(No Model.) 4 Sheets—Sheet 1.

A. A. LEHMANN.

PNEUMATIC FIRE ALARM.

No. 488,018. Patented Dec. 13, 1892.

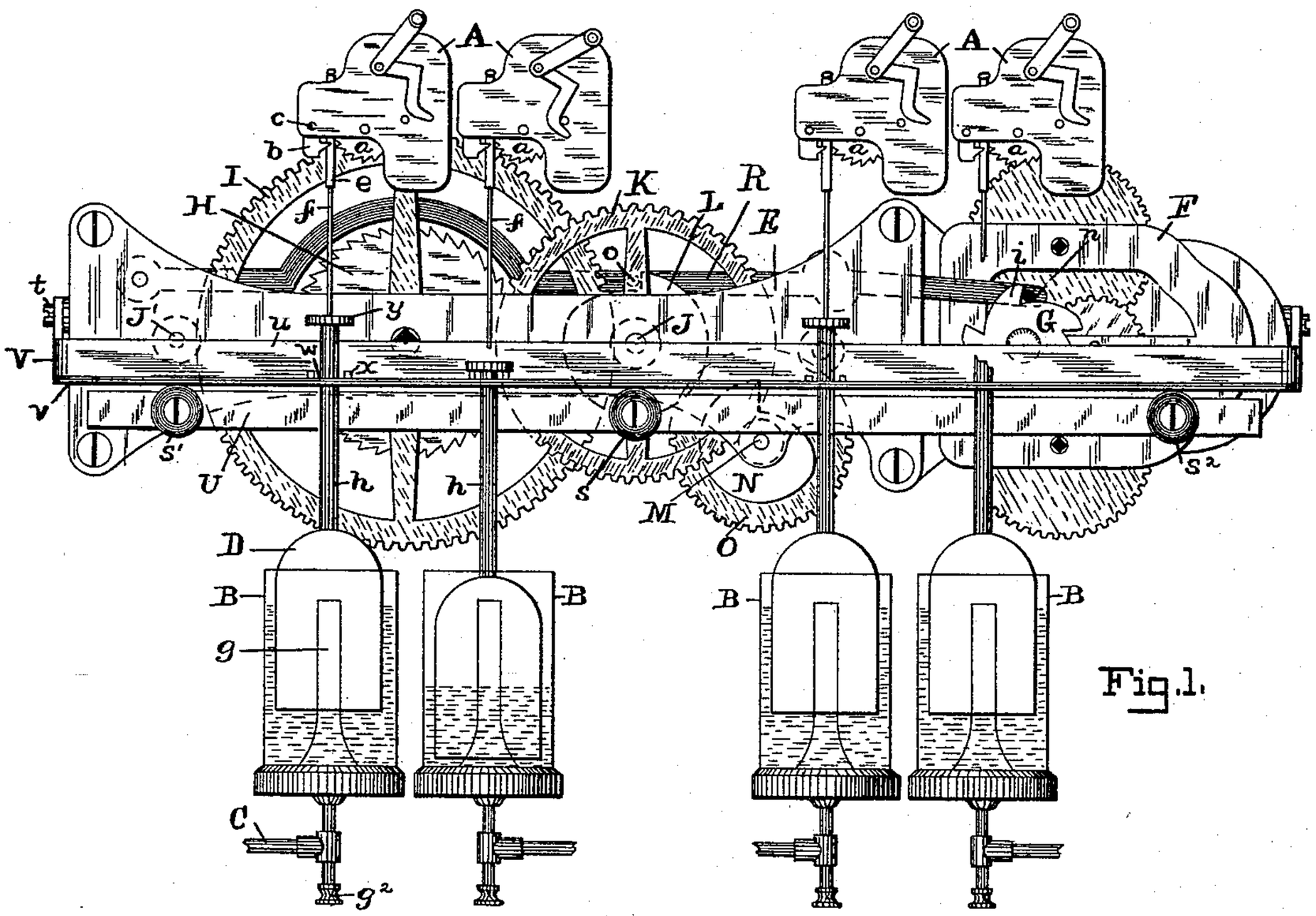

Fig. 1.

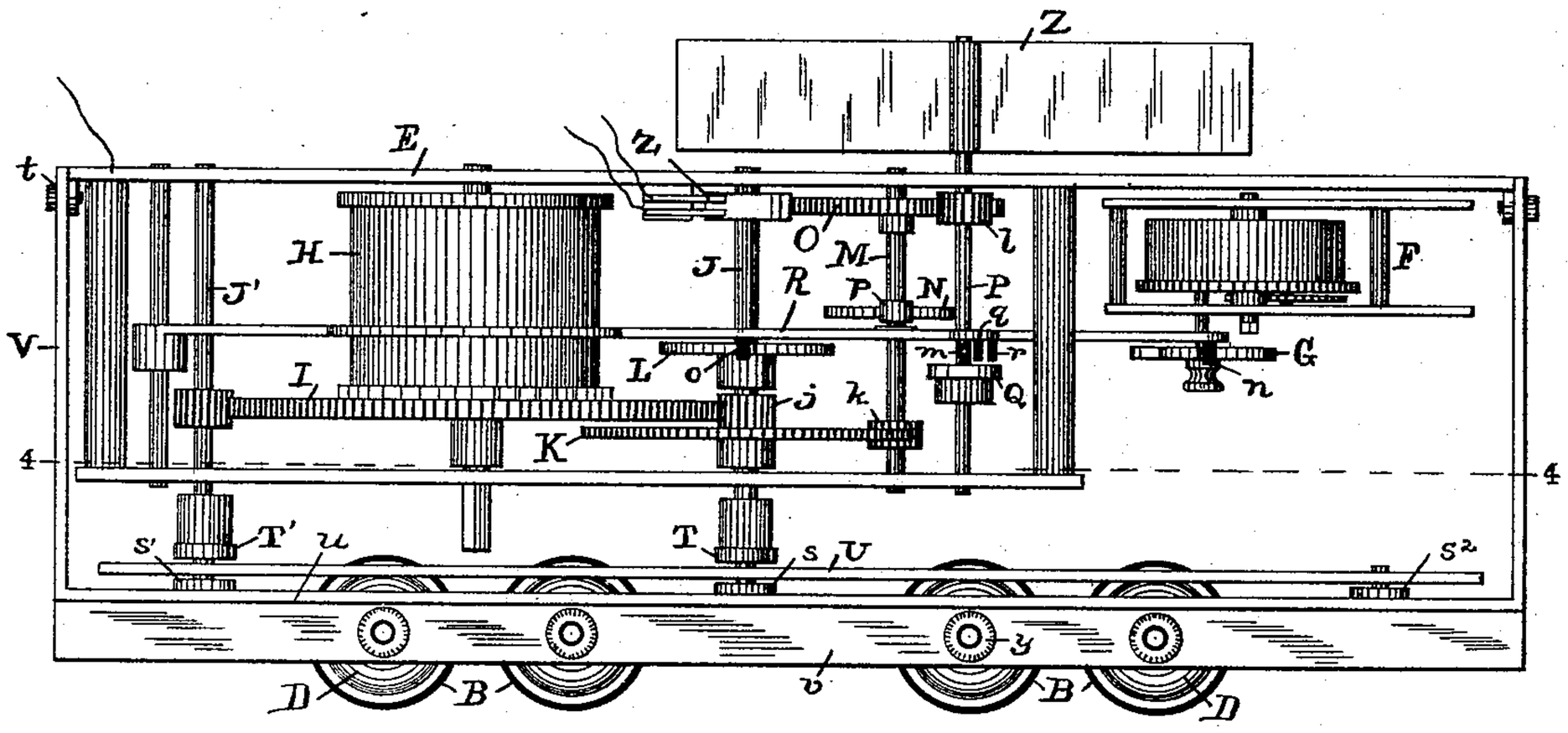

Fig. 2.

WITNESSES:

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F. P. Davis.

INVENTOR:

Anthony A. Lehmann,

BY Chas B. Mann

ATTORNEY.

(No Model.) 4 Sheets—Sheet 2.

A. A. LEHMANN.

PNEUMATIC FIRE ALARM.

No. 488,018. Patented Dec. 13, 1892.

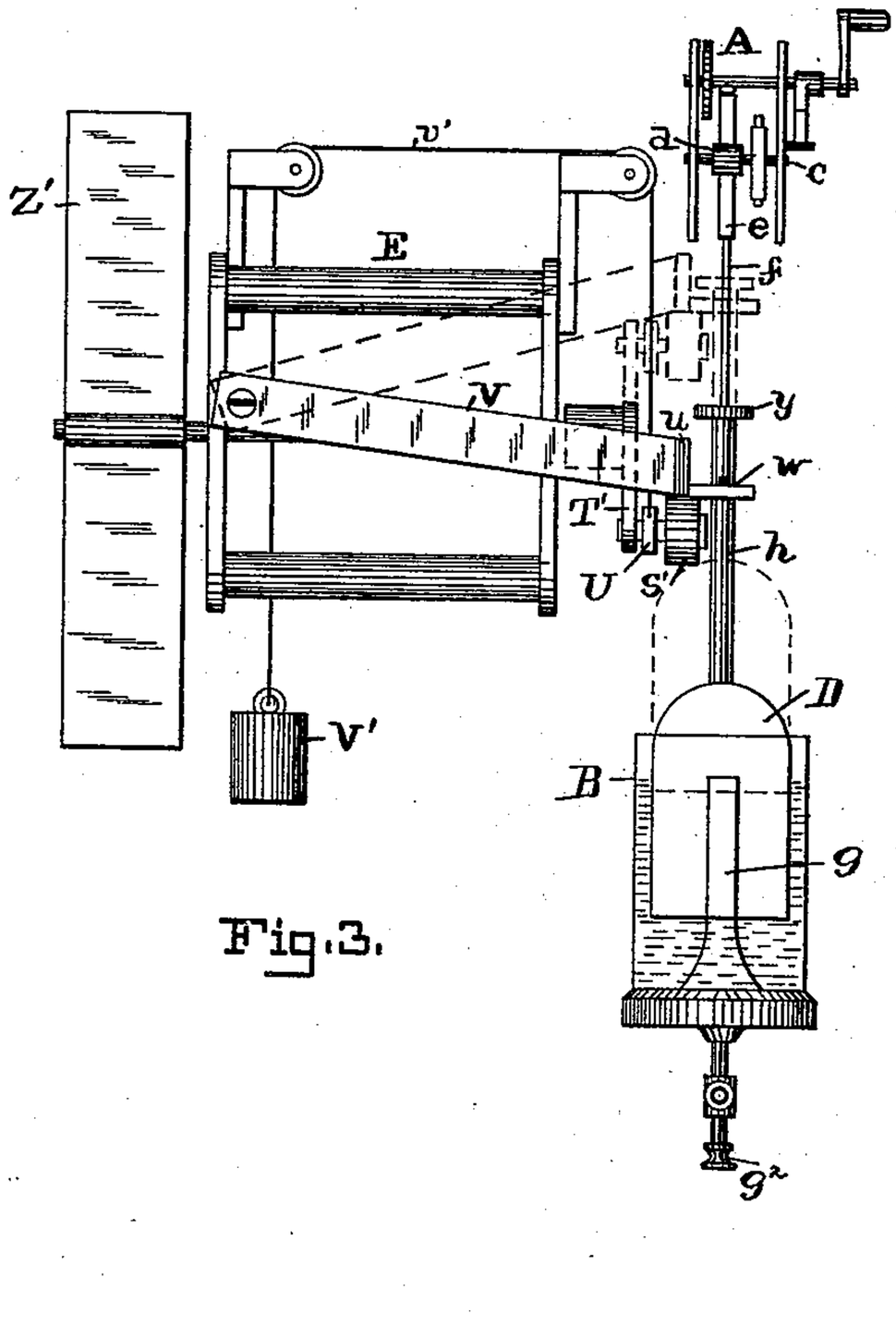

Fig. 3.

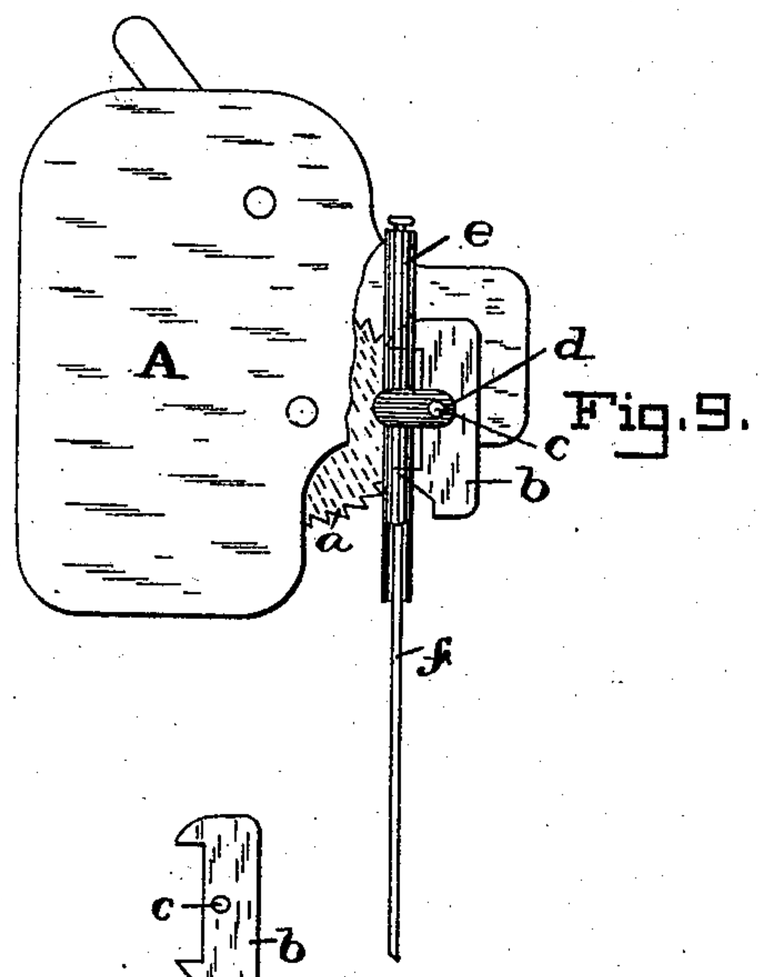

Fig. 9.

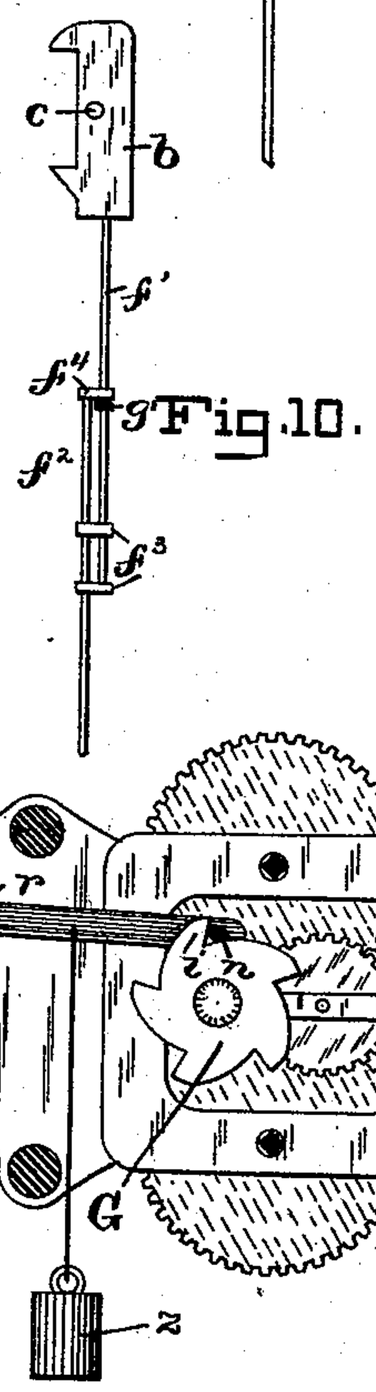

Fig. 10.

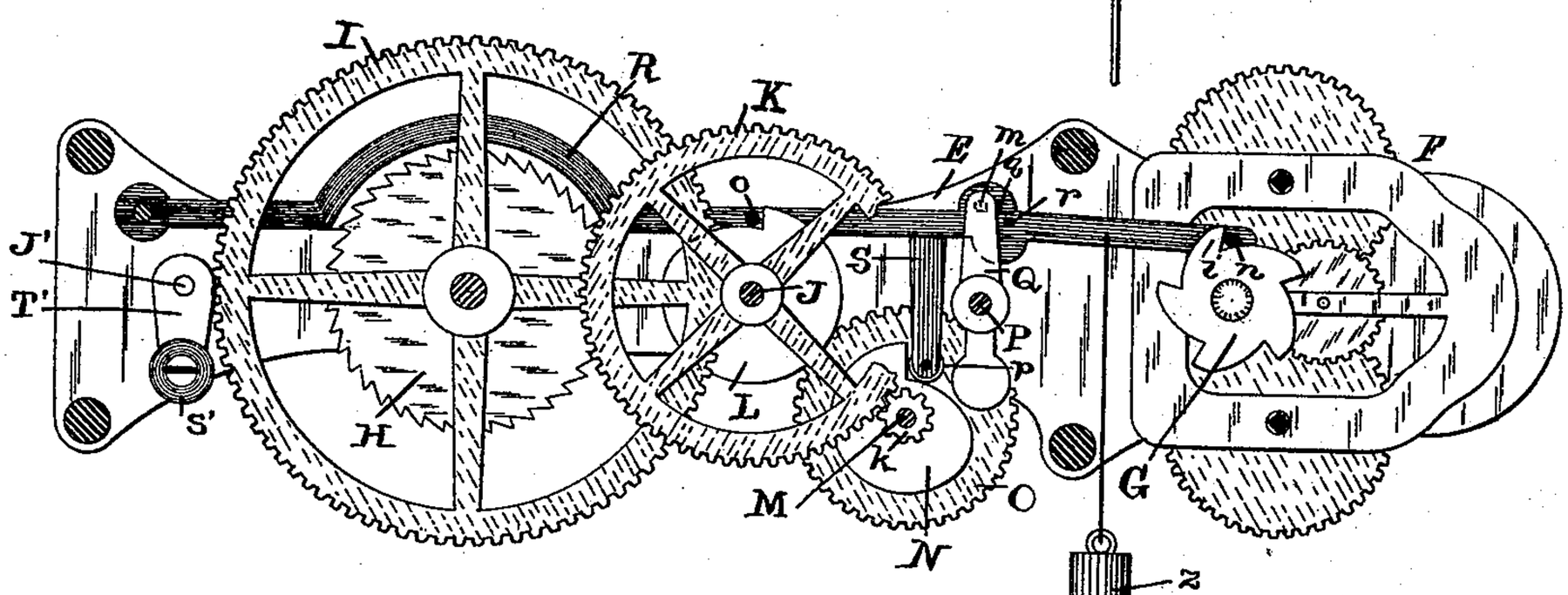

Fig. 4.

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(No Model.)

4 Sheets—Sheet 3.

A. A. LEHMANN.

PNEUMATIC FIRE ALARM.

No. 488,018. Patented Dec. 13, 1892.

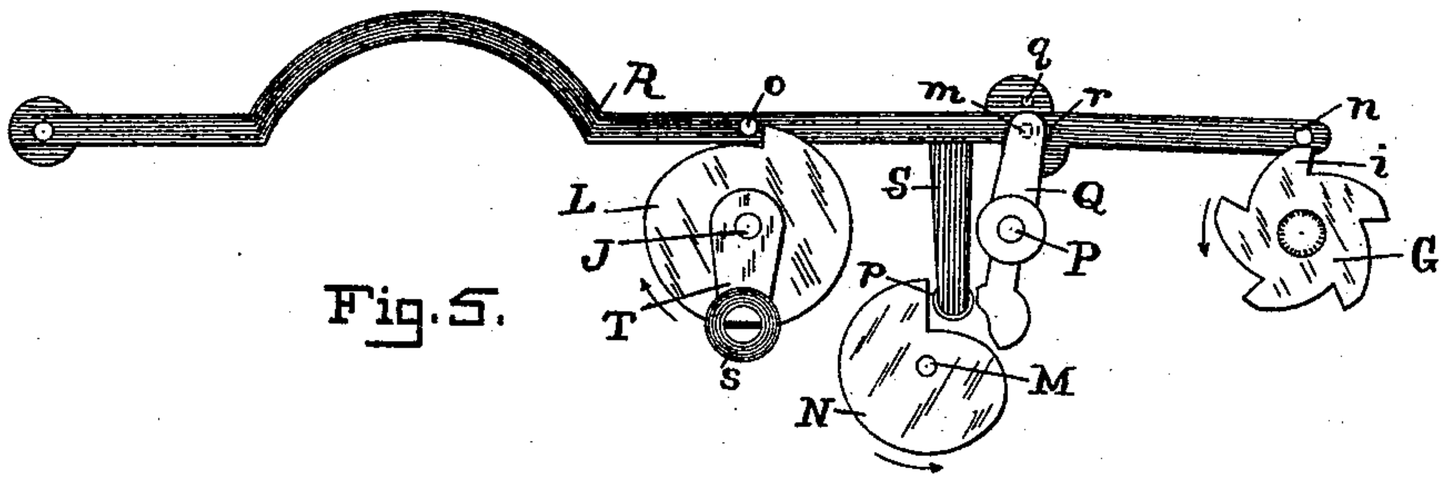

Fig. 5.

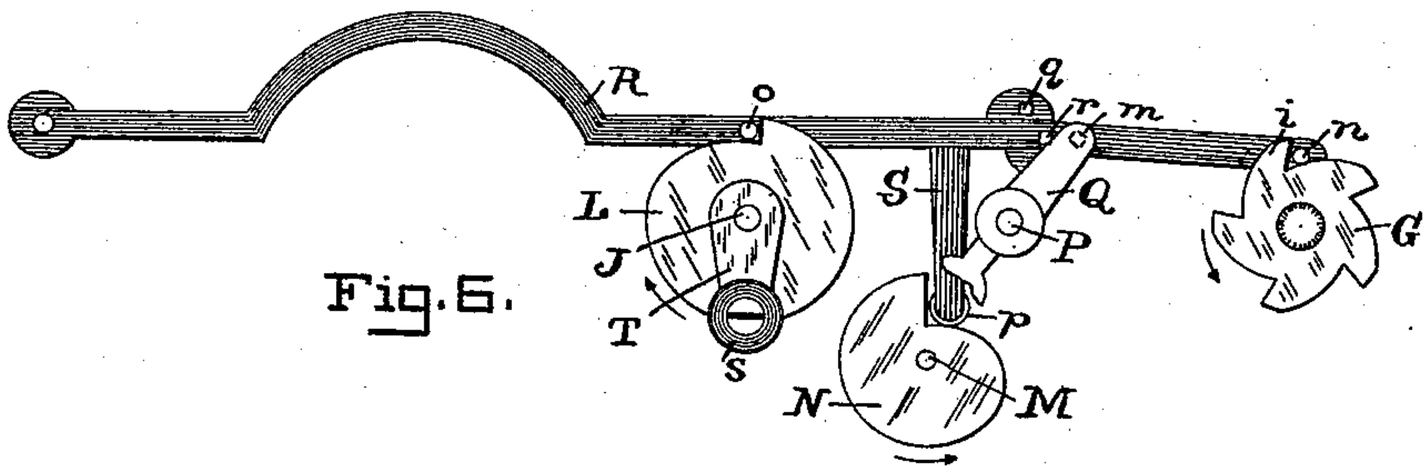

Fig. 6.

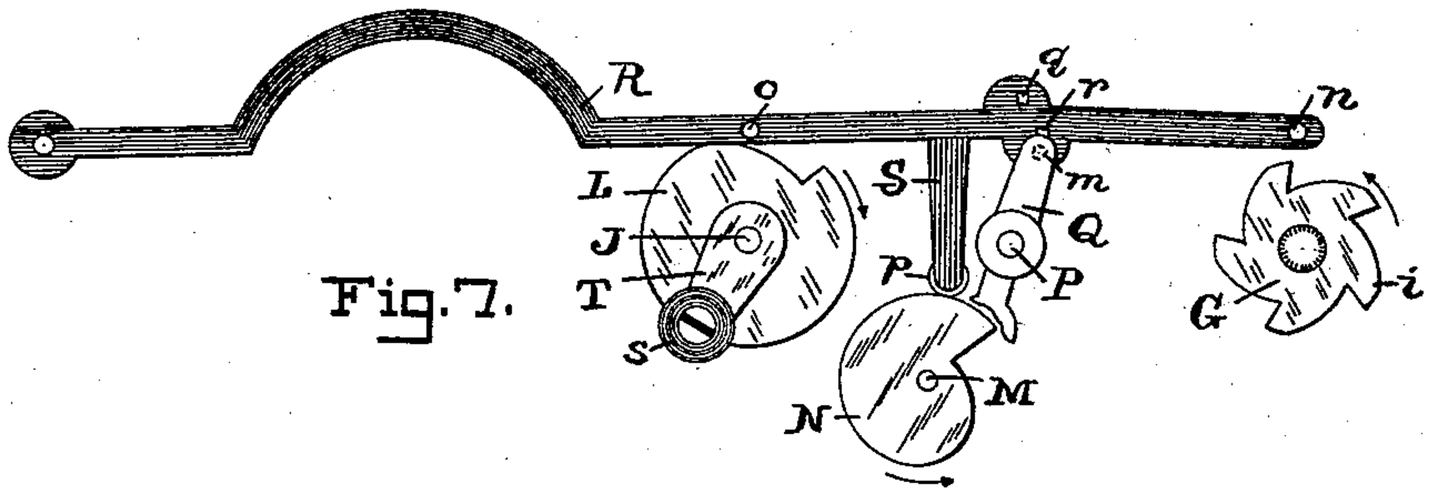

Fig. 7.

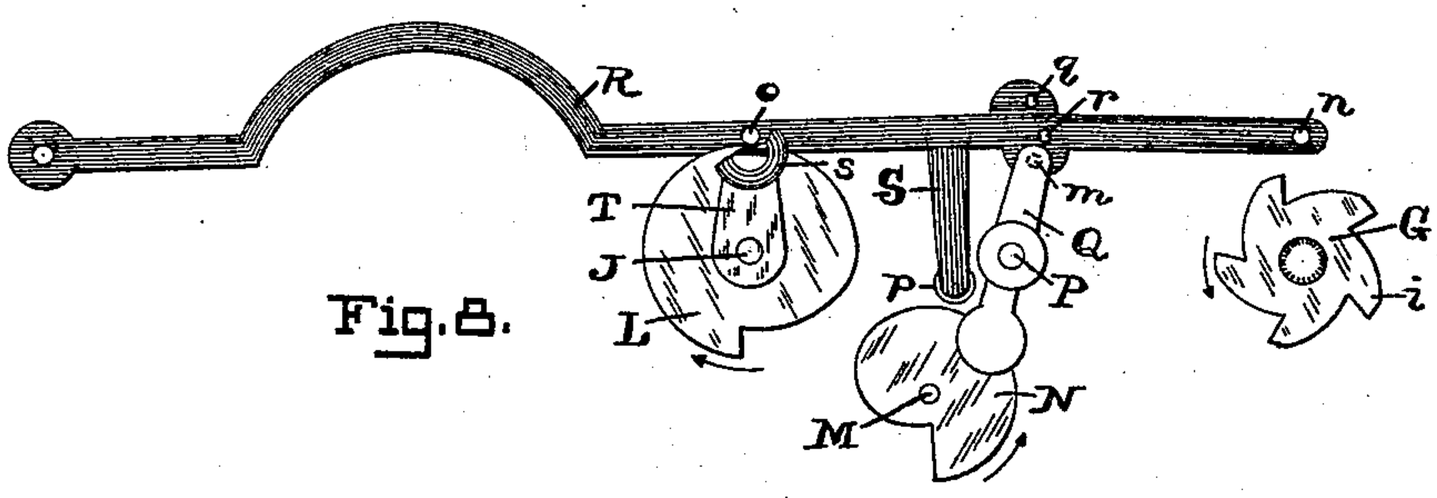

Fig. 8.

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(No Model.)

4 Sheets—Sheet 4.

A. A. LEHMANN.

PNEUMATIC FIRE ALARM.

No. 488,018. Patented Dec. 13, 1892.

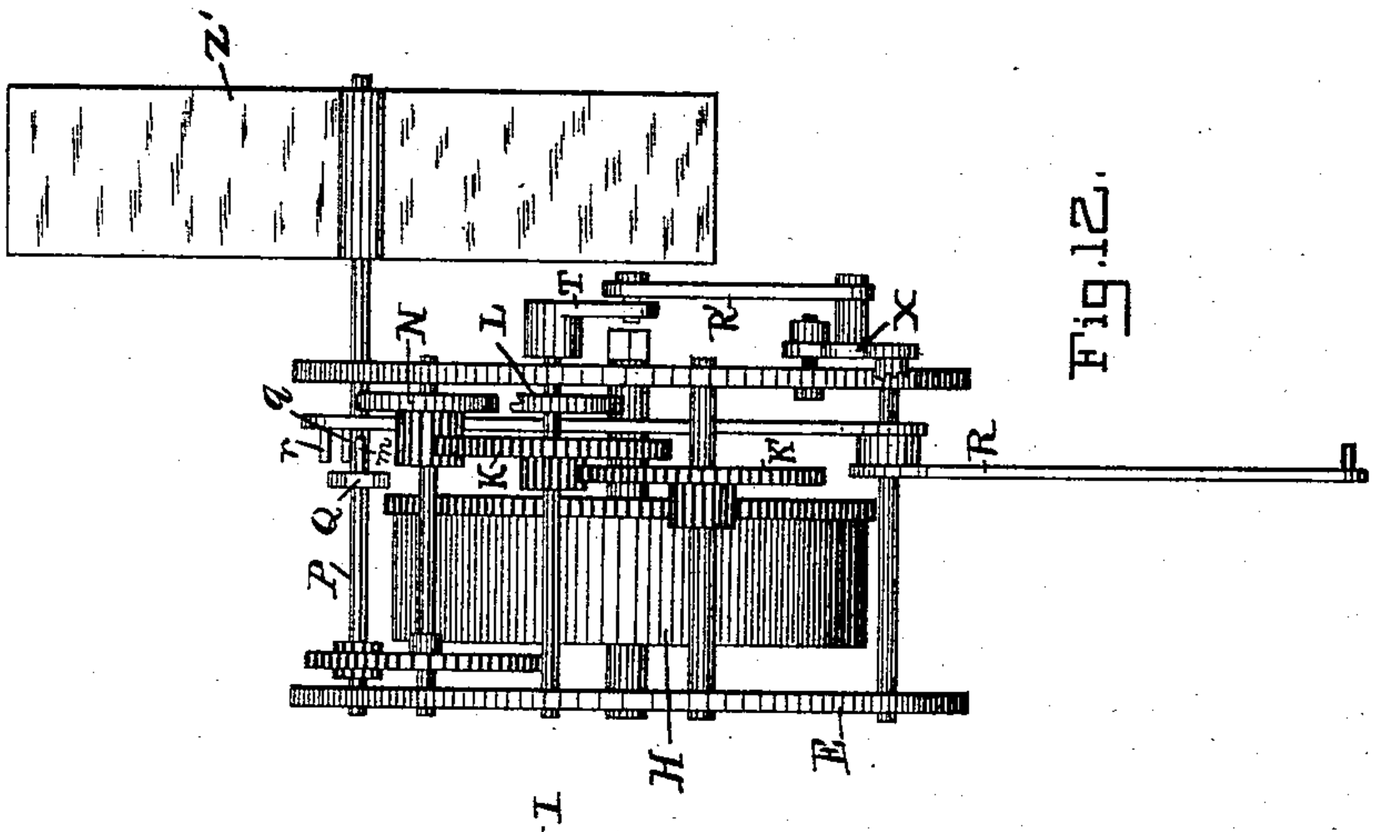

Fig. 12.

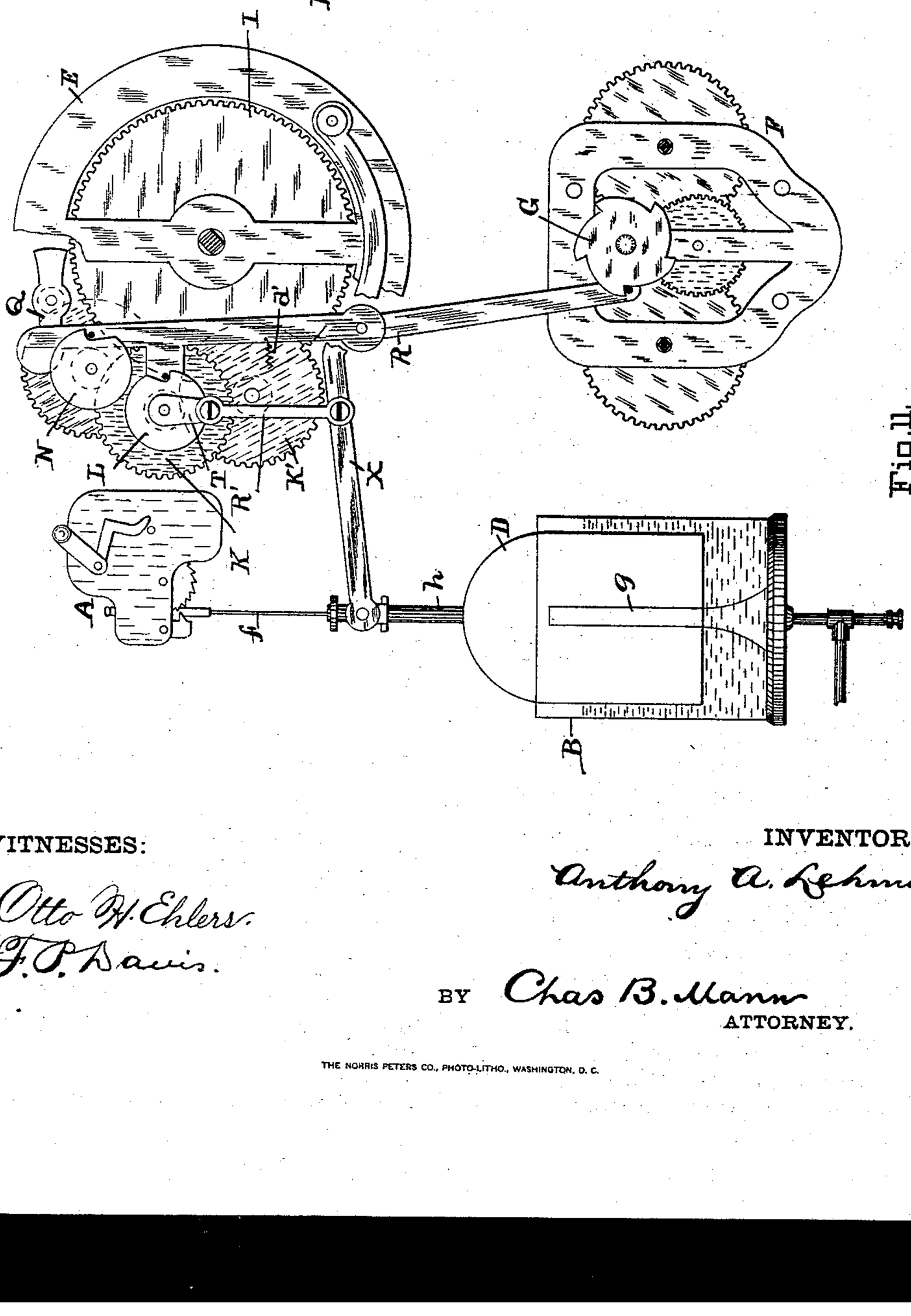

Fig. 11.

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INVENTOR:

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UNITED STATES PATENT OFFICE.

ANTHONY A. LEHMANN, OF BALTIMORE, MARYLAND.

PNEUMATIC FIRE-ALARM.

SPECIFICATION forming part of Letters Patent No. 488,018, dated December 13, 1892.

Application filed May 28, 1891. Serial No. 394,397. (No model.)

To all whom it may concern:

Be it known that I, ANTHONY A. LEHMANN, a citizen of the United States, residing at Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Pneumatic Fire-Alarm-Transmitting Mechanism, of which the following is a specification.

This invention relates to improvements in pneumatic fire-alarm-transmitting mechanism arranged to be placed in buildings and operating when a fire breaks out to automatically send in a signal to the fire department.

The object of my invention is to provide improved means for periodically lifting the inverted air cup or cups used in the system out of the liquid in which they are suspended in order to replenish them with air.

Another object is to provide an improved construction of pallet-tail for the call-boxes used in transmitting the signal.

Figure 1 represents a side view of the complete apparatus, showing one of the call-box movements released; Fig. 2, a top view; Fig. 3, an end view showing the hinged frame raised by the mechanism provided for this purpose; Fig. 4, a side view of the said mechanism, showing the parts in their normal position with the movement stopped; Fig. 5, a detail view illustrating the first or preliminary movement of the stop devices when released; Fig. 6, a similar view illustrating the next movement of said parts; Fig. 7, a similar view showing the releasing-arm raised and held up by the first cam; Fig. 8, a like view showing the said arm raised and held up by the second cam; Fig. 9, a detail view of one of the call-boxes, showing my improvement in the same; Fig. 10, a modified form of pallet-tail for said box; Fig. 11, a side view of a slightly-modified construction adapted for a single alarm, and Fig. 12 an end view of the same.

My apparatus, as shown in Figs. 1 to 10, is designed to be placed in a building having a number of stories, and I provide a call-box or transmitter A for each story to send in the alarm. *a* designates the escapement-wheel of this call-box, and *b* the pallet engaging the same and mounted rigidly on a shaft *c*, which also carries a boss *d*, having a tubular arm *e*, through which extends vertically a sliding pin or rod *f*, constituting the pallet-tail and having a suitable head, which prevents it from dropping through the said tubular arm. This pallet *b* is of the form ordinarily employed in clock-movements. It serves as a stop to the call-box movement as long as its tail *f* is held stationary; but as soon as the latter is released the pallet no longer acts to stop the movement.

Below each call-box is located an upright glass cylinder B, having an open upper end and a closed lower end. Within this cylinder is a vertical tube or stand-pipe *g*, which rises from the bottom of the same and is open at its upper end, while at its lower end it communicates with a pipe C, leading to the story of the building with which the transmitter or call-box above is to communicate. On this story at different points the pipe C will be provided with suitable thermostats, the purpose of which is to open the pipe should a fire break out in the building.

The glass cylinder B is partly filled with glycerine or some other suitable liquid through which air cannot readily pass. A glass cup D is inverted in this liquid over the stand-pipe *g*, and as long as the pipe C is kept air-tight the air in this cup is obviously confined and the glycerine cannot enter and displace it, and this air is compressed to the extent of the weight of the inverted cup. The cup is in this way buoyed up and kept elevated in the liquid. The stand-pipe *g* extends down below the cylinder and has on its end a suitable screw-cap g^2. The object of this construction is to prevent any liquid that may enter the stand-pipe from getting into the pipe C. Such liquid may be drained off through the cap g^2. The cup D has a hollow stem *h* and the pallet-tail *f* of the call-box extends down into this hollow stem, which thus holds said pallet-tail stationary and acts as a stop to the movement.

Upon the opening of the pipe C by the melting of a thermostat in case of a fire the air in said pipe can escape, and hence the air in the inverted cup D will be forced out through the open end of the stand-pipe *g*, causing the cup and hollow stem *h* to drop and said hollow stem to fall below the end of the pallet-tail *f* of the call-box, thereby releasing the latter and setting off the alarm which is transmitted from the call-box to the central fire-station in the usual way, the said call-box being electrically connected with the central station.

As the pipe C cannot be kept perfectly air-tight, there is a certain amount of leakage which would eventually cause the cups D to lower until the pallet-tails of the call-boxes were released, and alarms would then be unnecessarily sent in. I therefore provide mechanism to prevent this, which mechanism causes the cups to be lifted out of the liquid at certain intervals to recharge them with air and keep them properly buoyed up in the air-cylinders. This mechanism I will now describe.

The letter E designates the main frame of the apparatus. In one end of this frame, which I will call for convenience the "forward" end, is an ordinary clock-movement F, which is provided with a disk G. This disk has a continuous rotary movement and is geared to complete one revolution every five hours and is provided with five equidistant teeth *i*, although it will be obvious that the time of the disk and the number of teeth may be varied. At the opposite or rear end of the frame is mounted a drum H, which is actuated by a weight and carries a large cog-wheel I, meshing with a pinion *j* on a shaft J forward of the drum, which pinion is fast with a cog-wheel K, having less teeth than the large wheel I. The shaft J also carries a cam L. The cog-wheel K meshes with a pinion *k* on a shaft M below the said shaft J and carrying a cam N and a cog-wheel O, which in turn meshes with a pinion *l* on a shaft P above the shaft M. This shaft P carries a stop-arm Q, having a projecting pin *m*. An arm R is pivoted to the rear end of the frame and extends forward over the drum H to the clock-movement F, where it has a pin *n* engaging the toothed disk G. This pivoted arm has a pin *o* to bear on the cam L, and a downward-extending arm S, carrying a roller *p*, to bear on the cam N. It is also provided with a pair of stop-pins *q r*, one being located forward of and below the other. The shaft J, carrying the wheel K and cam L, has on its end outside the frame E a crank T, with a roller *s* on its end, and another shaft J′ is provided on the opposite side of the drum driven by the large cog-wheel I, which auxiliary shaft also has a crank T′ on its end provided with a roller *s*′. A bar U connects the two cranks T T′ and also projects to the forward end of the frame, where it has a third roller s^2. I provide a rectangular frame V, which is hinged to the main frame E at *t*, and has a longitudinal bar *u* extending the length of said frame E and resting on the rollers *s s*′ s^2. The longitudinal bar has a horizontal outward-extending flange *v*, having a number of holes *w* to correspond to the number of call-boxes and air-cylinders. Short pins *x* project on opposite sides of each hole. The stems *h* of the inverted cups D extend through these holes and have screw-heads or shoulders *y* to rest on the pins *x*.

The cups are lifted out of the liquid in the cylinders once every hour to allow the said cups to recharge with air by the mechanism above described in the following manner: In the normal position of the parts the pin *n* of the pivoted arm R is behind one of the teeth of the disk G, and the pin *m* of the stop-arm Q rests against the upper stop-pin *q* of said pivoted arm and the movement is stopped. Obviously one of the teeth *i* of said disk G passes under the pin *n* every hour, there being five of said teeth, and the disk making one revolution every five hours. As the tooth passes under the pin, it raises the pivoted arm R and first releases the stop-arm Q from the upper stop-pin *q*. This is only a preliminary movement, however, for the stop-arm after being released from the said upper pin stops against the lower pin *r*, as shown in Fig. 5. Upon the further movement of the disk G the pin *n* drops behind the tooth of said disk and the pivoted arm falls, allowing the pin *m* of the stop-arm to pass between the two stop-pins *q r*, as represented in Fig. 6. This, it will be observed, releases the movement and the first cam N immediately takes the pivoted arm R and holds it elevated with the pins *q r* out of the path of the stop-arm. When the said cam N has made one revolution of the second cam L takes the pivoted arm and still holds it elevated, so that the movement can continue. The crank T is on the same shaft as this cam L, and hence during the revolution of the said cam and while it is holding the pivoted arm R elevated the crank makes a revolution, and with the aid of the auxiliary crank T′ and bar U raises the hinged frame V and allows it to lower again. This, it will be observed, raises all the cups D out of the liquid in the cylinders and then allows them to drop again into the same, thus recharging them with air. This action taking place every hour counteracts any leakage of air from the pipes. The pins *x* on opposite sides of the holes *w* are for the purpose of allowing the stems of the cups to maintain their vertical position during the movement of the hinged frame, which obviously describes an arc. When the cam L has completed its revolution, the pin *o* of the pivoted arm R will be again over the depression of said cam, and the gearing is so timed that the roller *p* will simultaneously be over the depression in the cam N. The arm R will then drop and the stop-arm Q will abut against the upper stop-pin *q* and stop the movement. The said pivoted arm R will be held down by a weight *z* or by a spring.

The weight of the hinged frame V, together with that of the inverted cups, is considerable, and I therefore provide a counterbalance V′, connected by a cord *v*′ with the bar U beneath the frame. This weight V′ nearly counterbalances the frame and cups and greatly reduces the necessary power for driving the lifting-movement, as the latter has only to lift against the vacuums produced in the cups when raised in the liquid. The counterbalancing-weight also prevents the movement from running away after it has lifted

the frame and cups and while it is returning the same, for said movement has to raise the counterbalance in lowering the bar U, as will be apparent, and is thereby prevented from running away. The train of gearing leading from the drum to the stop-arm is employed so as to render the contact between the stop-pins very slight, whereby they will readily release.

The two cams L and N are both employed in the construction here shown for the following reasons: The revolution of the stop-arm is very rapid and the pivoted arm R must be taken by a cam before said stop-arm has made one revolution. Hence a cam is placed on the shaft M, whose revolution is more rapid than that of the shaft J; but this cam N would drop the pivoted arm after one revolution, and at this time the cranks T T′ would have moved but slightly. Therefore as the first cam reaches the end of its first revolution the office of holding the pivoted arm elevated is transferred to the second cam L on the crank-shaft J.

It may happen that the frame V will raise at the same time that an alarm is sent in. In this event I have provided against the stoppage of the lifting-movement and the call-box movement by the stem-head *h′* coming against the pallet-tail of the call-box in the construction of said pallet-tail. As shown in Figs 1 and 9, it comprises a sliding rod *f*, as previously explained. It will be seen that should the stem-head *h′* come against this rod it will simply slide it up and will not stop the call-box nor lifting-movement.

In the modification shown in Fig. 10 I use a rigid rod *f′* and a sliding extension f^2, working through guides f^3, secured on the rigid rod. The extension-rod also has a guide f^4, through which the rigid rod extends loosely. *g′* designates a stop-shoulder. This device comprises a disk mounted on said shaft J, which shaft revolves intermittently, as previously explained, and every hour, and the said disk is electrically connected with the central station. It will be seen that this modified construction of pallet-tail operates the same as the other form first described. An ordinary alarm device Z will be used in connection with the shaft J to send in an "all right" signal every hour. The air-cylinders and inverted cups are shown and described as being made of glass, but any other suitable material may be used.

In the modification shown in Figs. 11 and 12 the apparatus is adapted for a single alarm and is more compact than the other arrangement previously described. The clock-movement is located below the lifting-movement and the gear of the latter is disposed vertically, one cog-wheel being above another. It follows that the pivoted arm R has a vertical position. This arm is pivoted at an intermediate point instead of at one end and engages the toothed disk G of the clock-movement at its end, as before. It extends to the top of the lifting-movement, where it engages the stop-arm Q and has the stop-pins *q r* located relatively, as in the former case. The arrangement of the two cams L and N and the crank T on the shaft of the second is the same. In this modified construction, however, the said crank is connected by a rod R′ to the middle of a lever X, pivoted at one end to the frame E and at its opposite end connected to the stem *h* of the inverted cup D. A spring *d′* is necessary in this construction to hold the pivoted arm in position. The operation of this modified apparatus is precisely the same as that of the device previously described, and the same letters of reference are used for corresponding parts. It will therefore be readily understood without further comment. An additional cog-wheel K′ is interposed between the drum cog-wheel I and the wheel K to permit the movement to run as long as eight days. A spring is used in the drum H and sufficient convolutions of this spring cannot be obtained to cause the movement to run more than three or four days if the drum cog-wheel geared directly into the crank cog-wheel K. Hence the provision of the interposed cog-wheel K′.

In both forms of apparatus a suitable fan Z′ is placed on the stop-arm shaft P to govern the speed of the movement.

I do not claim, broadly, as my invention pneumatic fire-alarm-transmitting mechanism comprising an air-cup inverted in liquid, a call-box held in check by said air-cup, and a movement for periodically raising the air-cup.

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

1. In pneumatic fire-alarm-transmitting apparatus, the combination of an air-cup inverted in liquid, a motor or movement connected with said air-cup, whereby it may lift the same to replenish it with air, a stop which holds said motor or movement at rest, and an automatic trip to throw out said stop.

2. In pneumatic fire-alarm-transmitting apparatus, the combination of an air-cup inverted in liquid, a motor or movement connected with said air-cup, whereby it may lift the same to replenish it with air, a pivoted arm which holds the said motor or movement at rest, and an automatic trip which throws out said arm.

3. In pneumatic fire-alarm-transmitting apparatus employing an air-cup inverted in liquid, the combination of a motor or movement normally held in check and operating when released to lift said inverted cup for the purpose of replenishing it with air, said movement having a revoluble stop-piece, a pivoted arm holding the movement in check by engaging said stop-piece, and automatically-operating means for periodically moving said arm to release the lifting-movement, the arm returning after each operation of the move-

ment to its normal position, where it again holds the said movement in check.

4. In pneumatic fire-alarm-transmitting apparatus employing an air-cup inverted in liquid, the combination of a motor or movement normally held in check and operating when released to lift said inverted cup for the purpose of replenishing it with air, said movement having a revoluble stop-arm with a projecting pin, a pivoted arm having a projecting pin engaging that of the stop-arm and thereby holding the movement in check, and automatically-operating means for periodically moving said arm to release the lifting-movement, the arm returning after each operation of the movement to its normal position, where it again holds the said movement in check.

5. In pneumatic fire-alarm-transmitting apparatus employing an air-cup inverted in liquid, the combination of a motor or movement normally held in check and operating when released to lift the inverted air-cup for the purpose of replenishing it with air, said movement having a revoluble stop-arm with a projecting pin, a pivoted arm having two projecting pins with a space between them, against one of which pins the stop-arm pin engages, whereby the lifting-movement is held in check, and a time-movement having a revoluble disk engaging the pivoted arm and provided with a number of teeth, whereby as it revolves the stop-arm is first released from the pin of the pivoted arm with which it normally engages, stops against the other pin of said pivoted arm, and then passes through between the two pins as a tooth of the time-disk passes the pivoted arm, the lifting-movement thus released raising the inverted air-cup and then stopped again by the return of the pivoted arm to its normal position.

6. In pneumatic fire-alarm-transmitting mechanism employing an air-cup inverted in liquid, the combination of a motor or movement normally held in check and operating when released to lift the said air-cup for the purpose of replenishing it with air, said motor or movement having a revoluble stop-piece and a revoluble cam, a pivoted arm holding the movement in check by engaging said stop-piece, and automatically-operating means for periodically moving the pivoted arm to release the lifting-movement, the revoluble cam serving to hold said arm free of the stop-piece while the movement operates and then allowing it to return to its normal position, where it again holds the said movement in check.

7. In pneumatic fire-alarm-transmitting apparatus employing an air-cup inverted in liquid, the combination of a motor or movement normally held in check and operating when released to lift the said air-cup for the purpose of replenishing it with air, said motor or movement provided with a revoluble stop-piece and two revoluble cams, a pivoted arm holding the movement in check by engaging said stop-piece, and automatically-operating means for moving said pivoted arm to release the lifting-movement, the arm being held free of the stop-piece first by one of the revoluble cams and then by the other while the movement operates, after which the said arm again returns to its normal position, where it holds the movement in check.

8. In pneumatic fire-alarm-transmitting apparatus employing an air-cup inverted in liquid, the combination of a motor or movement normally held in check and operating when released to lift the said air-cup for the purpose of replenishing it with air, said movement having a revoluble stop-piece and two revoluble cams, a crank on the shaft of one of said cams and suitably connected with the inverted air-cup, a pivoted arm holding the movement in check by engaging the stop-piece and automatically-operating means for moving the said pivoted arm to release the lifting-movement, the arm being held free of the stop-piece first by one of the revoluble cams and then by the other while the movement operates, after which the said arm returns to its normal position, where it holds the movement in check.

9. In pneumatic fire-alarm-transmitting apparatus employing a number of air-cups inverted in liquid, the combination of a motor or movement normally held in check and operating when released to lift said air-cups for the purpose of replenishing them with air, a hinged frame having a loose engagement with each of said air-cups, suitable connections between said frame and the lifting-movement, a pivoted arm holding the movement in check, and automatically-operating means for moving said pivoted arm to release the lifting-movement.

10. In pneumatic fire-alarm-transmitting apparatus employing a number of air-cups inverted in liquid and each having a stem with a shoulder thereon, the combination of a motor or movement normally held in check and operating when released to lift said inverted air-cups for the purpose of replenishing them with air, a hinged frame having holes through which the stems of the air-cups extend, and pins on opposite sides of the holes to receive the shoulders of said stems, suitable connections between said frame and the lifting-movement, a pivoted arm holding said movement in check, and automatically-operating means for moving said arm to release the lifting-movement.

11. In pneumatic fire-alarm-transmitting mechanism, an air-cup inverted in a suitable liquid and having a stem and a call-box provided with a sliding pallet-tail engaged by the stem of said air-cup.

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

ANTHONY A. LEHMANN.

Witnesses:

THOS. KELL BRADFORD,

JAS. M. HUGGINS.