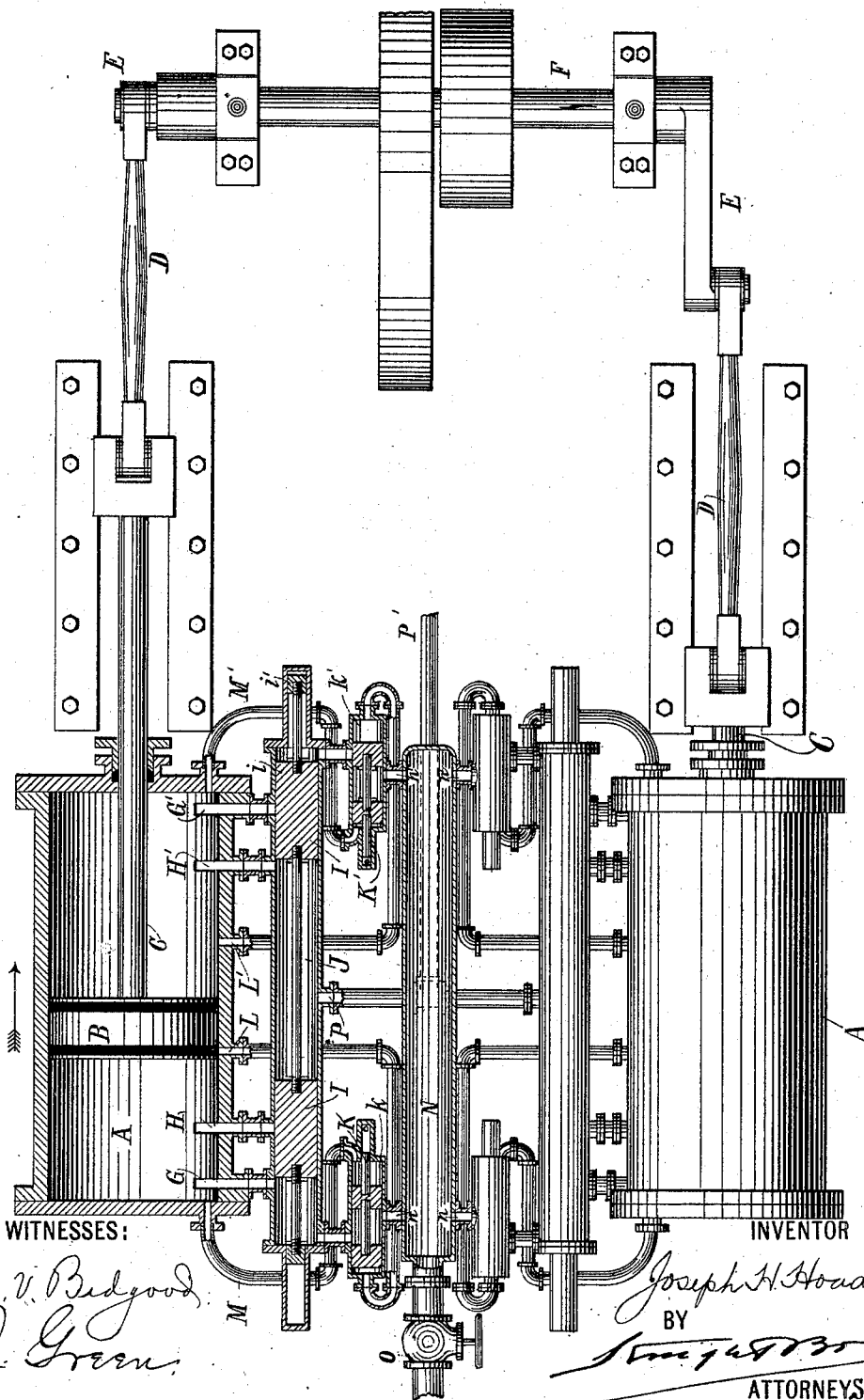


(No Model.)

J. H. HOADLEY.
AIR MOTOR.

No. 586,127.

Patented July 13, 1897.



UNITED STATES PATENT OFFICE.

JOSEPH H. HOADLEY, OF NEW YORK, N. Y.

AIR-MOTOR.

SPECIFICATION forming part of Letters Patent No. 586,127, dated July 13, 1897.

Application filed December 30, 1895. Serial No. 573,819. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH H. HOADLEY, a citizen of the United States, residing at New York, county and State of New York, have invented a new and useful Improvement in Fluid-Pressure Motors, of which the following is a specification.

The accompanying drawing represents a partly sectional plan view of the engine embodying my invention.

This invention relates to fluid-pressure engines in which the valves are operated by the fluid-pressure. In such an engine the compression of the fluid at the end of the stroke by the piston after it has passed the exhaust-port is utilized to throw open the valves, the compressed fluid passing through a passage leading from the end of the cylinder to the valve-chamber and operating therein upon the valve, so as to throw same into position for the reverse motion of the engine. Since, however, in order to obtain a sufficient degree of pressure the exhaust-port must be located some distance from the end of the cylinder, and since when the valve is opened the port is covered by the piston, so that the fluid cannot enter the cylinder, it follows that upon the return stroke the fluid in the cylinder will have been again reduced to atmospheric pressure by the time the port is uncovered by the piston.

My invention relates to means for obviating this difficulty; and it consists in providing double ports, the one set of ports being exhaust-ports, located the proper distance from the ends of the cylinder to give the necessary degree of compression at the end of the stroke, and the other set of ports being admission-ports, located at the ends of the cylinder, so that when the valves are thrown the pressure from the fluid-pressure supply will be admitted immediately to the cylinder to meet the pressure due to compression, thus gaining a smoothness and economy of operation that would not otherwise be obtainable.

My invention consists of a valve operating by fluid-pressure in connection with such ports, so as to close the admission-port when the exhaust-port at that end of the cylinder is opened, and vice versa.

In the accompanying drawing, A are the cylinders, B the pistons, C the piston-rods,

D the connecting-rods, E the cranks, and F the shaft, of the engine embodying my improvement. The cranks are set ninety degrees apart, so as to insure the proper rotation.

G G' are the admission-ports at the ends of the cylinders, and H H' are the exhaust-ports, located a proper distance away from the ends of the cylinders to give the required amount of compression.

I I' is the main valve; J, the main-valve chamber; K K', the cut-off valves in chambers *k k'*, adapted to cut off the supply of fluid-pressure to the main-valve chamber and thence to the cylinder and operated by fluid-pressure admitted to them from the cylinder by the passage of the piston over the port L L' through the cylinder-wall. These cut-off valves are thrown in an opposite direction to open passage from the pressure-chest to the main valve by compression of the fluid at the end of the stroke, the fluid under pressure flowing through passages M M', leading from the ends of the cylinder to the cut-off-valve chambers.

N is the fluid-pressure chest, supplied with fluid under pressure through throttle-valve O from any source of fluid-pressure.

The operation of the engine is as follows: Fluid-pressure being admitted through throttle-valve and the chest will find its way through passage *n* or *n'* to the cut-off-valve chambers. At least one of these cut-off valves will be open, as there is no condition of the engine where they are all four closed. In the position shown in the drawing the fluid under pressure passing through the left-hand cut-off valve into the main-valve chamber and from thence into the cylinder and through port G forces the piston in the direction of the arrow. As the piston passes the port L pressure will be allowed to pass into the end of the cut-off-valve chamber *k*, throwing over cut-off valve K, so as to shut off the fluid from further admission into the main-valve chamber and cylinder. The main valve, however, will remain in its position. When the piston arrives at the exhaust-port H' and closes the same by passing over it, compression will commence at the right-hand end of the cylinder and at the proper point will have reached such an amount that by means of

passage M' it will act to throw cut-off valve K' open, so as to admit the fluid-pressure through passage n' and cut-off valve into the main-valve chamber, where, operating upon the faces i i' of the main valve, which faces differ in area by the required amount, it will throw the main valve into a position the reverse of that shown in the drawing and allow the fluid-pressure to enter through admission-port G' into the cylinder. The piston having arrived at the end of the stroke will be thrown back by this incoming pressure, connection through the crank with the other side of the engine insuring passage over dead-center. As the main valve is thrown over the exhaust-passage H at the other end of the cylinder is opened through passage P to the exhaust-passage P', the admission-port at the same time being entirely closed. The exhaust-passage H' is also closed by the right-hand end of the main valve, so that the piston on its back stroke in uncovering the exhaust-port H' does not therefore let out the pressure. The piston continuing on its back stroke uncovers the cut-off port L', which admits pressure to the cut-off valve K' in such a manner as to close same and prevent further admission of fluid-pressure to the cylinder on that end. The ends of the cut-off valves K K' exposed to the closing-pressure coming through cut-off passages L L' are sufficiently larger than the other ends that are exposed to the opening - pressure coming through passages M to insure the closing of the cut-offs. A similar set of operations go on in the other half of the engine, being timed a quarter of a revolution behind.

By means of the independent admission and exhaust ports I may obtain any degree of com-

pression desired and yet have the fluid-pressure admitted to the cylinder as soon as the piston reaches the end of the stroke. The valves are all of the balanced type, and it will be noticed that they cut off the fluid not as it enters the valve-chambers, but as it leaves. This is a very necessary feature in balanced valves, as otherwise the incoming fluid would press so hard against the valve cutting it off as to create an undue amount of friction.

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

1. The combination of the piston B, cylinder A with admission-ports G, G' and exhaust-ports H, H' with a main valve controlling said ports, and operated by fluid-pressure from the source of fluid-pressure supply, and cut-off valves operated by fluid compressed at the end of the stroke by the piston to throw the said cut-off valves open, and by fluid-pressure from the cylinder through cut-off ports, to throw the said cut-off valves closed.

2. The combination in a fluid-pressure engine of the cylinder A, and piston B, fluid-actuated cut-off valves having one face exposed to cut-off ports leading from the cylinder, and the other face exposed to opening-ports leading from the end of the cylinder and a main valve also fluid-actuated and controlling admission, and exhaust-ports independent of each other and of the said opening-ports.

JOSEPH H. HOADLEY.

Witnesses:

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