

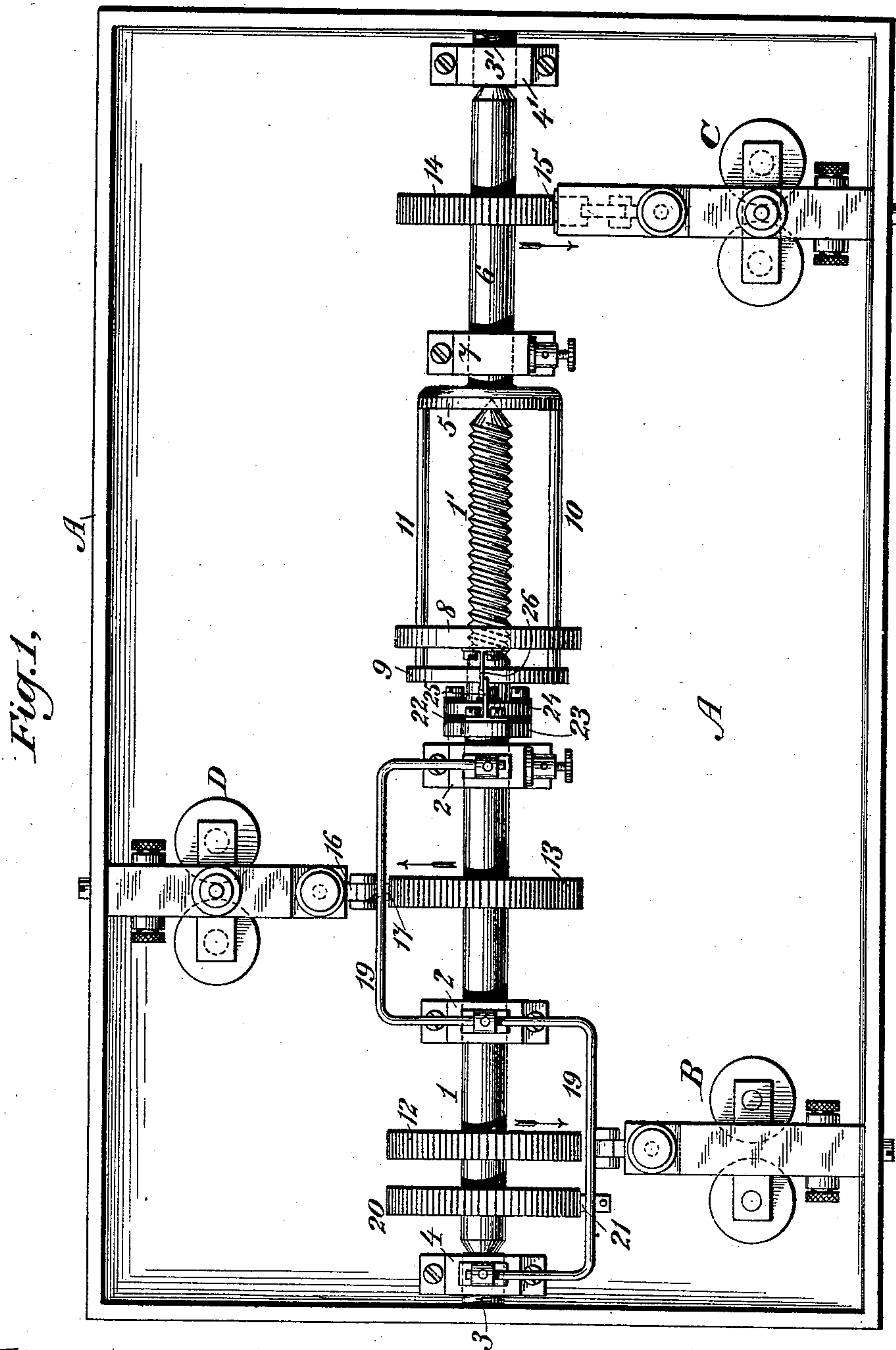
(No Model.)

3 Sheets—Sheet 1.

T. B. DIXON.  
REGISTER.

No. 543,593.

Patented July 30, 1895.



Witnesses:-

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Inventor:-

*Thomas B. Dixon*

*By E. M. Marble*  
*His attorney*

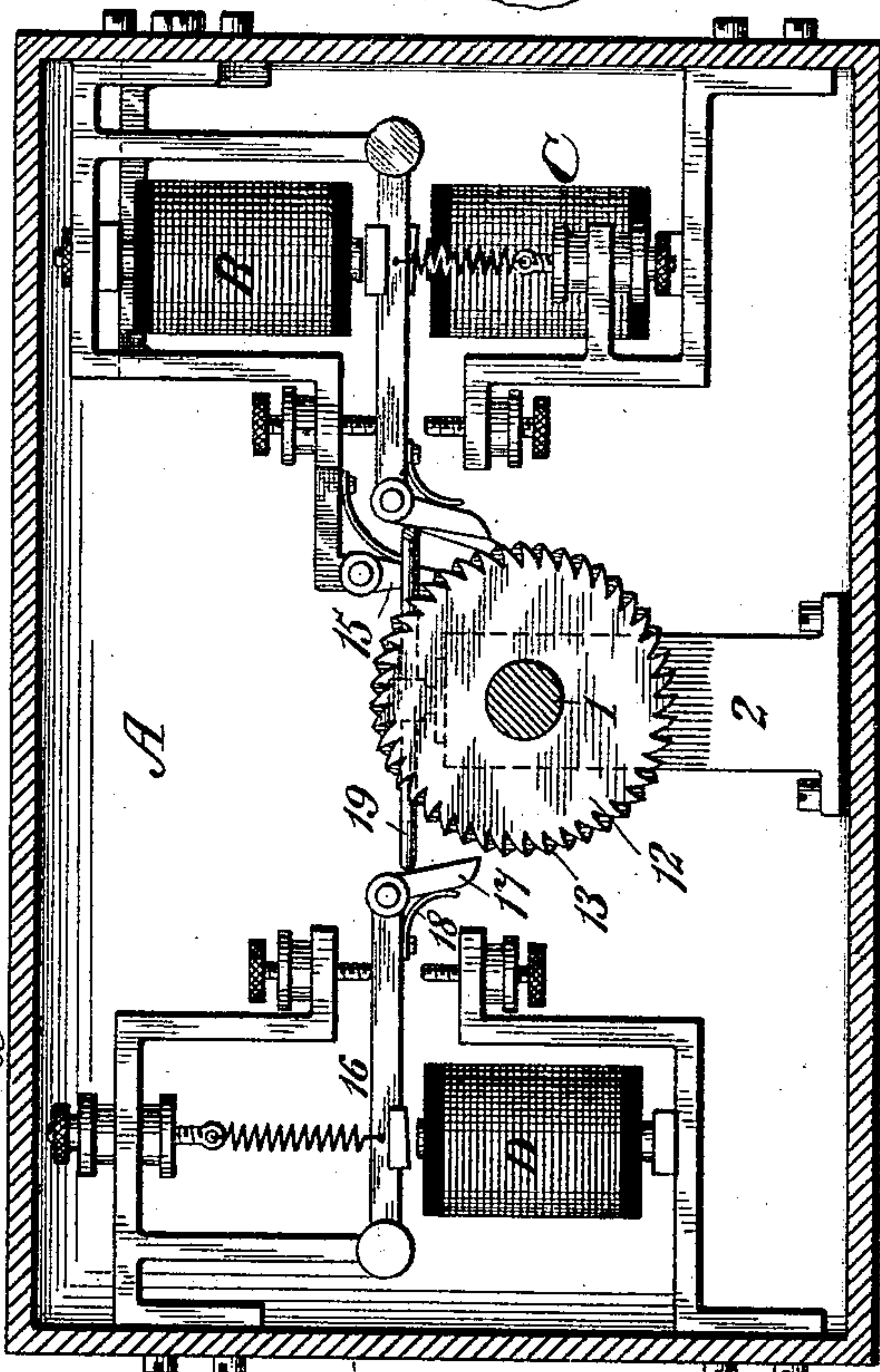
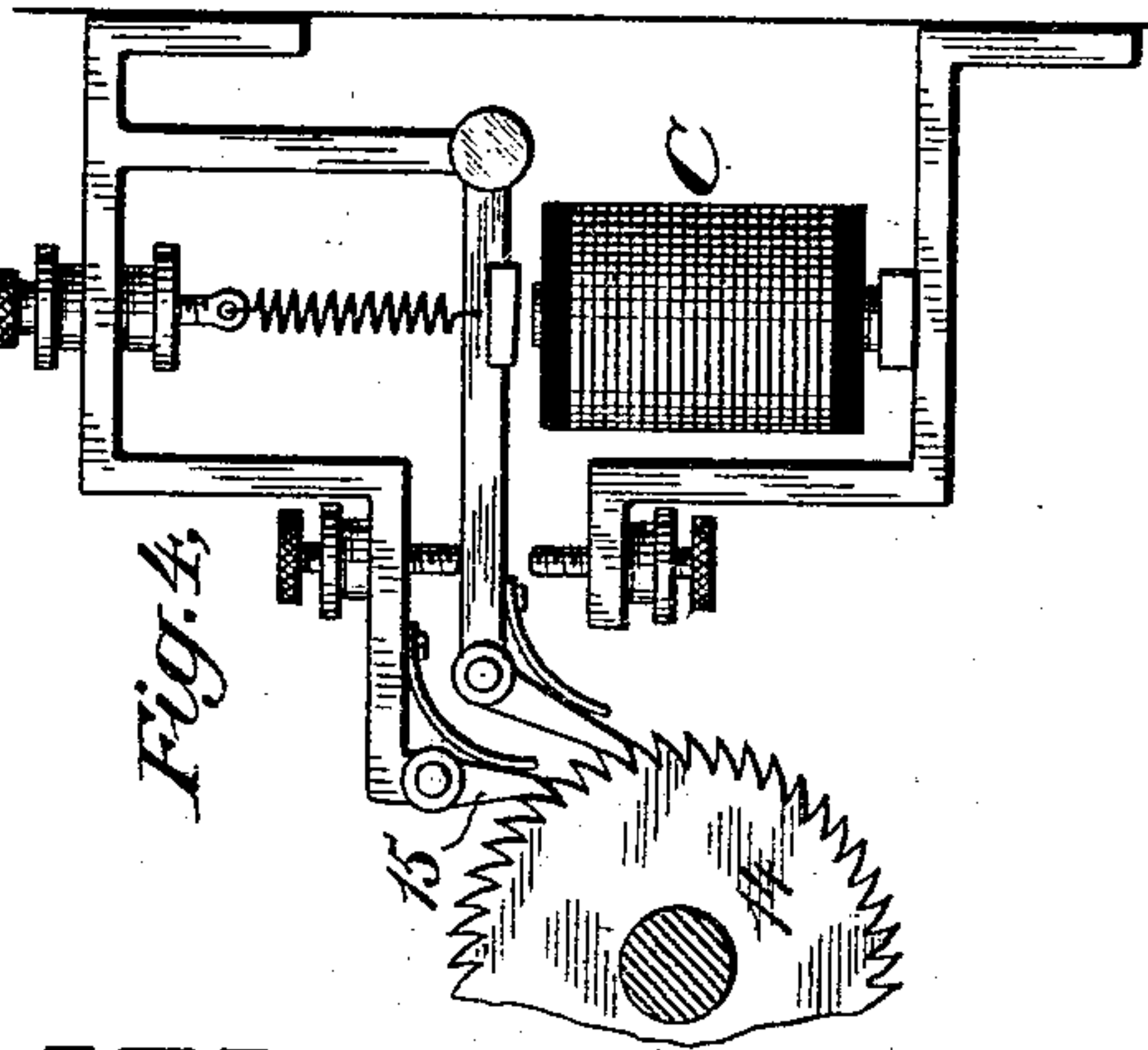
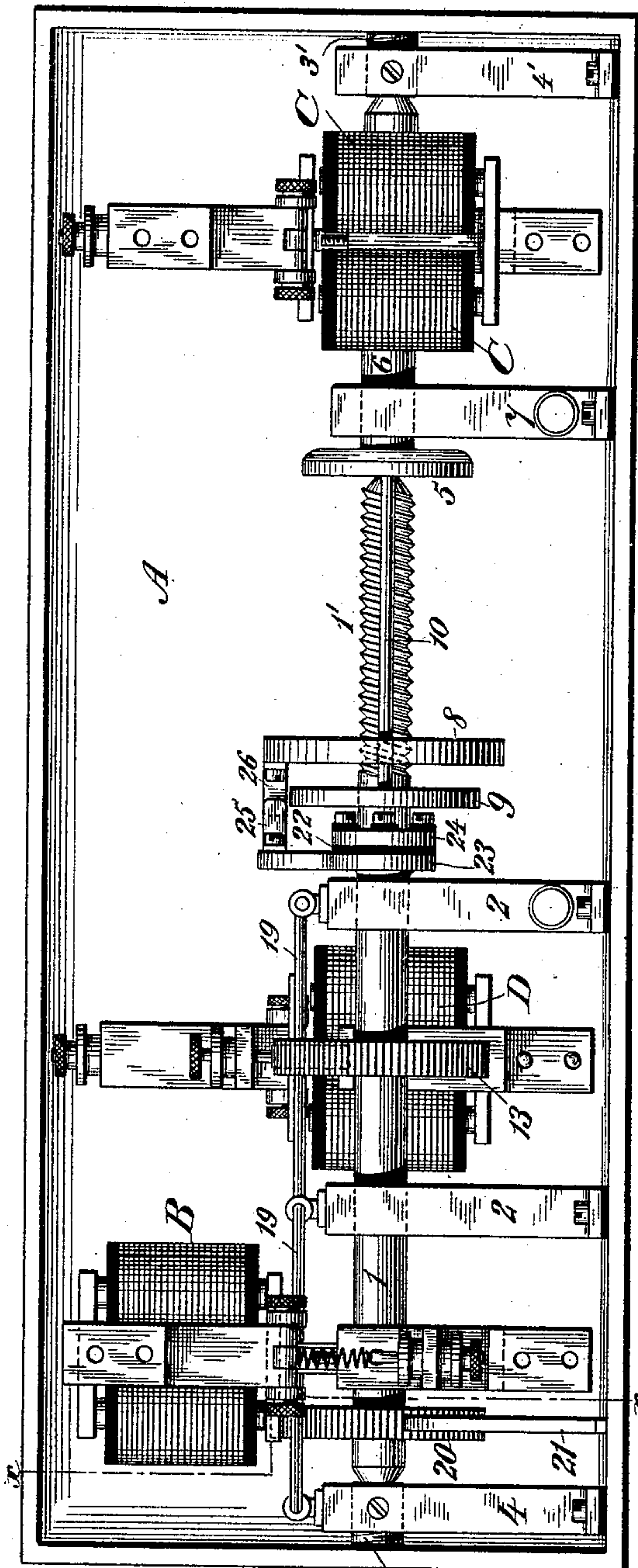
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3 Sheets—Sheet 2.

T. B. DIXON.  
REGISTER.

No. 543,593.

Patented July 30, 1895.



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Fig. 2.

A

Fig. 3.

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(No Model.)

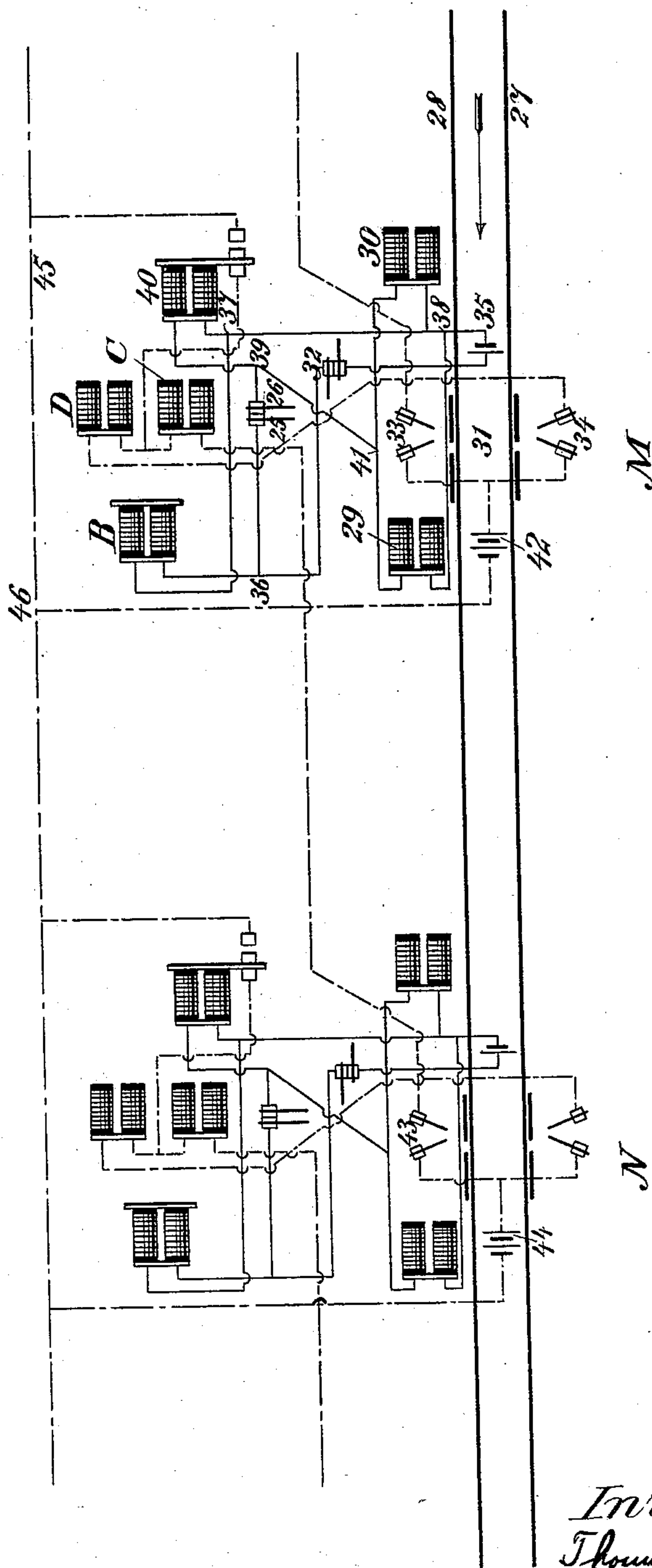
3 Sheets—Sheet 3.

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Fig. 5.



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# UNITED STATES PATENT OFFICE.

THOMAS BULLITT DIXON, OF HENDERSON, KENTUCKY.

## REGISTER.

SPECIFICATION forming part of Letters Patent No. 543,593, dated July 30, 1895.

Application filed February 14, 1894. Serial No. 500,169. (No model.)

*To all whom it may concern:*

Be it known that I, THOMAS BULLITT DIXON, a citizen of the United States, and a resident of the city of Henderson, county of Henderson, and State of Kentucky, have invented certain new and useful Improvements in Registers, of which the following is a specification.

My invention relates to counters or registers used to record or register automatically each and all of a number of occurrences of a particular character; and it relates particularly to improvements in electrically-operated registers or counters, and to that class of registers which are used in connection with automatic railway block-signal systems to register each wheel of a train as it passes into the block and to cancel the record so made of each wheel of the train as said wheel passes out of the block, the register being so connected with the signal-circuits that the signals set to "danger" when the train entered the block cannot be returned to "safety" until the same number of wheels have passed out of the block that first passed into it.

The objects of my invention are, first, to provide a register or counter adapted to work in connection with electric railway-signals and to perform the function above described; second, to provide a register or counter which shall unfailingly register the passage of each wheel of a train into the block to which that register belongs and shall cancel the passage of each wheel of said train out of that block, whether the wheels all pass out of the block at the same end at which they entered by a retrograde movement of the train or at the opposite end of the block by a forward movement of the train or whether the train breaks up within the block and part passes out of one end of the block and part passes out at the other end at different times or simultaneously; third, to so construct the parts of the register that they shall be able to move with sufficient rapidity to register wheels moving at high speed and in quick succession one to the other; fourth, to so construct and arrange the parts of the register as to make it strong, simple, inexpensive, easy of construction, requiring but little power to operate it, not liable to derangement, certain in action, and capable of unfailingly canceling the same

number of wheels that are registered; fifth, to provide means for controlling the signal-circuits from the register, so that the signals must be at "danger" so long as the register shows the presence of a wheel on the block. These objects are attained in the register herein described, and illustrated in the drawings which accompany and form a part of this application, in which the same reference letters and numerals indicate the same or corresponding parts, and in which—

Figure 1 is a plan view of the mechanism of the register, the cover of the inclosing-box having been removed. Fig. 2 is a side elevation of the register, the side of the inclosing-box having been removed. Fig. 3 is a sectional elevation, the section being taken on the line *xx* of Fig. 2. Fig. 4 is a detail view of the step-by-step ratchet mechanism of the canceling-magnet C; and Fig. 5 is a diagram of a block of a railway, illustrating the method of using the register.

In the drawings, A is the box or case, which incloses and protects the mechanism of the register.

B is the registering-magnet, C the canceling-magnet, and D the reverse canceling-magnet. These magnets, with their armature-levers, springs, and set-screws, are supported by frames bolted to the sides of the box A.

1 is a shaft carried in posts 2 2. It is formed in two parts, 1 and 1', which are joined by an insulating-coupling 22. The part 1' is screw-threaded, and its end is conical in shape and fits within a conical recess at the center of a disk 5, forming part of a shaft 6, carried in a post 7. The outer ends of shafts 1 and 6 are likewise conical in shape and fit within conical recesses in stub-shafts 3 and 3', supported in posts 4 and 4', so as to be capable of lateral adjustment.

Mounted upon the screw-threaded portion 1' of the shaft 1 is a screw-threaded nut or disk 8. A disk 9 is likewise mounted upon the same portion of the shaft 1, but is not screw-threaded, and revolves freely about the shaft. Rods 10 and 11 connect the disks 5 and 9, passing somewhat freely through apertures in the nut 8, so that the latter may slide along the rods in a lateral direction without undue friction.

Keyed to the shaft 1 are ratchet-wheels 12



and 13, opposite magnets B and D, respectively, and to the shaft 6 is secured a ratchet-wheel 14, opposite magnet C. Engaging with wheel 14 is an ordinary step-by-step ratchet mechanism operated by magnet C, adapted to carry wheel 14 down through the space of one tooth each time that the armature of magnet C is attracted, a pawl 15 holding the wheel while the armature rises. This mechanism is shown in detail in Fig. 4.

The step-by-step mechanisms of magnets B and D operate to turn shaft 1 in opposite directions, as shown by the arrows in Fig. 1, and therefore it is necessary that their pawls shall normally be out of engagement with their respective ratchet-wheels and shall come into actual engagement with their ratchet-wheels only when actually operating to turn the shaft. The conditions of use are such that it is impossible that both of the magnets B and D shall be operating at the same instant to turn the shaft, so that if both mechanisms be normally out of engagement with the shaft and are thrown into engagement with the shaft only when actually operating each mechanism is free to act upon the shaft without conflict from the other mechanism. The means employed for throwing the step-by-step mechanisms out of engagement with the shaft is shown in Fig. 3. Taking for example the mechanism of magnet D, 16 is the pivoted armature-lever and 17 the pawl carried thereby, a spring 18 tending to press said pawl forward into engagement with the ratchet-wheel 13 in rear of the ratchet-wheel 12. (Seen in Fig. 3.) A guard 19, of wire or other suitable material, prevents the pawl from being moved forward when the armature is not attracted by its magnet. When, however, the circuit of magnet D is completed and the armature is attracted, as the armature-lever 16 swings down the pawl 17 recedes from the guard 19 and the spring 18 forces it into engagement with the ratchet-wheel 13, the further movement of the armature-lever then causing the wheel 13 and shaft 1 to revolve through the space of one tooth. When the circuit of magnet D is broken, the armature-lever 16 rises and the guard 19 forces the pawl 17 out of engagement with the ratchet-wheel 13.

A toothed wheel 20 is keyed to the shaft 1, and a flat spring 21 engages therewith and acts as a resistance to the revolution of the shaft 1 and prevents the shaft from turning, except when it is moved positively by the ratchet mechanism of one of the magnets B or D.

I have arranged the registering mechanism—viz., that of magnet B—to be operated by a normally-closed circuit, which is broken each time that a wheel is to be registered, while the canceling mechanisms—viz., those of magnets C and D—I have arranged to be operated by normally-open circuits, which are closed each time that a wheel is to be canceled. This arrangement I believe to be the best

with due regard to safety, where the register is to be used with railway signal-circuits, since the breakage of a wire in the circuits can only cause the signals to go to "danger," if at "safety," or to remain at "danger," if already at "danger." Any of the mechanisms may be arranged to be operated either by normally-open circuits or by normally-closed circuits, as may be desired, and it may be that if employed for other purposes than to control the signals of railways it may be desirable to cause the magnets to operate differently from the manner shown in these drawings.

As has been stated, the two parts of the shaft 1 are joined by an insulating-coupling 22. This coupling consists of a disk 23, attached to the portion 1, and a disk 24, attached to the part 1', the two disks being separated by a washer of insulating material. Screws insulated from the disk 24 connect the disks. The disk 23 has an outwardly-projecting arm, to which is secured a contact-piece 25. The nut 8 has a corresponding contact-piece 26, and when there are no wheels upon the block the position of the nut 8 should be such that these contact-pieces are in contact with each other. The posts by which the shafts of the register are supported are all insulated from the case A. To one post 2 a binding-post is attached, and to the post 7 a similar binding-post is attached. These binding-posts are terminals for a circuit controlling the signals of the block. When the contact-pieces 25 and 26 are in contact, there is a circuit complete from the binding-post of support 2 through shaft 1, disk 23, contact-pieces 25 and 26, nut 8, screw 1', shaft 6, support 7, and to the binding-post thereon. The signal-controlling circuit connected to these binding-posts should be arranged to hold the signals at "safety" when the circuit is completed, but to set the signals to "danger" when the said circuit is broken. Any separation of the contact-pieces 25 and 26 will break the circuit, and thus will cause the signals to go to "danger" and to remain at "danger" until the contact-pieces 25 and 26 are again in contact. The disk 23 and the nut 8, with the contact-pieces 25 and 26, constitute what may be termed the "registering devices" of the instrument. Other types of registering devices may be employed—as, for instance, a dial-plate mounted upon the nut 8, and a pointer therefor upon the disk 23—so that the register may indicate at any time the number of wheels registered, and it is possible to have both the contact-pieces and the dial and pointer in one and the same instrument.

In Fig. 5 I have illustrated circuits of a block-signaling system, showing how my register may be employed for controlling the signals of a railway. The figure shows only one track of a double-track railway and but a single block M N on that track.

B is the registering-magnet, C the canceling-magnet, and D the reverse canceling-mag-



net of the register at M, shown diametrically without regard to their position in the register.

25 and 26 are the contact-pieces of the register. The mechanism by which these contact-points are operated through the closing and breaking of the circuits of magnets B, C, and D is not shown, but may be understood.

27 and 28 are the rails of the track and 29 and 30 are respectively home and distant signals at the entrance of the block.

The register is operated by a track-instrument 31, the mechanism of which is not shown, but the presence of which is indicated by four short lines parallel to and at the side of the rails, these lines representing rail-levers for operating the mechanism of the track-instrument. It is required that the track-instrument shall be adapted to operate simultaneously both normally-open and normally-closed contact-points; shall operate these contact-points each time that a wheel passes completely over the track-instrument, but shall not operate said contact-points unless the wheel does pass completely over the track-instrument, and shall operate one set of contact-points when the train is going in one direction and another set of contact-points when the train is going in the opposite direction. Any track-instrument fulfilling these requirements may be used.

In Fig. 5, since there is shown but one track of a double-track railway, traffic exists normally in but one direction, which is indicated by an arrow. On the right side of the track there are two sets of track-instrument contact-points 32, which are normally closed and are arranged to be broken when a wheel going in the direction of the arrow passes over the track-instrument, and 33, which are normally open and are arranged to be closed when the said wheel passes over the track-instrument.

34 is another set of normally-open contact-points, which are not operated by a wheel going in the direction of the arrow, however, but are operated by a wheel going in the opposite direction, and which, for that reason, does not operate either of the contacts 32 and 33. All of the track-instrument contacts are returned to their normal position immediately after the passage of the wheel operating them, so as to be in position to be operated by a succeeding wheel.

35 is a closed-circuit battery, which operates the signals 29 and 30, also the registering mechanism of the register. Its circuit goes from the positive pole of the battery through normally-closed contact 32 to 36, where the circuit divides, one branch going through the coils of registering-magnet B to 37, thence to 38, and so to the negative pole of the battery. The other branch, from 36, goes through the register contact-pieces 25 and 26 to 39, where the circuit again divides, one branch going through the magnet-coils of a relay 40—to be considered hereinafter—and

thence to 38, and so to the negative pole of battery 35. The other branch, from 39, goes to 41, where the circuit again divides, one branch going through the magnet-coils of signal 29, the other through magnet-coils of signal 30, thus placing the signals in multiple, the two branches uniting with the return-wire at 38, and so returning to the negative pole of battery 35. It has been said that the passage of a wheel over the track-instrument in the direction of the arrow will cause a momentary separation of contact-points 32. Such a separation will cause the breaking of the circuit of battery 35, thus breaking the circuit of the registering-magnet B, which has the effect of causing a separation of the contact-points 25 and 26 of the register, as will be explained when the operation of the register is described. The separation of the contact-points 25 and 26 breaks the circuits of signals 29 and 30, and, as has been said, these signals are arranged to be set to "danger" when their circuits are broken. The passage of a wheel over the track-instrument 31 in the direction of the arrow therefore causes the signals 29 and 30 to be set to "danger." Immediately after the passage of the wheel the contact 32 is closed again, but the register contact-points 25 and 26 remain separated, and therefore the signals remain at "danger" until, through the operation of the canceling or reverse canceling mechanisms, or both, contact-points 25 and 26 are again brought together. As the wheel moves over the track-instrument, it operates contact-points 33, as well as contact-points 32, closing them and completing a circuit from battery 42, which operates the canceling mechanism of the register at a station behind M. The canceling-magnet C of the register at M is controlled by contact-points 43, which are contact-points of the track-instrument at N, corresponding to contact-points 33 of the track-instrument at M, the entrance to the block. When a wheel beginning to enter the block beyond N operates the contact-points 43, it completes a circuit from the battery 44, through contact-points 43, to canceling-magnet C, thence through the contact-points of relay 40 to 45, and through a return-wire to battery 44. The completion of this circuit operates the canceling mechanism of magnet C, thus canceling the record formerly made by the wheel when it passed over the track-instrument 31. In the same manner if a wheel, after having passed over the track-instrument 31 in the direction of the arrow, moves backward over the track-instrument again in this backward movement, it does not operate contacts 32 and 33, but operates, instead, contact 34, and the closing of this contact completes a circuit from battery 42, through contact 34, and through the magnet-coils of reverse canceling-magnet D and the contact-points of relay 40 to 45, through the return-wire to 46, and so back to battery, thus operating the reverse canceling mechanism of magnet D. The op-



eration of the reverse canceling mechanism has the same effect in canceling the previously-registered record of a wheel that the operation of the canceling mechanism of magnet C has. The signals shown in this diagram may be of any suitable class, arranged to be operated automatically and to be controlled by an electromagnet. They are indicated by the conventional illustration of an electromagnet, which may be considered to be the controlling-magnet of the signal.

The relay 40 is a safety device which protects the mechanism of the register when trains are not running in the normal direction over the track. It is not a part of the register, and may be dispensed with. Its circuit is broken when the contact-points 25 and 26 are separated, so that its armature falls and remains down so long as these contact-points are separated. It is not necessary, therefore, to take notice of the relay in considering the operation of the register and signal circuits. The function of the relay is this: Should it happen, through exceptional conditions in the operation of the relay, that trains should pass over the track shown in this figure in the direction opposite to the arrow, it might happen that such trains would pass at times when no wheels were recorded on the register—that is, when the contact-points 25 and 26 were in contact. Such trains will operate the contact 34 of track-instrument 31, and so, in order to prevent the operation of the reverse canceling mechanism of magnet D at a time when there are no wheels registered on the register, the relay 40 is provided and is arranged to break the circuit of contact 34 when the contact-points 25 and 26 of the register are in contact.

The operation of my register is as follows: Supposing a train to pass over track-instrument 31, each wheel in passing will break the circuit of magnet B momentarily, causing the armature of this magnet to fall and revolving the ratchet-wheel 12 and shaft 1 through the space of one tooth. The nut 8 cannot turn with the shaft 1, since it is held by the pawl 15 acting upon the ratchet-wheel 14, and therefore the revolution of the shaft 1 separates contact-points 25 and 26, thus breaking the circuit which controls the signals. As succeeding wheels pass over the track-instrument the shaft 1 and wheel 12 are turned still farther. The rotation of the shaft likewise causes a lateral movement of the nut 8 to the right, so that, when by the continued operation of the registering mechanism the contact-point 25 has reached its former position which it occupied at the start, the nut 8 has moved so far to the right that the contact-points 25 and 26 will no longer engage. The shaft 1 may, therefore, rotate a second time, and so on, the capacity of the register being limited only by the length of the screw. When the train begins to enter the block next succeeding, as the wheels pass out of the block to which the track-instrument 31

belongs they should cancel the record formerly made at the register, so that when all of the wheels shall have passed out of the block the signals may be restored to "safety." As each wheel enters the advance-block it operates the contact-points 43 there, completing a circuit through canceling-magnet C, and thus causing the operation of the canceling mechanism. Each time that the magnet C is energized the wheel 14 and shaft 6 are rotated through the space of one tooth. This rotation is communicated to the nut 8 by the rods 10 and 11. There are the same number of teeth to the wheel 14 as to the wheel 12, and therefore when the same number of wheels have operated the canceling mechanism of magnet C the nut 8 will have moved through the same angular distance through which the contact-point 25 moved when the registering mechanism was operating. Moreover, this rotation of the nut 8 causes it to move laterally to the left, so that when the same number of wheels have been canceled as were registered the contact-points 25 and 26 will be together, the signal-controlling circuit will be complete, and the signals will be restored to safety. Should the train pass out of the block by backing over track-instrument 31, contact-points 34 will be operated as each wheel passes over the track-instrument, thus causing the operation of the reverse canceling mechanism of magnet D, thus turning the shaft backward; and as the wheel 13 has the same number of teeth as the wheel 12, when the same number of wheels have been canceled as were registered the contact-points 25 and 26 will be in contact and the signals will be restored to "safety," as before.

It is obvious that the mechanisms of magnets B and D cannot operate simultaneously, for it is impossible that trains should be passing over the track-instrument 31 in both directions simultaneously. Therefore, although both the registering and the reverse canceling mechanisms act upon one shaft, there is no conflict; but it is possible that while one train is passing out of the block at the distant end another train may be entering the block at the home end, so that both the registering mechanism of magnet B and the canceling mechanism of magnet C may be operated simultaneously; and it is clear that this is possible in my register, for the shaft 1 and nut 8 rotate independently of each other, and each will be rotated a distance corresponding to the number of wheels of the train which is causing it to rotate. In the same manner, if trains be passing out of the block at both ends simultaneously, then the canceling and reverse canceling mechanisms will be operated simultaneously, and the contact points 25 and 26 will be brought together when the two mechanisms together have canceled the same number of wheels that were first registered when the train entered the block.

I do not limit the use of my register to use



in the signal-circuits of railways or to the particular circuits shown in Fig. 5. It may be used in many different locations for many different purposes. This will be particularly true if equipped with the dial and pointer above mentioned for indicating the number of events which have been registered.

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

1. In a register for registering and canceling successive events, the combination, with a registering mechanism operated by successive impulses corresponding to the events registered, a canceling mechanism, operated by successive impulses corresponding to the events canceled and registering devices, of means for operating the registering devices by the simultaneous and independent operation of said registering and canceling mechanisms, substantially as described.

2. In a register, the combination, with a registering mechanism, two separate canceling mechanisms, and registering devices, of means for operating the registering devices by the operation of the said registering mechanism, and by the simultaneous and independent operation of said canceling mechanisms, substantially as described.

3. In a register for registering and canceling successive events the combination, with a registering mechanism, operated by successive impulses corresponding to the events registered a canceling mechanism, operated by successive impulses corresponding to the events canceled and circuit controlling registering devices, of means for operating the registering devices by the simultaneous and independent operation of said registering and canceling mechanisms, substantially as described.

4. In a register, the combination, with a registering mechanism, two separate canceling mechanisms, and circuit controlling registering devices, of means for operating the registering devices by the operation of said registering mechanism and by the simultaneous and independent operation of said canceling mechanisms, substantially as described.

5. In a register, the combination, with a screw-threaded shaft revolubly mounted, of a nut mounted on said shaft, means for rotating said shaft within said nut, means for rotating said nut about said shaft, and signal controlling devices controlled by said nut in accordance with its position on said shaft, substantially as described.

6. In a register, the combination, with a screw-threaded shaft revolubly mounted, of a nut revolubly mounted on said shaft, means for rotating the shaft within the nut, means for rotating the nut about the shaft, and electrical contact points operated by the movement of the nut relative to the shaft, and adapted to control electric circuits, substantially as described.

7. In a register, the combination, with a screw-threaded shaft revolubly mounted and a nut revolubly mounted upon said shaft, of a registering mechanism for rotating said shaft within said nut, a canceling mechanism for rotating said nut about said shaft, and a reverse canceling mechanism for rotating said shaft in a direction opposite to that in which it is rotated by the registering mechanism, substantially as described.

8. In a register, the combination, with a screw-threaded shaft revolubly mounted and a nut revolubly mounted upon said shaft, of a registering mechanism for rotating said shaft within said nut, a canceling mechanism for rotating said shaft in a direction opposite to that in which it is rotated by the registering mechanism, and electrical contact points operated by the movement of the nut relative to said shaft, and adapted to control electric circuits, substantially as described.

9. In a register, the combination, with a screw-threaded shaft revolubly mounted and a nut revolubly mounted on said shaft, of a registering mechanism for rotating said shaft in one direction, a canceling mechanism for rotating said shaft in the opposite direction, and means for normally throwing both registering and canceling mechanisms out of gear with the shaft, but adapted to throw either of said mechanisms into gear with the shaft when it begins to operate, substantially as described.

10. In a register, the combination, with a screw-threaded shaft 1, and the nut 8 mounted thereon, of the shaft 6 revolubly mounted, means for rotating said shaft, and means for causing said nut to be revolved by the revolution of the shaft 6, substantially as described.

11. In a register, the combination, with a screw-threaded shaft 1, and the nut 8 mounted thereon, of the shaft 6 revolubly mounted in line with shaft 1, means for rotating said shaft 6, and rods 10 and 11 carried by said shaft and having bearings in said nut 8, whereby the nut 8 is caused to rotate with shaft 6, substantially as described.

12. In a register, the combination, with the shaft 6 revolubly mounted, the disk 5 thereon, and the shaft 1 revolubly mounted in line with shaft 6 and having a conical end bearing within a conical recess in disk 5, of the nut 8 mounted upon said shaft 1, rods 10 and 11 carried by said disk 5 and having bearings in the nut 8, and a disk 9 mounted upon said shaft 1 and supporting the ends of said rods 10 and 11, substantially as described.

13. In a register, the combination, with a shaft 1 revolubly mounted and having a screw-threaded portion 1' insulated from the main body of the shaft, of a nut 8 mounted upon said screw-threaded portion 1', means for rotating the shaft within said nut, means for rotating said nut about said shaft, a con-



tact point 26 carried by the nut, and a contact point 25 carried by an arm projecting from the main body of the shaft and adapted to engage with said contact point 26, but to  
5 be separated therefrom by motion of the nut relative to the shaft, substantially as described.

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

THOMAS BULLITT DIXON.

Witnesses:

W. H. NEYLEY,  
L. W. POWELL.