Off-Highway...

Firestone Giants Move The Earth

The legendary feats of Paul Bunyan, Joe Magyar and John Henry are no more spectacular than real deeds performed by real men today. A few years ago what could have seemed more impossible than a monster which scrapes up and hauls away 5,000 tons of dirt per day, or a 120,000-pound "crasher" which clears an acre of dense woods in 20 minutes? Yet such juggernauts currently roam American construction sites in search of unwanted dirt, boulders and trees.

The mythical human giants and modern-day earthmovers are both products of imagination. The difference is that today's engineers have an eye to the future, so they create "monsters" with a purpose, monsters that would not be possible without the rubber tire.

By 1972, a 41,000-mile network of multi-lane, controlled-access highways will be completed, linking every major metropolitan center in our nation. Already open are 19,000 miles of highway built under the program for the National System of Interstate and Defense Highways. Playing a large part in the challenge of earth moving and road building are giant off-the-highway tires made by Firestone.

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THERE IS NO limit to the size and speed with which heavy equipment manufacturers can endow their creations, so it becomes the responsibility of Firestone off-the-road tire development engineers to cast their far-sighted eyes at things to come in order to keep pace. Firestone men design and build the largest tires in the world, and this is only the beginning.

In the 1930's, giant earthmover tires were capable of full-load operation at top speeds of five miles per hour or less. Today, larger tires carry much greater loads at speeds approaching 60, and this upward trend in both speed and weight is continuing.

The tremendous improvements in off-the-road tires are due in large part to Firestone's research policy of considering each construction job as a separate problem, and designing or recommending a specific tire for that job alone.

Firestone has long been the leader in manufacturing special off-the-road tires for unusual jobs, and the experience gained has given the company's products excellent acceptance in both original equipment and replacement markets for all phases of construction work.

Firestone tires for earthmoving equipment were a natural outgrowth of the company's pioneering activities in the farm tractor tire field.

The earliest references to earthmover tire development as such are in the company's archives for 1934. In the late fall of that year, five tires of size 17.25-24 (later 18.00-24) were made for experimental work for a large earthmover truck manufacturer, but the development was discontinued, so Firestone sold the tires in the spring of 1935 for application to Euclid earthmoving equipment in operation at Tappan Dam, Tappan, Ohio. The tires were successful and were adopted by Euclid as standard. (Euclid then was a small equipment manufacturing firm — now an important division of General Motors.)

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AT THE SAME TIME a road and construction contractor named Robert G. LeTourneau became interested in tires for his equipment. He wrote to Firestone in 1934 with a unique proposition. Then unknown, now world-renowned, Mr. LeTourneau thought that if he put great, over-sized, low pressure rubber tires on his dirt-moving equipment that he could move earth long distances quickly and cheaply.

Firestone engineers studied the idea; and tested dual sets of big tires that would support heavy earthmoving equipment and let it roll as easily as a heavy truck; but they didn't quite do the job. The engineers studied and experimented some more and came up with a single super-tire instead of sets of two smaller tires. They had a vulcanizing mold made that would hold a bigger tire than had ever been built, called the 18.00-24, five feet high and 18 inches across, with a rim two feet in diameter. Even to the imaginative Harvey S. Firestone, it seemed an impractical Gargantuan affair, and it cost $7,000 for the mold alone.

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MR. LeTOURNEAU was satisfied; and called for bigger and bigger tires. Why not a tire that would let him move as much as 50 tons of earth a load—and move along at 20 miles or more an hour? So Firestone built a real super supermold and soon was building tires 9 feet tall, and 3 feet across, weighing 3,400 pounds and costing $4,021.50 each, without the tube.

The line of earthmovers grew and Firestone called them Ground Grip Earth Mover tires. Their name remains the same today. They have been joined by the Rock Grip tires especially for the toughest rock, coal and ore operations, as well as excavating, earth moving and grading.

In 1940 announcement was made of another "largest tire ever built." This was a 36.00-40, "truly a wonder of the world," according to Alfred Lief in **The Firestone Story**. This was the largest pneumatic ever produced. Thirty-four plies built on a special drum; expanded in a machine two and a half stories tall; cured in a mammoth mold. Each tire weighed 3,646 pounds with tube and protecting flap. A set of these tires could sustain 25 tons and float the huge earth-scraping and hauling equipment over rocky or soggy terrain.

By 1947, earthmover tires, with 21.00 cross section and larger were built by Firestone with a tapered fit between the bead and the rim—an innovation that became standard for the industry. Firestone Steel Products had developed this improvement on the wartime divided rim in 1946. It eliminated the rocking and shifting of heavy tires on their bead seats and prevented premature bead failure; only one bead had been anchored before.

For on-the-job changes of giant earthmover tires. Firestone fashioned a bead loosening tool. Another development, a large dynamometer, determined the horsepower requirements of huge construction equipment and tested the tractive ability of heavy-duty tires.

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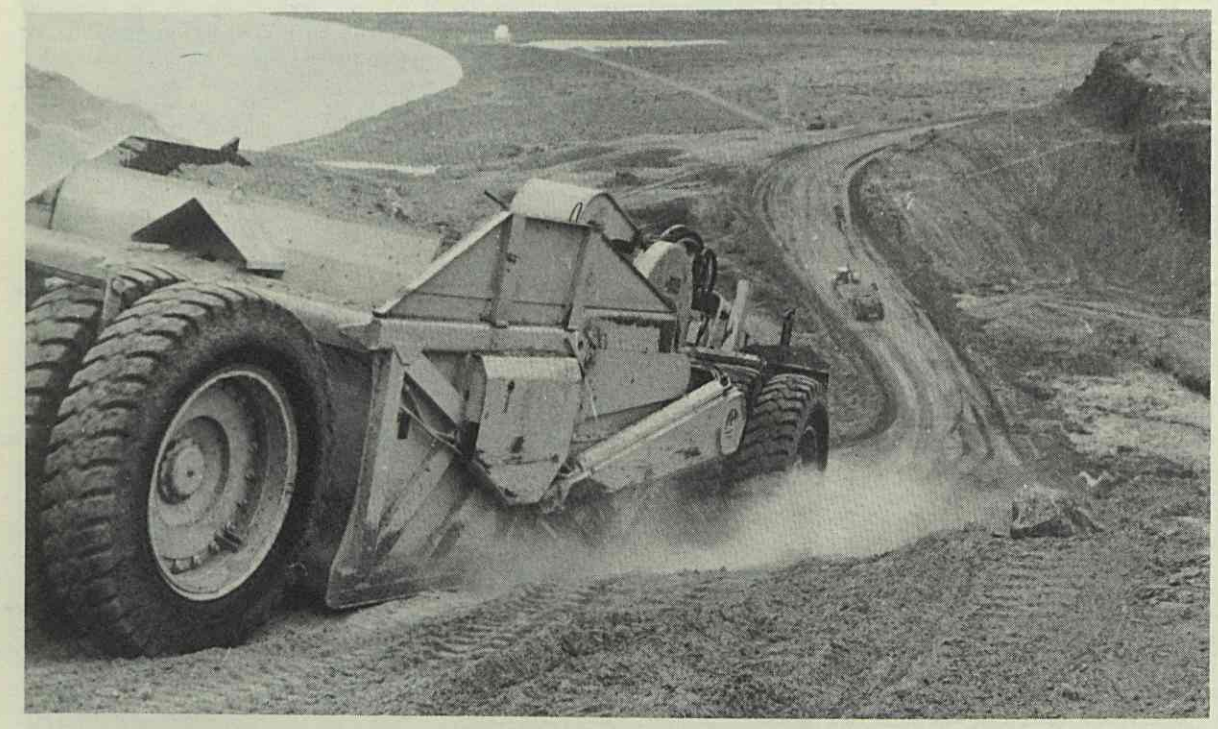
NO "GIANT TIRE" story would be complete without mention of the ultra-specialized behemoths Firestone builds. Now largest commercially produced tires in the world are the 10-feet-high size 48-68's in use on the Army Transportation Corps' LeTourneau Overland Cargo Carrier, better known as the "Snow Train." This monster has 13 self-propelled cars and is designed to cross the ice, snow, mud and marsh of Arctic wastes in Alaska and to operate on the Greenland icecap. Each of these tires carries up to 15,000 pounds at only 10 pounds per square inch of air pressure.

More heavily built, if smaller, is the 9½-foot high, 3 feet wide 36.00-41 developed by Firestone for use on the Army's amphibious "Barc," built to unload offshore ships and haul the cargo inland. This tire contains enough rubber to manufacture more than 150 popular sized automobile tires.

There were only two sizes of large off-the-road tires available 27 years ago. Today, the list of sizes is long, and for every size there is a series of different tread patterns and tire constructions as well as different ply ratings. And each day brings new requests for sizes and types of tires not currently available.



LARGEST SINGLE construction job ever serviced in the company's history was announced in 1962 when Firestone was designated tire supplier for the $345 million Mangla Dam project on the Jhelum River in West Pakistan, the first part of the huge Indus River development which will be more than seven times the size of the St. Lawrence Seaway development when completed.

AIRCRAFT TIRE engineers are constantly faced with problems of contrast in aircraft tires — tires for large and small planes, hot and cold temperatures, high and low speeds. Jet transportation added the problems of higher speeds, heavier weights, longer taxi runs and excessive braking on landing.

Aircraft...

Company Interest In Aviation Started In World War I

Air transportation is dependent upon rubber tires. Aircraft tire development at Firestone has been dependent on all areas of tire development, research and testing. Developments in passenger, racing, farm and other tires have all contributed to aircraft tire development.

The interest of the company in the field of aircraft tires dates from the First World War when the company developed and manufactured such tires for the United States Government.

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IN THE EARLY DAYS of the aviation industry, Firestone engineers were among the first to develop new tire constructions that could withstand landing impact, severe braking and extreme temperature changes. Firestone tires flew on many of the pioneer flights that marked the historic development of air transportation.

In 1911, Harvey S. Firestone, initiated a high speed tire test program at the Indianapolis Speedway. This program began paying dividends almost immediately as race speeds increased. Through this program, valuable information was obtained and utilized in aircraft tire construction.

When gum-dipping was perfected by Firestone engineers in 1923, the new process gave added protection in the vital cord body of the tire against the common cause of failure — internal friction and heat. The result was a gain in both tire body strength and flexibility which was particularly beneficial to aircraft tires.

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SINCE 1921, Firestone's development department had been experimenting with larger tire cross sections. The result was the "balloon" tire and the impact of the balloon tire on aircraft tire performance and efficiency has no parallel.

In 1932, Firestone began a series of experiments to determine if synthetic rubber was suitable for aircraft tires. The results of these experiments led the company in 1933 and 1934 to build tires of DuPont's Neoprene, and become the first to supply the United States Army with synthetic rubber aircraft tires.

An innovation in Firestone's 1938 Indianapolis racing tire was the use of tread stock on the two outside plies to give the tire greater high speed tread adhesion characteristics. This and other changes in the racing tire were important factors in the development of high-speed tires for World War II aircraft.

Culmination of the years of engineering effort came at the start of World War II, when the largest airplane tires ever built up to that time landed the famous B-19 after its maiden flight.

At the outbreak of the war, industrial mobilization was a critical problem. To speed the production of high-speed fighter plane tires, the government wrote the Firestone race tire formula into the specifications for all Army and Navy aircraft tires. The government also adopted the flat channel tread, with its wide footprint, as standard.

The channel tread was developed by Firestone for aircraft tires in 1941. It enabled combat planes to take off and land on soft fields (mud or snow covered) where other tires bogged down. The company's work in synthetic rubber also gave a big boost to aircraft tires.

An outstanding contribution to the air force was the Firestone development and testing of a track landing gear system which made it possible for aircraft to land on soft and uneven ground.

The company's low-profile tire and wheel unit was another valuable aid to the air arm of national defense. The old style round contour landing tires for fast fighter planes sometimes dug deeply enough into soft earth to ground loop the planes. The low-profile tire that was a part of the new unit was designed so that the whole width of the tread came in contact with the soil at one time, without the necessity of sinking in to get ample contact area for flotation.

This development greatly increased flight safety for it enabled pilots to take off and land aircraft even after the tires had been punctured by anti-aircraft fire and flying shell fragments. Through this development a whole series of nose-wheel tire sizes was developed. The famous Bell "Airocobra" and many other fighter planes used this low-profile tire.

In 1953, Firestone developed the first main wheel tubeless airplane tire designed to reduce the weight of aircraft. Constructed with nylon cord, the new tire was 20 per cent lighter in weight than the rayon cord tire and tube. The significance of the successful performance of the tubeless airplane tire was that the time, money and space required by the government for purchasing, shipping and storage of tubes could be drastically reduced as well as the weight of the aircaft.

With the coming of the jet age, Firestone again called on its racing know-how and developed a new tire with many of the construction principles of the Indianapolis tire. This revolutionary tire made 50 simulated landings on a laboratory "runway" at 250 miles per hour in August, 1952, thus becoming the first tire of its size to meet the high speed requirements established by the Air Force.

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