No. 776,545. PATENTED DEC. 6, 1904.

E. F. PORTER.

SWITCH.

APPLICATION FILED MAR. 30, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

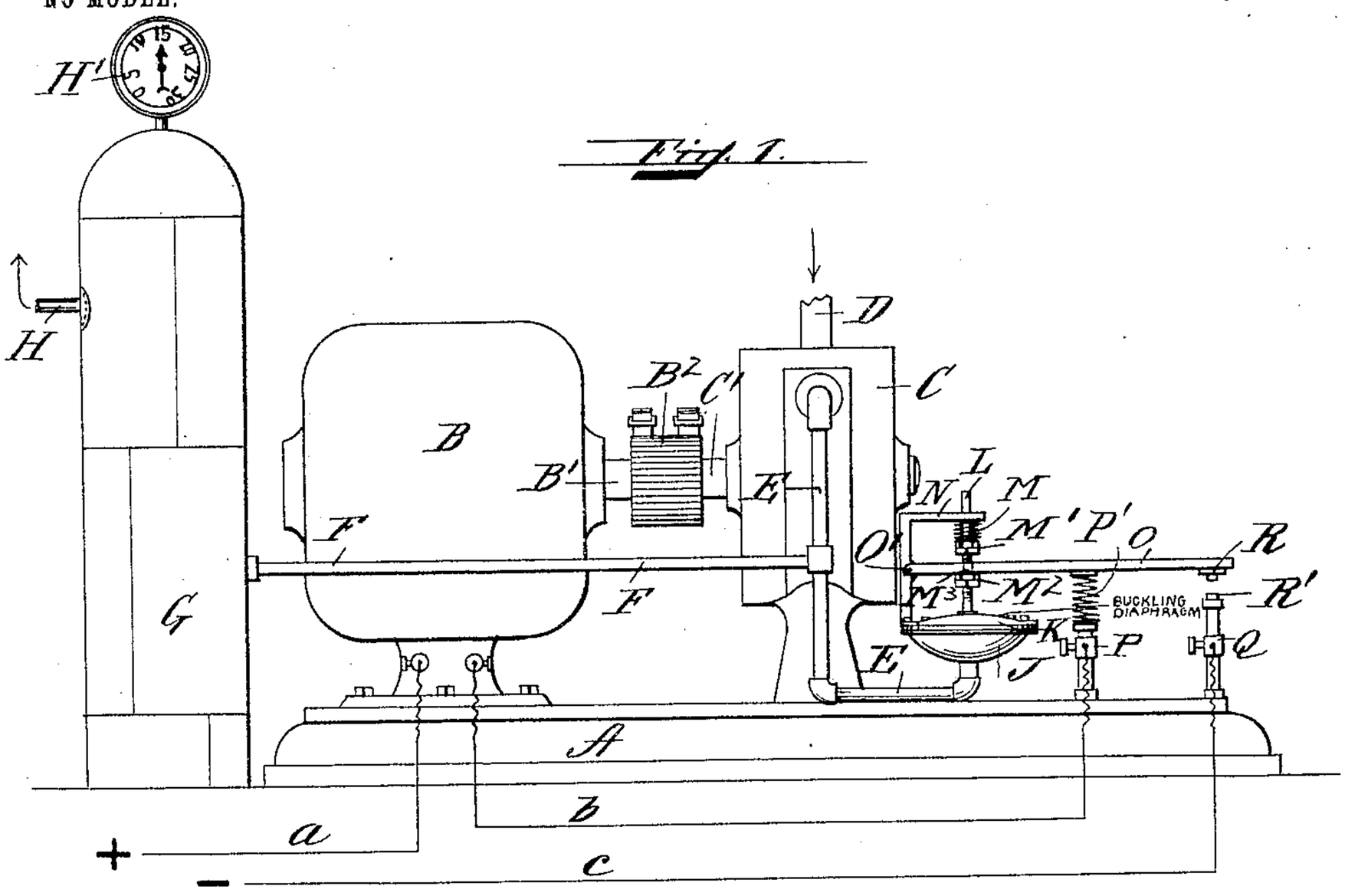
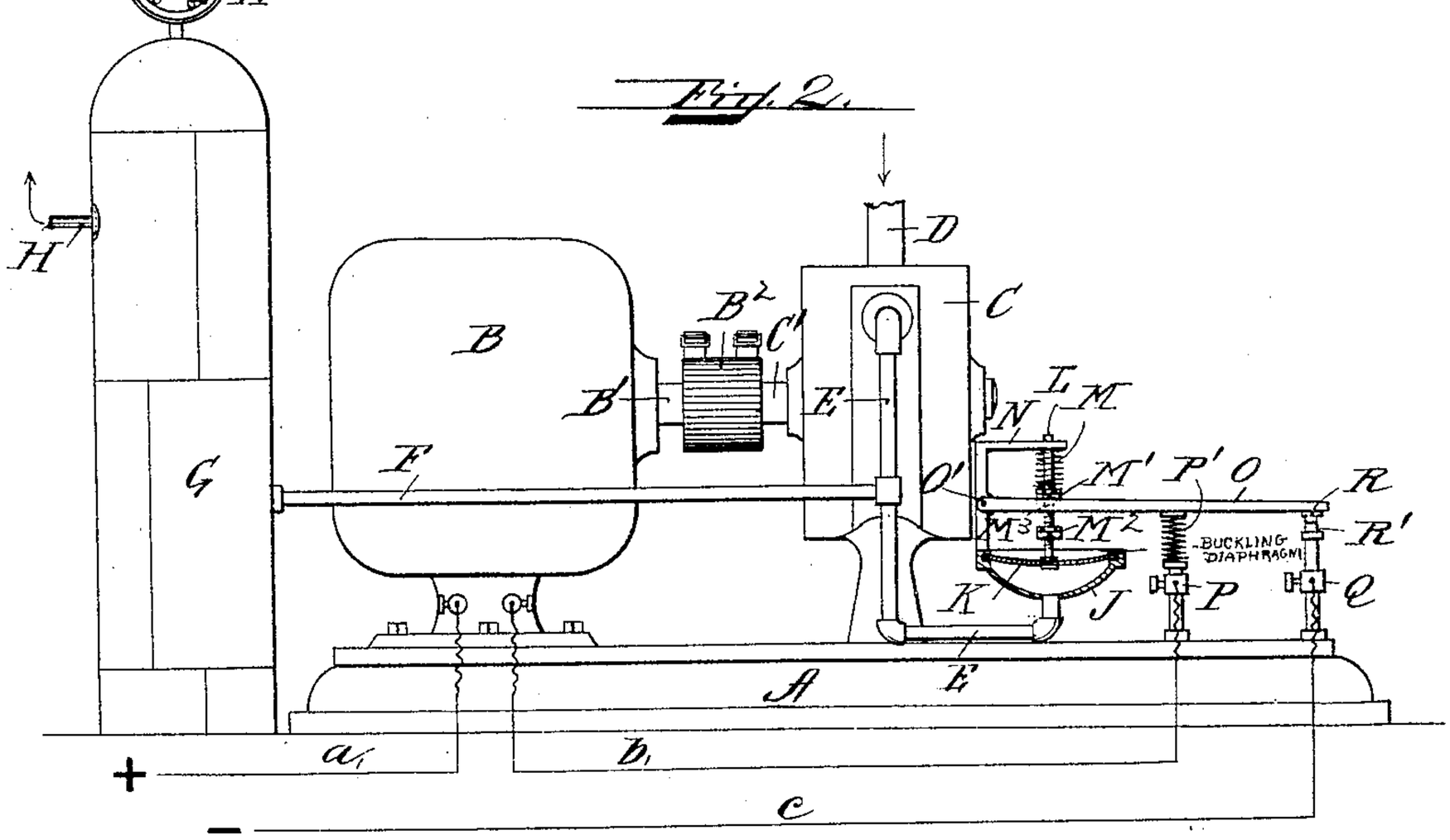


Fig. 2.



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A. L. Mercer

Inventor:
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SWITCH.

APPLICATION FILED MAR. 30, 1903.

NO MODEL. 2 SHEETS—SHEET 2.

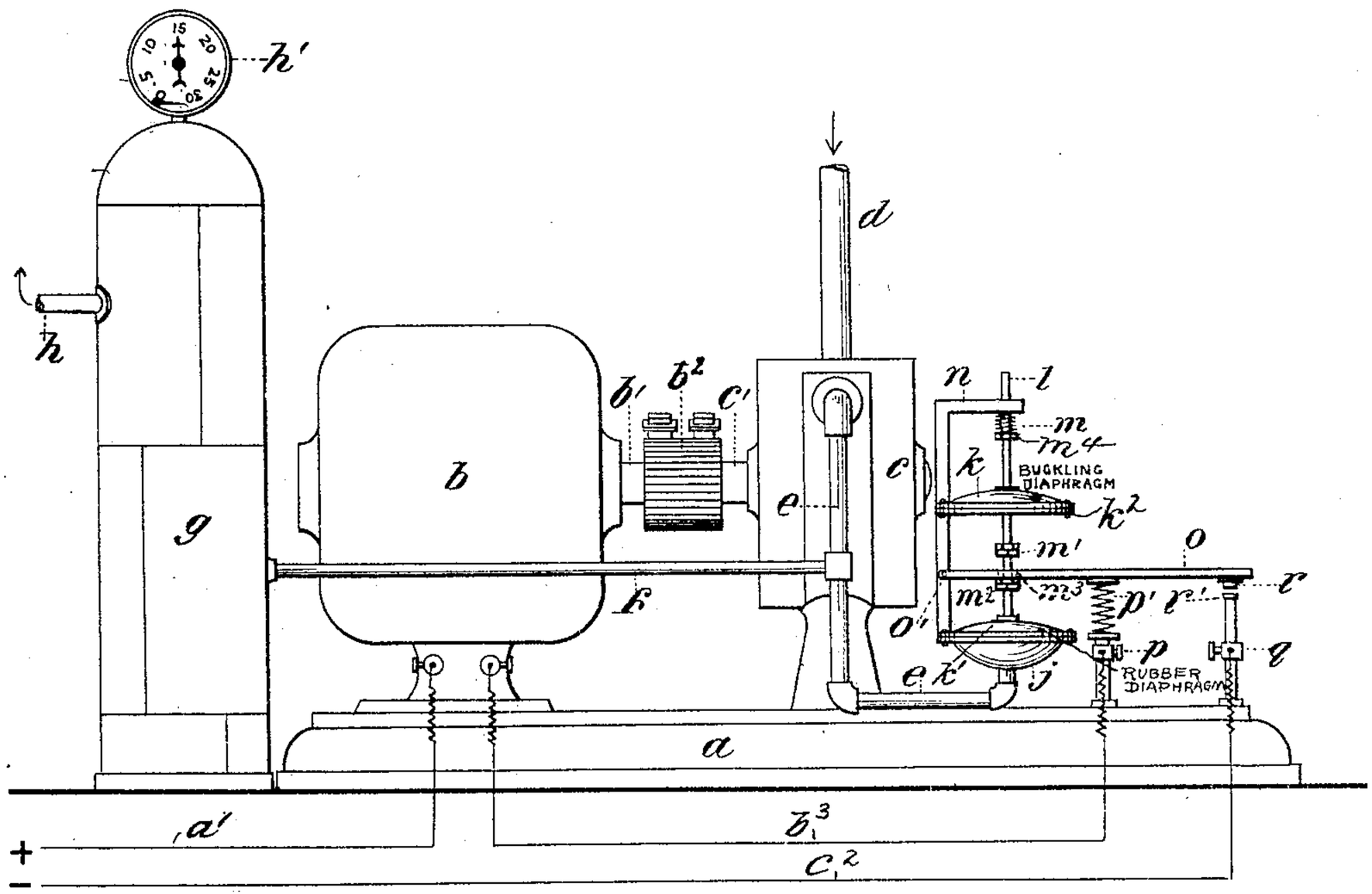

Fig. 3

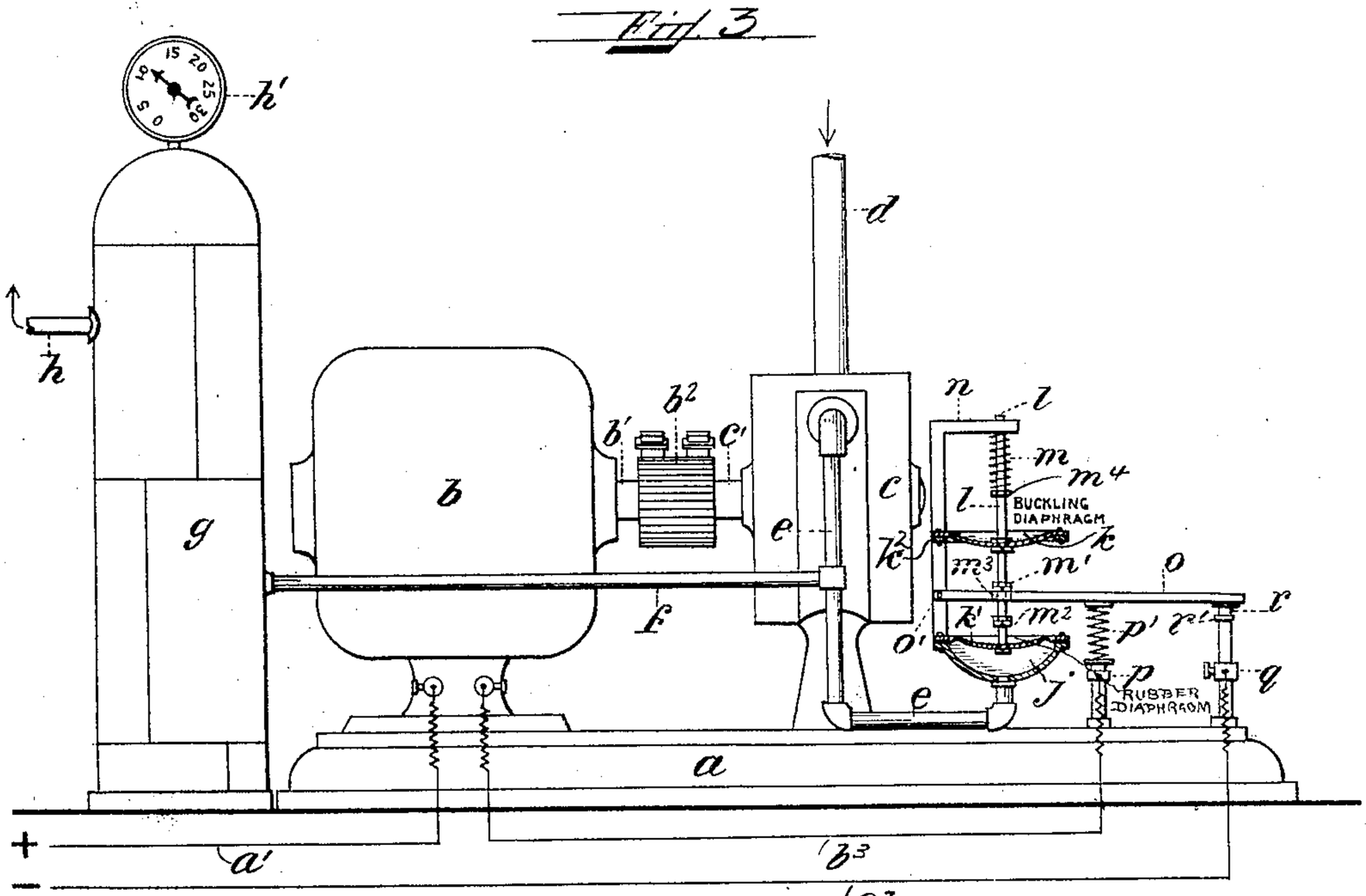

Fig. 4

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No. 776,545. Patented December 6, 1904.

UNITED STATES PATENT OFFICE.

EDWIN F. PORTER, OF BOSTON, MASSACHUSETTS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO PORTER AIR COMPRESSOR COMPANY, OF KITTERY, MAINE, A CORPORATION OF MAINE.

SWITCH.

SPECIFICATION forming part of Letters Patent No. 776,545, dated December 6, 1904.

Application filed March 30, 1903. Serial No. 150,098. (No model.)

To all whom it may concern:

Be it known that I, EDWIN F. PORTER, of Boston, (Dorchester,) in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Switches, of which the following is a specification.

My invention relates to new and useful improvements in switches, and especially to that class of switches known as "electric" switches; and the object of my invention is to provide a quick make-and-break device.

My invention consists of certain novel features hereinafter described, and particularly pointed out in the claims.

In the accompanying drawings, which illustrate a construction embodying my invention, Figure 1 is a side elevation of the air-compressing apparatus operated by the motor, with my switch in combination therewith and showing the switch open. Fig. 2 is a similar view, partly in section, showing the switch closed. Fig. 3 is a modification showing in side elevation the air-compressing apparatus operated by the motor with the switch open. Fig. 4 is a similar view of the modification shown in Fig. 3 with the switch closed and with parts in section.

Like letters of reference refer to like parts throughout the several views.

On the base A is mounted the motor B, which operates the air-compressor C, having the respective shafts B′ and C′ coupled by a suitable coupling B^2. The air-compressor C is provided with an air-inlet D and an air-outlet E, to which is connected by the pipe F a storage-reservoir G, from which the air passes by a suitable outlet H. The pipe E leads to the bottom of the chamber J. The chamber J is closed at the top by the metallic diaphragm K, which diaphragm operates the rod L, and this rod is regulated by the compression-spring M, and the compression of this spring is regulated by the guide N and held securely by the proper nut and lock-nut M′. The support N guides the rod L and also offers a support to the switch-lever O, which is pivoted at O′. The rod L slides through the clearance-hole at M^3 in the lever O, which is screw-threaded, as is also the nut and lock-nut M′ and the nut and lock-nut M^2, and the object of the nut and lock-nut M^2, as will be seen, is to contact the lever O on the upward throw of the diaphragm K, thereby opening the switch.

R and R′ are two carbon terminals to the electric switch, the circuit through which is as follows: The current enters through the wire *a* and passes through the motor B out through the wire *b* to the binding-post P, through the spring P′, which spring serves a double purpose, that of carrying the current and drawing the switch-lever O into contact. The current passes on through the lever O to the carbon point R, through the carbon point R′, through the binding-post Q, and out through the wire *c*.

With the parts in the position shown in Fig. 1, the switch being open, the switch is held in the open position by the pressure of air in the reservoir G, indicated by the gage H′, which shows a pressure of fifteen pounds. This pressure is arrived at through the adjustment of the compression-spring M, which spring is intended to vary the tension of the diaphragm K. It will be seen that by means of this compression-spring M through the medium of the nut M′ the point of opening the switch may be varied arbitrarily; but for the purposes of illustration the point has been placed at fifteen pounds. A slight lowering of pressure in the system allows the diaphragm to descend, as shown in Fig. 2, where the chamber and diaphragm are in section. This descent of the diaphragm closes the switch, the gage showing a variation of three pounds to accomplish this, the gage pointing at twelve pounds in Fig. 2, where the switch is shown closed. This automatically starts the machinery. When the pressure again reaches fifteen pounds, the switch is automatically opened, and the operation is continued, as above described. The diaphragm K in this device is of peculiar construction, and on this peculiarity depends the quick make and break of the circuit. This is peculiar, inasmuch as

it differs from the ordinary diaphragm (which is of rubber or some flexible material) in being made of a material which yields quickly, the structure being similar to that of an ordinary oil-can, where the diaphragm is buckled and yields suddenly to pressure or release. This construction is familiar in the oil-can spoken of, the diaphragm operating quickly under pressure, which results in passing the critical point or dead-center, at which point the flexion is accelerated, and repeating the motion in reverse or release. The lock-nut M^2 is placed out of contact with the switch-lever, as shown in Fig. 2, for the purpose of allowing the lever O to remain undisturbed during the primary movement of the diaphragm K and contacts at the moment the diaphragm passes the dead-center, thereby striking the lever a quick blow and making the quick break desirable. The tension-spring P′ holds the switch-lever O in contact with the nut M^2, following it back as the diaphragm recedes and making the circuit quickly as the diaphragm passes the dead-center on its return.

This switch may be constructed with a rubber or leather diaphragm to operate gradually by the rise and fall of air-pressure, and this peculiar buckled diaphragm may be placed at some other point in relation to the switch interfering with the gradual action of the air-diaphragm and causing the quick make and break, as shown in Figs. 3 and 4.

In the modification shown in Fig. 3 and 4 there is mounted on the base *a* the motor *b*, which operates the air-compressor *c*, having their respective shafts *b′ c′* coupled by a suitable coupling b^2. The air-compressor *c* is provided with an air-inlet *d* and an air-outlet *e*, to which is connected, by the pipe *f*, the storage-reservoir *g* from which air passes by suitable outlet *h*. The pipe *e* leads to the bottom of the chamber *j*. The chamber *j* is closed at the top by the diaphragm *k′* of rubber, leather, or other suitable material, which operates the rod *l*, and this rod is regulated by the compression-spring *m*, and the compression of this spring is regulated by the guide *n* and the nut m^4, and the guide *n* also guides the rod *l* and offers a support to the switch-lever *o*, which is pivoted at *o′*. The rod *l* slides through a clearance-hole m^3 in the lever *o* and is screw-threaded, as are also the nuts and lock-nuts *m′* m^2. The object of this nut and lock-nut m^2, as will be seen, is to contact the lever *o* on the upward throw of the diaphragm *k′* and open the switch. Located above the lever *o* is the metallic buckled diaphragm *k*, supported in a suitable frame k^2 and firmly secured to the rod *l* by suitable nuts. *r r′* are two carbon terminals to the electric switch, and the circuit through which is as follows: The current enters by the wire *a′* and passes through the motor *b* out through the wire b^3 to the binding-post *p*, through the spring *p′*, which spring serves the double purpose of carrying the current and drawing the switch-lever *o* into contact, assisting the nut and lock-nut *m′*. The current passes on through the lever *o* to the carbon point *r*, through the carbon point *r′*, through the binding-post *q*, and out through the wire a^2. With the parts in the position shown in Fig. 3, the switch is held in the open position by the pressure of air in the reservoir *g*, indicated by the gage *h′*, which shows a pressure of fifteen pounds. This pressure is arrived at through the adjustment of the compression-spring *m*, which spring is intended to vary the tension of the diaphragm. It will be seen that by means of this compression-spring *m*, through the medium of the nut m^4, the point of opening the switch may be varied arbitrarily; but for the purposes of illustration the point has been placed at fifteen pounds. A slight lowering of the pressure in the system allows the diaphragm *k′* to descend, as shown in Fig. 4, where the chamber and diaphragm are in section. The descent of the diaphragm closes the switch, the gage showing a variation of three pounds to accomplish this, the gage pointing at twelve pounds in Fig. 4, where the switch is shown closed. This automatically starts the machinery. When the pressure again reaches fifteen pounds, the switch is automatically opened and the operation is continued, as above described. The diaphragm *k* in this device is similar in construction and operation to the diaphragm K (shown in Figs. 1 and 2) and operates in identically the same manner to open and close the circuit. The lock-nut m^2 is placed out of contact with the switch-lever, as shown in Fig. 4, to allow the lever *o* to remain undisturbed, for the purpose previously described with reference to the lever O in Figs. 1 and 2. The tension-spring *p′* is for the same purpose as the tension-spring P′, hereinbefore described.

Having thus ascertained the nature of my invention and set forth a construction embodying the same, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In an apparatus of the character described, an air-pressure pump, an air-inlet to said pump, an air-outlet from said pump, an electric motor for operating said pump, an electric circuit for operating said motor, a switch controlling said circuit, a switch-lever for opening and closing said circuit, and a buckled diaphragm controlled by the pressure from said pump for operating said switch-lever as it passes to opposite sides of its dead-center line.

2. In an apparatus of the character described, an air-pressure pump, an air-inlet to said pump, an air-outlet from said pump, an

electric motor for operating said pump, an electric circuit for operating said motor, a switch controlling said circuit, a switch-lever for opening and closing said circuit, a buckled diaphragm controlled by the pressure from said pump for operating said switch-lever as it passes to opposite sides of its dead-center line, and a spring acting on said lever to close the circuit.

3. In an apparatus of the character described, an air-pressure pump, an air-inlet to said pump, an air-outlet from said pump, a storage-reservoir for the air, an electric motor for operating said pump, an electric circuit for operating said motor, a switch controlling said circuit, a switch-lever for opening and closing said circuit, and a buckled diaphragm controlled by the pressure from said pump for operating said switch-lever as it passes to opposite sides of its dead-center line.

4. In an electric switch, a movable switch-lever, a buckled diaphragm for operating said lever as it passes to opposite sides of its dead-center line, and connections between said diaphragm and said lever.

5. In an electric switch, a movable switch-lever, a buckled diaphragm for operating said lever as it passes to opposite sides of its dead-center line, connections between said diaphragm and said lever, and a spring acting on said lever and tending to close the circuit.

6. In an electric switch, a movable switch-lever, a buckled diaphragm for operating said lever as it passes to opposite sides of its dead-center line, a rod secured to said diaphragm and passing through said lever, and nuts on said rod on opposite sides of said lever for operating said lever upon the movements of the buckled diaphragm.

7. In an electric switch, a movable switch-lever, a buckled diaphragm for operating said lever as it passes to opposite sides of its dead-center line, a rod secured to said diaphragm and passing through said lever, nuts on said rod on opposite sides of said lever for operating said lever upon the movements of the buckled diaphragm, and a spring acting on said lever and tending to close the circuit.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 24th day of March, A. D. 1903.

EDWIN F. PORTER.

Witnesses:
A. R. LARRABEE,
A. L. MESSER.