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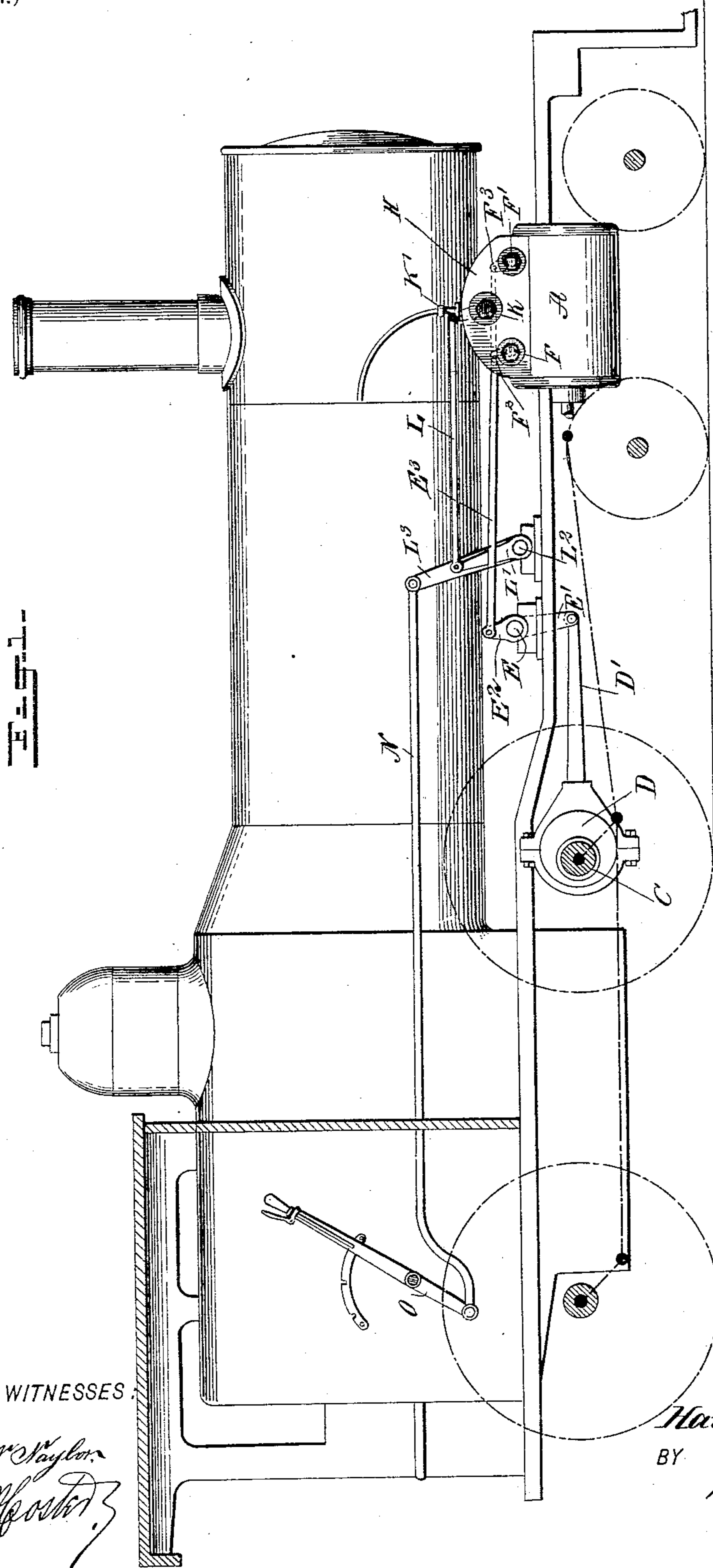
Patented June 17, 1902.

H. MAXWELL,
LOCOMOTIVE VALVE GEAR.

(Application filed Aug. 14, 1901.)

(No Model.)

3 Sheets—Sheet 1.



WITNESSES

Geo W Taylor
Henry Hester

INVENTOR

Harry Maxwell

BY

Mumford
ATTORNEYS

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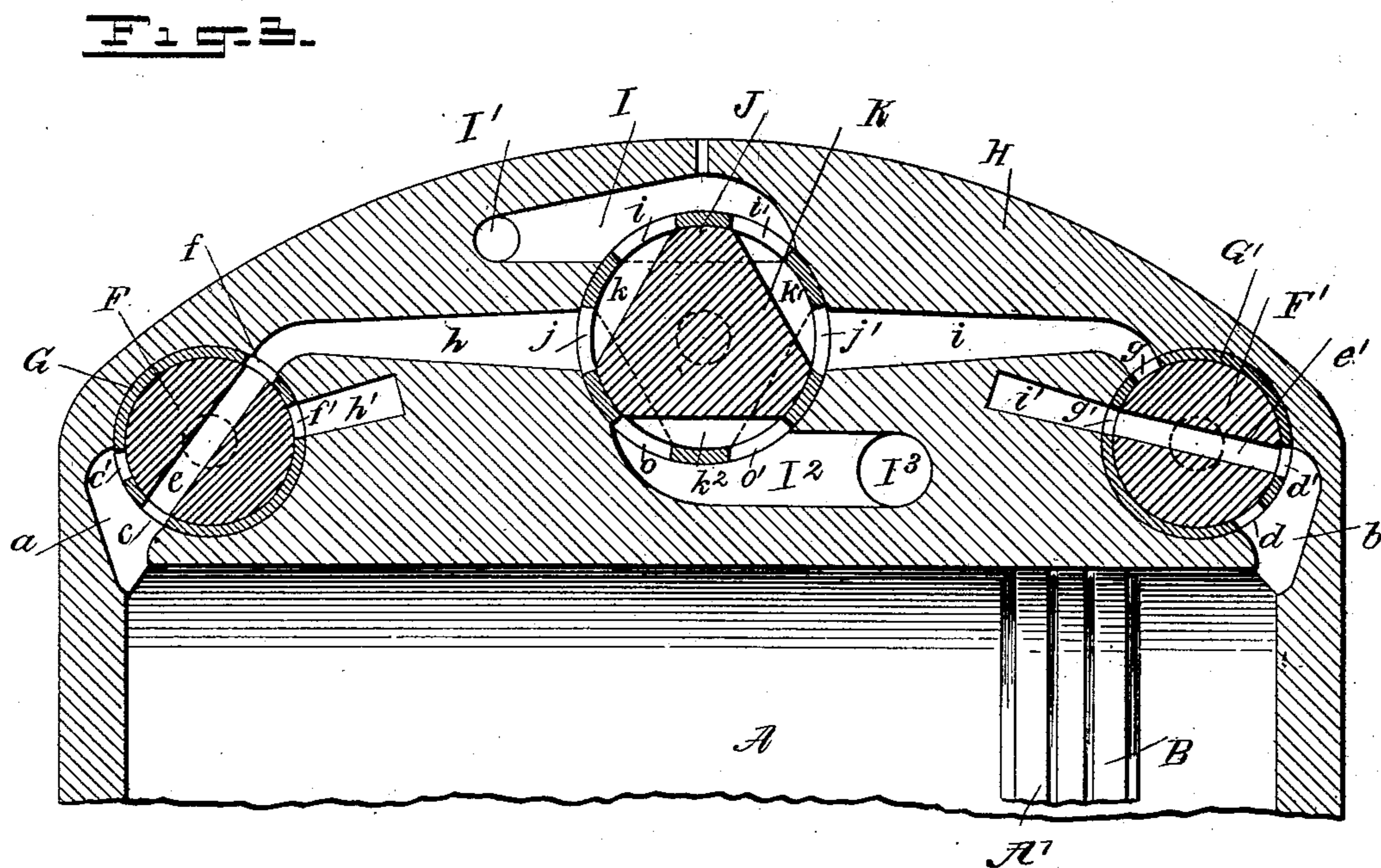
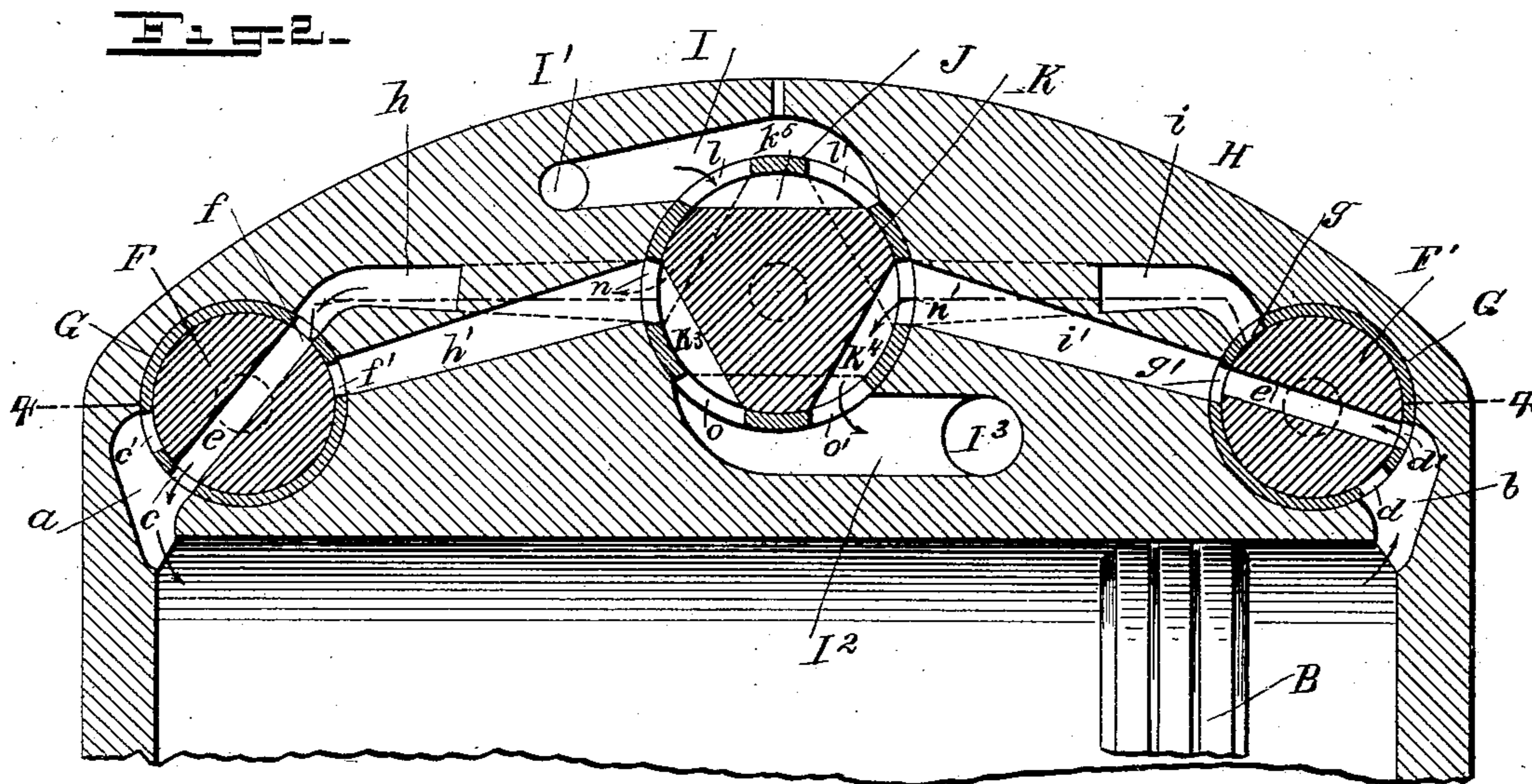
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WITNESSES :

Geo. W. Naylor.
Rev. Hester

INVENTOR

Harry Maxwell

BY

Mum
ATTORNEYS

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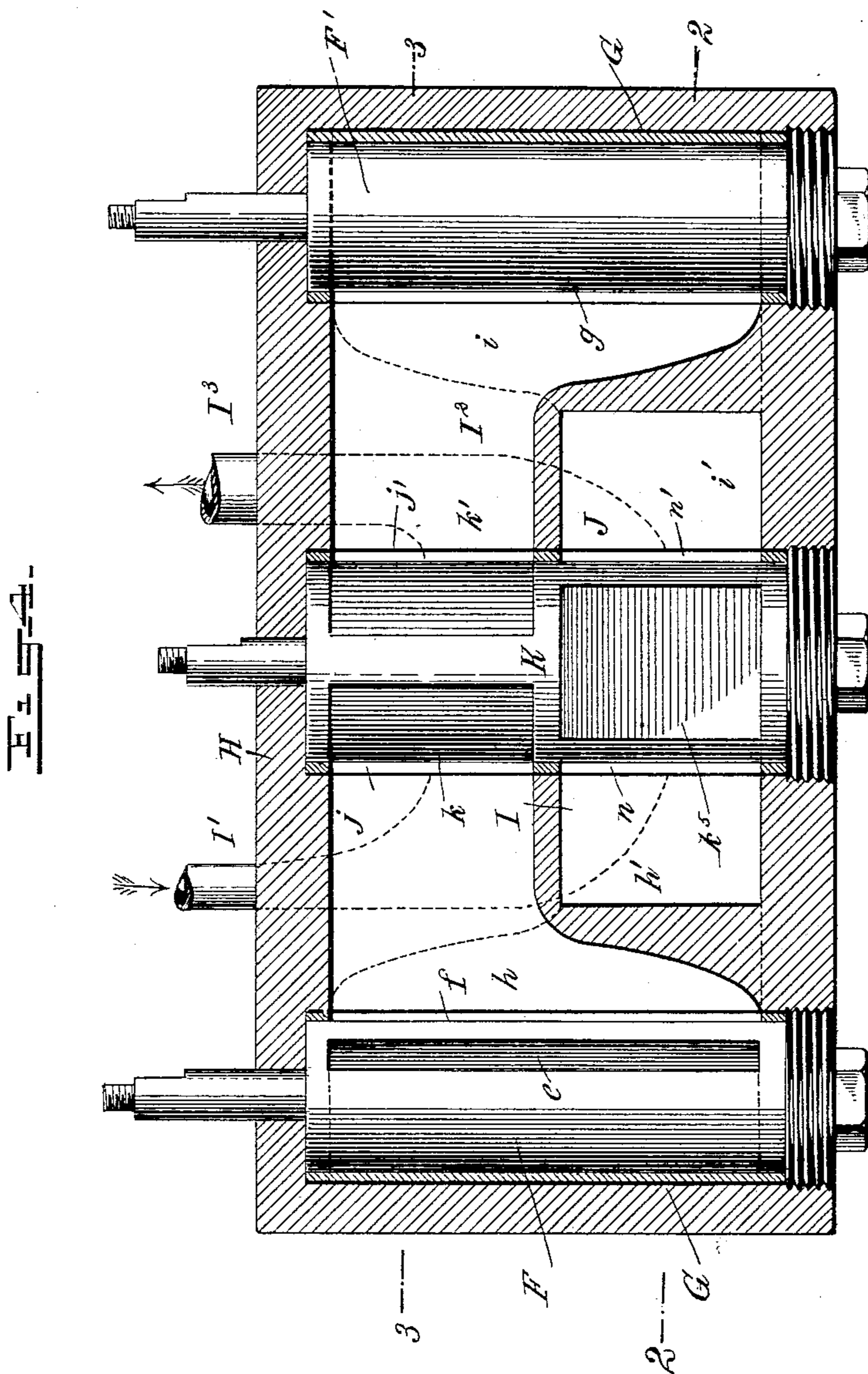
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WITNESSES:

Geo. W. Weylton
Rev. J. Foster

INVENTOR

Harry Maxwell

BY

Heenan
ATTORNEYS

UNITED STATES PATENT OFFICE.

HARRY MAXWELL, OF WEST OAKLAND, CALIFORNIA.

LOCOMOTIVE VALVE-GEAR.

SPECIFICATION forming part of Letters Patent No. 702,809, dated June 17, 1902.

Application filed August 14, 1901. Serial No. 71,989. (No model.)

To all whom it may concern:

Be it known that I, HARRY MAXWELL, a citizen of the United States, and a resident of West Oakland, in the county of Alameda and State of California, have invented a new and Improved Locomotive Valve-Gear, of which the following is a full, clear, and exact description.

The object of the invention is to provide a new and improved locomotive valve-gear which is simple and durable in construction and arranged to actuate the admission-valves from the locomotive-engine and to allow of manipulating a separate reversing-valve by the engineer for conveniently and quickly reversing the engine independently of the motion of the admission-valve gear to prevent flying back of the reversing-lever.

The invention consists of novel features and parts and combinations of the same, as will be fully described hereinafter and then pointed out in the claims.

A practical embodiment of the invention is represented in the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a side elevation of the improvement as applied, parts being in section. Fig. 2 is an enlarged sectional side elevation of the improvement, the section being on the line 2 2 in Fig. 4. Fig. 3 is a similar view of the same on the line 3 3 in Fig. 4, and Fig. 4 is a sectional plan view of the same on the line 4 4 in Fig. 2.

In each cylinder A of the locomotive-engine reciprocates a piston B, connected in the usual manner with one of the driving-axles C, carrying an eccentric D, connected by its eccentric-rod D' with the arm E' of a rock-shaft E, having an arm E², connected by a link E³ with crank-arms F² F³ on the stems of the admission and exhaust valves F F', mounted to rock in cylindrical casings G G', held in a steam-chest H, secured to or forming part of the cylinder A. The steam-chest H is provided with a steam-inlet chamber I, connected by a pipe I' with the steam-dome of the locomotive-boiler, and said steam-chest H is also formed with an exhaust-chamber I², from which leads a pipe I³ to the smoke-stack in the usual manner. The chambers I I² connect with a casing J, in which is mounted to

turn a reversing-valve K, carrying at one outer end of its stem an arm K', connected by a link L with an arm L' on a rock-shaft L², from which extends an arm L³, connected by a link N with a reversing-lever O, located in the cab of the locomotive and under the control of the engineer.

From the foregoing it is evident that when the engine is running the valves F F' control the admission of the steam to and from the cylinders A, while the reversing-valve K remains stationary and is only actuated by the engineer manipulating the lever O when it is desired to reverse the engine.

In order to control the movement of the steam, the following arrangement is made: The cylinder-ports *a b* connect with ports *c c'* and *d d'*, respectively, formed in the casings G G', and the ports *c c'* are adapted to alternately connect with a diagonal port *e* in the valve F, and the ports *d d'* alternately connect with a diagonal port *e'* in the valve F'. The ports *e e'* are adapted to connect alternately with ports *f f'* and *g g'*, respectively, of which the ports *f f'* are in the casing G diametrically opposite the ports *c c'*, and the ports *g g'* are in the casing G' directly opposite the ports *d d'*. The ports *f* and *g* are in communication at all times with the inlet-ports *h* and *i*, and the ports *f'* and *g'* are likewise in communication at all times with the exhaust-ports *h' i'*. The ports *h i* register with ports *j j'* in the stationary casing J, and the said ports *j j'* are adapted to register, by ports *k k'* in the sides of the reversing-valve K, with ports *l l'* in the said casing J, said ports *l l'* opening into the steam-inlet chamber I. The ports *h' i'* register with stationary ports *n n'* in the casing J, and these ports *n n'* are adapted to register with ports *k³ k⁴*, formed in the reversing-valve K, (see Fig. 2,) and the ports *k³ k⁴* are adapted to register with ports *o o'* in the casing J, said ports *o o'* opening into the exhaust-chamber I². The valve K is also provided with ports *k² k⁵*, of which the port *k²* is in a plane with the ports *k k'* and moves into an active position when the valve is reversed, and the port *k⁵* is in a plane with the ports *k³ k⁴* and likewise moves into an active position when the valve is reversed. When the reversing-valve K and the admission-valves F F' are in the position shown in Figs. 2, 3, and 4, then live steam passes from

the inlet-chamber I, by way of the ports $l k j$
 $h f e c a$, into the left-hand end of the cylinder A to push the piston B from the left to the right, the exhaust in front of the piston
 5 passing through the ports $b b' e' g' i' n' k^4 o'$
 into the exhaust-chamber I², and when the piston B reaches the end of its stroke then the valves F F' are rocked by the action of the
 10 eccentric D and the connection between the
 eccentric and said valves, as above described, so that the port e' connects the ports $d g$ with each other to allow the live motive agent to pass from the chamber I by way of the ports
 15 l', k', j', i, g, e', d , and b into the right-hand end of the cylinder A to push the piston B from the right to the left. The steam in front of the piston B now passes through the ports
 20 $a c' e f' h' n k^3 o$ into the exhaust-chamber I². The valves F F' rock back to their former positions (shown in Figs. 2 and 3) as soon as the piston B reaches the end of its return stroke, and the above-described operation is then repeated as long as the engine is running. When it is desired to reverse the engine,
 25 then the engineer throws the reversing-lever O over to give a sixth of a turn to the reversing-valve K, so that the ports $k^3 k^5$ in the reversing-valve K will be live-steam-supply ports for the ports n, h', i' , and n' , while
 30 the ports k^2 and k' will be exhaust-ports for the ports $h j$ and $i j'$, it being understood that the port k^3 then connects the ports $l n$ with each other, while the port k^5 connects the ports
 35 $l' n'$ with each other and the port k^2 connects the port j with the port o , and the port k' then connects the port j' with the port o' . As the reversing-valve K is only actuated when it is desired to reverse the engine, it is evident that said valve is subjected to very little
 40 wear, and as the said valve K is reversed or actuated independently of the movement of the valves F F' it is evident that it requires but little power or force on the part of the engineer to turn the valve K without the
 45 slightest danger of the reversing-lever O flying back accidentally.

It will further be seen that by the arrangement described a reversal is readily effected without any necessity for shutting off steam
 50 while reversing.

Although I have described my invention in connection with a locomotive-engine, it is evident that the improvement is applicable to stationary engines.

55 Having thus fully described my invention, I claim as new and desire to secure by Letters Patent—

1. A locomotive-engine having steam admission and exhaust valves, a valve-gear for
 60 actuating said valves and controlled by the engine, and a reversing-valve arranged between the admission and exhaust valves and controlling the admission of the steam to and the exhaust of said steam from said admission and exhaust valves, the reversing-valve
 65 being under the control of the engineer, as set forth.

2. An engine valve-gear, comprising admission and exhaust valves, a valve-gear controlled by the engine and connected with said
 70 admission and exhaust valves, to periodically rock the same, and a reversing-valve under the control of the engineer and having its valve-casing connected with the inlet-chamber and the exhaust-chamber, said reversing-
 75 valve being between the admission and exhaust valves and arranged to connect the inlet-chamber with both the admission and exhaust valves, and to connect the latter with said exhaust-chamber, as set forth. 80

3. In an engine valve-gear, admission and exhaust valves at opposite ends of the cylinder, a valve-gear controlled by the engine for actuating said valves, and a rocking reversing-valve arranged between the admission
 85 and exhaust valves and having its casing connected with the inlet and exhaust chambers, said valve being under the control of the engineer and provided with ports for connecting the inlet-chamber with both the inlet and
 90 exhaust valves, and the exhaust-valve with the said exhaust-chamber, as set forth.

4. In an engine valve-gear, admission and exhaust valves at opposite ends of the cylinder, a valve-gear controlled by the engine for
 95 operating said valves, a rocking reversing-valve arranged between the admission and exhaust valves and having its casing connected with the inlet and exhaust chambers, said valve being under the control of the engineer and provided in its periphery with oppositely-arranged sets of ports for connecting the inlet-chamber with both the admission and exhaust valves, and the exhaust-valve
 100 with the exhaust-chamber, as set forth. 105

5. In an engine valve-gear, the combination with a cylinder, and a steam-chest thereon, said chest having ports leading to the opposite ends of the cylinder, of admission and exhaust valve casings in the chest and each
 110 provided with a pair of oppositely-arranged ports, a valve in each casing and provided with a port leading therethrough, means for operating the said valves from the engine, a reversing-valve casing in the said chest between the admission and exhaust valves, and
 115 provided with a plurality of ports, two of which are in communication with the inlet-chamber, two in communication with the exhaust-chamber, and two in communication
 120 with ports leading to the ports of each of the admission and exhaust valve casings, a rocking reversing-valve in said casing and provided in its periphery with oppositely-arranged sets of ports, and means for operating
 125 the reversing-valve, as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

HARRY MAXWELL.

Witnesses:

CHARLES L. WINES,
 WM. SORECKENFELDER.