(No Model.) 3 Sheets—Sheet 1.

S. W. WOOD.

CONDENSING PUMP.

No. 545,032. Patented Aug. 20, 1895.

Fig: 1.

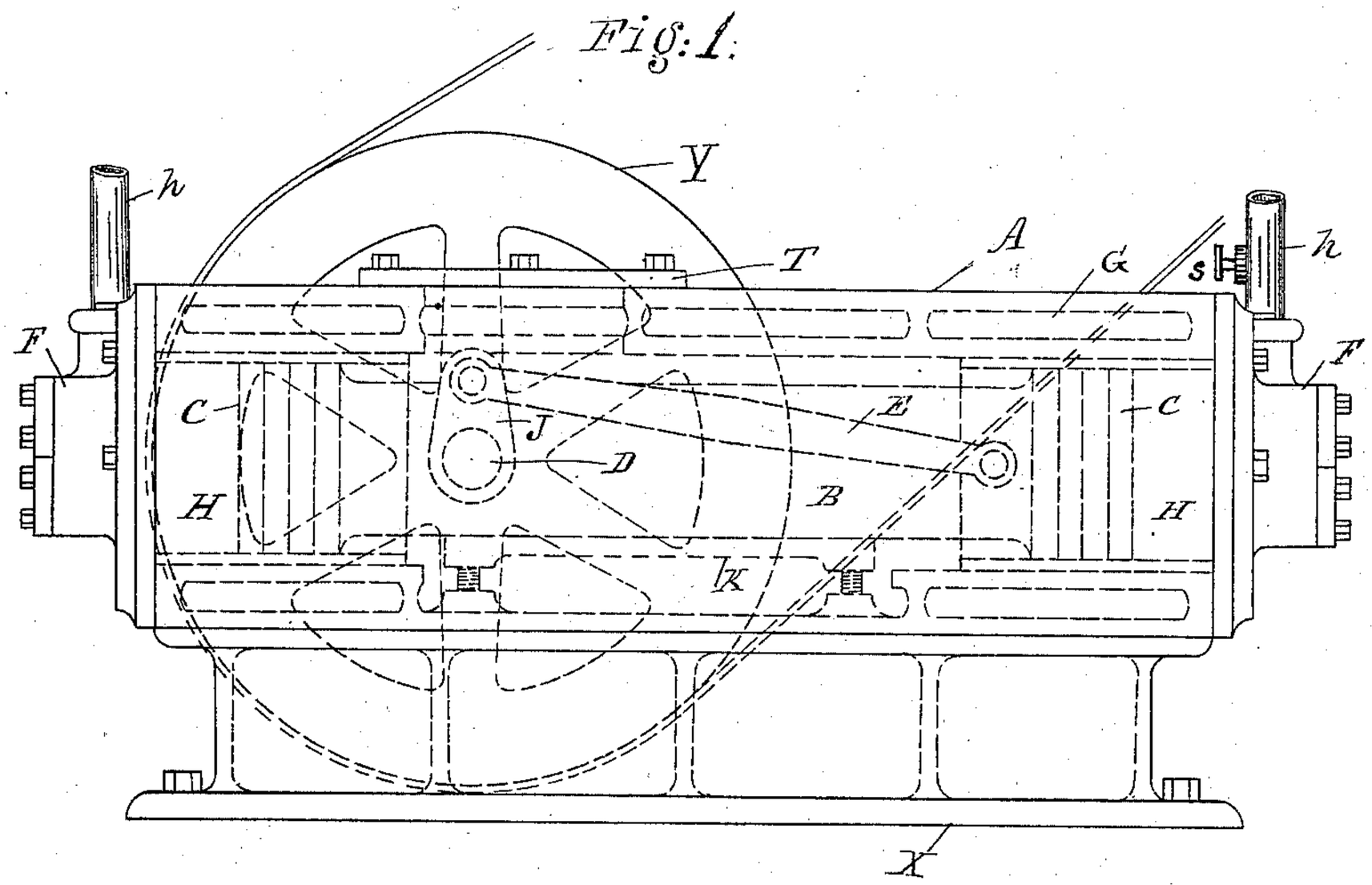
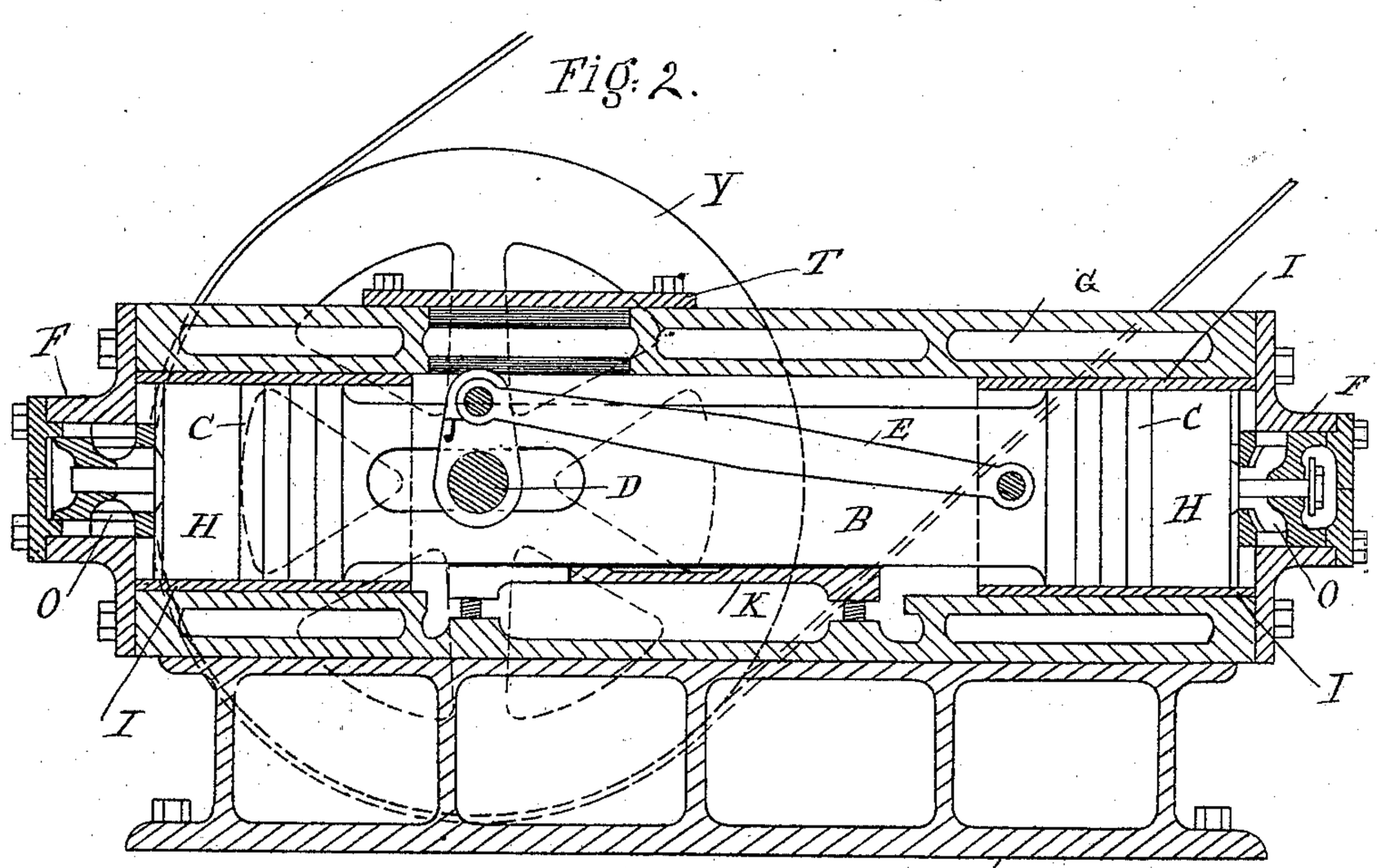


Fig: 2.



WITNESSES:

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(No Model.) 3 Sheets—Sheet 2.

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Fig: 3.

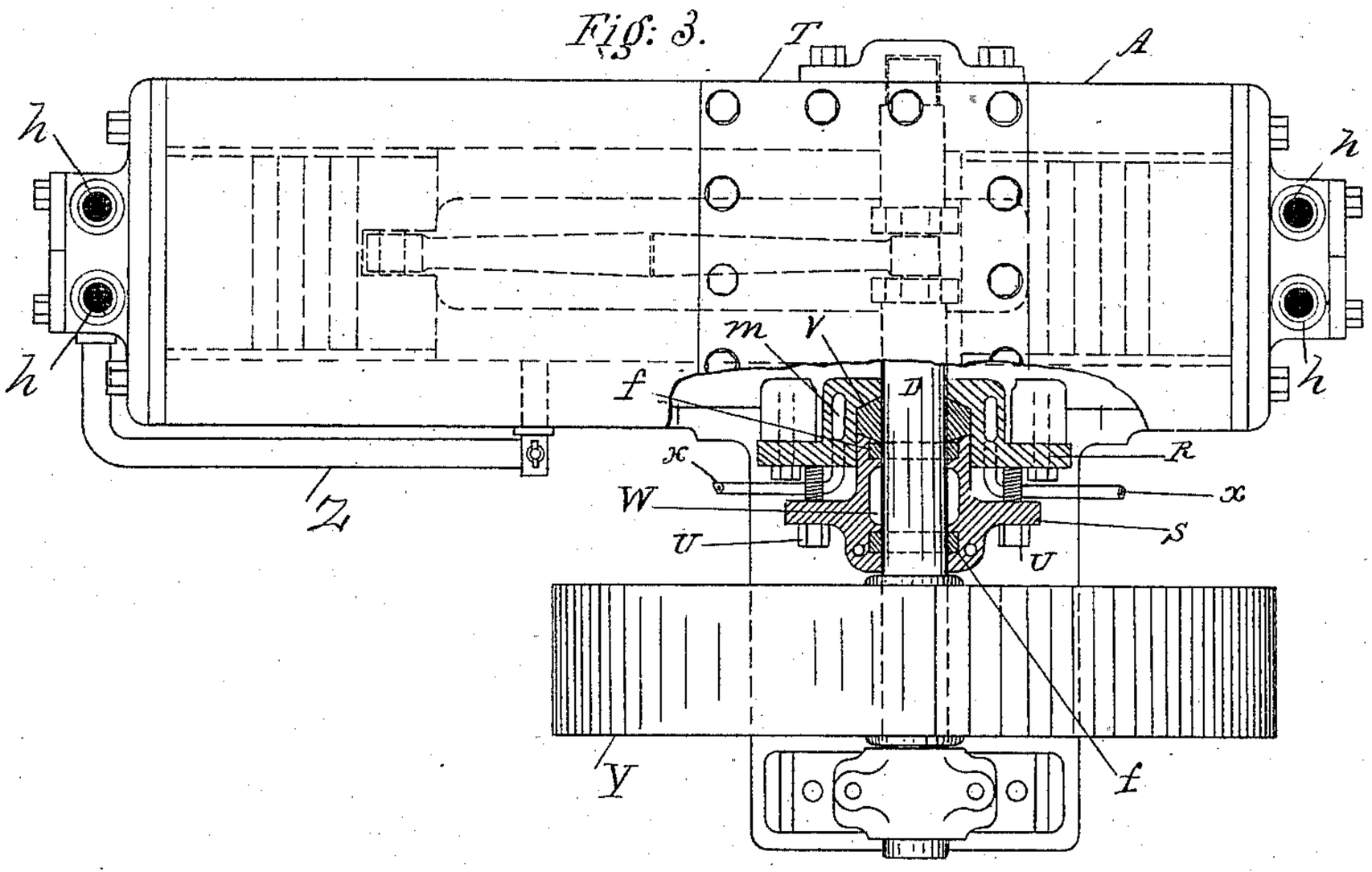


Fig: 4.

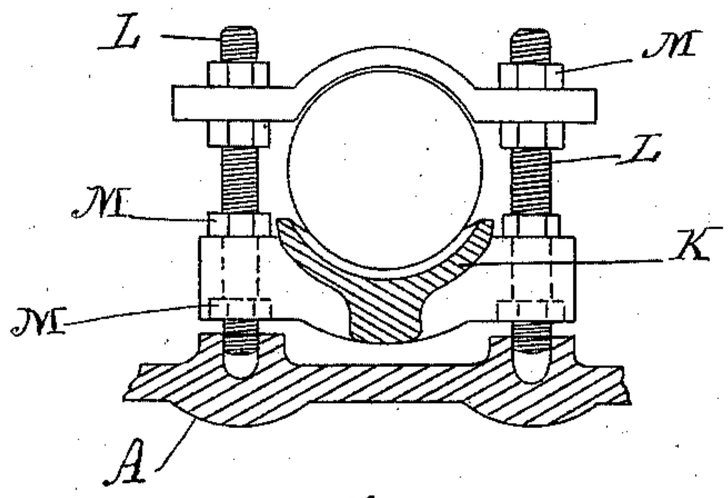
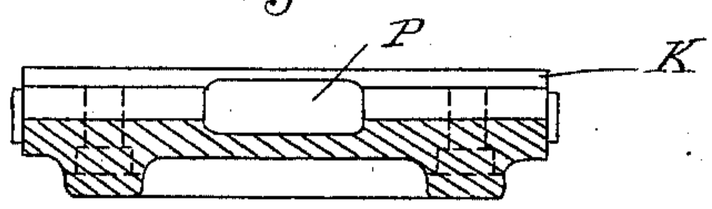


Fig: 5.



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3 Sheets—Sheet 3.

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CONDENSING PUMP.

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Fig. 6.

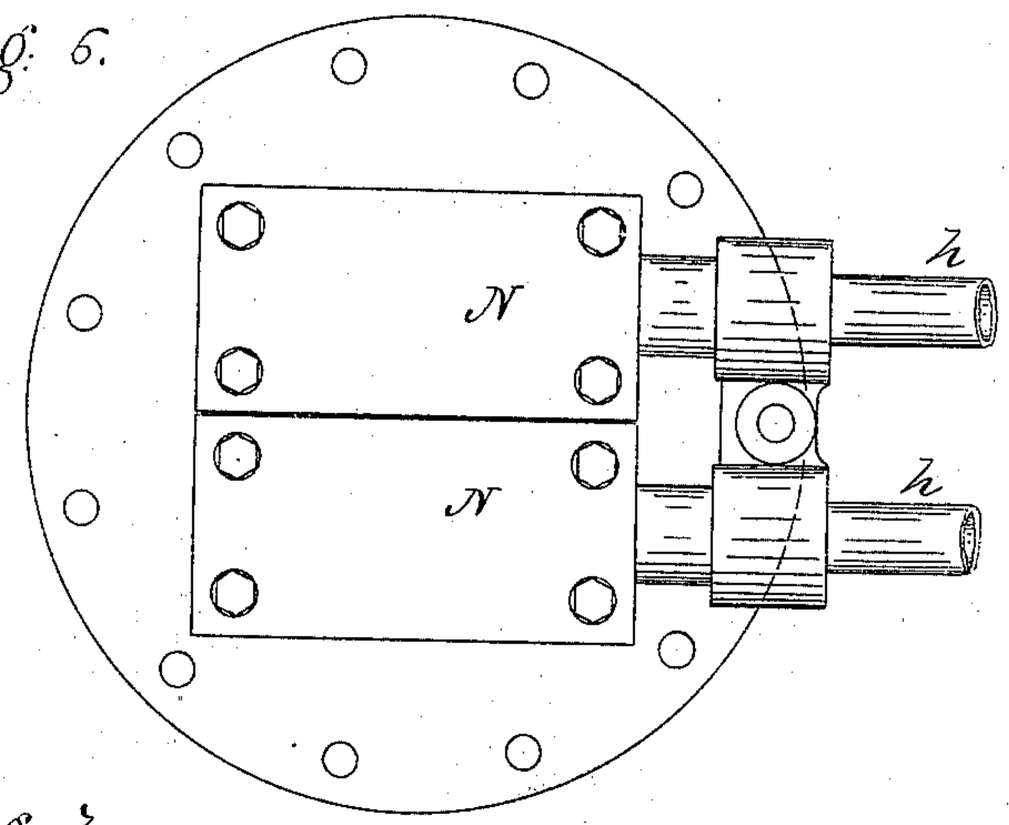


Fig. 7.

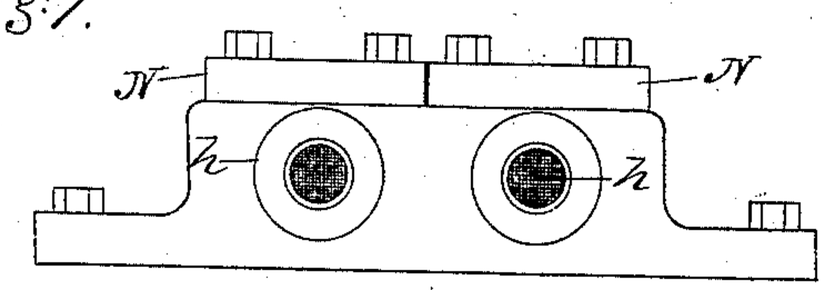


Fig. 8.

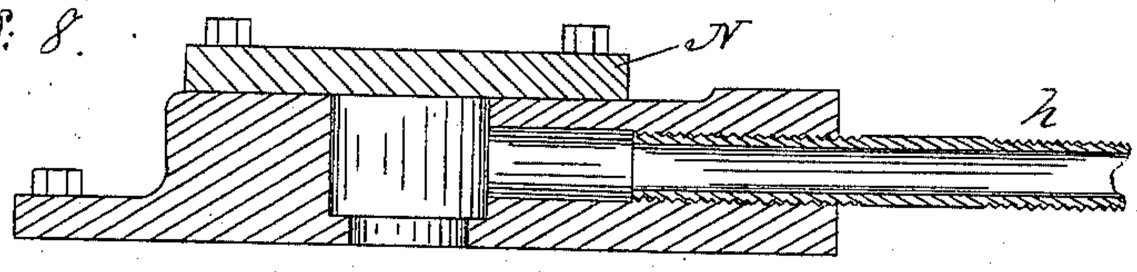
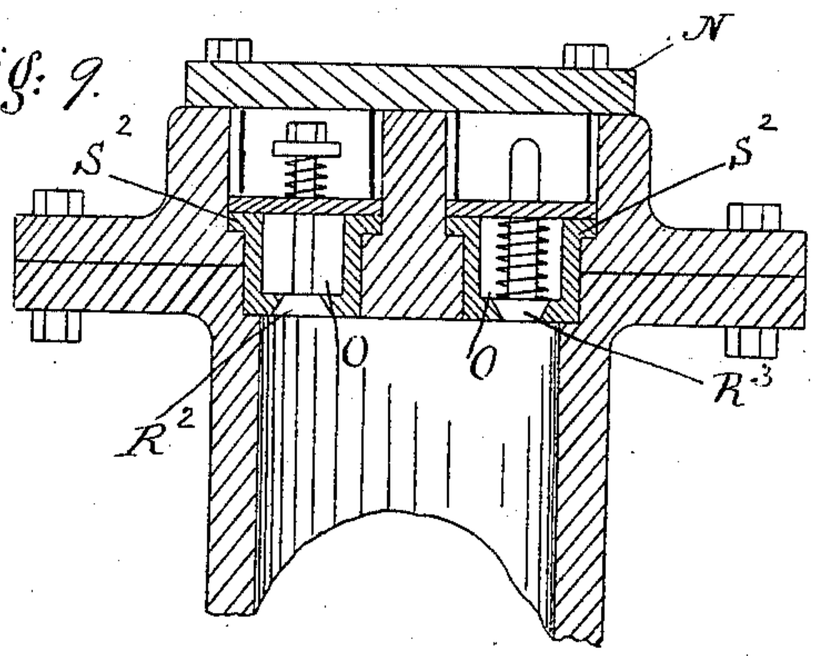


Fig. 9.



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UNITED STATES PATENT OFFICE.

STEPHEN W. WOOD, OF NEW YORK, N. Y.

CONDENSING-PUMP.

SPECIFICATION forming part of Letters Patent No. 545,032, dated August 20, 1895.

Application filed January 17, 1893. Renewed July 26, 1895. Serial No. 557,250. (No model.)

To all whom it may concern:

Be it known that I, STEPHEN W. WOOD, a citizen of the United States, residing in the city, county, and State of New York, have invented new and useful Improvements in Condensing-Pumps Adapted to be Employed in Refrigerating and Making Ice, of which the following is a specification.

The object of this invention is to produce a condensing-pump that may be operated either as single or double acting, the cylinders therein being in one and the same casting, but separate and independent of each other in their operation, the employment of a single piston-rod to operate the two pistons thereon back and forth in pumping, and the driving mechanism arranged to operate in the space between the two cylinders, substantially as represented.

Figure 1 represents a side elevation of this condensing-pump, the single piston-rod and pistons, the crank and connecting-rod therein being shown in dotted lines. Fig. 2 is a vertical longitudinal central section of Fig. 1, the single piston-rod and pistons, the crank and connecting-rod being in elevation. Fig. 3 represents a plan or top view of this condensing-pump, a portion of the side thereof being broken to represent, in section, the manner of rendering this condensing-pump gas-tight, the interior driving mechanism being shown in dotted lines. Fig. 4 represents a vertical cross-section, detached, of an adjustable and removable support to relieve the pistons of the weight of the piston-rod. Fig. 5 is a vertical longitudinal central section of this adjustable and removable support and guide, also detached. Figs. 6, 7, 8, and 9 represent, respectively, detached views, enlarged, of the independent detachable valves employed in this condensing-pump, as will be described.

Similar letters refer to corresponding parts throughout the several views.

The exterior or outer casing A of this condensing-pump is composed of a single rectangular casting in which two cylinders H H are formed in the opposite ends thereof and in the same plane as represented. The usual water-chambers G to cool these cylinders are provided, as shown in Figs. 1 and 2. The interior of these cylinders are fitted with linings or sleeves I I, which in practice are found to be economical and a certain method of obtaining perfect cylinders necessary to a perfect condensing-pump. A single piston-rod B, with pistons C C on either end thereof and extending from cylinder to cylinder, is fitted so as to be driven back and forth, by means of a crank J and connecting-rod E, the main driving-shaft D passing centrally through a suitable opening in the piston-rod, so that when the greatest degree of power is to be exerted in pumping the connecting-rod E and the crank J will approach and pass the point (the extreme of their stroke) in a straight line centrally with the pistons C C and cylinders H H, as shown.

In order to relieve the pistons C C from the weight of the piston-rod B and to preserve the cylindrical contour of the pistons C C and the cylinders H H, an adjustable support K is provided and fitted centrally to the interior of the outer casing A, upon which support the piston-rod B may rest and slide back and forth thereon and be guided the same as an ordinary slide in a steam-engine. Fig. 4 represents a cross-section of this support K and the manner of its adjustability up and down by means of screw-bolts L and nuts M, the ends of the screw-bolts L resting in recesses formed in the inner side of the casing A. In the central sectional view, Fig. 5, of this support K is formed in its upper surface a recess P to contain lubricant to lubricate the piston-rod B, if required.

In order to prevent the escape of gas from around the driving-shaft D, a chambered box composed of two separate sections is provided—an inner fixed section and outer adjustable section—the inner fixed section R of which is firmly bolted to the exterior A of the pump, the outer section S being maintained in position and rendered adjustable to compress the flexible packing V in the fixed section R, around the driving-shaft by means of the screw-bolts U, in the usual manner. This sectional box is provided with an annular water-channel *m*, formed in the inner fixed section R, and an annular recess W, formed in the outer adjustable section S, the latter to contain oil or other suitable liquid, as will be described.

The annular channel *m* in the fixed section R is adapted to permit a current of water to flow through it to cool the driving-shaft D, the water entering and leaving this annular channel *m* through inlet and exit pipes *x x*, passing through the outer casing A, so that no water may find its way into the interior of the pump, as shown.

In the outer and adjustable section S the annular recess therein, together with the driving-shaft D, forms an annular chamber W, to contain a body of oil which serves as a liquid packing to prevent the escape of any gas that may find its way past the pistons C C into the interior of the pump and past the flexible packing and metal ring *f* from around the driving-shaft.

The metal packing-rings *f f* serve to confine the oil within the annular chamber or recess W, surrounding the driving-shaft D, and operate the same as metal packing-rings in the pistons C C. The flexible packing V, confined in the fixed inner section R, serves the same purpose as flexible packing in an ordinarily-constructed packing-box to be compressed from the exterior. The metal rings *f f* slide upon the shaft D as the flexible packing is being compressed. By this construction and arrangement the interior of this condensing-pump is rendered gas-tight with the least friction to the driving-shaft.

Figs. 6, 7, 8, and 9 represent, respectively, detached views of the valves employed in this condensing-pump.

In Fig. 9 the detachable valves R^2 R^3 are represented as being supported and maintained in position by detachable valve-seats S^2 S^2, fitted to the cylinder-head and confined therein and rendered gas-tight by means of caps N N, bolted to the cylinder-head as shown, the ports O O extending so as to receive and connect with the supply and exhaust pipes *h* h_2, as clearly represented in Figs. 6 and 8.

In sectional views Figs. 2 and 9 the annular ports O O are represented, through which the refrigerant may flow freely into and from the cylinders in pumping.

By this construction and arrangement it will be seen that any one of these valves may be removed for repairs or be replaced by a new one without disturbing the other valve in the same head or stopping the condenser by cutting off the supply of gas to that cylinder.

The gas from either of the supply-pipes may be cut off and the opposite independent cylinder continue to be operated, thus changing from a double to a single acting pump, which is important to maintain a certain degree of temperature for a time or when less refrigeration is required or a less quantity of ice is to be produced or repairs to be made in one of the cylinders.

As a means of reaching the crank J and connecting-rod E when within the condenser, an opening is formed in the upper side of the casing A, which opening is provided with a cover T to render the interior of the pump air-tight, as shown more clearly in Fig. 2. The belt-wheel Y serves, also, as a balance-wheel, as represented.

In order to obtain sufficient space above the floor, upon which the pump may be placed, for the balance-wheel Y, a base X is provided, upon which the pump proper is mounted and firmly secured thereto, as shown in Figs. 1 and 2.

Should an excess of gas collect in the space between the cylinders, it may be removed therefrom through the pipe Z, connecting said space with one of the supply-valves, as shown in Fig. 3. Thus by shutting off the regular supply-pipe by closing a stop cock or valve S therein and opening the check-valve in the pipe Z the gas in the space between the cylinders will be immediately drawn into one of the cylinders, after which the pipe Z may be disconnected and the regular supply-pipe again connected, and thus the gas in the space between the cylinders may be removed whenever required.

If preferred, an eccentric or other mechanical device may be employed to operate the piston-rod B back and forth in pumping instead of the crank J and connecting-rod E, as represented.

I am aware that it has heretofore been proposed to exhaust gas from the rear of the piston through a pipe or passage leading around the piston; but I am not aware that any provision has heretofore been made to stop the flow of gas into the cylinder during the exhausting operation. My invention in this respect therefore involves the application to the inlet-pipe of a stop-cock, whereby the gas-supply is temporarily cut off, and without which it would be impossible to exhaust from the rear of the piston below the normal pressure of gas in the supply-pipe.

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

1. In a horizontal, double acting, condensing pump the combination of two cylinders in axial alignment with each other, reciprocating pistons in said cylinders, a piston-rod connecting said pistons, and a vertically adjustable support to sustain the weight of the piston rod and pistons and to take up wear of the parts.

2. In a horizontal condensing pump the combination of a reciprocating piston rod and piston, and a vertically adjustable bearing for the piston rod to sustain the weight of the same.

3. In a gas-compressor the combination with the cylinder and its piston and with the valved supply and delivery pipes, through which gas is drawn into the cylinder and forced therefrom, of a valved pipe connection between the supply pipe and the cylinder in rear of the piston, and a cock in the supply pipe be-

yond said pipe connection, whereby, by cutting off the supply pipe any gas in rear of the piston may be drawn off.

4. In a gas-compressor the combination with the driving shaft and with the frame or casing, of a shaft bearing having within it an annular water-chamber exterior to the bearing surface, and inlet and outlet passages communicating with said chamber to permit the passage of a current of water therethrough.

5. In a double acting pump the combination of two cylinders in alignment with each other, reciprocating pistons therein, a piston rod connecting said pistons, means for reciprocating the piston rod and pistons, and a stationary rest or support between the cylinders to sustain the weight of the piston rod and pistons, the said rest or support having an extended bearing surface to prevent angular movements of the piston rod.

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