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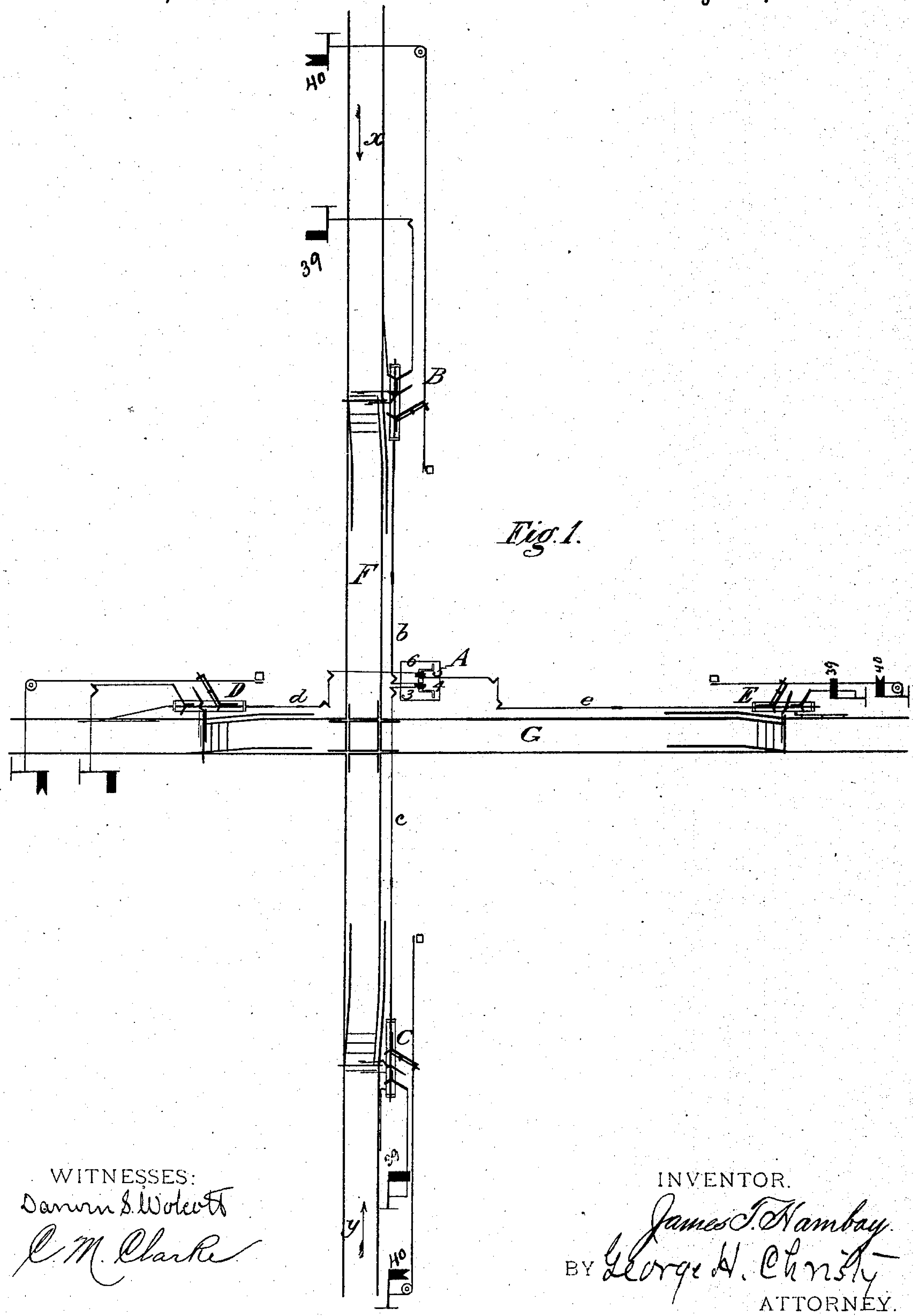
J. T. HAMBAY.

INTERLOCKING SWITCH AND SIGNAL APPARATUS.

No. 322,283. Patented July 14, 1885.



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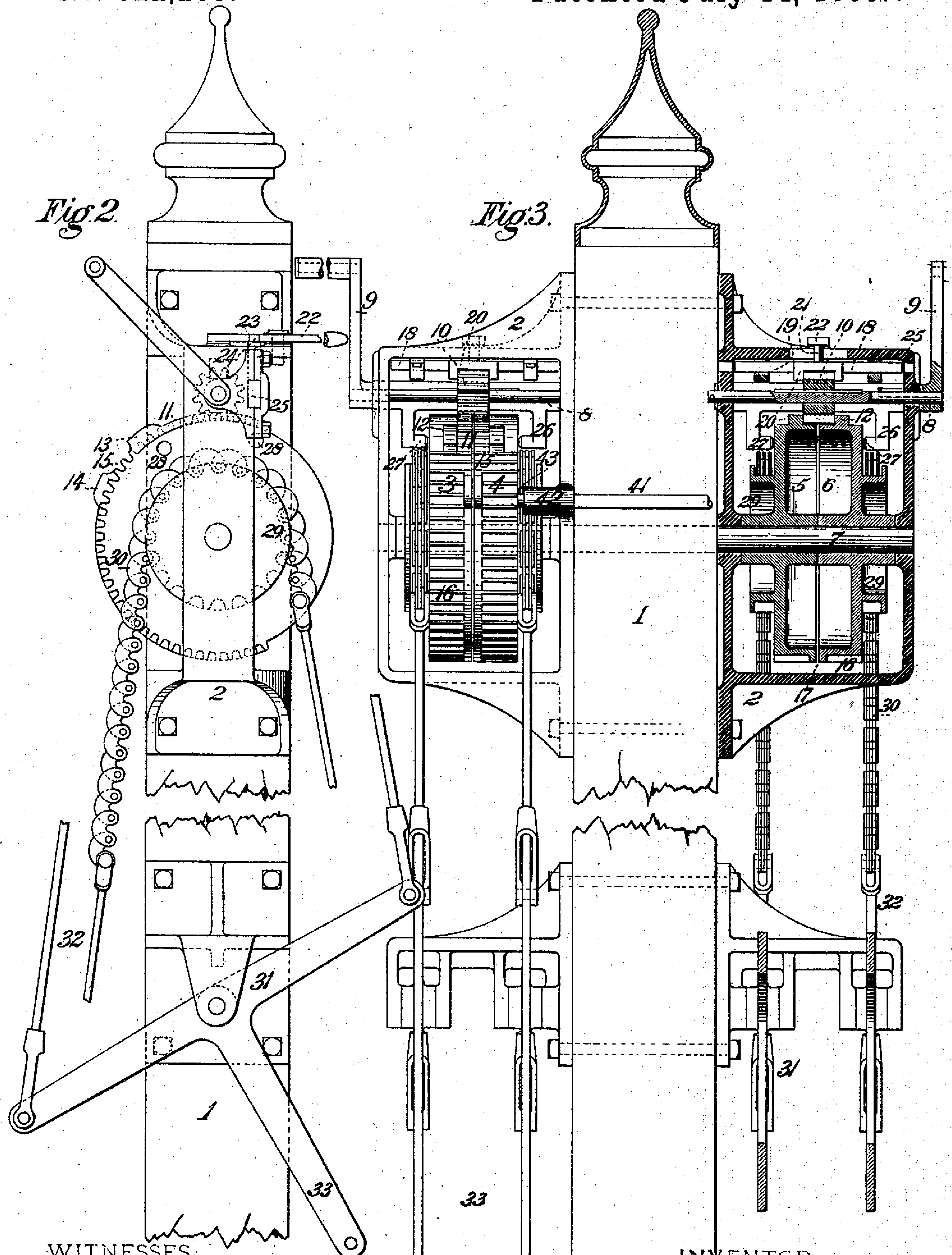

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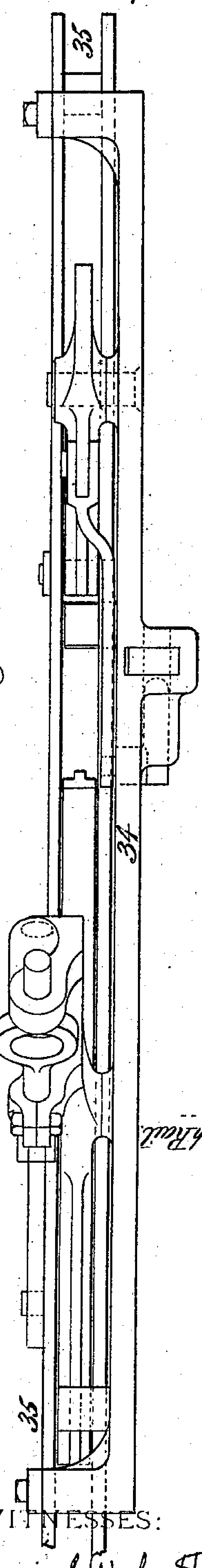

Fig. 4.

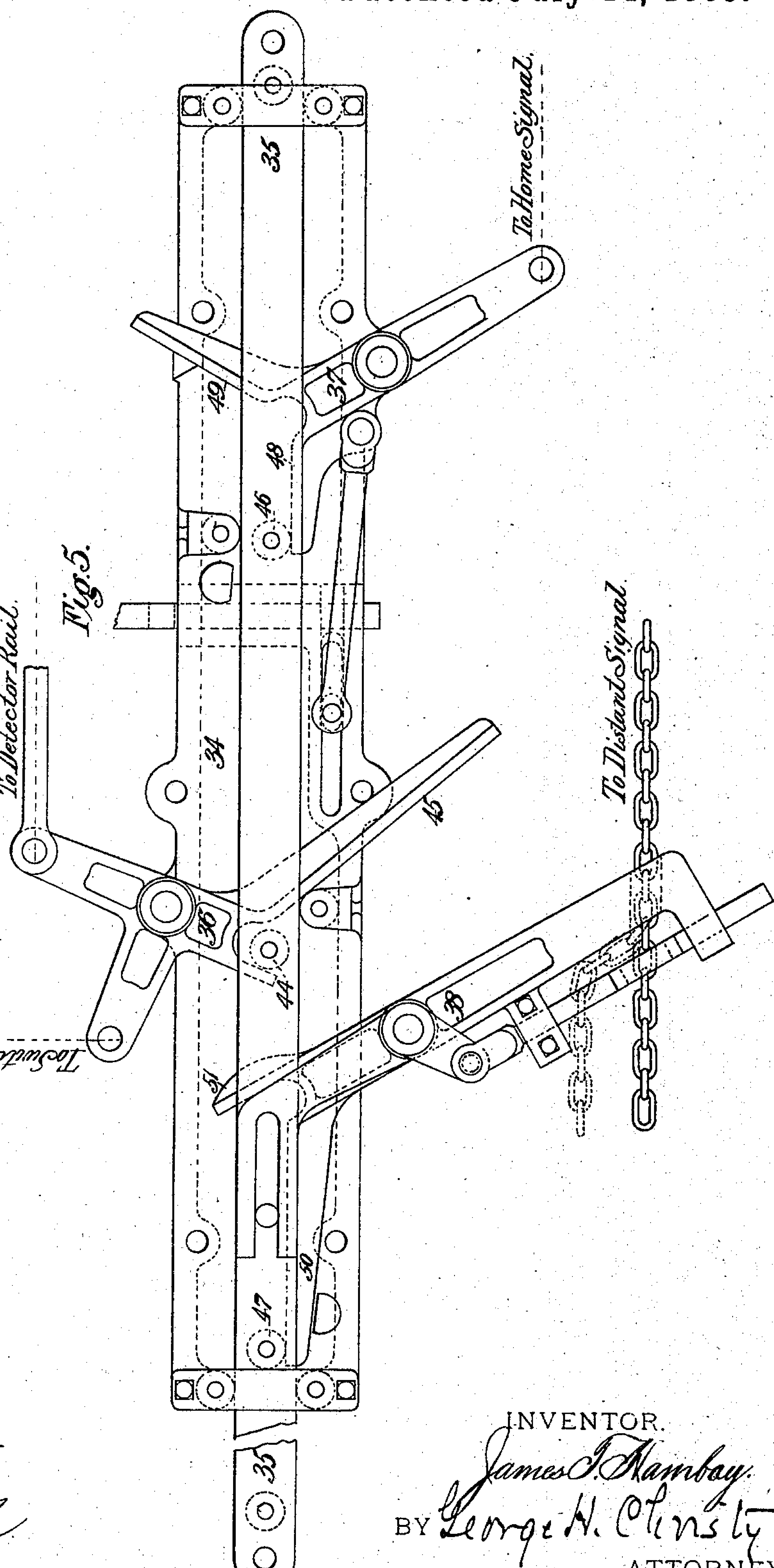

Fig. 5.

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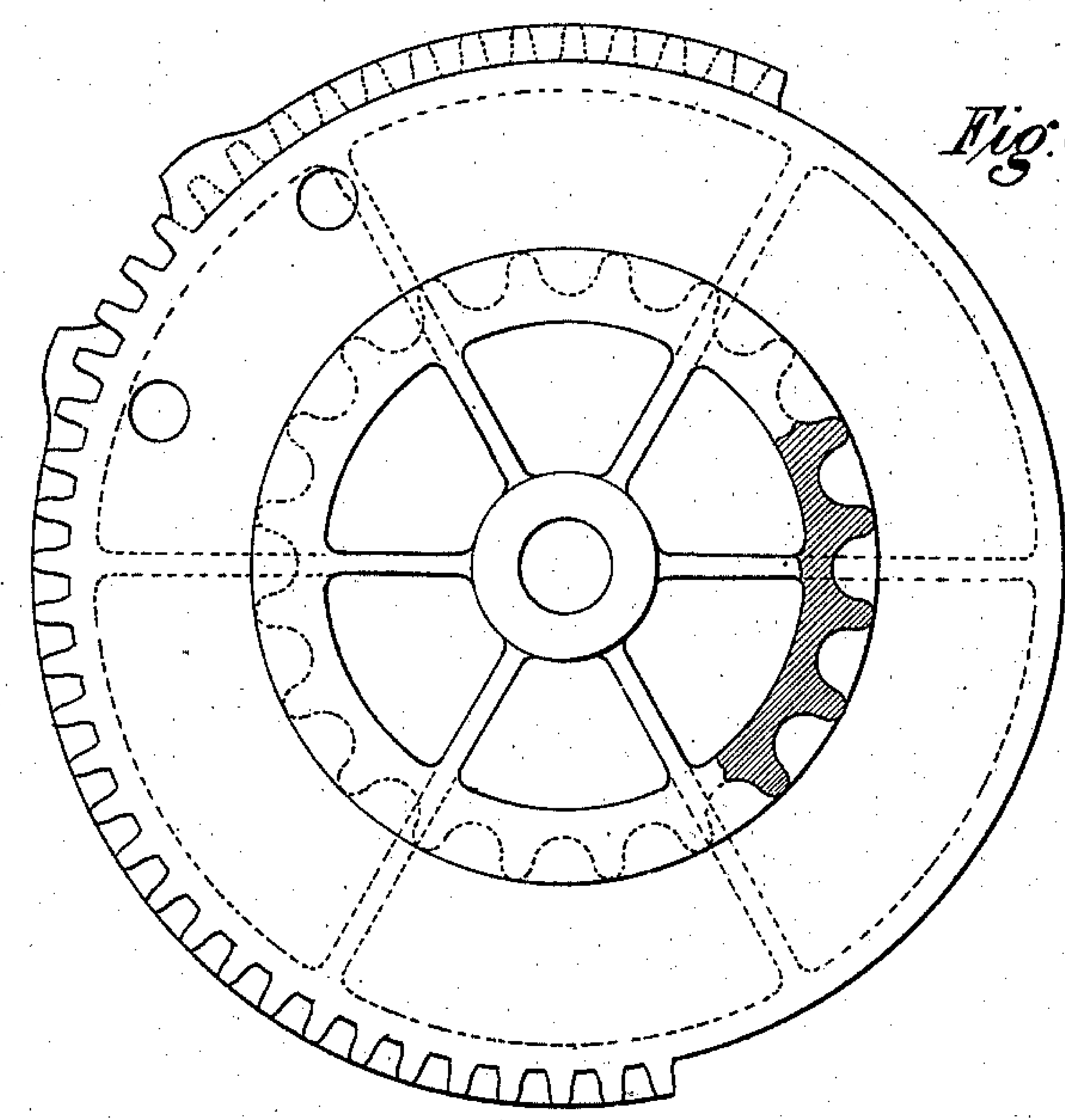

Fig. 6.

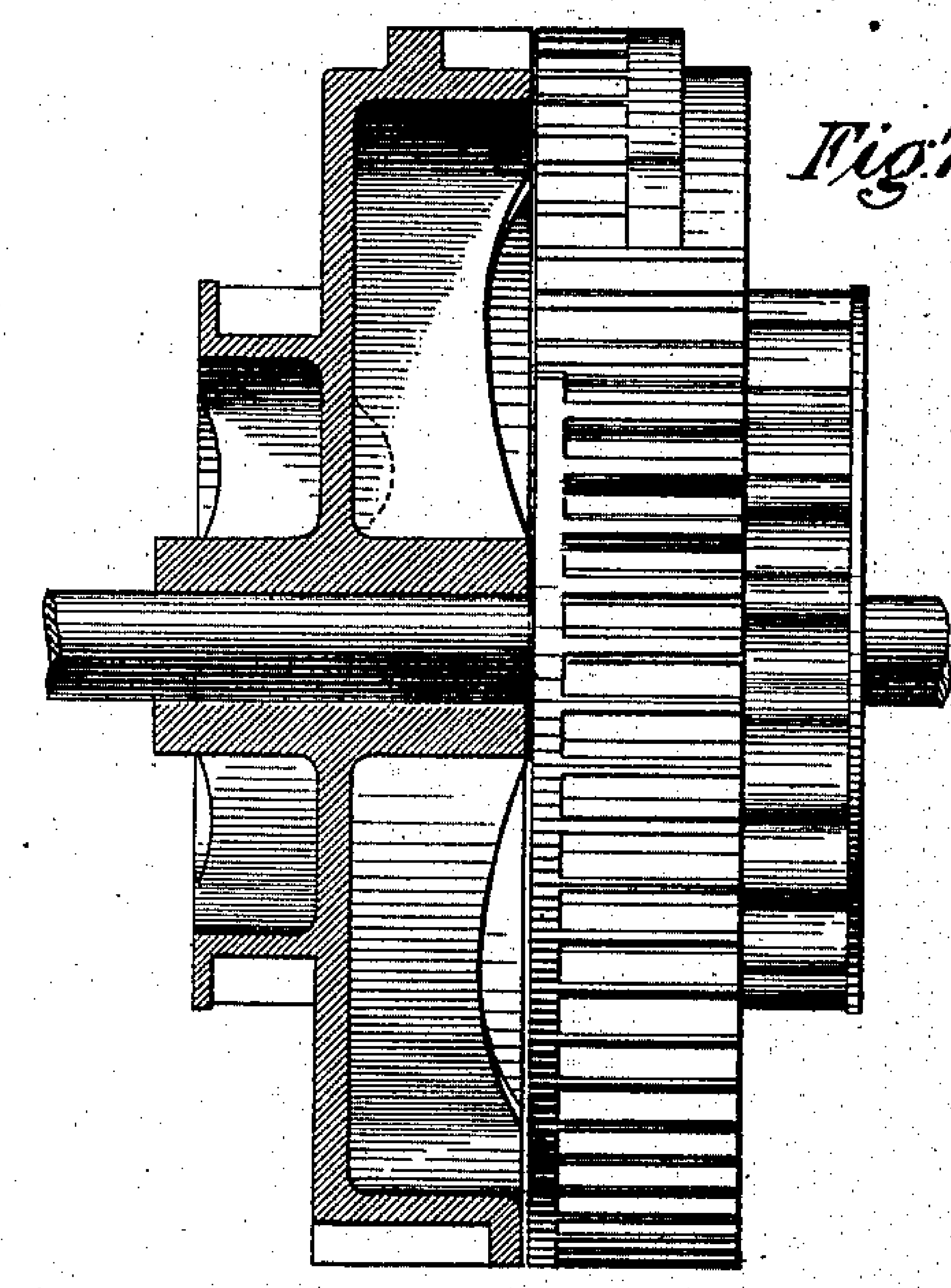

Fig. 7.

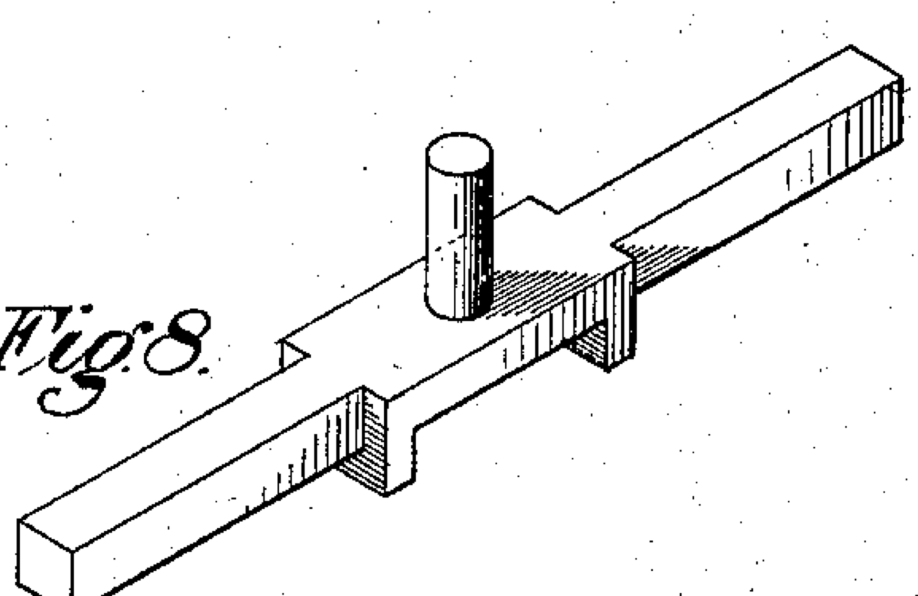

Fig. 8.

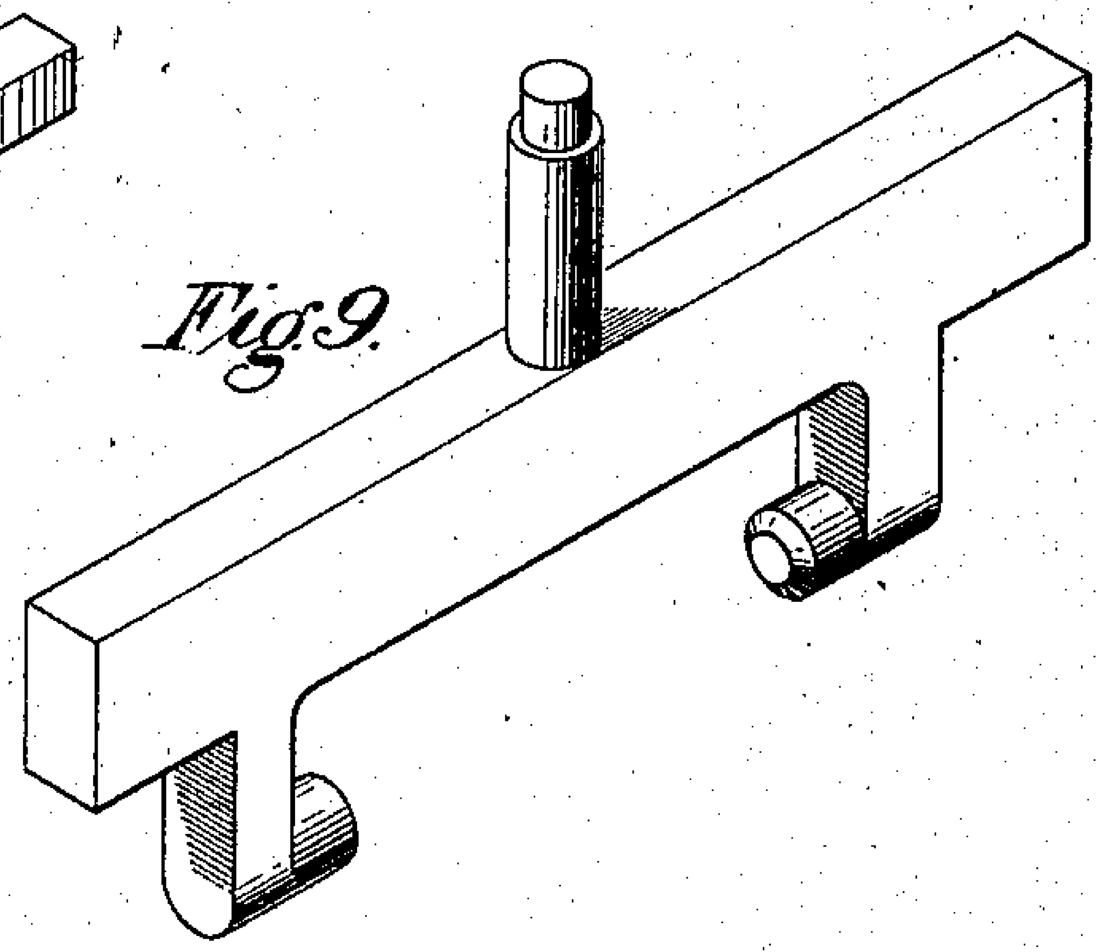

Fig. 9.

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INTERLOCKING SWITCH AND SIGNAL APPARATUS.

SPECIFICATION forming part of Letters Patent No. 322,283, dated July 14, 1885.

Application filed April 15, 1885. (No model.)

To all whom it may concern:

Be it known that I, JAMES T. HAMBAY, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, a citizen of the United States, have invented or discovered certain new and useful Improvements in Interlocking Switch and Signal Apparatus, of which improvements the following is a specification.

In the accompanying drawings, which make part of this specification, Figure 1 is a diagrammatic view of a railroad grade crossing, showing the arrangement of the derailing-switches, the signal-station, and the switch and signal operating mechanism. Fig. 3 is a view in front elevation, partly in section, of my improved interlocking apparatus. Fig. 2 is a view of the same in side elevation. Figs. 4 and 5 are edge and plan views of the switch and signal operating mechanism. Figs. 6 and 7 are detail views, on an enlarged scale, of the operating-wheels. Figs. 8 and 9 are details of the pinion-shifter and the locking-bar.

My invention relates to improvements in interlocking switch and signal systems, and in mechanism employed in connection therewith; and the object of my invention is to so construct and arrange such mechanism as to obviate the multiplication of operating and locking levers, and to provide for the locking of the switches and signals, not only in the signal-stations but also at the switches themselves, thereby providing a double lock and check as against improper shifting of switches and signals.

In the interlocking apparatus as heretofore constructed, it has been necessary to provide a lever for the switch and each signal guarding such switch, and also a locking-lever—as, for example, in the simplest form of the apparatus where home or distant signals are employed it is necessary to use four levers, and in operating such apparatus six lever movements are necessary; but in my improved apparatus I provide for the shifting of two switches and such signals as will govern the approaching train, and also the locking of all other switches and signals in the system by two movements of the operating-handles; and I also provide for the outside locking of such switches and signals as may be shifted, the shifting and locking being effected in orderly succession.

Upon opposite sides of a suitable post or standard, 1, are secured the frames 2, within which are located the wheels 3, 4, 5, and 6, said wheels being loosely mounted on the shaft 7 passing through the post 1, and having its bearings in the sides of the frames.

In each frame, above the wheels 3, 4, 5, and 6, is mounted a shaft, 8, provided with an operating-crank, 9, and on this shaft is mounted the pinion 10, held in engagement with the shaft by a spline and groove, whereby the pinion is caused to rotate with the shaft, but is free to move longitudinally thereof.

Along the inner edges of the wheels 3, 4, 5, and 6 are formed teeth 11, which extend around a portion of the peripheries of the wheels, and are adapted to engage the pinions 10. The teeth in each wheel are made of a length approximately equal to half the width of the face of the pinion 10, so that the combined length of the teeth, when two of the wheels are placed together, as shown, will equal the width of the face of the pinion 10, and along their outer ends is formed the continuous flange 12, which serves as a stop as against any lateral movement of the pinion 10 while in engagement with the teeth 11.

At what may be termed the "front end" of the toothed portion 11 the flanges 12 are increased in height, forming stops 13, and at a distance in front of the stops 13 equal to the diameter of the pinion 10 are formed, on the inner edge of the periphery of the wheels 3, 4, 5, and 6, the stops 14, and between these stops 13 and 14 are formed the teeth 15, extending entirely across the face of the wheels, and forming a continuation of the teeth 11. From the toothed portion 15 the outer edges of the face of the wheels are provided with teeth 16, of a length equal to the width of the face of pinion 10, said teeth being so constructed as to form a continuation of the toothed portions 11 and 15, and along the inner ends of these teeth 16 are formed flanges or ribs 17, adapted to prevent the pinion 10 from being shifted from one wheel to the adjoining wheels while in engagement with the toothed portion 16.

It will be seen from the above that while the pinion 10 is in engagement with the toothed portions 11 of two adjoining wheels, 3 and 4, or 5 and 6, these two wheels will be rotated in unison, and that in order to move one of the wheels independent of the other the pinion must be rotated until it is in engagement with the toothed portions 15, at which point its onward movement will be arrested by the stops 14 until shifted to one side or the other of said stops, when said pinion will be free to engage the toothed portions 16; and in order to shift the pinion from one wheel to the other or to the toothed portions 11 of two adjoining wheels while it is in engagement with the toothed portion 16 of either wheel, it must be rotated until the toothed portions 15 of both wheels are in line and the motion of the wheel being rotated is arrested by its stop 13.

The shifting of the pinion 10, above stated, is effected by the slide 18, mounted in suitable bearings, 19, in the frame 2, and provided with depending lugs 20, adapted to engage the sides of the pinion 10, and with a pin, 21, by which it is connected to the lever 22, pivoted to the frame 2, as shown at 23. To this lever is also connected by a pin, 24, the locking-slide 25, provided with arms 26, having inwardly-projecting pins 27, adapted to engage sockets 28, formed in the outer sides of the wheels 3 and 4 or 5 and 6. This locking-slide is so constructed that when the lever 22 is moved to shift the pinion onto one of the two adjoining wheels, 3 and 4, or 5 and 6, one of the pins 27 will be caused to engage the other wheel, thereby firmly locking it against rotation.

On the outer sides of the wheels 3, 4, 5, and 6 are formed sprocket-wheels 29, around which pass the chains 30, connected at their ends to the opposite arms of the double bell-crank levers 31 by rods 32.

The post 1, having the devices above described attached thereto, is located, when employed for operating switches and signals for single-track crossings, near such point of crossing, as shown at A in Fig. 1, and from the arms 33 of the double bell-crank levers 31 extend rods or pipes *b*, *c*, *d*, and *e* to the signal-operating mechanisms B, C, D, and E, which are located in convenient proximity to the derailing-switches, which are laid out in each line on each side of the crossing, as shown in Fig. 1. Each of these switch and signal operating mechanisms consists of a bed-plate, 34, on which is mounted a slide, 35, provided with suitable rollers adapted to engage and operate the switch and signal operating levers 36, 37, and 38, pivoted to the bed-plate on opposite sides of the slide 35, the lever 36 being connected to the switch-rails, and the levers 37 and 38 to the home and distant signals 39 and 40, respectively. These switch and signal operating mechanisms are so constructed and connected to the switch-rails and the signals, and to the devices on the post 1, that when the pinions 10 are in engagement with the teeth at the rear ends of the toothed portions 11 of the wheels 3, 4, 5, and 6 the switch-rails will be in line with the sidings, and the home and distant signals will stand at "danger;" or, in other words, the various parts will stand at what is termed the "normal" position, both tracks being blocked.

It will be observed that the wheels 3 and 4, composing one pair, are connected to the signal-operating mechanisms on the same line of track F, but on opposite sides of the crossing X, and that the other pair of wheels, 5 and 6, are connected to the signal-operating mechanisms on the other line of track, G, but on opposite sides of the crossing X. In order to prevent the operation of both pairs of wheels simultaneously, and therefore clearing both tracks, an automatically-acting bar, 41, is mounted in suitable bearings, 42, in the post 1, as shown in Fig. 3. The ends of this bar are rounded or beveled, as shown, for engagement with correspondingly-shaped recesses 43, in the inner wheels, 4 and 5, and the bar is made of such a length that when one end is in engagement with the recess 43 in the wheel 4 the other end of the bar will just clear the recess in the wheel 5, and vice versa, and these recesses are so located in the wheels as to be in line with the ends of the locking-bar 41 only when said wheels are in their normal position—*i. e.*, the pinions 10 in engagement with the teeth at the rear ends of the toothed portions 11.

By rounding or beveling the points of the locking-bar, and by making the recesses shallow, the locking-bar can be shifted by the rotation of one of the wheels, provided the other wheel is in its normal position, having its recess 43 in position to receive the adjacent end of the bar. If, while the operating devices are, as above stated, at their normal positions with the switches open and the signals at "danger," it is desired to clear one of the tracks for the passage of a train—as, for example, the track F—the pinion 10, engaging the wheels 3 and 4, is rotated by its crank-arm 9, thereby causing the wheels 3 and 4 to rotate until the stops 14 abut against the pinion 10. This movement of the wheels 3 and 4 is sufficient to shift, through the medium of the bell-cranks 31, the slides 35 at B and C a distance necessary not only to cause the rollers 44 to shift the levers 36 and the switch-rails in connection therewith, but also to lock the levers in their shifted positions by engagement with the long horns 45 on said levers. If the train is moving on the track F in the direction of the arrow *x*, the pinion 10, being in engagement with the toothed portions 15 of the wheels, is shifted by the lever 22 over onto the wheel 4, the movement of the lever effecting a simultaneous movement of the slide 25 to lock the wheel 3. The pinion is again rotated to turn the wheel 4, thereby continuing the movement of the slide 35 at the switch B until the rollers 46 and 47 engage and shift the levers 37 and 38 to set the home and distant signals at "safety."

During the movement of the slide 35 at switch B to shift the switch, the rollers 46 and 47 move along the horns 49 and 50 of the levers 37 and 38 without changing the position of said levers, but during the second movement of said slide the rollers 46 and 47 engage the horns 49 and 51 and shift the levers 37 and 38, and set their signals at "safety." These levers have their respective horns so constructed, and the rollers 46 and 47 are so located on the slide, that the lever 37 is shifted and locked by the engagement of the roller 46 with the horn 49 before the roller 47 engages the horn 51 of the lever 38 to shift said lever and its distant signal; and the horn 45 of the lever 36 is so constructed, and the roller 44 is so located on the slide, that the lever 36 remains locked while the signals are being shifted. For a more full and exact description of the construction, arrangement, and relative operation of the parts of the switch and signal shifting mechanism, reference should be had to my application No. 152,609, filed January 12, 1885.

As the switch at C is a trailing switch to a train moving in the direction of the arrow x it is not necessary to shift the signals at such switch. They are therefore left at "danger" to protect the switch C and crossing X from a train moving in the direction of the arrow y. If the train on the track F had been moving in the direction of the arrow y, the pinion 10 should have been shifted onto the wheel 3, and the wheel 4 locked by the slide 25. During this working of the switches and signals on the track F the switches and signals on the track G are locked at "normal" or "danger" by the locking-bar 41, which was shifted into engagement with the wheel 5 by the first movement of the wheel 4; and as the wheels 5 and 6 are locked together by the engagement of their toothed portions 11 with the pinion 10, and as the bar 41 cannot be freed from the wheel 5 until the wheel 4 has been returned to its normal position, when the signals of the track F will be again set at "danger," it follows that while the signals on one track are at "safety," those on the other track must remain at "danger."

By the addition of more operating-wheels and suitable interlocking devices this system may be greatly extended beyond the scope shown in the drawings, and may be adapted for operation in connection with double crossings, turn-outs, and branch roads.

It is a prominent characteristic of my improved apparatus that switches and signals for clearing one line of track and those for blocking the other track or siding are set and locked by only two movements in the signal-station; but the switch and signal operating mechanism outside of the signal-station is so constructed that safety-signals can be given only after the shifting of the switch to main line, and that in case of the breakage of any of the parts between the station and such mechanism, either before or during the movements of such mechanism, the signals will remain at "danger." And it is another characteristic of my invention that as each switch and its signals are operated by continuous movement of single mechanism, a multiplication of operating and locking levers and their numerous and complicated connections and movements are avoided.

I claim herein as my invention—

1. In an interlocking switch and signal system for railroad-crossings, interlocking switch and signal operating mechanisms located at or in convenient proximity to the derailing-switches of the intersecting roads, and operated from a centrally-located station to effect the orderly movement of the switches and signals governing the movements of the approaching train, in combination with a hand-actuated interlocking mechanism located at the central station for actuating the switches and signals for said approaching train and simultaneously locking the switch and signals for conflicting trains, substantially as set forth.

2. In a railroad grade crossing, a system of apparatus having in combination a derailing-switch in each track on each side of the crossing, an interlocking switch and signal shifting mechanism at or in convenient proximity to each switch, and each arranged for the orderly movement of the switch or switch and signals in succession and the proper locking of the same when moved, a central station, and mechanism for operating the switches and signals on or along the track over which a train is expected and simultaneously locking the protecting signals and switches on the crossing-line, substantially as set forth.

3. In an interlocking switch and signal system, interlocking switch and signal operating mechanism located at or in convenient proximity to the switches included in such system and operated from a centrally-located station, to effect the orderly movement of the switches or switches and signals governing the movement of the approaching train, in combination with a pair of suitably-actuated wheels constructed to be partially rotated in unison, and mechanism for locking one of said wheels after said partial rotation, thereby permitting the independent rotation of the other wheel, substantially as set forth.

4. In an interlocking switch and signal system, the pinion 10, in combination with two wheels constructed to simultaneously engage the pinion and to be partially rotated thereby, and mechanism for shifting the pinion into engagement with only one of the wheels to be independently rotated by such pinion, substantially as set forth.

5. In an interlocking switch and signal system, a pinion, 10, in combination with a pair of loosely-rotating wheels having a portion of their peripheries toothed along their inner edges for simultaneous engagement with the pinion, the toothed portions 15, extending en-

tirely across the peripheries, for the shifting of the pinion, and the toothed portions 16 along the outer edges of their peripheries, for the independent engagement of the pinion, substantially as set forth.

6. In an interlocking switch and signal system, a pinion, 10, in combination with a pair of loosely-rotating wheels, having a portion of their peripheries toothed along their inner meeting edges for simultaneous engagement with pinion, the toothed portions 15, extending entirely across the face of the peripheries, for the shifting of the pinion, the stops 14 at the front ends of the toothed portions 15, the toothed portions 16, formed on the outer edges of their peripheries, for the independent engagement of the pinion, and the stops 13, located at the front ends of the toothed portions 11, substantially as set forth.

7. In an interlocking switch and signal system, a pinion, in combination with a pair of loosely-mounted wheels having their peripheries toothed, as described, for simultaneous and independent engagement with the pinion, a lever for shifting the pinion from engagement with both wheels to engagement with only one, and a locking mechanism operated simultaneously with the shifting of the pinion for the wheel from which the pinion is shifted, substantially as set forth.

8. In an interlocking switch and signal system, two pairs of loosely-mounted wheels arranged for independent rotation, in combination with locking mechanism arranged to lock one pair of wheels by the rotation of the other pair, substantially as set forth.

9. In an interlocking switch and signal system, the combination of two pairs of wheels, the wheels of each pair being constructed and arranged for simultaneous engagement with the pinions 10, and a locking mechanism arranged to lock one pair of wheels by the rotation of the other pair, substantially as set forth.

10. In an interlocking switch and signal system, the combination of a pinion, a pair of loosely-mounted wheels having their peripheries toothed, as described, for simultaneous engagement with the pinion, slides 35, suitably connected to said wheels, wrists or rollers 44, on said slides, and switch-shifting levers 36, having arms 45, suitably arranged and proportioned, whereby, when the switches are shifted, they will be retained or locked in their position by the wrists or rollers 44 engaging the arms 45, substantially as set forth.

11. In an interlocking switch and signal system, the combination of a pinion, a pair of loosely-mounted wheels having their peripheries toothed, as described, for simultaneous and independent engagement with the pinion, slides 35, suitably connected to said wheels, wrists or rollers 44 on said slides, switch-shifting levers 36, having arms 45, suitably arranged and proportioned, whereby, after the switches have been shifted, they will be retained or locked in their new positions by the wrists or rollers 44 engaging the arms 45, and signal-shifting mechanisms also taking motions from said slides 35 and operative in shifting one or more signals while the wrists or rollers 44 are moving along in engagement with the arms 45 substantially as set forth.

In testimony whereof I have hereunto set my hand.

JAMES T. HAMBAY.

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