No. 833,931. PATENTED OCT. 23, 1906.

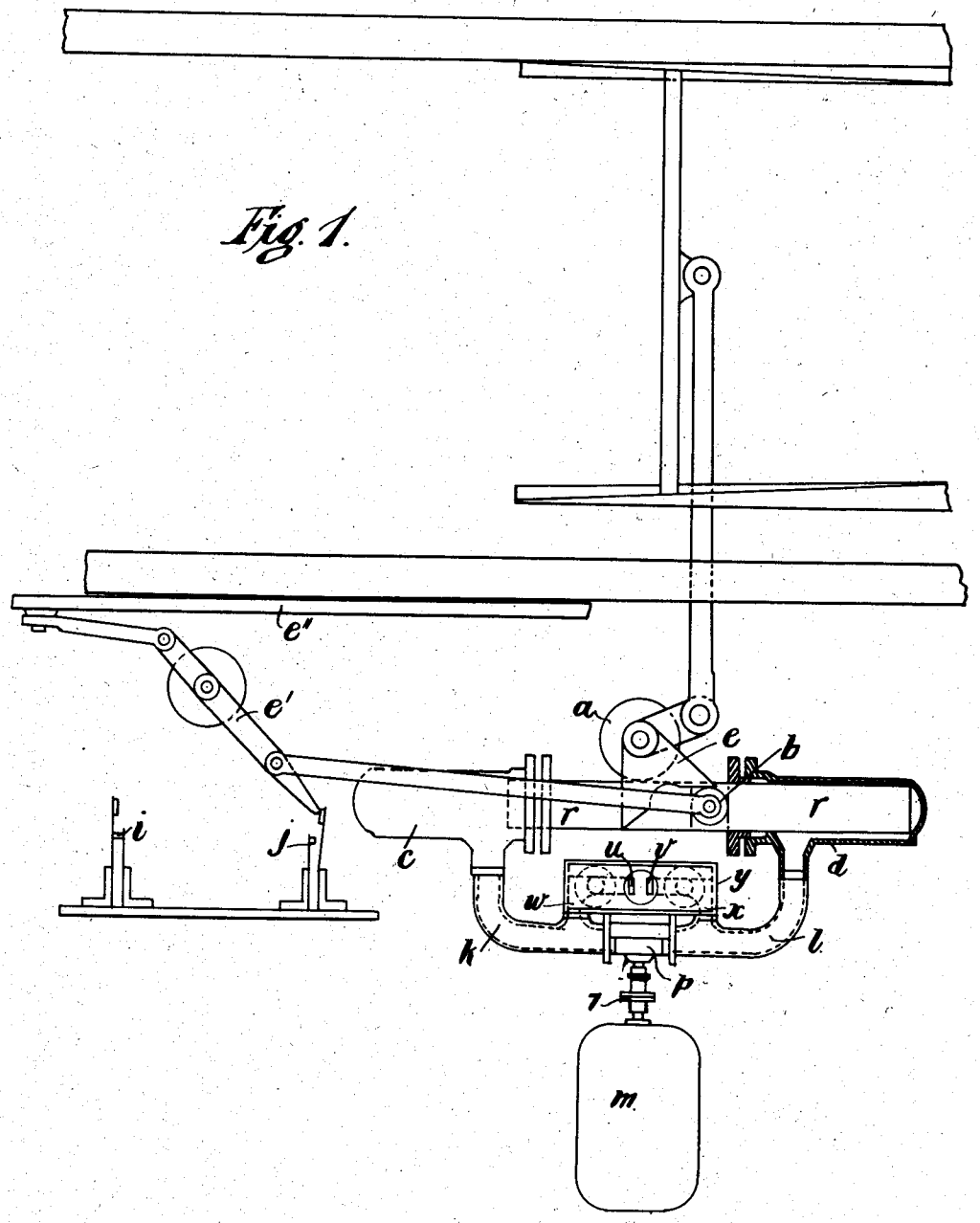
A. H. JOHNSON.

APPARATUS FOR OPERATING RECIPROCATING HYDRAULIC MOTORS.

APPLICATION FILED JUNE 2, 1906.

3 SHEETS—SHEET 1.

Fig. 1.



Witnesses.

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Fig. 6.

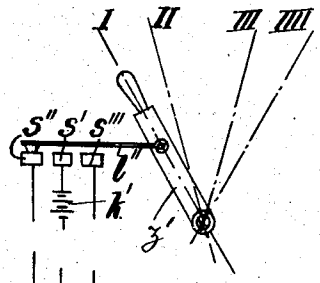
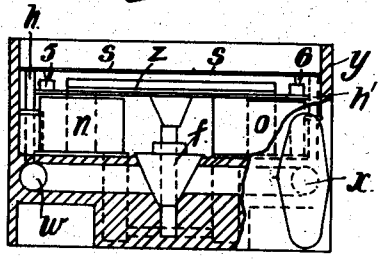


Fig. 2.



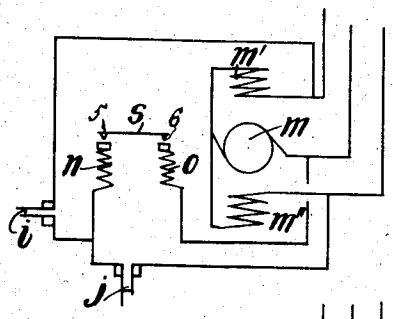
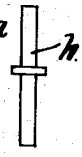


Fig. 2a



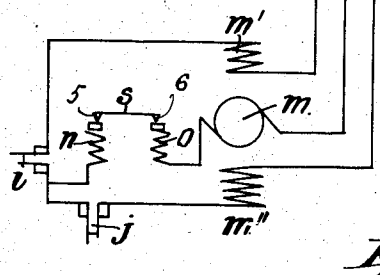


Fig. 7.

Fig. 3.

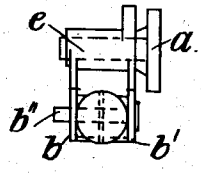


Fig. 4.

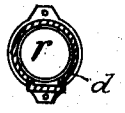
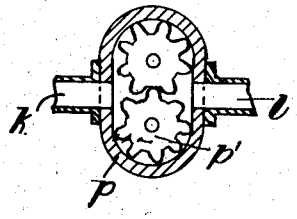


Fig. 5



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3 SHEETS—SHEET 3.

Fig. 8.

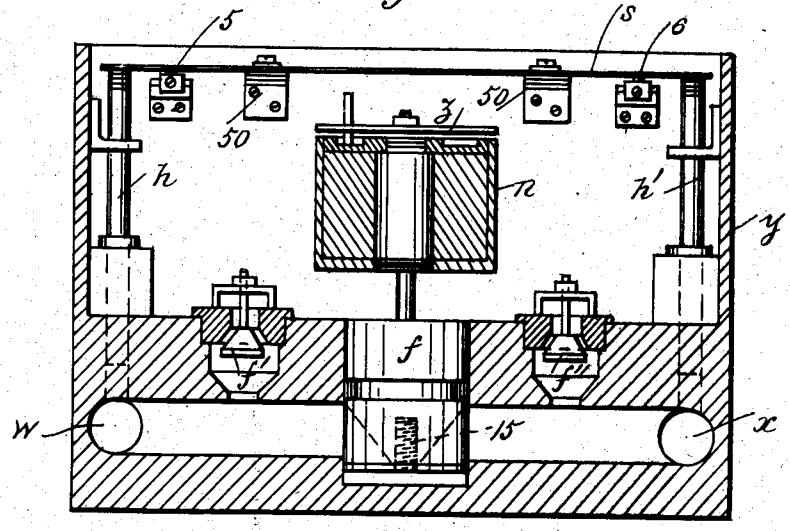
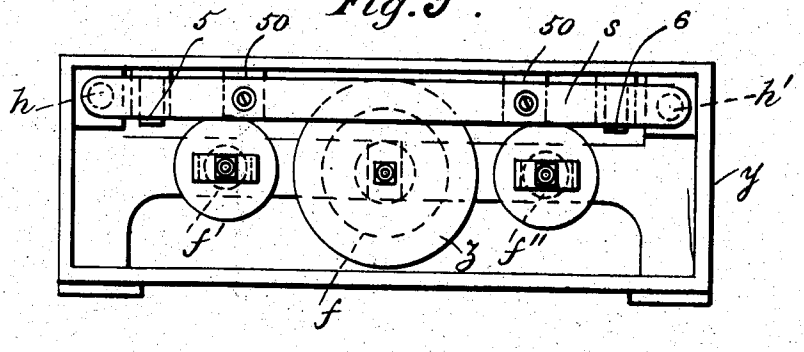


Fig. 9.



WITNESSES:

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UNITED STATES PATENT OFFICE.

ARTHUR HENRY JOHNSON, OF BICKLEY, ENGLAND.

APPARATUS FOR OPERATING RECIPROCATING HYDRAULIC MOTORS.

No. 833,931. Specification of Letters Patent. Patented Oct. 23, 1906.

Application filed June 2, 1906. Serial No. 319,927.

To all whom it may concern:

Be it known that I, ARTHUR HENRY JOHNSON, a subject of the King of Great Britain and Ireland, residing at Bickley, in the county of Kent, England, (whose post-office address is "Winfrith," The Avenue, Bickley, Kent, England,) have invented certain new and useful Improvements in and Relating to Apparatus for Operating Reciprocating Hydraulic Motors; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention has for its object improvements in or relating to apparatus for operating or controlling railway switch-points, signals, and the like; and it consists in the novel features of construction and combination of parts or devices hereinafter fully disclosed, and more particularly pointed out in the claims.

In the accompanying drawings, which illustrate a method of carrying out my invention, Figure 1 shows my invention applied for operating a pair of railway switch-points. Fig. 2 is a sectional view of part of my apparatus, disclosing the by-pass and means for controlling the same, hereinafter described. Fig. 2ª is a detail view of one of the small rams *h h'*, hereinafter referred to. Fig. 3 is an end elevation of the rollers *b b'* and escapement-crank *e* employed in Fig. 1 and hereinafter described. Fig. 4 is a sectional elevation of the chamber *d* and ram *r*, hereinafter referred to. Fig. 5 is a view of the rotary gear for moving the liquid, as hereinafter described. Fig. 6 is a diagrammatic view of the electric circuits. Fig. 7 is a similar view to Fig. 6, but shows a valve-magnet arranged in series with the motor-armature. Fig. 8 is a vertical section showing a modified arrangement of valve mechanism for controlling the by-pass. Fig. 9 is a plan view of the parts shown in Fig. 8.

Referring to the drawings, *e''*, Fig. 1, represents the well-known lock-bar, the bolt for locking the switch-points being omitted.

m is an electric motor, the spindle of which is coupled by coupling 7 to the spindle *p'*, Fig. 5, of the rotary gear *p*, Figs. 1 and 5.

r is a two-ended ram, one end being carried by a packed stuffing-box of the ram-chamber *c*, the other end being carried by the stuffing-box of the chamber *d*. Chambers *c* and *d* are connected through the medium of the pipes *k* and *l* and the gear *p*. The chambers *c* and *d*, the pipes *k* and *l*, and the gear-chamber are filled with a liquid—such, for instance, as a mineral oil. When the motor-spindle rotates, the gear-wheels are revolved and liquid is taken from one ram-chamber and forced into the other, thus displacing the ram *r*. When the rotation of the electric motor-spindle is reversed, the ram *r* is displaced in the opposite direction.

b is a roller carried by a pin *b''*, passing through the ram. The roller *b'* (shown at Fig. 3) is carried by the same pin. Each of these rollers *b b'* engages with an arm of an escapement-crank *e*, mounted on the pin-plate *a*. The switch-points are connected to the escapement-crank, as shown. On a complete movement of the ram in either one direction or the other it is clear that the rollers *b b'* will turn the escapement-crank *e* upon the pin-plate *a* as a fulcrum, and thus reverse the switch-points.

Referring to Figs. 1 and 2, *y* is a box in which a by-pass pipe *w x* is formed. The box is bolted against the pipes *k* and *l*, so that there is direct communication between the by-pass and the pipes at *w x*. The by-pass has openings *u* and *v*, Fig. 1, in a valve-seat of a conical valve *f*, Fig. 2. When the valve *f* is held down on its seat by the armature *z* being attracted to the electromagnet-cores *o* and *n*, no liquid can circulate by means of the by-pass; but when magnets *o n* are demagnetized the valve *f* is forced from its seat upon working the motor *m*, which is thus allowed to run on, although ram *r* is obstructed or has come to the end of its stroke.

In Fig. 2ª is shown a detail of a small ram *h*, two such rams being shown in position at *h h'*, Fig. 2. It will be seen that the barrels into which they are inserted communicate with the by-pass. The spring *s* is supported in any approved manner in the upper part of the box *y*, and in Figs. 8 and 9 brackets 50 are shown for holding the spring in position. The end portions of the spring *s* bear downwardly on the rams *h h'* when the electric contacts 5 and 6 are closed, and the electromagnets *o n* being energized then hold down the armature *z*. Now spring *s* is sufficiently strong to hold down either ram *h* or *h'* when subjected to the ordinary working pressure of the liquid; but should any obstruction cause an abnormal pressure to be formed in the chambers *c* and *d* the ram *h* or *h'*, as the case may be, is forced

upward, thus opening contacts 5 or 6, and as both these contacts are in series with the windings of the magnets *o n* they lose their power, the valve *f* is open, and the liquid circulates by means of the by-pass, thus preventing a sudden stoppage of the motor. The valve *f* is raised by the pressure of the fluid under it when permitted to do so by the electromagnets, or it may be raised by suitable lifting mechanism, if desired. When the valve is conical, a portion of the fluid escapes upward into the box *y;* but this is more advantageous than otherwise. The escaped fluid subsequently returns by gravity. When a cylindrical by-pass valve is used, as shown in Fig. 8, it is desirable to provide relief-valves *f' f''* to let a little fluid escape into the box *y*.

The electric circuits are shown at Fig. 6. *z'* is an operating-lever for closing or opening the reversing-switch *s' s'' s'''*. This switch is shown open to correspond with the position of the points, Fig. 1. To reverse the points, the lever *z'* is moved over to the position 111, thus closing contacts *s' s'''*. The battery or other electrical source *k'* then sends a current via armature *m*, field *m''*, contact *s'''*, and battery *k'*. At the same time a shunt-current circulates via valve-magnets *o n* and contact *j*. The armature then rotates in the direction determined by the field *m''*, and as the valve is held closed by the magnets *o n* the ram is forced over as regards Fig. 1 from right to left, thus reversing the points.

On reference to Fig. 1 it will be seen that lever *e'* is prolonged in order to open contact *j* at one end of its stroke and *i* at the other end. For the sake of clearness these contacts are shown working in connection with lever *e';* but they may be attached to box *y* and opened by a projection from ram *r*. Contacts *i* and *j* are shown in the circuit-diagram, Fig. 6, and it will be seen that the effect of opening either is to demagnetize coils *o n*, thus releasing the by-pass valve and allowing the motor a free run while the operating-contacts *s' s'''* are closed. The motor is then stopped by moving the lever to position IIII, thus opening the circuit at *s' s'''*. To return the points to their normal position, lever *z'* is placed in position II, thus closing switch-contacts *s', s''*. Current will then circulate as follows, viz: *k', m*, field-coil *m'*, valve-magnets *n o*, battery *k'*. The direction of the rotation of armature *m* is now reversed, owing to field *m'* being wound in opposition to *m''*. The rotary gear is thus driven in the opposite direction to that previously described, and the ram *r* is thus traversed from left to right, returning the points to their normal position, as shown. An important feature of the rotary gear when used as shown and described is that it does not depend upon its suction action as a pump, but acts on the liquid as a simple cog-wheel, for as fast as liquid is expelled in front of the cog-wheels it is fed in behind them by the action of ram *r*.

In Fig. 6 the valve-magnets *o n* are shown shunted across the motor-wires; but it is obvious that their windings might be in series with the motor-armature, and a circuit for accomplishing this is shown at Fig. 7, like parts bearing the same letters of reference. Instead of employing either series or shunt windings *o n* by themselves I may use a compound winding, partly series and partly shunt. The shunt-winding will oppose a series winding in the well-known way. The object of this is to weaken the force of magnets *o n* when the current through the motor rises.

The rotary wheels *p'* and their casing constitute one form of reversible rotary pump, and the rams *r*, with their cylinders and connections, constitute a double-acting reciprocatory engine, which is driven in one direction or the other by the pressure of the fluid forced into it by the said pump. This engine affords a means for moving a points-rod, a signal-rod, or other similar device back and forth at will.

In order to clearly illustrate the action of the by-pass valve *f* and to show that its action when lifted is not for the purpose of opening an outlet to chamber *y*, I show a modified form of valve at Figs. 8 and 9, in which parts equivalent to those shown in the preceding figures bear the same reference-symbols. Valve *f* will be seen to be of cylindrical form, and the holding-magnet is here shown of the well-known ironclad type. It will be seen that valve *f* acts as a gate-valve, and no liquid can pass out into the chamber *y*. Expansion and contraction of the liquid in the ram-chambers and pipes take place via valves *f' f''*, which are adapted to fly up and close their ports when pressure is applied to the liquid by means of the rotary gear.

What I claim, and desire to secure by Letters Patent, is—

1. The combination, with a casing, and intergearing toothed wheels journaled therein; of a reversible motor for driving the said wheels, two cylinders, a piston having its end portions slidable in the said cylinders, pipes connecting the opposite ends of the said cylinders with the opposite sides of the said casing respectively, a by-pass connecting the opposite ends of the said cylinders, a valve controlling the said by-pass, an electromagnet normally holding the said valve closed, and means for deënergizing the said electromagnet at will.

2. The combination, with a casing, and intergearing toothed wheels journaled therein; of a reversible motor for driving the said wheels, two cylinders, a piston having its end portions slidable in the said cylinders, pipes connecting the opposite ends of the said cylinders with the opposite sides of the said cas-

ing respectively, a by-pass connecting the opposite ends of the said cylinders, a valve controlling the said by-pass, two barrels communicating with the end portions of the said by-pass, two rams slidable in the said barrels, a spring normally preventing the said rams from sliding, an electromagnet normally holding the said valve closed, and electric contact mechanism controlling the said electromagnet and actuated by the said rams when the pressure in the said cylinders becomes excessive.

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

ARTHUR HENRY JOHNSON.

Witnesses:
D. H. TINSON,
H. P. SCOTT.