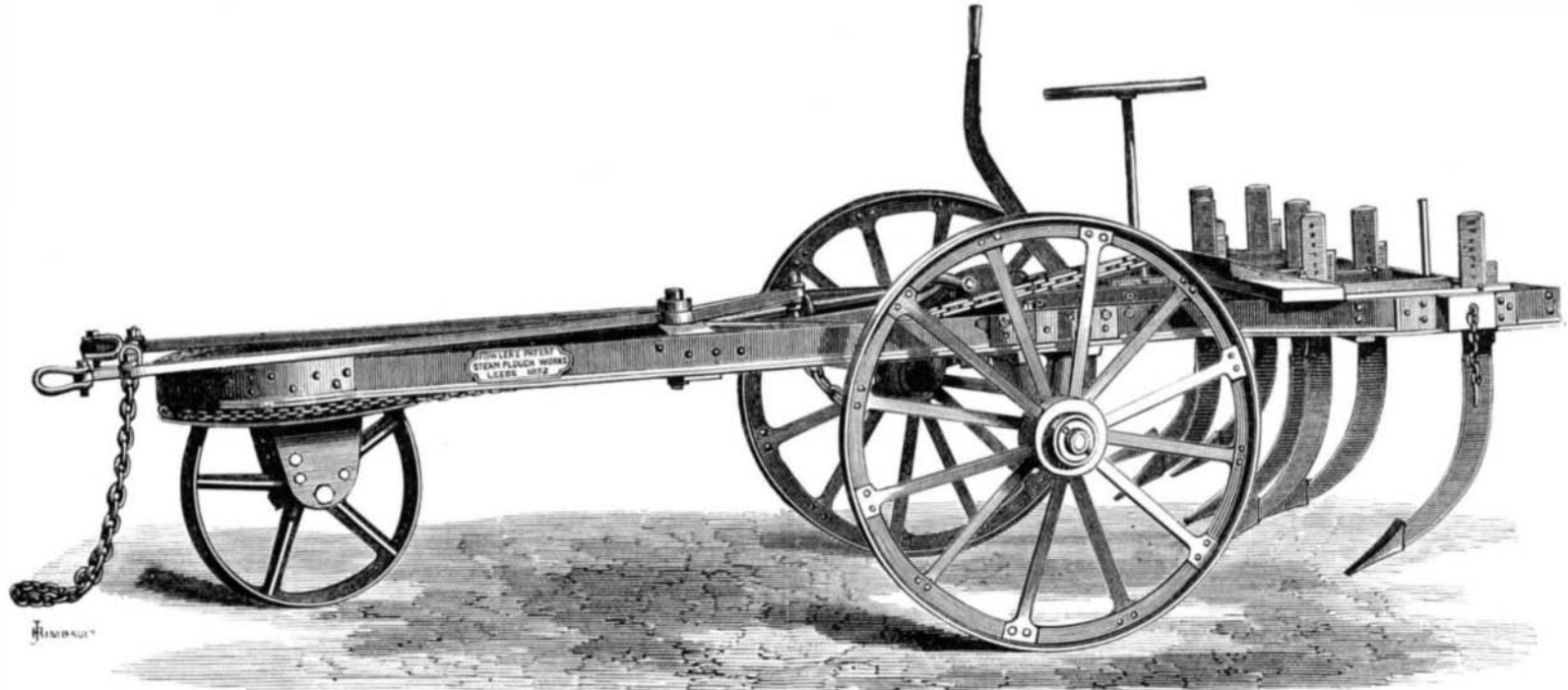


STEAM CULTIVATION.

The Fowler system of steam plowing has been frequently mentioned in these columns as being the most successful of many attempts to solve a problem of some difficulty and of great importance to the future of agriculture. We illustrate herewith a cultivator, intended by the makers for use where the double machine would be unnecessarily large and expensive; it is constructed so as to be readily turned and operated in the reverse direction after one set of furrows has been cut. Messrs. Fowler have made some improvements in this apparatus, one of which deserves special comment. This consists merely in making the lever, to which

the screw working in the water of replacement was to take away some of the pressure which drives the ship. But with reference to the advantage of housing in a tunnel if the screw were driven at excessive speed, he thought it not unlikely that the housing would produce a beneficial effect by preventing the scattering of the water, and whatever reaction the water supplied would be more effectively directed into the line of motion; nevertheless he considered it would involve the drawback of adding largely to the surface friction of the vessel, and he expected that nearly the same advantage, but less encumbered by surface friction, would be obtained with any kind of shrouding given to the tips of

water, which, being sucked in by the action of the screw, frequently break some, if not all, of its blades. Mr. Griffiths also considers that the effects of racing will be much decreased, on account of the water being taken in from below, and therefore he thinks that the whole of the after part of the vessel will have to be lifted out of the water before any racing will take place. There can be no doubt, however, that for ships of war it is a matter of no small importance that the screw should be protected from shot and shell, and, if possible, completely cased with armor plates. It is well known that at present the helm has to be put over to port or starboard, according as the screw is left or right handed, and

**FOWLER'S STEAM CULTIVATOR.**

the ropes are attached, of a forked shape, as shown. In use that arm of the fork to which the hauling rope happens to be attached is of course brought into a direct line with the strain; while the other arm is thereby caused to project laterally, thus bringing the tail rope clear of the wheels, and causing it to be in a favorable position for turning the implement when the headland is reached. The tail of the draft lever is coupled to a short chain; and when, on arriving at a headland, the strain is transferred to what was previously the tail rope, and the draft is thus brought at right angles to the implement, this chain is tightened and, by acting on a segment, turns the main axle, which is cranked, and this, by depressing the supporting wheels, lifts up the main frame, and raises the tines clear of the ground. The tines being maintained in this position by a lever and catch, the turn is readily made; and on its being accomplished, the steersman allows the frame and tines to fall again, and the implement starts on a fresh journey. The action of this turning arrangement is admirable. The turns are made with great promptitude, and within a very limited space, while the implement is altogether thoroughly manageable, and there is nothing about it liable to get out of order.

RECENT IMPROVEMENTS IN THE SCREW PROPELLER.

It would be by no means an easy task to enumerate the many inventions which have been made, since the introduction of steam navigation, to improve the form of the screw. The modification of the screw propeller devised by Mr. Griffiths has been generally admitted to be one of the best. Mr. Griffiths, however, has since arrived at the opinion that we have hitherto been neglecting the true principles in screw propulsion; and after a series of experiments he concludes that the difference, between the amount of power exerted to propel a ship by a screw and that required to tow her, which in one case Mr. Froude found to amount to a loss of 58 per cent of the power supplied, is due to the screw not being sufficiently supplied with water. With a full-sterned ship this is greater than in one having a fine run, as the water runs into the space left by the stern, and deprives the screw of its full supply.

To remedy this, Mr. Griffiths' plan is to put the screw into a casing of 50 to 75 per cent larger area than that of the screw's disk, and provided with an opening underneath, so that the screw is not supplied with the water which would otherwise flow into the space left by the ship, nor does the ship rob it of any of the water which it requires to force back in order to give the thrust to the screw shaft for propelling the ship. This view of the case was not, however, assented to by Mr. Froude, who thought that the effect of

the screw blades. Since then Mr. Griffiths has had H.M.S. Bruiser placed at his disposal to experiment with, and the results certainly appear to bear out the experiments with models previously made by that gentleman. The Bruiser was first tried, on February 26, with her propeller fitted in the ordinary way, her course being over the measured distance within the breakwater at Plymouth. The force of the wind was 2 to 3, and its direction E.S.E., and the sea smooth. The draft of the ship was 8 feet, both fore and aft, and she was fully equipped and ready for sea. The screw fitted was one of Griffiths', with two blades, having a diameter of 6 feet and 8 feet pitch, with 60 nominal horse power, and a mean pressure in the cylinders of 35.79 lbs. her mean number of revolutions, after six runs, was 881 per mile, and her true mean speed 8.016 knots. Having been docked, and the casing fitted to her, as shown in the accompanying illustration, she was again tried on July 2, under almost similar circumstances to those of the first trial. The force of the wind and the state of the sea were the same, though the direction of the former was S.W. instead of E.S.E. She carried one more ton of coals, and her trim was a little different, being 7 feet 10 inches forward, and 8 feet 1 inch aft. With the same nominal horse power, and only 0.4 more horse power indicated, the mean number of revolutions was only 836, whereas the speed gained was 8.274 knots, or rather more than a quarter of a knot beyond what was realized without

that some loss of speed is thereby occasioned; but with the screw in a casing this is not necessary, and perhaps a good deal of the quarter to half knot increased speed obtained with the Bruiser may be due to this cause. Mr. Griffiths' system, however, is not all included in placing the screw in a casing, for he also proposes to divide his power into two parts, by using two small screws instead of one large one, and putting one at the bow and the other at the stern of a ship. The engines and shafts, also, would be placed lower down in the ship, and therefore, in men-of-war, be more protected against shot. But perhaps the most important improvement claimed for this system consists in having two separate sets of engines, boilers, and propellers, so that if one were placed *hors de combat* the other would still be available to keep the ship off a lee shore, or from getting into the trough of the sea. The experiments with the casing round the screw having proved so far successful, the British Government have now placed a small screw launch at Mr. Griffiths' disposal with which to try still further experiments.

Three Curious Discoveries.

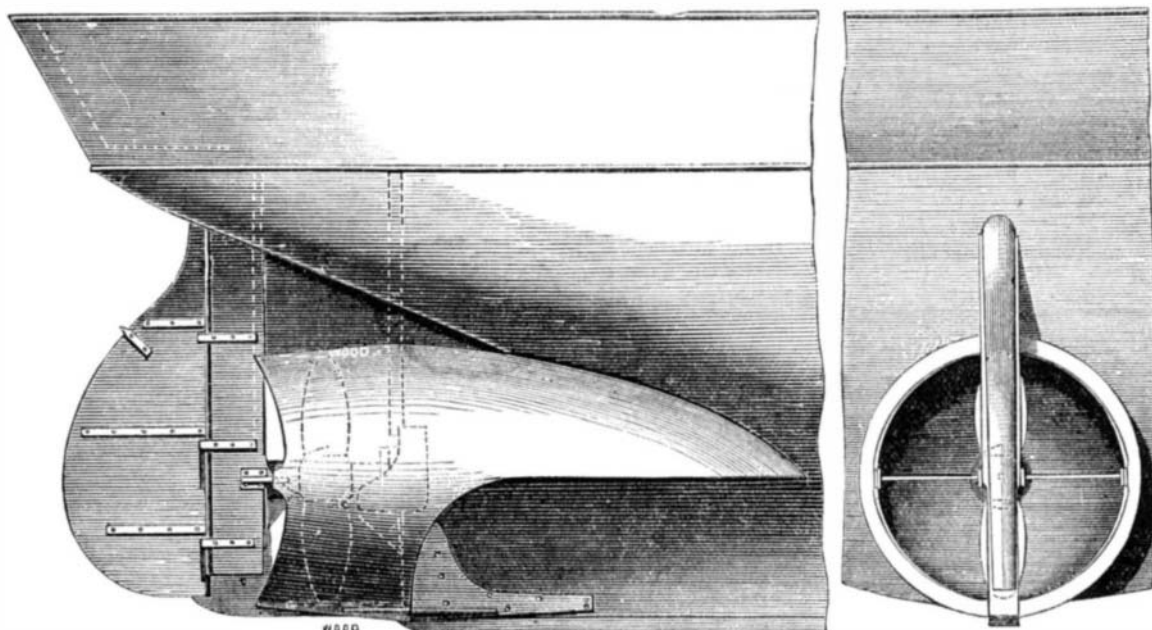
A recent examination of the bottom of an old Roman well, located near the hot springs of Bourbonne les Bains, in France, has resulted in three remarkable discoveries, two of an archaeological nature, and one of some importance from a geological point of view.

After the excavation had been thoroughly drained, and a thick layer of refuse penetrated, the first discovery was made in the bringing to light of thousands of small metallic objects of art. These included ornaments, statuettes, and coins, the last of silver, gold, and copper, dating back to the times of Nero and Hadrian.

Beneath the layer of ornaments, etc., a second layer was found, composed entirely of fragments of sandstone, which, together with the metallic objects, were completely covered and held in masses by metallic crystals, evidently deposited by the water above. These crystals were subjected to careful investigation; and as a result they have been pronounced to be of such a nature that geologists would unhesitatingly describe their formation to natural causes, working

through ages. That such is not the case is plainly evidenced by the known eras of the coins above which they have formed. It will be seen that the circumstance, which constitutes the second discovery, may throw serious doubt over a large quantity of important geological deductions as to lapses of time, when the same, as is the fact in many instances, are wholly based on supposed slowness of formation of similar deposits.

The third discovery relates to the fragments of sandstone

**THE GRIFFITHS SCREW PROPELLER.**

the casing. It being thus evident that Mr. Griffiths was correct in his conclusions, that greater speed would be obtained with a screw in a casing than with one fitted in the ordinary manner, it may be as well to inquire into the other advantages which he claims for his system. No small value is attached by him to the fact that a complete protection will be afforded to the propeller by the casing, as a safeguard against the dangers a screw usually is liable to from pieces of wreck, ice, etc., floating on or near the surface of the