



# AT THE DAWN OF THE

Horse teams supplied the bulk of power required on Australian farms in the 1890s

# RISE OF IRON HORSES

Without doubt Australia has ridden to fame and fortune on the back of our agricultural endeavours. And since its inception 120 years ago, in 1891, *Power Farming* magazine has been a first-hand witness to many milestones and this incisive commentary is from its extensive archives

**I**t was not obvious at the time, but in 1891, farming was facing its most significant and far-reaching change in history.

And the really big challenge was in mechanisation and particularly the sources of power to manage the ever increasing production burdens being placed on farm labour.

In the early 1890s farmers in Australia were still depending on the slow pace of a team of horses or, very occasionally, oxen to deal with cultivation, harvesting and transport work, and animals also provided the power to operate some stationary equipment such as threshing machines.

The big disadvantage of farming with animal power was the slow work rate. A typical output for a ploughman with a two-horse team pulling a single-furrow plough would be little more than 0.4ha (one acre) per day, although some teams did manage up to 0.8ha (2 acres) when encountering easy-working soil with the plough at a shallow setting.

Compared with the obvious disadvantages, the benefits of working with animal power were small. The best advantage was that a farm with horses or oxen could breed its own replacements, and the animals produced manure to contribute to soil fertility.

But using animal power meant that grass and other home-grown food for the team could negate any income from about 5ha (12.5 acres) for the eight or so working horses typically needed on a farm growing 200ha (500ac) of crops.

An argument sometimes used by those who favoured real horse power was the fact that draft animals could be eaten when their working life is finished, but this is unlikely to tempt many farmers to exchange their tractors for a team of horses, today.

One result of the slow work rate of farming with draft animals in the 1890s was a big demand for manpower.

Around 40 per cent of the country's labour force was employed in the farming industry in 1891. Compared to less than four per cent today.

While the total number of horses in the country recorded a fourfold increase from 431,525 in 1860 to reach around 1.7 million during the 1890s and early 1900s peaking at 2.5 million in 1918. The majority of the horses at that time were working on farms, and the big increase in their numbers coincided with a rise in the area of crops grown on Australian farms from less than 1.2 million acres (480,000 ha) in 1860 to 9.4 million acres (3.76 million ha) in 1905.



While farmers in 1891 were working their farms with horses or oxen, there was also a small number who also used steam power, mainly from Britain, where most of the steam engine developments took place. The toughest challenge for steam pioneers was to put their engines to work in agriculture, then the biggest industry, but they achieved only limited success.

Stationary steam engines were powering threshing machines on some British farms from the late 1790s, but the numbers were small and the huge investment usually had more to do with impressing the neighbours than with making a profit. Threshing was a job that could be done when there is little alternative work on an arable farm, which means that the expensive steam engine would be powering the thresher while the farm's horses were idle.

A partial breakthrough came later with the development of portable steam engines that could be pulled by horses from farm to farm. They were often owned by contractors who offered a threshing service on farms in their area and also used the engines to power equipment such as pumps and saws.

As early as 1847 portable steam engines arrived in Australia and by about 1885 we had become a major export market from Britain and America, with sales peaking over the next 20 years.

As well as portable engines for threshing, self-propelled steam traction engines were also popular here for hauling timber, grain and wool, and

**In 1891 a four-horse team pulls a cultivator as their predecessors had done for centuries before... meanwhile a Fowler cable-ploughing steam engine toils away in the background and sets the scene for the mechanisation of Australian farms that will eventually displace the dedicated and detrimined workhorse**

some replaced portable engines for threshing work.

This was really the limit of steam's success, as attempts to harness steam power for extensive paddock cultivation and harvesting made little headway on Australian farms.

Cable systems for ploughing and cultivating were developed in the 1850s in Britain by John Fowler and others, but only around 100 were sold into Australia. This was partly because of the high cost of buying two big steam engines, each with a winding drum and a length of cable to pull a special plough or cultivator to and fro between them, and also because the limited length of cable that could be used was often inadequate for the big paddocks on our local farms.

Traditional steam engines had a number of disadvantages, including the hour or more it can take to heat the water to produce steam, the heavy weight of the engines caused problems on soft ground and it was difficult in some areas to maintain a supply of coal. Some steam engines were adapted to burn wood or straw instead of coal, but this reduced the engine's efficiency.

The steam engine's limited contribution to mechanisation on farms was already under threat from the development of tractor power, when the genesis of Power Farming magazine first appeared in 1891.

Tractor development was still in its very earliest stages

and there were probably no more than four or five tractors in existence. They were all in the United States and they were all basically traction engines powered by a petrol engine instead of steam and, like a traction engine, they were used mainly with a belt pulley for threshing or for haulage.

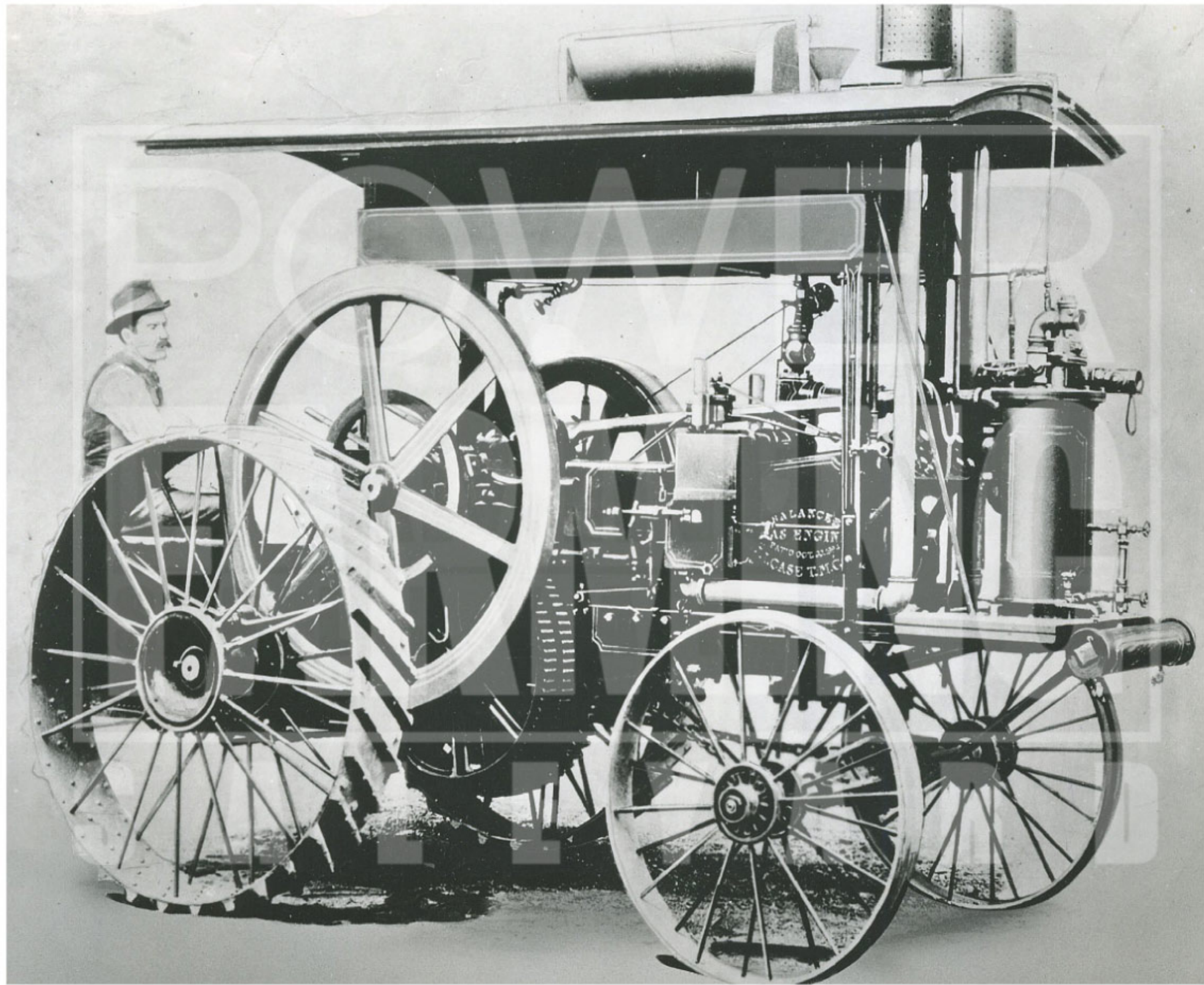
The very first oil burning tractor was built in 1889 by the Charter Gas Engine Co of Chicago. They used one of their own single-cylinder petrol engines mounted on the chassis and wheels of a Rumely steam engine, and they gave it a trial run driving a threshing machine. It worked



**A belt drive from a Ruston Proctor steam traction engine powers a Ransomes threshing drum**



**Attaching a belt to allow this restored Foster traction engine to power a thresher is still a team effort today**



**J I Case built this experimental tractor in 1892 but abandoned the project because the reliability was not as good as their steam engines**

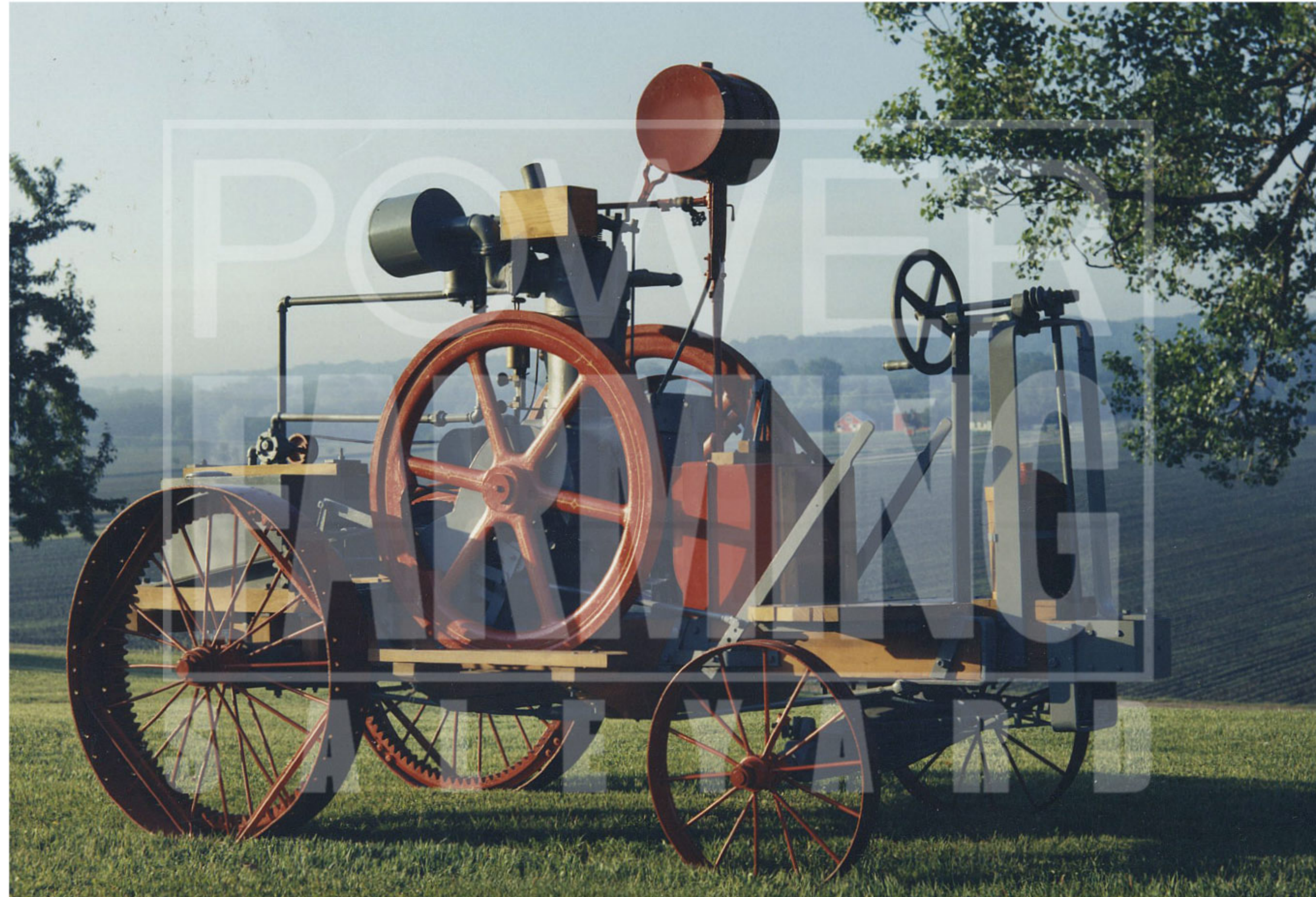
well, avoiding some of the disadvantages of steam power, and Charter built five or six similar tractors over the next two to three years.

News of the Charter's success prompted others to experiment with petrol powered self-propelled threshing engines. These included the J I Case Threshing Machine Co which built a prototype tractor in 1892.

Case was already making steam engines for the farming industry and their decision to experiment with a petrol engine showed remarkable foresight. They also showed good

judgement when they stopped the experiment, realising that the primitive fuel and ignition systems on early engines could not match the reliability of steam power. By the early 1900s Case was the world's biggest agricultural steam engine manufacturer, but they returned to tractor production just as engine reliability was improving and the market was beginning to expand.

Another of the 1892 petrol experimental tractors was built by an Iowa contractor, John Froelich. The success of his prototype model encouraged him to form the Waterloo



**This 1892 Froelich tractor design only sold two units but it was to become the earliest ancestor of the modern John Deere range**

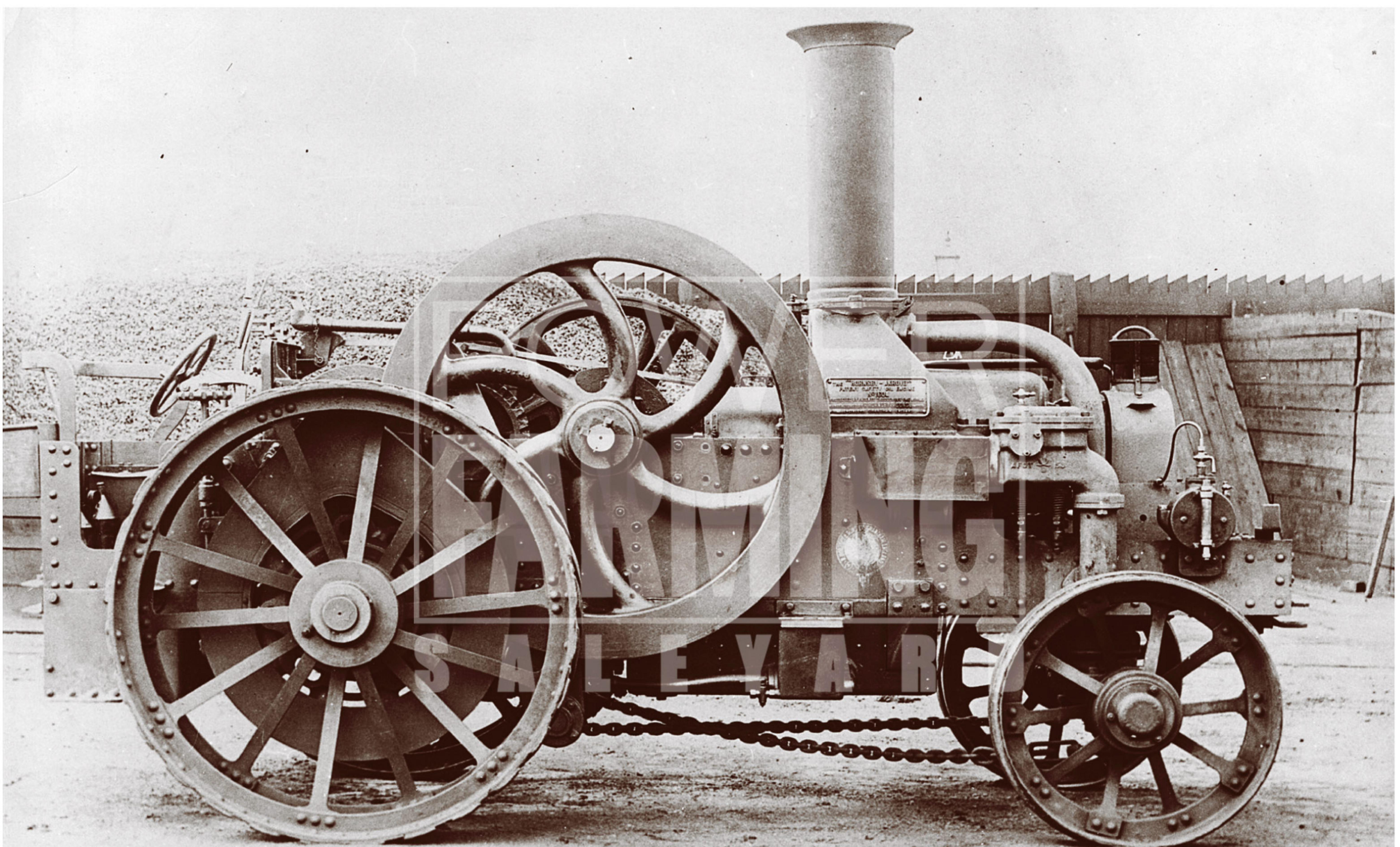
Gasoline Traction Engine Co which was bought by John Deere when they decided to move into the tractor market in 1918.

The first British built oil-burning tractor was recorded in 1896 when Richard Hornsby & Sons announced the Hornsby-Akroyd Patent Safety Oil Traction Engine. Based around an Akroyd Stuart 15kW (20hp) single-cylinder horizontal oil engine, it was also one of the first tractors to be sold here when three of them were imported in 1898.

Hornsby tractors, designed mainly to replace steam power

for threshing, were powered by a single-cylinder hot bulb or semi-diesel engine offering the advantage of having no electrical ignition system, which eliminated one of the main causes of engine problems on the early tractors.

Building heavyweight tractors to do the job of a steam engine was not a major step forward and only a minority of farmers could benefit. The big breakthrough was to design a tractor that was smaller, lighter and much more versatile than a steam traction engine and could replace animal power for jobs such as pulling a plough



**The Hornsby-Akroyd was the first oil-burning tractor to be built in Britain and the first 'oil-burner' to be imported into Australia, when three models landed here in 1898**

or a mower as well as dealing with haulage work as well as powering belt driven machinery.

Several British designers demonstrated tractors of this type between 1900 and about 1904, starting with Prof John Scott from Scotland who designed a 15kW (20hp) tractor with a rear-mounted, power-driven rotary cultivator and seed drill combination.

The Scott tractor/cultivator was simply too far ahead of its time to attract many customers, but Dan Albone's three-wheeled Ivel tractor announced in 1902 was much more successful.

Australia was high on the list of export markets including a Tasmanian customer who ordered a special version of the Ivel for working under his fruit trees. When it arrived in Tasmania in 1903 it was probably the world's first production line orchard tractor.

The Ivel, powered by a four-stroke engine, water-cooled from a large rectangular tank on the driver's left. It developed some 18kW (24hp) at 800 rpm. A twin-cone clutch gave forward or reverse motion to the single-speed transmission.

And following closely on its heels in 1908 was Australia's very first home grown tractor, the McDonald Imperial Oil Tractor model EA, made by AH McDonald & Co, located in Flinders Street Melbourne (Vic). While it started on petrol, it actually ran on kerosene, driving through a 3F/1R gearbox from a two cylinder engine of 15kW (20hp).

But in spite of these developments the demand for tractors here and elsewhere was still very small. This was partly because of poor reliability of engines that were still at an early stage of development and also because the small production volumes meant that the early models were expensive to buy. The situation did not alter until the 1914-18 war brought a big increase in sales and it was mainly American manufacturers that began to produce affordable tractors in large numbers.

While the origin of tractor developments is often difficult to trace, there is a considerable amount of information available about the history of grain harvesting machinery. A sector where much of the pioneering work began in Australia.

The development of the combine harvester has been traced back to 1843 when Adelaide (SA) farmer John Bull, tried to develop a grain stripper that cut the crop, remove and place the grain into bins. Bull



**The powered rotary cultivator and seed drill combination on the 1900 Scott tractor was at least 60 years ahead of its time**



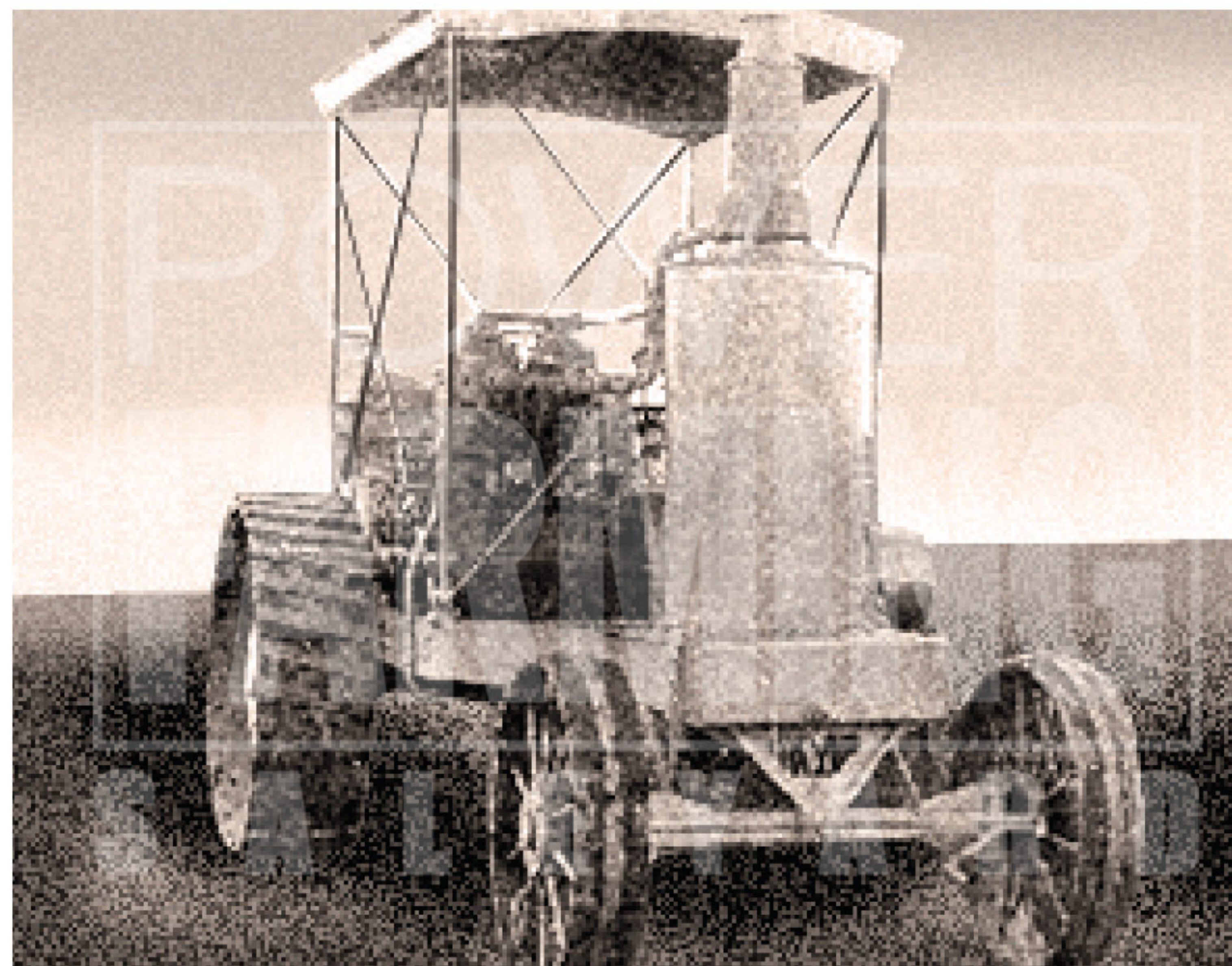
**A special 'low profile' version of the Ivel tractor delivered to a Tasmanian fruit grower in 1903 was probably the world's first orchard tractor**

was unsuccessful at his first attempt at a working model and two months later with a similar design came flour miller John Ridley, also from Adelaide (SA).

John Ridley's design, a grain stripper machine with a comb-like structure that stripped the ears from the top of the straw, did work. Ridley designed the machine to reduce the grain losses he experienced when over-ripe wheat was harvested manually using a sickle or a scythe.

He added a set of beaters to remove the grain from the ears, bringing the harvesting and threshing together in one machine, although it did not attempt to remove the chaff from the grain which was done as a separate winnowing operation later.

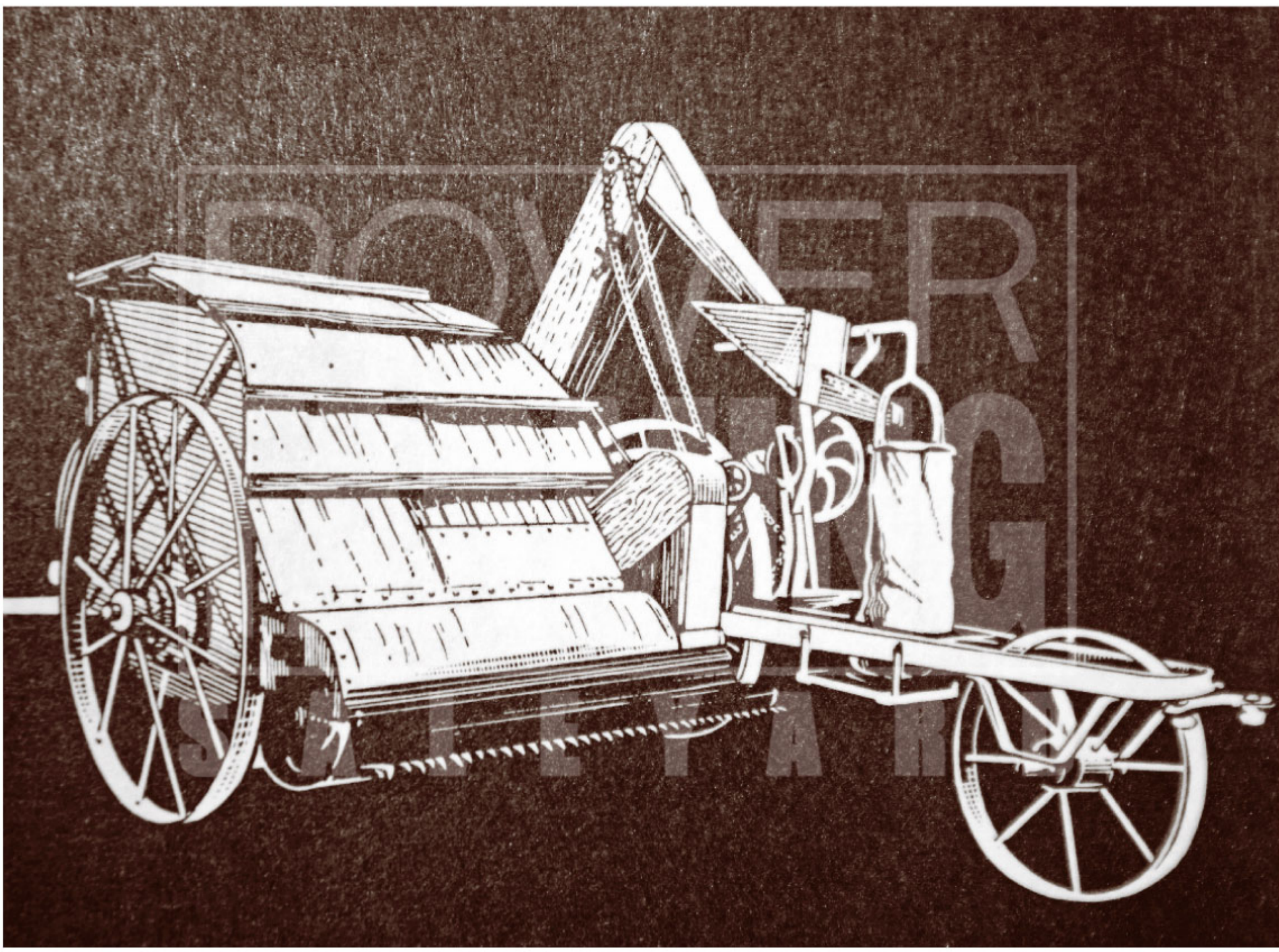
The stripper harvester was an important step forward, it meant that four men could



**The McDonald Imperial Oil Tractor model EA was Australia's first local designed and made oil burning tractor in 1908**

strip as much wheat grain from straw in one day as they used to in a whole season, but Ridley chose not to patent it as he wanted other farmers to

benefit from his idea. Other machinery manufacturers built grain strippers based on the Ridley invention, including Massey-Harris which built



**An artist's rendering of the stripper harvester built at Ballarat by H V McKay in the early 1890s**

large numbers including some that were imported into Australia.

The next stage in combine harvester development also started in Australia. In 1884 Hugh Victor McKay added a winnowing unit to an existing stripper to produce a stripper harvester, and successfully trialled it on the family's farm in Drummartin (Vic), it was the forerunner of the combine harvester.

The advantages were instantly obvious, and many of the farmers who were already using a stripper asked McKay to convert their machines. And the demand increased so much that in 1885 he opened a factory in Ballarat where he built the Sunshine stripper harvester.

Massey-Harris – later to become Massey Ferguson – was responsible for the next major step forwards in combine

harvester development, and the design work was handled by two Australian engineers named Charlton and East who were employed by the Canadian company. Their job was to bring all the major components of a harvester together in one machine that was light enough to be pulled by a small team of horses.

The result was the Massey-Harris reaper-thresher which was completed in 1909 and featured both a cutterbar and a grain stripping comb plus a platform with a canvas conveyor belt to move the cut crop. Threshed grain and straw moved over a set of straw walkers and the cleaning mechanism included a sieve and a fanning mill. The cleaned grain was transferred to a bulk tank, but when the tank was full the harvester had to be stopped while the grain was unloaded into sacks.



**Giant combines powered by steam or by teams of up to 40 horses or mules were at work in the early 1900s following ground breaking Australian harvesting developments**

Australians were always at the forefront of developments for cultivation. The prototype of agricultural equipment maker, Robert Bowyer Smith's Vixen three-furrow stump-jump plough was exhibited and won first prize at the Moonta Show (SA) in 1876. Among the most important agricultural inventions of the nineteenth century, the stump-jump plough revolutionised global farming practices by allowing the cultivation of newly-cleared land before all the stumps and rocks were removed.

Then along came, sixteen year old farmer's son Arthur Cliff Howard to build the world's first rotary hoe in a blacksmith's shop at Gilgandra, (NSW) in 1912.

Howard saw how his father's tractor wasted power by turning its wheels and just pulling the plough. He wanted to put the power of the tractor directly

into ploughing, and through trial and error, he designed the rotary plough.

There was little interest in his first version powered by a motorcycle engine. But after World War I he tried again and in 1921 raised sufficient finance to start manufacturing the Howard rotary hoe. His equipment was exported to more than 120 countries and had revolutionised agriculture globally. □

*During 2011 – our 120th year, a series of articles will appear in Power Farming describing the progress and some of the most memorable Tractor and farm equipment releases since 1891, up to the present day. Make sure you don't miss this incisive look at the history of farm tractors and equipment in Australia. Order now online, to make sure you receive a copy, go to our subscription page at [www.powerfarming.com.au](http://www.powerfarming.com.au)*



**Steam powered cable ploughing equipment from Britain like this Fowler engine built in 1870 attracted around 100 sales to Australian farmers**

## In the next exciting 120 year series



In our next installment. How steam would face a tough battle for survival against internal combustion tractor power. In a classic example of long established manufacturing companies challenged by new technology, with many of the big names in the agricultural steam engine industry eventually being forced out of business. And more on Australian tractor makers that would stake a claim for local dominance. □