(No Model.) 3 Sheets—Sheet 1.

A. WARTH.

STEAM PUMPING ENGINE.

No. 348,076. Patented Aug. 24, 1886.

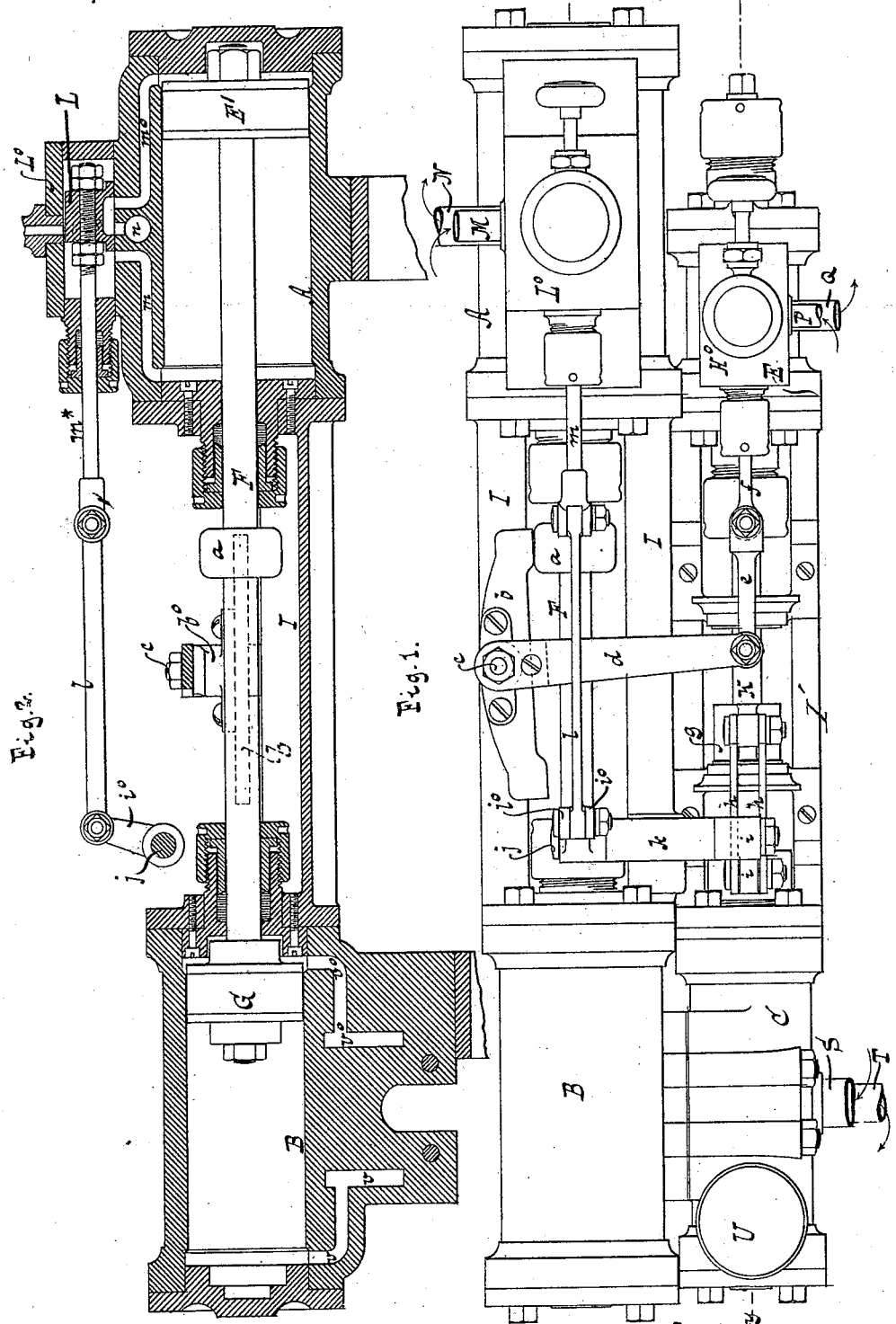

Fig. 2.

Fig. 1.

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Fig. 3.

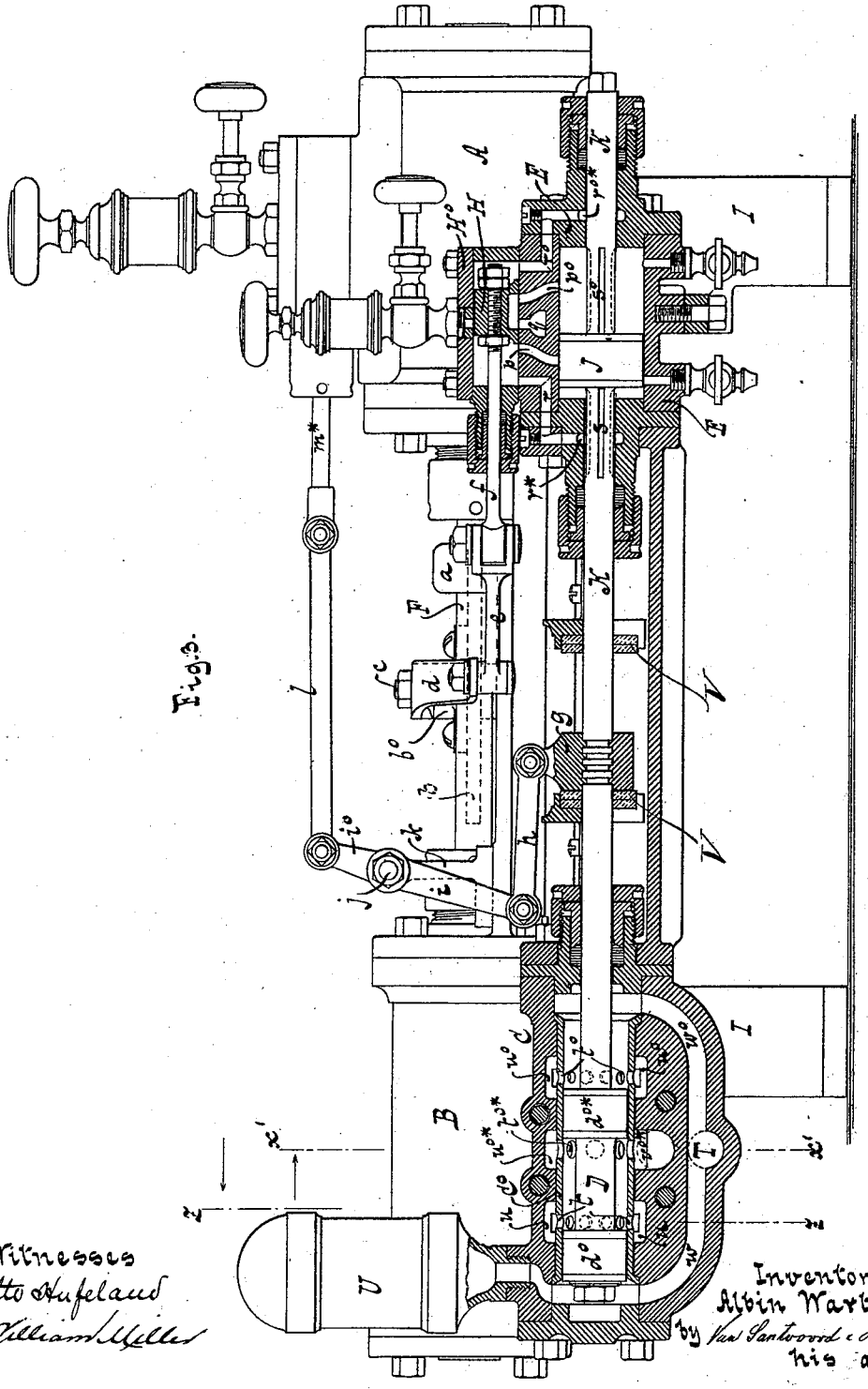

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Fig. 4.

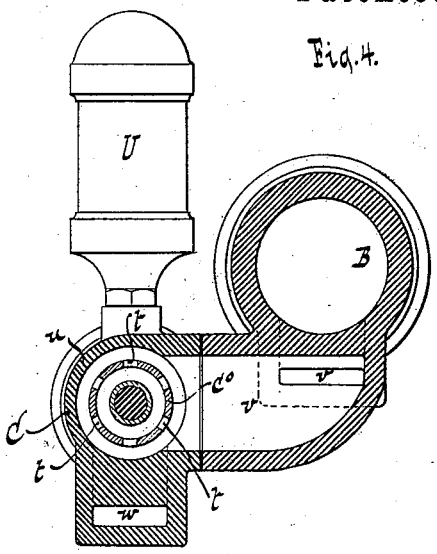
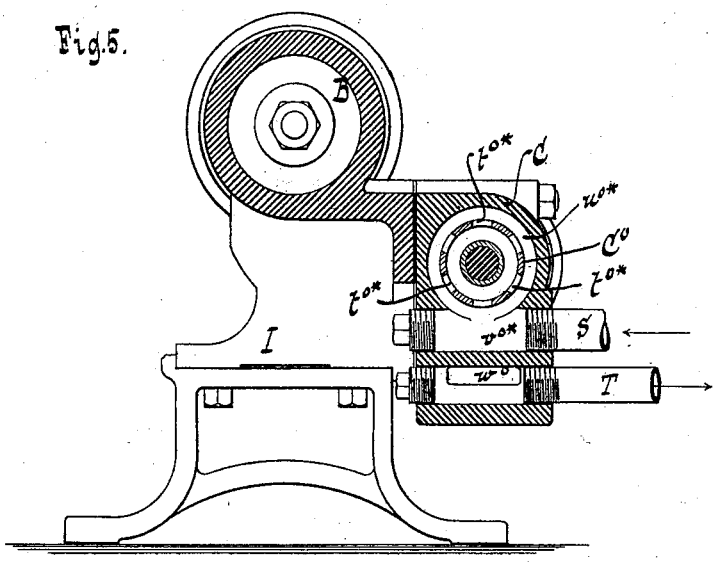


Fig. 5.



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UNITED STATES PATENT OFFICE.

ALBIN WARTH, OF STAPLETON, NEW YORK.

STEAM PUMPING-ENGINE.

SPECIFICATION forming part of Letters Patent No. 348,076, dated August 24, 1886.

Application filed March 6, 1885. Serial No. 157,949. (No model.)

To all whom it may concern:

Be it known that I, ALBIN WARTH, a citizen of the United States, residing at Stapleton, in the county of Richmond and State of New York, have invented new and useful Improvements in Steam Pumping-Engines, of which the following is a specification.

This invention relates to pumping apparatus; and the object of the invention is to provide a pump which will operate easily, and the parts of which can be readily put together and taken apart. The pump-valve can be operated by a piston, and suitable cushions can be provided to prevent slamming or jamming of said piston. The pump-valve chamber may be provided with small openings to prevent the operation of the valve from being disturbed.

This invention is illustrated in the accompanying drawings, in which Figure 1 represents a plan or top view. Fig. 2 is a longitudinal vertical section in the plane *x x*, Fig. 1. Fig. 3 is a similar section in the plane *y y*, Fig. 1. Fig. 4 is a transverse vertical section in the plane *z z*, Fig. 3. Fig. 5 is a similar section in the plane *x' x'*, Fig. 3.

Similar letters indicate corresponding parts.

In the drawings, the letter A designates the main cylinder. B is the pump-cylinder. C is the valve-chamber. D is the pump-valve.

E is a secondary cylinder, by means of which motion can be imparted to the pump-valve D.

E' is the piston of the main cylinder A. The piston E' can communicate motion to the pump piston or plunger G by means of a piston-rod, F.

On the piston-rod F is firmly mounted or secured a collar or shoulder, *a*. When the piston-rod F is in motion, the collar or shoulder *a* acts first upon one arm and then upon another arm of a lever, *b*. The double-armed lever *b* oscillates about the fulcrum or pivot *c*, and communicates motion to an arm or lever, *d*. The shaft or pivot *c* can be provided with a hub, b^{o}, Fig. 2, to which hub the lever *d* can be secured. The lever *d* is connected by a link, *e*, with a rod or arm, *f*. The rod or arm *f* imparts motion to the valve H of the secondary cylinder E, Figs. 1 and 3. The rock-shaft or pivot *c* has its bearing in the main frame I. The piston J of the secondary cylinder E connects by a rod, K, with a pump-valve, D. The rod K is connected by a link, *h*, with a lever, *i*. The link *h* may connect with the rod K by means of a collar, *g*, which collar can be screwed or firmly secured to the rod K, Fig. 3. The lever *i* imparts motion to rock-shaft *j*. The rock-shaft *j* has its bearings in a standard, *k*. The standard *k* can be secured to the main frame I. The rock-shaft *j* imparts motion to a lever, i^{o}, which connects by a link, *l*, with a rod or arm, m^{*}. The rod m^{*} imparts motion to the valve L of the main cylinder. From this description it will be understood that the valve H of the secondary cylinder E is actuated or changed by the action of the piston E' of the main cylinder A, and the valve L of the main cylinder A is actuated or changed by the action of the piston J of the secondary cylinder E. The valve-chest L^{o} of the main cylinder is provided with a supply-pipe, M, and with an exhaust, N, Fig. 1, and said valve-chest L^{o} communicates with the main cylinder A by ports m m^{o}, and with the exhaust N by the port *n*, Fig. 2. The valve-chest H^{o} of the secondary cylinder is provided with a supply-pipe, P, and with an exhaust, Q, Fig. 1, and it communicates with said secondary cylinder by ports p p^{o}, and with the exhaust Q by the exhaust-port *q*, Fig. 3. Additional ports r r^{o} lead from the valve-chest H to the annular grooves r^{*} r^{*o}, which surround the piston-rod K, and in this piston-rod K, on each side of the piston J, are a series of cavities, s s^{o}, the object of which will be presently more fully explained. The pump-valve D is composed of two pistons, d^{o} d^{o*}, which work in a lining, C^{o}, which lining is made of metal or other suitable material, and which lining is firmly secured in the valve-cylinder or valve-chamber C, and which is provided with three sets of openings, t t^{o} t^{o*}, which communicate with annular grooves u u^{o} u^{o*} in the inner surface of the valve-cylinder C. The groove u connects, through a channel, *v*, Figs. 2 and 4, with the outer end of the pump-cylinder B, the groove u^{o*} connects, through a channel, v^{o}, Fig. 2, with the inner end of the pump-cylinder B, and the groove w^{o*} connects, through port v^{o*}, Figs. 3 and 5, with the suction-pipe S. The ends of valve-cylinder C connect, through ports w w^{o}, with the discharge-pipe T, Figs. 3 and 5, and the ports w w^{o} also connect with the air-chamber U, Fig. 3. In the position shown in the drawings, the piston E' has

just completed its outward stroke, and the pump-piston C has forced the water or fluid in front of it through the port v^o, groove u^o, holes t^o, and port w^o to the discharge-pipe T, while water has been sucked in from the suction-pipe S, port v^{o*}, annular groove u^{o*}, holes t^*, holes t, annular groove u, and port v, into the pump-cylinder B. In order to drive the piston E' inward, the slide-valve L must be changed, and this change is effected by the piston J of the secondary cylinder E. By referring to Fig. 3 it will be seen that steam or motive fluid passes through port r, groove r^*, and recesses s into the inner end of the cylinder E, and consequently the piston J is driven outward, and by the time the recesses s have passed the groove r^* the piston d^o of the pump-valve D has passed over the holes t, so that t^o t^{o*} get between the two pistons d^o d^{o*} of the fluid-valve, and at the same time the slide-valve L of the main cylinder has become changed by the action of the collar g, link h, levers i i^o, link l, and rod m, the main piston E' begins its inward stroke, and the water contained in the pump-cylinder is driven through port v, annular groove u, holes t, and port w to the discharge-pipe T. During the inward stroke of the piston E' the slide-valve H of the secondary cylinder is changed, steam or motive fluid is admitted to the outer end of this cylinder, and the different parts are brought back to the position shown in the drawings.

The object of the supplementary ports r r^o in the secondary cylinder, and of the recesses s s^o in the piston-rod K, is twofold: First, to admit steam or motive fluid to the cylinder E before the slide-valve H has been changed, and, second, to provide a steam or fluid cushion in front of the piston J, to prevent the same from slamming.

When steam is employed to operate the pump, the cushion which is provided for the piston J is formed by live steam, which, being under high tension, forms a very elastic and effective cushion.

In addition to the provision made for cushioning the piston J by steam or fluid, I have also applied cushions V, of rubber or yielding material, which limit the movement of the collar g, and consequently of the piston-rod K.

From the foregoing description, and from the inspection of the drawings, (particularly Fig. 3,) it will be seen that the pump-valve D is balanced, or nearly so, at all times, the outer heads of the pistons d^o d^{o*} being always exposed to the pressure of the column of water or fluid contained in the discharge-pipe, while the inner heads of said pistons d^o d^{o*} are always exposed to the suction, and consequently it takes comparatively little power to move the pump-valve, and I am enabled to run my pump with very great speed to force water or other liquid to a considerable height with comparatively little strain on the working parts.

My pump can be used for pumping liquids or gases, and in certain cases the motion can be imparted to the pump-piston by hand or other power, so as to dispense with the steam-cylinder.

In constructing my pump I prefer to support the main cylinder A and the pump-cylinder B, with their adjacent parts, upon a frame, I, and to support or partly support the secondary cylinder E and the valve-chamber C, with their adjacent parts, upon a secondary frame, I'. Parts of the pump which need examination or repairing can thus be readily detached without disturbing the remainder of the mechanism. It is also to be noticed that the holes t t^o t^{o*} in the valve-chamber are preferably made so small as to prevent any material entering the valve-chamber which would be likely to interfere with the operation of the valve D, and the packing of the pump-valve D, which often is soft or yielding, is kept from catching or tearing, as the lining C^o allows the valve D to move or slide easily, and the holes in the lining C^o are so small that the packing of the valve D cannot strike or tear against the edges of the holes t t^o t^{o*}. The valve-chamber C can be connected to the pump-cylinder B by bolts or screws, so that said valve-chamber C can be readily attached to or detached from the apparatus.

What I claim as new, and desire to secure by Letters Patent, is—

1. The combination, with a main cylinder, A, and its valve, of a pump-cylinder, B, pump-valve D, secondary cylinder E, a rod connecting the piston of the secondary cylinder with the pump-valve, mechanism for actuating the valve of the main cylinder by the piston of the secondary cylinder E, mechanism for actuating the valve of the secondary cylinder by the piston of the main cylinder, supplementary ports leading into the secondary cylinder E, and recesses in the piston-rod of said secondary cylinder.

2. The combination of the main cylinder A, pump-cylinder B, secondary cylinder E, valve-case C, pistons E' J, rods F K, cylinder-valves H L, levers b d, link e, and rod f, for actuating the valve of the secondary cylinder from the piston-rod of the main cylinder, and the link h, lever i, rock-shaft j, and means for connecting said rock-shaft with the valve of the main cylinder, whereby said valve is actuated from the piston of the secondary cylinder, substantially as described.

3. The combination, with the pump-valve D, piston J, and piston-rod K, having collar g, of the cushion-plates V, link h, lever i, rock-shaft j, lever i^o, link l, and rod or arm m^*, for actuating the valve of the main cylinder, substantially as described.

In testimony whereof I have hereunto set my hand and seal in the presence of two subscribing witnesses.

ALBIN WARTH. [L. S.]

Witnesses:
W. HAUFF,
E. F. KASTENHUBER.