

(No Model.)

3 Sheets—Sheet 1.

G. S. KING.
REVERSING GEAR.

No. 334,238.

Patented Jan. 12, 1886.

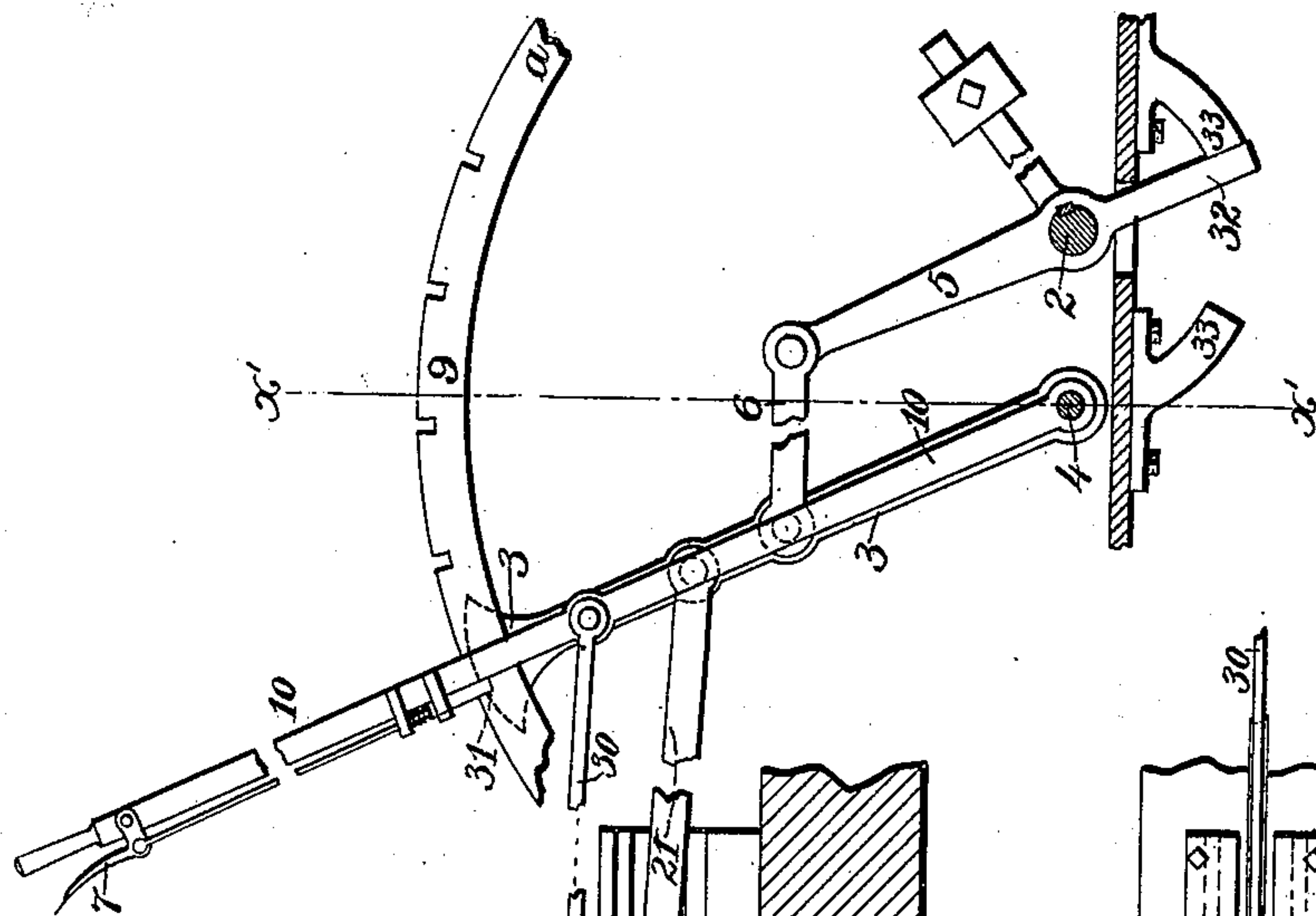


Fig. 1.

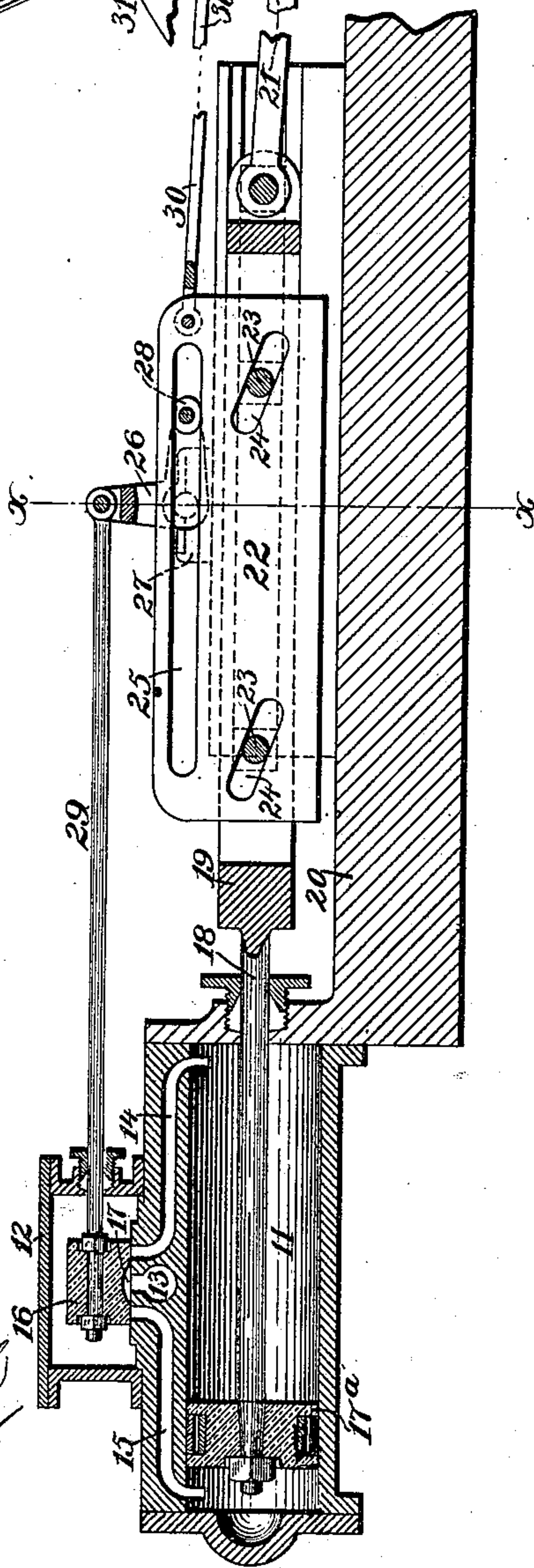
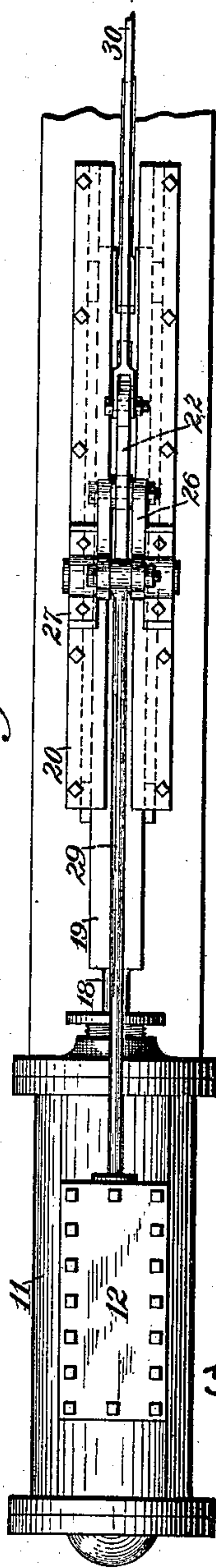


Fig. 1.



Witnesses.
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Bakerwell & Kern

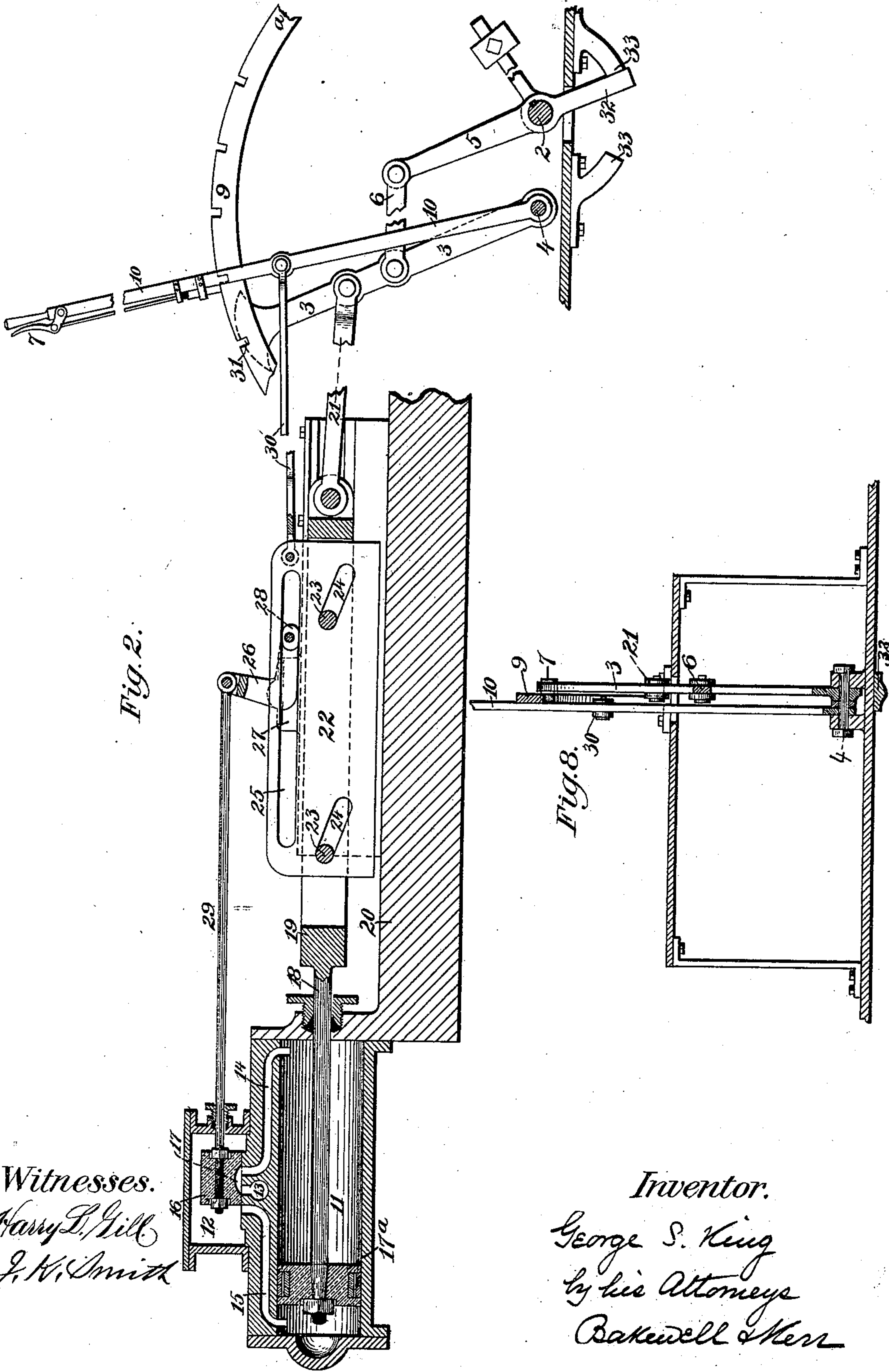
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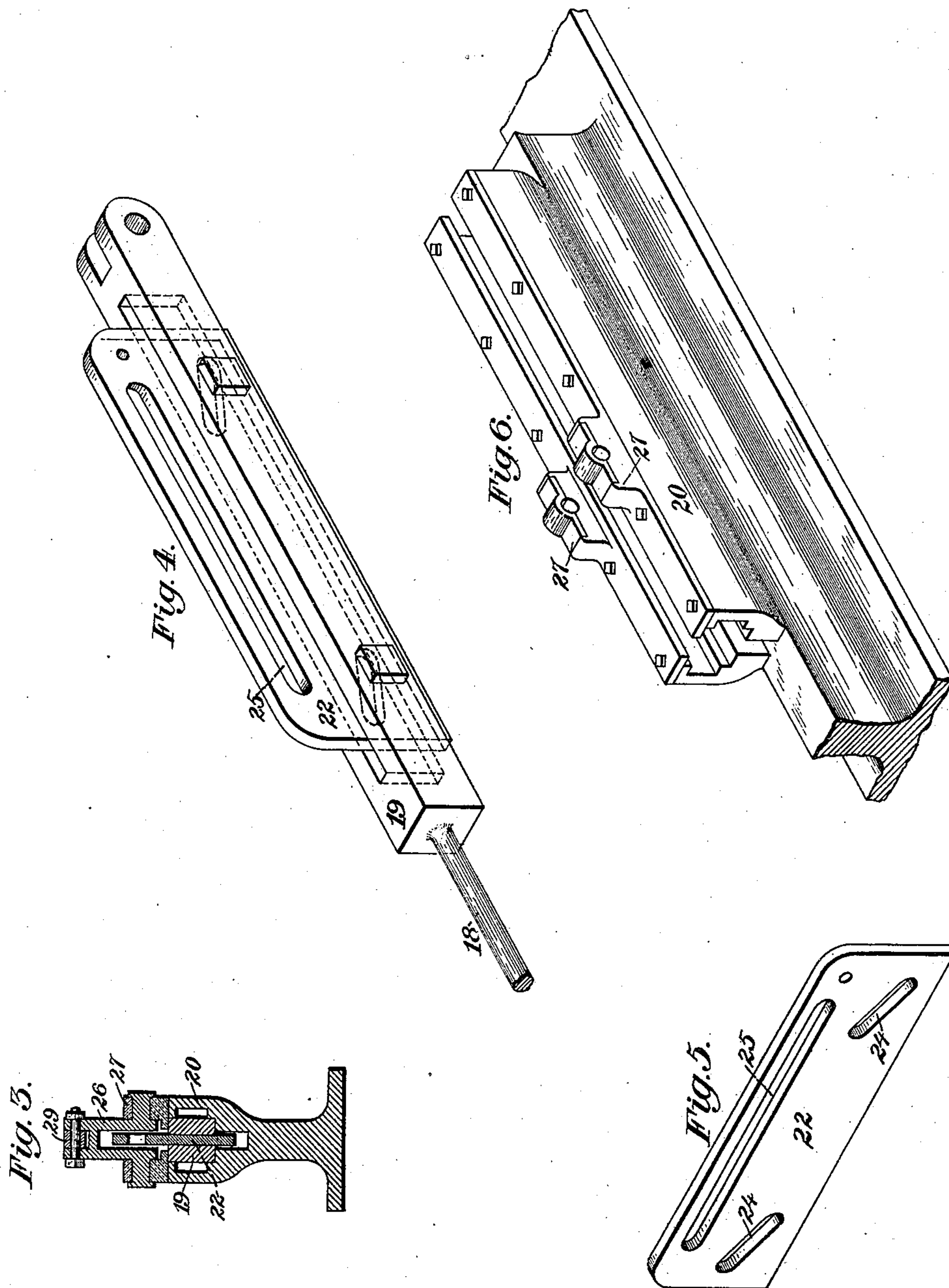


Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

Witnesses.

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UNITED STATES PATENT OFFICE.

GEORGE S. KING, OF PITTSBURG, PENNSYLVANIA.

REVERSING-GEAR.

SPECIFICATION forming part of Letters Patent No. 334,238, dated January 12, 1886.

Application filed May 15, 1885. Serial No. 165,597. (No model.)

To all whom it may concern:

Be it known that I, GEORGE S. KING, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Reversing Engines; and I do hereby declare the following to be a full, clear, and exact description thereof.

It is well known that in order to operate the reversing-levers of steam-engines, especially those of the class used on steam-vessels and locomotives, a considerable degree of force has to be expended.

It is the object of my invention to better this by providing for the operation of this lever and analogous mechanism by an auxiliary engine constructed and connected with its driven parts in a novel and peculiar manner.

In the accompanying drawings, which form part of this specification, Figure 1 is a longitudinal section of my improved mechanism. Fig. 2 is a similar view of the same when occupying a different position. Fig. 3 is a vertical cross-section on the line xx of Fig. 1. Figs. 4, 5, and 6 are perspective views of parts. Fig. 7 is a plan view. Fig. 8 is a section on the line $x'x'$ of Fig. 1.

Like letters of reference indicate like parts.

In the drawings, 2 represents the rotary shaft which operates the links commonly used in reversing the valves of steam-engines. This shaft is connected with a reversing-lever, 3, by intermediate connecting-levers, 5 and 6. A hand-lever, 10, of the usual type is pivoted preferably at the same point 4 with the lever 3, and is provided with a trigger-latch, 7, working on a notched quadrant, 9, in the ordinary manner.

My invention consists, chiefly, in the combination of the reversing-lever 3 with a motor-engine, such as is shown in Figs. 1 and 2. Thus 11 represents a steam-cylinder which is independent of the driving-cylinders of the engines, and receives its steam from a pipe leading from the boiler into a steam-chest, 12, mounted on the cylinder in the usual way, and communicating therewith through ports 14 and 15. The sliding valve 16, which is within the steam-chest 12, has the usual port, 17, for connecting a discharge-port, 13, with either of the passages 14 or 15 desired. The

cylinder 11 has a piston, 17^a, and piston-rod 18, connected therewith and extending outside of the cylinder, where it is connected with a sliding bar, 19. When the parts of the steam-chest and cylinder are in the relative positions shown in Fig. 2, the admission of steam into the steam-chest 12 would drive the piston-rod 18 forward in a manner which will be readily understood. When, however, they are in the position shown in Fig. 1, with the valve in the middle of its seat steam will be cut off from the cylinder and the piston held at rest.

The bar 19 is shown in detail in Figs. 3 and 4. It is slotted longitudinally and vertically for the reception of a sliding plate, hereinafter to be described, and is itself mounted within a frame, 20, which permits a free longitudinal motion to the bar as the piston moves backward and forward in the cylinder. The bar 19 is further connected with the reversing-lever 3 by a connecting-rod, 21, which is pivoted to each of these parts. Motion of the piston will therefore correspondingly move the lever 3, and will turn the shaft 2 by means of its intermediate mechanism. A plate, 22, which is vertically mounted within the slot of the bar 19, is held therein by pins 23, which pass through the bar and through slots 24, made through the plate 22, and slightly inclined upward from a horizontal plane. The slot in the bar 19 is made so much longer than the plate 22 as to allow the latter to be moved longitudinally through the length of the slots 24. If the plate 22 be moved forward from the position shown in Fig. 1, the action of the fixed pins 23 upon the sides of the slots 24 will be to depress the plate within in its slot into the position shown in Fig. 2. The upper part of plate 22 is provided with a longitudinal slot, 25, whose length is equal to that of the stroke of the piston 17^a, plus the length of one of the slots 24. A bell-crank lever, 26, is pivoted within cheeks 27 on the upper face of the frame 20, and the end of one of its arms has a block or roller, 28, which fits within the slot 25, while the other end of the lever is pivoted to the valve-rod 29 of the steam-chest. As before explained, a forward movement of the sliding plate 22 will depress it, and will also depress

the end 28 of the lever 26, so as to move the valve 16 forward. The length of the slots 24 and of the lever are so regulated that a movement of the plate so as to bring the pins 23 from one end of the slots to the other will just reverse the direction of the steam, and that when the pins are in the middle of their slots the valve will be in the middle of its seat, cutting off both ports 14 and 15 from the steam-chest. The plate 22 is connected with the hand-lever 10 by a rod, 30.

Suppose, now, the parts to be in the position shown in Fig. 1, and it is desired to turn the shaft 2, so as to reverse the engine, the engineer seizes the hand-lever 10, and, having disengaged the trigger-latch 7 from its notch in the quadrant 9, pulls the lever forward for a short distance, as shown in Fig. 2. The effect of this is to admit steam behind the piston 17^a, which will move the piston, the bar 19, and the reversing-lever 3 toward the lever 10.

It will be observed that the lever 10 cannot be moved from the position of Fig. 1 more than one-half the length of the slots 24, because then the ends of these slots engage their pins 23, and any further strain upon the lever will be exerted upon the bar 19, and upon its reversing-lever 3. If, therefore, the lever 10 be pulled continuously, so as to keep the pins 23 at the end of their slots, the valve 16 will be kept open and the piston and reversing-lever continuously moved in the same direction with the hand-lever and following it. I call this a "positive motion," because it is regular and continuous with the movement of the hand-lever, and because if the steam in the cylinder be not enough to move the piston the engineer's force put on the hand-lever will aid in moving the reversing-lever, and if the steam be for any reason cut off altogether the lever 3 may be moved by the hand-lever alone.

This feature of my invention is important, because it serves as a means to prevent danger, which has hitherto existed in the use of auxiliary reversing-engines. In some cases it has occurred that the steam has, for some reason, been stopped from entering the steam-chest of the auxiliary reversing-engine, and on the engineer moving his hand-lever to reverse the engine the hand-lever moved as usual, but the reversing-lever remained stationary. Unless the engineer was in sight of his engine, he would have no means of detecting such occurrence, and where the reversing-engine is used in connection with inclined railways or with the steering apparatus of steamboats serious results might ensue. This could not happen with the use of my improvement, where the hand-lever is connected with the piston-bar, as well as with the reversing-valve, because if the steam be cut off from the latter the strain on the hand-lever will be exerted upon the reversing-lever, and the engineer will have an opportunity either to stop the engine or to apply sufficient force to the hand-lever to reverse it. The purpose of the slots

24 and pins 23 is therefore twofold; first, to impart such a motion to the plate 22 when it is moved lengthwise as to operate the valve; and, second, to cause the plate to be connected with the piston-bar when the former has been moved far enough to open the valve in either direction. Equivalent devices—such as a plate mounted in an inclined slot and provided with a stop or stops at the ends of the slots—may be employed instead of the plate 22 and slots 24, and I desire to cover such by the claims of this specification. As soon as the hand-lever 10 is stopped and held so, it also checks the forward motion of the plate 22. Then as the bar 19 moves forward with the piston 17^a by expansion of the steam, the action of the pins 23 upon the slots 24 is to raise the plate, and through the bell-crank 26 to move the valve 16 backward. As soon, however, as this valve reaches the middle of its seat, as shown in Fig. 1, which will be when lever 3 travels one-half the length of slot 24, the steam will be cut off and the piston and reversing-lever will be stopped immediately.

The upper end or head of the lever 3 has a notch, 31, adapted to fit the trigger-latch 7, and to be engaged therewith while the latch is in any of the notches in the quadrant 9—*i. e.*, a partial movement of the trigger will detach it from the reversing-lever, and a still further movement will detach it from the quadrant also. The notch 31 is so placed on the head of the lever 3 that when the parts are in the position just described—*i. e.*, with the valve 16 in the middle of its seat—the notch will be in exact opposition to the latch of the trigger 7. If, then, the lever 10 be moved to one of the notches of the quadrant, the latch will engage both of the latter and the reversing-lever. The advantage of this arrangement is that if the engineer should drop the reversing-lever 10 by accident and its friction with any other part should move it onward, as soon as it reaches a notch on the quadrant it will be stopped by the latch 7, and as the lever 3 reaches it the latter will also be caught by the latch and held.

The purpose of the connection of the lever 10 with the plate 22 is important. If it were not for this, the reversing-lever, when started, would move with violence to the end of its stroke, and practically without control of the engineer; but, as described, the construction enables the reversing-shaft to be stopped at any desired position by a simple checking of the hand-lever, the interval of time and distance being almost inappreciable. The reversing-lever cannot pass the hand-lever without cutting off the steam from the cylinder and stopping itself. The action of the lever 10 by the engineer is therefore similar to the action of the reversing hand-lever now in use, because it is positive and immediate, but differs therefrom to a great degree in the amount of exertion required.

In my improvement the only machinery to be moved by the engineer is the hand-lever, on

which there is but little friction, while in the other case not only the lever but the reversing-shaft and links have all to be worked and a great and useless expenditure of energy required.

It has been observed that the length of the slot 25 is equal to the stroke of the piston, plus the longitudinal stroke of the plate 22 in its slot in the bar 19. The purpose of this is that the plate may be moved with the levers 3 and 10 from one end of the quadrant to the other without interfering with the end 28 of the lever 26. The stroke of the piston is about equal to the chord of the quadrant 9.

The reverse movement of the shaft 2 from that last described is accomplished in a like manner by a backward movement of the lever 10. Thus, starting from the end of the quadrant 9, (marked *a*,) a back move of the hand-lever will raise the plate 22, and admitting steam in front of the piston 17^a will throw the reversing-lever 3 toward the cylinder.

In order to regulate the limits of motion of the shaft 2, it may be provided with a projecting arm, 32, and stops 33, which engage this arm at its forward and backward limits of movement respectively. This arrangement prevents any unnecessary jarring of the parts of the mechanism.

It will be noticed that if my improvement be connected with other apparatus besides the reversing mechanism of steam-engine it will work in the same manner. Thus it will be useful in the controlling of cranes and elevators, and in steering vessels, or in the management of any other machine requiring a certain positive motion which should be capable of being stopped, started, and reversed suddenly and easily, and whose limits should be accurately regulable by the engineer.

The application of my improvement to these and analogous uses is obvious, and needs no further explanation.

Instead of the use of steam to operate the piston in the cylinder 11, compressed air, water, gas, or any other suitable motor may be used.

I do not desire to limit myself to the specific form of the parts herein described and shown; but

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

1. The combination, in a steam-engine, of a reversing-lever, a piston connected therewith and capable of moving the same, a valve for admitting steam to the piston and for cutting it off, and a hand-lever for moving the valve, said hand-lever being connected both with the valve and with the reversing lever or piston, whereby movement thereof will not only move the valve, but will exert a strain on the reversing-lever, substantially as and for the purposes described.

2. The combination of a reversing-lever, a piston connected therewith and capable of actuating the same, a valve for admitting steam to the piston and for cutting off the same, a piston-bar, and a plate movably mounted thereon connected with said valve, and capable of moving so as to operate the same when the plate and piston-bar are moved relatively to one another, substantially as and for the purposes described.

3. The combination of a reversing-lever, a piston connected therewith and capable of actuating the same, a valve for admitting steam to the piston and for cutting it off, a piston-bar, and a plate mounted thereon and provided with means for imparting a vertical motion to the plate when a longitudinal motion relative to the bar is given thereto, said plate being connected with the valve and capable of operating the same by its vertical movements, substantially as and for the purposes described.

4. The combination of a reversing-lever, a piston connected therewith and capable of actuating the same, a valve for admitting steam to the piston and for cutting it off, a piston-bar, a plate mounted thereon and provided with means for imparting a vertical motion to the plate when a longitudinal motion relative to the bar is given thereto, said plate being connected with the valve and capable of operating the same by the vertical movements of the former, and a hand-lever connected with said plate for moving it longitudinally, substantially as and for the purposes described.

5. The combination of a reversing-lever, a piston connected therewith and capable of actuating the same, a valve for admitting steam to the piston and for cutting off the same, a piston-bar, a plate mounted thereon and provided with means for imparting a vertical motion to the plate when a longitudinal motion relative to the bar is given thereto, said plate being connected with the piston and capable of operating the same by the vertical movements of the former, and a hand-lever connected with said plate for moving it longitudinally, said plate being provided with a stop consisting either of the end of a slot acting on a pin, or other suitable stop for causing a strain upon the plate to be exerted on the piston-bar after the former has been moved far enough to open said valve, substantially as and for the purposes described.

In testimony whereof I have hereunto set my hand this 22d day of April, A. D. 1885.

GEORGE S. KING.

Witnesses:

F. W. BAKEWELL,
JOHN S. KENNEDY.