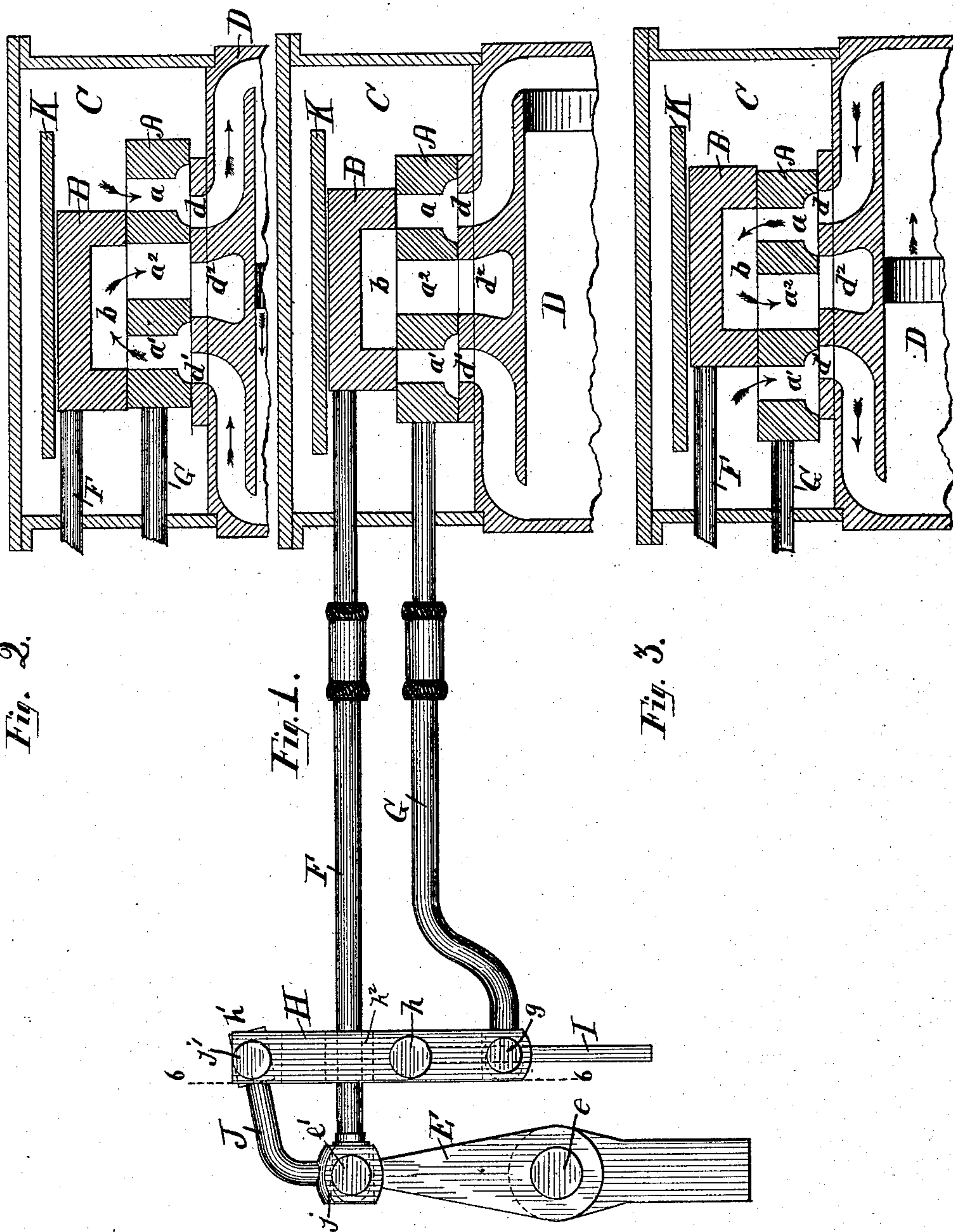


2 Sheets—Sheet 1.

No. 388,414.

Patented Aug. 28, 1888.



Edw. H. Simpson, Jr.
Arthur C. Clarke.

John Heath,
Inventor,
by his atty Wm. J. Peyton

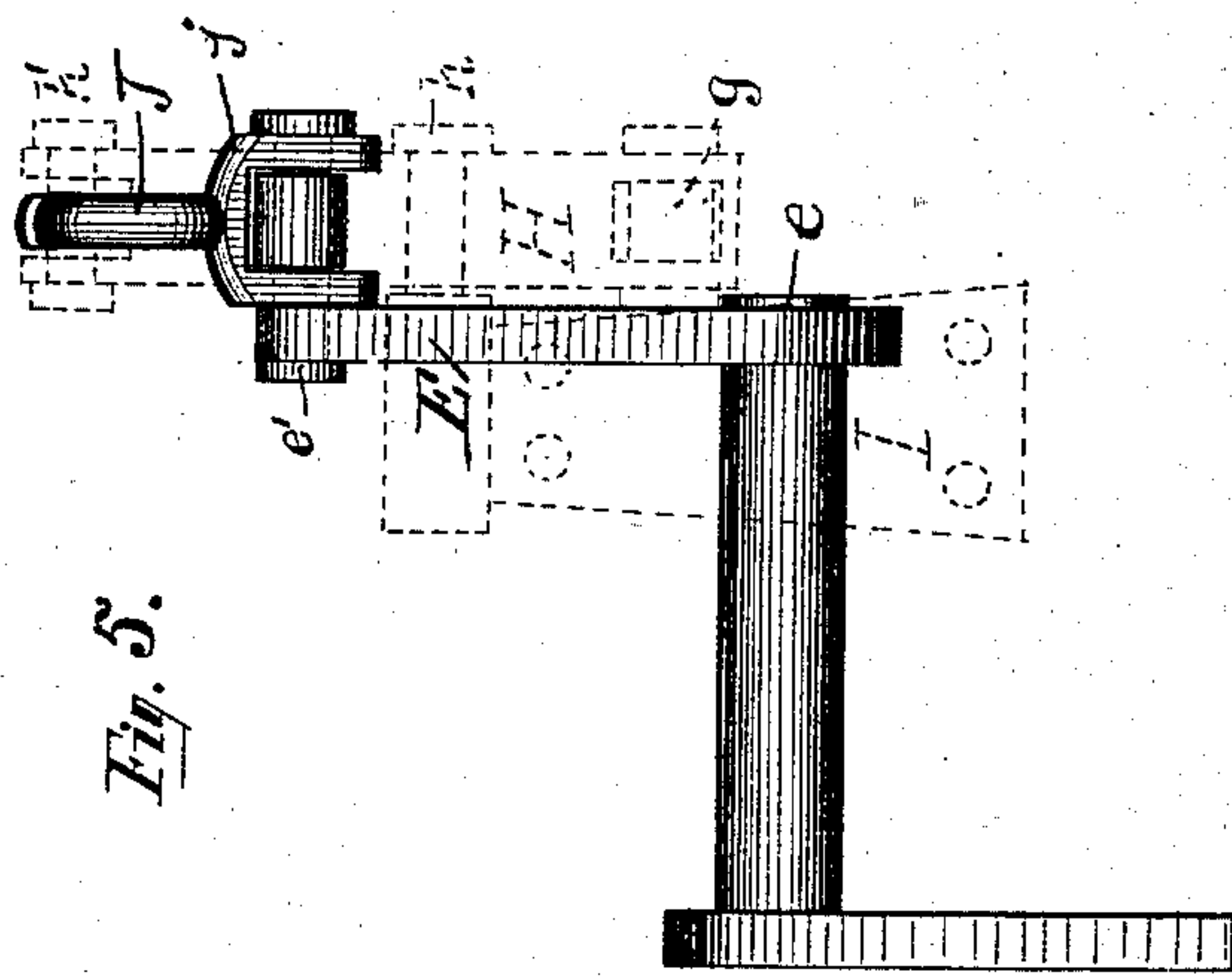
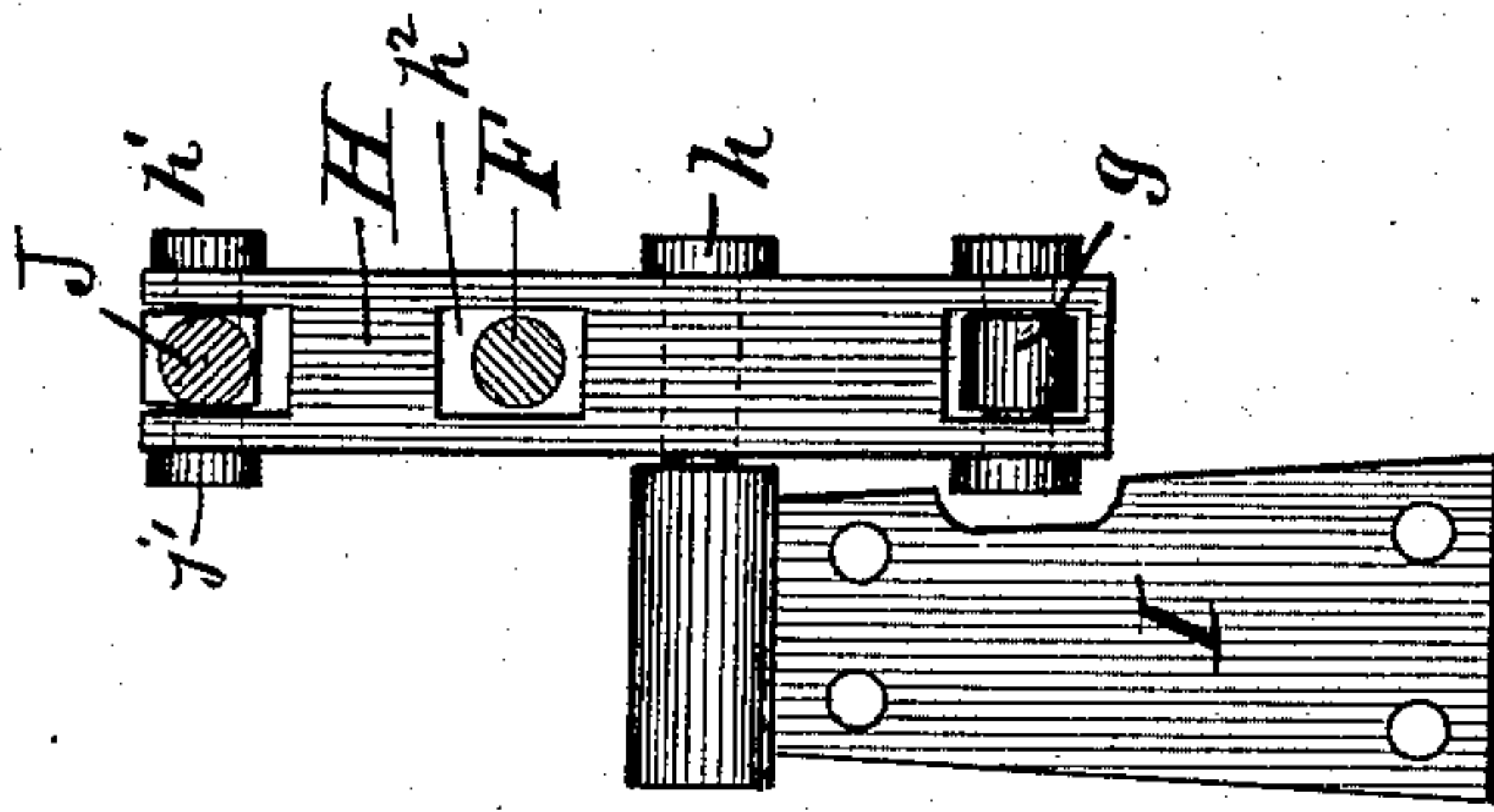
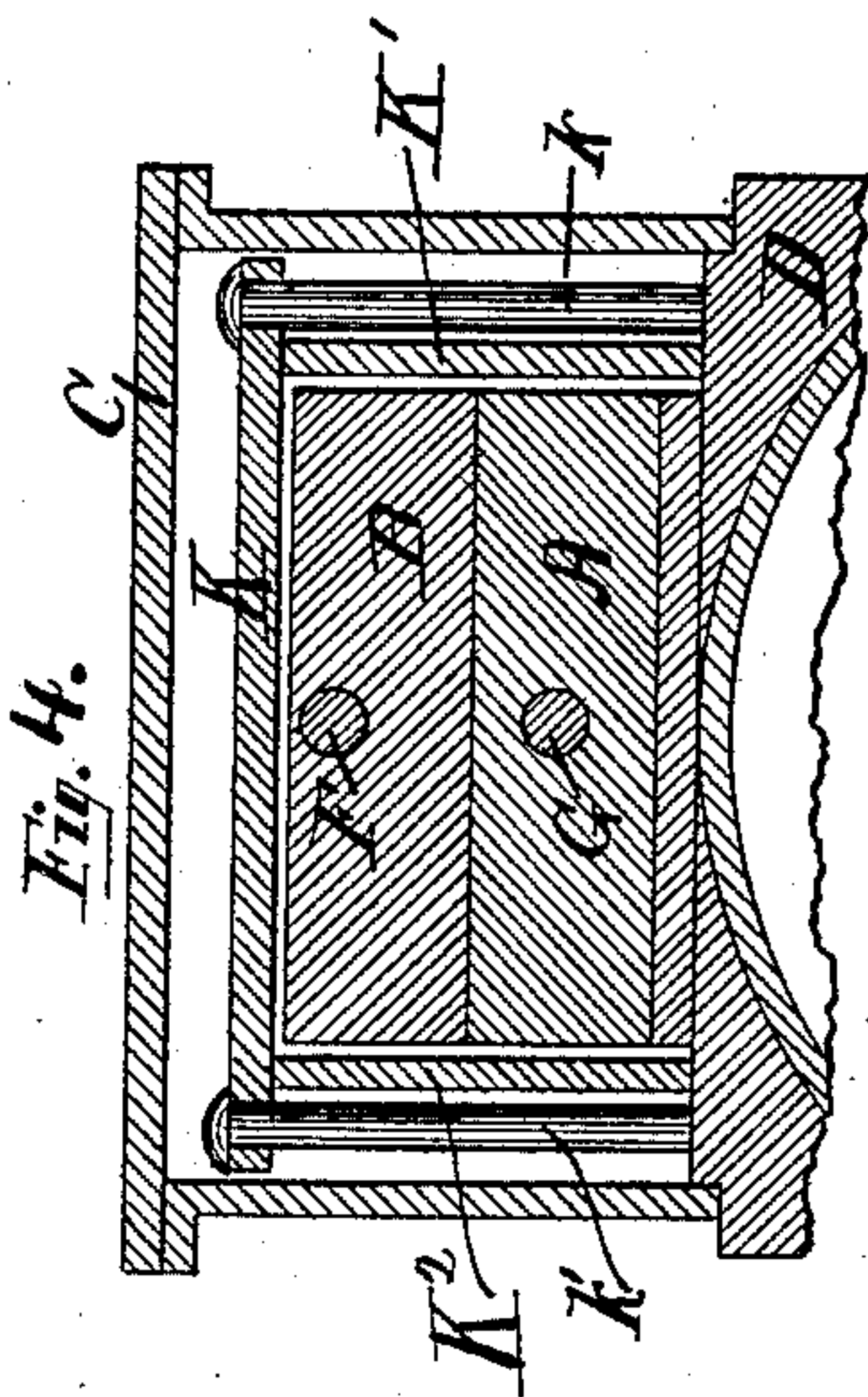
(No Model.)

2 Sheets—Sheet 2.

J. HEATH.
STEAM ENGINE VALVE.

No. 388,414.

Patented Aug. 28, 1888.



Attest:

Edw. F. Simpson, Jr.
Arthur C. Clarke

John Heath,
Inventor,
by his Atty Wm J. Peyton

UNITED STATES PATENT OFFICE.

JOHN HEATH, OF JANESVILLE, WISCONSIN.

STEAM-ENGINE VALVE.

SPECIFICATION forming part of Letters Patent No. 388,414, dated August 28, 1888.

Application filed February 14, 1888. Serial No. 263,954. (No model.)

To all whom it may concern:

Be it known that I, JOHN HEATH, a citizen of the United States, residing at Janesville, in the county of Rock and State of Wisconsin, have invented certain new and useful Improvements in Steam-Engine 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 the construction and operation of the valves of steam-engines, more particularly the slide-valves of reciprocating engines, and belongs to engines of the class employing two valves movable in opposite directions in opening and closing the steam-ports.

The object of my invention is to improve the construction of such valves and their operating-gear, whereby a greatly-improved valve mechanism is attained.

The nature and advantages of my improvements will more clearly appear by the following description in detail of the best way now known to me of embodying them, and the subject-matter claimed by me as of my invention will be distinctly recited at the close of this specification. I desire it understood here at the outset also that some of my improvements may be used without the others, and in machines differing from that herein particularly described.

The accompanying drawings show so much of a valve mechanism and its operating-gear as is necessary to illustrate my improvements, and in said drawings, Figure 1 is a side view, partly in elevation and partly in section, of my improved valve and operating-gear with the steam-ports closed. Figs. 2 and 3 are longitudinal central sectional views of the steam-chest, showing the double valve in its extreme positions on the valve-seat, with the right and left hand or forward and back ports to cylinder unclosed, respectively; and Fig. 4 is a transverse section thereof, showing more particularly the arrangement of the steam-relieving anti-friction plates and the valve-ports omitted. Fig. 5 is an end view of the rocker-arm which operates the valves, with a portion of its connections shown in dotted lines. Fig. 6 is a transverse section through the operating-connections on the line 6 6 of

Fig. 1, showing more particularly an end view of the bracket and connections in advance of the rocker-arm.

My improved valve consists of two oppositely-moving parts—a lower or main valve, A, provided with entrance-ports $a a'$ and an exhaust-port, a^2 , and an upper valve, B, moving on said lower valve, A, and provided with an exhaust cavity or port, b . This double valve is inclosed by and moves in the steam-chest C, as usual, and said chest may be supplied with steam in the usual manner. The valves A B are so constructed and are operated in such a manner by my improved gearing or operating-connections that when the right hand or forward port, d , of the cylinder D is opened for the admission of steam to the cylinder, which occurs when ports a and d coincide, the back or left-hand cylinder-port, d' , and port a' of the valve A also coincide; but the entrance of steam therethrough is prevented by the position of the upper valve, B, which covers said port a' of the valve A, and at the same time opens the cavity or exhaust-port a^2 of valve A, so as to permit of the exhaust of the steam through the exhaust-port a^2 of valve A and out through the exhaust-port d^2 of the cylinder D. The lower ends of the port-openings $a a'$ of the main valve A, next to the cylinder D, are or may be cut away or enlarged to insure a full opening of the ports $d d'$ of said cylinder when only a half-stroke of said valve has been made, which is all that is necessary for a full opening of said ports $d d'$, because of the upper valve, B, having been also moved the same distance, but in the opposite direction, thereby covering or uncovering the ports $a a'$, as the case may be, and alternately opening and closing the cylinder-ports $d d'$ in about half the time required by a single sliding-valve.

Instead of using two separate sets of gearing or connections, one for each valve, for moving the upper and lower valves simultaneously in opposite directions, I prefer to use a single mechanism, and to this end have invented a simple gearing or operating-connection, whereby both valves may be moved in opposite directions simultaneously, one upon the other, by one main rocker-arm and its connections. To this end, therefore, I preferably employ a rocker-arm, E, rocking on

its axis e in suitable bearings, which may be actuated by an eccentric and gearing, as usual, such actuating-connections, however, not being shown in the drawings, as they may be of any well-known suitable construction. Piv-
 5 otally connected to the rocker-arm E at its crank end e' is the upper valve stem or rod, F. The lower valve rod or stem, G, is pivotally jointed at g to the lower end of a beam
 10 or arm, H, fitted to rock on an axis, h , extending from a bracket-frame, I, suitably mounted on the engine-frame. Said beam or arm H is connected at its upper end, h' , to the rocker-
 15 arm E by a link, J, having a knuckle-joint, j , at one end and a rocking joint, j' , at the other, whereby there is a yielding operating link-connection between the rocker-arm E and rocking beam H.

To bring the valve-rods F G in vertical line
 20 with each other, I provide the arm or beam H with an opening, h^2 , therein, through which the rod F may pass.

The beam or arm H may be mounted either in front or behind the main rocker-arm E, the result being the same in either case; but I
 25 have shown said beam H in front of the arm E. It will thus be seen when the valves are in their central position, as in Fig. 1, that if the rocker-arm E is rocked backward on its
 30 axis e the beam H will follow, and consequently thrust the main or lower valve, A, forward a half-stroke to cause the ports a d to coincide. These ports a d , in fact, already coincided by reason of the enlargement of the
 35 lower end of the port a , but the position of valve B then prevented the entrance of steam therethrough. Obviously, at the same time that the valve A is thrust forward the valve-
 40 rod F is moved backward by its connection with the rocker-arm E, and consequently moves the upper valve, B, backward also a half-stroke, thereby entirely uncovering or
 45 opening the port a of the main valve A, which, as has already been said, was moved forward a half-stroke. This movement of the two
 50 parts of the valve by their operating-connections is sufficient to open the ports a and d so as to freely admit steam through said ports into the cylinder D, the steam already in said
 55 cylinder at the opposite side of the piston being exhausted through the exhaust-ports d' , a' , b , a^2 , and d^2 . The next movement of the rocker-arm E in the opposite or reverse direc-
 60 tion of course reverses the movement and direction of the valves A B relatively to each other and to the ports of the cylinder, so as to permit steam to enter at the opposite side and be exhausted from the opposite side of the cylinder thereto, as before.

The valve-stems are provided with suitable means—such as turn-buckles, for example—for properly adjusting the positions of the valves, and so as to admit a greater or lesser quantity of steam for regulating the speed of the en-
 65 gine.

I have described the two valves as moving

the same distance. This is not necessary, however, as one may be fitted to move a greater distance than the other, and such fitting of the valves is even desirable in certain instances. 70
 For instance, if the whole travel of the two valves is equal to eight inches, the upper valve may be fitted to travel five inches and the lower valve travel three inches; or, if the throw of the eccentric and upper valve is four and
 75 one-half inches, the lower valve may be made to travel three and one-half inches. This may be desirable owing to different sizes of cylinders and kinds of valve-seats and ports.

To relieve the valves of the pressure of the steam and the consequent friction to which they are thereby subjected, (the steam in said chest pressing down upon the valves and causing friction between the valves and the valve-seat, upon which the valves slide in opening
 80 and closing the ports to the cylinder,) I preferably mount a rigid plate, K, just above said valves to take the pressure of the steam and enable the valves to work comfortably and without friction. Said steam-plate K is sup-
 85 ported by two side plates, K' K^2 , one placed on each side of the valves, but not close enough thereto to interfere with the easy working thereof, and bolts k k' may be passed through said steam-plate K, outside said side support-
 90 ing-plates, K' K^2 , into the top of the cylinder to secure the parts firmly in the desired position within the steam-chest. These plates K K' K^2 do not interfere with the admission or exhaus-
 95 tion of steam, but insure the easy working of the valve, effectively relieving said valve from all or almost all the friction arising from the pressure of the steam thereon. This improve-
 100 ment in relieving the valve from steam-pressure is of course applicable as well to single as
 105 to the type of double or two-part valves I have shown, and it can be used to advantage upon or with all kinds of slide-valves.

The valves are supplied with oil, as usual, and the plate K may be perforated for that
 110 purpose.

I am aware that it is not broadly new to employ two valves moving simultaneously in opposite directions; but

What I claim is—

1. The combination of the two-part valve, the lower valve having two steam-inlet ports and an exhaust-port, and the upper valve hav-
 115 ing an exhaust port or passage therein, in combination with the cylinder having two en-
 120 trance-ports and an exhaust-port and operating-connections to move said valves simulta-
 125 neously and in opposite directions with respect to each other in admitting and exhaust-
 130 ing steam, substantially as described.

2. The combination of the two-part valve, the single rocker-arm, and the intermediate connections, substantially as described, where-
 by the parts of said valve are moved simulta-
 130 neously and in opposite directions with re-
 spect to each other.

3. The combination, in a two-part valve-

gear, of the main rocker-arm, a second rocking arm or beam connected to and actuated by said first-mentioned rocker-arm, and the valve-rods, whereby the movement of the main rocker-arm, which moves one of said valve-rods, also moves the other valve-rod in the opposite direction, substantially as described.

4. In a two-part valve-gear, the combination of two rocker-arms, two valve-rods pivotally connected one with each of said rocking arms, and a link-connection between said rocking arms, substantially as described.

5. The combination, with the valve and steam-chest in which it is mounted, of a steam-

plate rigidly supported above said valve, the side supporting-plates of said steam-plate, and the fastening-bolts securing said steam-plate and side plates together around the valve and passing through said steam-plate outside said side supporting-plates and into the cylinder-face, substantially as described.

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

JOHN HEATH.

Witnesses:

GEO. G. SUTHERLAND,
JOSEPH B. DOE, Jr.