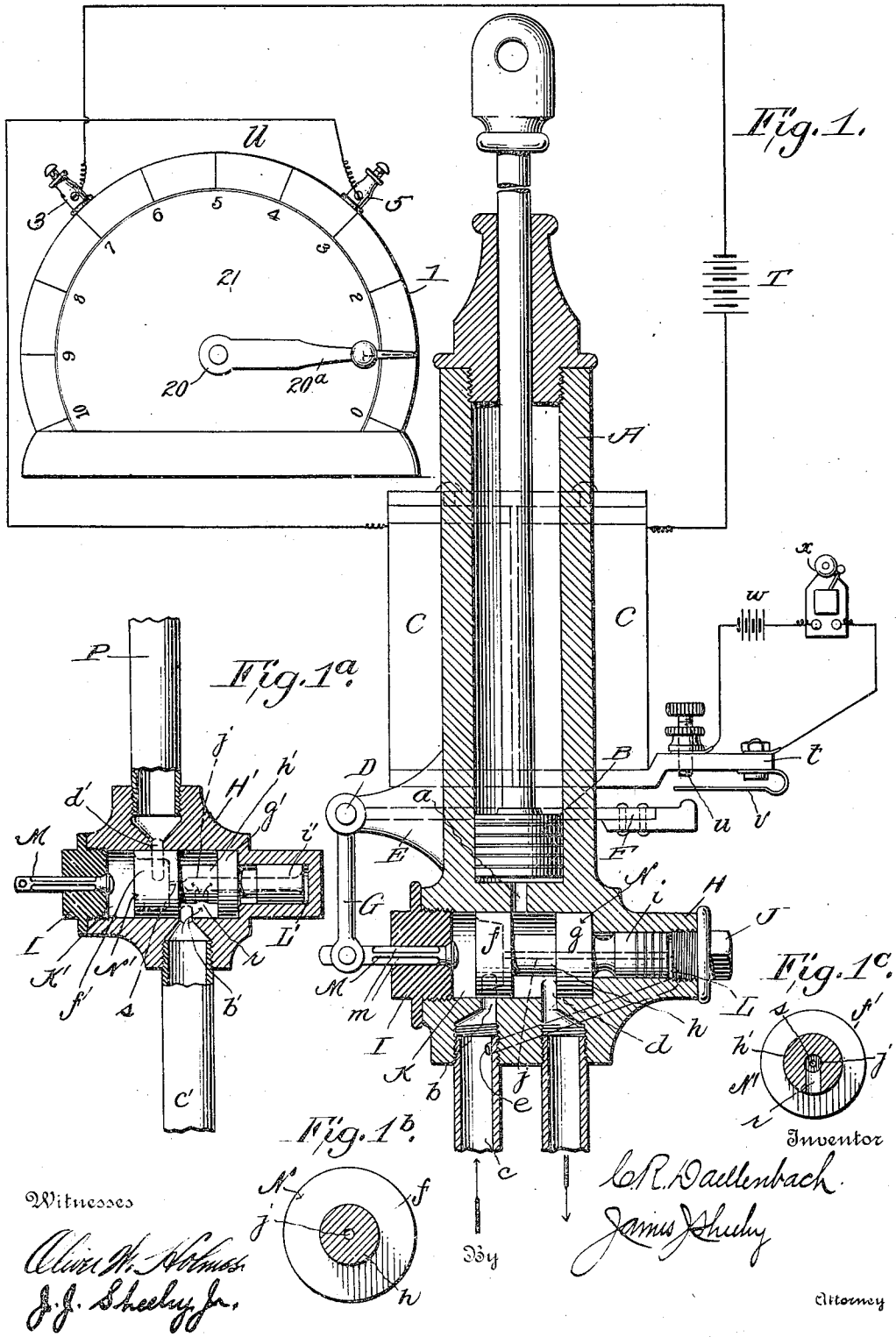
C. R. DAELLENBACH.

ELECTROFLUID PRESSURE APPARATUS.

APPLICATION FILED JULY 16, 1909.

968,453. Patented Aug. 23, 1910.

2 SHEETS—SHEET 1.



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2 SHEETS—SHEET 2.

Fig. 2.

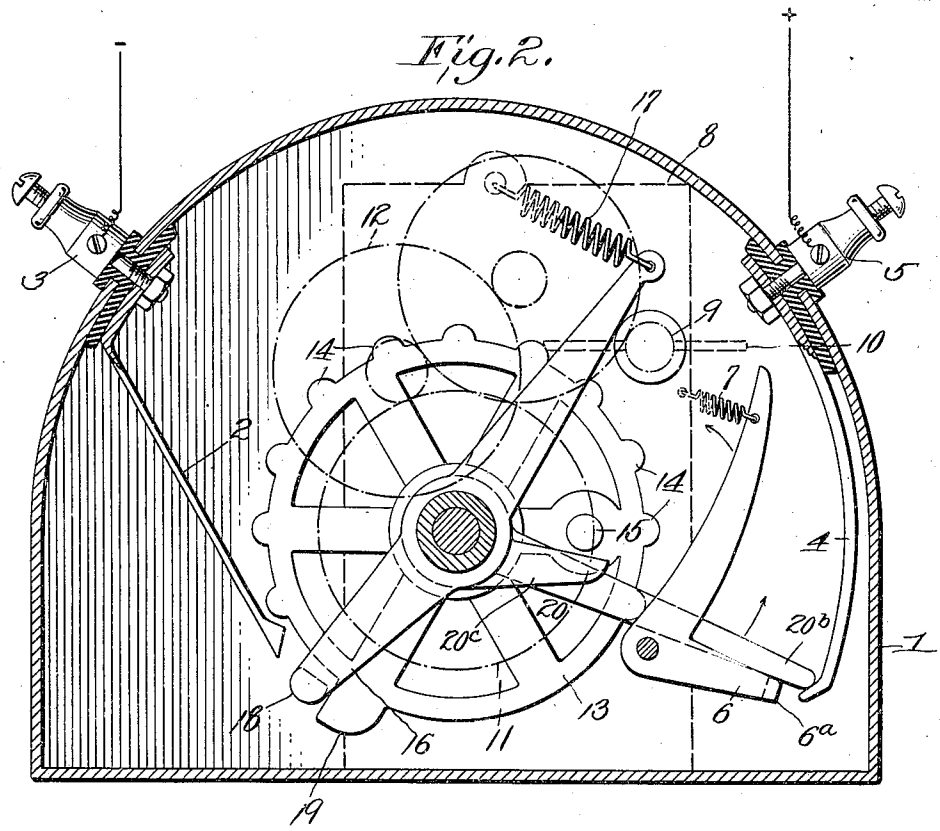
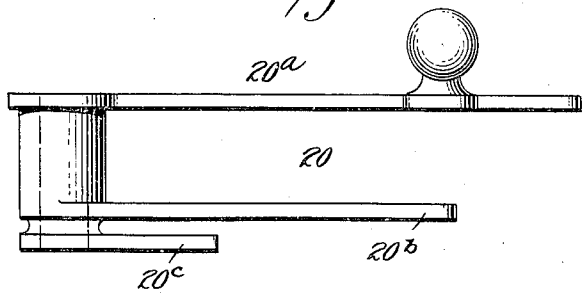


Fig. 3.



Witnesses

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ELECTROFLUID-PRESSURE APPARATUS.

968,453. Specification of Letters Patent. Patented Aug. 23, 1910.

Application filed July 16, 1909. Serial No. 508,034.

To all whom it may concern:

Be it known that I, CARL R. DAELLENBACH, citizen of the United States, residing at Braddock, in the county of Allegheny and State of Pennsylvania, have invented new and useful Improvements in Electro-fluid-Pressure Apparatus, of which the following is a specification.

My invention pertains to electro fluid-pressure apparatus; and it contemplates the provision of a simple and reliable apparatus of the kind stated, designed more particularly for use in connection with the operation of railways, and adapted for actuating signals, operating whistles or gongs, working throttle valves or throwing switches or any other devices that are to be moved by a person located at a distance from the same.

The invention also contemplates the provision of an apparatus characterized as stated and constructed in such manner that by a single movement of the controlling element, the fluid under pressure may be supplied to and cut off from the device to be actuated a number of times in succession.

Other objects and advantages of the invention will be fully understood from the following description and claims, when the same are read in connection with the drawings, accompanying and forming part of this specification, in which:

Figure 1 is a view, partly in section and partly in elevation of a complete apparatus constructed in accordance with my invention. Fig. 1ª is a sectional view showing a fluid-pressure valve designed more particularly for use when the fluid-pressure is to act directly against a whistle or other device to be actuated. Figs. 1ᵇ and 1ᶜ are cross-sections of the piston valves N and N′, respectively. Fig. 2 is a section, on an enlarged scale, taken through the casing of the circuit making and breaking device comprised in my improvements. Fig. 3 is a plan view showing the hand lever of the said circuit making and breaking device or controller.

Referring by letter and numeral to the said drawings, and more particularly to Figs. 1, 2 and 3, thereof: A is a cylinder having a piston B movable therein; the said piston being designed to be connected in any manner consonant with the purpose of my invention to a device to be actuated. C C are electro-magnets disposed at one side of the cylinder A.

D is a rock-shaft mounted in a bracket arm E on the cylinder A and having an armature F arranged in proper relation to the magnets C, and also having an arm G disposed at a right angle to the said armature, and H is a valve casing, disposed, by preference, at one end of the cylinder A and formed integral therewith. The said valve casing is provided at its opposite ends with plug-like heads I and J, and in it are formed a chamber K and a sub-chamber L; the said sub-chamber being arranged at the end of the chamber K remote from the head I, and being smaller in diameter than the chamber K in about the proportion illustrated. It will also be noted by reference to Fig. 1 that the valve casing H is provided with a port *a* effecting connection between its chamber K and the interior of the cylinder A, an induction port *b* communicating with the chamber K and designed to be connected through a pipe *c* with a source of fluid pressure supply, a port *d* designed to exhaust fluid under pressure from the chamber K, and a conduit or passage *e* communicating with and extending intermediate the supply port *b* and the sub-chamber L.

Extending longitudinally through and movable rectilinearly in the casing head I is a valve M, headed at its inner end and suitably connected at its outer end to the arm G, and movable in the casing H is a piston valve N which, as clearly shown in Fig. 1, comprises a chambered head *f*, a head *g* and an intermediate reduced portion *h*, all movable in the chamber K, and an end portion *i*, of small diameter as compared with the heads *f* and *g*, and arranged and movable in the sub-chamber L. The valve N is also provided with a longitudinal central passage *j* which extends from the chamber in the head *f* to the opposite end of the valve. See in this connection the dotted lines in Fig. 1.

By virtue of the construction thus far described it will be manifest that when the parts are in the positions shown in Fig. 1 and an adequate supply of fluid pressure is maintained in the pipe *c*, the parts will be maintained in such positions so long as the valve M is not opened. When, however, the electro-magnets C are energized to attract the armature F thereto, it will be seen that the valve M will be moved inwardly, and that the accumulated pressure in the chamber K at the left of the valve N will pass

out through the opening in the head I and the recesses *m* in valve M, whereupon the fluid pressure acting through the passage *e*, which is larger than the valve passage *j*, will press the valve N toward the left to enable the valve head *g* to close the port *d*, and the valve head *f* to overrun the port *b* and effect communication between said port *b* and the port *a*, so as to permit fluid under pressure to pass directly from the source of supply through the chamber K and the port *a*, and by acting against the piston B to move the said piston in one direction. It will also be understood that the piston B will be maintained in the position to which it is moved so long as the electro-magnets C are energized. When, however, the said electro-magnets C are deënergized, and the armature F drops away therefrom, it will be seen that the valve M will be closed, and that consequently the fluid pressure passing from the port *b* through the casing passage *e*, the sub-chamber L and the valve passage *j*, will accumulate in the chamber K at the left of the valve, and by reason of the head *f* being larger in diameter than the end portion *i* of the valve, will move the valve toward the right until the valve head *g* passes beyond and opens the port *d* and the valve head *f* rests over and closes the port *b*. At this time the port *a* is open through the chamber K to the exhaust port *d*, and consequently the fluid pressure behind the piston B is enabled to pass out of the cylinder A and permit movement of the piston in the direction opposite to that first stated. From this it follows that by alternately energizing and deënergizing the electro-magnets C the piston B may be reciprocated to actuate a semaphore or any other device to be moved and with which the piston may be connected.

In Fig. 1ª I illustrate a modified valve casing H′ and valve N′ designed for use when the fluid pressure is to be employed to act directly against the thing or device to be actuated, such, for instance, as a whistle. By reference to said figure, it will be seen that P is a pipe connected with the casing H′ and designed to lead to the whistle or other device to be actuated, and that the casing H′ is provided with a chamber K′, a comparatively small sub-chamber L′, and a head I designed to receive a valve M, which valve M is adapted to be controlled and moved by the electro-mechanical means before described in detail. It will also be observed by reference to Fig. 1ª that the casing H′ is provided with a port *d′* between the chamber K′ and the pipe P, and a port *b′* between the chamber K′ and a pipe *c′*, designed to lead from a suitable source of fluid-pressure supply. The valve N′ of the modified construction is provided with a chambered head *f′*, a head *g′*, an intermediate portion *h′*, and an end portion *i′*; and it will also be noted that the valve has a longitudinal central passage *j′* extending from the chamber in the head *f′* to the smaller end of the valve, and that a port *r*, formed in the intermediate portion *h′* of the valve, effects communication between the said passage *j′* and the chamber K′. Thus it will be understood that when adequate pressure is maintained in the pipe *c′*, the parts will be retained in the positions shown in Fig. 1ª so long as the valve M is closed. When, however, the valve M is moved inwardly to open the same, the accumulated pressure will escape from the chamber K′ at the left of the valve, whereupon the pressure gathering in the sub-chamber L′ will move the valve toward the left, this because the connection between the passage *j′* and the chamber in the head *f′* is contracted as indicated by *s*. The said movement of valve N′ toward the left will open the port *d′* to the port *b′* and permit fluid pressure to pass from the port *b′* through the chamber K′ to and through the port *d′* to the pipe P. It will also be noted that when the valve M is closed the pressure accumulating in the chamber K′ at the left of the valve will, by acting against the head *f′*, overcome the pressure in the sub-chamber L′ and move the valve to the position shown, whereupon communication between the chamber K′ and the port *d′* will be closed.

It will be gathered from the foregoing that the fluid pressure mechanism constructed in accordance with my invention is reliable in operation, notwithstanding its simplicity and inexpensiveness, and that it embodies no delicate parts such as are likely to get out of order after a short period of use.

In Fig. 1 I show the electro-magnets C in a normally open electric circuit with a source of electric energy indicated by T, and a controller U, which latter is designed to be manually operated and is preferably in the form of a circuit maker and breaker. When the said controller U is operated, the electro-magnets C are energized and deenergized as before described; it being understood that the said controller will be located at a distance from the set or sets of electro-magnets with which it is arranged in circuit, so that a person located at a distance from the fluid pressure mechanism may effectually control the operation of the latter.

In order to sound an alarm in the event that there is no fluid-pressure to move the piston B when the described electric circuit is completed by the controller U, I provide the means shown at the right of Fig. 1, which means comprises a bracket *t*, a terminal *u*, and a spring terminal *v*; the said terminals *u* and *v* being arranged in a normally open electric circuit with a source of

electric energy w, and an electric bell or other electric signal x, and the spring terminal v being arranged in the path of movement of the armature F, so that when the said armature F is attracted to the magnets C, the electric circuit last described will be completed and what may be properly termed the sub-signal x will be actuated. It will here be noted that the sub-signal x will be actuated on each attraction of the armature F to the magnets C, and that on failure of the fluid pressure apparatus or mechanism, the said sub-signal will serve in lieu of the fluid pressure apparatus. In this connection it will be obvious that any suitable electro-mechanical device may be used in lieu of the bell or signal x, without involving departure from the scope of my invention as defined in the claims appended.

In the preferred embodiment of my invention the controller U is constructed in the manner best shown in Figs. 2 and 3—that is to say, it comprises a casing 1, a spring terminal 2 arranged in and connected to but insulated from the casing 1 and connected electrically through a suitable binding post 3 with one of the poles of the source of electric energy T, a spring terminal 4, arranged opposite the terminal 2 and connected to but insulated from the casing 1 and connected through a binding post 5 with the other pole of the source of electric energy T, a bell-crank 6 mounted in the casing and having a lower arm adapted to coöperate with the spring terminal 4, and also having its upper arm connected with a tractile spring 7 for moving it in the direction indicated by arrow in Fig. 2, suitable clock mechanism 8 arranged in the casing and having a spindle 9 and fan blades 10 thereon, and also having a spring 11 and a train of gearing 12 intermediate the same, and the spindle 9, a wheel 13 connected with the said spring 11 and adapted when moved in one direction to put the spring 11 under tension, and having a plurality of peripheral protuberances 14, and also having a lateral projection 15, a lever 16 movable about the same center as the wheel 13, and having an arm connected with a tractile spring 17 and adapted to engage the spindle 9, and also having another arm on which is a lateral projection 18 to be engaged by the peripheral projection 19 of the wheel 13, and a hand lever 20 having an exterior arm 20^a movable in front of the dial 21 of the controller U, and also having an arm 20^b for coöperating with the spring terminal 4 and the bell crank 6, and a shorter arm 20^c for coöperating with the lateral projection 15 of the wheel 13.

In the operation of the controller U it will be understood that when the handle 20 is moved in the direction indicated by arrow in Fig. 2, the arm 20^c coöperating with the lateral projection 15 will move or turn the wheel 13 a corresponding distance and by so doing will put the spring 11 under tension. It will also be understood that on said movement of the handle or hand lever 20 in the direction stated, the arm 20^b will permit the upper arm of the bell-crank 6 to swing inwardly into the path of the fan 10, so as to hold said fan against rotation until the hand lever is returned to the zero position shown in Fig. 2, when the arm 20^b coöperating with the lateral projection 6^a on bell-crank 6, will move the bell-crank to carry the upper arm thereof out of the way of the fan 10. On the movement of the hand lever 20 in the direction indicated by arrow in Fig. 2, a number of the protuberances 14 on wheel 13 will be carried beyond the end of the terminal spring 2; the said number of protuberances corresponding to the number to which the pointer arm 20^a of the hand lever 20 is moved. Then when the hand lever 20 is released and the spring 11 turns the wheel 13 and the hand lever 20 in the direction opposite to that indicated by arrow, it will be noticed that the circuit will be made or completed and broken a number of times corresponding to the number of protuberances that were moved beyond the end of the terminal 2 in the first instance, the circuit being from the terminal 2 through the protuberances 14 of the wheel, the said wheel and the arm 20^b of the hand lever 20 to the terminal 4. By reason of the before described bell-crank 6, the wheel 13 cannot turn by the action of the spring 11 until the hand lever 20 is returned to the position where its pointer arm 20^a is directed to zero. At that time, however, the wheel 13 turns toward the right and makes and breaks the circuit until the peripheral projection 19 on said wheel brings up against the lateral projection 18 on the lever 16, when the wheel will be stopped in a cushioned manner and at the same time the lever 16 will be moved, against the action of the tractile spring 17, against the spindle 9 to brake the latter.

It will be gathered from the foregoing that when the pointer arm 20^a of hand lever 20 is moved to 4 on the dial of the controller U and then released, the electric circuit will be made and broken four times and in consequence the electro-magnets C will be energized and deënergized four times, and the piston B will be moved up and down a corresponding number of times. When the pointer arm 20^a is moved to 1 on the dial of the controller U as shown in Fig. 1 and then released, the circuit will obviously be made and broken but once.

The construction herein illustrated and described constitutes the best practical embodiment of my invention that I have as yet devised, but it is obvious that in the future practice of the invention such

changes or modifications may be made as do not involve departure from the scope of my invention as defined in the claims appended.

Having described my invention, what I claim and desire to secure by Letters-Patent, is:

1. In an apparatus for the purpose described, the combination with a valve casing having a chamber, an induction port and an eduction port for fluid under pressure connected with said chamber, an exhaust port also connected with the chamber, and a comparatively small sub-chamber; of a piston valve having heads movable in the chamber and a reduced portion movable in the sub-chamber and also having a longitudinal passage connecting the chamber with the sub-chamber, and means for conducting fluid under pressure from the induction port to the sub-chamber, a normally closed valve controlling the exhaust port of the chamber, and means for opening said valve.

2. In an apparatus for the purpose described, the combination with a valve casing having a chamber, an induction port and an eduction port for fluid under pressure connected with the side of the said chamber, an exhaust port leading from the chamber at one end thereof, and a comparatively small sub-chamber at the opposite end of the chamber; of a piston valve having heads movable in the chamber of the casing and also having a reduced portion movable in the sub-chamber thereof, means for conducting fluid under pressure from the induction port to the sub-chamber, means for conducting fluid under pressure from the induction port to the chamber, a normally closed valve controlling the exhaust port of the chamber and having a stem extending outside the casing, an electro-magnet, a rock-shaft having an armature movable toward and from the same and also having an arm connected to the stem of the exhaust valve, a controller, and a source of electric energy arranged in a normally open circuit with the electro-magnet and the controller.

3. An apparatus for the purpose described, comprising a valve casing having a chamber, an induction port and an eduction port for fluid under pressure connected with said chamber, an exhaust port also connected with the chamber, and a comparatively small sub-chamber; a piston valve having heads movable in the chamber and a reduced portion movable in the sub-chamber and also having a longitudinal passage extending between and connecting the chamber and the sub-chamber, means for conducting fluid under pressure from the induction port to the said sub-chamber, a normally closed valve controlling the exhaust port of the chamber, and means for opening said valve.

4. In an apparatus for the purpose described, the combination with a valve casing having a chamber, an induction port and an eduction port for fluid under pressure connected with the side of the said chamber, an exhaust port leading from the chamber at one end thereof, and a comparatively small sub-chamber at the opposite end of the chamber; of a piston valve having heads movable in the chamber of the casing and also having a reduced portion movable in the sub-chamber thereof, means for conducting fluid under pressure from the induction port to the sub-chamber, means for conducting fluid under pressure from the induction port to the chamber, a normally closed valve controlling the exhaust port of the chamber and having a stem extending outside the casing, an electro-magnet, a rock-shaft having an armature movable toward and from the same and also having an arm connected to the stem of the exhaust valve, a controller, a source of electric energy arranged in a normally open circuit with the electro-magnet and the controller, and normally separated terminals arranged in a normally open electric circuit with a source of electric energy and an electrical device to be actuated; one of the said terminals being movable by the armature into contact with the other terminal.

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

CARL R. DAELLENBACH.

Witnesses:

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H. C. RHEA.