(No Model.)

F. E. CULVER.

GAS ENGINE.

No. 601,012. Patented Mar. 22, 1898.

Fig 1

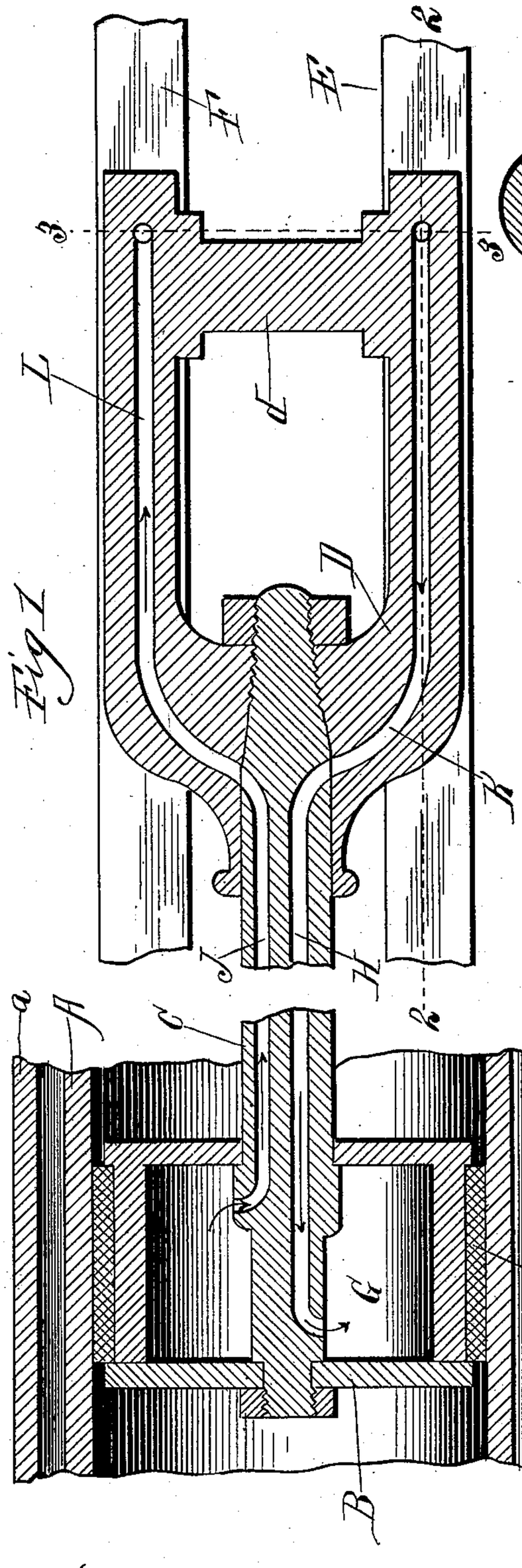

Fig 2

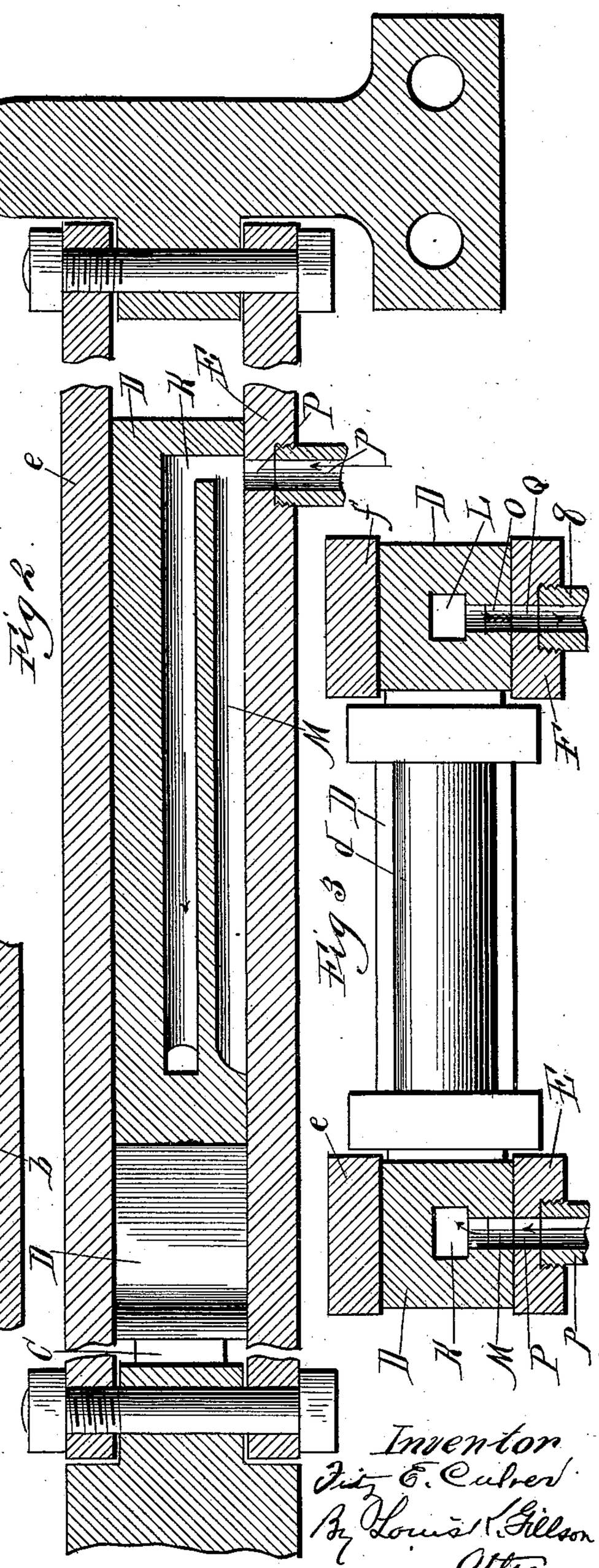

Fig 3

Witnesses
Hester Baird.
C. H. Crawford

Inventor
Fritz E. Culver
By Louis L. Gillson
Atty.

UNITED STATES PATENT OFFICE

FITZ E. CULVER, OF CHICAGO, ILLINOIS.

GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 601,012, dated March 22, 1898.

Application filed December 14, 1896. Renewed December 27, 1897. Serial No. 663,767. (No model.) Patented in England December 16, 1896, No. 28,842, and in France March 22, 1897, No. 262,204.

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.

This invention was patented to me in Letters Patent of Great Britain No. 28,842, dated December 16, 1896, and Letters Patent of France No. 262,204, issued March 22, 1897.

The invention relates to means for cooling the piston of a gas-engine by circulating through it a fluid, the object being to provide means of communication between a chamber within the piston and a source of supply and with a discharge-pipe.

The invention consists in forming the piston-rod with induction and eduction ducts leading to and from the chamber within the piston and communicating with service and discharge ports in a fixed part of the engine by means of grooves formed in sliding surfaces moving over such fixed part, such grooves being prolonged in the direction of movement of the sliding part. As shown in the drawings, the communication between the ducts in the piston-rod and the service and discharge ports in the fixed portions of the engine is through a cross-head, but may be through any moving part having a sliding contact with the fixed part, whether such moving part has a reciprocating movement, as in the illustrations, or a rotary movement.

In the accompanying drawings, Figure 1 is a detail central plan section of an engine-cylinder, piston, connecting-rod, and cross-head. Fig. 2 is a sectional view on the line 2 2 of Fig. 1, and Fig. 3 is a sectional view on the line 3 3 of Fig. 1, in both of the last two figures parts being restored which do not appear in Fig. 1.

At A is shown a section of the typical gas-engine cylinder, having a water-jacket *a*. The piston B is of sufficient length only to provide within it an ample chamber G and to carry upon its periphery a suitable packing-ring, as *b*. The piston-rod C is connected, in the instance illustrated, with a cross-head D, sliding between lower and upper guide-bars E *e* and F *f* and being provided with a wrist-pin *d*.

A pair of ducts H J extend longitudinally through the piston-rod, opening at the one end laterally to the chamber G within the piston B and at the other to ducts K L within the cross-head D and leading the one to one of the arms of the cross-head and the other to the other and terminating in grooves M O, respectively formed in the lower sliding faces of the cross-head and being in line with and of as great length as the movement of the cross-head. Ducts P Q open through the guide-bars E F, respectively, to communicate with the grooves M O, and are so located that they are at the extreme end of these grooves at the end of the piston stroke. Pipes *p q* lead to and from the ports P Q, respectively.

A fluid led to the engine through the pipe *p* under suitable pressure will enter the duct K through the groove M and will pass into the chamber G of the piston and be discharged therefrom through the ducts J L, the groove O, and the pipe *q*, thereby cooling the piston and preventing its enlargement by expansion and the consequent increased friction upon the cylinder-walls, and preventing also the heating of the face of the piston and the consequent ignition of any residuum from the burned gases which may be deposited thereupon. Usually the fluid employed for this cooling effect will be water, though, if desired, other liquid or air or other vapor may be employed.

In an engine in which a cross-head is employed I deem the arrangement of the fluid joint between the fixed and moving parts, which I have shown and described, to be preferable to any other, though it is obvious that, if desired, the induction and discharge ducts may be upon the same side of the cross-head and the communication with the fixed part of the engine may be through the upper instead of the lower guide-bars. Indeed a variety of changes may be made in the arrangement of these ducts and in their adaptation to other

parts than the cross-head and guide-bars, but such changes would be mere adaptations of the invention as now disclosed, and I desire to be protected in their use.

I claim as my invention—

1. In an engine the combination with a chambered piston and with a piston-rod, having ducts leading to and from the piston-chamber, and opening through sliding faces which are grooved from the mouths of such ducts in the direction of movement, of fixed parts over which such sliding faces move, and having ports so disposed as to be at all times in register with the grooves of such faces.

2. The combination with a reciprocating chambered piston, of a piston-rod having longitudinal ducts opening to the chamber of the piston, a cross-head having ducts connecting with the ducts of the piston-rod and opening through sliding faces of the cross-head, such faces being grooved from the mouths of such ducts in the direction of movement, and guide-bars coöperating with the cross-head and having ports opening to the grooves therein.

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

FITZ E. CULVER.

Witnesses:

LOUIS K. GILLSON,

WILLIAM F. BATES.