of water through the sucking pipe G from H, the pond, well, or river.

“ This being done, and the receiver now being filled with water, first turn C, and let the steam pass into the receiver E, and it will force the water therein through F by K up to L, which water cannot descend because of the clack valve I. When E is thus emptied, which may be easily perceived by its being hot, as before, turn C, and confine your steam in B, then open the cock M, which will let a little cold water into E and that, by condensing the steam in E, will cause the water to ascend immediately from H and replenish E. Then turn C to let the steam into E, and it will force the water out of it up L, into a cistern at O, placed at the top to receive it. Then confine your steam at C as before, and turn M for the space of a second or two of time, and E will be refilled, and may again be discharged up L as before ; so that this work may be continued as long as you please. The valves placed in the pipes at I and K are shown on a larger scale at the side, and will enable the read er to see how they permit the water to ascend, but prevent its return by the weight of the water pressing down the

clack.

“ It must be noted that this engine is but a small one in comparison of many others of this kind that are made for coal-works ; but this is sufficient for any reasonable family, and other uses required for it in watering all middling gardens. Its dimensions are as follows :—the pipe from the surface of the water to F is 16 feet, and from F to the upper cistern 42 feet high ; the diameter of both pipes 3 inches, and of the steam-pipe D, an inch. The receiver E holds 13 gallons of water, and the boiler three times that quantity.

“ This engine will throw up four of the receivers full in one minute=52 gallons, which is 3110 gallons an hour, =52 hogsheads an hour, or

1248 hogsheads in 24 hours. The prime cost of such, an engine is about L.50, as I myself have had it from the ingenious author’s own mouth, and the quantity of coals required to work it about one bushel in twenty-four hours. The expense is not considerable to what horse-work is, which must be shifted twice or thrice aday, especially in all wood or coal countries.”

It seems to us very probable, from the form of Savary’s engine, that it was taken directly from that of a common drawing and forcing pump, with the substitution of the force of steam only for that of the pump piston. In Fig. 14, A BC D EF represent a common forcing pump, as given in the hydraulic works of that epoch. A' B' C' D' F7 F' arc the parts of one of Savary’s steam-pumps. In the case of the common pump, the solid piston or plug at C, exactly fitted to the cylindrical chamber at C, is forced

down by the lever E upon the water in the chamber C, which is pressed out through the pipe at the bottom, and being prevented from passing down to A by the closing valve B, is carried up through the open valve D, and raised towards the top of the reservoir F. When the chamber C is thus emptied, the piston is again raised, and as it is perfectly tight, so that no air can enter, the water is carried up through the valve B, which only opens up­wards, and thus the vacuum at C is filled from below, by atmospheric pressure, with water, which is again to be forced back by the descent of the piston ; but as the valve B closes by the pressure above it, and the valve D opens upwards, the water is carried upwards and delivered at F, the top of the reservoir. For the solid piston of the pump we have only to substitute the agency of steam, and we have Savary’s machine. The close chamber C' being conceived full of water, steam from the boiler is admitted by S', and, by its elastic force, presses downwards on the surface of the water at C', so as to force it out of the receiver ; and finding no exit by the closed valve B', it is forced through the rising valve D' towards the receiver F' ; in these circumstauces, the little jet brought from the pipe E' is allowed to throw cold water for a second or two on the close chamber C, now filled with steam, which is immediately condensed into the small quantity of water from which it was originally formed, and leaves the remaining space vacuous—into which vacuum, as in the former case, water is carried up by the force of the atmosphere, so as again to replenish the chamber C', as at first, with water, which is in its turn to be acted on by the elastic force of steam admitted through S', and carried up through D' F' to be delivered at F'.

The reader who has followed this examination of Savary’s steam-engine in its earlier form, is now pre­pared to understand the more complex but more efficient form in which the engine was more generally used. This form is that of the double receiver. The form hitherto examined does not produce a uniform stream, because the receiver, after having emptied its contents, requires a considerable interval to fill again. The double machine renders the stream nearly constant, for there are two receivers placed in communication with the boiller and the