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P. G. PUTTEMANS.

PNEUMATIC CLOCK SYSTEM.

No. 362,462. Patented May 3, 1887.

Fig. 8

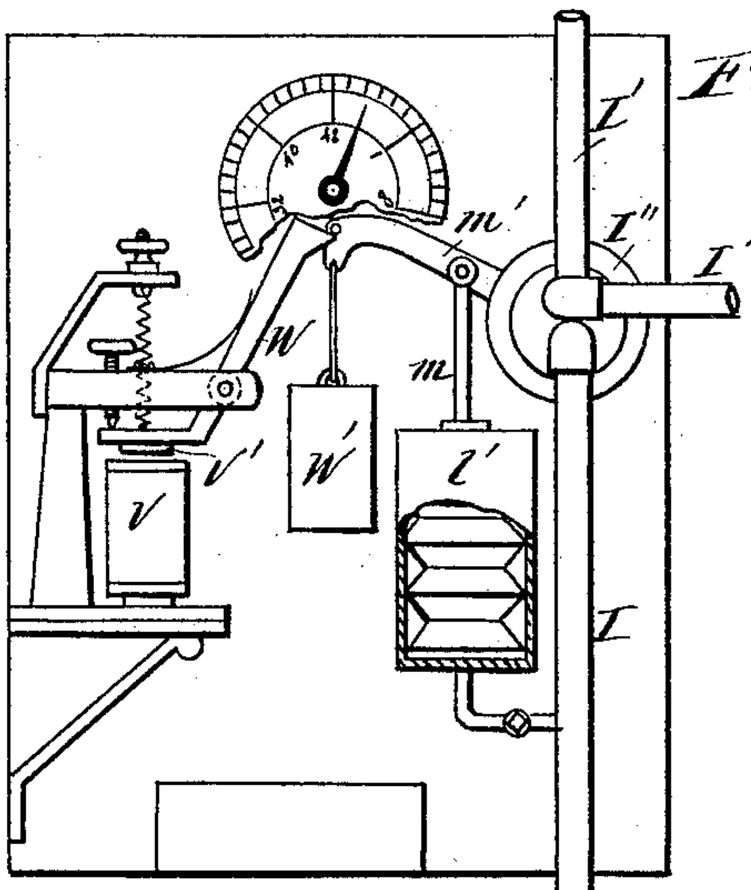

Fig. 1

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Fig. 2

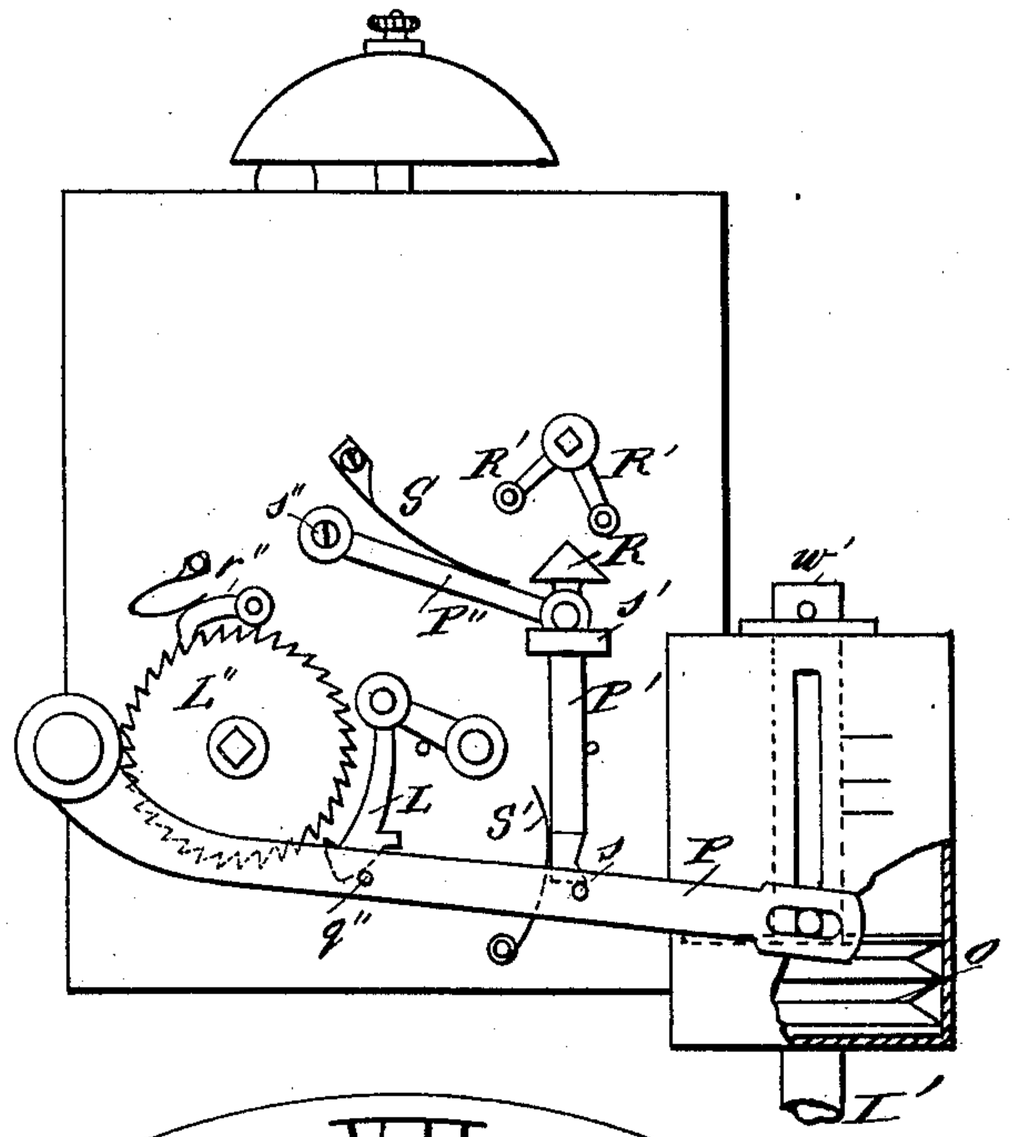

Fig. 3

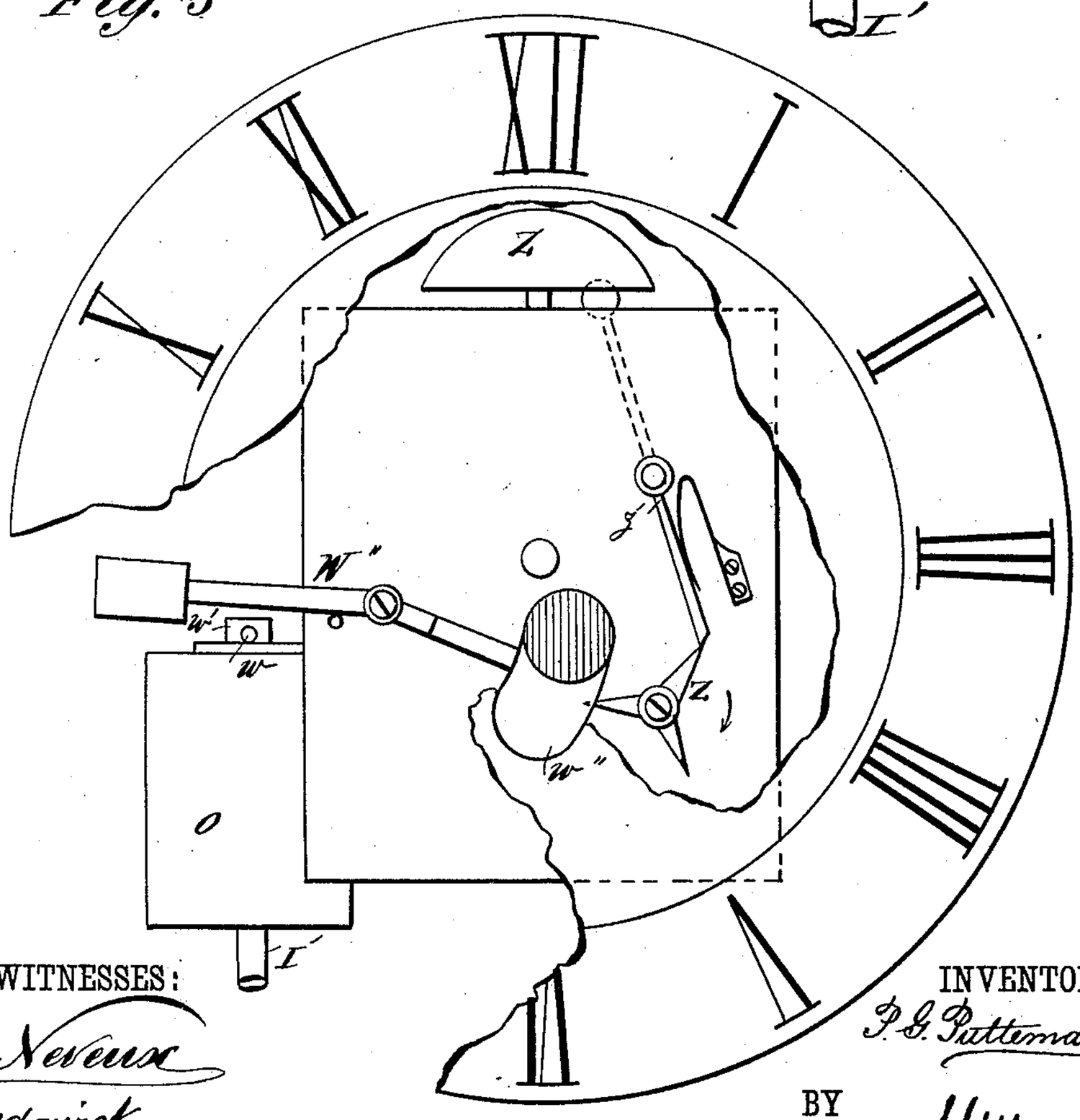

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Fig. 4

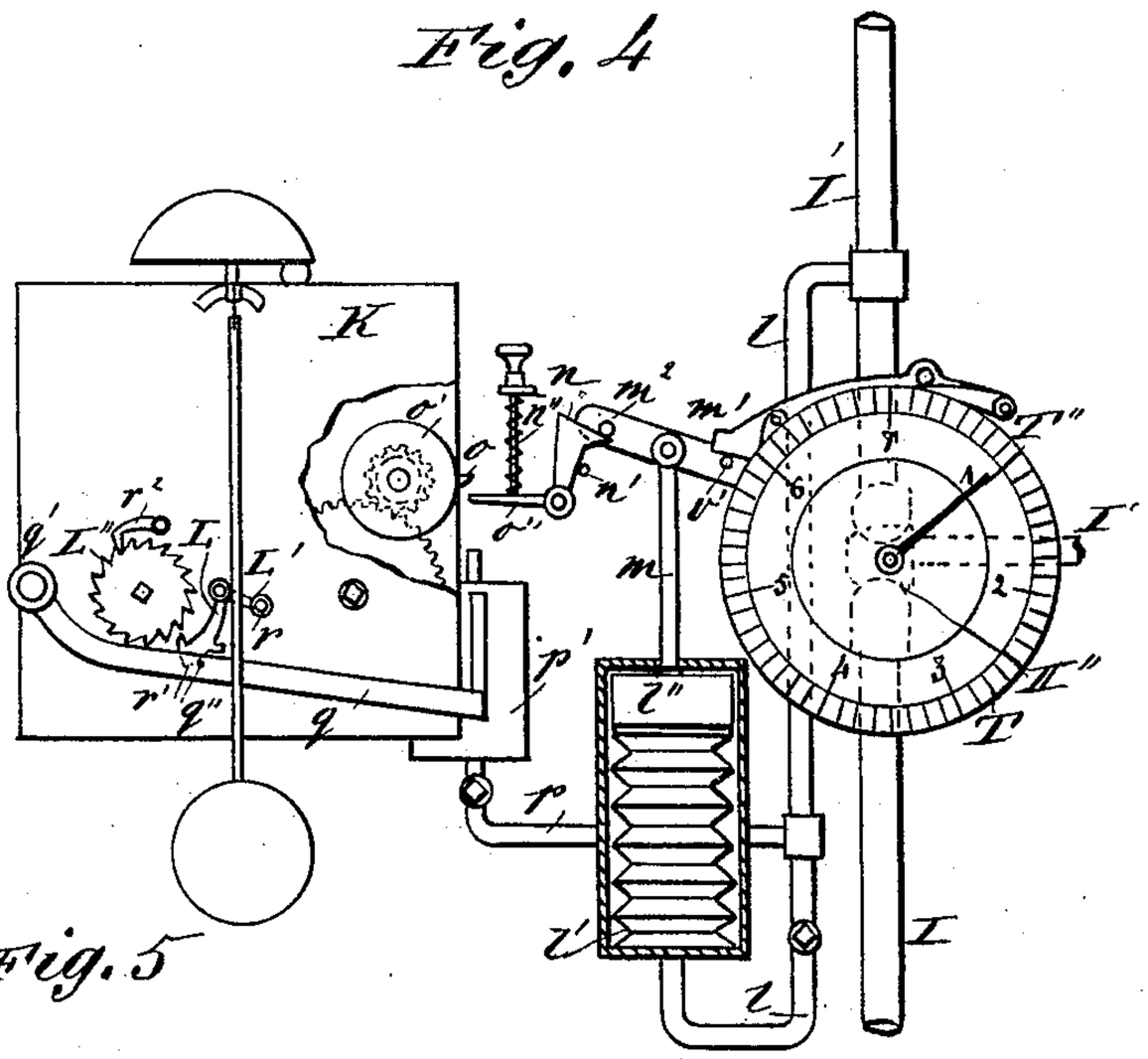


Fig. 5

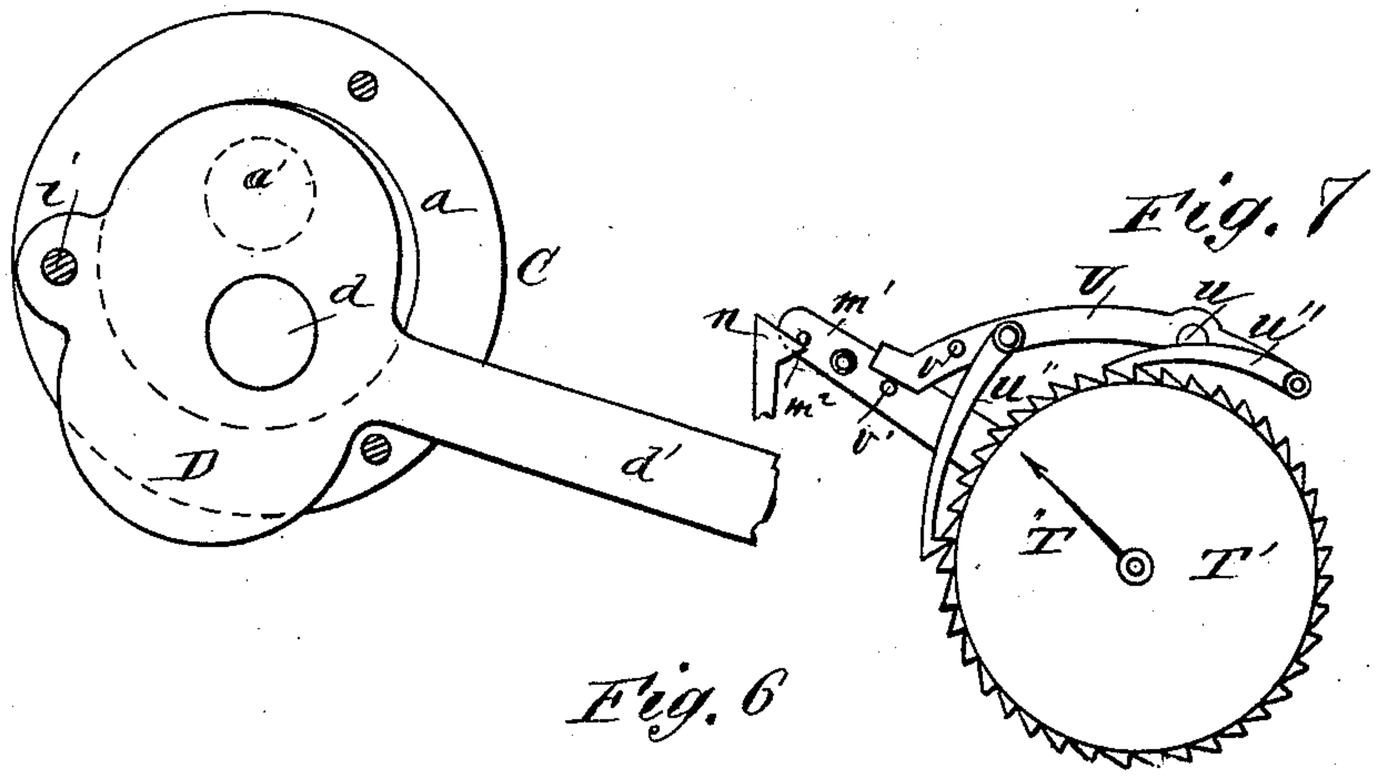
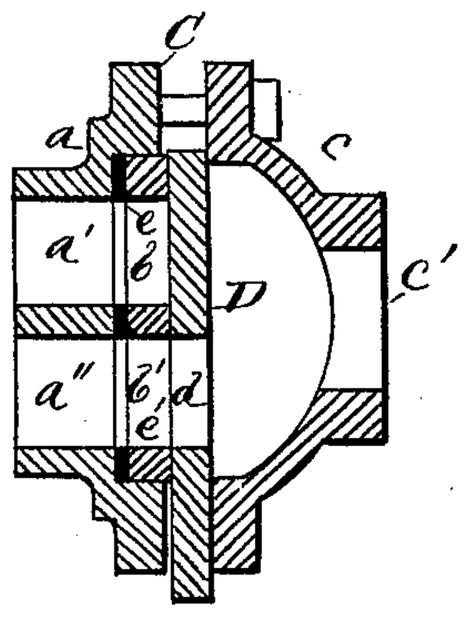


Fig. 7

Fig. 6



WITNESSES:

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UNITED STATES PATENT OFFICE.

PIERRE G. PUTTEMANS, OF BROOKLYN, NEW YORK.

PNEUMATIC CLOCK SYSTEM.

SPECIFICATION forming part of Letters Patent No. 362,462, dated May 3, 1887.

Application filed February 24, 1886. Renewed January 28, 1887. Serial No. 221,751. (No model.)

To all whom it may concern:

Be it known that I, PIERRE GUILLAUME PUTTEMANS, of Brooklyn, in the county of Kings and State of New York, have invented a new and Improved Auto-Pneumatic Clock System, of which the following is a full, clear, and exact description.

My invention relates to the construction and arrangement of an auto-pneumatic clock winding and synchronizing mechanism; and the invention consists, essentially, of a hydrostatic air-compressor of peculiar and novel construction that is arranged to supply the required amount of pressure to a clock winding and setting mechanism.

The invention further consists of an attachment whereby the working condition of the apparatus is indicated and recorded, and of certain other novel constructions used in connection with the system, all of which will be hereinafter more fully explained, and specifically pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a side view of my improved air-accumulator, certain portions of the apparatus being cut away to disclose the construction of the parts. Fig. 2 is a view of the clock winding and setting mechanism, a portion of the bellows case being broken away. Fig. 3 is a view of the clock-dial, of which certain portions are broken away and the hands of the clock removed, in order that the construction of the indicating and alarm mechanism may be shown. Fig. 4 is a view of the rear of the central clock and its connections, a portion of the case being broken away to disclose the construction of the tripping mechanism. Fig. 5 is a view of a double valve of novel construction employed in connection with my pneumatic system, the inner portion of the casing being removed to disclose the construction of the parts. Fig. 6 is a sectional view of the said double valve, the view being taken on line *x x* of Fig. 1. Fig. 7 is a detail view illustrating the construction of the mechanism employed to indicate the condition of the secondary clocks; and Fig. 8 is a face view of an operating mechanism wherein the tripping of the parts is brought about by means of an electric current, this construction being designed for use in places where the simple pneumatic system could not be advantageously employed.

In all pneumatic systems it is necessary that there should be a constant supply of compressed air, and in order to provide for this needed supply I have devised such a compressing and storing apparatus as is illustrated in Fig. 1, wherein A represents an air-compressing chamber, and B a storage-chamber connected in a manner to be hereinafter described. A pipe, A′, leads to the chamber A from an elevated tank, A″, or the pipe A′ might be connected with the water-main, water being delivered to the chamber A through a double valve, C, the construction of which is best shown in Figs. 1, 5, and 6, the outer portion, *a*, of the casing of said valve being formed with an induction-port, *a′*, and an eduction-port, *a″*, the port *a′* being connected with the pipe A′. The port *a″* is connected with a discharge-pipe, B′. The inner face of the outer case, *a*, is recessed to receive a rubber packing-ring, *b*, against the face of which there rests a metallic packing-ring, *b′*, having ports *e e′*, corresponding with the ports *a′ a″*.

The inner case, *c*, of the valve C is formed with a single port, *c′*, that is connected with a pipe or tube, *c″*, leading to the interior of the chamber A, and between the two sections of the valve-case, which are riveted or bolted together, there is pivotally mounted a plate, D, formed with an aperture, *d*, and provided with a lever-arm, *d′*, the parts being so proportioned that by turning the plate D upon its pivotal connection *i* with the valve-case the port *d* may be brought to register either with the port *e* or *e′*, so that by adjusting the plate water may be delivered within or drawn from the chamber A.

Connection between the chambers A and B is established by means of a pipe, E, in which there is arranged a check-valve, E′, and a water-cut-off, E″, the check-valve being of ordinary construction and the water-cut-off consisting of a float, *f*, which normally rests on a cage, *f′*, a plug, *f″*, being carried by the float and arranged so that when the water rises within the chamber inclosing the float *f* said float will be raised so that its plug *f″* will be seated within the valve-seat *g*. A pipe, F, branches out from the pipe E, and in turn is provided with a

small branch pipe, F′, the pipe F leading to a case, F″, in which there is arranged a bellows, G, and a piston, *g′*, the piston-rod *g″* projecting upward through the top of the case F″, to be pivotally connected to a lever, G′, said lever being pivotally connected at *h* to any stationary object, and being connected by a rod, *h′*, with the lever-arm *d′* of the slide D, there being a weight, G″, upon the end of said lever-arm *d′*. The pipe F′ leads to a chamber, H, in which there is arranged a bellows, *h″*, that operates upon a piston provided with a rod, *j*, that is pivotally connected to a lever, H′, said lever being pivotally mounted at *j′* to any stationary object, as to the outer wall of the chamber B. A catch-tooth, H″, is hinged to the lever H′, so as to be free to swing to the position shown in full lines in Fig. 1, and, in fact, is normally held in said position by a spring, *i′*, against the tension of which, however, the catch-tooth may be slightly thrown back without disturbing the position of the lever H′. Upon the end of the lever H′ there is a weight, *i″*.

Such, in general, is the construction of the air-accumulator and storage-tank, the parts operating as follows: The valve C having been adjusted to admit water to the compartment A through the pipe *c″*, the parts will be in the position shown in full lines in Fig. 1, and, as the water rushes into the chamber or compartment A, the air therein, as well as the air within the chamber B, will be compressed, and this compression of the air will continue until the pressure is sufficient to raise the weight G″, and, as ordinarily employed, I propose that the weight G″ shall be so proportioned as to be raised by a pressure equal to about ten pounds to the square inch, this raising of the weight being brought about by the pressure acting upon the bellows G to force up the piston *g′*, thus raising the lever G′ and bringing its pin *k* into engagement with the upper face of the catch-tooth H″, as indicated in dotted lines. This movement of the lever G′ raises the lever-arm *d′* and closes the induction-port of the valve C, opening the way, however, to the eduction-port, air being admitted to the chamber A through the small check-valve *k′*, the pressure at this time being maintained within the chamber B by the operation of the valve E′.

Just after the operation described the indicator *k″* of the chamber B will denote a pressure of, say, ten pounds, and in order that this pressure may not be entirely diminished before being replenished I would so proportion the weight *i″* that after the pressure in the chamber B has decreased to, say, five pounds, the weight, and consequently the lever-arm H′, will drop, thus withdrawing the catch-tooth H″ from engagement with the pin *k*, thereby allowing the weight G″ to fall, and thus operate the valve C, so that the induction-port will be again open and the eduction-port closed, in order that a fresh supply of water may be admitted to the chamber A to restore the pressure to the original ten-pound limit.

The chamber B is connected by a pipe or tube, I, with the tubes I′, which lead to the clocks that are to be set and wound, a valve, I″, which is similar in construction to the valve C, being, however, interposed in the line, as indicated in Fig. 4, said valve I″ being located in close proximity to the central regulating-clock, K. Just beyond the valve I″ the pipe I′ is tapped by a small pipe or tube, *l*, which leads to a bellows, *l′*, above which there is a heavy piston, *l″*, having a rod, *m*, that connects with a lever-arm, *m′*, which bears a similar relation to the valve I″ as does the lever-arm *d′* to the valve C. The lever *m′* is upheld by a catch-arm, *n*, with which the pin *m″* of the lever *m′* engages, as shown, the catch-arm *n* being normally held against the limit-pin *n′* by a spiral spring, *n″*, but being arranged so as to be tripped by a cam-tooth, *o*, of an extra wheel, *o′*, carried by the clock K, the catch-arm *n* being formed with a lever-arm, *o″*, which extends within the path of the cam *o*. The wheel *o′* is so proportioned and connected that at certain intervals its cam *o* will depress the lever-arm *o″*, thus withdrawing the catch arm from engagement with the pin *m″* and allowing the lever *m′* to drop, which movement of the lever will draw down the slide of the valve I″, so as to permit the compressed air to pass from the tube I into the tube I′, leading to the secondary clocks, the compressed air being utilized in connection with said clocks, as will be presently explained; but the compressed air also passes into the tube *l*, and thence into a tube, *p*, leading to a bellows, *p′*, and when this bellows is expanded by the compressed air it raises the lever *q*, pivoted to the clock-case at *q′* and carrying a pin, *q″*, against which pin there is arranged a catch-tooth, L, loosely hung upon a lever, L′, that is secured to the clock-frame at *r*, the construction being such that as the lever *q* is raised the pin *q′* will bear against the under cam-face, *r*,′ of the catch-tooth L and force said catch-tooth into engagement with the ratchet-wheel L″ of the mainspring-shaft of the clock, thence carrying said shaft in the required direction to wind the spring, the wheel L″ being held in the position to which it has been moved by the catch-tooth L by a pawl, *r″*.

As the pressure extends through the pipe I′ it operates upon a bellows, O, located in connection with each of the secondary clocks of the system, said bellows being connected with a lever, P, in all respects similar to the lever *q*, except that it is provided with a small pin, *s*, arranged to engage with the lower end of the sliding rod P′, which is guided within a slide or way, *s′*, and pivotally-connected to the end of a lever, P″, said lever being in turn pivotally connected at *s″* to the clock-case, as shown. The upper end of the bar P′ is pointed in the form of an expanded V, as shown at R,

and when the rod P′ is raised by the action of the compressed air upon the bellows O this point R enters between the extending arms R′, which are carried by the arbor of the minute-hand of the clock. Now, as the point R enters the space between the arms R′ R′, said arms will be moved so that both will correspond with the upper-face angle of the point R, thus moving the minute-hand of the clock forward or back to the required position upon the clock-dial, it being understood that the compressed air is only admitted to operate the hand-setting mechanism at certain predetermined times and that the relative position of the arms R′ and the minute-hand of the clock are so adjusted that at the time the compressed air is permitted to act upon the bellows O the hands of the secondary clocks will be moved to a position to correspond to that of the central-clock hands. As the arms R′ are rigidly connected to the arbor of the minute-hand, it follows that if the point R was held for any length of time between such arms the movement of the clock would be arrested; but from the peculiar mounting of the bar P′ such bar is thrown from engagement with the pin *s* just after the arms have been brought in alignment with the point, such disconnection being brought about by the swing imparted to the bar P′ by the lever P″, for it will be seen from an inspection of Fig. 2 that the pivotal support of the lever P″ is above the connection between the lever P″ and the bar or rod P′, so that as the bar is raised the upper end is thrown forward and the lower end thrown off from the pin *s*, and immediately upon the disconnection of the parts a spring, S, will throw the lever and bar to the position shown in full lines, a second spring, S′, acting to hold the bar P′ against a limit-pin.

At the same time that the secondary clocks are set, as just described, they are wound by such an attachment as has heretofore been described in connection with the central clock; and as the mechanism employed to wind both the central and the secondary clocks is precisely the same, similar letters of reference have been used in connection with each winding attachment.

It will of course be understood that it is extremely desirable to know at all times the exact condition of the clocks—that is, to know to what extent they are wound up. This desired information I obtain by means of an automatic indicator arranged in connection with the central clock. If it is determined that the clocks shall be set and wound at intervals of three hours, I provide a dial divided into seven spaces, each space being divided into eight subdivisions, and in connection with this dial, which is shown at T, I arrange a ratchet-wheel, T′, which carries the hand or pointer T″, the ratchet-wheel being, of course, arranged behind the dial. Above the ratchet-wheel there is a lever, U, pivotally mounted at *u* and carrying two pawls, *u′ u″*, the pawl *u′* being held against the peripheral toothed edge of the ratchet-wheel by a spring, while the gravity of the pawl *u″* holds it in engagement with the teeth of the ratchet-wheel. The projecting end of the lever U rests upon a pin, *v′*, carried by the lever-arm *m′* and arranged so that as the lever drops after being disconnected or thrown off from the arm *n* the lever U will also drop, and its pawl *u″* will engage with the next lower catch-tooth, so that when the lever *m′* is again raised by the action of the compressed air upon the bellows *l′* the pin *v′* will raise the lever U and carry the ratchet-wheel T′, and consequently the pointer T″, forward one step.

In operation the pointer should move through eight spaces during twenty-four hours; but if the apparatus should have failed to work at one of the predetermined intervals, the pointer will only be moved through seven spaces, so that I shall know that the clocks lack three hours of being wound up to their full extent.

If during the course of a week the apparatus should happen to fail to operate for, say, eight times, the pointer will point to the end of the sixth instead of to the end of the seventh division at the end of that time, so that by knowing the position of the pointer at any time when the condition of the clocks is known I can always calculate to what extent they have run out, and hence guard against the possibility of any of the clocks running down.

In places where the secondary clocks are spread out over too much ground to permit of their regulation by means of a single central clock, so that two central clocks would have to be employed, I propose to use an electric tripping apparatus controlled by a single central clock, said tripping apparatus taking the place of the central clock of a single system. This apparatus is illustrated in Fig. 8, wherein V represents an electro-magnet, of which the armature V′ is carried by an arm formed upon a catch-arm, W, that is in all other respects similar to the catch-arm *n*, (shown in Fig. 4,) and when withdrawn by the action of a current passing through, the magnet V will release the lever *m′*, so that said lever will drop and open the way to the tubes I′, leading to the secondary clocks, the lever in Fig. 8 being shown as carrying a weight, W′, instead of being provided with and operated by a weight carried by the valve-stem *m′*.

It is desirable that each of the secondary clocks should be provided with an attachment, so that the fact of their having been wound and set will be indicated at the time of such winding and setting, and to this end I provide the clocks with a lever, W″, carrying a weight and a disk, one end of which is painted in some distinguishing color.

The lever W″ projects outward over a pin, *w*, carried by a short rod, *w′*, arranged to be forced outward and upward when the bellows O is expanded by the compressed air delivered through the tube I′, so that as the pin *w* is raised the colored portion of the signal-disk

is thrown downward opposite an aperture, w'', formed in the dial of the clock, and, in order that an audible signal may be given when the clock is wound, I provide a star-wheel, z, that is fixed to the mainspring-shaft, and when such shaft is turned the star-wheel z trips a lever, z', carrying a bell-hammer, thus throwing the bell-hammer against the bell Z.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a pneumatic clock system, the combination, with a compressing-chamber, of a double valve and its operating mechanism, the said valve consisting of the casings a c, the casing a being formed with ports a' a'' and the casing c with a single port, c', a packing-ring formed with ports corresponding to the ports a' a'', and a slide, D, formed with a single port, d, and an arm, d', substantially as described.

2. In a pneumatic clock system, the combination, with a compressing-chamber, A, and a storage chamber, B, connected by a tube, E, and a check-valve, E', a water-cut-off, E'', being arranged in connection with said tube, of a double valve, C, of which the arm d' carries a weight, G'', a lever, G', carrying a pin, k, and connected to the arm d' by a rod, h', bellows G, and a tube, F, in communication with the bellows G and the compressed air, a second bellows, h'', connecting-tube F', weighted lever H', and a catch arm, H'', substantially as described.

3. In a pneumatic clock system, the combination, with an air-compressing mechanism, of a double valve, I'', and a mechanism for operating the valve, consisting of a wheel, o', arranged in connection with a central clock and carrying a cam, o, a catch-arm, n, provided with an arm, o'', an arm in connection with the valve I'' and provided with a pin, m'', a weighted piston, l'', connected to the lever-arm m' and arranged in connection with a bellows, l', and tubes I, I', and l, substantially as described.

4. In a pneumatic clock system, the combination, with a compressed-air chamber and a tube leading therefrom, of a clock-winding mechanism, an interposed valve and a valve-operating mechanism, the said clock-winding mechanism consisting of a bellows arranged to be thrown in communication with the compressed-air chamber by the interposed valve, a pivotally-mounted lever-arm connected to the bellows and carrying a projection or pin, a cam-faced swinging catch-tooth hanging in front of the projection on the lever-arm, and a ratchet-wheel carried by the spring-shaft and held by a pawl, substantially as described.

5. In a pneumatic clock system, the combination, with a compressed-air chamber and a tube leading therefrom, of a clock-setting mechanism, an interposed valve, and a valve-operating mechanism, the said clock-setting mechanism consisting of a bellows arranged to be thrown in communication with the compressed-air chamber by the interposed valve, and a pivotally-mounted lever-arm connected to the bellows and carrying a pin upon which the foot of a sliding rod rests, the said rod being formed with a V-shaped point and connected to a swinging lever-arm, the arbor of the minute-hand being provided with expanded arms arranged to receive the V-shaped point, substantially as described.

6. In a pneumatic clock system, the combination, with an air compressing and storing mechanism, of a clock-setting mechanism and a signal mechanism, substantially as set forth, consisting of a lever carrying a colored target or disk counterbalanced by a weight, and a bellows arranged to be thrown in communication with the compressed air, said bellows being arranged below a sliding rod carrying a pin that engages with the lever carrying the disk, substantially as described.

7. In a pneumatic clock system, the combination, with an air compressing and storing mechanism, of a clock-winding mechanism and a mechanism for indicating the energy expended by the clock-spring, said indicating mechanism consisting of a disk, a pointer, and an operating mechanism whereby the pointer is moved forward one step for each movement of the winding mechanism, substantially as described.

PIERRE G. PUTTEMANS.

Witnesses:
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EDGAR TATE.