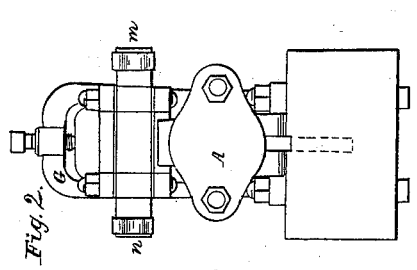
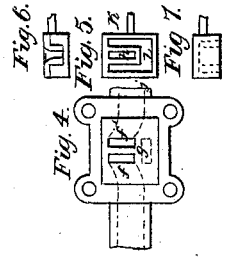
J. COCHRANE.

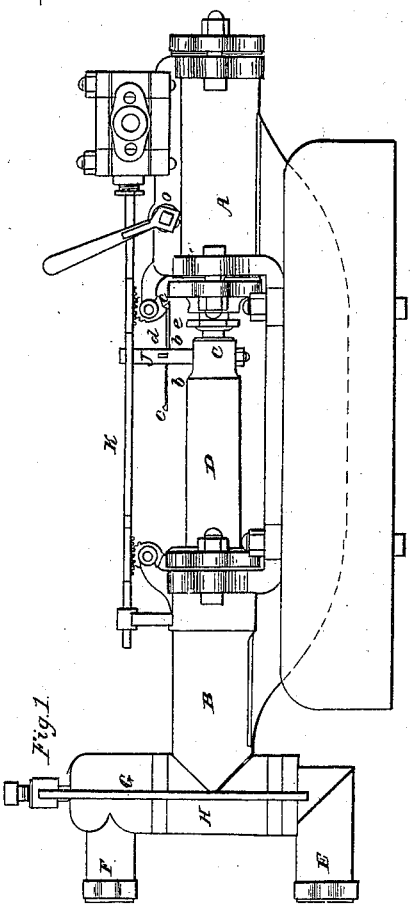
Steam Pump.

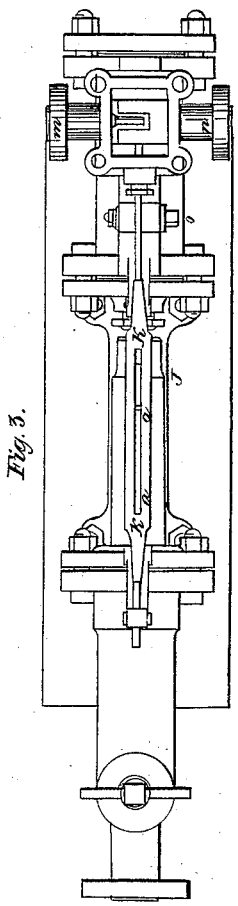
No. 4,003.

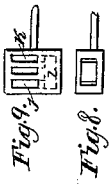
Patented Apr. 16, 1845.











UNITED STATES PATENT OFFICE.

JOHN COCHRANE, OF BALTIMORE, MARYLAND.

MANNER OF ARRANGING THE PARTS OF AUXILIARY ENGINES TO BE USED IN SUPPLYING STEAM-BOILERS WITH WATER.

Specification of Letters Patent No. 4,003, dated April 16, 1845.

To all whom it may concern:

Be it known that I, JOHN COCHRANE, of the city of Baltimore, in the State of Maryland, civil engineer, have invented certain new and useful Improvements in the Manner of Arranging the Parts of Auxiliary or Independent Engines and of Combining the Same with Steam-Boilers for the Purpose of Supplying Them with Water; and I do hereby declare that the following is a full and exact description thereof.

The intention of an auxiliary supply engine is not only to supply water to a boiler, but to preserve the same at a uniform height therein without its being affected by any irregularity in the consumption or evaporation of that fluid; said auxiliary engine stopping and starting, and working quickly or slowly as the demands of the boiler may require. Under the arrangement that I prefer, the admission of steam to the auxiliary engine is governed by a float and balanced valves placed in a chamber outside of the boiler, but communicating therewith by two branches; one above, and the other below, the water line; so that the water may have the same level both in the chamber and boiler. The float is furnished with a tubular stem at bottom opening into it, for the purpose of carrying off any leakage; this stem passes out through a stuffing box in the lower part of the chamber; the arrangement of this part being substantially the same with that represented and described in the specification and drawings accompanying Letters Patent of the United States granted to me on the 13th day of July 1844, for regulating the supply of water in steam boilers. The float, however, may be otherwise arranged and modified, the only requisite being that its action on the steam valve should be governed by the height of water in the boiler.

It is not pretended that an auxiliary engine for the supplying of water to steam boilers is in itself new, such engines having been heretofore employed for that purpose; but I have, as I believe, succeeded in so constructing and arranging the parts of such an engine as to obviate the main difficulties heretofore encountered in the attempts to employ them.

In the accompanying drawing Figure 1 is a side elevation of my engine placed horizontally. Fig. 2 is an end elevation thereof, and Fig. 3 a plan or top view.

A, is the steam cylinder, and B, the pump cylinder.

C, is the piston rod, and D, the pump plunger.

E, is the pipe connected with the hot water, or supply well, and F, that through which it passes into the boiler; the valves in this part of the apparatus being arranged in the ordinary way.

G, is a stirrup by which the upper and lower, may be confined to the middle portion, H, of the water way.

To give stability to the engine the steam and pump cylinder, and the part H of the water way may constitute one casting, being connected by the bottom piece I, I, or by side shears.

J, is a piece of metal which operates as a tappet to work the slide valve, and may also serve as a key to unite the piston rod with the plunger. This tappet works in a long slot *a*, *a*, in the valve stem, or rod, K; but it is not allowed to carry the slide valve sufficiently far to complete its stroke, its action being such as completely to close one steam port, and to open the other to a short distance only, the stroke being completed in a manner to be presently described. This partial opening of the steam port reverses the motion of the engine and tappet, leaving the bars of the valve nearly covering the ports. To complete the traverse of the valve, the tappet carries spring arms *b*, *b*, having catches *c*, *c*, at their ends; *d*, *d*, are segment wheels sustained upon suitable arms, having teeth that take into rack teeth on the under side of the valve stem K. The catches *c*, *c*, engage with the projections *e*, *e*, on the segment wheels, and as the reversed stroke of the engine commences, that of the slide valve is thereby completed, and the induction port is completely opened. The beneficial effect of this arrangement will be manifest to every engineer.

Fig. 4, is a view of the face plate of the valve, in which *f*, *f'*, are the two steam ports, and *g*, the exhaust passage, which is represented by dotted lines, as I do not always form said opening in the face plate, but in the slide valve itself.

Fig. 5, is the face side of the valve; *h*, being the central steam passage; and *j*, *k*, *l*,

a tri-lateral cavity made in such a form as to adapt it to the particular arrangement of the steam ways. When the steam passage *h*, is over either of the ports *f*, *f'*, the part *j*, or *k*, of the cavity will be over the other port; and the exhaust port *g*, will always be surmounted by the part *l*, of the cavity, allowing a free exit to the steam at all times from whatever portion of the steam ports it may escape.

Fig. 6, is an end view of the valve next the steam pipe *m;* and Fig. 7, is a view of the opposite end,—showing the depth of the cavities by dotted lines.

In Fig. 3, the cover of the steam chest is removed to show the form and position of the valve at the moment the piston has completed its stroke, that is to say, when it has been carried by the tappet so far as partially to open the opposite port, at which moment the spring *b*, Fig. 1, will have locked behind the catch *e*, of one of the segment wheels *d;* the steam now rushing into this port reverses the motion of the piston, the spring catch consequently draws on the segment wheel, and the stroke of the valve is completed, as above indicated.

Instead of turning the exhaust steam through the port *g*, in the face plate, I sometimes make an opening in the end of the valve, seen in Fig. 8, and discharge it at once through the steam chest into the pipe *n*. Fig. 9, represents the face side of this valve, under this modification of it; the exhaust port *g*, in the valve face being dispensed with; the corresponding part *l*, is covered over with a plate of metal to serve as a face for the valve, and above this plate, through the back of the valve, the discharge takes place; in all other respects the valve is the same with that shown in Figs. 5, 6 and 7.

In working the pump of an auxiliary supply engine as heretofore constructed its action has been irregular in consequence of the power applied to move its piston, or plunger, being the same in both directions, while it is manifest that much less power is necessary to raise the water from the well, than that required to force it into the boiler under a pressure of steam. To regulate this action, I make a corresponding diminution in the size of that side pipe that conveys steam to the lifting side of the steam piston, and to control it perfectly I insert a valve, or cock, in this steam way; as shown at *o*, *o*, Figs. 1, and 2. The steam piston should be from one-third to one-fourth larger in diameter than the plunger, to overcome, with facility, the resistance from pressure in the boiler, and the friction of the rubbing parts.

Having thus fully described the nature of my improvements in the auxiliary supply engine, what I claim therein as new and desire to secure by Letters Patent is,

1. The manner herein described of completing the stroke, or traversing motion of the valve by the commencing return stroke of the piston, operating on the spring arms *b*, *b*, substantially in the manner, and for the purpose, herein set forth.

2. I likewise claim the manner of regulating the stroke of the water pump, by adjusting the same by means of a valve or cock, as set forth so that a smaller, and regulated quantity of steam shall be admitted to the lifting, than is admitted to the forcing side of the piston, as described.

JOHN COCHRANE.

Witnesses:
JACOB BALDERSTON,
JAMES COCHRANE.