

AN IMPROVED CULTIVATOR.

Our engraving represents an ingenious machine constructed by Messrs. Galland & Granjon. It is an improved cultivator that can be easily operated by one man. It appears to us as if it ought to be added to the most interesting of agricultural implements. It is assuredly destined to render services in substituting perfect mechanical work for labor that is laborious when done by hand. If we are to believe the documents communicated to us by the manufacturers, the operator, having to exert a stress of but from nine to ten pounds upon the winch handles, can produce, through the combination of the gear wheels, a stress of from 440 to 450 pounds upon the toothed cylinder, designed to dig up and turn over the earth.

The principle of the invention consists in the use, for the digging and weeding of the ground, of a cylinder armed with steel teeth, to which is communicated a rotary motion for the purpose of causing the curved teeth to penetrate the earth. Upon operating the machine, the earth caught between the teeth is lifted and turned over in a continuous manner. The machine, while operating, causes the carriage that supports it to move forward. The frame of this carriage is provided with a series of knives that pass between the teeth and cut and break the clods of earth at the moment that they are lifted.

Our figure gives so correct an idea of the device that it will not be necessary for us to give a long description of it. It will be seen that the apparatus consists of a central frame, carried by another frame on four wheels. The shaft, which is provided with large teeth or picks, constitutes the digging cylinder. A chain passing over the shaft engages at the top of the upright frame with a sprocket wheel that receives its motion from the winch handles. In order to regulate the tension of the chain, the sprocket wheel and gear wheels are mounted in a cap terminating at the upper part of the frame. The apparatus, as we have said, is supported by four wheels, two in front and two behind. The wheels are mounted at the extremity of levers jointed upon the axis of the digging tool. A special combination formed of connecting rods permits, through the winch handles, of raising or lowering the tool at will. This manœuvre serves on the one hand to regulate the depth of the digging, and, on another, to entirely lift the tool above the ground in order to permit of the moving about of the apparatus.

There is a slightly smaller size of the mechanical digger than the one shown in our engraving. It is provided with two wheels only, but works in nearly the same manner as the first model. This cultivator may be advantageously employed for gardening and for the culture of all plants that are grown in rows, such as grapevines, beets, hops, tobacco, etc. The depth of the digging may be regulated at will. One man, with this machine, can perform the same work as five or six laborers using the mattock; besides, the work is much better done, since the earth is turned upside down and the clods are divided into small fragments through being cut by the steel knives mounted between each row of teeth.

The style here with figured is capable of digging to a depth of from six to seven inches for a width of twenty-six inches. The smallest model digs to a depth of from four and one-half to five inches for a width of from eighteen to twenty inches. The weight of the machine renders it easy to handle. The large size weighs 308 pounds and the small one from 22 to 132 pounds. Let us add that the operator, while the machine is in action, preserves a vertical position, which is much more hygienic than is that of the present method of working.—*La Nature*.

SANTA FE, N. M., was founded in 1805, and is 7,000 feet above the sea.

Long Distance Transmission of Steam.

At a recent meeting of the American Society of Mechanical Engineers, Eckley B. Coxe described a method he had used in carrying steam a long distance. At a colliery they wished to carry steam to a water works about 4,500 feet over a hill from the boiler plant. A trough was made by nailing the edges of two boards together, so that they formed a right angle. The trough was supported by two stakes driven in the ground and

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crossing just beneath the trough. The pipe was laid in the trough resting on cast iron plates, the pipe surrounded by mineral wool and a similar inverted trough placed over the top. To allow expansions, a bend was made to one side at the top of the hill, and then it was turned back to its original direction. A large receiver was introduced in the pipe at the pumps. This was made of three sheets of an old boiler, and was 34 inches in diameter. This also served as a separator. As the elevation was 1,800 feet above the sea, the cold was excessive in the winter time, but this arrangement has been in use since 1877, has cost nothing for maintenance, and has given no trouble. Mr. Coxe believed that the secret in carrying steam long distances to an engine without causing a drop in the steam pressure was in the use of a receiver or reservoir.

THE TORPEDO BOAT DESTROYER HORNET.

We have in previous numbers given particulars of the two new sister torpedo boats Havock and Hornet, lately added to the British navy. Both are remarkable for speed. The Hornet has attained 28 3/3 knots

machinery space, and 30 feet abaft this to the ward-room and cabin, where the officers are berthed, while the crew is accommodated forward, the space under the turtle-back affording a commodious forepeak. The full complement is forty-two, officers and crew. These boats differ from the torpedo boats proper in having at the ends watertight flats, which give the security of a double bottom. The bunker capacity is sixty tons, which gives a radius of action, on fuel carried, of 4,000 miles at ten knots; so that the vessels may be considered "ocean-going" in the widest sense, as they would never be likely to be required to go out of steaming distance of a British coaling port in time of war. The armament consists of one 12-pounder and two 6-pounder guns, one pair of swivel torpedo tubes on deck, and a built-in torpedo tube in the bow. These dischargers are for 18 inch torpedoes. On her trial the mean draught of the hull of the Hornet was 5 feet, but if the propeller be included, the draught would be 7 feet 6 inches, as the blades project below the bottom. The displacement would be about 220 tons at this draught.

The torpedo boat destroyers are all twin-screw, and the engines in the Hornet are of the ordinary tri-compound torpedo boat type, designed by Messrs. Yarrow. The cylinders are 18 inches, 26 inches, and 39 1/2 inches in diameter, the stroke being 18 inches. There is a separate cylindrical condenser to each engine. The usual air-compressing, distilling, electric light, and other auxiliary machinery is carried. There are a 24 foot whale boat and two 20 foot Berthon boats. The safety valves on the boilers are arranged to lift at a pressure of 180 lb. to the square inch.

The boilers are the most interesting feature in this boat. The heating surface in each boiler is 1,027 square feet, and the bar surface 206 square feet, the bars being 6 feet 6 inches long. The weight of each boiler with water and all fittings is 5 tons 7 hundredweight, and it has been found on test that a single one of the Hornet's boilers will evaporate 12,500 pounds of water per hour. The boilers are arranged in two groups of four, and are placed in two separate stokeholds.

Seventy Miles an Hour.

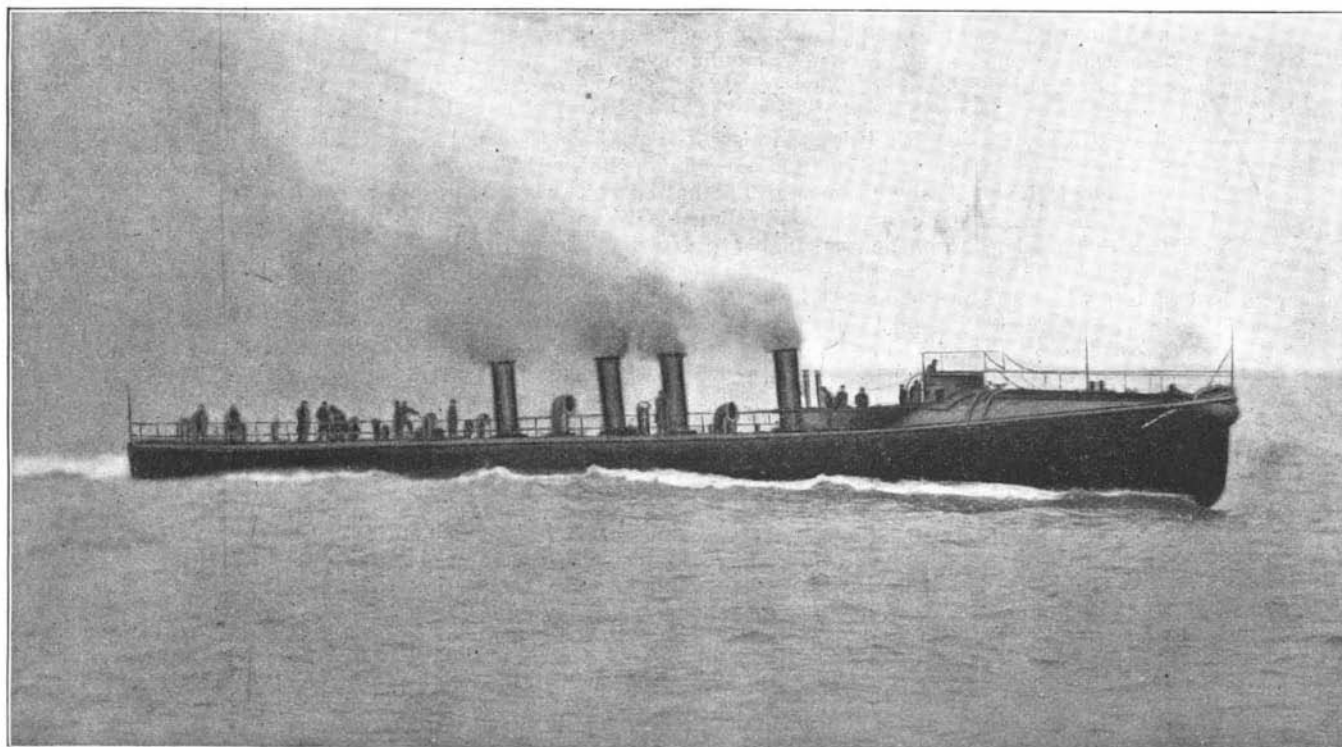
The special train bearing the Vanderbilt inspection party on the Lake Shore recently made some fast time between Cleveland and Buffalo. The run from Cleveland to Erie, a distance of 95 1/2 miles, was made in 95 minutes, including a four minute stop at Ashtabula for water, making the total running time for the 95 miles 91 minutes. From Collinwood yards an 88 mile run was made in 82 minutes, including another four minute stop. From Collinwood to Saybrook, a distance of 42 miles, was made in 36 minutes, or at a rate of 70 miles hour. The run from Kingsville to Dock Junction, 33 miles, was made in 28 minutes, or a rate of 70 7/10 miles

an hour, the fastest time ever made on this division of the road. The locomotive pulling the train was No. 188, one of the Brooks Locomotive Works 10-wheel passenger engines. This run would seem to disprove the statement made by some railway experts that only an 8-wheel type of locomotive was adapted for high speed.

Lehigh Valley engine 655, lately rebuilt, was tried between Buffalo and Batavia, N. Y., on May 7, and ran a mile in the face of a strong wind at the rate of 82 1/2 miles per hour. It is expected this engine will be able to

average 70 miles an hour drawing a heavy passenger train.

CHLORINE water decomposes so readily that if found at all in the stores it is generally of poor quality. Sealed glass tubes containing five grammes of liquid chlorine are now to be had in commerce. With one of these it is possible to extemporaneously prepare one kilo. of chlorine water.

**THE BRITISH TORPEDO BOAT DESTROYER HORNET.**

or 32 1/2 miles per hour, which is a little in excess of the speed of the new torpedo boat built in Germany for the Brazilian government, of which an illustration is given in our this week's SUPPLEMENT.

The Hornet is 180 feet long and 18 feet 6 inches wide, and is of the usual torpedo boat construction in general appearance. The Hornet has eight boilers. The hull is divided into thirteen compartments by watertight bulkheads, 76 feet amidships being devoted to