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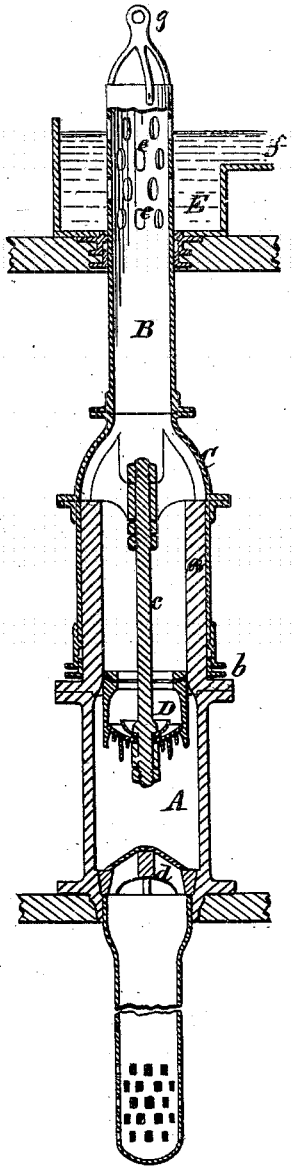
E. DAGGETT.

MINE-PUMP.

No. 193,227. Patented July 17, 1877.

Fig. 2.

Fig. 1.



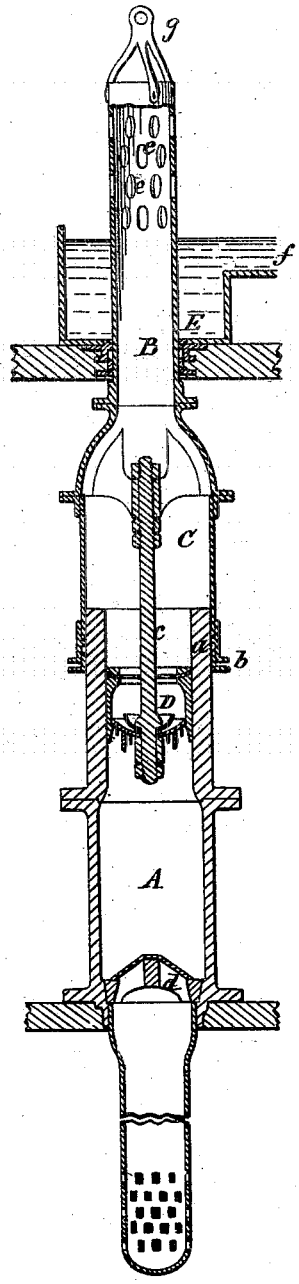
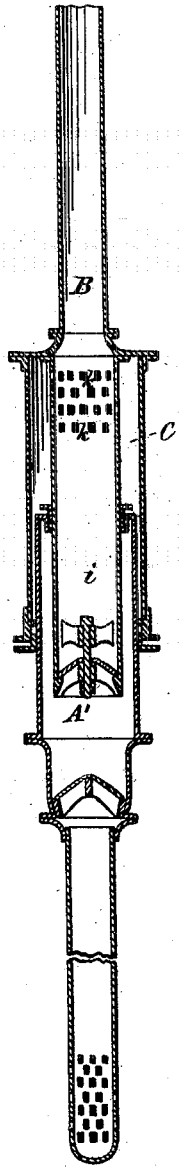


Fig. 3.



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2 Sheets—Sheet 2.

E. DAGGETT.

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Fig. 4.

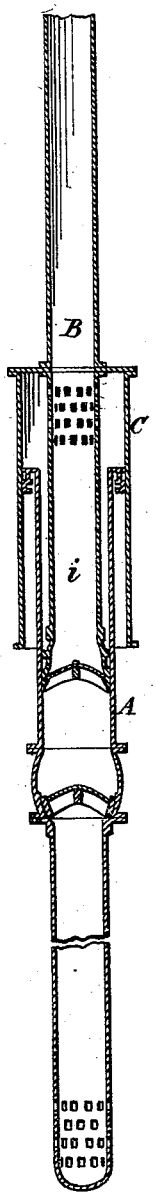


Fig. 5

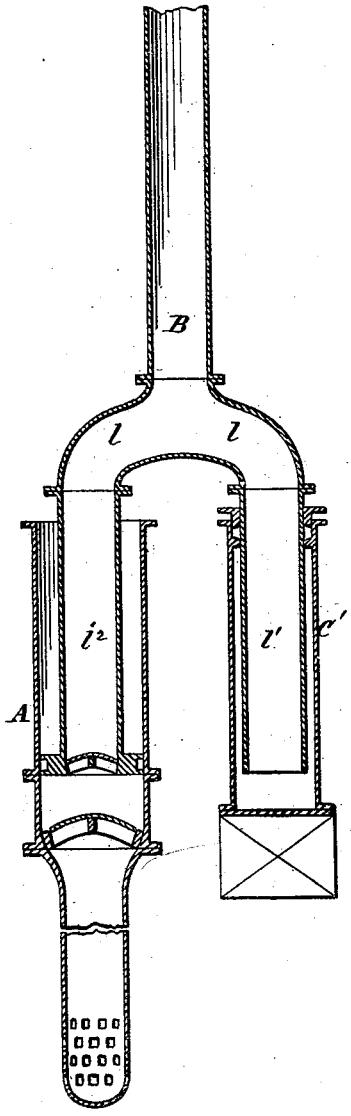
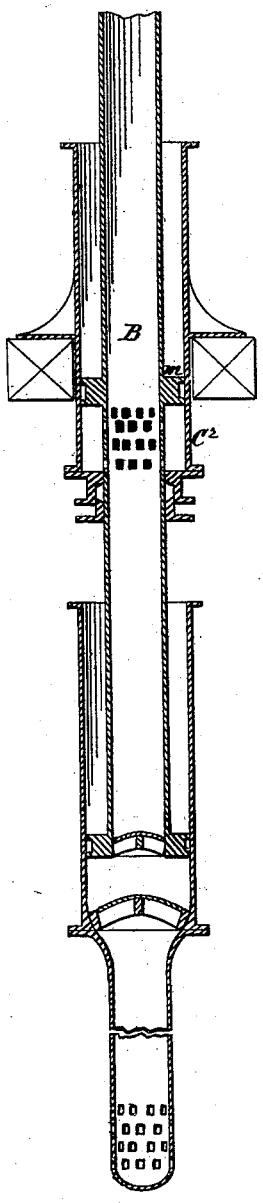


Fig. 6.



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UNITED STATES PATENT OFFICE.

ELLSWORTH DAGGETT, OF SALT LAKE CITY, UTAH TERRITORY.

IMPROVEMENT IN MINE-PUMPS.

Specification forming part of Letters Patent No. **193,227**, dated July 17, 1877; application filed May 5, 1877.

CASE A.

To all whom it may concern:

Be it known that I, ELLSWORTH DAGGETT, of Salt Lake City, in the county of Salt Lake and Territory of Utah, mining engineer, have invented certain new and useful Improvements in Mine-Pumps; and I do hereby declare that the following specification, taken in connection with the drawings furnished and forming a part of the same, is a clear, true, and complete description thereof.

My improvements relates to that class of pumps in which reciprocating pipes are employed.

The main object of my invention is to obviate, either wholly or to a considerable extent, any necessity for the well-known so-called "balance-bobs," (such as are employed in Cornish pumps,) for the purpose of balancing the weight of the pipe during its lift; and to that end my invention consists in the combination, with the pump and its pipe, of an auxiliary or water-balance chamber, into which a portion of the water contained in the pipe is received during its upward movement, thereby causing the column of water to wholly balance the weight of the pipe, or balance any desired lesser portion thereof.

Another object of my invention is to effect an easy and free discharge of water from the reciprocating pipe, and at the same time, when such is desirable, to provide for a direct connection with the top of said pipe, of the pitman, by which it is connected with the operative mechanism; and to these ends my invention further consists of the combination of a stationary receiving and discharging tank, provided with a stuffing-box in its bottom, with a longitudinally-reciprocating pipe, through which the water is forced or lifted and discharged into the tank.

To more particularly describe my invention, I will refer to the accompanying drawings, in which—

Figures 1 and 2 represent, in vertical section, a pump embodying the several features of my invention. Figs. 3, 4, 5, and 6 represent, in similar sections, modifications of pumps embodying the water-balance feature of my invention.

In all the figures, A represents the pump-barrel, which is stationary, and located at any desired point in the shaft, and any desired number of them may be employed, one above the other, at proper intervals, provided several pipes, B, are so connected that all of them will be reciprocated as one pipe, as is described in another application by me for Letters Patent.

The construction of the pump-barrel may be largely varied, and although I have herein in this connection shown and described certain details in construction which are novel and of value, they constitute no portion of the invention which I at this time desire to claim.

In Fig. 1 the pump-barrel is shown to be constructed in two parts, the lower being of a greater diameter than the upper. The upper portion is shown to be of considerable thickness, as at *a*, for the reason that in this instance it is desirable to have a greater exterior diameter of the barrel than would be attained if the metal were no thicker than would be actually requisite in an ordinary pump-barrel of the same interior diameter. The exterior of this upper portion is turned off truly.

C denotes one form of an auxiliary chamber, by means of which the "water-balance" is effected. In Fig. 1 it is connected, by means of its dome and flanges, to the lower end of the reciprocating pipe B. It has an interior diameter greater than the exterior diameter of the upper section of the pump-barrel, and the sliding joint between them is guarded by a packing-box, as at *b*.

The valve D is attached to the lower end of the valve-rod *c*, which, in turn, at its upper end is centrally secured to the interior of the dome of the auxiliary chamber C, in a manner well known. The usual lower valve is shown at *d*.

E denotes a stationary tank, which is located at the mouth of the shaft, or at any point below, from which direct drainage is possible. The bottom of the tank is provided with a stuffing-box for packing with the exterior surface of the pipe B, which is properly turned off and extends upward into the tank. The pipe B, near its upper end, is provided with numerous perforations, as at *e*, for discharging water laterally into the tank, which is pro-

vided with an overflow-chute, as at *f*. The upper end of pipe B is provided with a suitable bale, as at *g*, with which the pitman is directly connected.

Under some circumstances I prefer that the upper section of pipe B be made of wrought-iron or even low steel; but ordinarily good cast iron may be employed.

In Fig. 1 the pipe B is shown at the bottom, and in Fig. 2 at the top, of the stroke.

It will be readily seen that, as the pipe B is lifted, water will be drawn through the lower valve into the pump-barrel; and, also, that the water in the upper portion of the pump-barrel is lifted by the moving valve. As the auxiliary chamber C is lifted, its cubic capacity is rapidly enlarged, so that only a portion of it is filled by the water lifted by the valve, and the remainder of said chamber is filled by water from the pipe B. In other words, the column of water in pipe B (having its base in a chamber which is enlarged as the pipe rises) induces pressure within the chamber, which, when exerted upon its dome, contributes to the lift of the pipe and lessens the power otherwise requisite to raise it; and it will also be seen, if the chamber be properly proportioned with reference to the pump-barrel, the length of stroke, and the pipe B, that the weight of said pipe may be practically offset or balanced by the column of water within the pipe, and that, therefore, "balance-bobs," as in Cornish pumps, may be wholly obviated, or, if used at all, they may be reduced in weight to any desired degree. As the pipe B descends, the upper valve opens and water passes from the lower portion of the pump-barrel, the cubic capacity of the auxiliary chamber meantime decreasing, and therefore at each descent of the pipe as much water is discharged therefrom at its top as is taken into the pump-barrel through its lower valve, which is all that any pump which operates in forcing water only during the downward movement of its piston could discharge.

In connection with the discharge of the water from the pipe B, it will be seen that it is delivered freely into the open tank, because the numerous perforations afford an aggregate area of opening much greater than the sectional area of the pipe. As mining-pumps are usually of long stroke, it is a matter of consequence to lessen, as far as is practicable, the height of the column of water above the point from which flowage may occur, and to discharge it with a minimum of pressure.

As before stated, the pump-barrel may be varied largely in its construction, and the same is true of the auxiliary chamber, and these variations may be employed without departing from the spirit of my invention.

In Fig. 3 I have illustrated a modification having an auxiliary water-balance chamber, C, which is substantially as in Figs. 1 and 2. The pump-barrel A′ is in one piece, mounted on a valve-box. Instead of a valve-rod a tubular piston, *i*, is employed, which, at the upper end, communicates with the pipe B, but has a greater interior diameter. At the upper end of piston *i* it is provided with numerous perforations, *k*, which open into the water-balance chamber.

In Fig. 4 the tubular piston i^1 is packed at its lower end, instead of at the upper part of the pump-barrel A′, as in Fig. 3. It is also of the same diameter as the pipe B. The packing between the pump-barrel and the auxiliary chamber is located at the top of the barrel, instead of at the bottom of the chamber, as in Fig. 3.

In Fig. 5 the pump-barrel is of the simplest possible form, and has a tubular piston, i^2. In this instance the auxiliary or water-balance chamber C^1 is wholly separate, as a structure, from the pump-barrel. This chamber is stationary, while those previously described have been attached to, and move with, the pipe B. The chamber and pump-barrel communicate with each other and with the pipe B by means of a branch pipe at *l*, which has for one leg the tubular piston i^2 and the other leg the pipe *l*′, which occupies the water-balance chamber.

In Fig. 6 the pump-barrel is as in Fig. 5, but the stationary water-balance chamber C^2 is located above, and the pipe B is straight, extending from the pump upward through a stuffing box in the bottom of said chamber. Said pipe within the chamber is provided with a piston, as at *m*, and below the piston the pipe is perforated.

This line of modification could be presented by me almost indefinitely from plans which have long been prepared by me and duly approved; but I have shown a sufficient number thereof to illustrate, to some extent, how far mere construction may be varied without materially affecting the results sought.

In connection with each form of pump herein shown, it will be seen that as the pipe B is lifted the column of water therein is not lifted, and also that said column contributes, by its pressure upon the water within the balance-chamber, to lift said pipe, and that, by due consideration of the several points involved, a practically-perfect balance of said pipe may be attained in like manner, as pump-rods have been heretofore balanced by "balance-bobs," as in the Cornish pump.

The value in a mining-pump of the reciprocating pipe, in lieu of the stationary pipe and pump-rods, has long been conceded, in that, if for no other reason, less space is required in a shaft; and it will be seen that, with my water-balance improvements, the moving pipes may be employed without the cumbrous balance-bobs heretofore deemed essential in deep-mine pumps.

Having thus described my invention, I claim as new and desire to secure by these Letters Patent—

1. In a mining-pump, the combination, with a reciprocating pipe, a pump-barrel, and suit-

able valves, of an auxiliary or water-balance chamber, substantially as described, whereby the weight of the pipe may be wholly or partially balanced, as set forth.

2. In a mining-pump having a reciprocating pipe, the combination, with said pipe, of a discharge-tank provided with a stuffing-box in its bottom for the passage of the pipe, substantially as described.

ELLSWORTH DAGGETT.

Witnesses:
E. E. McCAMMON,
R. A. KEYES.