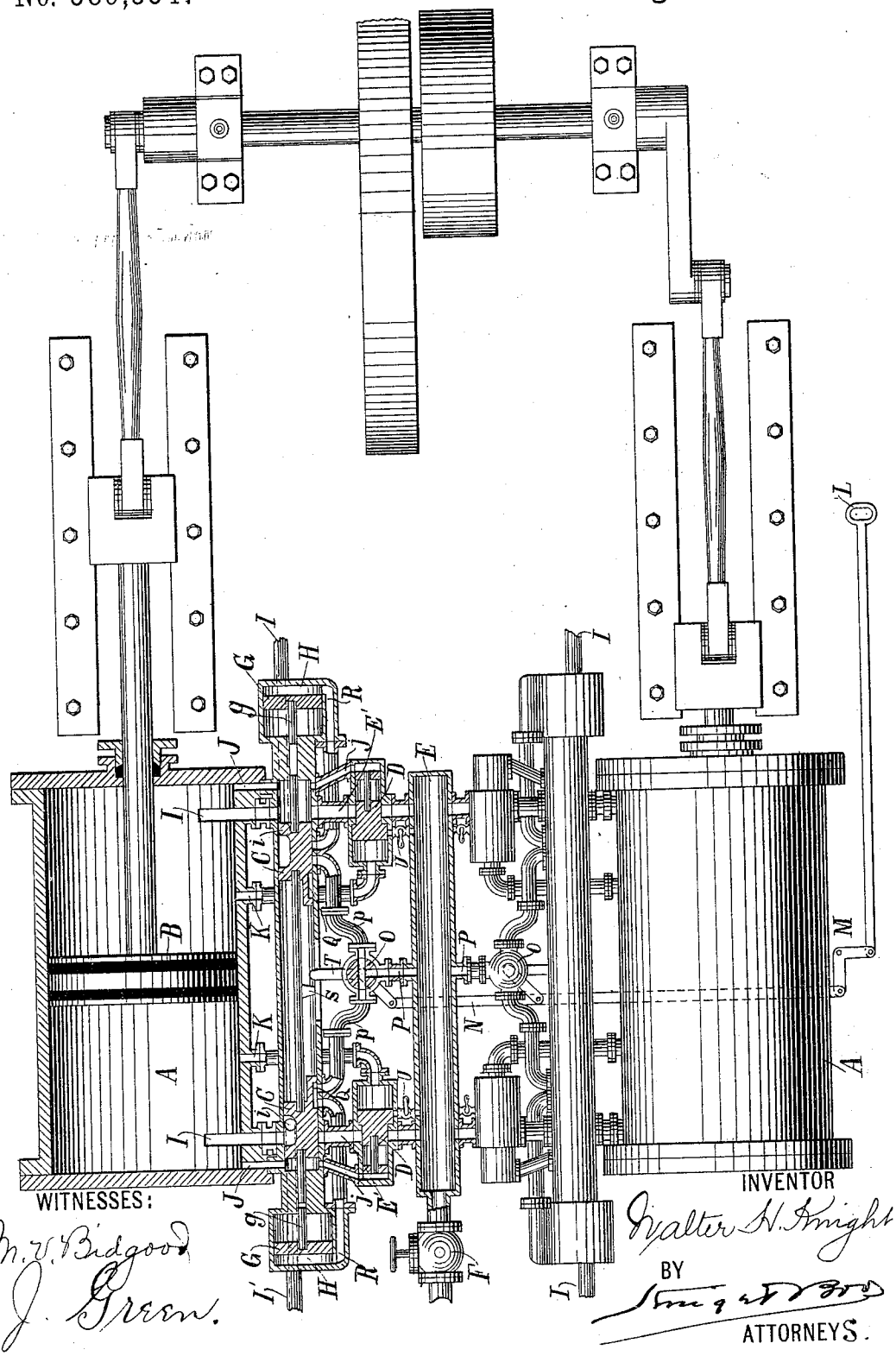
(No Model.)

W. H. KNIGHT.

FLUID PRESSURE ENGINE.

No. 589,354. Patented Aug. 31, 1897.



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UNITED STATES PATENT OFFICE.

WALTER H. KNIGHT, OF NEW BRIGHTON, NEW YORK.

FLUID-PRESSURE ENGINE.

SPECIFICATION forming part of Letters Patent No. 589,354, dated August 31, 1897.

Application filed December 30, 1895. Serial No. 573,825. (No model.)

To all whom it may concern:

Be it known that I, WALTER H. KNIGHT, a citizen of the United States, residing at New Brighton, Richmond county, New York, have invented a new and useful Improvement in Fluid-Pressure Engines, of which the following is a specification.

My invention relates to fluid-pressure engines in which the valves are operated by the fluid; and it consists of various combinations of valves and reversing mechanism. In such an engine it is simply necessary to throw the main valve controlling the admission and exhaust into a reversed position in order to reverse the engine, and in the engine to which my invention relates this reversing of the main valve is accomplished by means of the compressed fluid, the fluid being directed to the proper end of the valve to cause a reversal of the same by suitable ports in the valve itself. As these ports are so located that the fluid-pressure for reversing will always be guided to the proper end of the valve that will throw the valve in the opposite direction it is obvious that when so thrown the fluid-pressure, if allowed to continue to operate through such ports, would cause a re-reversal of the valve, and thus the valve might hammer back and forth.

This invention consists of means for preventing such reciprocation of the valve, as hereinafter described.

The accompanying drawing represents in partly sectional plan a fluid-pressure engine embodying my invention.

A are cylinders, and B one of the pistons; C, the main valve, controlling the admission and exhaust to and from the cylinders.

D are cut-off valves.

E is the fluid-pressure chest, to which fluid-pressure is admitted by throttle-valve F.

G are pistons moving in cylinders H and adapted to reverse the main valve.

I are the main ports, through which admission and exhaust to and from the cylinder takes place, E′ E′ being the live-air passages and I′ *i* the exhaust-passages.

J are auxiliary ports through which the fluid-pressure operates when compression takes place at the end of the cylinder to throw the main valve into its reversed position for the back stroke.

K are cut-off ports which when the piston passes over them will allow fluid-pressure to act on the cut-off valves D and throw them to their position. The cut-off valves are again opened when the piston arrives at the end of the stroke by the fluid under compression entering through passage *j*.

It will be seen that the passage J forms a communication from the end of the cylinder to the end of the valve-chamber, so that whenever there is compression at the end of the cylinder the pressure will be communicated to that end of the valve. On the other hand, the main port or passage I is alternately in communication with the fluid-pressure supply and the exhaust on its valve end, and is closed off and held closed off by the piston B on its cylinder end as long as compression is taking place, or rather until the piston B on its back stroke has again uncovered it. By these means I obtain an initial entrance of fluid under pressure from the fluid-pressure supply through the passage J, which fluid-pressure thus meets with and augments the pressure due to compression, thus preventing the fall of pressure that would occur if passage I were alone depended upon for admitting fluid-pressure to the cylinder.

L is a reversing-handle connected through cranks M and connecting-rods N to operate reversing-cocks O. When the reversing-cocks are thrown by the reversing-handle into the position shown in the drawing, the fluid-pressure is admitted through passage P to passage *p*, which leads to ports Q in the main valve, which ports serve to direct the fluid-pressure into either one or the other of passages R, but not to both of them. The passage R, to which the pressure will be thus admitted, will be the one toward whose end the main valve has been thrown. The ports R lead to the cylinders H, in which the pistons G fit tightly. Pistons G have a piston-rod *g*, adapted to come in contact with a piston-rod on the main valve. When the pressure is admitted behind the piston G, as above described, through the passage R, the said piston moves forward toward the main valve

and pushes the said main valve into the reversed position, so as to reverse the engine. The area of these pistons G should be greater than the end of the valve C, in order that the said pistons G will always be able to control the main valve irrespective of any pressures that may be operating upon the latter.

In the ordinary operation of the engine the piston receives the compressed air first through port J from passage E′ and then through port I as soon as it is opened by the passage of the piston. The air continues to enter the cylinder until the first port K is uncovered, when the air shifts the cut-off valve, and the remainder of the stroke is made under the expansion of the air. At the end of the forward stroke of the piston the main valve and cut-off valve are shifted by the compression in the end of the cylinder and the piston is moved back in the same manner. After each cut-off valve is closed it remains closed until again opened by the compression in its end of the cylinder for admitting air for another stroke of the piston.

A projection S from the main valve striking against a projection T on the reversing-cocks or mechanism connecting therewith causes such cocks to be automatically closed when the main valve is thus reversed, in which closed position the said cocks O remain until again opened by the operator for another reversal. The projection T is only thrown into the path of the projection S when the reverse-cocks are set in a position for reversing, so that the normal reciprocation of the main valve will not affect the reversing mechanism. As there are times when it is desired to have the piston acted on with full pressure to the end of the stroke, I provide cocks U, which when open allow fluid-pressure to enter in the chamber of valve D on the opposite side from that exposed to pressure coming through passage K, so as to hold the cut-off valves into their open position when they are shifted by the compression at the end of the cylinder. The cut-off valves will be held open when cocks U are open, because the pressure will be the same on both sides of the valves.

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

1. In a fluid-pressure engine in which the valves are operated by the fluid-pressure, the combination with said valves, of a reversing device for reversing the valves so as to cause a reversal of the engine, and a device actuated by the valves for automatically throwing such mechanism into an inoperative position after it has performed its function.

2. The combination of the cylinder, and main valve controlling admission and exhaust to and from the same, a reversing device for reversing the main valve so as to reverse the engine, and hand-lever for controlling such reversing device, and a device attached to the main valve and adapted to engage with the reversing device to automatically throw the same into an inoperative position.

3. The combination in a fluid-pressure engine of the cylinder, the ports thereto controlled by the main valve, the said valve operated normally by the fluid-pressure so as to give the regular reciprocations and means for throwing the said valve into a reversed position by means of fluid-pressure said means controlled by a manual lever and thrown out of action when the valve is so reversed.

4. In a fluid-pressure engine, the combination with the cylinder and piston, a main valve and two (2) passages leading from the cylinder to the main-valve chamber, the passage nearest the end of the cylinder for operating the valve by the compression of the fluid by the piston at the end of the stroke, and the other passage located a sufficient distance from the end of the cylinder to give the necessary compression when cut off by the piston and adapted to be covered by the piston when compression is taking place, the said passage being so controlled by the main valve as to be alternately in communication with the fluid-pressure supply and with the exhaust.

5. The combination in a fluid-pressure engine of a cylinder and piston, a main valve operated by the fluid-pressure, cut-off valves operated by the fluid-pressure from the cylinder to cut off the supply of fluid-pressure to the cylinder operating upon an enlarged area of said valve, and by fluid-pressure due to compression at the end of the cylinder, operating on a smaller area of said valve to set the cut-off valves open.

6. The combination in a fluid-pressure engine, of the cylinder and piston with a fluid-actuated main valve and cut-off valves also fluid-actuated, and means for holding said cut-off valves in their open position.

7. The combination in a fluid-pressure engine of pistons and cylinders with fluid-actuated valves, passages leading from the ends of the cylinders to the valve-chambers to enable said valves to be operated by the compression occurring at the end of the stroke with passages leading from the said valve-chambers to the source of fluid-pressure, so that when the valves are thrown, the fluid under pressure will enter the cylinders through the same passages that admitted compression-pressure to the valve-chamber.

8. The combination in a fluid-pressure engine of pistons and cylinders with valves operated by the fluid-pressure generated at the end of the stroke after the piston passes and closes the exhaust-port, one of said valves being a main valve controlling the main admission and exhaust ports, and the other valve being a cut-off valve.

9. The combination in a fluid-pressure engine of main valves and cut-off valves both

actuated by the fluid compressed at the end of the stroke.

10. The combination in a fluid-pressure engine of pistons and cylinders, the latter having double ports at each end, the ports nearest the ends serving alternately to admit fluid-pressure due to compression from the cylinders to the valves, and to admit fluid-pressure from the source to the cylinders, and the ports farther from the ends serving alternately as exhaust and admission ports.

WALTER H. KNIGHT.

Witnesses:
M. V. BIDGOOD,
H. E. KNIGHT.