(No Model.)

C. SINTZ.

STEAM PUMPING ENGINE.

No. 305,971. Patented Sept. 30, 1884.

Fig. 3

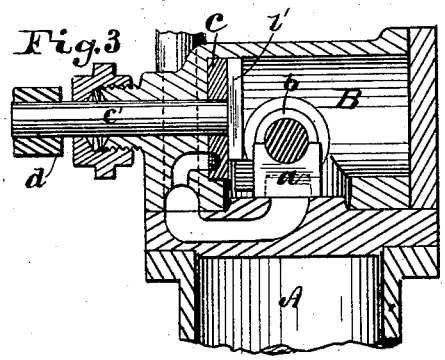


Fig. 4

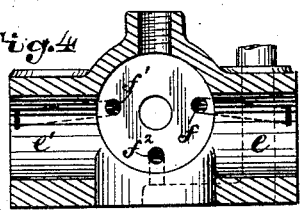


Fig. 5

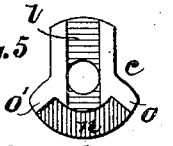


Fig. 6

Fig. 7

Fig. 8

Fig. 1

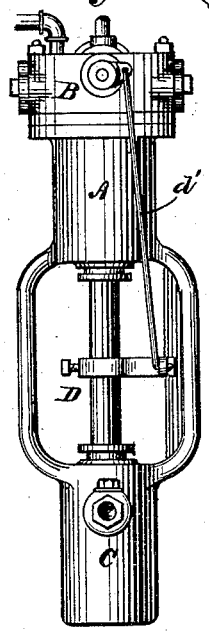
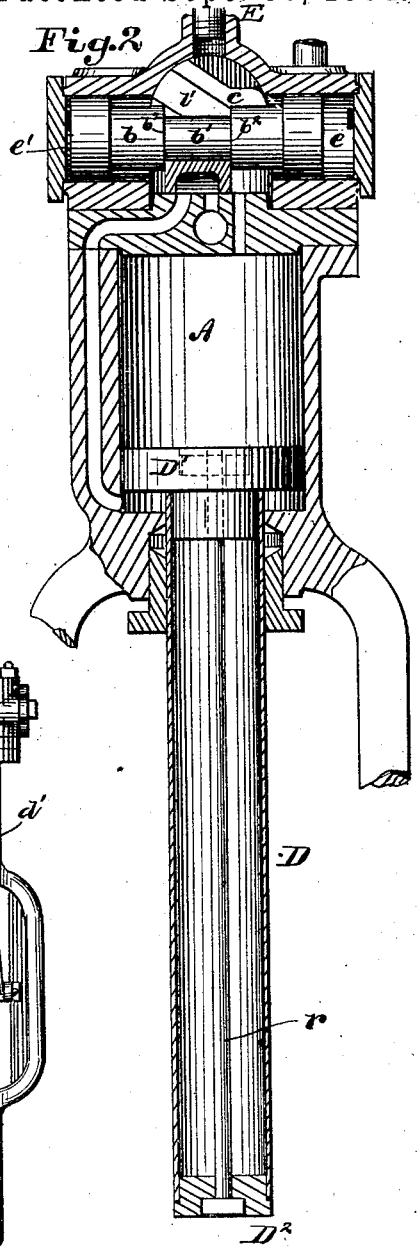


Fig. 2



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UNITED STATES PATENT OFFICE.

CLARK SINTZ, OF SPRINGFIELD, OHIO.

STEAM PUMPING-ENGINE.

SPECIFICATION forming part of Letters Patent No. 305,971, dated September 30, 1884.

Application filed March 28, 1884. (No model.)

To all whom it may concern:

Be it known that I, CLARK SINTZ, of the city of Springfield, in the county of Clark and State of Ohio, have invented certain new and useful Improvements in Steam Pumping-Engines, of which the following is a specification.

My invention relates to steam-pumps, and particularly to that class of pumps in which the main valve is actuated by the steam operating through the agency of a supplemental piston.

My invention consists in novel organizations and combinations of mechanism, as hereinafter described and claimed; and its objects are, first, to provide means whereby steam is supplied to both ends of the supplemental piston at all times except at the moment of throwing the main valve; second, to provide for positively moving the main valve in case the supplemental piston should stick or fail to operate; third, to render the supplemental piston capable of a rotary movement independent of the main valve; and, fourth, to provide a simple, light, and inexpensive plunger for the pump. I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation view of a pump embodying my invention. Fig. 2 is a vertical sectional view of the steam-chest and cylinder thereof taken longitudinally through the supplemental piston. Fig. 3 is a vertical sectional view of the steam-chest and cylinder taken at right angles to the supplemental piston. Fig. 4 is a vertical longitudinal sectional view of the steam-chest with the valves and supplemental piston removed. Figs. 5, 6, and 7 are front, end, and back views, respectively, of the reverse valve; and Fig. 8 is a top or plan view of the main valve.

Like parts are indicated by similar letters of reference throughout the several views.

A represents the main cylinder; B, the steam-chest; C, the pump, and D the plunger. The steam-chest B contains the main valve *a*, the supplemental piston *b*, adapted to actuate said main valve, and the reverse-valve *c*, adapted to admit and exhaust the steam to and from the respective ends of the supplemental piston *b*. The reverse-valve *c* is secured on the end of a valve-stem, *c'*, which extends to the outside of the steam-chest B at right angles to the supplemental piston *b*. A crank, *d*, on the outer end of said valve-stem *c'* receives motion through a suitable connection, *d'*, from the plunger D. As the plunger D reciprocates up and down, the valve-stem *c'* through the medium of crank *d* is given an oscillatory movement on its axis, carrying with it the reverse-valve *c*. The supplemental piston *b* fits at each end in chambers *e e'*, to which the steam is admitted through ports *f* and *f'*, located in the seat of the reverse-valve *c*. An exhaust-port f^2, also located in said valve-seat, opens directly into the main exhaust-passage from the main cylinder A. The reverse-valve *c* is provided on its face with an exhaust-pocket, *h*, (see Fig. 7,) adapted to cover the exhaust-port f^2 at all times, and at the ends of the stroke of the pump to connect the respective ports *f* and *f'* with said exhaust-port f^2. The reverse valve *c* is so constructed that both the steam-ports *f* and *f'* are always open, except at the time of exhausting from one end of the supplemental piston *b*. This is preferably accomplished by cutting the face of the valve away at the top, as shown in Fig. 7, at *i i*. The valve may thus be large enough to have bearing on each side of the valve-stem, and thereby tend to wear the valve-seat evenly.

The reverse-valve *c* may be secured rigidly on the end of the stem *c'*, or, as is preferable, it may be made separate therefrom and provided at the back with a recess, *l*, in which a T-head, *l'*, on the end of the valve-stem *c'* is adapted to rest. The valve *c* is thus adapted to turn with the stem *c'*, but is capable of adjusting itself independently of the valve-stem, to compensate for any wear on the valve-seat.

The main valve *a* is of the ordinary slide pattern, and is adapted to admit and exhaust the steam to and from the respective ends of the main cylinder A in the ordinary manner. The main valve *a* is connected to the supplemental piston *b*, and is moved thereby. It is desirable that the connection between the supplemental piston and the main valve be such that the said piston may be capable of a rotary movement about its axis, so that in case fine sediment or grit should be carried into the steam-chest by the priming of the boiler or otherwise, the piston, instead of traveling in the same path, and thus forming longitudinal grooves in the respective chambers *e e'*, would have a tendency to make a slight revolution about its axis at each stroke, and thus bring new surfaces into contact, thereby preventing

the grooving of the said chambers. I preferably accomplish this by reducing the size of the piston *b* in the center, forming a journal, *b'*, which is adapted to rest in a concave bearing in the top of the valve *a*, said valve being adapted to fit the journal *b'* and to rest snugly between the shoulders b^2, formed at each end of said journal. (See Figs. 2 and 3.) The main valve *a* is thus adapted to be moved positively by a longitudinal movement of the supplemental piston *b*, said piston being capable of a rotary movement on its axis independently of said main valve. The main valve *a* is provided on one side with a lug, *a'*, which extends into a recess, *n*, formed between two lugs or shoulders, *o o'*, on the back of the reverse-valve *c*. If it should happen that from any cause the supplemental piston *b* should stick in the chambers *e e'*, the lugs *o* and *o'*, respectively, would engage on opposite sides of the lug *a'* on the main valve at either end of the pump-stroke, and thus throw the said valve over.

To secure lightness combined with strength, I construct my pump-plunger D of a hollow tube or pipe, D, to which, at either end, are secured the main piston D' and the plunger proper, D^2, respectively, the said parts being held together by a bolt, *r*, which passes longitudinally through said plunger D, or in any other suitable manner.

The operation of my pump is as follows: The steam enters the steam-chest at E and passes through the normally-open ports *f f'* and enters into the chambers *e e'* at the respective ends of the piston *b*. The said piston thus has an equal pressure on each end, and is completely surrounded by live steam, which keeps the chambers at the ends of the piston *b* always hot, and thus prevents condensation. The main valve *a*, being in the position shown in Fig. 2, the steam enters the cylinder A and forces the plunger D to descend. As the plunger descends a rotary or oscillating motion is imparted to the reverse-valve *c* through the medium of the crank *d* and connection *d'*. The valve *c* is thus revolved until the plunger has nearly reached the end of its downward stroke, at which time the pocket *h* in said valve covers the port *f*, and the steam in the chamber *e*, at one end of the supplemental piston *b*, is exhausted through the exhaust-port f^2. The supplemental piston is thus relieved from pressure at one end, and the pressure at the other end immediately forces the said piston into the exhausted chamber, thus changing the position of the main valve *a* and admitting the steam to the lower end of the cylinder A. The plunger is now forced upward until near the end of the upward stroke, when the pocket *h* covers the other steam-port *f'*, thus exhausting the steam from chamber *e'* and changing the position of the main valve *a*, as before. As the plunger D approaches the limit of its stroke at either end the crank *d* is traversing that portion of its arc of travel at which its velocity is greatest. The reverse-valve *c* is thus moved quickly over the ports *f* and *f'*, respectively, and the main valve *a* reversed almost instantly. At the same time the pocket *h* covers either of the ports *f f'*. One of the lugs *o o'* on the reverse-valve engages with the lug *a'* on the main valve, and in case the pressure of the steam does not start the piston *b* instantly the valve *a* is moved longitudinally by the said lugs. This last-mentioned feature is of great utility in starting the pump after it has been standing idle for some time, under which circumstances the piston *b* may have become rusted or stuck fast in its chambers, and will not readily move by the pressure of the steam. By having the steam-ports *f* and *f'* normally open, and thus keeping the pressure equal at both ends of the piston, except at the moment of reversing the position of the main valve, the chance of leakage by blowing past the piston is confined to the short space of time consumed in reversing the valve. The chambers at the ends of the piston are also thus kept heated by the live steam therein, the opening to the air through the exhaust-port being closed immediately after the valve is reversed.

Having thus described my invention, I claim—

1. In a steam-pump provided with a supplemental piston adapted to move the main slide-valve, the reverse-valve *c*, provided with the exhaust-pocket *h*, and adapted to admit steam to both ends of said supplemental piston, except at the moment of changing the position of the main valve, substantially as set forth.

2. The reverse-valve *c*, provided with recess *n* and lugs *o o'*, adapted to engage with lug *a'* on the main valve, substantially as and for the purpose specified.

3. The combination, with the supplemental piston and the main valve actuated thereby, said main valve being provided with a lug, *a'*, of the reverse-valve adapted to normally admit steam to both ends of said piston, and to exhaust said steam alternately from the ends of said piston, said reverse-valve being provided with lugs *o o'*, adapted to engage with lug *a'* on the main valve in case said main valve fails to move by the action of the said piston, substantially as set forth.

4. The combination, with the supplemental piston *b* and the main valve *a*, adapted to be moved thereby, of a reverse-valve, *c*, adapted to normally admit steam to both ends of said piston, and to exhaust said steam alternately from the ends of the said piston as the pump approaches the limit of its upward or downward stroke, substantially as specified.

In testimony whereof I have hereunto subscribed my name this 25th day of March, 1884.

CLARK SINTZ.

Witnesses:
CHASE STEWART,
PAUL A. STALEY.