Jan. 2, 1923.

1,440,443

L. BOIRAULT.

BRAKE OPERATING DEVICE FOR RAILWAY VEHICLES.

FILED JUNE 1, 1920.

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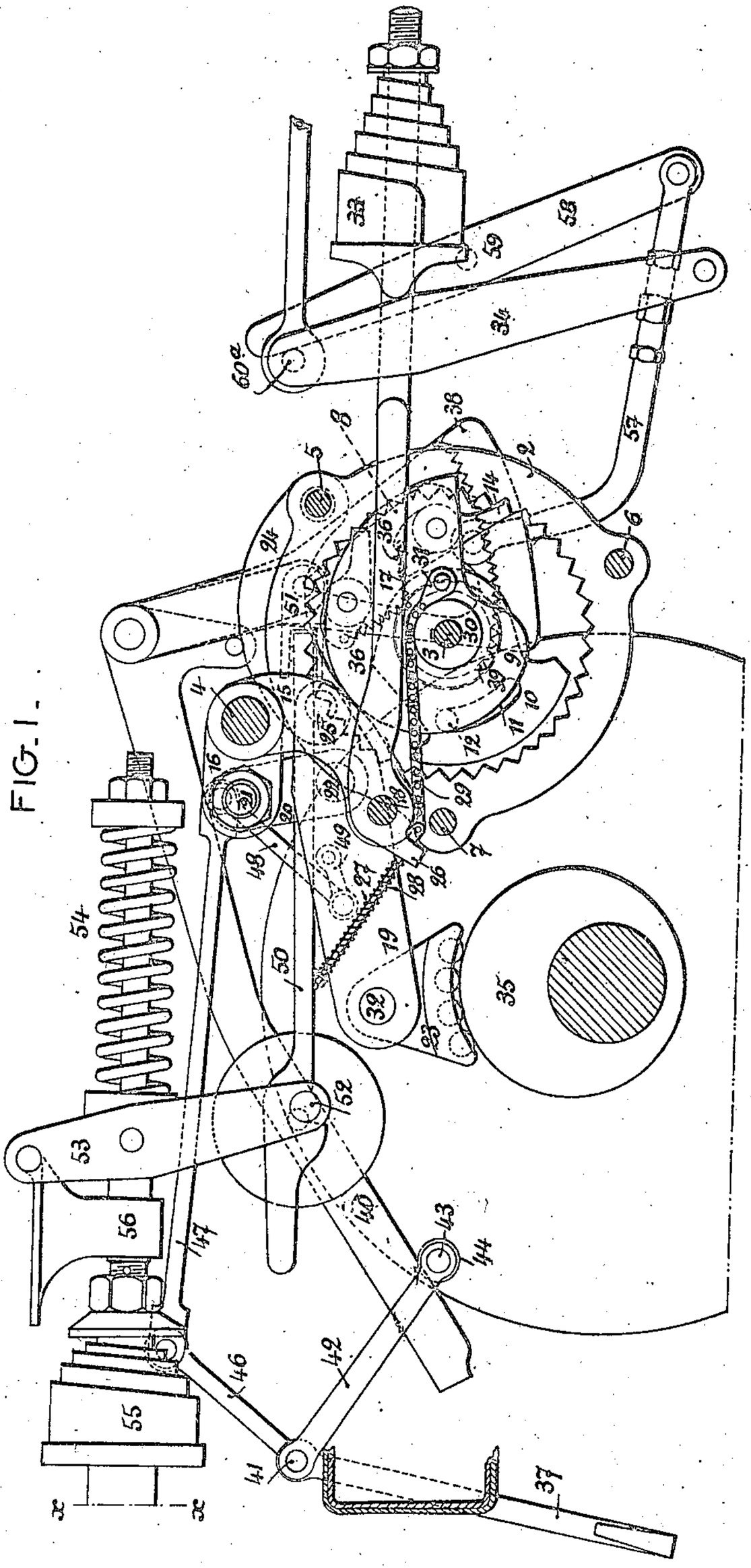

FIG. 1.

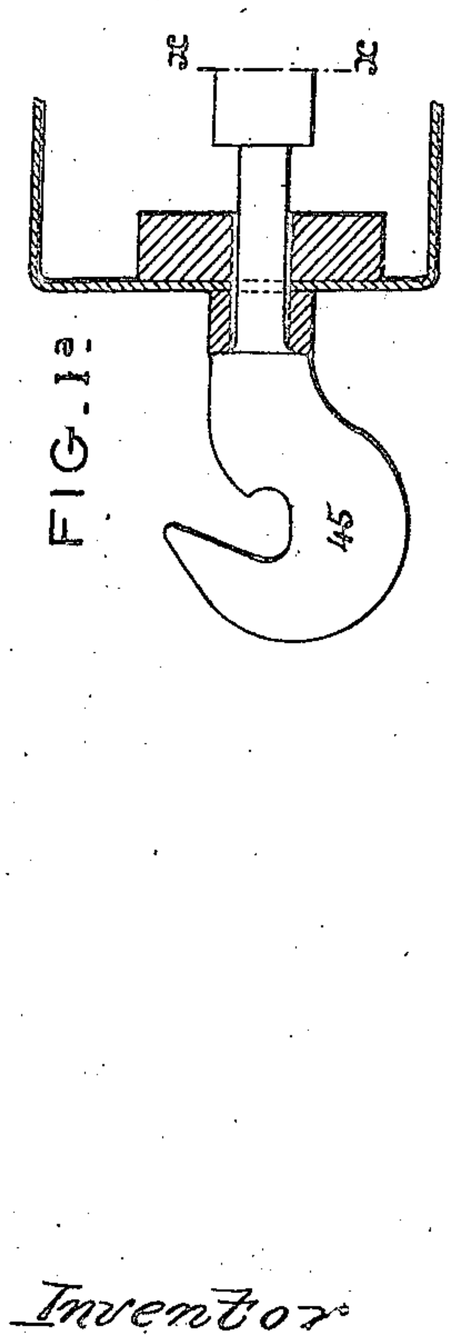

FIG. 1a.

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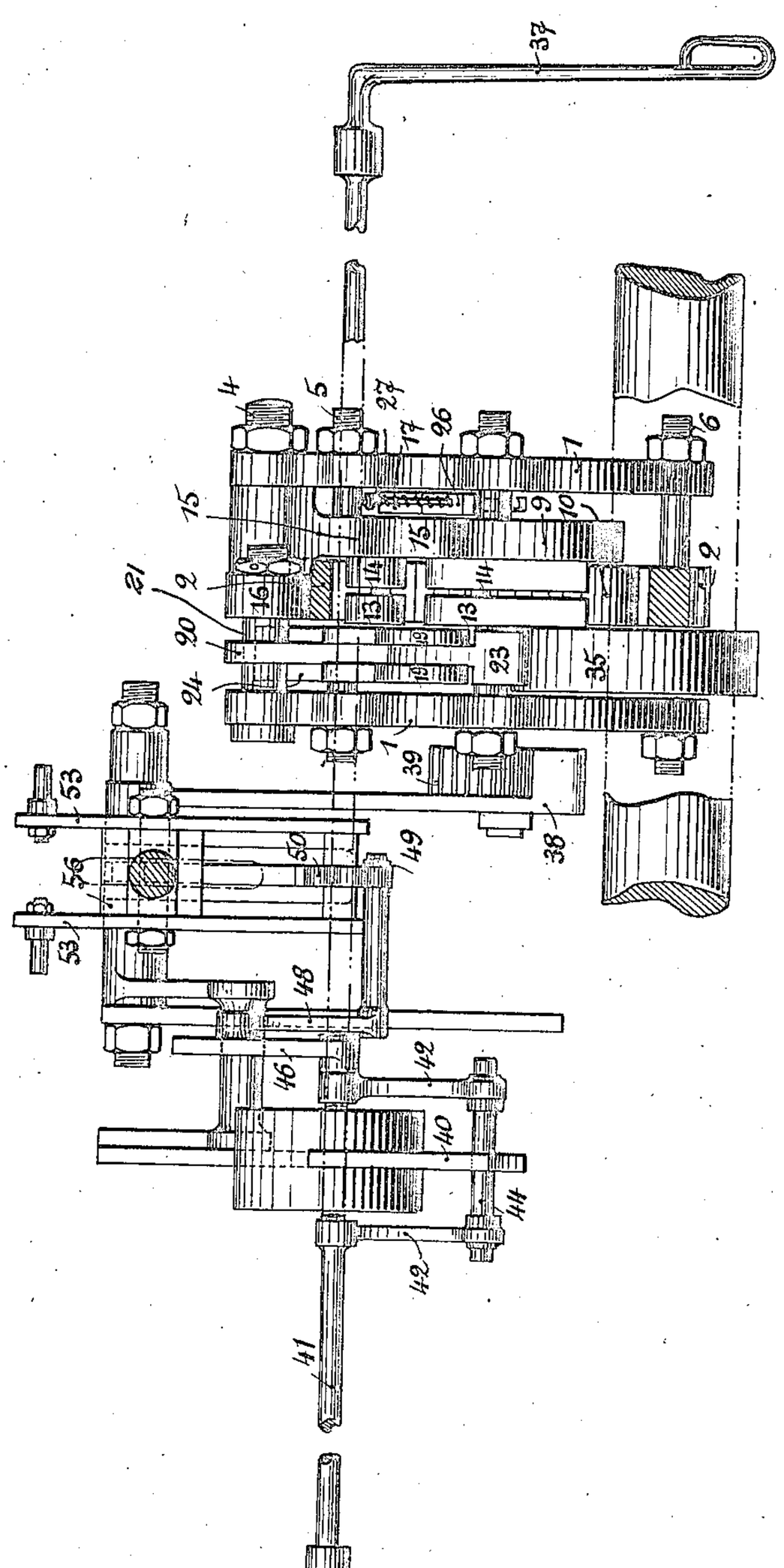
FIG. 2.



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BRAKE OPERATING DEVICE FOR RAILWAY VEHICLES.

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FIG-3-

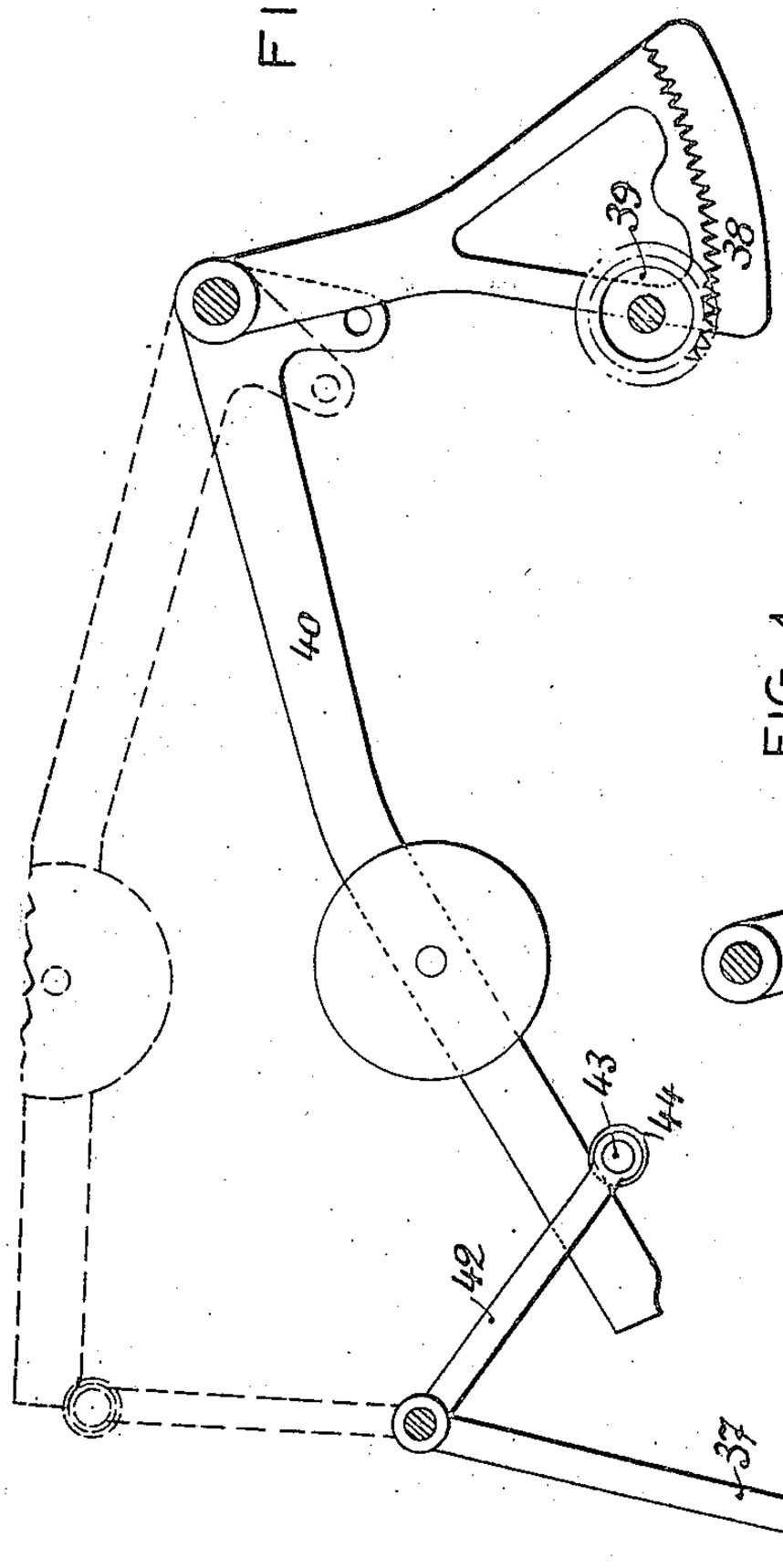
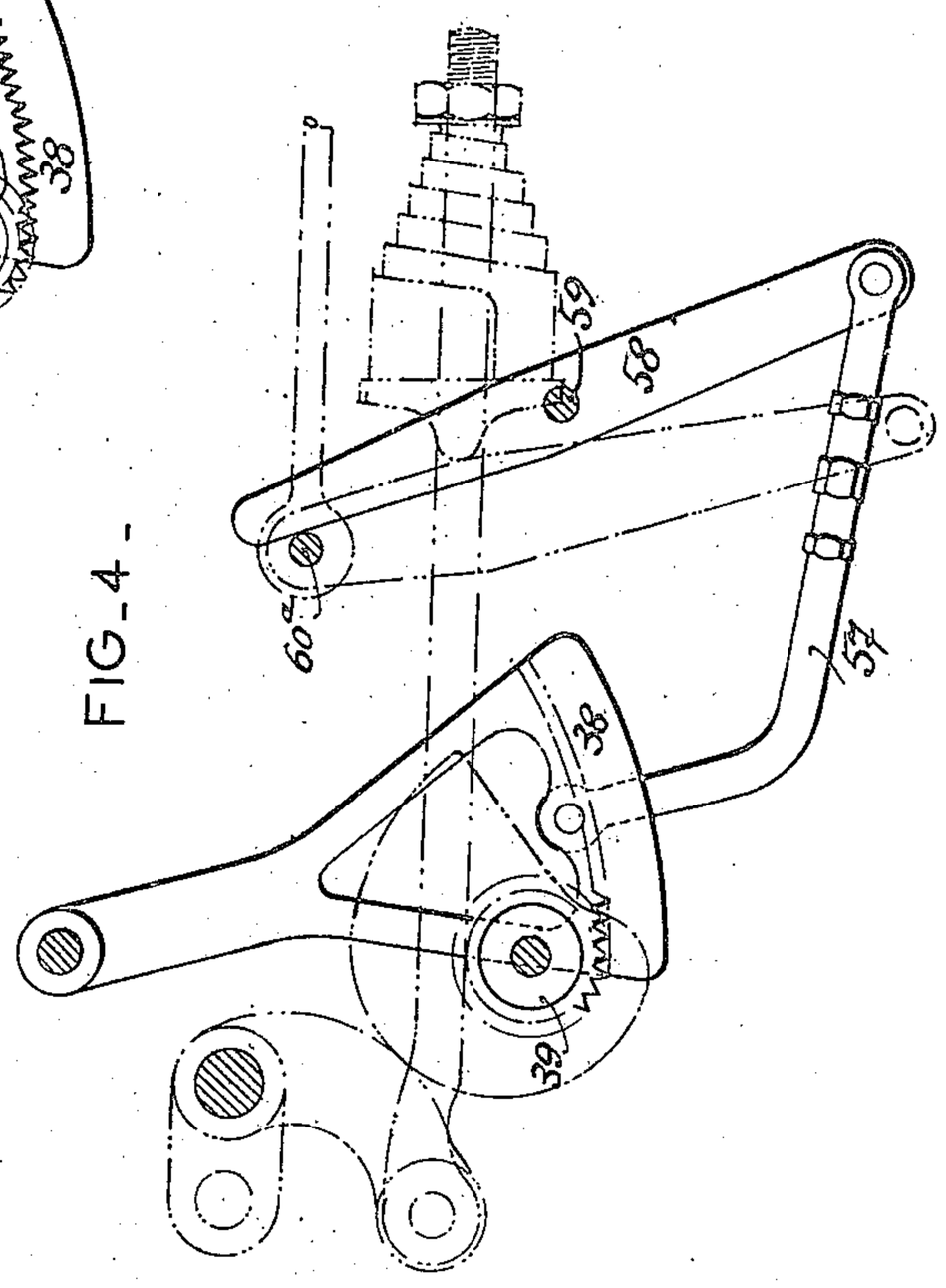


FIG-4-



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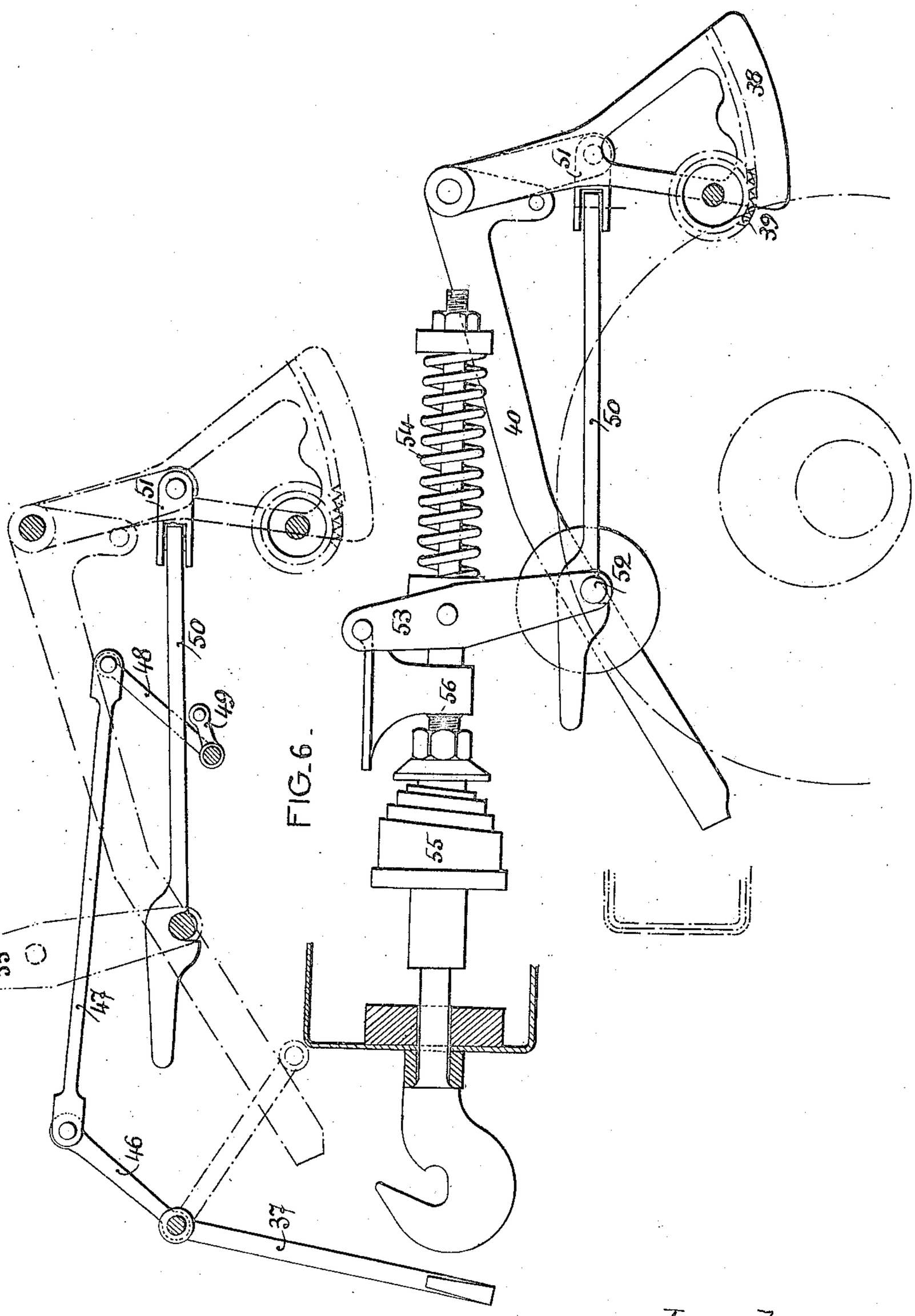

FIG. 5

FIG. 6.

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BRAKE OPERATING DEVICE FOR RAILWAY VEHICLES.

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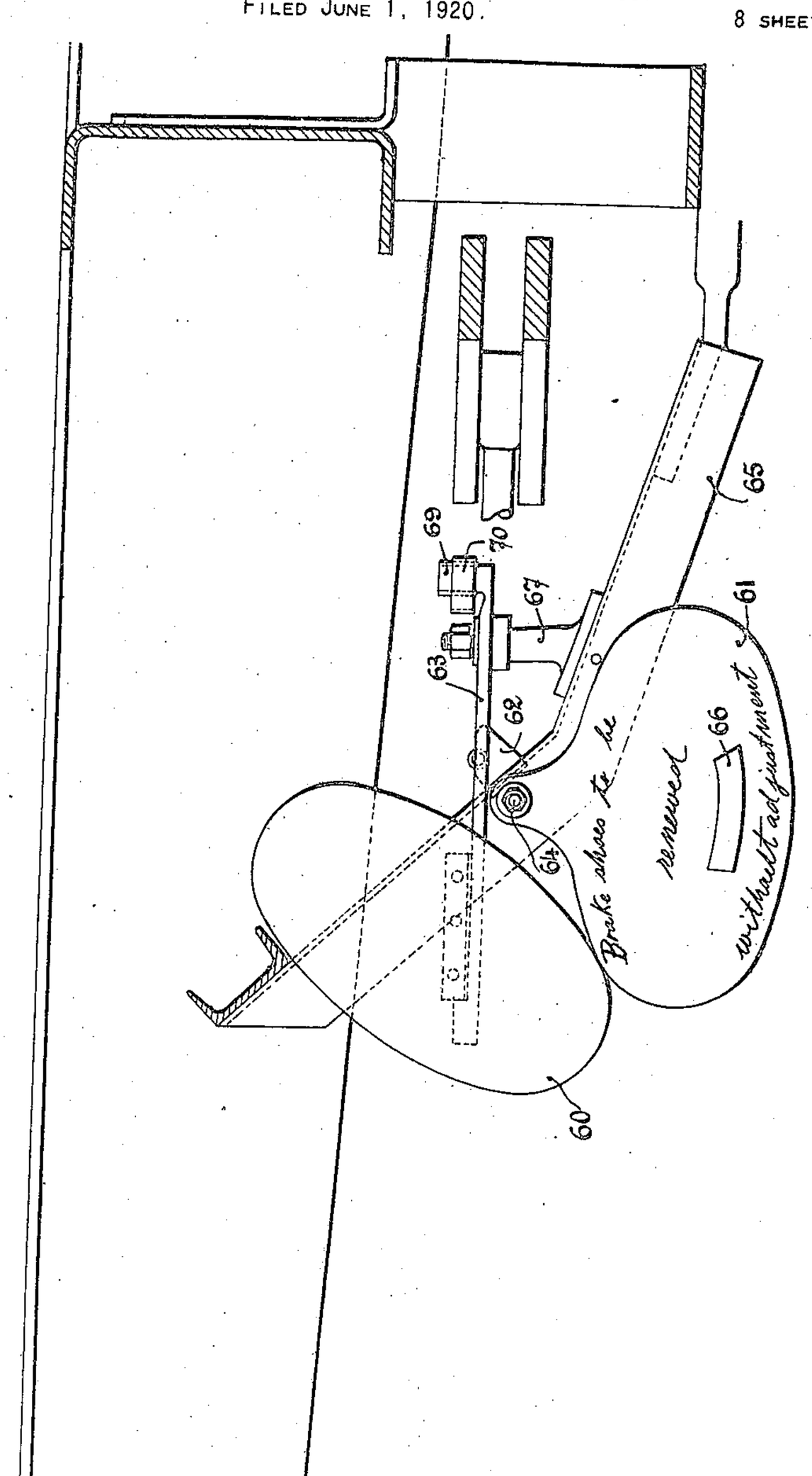
FIG. 7.



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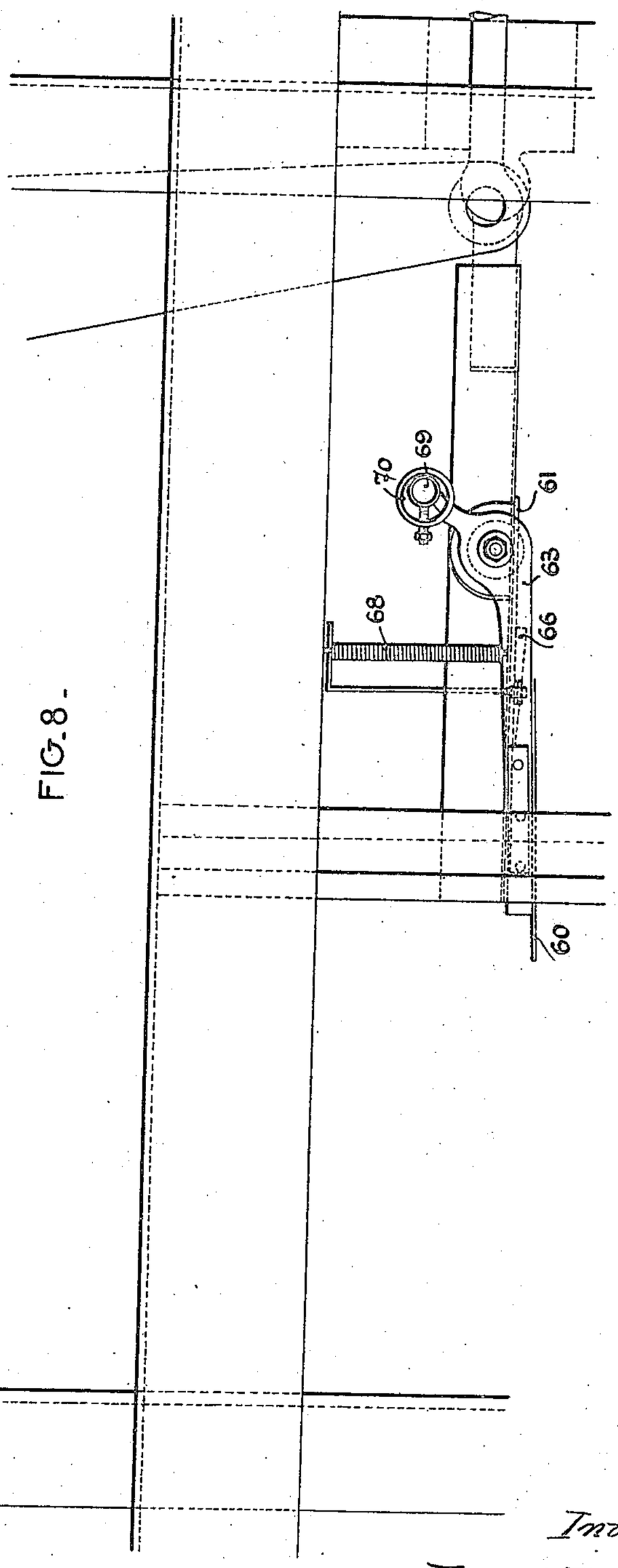

FIG. 8.

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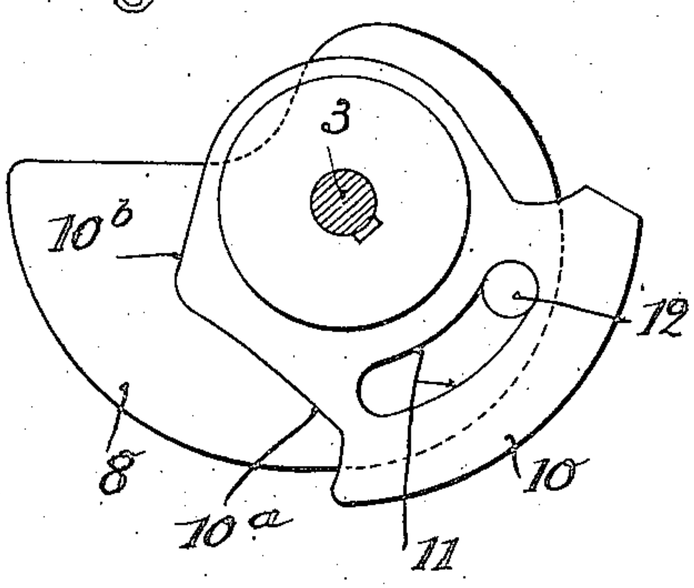
Fig. 10



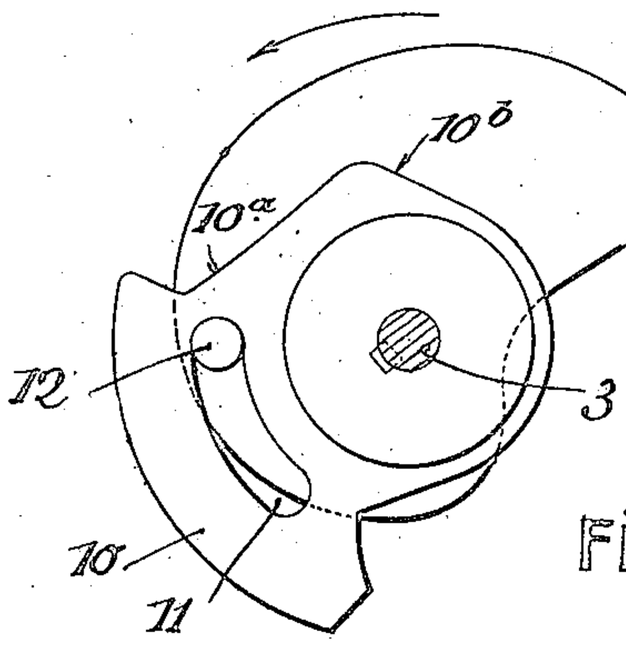


Fig. 12

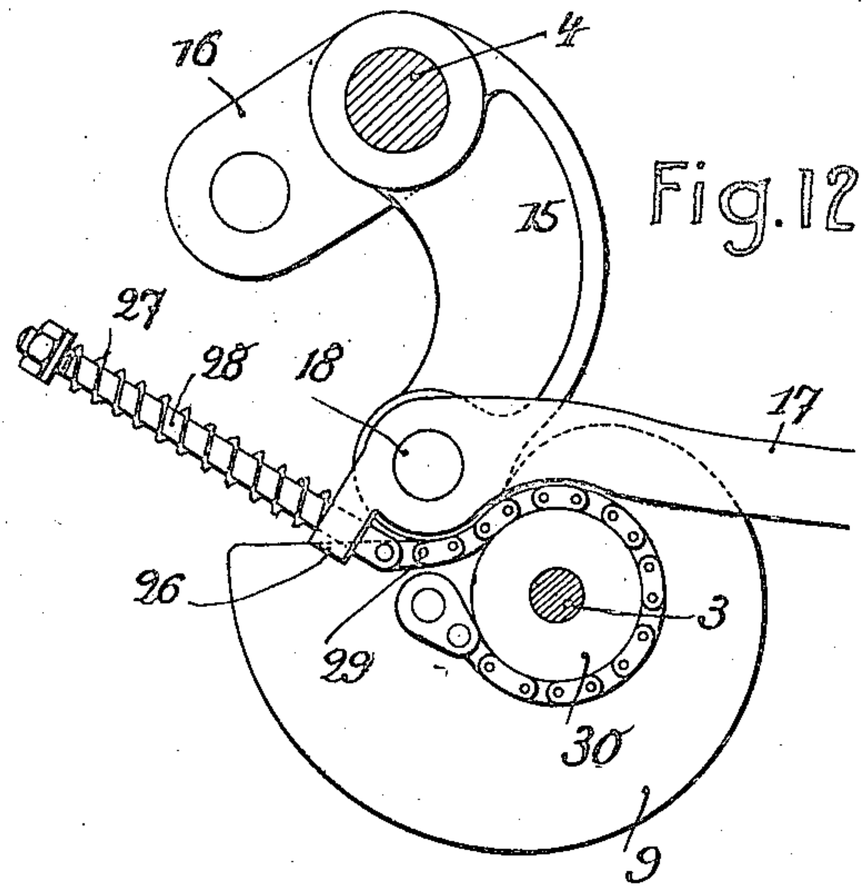
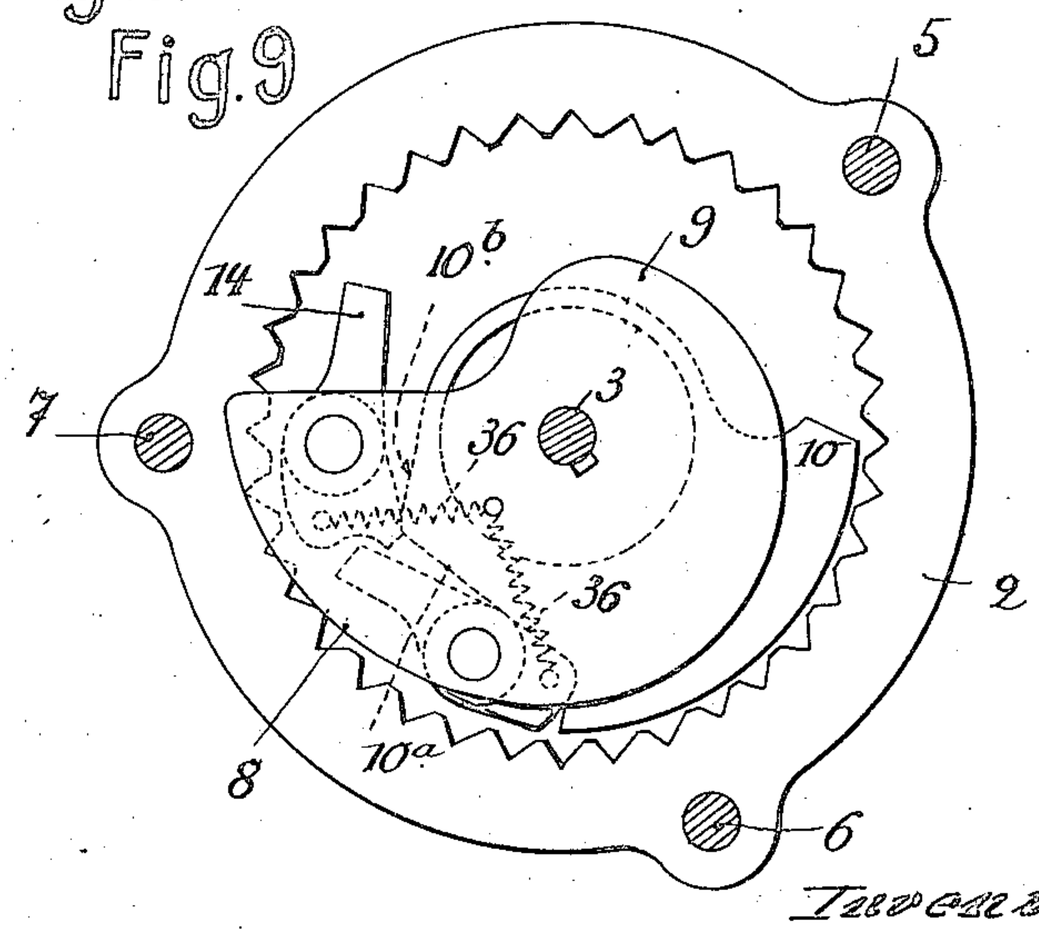


Fig. 11

Fig. 9



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BRAKE OPERATING DEVICE FOR RAILWAY VEHICLES.

FILED JUNE 1, 1920.

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Fig. 14

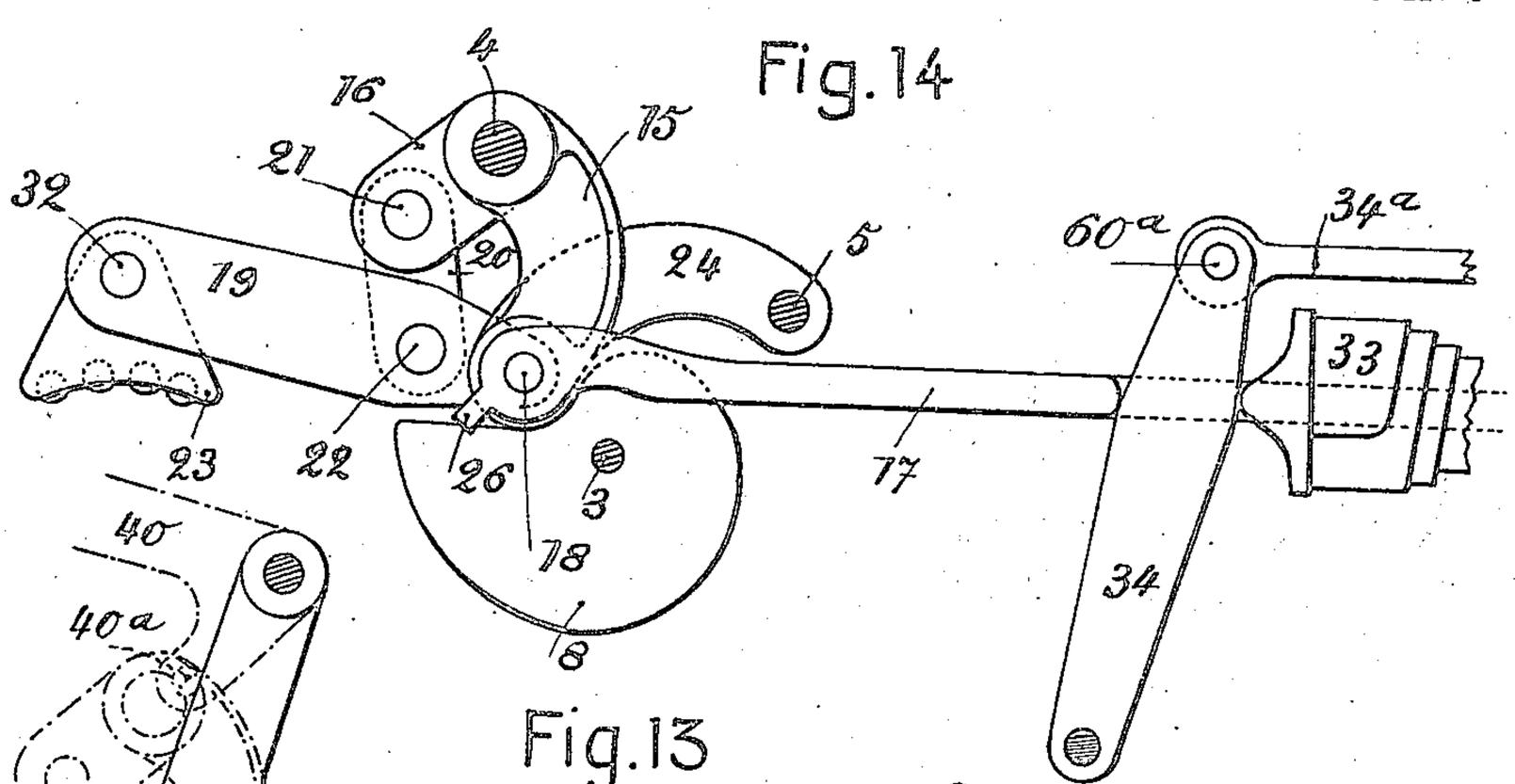


Fig. 13

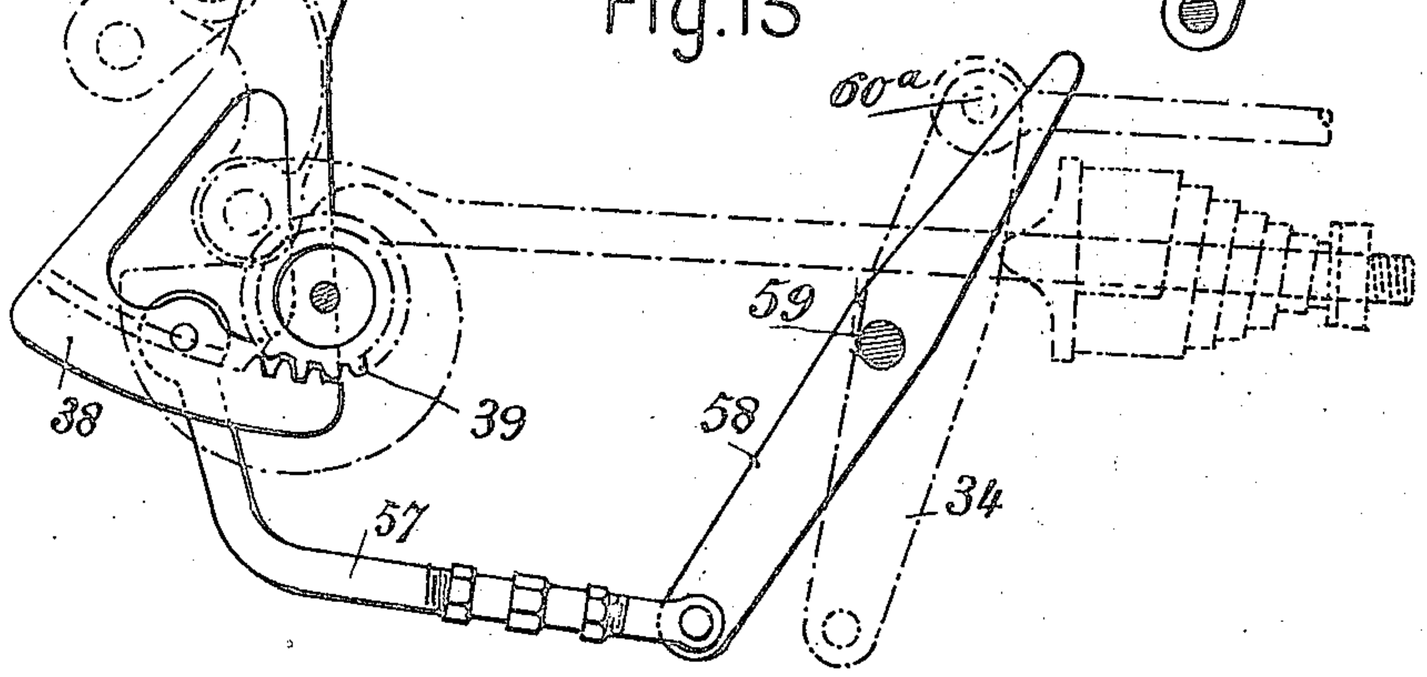
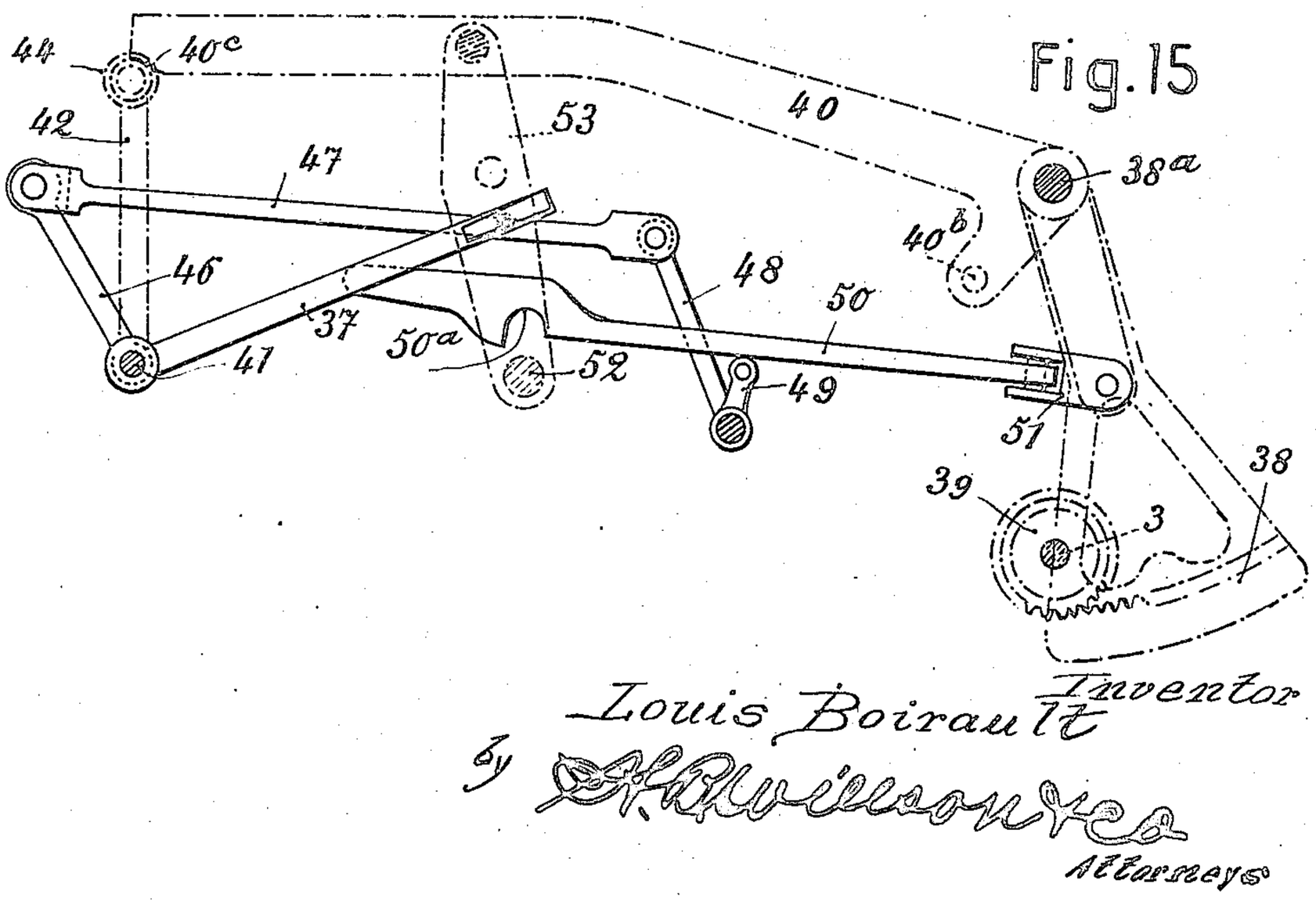


Fig. 15



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Patented Jan. 2, 1923. 1,440,443

UNITED STATES PATENT OFFICE.

LOUIS BOIRAULT, OF PARIS, FRANCE.

BRAKE-OPERATING DEVICE FOR RAILWAY VEHICLES.

Application filed June 1, 1920. Serial No. 385,657.

To all whom it may concern:

Be it known that I, LOUIS BOIRAULT, a citizen of the Republic of France, residing at Paris, Seine Department, 58 Rue Taitbout, in the Republic of France, engineer, have invented certain new and useful Improvements in Brake-Operating Devices for Railway Vehicles, of which the following is a specification.

This invention relates to brake-operating devices for railway vehicles, in which the operation of the brakes during the running of the train is secured by means of an eccentric member keyed to the vehicle axle and actuating the customary brake gear through the medium of a system of levers one of which is normally situated outside of the area covered by the movement of the eccentric; but is brought within this area at the proper time by the action of a cam which is controlled either from the brakeman's caboose or from the ground at either side of the vehicle, or again, by automatic action under the influence of the tension of the coupling gear of the wagon.

The improvements which from the subject of this invention relate more particularly on the one hand to the means which are employed for producing the rotation of the cam, and on the other hand to the arrangements which are provided to obviate the difficulties resulting from the wear of the brake shoes.

These improvements are set forth in the following description together with the accompanying drawings which are given by way of example.

Fig. 1 is an elevation in partial section, of the assemblage constituting a brake-operating device according to this invention, in the position for which the brakes are thrown on.

Figure 1ª is a continuation of Fig. 1.

Fig. 2 is an elevation of the same device, with a portion of the ratchet mechanism removed.

Fig. 3 represents separately a counterweight lever arrangement for controlling the operating shaft.

Fig. 4 is a device for automatic regulation of the stroke of the brake gear of the vehicle according to the amount of wear of the brake shoes whereby the braking effect is made independent of such wear.

Fig. 5 shows a lever system for suspending or restoring at will the automatic action of the brake control.

Fig. 6 represents separately a method for automatic brake control by the action of the vehicle coupling gear.

Fig. 7 is an elevation of a device employed to indicate to the railroad personnel that the brake shoes are worn out and require replacing.

Fig. 8 is a plan view of the same device.

Figure 9 shows the locking parts in the inoperative position.

Figures 10 and 11 show two positions of the members termed sector-shaped member and cam.

Figure 12 represents a locking member and the parts pertaining thereto.

Figure 13 shows parts of the apparatus on the released position.

Figure 14 shows other parts also in the released position.

Figure 15 represents a connecting piece termed "automatic bar" and the parts pertaining thereto.

The apparatus is almost entirely enclosed in a casing formed of two end plates 1 and a ratchet member 2. These two plates carry the operating shaft 3 and a shaft 4, each plate having an annular boss of large size situated on the same axis as the operating shaft 3, the plates being connected together and also to the ratchet member by means of three large bolts 5, 6 and 7. This assemblage is mounted on a frame (not shown here) which is secured directly to the frame of the bogie.

In the interior of the casing, a cam 8 and a locking member 9, both having exactly the same spiral form, are mounted free upon the bosses of the end plates 1. Between the cam and the locking member is a sector-shaped member 10, which is keyed upon the shaft 3. This member is provided with a circular arc shaped slot 11 having disposed slidably therein a cam stud 12, this being a suitable projection riveted to the cam; the sector-shaped member has a suitable form for operating pawls 13 connected to the cam 8, and pawls 14 connected to the locking member 9. The double arm lever 15—16 is mounted free on the shaft 4; its long arm is connected to the operating bar 17 by means of the pin 18, and the small arm 16 is connected to the driving lever 19 by means of the strap 20, the pin 21 and the pin 22.

The driving lever 19 is composed of two cross-connected plates and is provided with a roller shoe 23 on the end outside the casing, while its inner end is pivoted to the hanger arm 24 by means of the bolt 25. The hanger arm 24 is adapted to move by pivotation on the bolt 5, its outer end being always in contact with the edge of the cam 8. The operating bar 17 actuates the pawl 9 by means of its projecting end 26 through the medium of a spring 27, a rod 28 and a sprocket chain 29 bearing upon the boss 30 of the locking member 9 and attached to this latter at 31. Outside the casing, the roller shoe 23 is mounted on the driving lever 19 and moves by pivotation on the pin 32. The operating bar 17 actuates the brake gear of the vehicle through the medium of a pivoted bar and a spring 33 acting upon a balance crossbar 34.

The operation of the hereinbefore described members is as follows. The brake being supposed to be in the inoperative position, if the operating shaft 3 is turned in the counter-clockwise direction, the sector-shaped member 10 is rotated alone in the first place and through an arc which is equal to that represented by the circular shaped slot 11, and then it will draw along the cam 8 as soon as the cam stud 12 strikes against the end of the slot, the cam being thereafter actuated by the sector and by reason of its profile it lifts the outer end of the hanger arm 24, whereupon the driving lever 19 will pivot upon the shaft 22 until the shoe 23 comes in contact with the eccentric 35 keyed to the vehicle axle.

From this moment, two cases are to be considered.

1. Braking action, when the vehicle is stationary.

2. Braking action, when the vehicle is in movement.

1. Vehicle stationary.—In this case the above mentioned operation of the parts is brought about by the release of the counterweight lever 40 whose action will be further described.

The shoe 23, upon coming in contact with the eccentric, now constitutes a fixed point, whereupon the cam 8 continues its movement, and the same condition prevails for the outer end of the hanger arm 24, so that the driving lever 19 bearing upon the shoe 23 now acts to lift up the strap 20 and causes the rotation of the double-arm lever 15—16; the operating bar 17 is thereby actuated, thus throwing on the brakes of the vehicle.

This braking action increases up to its full effect when the vehicle is set in movement.

2. Vehicle in movement.—In this case, the rotation of the shaft 3 can be effected either through the medium of the counterweight lever 40, or by operating within the brakeman's caboose, or by automatic action by the movements of the vehicle coupler bar as will be further described, and the preliminary operation already mentioned will be continued in the following manner.

The rotation of the eccentric 35 acts through the medium of the shoe 23 to raise the driving lever 19 which bears upon the non-reversible profile of the cam 8 by means of the end of the hanger arm 24; the double-arm lever 15—16 actuated by the strap 20 will rotate in the clockwise sense, actuating the bar 17 and compressing the spring 33, which causes the braking action to a predetermined degree. By the term "non-reversible profile" is meant that at each point on the profile of the said cam, the inclination of the tangent with reference to the pressure exerted by the lever 19 upon this point is such that this pressure, however considerable it may be, cannot affect the slip of the cam relative to the lever nor in consequence its rotation in the sense of the brake release. In other words, the cam 8 may actuate the lever 19, but the latter is unable to actuate the cam. Whatever may be the method of operating the shaft 3, the braking effect produced by the momentary action of the eccentric is thenceafter maintained by means of the locking or coupling members 2, 13, 14. When in its inoperative position and with the brakes thrown off, the sector 10 maintains the pawls 13 and 14 out of contact with the ratchet 2, but these pawls are released as soon as the sector has moved through an angle slightly below that of the arc-shaped slot 11; the springs 36 will now apply the pawls fully into the ratchet, thus preventing all possibility of an accidental rearward motion of the cam 8 and the locking member 9. The object of the quadrant 10 is to put the pawls 13, 14 out of action at the moment of the release of the brake. To this end, it affects the release of the pawls from the teeth of the ratchet member 2, against the action of the springs 36. In the position shown in Fig. 1 corresponding to the application of the brakes, the pawls 13, 14 are represented in the operative position. But in the brake release or the inactive position, the quadrant 10 is raised and its two ramps 10^a, 10^b (see Fig. 9) will lift the tail parts of the pawls 13 and 14 and will thus cause the pointed end of the pawl to recede from the ratchet 2. The pawls of the ratchet are so disposed that this back motion shall not exceed half the pitch of the ratchet teeth.

The locking member 9 is actuated by the brake operating bar 17 through the medium of the chain 29, the spring 27 and the rod 28, in such manner that the operating bar 17 will be thus maintained in the position into which it was brought by the action of the eccentric on the shoe 23.

The large arm 15 of the lever member

which rotates upon the shaft 4 should remain in contact with the locking member 9 rotating on the operating shaft 3, but since the portion of the said large arm 15 which is adapted to be stopped by the locking member 9 has a tendency to enter upon the area covered by the swinging movement of the latter, it will follow that if the locking member should be stopped while the operating bar 17 continues its movement, this movement will be taken up by the spring 27 which is now compressed upon its rod 28.

For throwing off the vehicle brakes, all that is required is to rotate the operating shaft 3 in the clockwise sense; the sector 10 is actuated in the same sense, in the first place alone and through an arc equal to that of the slot 11, and during this first part of the movement, it releases the pawls of the ratchet 13 secured to the cam 8, then draws along this latter as soon as the end of the said slot strikes against the cam stud 12. The sector 10 continues its movement and releases the ratchet pawls 14 attached to the locking member 9 and draws along this latter through the medium of its projection which strikes against one of the pawls 14.

The brake-operating mechanism is controlled by hand from the brakeman's caboose or from the ground, or automatically through the medium of the vehicle coupling gear.

The method employed for controlling the shaft 3 from the brakeman's caboose is not represented here; this control is effected by means of a hand wheel disposed after the manner of the usual hand brake wheel, and the movement of rotation of this wheel is transmitted to the shaft 3 through the medium of any suitable mechanism comprising gear wheels, chains, etc., or by any other means which will provide for the reverse control movement.

Control of the brakes from the ground is carried out by pulling upon the handle of one of the levers 37 which are disposed diagonally upon the sides of the vehicle and in the rear part of the latter with reference to the person employed in this operation, who is supposed in regular practice to be stationed to the left with reference to the direction of running. In consequence, this operation involves no danger, since it is carried out entirely outside the track and in the rear of the vehicle.

The following arrangement is employed:

The toothed sector 38 controls the brake-operating device through the medium of a gear wheel 39 keyed to the operating shaft 3. This toothed sector is caused to rotate in the braking direction by a counterweight lever 40. The effect of this lever can be stopped as desired by a counter clockwise operation of the levers 37 situated one on each side of the vehicle, each lever being mounted upon a cross shaft 41 carrying a link member 42 composed of two bars connected together at the ends by a pin 43 carrying the roller 44. This link member raises the counterweight 40 upon actuating the cross shaft 41 in the above-indicated direction.

When in the raised position, the counterweight rests by means of a suitable groove upon the roller 44, the link member 42 being now vertical as shown in dotted lines Fig. 3.

When in this position and held in place by its groove, the counterweight has no action upon the brake-operating mechanism. Pulling upon either one of the levers 37 acts to release the counterweight, and it immediately comes into effect.

Automatic control by means of the vehicle coupling gear is obtained in the following manner. The counterweight 40 is normally released upon coupling the safety chains, these latter being connected to the link member 42 by small chains which are not represented here.

When the counterweight is released. the toothed sector 38 can be actuated by the coupling hooks 45. The counterweight is normally released upon attaching the safety chains, and therefore the regular introduction of a vehicle into a train will cause the automatic operation of the brake throwing device

To carry this out, a link member 46 keyed on the cross shaft 41 is connected by a rod 47 to a link member 48, 49 which operates to raise or release a connecting bar 50, termed automatic bar, connected by means of the articulation 51 to the toothed sector 38 which can be thus driven in either direction. A notch in the automatic bar 50 provides for the connection of the latter to the pin 52 secured to the lever arm 53, termed automatic lever arm.

The coupling hooks actuate the automatic lever arm 53 through the intermediary of mechanical transmission gear not represented here and composed of rods and levers.

Each of the vehicle coupler rods operates in an elastic manner the automatic lever arm 53 through the medium of a coiled spring 54 mounted in tandem with the traction spring 55. This traction spring only comes into action when the spring 54 has moved the automatic lever arm 53 through the distance representing the release of the vehicle brakes. At this moment, the traction spring 55 is flattened against its usual stop pieces and the spring 54 is compressed against the guide piece 56 secured to the vehicle frame and serving as a stop piece. The range of compression of the coiled spring 54 is greater than that of the traction spring 55, thus limiting the amount of thrust upon the guide piece 56, and the thrust due to the

principal efforts of traction will always come upon the usual mechanism provided to that effect.

It has already been observed that the action of inserting in a train a wagon provided with the automatic brake-operating device has the effect of disposing the automatic bar 50 in such manner that it will engage the pin 52 of the automatic lever arm when the link member 48, 49 is lowered, this being effected by the coupling of the safety chains. The rod 50 becomes engaged immediately upon the start of the train, under the action of the first effort of traction, and thenceforth the brake is entirely under the control of the engineman, should the latter slow up speed, the wagons will become pushed together, and the coupling hooks will move back towards the cross beam; the counterweight comes into action, and this results in a braking effect which is proportional to the back movement of the coupling bar.

The train is normally brought up to speed by the successive release of the previously-braked wagons. The train is stopped under the same conditions as the slowing up, except that each of the wagons in question will be braked to the maximum degree.

Since the braking action is produced by the kinetic energy of the train as transmitted through an eccentric mounted on the axle, the power thus available will be much too large, and it becomes essential to employ only a part of this power. In order to obtain the desired result, a suitable member must be provided in the first place, to wit, a spring 33 must be interposed for the transmission of the braking effort, for by reason of the wear of the brake shoes the distance to be covered would be variable in consequence, and this would also be true for the amount of compression of the spring, so that a variable effect would prevail in the braking action whose maximum is represented by the total stroke given to the brake bar by the operating device. The maximum braking effect obtainable in any event would be found in the case of a wagon which is fitted with new brake shoes, and this braking action would be the only one having a rational value.

In order to overcome this drawback, the operating shaft 3 has mounted thereon the gear wheel 39 engaging the toothed sector 38. Pivoted to this sector is a rod 57 of adjustable length which actuates a lever arm 58 for automatic regulation, which moves by pivotation on the stationary axle or pin 59 carried by the vehicle frame. This swinging movement is limited on the left hand side by a pin 60^a forming part of the lever 34.

Fig. 4 shows the above members in the position in which the counter-clockwise rotation of the operating shaft 3 and the cam 8 is stopped; these members are thus placed in the operative position as soon as the lever arm for automatic regulation 58 strikes against the pin 60^a, when the lever 34 is stopped by reason of the contact between the brake shoes and the wheel.

Let us suppose the case of an empty wagon fitted with new brake shoes. With the brake-operating device in the braking position, the rotation of the operating shaft 3 will move the lever 58 towards the lever 34 under the action of the spring 33 until the shoes come in contact with the wheels. At this moment, the lever 58 will still allow the operating shaft 3 to move through a certain arc, which gives rise to a pre-determined compression of the spring 33, thus producing a well-defined braking action. When this arc has been covered, it will be impossible to effect any further braking movement and the brakeman cannot increase except by a negligible quantity this action in spite of all efforts on his part.

If we suppose a second case in which the same car has its brakes in a worn condition, the lever 34 will now travel farther, but when it becomes stopped, the operating shaft 3 will be enabled to move through an arc having practically the same extent as the arc above mentioned, before the lever 58 strikes against the pin 60^a.

It will be thus observed that the braking action is practically independent of the wear of the brake shoes.

The brake-operating device as set forth in the preceding description is especially applicable to the wagons of freight trains, and it provided a very powerful braking effect. In consequence, the brake shoes are subjected to a more rapid wear than what is produced in other braking systems, and therefore the railroad employees might be taken unawares and not have the proper time to replace the brake shoes; this would have the consequence of suddenly suppressing one or more powerful braking units, during the running of the train, upon which the engineman had been relying for the safe action of this train.

It is therefore advisable to provide an automatic device which will give proper notice to the railroad men in question that the brake shoes require to be renewed.

This device can be constructed in the following manner (Figs. 7 and 8): A fixed plate 60 serves as a shield for the indicating plate 61, before the removal of the latter. The plate 60 is secured by means of a small angle iron piece 62, to a lever 63. The indicating plate 61 swings about its pin 64 mounted on the angle iron member 65 which is secured to the vehicle frame. Upon the plate 61 is disposed a strip 66 acting as a stop piece for the plate 61. The lever 63 is arranged to rotate upon its support 67 which is bolted to the angle iron member 65. It

is brought back to its initial position by the spring 68, where required. The end of the lever carries a vertical stud 69 upon which is disposed a contact member 70 having the form of an eccentric, for regulating purposes. This piece 70 serves as an intermediate member through which the properly chosen point of the brake gear will act to move the lever 63 from its initial position.

Fig. 7 represents the indicating plate 61 in the released position. To replace the same, the plate is raised until its strip 66 acting as a cam, which had previously displaced the plate 60 and its attached lever 63, shall come upon the lever 63 which has been returned to its original position by the spring 68. When the wear of the brake shoes shall have reached the determined limit, the chosen point of the brake gear will now actuate the lever 63 by means of its eccentric contact piece 70. This movement releases the plate 61, allowing it to drop, thus showing the indication which it carries ("Brake shoes to be renewed without adjustment"). After the shoes have been changed, this causes a reduction in the stroke of the brake gear used to throw on the brakes, and the lever 63 can no longer be actuated. When once the indicating plate has been raised in place, it will remain there until the new brake shoes have arrived at their limit of wear.

The above-described brake-operating device can be employed as for brake control which is effected only from the ground level, where it is used as a substitute for the customary brakes of the lever type, but in this case it can be simplified to a considerable degree, and the locking member 9 with its accessory members the ratchet 2 and the pawls 13; 14, can now be suppressed. The operating method is the same as has been previously set forth (brakes thrown by counterweight).

The brake-operating device as thus simplified has the advantage over the customary brakes of the balance arm type or the lever type, from the fact that they permit a very rapid manœuver which is easily carried out and without danger. On the other hand, the braking power has no limit except that which practice may find suitable to assign to it.

Claims:

1. In a brake-operating device of the kind specified, the combination of a brake-operating shaft (3) a pinion secured thereto, a swinging toothed sector engaging the said pinion, a swinging bent lever one of whose arms is weighted while the other arm is adapted to drive the said swinging sector in the sense corresponding to the braking effect, a swinging arm for maintaining the weighted arm of the said lever in the raised position and for allowing this arm to drop, and means for effecting the hand operation of the said swinging arm.

2. In a railroad wagon provided with the so-called safety coupling chains and a brake-operating device of the kind specified, the combination of a brake-operating shaft (3), a pinion secured thereto, a swinging toothed sector engaging the said pinion, a swinging bent lever one of whose arms is weighted while the other arm is adapted to drive the said swinging sector in the sense corresponding to the braking effect, a swinging arm for maintaining the weighted arm of the said lever in the raised position and for allowing this arm to drop, and means for effecting the hand operation of the said swinging arm, the said means being connected to the said coupling chains for the purpose of providing the automatic release of the said bent lever when the said chains are coupled to a second wagon.

3. In a railroad wagon provided with a spring mounted coupling bar and a brake-operating device of the kind specified, the combination of a brake-operating shaft (3), a pinion secured thereto, a swinging toothed sector engaging the said pinion, and connecting means between the said sector and the spring-mounted coupling bar whereby the said operating shaft shall be rotated in the sense of the release of the brakes under an effort of traction upon the said coupling bar.

4. In a railroad wagon device of the kind specified, the combination of a brake-operating shaft (3), a pinion secured thereto, a swinging toothed sector engaging the said pinion, and connecting means between the said sector and the spring-mounted coupling bar whereby the said operating shaft shall be rotated in the sense of the release of the brakes under an effort of traction upon the said coupling bar, the said means comprising a link member pivoted to the said swinging sector, and a swinging arm spring-connected to the said coupling bar, the said link member and the said arm being connected together in a readily removable manner.

5. In a railroad wagon provided with a spring mounted coupling bar and a brake-operating device of the kind specified, the combination of a brake-operating shaft (3) a pinion secured thereto, a swinging toothed sector engaging the said pinion, a bent lever one of whose arms is weighted while the other arm is adapted to drive the said swinging sector in the sense corresponding to the braking effect, hand-operated means for maintaining the weighted arm of the said bent lever in the raised position and for allowing this arm to drop, a link member pivoted to the said swinging sector, a swinging arm spring-connected to the said wagon coupling bar, the said link member and the said arm being connected together in a read-

ily removable manner, and means whereby the said link member is connected to or disconnected from the said arm, these latter means being connected to the said means for raising and lowering the weighted arm of the said lever, for the purpose set forth.

6. In a railroad wagon provided with a brake operating device of the kind specified whereby the brake shoes are actuated through the medium of movable brake gear, the combination of a brake operating shaft (3), a pinion secured thereto, a swinging toothed sector engaging the said pinion, controlling means for actuating the said sector, and means for automatic regulation connected to the said sector and adapted to strike against a point on the said movable brake gear for the purpose set forth.

7. In a railroad wagon provided with a brake operating device of the kind specified whereby the brake shoes are actuated through the medium of movable brake gear, the combination of a swinging indicating member and means whereby the same shall be locked in position or dropped, the said means engaigng the said brake gear and being operated thereby when the wear of the brake shoes shall have caused the movement of the gear to become considerable, for the purpose set forth.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

LOUIS BOIRAULT.

Witnesses:
J. F. McGurk,
Maurice Roun.