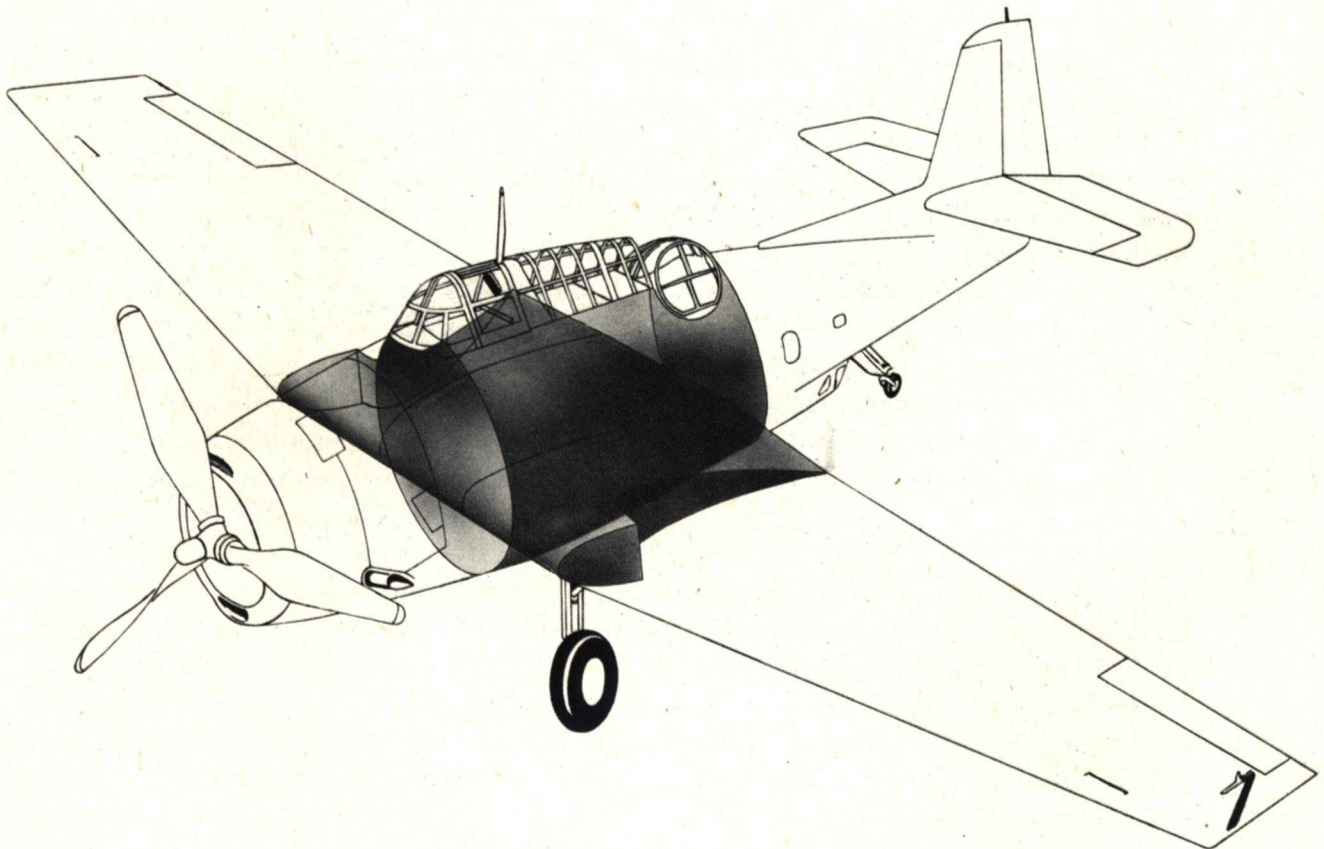


TRENTON

THE AVENGER TORPEDO BOMBER is assembled at the Trenton plant of the Eastern Aircraft Division. Here, assemblies from the plants at Tarrytown, Baltimore, and Bloomfield meet Trenton-fabricated parts and join in final assembly into the complete ship.

Bombers once off the line are sent to the modern airport and field a short distance from the plant, where Trenton mechanics and test pilots put each plane through grueling tests before delivering it to the Navy.



TRENTON

IN NOVEMBER, 1938, a new and modern factory took shape on an 86-acre tract of land in the heart of rolling farm country approximately four miles from the City of Trenton, New Jersey. This new plant, dedicated as the Trenton-Ternstedt Division of General Motors, was to fill a vital need in the General Motors expansion on the East Coast.

The plant, which spread well over seven hundred thousand square feet of floor space, wasn't long in taking its place with the industrial leaders of the country. Sets of automotive hardware, in some cases numbering over three hundred items to the set, were coming off the line at 2500 per day — hinges, door locks, window regulators, roof drip moldings, trim finish moldings, etc., were becoming a part of Chevrolets, Pontiacs, Oldsmobiles, Buicks and Cadillacs.

Because these products had to precede production of the car itself, Trenton was the first to feel the effect of government curtailment orders on the use of critical materials. Many of the bright-finish items had been taken off automobiles by late 1941, and cars known as "Blackout Models" were still being manufactured in other plants while operations at Trenton-Ternstedt were coming to a halt — production finally stopped on December 12, 1941.

January 21, 1942, found the plant a member of the newly formed Eastern Aircraft Division of General Motors, and already considered for the job of fabrication and assembly of a new carrier-based plane, known as the Avenger torpedo bomber.

Seasoned automotive men that they were, Trenton's employes knew practically nothing about producing aircraft at this early date. First a number of top supervisors went to the Grumman Aircraft Engineering Corporation on Long Island to learn some of the fundamental problems concerned with the manufacture of the Avenger. These were followed by engineers and foremen, who went right out on the Grumman assembly line and worked beside Grumman employes for weeks, learning to produce electrical assemblies, splice cable, rivet skins, and the thousand and one other intricate production operations necessary in the construction of planes.

Difficulty in establishing engineering information resulted eventually in the acquisition of two "PK" (for Parker-Kalon screws used so that planes may be taken apart easily and studied carefully) Avenger fuselages.

A great program of physical conversion was already in motion inside the plant. Thousands upon thousands of dollars worth of automotive

equipment was carefully dismantled, tagged, greased and made ready for storage. Tools, machines, and monorail equipment, which had been tuned for perfect industrial harmony, were carefully taken down, as the symphony of the future was being written. A huge warehouse across the street was going up to receive this valuable peacetime equipment. Then giant tractor-trailers began moving this material into the warehouse's 182,000 square feet, over a temporary corduroy road constructed through the thick Jersey clay to the new building. Millions of pounds of steel and zinc, thousands of pounds of copper and aluminum, hundreds of pounds of magnesium, and again millions of pounds of finished or semi-finished parts were moved in this manner.

As early as June 1, while training, conversion, and installation of new equipment were still going on full blast, Trenton fabricated its first airplane part. Shortly afterward the first TBM—an Eastern-produced Avenger—started on its way to final assembly. On November 11, 1942, the first Avenger was rolled off the final assembly line over to the new airfield which was assuming final shape across the road. This happened nine months after Eastern had accepted the Navy contract for Avengers.

Meanwhile, to insure eventual peak production, Trenton had been conducting a vast in-plant training program for the thousands of additional new workers who were being hired. Between January and October of 1942 — 1,413 men and 1,173 women had graduated from these various courses and had taken their places out in the shop.

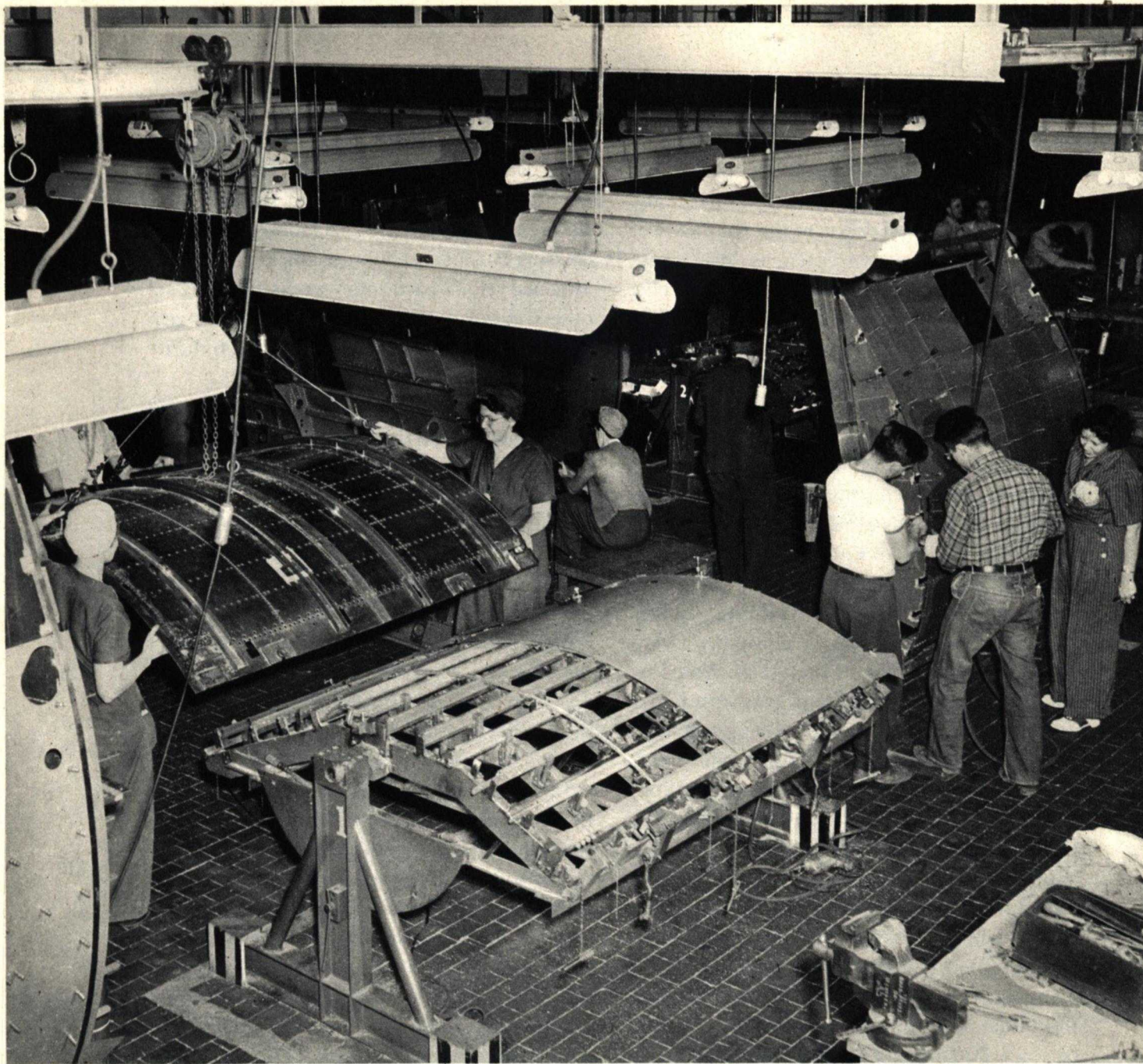
Having built several planes by the end of 1942 — enough to meet its monthly schedules

— Trenton began 1943 with an all-out effort to bring plane production up to the effective level which the Navy required. It was not an easy battle. Many discouraging setbacks were suffered. But Trenton slowly forged ahead, increasing output each month—picking up speed at a marvelous pace some weeks, leveling off others. A steady flow of engineering changes, sent on almost daily by the Navy, had to be incorporated in the planes — and quickly.

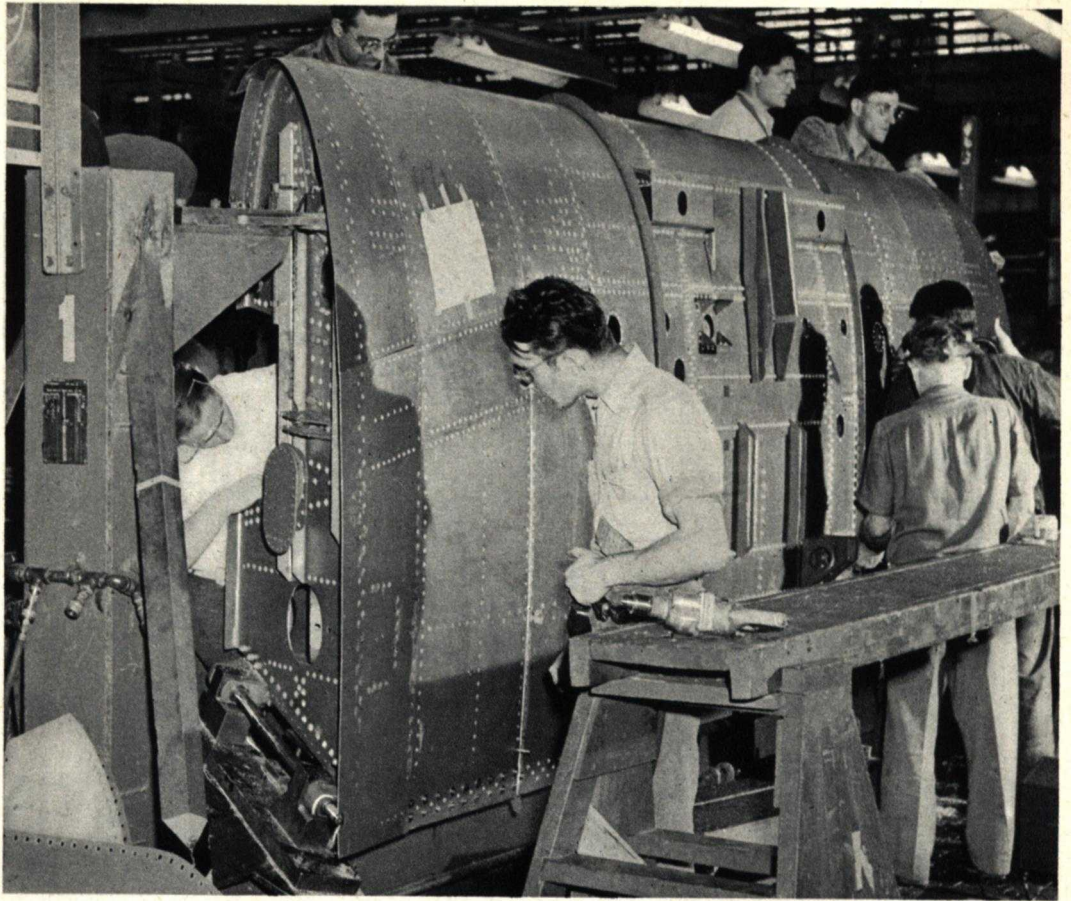
Physical expansion of the plant facilities was carried out even as the battle of production was being waged with unrelenting determination. A new engineering, accounting and personnel building was constructed across the street from the main plant. The new airfield, already mentioned, was supplied with a huge hangar divided into two sections. Shortages of materials frequently slowed down the progress of these projects, but they were pushed through finally to completion. Additions were made to the main building to accommodate Trenton's expanding S-type final assembly line.

In December of 1943 Trenton held a celebration when it delivered the 1,000th Avenger to the Navy, to which high Navy officials, representatives of the press and General Motors officials came. The schedule for the year was completed more than two weeks ahead of time.

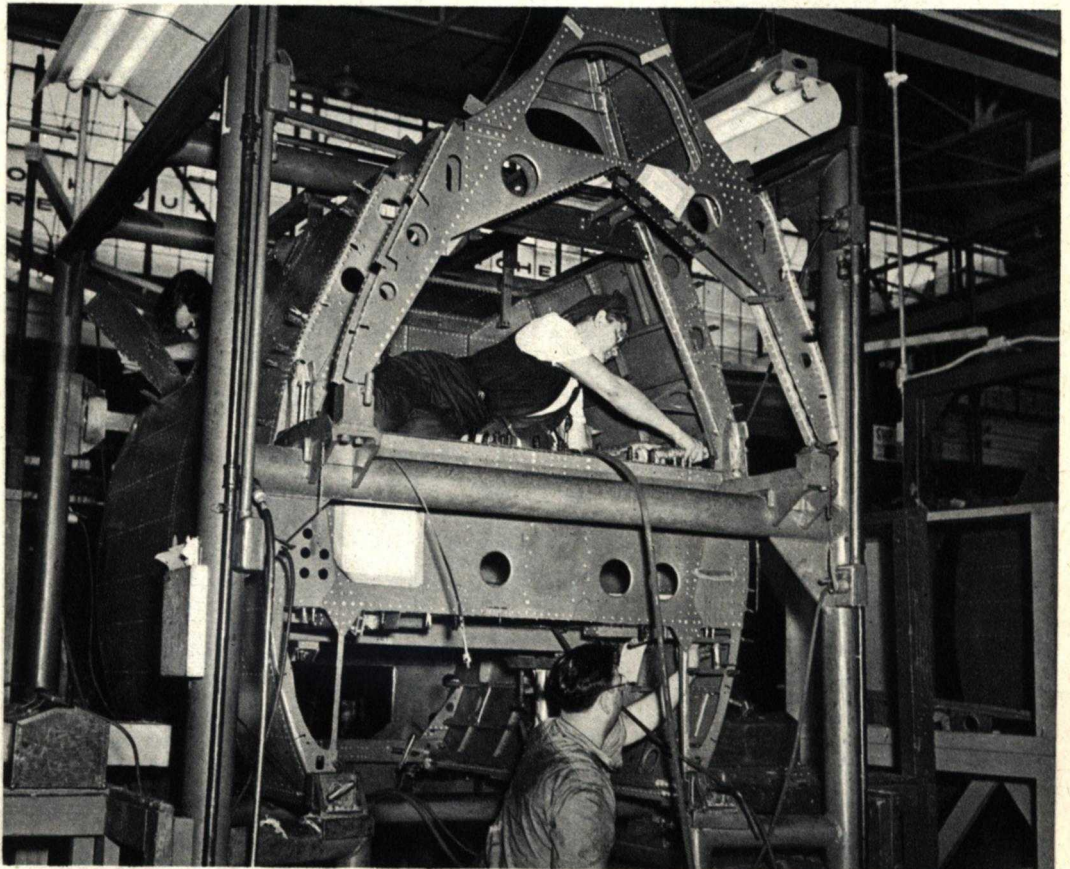
Having proved to itself, the Division, and the nation that the job could be done, Trenton entered 1944 confident and anxious to show that it could reach peak production. This was done in the spring of 1944 — in the midst of omens that the Allies were turning the tide against the Axis. Avengers were being produced and flown away as fast as the Navy required them, and the flow continues.



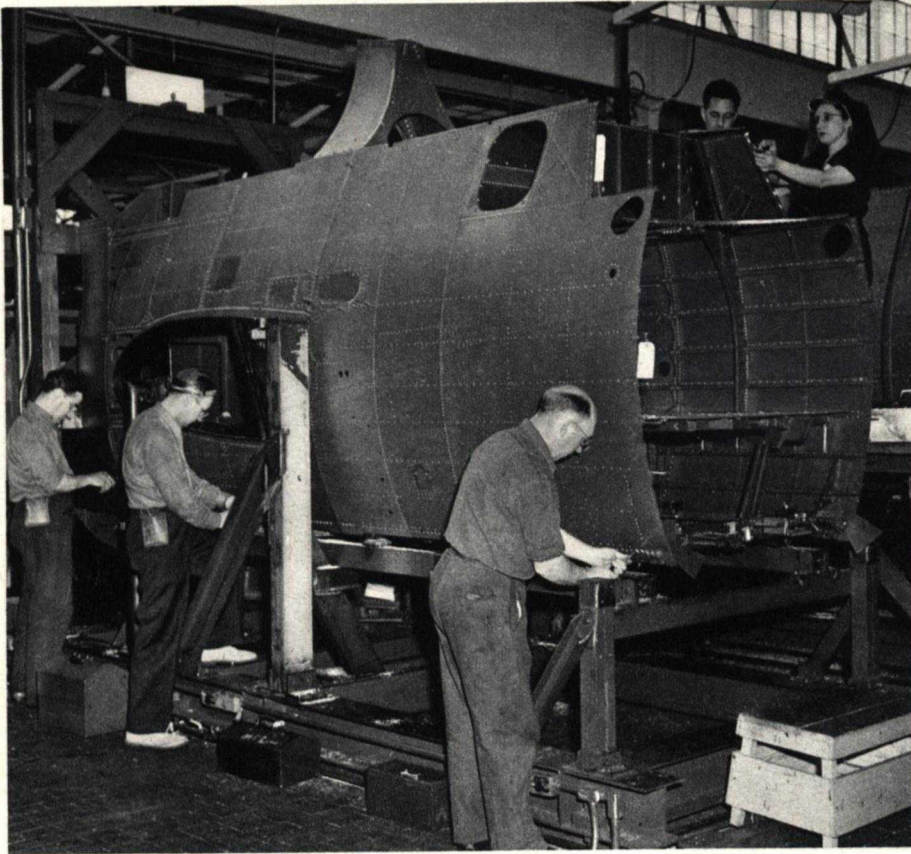
Production accuracy! A contoured drill plate swings into place over a section of the bomber "skin," at the Trenton plant. This jig insures pin-point accuracy in lining up rivet holes in future assembly operations.



Trenton and Tarrytown collaborate on the difficult Avenger center section job.

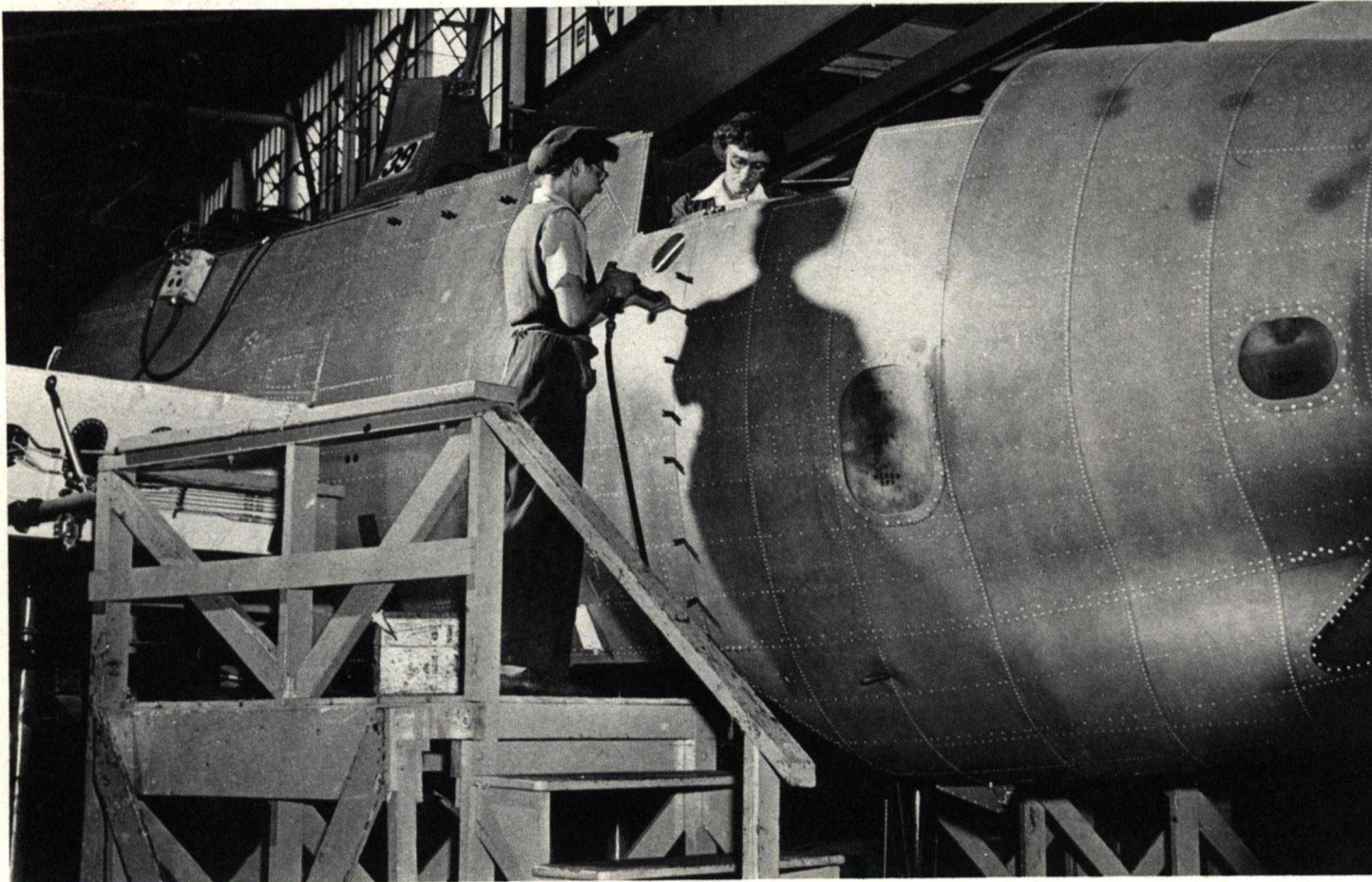


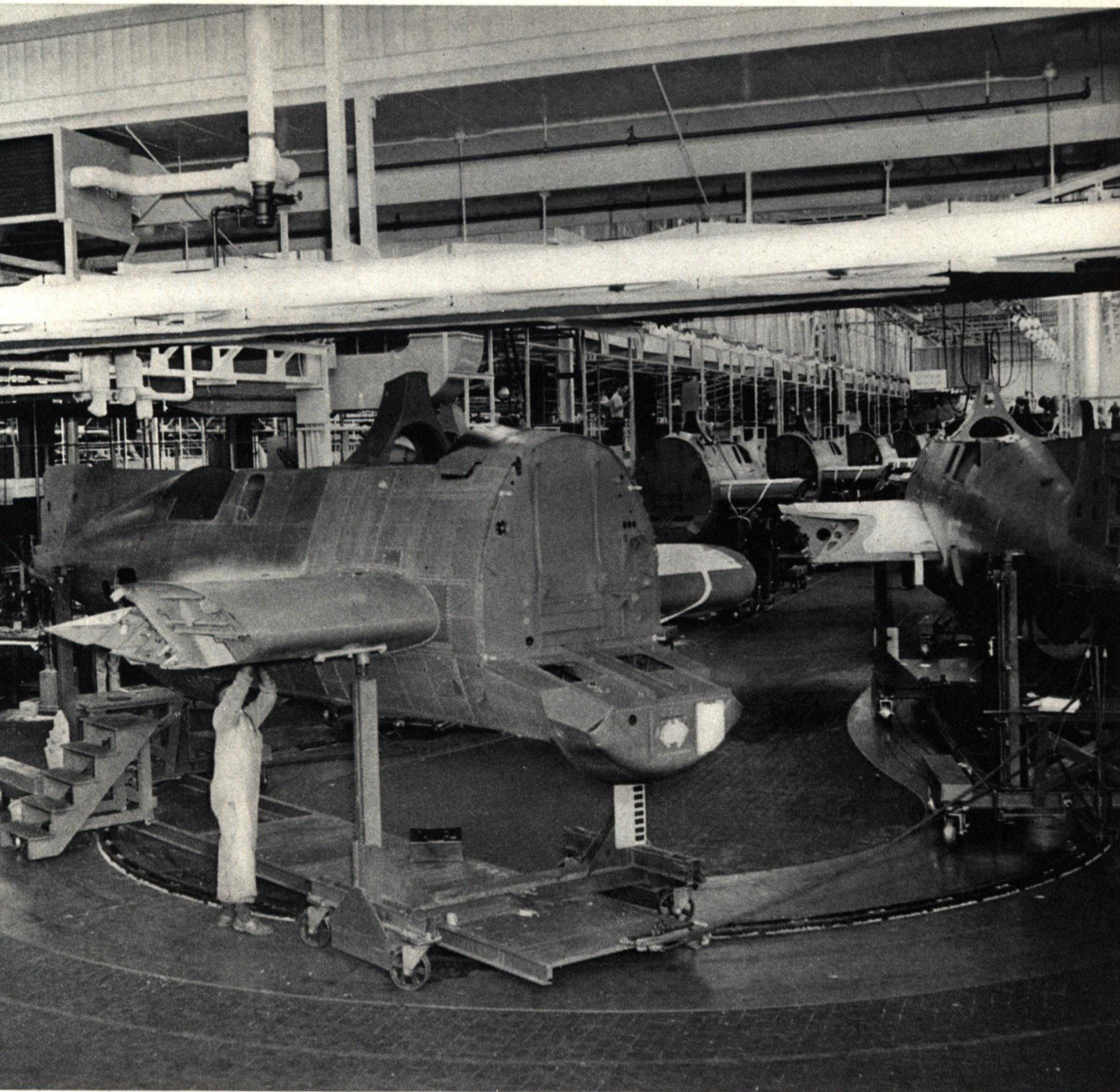
Trenton workers have dubbed this — among first of bomber assemblies — the “penthouse.”



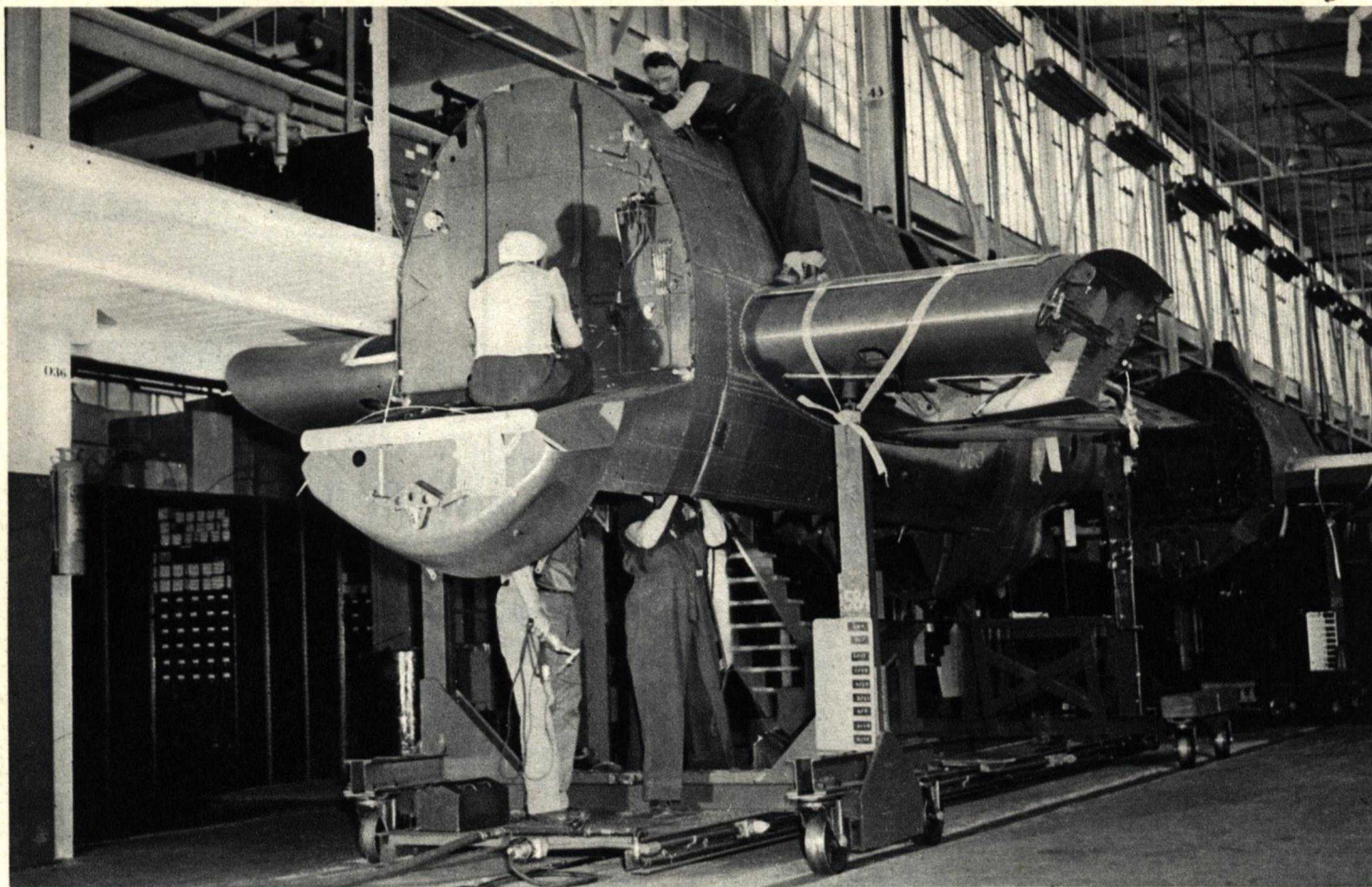
Forward section of the Avenger is put together in this Trenton jig. Tarrytown's gill and firewall go in here.

Baltimore's tail assembly and the forward section are knit together here. Wing center section has been installed.





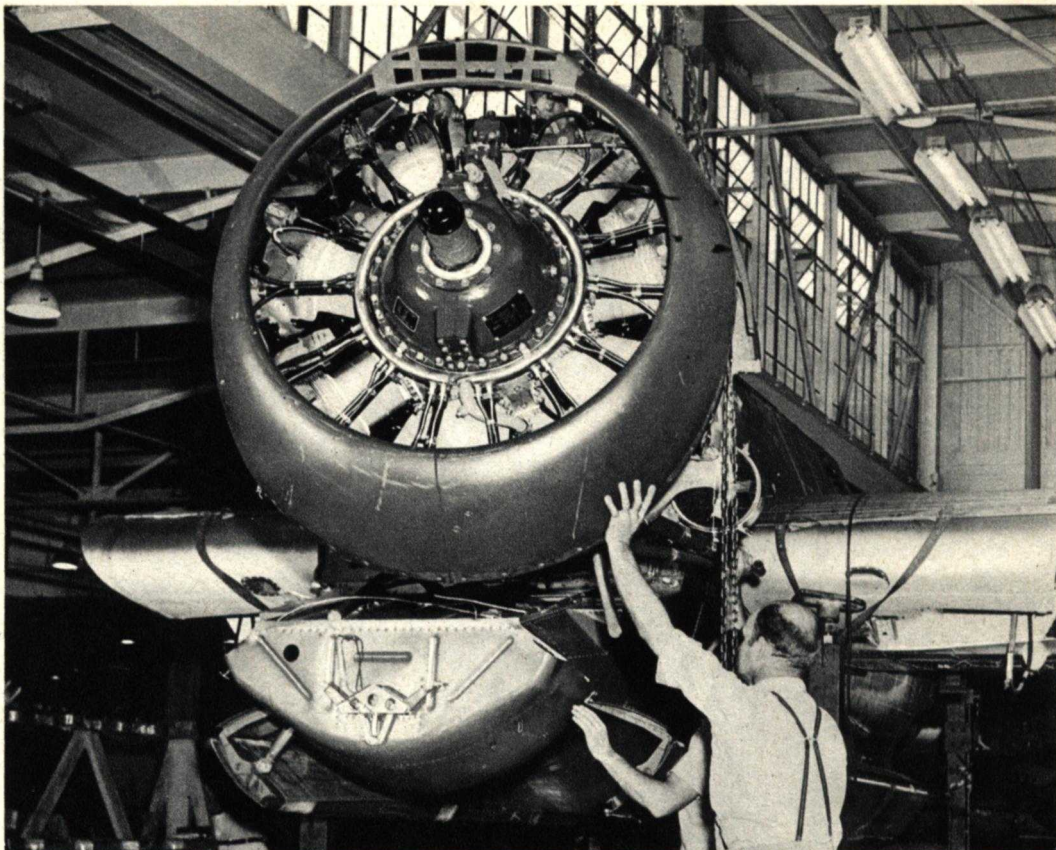
Now beginning to look more like a plane, the fuselage is removed from its stationary splicing jig and taken to the long "S"-type final assembly line where it will snake through many bays receiving hundreds of parts.



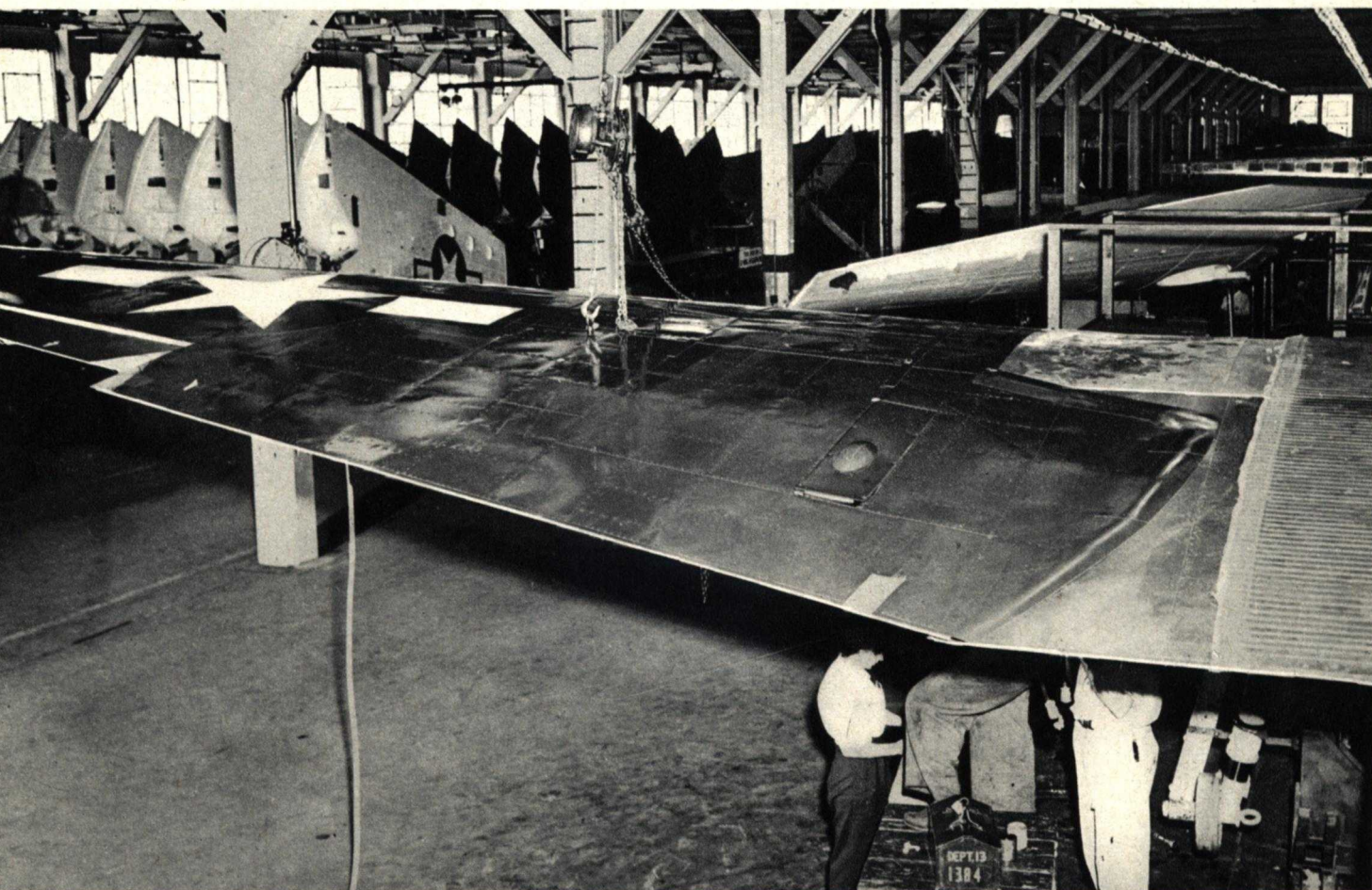
On Trenton's final assembly line a girl worker, seated on the gill, installs assemblies made at Bloomfield.

More Bloomfield parts, hydraulic assemblies among them, are put in an Avenger's cockpit by Trenton workers.

On the trip, the plane's motor, complete with mount and cowling, is swung into place by a big hoist chain.



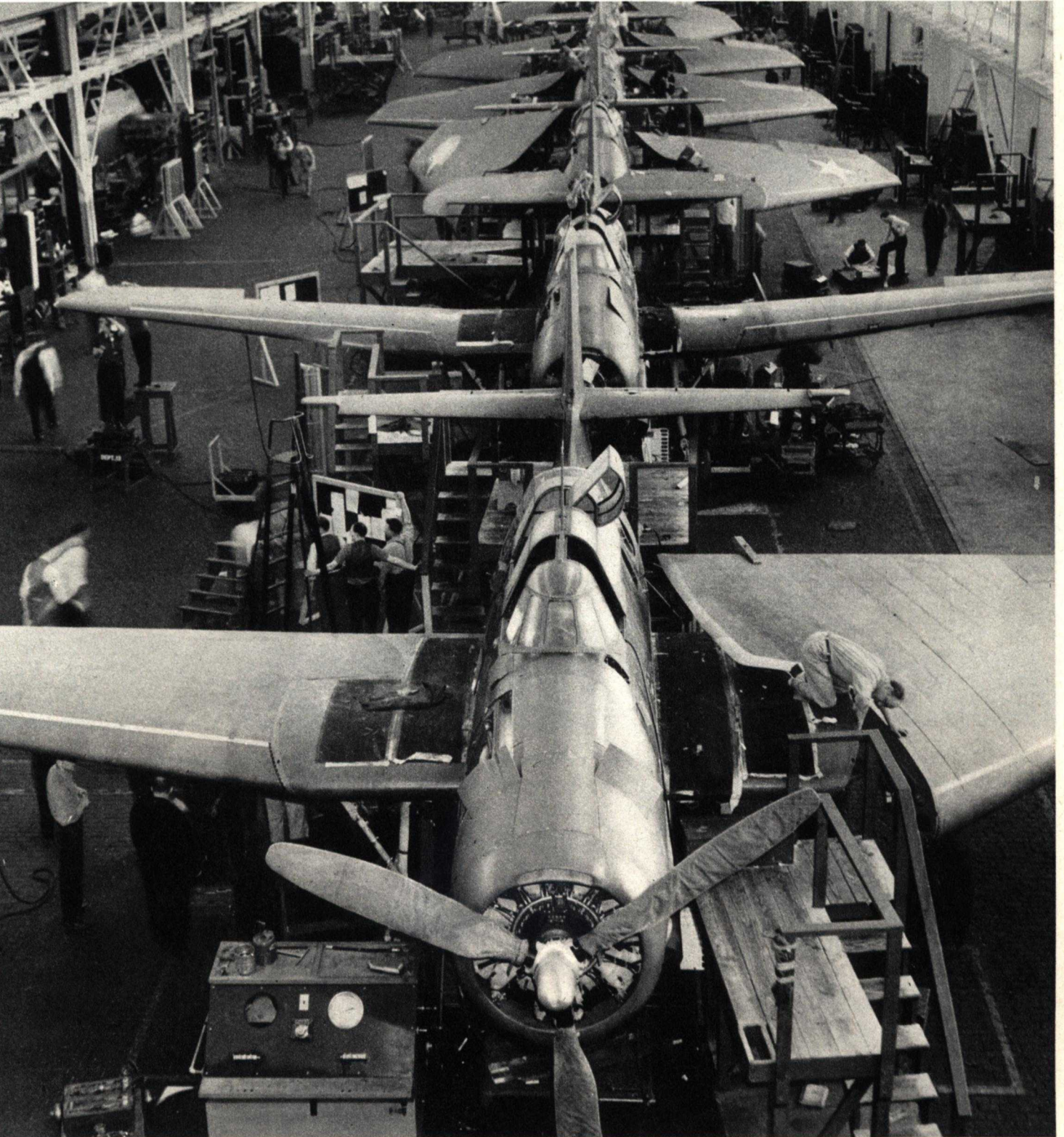
Then on to the new section of the plant where the big Avenger sprouts Tarrytown's giant star-blazoned wings.

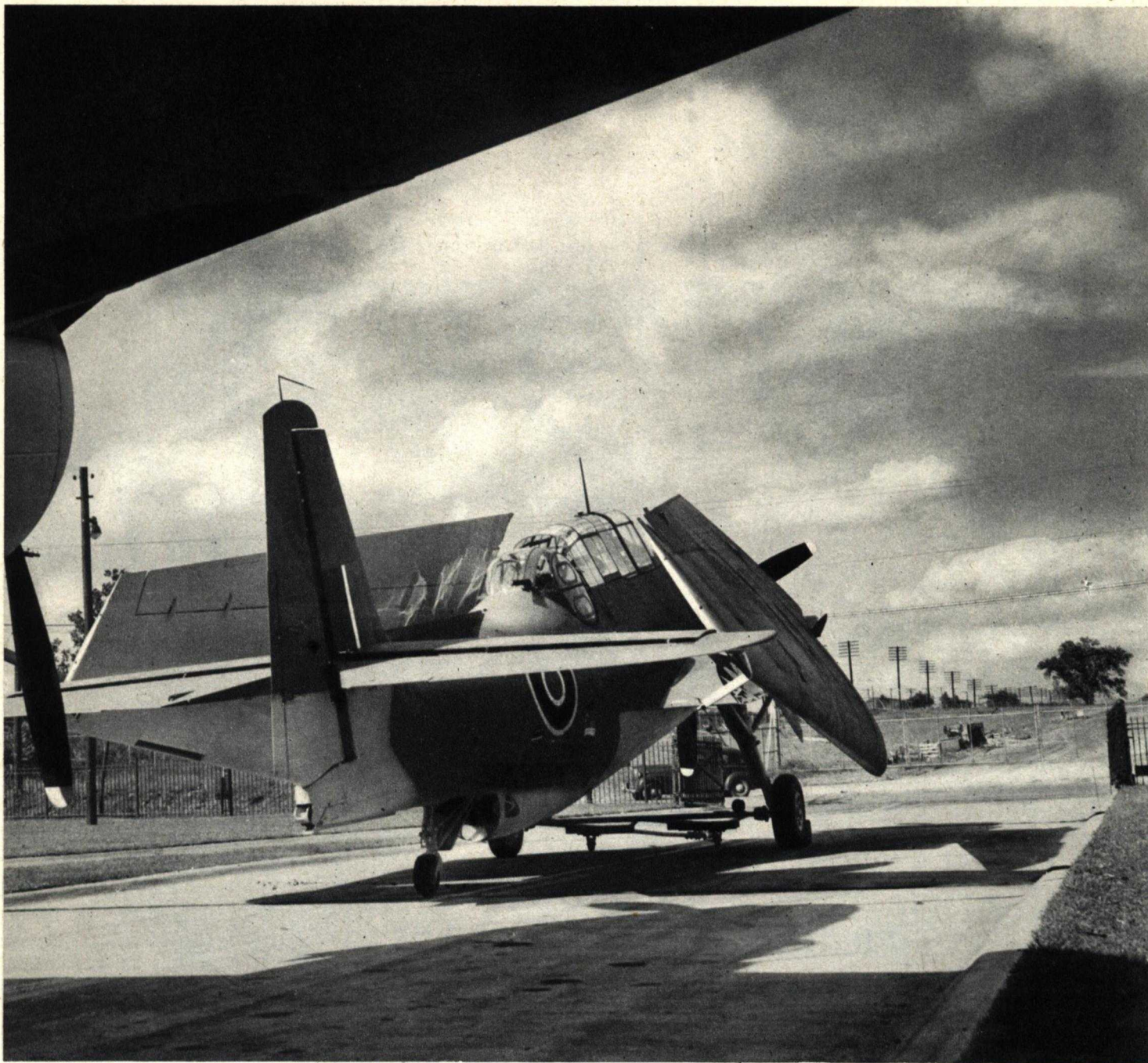




Up goes the plexiglass gun turret to be set behind the pilot's cockpit as the Avenger approaches the end of its final assembly trip. Forward, the canopy fashioned in Tarrytown is already up in place.

Down the final crane bay come the nearly completed bombers to receive paint, propellers, radio equipment, and the other final touches, that will make them first-class fighting ships. Folding wings are tested, too.



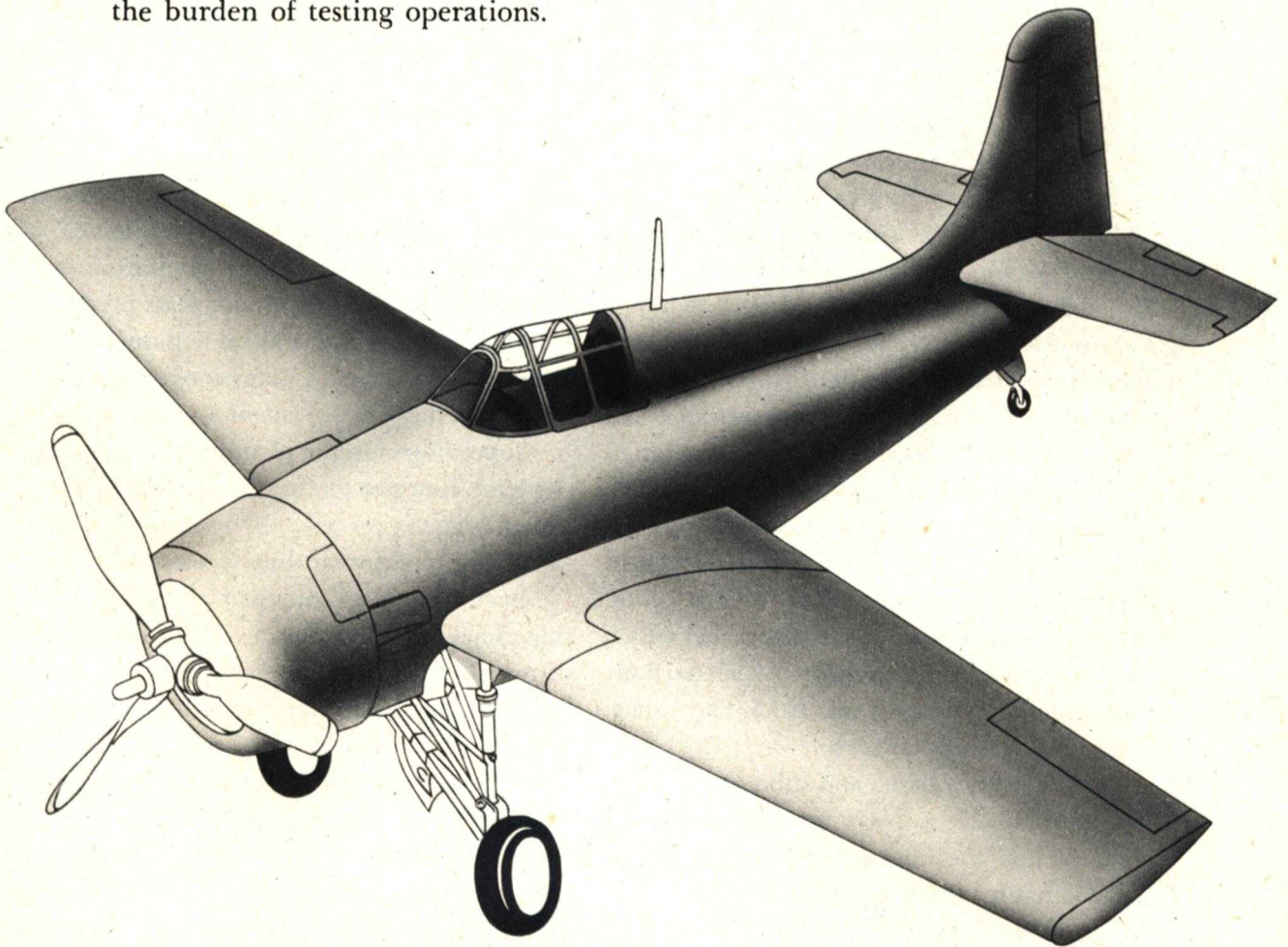


One for the British. An Avenger leaves final assembly at Trenton, is rolled out the great automatic doors for delivery to the Flight Department. A certain percentage of Eastern's ships go to Britain's Royal Navy.

LINDEN

THE WILDCAT FIGHTER is produced at the Linden, N. J., plant of Eastern Aircraft. The other supplier for this plane within the Division is the Bloomfield plant. Many parts and assemblies are sub-contracted with outside vendors, but by far the greatest majority of the work is done under the one roof of the former auto assembly plant.

A modern airport and field across the highway from the plant carries the burden of testing operations.



LINDEN

LINDEN, N. J., an industrial city of 28,000 inhabitants, located on Route 1, twenty-five miles from New York City, was the scene of another General Motors plant conversion in 1942.

Here in 1937 a modern automobile assembly plant, complete with testing grounds, was constructed for the mass production of Buicks, Oldsmobiles and Pontiacs for shipment to General Motors dealers in the New York and Philadelphia areas.

After a successful four-year period, in which as many as 18,832 cars were completed in a single month, activities at the plant came to a halt — due to the nationwide curtailment of critical materials in the latter months of 1941.

Contacts were sought the country over for suitable work, but to no avail. Then — almost by accident — a representative of the plant, while in Washington, unearthed a lead which matured quickly and eventually affected four other General Motors plants from Tarrytown, N. Y., to Baltimore, Md.

Through this contact, and subsequent meetings with the U. S. Navy, other government agencies, and the management of the Grumman Aircraft Engineering Corporation of Bethpage, L. I., a new Division was quickly formed to take on the seemingly impossible

job of producing two of the Navy's most important carrier-based ships.

The Linden plant became a part of the Eastern Aircraft Division on January 21, 1942, and accepted the job of producing the fighter ship designated by the Navy as the FM-1 Wildcat.

There was much to try the patience of Linden automobile men. Few, if any, knew much about the production of aircraft. Their experience had been gained in the complex and delicately balanced mechanics of mass production in the Linden plant. But these pioneers in the plant planned — and plans took shape on paper — then came movement and action.

Supervisors left the plant for Bethpage, L. I., to learn how the job was being done by Grumman.

The job of dismantling was started.

Back from the Grumman plants came engineers with information — information taken from sketches and photographs of tools seen on the floor and conversations held with Grumman workers. They were learning the hard and slow way, for prints of these planes were not available in the form automobile men were used to — but planes had to be produced and flown a few months hence. A sample plane for knock-down and study purposes was requested, and the Grumman organization shipped it.

From the initial engineering studies, tools were ordered. Raw materials and standard parts also went on order, but many Grumman suppliers had to be avoided, by order of the U. S. Navy, for many of these suppliers were already working to capacity.

Integration of effort was slowly effected, and the first plane took form. Actually, the production of this ship, which was hand fabricated, preceded the formation of some departments. Behind it a new production machine, complete with assembly line, was taking shape.

The first Wildcat was tested successfully on August 31, 1942, before thousands of new employes who were encouraged by this, their first contribution to a newer and bigger U. S. Navy.

A new surge went into production for the balance of the year, and although many difficulties were being encountered with the information at hand, planes were produced in increasing quantities — and when the year ended, the Linden plant had exceeded the schedule of deliveries as outlined by the U. S. Navy.

Changes in the new ship went hand-in-hand with production. Some slowed the smooth flow of production, but it was a problem that had to be faced and overcome. To automobile men many of these changes were comparable to a model change in peacetime, and they learned to tool lightly to avoid loss, for changes could cause obsolescence and the scrapping of tools.

Before the first few FM-1's were winging their way to a Navy base the Linden plant was told the plane was due for a major change. While the appearance was to remain the same, numerous and important changes brought a

new Navy designation for the ship — the FM-2 — and more engineering and production problems.

Early in 1943, the entire responsibility of engineering and producing the FM-1 and the new FM-2 was transferred to the Linden plant.

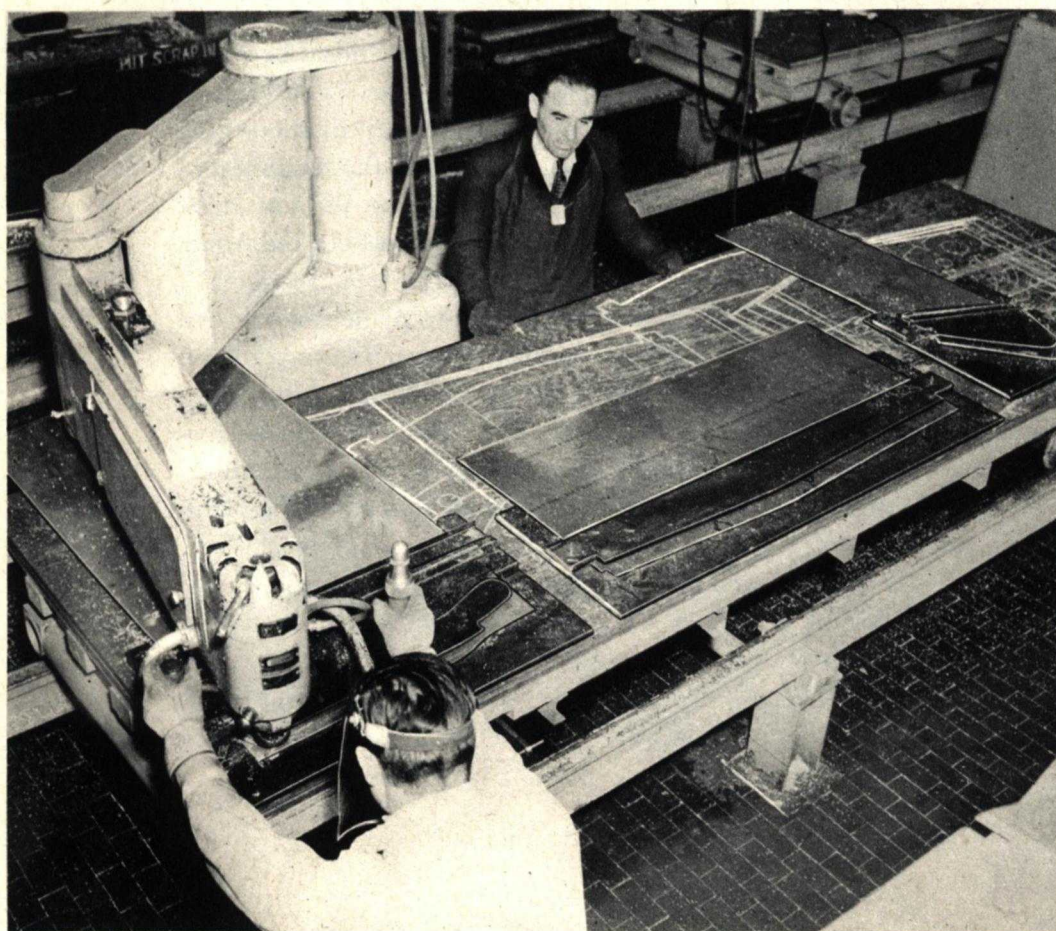
As plans went forward on the FM-2, the FM-1 was being produced in ever-increasing quantities during the early months of 1943. Thus the plant was burdened with two planes rather than one, in addition to a sharply rising schedule. Engineers were still straightening out the information on the first ship while working frantically on the design of the second one. Plans were being made for new tooling and new purchases of parts and materials, when the first new ship, the FM-2, took its place in the line. Other FM-2's followed, intermingled with the production of the FM-1's — following the same route through the plant, into the paint shop and out the door for test run-ins at the hangar — then into the air. As the months went by the number of new FM-2's overbalanced the FM-1's and the original Wildcat became a thing of the past.

Reports from battle areas in the succeeding months indicated frequently the toughness of Linden's plane, as these new Wildcats took part in major engagements in both the Atlantic and the Pacific.

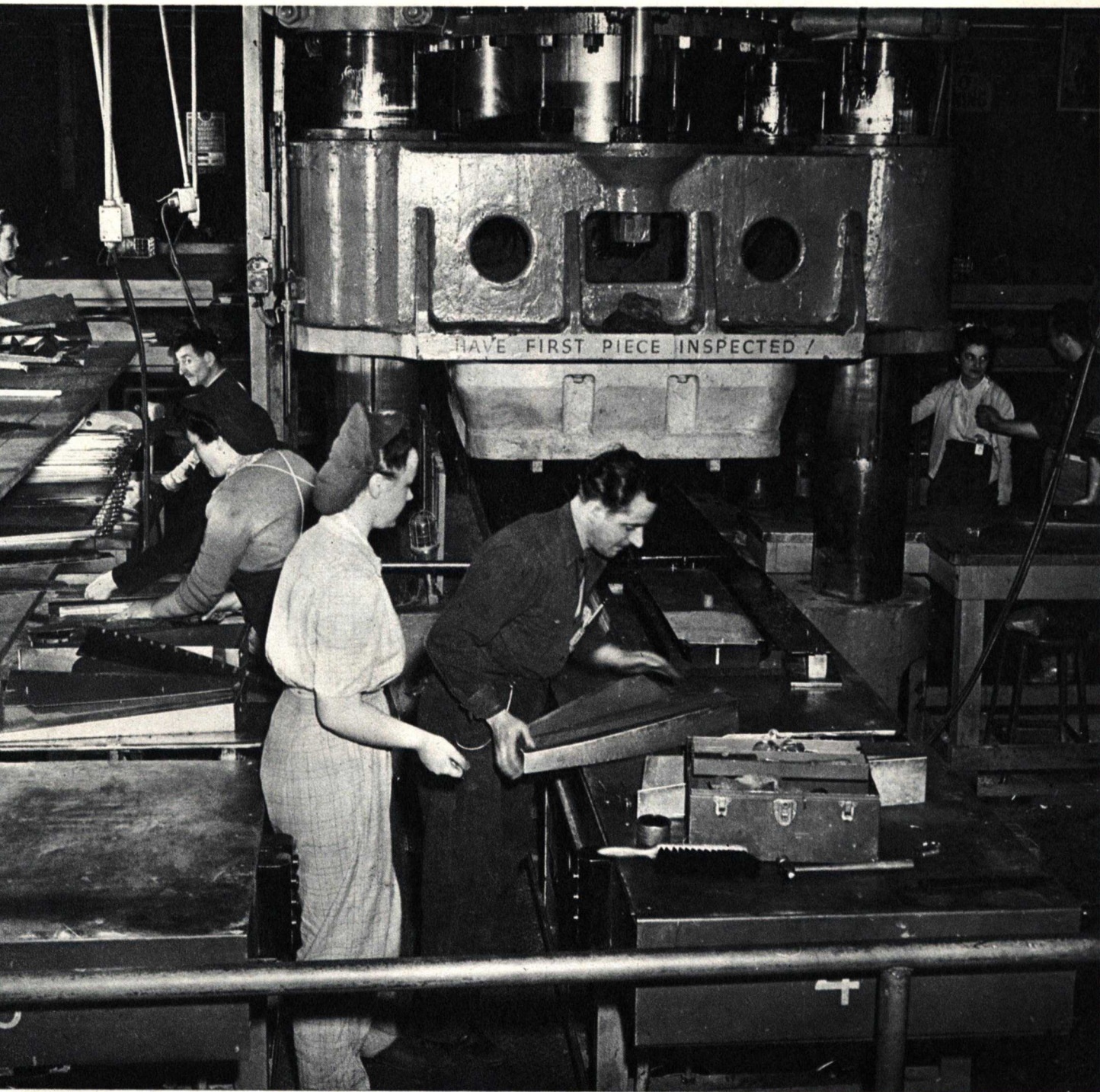
Peak production of the plane was reached at Linden in April, 1944, exactly two years and two months after the Linden plant became a part of the youngest of General Motors Divisions. It had been attained by the determined efforts of every man and woman in the plant.



Linden drill press operators start a Wildcat on its way by drilling thousands of small parts which go into assemblies.



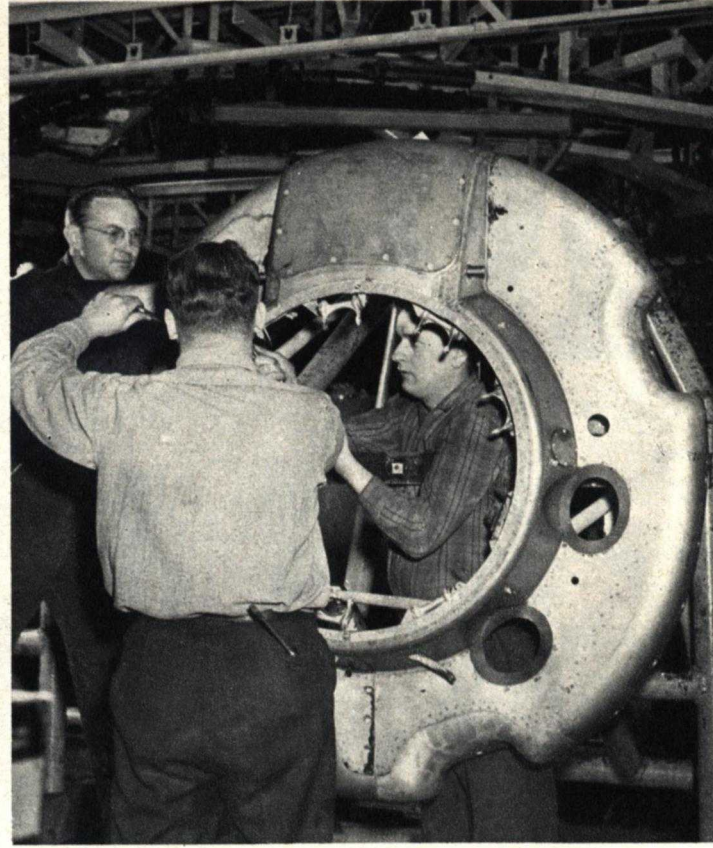
Meanwhile, sheets of metal are cut to exact size on a routing machine. An airplane requires many parts cut from sheet metal.



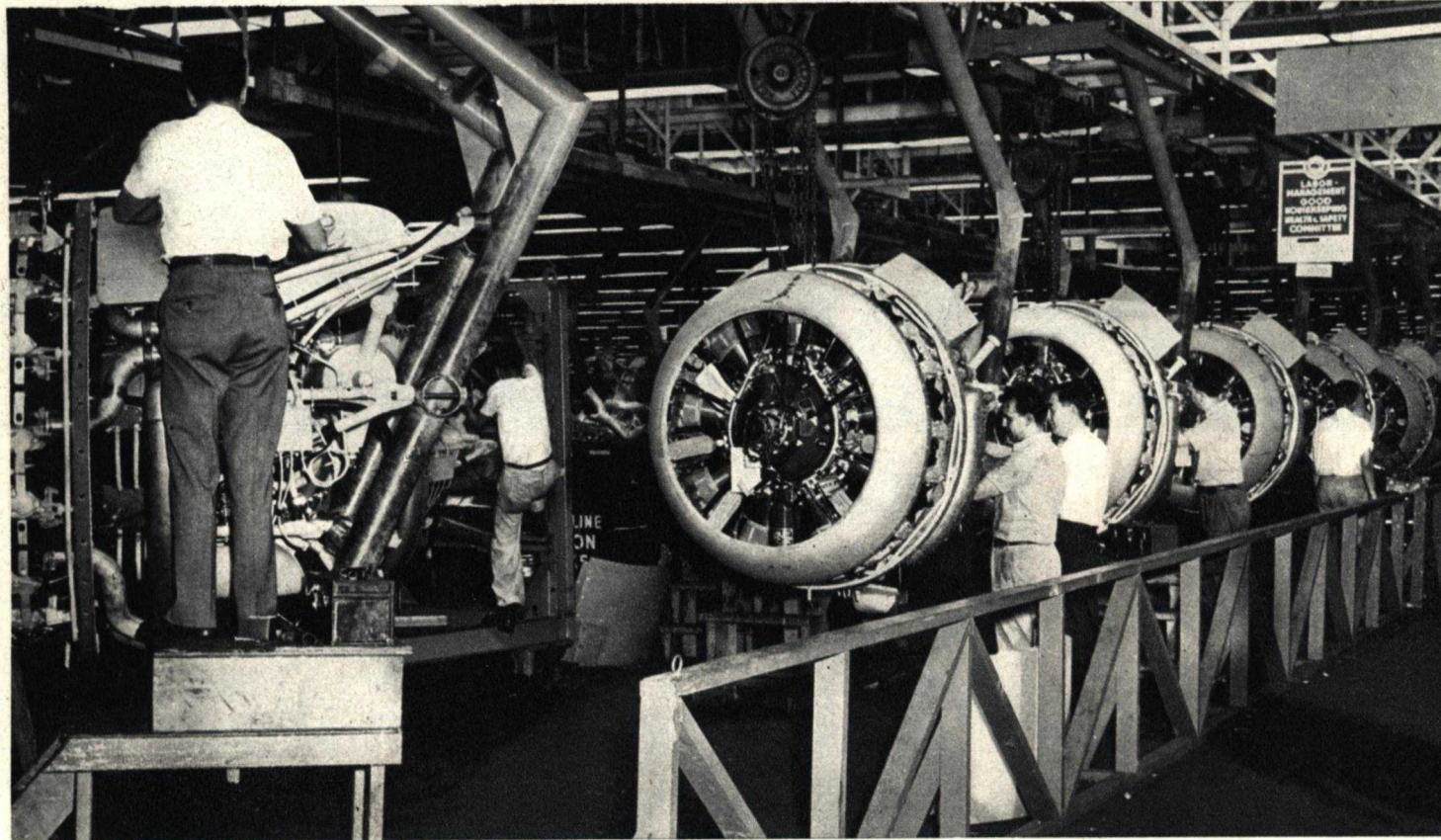
Other, more intricately shaped parts are stamped on this great hydraulic rubber platting press at the Linden plant. Operators are able to keep material flowing swiftly by using these automatic feed tables.



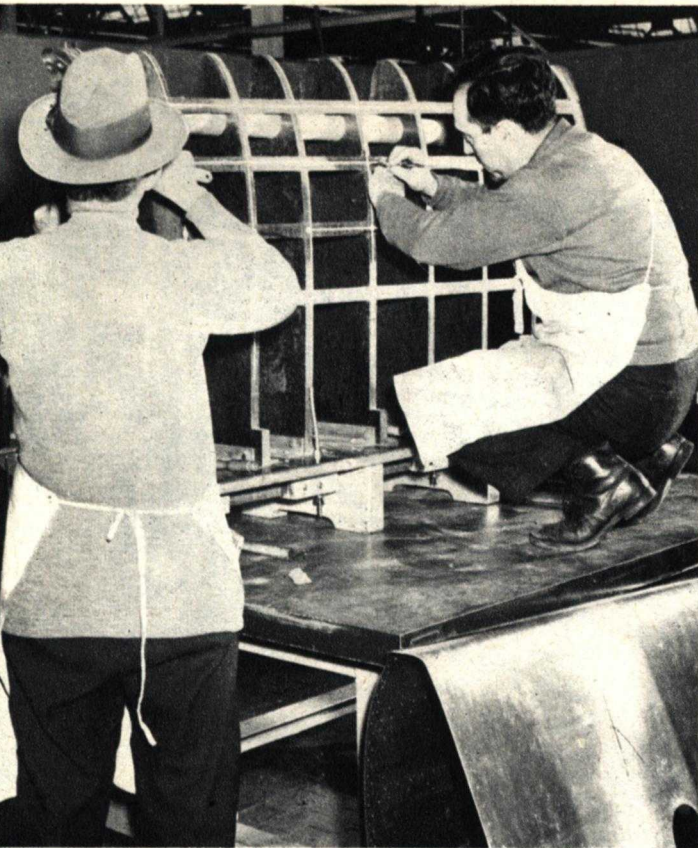
Skilled workers weld the motor mount with great care, for strength in this assembly is of great importance.



Linden workers put the finishing touches on the fire wall, which will go in behind the fighter's engine.



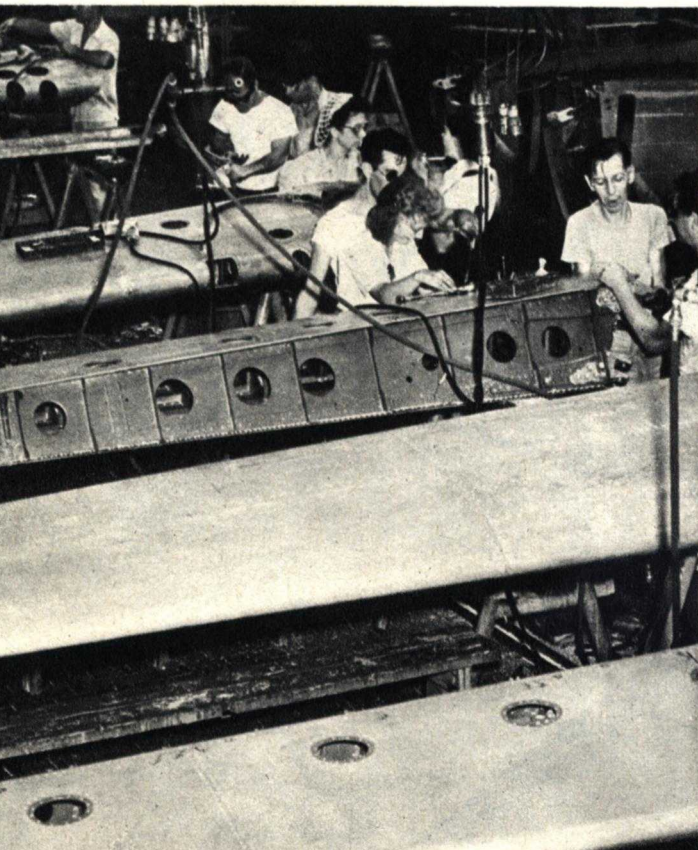
Moving about on this unique conveyor called the "merry-go-round," motors are covered with a cowling and joined to the motor mount. Skilled Linden operators keep the plane motors flowing toward final assembly.



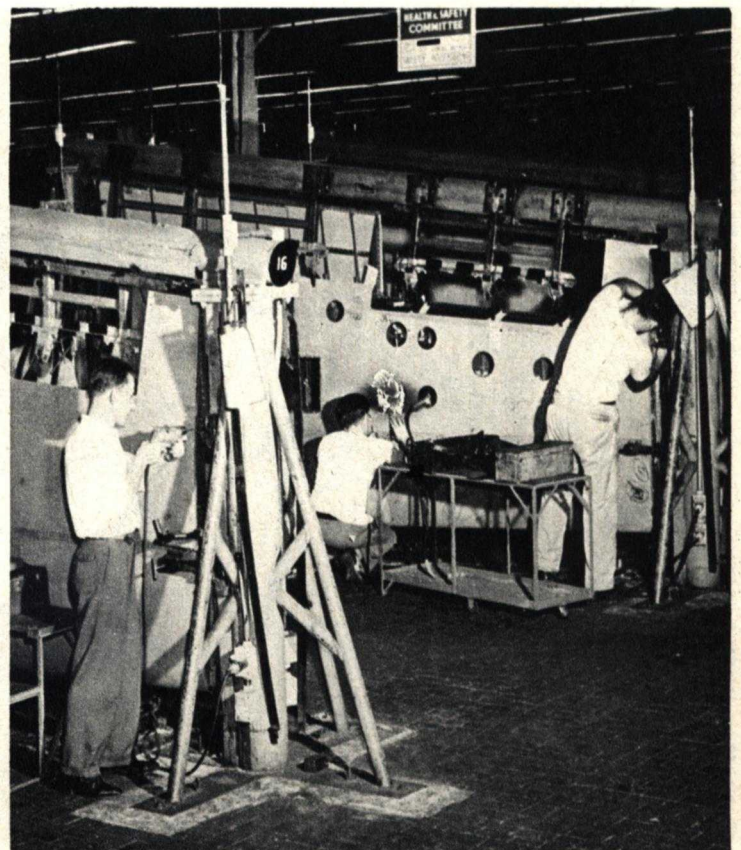
An aluminum "skin" is checked for fit against plastic mock-up of the Wildcat's wing leading edge assembly.



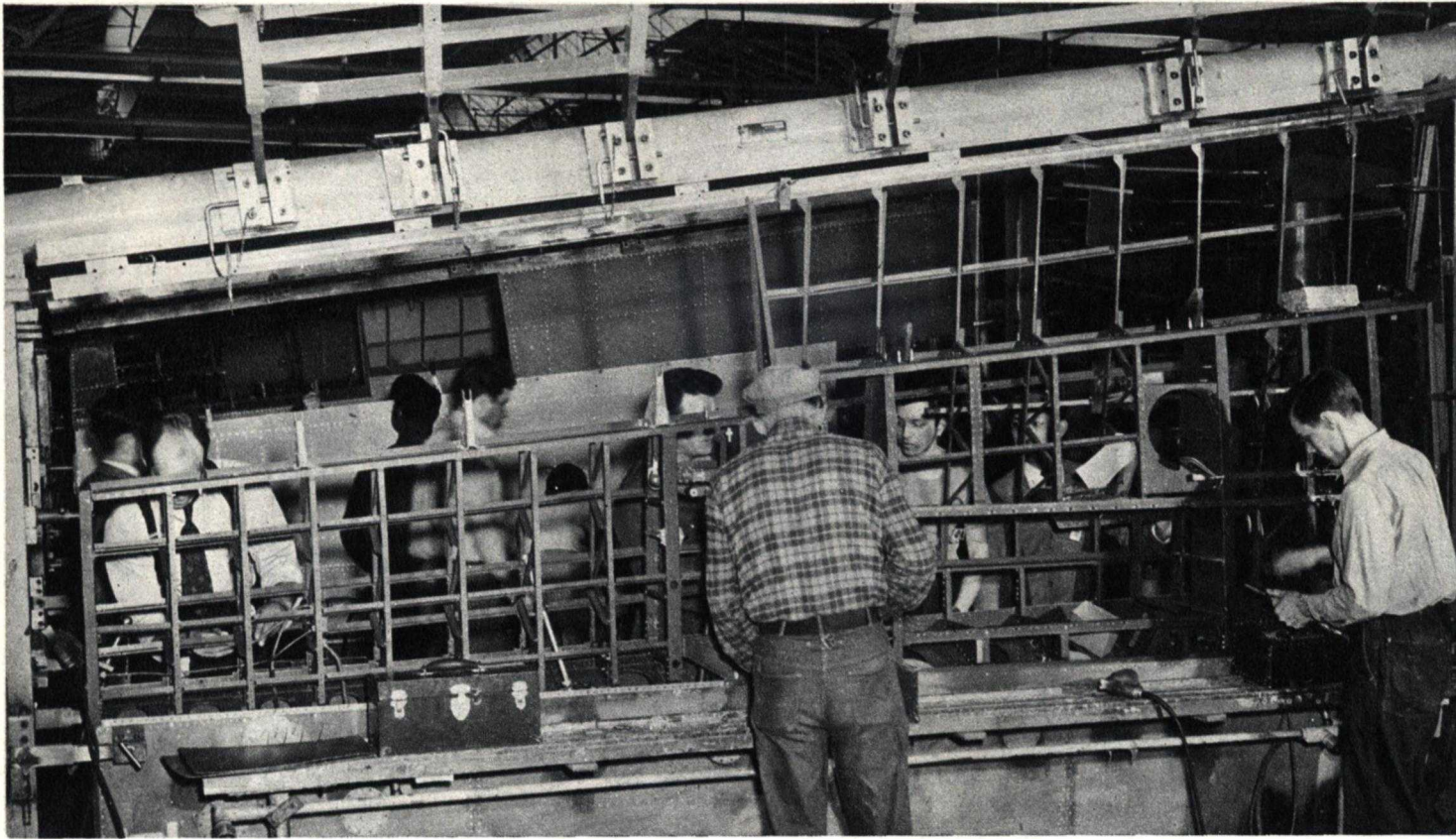
Holes in the skins of the leading edge are checked for accurate placement by a venilite master pattern.



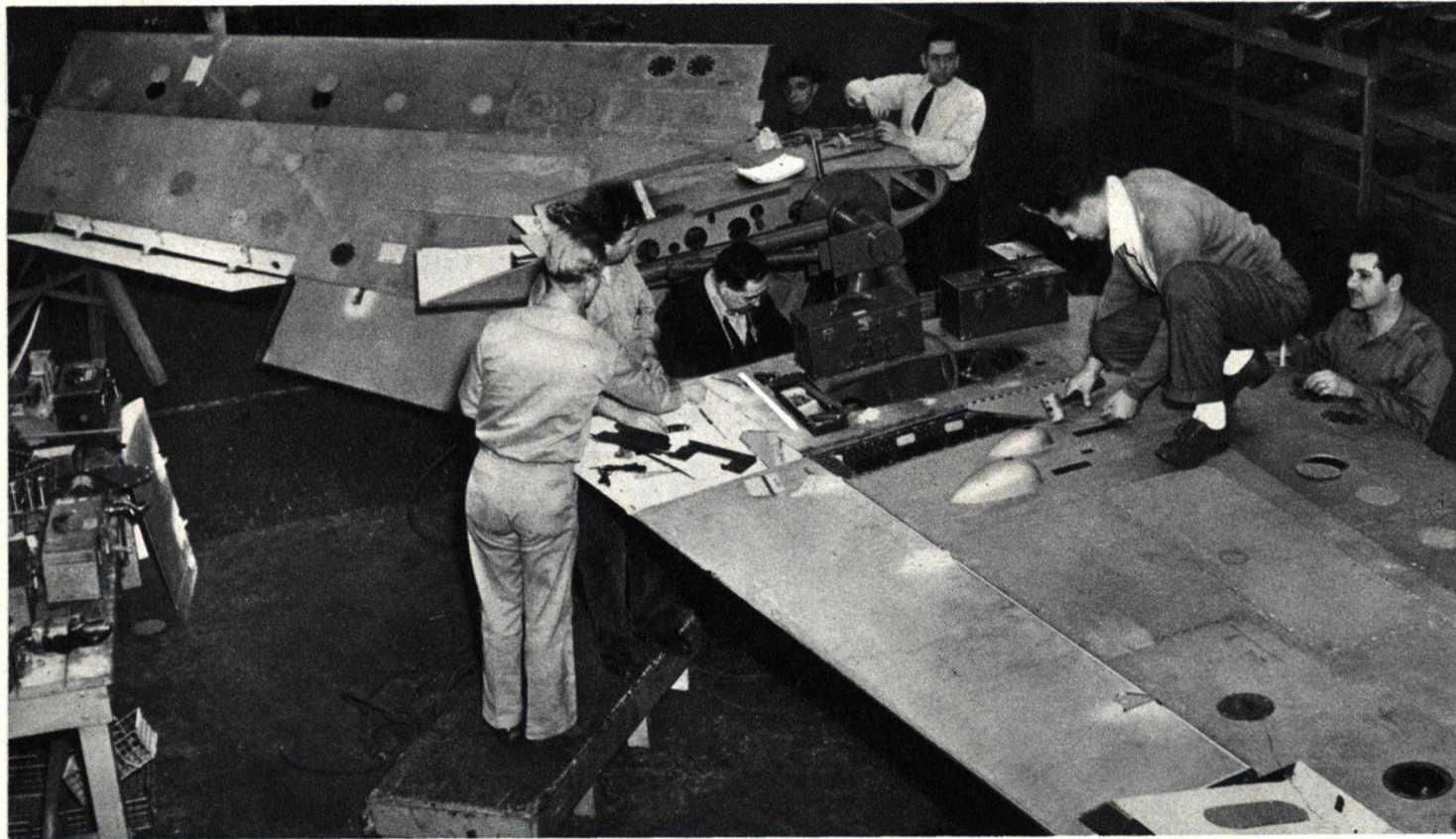
Now, assembly of the leading edge gets underway, as hundreds of rivets are poured into the structure.



Nextstop is wing final assembly where the leading edge meets other assemblies and is joined to them.

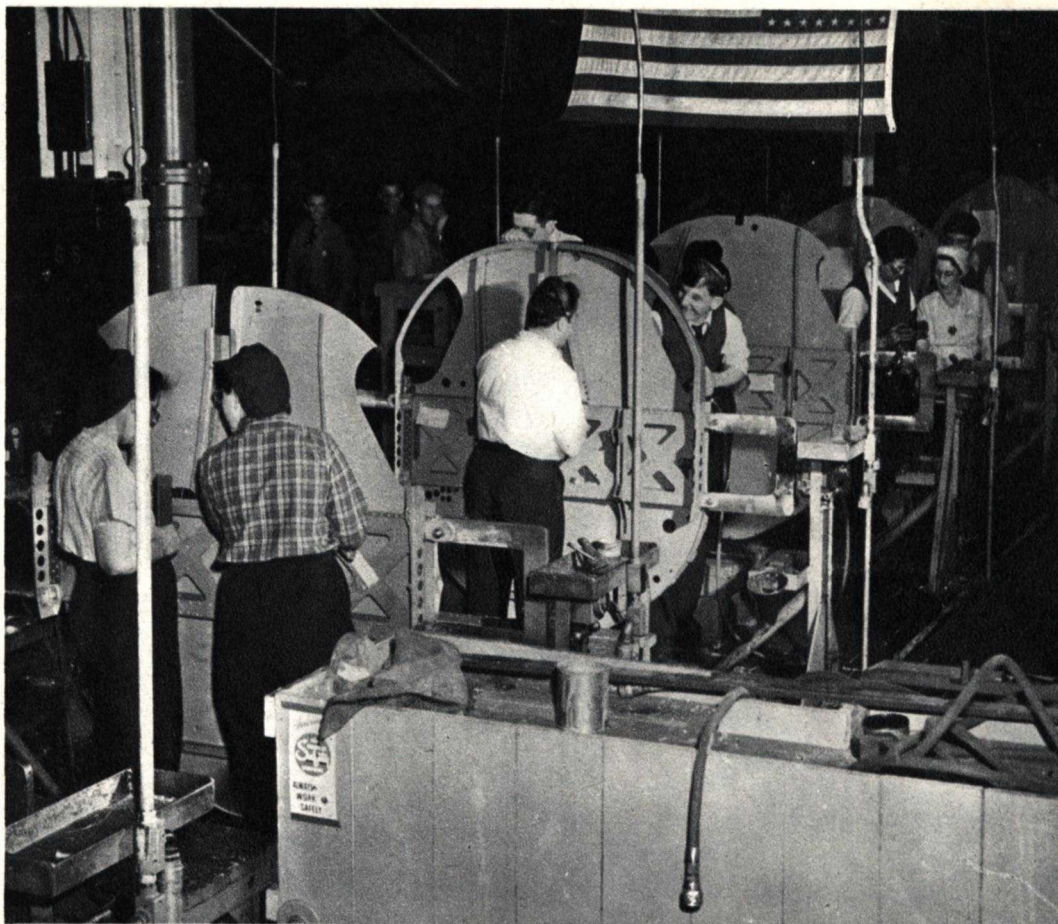


A closeup view of the fighter wing in final assembly reveals the intricate pattern made by the scores of delicately engineered assemblies within the wing itself. Workers complete an "inside" job carefully.



Once the wing is finished, it is brought to this unique jig and attached to the stub-wing assembly. Here, too, the folding apparatus is tested to make sure the wings fold back from the stub with complete freedom.

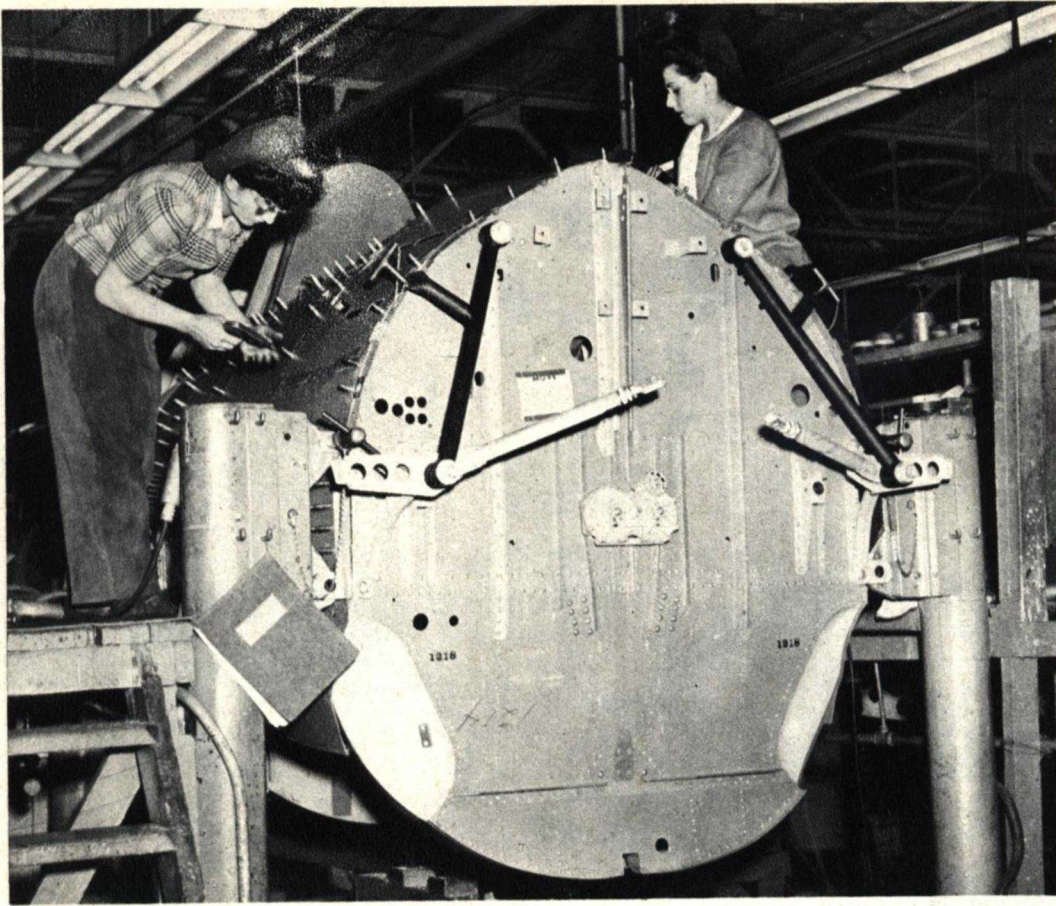
Elsewhere, fuselage assemblies are under construction. These bulkheads give the Wildcat its tapering, streamlined shape.



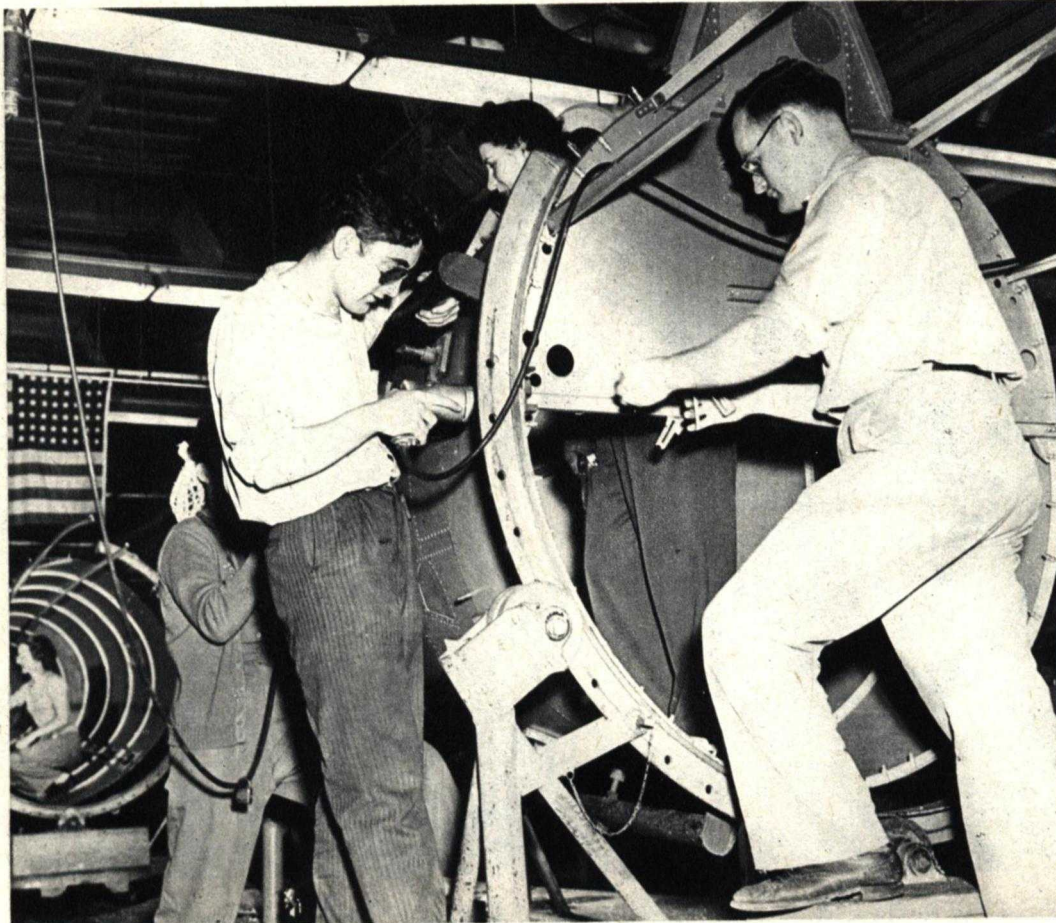
The aft tail section comes first, as the fuselage is built from the tail forward. Two women on the job.



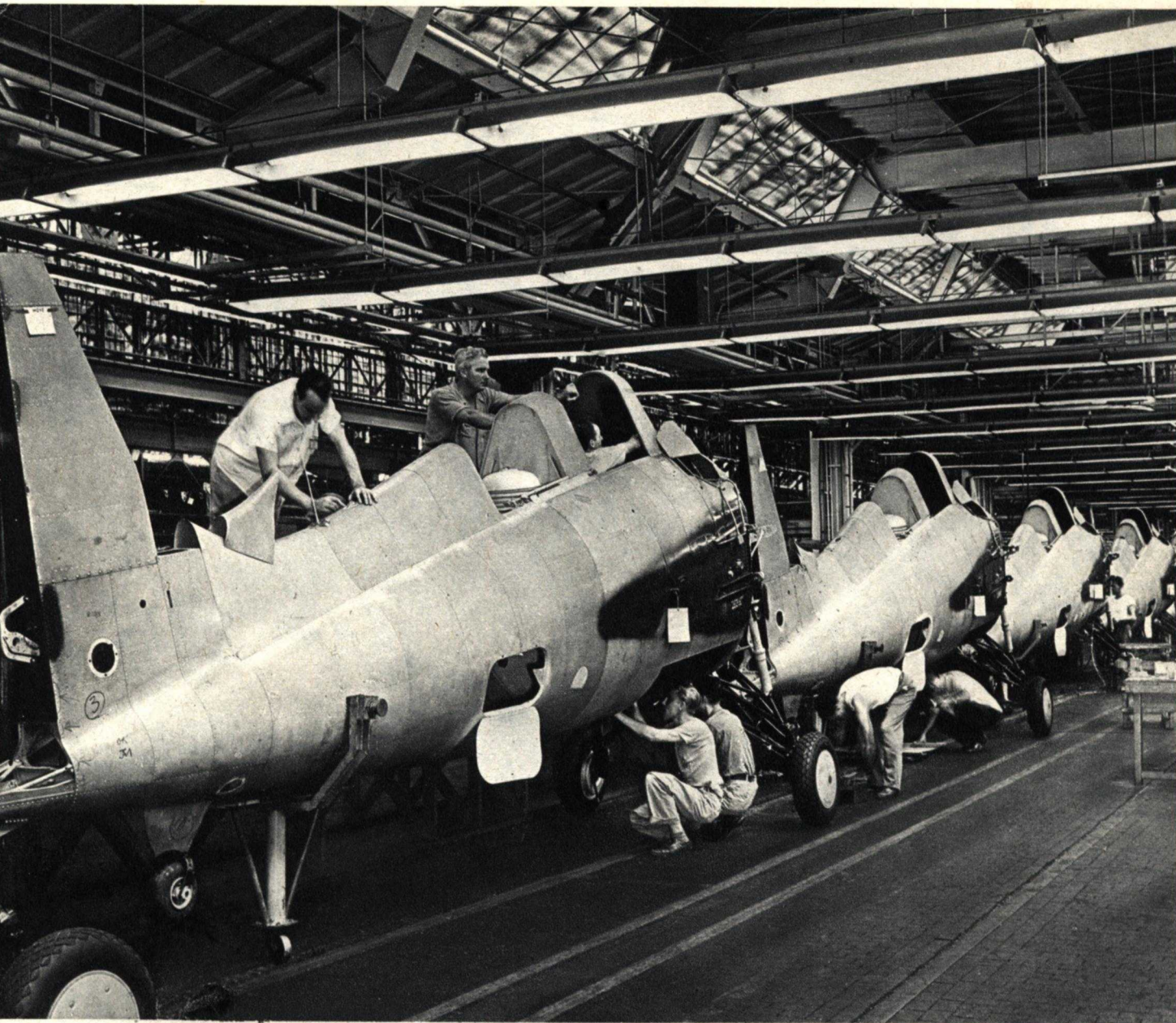
The fuselage broadens out as a new assembly is added to the aft tail section. Fuselage is now recognizable.



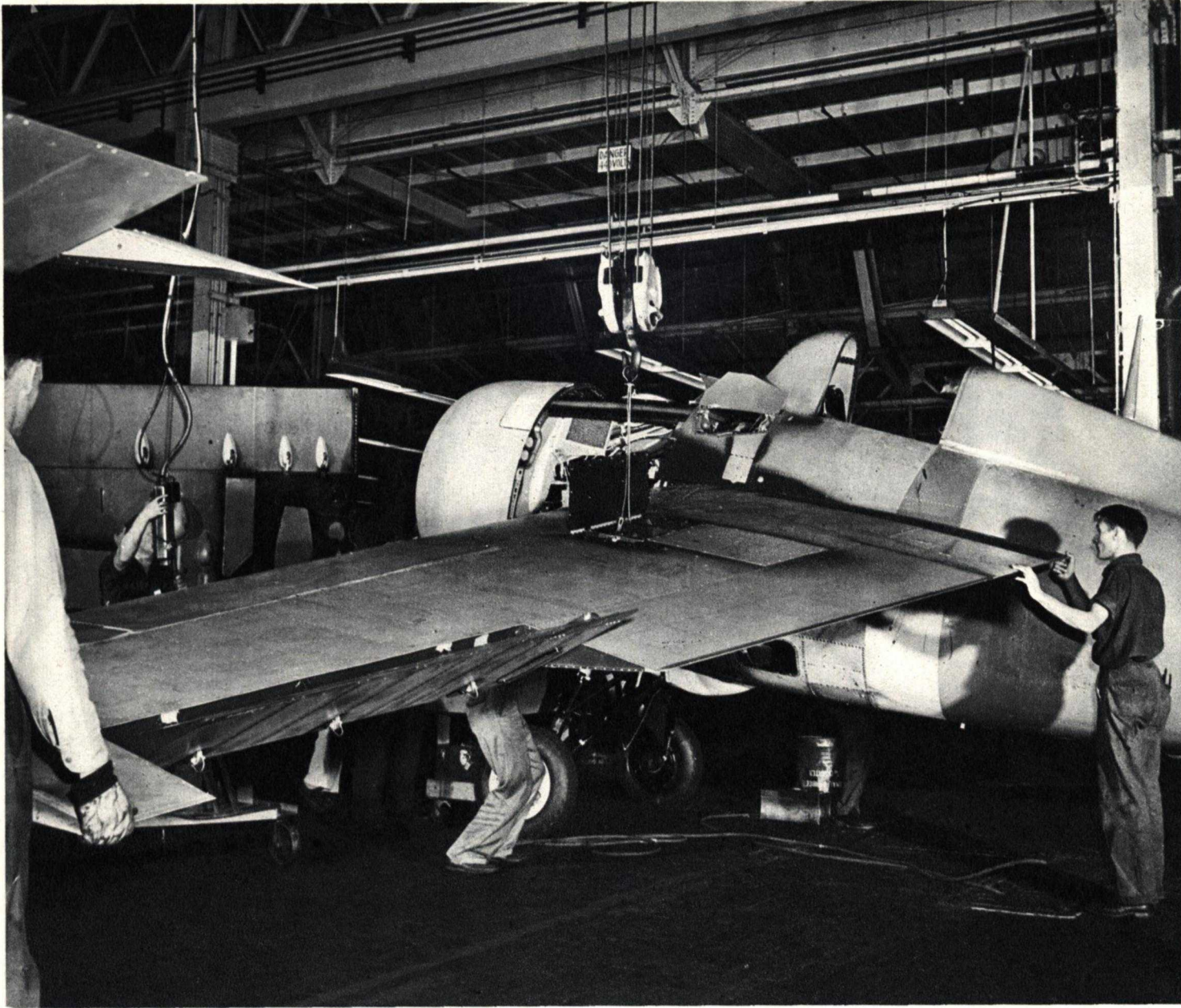
As the "tepee" of the fuselage becomes longer, it is placed in a special jig where "skins" can be riveted around the outside



The "tepee" is now ready to be joined to the forward fuselage section. Workers insert final rivets in the aluminum skins.

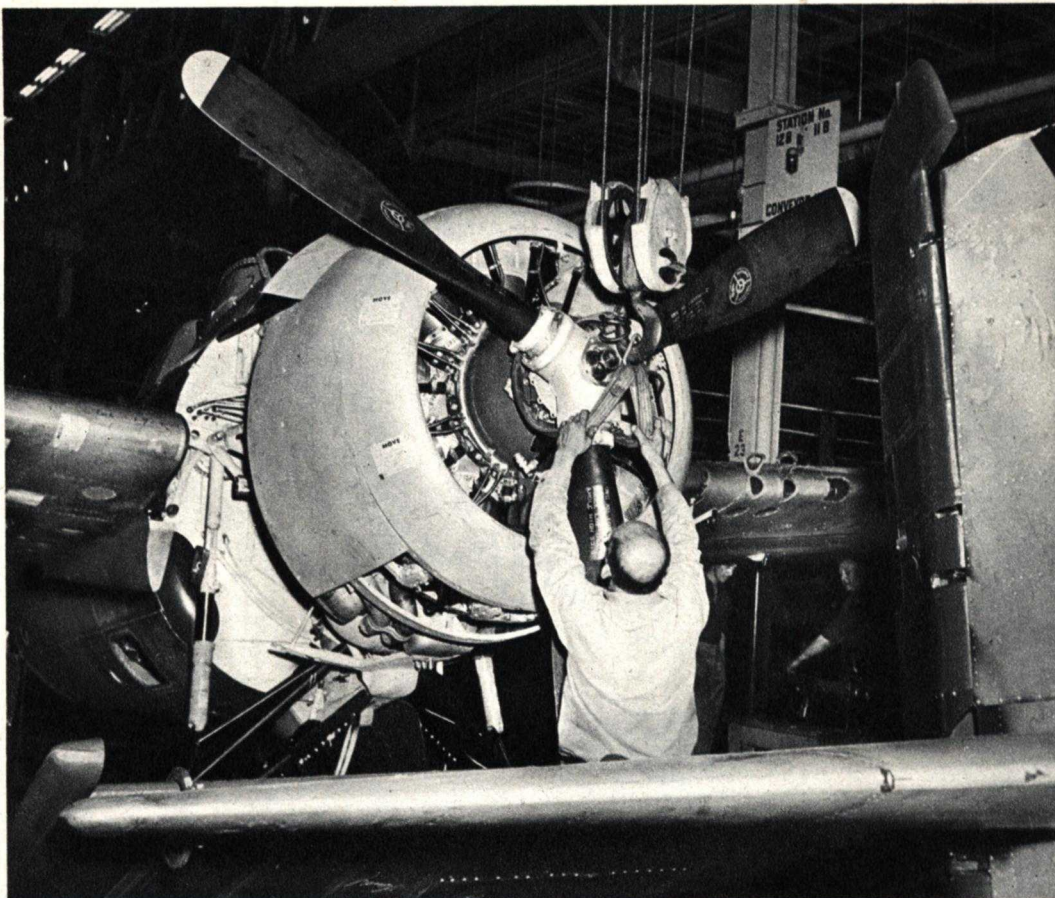


Finished assemblies are now beginning to pour into the start of final assembly. Here are fuselages without wings or motors, lined up awaiting the arrival of other assemblies which make up the Wildcat.



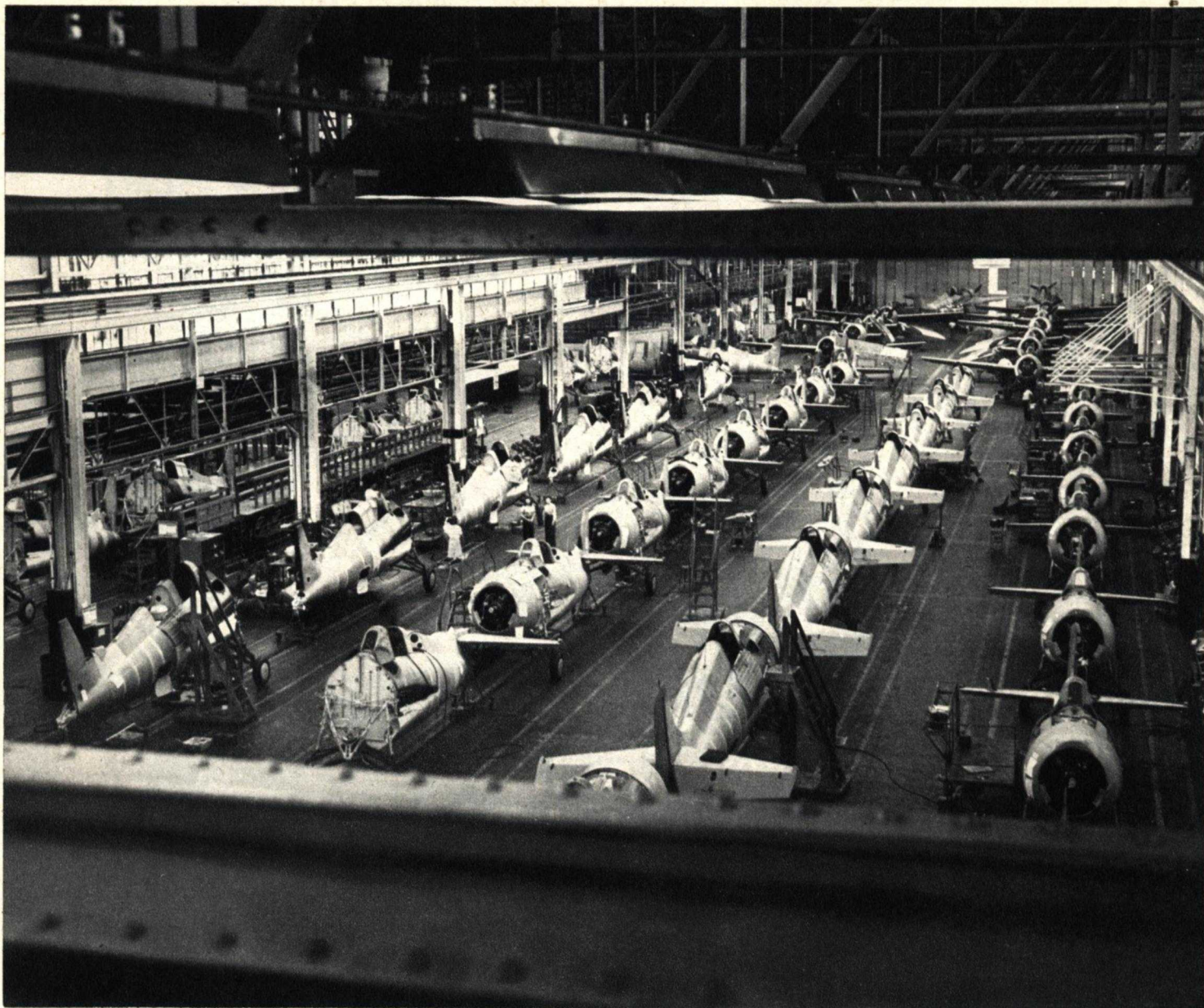
Here is an especially difficult operation in final assembly — the completed fighter wing is carefully lifted into place and joined to the fuselage in one of the major tasks along the final assembly line.

A huge three-bladed propeller is put on when the new fighter is nearing the end of Linden's final assembly bay.



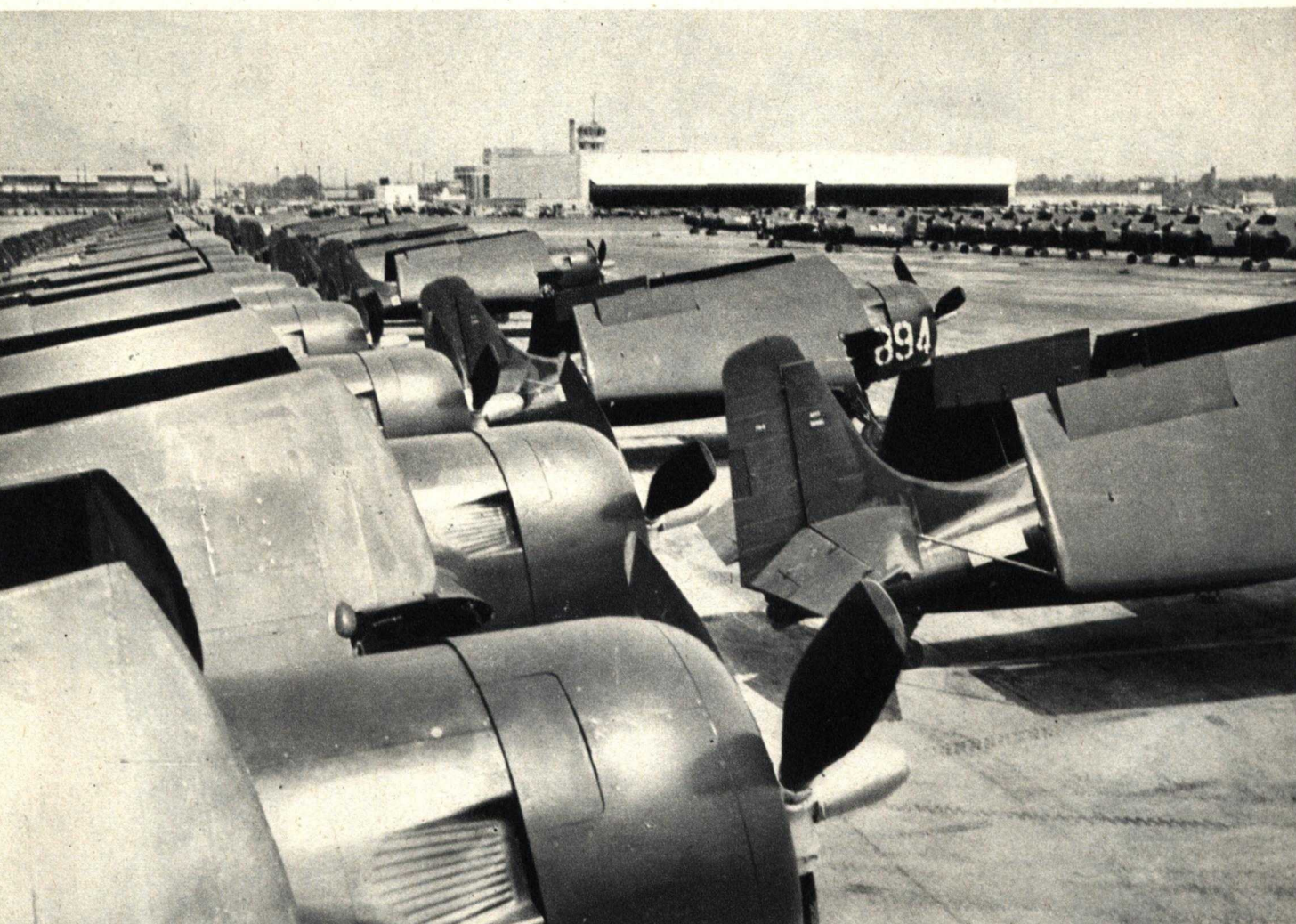
Installation of the rear control surfaces to the aft tail assembly sends the Wildcat a little farther down the line.





Wildcats in various stages of completion move through the vast, high-vaulted final assembly bay at Linden. An idea of the amount of activity going on every day in a wartime aircraft plant can be gained here.

After being carefully checked by
Flight Department a Wildcat
wings its way over Linden on
one of several test hops.



The "sales" line at the Linden airport strings out beside the hangar. Finished Wildcats await the time when Navy pilots can take them up for test flights. Soon these ships will see action off a Navy carrier.





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