

## FARM TRACTOR DEVELOPMENT

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**The development of the farm tractor began a little over 100 years ago. The use of tractors in forest tree nurseries started approximately 50 years ago. However tractor use did not become widespread until after 1945. The Creeper Gear or hydrostatic ground speed control transmissions have contributed greatly to improved nursery productivity.**

### INTRODUCTION

During the 17th century, as a result of widespread interest in scientific research in Europe, experiments on heat engines were taking place in many countries. While the origin of the internal combustion engine is obscure, the present engine is the result of a long-continued development the early stages of which were mainly exploratory in character. For instance, Huvghens, a Dutch physicist in 1680 experimented with gun powder. Thomas Newcomen in 1705 made a <sup>P</sup>ractical success of an atmospheric engine. Indeed, more than twenty-one centuries ago, Hero of Alexandria (130 B.C.) described an apparatus that made use of heated air for opening an closing temple doors. This is the first air en<sup>g</sup>ine of record and the first device known to do mechanical work with ex<sup>P</sup>anded air.

In 1769 James Watt took out a patent on a steam engine making use of a separate condenser and produced steam engines from 1774 to 1800, when the patents expired. The contributions made by Watt were of such significance that he is frequently referred to as the inventor of the steam engine.

The Cugnot steam road wagon built in France in 1769, is said to be the first self-propelled vehicle constructed for road use. It was used for hauling artillery.

**In 1784 William Murdock, a Scotchman and close associate of Watts, built a small working model of a high-pressure locomotive engine which performed satisfactorily. About 1800 Richard Trevithick, in England, and Oliver Evans, in America, started experiments in the use of steam for railway carriages. Steam turbines for marine use and steam engines for stationary and motive power were in the experimental stage during this period. In 1810 Major Pratt of England attempted to use steam power for plowing, hut many years passed before significant progress was made in the practical application of steam power to agriculture.**

## STEAM ENGINES AND TRACTORS

The "steam Plow," or traction engine, was the forerunner of the gasoline tractor and the first step of importance in mechanical power farming in this and other countries. In addition to the demand for steam power for plowing, new farm machines invented in the first half of the 19th century stimulated a need for mechanical power. In 1831 McCormick invented his reaper. This was soon to create a demand for belt power with which to thresh the mechanically harvested grain crops. By 1847 the Pitts pattern threshing machine was being built by many shops from Maine to Mississippi and by 1860 over 50 shops were building threshers under license from Pitts Brothers. Shortly thereafter, steel plows, mowers, shellers, fodder cutters, and other machines were being offered.

Between 1870 and 1880, farm machinery inventors devised a suitable gearing for the rear wheels of portable steam engines, and also a chain or belt drive from the engine flywheel to a countershaft of this gearing to provide self propulsion. The bevel gear and inclined shaft developed by C. and G. Cooper of Mt. Vernon, Ohio, was also a popular method of drive at this time. The development of steam tractors flourished from 1885 to 1919. Starting in 1920 the gasoline engine gained universal acceptance.



C. L. Best Steam Tractor (vertical fire tube boiler), 1885.

## INTERNAL COMBUSTION ENGINES AND TRACTORS

John Barber, an Englishman, in 1790 built the first engine to employ gas as a fuel. The device employed a paddle-wheel (gas-turbine Principle) that revolved rapidly when a continuous flame from a gas exploder was directed against the paddles. In 1794 Robert Street, also an Englishman, Patented the first real engine. It contained a cylinder in which worked a Piston connected to a lever and operated a pump. Turpentine as the fuel, was introduced and heated, and the air drawn in produced the combustible mixture.

The internal combustion engine as a practical power unit began to assume importance with the Otto engine in 1876. Otto's four-stroke cycle engine was thought to be at a serious disadvantage because of only one power stroke for every two revolutions of the crankshaft. Experimenters accordingly turned their attention to the development of an engine operating on a two-stroke cycle in which there is a power stroke each revolution of the crankshaft.

In 1893 Rudolph Diesel, a German scientist and inventor described a new form of internal combustion engine which we know now as the Diesel engine. Diesel's first engine was patented in 1892, the inventor claiming to have originated a compression-ignition engine to burn coal dust blown into the engine cylinder by compressed air, although it was further claimed any kind of fuel could be used.

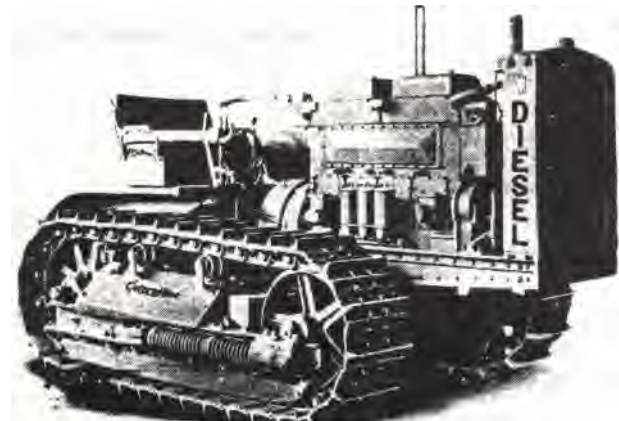
It is difficult to state definitely who first made use of petroleum fuel in an internal combustion engine. The discovery of its potentialities for this purpose, however, paved the way for the development, improvement and increasing use of the tractor. The first Diesel tractor in the United States was built in 1931 by the Caterpillar Tractor Co., Peoria, Illinois. It was of the track-type powered with a 4-cylinder Diesel engine and made use of a 2-cylinder gas engine for starting.

#### GASOLINE/DIESEL

The early development of the tractor followed a pattern similar to that of the steam traction engine-- the stationary engine was mounted on skids or wheels to make it portable and then a drive was devised to make it self-propelled. The trend continued for many years but gradually absorbed certain automotive principles until 1954 such features as the automobile type steering and transmission, high speed engine, and a much lighter and more efficient tractor unit. Indeed, the trend went further and added such items as belt pulley for belt work, drawbar for pulling machines, power take-off (p.t.o.) for driving mounted or pulled machines and finally hydraulic controls for controlling many drawn and nulled machines-- furnishing four different methods of applying power.



1898 Huber



Caterpillar Diesel 65

SLOW MOVING OR CREEPER TRACTORS  
(FOREST NURSERY OPERATIONS)

As the cost of Producing seedlings continued to rise it became a<sup>P</sup>parent that something had to be done to keep cost down. It was determined that the most labor intensive part of the tree nursery operation was the handling of seedlings, specifically field lifting and packing shed. These labor intensive activities became an area for immediate attention. Several different ty<sup>P</sup>es of equipment were developed to lift the seedling. A means now existed to more economically lift seedlings. This new technology did not come without creating additional problems. A tractor related problem surfaced, first the lifter required very low ground speed (less than 1/2 MPH) while needing high traction capabilities. The combination was not available in conventional wheel tractors. Crawler tractors could provide the combination, however the crawler did not match the seedling bed configurations. In the late 1960's the hydrostatic transmission and a suitably matched engine became available from International Harvester (IHC), which worked well for a number of years. More recently, the cree<sup>P</sup>er gear machines from Case and Hesston have been filling the need.



**International Farmall 544 Hydrostatic Gasoline**

Literature Cited

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