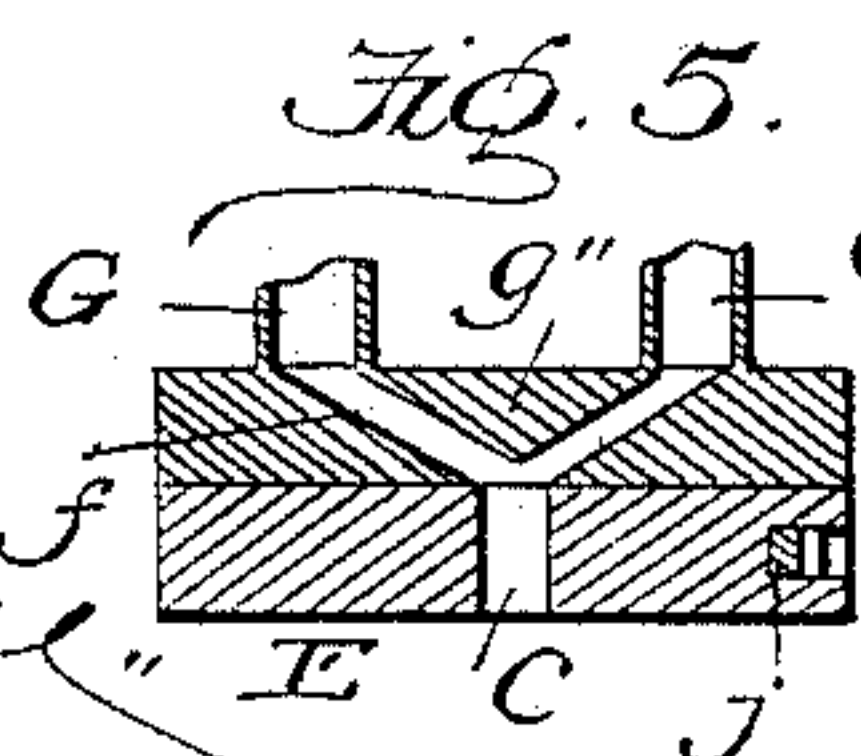
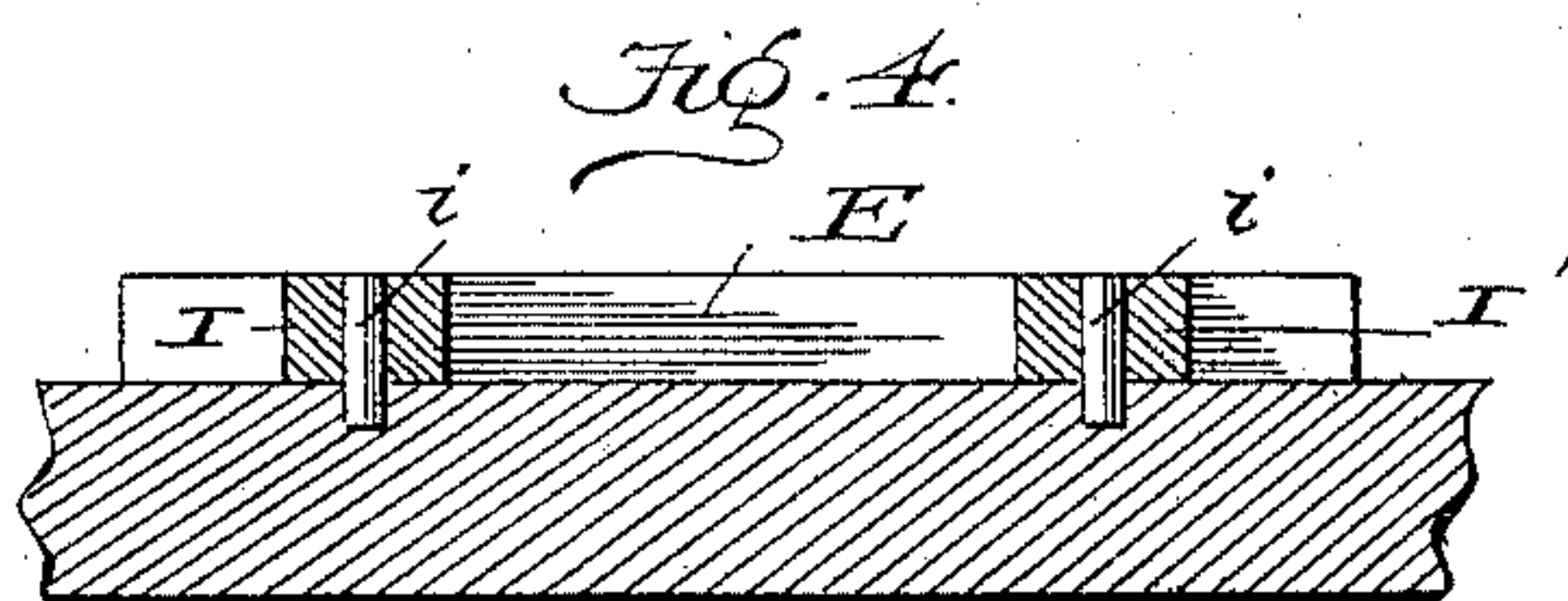
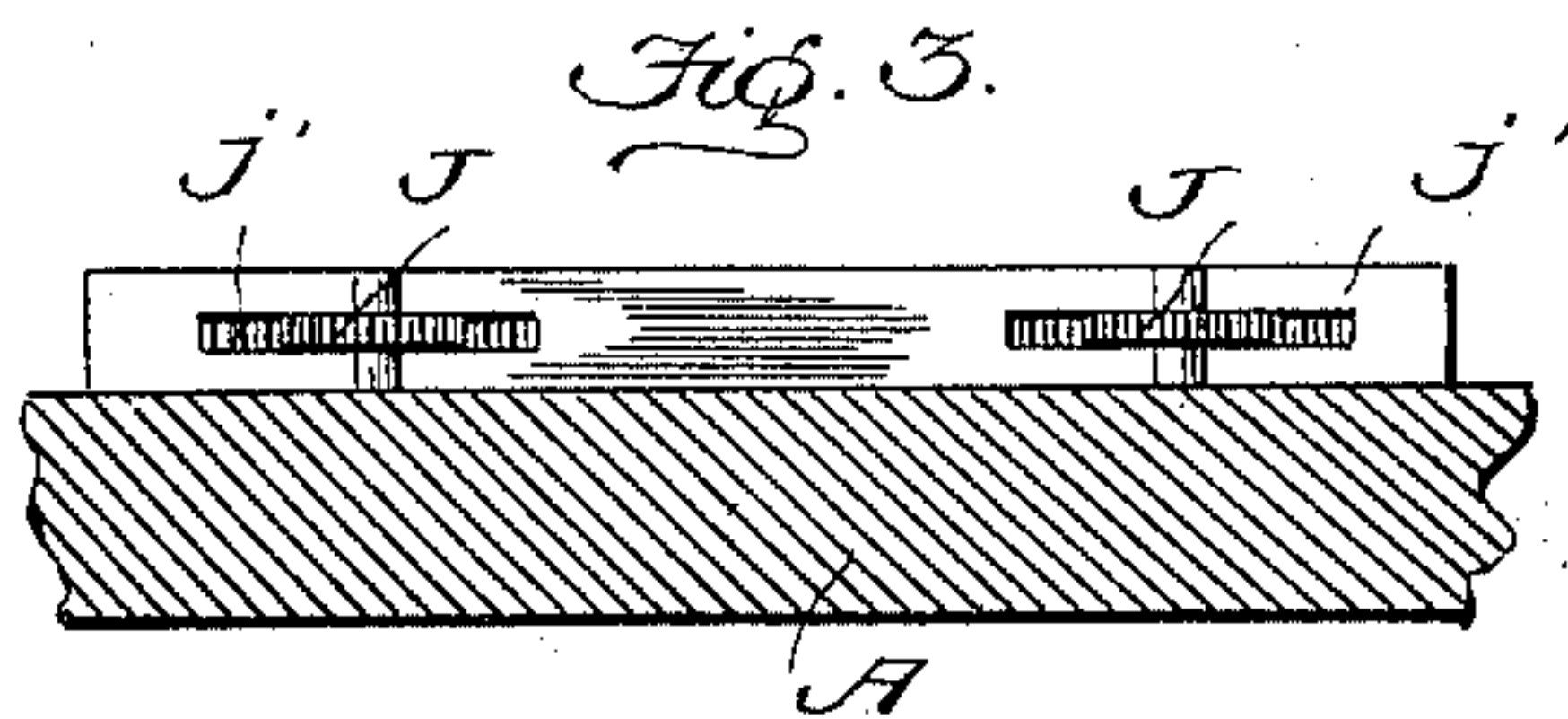
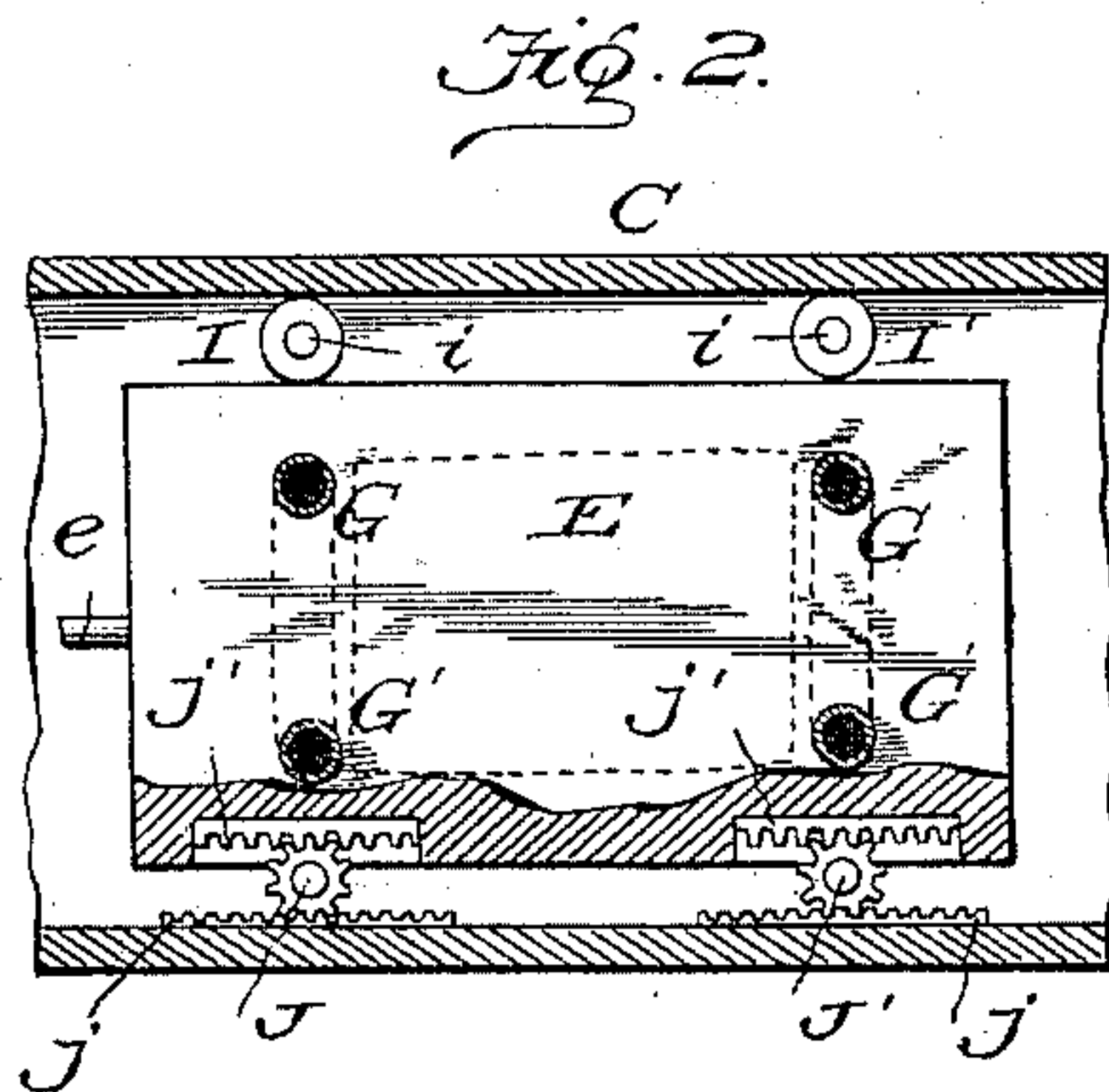
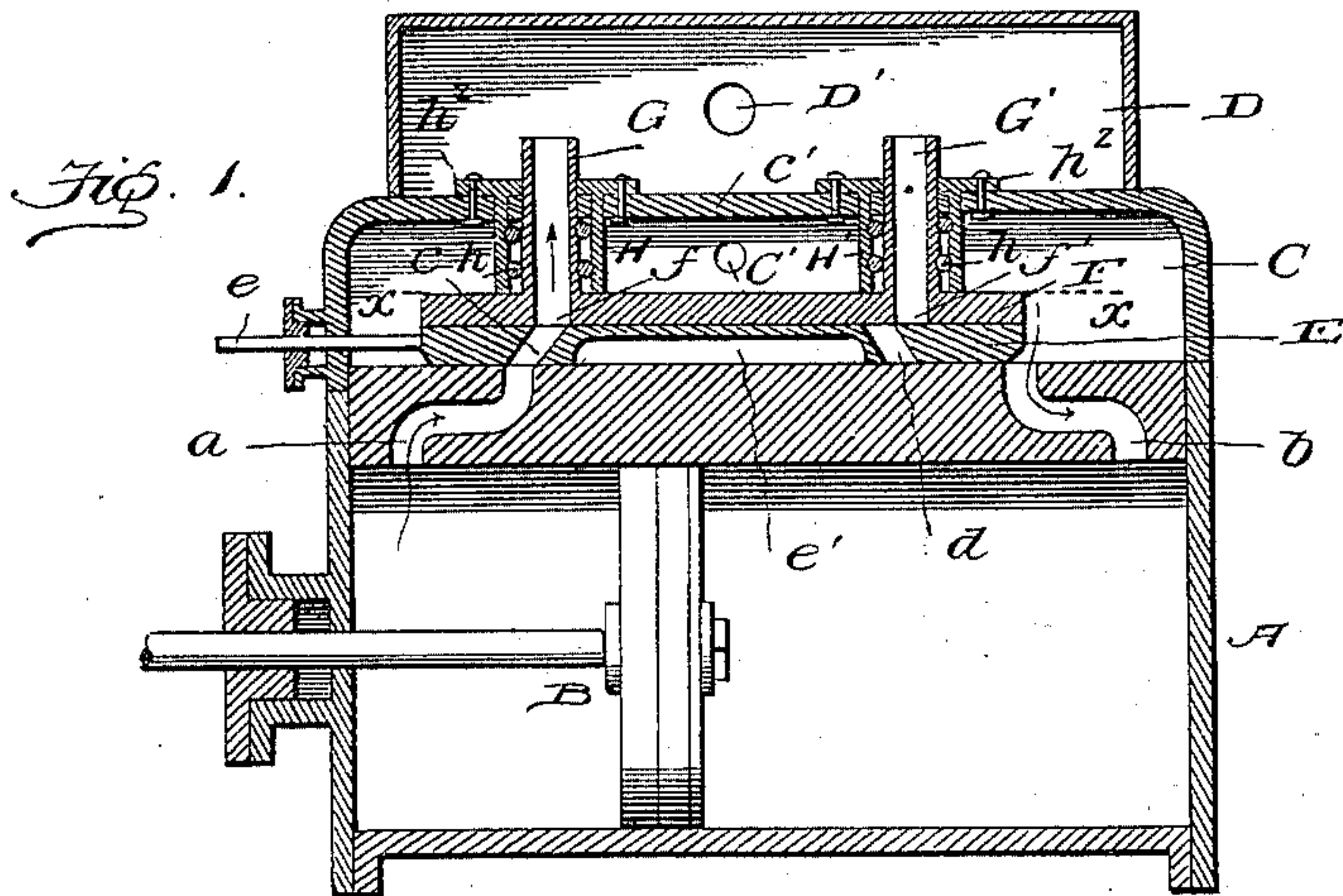


(No Model.)

G. COOK.
BALANCED SLIDE VALVE.

No. 566,501.

Patented Aug. 25, 1896.



George Cook -
Inventor.

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UNITED STATES PATENT OFFICE.

GEORGE COOK, OF SYRACUSE, NEW YORK.

BALANCED SLIDE-VALVE.

SPECIFICATION forming part of Letters Patent No. 566,501, dated August 25, 1896.

Application filed February 25, 1896. Serial No. 580,660. (No model.)

To all whom it may concern:

Be it known that I, GEORGE COOK, a citizen of the United States, residing at Syracuse, in the county of Onondaga and State of New York, have invented certain new and useful Improvements in Balanced Slide-Valves; and I do hereby 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.

My invention relates to improvements in balanced slide-valves for various kinds of steam-engines in which the top side or face of the valve is relieved from pressure of the steam while the sides of the valve are exposed to steam-pressure within the chest or box. This valve is guided in its reciprocal play by suitable form of guide-rollers, which also insure free travel or movement of the valve; and the exhaust-steam from the cylinder is conducted by the devices which relieve the top side of the valve from steam-pressure into a separate chest or box which is noncommunicative with the live-steam chest.

To the accomplishment of these ends, my invention consists of the novel construction and combination of parts, which will be hereinafter fully described and claimed.

To enable others to understand my invention, I have illustrated the preferred embodiment thereof in the accompanying drawings, forming a part of this specification, and in which—

Figure 1 is a vertical sectional view through a portion of a steam-cylinder and showing my improved valve in operative position within the live-steam chest. Fig. 2 is a horizontal sectional view on the plane indicated by the dotted line *x x* of Fig. 1. Figs. 3 and 4 are detail views of part of my improvement applied to a slide-valve; and Fig. 5 is an enlarged cross-sectional view through a portion of the valve and the pressure-relieving plate for the valve, illustrating the form of the port through which the steam is exhausted into the steam-tubes and thence to the exhaust chest or box.

Like letters of reference denote corresponding parts in all the figures of the drawings, referring to which—

A designates a steam-cylinder, and B is the

piston operating therein, which parts may be of the usual or any preferred construction.

To one side of the cylinder is applied or secured in any suitable way the valve chest or box C, and to the outside of this valve-chest is secured a steam-chest D. These chests may be of the usual or any preferred construction of chests familiar to those skilled in the art to which my invention relates; but said chests do not communicate, except through the tubes or pipes hereinafter described, to permit of the passage of steam to or from the outside chamber D according as it is used as the exhaust-chamber or as the live-steam chamber.

Communication between the valve-chest C and the steam-cylinder is had by means of the ports *a* and *b*, and such communication is controlled in the usual way by the slide-valve E, which is provided with the ports *c* and *d*, adapted as the valve is reciprocated to alternately coincide with the ports *a* and *b* of the cylinder. This valve E has the usual rod *e* for actuating it in synchronism with the reciprocating play of the piston and the valve-gear, and I prefer to provide the cavity *e'* in the lower side or face of the valve to lighten the weight of the same.

One of the leading features of my invention consists in the provision of means whereby the valve is relieved from steam-pressure on its top face while the sides of the valve are exposed to the pressure of the steam when the chest C is used as the live-steam chamber. In the preferred embodiment of my invention for relieving the top of the valve from steam pressure I provide the longitudinal plate F, which is arranged in a fixed position over the valve E and at such a distance above the wall of the steam-cylinder and the seat of the valve on said steam-cylinder that sufficient space is provided between the valve-seat and the plate F for the valve to play freely back and forth in the space between its seat and the plate F. This plate F is provided with ports *f f'*, which communicate, respectively, with the ports *c* and *d* in the valve E, and the plate F is furthermore provided with the tubes or pipes G G', which are preferably cast integral with the plate F, so as to communicate with the ports *f f'* therein. These tubes or pipes G G' extend upwardly from the plate F in the embodiment of my invention shown by

Fig. 1 of the drawings, and said tubes extend across the top part of the valve-chest C and through the wall *c*, which divides the two chests C D.

5 Around the tubes or pipes G G' are fitted the bushings H H', and between the tubes or pipes and the bushings are placed the packing-rings *h h*, of any approved construction and material, whereby the joint between the tubes
10 and the bushings is made perfectly steam-tight. These bushings have their lower ends fitted tightly against the top or outer side of the suspended fixed plate F, and the other ends of the bushings pass through openings
15 in the wall *c'*, said outer or upper ends of the bushings H H' being flanged, as at *h²*, to rest against the top or outer side of the wall *c'*, and these flanges are bolted, as shown by Fig. 1, or otherwise rigidly fastened to the wall *c'*
20 between the two steam-chests C D.

From this description it will be seen that the plate F is rigidly suspended within the valve-chest in a position for the valve E to play freely back and forth in the space between
25 the valve-seat and the plate, so that the valve will not be exposed to steam-pressure on its top face, while at the same time the described construction provides means for the steam to pass through the valve to or from the outer
30 chest D without danger of the steam leaking through weak joints provided in the devices for suspending the pressure-relieving plate F for the valve.

I prefer to use the chest C for the live-steam chest and the outer chest D as the exhaust-
35 steam chest; but this relation of the two chests may be reversed, that is, chest C may be used as the exhaust and chest D as the live steam chest. In the preferred embodiment of the invention live steam is admitted to the
40 chest C through the medium of the supply-pipe C', (indicated in Fig. 1 of the drawings,) while the exhaust-steam is taken from the chest D by a pipe D'. (Indicated also by
45 Fig. 1.)

In the preferred embodiment of the invention shown in the accompanying drawings I have shown four tubes G G and G' G', (see Fig. 2,) for supporting the plate F in
50 fixed position within the valve-chest and to provide for the escape of the exhaust-steam from the cylinder into the chest D; but the number of tubes and the fittings therefor may be varied, as, for example, I may use only
55 two tubes or pipes G G'. I prefer, however, to employ four tubes G G', as indicated by Fig. 2, to provide for the free and unimpeded escape of the exhaust-steam; and in the construction of the plate F to adapt it for use in
60 connection with these four tubes I have made the ports *f* and *f'* of the form shown by the detail view, Fig. 5 of the drawings. In this embodiment of the invention the pair of tubes G or G' at each end of the plate F are disposed
65 or arranged quite closely together, and the port *f* or *f'* is made flaring or tapering from the bottom side or face of the plate F upwardly,

thereby forming the flaring walls and the central double-tapered abutment *g''*, which serves to divide the current of exhaust-steam
70 and deflect it in equal volumes to and through the pipes G G or G' G', whichever may be in use at the time being for exhausting the steam from the cylinder. This novel construction insures a free, unimpeded, and rapid escape of
75 the exhaust-steam from the cylinder to the chest D, the pipes or tubes G G' opening into the chest D, as shown by Fig. 1.

My valve E is not made as wide as the chest C, in which it is fitted or seated, and
80 the pressure-relieving plate F corresponds substantially in width to the width of the valve. By this construction free spaces are provided around the sides and ends of the valve, as indicated in Fig. 2, whereby the
85 steam is free to have access to the sides and ends of the valve, but the steam cannot press on the top or bottom faces of the valve because the seat operates to exclude steam from the lower face of the valve, while the fixed
90 plate F prevents the steam from pressing on the top face of the valve.

To insure free sliding movement to the valve and to keep it in its proper position within the valve-chest without liability of
95 sidewise or lateral play, I have provided novel devices for guiding the valve in its back-and-forth motion, which guiding devices do not in any way increase the friction on the moving parts. In Figs. 2, 3, and 4 of the
100 drawings I have shown these guiding devices as consisting of the antifriction-rollers I I' on one side of the valve and the loosely-mounted and freely-movable gears or pinions J J' on the opposite side of the valve, said
105 rollers being preferably made of hardened steel. The antifriction-rollers I I' are arranged between one edge of the valve and the wall of the steam-chest so as to have rolling contact with the edge of the valve, and said
110 rollers are journaled to rotate freely on the arbors *i'*, which are fastened in a suitable way to the wall of the valve-chest. (See Fig. 3.) The gear-wheels or pinions J J', however, are not confined in place by having their
115 shafts or arbors attached in any way to the walls of the chest or the cylinder, but said pinions or gear-wheels are free to move with the valve in its travel within the chest C.

I prefer to form recesses in the edge or side
120 of the valve to receive the racks *j*, which are suitably fastened to the valve within the recesses, (see Fig. 2,) and in the opposite wall of the chest, or in the wall of the cylinder to which the chest is affixed, are provided the
125 racks *j'*, which are opposite to the racks *j*, and are of a length equal to or somewhat longer than the travel of the valve in the chest C. Between the racks *j* on the valve and the fixed
130 racks *j'* on the chest are arranged the loose traveling gears or pinions J J', the teeth of which mesh with the teeth on the racks *j j'*. The gears or pinions J J' work or fit in the recesses provided in the edge or side of the

valve, and by thus fitting the gears and arranging them to mesh with the opposing racks the gears are held or confined in place in a manner to cause them to roll and travel with the valve as it plays back and forth in the chest C.

My improved mechanism for guiding the valve in its sliding movement operates to hold the valve to its proper position to prevent lateral or sidewise play thereof, while at the same time the valve is mounted on rolling bearings, which insure free, easy, and quick movement to the valve.

It is thought that the operation and advantages of my improvements will be readily understood from the foregoing description, taken in connection with the drawings.

One of the advantages resulting from the employment of my means for guiding the valve in its travel by devices which have rolling contact with the valve is that the valve may be used on all kinds of engines, and particularly those which employ valves arranged in vertical positions to have edgewise bearings on the sea, as, for instance, in locomotive-valves.

Another advantage is that the plate F is adjustable to compensate for wear, and it can be removed at any time.

I am aware that changes in the form and proportion of parts and in the details of construction herein shown and described as the preferred embodiment of my invention may be made by a skilled mechanic without departing from the spirit or sacrificing the advantages of my invention, and I therefore reserve the right to make such modifications and alterations as fairly fall within the scope of my invention.

What I claim as new, and desire to secure by Letters Patent, is—

1. The combination with a cylinder, two steam-chests, and a valve, of a pressure-relieving valve in contact with the valve and provided with ports to coincide with the valve-ports, the tubes or pipes rigid with the plate and communicating with the ports in said plate and with the external steam-chest, the bushings surrounding the pipes or tubes and fastened to the chest, and packings between the tubes and bushings, substantially as described.

2. The combination with a cylinder, a valve-chest, and a valve, of a pressure-relieving plate arranged in contact with the outer side of the valve and provided with the tapering ports having the inclined abutments, and the fixed suspending tubes or pipes which are fastened to the plate to communicate with the ports therein, substantially as described.

3. The combination with a valve-chest, and a valve arranged therein to leave steam-spaces between the side edges of the valve and the chest, and guide devices having edgewise and rolling contact with the sides of the valve, substantially as described.

4. The combination with a valve-chest, and a valve arranged therein to leave steam-spaces between its sides and the chest, of the loose antifriction-rollers arranged to have edgewise and rolling contact with the sides of the valve, substantially as described.

5. The combination with a valve-chest and a valve, of stationary racks facing each other on the opposing walls or sides of the valve and chest, and traveling gears or pinions which mesh with said racks and have rolling contact edgewise to the sides of the valve, substantially as and for the purposes described.

6. The combination with a valve-chest, of a valve seated therein and provided on one side with the racks which are fastened to the same, stationary racks arranged opposite to the racks on the valve, traveling gears which mesh with the racks, and antifriction-rolls having rolling contact with the opposite side of the valve, substantially as and for the purposes described.

7. The combination with a cylinder, two steam-chests, and a valve of a pressure-plate arranged in contact with the outside of the valve, the fixed steam tubes or pipes which are fastened to the plate and open into the outer steam-chest, the bushings and packings surrounding the steam pipes or tubes, and the guide-rollers having contact with the side edges of the valve, substantially as and for the purposes described.

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

GEORGE COOK.

Witnesses:

HENRY E. COOPER,
H. T. BERNHARD.