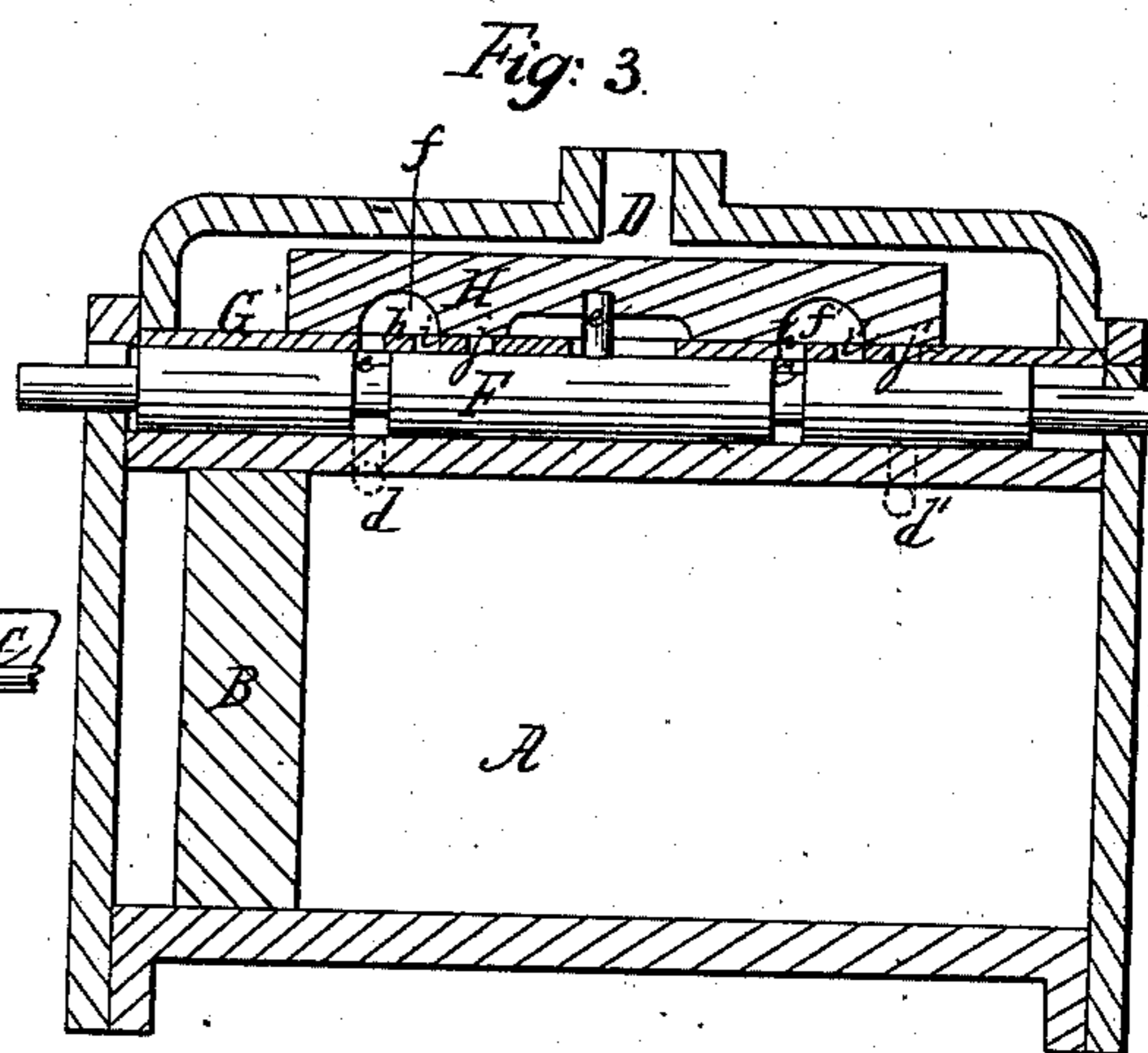
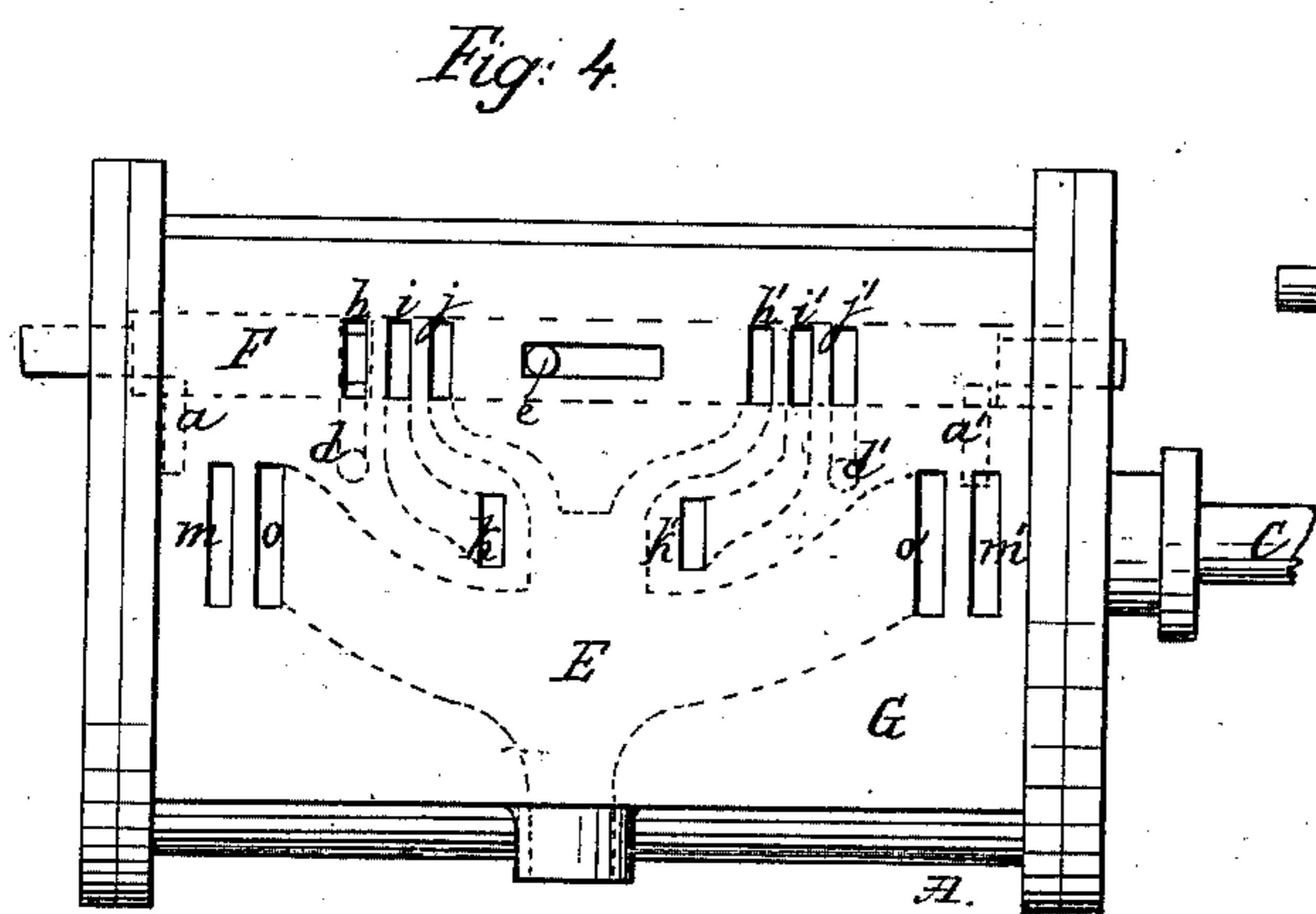
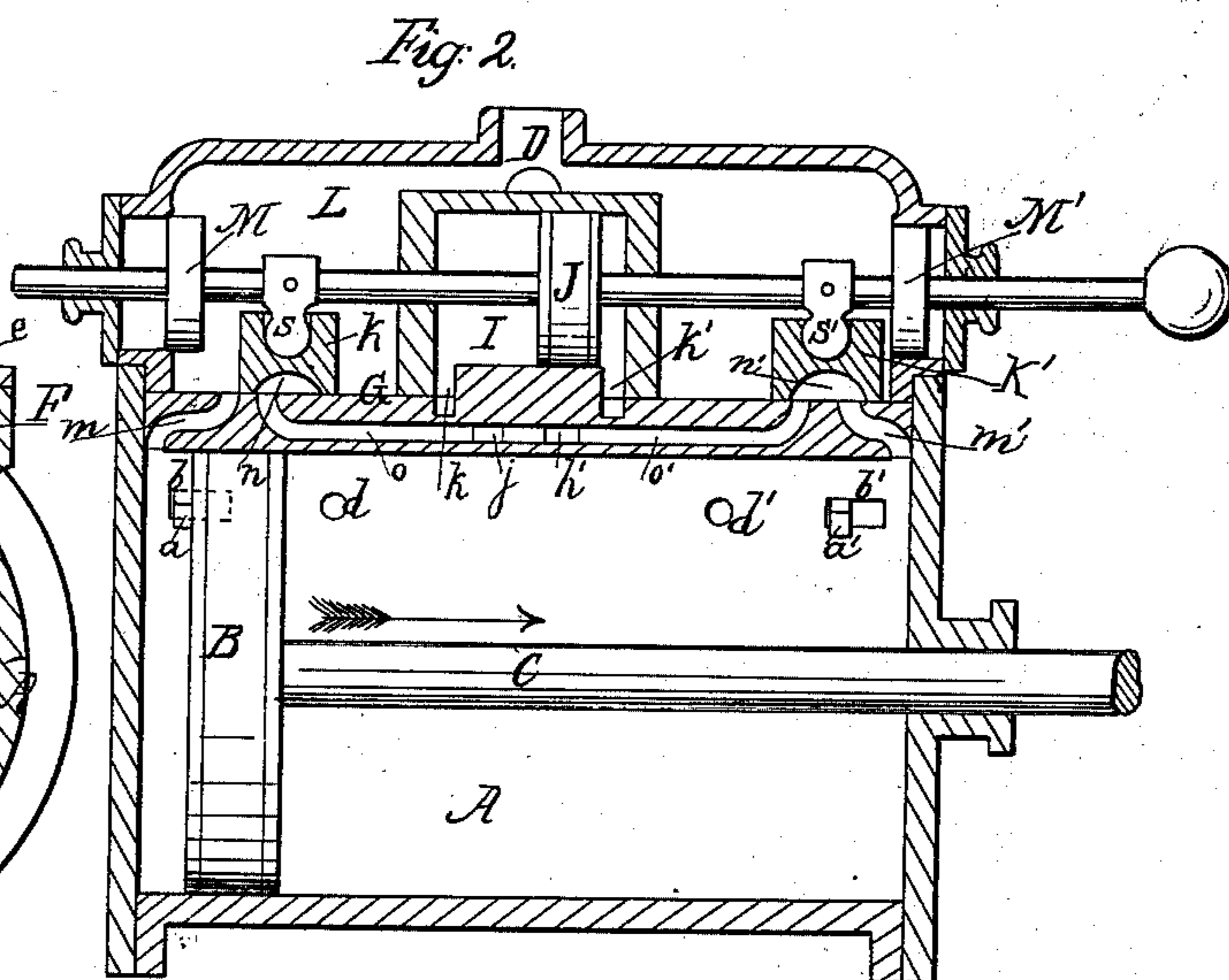
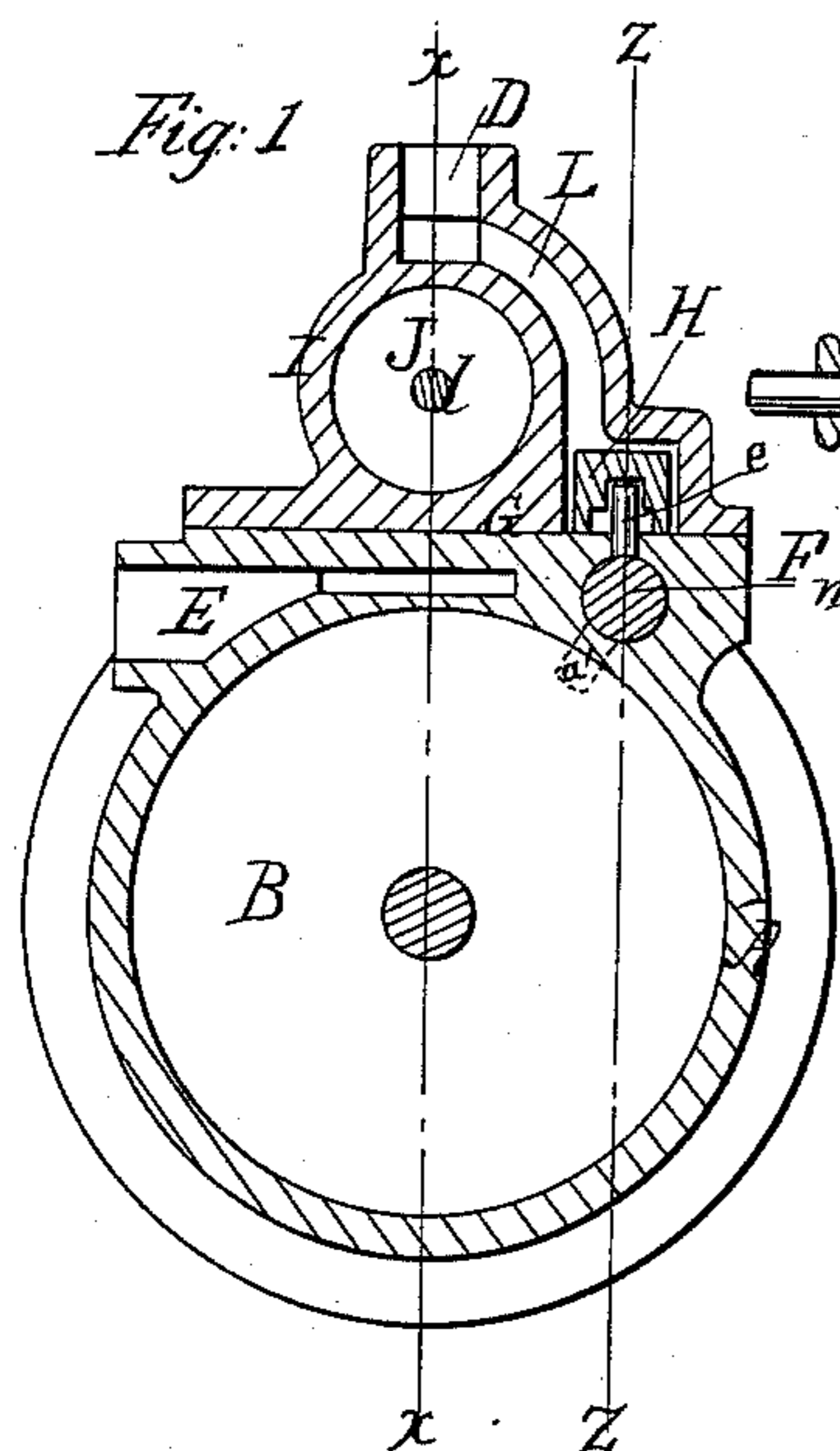


G. W. & E. Hopkins,
Steam Slide Valve.
N^o 68,745. Patented Sep. 10, 1867.



Witnesses,
L. Holmes
GW Reed

Inventors:
George W Hopkins
Elisha Hopkins

United States Patent Office

GEORGE W. HOPKINS AND ELISHA HOPKINS, OF BROOKLYN, NEW YORK.

Letters Patent No. 68,745, dated September 10, 1867.

IMPROVEMENT IN VALVES FOR STEAM ENGINES.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that we, GEORGE W. HOPKINS and ELISHA HOPKINS, both of Brooklyn, in the county of Kings, and State of New York, have invented a new and useful Improvement on Automatic Valves for Steam and other Engines or Pumps, of which the following is a full, clear, and exact description, reference being had to the accompanying drawing, forming part of this specification, and in which—

Figure 1 represents a central transverse section through an engine-cylinder with its driving-piston, and our improved valve applied thereto.

Figure 2, a central longitudinal section of the same, taken as indicated by the line $x x$ in fig. 1.

Figure 3, a longitudinal section taken as denoted by the line $z z$ in fig. 1; and

Figure 4 a plan, with the outer valve-case and valve or valves removed.

Similar letters of reference indicate corresponding parts.

Our improvement relates to that description of valves on which Letters Patent of the United States for an improvement were issued to us on the 28th day of August, 1866, and in which the exhaust steam from the engine is made to throw the valve controlling the action of the piston; but in this our present improvement we dispense with sliding-rings operated by the valve for controlling the ports or passages which admit the spent steam from the engine-cylinder to act upon the valve, and differ from such previous arrangement in other important respects, our invention consisting in a direct action of the engine-piston on a shifter operating in connection with a balance-valve and suitable ports or passages for alternating the admission of the spent steam from the engine-cylinder to opposite sides of a supplementary piston that serves to throw loose independent slides, which govern the main ports or passages of the engine-cylinder.

Referring to the accompanying drawing, A represents an engine-cylinder, B its piston, and C the rod to the latter. D is the main steam inlet, and E the main exhaust. F is the shifter, preferably made of cylindrical form, and arranged to reciprocate, when struck, in a passage formed in the engine-cylinder parallel to its axis. This shifter is provided at or near either of its ends with arms or pins $a a'$, arranged to project through slots $b b'$, into the engine-cylinder, and is further provided with annular passages $c c'$, which, in the intermittent reciprocating action of the shifter, alternately communicate with apertures $d d'$ that open into the engine-cylinder. G is the valve-seat or plate, on which, at one side of the axial line of the piston and over the shifter, is a balanced or partly balanced, by pressure of steam on its upper and under faces, slide-valve H, in gear with the shifter by a pin, e , and having cavities $f f'$ which control passages $h i j$ and $h' i' j'$. The passages h and j communicate with the apertures $d d'$ that open into the engine-cylinder, the passages j and h' with the main exhaust E, and the passages $i i'$ with the ports $k k'$ that open at opposite ends into a cylinder, I, in which is arranged a reciprocating piston, J, hung on a valve-rod, l , that is in loose or independent gear, by tappets or pins $s s'$ with D; valves K K', which control steam inlets $m m'$, connecting the engine-cylinder with the steam-chest I; also by their cavities $n n'$ controlling outlet passages $o o'$ to the main exhaust E. Cushioning-disks, working in suitable recesses, M M', may be hung on the rod l , to break shock in throw of the piston J, as in other abrupt valve actions.

The operation is as follows: Supposing the engine to have been started by suitable adjustment of the rod l , and steam to have urged the piston B to the position shown for it in figs. 2 and 3, causing the pin a , as the piston is about completing such stroke, to be struck so as to move the shifter F and valve H to the positions represented for them in fig. 3. This causes the spent steam to escape by the aperture d , round the annular passage c , through the passage h , into the cavity f ; and from thence through the opening i to the port k of the cylinder I, on one side of the piston J, at the same time opening communication on the opposite side of the piston J with the exhaust E, by the ports and passages $k' i' f' h'$. Such being the position of the parts, the piston J is thrown by the force of the spent steam to the situation it occupies in fig. 2, shifting the valves K K' so as to admit the live steam through the port m to the opposite side of the engine-piston, and at the same time open the cylinder on the reverse side, by the port m' cavity n' , and passage o' to the main exhaust, for escape of the remaining portion or bulk of the spent steam, which gives to the engine-piston a reverse action, at or towards the completion of which the motion is again changed by the piston B, striking the pin a , and operating

the shifter F and valve H to reverse the communication of the ports or passages which connect the cylinder I with the engine-cylinder and main exhaust, thus shifting the valves K K'.

In this way is a portion of the spent steam from the engine-cylinder, by a direct action of the piston without outside connections, made to control or reverse the operation of loose or independent main valves, which, accordingly, are free to adjust themselves to a close working contact with their seats. This arrangement will be found very efficient in the working of steam-pumps, but is also applicable to other purposes.

What is here claimed and desired to be secured by Letters Patent, is—

1. The combination, with a shifter F, operated as described, of a valve, H, in gear with the shifter for controlling the throw of the main valve or valves, as herein set forth.

2. The shifter F, driven as specified, valve H, operated thereby, piston J, or its equivalent, and independent main valves K K', with their several ports or passages, all for operation together essentially as described.

GEORGE W. HOPKINS,
ELISHA HOPKINS.

Witnesses:

J. W. COOMBS,

G. W. REED.