46. The first part of the table gives the size of the pump suited to the growth of water. The second gives the size of the cylinder suited to the load of water. If the depth is greater than any in this table, take its fourth part, and double the diameter of the cylinder. Thus, if 150 hogsheads are to be drawn in an hour from the depth of 100 fathoms, the last column of part first gives for 149.40 a pump of seven inches bore. In a line with this, under the depth of 50 yards, which is one-fourth of 100 fathoms, we find $20\frac{1}{2}$, the double of which is 41 inches for the diameter of the cylinder.

It is almost impossible to give a general rule for strokes of different lengths, &c., but one who professes the ability to erect an engine, should surely know as much arithmetic as will accommodate the rule now given to any length of stroke.

We venture to say, that no ordinary engineer can tell *à priori* the number per minute which an engine will give. We took twelve strokes of six feet each for a standard, which a careful engineer may easily accomplish, and which an employer has a right to expect, the engine being loaded with water to half the pressure of the atmosphere: if the the load be less, there is some fault; an improper counterweight, or too little boiler, or leaks, &c. &c.

47. Such is the state in which Newcomen's steam-engine had continued in use for 60 years, neglected by the philosopher, although it is the most curious object which human ingenuity has yet offered to his contemplation, and abandoned to the efforts of the unlettered artist. Its use has been entirely confined to the raising of water. Mr Keane Fitzgerald, indeed, published, in the Philosophical Transactions in 1758, a method of converting its reciprocating motion into a continued rotatory motion by employing *a combination of large-toothed wheels, and of smaller ratchet-wheels, worked by teeth upon the arch or sector of the great beam. One of these ratchet-wheels being put in motion by the*