

No. 857,040.

PATENTED JUNE 18, 1907.

C. I. EARLL.

TROLLEY RETRIEVER.

APPLICATION FILED OCT. 24, 1904.

4 SHEETS—SHEET 1.

Fig. 1

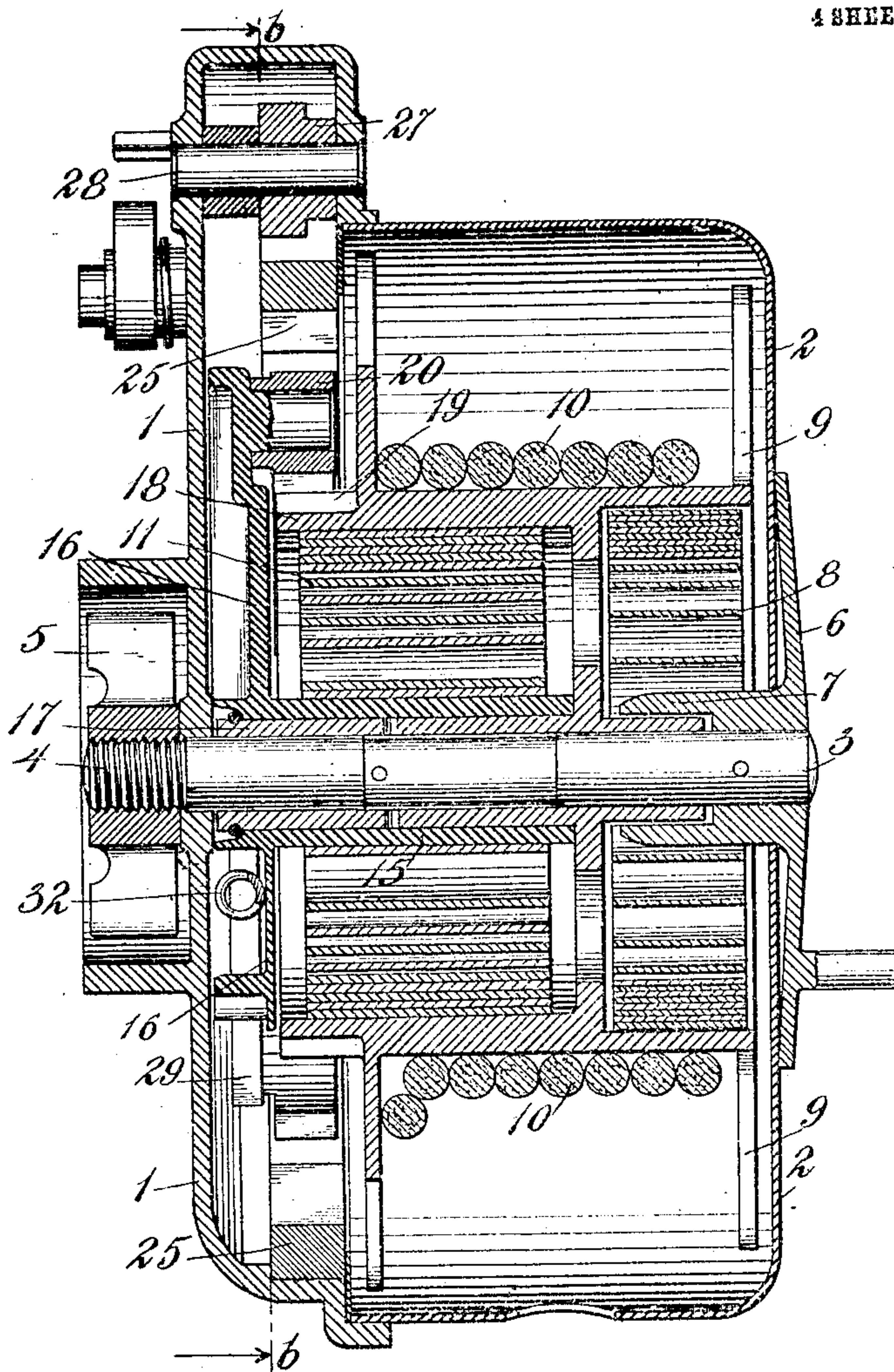
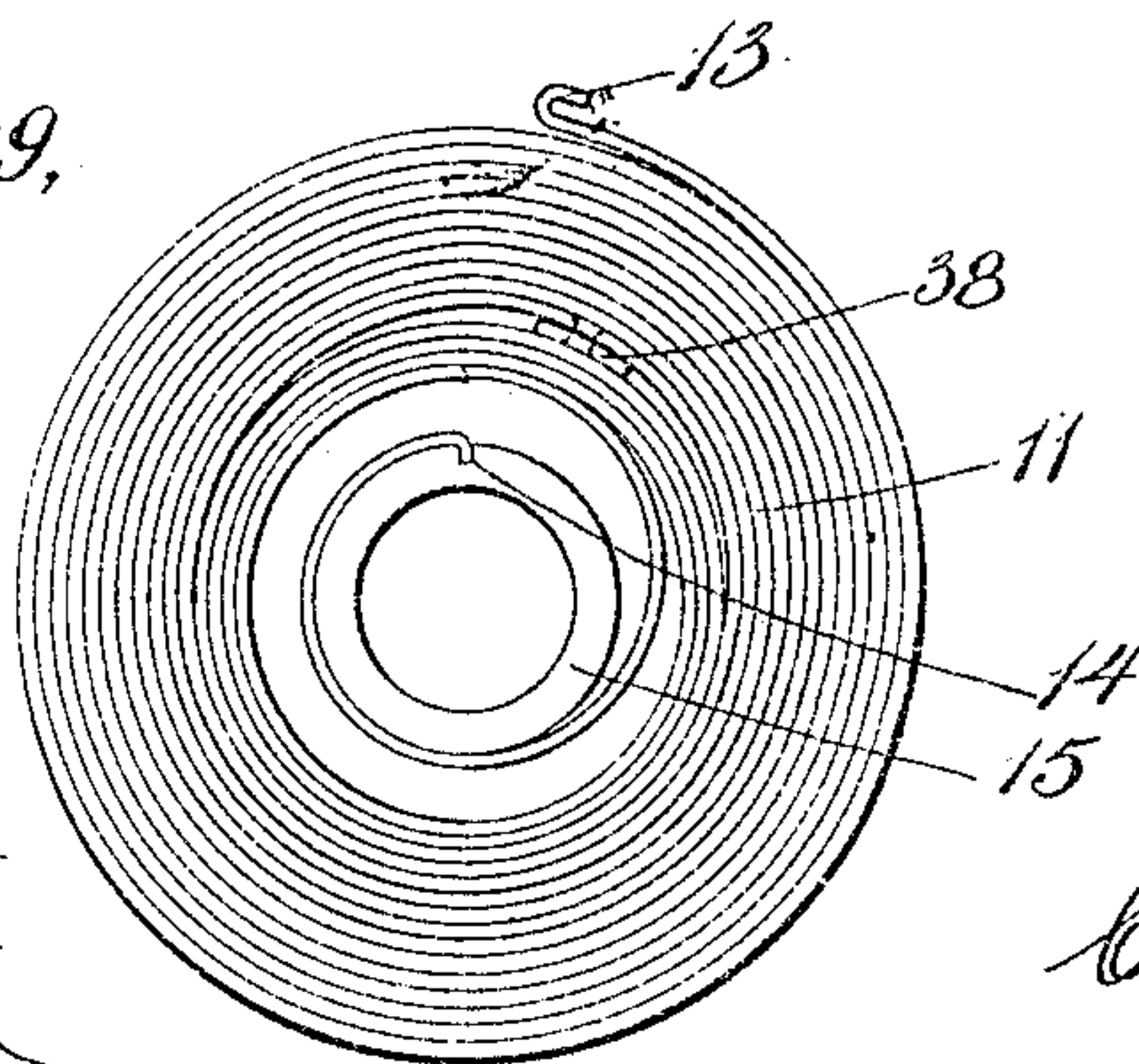


Fig. 9.



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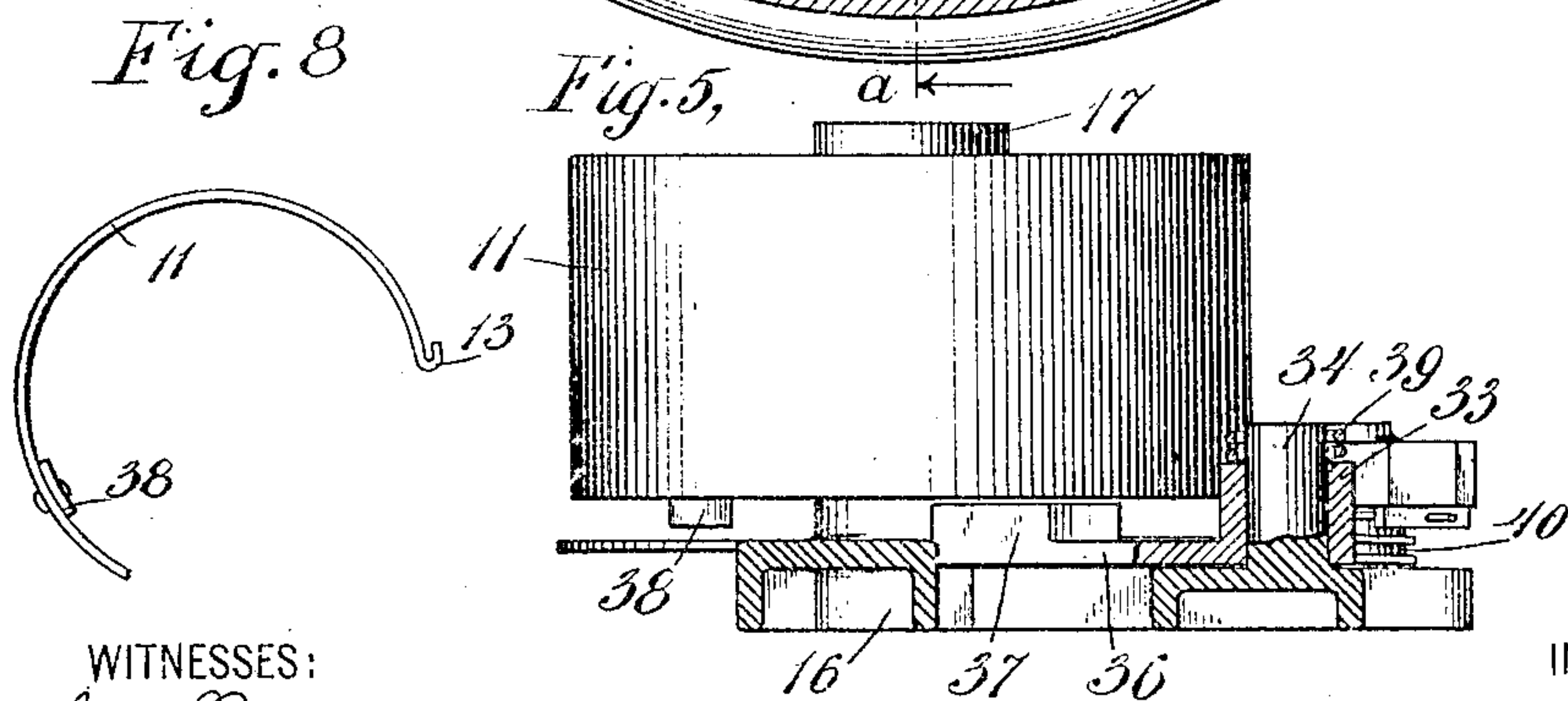
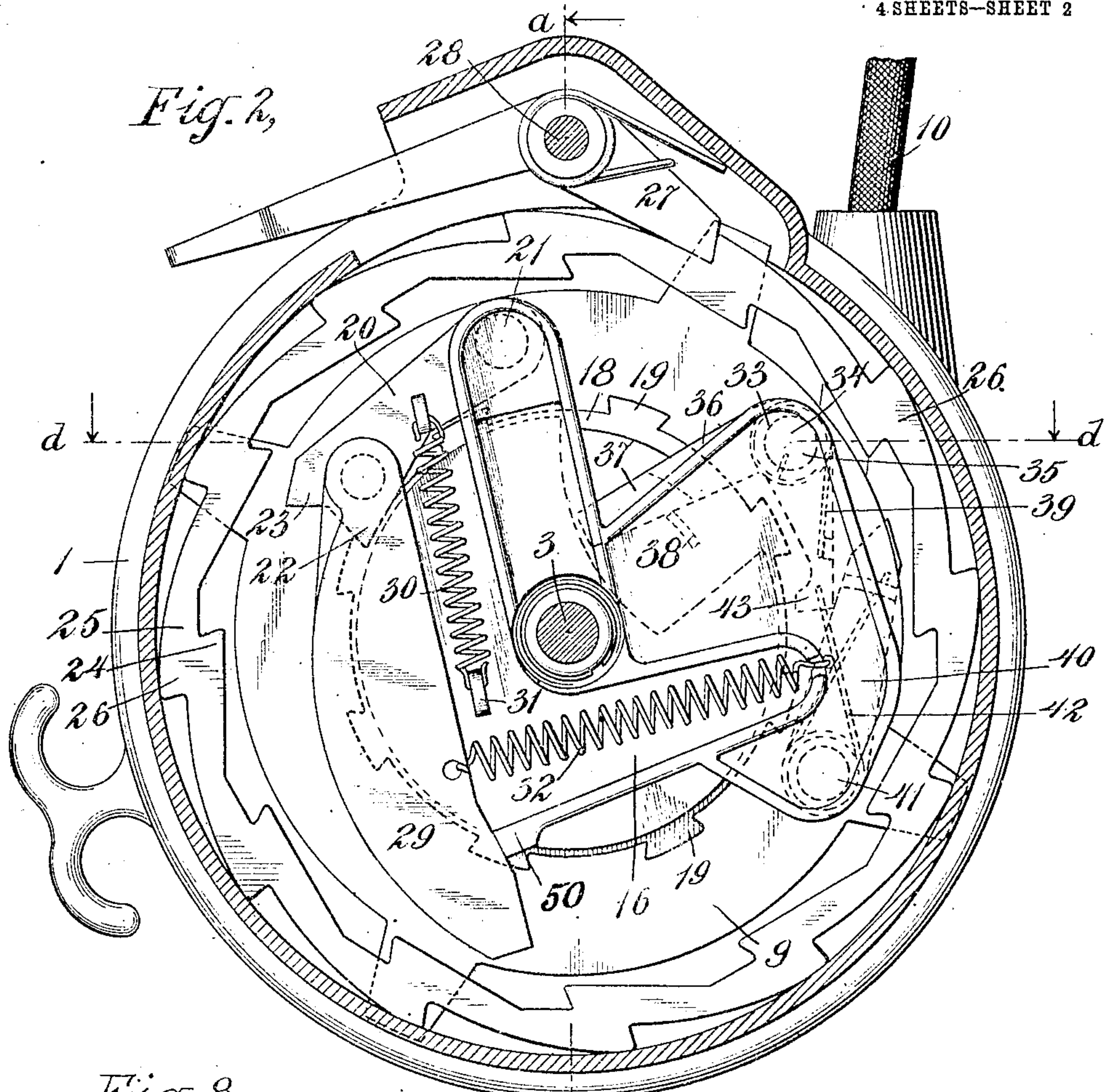
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4 SHEETS—SHEET 2



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4 SHEETS—SHEET 3.

Fig. 3,

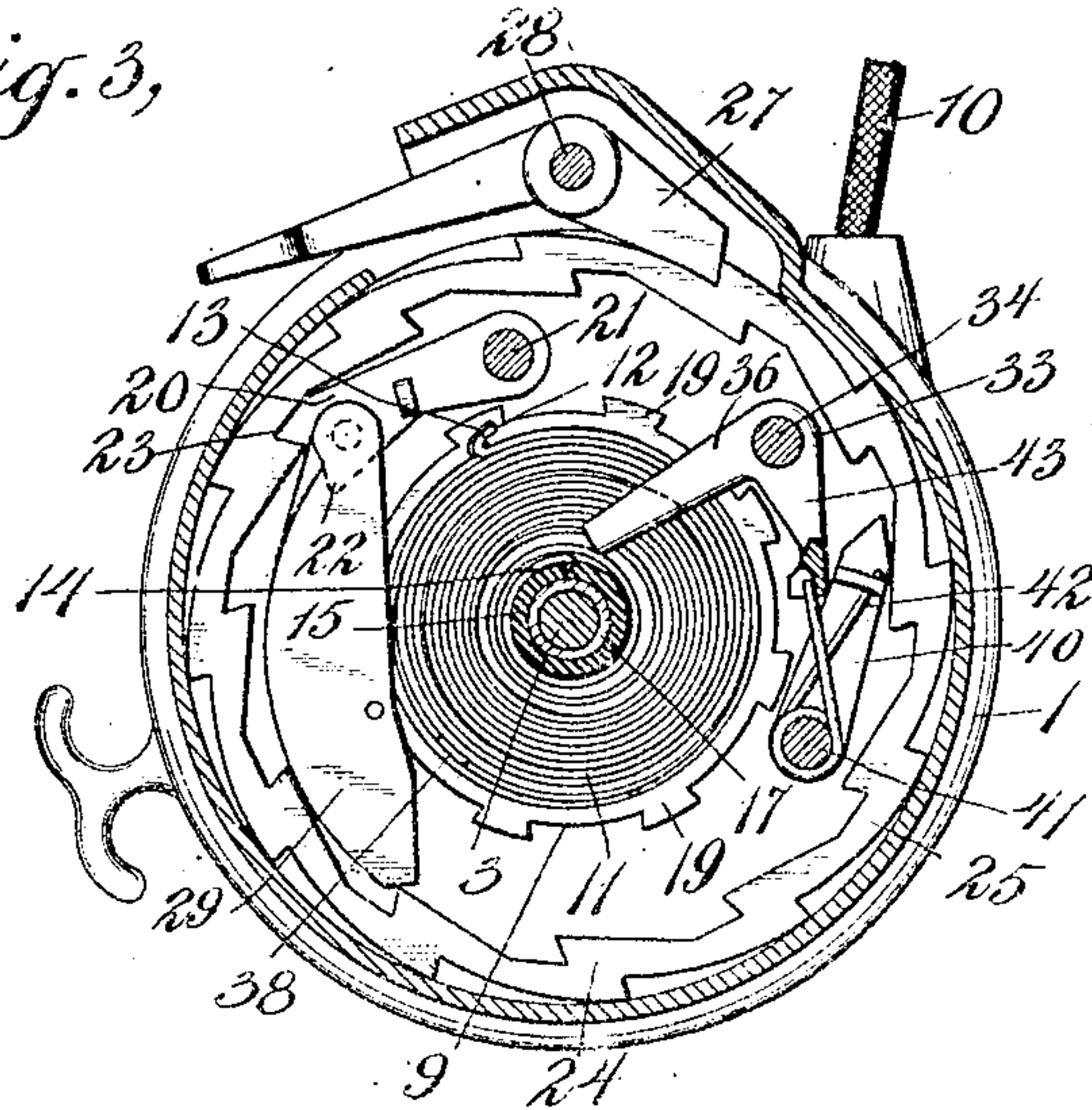
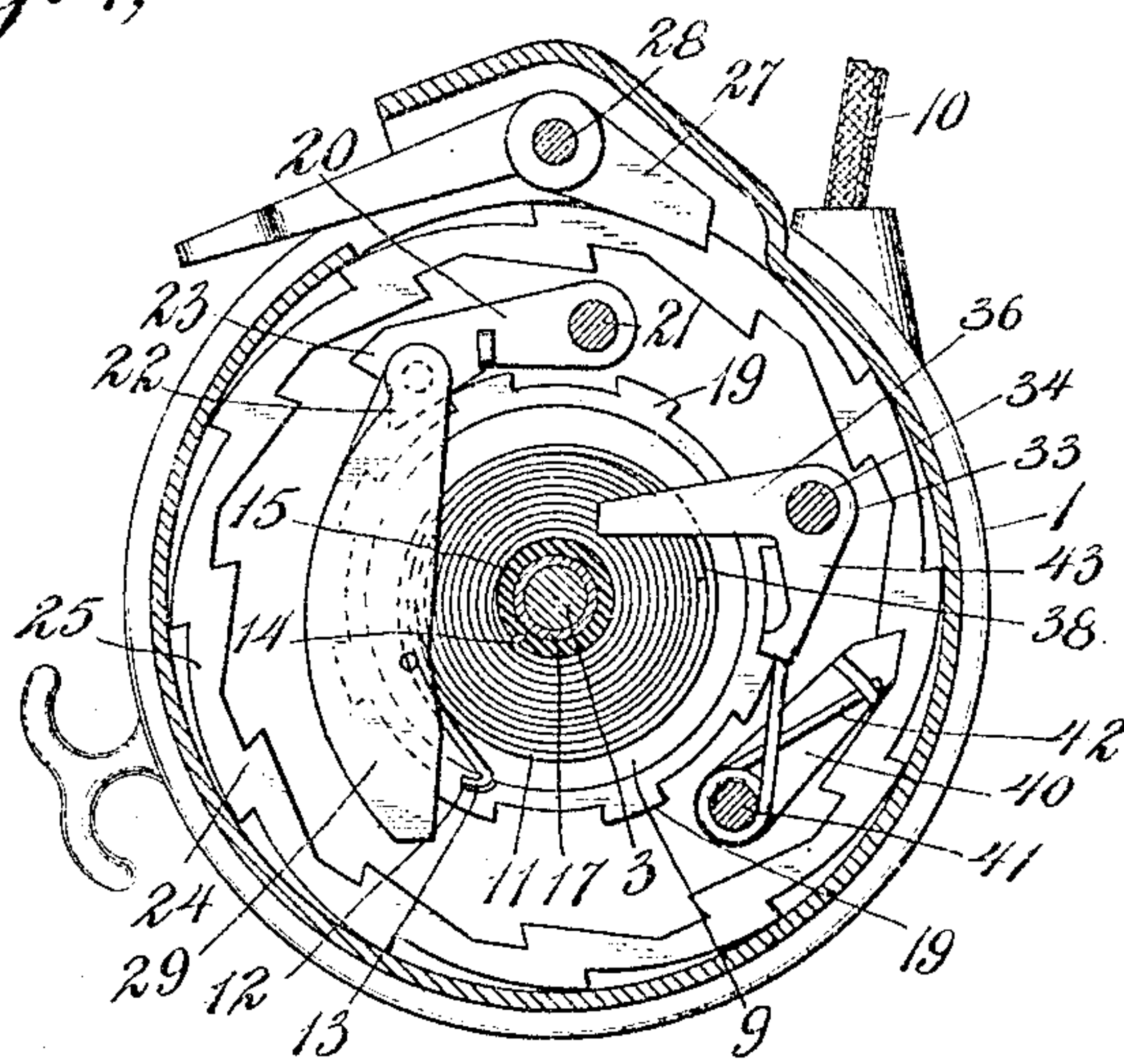


Fig. 4,



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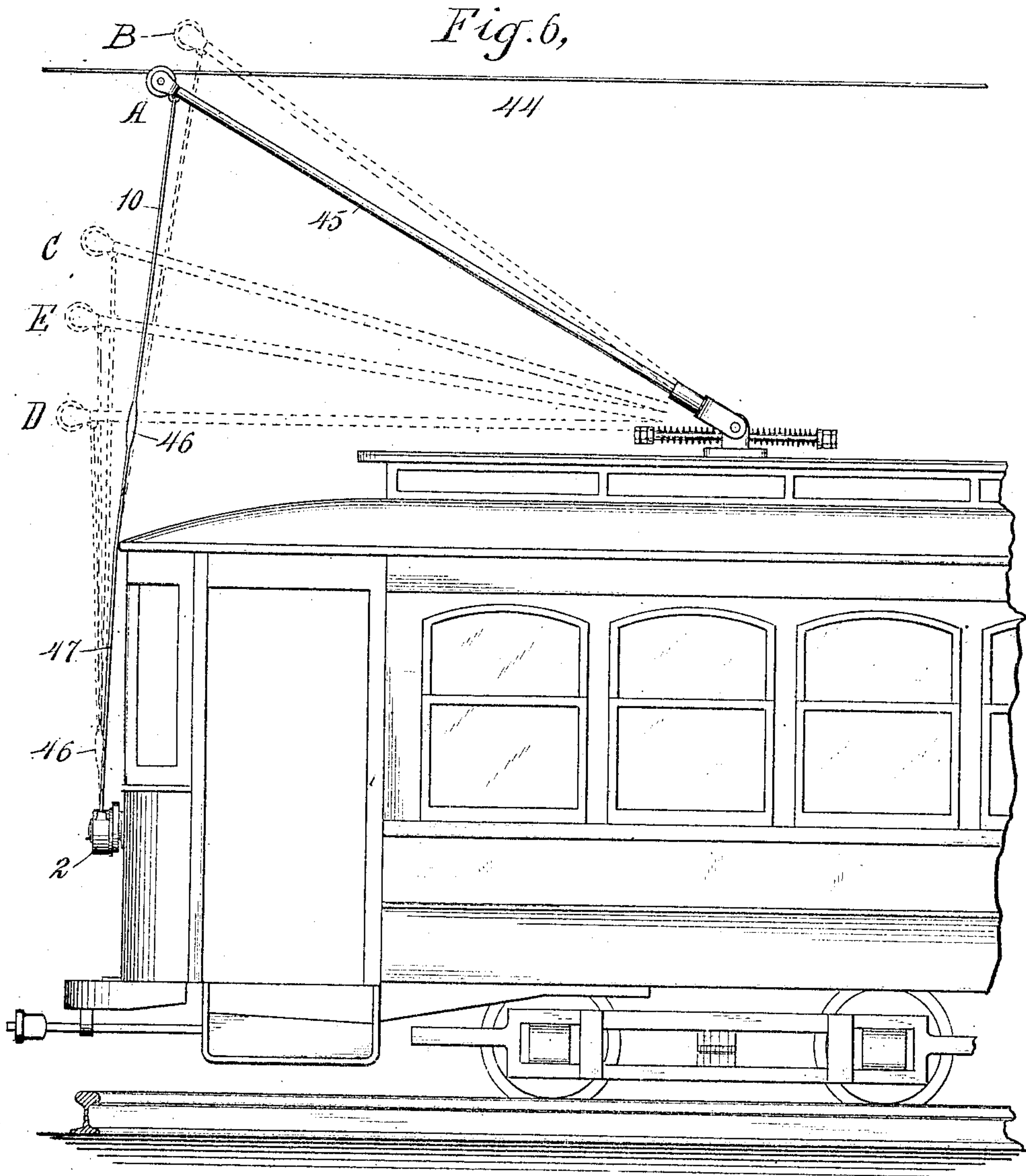
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4 SHEETS—SHEET 4.



*Fig. 7,*

10 46

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# UNITED STATES PATENT OFFICE.

CHARLES I. EARLL, OF NEW YORK, N. Y.

## TROLLEY-RETRIEVER.

No. 857,040.

Specification of Letters Patent.

Patented June 18, 1907.

Application filed October 24, 1904. Serial No. 229,731.

*To all whom it may concern:*

Be it known that I, CHARLES I. EARLL, a citizen of the United States of America, and a resident of the city, county, and State of New York, have invented certain new and useful Improvements in Trolley-Retrievers, of which the following is a specification.

My invention relates to trolley retrievers. In devices of this class there is a drum adapted to receive the trolley rope, a light tension spring adapted to act upon the rope to take up the slack therein but with power insufficient to pull the pole down and a heavy or power spring to pull the pole down, normally in a set or strained condition and adapted to be put into action by the rapid rotation or sudden impulse given to the drum when the trolley jumps the wire. In all devices of this class the power spring relaxes or unwinds in the act of pulling down the trolley, and in order to restore it to its normal condition so that it will be ready when called upon to pull the pole down again it is necessary to set or wind up the spring. This is usually accomplished by pulling out the rope from the retriever against the action of the power spring, means being provided to hold one end of the spring against rotation and to cause the other end to turn with the drum during the operation of setting.

As is well known retrievers are usually attached to the rear ends of car and they are left in charge of conductors whose duty it is to set the retriever and to restore the trolley to the wire. In some of the retrievers heretofore in use, it has been necessary for the conductor to operate levers or pawls either before or after, or both before and after pulling out the rope to set the retriever to its normal condition. This manner of operating the retriever is objectionable because it places an extra burden upon the conductor and because the conductor may neglect to perform some or all of the operations necessary to put the retriever in proper condition and again, because it requires greater time and effort on the part of the conductor to learn to properly operate the retriever. Other retrievers have been constructed which, while not requiring manual operation of levers or pawls for setting, have required a long continuous pull, without interruption, upon the trolley rope, which pull if not completed results in the pole being brought back again to its depressed or lowered position, and which if completed while the car is in

motion permits the pole to rise above and strike the span wires, for it is impracticable if not impossible for the conductor to guide the trolley back to the wire at the same time that he is pulling out the rope to set the retriever.

The object of my invention is to provide a retriever for trolleys which may be set by merely taking hold of the trolley rope without the necessity of having to operate manually any pawls, levers or other mechanism before, during or after the setting, one in which the power spring is locked against unwinding at intervals during the setting so that it may be set in stages or steps without maintaining a continuous pull of the rope against the action of the spring, one in which the setting may be performed by reciprocating the rope back and forth into and out of the retriever in a plurality of strokes, one in which after the retriever has operated to pull down the pole it is in a condition in which it will take in slack rope under the action of the tension spring after the retriever spring has been wholly relaxed and begin at once to set the retriever spring when rope is withdrawn and one in which the setting mechanism is automatically thrown into operative condition when the retriever spring has relaxed below a predetermined limit.

My object is further to provide a trolley rope of special construction to be used in connection with retrievers to facilitate the operation of setting and at the same time retain adequate flexibility.

My object is further to provide a mechanism of this class which shall be simple and effective in its construction and operation.

My invention consists in providing a set mechanism for trolley retrievers which shall automatically be put in operative condition to cause the unwinding of the rope from the drum to effect the setting or winding-up of the power-spring when the spring has relaxed or unwound a predetermined amount, and which shall remain in an operative condition until the retriever is set up to a predetermined amount, and further in providing a mechanism which shall be capable of retaining less than the full amount of set in case the operation of setting is stopped before completion, and which shall permit the tension spring to take in slack when the retriever spring is wholly relaxed or only partially set.

My invention consists further in providing



a trolley rope having that portion which is wound on the drum of relatively small diameter and having a portion of larger diameter adapted to come in position convenient to be grasped by the conductor in the act of setting the retriever.

My invention consists in other novel devices and features of construction to be hereinafter more fully pointed out and described.

In carrying out the preferred form of my invention I provide a suitable frame or case in which is mounted a central shaft. Upon this shaft is mounted a sheave or drum adapted to receive the trolley rope. The drum is provided with an intermediate web and an elongated hub forming recesses on either side of said web in the outer of which is placed the tension spring which has one end secured to the drum and the other end to a stationary inwardly projecting hub. The tension spring is of sufficient power to produce a tension in the trolley rope of from two to four pounds. It acts at all times upon the drum and its purpose is to take up the slack rope. In the recess in the drum on the opposite side of the web is placed the retrieving or power spring which has its outer end secured to the drum and its inner end to the sleeve or hub of an intermediate pawl carrying member. The sleeve of the intermediate member fits loosely on the hub of the drum this relation being such that if the intermediate member is held against rotation and the drum is caused to revolve by unwinding the trolley rope therefrom it will wind up the power spring and put the same in a strained condition.

The intermediate member is provided with a stud on which is mounted a pawl and the drum is provided with a flange which projects toward the intermediate member, the said flange being provided with teeth adapted to be engaged by the said pawl, the relation being such that when the retrieving spring is wound up said pawl which will be referred to hereinafter as the main lock pawl, will drop into engagement with the teeth on the drum and retain the retrieving spring against unwinding or relaxing. A normally stationary member or ratchet ring is mounted in the frame of the machine in the plane of the main lock pawl and the teeth on the drum. A centrifugal pawl is mounted on the main lock pawl in such a manner that when the drum is given a sudden impulse by the rapid unwinding of the rope therefrom the said centrifugal pawl will move outward into engagement with the ratchet ring, and thereby force the main lock pawl out of engagement with the drum and into engagement with the ratchet ring. This operation puts the power spring in action to wind up rope upon the drum.

Mounted on the intermediate member is a second pawl which I will refer to hereinafter

as the automatic set pawl. This pawl is also in the plane of the ratchet ring and means are provided whereby when the power-spring is wound up to a predetermined point the automatic set pawl is automatically withdrawn from engagement with the ratchet ring and whereby when the power spring has relaxed or unwound a predetermined amount said automatic set pawl is caused to engage the ratchet ring thereby holding the intermediate member from rotation when the rope is unwound from the drum to set the power spring. A bell crank is also mounted on the intermediate member in the plane of the ratchet ring the said bell crank forming a preferred means for automatically throwing the automatic set pawl into and out of engagement with the ratchet ring and at the same time forming an automatic stop to limit the amount of setting or winding up of the power spring. The bell crank is operated automatically by a lug secured to the power spring all of which will be more particularly described and explained hereinafter.

In the drawings accompanying and forming part of this specification Figure 1 is a vertical section through the axis of the sheave on line *a-a* of Fig. 2. Fig. 2 is a section on line *b-b* of Fig. 1. Figs. 3 and 4 are sections corresponding with Fig. 2 in which some of the parts have been omitted in order to show the different operative positions of certain parts. Fig. 5 is a partial section on line *d-d* of Fig. 2. Fig. 6 is a partial view of a car provided with my invention showing the different positions of the trolley pole and trolley rope. Fig. 7 is an enlarged view of a portion of the trolley rope. Fig. 8 is a partial view of the power spring, and Fig. 9 is a view of a modified power spring.

The referenced characters are used in the same sense throughout the drawings and specification.

Numerals 1 represents the back of the frame or case which incloses the mechanism.

2 is a steel shell forming the front portion of the inclosing case.

3 is a shaft mounted in the back 1 and shell 2 having a threaded end 4, engaged by the thumb-nut 5 and a disk 6 secured to its outer end. The disk 6 has an inner projecting hub 7 which engages the inner end of the tension spring 8.

9 is the drum on which the trolley rope is wound. The outer end of the tension spring 8 engages the drum 9.

10 represents the trolley rope.

11 represents the power spring which is located within the drum. It has a hook or bend 13 on its outer end which engages a cored recess 12 formed in the drum. The inner end of the power spring 11 engages a groove 14 in the sleeve or hollow arbor 15 which is formed integrally with the intermediate member or pawl carrying flange 16.



The pawl carrying flange or intermediate member is mounted loosely on the hub 17 of the drum. The drum 9 is provided with a projecting flange 18 which has formed on its outer surface teeth 19.

20 is a pawl mounted on the pin 21 of the intermediate member 16. The pawl 20 has a tooth 22 adapted to engage the teeth 19 on the drum and the tooth 23 adapted to engage with teeth 24 on the ratchet ring 25. The ratchet ring 25 is a normally stationary member and is loosely mounted in the back 1 and it has external teeth 26 as well as the internal teeth 24. The external teeth are engaged by the pawl 27. The pawl 27 is mounted on the shaft 28 in the back 1.

29 is a centrifugally controlled pawl having its end in pivotal connection with the pawl 20.

30 is a spring secured at one end to the pawl 20 and at the other end to the lug 31 on the pawl carrier 16.

32 is a spring having one end attached to the pawl carrier 16 and the other end to the centrifugal pawl 29.

The parts thus far are similar in their action and construction to the corresponding parts in an earlier application filed by me Aug. 1, 1904, Serial No. 218978.

33 is a bell-crank mounted on the stud 34 of the intermediate 16. This bell-crank has an arm 36 extending down in front of the retriever spring 11 and the end of said arm is provided with a projecting lug 37 which extends toward the retriever spring 11 in the plane of the projecting lug 38 attached to the retriever spring. The lug 38 attached to the retriever spring 11 is preferably located on the outer coil of said retriever spring between one-half and three-quarters of the way around from the hook 13.

When the retriever spring is fully relaxed the outer coils lie close to the circumference of the recess of the drum and the outer end of the lug 37 is so located that the lug 38 will pass over the lug 37 without touching it until the lug 38 has moved in toward the center a certain amount as the retriever spring is wound up.

39 is a spring mounted on the stud 34 having one end attached to said stud and the other end engaged with the bell-crank 33. This spring acts upon said bell-crank to give it left-handed rotation as seen in Figs. 2, 3 and 4.

40 is a pawl mounted on the stud 41 of the intermediate member 16, which pawl I will refer to hereinafter as the automatic set pawl. This pawl when in its outer position as shown in Figs. 3 and 4 is adapted to bear against the ratchet ring 25 and make engagement with the teeth 24 thereof.

42 is a spring mounted on the automatic set pawl having one of its ends secured to the automatic set pawl and the other end engag-

ing the arm 43 of the bell-crank 33. The action of said spring is to hold the arm 43 in engagement with the automatic set pawl 40 and at the same time it permits the automatic set pawl to remain in engagement with the ratchet ring when the bell-crank is acted upon by the lug 38 as shown in Fig. 4.

The operation of my invention is as follows: When the power spring is fully set and the parts are in their normal condition they will be as represented in Fig. 2. The main lock pawl 20 will be in engagement with one of the teeth 19 on the drum, the centrifugal pawl 29 held against its banking 50 on the intermediate member 16. The lug 38 in contact with the lug 37 of the bell-crank 34 will hold the automatic set pawl 40 out of engagement with the ratchet ring. In this condition the drum will be under the action of the tension spring 8 and the trolley rope may be wound up or unwound to any extent thereon. When the rope is rapidly unwound from the drum, as when the trolley jumps the wire, the sudden impulse or rapid rotation of the drum will cause the centrifugal pawl 29 to move outward and make engagement with one of the ratchet teeth 24 of the ratchet ring and force the main lock pawl 20 out of engagement with the teeth 19 of the drum and into engagement with one of the teeth of the ratchet ring as shown in Fig. 3. Immediately after the main lock pawl has been disengaged from the drum the drum will be acted upon by the power spring 11 which will rotate the drum in a right-handed direction as seen in Figs. 2, 3, and 4, thereby winding up the trolley rope on the drum with sufficient power to pull down the trolley pole. When this has taken place the parts will be in the position shown in Fig. 3. Immediately after the main lock pawl has been released from the drum and made engagement with the ratchet ring the intermediate member 16 will be held stationary and as the drum starts to revolve the lug 38 on the power spring will be carried away from lug 37 of the bell crank 33 thereby permitting the spring 39 to act upon said bell-crank and move the automatic set pawl 40 out against the ratchet ring. During this operation the trolley will be pulled down until the power spring acting to wind up the trolley rope on the drum, and the trolley base springs acting to force the trolley upward are in substantial equilibrium. Sometimes the trolley and the trolley pole in being pulled down will attain sufficient momentum to carry them down below the point of equilibrium and so as to wholly relax the power spring, in which case the pressure being relieved from the main lock pawl it will be pulled out of engagement with the ratchet ring. When this has taken place the automatic set pawl will move into engagement with one of the teeth of the ratchet ring and



prevent the unwinding of the rope from the drum. If this does not take place the main lock pawl 20 may be easily released from its engagement with the ratchet ring by pulling the rope down a short distance so as to sufficiently relax the power spring.

To set the retriever after it has operated as above, it is only necessary to pull out the trolley rope thereby unwinding the same and turning the drum in a left-handed direction as seen in Figs. 2, 3 and 4. As the rope is pulled out and the drum revolves, the intermediate member 16 being prevented from turning by the engagement of the automatic set pawl 40 with the ratchet ring, the power spring will be wound up or set until the lug 38 engages the lug 37 of the bellcrank and causes the arm 43 of said bell-crank to move into engagement with one of the ratchet teeth 19 on the drum. This engagement stops the unwinding of the drum although the automatic set pawl 40 is still in engagement with the ratchet ring as is clearly seen in Fig. 4. As soon however, as the pull on the trolley rope is relaxed the drum will start to turn in the opposite direction, to the right in Figs. 2, 3 and 4, and the main lock pawl 20 will engage one of the teeth 19 on the drum, and thus relieve the automatic set pawl from pressure against the teeth of the ratchet ring. The automatic set pawl will thereupon under the action of the spring 42, return to its position against the arm 43 of the bell-crank 33 as shown in dotted lines in Fig. 2.

It will be apparent that as the rope is pulled out to set the retriever, the main lock pawl 20 will drop into engagement with the teeth and hold the drum from rewinding that which has been unwound and that at any time during the pulling out of the rope the conductor may relax the strong pull necessary to set the retriever spring to obtain a new hold, and that should the rope slip in his hands it will not be rewound back upon the drum. If it is partially set and the rope is pulled down so as to overcome the upward pull of the trolley pole the tension spring will cause the drum to take up the slack and the automatic set pawl 40 will ride backward over the ratchet teeth of the ratchet ring under the action of the tension spring. The main lock pawl however, dropping into engagement with the teeth 19 of the drum will retain whatever set has previously been given to the power spring. The effect of this feature of operation is that in the act of setting, the pole may be brought down close to the roof of the car and reciprocated back and forth in short strokes.

In Fig. 6 I have illustrated the end of a trolley car equipped with my improved trolley retriever in which 44 represents the trolley wire, 45 the trolley pole, 10 the trolley rope, 46 the grip or enlarged portion thereof, and

47 that portion which may be wound into the retriever which is of relatively small diameter. A represents the position of the trolley on the wire. B represents the position to which it rises after jumping the wire, at which the power spring begins to act. C represents the position to which it is brought by the retriever. Now if the trolley jumped the wire and were brought down to the position C while the car was in rapid motion, it would be unsafe to begin to draw out the rope to set the retriever from this point because in so doing, the trolley would rise above the wire to the position B. Moreover the height of the wire is likely to change somewhat. In the operation of my retriever as will be readily understood from the foregoing description, after the trolley has been brought down to the position C the conductor may take hold of the rope and pull it down to the position D and then reciprocate the trolley back and forth from position D to position E until the retriever is fully set, after which he may replace the trolley to the wire in the usual manner. The grip 46 is so located that when the trolley is in position D, the grip will be where it can be conveniently taken hold of by the conductor.

The grip 46 may be braided into the rope while the rope is being made or it may be applied after the rope is made by winding any suitable material, such for instance, as electric tape, around the rope at the proper point. Or two different sizes of rope may be joined together using a rope of relatively small diameter for the lower portion which is wound around the drum and the rope of relatively large diameter for that portion which extends from the junction up to the trolley pole. When this latter construction is employed I may use a wire rope for that portion which is wound around the drum using a section of cotton rope of an appropriate diameter to connect the wire rope with the trolley pole.

I prefer to locate the lug 38 as shown in Fig. 8 on the inside of the outer coil of the power spring and to so arrange the top of the lug 37 that the lug 38 will pass over it in the first two or three revolutions according to the amount that it is desired to pull the pole down.

In lieu of placing the lug 38 on one of the outer coils of the spring 11 and arranging the lug 37 so that the lug 38 will pass over it during so many revolutions as it is desired to have the drum make before operating the bell-crank 33, I may locate the lug at an intermediate point between the outer and inner ends of the spring, so that, the sleeve to which the inner end of the spring is attached being stationary the lug 38 will make one or less than one revolution for the required predetermined number of revolutions



made by the drum, for it is obvious, referring to the Fig. 9 that if the inner end of the spring is held stationary and the outer one is caused to make a certain number of revolutions a lug secured between the inner and outer ends of the spring may be so located as to give any desired fraction of the number of revolutions less than that made by the outer end of the spring.

The ratchet ring 25 is normally stationary being held by the pawl 27. It may however, be released at any time by detaching the pawl 27 from engagement therewith, the purpose of this construction being to permit the immediate restoration of the trolley to the wire after it has been pulled down before setting the retriever. It will be obvious however, that the internal ratchet teeth 24 may be cast integrally with or permanently attached to the back 1 without changing the mode of operation of the other parts of the mechanism.

In the type of retriever to which I have applied my invention as herein described the power spring has one of its ends permanently engaged with the drum and the other end with the intermediate member 16, and when the power spring is set either partially or wholly both of the ends of said spring are retained by the drum; the power spring being thrown into action by releasing one of the ends of the spring from the drum through the instrumentalities of the intermediate member 16 and the main lock pawl 20. My invention is not limited to any particular type of retriever.

Having thus described my invention what I claim is:

1. In a trolley retriever the combination with three relatively movable members; one constituting a drum, another a normally stationary member, and another an intermediate member; and a power spring having one end attached to the intermediate member and the other end to one of the other of said members, of means automatically connecting said intermediate member with the drum while the drum is moved in one direction and means automatically connecting said intermediate member with the normally stationary member while it is moved in the other direction, during the setting of said power spring.

2. In a trolley retriever the combination with three relatively movable members, one constituting a drum, another a normally stationary member, and another an intermediate member, of a power spring having one end secured to the intermediate member and the other end to one of the other of said members with ratchet and pawl connections between the intermediate member and the drum, and between the intermediate member and the normally stationary member, such that during the setting of the power spring the turn-

ing of the drum in one direction will cause the engagement of the ratchet connections between the intermediate member and the drum and the turning of the drum in the opposite direction will cause the engagement of the ratchet connections between the intermediate member and the normally stationary member.

3. In a trolley retriever the combination with three relatively movable members, one constituting a drum, another a normally stationary member, and another an intermediate member, of a power spring normally set in a strained condition, having one end secured to the intermediate member and the other end to one of the other of said members, means to connect the intermediate member with the drum when the drum is turned in one direction, and means to connect the intermediate member with the stationary member when the drum is turned in the opposite direction, thrown into action automatically during the setting of said power spring.

4. In a trolley retriever the combination with three relatively movable members, one constituting a drum, another a normally stationary member, and the third an intermediate member and a power spring having one end secured to the intermediate member and the other end to one of the other said members, said power spring being normally held in a set or strained condition and inactive to produce rotation of said drum, means for throwing said power spring into action to rotate said drum, and power spring setting means, automatically connecting said intermediate member with the drum while the drum is turned in one direction and with the stationary member while turned in the opposite direction during the setting, and means for automatically throwing said setting means out of action when said power spring has been set to a predetermined limit.

5. In a trolley retriever the combination with three relatively movable members, one constituting a drum, another a normally stationary member and the third an intermediate member, and a power spring having one end secured to said intermediate member and the other end to one of the other members, and holding means automatically thrown into action to hold said intermediate member to said drum while the drum is turned in one direction and holding means automatically thrown into action to hold said intermediate member to said normally stationary member while it is turned in the opposite direction during the setting of the power spring.

6. In a trolley retriever the combination with three relatively movable members, one constituting a drum, another a normally stationary member and the third an intermediate member and a power spring having one end secured to said intermediate member and the other end to one of the other members, and



holding means automatically thrown into action to hold said intermediate member to said drum while the drum is turned in one direction and holding means automatically thrown into action to hold said intermediate member to said normally stationary member while it is turned in the opposite direction, and means for automatically throwing the holding means between said intermediate member and one of the other said members out of action when the power spring has been set to a predetermined limit.

7. In a trolley retriever the combination with three relatively movable members, one constituting a drum, another a normally stationary member and another an intermediate member and a power spring having one end secured to the intermediate member and the other to one of the other of said members, of an automatic step by step setting mechanism operated by the rotation of the drum in the direction to unwind the rope therefrom.

8. In a trolley retriever the combination with three relatively movable members, one constituting a drum, another a normally stationary member and another an intermediate member, and a power spring having one end secured to the drum and the other end to the intermediate member, of means for automatically connecting the intermediate member with the drum while the drum turns in one direction and means for automatically connecting said intermediate member with said stationary member while it turns in the opposite direction during the setting of said power spring.

9. In a trolley retriever the combination with three relatively movable members, one constituting a drum, another a normally stationary member and another an intermediate member, and a power spring having one end secured to the drum and the other end to the intermediate member, of means for automatically connecting the intermediate member with the drum while the drum turns in one direction and means for automatically connecting said intermediate member with said stationary member while it turns in the opposite direction during the setting, said means including means for freeing said intermediate member from one, and leaving it in engagement with the other, of said members after said power spring has been set a predetermined amount.

10. In a trolley retriever the combination with three relatively movable members, one constituting a drum, another a normally stationary member, and the third an intermediate member, and a power spring having one end secured to the drum and the other end to the intermediate member, of means for automatically connecting the intermediate member with the drum while the drum turns in one direction and means automatically connecting the intermediate member with said

stationary member while the drum turns in the opposite direction during the setting of said power spring, and an automatic stop to prevent the setting of said power spring beyond a predetermined limit.

11. In a trolley retriever the combination with a drum, and a power spring adapted to be thrown into action by the rotation of said drum to wind up the trolley rope, during which said power spring unwinds, of means automatically thrown into action by the unwinding of said power spring to cause the unwinding of rope from the drum to rewind said power spring.

12. In a trolley retriever the combination with a drum adapted to receive the trolley rope of a power spring normally in a set condition adapted to be thrown into action by the rotation of said drum, to wind up the trolley rope, and means automatically thrown into action for retaining said power spring at intervals while it is being reset.

13. In a trolley retriever the combination with a drum adapted to receive the trolley rope, of a spring, normally under strain and adapted to be thrown into action by the sudden acceleration or rapid rotation of said drum to wind up the trolley rope, and means automatically thrown into action during said action of said spring whereby the unwinding of the rope from said drum will wind up or set said spring.

14. In a trolley retriever the combination with a drum adapted to receive the trolley rope of a spring normally under strain adapted to be thrown into action by the sudden acceleration or rapid rotation of said drum to wind up the trolley rope, and means automatically thrown into action by the unwinding of rope from said drum to set said power spring and means to retain said spring at intervals.

15. In a trolley retriever the combination with a drum, a tension spring and a power spring of a ratchet and pawl retaining mechanism automatically thrown into action to hold said power spring in a plurality of stages while it is being set.

16. In a trolley retriever the combination with a drum, a tension spring and a power spring of the ratchet and pawl retaining mechanism automatically thrown into action to hold said power spring in a plurality of stages while it is being set and an automatic stop to limit the amount to which said power spring is set.

17. In a trolley retriever the combination with a drum, a tension spring and a power spring of a ratchet and pawl retaining mechanism automatically thrown into action to hold said spring in a plurality of stages during the setting and means for automatically throwing said ratchet and pawl connecting mechanism out of action when said power spring has been set to a predetermined limit.



18. In a trolley retriever the combination with three relatively movable members, one constituting a drum, another a normally stationary member, and another an intermediate member, and a power spring having one end secured to the intermediate member and the other end to one of the other of said members, of ratchet and pawl connections between said intermediate member and said stationary member and ratchet and pawl connections between said intermediate member and said drum and means for automatically throwing both of said ratchet and pawl connections into action.

19. In a trolley retriever the combination with three relatively movable members, one constituting a drum, another a normally stationary member and another an intermediate member, and a power spring having one end attached to the intermediate member and the other end to one of the other of said members, of ratchet and pawl connections between said intermediate member and said stationary member and ratchet and pawl connections between said intermediate member and said drum, means for automatically throwing both of said ratchet and pawl connections into action and means for automatically throwing one of said ratchet and pawl connections out of action when said power spring has been set a predetermined amount.

20. In a trolley retriever the combination with a drum, a tension spring and a power spring of a lug secured to said power spring intermediate its two ends, a setting mechanism for said power spring and means engaging said lug to throw said setting mechanism into action.

21. In a trolley retriever the combination with a drum and a power spring adapted to be thrown into action to rotate said drum, of a setting mechanism for said power spring and means engaging said power spring intermediate its two ends to throw said mechanism into action.

22. In a trolley retriever the combination with a drum, and a power spring of a setting mechanism, a lug secured to said power spring intermediate its two ends and means actuated by engagement with said lug to limit the setting of said power spring.

23. In a trolley retriever the combination with three relatively movable members, one constituting a drum, another a normally stationary member and another an intermediate member, and a power spring having one end attached to the intermediate member and the other end to one of the other of said members, a lug secured to said power spring connections between the said intermediate member and one of the other of said members adapted to be thrown into and out of action by engagement with said lug.

24. In a trolley retriever the combination

with two members one constituting a drum, the other a normally stationary member and a power spring, normally in a strained condition and having its two ends retained by one of said members, means for automatically releasing one of the ends of said spring from the member by which it is normally held and connecting said released end to the other member to bring said drum under the action of said power spring, and automatic means for retaining the said released end of said spring by said stationary member and said drum alternately when said drum is rotated alternately in opposite directions.

25. In a trolley retriever the combination with a drum of a power spring adapted to be thrown into action by the rotation of said drum, to wind up the trolley rope, of means automatically thrown into action during the winding up of said trolley rope to cause the unwinding of rope from said drum to reset said power spring.

26. In a trolley retriever the combination with a drum adapted to receive the trolley rope, a tension spring and a power spring of a set mechanism for the power spring thrown into action by the unwinding of said spring and thrown out of action when said spring is wound up to a predetermined point and adapted to permit the drum to take up slack under the action of the tension spring and to prevent the unwinding of the power spring before said retriever spring is fully set.

27. In a trolley retriever the combination with a drum, a tension spring, a normally stationary member and an intermediate member of a power spring secured to said drum and said intermediate member, automatic means for locking said intermediate member to said drum when said drum is turned in one direction and automatic means for locking said intermediate member to said stationary member when the drum is turned in the opposite direction.

28. In a trolley retriever the combination with a drum a stationary member and an intermediate member of a power spring having one end secured to said drum and the other end to said intermediate member, retaining means on said intermediate member adapted to engage the drum when the drum is turned in one direction and to engage the stationary member when it is turned in the opposite direction.

29. In a trolley retriever the combination with a drum a stationary member and an intermediate member of a power spring, having one end secured to said drum and the other end to said intermediate member, retaining means on said intermediate member adapted to engage the drum when the drum is turned in one direction and to engage the stationary member when it is turned in the opposite direction, and means for automatic-



ally freeing said intermediate member from said stationary member when said power spring is wound up to a predetermined limit.

30. In a trolley retriever the combination with a drum a stationary member and an intermediate member of a pawl upon said intermediate member engaging teeth upon said drum a pawl upon said intermediate member engaging teeth upon said stationary member and means for automatically throwing last named pawl into and out of action.

31. In a trolley retriever the combination with a drum a stationary member and an intermediate member, of a power spring secured to said drum and said intermediate member, a pawl upon said intermediate member adapted to engage teeth upon said drum and means for throwing said pawl into engagement with said teeth to prevent the relative rotation of said drum and said intermediate member when said power spring has been wound up to a predetermined limit.

32. In a trolley retriever the combination with a drum adapted to receive the trolley rope, a tension spring and a power spring, of means for retaining said power spring when said drum rotates under the action of said

tension spring and means for causing the unwinding of rope from said drum to set said power spring and a trolley rope having an enlarged portion for the grip.

33. In a trolley retriever the combination with the drum, the tension spring and the power spring, of reciprocating setting means and a rope having an enlarged grip portion.

34. In a trolley retriever the combination with two relatively movable members, one constituting a drum and the other a normally stationary member, and a power spring having one of its ends secured to one of said members, of mechanism automatically connecting the other end of said power spring with the drum when the drum is turned in one direction and with said normally stationary member when the drum is turned in the opposite direction, during the setting of said power spring.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

CHARLES I. EARLL.

Witnesses:

GEO. E. HARDY,

ELSIE C. NEWKRANTZ.