

on the perfection of the machinery for tile-making; and here, as almost everywhere else, agriculture and the mechanical arts go hand in hand. Labor is much dearer in America than in Europe, and there is therefore, more occasion here than there, for applying mechanical power to agriculture. We can have no cheap drainage until we have cheap tiles; and we can have cheap tiles only by having them made with the most perfect machinery, and at the lowest prices at which competing manufacturers, who understand their business, can afford them.

In the preceding remarks on the cost of tiles, may be found estimates, which will satisfy any thinking man that tiles have not yet been sold in America at reasonably low prices.

To give those who may desire to establish tileries, either for public or private supply, information, which cannot readily be obtained without great expense of English books, as to the prices of tile machines, it is now proposed to give some account of the best English machines, and of such American inventions as have been brought into notice.

It is of importance that American machinists and inventors should be apprised of the progress that has been made abroad in perfecting tile machines; because, as the subject attracts attention, the ingenuity of the universal Yankee nation will soon be directed toward the discovery of improvements in all the processes of tile-making. Tiles were made by hand long before tile machines were invented.

A Mr. Read in the "Royal Agricultural Journal," claims to have used *pipe* tiles as early as 1795, made by hand and formed on a round stick. No machine for making tiles is described, before that of Mr. Beart's, in 1810, by which 'common tile and sole (not pipes or tubes) were made.' This machine, however, was of simple structure, and not adapted to the varieties of tiles now used.

All tile machines seem to operate on the same general principle—that of forcing wet clay, of the consistency of that used in brick-making through apertures of the desired shape and size. To make the mass thus forced through the aperture, *hollow*, the hole must have a piece of metal in the centre of it, around which the clay forms, as it is pushed along. This centre piece is kept in position by one or two thin pieces of iron, which of course divide the clay which passes over them, but it unites again as it is forced through the die, and comes out sound, and is then cut off, usually by hand, by means of a small wire, of the required length, about fourteen inches.

Tile machines work either vertically or horizontally. The most primitive machine which came to the author's notice abroad, was one which we saw on our way from London to Mr. Mechi's place. It was a mere upright cylinder, of some two feet height, and perhaps eight inches in diameter, in which worked a piston. The

clay was thrown into the cylinder, and the piston brought down by means of a brake, like an old-fashioned pump, and a single round pipe tile forced out at the bottom. The force employed was one man and two boys. One boy screened the clay, by passing through it a wire in various directions, holding the wire by the ends, and cutting through the mass till he had found all the small stones contained in it. The man threw the mass thus prepared into the cylinder, and put on the brake, and the other boy received the tile, upon a round stick as they came down through the die at the bottom, and laid them away. The cylinder held clay enough to make several, perhaps twenty, two-inch pipes. The work was going on in a shed, without a floor, and upon a liberal estimate, the whole establishment, including shed and machine, could not cost more than fifty dollars. Yet, on this simple plan, tiles were moulded much more rapidly than bricks were made in the same yard, where they were moulded singly, as they usually are in England. It was said that this force could thus mould about 1,800 small tiles per day.

This little machine seems to be the same described by Mr. Parkes as in general use in 1843, in Kent and Suffolk Counties.

Most of the tile machines now in use in England and America are so constructed, as to force out the tiles on a horizontal frame-work, about five two-inch, or three three-inch pipes abreast. The box to contain the clay may be upright or horizontal, and the power may be applied to a wheel, or by a crank turned by a man, or by horse, steam, or water power, according to the extent of the works.

We saw at the Exhibition of the Royal Agricultural Society, at Salisbury, in England, in July, 1857, the 'pipe and clay machine,' of W. Williams, of Bedford. It was in operation for exhibition, and was worked by one man, who said he was a tile maker, and that he and one boy, could make with the machine 7,000 two-inch tiles per day, after the clay was prepared in the pug mill. Four tiles were formed at once, by clay passed through four dies, and the box holds clay enough for thirty-two two-inch tiles, so that thirty-two are formed as quickly as they can be removed, and as many more as soon as the box can be refilled.

The size No. 3, of this machine, such as we then saw in operation, and which is suitable for common use, costs at Bedford, \$88 50, with one set of dies; and the extra dies for making three, four, five and six-inch pipes, and other forms, if desired, with the *horses*, as they are called, for removing the tiles, cost about five dollars each. This, like most other machines, is adapted to making tiles for roofs, much used in England instead of shingles or slates, as well as for draining purposes.

There are several machines now in use in England, namely: Etheridge's, Clayton's, Scriven's, Whitehead's, and Garret's—either of which