J. C. King,

Double-Acting Pump,

No. 68,994. Patented Sep. 17, 1867.

Fig. 1.

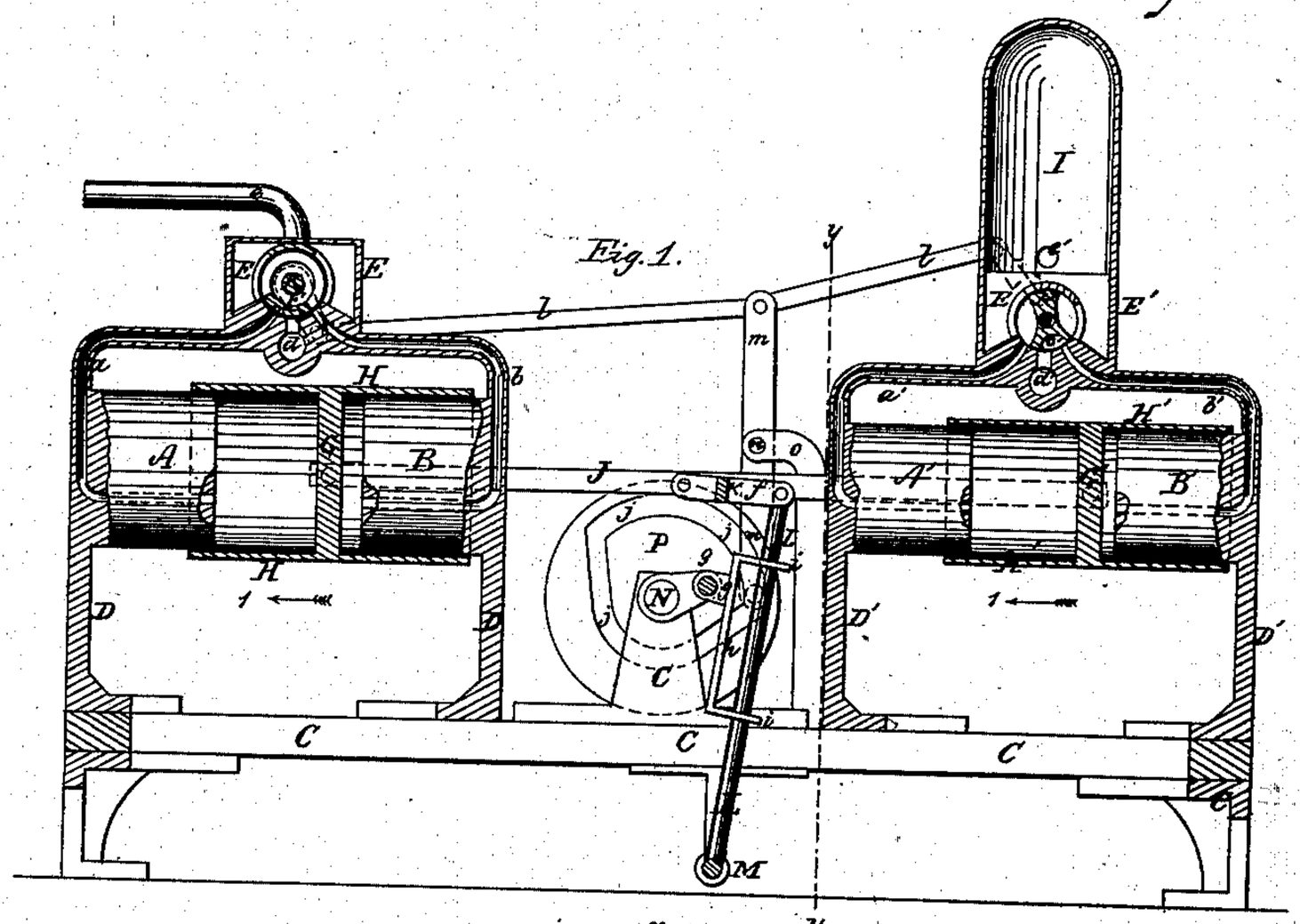
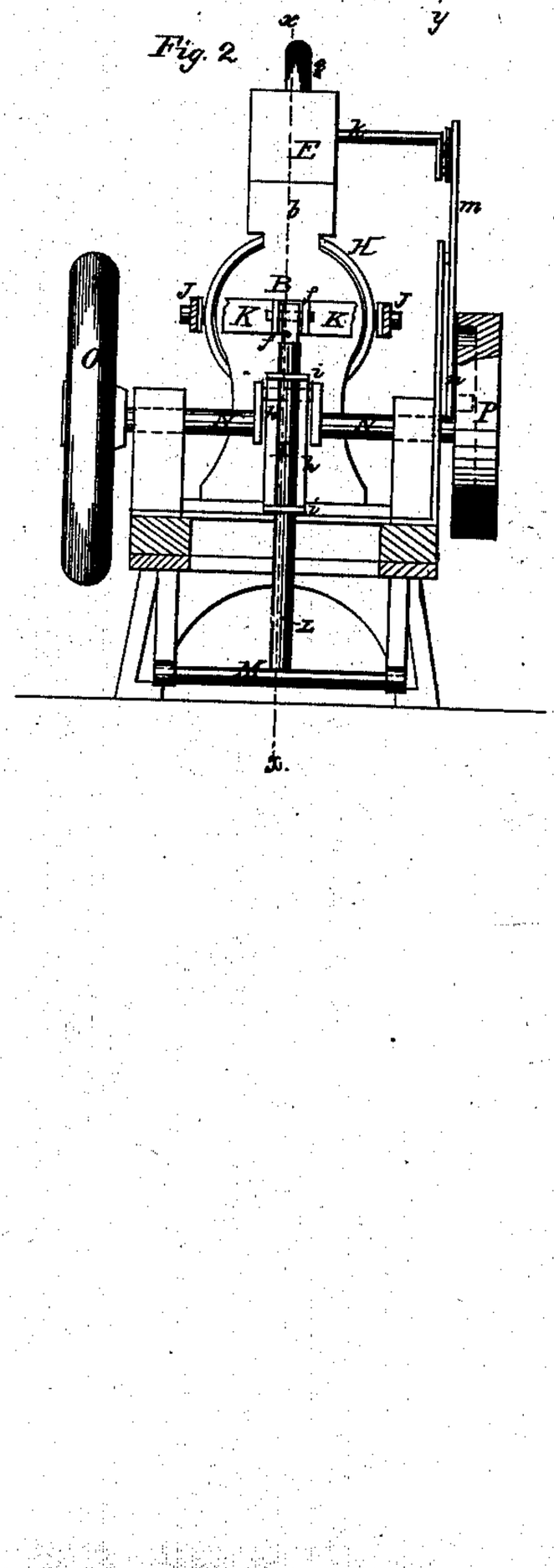


Fig. 2



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JOHN C. KING, OF NEW YORK, N. Y., ASSIGNOR TO HIMSELF AND GEORGE M. WOODWARD, OF THE SAME PLACE.

Letters Patent No. 68,994, *dated September* 17, 1867.

IMPROVEMENT IN MECHANISM FOR OPERATING THE VALVES OF FORCE-PUMPS.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that I, JOHN C. KING, of the city, county, and State of New York, have invented a new and improved Double-Acting Force-Pump; and I do hereby declare that the following is a description thereof which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 represents a vertical longitudinal section of my improved force-pump, the plane of section being indicated by the line *x x*, fig. 2.

Figure 2 is a vertical cross-section of the same, the plane of section being indicated by the line *y y*, fig. 1.

Similar letters of reference indicate corresponding parts.

This invention relates to a steam-pump, in which the circumference or rim of the cylinders is connected with, attached to, and moving with the piston, between the stationary heads, thereby doing away with piston-rods and piston-packings. The posts pass through the stationary heads, and the water or steam is acted upon by the motion of the piston in the same manner as in ordinary cylinder engines. The valves by which the ports are alternately opened and closed, and connected alternately with the discharge and feed pipes, are operated by the moving cylinders, or by rods attached thereto in such a manner that they will remain in position while the piston is moving, and will be set or changed as the stroke of the piston is at an end.

A and B are the two heads of the engine; they are cylindrical, and are secured upon a stationary bed, C, by means of posts or supports D D. The distance between the inner ends of the heads is equal to the length of stroke of the piston, minus the thickness of the piston. The length of each head is at least equal to the length of half the stroke. Each head is connected with one of the steam-passages *a b*, and thereby with the steam-chest E, in which an oscillating valve, F, is arranged, as shown, said valve having a recess, *c*, at its under side, by which one of the ports *a b* is connected with the exhaust *d*, while the other port is open, and receives the steam, which is fed into the chest E by the supply pipe *e*. G is the piston, which is a solid circular disk, secured to or in a cylindrical shell, H, which is about as long as the distance between the heads A B, plus the full length of one of the heads. The inner diameter of the shell H corresponds to the diameter of the heads A and B. Packing may be applied on the ends of the cylinder, between the same and the heads. It will be seen that as steam is admitted through one of the ports *a b*, the piston will be moved and the cylinder will be carried by the piston sliding on the stationary heads. The pump itself consists of heads A′ B′, resting upon supports D′, of a piston, G′, and shell H′, which are all made and operating exactly like those heretofore described. The heads are provided with parts *a′* and *b′*, by means of which they are connected with the water-box E′, in which an oscillating valve, F′, is arranged, said valve having a recess, *c′*, at its under side, by which one of the ports, *a′ b′*, is connected with the induction pipe *d′*, while the other port is open to allow the water to be discharged into the air-chamber I, whence it is forced out through the discharge pipe *e′*, as is clearly shown in fig. 1. The axis of the cylinders H and H′ are arranged in one line, so that the cylinders can be connected by two or more bars J, by which the action is transmitted from the engine to the pump. Thus, as the piston in the engine is forced by the steam in one direction the piston in the pump will be moved in the same direction. Between the engine and the pump is arranged a cross-bar, K, the ends of which are secured to the bars J J. From the bar K project two ears or lugs *f f*, between which the upper end of a rod, L, is pivoted, the lower end of which is firmly secured in a horizontal rock-shaft, M, which has its bearings in the stationary framework C, by which the whole machinery is supported. Thus, when the engine is in motion the rod L will oscillate on the axis M. N is a horizontal crank-shaft, which has its bearings in the frame C, and which is arranged considerably above the rock-shaft M, but below the bars J, as shown. The crank on the shaft N turns in a box, *g*, which is connected with an upright plate, *h*, on the ends of which projecting lugs *i* are formed. These lugs *i* fit around the rod L, as is clearly shown in the drawings. Thus, as the rod L is made to oscillate, the box *g* will slide up and down on it, and will be carried forward and backward by it, thereby carrying the crank of the shaft N around and revolving the said shaft. A fly-wheel, O, mounted on the latter, aids in carrying the shaft N around. P is a disk, mounted on the shaft N, and revolving with the same. In one of its faces is arranged a groove, *j*, which is made partly concentric, partly eccentric, with the axis of the shaft N; that is to say, it consists of two concentric

portions arranged on opposite sides of the shaft N, on the disk, both extending over an equal number of degrees, although their radii may not be of equal length. The ends of these concentric grooves are connected by eccentric grooves, as is clearly indicated in fig. 1. The oscillating valves F and F′ are mounted on shafts *k* and *k′*, which are arranged across the steam-chest and water-box, respectively, and have their bearings in the same. These shafts *k k′* are provided with cranks outside of their respective boxes, as is indicated by dotted lines in fig. 1. The ends of these cranks are connected by horizontal bars *l l* with the upper end of a lever, *m*, which is pivoted by a pin, *n*, to a stationary arm, *o*, projecting from the frame C. The lower end of the lever *m* is provided with a pin or friction-roller, which fits into the groove in the disk P. As long as this pin is in the concentric portion of the groove, the lever *m*, bars *l*, shafts *k k′*, and valves F F′ will remain stationary in a certain position while a stroke is being made by the pistons. As soon as the pin on the lever comes into the eccentric portion of the groove in the disk P, the lever *m* and its appendages will be moved and the valves shifted, so as to change the motion of the piston.

The operation is simple, and as follows: When the valve F stands as shown in fig. 1, the steam will enter the cylinder H through the port *b*, driving the pistons in the direction of the arrow 1, fig. 1. The water will then be forced through the port *a′* into the water-box and air-chamber, while water will be drawn into the port *b′*, and the space between the head B′ and piston G′ will be filled with it. When the stroke of the pistons has been finished the valves will be shifted so as to open the passage *b* to the steam-chest and the port *a′* to the water-box. The pistons will then be moved in the opposite direction, but the same result will be obtained.

The construction of steam or pump-cylinders, herein shown and described, *i. e.*, arranging the rim of the cylinder so that it will move with the piston, and connecting the same with the piston, can of course be applied to all kinds of engines and pumps, whether the same are operated by steam, hand, or other power, and whether they are arranged in a vertical inclined or horizontal position.

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

The rods J J, by which the cylinders H H′ are connected, in combination with the cross-bar K, rock-shaft M, oscillating bar L, box *g h i*, and crank-shaft N, all made and operating substantially as and for the purpose herein shown and described.

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