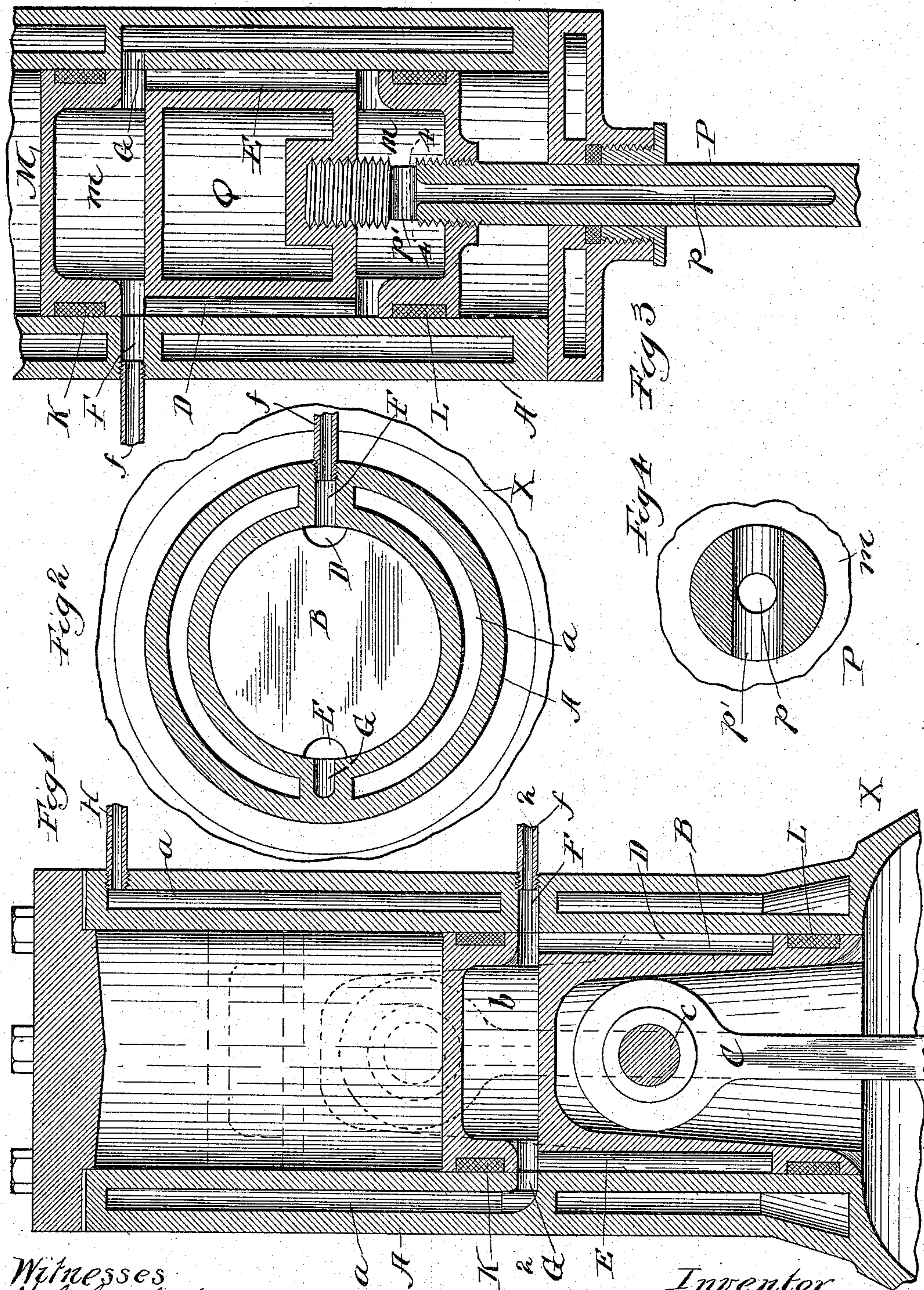


(No Model.)

F. E. CULVER.
GAS ENGINE.

No. 573,209.

Patented Dec. 15, 1896.



Witnesses
W. C. Corlies
C. H. Crawford

Inventor
F. E. Culver
By Louis K. Gillson
Attorney.

UNITED STATES PATENT OFFICE.

FITZ E. CULVER, OF CHICAGO, ILLINOIS.

GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 573,209, dated December 15, 1896.

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To all whom it may concern:

Be it known that I, FITZ E. CULVER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Gas-Engines; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

One of the difficulties encountered in gas-engines is the heating of the cylinder and piston and the consequent burning of the lubricant which becomes incrustated upon the walls of the combustion-chamber and not only increases the friction, but is apt to become ignited and cause premature explosions. This is measurably guarded against by the use of a water-jacket for the cylinder, but this in turn gives rise to unequal expansion of the parts, the cylinder being kept comparatively cool while the piston becomes hot, and it fails to prevent the combustion of the oil which accumulates upon the face of the piston.

The object of this invention is to provide improved means for cooling the piston of such an engine by the use of water; and to this end it consists in forming the piston-head with a water-chamber through which water is circulated by the use of cylinder and piston ports, these ports being maintained in constant communication by the use of longitudinal channels in the peripheral face of the piston.

As the invention has no relation whatever to the gas and air supply or to the exhaust of the engine I have not shown in the drawings ports or valves for these purposes, the invention being applicable to any form of gas-engine in connection with which a piston is used which may be chambered.

In the drawings, Figure 1 is a longitudinal central section of the cylinder and piston of a single-acting gas-engine, the piston being at the end of its outstroke, dotted lines indicating its position at the end of its instroke. Fig. 2 is a transverse section on the line 2 2 of Fig. 1. Fig. 3 is a central longitudinal section of the cylinder and piston of a double-

acting gas-engine. Fig. 4 is a detail section on the line 4 4 of Fig. 3.

I show at A the cylinder of a vertical gas-engine, a portion of the base being shown at X. Within the cylinder reciprocates a trunk-piston B, to which is attached a pitman C by means of a wrist-pin c. Within the head of the piston is formed a chamber b. In the peripheral walls of the piston are formed longitudinal grooves or channels D E, which may be oppositely disposed, as shown, or otherwise arranged, as may be desired or may be found necessary in view of the arrangement of gas and other ports in the particular engine to which the invention is applied and which may be of any desired width. These grooves or channels D E are of as great or greater length than the stroke of the piston and at one end each communicates with the chamber b.

Induction and eduction ports F G are formed in the cylinder-walls and lead to the channels D E, respectively. These ports are so located that the channels are in communication with them throughout the entire stroke of the piston. A water-pipe f leads to the port F, and the port G discharges as may be desired, as shown, into the ordinary water-chamber a in the walls of the cylinder. Of course the port F may, if desired, be served from the water-chamber a, though I prefer to introduce the water first into the piston.

At H is shown an eduction-pipe for the water-chamber a.

Packing-rings K L are placed around the piston B beyond the ends of the channels D E to prevent leakage of water.

It will be seen that the construction described provides for a continuous circulation of water through the piston-chamber, the service and discharge ports being at all times open through the channels D E to this chamber.

In adapting the invention to a double-acting engine it is necessary to use a trunk-piston M, so as to provide for the channels D E between the packing-rings K L. Both ends of the piston are chambered, as indicated at m m, and the channels D E communicate with both chambers. The piston-rod P is screwed into the piston-head, and in order to provide ample strength, while leaving comparatively little metal between the chamber m and the

exploding-chamber of the cylinder, the piston-rod is prolonged and enters the opposite wall of the chamber *m*.

In order to keep the piston-rod *P* cool, I form it with a longitudinal duct *p*, opening to the chamber *m* through the transverse aperture *p'*.

In order to avoid excessive weight of the piston, I core the center of it, as shown at *Q*, and for the same reason do not open the chamber thus formed to the water-chambers, though it is obvious that the entire interior of the piston might be a single chamber.

I claim as my invention—

1. In a gas-engine, or the like, the combination with a cylinder, of a trunk-piston having a chambered head and longitudinal grooves in its peripheral surfaces, such grooves being of as great length as the stroke of the piston and having both terminals intermediate of the ends of the piston and being open to the chamber in its head, and induction and discharge ports in the cylinder-walls, each registering with one of the grooves throughout the entire stroke of the piston.

2. In a gas-engine, or the like, the combination with a cylinder, of a piston having a chamber within its head, and induction and education ports in its walls communicating with the chamber, and cylinder-ports registering with the said piston-ports, whereby fluid may be circulated through the piston.

3. In a gas-engine, or the like, the combina-

tion with a cylinder, of a trunk-piston, packing-rings encircling the piston, a chamber in the head of the piston, longitudinal grooves in the peripheral surface of the piston wholly between the packing-rings, and of a length as great as the stroke of the piston, ports leading from such grooves to the piston-chamber, and cylinder-ports registering continuously with such grooves.

4. In a double-acting gas-engine, or the like, the combination with a cylinder, of a chambered piston, a piston-rod apertured longitudinally from its inner end, its aperture being open to the chamber of the piston, ports in the walls of the cylinder and opening to its chamber, and ports in the cylinder registering with such piston-ports.

5. In a gas-engine or the like the combination with a cylinder, of a trunk-piston having a chambered head and longitudinal grooves in its peripheral surfaces, such grooves having both of their terminals intermediate of the ends of the piston and being open to the chamber in its head, and induction and discharge ports in the cylinder-walls, each registering with one of the grooves.

In testimony whereof I affix my signature in presence of two witnesses.

FITZ E. CULVER.

Witnesses:

LOUIS K. GILLSON,
ISABEL A. HELMICH.