

SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XXIX.--No. 2.]
[NEW SERIES.]

NEW YORK, JULY 12, 1873.

[\$3 per Annum,
IN ADVANCE.]

STEAM PLOWING BY DIRECT TRACTION.

With some modifications in its construction, and which do not impair its usefulness as a hauling engine, the well known road and farm locomotive of Messrs. Aveling & Porter, of Rochester, England, has been successfully applied to direct traction steam plowing.

Although there can probably be no question that the double engine rope system of steam cultivation, as practiced in Great Britain, is more thorough and comprehensive in its application than any form of direct traction steam plowing, yet the large cost of the machinery necessary for working the first named principle, seems to preclude the probability of its general adoption in this country.

The requirements for an expeditious and economical means for tilling the land by steam power are, however, far greater in the United States than in Europe, and in view of the numerous inquiries for steam plows suitable to the wants of our agriculturists, Messrs. Aveling & Porter have, for a long time, given much attention to the subject and, after repeated and careful trials, have adopted, with some alterations, the Fowler balance plow as being the best form of implement to use in conjunction with an engine which has to travel over the land to be plowed.

The difficulties that have presented themselves in the many attempts at direct traction steam plowing have, it is claimed, been overcome by using the balance plow; which, it is stated, avoids the necessity and consequent loss of time in turning the plow at headlands, decreases the liability of breakage, and insures perfect control of the plows both with regard to steerage and depth of furrow. From repeated trials on heavy land, it has been found that an engine, weighing a little more than five tons and working a four furrow balance plow, can accomplish eight acres a day, cutting a furrow from eight to ten inches deep and ten to twelve inches wide. Thrashing, hauling, and a variety of other duties can also be performed by the same machine.

The engine above referred to and illustrated does not materially differ in construction from the Aveling & Porter road and farm locomotive, which gained the first prize given by the Royal Agricultural Society of England, in 1871.

The engines have single cylinders, placed on the forward part of the boiler and surrounded by a steam jacket in direct communication with it. Engines having single cylinders and reversing gear, when connected to the driving axle by means of Aveling's usual gear, have proved themselves to

be thoroughly efficient, more powerful, less complicated, and in every respect better adapted for general traction purposes than engines with double cylinders. They have tender and tank for an ample supply of fuel and water, and a steerage eminently simple and perfect in action. The compensating motion to the driving wheels of Aveling & Porter's engines is of malleable iron, the use of which, although more costly than ordinary cast iron, greatly increases the strength of the working gear. One man only is required for the entire management of the engine. The boiler is horizontal and multitubular, and is a more economical consumer than upright boilers. It is made of "best best" Staffordshire plates, and the fire box is invariably of Lowmoor iron. It is lagged and felted, and proved to a pressure of 200 lbs. to the square inch. The daily expense of working a six horse power Aveling & Porter engine is approximately \$6. The increased cost of using such an engine, in conjunction with the steam plow, would be simply the wages of one additional man.

To this time Messrs. Aveling & Porter have built more than 900 road locomotives, many being successfully in use in the United States and can be seen at work within a few miles of New York.

Mr. G. W. Dick, of Ross, Ohio, who has a six horse power Aveling & Porter engine, writes:

"We have used our engine for almost all possible purposes—on the gravel road, for drawing logs out of the wood, for thrashing grain, and are now hauling pork in the streets of Cincinnati, over a boulder pavement.

"On the macadamized road we draw from Hamilton to Venice, including wagons, 25,000 lbs. of coal in one load—a distance of eleven miles. For logs in the wood, it is unequalled; we detach the engine from the wagon, and roll the tree on to the wagon, an inch at a time if we choose, and hold it there—a feat that horse power will not perform. All who see it at this work are amazed at the power we possess, and say that it seems to be a thing of life.

"We have thrashed nearly 40,000 bushels of grain with it since harvest, and have found no place that we were unable to reach, no matter what the grade or how deep the mud. Its facility for taking itself and thrasher away makes it a great favorite with the farmers, who have been bored with hitching their horses to a heavy steam engine, and spoiling them with the over load. Our greatest gain is in time, moving from place to place. In five minutes after the last sheaf

is through, we are on the road; and we once moved 600 feet and were thrashing again in ten minutes from the time the last sheaf was through at the last place (by a watch held on us by a friend)."

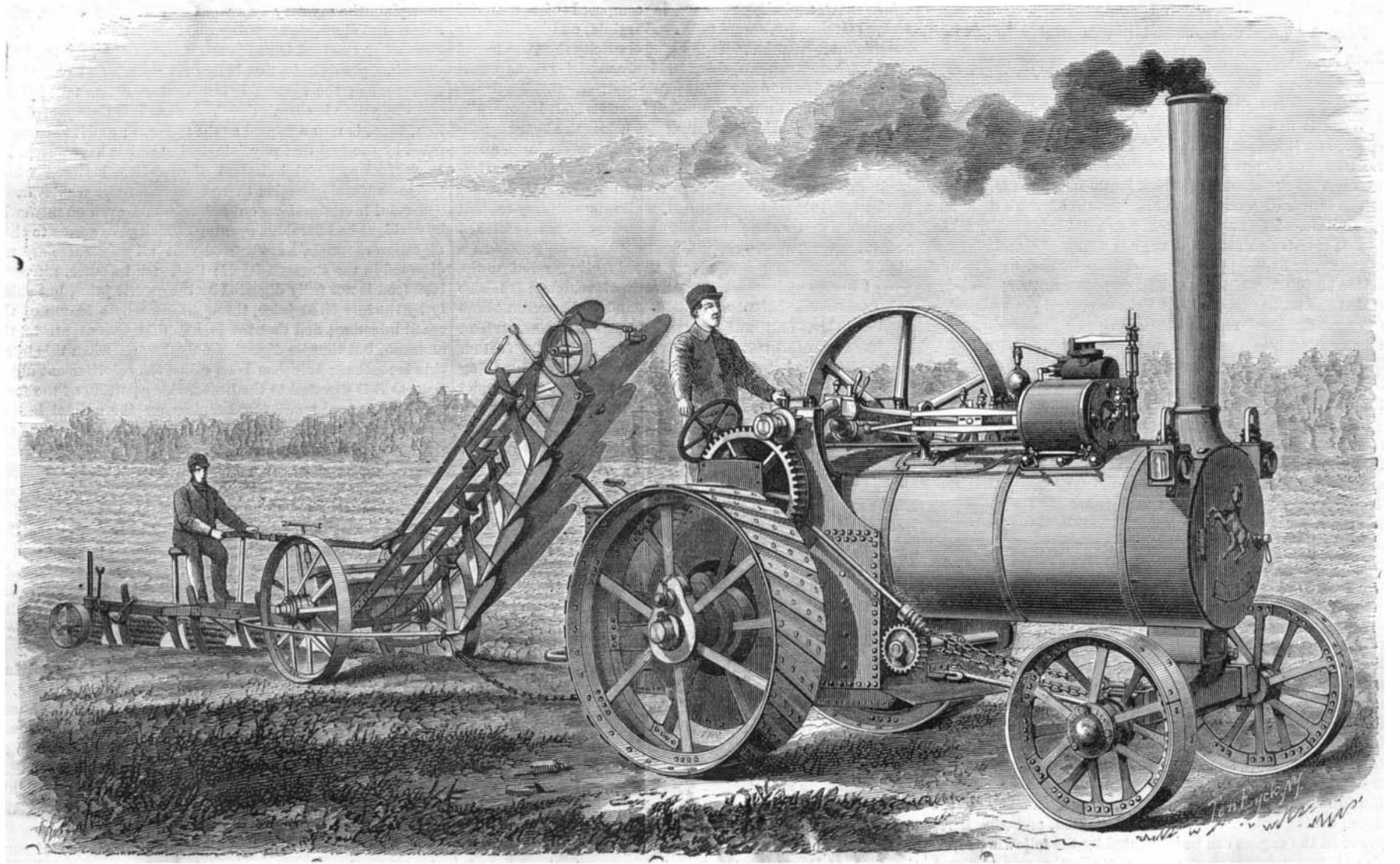
To the tests of these machines, made during the autumn of last year by Professor Thurston, of the Stevens Institute of Technology, we have already alluded in detail. During their progress, with one six horse power engine, the enormous load of 63,400 lbs., made up by a train of ten loaded wagons, was hauled up a long grade of one in nineteen, at the rate of two and a half miles an hour, the wheels showing no signs of slipping.

Messrs. Aveling's engines are often constructed with a steam crane attached to the fore part of the boiler, and at this time two of them are employed at the Vienna Exposition in unloading and removing packages from the trains as they arrive. By simply removing the road wheels and replacing them with ordinary flange wheels, the engine may be converted into a tramway engine.

We are informed that the machine may soon be seen in actual operation, cultivating the land on the Ogden farm, the property of Colonel G. E. Waring, Jr. The agent of Messrs. Aveling & Porter in America is Mr. W. Churchill Oastler, 43 Exchange place, New York city

Iron-Clad Vessels.

The invention of iron plates to protect vessels is far from being of as recent date as is generally supposed. During the 12th century, the Normans covered their ships, from the water line up, with an iron casing, terminating in a ram on the bow. Still earlier they had adopted a system of protecting the upper works with metal shields. In 1534, Peter of Arragon ordered his ships to be iron-plated in order to protect them from the burning missiles then in common use. In 1530, the squadron of André Doria contained a vessel built by the Knights of St. John, which was armored with several thicknesses of iron. At the battle of Lepanto, several ships protected their batteries with bars of iron. For two centuries, no progress seems to have been made. In 1782, at the siege of Gibraltar, an engineer officer constructed six ships, which were the types of the modern iron-clads. They were covered with an armor of hard wood, leather, and bar iron. It is said that they resisted the fire of the forts for a long period, but were finally sunk by red hot shot.



AVELING & PORTER'S ROAD LOCOMOTIVE ADAPTED TO DIRECT TRACTION STEAM PLOWING.