast. And this, in the crisis, was enough.

The company that has built them faster than they have ever been built before is a California firm called the Joshua Hendy Iron Works, located on the peninsula below San Francisco, in the pleasant farming community of Sunnyvale. Its history goes back to the California Gold Rush. The company has supplied machinery to the western mining industry ever since there was such an industry. One of the old-timers in the shop helped to grind the shaft for the U.S.S. *Oregon*, before the Spanish-American War. Today Hendy is one of the world's biggest producers of seagoing engines.

The reciprocating engine was not exactly a stranger to Hendy. It built eleven for the government in the last war, and took twenty-five months to finish them. This war it is pushing them out the back door at the rate of thirty-five a month—or one every twenty-one hours. When the last of the orders for 540-odd engines are worked off, probably in October, the firm of Joshua Hendy alone will have provided the propulsion equipment for



one-third of the entire Liberty fleet of around 1,600 vessels.

In making this astonishing production record with the old "up-and-downer," Hendy did not delude itself into thinking that the good old days were back to stay. It is shifting as fast as it can to the turbine program. But the men who own and run the company would be ingrates if they did not acknowledge their debt to the old EC-2 engine they will soon cease to make. It isn't often that a company, bankrupt and down to sixty employees, can reestablish itself in business, and in two and a half years reach a backlog of \$125 million in orders, chiefly on the strength of a technologically extinct product. Or that a salesman is able to make a big killing by buying out a customer determined to sue him.

THE ORIGINAL DEAL

One of these men, it may be taken for granted, is Henry J. Kaiser. Mr. Kaiser is sometimes prone to credit himself with the rehabilitation of Hendy and to count it in with the other provinces of the "Kaiser Empire." This, however, is a harmless exaggeration that perhaps springs from an honest confusion over the contents of his ever expanding portfolio. But slips of this sort have made Hendy executives touchy about their sovereignty. A careless reference to Hendy as a "Kaiser company" is met with the same chill disapproval that settles over the stranger who in the presence of Canadians makes the error of describing their country as a British colony.

Mr. Kaiser does own 7.5 per cent of Hendy. But his little piece is swallowed up in the aggregate control exercised by the famous combination of western contractors, originally called the Six Companies, who teamed together twelve years ago to build Boulder Dam. Now grown rich and powerful and partly industrialized, working sometimes alone but usually in combination, they operate shipyards, magnesium and steel plants, and other projects too numerous to mention. Hendy is one of their side shows. It is a rather special one, however, in that the Group permitted the biggest single share of stock to remain in the possession of an outsider—Charles E. Moore, Hendy's President.

At forty-nine Charlie Moore is an impressive example of what the average Native Son doubtless longs to be. Six feet, four inches tall, he towers over most gatherings; the gulf between him and ordinary men is exaggerated by his taste for loose-fitting, bright blue and green suits, with hats to match, which make him look twice as big. He is blond, with piercing blue eyes, a bone-crushing handclasp, and the jaunty, breezy manner of a man perpetually engaged in doing what he likes. "I like people," says Charlie Moore, "and I'm as much at home in Washington and New York as I am in San Francisco."

A crack machine-tool man, Moore served in OPM's Tool Section. In 1941 he was sent to England with the Harriman

CHARLIE MOORE OF SUNNYVALE

Charles E. Moore, President and biggest stockholder (35 per cent) of Hendy, is six-feet-four. A former boomer machinist turned salesman and proprietor, he is of the "burning-daylight" tradition, tireless, full of epic schemes. "We in the West are not worried about a postwar depression," he says. "Nothing can stop this area now. The West is on its way." On the right is shown an assembly of turbine reduction gears. The precision that Hendy puts into them may be judged from the fact that the gear hobber at Mr. Moore's back takes seventeen days to cut a set of gears.

mission to study British production methods and help work up schemes for the more economical use of the available supply of machine tools. Charlie Moore describes his mission as perhaps the only instance in recent American diplomatic history in which an envoy returned from a lend-lease country with a plus balance. The object of the trip was to relieve the demands on the American machine-tool industry by inducing the British to turn back our own rearmament-program tools that had earlier been allocated to them. Moore not only succeeded in this; he talked the British into selling him a \$224,000 Craven planer and a \$150,000 gear hobber, beautiful custom-made tools that simply were not to be had on this side of the ocean. These he triumphantly shipped back to Sunnyvale. He also brought back a letter from Lord Beaverbrook, which says in part: "It is very rare for the judge not merely to acquit the prisoner but also to give him a new outlook on life. That is what you have done."

Charlie Moore came the hard way by the jauntiness that he so easily wears. His schooling stopped in the eighth grade when he went to work for the Santa Fe as an apprentice machinist. "After I learned my trade," he says, "I became a 'boomer'—the machinists' name for a drifter. I was about

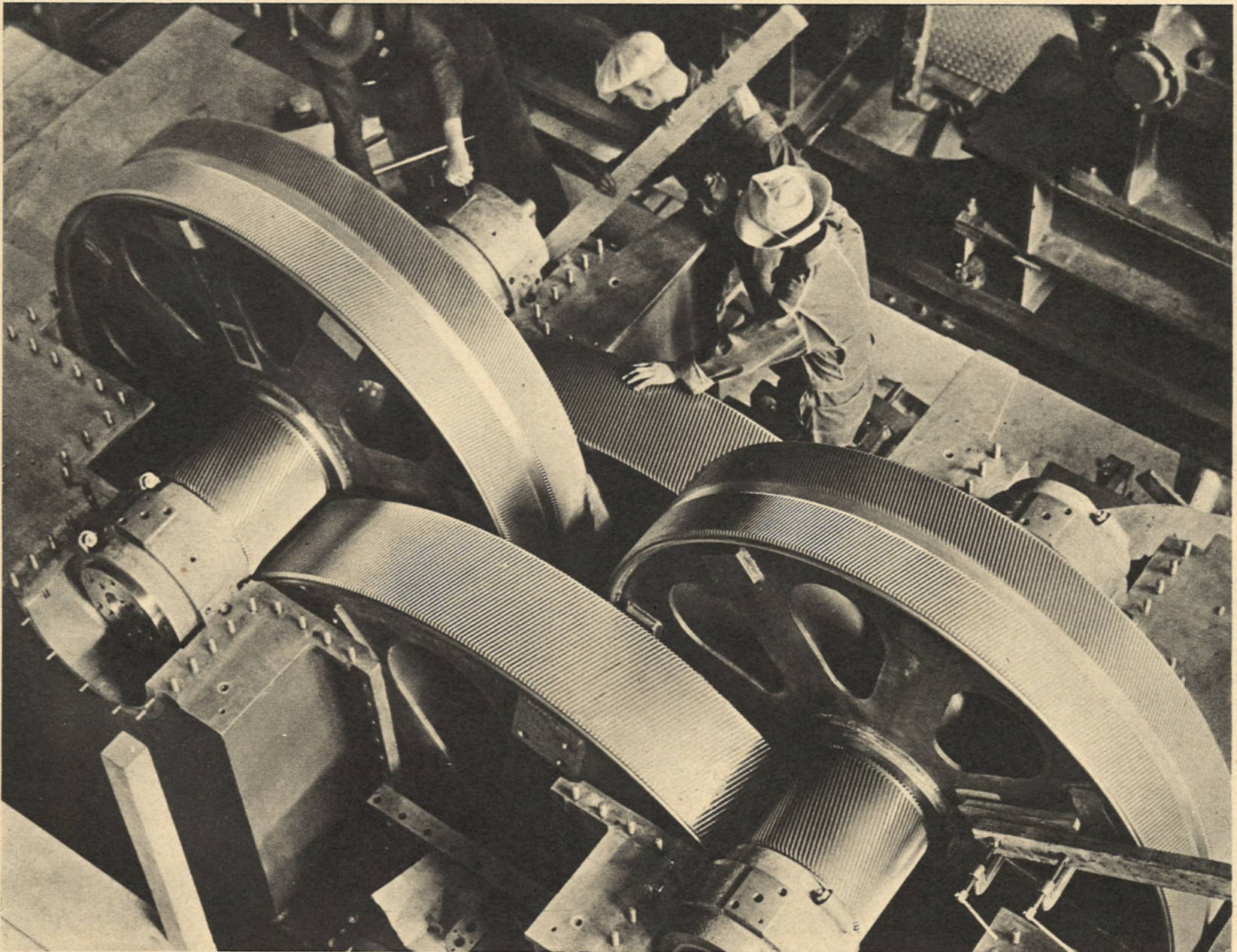
WAR, PEACE, AND THE SIX COMPANIES

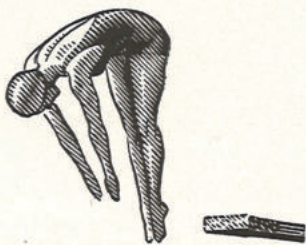
This article on Joshua Hendy, engine builder, is a prelude to a two-part series, starting next month, on that prodigious confederation of western earth movers, river benders, and mountain levelers who call themselves the Six Companies. Henry J. Kaiser is one. They are in shipyards, aircraft, magnesium, cement, oil. They helped raise the sunken ships of Pearl Harbor and built the airports that saved Alaska. And they are positive the postwar world will be their oyster.

eighteen then, and for several years I boomed all over this country and Mexico."

Back in Los Angeles, where he had started, Charlie Moore at twenty-one was ready to settle down. He got a job with a machine-tool company and presently aspired to be a salesman. His boss, with brutal frankness, told Charlie he didn't have the necessary education. "I was horribly insulted," he recalls, "but then I calmed down and realized that he was right." Although sensitive about his age and height, he entered high school and by his own account finished four years' work in one.

[Continued on page 170]





VACATIONLAND and PROFITLAND



IDEAL for vacations? Maine is that, of course—and a great deal more! For Maine offers *five big, basic advantages* that make Maine a profitable location for industrial plants:

- 1 Power.** Power facilities in the Pine Tree State are abundant.
- 2 Natural Resources.** Particularly in hard and soft woods, Maine is blessed with ample resources.
- 3 Skilled Labor.** Maine labor is friendly to management, industrious, loyal and famous for "down-East ingenuity."
- 4 Transportation.** Maine industries enjoy fast transportation service, are overnight from major Eastern markets.
- 5 Low Taxes.** Maine's favorable tax situation invites investigation by profit-minded business men.

May we give you some meaty details? Write for your free copy of "INDUSTRIAL MAINE"—it's full of significant Maine facts! Address:

Maine Development Commission, Room 7-F, State House, Augusta, Maine.



WRITE FOR THIS FREE BOOK



Joshua Hendy

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The first war with Germany interrupted this meteoric progress before he reached the college curriculum. He enlisted the day Congress declared war.

After being mustered out a lieutenant in the Coast Artillery, Charlie Moore returned to his old job. He was presently promoted to salesman and in 1927 had the satisfaction of buying for \$175,000 the company that told him he didn't know enough to be a salesman. The final touch he supplied by renaming the company after himself.

The Moore Machinery Co., in its owner's phrase, is "an institution out here on the Coast." He mentions with pride that U.S. Steel, Bethlehem, and the other big eastern corporations have long bought through him the machinery for their western divisions. Moore himself became the top machinery salesman on the West Coast. This success he ascribes to "a policy of never selling a machine that we wouldn't take back if the customer didn't like it."

One of Moore's stockholders was Alan MacDonald of MacDonald & Kahn, a successful construction firm in San Francisco. It became one of the Six Companies, and through MacDonald, now dead, Charlie Moore came to know his partner Felix Kahn, together with W. A. "Dad" Bechtel, Charlie Shea, Henry Kaiser, and the other head men of that hard-driving team. He managed to place machinery at Boulder Dam but he never got beyond the outer fringes of the group until the Hendy deal in November, 1940.

According to the pat and romanticized account, Joshua Hendy was bought in a fifteen-minute trade with the idea of converting the plant to the production of marine engines. Actually the deal hung fire for ten days and the motives were mixed. Charlie Moore knew he could buy Hendy cheap, and from his inside knowledge of the secondhand machine-tool market he figured to turn a quick profit by washing out the corporation and selling off the machinery. The operation further appealed to him as a painless way of heading off a lawsuit he did not wish to fight.

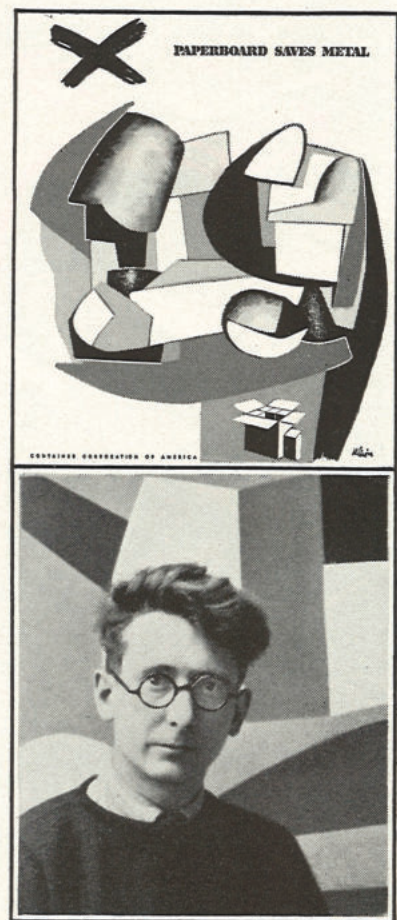
Hendy was one of Moore's customers and the threatened suit concerned the alleged failure of machinery he had sold the company. The Hendy crowd, spurning Moore's customary money-back offer, insisted upon being reimbursed as well for losses that they blamed on his equipment. Moore went out to Sunnyvale hoping to talk them into a more reasonable mood. And it was while walking through the old red wooden buildings that the idea came to him to bid in the company for the breakup value of its fine lathes and milling machines, not to mention the well-equipped foundry. Hendy, as he was well aware, had been taken over by the Bank of California; the almost deserted shops told of the slow death overtaking it.

In San Francisco he telephoned Felix Kahn. A saturnine and small man, with a twisted smile that plays a beam of light across a bleak, dark visage, Kahn is one of the famous brothers of whom the late Albert Kahn, the great industrial engineer, was the most famous. For a long time, until Henry Kaiser became an empire maker on his own hook, Felix Kahn was the one who always figured the jobs for the Six Companies Group. As Kahn recalls, the telephone conversation went like this:

Moore: "Hello, Felix. You don't know it yet, but you're going into a new business."

Kahn: "Listen, Charlie, I've got enough businesses now."

Moore: "It's a first-class proposition. We can junk it or run it and make out fine. Let's have lunch."



THIS advertisement was designed by Jean Helion, noted French-American abstract painter, to point out that paperboard packaging saves critical materials. Since it constitutes a very personal form of expression, we have obtained the artist's permission to quote from a letter describing this interpretation:—

I count mostly on the power of "surprising" in such an abstract drawing, and on its provoking the question:

"What in the world is this?"

—"PAPERBOARD SAVES METAL."

"How?"

—"... in packaging."

"By whom?"

—"CONTAINER CORPORATION OF AMERICA."

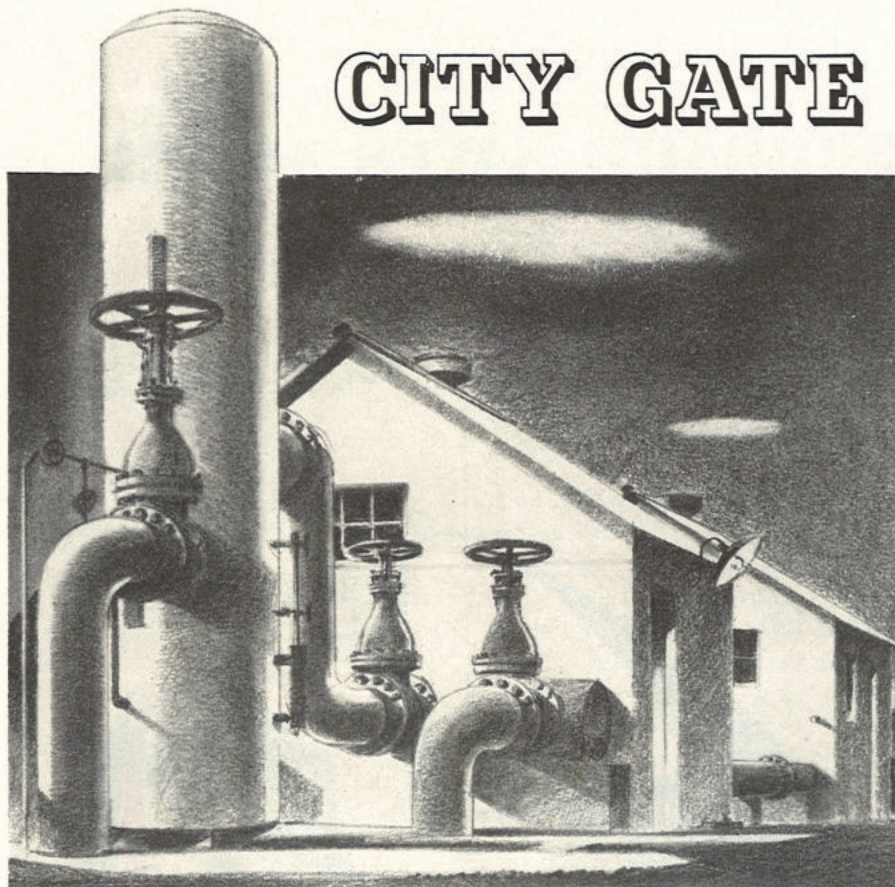
The drawing acts as an underline to the only 3 elements that are not fully abstract, that is to say that the public will recognize at once the 2 lines of text, and the piece of drawing. The smaller "Container Corporation of America" is, the more attention it should attract, because the puzzled reader cannot fail to want to find who is puzzling him so.

The black cross is, in my mind, a negative sign put over the former metal container. I had actually begun my studies with a sketch of a tin can, but the spirit of my composition necessarily eliminated it, and the line of text that I have suggested—PAPERBOARD SAVES METAL—placed just in line with the cross, renders the implication perfectly clear.

Helion

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CITY GATE



... WHERE NATURAL GAS IS ROUTED TO INDUSTRY

IT'S not a particularly imposing sight, this "city gate" on the prairie, outside the busy city. But through it flow millions of cubic feet of natural gas daily, there to be routed to the fires of industry. Here natural gas once more goes through a "scrubbing" process, is measured, and sent on its way at the required pressure.

Thus natural gas that was once hidden away in the depths of the earth has been discovered by the work of the geologist and the driller, has been controlled, processed and transmitted to the industrial areas where it is recognized as industry's best fuel.

Houston Pipe Line Company's ability to serve is well known to countless Texas Gulf Coast industries. It is backed by a dependable supply of natural gas from many Gulf Coast fields, and by an eighteen-year record of unflinching service. Here, after victory is won, will continue an industrial expansion that will be the talk of the nation in the post-war period. For those forward-looking companies who are even now planning for post-war expansion, Houston Pipe Line Company is glad to furnish facts and figures about this region's many raw resources and advantages. Simply address your request to Research Department, Houston Pipe Line Company, Petroleum Building, Houston, Texas.

FOR VICTORY BUY UNITED STATES WAR BONDS

HOUSTON PIPE LINE CO.

Subsidiary of Houston Oil Company of Texas

Wholesalers of
Natural



Joshua Hendy

[Continued from page 170]

Kahn: "All right, all right. But remember I'm not going into a new business."

A few hours later they met at the Palace Hotel, where the Six Companies crowd always lunch. "I gave Felix the picture," Charlie Moore says, "and he started to thaw. 'What do you think we could get for it?' he said, with that old light in his eye. I said we ought to be able to sell the machinery for \$450,000. The difference between that and what we pay for the company should be the profit."

Felix had really thawed. He drove down to Sunnyvale that afternoon. On the way back they stopped, at his suggestion, at the Bank of California. Kahn asked one of the officers point-blank what the bank wanted for Hendy.

"Whatever the book value is," said the banker smoothly. "Somewhere between \$350,000 and \$360,000."

Without waiting for Moore, Kahn said, "We'll take a ten-day option for \$325,000."

Outside in the street Felix's twisted smile lit up his face. "Like I said, Charlie, no new business."

THE FIRST ORDERS

The events surrounding the dying house of Hendy now moved into high gear. A tip from the Hendy sales manager that Navy Ordnance wanted the company to try its hand at torpedo-tube mounts sent the two partners off to Washington. Four days later they were back with \$10 million in Navy contracts and \$1,300,000 for new facilities.

The original idea of junking the plant was forgotten. They took up the option and Kahn decided they ought to have \$175,000 more in working capital. Then, following the custom inaugurated at Boulder Dam, he called up the Six Companies boys and asked each in turn if he wanted a piece of Hendy and how big. This is how Henry Kaiser came in. He put up \$37,500, which gave him his 7.5 per cent. Four others took the same amount, and two took less. Felix cut himself in for 17.5 per cent. This left 35 per cent for Charlie Moore.

Mr. Kaiser has been so busy building ships, learning how to make steel and magnesium, and investigating postwar airplanes and motorcars, that he has visited Hendy only on ceremonial occasions. But before he even saw the plant a casual remark of his, made 3,000 miles away, was to put Hendy in the engine business.

One spring day in 1941 Mr. Kaiser was discussing ships with Admiral Vickery in Washington. The Admiral mentioned his grave concern over the lack of engine capacity for the Liberty program. The famous contractor said, "Look, I've just bought a machinery plant, Admiral, maybe I can help you," and he referred him to Charlie Moore. Vickery grasped at this straw. One reason he was quick to grasp it was the need of immediately setting up on the West Coast an independent engine supply for the new yards.

The first order placed in March was for twelve EC-2 engines. Almost immediately Vickery telephoned from Washington to ask Moore if he could double it. Moore replied: "Sure, but I can tool up just as easily for a hundred."

Moore got an order for 112 and then stopped worrying. Altogether the reciprocating-engine business alone means almost \$60 million in gross sales. He and Vickery had a sharp tussle over price. The Maritime Commission's top price—to a green producer—for this engine was \$113,000. Moore and

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Joshua Hendy

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Kahn argued hard for this but the Admiral finally beat them down to \$108,000.

Now the long calm that had settled over Hendy was violently rent. The new construction that seemed never to stop overflowed into sixty acres, swallowing the pear trees and absorbing the farm hands to work the machines. The new buildings, like the old, are all of wood—huge beams of Oregon pine and Douglas fir that look as if they would last forever. In this setting Charlie Moore the industrialist has found satisfactions and power that had eluded him as a salesman. "It's a sort of disease with us guys out here, building things this way and busting records," he says. "Back East they're used to sitting on a lot of dough and having power. Out here success is like wine that has gone to our heads."

"THE BATTLE JOB"

In addition to the reciprocating-engine program and the original torpedo-tube mounts (the total value of which is secret), Hendy has the following contracts:

100 2,750-horsepower Vickers reciprocating engines for corvettes, a lighter (70 tons) and more efficient unit than the older EC-2 type. Total value: \$10 million.

24 4,000-horsepower Westinghouse-design C-1 turbines. At \$175,000 each this comes to \$4,200,000.

242 300-kilowatt lighting sets, which supply the power for ship's lights, cooking, winches, etc. At \$25,000 each this comes to \$6,050,000.

At the entrance to the administration building fly the honor flags of the Maritime Commission and the Army and Navy. Charlie Moore purrs like one of his own slick machine tools when he talks about production. "We tripled the number of torpedo-tube mounts called for in the Navy contract," he says, "without adding machines or manpower."

For Moore one of the "great moments of my life" was the trial run of the Liberty ship *James Otis* in February, 1942. The *James Otis* was driven by the first Hendy EC-2 and down in the hot, sweet-smelling oily reek of the engine room, eyeing the revolution counter and hearing the swish of the connecting rods, Charlie felt the landlubber's pride: "When it's neither so tight you can smell it nor so loose you can hear it, then you can bet a ball of wax it's a damn fine engine."

But for Moore what was done with the British Vickers engine exemplifies the new Hendy. To distinguish it from the others that go into noncombatant vessels, he calls it "the battle job." He first heard of it last October, after the Navy, desperately expanding its escort-vessel program, had appealed to the Maritime Commission for engines.

Admiral Vickery summoned six companies, among them Hendy, to Washington and announced that he wanted them to build this engine if they could. The other companies (Koppers, York Ice Machinery, Valley Iron Works, Diamond Iron Works, Beloit Iron Works) were all newcomers to the engine program. The Admiral presented them with photostats of the British design and waved them back to their plants.

Two days later Moore telephoned Admiral Vickery that Hendy would tackle the engine. On November 5 the "go ahead" came through from the commission. The order caught Moore short of engineers. He could spare only five from his staff, which was tied down to other jobs. However, the other companies sent in their own engineers to work with Hendy's, and by soft-soaping his friends among the big companies in the bay area he managed to borrow more, until there were thirty-five.



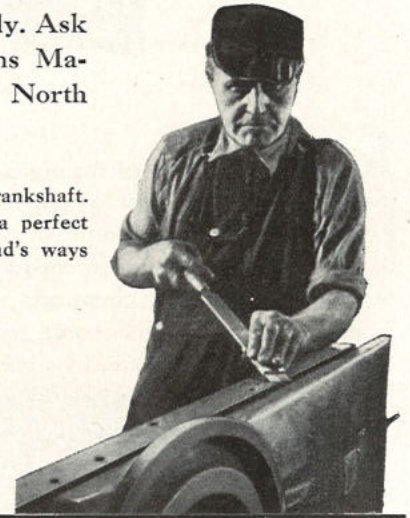
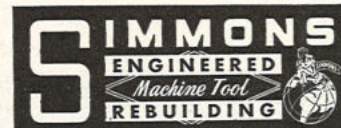
**MUST
MUST:**
A war production
ENGINEERED REBUILDING
keeps machine tools running!

The Arsenal of Democracy is now tooled up and producing for all it's worth. From here on in...existing plants and machine tools must turn out the matériel for final victory. "Making the most of what we have," as a result, becomes the order of the day, and Simmons is prepared, as it has been ever since this war first threatened, to help metal-working industries over their machine tool obstacles by *Engineered Rebuilding*.

Today more than ever, when machine tools break down they must be speedily and efficiently rebuilt. Simmons has the experience and facilities to solve your rebuilding problem quickly. Ask today for full details. Simmons Machine Tool Corporation, 1711 North Broadway, Albany, N. Y.

★ ★ ★

ABOVE: Building up a worn steel crankshaft.
RIGHT: A skilled mechanic develops a perfect bearing on the surface of a turret head's ways by hand scraping.



[Continued on page 176]

LOUISVILLE

CHEMICALS


DRYER

CUTS

COSTS, SPACE,

INVESTMENT!

FORMER PROCESS	
<small>Steam-jacketed filter presses with hot air introduced under pressure!</small>	
Annual Production, tons . . .	18,000
Drying Cost, per ton	\$1.30
Space Required, sq. ft.	1,000
Installed Cost	\$55,000
LOUISVILLE INSTALLATION	
<small>Louisville Rotary Steam Tube-Dryer!</small>	
Annual Production, tons . . .	18,000
Drying Cost, per ton	\$0.54
Space Required, sq. ft.	450
Installed Cost	\$7,000



IF you use any sort of drying process in your manufacturing operations, study the little "blue-print" above. It gives the essential facts about a Louisville Rotary Dryer installation in which *Engineered Drying* is drastically reducing the cost, space and investment formerly required for the drying of a more or less typical heavy chemical. . . . For many years a large part of this company's business has come from just such installations, in which we have been able to prove, in advance, the lasting economies of real *Engineered Drying*. Our pilot plants and laboratories are available for tests of your production. Drop us a line for details. Address: Louisville Drying Machinery Co., Incorporated, 400 Baxter Avenue, Louisville, Kentucky.

America's Largest Exclusive Manufacturer of Rotary Drying Equipment

Joshua Hendy

[Continued from page 175]

Hendy was the "lead" company in the corvette-engine program. It was responsible for modifying the British design and also for breaking it down for production. The other companies sent their draftsmen to Sunnyvale to work on the master blueprints. Some 600 drawings were made of 2,000 parts. In many cases the patternmakers didn't wait for the finished engineering drawings but plowed ahead on rough data that was corrected as they went along. The patternmakers finished their working models January 15, the engineers' drawings were ready February 15; three days later the last pattern was completed and out in the foundry the first iron was poured into the sand pits for the first bedplate. Nine weeks later, April 23, the first engine was on a flatcar, on its way to a waiting hull.

Joshua Hendy is currently producing ten Vickers engines a month. In July, when this article appears, the figure should be doubled. Hendy by itself expects to turn out half the national total. But its feat has not gone wholly unmarred. In breaking the engine down for fast production, Moore's engineers were free with the British design, and this has made for complications. The Maritime Commission wanted the engine to be interchangeable on British, Canadian, and American corvettes. But this economical idea got lost in the rush. It now appears that the American-type Vickers, before it can be used in a British or Canadian corvette, must be modified back. However, no one is complaining. "A simple case of overenthusiasm," says Admiral Vickery indulgently.

MOORE ON PRODUCTION

Partner Kahn is convinced that the company's fine record with hurry-up jobs is largely attributable to Charlie Moore's acute knowledge of machine-shop practice. "There isn't a tool on the floor," Mr. Kahn says admiringly, "that Charlie couldn't operate himself." Indeed, during the first desperate months it was not unusual for President Moore, while inspecting the shop, to peel off his coat, step up to a milling machine, and show a "thirty-day wonder" how a "boomer" would handle a tool.

The years of tramping down the oil-stained alleys of West Coast machine shops paid off for Charlie Moore. When he started to recruit labor in the spring of 1941, reliable toolmakers and shop foremen were scarcer than turret lathes. But Moore knew dozens—from Seattle to San Diego; in luring them to Sunnyvale he quieted his own conscience—if not their former employers—with the reasoning that they would contribute more to the war effort at Hendy. This argument won him his thirty-three-year-old plant manager and production chief, Harry Gunetti, who had been a machine-shop superintendent for a valve company in Oakland.

Moreover, Moore's intimate knowledge of the machine-tool situation, reinforced by his tour of duty with OPM, came in handy. Admiral Vickery tells with awe what he saw on his first visit to Sunnyvale, a month or so after Moore got his first contract. "Charlie didn't beat his brains out trying to get priorities for brand-new equipment. He went into the secondhand market. The day I was there, there were twenty-five freight cars lined up on the siding, full of secondhand tools."

Yet to assume from this that Hendy is mostly equipped with worn-out tools held together with baling wire would be a mistake. On the contrary, the impression left with a visitor is of an eye-filling expanse of shiny new tools that Moore swears is "one of the biggest and best—if not *the* best—single collection of machine tools west of the Mississippi." He appraises it at

[Continued on page 178]

**BULLETS
FOR THE AXIS**

**BISCUITS
FOR THE BOYS**

...Even More Than in Peacetime—Industry at War Relies on Experienced Conveyor Engineering to Help Push Production

Munitions — arms — equipment — food — prime products of industry geared for war.

In many war plants specially designed and built Standard power and gravity conveyors — shell conveyors, for example — are doing their part to maintain peak production. In essential industries, such as food products plants — process industries — Standard Conveyors are in greater use than ever — keeping production flowing.

An extensive and varied experience record qualifies Standard Conveyor Company to render valuable aid and counsel to production and plant executives. Tell us what you handle — how much — how far — our recommendations will prove worth while.

Available reference book, "Conveyors by Standard" Catalog FO-7 will be included in response to your inquiry.

STANDARD CONVEYOR COMPANY
General Offices: NORTH ST. PAUL, MINN.
Sales and Service in All Principal Cities

STANDARD

Gravity and Power
CONVEYORS

★ ENGINEERED FOR FASTER PRODUCTION ★

Joshua Hendy

[Continued from page 176]

over \$10 million—"more dollars worth than I used to sell in five years on the entire West Coast."

After two and a half years on the factory floor, Charlie Moore has decided there are only three sure-fire ways of holding your own in this war-production game.

First: "You've got to have good men two deep in every key position." It is a pet theory of his that a lot of good men have burned themselves out trying to finish the war in a month. "I've seen men so punch drunk that they can't remember what they're trying to do." The rule at Hendy is that the key supervisors shall take a full day off at least every other week. "And I mean an honest-to-God day off. No telephoning the plant. No shoptalk. Play golf, get drunk, do anything. But stay away."

To do this and still keep the plant on the seven-day week, executives are required to train competent substitutes. "It's a quick way to develop second-string executive material," says Charlie. "And if the going gets tough you can always put back the first team."

Second: "You've got to keep on top of the materials flow." Moore's scheme centers around a "board of strategy" that meets every Wednesday afternoon. It comprises twenty key people—plant superintendents, control men, inspectors, subcontracting specialists. Each reports on the state of his materials—which parts are ahead, which behind. If any item is out of line—and almost always one is—they decide before adjourning what shall be done. "The important thing," says Charlie Moore, "is that we make up our minds."

Third: "We didn't waste our original supply of skilled men by putting them to work building engines—they were too few to build many. We used their brains to invent and make machines that green men, by the hundreds, could operate, just by pushing a button."

Before the war, marine engines were strictly custom jobs. Each part was carefully machined to fit its companions in the sequence of assembly and the work was done by big costly machines operated by men who had served a tedious apprenticeship. Between wars any other method was uneconomical. But in supplying a government with a limitless appetite for engines Moore could forget about costs and "tool this plant up like a machinery salesman's dream."

What Moore calls the "New Hendy Method" is really just a further refinement of the familiar process of breaking down a complicated job. He and his production man Gunetti appear to have carried the breakdown process further than anyone else. They have gone in heavily for dozens of small machines rigged for a simple repetitive task, and for setup plates on which the work is laid out, aligned, or clamped before it is brought to the tool. The tooling for the reciprocating engine alone cost about \$1 million.

Under the old method just the machining of an EC-2 cylinder was a two weeks' job. It was done with a horizontal boring mill, which cost \$75,000, by a man who had served a four-year apprenticeship. Now the work is done with three machines, a few setup plates, and half a dozen men who learned their jobs in two weeks. Time: one day. Similarly, the assembly time of a crankshaft has been cut from one week to one hour.

These and other tricks have enabled Hendy to cut the final assembly time on an EC-2 engine from 4,500 to 1,800 man-hours and to become the nation's fastest producer. But not the cheapest. General Machinery, of Hamilton, Ohio, first in

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but we sent him a check, because he had the foresight to realize that loss of income, coupled with doctors', nurses' and hospital bills could well be the most serious injury he would suffer from an accident.

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the program, has worked its price down to \$90,000 per engine, and the average for all the producers is \$96,000. Hendy's price of just under \$100,000 is therefore above the average.

Moore's explanation for this is: "We give the country the most engines of the highest quality but we can't do that at the cheapest price."

WHILE TWENTY SHIPS WAITED

It remains to be seen whether the "Iron Men of Hendy"—as they like to call themselves—will be able to deal as successfully with the turbine. Their experiences with it thus far have certainly been sobering. While Charlie Moore will talk your ear off about what Hendy's going to do with the turbine, he brushes off as unworthy of consideration the drudgery and secret disappointments connected with it to date.

Somebody miscalculated. Last December, at the docks of the Consolidated Steel Corp. at Wilmington, California, were twenty-odd C-1 cargo ships with strange big holes gaping in their sides. These were to admit the turbines that had failed to come when the hulls were on the ways. The shipbuilders were wild. They said these motionless ships had given them a terrible and undeserved black eye and to put the blame where they thought it belonged they hung signs on the hulls saying in effect: "These ships are waiting for Hendy turbines."

In the face of this, Charlie Moore argues stoutly that Hendy was only two weeks late with its first turbine and that everything is fine. But the contrast of his optimism with the discouraging reports from other sources is strangely reminiscent of the baffling contradictions that used to surround Willow Run.

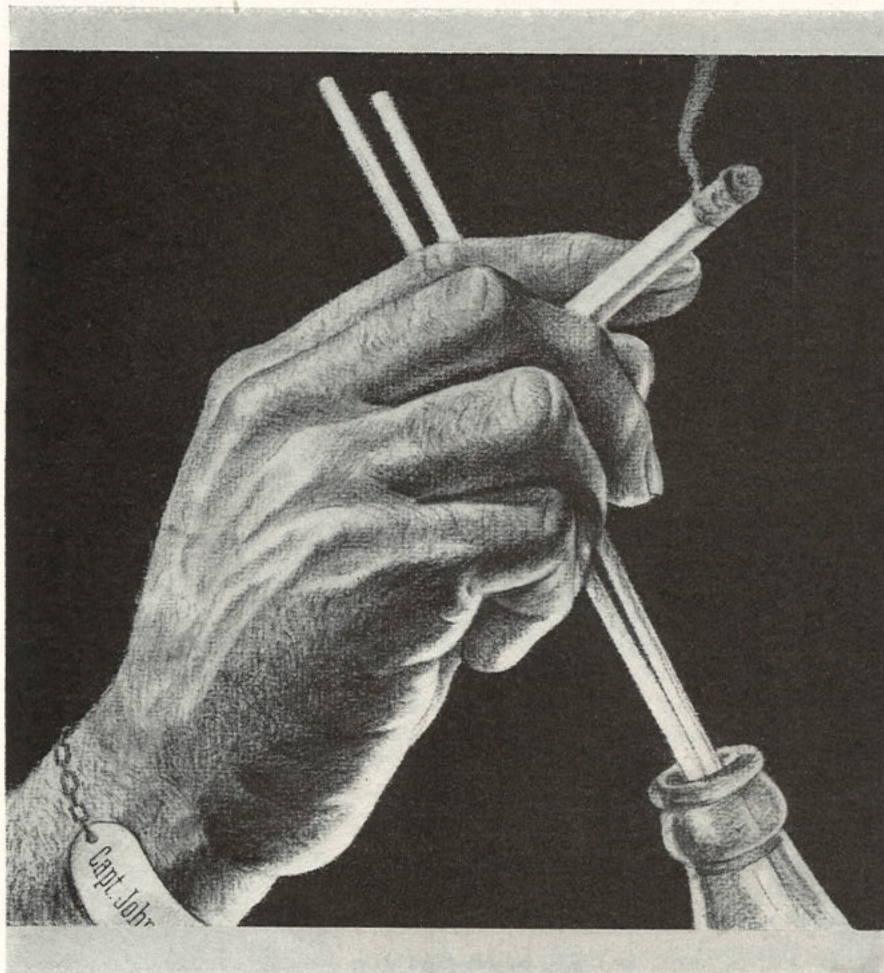
The facts are: Admiral Vickery brought Hendy into the turbine program as a dark horse. In July, 1941, he foresaw that his Consolidated hulls would start coming off the ways in May, 1942, and he was crazy for turbines. Westinghouse, which designed the turbine for this ship, refused to promise delivery earlier than November of that year. But out at Sunnyvale, while Moore was away on his mission to England, Henry Kaiser and Felix Kahn promised the Admiral he could have two turbines a month, beginning in June. On the strength of this generous promise, Vickery canceled the Westinghouse contract.

It appears that Kaiser and Kahn did not consult either the production department or Charlie Moore. "I came back from England in December," Moore recalls, "to find myself in the turbine business." A quick look convinced him that the promise was impossible and he informed the Maritime Commission he could not start deliveries before October.

In May, 1942, when the WPB schedules came out, Westinghouse was stunned to find itself down to provide eighteen turbines for Consolidated, the first to be delivered in six months. And across the continent in Sunnyvale, as the summer came on, tempers were beginning to wear thin. President Alden Roach of Consolidated was prodding Vickery, who was prodding Moore, who was finally forced to admit he could not meet the revised schedule unaided.

In desperation, Moore asked Westinghouse to cut the gears for the first three turbines—in some respects the hardest part of the job. "Without regard to cost," he says, "the blanks and gears were shipped by express across the country and back. This alone cost us \$2,600 more than the freight." Moore did not wait to test the finished Westinghouse gears in the first Hendy case. Case and gears were shipped separately to Wilmington and assembled aboard ship. Westinghouse engineers,

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"Hot Pilot"

Enjoying a well-earned smoke, coke, and breath of cool air, a Navy pilot has just returned to his carrier from an attack on a Jap airport.

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after four decades of humbling experience with turbines, expected plenty of trouble. But the gears meshed beautifully, the alignment was perfect. This was no surprise to Charlie Moore. Westinghouse, however, put it down to beginner's luck.

Many of Hendy's troubles were of the sort one would expect of green hands. Only a dozen of the first 300 or 400 workers recruited for the turbine plant had ever seen a turbine. Neither the superintendent (who had been a master mechanic for American Car & Foundry) nor the chief inspector (who had been with Cadillac) was among them. Westinghouse invited the two to come east and study its methods, and for a couple of months, while Hendy was tooling up, they camped at the South Philadelphia works. Back in Sunnyvale they tried to communicate to the farm hands, fruit pickers, and clerks the reverence for high tolerance that had been instilled in them.

Another source of difficulty was a peculiar and, for a long time, irremovable bottleneck in the gear-cutting department. The reduction gears that step down the 6,000 r.p.m.'s of the smallest blade in the high-pressure turbine to the 90 r.p.m.'s of the C-1 propeller must be true within a few ten-thousandths of an inch. Otherwise, with the teeth meshing at about 11,000 feet per minute, a rough action results that is undesirable for several reasons. The turbine becomes inefficient and the noise can be picked up by submarine listening devices much farther off than the propeller beat.

Gear cutting is therefore a fussy and exasperatingly slow operation. Gear hoppers are housed in air-conditioned rooms, on massive foundations insulated against shock. ("The vibrations of a passing train," Moore says, "would be disastrous.") But even under these pampered circumstances, the \$150,000 tool that Moore brought from England takes seventeen days to cut 594 teeth in the bull wheel of the C-1 reduction gears. It cannot be hurried and the whole output has been governed by the painstaking slowness of its rounds.

Gear hoppers take a year to construct, and because additional ones were not to be had soon enough, Charlie Moore has arranged with the toolmaker to build several at Hendy. The machines in operation and those building will soon give the company a capacity of five gear units a month.

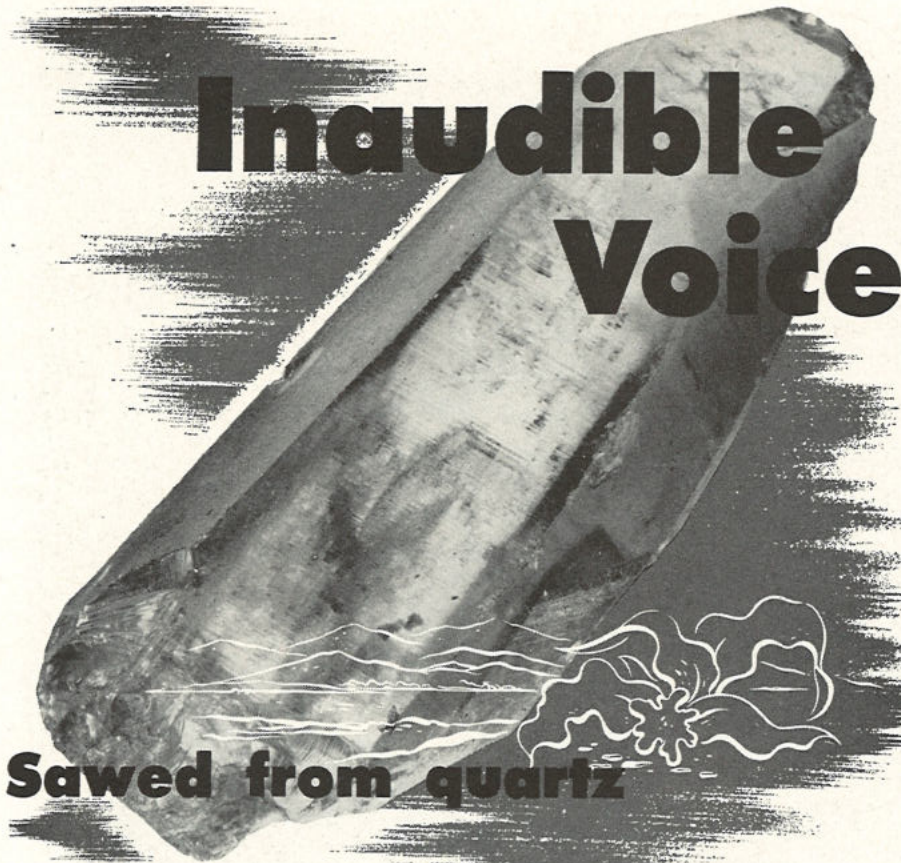
"I'm practically there now," says Charlie Moore, refusing to be downcast just because Hendy is now four units behind schedule. Moreover, his confidence is shared by the Maritime Commission and Westinghouse. The company delivered in April the first all-Hendy turbine, built from the ground up at Sunnyvale, and the major crisis seems safely behind.

Moore expects to complete the C-1 order of twenty-four in October. He will then swing into production on forty-eight 8,500-horsepower Westinghouse-design C-3 turbines. These are for the long-range seventeen-knot C-3 ships, which are combination passenger-cargo carriers, somewhat bigger (12,600 deadweight tons) than the Victories. As the Maritime Commission plans to use the same turbine in some of the Victories, Moore's order will almost certainly be increased. And he expects to build the 6,000-horsepower modified C-2 turbine, which is basic for the Victory—about \$20 million worth a year.

"THEY'RE OFFERING MILLIONS..."

"We've got quite a little business here," says Charlie Moore comfortably. In the first year (November, 1940, to November, 1941) the dollar value of Hendy deliveries was about \$3 mil-

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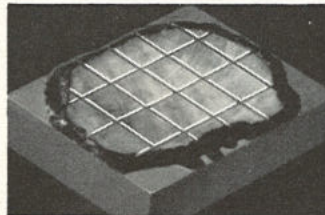
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lion. In the second, between \$25 and \$30 million. For the last twelve months, \$60 million. And the current rate of \$8 million a month means that Hendy is about to join the blue-chip corporations grossing \$100 million a year or more.

Being a privately held corporation, Hendy publishes no financial statement. But Mr. Moore has the Westerner's willingness to let others in on a good thing. He says that in the second fiscal year (ending last November), Hendy's profits were just over \$4 million before taxes and renegotiation. Renegotiation will take away about \$1,300,000, and taxes another \$2,200,000. This leaves the company a net profit of around \$500,000.

The Maritime Commission owns about \$11 million worth of facilities at Hendy. The Navy, until recently, had \$1,300,000. And the company itself has borrowed \$12,500,000 from the banks to finance its operation and expansion. Any suggestion that all this will collapse at the end of the war is explosively rejected by Charlie Moore. He says he and his partners have already turned down an offer from a "powerful eastern corporation" that wants to buy the company. "They're offering millions, but we're not selling."

Moore is full of plans for Hendy in the postwar world. Some are mere shots in the dark. He likes to guide visitors past a shed, plastered with No Admittance signs. Turning mysterious he will whisper confidentially, "Inside that shack is Hendy's secret postwar weapon. A new magnesium process ten times better than Henry Kaiser's—if it works." But the main theme of Moore's thinking is logically in terms of "the production of power—our field."

This theme runs through several recent deals. Hendy paid \$3,200,000 for the old firm of Crocker-Wheeler Manufacturing Co. (Ampere, New Jersey), which makes electric motors and generators. It paid \$2,500,000 for the Pomona Pump Co. (with plants in Pomona and Torrance, California, and St. Louis) and the Torrance plant of the Hydril Co., which also makes pumps. All three are producers of ship's power equipment auxiliary to Hendy's. The Maritime Commission encouraged Moore to absorb them, in order to make the West Coast shipbuilding industry as nearly self-sustaining as possible.

"Is there any reason," Moore asks, "why we should not return these divisions, after the war, to the business of making electric motors and pumps? I anticipate none. And now that we've learned how to make turbines, you don't think we'll want to give that up, do you?"

Productionwise, Hendy has unraveled its last umbilical connection to Westinghouse. The latter supplied all the blades, nozzle blocks, and diaphragms for Hendy's first six engines, and the gears for the first three. Now Hendy is completely independent. Engineeringwise, the situation is reversed. Hendy has no design of its own and only a five-year license to manufacture Westinghouse marine turbines. But Charlie Moore says smoothly that the engineering will take care of itself; the national interest, after all, will require that an independent turbine capacity be maintained west of the Rockies.

"But I'm in no hurry to get my chips down in this postwar game," Charlie has decided. "With the tools I got I can make nearly anything. And I've got something else. Adding those eastern subsidiaries made Hendy the first national producer's goods corporation to be run from the Pacific Coast. That's a pretty big thing out here."