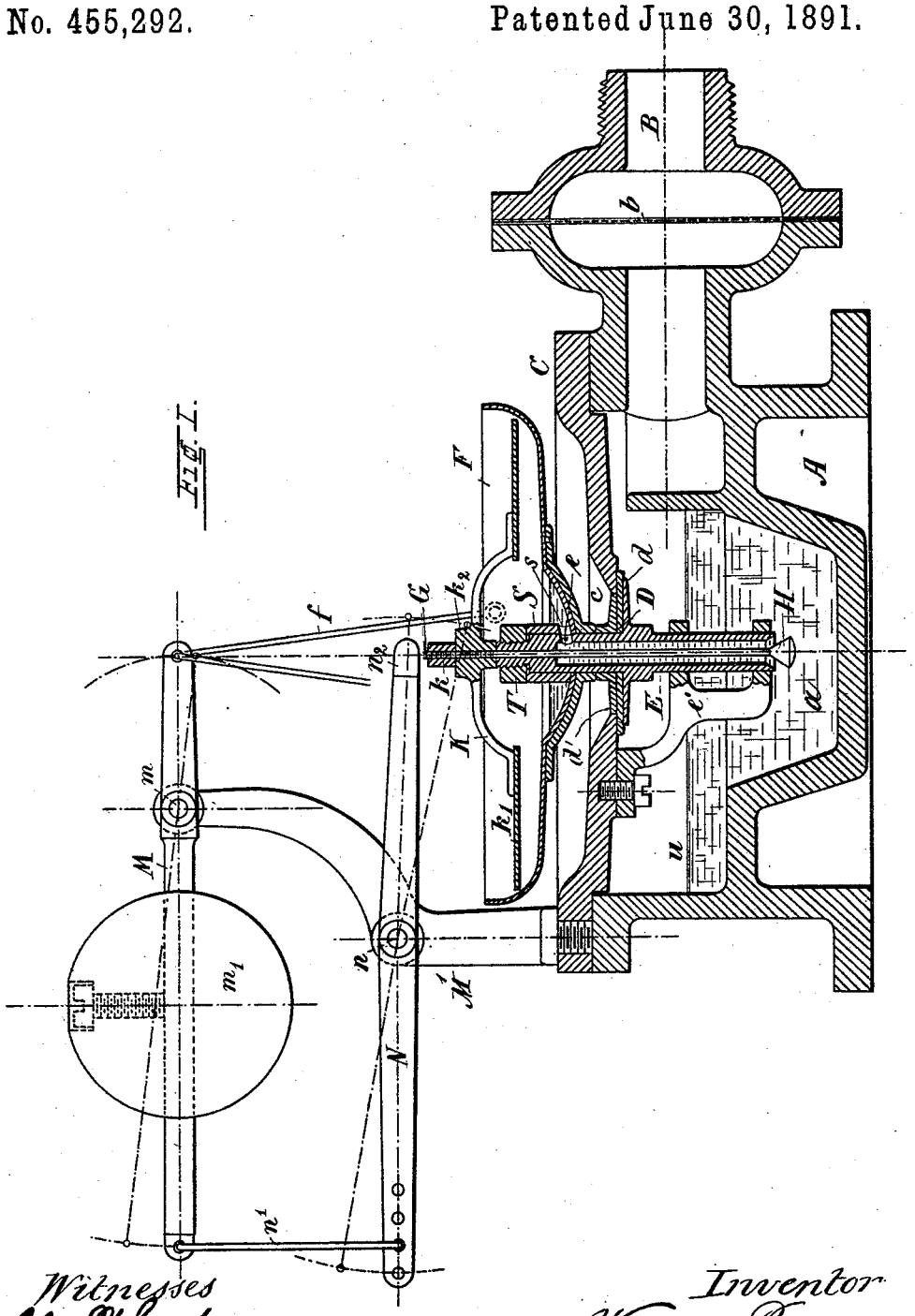
(No Model.) 2 Sheets—Sheet 1.

# V. POPP.

## RELIEF VALVE.

No. 455,292. Patented June 30, 1891.




Witnesses
Chas. W. Coubye.
B. H. Sommers

Inventor
Victor Popp.
by Henry Orth
his atty

(No Model.) 2 Sheets—Sheet 2.

# V. POPP.

## RELIEF VALVE.

No. 455,292. Patented June 30, 1891.

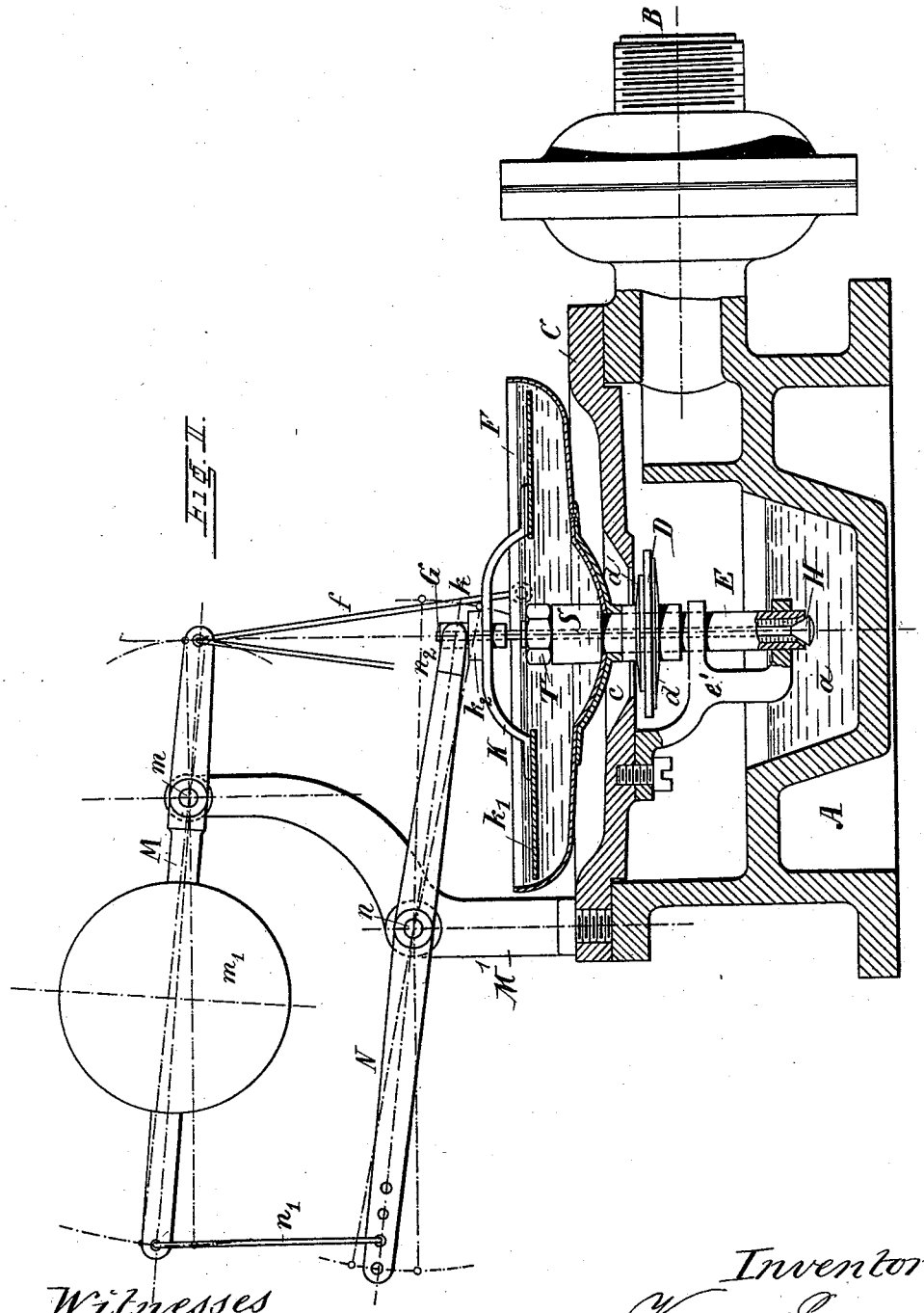



FIG. II.

Witnesses
Chas. W. Coulby
B. N. Sommers.

Inventor
Victor Popp.
by Henry Orth
his attys.

# UNITED STATES PATENT OFFICE.

VICTOR POPP, OF PARIS, FRANCE, ASSIGNOR TO THE INTERNATIONALE DRUCKLUFT & ELECTRICITÄTS-GESELLSCHAFT, OF BERLIN, GERMANY.

## RELIEF-VALVE.

SPECIFICATION forming part of Letters Patent No. 455,292, dated June 30, 1891.

Application filed August 28, 1890. Serial No. 363,305. (No model.) Patented in France March 5, 1890, No. 204,181; in England May 30, 1890, No. 8,369; in Spain August 9, 1890, No. 10,870, and in Austria-Hungary October 7, 1890, No. 24,682 and No. 48,697.

*To all whom it may concern:*

Be it known that I, VICTOR POPP, engineer, a citizen of the Republic of France, residing at Paris, 54 Rue Etienne Marvel, France, have invented certain new and useful Improvements in Relief-Valves for Automatically Discharging Air from Air-Conduits Temporarily Supplied with Air under Pressure, (for which I have obtained Letters Patent in the following countries: France, No. 204,181, dated March 5, 1890; Austria-Hungary, No. 24,682 and No. 48,697, dated October 7, 1890; Spain, Patent liber 11, fol. 179, No. 10,870, dated August 9, 1890; Great Britain, No. 8,369, dated May 30, 1890, and for which I have made application in Germany, Serial No. F, 2,277, II 47, May 30, 1890;) 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, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

This invention relates to means for relieving conduits for fluids of pressure or of an excess of pressure; and it consists, essentially, of a peculiarly-constructed relief or exhaust valve adapted to perform its functions automatically through the pressure in the conduit whenever such pressure rises above a predetermined pressure, as will now be fully described, reference being had to the accompanying drawings, in which—

Figures 1 and 2 are vertical longitudinal sectional elevations, showing the relief-valve in its closed and open positions, respectively.

The invention is more especially designed for use as a means for reducing the pressure, or in fact restoring the pressure to that of the atmosphere within the air-conduits of pneumatic clock-regulating or regulating and winding systems, in which means for rapidly or instantaneously relieving the actuating devices of pressure are of great importance and well understood by those conversant with this branch of the arts.

Although the exhaust or relief valve is more particularly designed for the uses above stated, it will be apparent from the description of its construction and operation that it is adapted for use for many other purposes in the arts where a reduction in the pressure or a relief of an excess of pressure in a fluid-conduit is desirable. The operation of the valve being controllable it may be used upon conduits or other fluid-holders for the purpose of maintaining therein a predetermined constant pressure.

In the drawings, in which Fig. 1 is a longitudinal sectional elevation showing the relief-valve closed, and Fig. 2 a like view showing the valve open, A indicates a valve-casing, in which is formed a cup or vessel *a*, said casing being provided with a branch B, adapted for connection with the air-conduit. In the said branch is formed a chamber, in which is arranged a diaphragm *b* of some suitable foraminous material to prevent impurities that may be carried along by the air through the conduit from entering the cup *a*, which is partially filled with mercury to about the point *u*. The valve-casing A is hermetically closed by a lid or cover C, to the under side of which is secured a guide-bracket *e'*.

In the lid C is formed a valve-port *c*, that is normally closed by the exhaust or relief valve D, secured to a tubular valve-spindle E, that is guided in its vertical movements on the arms of the bracket *e'*, secured to cover C, above referred to. The tubular valve-spindle has a screw-threaded extension, and below the same it is provided with a peripheral port *e*, the area of which may be decreased by means of a tubular or cylindrical valve S, having a port *s*, of approximately the same area as the port *e*, said valve being so mounted on the end of the tubular valve-stem as to be revolved thereon for the purpose of regulating the area of the port *e*, the cylindrical valve being held against vertical displacement on the stem by a nut T.

The relief-valve is preferably secured to its stem between two disks *d d'*, the hub of the upper disk *d'* forming a seat for a float-cup F, which, like the valve D, is rigidly secured to the spindle E in such manner that the port *e* thereof will communicate with the cup F at or near the bottom thereof.

Within the valve-stem E is contained a sec-

ond valve-stem G, that carries at its lower end a cone-valve H, adapted to close the mouth of the tubular valve-stem E, and to the upper end of said valve-stem is secured a float K. The valve-stem G has free vertical motion within the contracted extension of the tubular valve-stem E, though the stem G should fit said extension sufficiently tight to prevent escape of the air entering into the valve-casing A from the conduit to which it is connected.

The float-cup F is connected by means of rods *f* with the shorter arm of a two-armed lever M, fulcrumed at *m* in a suitable standard M′ rising from the valve-casing A or from its cover C. The longer arm of the lever M carries a weight *m′*, that is adjustable on said arm by means of a set-screw $m^2$, said weight being adjusted to hold the relief-valve D to its seat against a weight acting upon the valve in an opposite direction when the pressure of air within the valve-casing A after reaching a maximum pressure is in any manner reduced.

The weighted arm of the lever M is connected by a rod *n′* to the longer arm of a two-armed lever N, also fulcrumed upon standard M′ at *n*, the shorter arm of said lever N, which is considerably longer than the short arm of lever M, projecting over the end of the valve-spindle G. The end of the short arm of lever N is forked and is adapted to straddle the end of the spindle G and retaining-nut *k* and bear upon the hub $k^2$ of the float K when said lever-arm moves down.

The operation of the exhaust or relief valve is as follows: During the time of rest of the devices that actuate the setting or correcting mechanism of a clock, or of a series of such clocks, or said mechanism and the winding mechanism for the clock or clocks there is practically no pressure within the conduits. At the time of correction or of correction and winding of the clock or clocks compressed air is admitted to the conduit or conduits and to the valve-casing A. The increased pressure within the valve-casing at once forces the mercury in the cup *a*, in which the tubular valve-stem is partly immersed, up said stem into the float-cup F through ports *e* and *s*, and when the mercury reaches the arms *k′* of the float K, the said float will also rise and with it the valve H, thus closing the inlet-orifice of the tubular valve-stem and consequently stops the flow of mercury to the float-cup F. The parts will remain in this position until the compressed air has performed its work, when some exhaust-port is opened to slightly reduce the pressure within the air-conduit. When this reduction in the pressure within the valve-casing takes place, the float-cup F is partially filled with mercury, thus weighting the cup to such an extent as to overbalance the weight *m′*, said cup, the valve-stem E, and valve D will suddenly descend or drop, thereby opening wide the exhaust or relief port and allowing the air in valve-casing A and the conduit connected thereto to escape. In the downward movement of the float-cup and valve D the short arms of both levers M and N will move in the same direction by reason of the connections above referred to; but as the short arm of lever N is considerably longer than the like arm of lever M it will move down quicker, and bearing upon the float F presses the same down and opens the valve H, allowing the mercury to flow out of the float cup and permitting the weight *m′* to again return the valve D and lever N into their normal positions by gravity.

Although the described movements are effected with great rapidity, the valve D will remain open sufficiently long to reduce the pressure within the conduit or conduits to that of the atmosphere—that is to say, will allow of all of the air admitted under pressure to such conduit or conduits to escape.

Instead of mercury other liquids may be used, and instead of the weight a spring, the tension of which is adjustable, may be used, as will readily be understood.

Having thus described my invention, what I claim is—

1. An exhaust or relief valve comprising a valve-casing provided with a fluid-inlet and with a fluid exhaust or relief port, and a loaded exhaust or relief valve, the load of which tends to move said valve in the direction of the exhaust or relief port to normally close the same, in combination with a motive power controlled by the pressure within the valve-casing and exerting its power upon the valve in antagonism to the load thereof to move said valve in an opposite direction and open the valve-port, substantially as set forth.

2. An exhaust or relief valve comprising a valve-casing provided with a fluid-inlet and with a fluid exhaust or relief port and a loaded exhaust or relief valve, the load of which is adjustable and tends to move the valve in the direction of the exhaust or relief port and normally close the same, in combination with a variable load controlled by the pressure within the valve-casing and exerting its power upon the valve in antagonism to the load thereof to move said valve in an opposite direction and open the valve-port, substantially as set forth.

3. An exhaust or relief valve comprising a valve-casing provided with a chamber for the reception of a liquid, with a fluid-inlet in communication with said chamber and with an exhaust-port, a loaded or weighted valve the weight of which tends to move the valve in the direction of said port to normally close the same, a receptacle connected with the valve, and a valved connection between said receptacle and the chamber of the valve-casing, in combination with a float arranged in said receptacle and adapted to control the valve, of the connections between such re-

ceptacle and the chamber of the valve-casing, substantially as and for the purposes set forth.

4. An exhaust-valve comprising a valve-casing provided with a chamber for the reception of a liquid, with a fluid-inlet in communication with said chamber and with an exhaust-port, a weighted valve, the weight of which tends to move said valve in the direction of the exhaust-port to normally close the same, a tubular valve-stem for said valve open at its lower end and extending into the chamber of the valve-casing, a receptacle secured to said stem and in communication with its interior, in combination with a float mounted and having motion on the valve-stem within the receptacle thereon, a valve adapted to control the inlet of the tubular valve-stem, a connection between said valve and the float, and a lever controlled by the weight of the exhaust or relief valve and adapted to control the movement of the float in one direction, substantially as and for the purposes set forth.

5. An exhaust or relief valve comprising a valve-casing provided with a chamber for the reception of a liquid, with a fluid-inlet in communication with said chamber and with an exhaust-port, a valve for said port, a tubular valve-stem for said valve, the lower open end of said stem extending into the chamber of the valve-casing, a vessel or receptacle secured to the upper end of said valve-stem and in communication with the interior thereof, and a weighted lever connected with the exhaust-valve and operating to hold the same to its seat to normally close the exhaust-port, in combination with a float mounted and having motion on the tubular valve-stem within the receptacle thereon, a valve controlled by said float and adapted to control the inlet of the valve-stem, and a lever controlled by the movement of the exhaust-valve and adapted to control the movement of the float in one direction, substantially as and for the purposes set forth.

6. An exhaust or relief valve comprising a valve-casing provided with a chamber for the reception of a liquid with a fluid-inlet in communication with said chamber and with an exhaust-port, a valve for said port, a tubular valve-stem for said valve, the lower open end of said stem extending into the chamber of the valve-casing, a vessel or receptacle secured to the upper end of said valve-stem, and in communication with the interior thereof, a valve for controlling said communication, and a weighted lever connected with the exhaust-valve and operating to hold the same to its seat to normally close the exhaust-port, in combination with a float mounted and having motion on the tubular valve-stem within the receptacle thereon, a valve controlled by said float and adapted to control the inlet of the valve-stem, and a lever controlled by the movement of the exhaust-valve and adapted to control the movement of the float in one direction, substantially as and for the purposes set forth.

7. An exhaust or relief valve comprising a valve-casing provided with a chamber for the reception of a liquid with a fluid-inlet in communication with said chamber and with an air-exhaust port, a valve for said port, a tubular valve-stem the open end of which extends into the chamber of the valve-casing, a vessel or receptacle secured to the upper end of the valve-stem and in communication with the interior thereof, a weighted lever and a connection between the shorter arm of said lever and the said vessel, in combination with a float mounted and having motion on the exhaust-valve stem within the vessel thereon, a valve controlled by said float and adapted to control the inlet to said exhaust-valve stem, a lever the shorter arm of which is longer than the like arm of the weighted lever and adapted to move the float in one direction, and a connection between the longer arm of said lever and the like arm of the weighted lever, substantially as and for the purposes set forth.

8. In an exhaust or relief valve, the combination of the casing A, provided with the cup or chamber *a* and with an exhaust-port, the fluid-inlet B in communication with said chamber, a foraminous diaphragm arranged in said communication, and a weighted valve adapted to normally close the exhaust-port of a counter-weight adapted to be controlled by the pressure within the valve-casing and to operate on the valve in antagonism to the weight of the exhaust-valve to move the same away from the exhaust-port, substantially as and for the purposes set forth.

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

VICTOR POPP.

Witnesses:
L. HARTOGH,
R. J. PRESTON.