

B. S. LAWSON.
Steam-Pumps.

No. 145,806.

Patented Dec. 23, 1873.

Fig. 1.

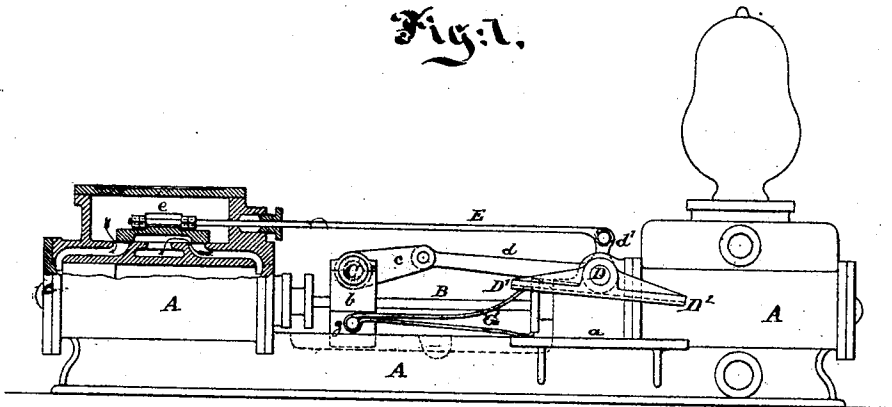


Fig. 2.

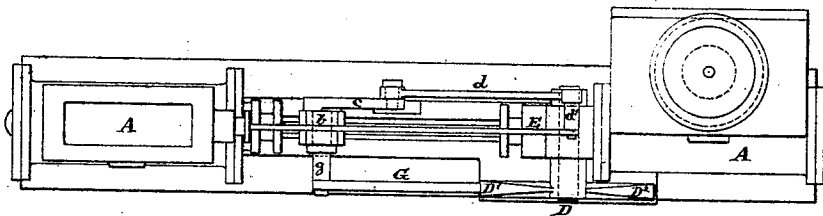
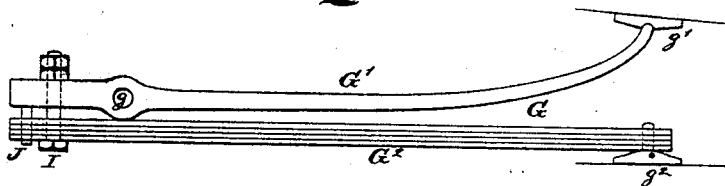


Fig. 3.



Witnesses:

Inventor:

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UNITED STATES PATENT OFFICE.

BENJAMIN S. LAWSON, OF NEW YORK, N. Y.

IMPROVEMENT IN STEAM-PUMPS.

Specification forming part of Letters Patent No. **145,806**, dated December 23, 1873; application filed October 27, 1873.

To all whom it may concern:

Be it known that I, BENJAMIN S. LAWSON, of New York city, in the State of New York, have invented certain Improvements relating to Steam-Pumps, of which the following is a specification:

I employ a crank peculiarly mounted and connected. The crank-shaft is carried on bearings attached to the piston-rod of the pump, and requires for the space between the cylinders little more than the diameter of the crank. The steam-valve is worked from a bell-crank lever or side arm on the connecting-rod, which latter is keyed to a shaft mounted in fixed bearings on the frame-work, and is rocked in one direction and the other as the crank is revolved by the working of the pump. A stout spring is, by the working of the pump, moved backward and forward under this rocking-shaft, and lifts alternately on arms which extend from opposite sides. The force of the spring aids in carrying the crank past the center.

My pump has marked advantages. It can be adjusted to work very rapidly in case of fire or the like, or, when adjusted to pump slowly, it can work the slowest without stopping of any pump known to me.

The following is a description of what I consider the best means of carrying out the invention. The accompanying drawings form a part of this specification.

Figure 1 is a side elevation, partly in section, and Fig. 2 is a plan view. Fig. 3 shows some details on a larger scale.

Similar letters of reference indicate corresponding parts in all the figures.

A represents the fixed frame-work, including the pump-cylinder and steam-cylinder—in short, all the fixed work of the machine. B is the reciprocating rod, which I will term the piston-rod, which connects the piston of the steam-cylinder with the piston of the pump. *b* is a casting fixed thereon, the lower end of which traverses in a longitudinal groove in the framing A, and the upper part of which carries a shaft, C, on which is keyed a crank, *c*. On the side of the casting *b* a spring, G, is pivoted. The spring is compelled to reciprocate with the piston-rod B and shaft C, and performs an important function, as will pres-

ently appear. A stout connecting-rod, *d*, leads from the crank-pin on the end of the crank *c* to a rocking shaft, D, on which it is firmly keyed. The slide-valve *e* controls the working of the steam in the steam-cylinder, by being reciprocated by the rod E. This rod is pivoted to a short arm, *d'*, on the rock-shaft D. This shaft D is mounted in fixed bearings on the frame-work A. In addition to the arms *d d'* there are two arms, D¹ D², which stand opposite to each other, and form, in fact, a straight cross-piece with a smoothly-finished channeled under surface. The arms or cross-pieces D¹ D² tilt with the motion of the crank *c*. I will in future designate them as the tilting cross-piece D¹ D². It has a length a little greater than the stroke of the pump. Under it is a corresponding smooth track, *a*, fixed on the framing and part of the frame-work A. The spring G, before referred to, acts between the tilting cross-piece D¹ D² and the fixed track *a*. It is of a bifurcated form, the arms tending to spring apart. One presses downward on the fixed track, and the other upward against the tilting cross-piece. It exerts a nearly constant force, tending to separate these surfaces. Fig. 3 shows what I esteem a preferable construction of this spring G, but the simpler construction, shown in Figs. 1 and 2, may serve with success in small pumps. The upper part G¹ carries a shoe, *g*¹, which runs in the channeled under surface of the cross-piece D¹ D². The lower part of the spring is formed of a number of thin steel plates, G², and presses downward on a shoe, *g*², which runs on the fixed way or track *a*. Near the pivot *g*, which connects this compound spring to the casting *b*, is an adjusting-screw, I, provided with a nut and jam-nut, by means of which I can readily adjust the force with which the parts G¹ and G² tend to separate. J is a fixed pin mounted near the screw I, and standing in close-fitting holes in the plates G², to maintain their proper longitudinal and lateral positions.

As the piston-rod B reciprocates, the crank-shaft C is carried bodily forward and backward, and the crank *c* revolves and communicates a proper rocking motion to the rocking shaft D, and thus, through the arm *d'* and rod E, operates a slide-valve. As the

pistons and piston-rod approach either end of their stroke the spring G, which has been previously compressed, exerts a force tending to promote the turning of the shaft D in the proper direction. The force of this spring should be adjusted so as to be sufficiently active to throw the crank rapidly past the center, no matter how slowly the pump may be working.

In all reciprocating steam-pumps a difficulty is involved in giving a complete throw to the valve, especially when working very slowly. My device overcomes the difficulty by treasuring up in the spring G a sufficient amount of force during the middle portion of the stroke to carry the parts past the crank-center with a quick motion. I so proportion the parts that before the slide-valve *e* changes the distribution of the steam at the end of the stroke, or commences to change it, the force of the spring G will be actively felt in impelling the crank *c* forward. At the moment when the steam commences to be admitted on the opposite side of the piston, the crank and all its connected parts is in the act of darting rapidly past the center under the influence of the spring G. The importance of delicate adjustment of the spring is liable to be over-rated. If it is too strong, it is liable, by springing the parts, to throw the crank past the center, and consequently shift the valve before the pistons have quite completed their stroke, but this is a very insignificant evil in small pumps.

I prefer in pumps of considerable size to adjust the spring so that it shall have only

a sufficient force to overcome the resistance and allow the stroke to be fully completed by the direct action of the steam without any considerable strain on the crank and its connections.

By carrying the crank-shaft on the piston-rod, I economize room and simplify the machine, besides obtaining the facilities for securing the other several points of advantage described.

I claim as my invention—

1. The crank-shaft C, carried on the piston-rod, in combination with the crank *c* and connecting-rod *d*, the latter connecting to a pivot or shaft, D, mounted in fixed bearings, as herein specified.

2. The cross-piece D¹ D² on the rocking shaft D, which, by a suitable connection, operates the valve *e*, in combination with the spring G carried on or by the piston-rod, as herein specified.

3. The valve-rod E and valve *e*, operated by the arm *d'* on the rocking lever D, in combination with the long arm or connecting-rod *d*, and cranked shaft C *c* carried on the piston-rod, and with spring G, also carried thereon, arranged to serve in throwing the crank past the center, as herein specified.

In testimony whereof I have hereunto set my hand this 21st day of October, 1873, in presence of two subscribing witnesses.

BENJAMIN S. LAWSON.

Witnesses:

WM. C. DEY,
ARNOLD HÖRMANN.