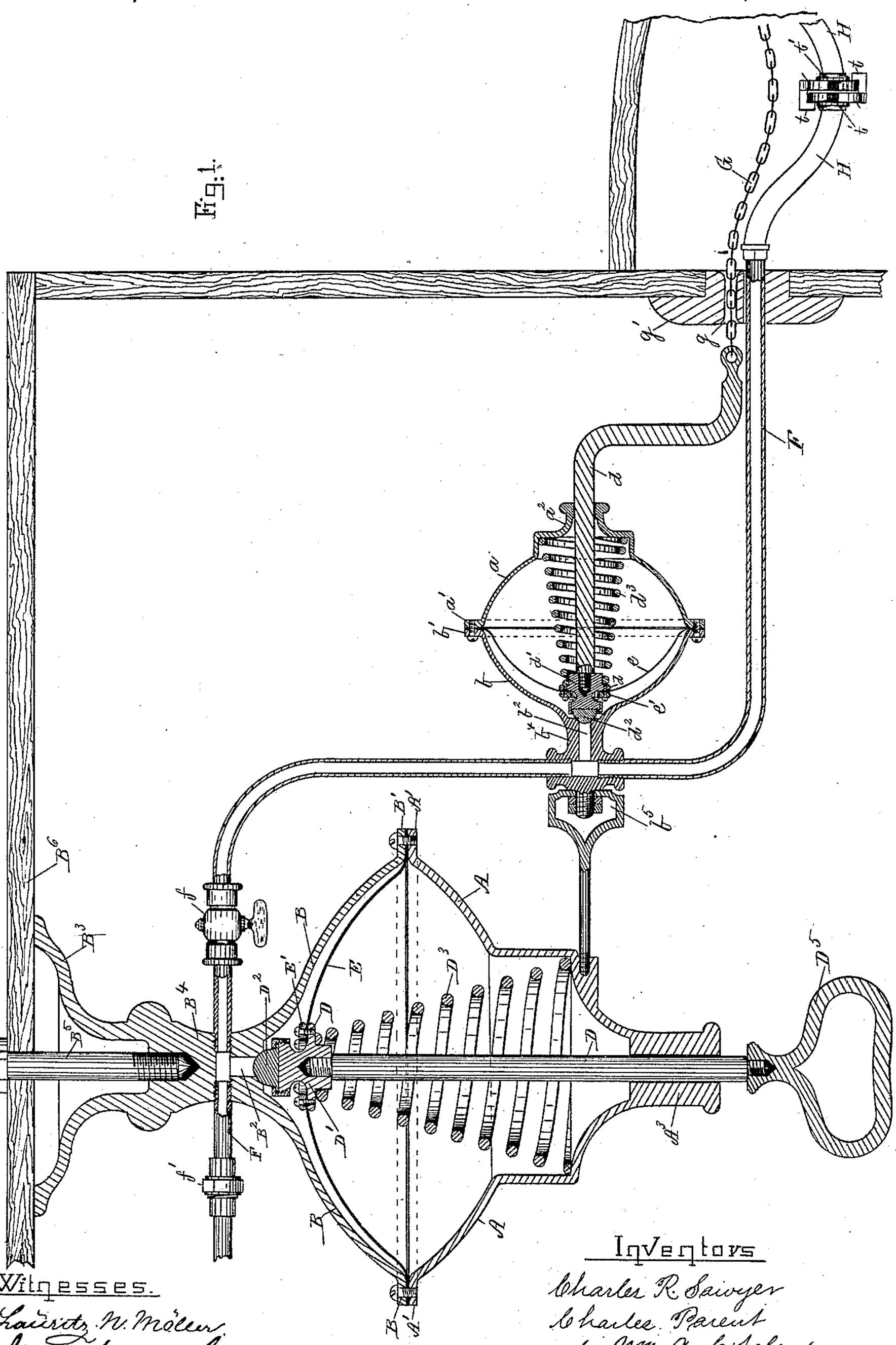
(No Model.) 4 Sheets—Sheet 1.

C. R. SAWYER & C. PARENT.

PNEUMATIC BELL ALARM.

No. 396,608. Patented Jan. 22, 1889.

Fig. 1.



Witnesses.

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Inventors

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their atty.

(No Model.) 4 Sheets—Sheet 2.

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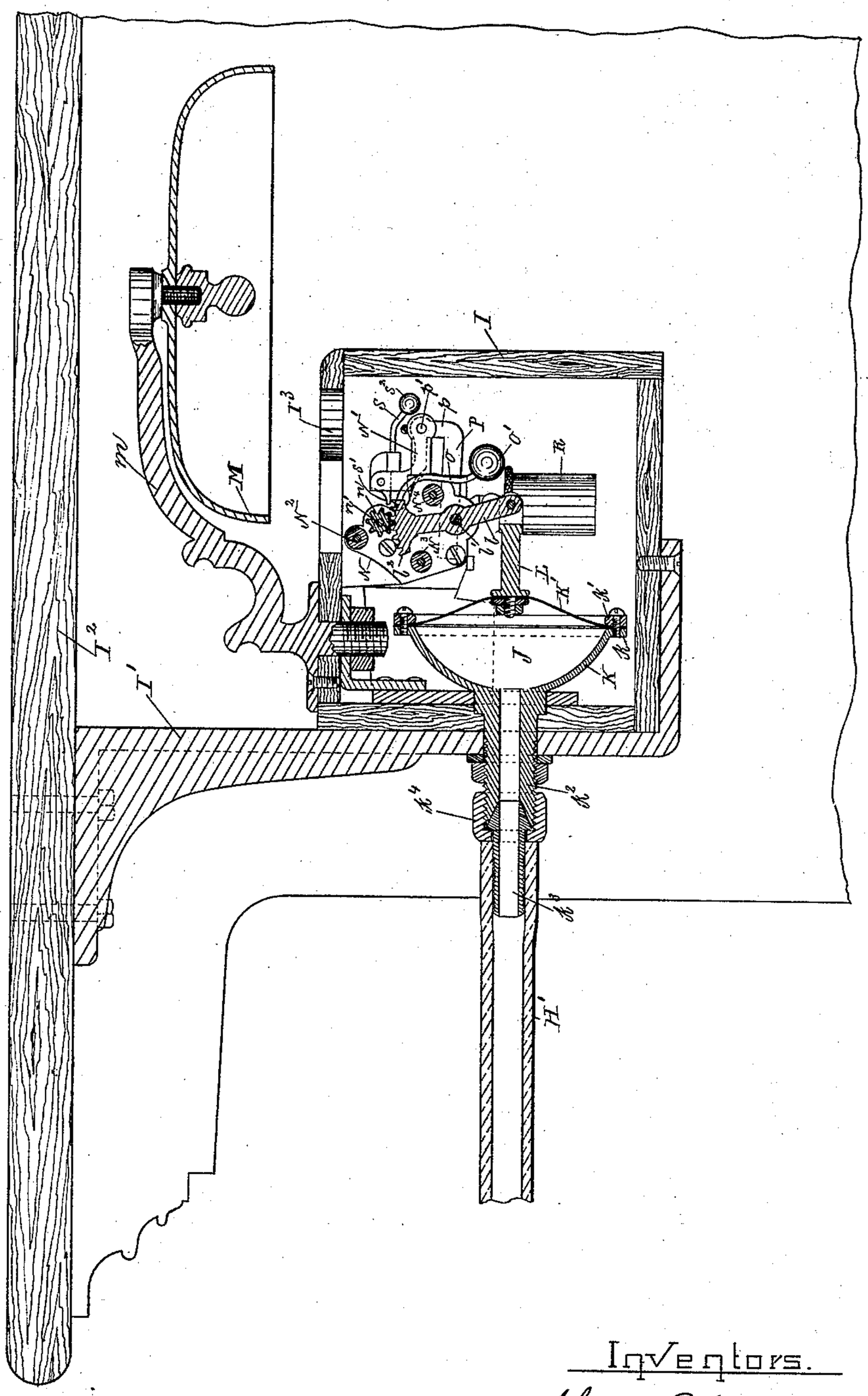
Fig. 2.



Witnesses.

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(No Model.) 4 Sheets—Sheet 3.

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PNEUMATIC BELL ALARM.

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Fig. 3.

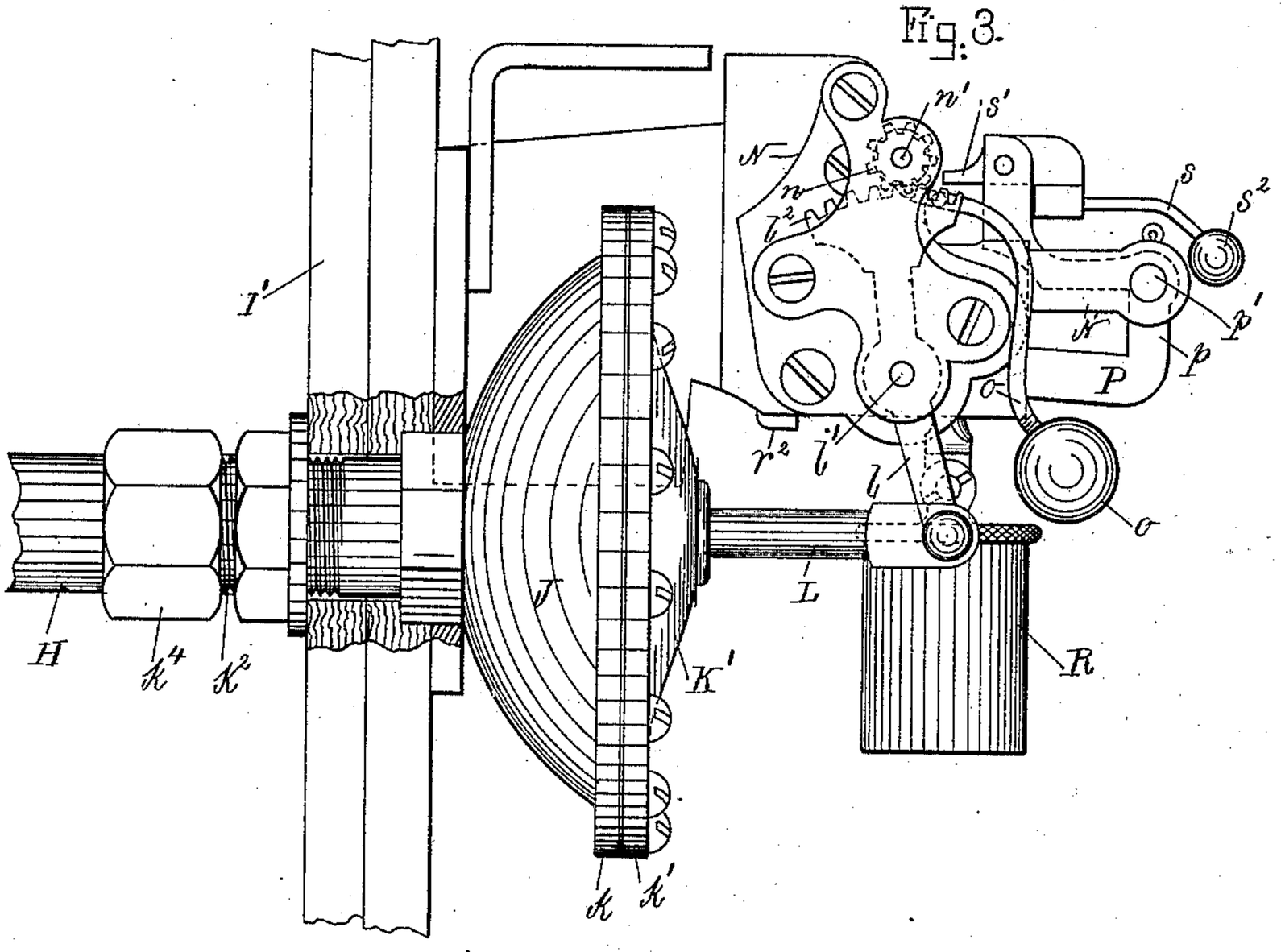


Fig 5.

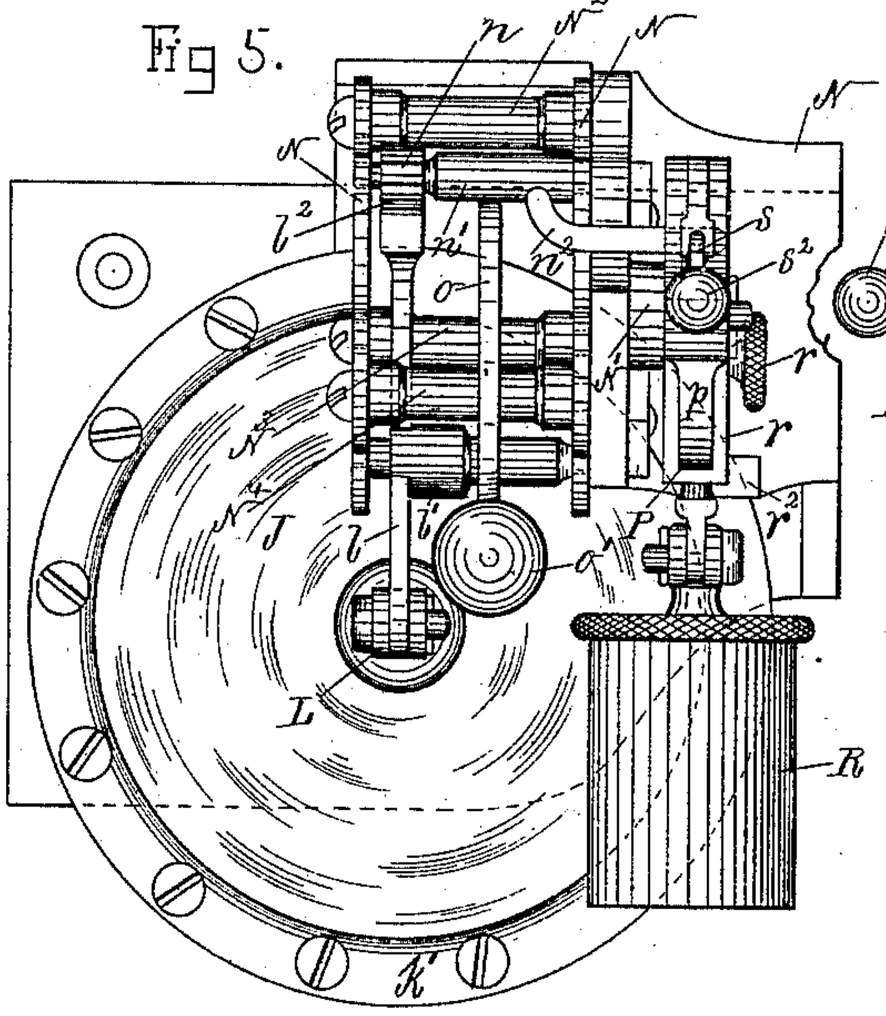
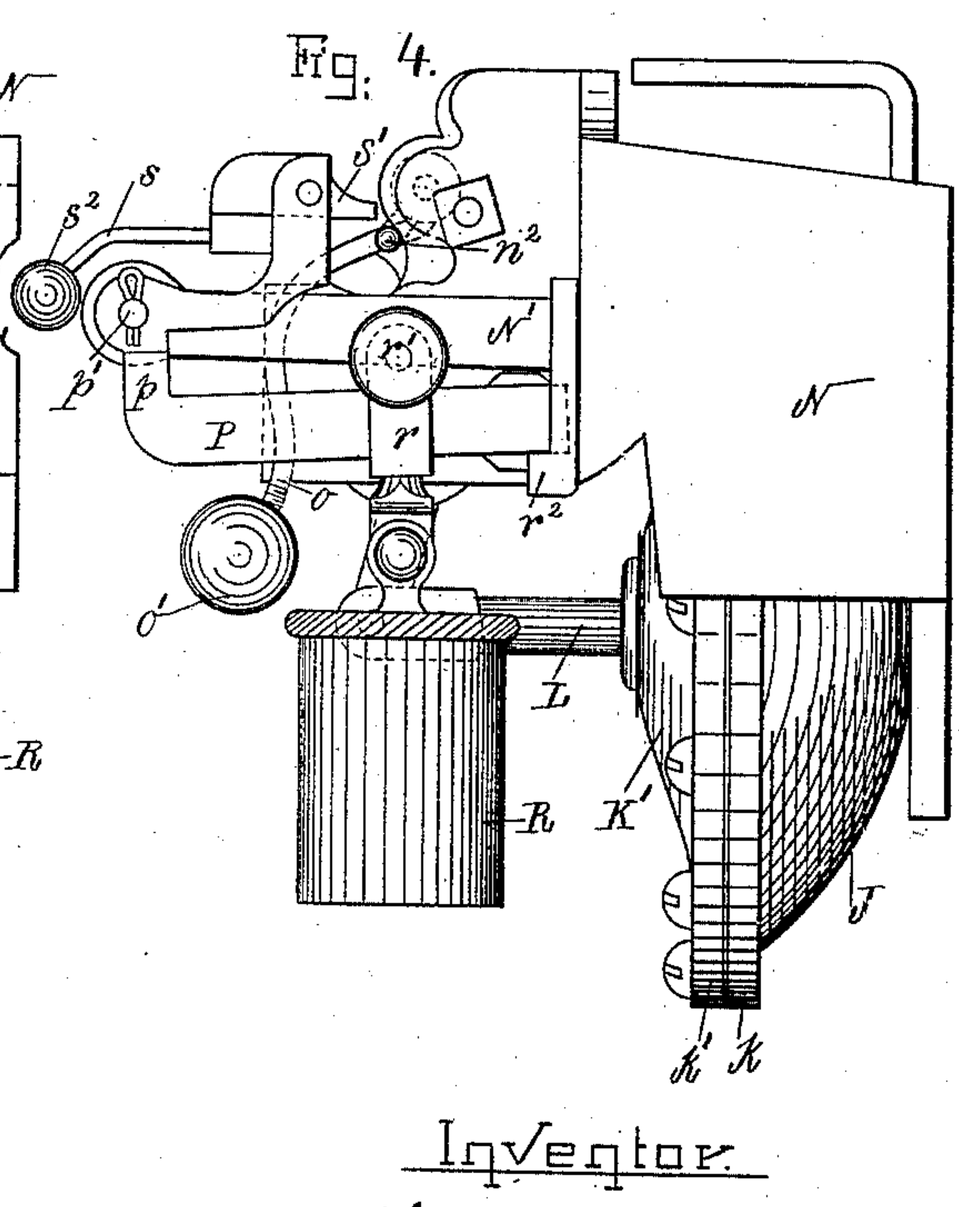


Fig. 4.



Witnesses.

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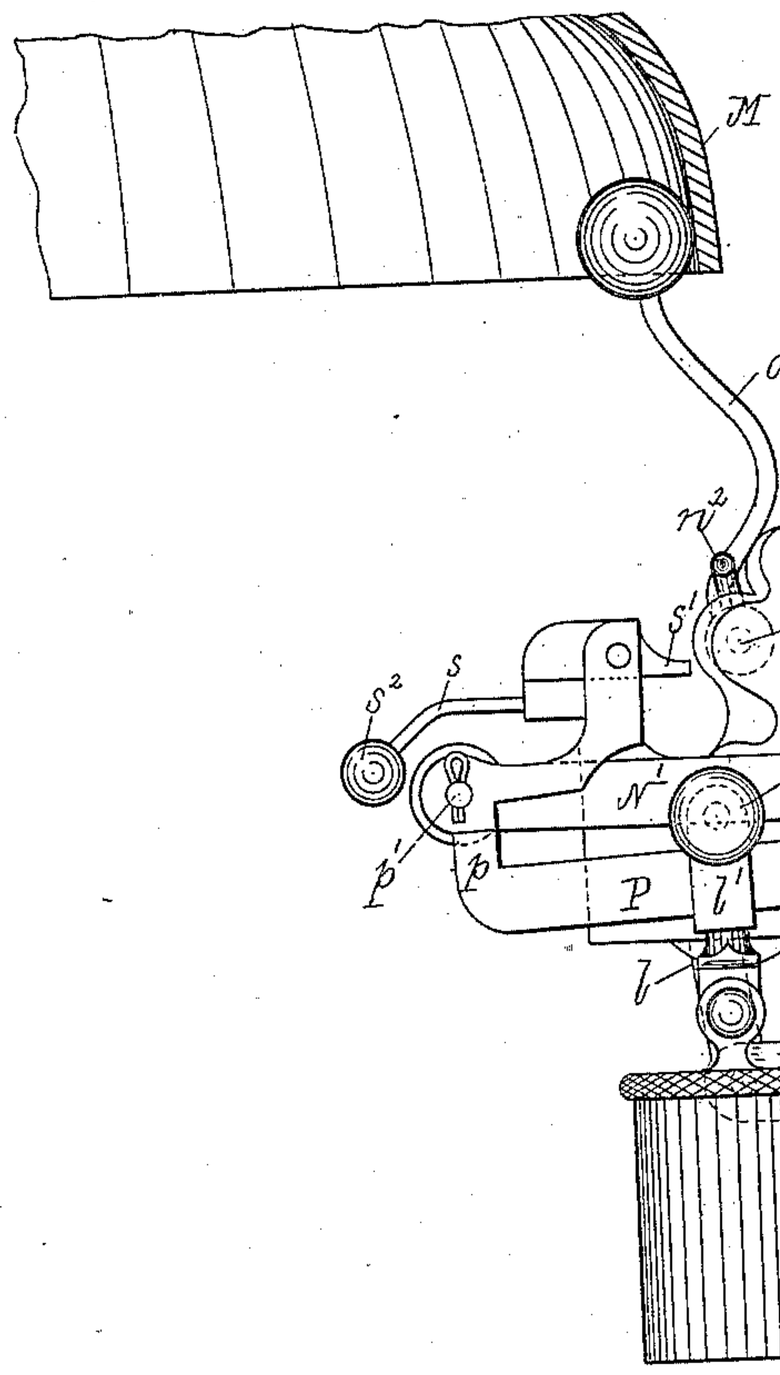
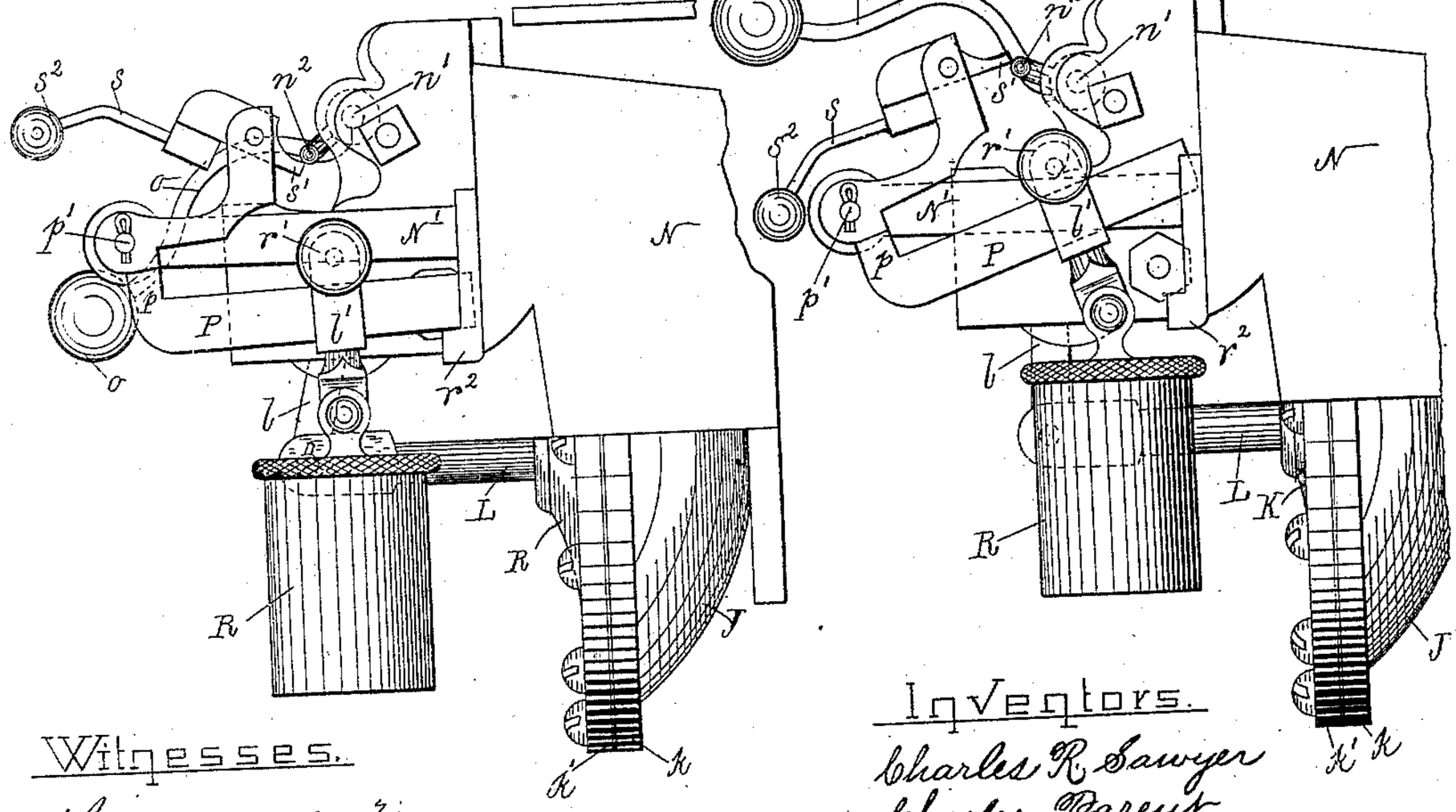


Fig. 6.

Fig. 8.

Fig. 7.



Witnesses.

Laurits N. Möller.

Inventors.

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Charles Parent
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UNITED STATES PATENT OFFICE.

CHARLES R. SAWYER, OF BRAINTREE, AND CHARLES PARENT, OF BOSTON, MASSACHUSETTS.

PNEUMATIC BELL-ALARM.

SPECIFICATION forming part of Letters Patent No. 396,608, dated January 22, 1889.

Application filed May 24, 1888. Serial No. 274,956. (No model.)

To all whom it may concern:

Be it known that we, CHARLES R. SAWYER, of Braintree, in the county of Norfolk, and CHARLES PARENT, of Boston, in the county of Suffolk, both in the State of Massachusetts, have invented a new and useful Improvement in Pneumatic Bell-Alarms, of which the following is a specification, reference being had to the accompanying drawings, which form a part hereof.

Our invention relates to a pneumatic bell-ringing apparatus adapted to be operated at considerable distances, as from a railroad-car to the engineer's cab of a locomotive, in which an air-pump located at the place where the operator stands is connected with an air-chamber located near the bell, which chamber has a flexible diaphragm connected with mechanism for operating the hammer of the bell.

Our invention consists, mainly, in the combination of an air-pump, a connecting-tube, and a chamber having a flexible diaphragm connected with mechanism to operate the hammer, so that the suction of air from the connecting-tube and chamber by the pump will cause the diaphragm to be drawn inward and operate the striking mechanism connected with the diaphragm.

Our invention also consists in the combination, with the piston of the air-pump, of suitable devices whereby the alarm may be rung automatically when the locomotive or one of the cars becomes detached from the rest of the train; also, in the peculiar construction of the air-pump, which consists of a chamber composed of two metal cups, one of which has a hole in the base, through which a piston works, and the other cup having a neck with a transverse hole, in which the connecting-tube is inserted, and a port leading from the transverse hole in the neck to the interior of the cup, and a flexible cup-shaped diaphragm with its rim clamped between the rims of the two metal cups, the inner end of the piston being secured to the middle of the diaphragm, a valve on the convex side of the diaphragm to cover the port leading to the air-tube, and a spring connected with the piston to keep the valve closed; also, in holding the bell-hammer under tension during the first part of its stroke, and then suddenly releasing the tension before the completion of the stroke to increase the power of the blow.

In the drawings, Figure 1 is a vertical longitudinal section of the pumps and connecting-pipe or air-tube supposed to be on one side of a car near the forward end, all unnecessary parts being omitted for clearness, showing also the hose-coupling. Fig. 2 is a vertical longitudinal section through the bell and air-chamber and operating mechanism in the cab of the locomotive. Figs. 3 and 4 are opposite side views of the mechanism shown in Fig. 2, the bell and box being removed. Fig. 5 is a front view of the same. Fig. 6 is a side view showing the hammer striking the bell. Fig. 7 shows the hammer moving downward after a stroke just before the tripping-rod slips past the trigger. Fig. 8 shows the hammer in its upward stroke, with the tripping-rod engaged with the trigger and just before the trigger slips off.

In describing our invention now we shall consider it as applied to a railroad-train, although it is equally adapted for use in hotels and other buildings.

The pump for hand use has two saucer-shaped metal cups, A and B, with a flange on the rim of each. The lower saucer, A, has a bore lengthwise through the stem A^2, in which the piston D works. The upper end of this piston is screwed into a block, D'. A cup-shaped diaphragm, E, of rubber or leather or other flexible material, is clamped around its rim between the flanges A' and B' of cups A and B by screw-bolts. Through the middle of the diaphragm projects block D', attached to the end of the piston, the rim of the diaphragm around the hole through which the block D' passes being clamped by ring E and screw-bolts to the flange D^4 on the block. On the end of the block on the convex side of the diaphragm is a valve or nipple, D^2, to close the port B^2. A spring, D^3, surrounds the piston D, the lower end resting upon a seat in the lower cup, A, and the upper end pressing against block D' to keep the valve closed. The cup B is formed with a bracket attachment, B^3, which is secured to the top of the car B^6 by a bolt, B^5, the neck B^4 having a transverse hole, into which the sections of air-tube F are screwed, as shown in Fig. 1. A

stop-cock, *f*, allows the passage to be open or closed for the purpose to be explained later on. The handle D^5 is for use in operating the pump by hand.

A smaller pump, adapted to be operated automatically when the cars break apart, is shown supported by a yoke, b^5, screwed into a lug on the side of the hand-pump. Any other support will answer equally well. The several parts of the pump are designated by small letters corresponding with similar parts of the hand-pump, which are designated by capital letters. The piston *d* is connected by a chain, G, with the piston of a like pump in the rear end of the next car ahead similarly arranged, the chain being slack enough to afford a little play, and the end of the piston *d* being a short distance from the frame *g'*, so as to allow sufficient piston draft to open the valve d^2. This chain G is light enough to be easily broken when the cars part. The end of the piston *d* has a stop on the end large enough to prevent its being drawn into the aperture *g*, through which the chain passes over the car-door. The hose H, connecting the tube F with the corresponding tube in the next car, is left with a little more slack than the chain G, so that when the cars break apart the piston *d* will open the valve d^2 and give the alarm before the hose breaks.

In Fig. 2 the bell and the mechanism connected with its operation are shown attached to a box, I, supported by a bracket I', suspended from the roof I^2 of the engineer's cab.

The air-chamber J is formed of a saucer-shaped metallic cup, K, and flexible diaphragm K', of rubber or other air-tight flexible material, which is securely clamped around its edge to the flange *k* on the rim of the cup K by a ring, *k'*, and screw-bolts, making the joint air-tight. The cup K has a hollow stem, k^2, connected with the hose H' by the union k^3 and nut k^4. The hose H' is coupled to the connecting-tube in the car back of it. The bell M is suspended from an arm, *m*, above the box I.

I^3 is a slot in the top of the box, through which the hammer passes when it strikes the bell.

To the middle of the diaphragm K' is attached a piston, L, which reciprocates with the in-and-out movement of the diaphragm. On the outer end of this piston is pivoted the lever *l*, which is fulcrumed on the shaft *l'*, and which has at its upper end a segmental rack, l^2, engaging with pinion-wheel *n*, mounted on shaft *n'*, to which is attached the lever *o*, carrying the hammer *o'*. The shafts *l'* and *n'* are journaled in a frame, N. The posts N^2 N^3 N^4 are parts of the supporting-frame N.

When the conductor desires to signal to the engineer, he pulls down the handle D^5 and piston D, thereby drawing in the diaphragm E and opening valve D^2. The diaphragm E being air-tight, the suction thus produced within the tube F and chamber J will cause the outside pressure of air upon the flexible diaphragm K to press the diaphragm inward to its full distention, carrying the piston L and causing the lever *l* to turn on its fulcrum *l'*, the segmental rack l^2 moving in the opposite direction from the lower end of the lever and turning the pinion-wheel *n* and shaft *n'*, thereby raising lever *o* and hammer *o'*.

The object of our regulator attachment is to hold the hammer under tension during a part of its upward movement, and then suddenly release the tension to allow the hammer to complete its upward stroke with an impulse.

The form of regulating device which we have shown in the drawings is described as follows: A lever, P, having an arm, *p*, bending upward and backward, is pivoted on a pin, *p'*, projecting from an arm, N', of the supporting-frame N, and weight R is suspended from the beam P by a hanger, *r*, which can be adjusted to different distances from the fulcrum by nut *r'* to regulate the amount of tension. The lever P can be tilted upward on its pivot, while a stop, r^2, prevents it from falling below a horizontal position. A tripping-lever, *s*, is pivoted in a fork of the arm *p*, the rear projection, *s'*, of which acts as a trigger, on the under and upper sides of which tripping-rod n^2 strikes alternately in the up-and-down stroke of the hammer. This lever has a shoulder or stop which prevents the lever from falling below the position shown in Figs. 3, 4, 5, and 6, but does not prevent it from being tilted upward, as shown in Fig. 7. As the shaft *n'* revolves and the hammer rises, the tripping-rod n^2 (shown in Fig. 5 as projecting from shaft *n'*) is carried upward and strikes against the under side of trigger *s'*. The stop on lever *s* in front of the fork prevents lever *s* from moving on its pivot; consequently beam P is tilted upward on its pivot *p'*, as shown in Fig. 8. The paths of motion of the rod n^2 and of trigger *s'* being in arcs of circles and diverging as they move upward, as will be clearly seen from Fig. 8, the rod n^2 after reaching a certain point will slip off the end of trigger *s'*, thus removing the tension on the hammer and allowing it to fly quickly upward to strike the bell. As soon as the tripping-rod has escaped the trigger, weight R causes the beam P to descend and fall back to its rest on stop r^2, as shown in Fig. 6.

A much heavier blow may be struck by means of the regulator attachment than without, for when the weight is released the force which has been expended in raising the weight and hammer together is suddenly transferred to the hammer alone and gives it a sudden impulse, throwing the hammer quicker than when raised the full distance without tension. The greater the tension within the power of the pump to overcome the more powerful will be the blow. The tension can be regulated by having the weight adjustable to different distances from the fulcrum of the beam P, as already described.

When the handle D^5 is released after being pulled down, the spring D^3 will raise the piston again and close the valve, and the pressure of air in the tube F and chamber J will throw the diaphragm K outward to its first position, reciprocating the piston L back again. Lever *l*, rack l^2, and pinion *n* will move in the reverse direction and hammer *o'* will drop. Tripping-rod n^2 strikes trigger *s'* on the upper side in its descent, and as there is no stop to prevent the outer end of lever *s* from rising the weight of the hammer in falling will cause the rod n^2 to bear down the trigger *s'*, and thus raise the outer end of lever *s*, as shown in Fig. 7. As in the ascent, the paths of motion of the trigger *s'* and rod n^2 diverge until the rod slips off the trigger. The lever *s* overbalances the trigger *s'*, and it will immediately fall back to its rest again, as shown in Fig. 4, ready for another stroke. A small weight, s^2, on the end of the lever facilitates its return movement.

Numerous other devices might be used by which the hammer can be held under tension during a portion of its stroke and then released; but the one I have described is the best now known to me.

It is best to so adjust the bell that the hammer will strike before it reaches the vertical, so that if for any reason spring D^3 fails to act the hammer will fall of its own weight.

If from any cause the diaphragm of any pump leaks, the valve still keeps the port closed, so that one pump does not have to draft from the chamber of any of the other pumps which are not in operation, as would be the case were no valve used, and which would necessitate the use of a much more powerful pump when the train of cars is long.

The automatic pump is intended to work only in case of accident, as when two cars break apart. When the chain G becomes drawn taut, a slight additional pull will draw the piston *d* until the stop on the end butts against the frame *g'*. The length of play between the piston and the frame should be sufficient to just allow the opening of the valve, and the slack in the hose H should be a little more than the slack in the chain, so that the piston will be pulled and the alarm given before the hose breaks to cut off the connection.

In practice each car should be equipped with two automatic pumps and at least two hand-pumps—one at each end—with a stop-cock, *f*, in the pipe on the side toward the end of the car, so that it will work equally well whichever end of the car is forward. The stop-cock at the rear end of the car should always be kept closed and all the others open. It is preferable to have a hand-pump also midway of the length of the car on the side so as to be readily accessible in case an alarm is desired to be rung quickly when the conductor is in the middle of the car.

It is obvious that with but slight change in details of construction our invention is equally adapted for hotels or other large buildings where bell-signal is used.

What we claim as our invention is—

1. The combination of an air-chamber, J, one of the walls of which is composed of a flexible diaphragm, K', a piston, L, attached to the diaphragm and connected with the hammer of a bell, an air-tube opening into the chamber J through the wall K opposite the diaphragm K', and a pump connected with the air-tube, whereby suction of air from chamber J will cause diaphragm K' to move inward and reciprocate the piston L, and thereby throw the bell-hammer, substantially as described.

2. The combination of an air-chamber, J, one wall of which consists of a flexible diaphragm, K', a piston, L, attached to the diaphragm and connected with the hammer of a bell, an air-tube opening into the chamber J through the wall opposite the diaphragm K', a pump connected with the air-tube, the operation of which causes suction of the diaphragm K', thereby reciprocating the piston L and throwing the bell-hammer, and a regulator for keeping the hammer under tension during a portion of its stroke, and then releasing the tension before the blow, substantially as and for the purpose described.

3. The combination of an air-pump, an air-tube connected at one end with the pump and at the other end opening into an air-chamber, the wall opposite the opening consisting of a flexible diaphragm, a piston with one end secured to the diaphragm and the other end pivoted to one end of a lever fulcrumed in a shaft which is journaled in a supporting-frame, the other end of the lever having a segmental rack thereon which engages with a pinion mounted on a shaft in said frame, a hammer attached to the pinion-shaft, and a bell, substantially as described.

4. The combination of an air-pump, an air-tube connected at one end with the pump and at the other end opening into an air-chamber, the wall opposite the opening, consisting of a flexible diaphragm, a piston with one end secured to the diaphragm and the other end pivoted to one end of a lever fulcrumed in a shaft which is journaled in a supporting-frame, the other end of the lever having a segmental rack thereon which engages with a pinion mounted on a shaft in said frame, a hammer attached to the pinion-shaft, a bell, and a regulating device for holding the hammer under tension during a part of its upward movement and then releasing the tension before the blow, substantially as described.

5. The combination of an air-pump, an air-tube connected at one end with the pump and at the other end opening into an air-chamber, the wall opposite the opening, consisting of a flexible diaphragm, a piston with one end secured to the diaphragm and the other end pivoted to one end of a lever fulcrumed in a shaft which is journaled in a supporting-

frame, the other end of the lever having a segmental rack thereon which engages with a pinion mounted on a shaft in said frame, a hammer attached to the pinion-shaft, a bell, and a regulating device for holding the hammer under tension during a portion of its upward movement and then releasing the tension before the blow, said regulating device consisting of a lever having an upwardly-turned arm and a fulcrum at the bend, the lower arm carrying a weight and the upper arm having pivoted at its end a tripping-lever, one end of which acts as a trigger and engages with a tripping-rod projecting from the pinion-shaft, so that when the hammer rises the tripping-rod will engage with the trigger and tip the weighted bent lever on its pivot, thus holding the hammer under tension in its upward movement until the tripping-rod escapes the trigger, and when the trigger releases the tripping-rod the hammer completes its stroke with an impulse, substantially as described.

6. An air-pump consisting of two metallic cups, A B, a flexible cup-shaped diaphragm, E, inside one of the cups, B, with its rim clamped between the rims of the two cups and forming an air-tight partition between the two cups, a piston working through base of cup A and having its inner end secured to the diaphragm, the cup B having a port leading to an air-tube, a stopper on the convex side of the diaphragm to close the passage from cup B to the air-tube, and a spring connected with the piston to keep it closed, substantially as described.

7. An air-pump consisting of two metallic cups, A B, a cup-shaped diaphragm in one of the cups, B, clamped at its edge between the rims of the two cups A B and forming an air-tight partition between the two cups, the cup B having a port leading to an air-tube, and the cup A having a piston working through the base of cup A, attached at its upper end to the diaphragm E, a stopper on the convex side of the diaphragm to close the port in the cup B, and a spring connected with the piston to keep the port closed, in combination with an air-tube leading from the port in cup B and an air-chamber at the other end of the tube, the wall of the chamber opposite the tube being composed of a flexible diaphragm, substantially as and for the purpose described.

8. An air-pump consisting of two metallic cups, A B, a cup-shaped diaphragm in one of the cups, B, clamped at its edge between the rims of the two cups A B and forming an air-tight partition between the two cups, the cup B having a port leading to an air-tube and the cup A having a piston working through the base of cup A, attached at its upper end to the diaphragm E, a stopper on the convex side of the diaphragm to close the port in the cup B, and a spring connected with the piston to keep the port closed, in combination with an air-tube leading from the port in cup B and an air-chamber at the other end of the tube, the wall opposite that through which the tube enters being composed of a flexible diaphragm, K′, a piston with one end secured to the diaphragm K′ and the other end connected with the hammer of a bell, whereby the operation of the pump will cause suction of the diaphragm K′, reciprocating its piston and throwing the bell-hammer, substantially as described.

9. An air-pump consisting of two metallic cups, A B, a cup-shaped diaphragm in one of the cups, B, clamped at its edge between the rims of the two cups A B and forming an air-tight partition between the two cups, the cup B having a port leading to an air-tube, and the cup A having a piston working through its base and attached at its upper end to the diaphragm E, a stopper on the convex side of the diaphragm to close the port in the cup B, and a spring connected with the piston to keep the port closed, in combination with an air-tube leading from the port in cup B and an air-chamber, J, at the other end of the tube, the wall opposite that through which the tube enters consisting of a flexible diaphragm, K′, a piston with one end secured to the diaphragm K′ and the other end pivoted to one end of a lever fulcrumed in a shaft, which is journaled in a supporting-frame, the other end of the lever having a segmental rack thereon which engages with a pinion mounted on a shaft journaled in said frame, a hammer attached to the pinion-shaft, and a bell, substantially as described.

10. An air-pump consisting of two metallic cups, A B, a cup-shaped diaphragm in one of the cups, B, clamped at its edge between the rims of the two cups A B and forming an air-tight partition between the two cups, the cup B having a port leading to an air-tube, and the cup A having a piston working through its base and attached at its upper end to the diaphragm E, a stopper on the convex side of the diaphragm to close the port in the cup B, and a spring connected with the piston to keep the port closed, in combination with an air-tube leading from the port in cup B and an air-chamber, J, at the end of the tube, the wall opposite that through which the tube enters consisting of a flexible diaphragm, a piston with one end secured to the diaphragm and the other end pivoted to one end of a lever fulcrumed in a shaft, which is journaled in a supporting-frame, the other end of the lever having a segmental rack thereon which engages with a pinion mounted on a shaft journaled in said frame, a hammer attached to the pinion-shaft, a bell, and a regulating device for holding the hammer under tension during a part of its upward movement, and then releasing the tension before the blow, substantially as described.

11. An air-pump consisting of two metallic cups, A B, a cup-shaped diaphragm in one of the cups, B, clamped at its edge between the rims of the two cups A B and forming an air-tight partition between the two cups, the cup B having a port leading to an air-tube, and the

cup A having a piston working through its base and attached at its upper end to the diaphragm E, a stopper on the convex side of the diaphragm to close the port in the cup B, and a spring connected with the piston to keep the port closed, in combination with an air-tube leading from the port in cup B and an air-chamber, J, at the other end of the tube, the wall opposite that through which the tube enters consisting of a flexible diaphragm, a piston with one end secured to the diaphragm and the other end pivoted to one end of a lever fulcrumed in a shaft which is journaled in a supporting-frame, the other end of the lever having a segmental rack thereon which engages with a pinion mounted on a shaft journaled in said frame, a hammer attached to the pinion-shaft, a bell and a regulating device for holding the hammer under tension during a part of its upward movement, and then releasing the tension before the blow, said regulating device consisting of a lever having an upwardly-turned arm and a fulcrum at the bend, the lower arm carrying a weight and the upper arm having pivoted at its end a tripping-lever, one end of which acts as a trigger and engages with a tripping-rod projecting from the pinion-shaft, so that when the hammer rises the tripping-rod will engage with the trigger and tip the weighted bent lever on its pivot, thus holding the hammer under tension in its upward movement until the tripping-rod escapes the trigger, and when the trigger releases the tripping-rod the hammer completes its stroke with an impulse, substantially as described.

12. An automatic bell-ringing apparatus consisting of an air-pump composed of two metallic cups, one of which has a port connecting with an air-tube, a flexible cup-shaped diaphragm within said cup and clamped at its edge between the rims of the two cups, a piston working through a hole in the base of the second cup, the inner end of the piston being secured to the diaphragm, a stopper on the convex side of the diaphragm to close the port leading to the air-tube, a fragile connection of the piston with the piston of a similar pump in an adjoining car, a flexible hose-connection between the air-tubes of the two cars, and an air-chamber into which the end of the air-tube opens, said air-chamber having a flexible diaphragm connected with a bell, the bell being operated by suction of air from the air-chamber by means of the said pump, the hose-connection between the cars being so adjusted that the separating of the cars will cause the chain connecting the pistons of the pumps to pull the piston and ring the bell before the hose breaks, substantially as described.

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CHARLES PARENT.

Witnesses:
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