

No. 891,411.

PATENTED JUNE 23, 1908.

F. DUFFY.  
SWITCH OPERATING APPARATUS.

APPLICATION FILED JAN. 25, 1908.

3 SHEETS—SHEET 1.

Fig. 1.

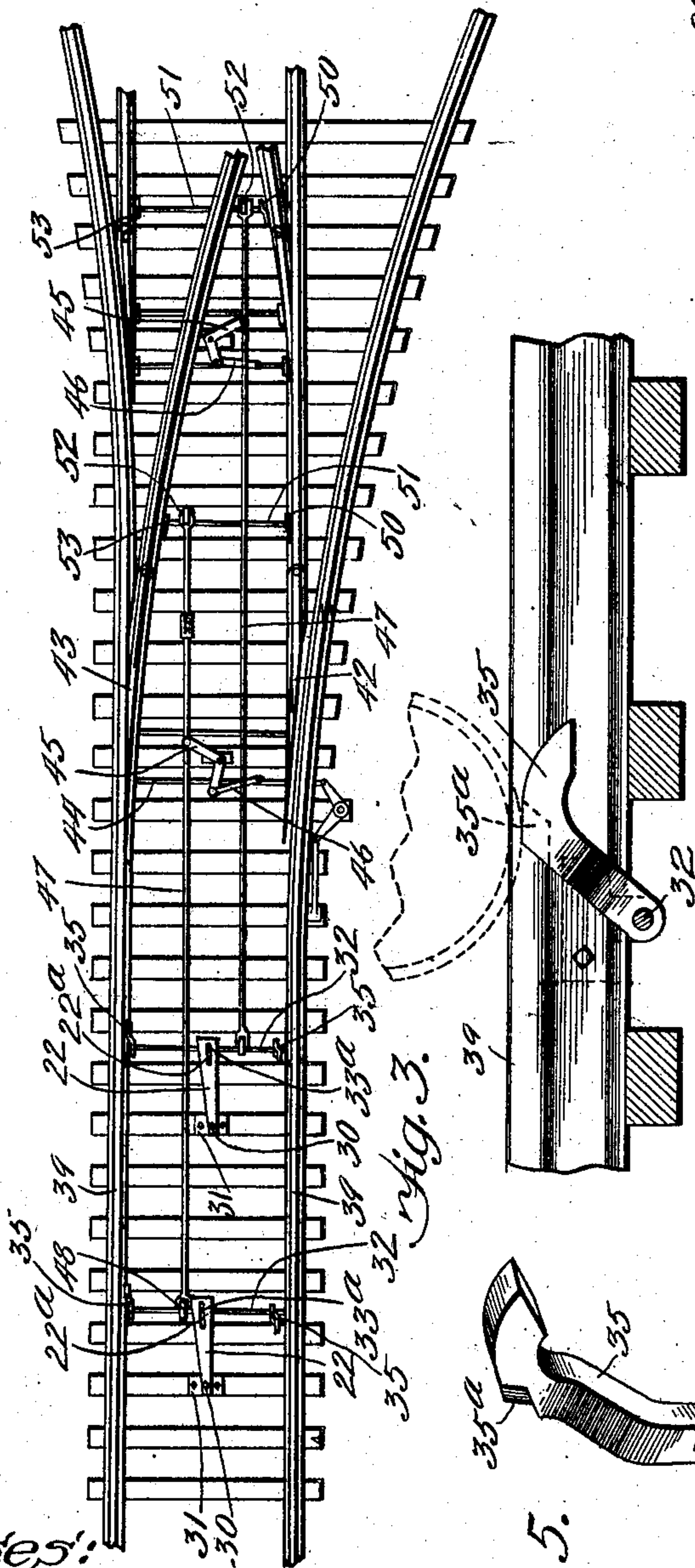


Fig. 3.

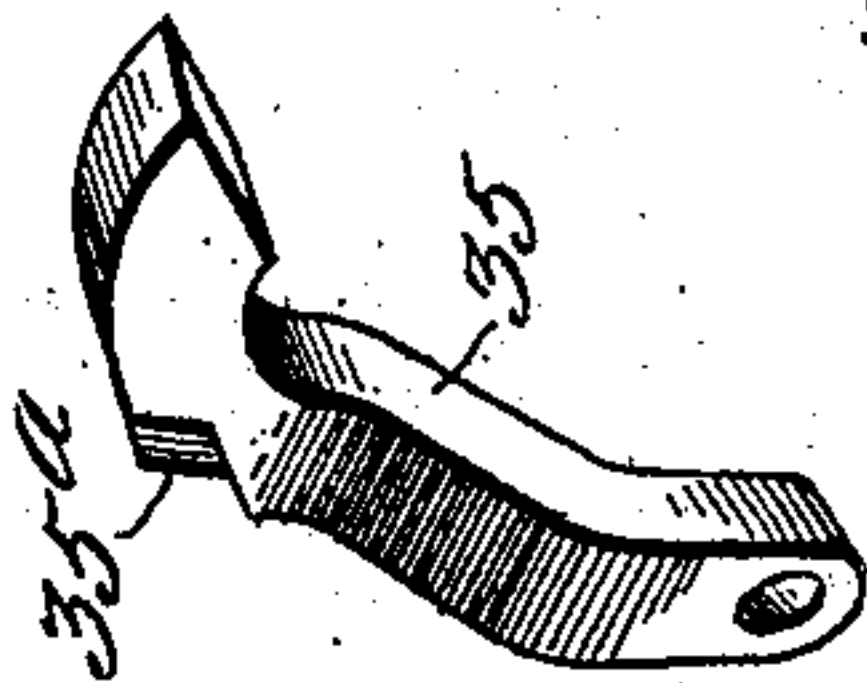


Fig. 5.

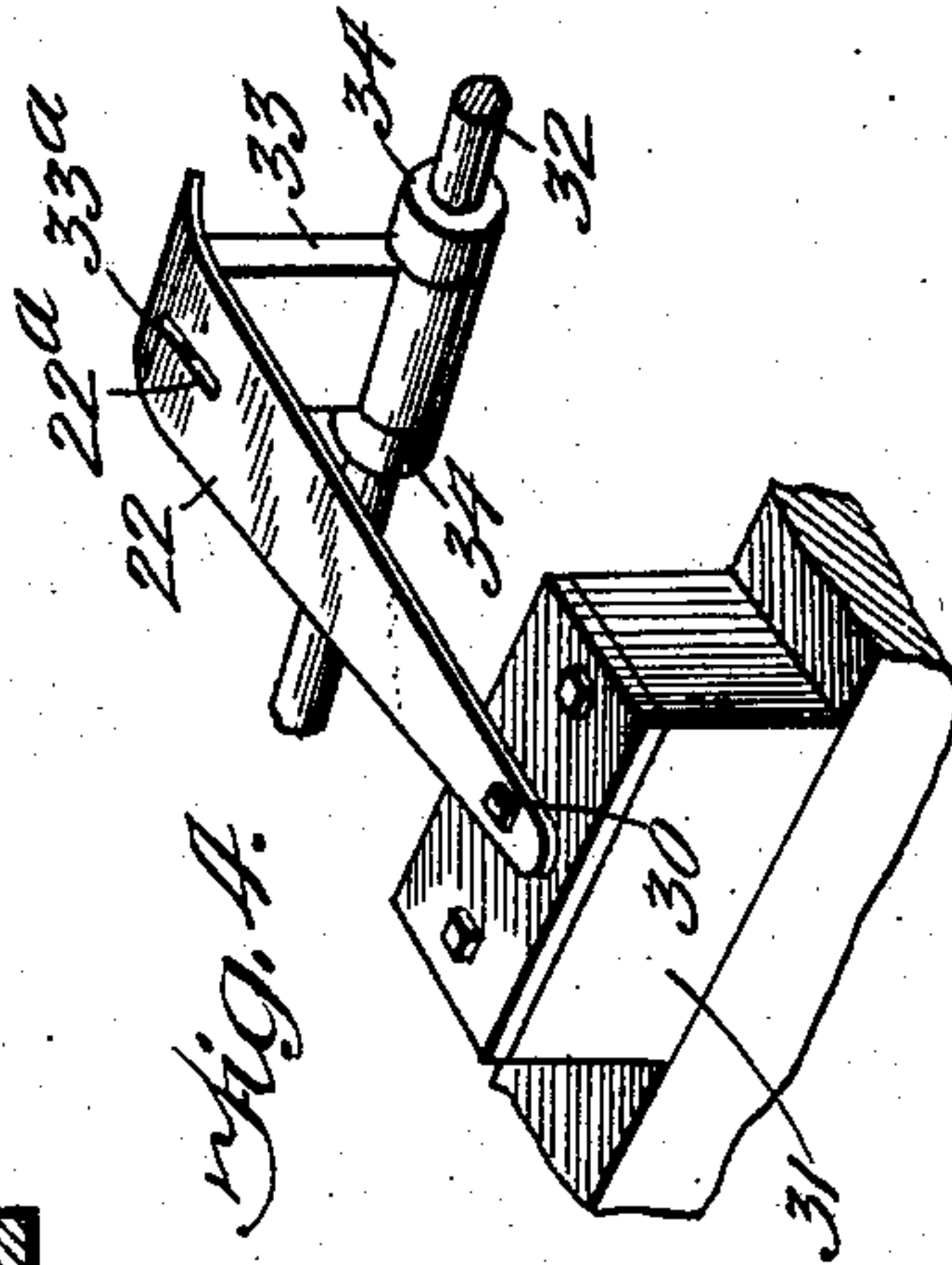
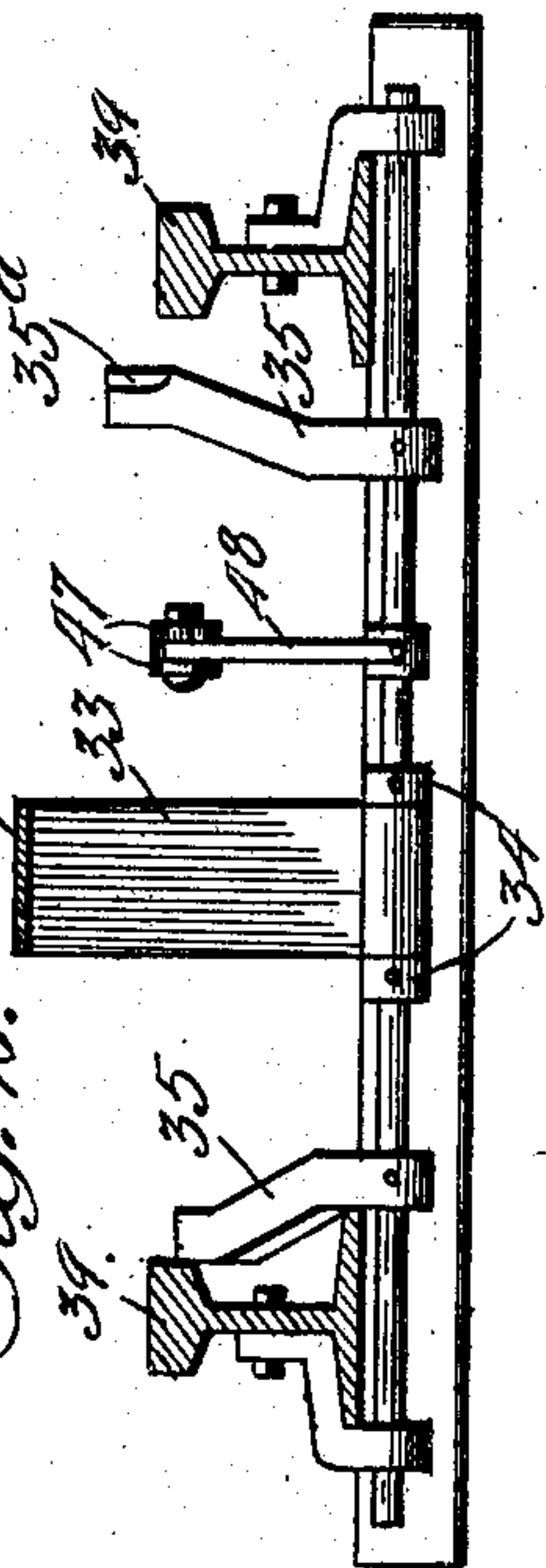


Fig. 2.



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Fig. 6.

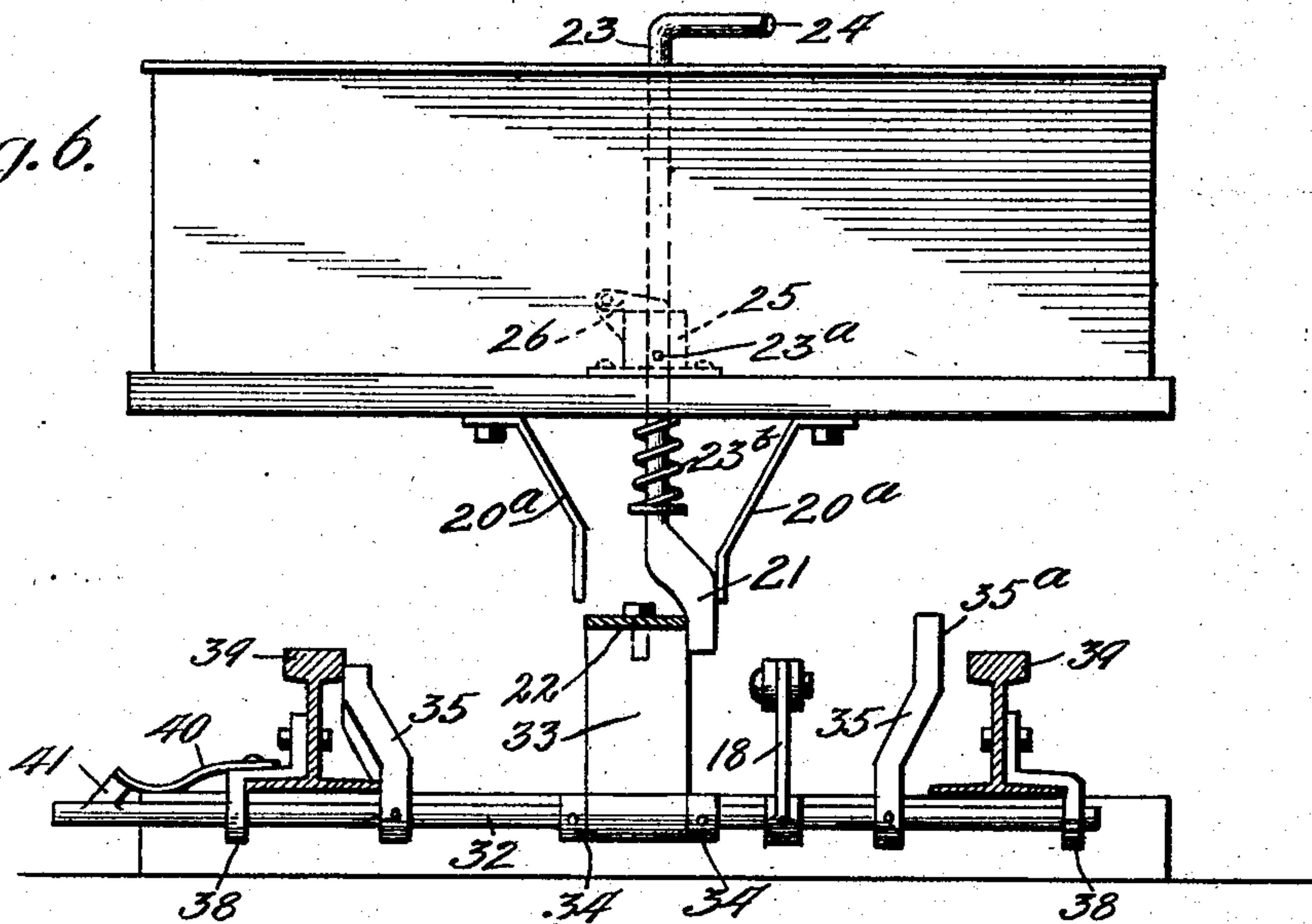


Fig. 7.

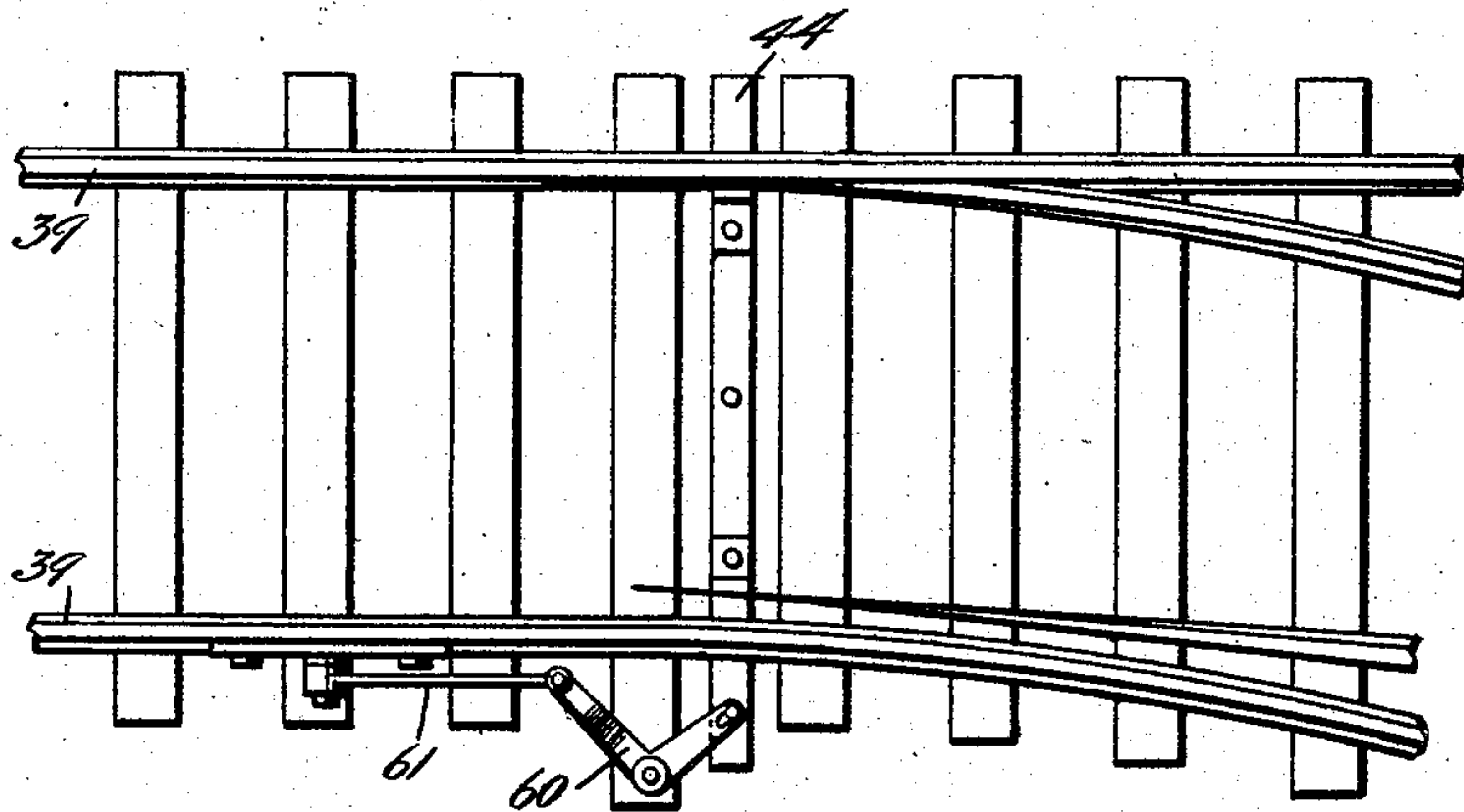
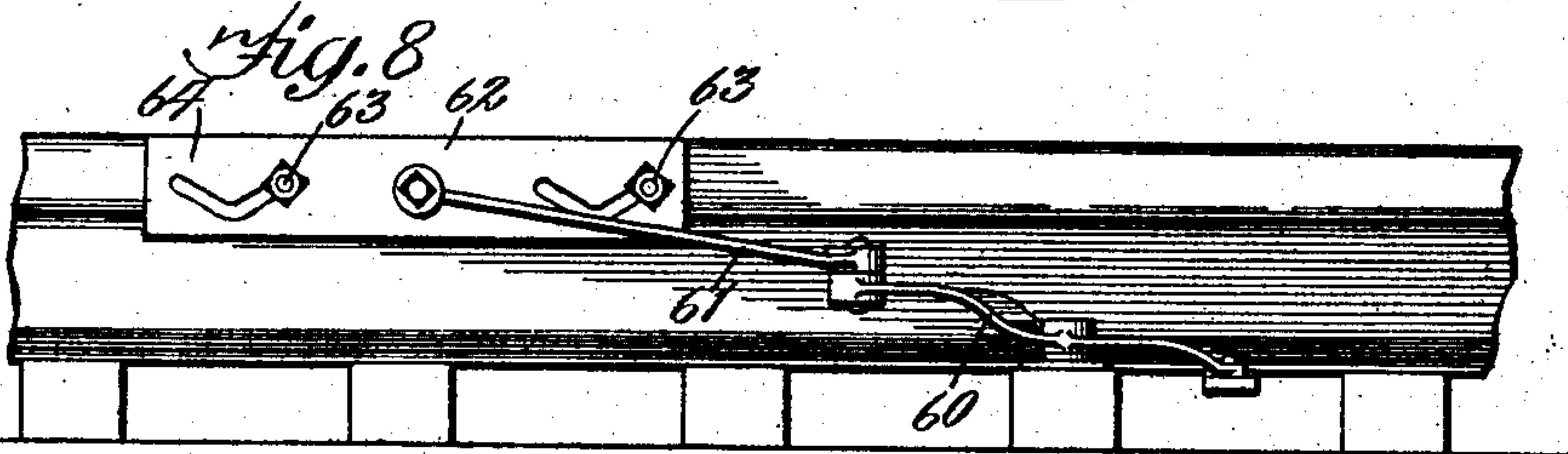


Fig. 8.



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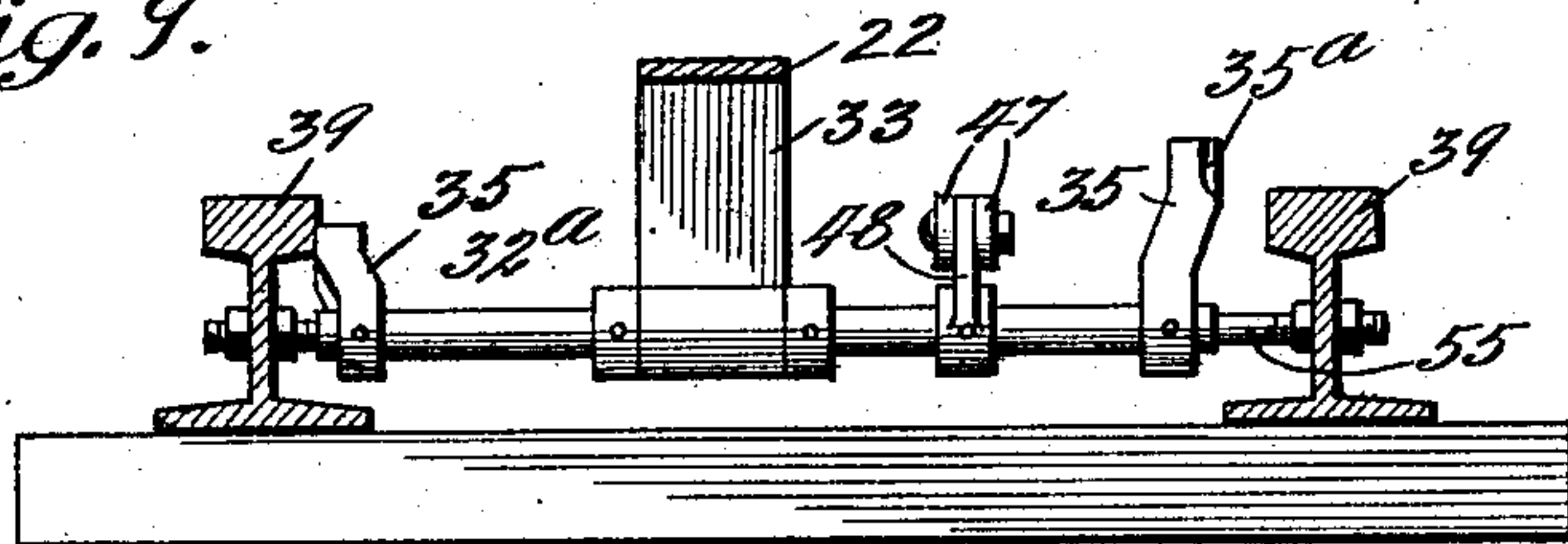
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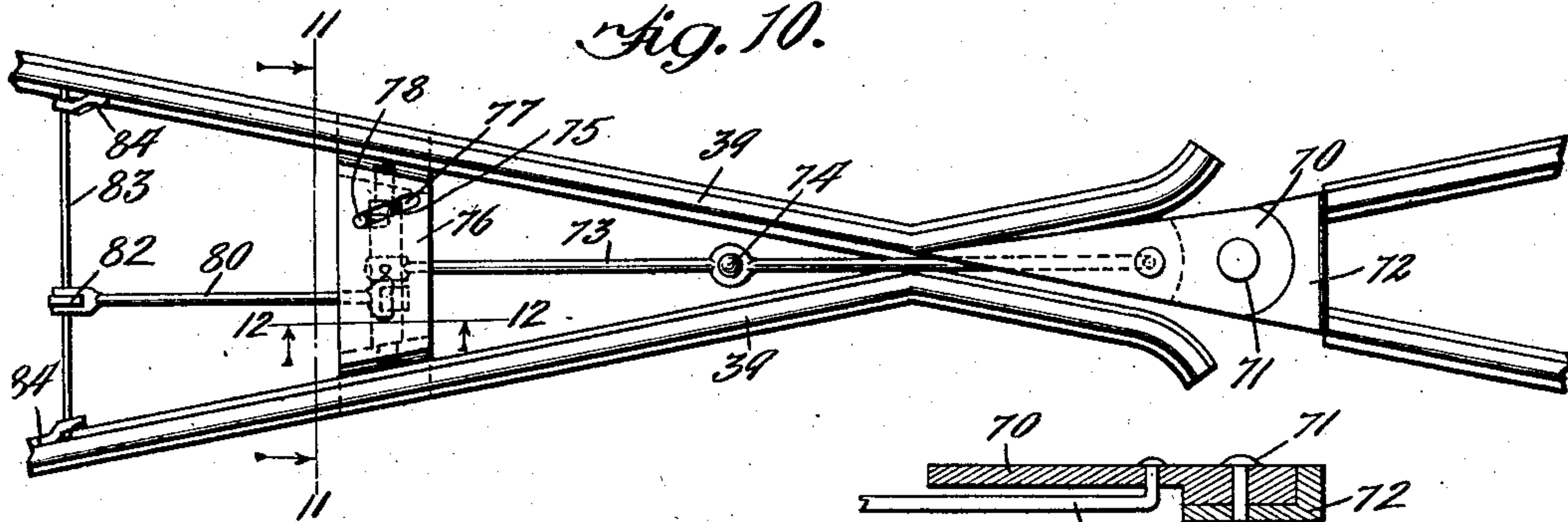
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3 SHEETS—SHEET 3.

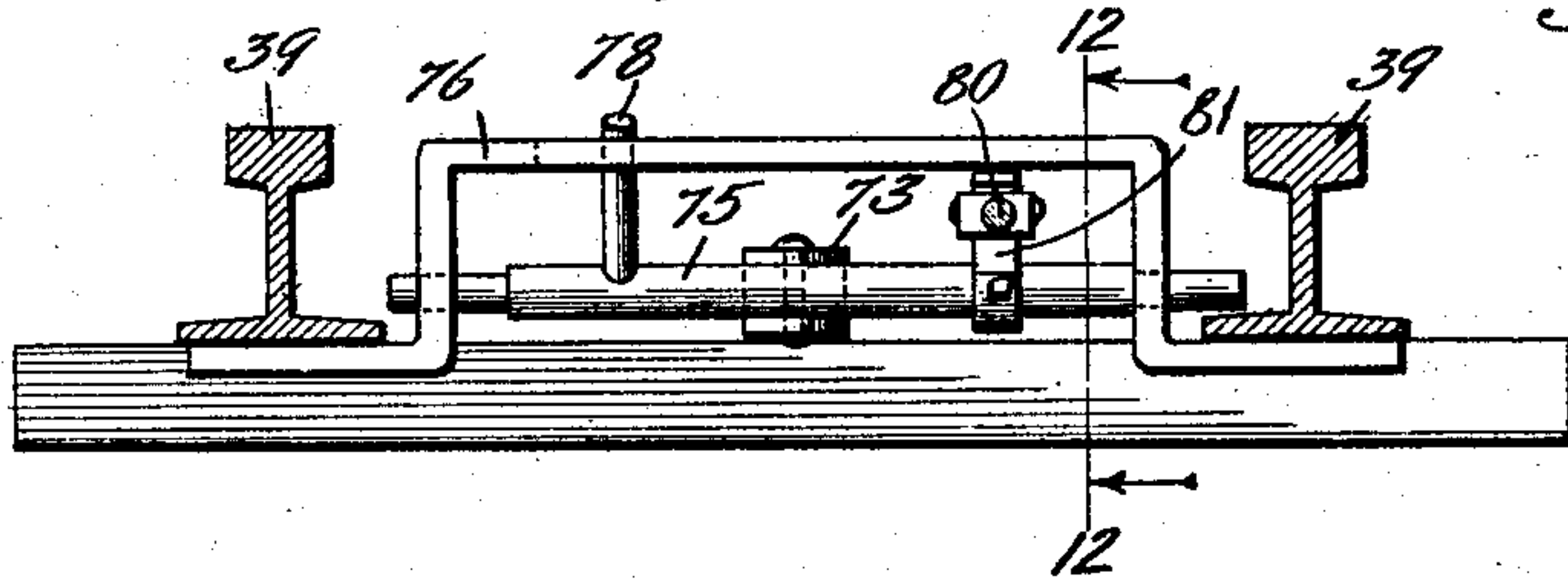
*Fig. 9.*



*Fig. 10.*

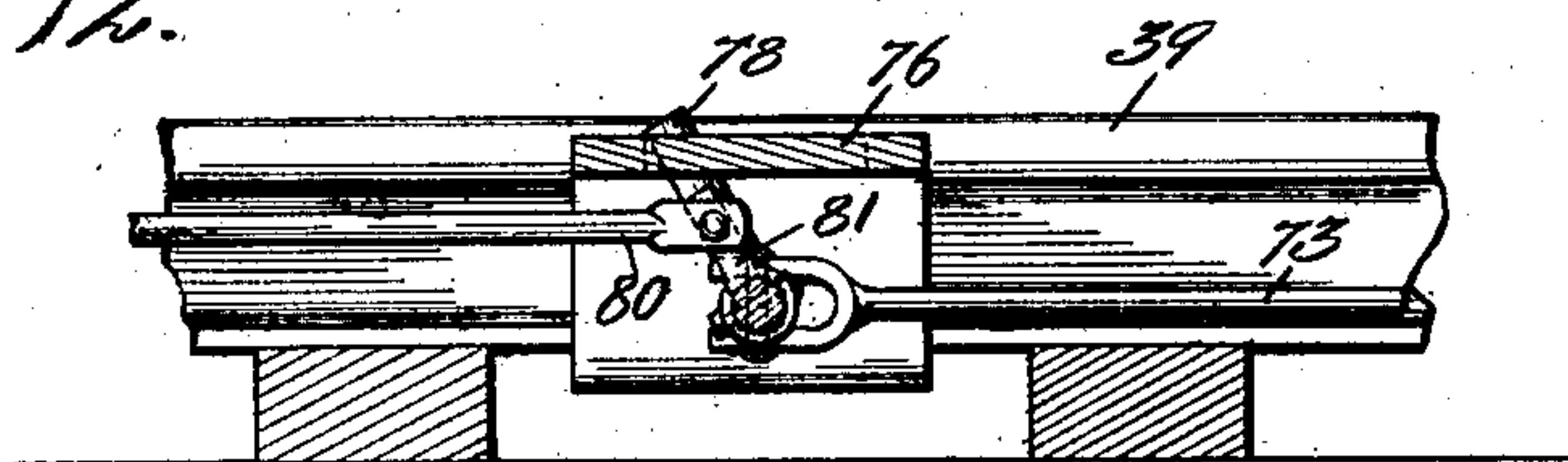


*Fig. 11.*



*Fig. 13.*

*Fig. 12.*



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# UNITED STATES PATENT OFFICE.

FRANCIS DUFFY, OF CHICAGO, ILLINOIS.

## SWITCH-OPERATING APPARATUS.

No. 891,411.

Specification of Letters Patent.

Patented June 23, 1908.

Application filed January 25, 1908. Serial No. 412,584.

*To all whom it may concern:*

Be it known that I, FRANCIS DUFFY, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Switch-Operating Apparatus, of which the following is a specification.

My invention relates to switch operating apparatus, and the object of the invention is to provide means whereby a switch may be operated from the moving car, and the motor man himself may predetermine the position which the switch ahead of him shall occupy.

I accomplish my object by the apparatus illustrated in the accompanying drawings, in which:

Figure 1 is a plan view of a section of track furnished with apparatus embodying my invention; Fig. 2 is a section in elevation taken transverse to the rails; Fig. 3 is a side elevation showing one of the strikers. Fig. 4 is a perspective view of the shifting cam, its support, and a portion of the striker rod which it operates; Fig. 5 is a perspective view of a striker; Fig. 6 is a sectional elevation taken transversely to the tracks showing the switch operating apparatus, including the parts mounted upon the car; Fig. 7 is a plan, and Fig. 8 is a side elevation of the safety apparatus by which complete movement of the parts is assured; Fig. 9 is a sectional elevation taken transversely to the track, and showing a modification in the apparatus for shifting the strikers. In this modified form the shifting apparatus is laid above the track instead of below it as in the form shown in Fig. 2; Fig. 10 is a plan of the movable frog and apparatus for operating the same; Fig. 11 is a sectional elevation taken on the line 11—11 Fig. 10; Fig. 12 is a sectional elevation taken on the line 12—12, Fig. 10, which is the same as line 12—12, Fig. 11; and Fig. 13 is a sectional elevation of the frog and its mountings.

Similar numerals refer to similar parts throughout the several views.

Mounted upon the car 20, indicated in Fig. 6, is the hand operated portion of the controlling apparatus. This, in its preferred form, which has here been selected for the purpose of illustration, consists of a controller 21, adapted to operate the controlling cam 22. The controller 21 is capable of occupying two positions laterally, being secured to the lower extremity of a controlling

rod 23, which is controlled by a hand operated controlling lever 24, and is so mounted as to rotate about a vertical axis.

A suitable mounting is indicated in Fig. 6, the rod being journaled in the block 25, secured in some convenient position upon the body of the car. The parts upon the car are so constructed and arranged that when the controller is in one position it acts upon one edge of cam 22 and when rotated to another position acts upon the opposite edge of said cam. In order that the controller 21 may be held up high enough to clear the cam 22 altogether and not engage it as the controller passes by, the rod 23 is provided with a pin 23<sup>a</sup> which is adapted to be engaged by the pivoted dog 26. A spring 23<sup>b</sup> tends to normally hold the controller down in operative position as shown in Fig. 6. If the operator wishes to pass a switch without operating it, he has simply to raise rod 23 far enough to permit dog 26 to come beneath pin 23<sup>a</sup> and support it and the attached rod 23 and controller 21. It might happen that the controller were in lowered position when approaching the cam 22 from the wrong direction. To avoid breakage under these conditions various expedients may be employed, for example the butt end of the cam may be bent downward as shown in Fig. 4, which will cause the controller to ride up over it. It is desirable in order that the controller itself may be of light construction, to provide braces 20<sup>a</sup> in such location that the controller 21 will contact one or the other of them depending upon the lateral position of the controller. They will then serve to brace the controller during its action upon the cam 22.

Referring to the preferred form of apparatus in which the rocking rod is located beneath the track, as best illustrated in Figs. 2, 3 and 4, controlling cam 22 is pivoted by means of a pin 30 or otherwise, to a stationary pivot block 31. Under ordinary circumstances, said block will be fastened to one of the cross ties of the track. The moving end of cam 22 is connected to the striker rod 32, preferably in the manner best shown in Fig. 4. In this form, a connecting piece 33 is loosely connected to rod 32 between two collars 34, which are rigid with said rod. This enables piece 33 to control the position of rod 32 laterally without preventing the rocking or oscillatory movement of said rod when operated by the strikers 35. In order that there may be the requisite play between piece



33 and the cam 22, said cam is provided with a slot 22<sup>a</sup>, through which extends the pin 33<sup>a</sup>, rigidly secured to piece 33.

The cam 22 is V shaped, as best shown in Figs. 1 and 4, and in order to permit operation when the car is traveling at a high speed, the sides are formed on what may be termed a "slow bevel," that is to say, the edges diverge at a small angle so that the lateral movement of the cam and its rocker rod 32 will be slow compared to the speed of the moving car. It is evident that as the result of this construction the controller 21 will, in passing, cause the lateral shifting of the rod 32, the shifting movement depending upon the position to which the controller has been previously set by the operator. Various means may be employed for supporting rod 32 in such manner that it may be both shiftable and oscillatory, one form being shown in detail in Figs. 2 and 6. In this form a hanger 38 is bolted to each one of the rails 39 and is apertured to receive the rod. It is desirable in order that the rod may be held in set position in spite of the shock or jar which may come to it from the action of the car wheels on the track or for any other reason, to provide a spring clip 40 which is secured to one of the hangers 38 and is adapted to engage a lug 41 upon rod 32. Spring 40 is U shaped and will on account of its form and the friction between it and the lug 41 tend to hold rod 32 in whatever position it is in. The spring will not, however, interfere with the positive and somewhat forcible action of the controller 21 when it engages the cam 22.

There are two strikers 35 upon each striker rod and they are rigidly secured to the rod in such position that when one of them is contiguous to the rail the other will be far enough away from its rail to permit the car wheels to pass by without contacting it. Said strikers extend at such angles from the rod that the action of the car wheels on one striker will be to rock the rod in one direction while the action of the wheels upon the other striker will be to rock the rod in the opposite direction. In other words, the shaft 32 will be rotated slightly in one direction or the other depending upon which striker is in close proximity to its rail.

It is desirable that the striker should be beveled at a point 35<sup>a</sup> shown for example in Figs. 3, 5 and 6. The purpose is to have the car wheels force the striker laterally out of the way in case the striker is erect and contiguous to a rail and the train is traveling in the reverse direction that is, to run through or "trail" the switch.

Referring now more particularly to Fig. 1, which is a plan of a portion of track embodying my invention, 42 and 43 represent the switch points of the switch which, in the present arrangement is the first one encountered by a train moving from left to

right and will cause the train to turn out to the right. As these switch points are typical, a description of them and the means for operating them will be sufficient to describe the invention. The switch points 42 and 43 are connected by the switch rod or spreader 44. This rod holds the switch points at the proper distance apart and serves to control their position laterally. Rod 44 is controlled by means of a bell crank 45 which is connected by means of a link 46 or otherwise to said rod and is fulcrumed upon some stationary object such as one of the track ties. Crank 45 is articulately connected to the connecting rod 47 which is articulately connected to the arm 48 rigidly fastened to the striker rod 32 as shown for example in Figs. 1, 2 and 6. The construction is such that when rod 47 is moved in one direction as a result of the rocking of rod 32, it will throw the switch one way, and when moved in the opposite direction will throw the switch the other way.

It will be apparent from the above description that the switch will be operated through the agency of the striker rod 32 and the connecting mechanism, and that rod 32 will be rocked in one direction or the other depending upon which of these strikers 35 is acted upon by the wheels of the moving train. It will also be apparent that the control as to which of the strikers shall be in proximity to its rail will depend upon the cam 22 and the action thereon by the controller 21, which may be set in either of its desired positions at the will of the operator. The operator, therefore, is enabled to control the position of the switch by throwing the lever 24 to the proper position. It will be seen that the power necessary to throw the switch points is derived not from the controller 21, but from the wheels of the moving train. All that the controller has to do is to shift the rod 32 by acting upon cam 22, and as the rod and the parts which it carries weigh only a few pounds, very little power is required to shift said rod. The controlling apparatus may therefore be made very light in construction, especially when the braces 20<sup>a</sup> are employed. (See Fig. 6). It will be noted also that the parts are simple in construction and few in number and that, except for the spring 40, which is really not an essential part of the apparatus, no springs are employed. In consequence the apparatus cannot readily get out of order and is certain to operate.

I have thus far described only so much of the mechanism as operates one pair of switch points from one side thereof; that is to say, I have described the operation only when the train is going in one direction, and that is the direction which faces the switch. It may be necessary, however, for the switch to be operated when the train is approaching in



the opposite direction that is, to trail the switch. According to my invention, if the switch is occupying the wrong position for the train when trailing it, the switch is automatically operated without requiring the attention of the motorman. This is accomplished by placing a striker 50 similar to the strikers 35 upon a striker rod 51 similar to the striker rods 32. Rod 51 is connected to rod 47 by an arm 52, similar in construction and function to the arm 48 previously described. The parts 50, 51 and 52, which are shown in Fig. 1, are so arranged that a car moving to the left along the straight track, Fig. 1, and approaching the switch 42, 43, would act upon striker 50 in such manner as to throw the switch point 42 close to its rail and move the switch point 43 away from its rail. Another striker 53 is fastened to rod 51 in proximity to the curved rail and operates in a similar manner for a similar purpose. Rod 51 is not shiftable for the switch will either be in right or wrong position, and if in right position the striker will be in depressed position anyway, and if in wrong position must be acted upon by the wheels. In consequence the switch points will be thrown in proper position automatically by a train moving in a direction to trail the switch.

Sometimes it may be impossible or impractical to mount the striker shaft below the rail as it is in Figs. 2 and 6 of the drawings. In such cases the rod may be mounted higher up as illustrated in Fig. 9. Referring to this last mentioned figure of the drawings, the striker shaft 32<sup>a</sup> is hollow and adapted to both slide and rotate upon the rod 55 which is secured directly to the web of the rails.

It is desirable that a safety appliance should be provided whereby close contact may be assured between the switch point and the rail, also for preventing the throwing of the switch while the train is passing over it. Such an appliance is shown in Figs. 7 and 8. The switch rod 44 is articulately connected to a second bell crank 60 which is fulcrumed on some stationary object such as one of the cross type. The other end of the bell crank is connected by rod 61 to a security bar 62 which is adapted to lie close to the tread of the rail and is supported upon two studs 63, 63, which are rigidly fastened to the rail. This security bar has two V shaped slots 64 therein whose lowest points are located midway between their extremities. The parts are so proportioned that when the studs are at either end of the slots the upper edge of the security bar will come flush with the top of the rail or practically so, and one switch point or the other will be in close proximity to its rail the bell crank will be rotated slightly about its fulcrum and will shift the security bar so as to bring an intermediate portion of the slots to the studs. This will

cause the upper edge of said bar to rise above the top of the rail. When this happens the car wheels will ride the bar and force it down, at the same time shifting it sufficiently to bring the switch point close to the rail.

Frogs with movable points are frequently employed in railway track work and where such frogs are employed it is desirable to provide means for automatically operating them in a system such as mine. A movable frog point and means for automatically operating the same are shown in Figs. 10, 11 and 12. In these views the frog point 70 is pivoted by means of a pin 71 to a stationary portion 72 of the frog as best shown in Figs. 10 and 13. This point is swung from one rail to the other by means of a rod 73 pivoted upon a stationary pin 74 and articulately connected to a bar 75 which extends transversely to the track and is mounted so as to be both rotatable and laterally shiftable in the stationary frame 76. This frame has an oblique slot 77 through which a stud 78 projects. This stud extends from and is rigidly fastened to the bar 75. The parts are so constructed that the rotation of bar 75 will produce a movement of stud 78 in the slot 77, which owing to the obliquity of the slot, will produce a shifting movement of the bar 75 which will swing 73 about its pivot 74 to move the frog point from one position to the other. This rotary movement of the bar 75 is produced by a connecting rod 80 which connects a crank arm 81 on bar 75 to a crank arm 82 on the striker rod 83. Rod 83 is rotary but non shiftable and is provided with two strikers 84 which are similar in construction and function to the strikers 35 on rod 32. It is unnecessary that rod 83 should be shiftable, for its strikers are associated with different tracks and therefore as a train may be on one track or the other but never on both simultaneously, only one striker can be operated by the car wheels at a time. When a car is upon a given track, if the frog point is in the wrong position for that track the associated striker will be up in position to be engaged by the car wheels to throw the frog point to proper position, but if the frog point is already in proper position the striker will be down and therefore will not be acted upon by the wheels. Consequently a striker will never be operated unless the frog is in wrong position, in which case it ought to be operated.

From the foregoing description taken in connection with the drawings it will be seen that my apparatus or system of switch control provides for the original operation of the switch points and also the maintaining of them in proper position while the train is passing. The parts are simple in construction and comparatively few in number and very little apparatus is required upon the car itself. The controlling apparatus need



be on only the first car, as the safety appliance secures the switch points in position after they have once been thrown.

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

1. In switch operating apparatus, the combination with the rails and movable switch points of a striker adapted to be operated by the car wheels, connections between said striker and the switch point for operating the latter, and means adapted to be operated by part of a moving car for moving said striker to operative and to non operative position.

2. In switch operating apparatus, the combination with the rails and movable switch point of a striker adapted to be operated by the car wheels, connections between said striker and the switch point for operating the latter, a cam connected to said striker for shifting the same to operative and to non operative position, and a controller having a fixed path with reference to said rails for operating said cam.

3. In switch operating apparatus, the combination with the rails and movable switch point of a striker adapted to be operated by the car wheels, connections between said striker and the switch point for operating the latter, a cam connected to said striker for shifting the same to operative and to non operative position; a car upon said rails, and means on said car moving in a straight line parallel to the rails and adapted to contact said cam for operating it.

4. In switch operating apparatus, the combination with the rails and movable switch points, of a pair of strikers adapted to occupy a plurality of positions, one with one striker in proximity to a rail where it may be struck by a passing car wheel, and another with the other striker in proximity to the other rail where it may be struck by a passing car wheel, connections between said strikers and the switch point whereby said switch point may be operated by said strikers, and means for shifting said strikers.

5. In switch operating apparatus, the combination with the rails and movable switch points of a pair of strikers adapted to occupy a plurality of positions, one with one striker in proximity to a rail where it may be struck by a passing car wheel, and another with the other striker in proximity to the other rail where it may be struck by a passing car wheel, connections between said strikers and the switch point whereby said

switch point may be operated by said strikers, and hand controlled means part of which moves in a fixed path parallel to the rails for shifting said strikers.

6. In switch operating apparatus, the combination with the rails and movable switch points of a pair of strikers adapted to occupy a plurality of positions, one with one striker in proximity to a rail where it may be struck by a passing car wheel, and another with the other striker in proximity to the other rail where it may be struck by a passing car wheel, connections between said strikers and the switch point whereby said switch point may be operated by said strikers, a cam mechanism for shifting said strikers and means having a path parallel to the rails for acting upon said cam.

7. In switch operating apparatus, the combination with the rails and movable switch points of a pair of strikers adapted to occupy a plurality of positions, one with one striker in proximity to a rail where it may be struck by a passing car wheel, and another with the other striker in proximity to the other rail where it may be struck by a passing car wheel, connections between said strikers and the switch point whereby said switch point may be operated by said strikers, a cam mechanism for shifting said strikers and a hand operated controller having a path parallel to the rails and capable of occupying two positions for producing different effects upon said cam.

8. In switch operating apparatus the combination with the rails and movable switch points, of a switch rod for moving the points, a security bar adapted to lie adjacent to the rails and having approximately V shaped slots therein, studs fastened to the rail and penetrating said slots and connections between said bar and the switch rod whereby a switch point will be held in close proximity to its rail when the top of the bar is flush with the top of the rail and said bar will be elevated above the level of the rail when the switch point is not in close proximity to its rail.

In witness whereof, I have hereunto subscribed my name in the presence of two witnesses.

FRANCIS DUFFY.

Witnesses:

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C. J. CHRISTOFFEL.