

No. 626,566.

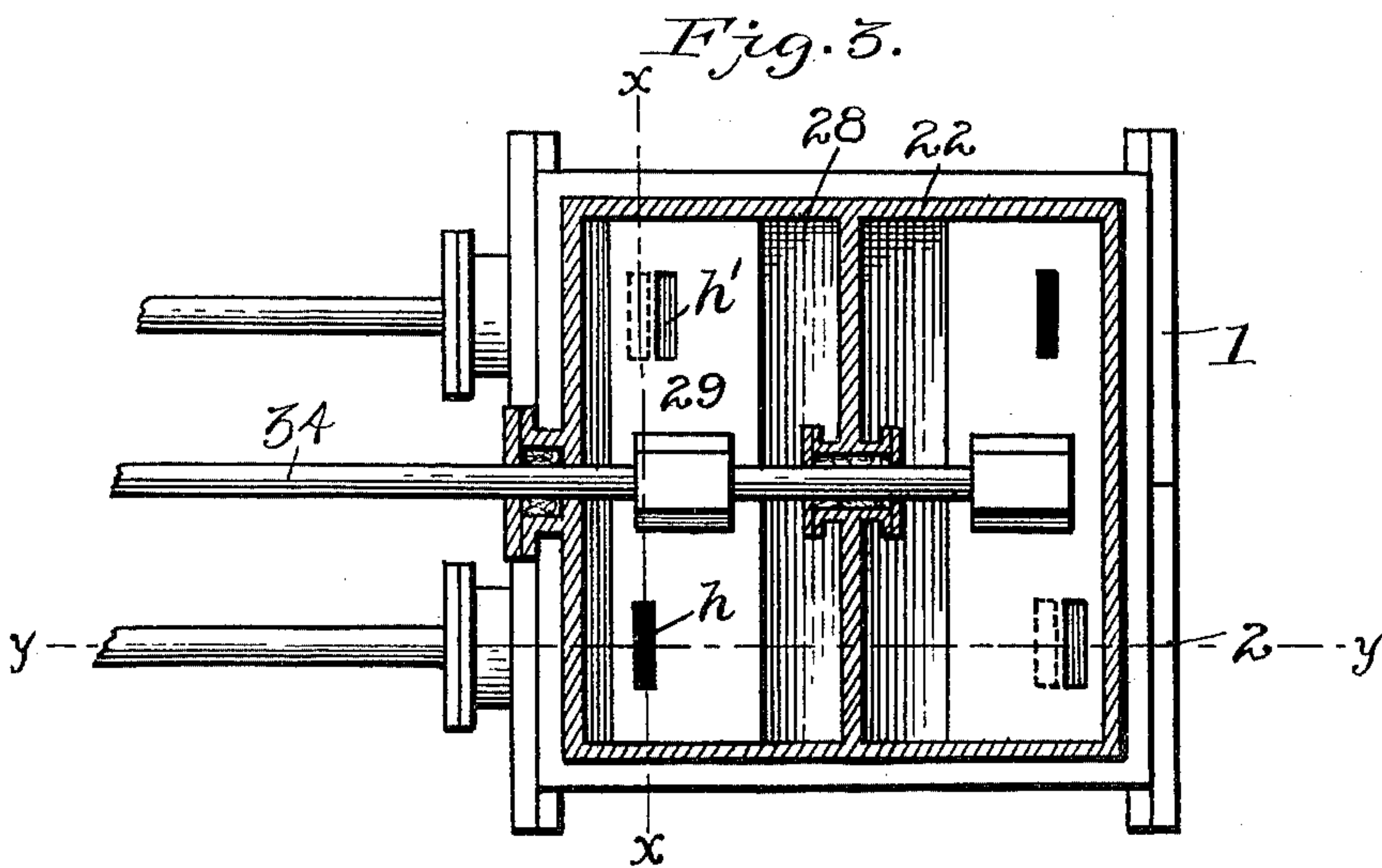
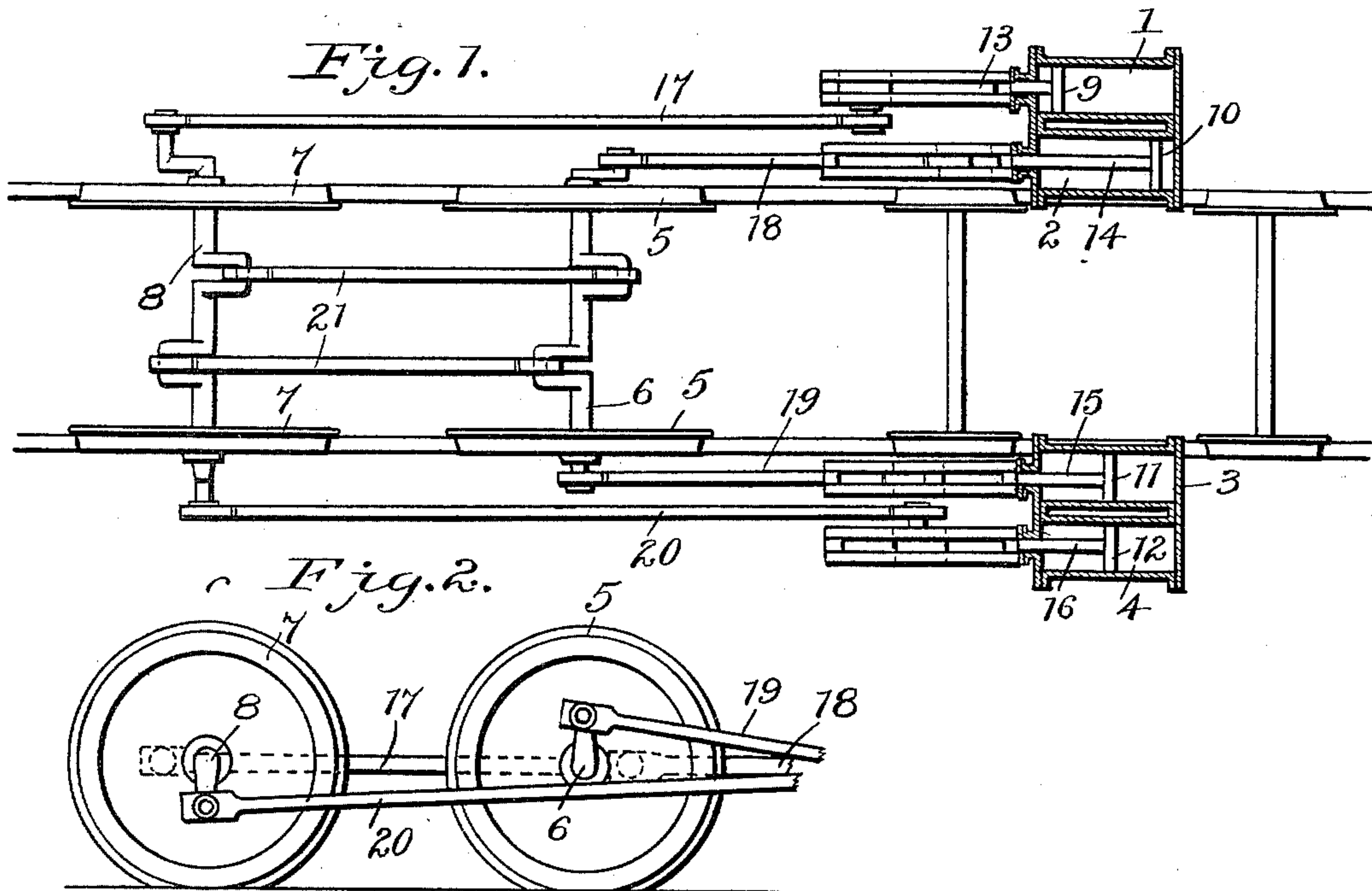
Patented June 6, 1899.

J. E. ROBERTS.  
LOCOMOTIVE ENGINE.

(Application filed Mar. 10, 1898.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses.

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2 Sheets—Sheet 2.

Fig. 4.

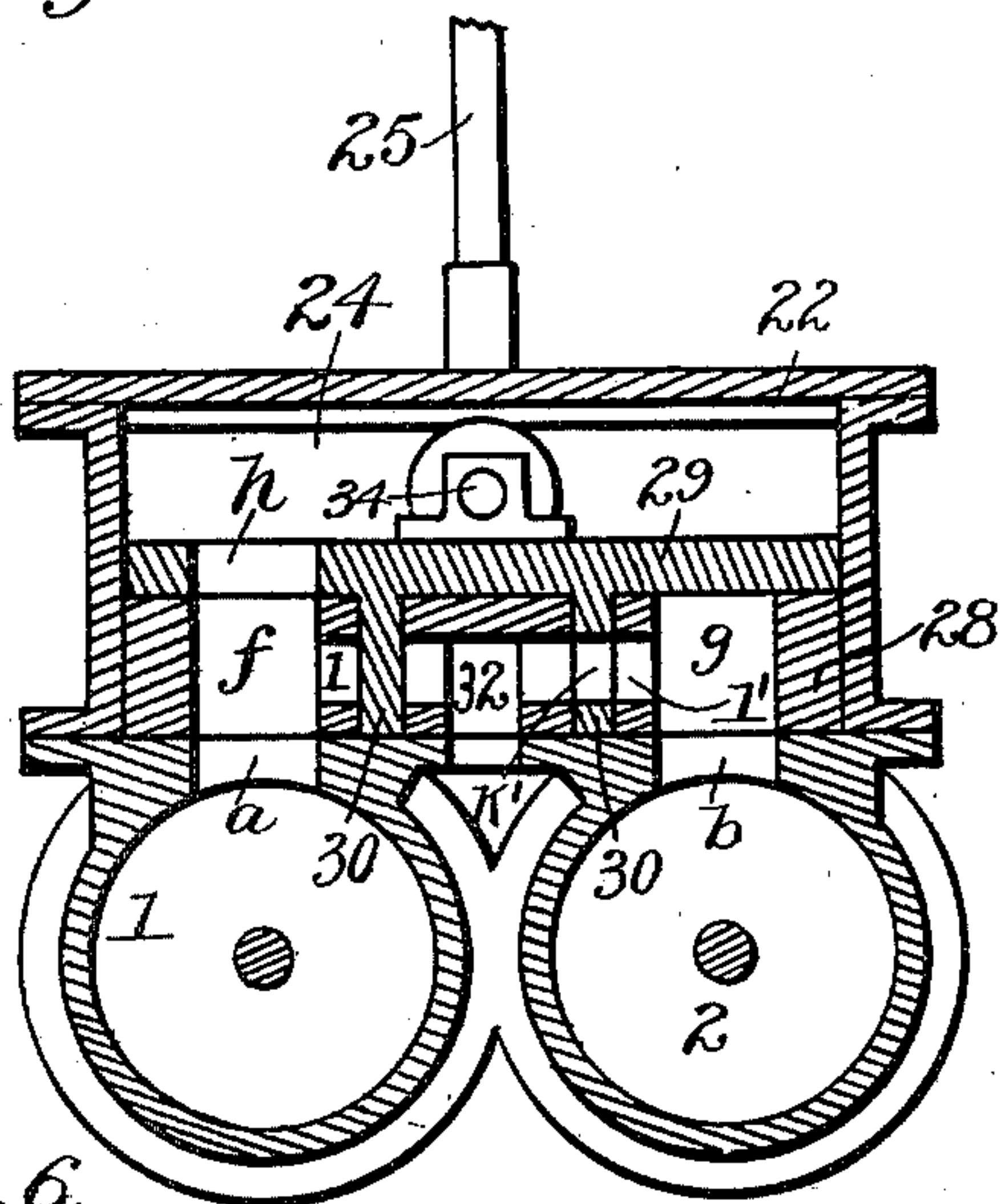


Fig. 5.

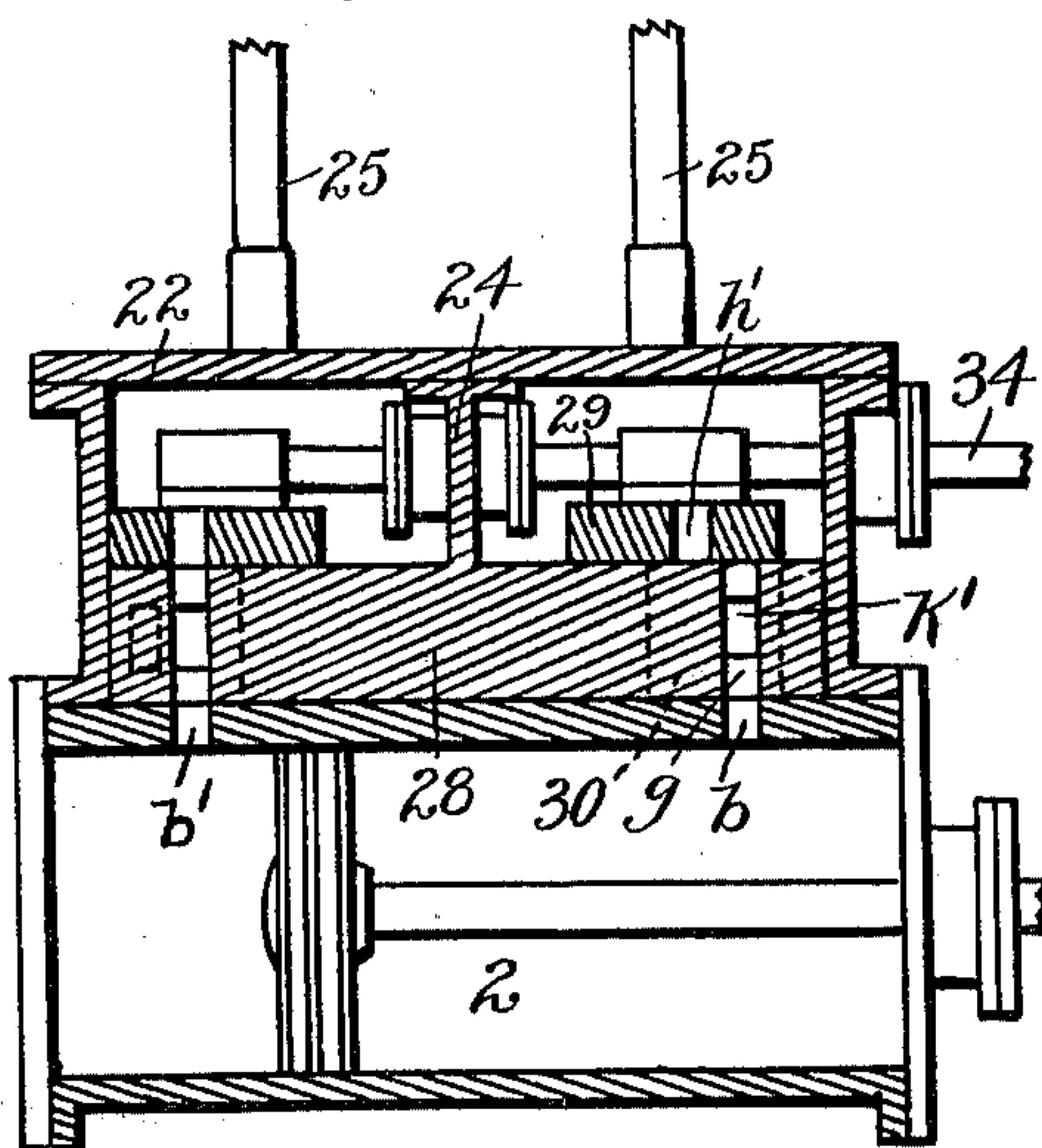


Fig. 6.

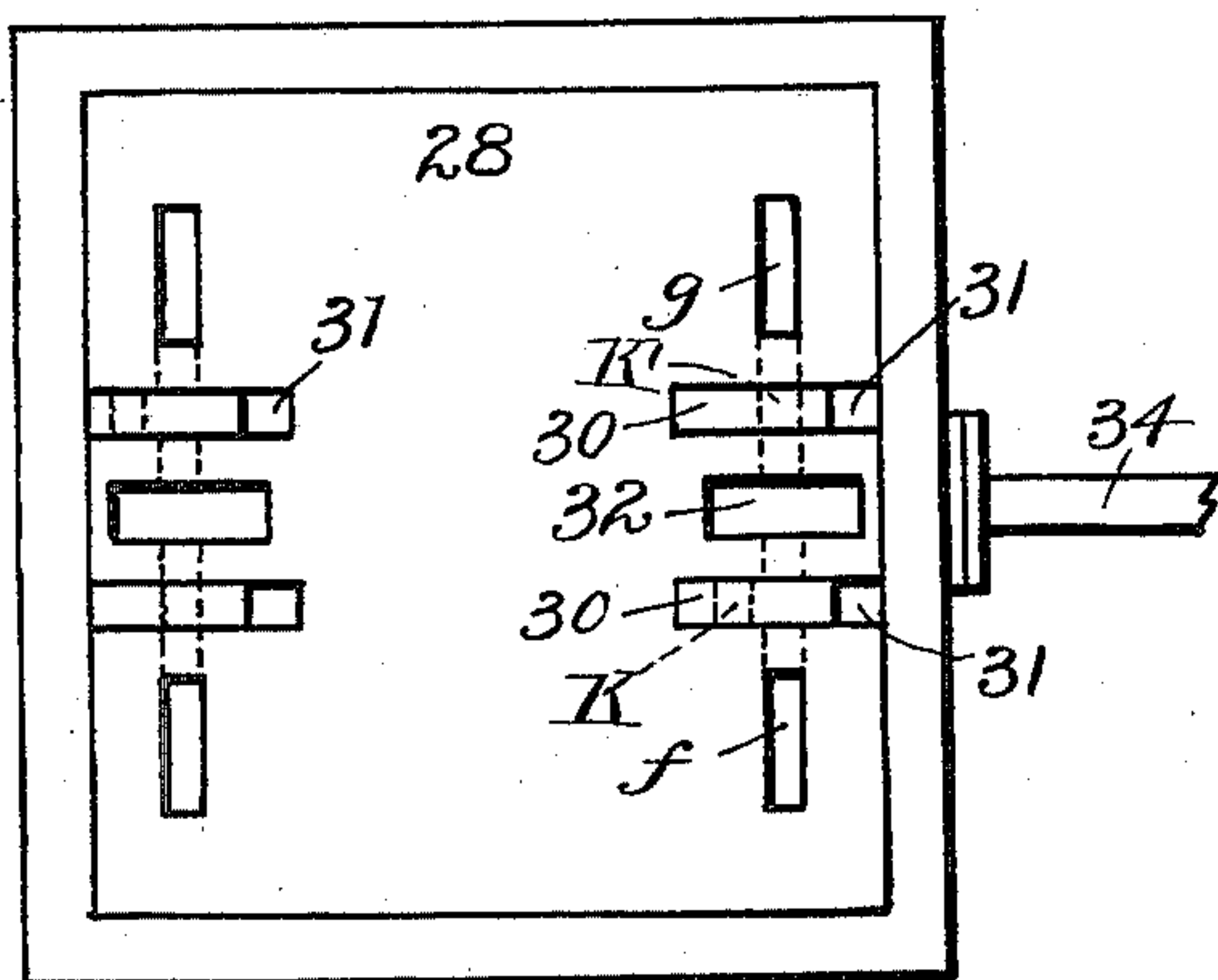


Fig. 7.

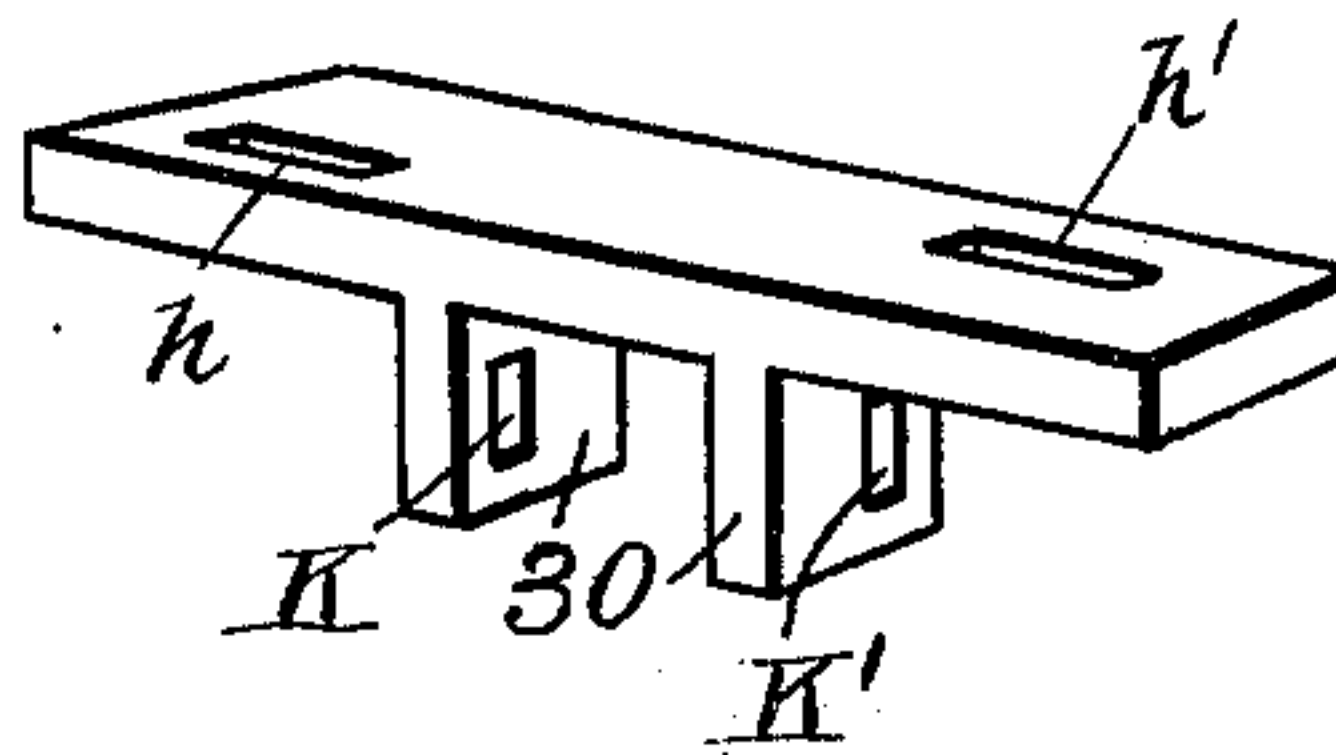
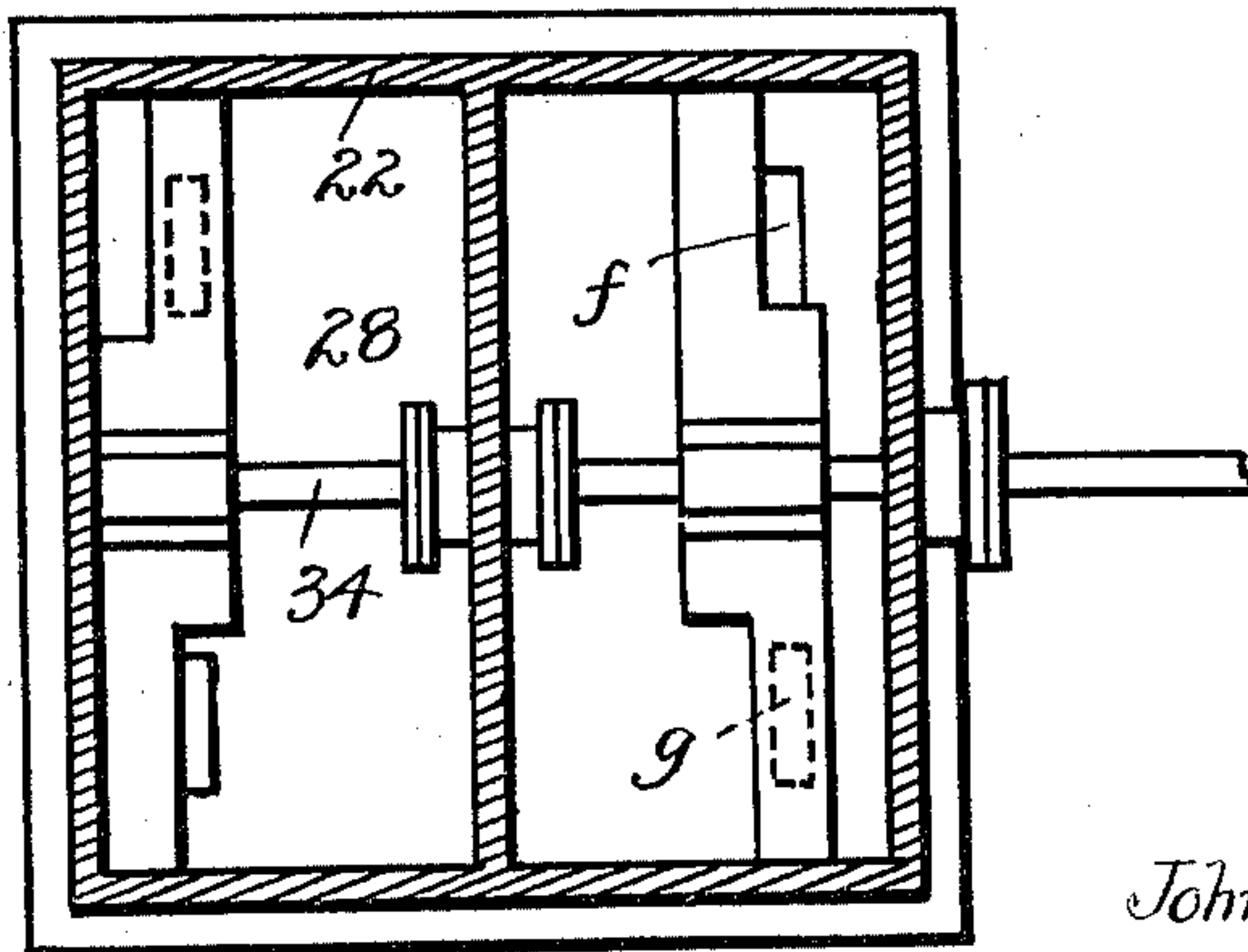


Fig. 8.



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# UNITED STATES PATENT OFFICE.

JOHN EDWARD ROBERTS, OF ONEDIA, KENTUCKY.

## LOCOMOTIVE-ENGINE.

SPECIFICATION forming part of Letters Patent No. 626,566, dated June 6, 1899.

Application filed March 10, 1898. Serial No. 673,381. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN EDWARD ROBERTS, a citizen of the United States, and a resident of Onedia, in the county of Clay and State of Kentucky, have invented certain new and useful Improvements in Locomotive-Engines; and I do 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, reference being had to the accompanying drawings, and to letters and figures of reference marked thereon, which form a part of this specification.

Figure 1 of the drawings is a plan view, partly in section, of a portion of a locomotive. Fig. 2 is a side view showing two of the driver-wheels and their connections. Fig. 3 is a horizontal section through one of the steam-chests. Fig. 4 is a transverse section on the line  $x x$ , Fig. 2. Fig. 5 is a longitudinal section on the line  $y y$ , Fig. 2. Fig. 6 is a plan view of the steam-chest removed and inverted. Fig. 7 is a detail perspective view of one of the valves. Fig. 8 is a horizontal sectional view of a steam-chest, showing a modified form of the valves.

This invention has relation to certain new and useful improvements in locomotive-engines of the single-acting type, the objects of the invention being, first, to overcome the jar or quiver of the locomotive which occurs in ordinary double-acting locomotive-engines upon the reversal of the valves, especially when running under high pressure; second, to provide means whereby the possibility of dead-centers is avoided, and, third, to utilize the full reactionary force of the steam admitted to the cylinders, and thereby increase the power of the engine with a given pressure of steam.

With these objects in view the invention consists in the novel construction and combination of parts, all as hereinafter described, and pointed out in the appended claims.

Referring to the accompanying drawings, the numerals 1, 2, 3, and 4 designate, respectively, four cylinders, two of which are placed side by side upon each side of the locomotive.

5 designates the front driving-wheels; 6, the axle thereof; 7, the rear driving-wheels, and 8 their axle.

9, 10, 11, and 12 are the four pistons, which work, respectively, in the cylinders 1, 2, 3, and 4.

13, 14, 15, and 16 designate the respective piston-rods, and 17, 18, 19, and 20 represent, respectively, the four connecting-rods. The rods 17 and 20, which are actuated by the pistons in the two outer cylinders 1 and 4, are connected to the respective cranked ends of the rear driving-wheel axle 8, while the rods 18 and 19 are connected to end cranks of the front driving-axle 6. The two end cranks of the axle 6 are set at ninety degrees to each other, as are also the cranks of the axle 8, and the two cranks of one axle are respectively at one hundred and eighty degrees from the corresponding cranks of the other axle. Said axles are each formed with two intermediate cranks, which are connected by rods 21. From this arrangement of the several cranks it will be seen that the pistons of each pair of cylinders will always be moving in opposite directions to each other and a full stroke apart and that the two pistons at one side will always be at different points of their strokes from the two cylinders at the opposite side.

Supported upon each pair of cylinders is a steam-chest 22 or 23 common to both cylinders, and these chests are each divided by a transverse partition 24 into two compartments. Each chest is supplied with steam by a branch 25 of a branched steam-pipe, having a valve under control of the engineer and by means of which steam may be let into either compartment of the chests and cut off from the other compartment.

Leading from the front compartment of the chest 22 to the forward end portion of the respective cylinders 1 and 2 are steam-feed ports  $a$  and  $b$ , and leading from the rear compartment of such chest to the rear end portions of the said cylinders are two similar ports  $a'$  and  $b'$ . The chest 23 has similarly-arranged ports leading from its respective compartments to the cylinders 3 and 4.

In each compartment of each chest is a valve 28, which is common to both cylinders. These four valves being in all respects duplicates of each other, the description will be confined to the valve which operates the ports  $a$  and



b. This valve consists of a stationary body portion, having the vertical portions *f* and *g* therethrough, which are respectively in line with the ports *a* and *b*, and of a top slide-plate 29, having ports *h* and *h'*, which are so arranged with respect to each other that when the port *h* is in line with the port *a* the port *h'* will not register with the port *b*, and vice versa. This plate has two depending flanges or wings 30, which work in slots 31 of the valve-body and which are provided with ports *k* and *k'*. Intersecting the said slots 31 and leading from the respective ports *f* and *g* to a common exhaust-chamber 32 are exhaust-ports *l l'*, and the ports *k k'* are so positioned with respect to these ports *l l'* that when the port *k* is in register with the port *l* the port *k'* will not register with the port *l'*. The slide-plate 29 is actuated by the usual eccentric-rod, and the two valves of each chest are connected by a rod 34, which extends through a suitably-packed opening in the partition 24. Said slide-plate may be of the form shown in Fig. 7, or it may be of the form shown in Fig. 8.

When the locomotive is running forward, steam is admitted to the forward compartments only of the steam-chests and the operation is as follows: When port *h* of the valve slide-plate comes in line with the port *f*, steam is admitted to the cylinder 1 in front of the piston, the exhaust-port of the said cylinder being closed. The exhaust-port of cylinder 2 is at this time open, while its feed-port *g* is closed. When the piston reaches the limit of its stroke, the valve reverses, the feed-port of cylinder 1 is closed, and its exhaust-port is opened, while at the same time the feed-port of cylinder 2 is opened and its exhaust-port is closed. The same operations take place, of course, at the cylinders 3 and 4, but at different times, corresponding to the differences in the positions of the cranks. To reverse the engine, steam is cut off from the forward compartments of the steam-chests and is admitted into the rear portions thereof. Thus it will be seen that whether the engine is running backward or forward steam is admitted only to the ends of the cylinders in the direction in which the locomotive is running, whereby the full reactionary force of the steam against the cylinder-head is utilized and the jar or quiver which occurs in double-acting engines due to the alternate admission of steam to opposite ends of the cylinders is avoided. It will also be seen that steam is always acting upon two of the pistons, and that inasmuch as the active pistons are always at different points in their strokes dead-centers are entirely overcome. The connection between the front and rear driving-axles prevents slipping of the drive-wheels in starting.

Although in the arrangement described it is necessary to operate all four of the sliding valve-plates, while but two of such valves are

acting at any time, there is no material loss therefrom, since the two idle valves move with but little friction, being free from steam-pressure.

I do not limit myself to the use of the particular valve mechanism herein shown and described, as various other arrangements thereof may obviously be employed.

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

1. In a locomotive, the combination with the front and rear driving-axles, of the four cylinders, two upon each side, the four pistons, two of which are connected to one of said axles, and the other two to the other axle, one piston upon each side of the locomotive being connected to the same axle, transversely-divided steam-chests, each of which is common to two of said cylinders, ports leading from each compartment of each steam-chest to the corresponding end portion of both cylinders at that side, means for supplying steam to that compartment of each steam-chest which is in the direction of movement of the locomotive, and valves controlling said ports to admit steam alternately to the two cylinders of each pair in a direction opposite to the direction of travel of the locomotive, substantially as specified.

2. In a locomotive, a pair of adjacent cylinders, a piston in each cylinder, one of said pistons being connected with one driving-axle and the other to the other driving-axle, a steam-chest common to both cylinders, and divided transversely into two compartments, means whereby steam may be admitted to either one of said compartments, and shut off from the other compartment, ports leading from each compartment to the corresponding end portions of each cylinder, and a valve in each compartment adapted to control said ports to alternately admit steam to the cylinders in a direction opposite to the direction of travel of the locomotive, substantially as specified.

3. The combination with a pair of steam-cylinders placed side by side, of a steam-chest divided transversely into two steam-compartments one of which has two steam-ports leading to the rear portions of the respective cylinders, and the other two similar ports leading to the forward portion of said cylinders, a valve located in each of said compartments and consisting of a stationary portion having vertical ports which communicate respectively with the steam-ports leading from that compartment to the cylinders, an exhaust-chamber intermediate of said ports, vertical slots located between the exhaust-chamber and the respective vertical ports, and ports leading from said vertical ports to the exhaust-chamber and intersecting said slots, and a sliding portion having cut-away portions arranged to alternately register with said vertical ports, and also having depending wings



or flanges which engage and reciprocate in said vertical slots, said wings or flanges having ports therethrough, together with means for actuating said sliding portion and means  
5 whereby steam may be admitted to either one of the said compartments, substantially as specified.

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

JOHN EDWARD ROBERTS.

Witnesses:

JAS. H. JEFFRIES,  
D. W. MANNING.