(No Model.)

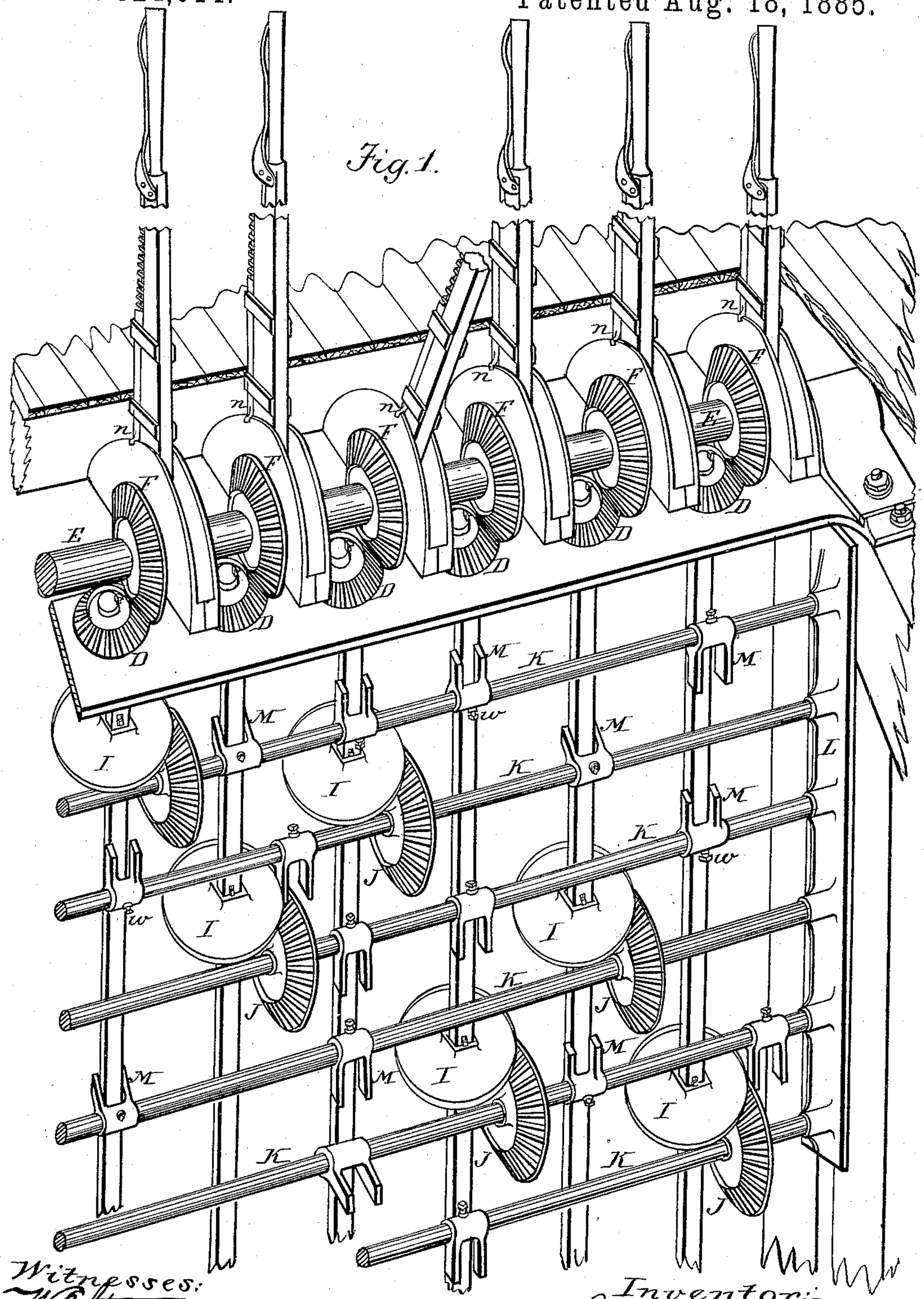
5 Sheets—Sheet 1.

E. H. TOBEY.

INTERLOCKING MECHANISM FOR RAILWAY SWITCHES AND SIGNALS.

No. 324,614. Patented Aug. 18, 1885.

Fig. 1.



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(No Model.)

5 Sheets—Sheet 2.

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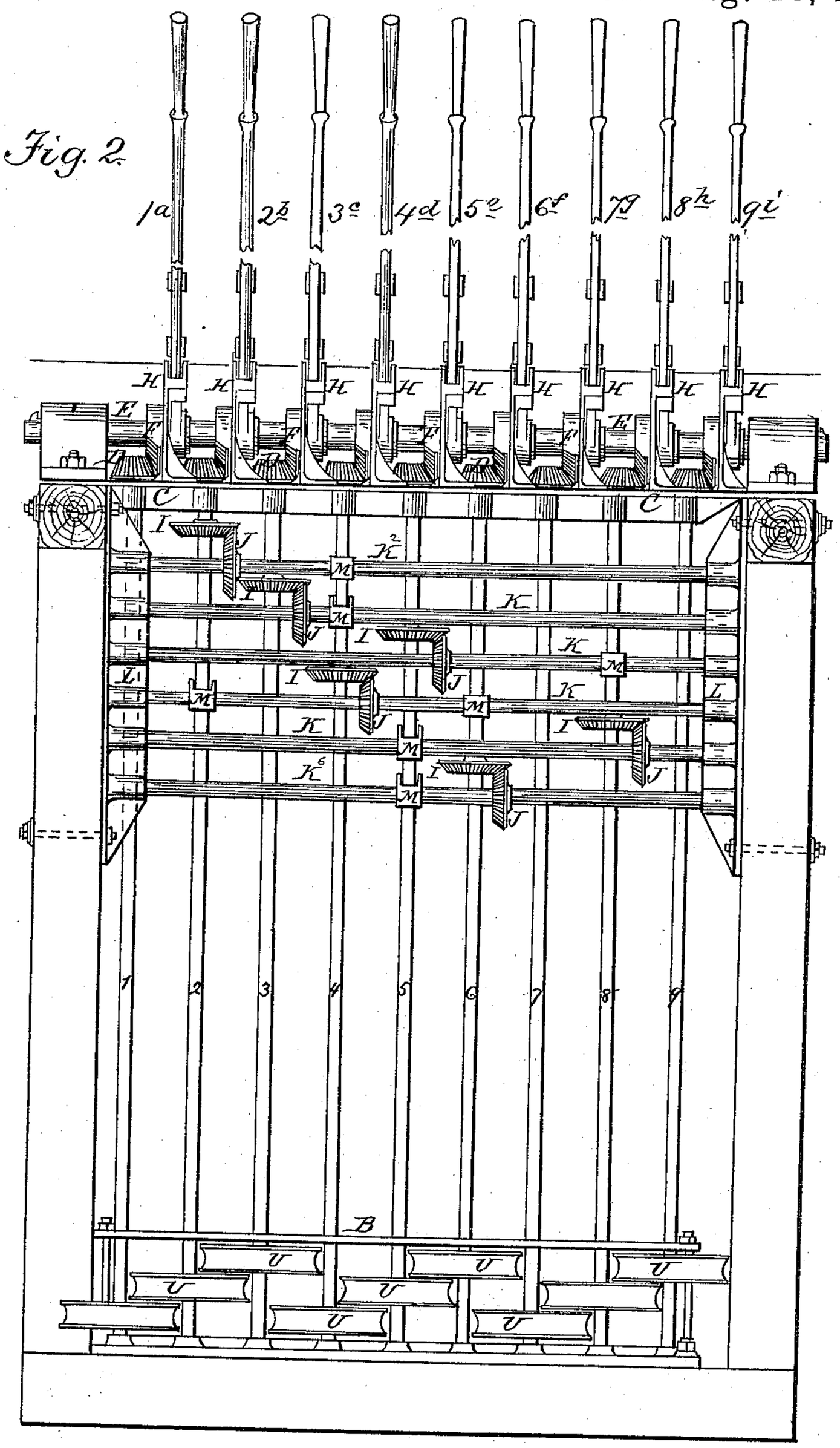
Fig. 2.



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5 Sheets—Sheet 3.

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INTERLOCKING MECHANISM FOR RAILWAY SWITCHES AND SIGNALS.

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Fig. 3.

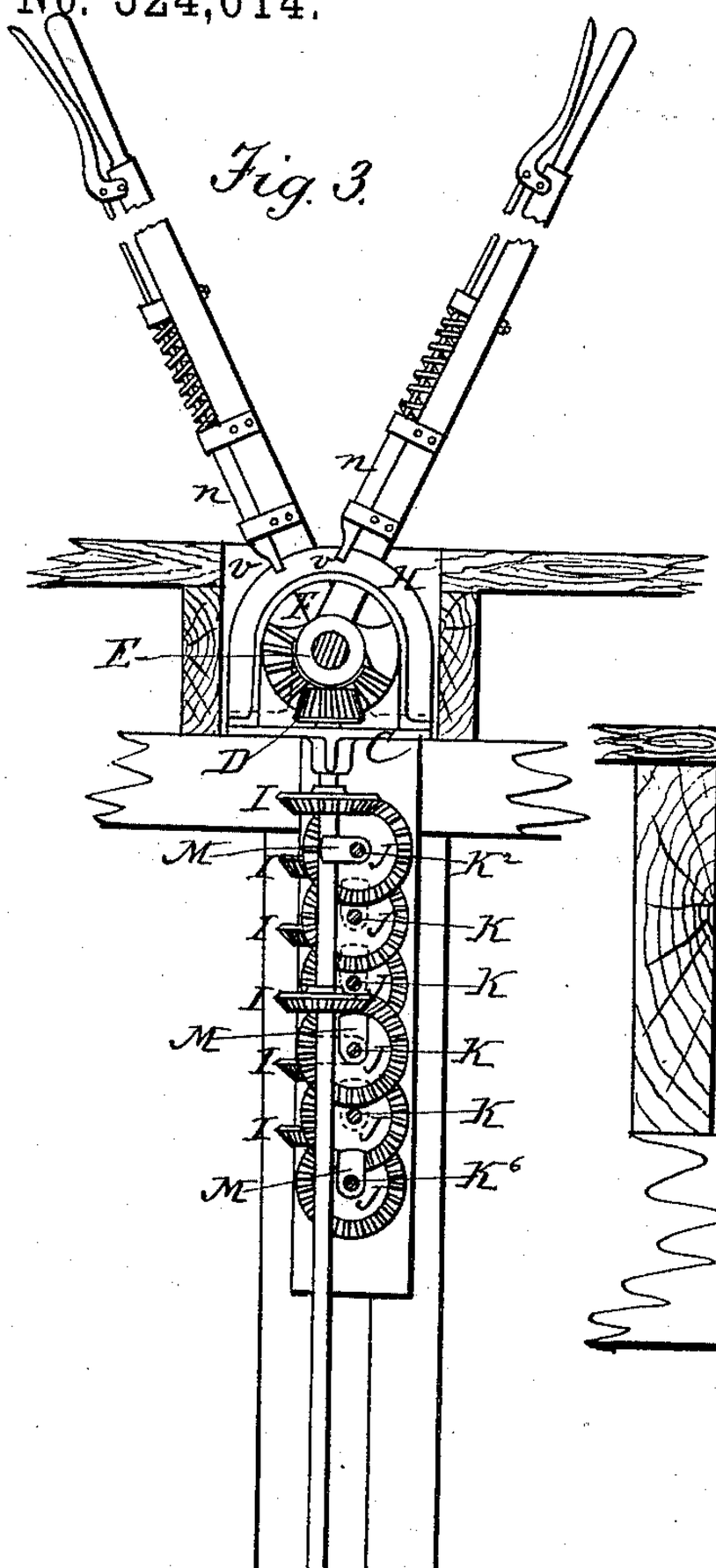
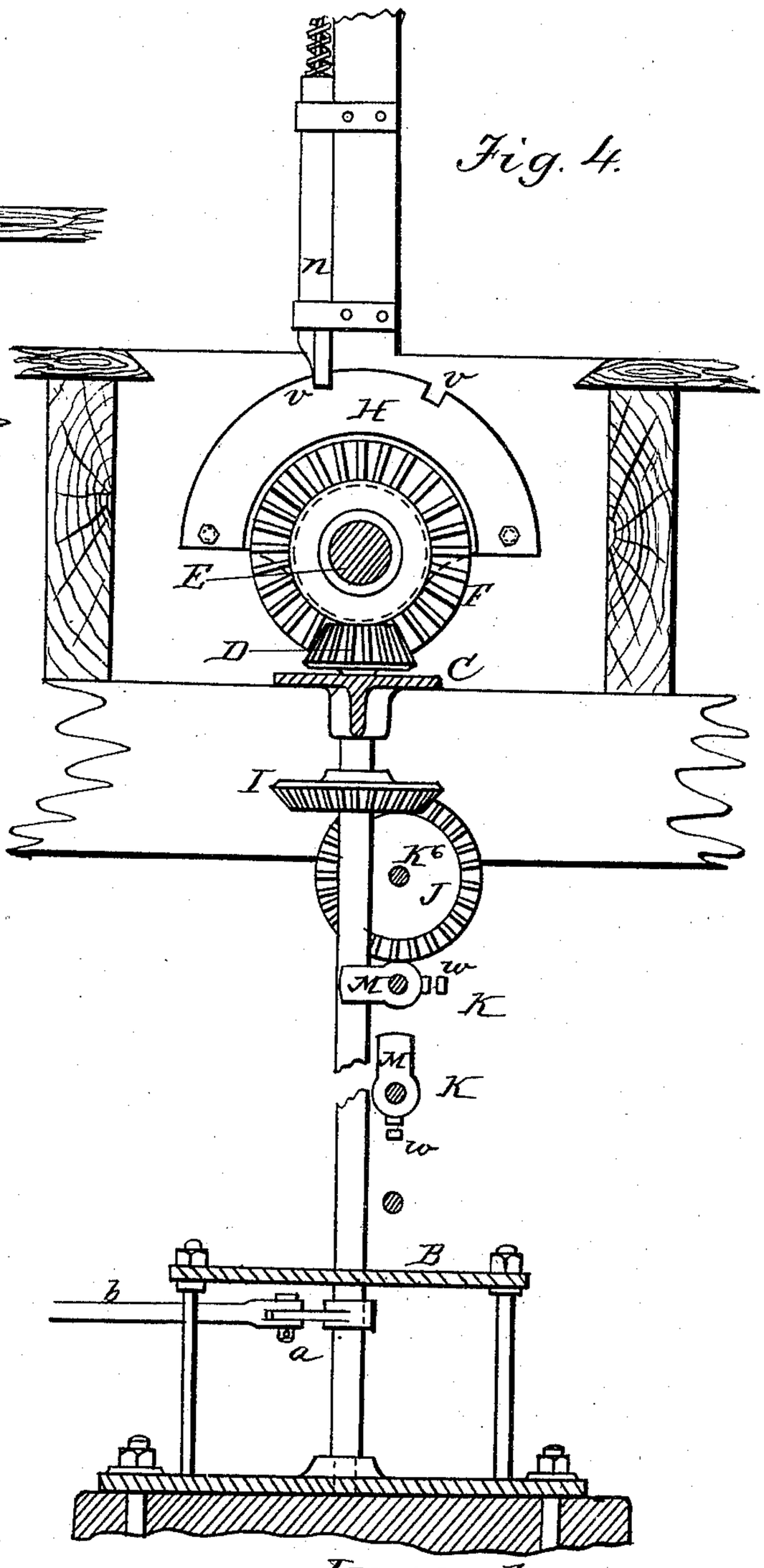


Fig. 4.



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INTERLOCKING MECHANISM FOR RAILWAY SWITCHES AND SIGNALS.

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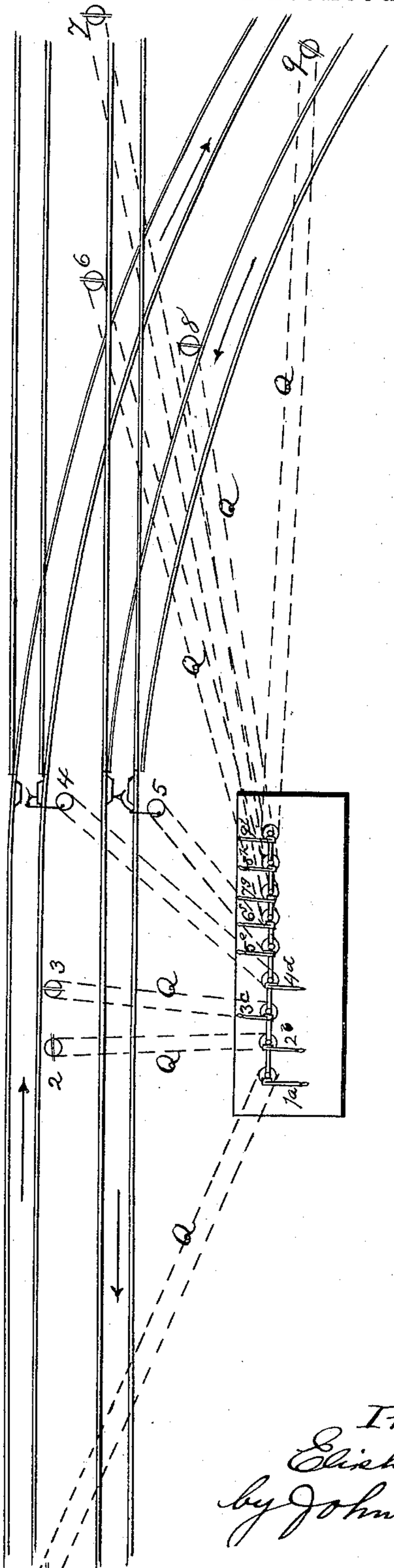

Fig. 5.

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(No Model.) 5 Sheets—Sheet 5.

E. H. TOBEY.

INTERLOCKING MECHANISM FOR RAILWAY SWITCHES AND SIGNALS.

No. 324,614. Patented Aug. 18, 1885.

Fig. 6.

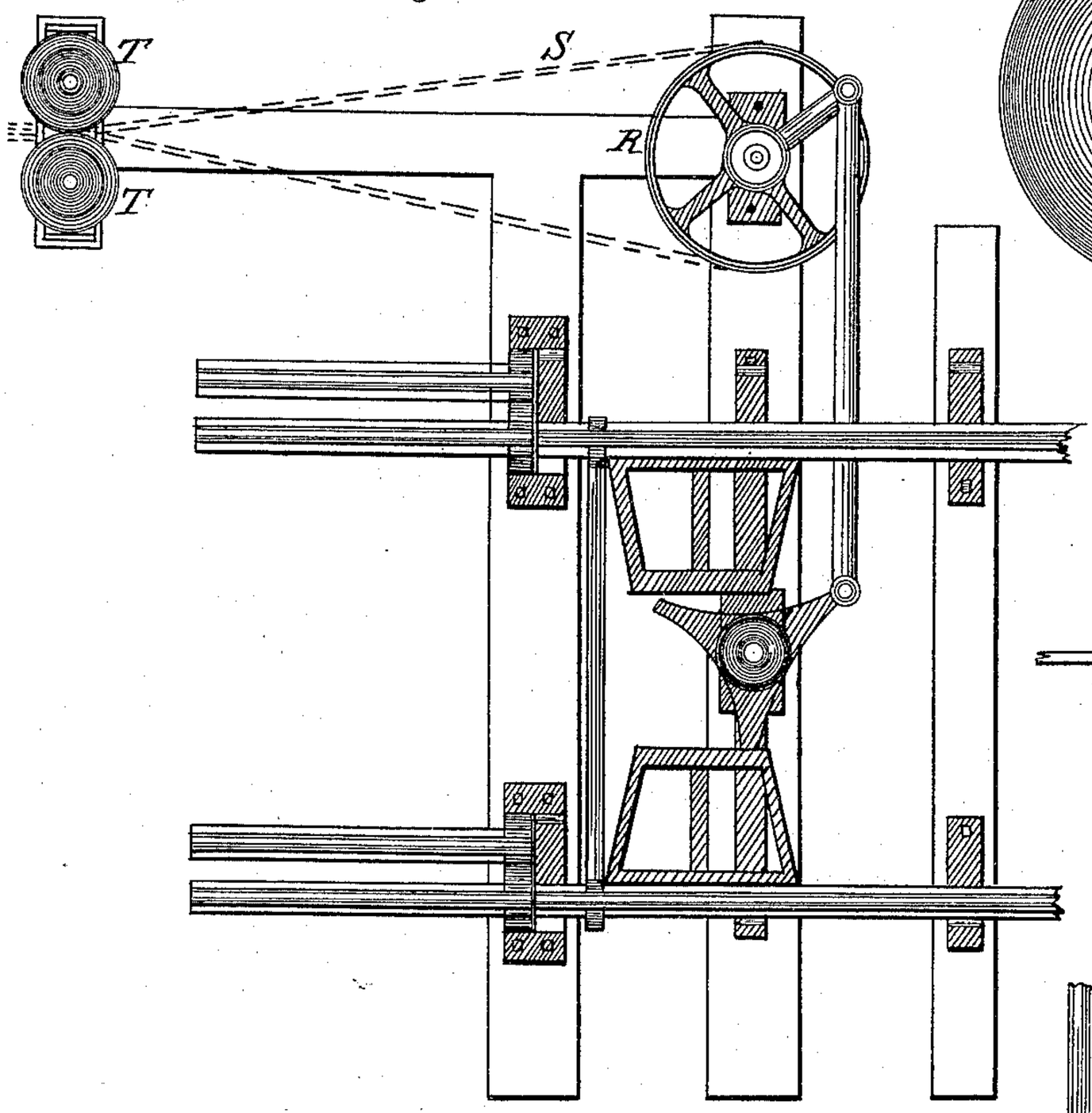
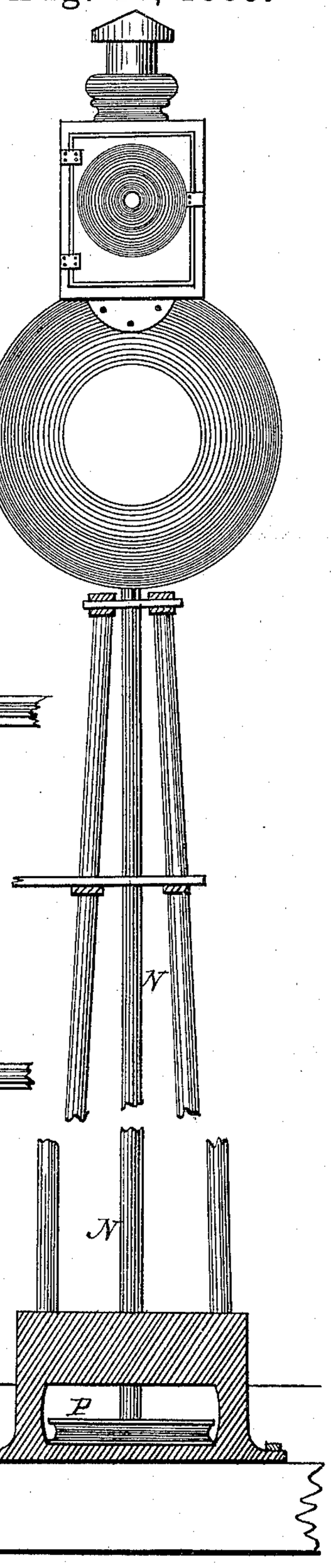


Fig. 7.



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UNITED STATES PATENT OFFICE.

ELISHA H. TOBEY, OF DENVER, COLORADO.

INTERLOCKING MECHANISM FOR RAILWAY SWITCHES AND SIGNALS.

SPECIFICATION forming part of Letters Patent No. 324,614, dated August 18, 1885.

Application filed February 28, 1885. (No model.)

To all whom it may concern:

Be it known that I, ELISHA H. TOBEY, a citizen of the United States, residing at Denver, in the county of Arapahoe and State of Colorado, have invented new and useful Improvements in Interlocking Mechanism for Railway Switches and Signals, of which the following is a specification.

My invention relates to improvements in safety signaling and switch-interlocking mechanism for railway crossings, switches, signals, and draw-bridges, operated from a central station or tower, whereby to lock and unlock the signals and switches, and to indicate to the engineer "danger" or "safety" in the condition of the "tracks" for trains running or to be run thereon.

The object and purpose of my improvements are to make it impossible for the station-operator to cause accident to approaching trains by giving wrong signals, and to lock and unlock both the signals and the switches by the same device.

In the organization of my system of cooperating interlocking signals and switches a train cannot be let through the station nor the right of way given a train by the outer or inner signals until after the switches on that line of track are so placed and locked as to let the train through safely. By my improvement the placing of these switches for said track releases the lock of the outer or inner signals, so that they can then be moved or turned to "safety" to give the right of way to the coming or going train, and it is the turning of these signals to "safety" at the same time and by the same movement that locks all switches and signals which are required to be locked for the safe transmittal of trains on this line of track. The turning of these outer or inner signals to "danger" operates to release the same line of signals and switches from their locks. It is in this way that all the switches and signals of the station are controlled, either to their interlocking or their released relation for the several lines of tracks, by the outer or inner signals, so that there can be no accident to trains, whether coming in or going out.

My invention embraces an interlocking mechanism for the signals and for the switches, by which the shaft operating either the signal or the switch is locked by a forked arm or device carried by a shaft operated by the same lever which operates the signal or the switch.

Referring to the accompanying drawings, Figure 1 represents in perspective so much of my improved interlocking mechanism as illustrates the construction of its parts; Fig. 2, an elevation of a complete plant as it is arranged in the signal-tower, three of the operating-levers, Nos. 1^a, 2^b, and 4^d, and their interlocking connections, being shown in the positions in which they are moved to operate the switch and signals and to lock the signals or switch to "danger." Figs. 3 and 4 represent sectional elevations of the same. Fig. 5 represents by outline diagram a double-track junction to illustrate the position of the switches, the signals, and their connections with the interlocking mechanism in the tower. Fig. 6 is a plan of a switch, and Fig. 7 represents a high signal-post, the signal whereof is controlled and locked or unlocked by the interlocking mechanism.

In the tower are arranged a number of vertical shafts, 1, 2, 3, 4, 5, 6, 7, 8, and 9, of angular or square cross-secetion, suitably mounted in a box, B, below the surface of the ground, and at their upper ends in a plate, C, of the frame of the tower, as shown. These shafts are placed in a line side by side, all of the same height, each having a bevel-pinion, D, fastened on its upper end, below the tower-floor, and these shafts are in number suited to the number of switches and signals of the station.

Immediately above and in line with the row of vertical shafts is arranged a fixed horizontal shaft, E, upon which bevel pinions or segments F are mounted at intervals, so as to turn loosely thereon in gear with the pinions D of the vertical shafts, and to each of these loosely-turning pinions or segments is fastened a hand-lever, designated 1^a 2^b 3^c 4^d 5^e 6^f 7^g 8^h 9^i. Each lever is supported loosely upon the shaft E in a suitable fixed quadrant, H, and extends above the floor of the tower, so that the moving of either of these levers will cause the vertical shaft to which it is geared to turn a quarter of a revolution, for a purpose to be presently stated. Certain of these vertical shafts are connected with the signal-op-

erating shafts, and certain others of the vertical shafts are connected to the switch-moving device, as shown in Fig. 4, by means of arms *a* and rods *b*, or by means of pulleys and wire cables, as shown in Figs. 2, 3, and 5, so that the turning of the vertical shafts by their separately-connected levers operates the signals and the switches as may be desired.

The interlocking devices are combined with the switch and signal operating shafts in a simple manner for doing the work.

Each of the vertical shafts, except 1, 7, and 9, has a bevel-pinion, I, below its upper bearing, which gears with a bevel-pinion, J, fixed on the horizontal shafts K, the number of the latter corresponding with the number of the vertical shafts to be locked, and arranged one above the other at the side of the vertical shafts in bearings in fixed uprights L. In the disposition shown of the gears I and J the upper horizontal shaft, K^2, is geared to vertical shaft 2, and the lower horizontal shaft, K^6, is geared to the vertical shaft 6, and the gears for the other shafts are intermediately disposed. Each of these horizontal shafts is provided with one or more forked locking-arms, M, placed in position to embrace, when turned in one direction, the angular vertical shafts to lock them from being turned. These forked locking-arms are placed upon their shafts so that the partial revolution of the latter will carry the locks through a limited arc over the vertical shafts, or away from them, to lock and to unlock or release the locks of the signal and switch operating shafts. The forked locking-arms can be adjusted or changed to act with different vertical shafts, as may be required for the safety of trains passing through the station on any desired line of track.

The signal-supporting shaft N is shown in Fig. 7 with a pulley, P, on its lower end, inclosed in a suitable base of the signal-post, and around which passes the wire cable Q, Fig. 5, to the lever-operated shaft in the tower; but a crank-arm may be used for a rod-connection, as in Fig. 4.

In Fig. 6 the switch is shown as being operated by a wire cable and pulley, R, the cable S passing through guide-pulleys T to a similar pulley, U, on the tower-operating shaft; but crank-arms and rod-connections may be used instead of the pulleys.

The quadrants for the hand-levers are secured to the iron plate C under the floor, and the vertical portion or sides H of said quadrants form segments having notches *v* to receive a spring-actuated bolt or latch, *n*, carried by the hand-lever to retain the latter in its front or back position, as shown in Fig. 3.

In the described use of the partially-rotating arms or fingers M the switches 4 and 5 or the signals can be interlocked one with the other, as may be desired, and the throwing of a switch from the main track will lock all signals that in any way interfere with that switch and release the signals desired. The movement of the signal to "all right" or "safety" will lock all switches that in any way interfere with the right of way over the tracks, thus giving an absolute safeguard against accident. This is of great importance when there are a large number of switches and signals at a station, and where it is necessary to work a number of tracks at once.

In Figs. 2 and 5 the levers 1^a, 2^b, and 4^d are thrown to backward positions. The rest stand forward, and the dispositions of the locking-arms on their respective carrying-shafts should be as follows: The arm on horizontal shaft geared with vertical shaft 2 should be set locked with vertical shaft 4. The arm or shaft geared with vertical shaft 3 should be set unlocked, but opposite vertical shaft 4. The arms or shaft geared with vertical shaft 4 should have locks set one opposite to vertical shaft 2, but unlocked, and one set locked with vertical shafts 6. The arm on shaft geared with vertical shaft 5 should have lock set locked with vertical shaft 8. The arm or shaft geared with vertical shaft 6 should have lock set unlocked opposite vertical shaft 5. The arm on shaft geared with vertical shaft 8 should have lock set unlocked opposite vertical shaft 5. In this arrangement vertical shafts 1, 7, and 9 have no horizontal shafts and gears to work them, as I prefer not to lock the distant signals in a plant where there are frequent passing trains for the reason stated. The locking-arms may be made adjustable upon their shafts by screws *w*, to secure them in proper positions for operations with the shaft with which they are intended to operate.

Description of the operation of my switch and signal interlocking device: The train run only one way on each track, as shown by the darts in Fig. 5. This plan represents two switches and seven signals, 1, 7, and 9 of which are the distant signals, and 6, 8, and 3 the inner signals, and No. 2 the branch down-signal, and 4 and 5 are the switches. I will here state that the switch-levers are numbered with numbers corresponding to those of the switches Nos. 4 and 5, and may be also painted red. All signal-levers are numbered to correspond with the numbers of the signals, and may be painted green. It is not absolutely necessary that the distant or outer signals should be locked as in the plan shown. I have not shown such provision. Still, if necessary, I can lock them. My reason for not providing for locking them in this case is that in a plant where a great many trains may be passing from the main track to the branch track, and from branch to main track, by not locking the distant signals (which in many instances are six hundred feet from the inner signals) I can let a train into the system as far as the inner signals without fear of accident, and thereby much time is saved in handling trains.

I will now give operation of the plant. I will first give description of the plant as it would be were it in its normal position.

All signals would indicate "danger" with signals Nos. 8 and 2 locked to "danger." These being the only ones locked, 8 would be locked by switch-lever No. 5, and No. 2 locked by switch-lever No. 4. All switches are set on the main tracks, and all levers in the tower are in their forward position and secured there by the spring catch-bolt *n* on the front notch, *v*, of the quadrants H. This then is the normal position of everything in this plant.

We will now change the system and describe the change. The operator now wishing to pass a train from the main track down onto the branch track, takes hold of lever-handle No. 4, raises the spring-bolt *n* from out of the front notch in the quadrant H, pulls over the lever until the spring-bolt drops into the back notch in the quadrant. Thus has the lever described the distance it has to move, and is again secured as when in its first position. Now, what has the movement of this No. 4 lever changed? It has moved No. 4 switch-rail from the main track down to the branch track as shown in Fig. 5. It has also unlocked No. 2 branch signal, which was in its normal position locked, as before stated. It has also locked signal No. 6, which was unlocked. This signal now defends the crossing-point of the tracks. These two signals were at "danger" before this No. 4 switch was moved from the main track; but this last movement has locked them there, where they must remain until No. 4 lever moves the switch-rail back to the main track, when they will again be released. As yet, no safety-signal has been given. No. 2 signal now being unlocked we will give it the "all-right" or "safety" signal by pulling back-lever No. 2 to its back position. Now, this turning of signal No. 2 by lever No. 2 has also locked switch-lever No. 4. No. 2 signal now being at "safety" I will turn the distant No. 1 to "safety." Now the train can pass from outside the system through the station on the branch downtrack with perfect safety, as shown by Fig. 5. Thus it will be seen that any desired changes can be effected with my system, and it is not deemed necessary that I should describe other changes. There are many levers in any plant which are unlocked, but should the operator by mistake throw over a wrong lever in my system it could do no harm, for such movement would lock any other switch or signal which could in any way cause an accident.

I claim—

1. In an interlocking switch and signal mechanism, the combination, with the switch and signal connecting shafts and their operating-levers, of the horizontal shafts geared with said signal and switch connecting shafts provided with locking-arms adapted to be locked with said vertical shafts, for the purpose specified.

2. In an interlocking switch and signal mechanism, the series of horizontal shafts provided each with one or more locking-arms arranged with vertical signal and switch connecting shafts to operate, as specified, to lock the switches and the signals, and to release them by a movement of said locking arm or arms in the arc of a circle toward and from said vertical shafts.

3. The combination, in an interlocking switch and signal mechanism, of vertical signal and switch connecting shafts having an angular cross-section, with the horizontal shafts carrying forked locking-arms arranged to be locked with said vertical shafts, and suitable gearing connecting these shafts with each other and with operating hand-levers, substantially as described, for the purpose specified.

4. In an interlocking switch and signal mechanism, a series of adjustable locking-arms, and a series of carrying-shafts therefor, arranged parallel one above the other, in combination with a series of vertical shafts arranged parallel one beside the other along and near the horizontal shafts, suitable connecting-gearing therefor, a separate operating hand-lever for each vertical shaft, and suitable connections for the latter with the switches and the signals, as set forth.

5. In combination, in an interlocking switch and signal mechanism, the vertical shafts having an angular cross-section, the horizontal shafts carrying the forked locking-arms, the gearing I and J for said shafts, the hand-levers, the gear D E, connecting the latter with said vertical shafts, and suitable connections for the latter with the switches, and with the signals all arranged for operation and for interlocking co-operation, substantially as described, for the purpose specified.

6. The combination, in an interlocking switch and signal mechanism, of vertical switch and signal connecting shafts, a series of horizontal shafts carrying one or more locking-arms adjacent to and in juxtaposition to said vertical shafts, and suitable connecting-gearing for said shafts, with levers corresponding in number to said vertical shafts, suitable gearing connecting them with the latter, and suitable means for controlling the movements of the levers to correspondingly control and limit the movements of the signals, the switches, and the arc described by the arms which lock the crossing shafts together and release said lock, substantially as described, for the purpose specified.

7. In an interlocking-switch mechanism for railway-crossings, the combination, with switch-operating connections consisting of a vertical shaft connecting each switch, and an operating-lever suitably geared to said shaft, with a horizontal shaft for each vertical shaft, carrying a locking-arm for the latter, and suitable gear for connecting and operating the shafts in pairs, and their locking device, substantially as herein set forth.

8. In an interlocking switch and signal mechanism for railway-crossings, the combination of a series of shafts crossing each other connected with the switches, with the signals,

and with their operating-levers, substantially as described, with one or more arms carried by one of said shafts and operated in harmony with their movement, and a provision on the other shaft whereby the said arm is adapted to lock the said shafts and to release said lock, as described.

9. The combination, in an interlocking switch and signal mechanism for railway-crossings, of a series of shafts crossing each other in separate parallel rows connected with the signals, with the switches, and with their operating-levers, as described, with one or more arms disposed upon the horizontal shafts in the order described to interlock with the vertical shafts in the order described, whereby the switches or the signals can be interlocked one with the other, as may be desired, for the purpose specified.

10. In an interlocking switch and signal mechanism, a series of shafts geared in pairs, each pair composed of a vertical and horizontal shaft, the two sets of shafts arranged in separate adjacent rows, the shafts of the horizontal row carrying each one or more forked arms in fixed relation thereto, and the shafts of the vertical row formed for angular cross-section at the point in juxtaposition to the forked arms, in combination with suitable switch and signal connecting mechanism and suitable operating-lever connections, substantially as described, for the purpose specified.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

ELISHA H. TOBEY.

Witnesses:
GEORGE RUST,
EDWD. E. STARCHFIELD.