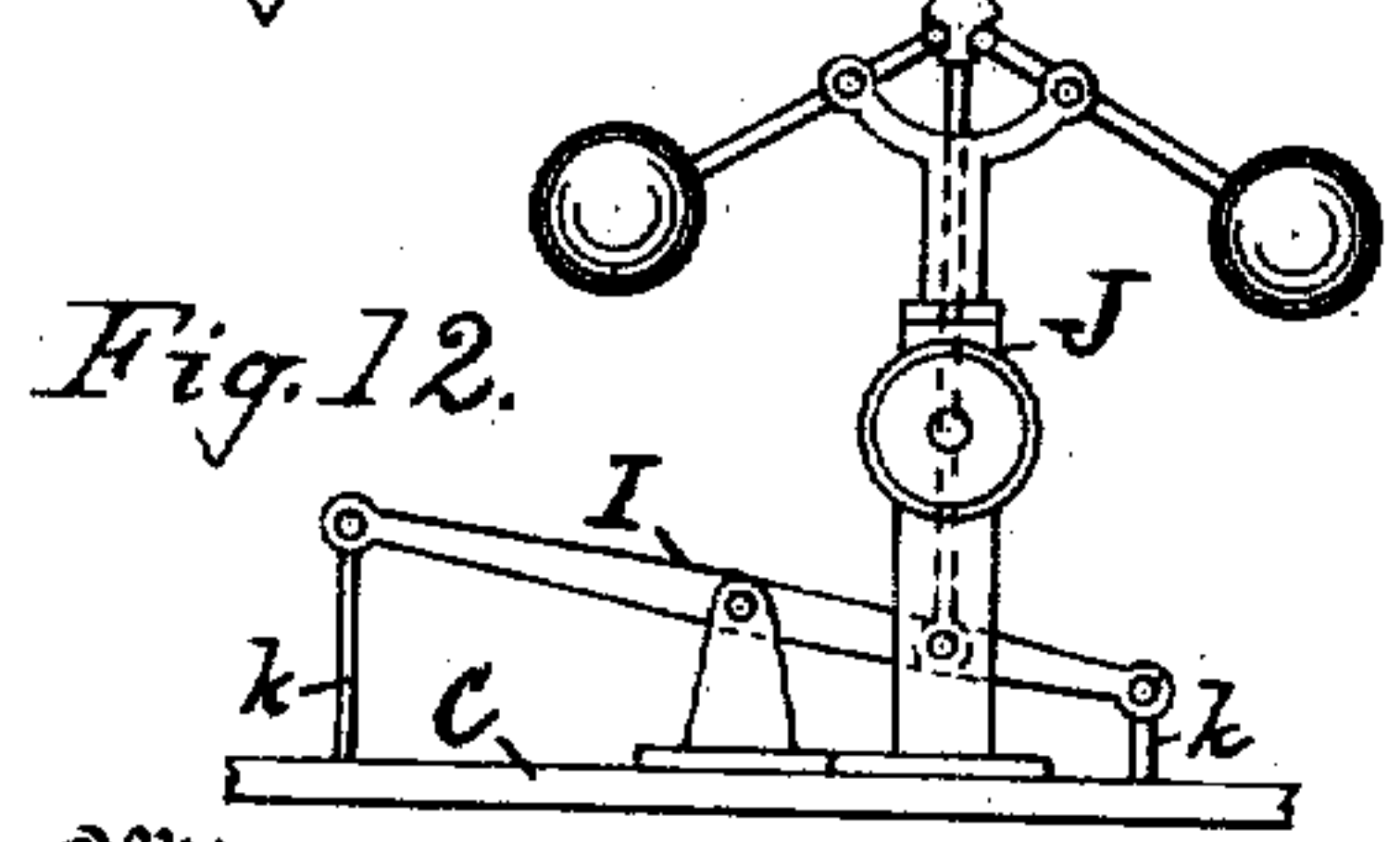
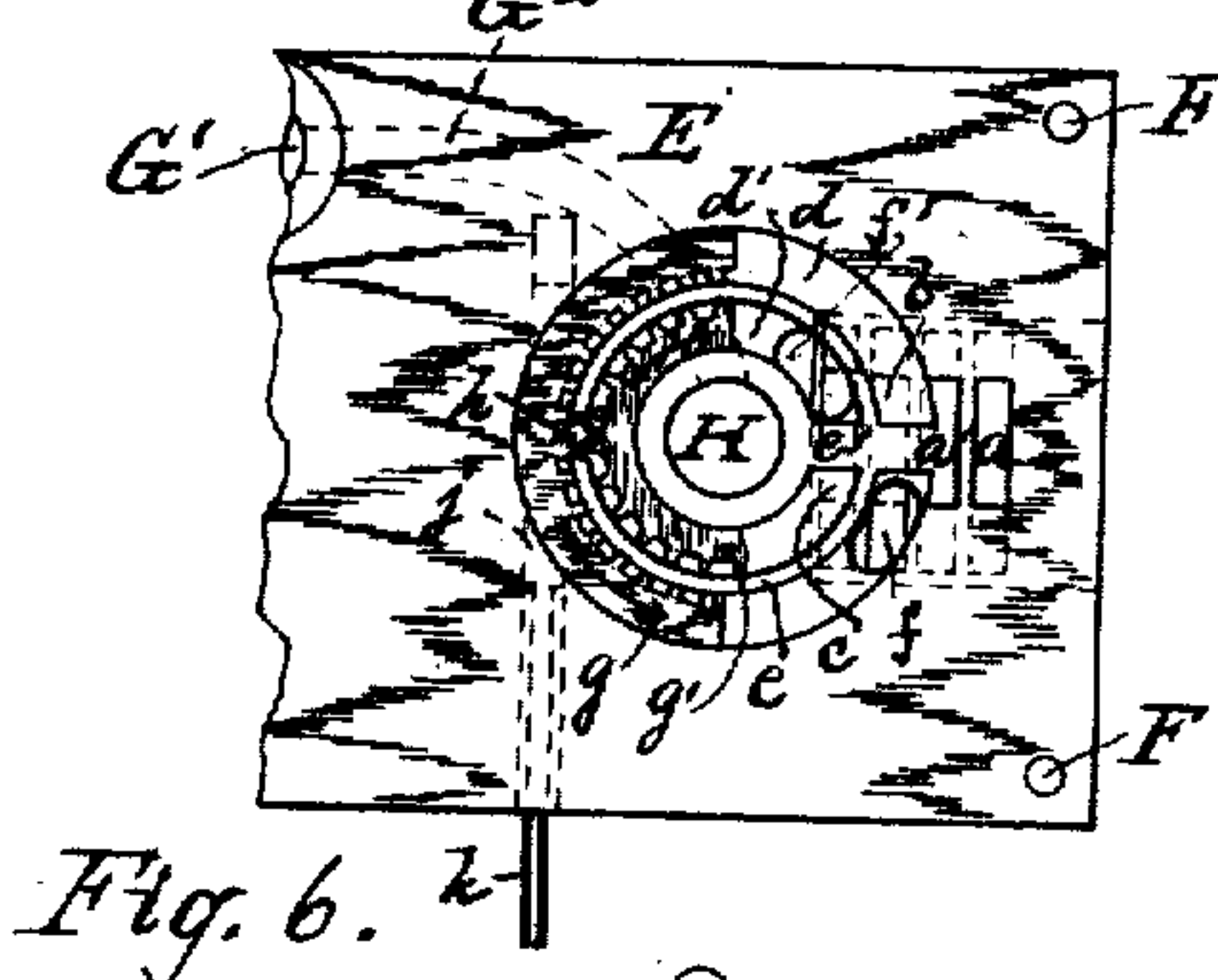
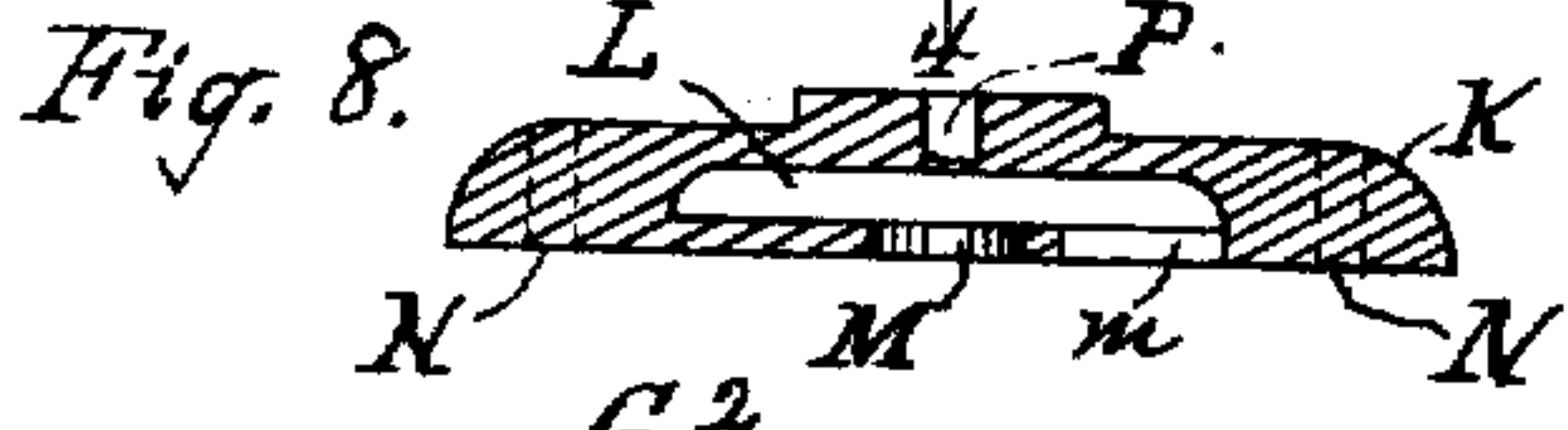
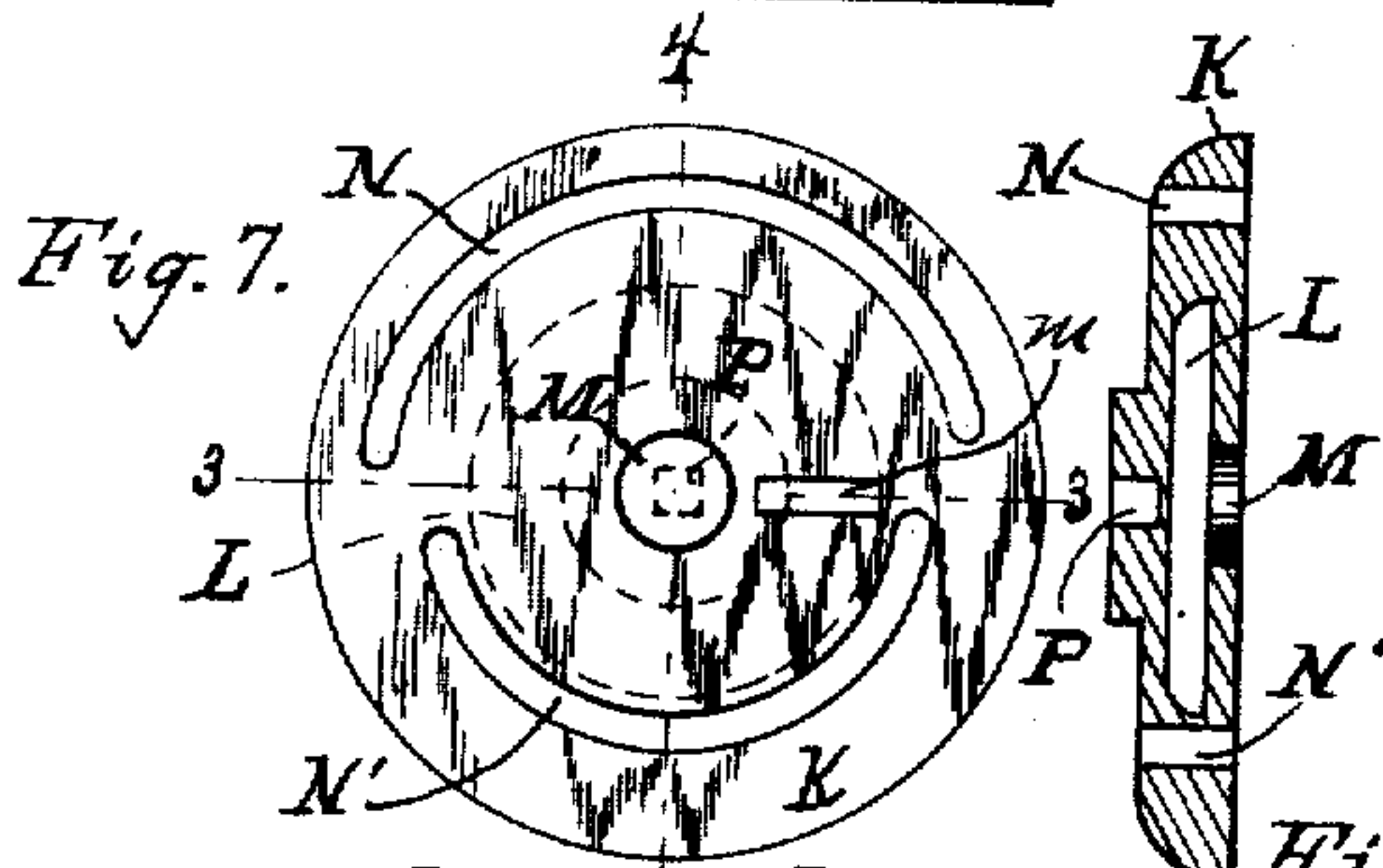
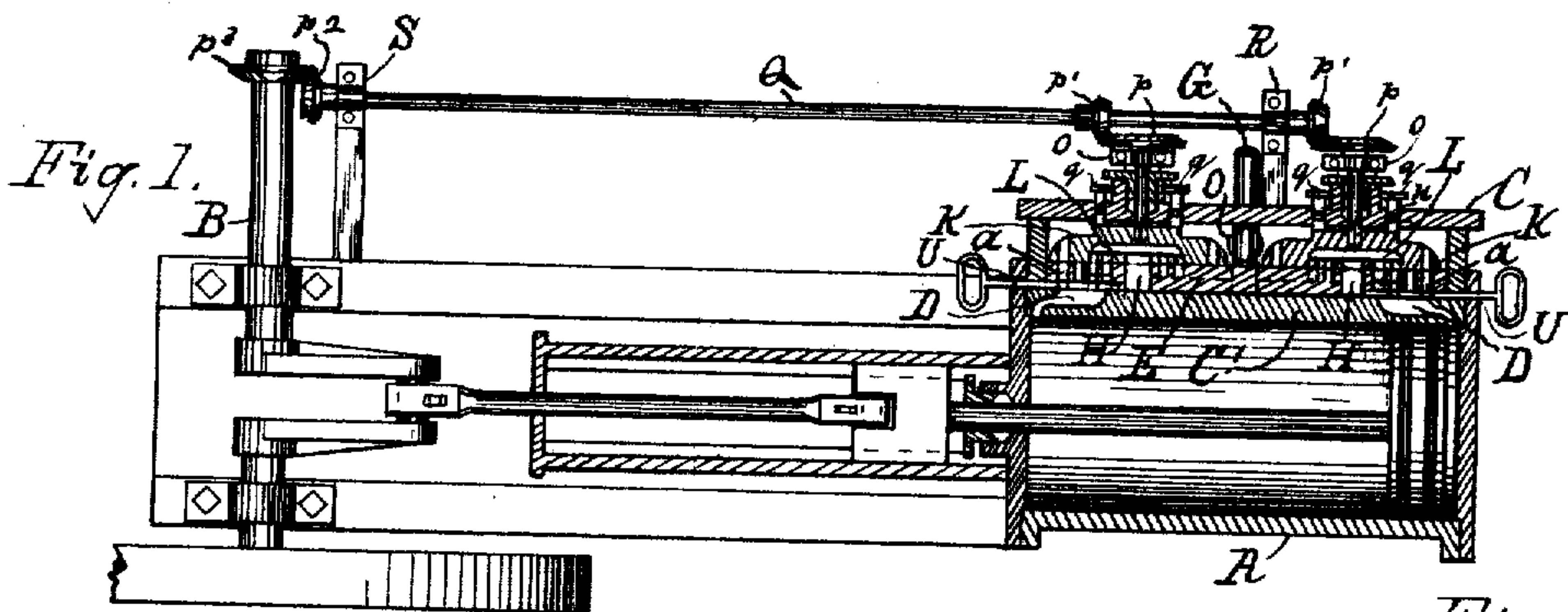


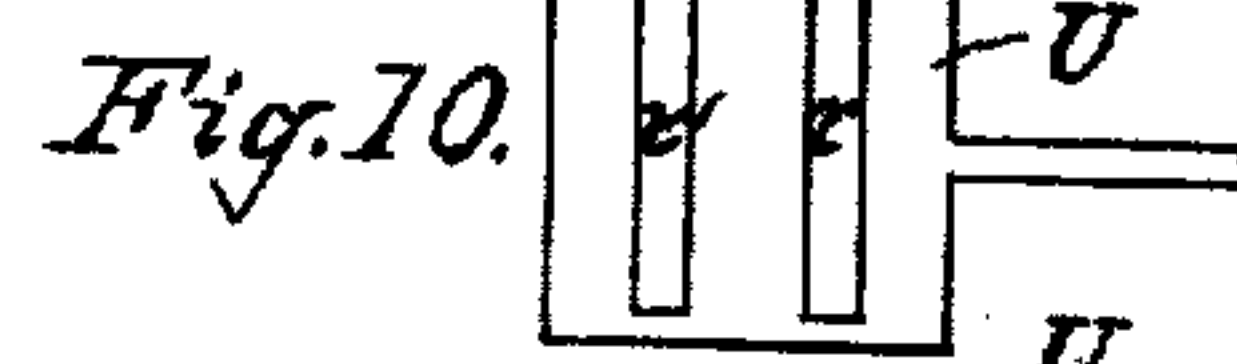
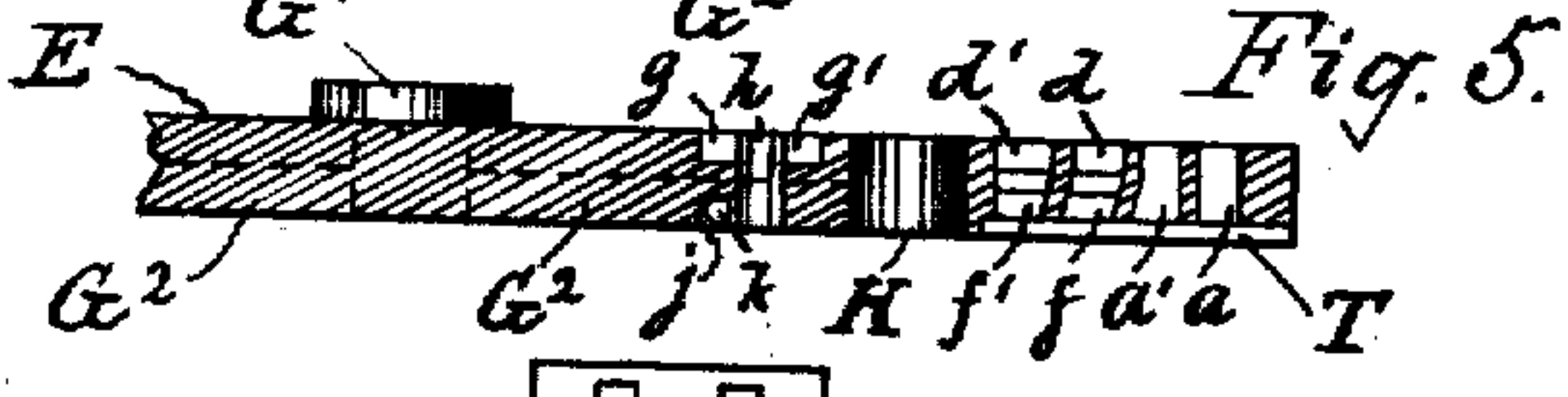
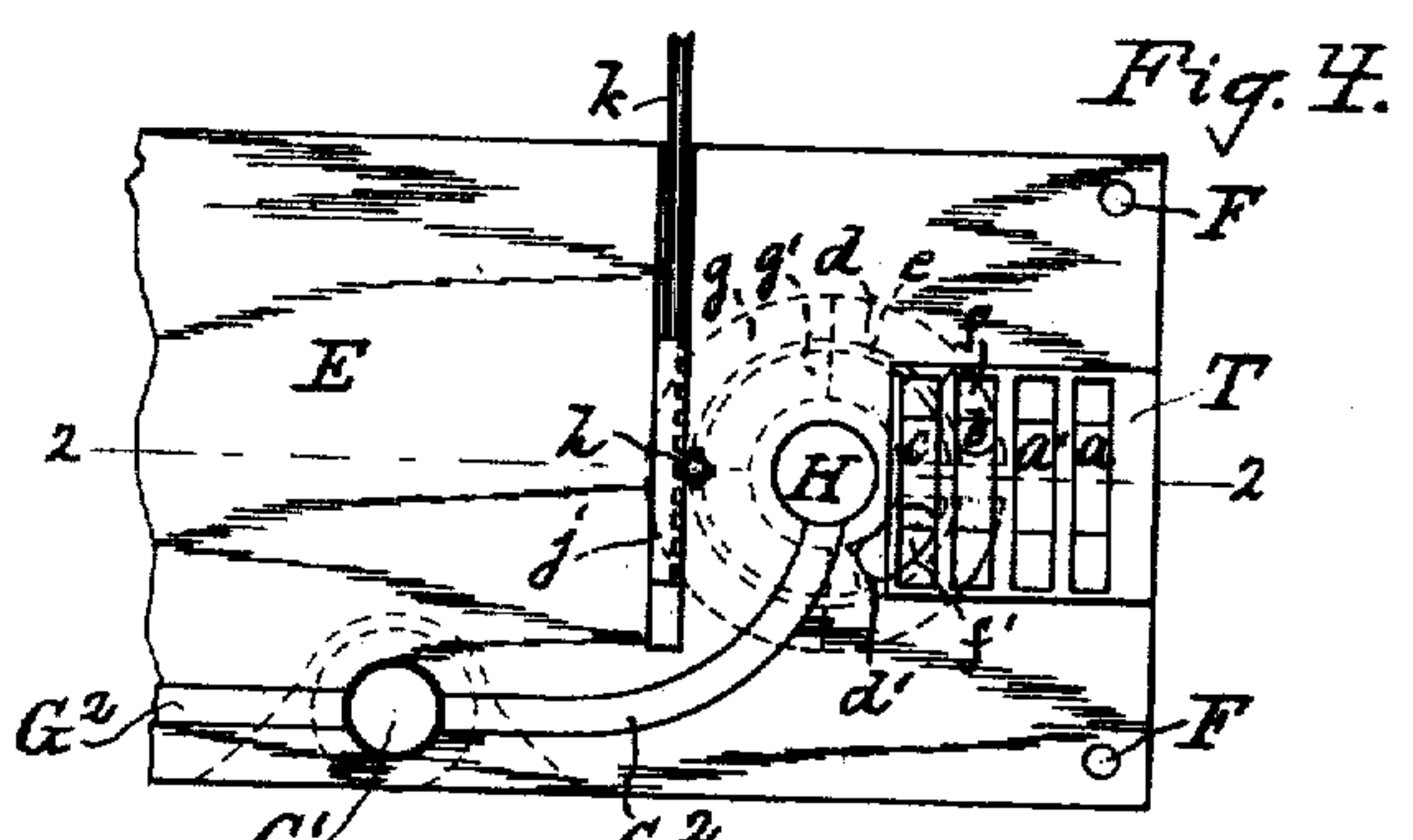
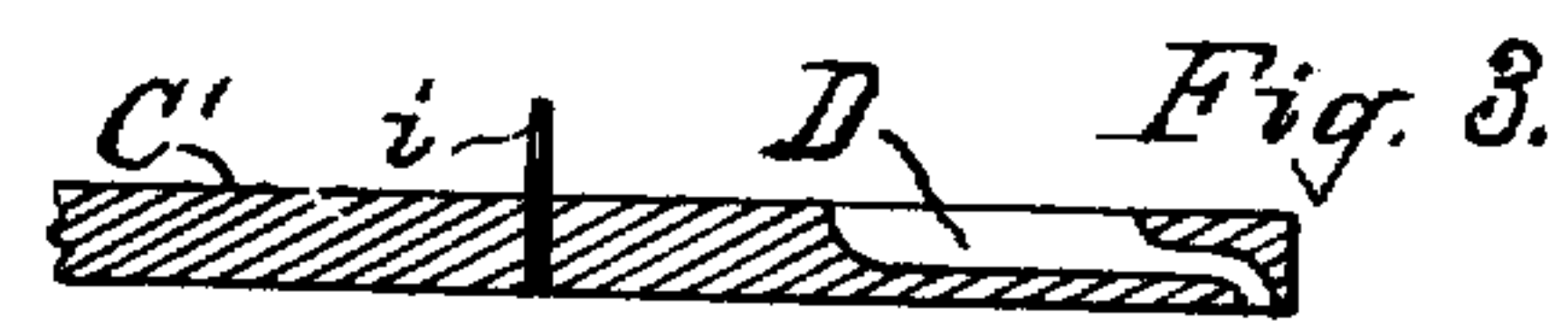
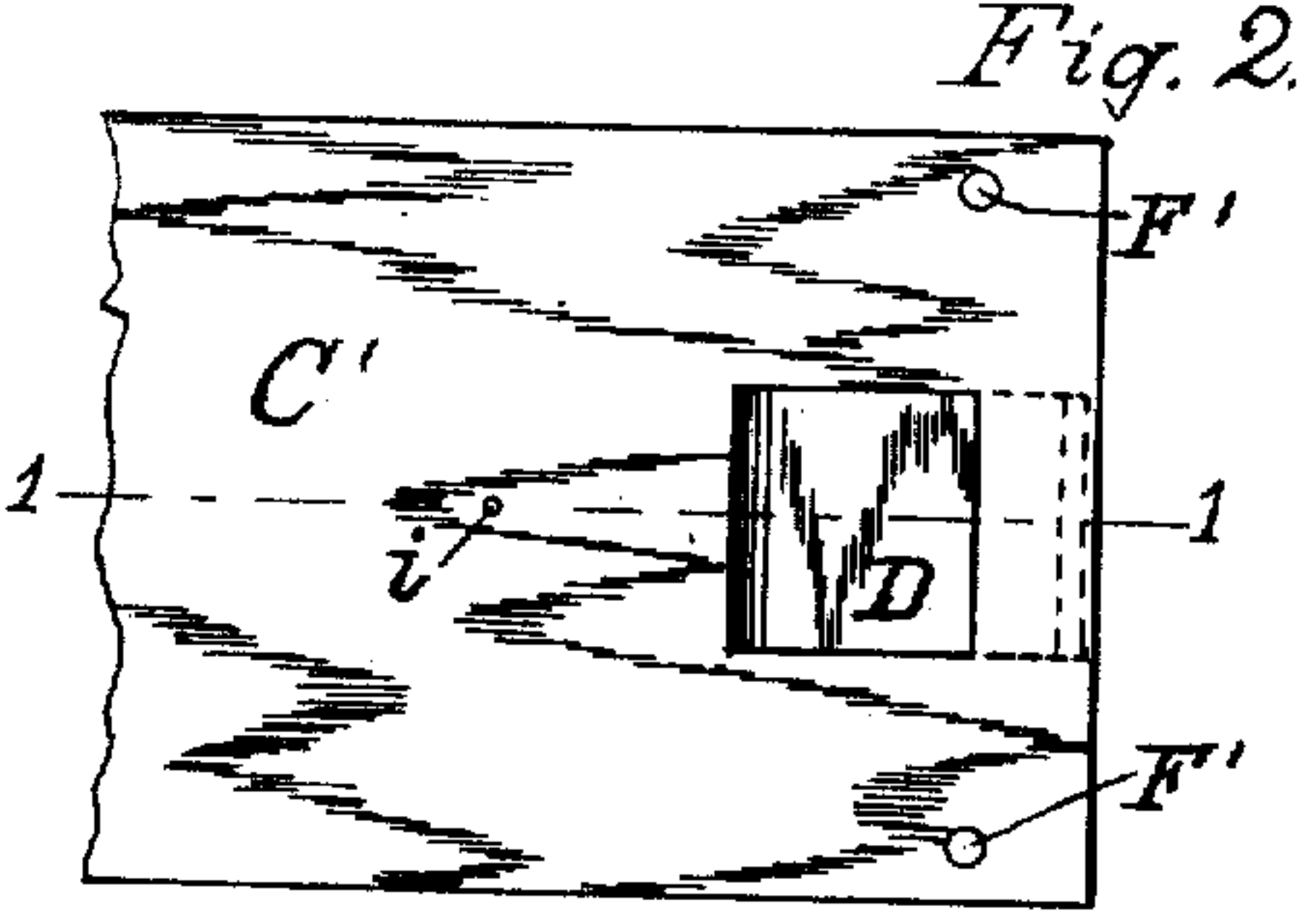
J. F. HOPPER.
VALVE FOR ENGINES.
APPLICATION FILED OCT. 10, 1908.

910,540.

Patented Jan. 26, 1909.



Witnesses
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UNITED STATES PATENT OFFICE.

JAMES F. HOPPER, OF SHERMAN, TEXAS.

VALVE FOR ENGINES.

No. 910,540.

Specification of Letters Patent.

Patented Jan. 26, 1909.

Application filed October 10, 1908. Serial No. 457,180.

To all whom it may concern:

Be it known that I, JAMES F. HOPPER, a citizen of the United States, residing at Sherman, in the county of Grayson and State of Texas, have invented certain new and useful Improvements in Valves for Engines, of which the following is a specification.

This invention relates to valves for reciprocating engines adapted to be propelled by steam and is equally applicable to engines running at a slow or a high rate of speed and performing any kind of work; and it consists in certain novel features hereinafter fully set forth and claimed, the object being an improvement over the slide valve or expensive Corliss types, and thereby produce a simple, cheap, and effective device of this character.

The nature and operation of the improvements will be readily understood by those skilled in the art from the following description.

In the accompanying drawings, Figure 1 represents a plan view, partly in section, of an engine fitted with my device. Fig. 2 represents one end of the face of a steam chest and port for use with the same. Fig. 3 is a section on the line 1 1 of Fig. 2. Fig. 4 represents a port plate that is secured to the face of the steam chest. Fig. 5 is a section on the line 2 2 of Fig. 4. Fig. 6 represents one end of the opposite side of the port plate shown in Fig. 4. Fig. 7 represents the face of a rotary valve. Fig. 8 is a section of Fig. 7 through the line 3 3. Fig. 9 is a section of Fig. 7 through the line 4 4. Fig. 10 represents a plan view of the reversing valve. Fig. 11 is an edge view of the same, and Fig. 12 represents a governor connection for regulating the steam supply.

In the drawing A represents an ordinary double acting steam cylinder shown connected in the usual way to the shaft B. The cylinder has a common steam chest C in which the exhaust steam only enters. At each end of the steam chest face C' is a port D communicating with the interior of the steam-cylinder. The port plate E is secured to the face C' of steam chest by bolts passing through holes F and into holes F', the latter being threaded. One end only of the port plate E is shown, but both ends are fitted with the same parts so a description of one

will suffice for both. Centrally located and near each end of the plate E are four rectangular port openings *a a' b* and *c* all diverging to a shorter opening on the opposite side of the plate as indicated. Steam from the boiler is supplied to the ports *b* and *c* respectively as the engine is to be run forward or backward, through the steam pipe G which is connected centrally near the bottom edge of plate E at a point indicated by G', from which point channels G² extend in either direction to cylindrical openings H that pass through the plate E. Near both ends of the opposite side of plate E are annular grooves *d d'*, the one radially exterior to the other, they are separated by an annular ring *e* and closed by a wall *e'*; these grooves open respectively in ports *b* and *c* through slots *f f'* extending through the wall of the plate E. In these grooves *d d'* are loosely fitted segmental sections *g g'*. The section *g* is provided with cogs extending across its inner face and the section *g'* has cogs on its outer edge as shown in Fig. 6 and the pinion *h* turning loosely on the pin *i* engages with the cogs of both sections and also with a vertically actuated rack *j* provided with a stem *k* that passes out through the top of steam chest C where they are connected to an arm I that is operated by a governor J and by which, should the speed of the engine increase, one stem *k* would be forced down, and the other stem correspondingly raised, moving the sections *g* and *g'* in the direction indicated by the darts; thus decreasing the amount of steam admitted to the engine, and vice versa should the speed of the engine decrease. The position of the sections *g g'* at the opposite end of the port plate (not shown) being reversed admits of the upward movement of the rack *j*, operating them in conformity with the section shown.

The rotary valve K has a steam chamber L and is provided with an opening M through its face which registers with the opening H of the port plate E, and when the engine is in operation said chamber is always full of live steam which is supplied through the channels G².

m is a steam port extending through the face of valve K to the chamber L, through which port, as the valve is rotated, steam is supplied from the chamber L to the engine

through either the plate slot f or f' as the engine may be desired to run forward or backward. The rotary valve has two exhaust ports N and N' radially exteriorly one to the other, they pass through the valve from one side to the other, and receive the exhaust steam from the engine through the plate ports a or a' according to the direction the engine may be running, and conduct the exhaust steam into the steam chest C , from whence it passes through exit O Fig. 1 which may be placed at any desired point. Centrally located within the outer side of the rotary valve is a square socket P , somewhat less in depth than the wall of the valve. In this socket the square end of a stem n enters and is loosely fitted, the stem from the socket outward is round, and extends through the side of steam chest which is provided with a suitable stuffing box, and thence through a bearing o that may be supported by a bracket attached to the steam chest. To the outer end of the stem is secured a bevel gear p , engaging with a pinion p' secured to a shaft Q , that is supported by a bearing and bracket R also attached to the steam chest; and thence, in line with the engine, the shaft extends through bearing S where it is provided with a pinion p^2 that engages a bevel gear p^3 attached to the engine shaft B . The bevel pinions on the shaft Q being one half the diameter of the bevel gears on the engine shaft and valve stems will obviously revolve the rotary valves synchronously with the engine shaft B .

If found necessary, spring adjustment, regulated by screws q may be utilized to insure the seating of the rotary valves against the port plate E , or any well known steam method may be employed for the purpose. At both ends of the port plate E , on the side that rests against the face of the steam chest, a recess T is provided in which valves U are fitted; these valves have two ports r r' corresponding in width and length to the ports a a' b and c in the port plate, but spaced a greater distance apart, when they are drawn outward; so the opening r registers with the plate port a , and r' with port b , the rotary valve in its passage will admit steam to the cylinder through its port m into port b until the port m in its revolution is covered by passing over the segments g g' which closes the port until the next forward stroke of the piston.

The exhaust steam during this passage has been escaping at the opposite end of the cylinder, through valve port r and plate port a , thence through the radial valve port N into the steam chest and out through the exit O . When desired to reverse the motion of the engine, the valves U are forced inward until the port r rests over plate port a' when valve port r' will rest over plate port c , steam then passes to the cylinder through the ports c and

r' with port b , the rotary valve in its passage will admit steam to the cylinder through its port m into port b until the port m , in its revolution is covered by passing over the segments g g' which closes the port until the next forward stroke of the piston. The exhaust steam during this passage has been escaping at the opposite end of the cylinder through valve port r , and plate port a , thence through the radial valve port N into the steam chest, and out through the exit O . When desired to reverse the motion of the engine, the valves U are forced inward until the port r rests over plate port a' when valve port r' will rest over plate port c , steam then passes to the cylinder through the ports c and r' , from slot f' and exhausts at the opposite end of the cylinder through valve port r , plate port a' and through rotary valve port N' , into the steam chest.

What I claim as my invention and desire to secure by Letters Patent of the United States, is—

1. In a valve mechanism for engines impelled by steam under pressure, the combination, with a cylinder and piston reciprocating therein, of a steam-chest, rotary valves rotating in said steam-chest and having annular exhaust ports near the periphery thereof, and a port plate connected to said cylinder covering cylinder ports, the said port plate being provided at each end with two steam ports, and two exhaust ports whereby the steam is admitted to and from the cylinder ports, all beneath the said rotating valve, substantially as described.

2. In a valve mechanism for engines impelled by steam, the combination, with a cylinder and piston reciprocating therein, of a steam-chest, rotary valves rotating in said steam-chest and having annular exhaust ports near the periphery thereof, a steam chamber within the valves opening centrally through the face thereof into a port plate and provided with a steam port opening into annular grooves in a port plate, together with means for rotating the valves, substantially as described.

3. In a reciprocating steam-engine, the combination, with a steam-chest, a cylinder provided at each end with ports entering into the same, of a port plate secured to the port face of the cylinder, said port plate provided with ports opening into the cylinder ports through a suitable valve portion; and rotary valves rotating against the face of the port plate having annular exhaust ports therein, and provided with a steam chamber and a steam port for admitting steam to the ports in the port plate, substantially as and for the purposes described.

4. In a reciprocating steam-engine, the combination with a steam-chest, a cylinder having ports at each end entering into the same, of a port plate secured to the port face

of the cylinder, annular grooves in the port plate carrying segmental sections, a pinion engaging the sections, a rack having a stem connected with a governor and engaging said pinion, ports through each annular groove for the admission of steam to the port face of the cylinder, and a rotary valve having steam and exhaust passages rotating

against the outer face of the port plate, substantially as described.

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

JAMES F. HOPPER.

Witnesses:

W. L. BROWN,

THOS. P. HOPPER.