(No Model.) 6 Sheets—Sheet 1.

J. WAYLAND & J. S. BALDWIN.

AUTOMATIC SYSTEM FOR OPERATING SIGNALS, &c.

No. 428,579. Patented May 20, 1890.

Fig. 2a

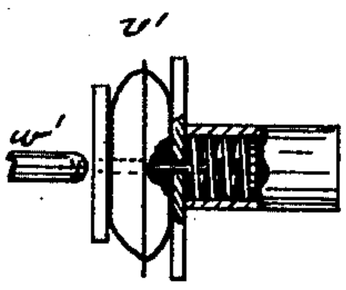
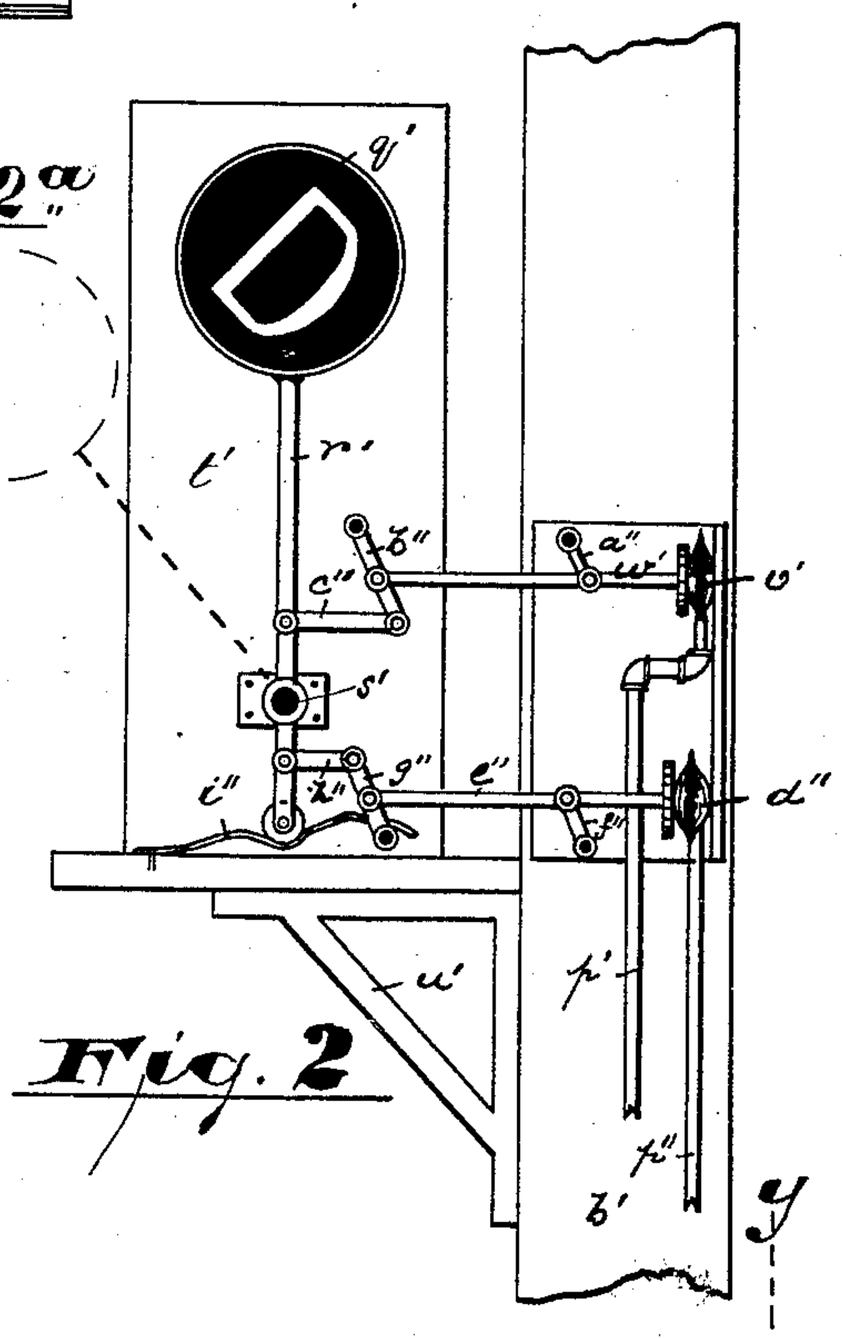


Fig. 2



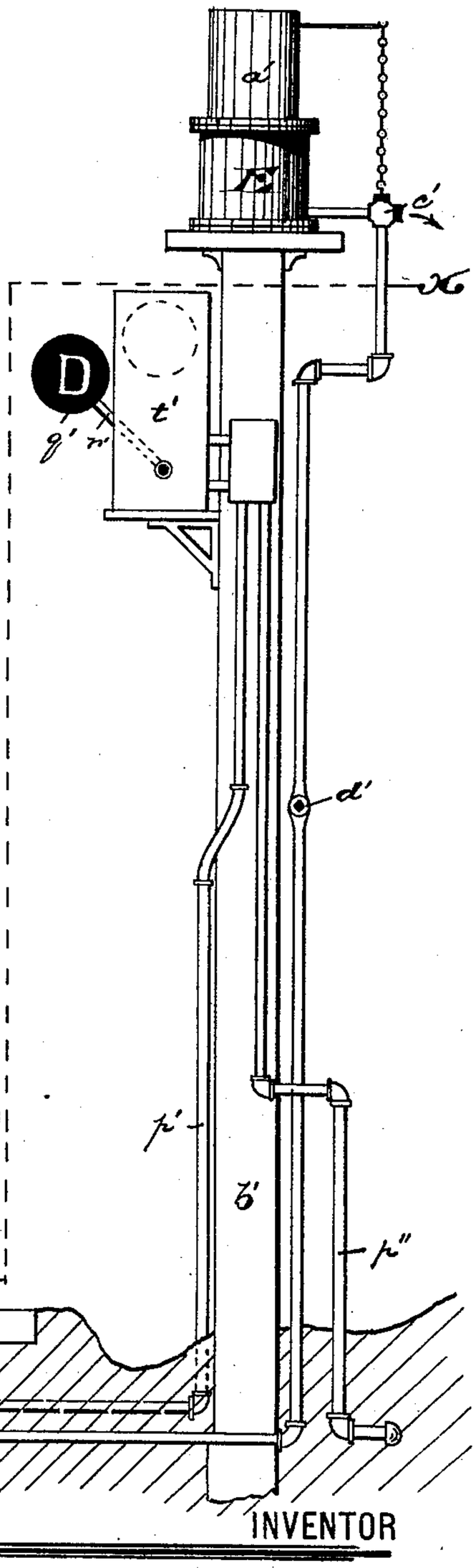
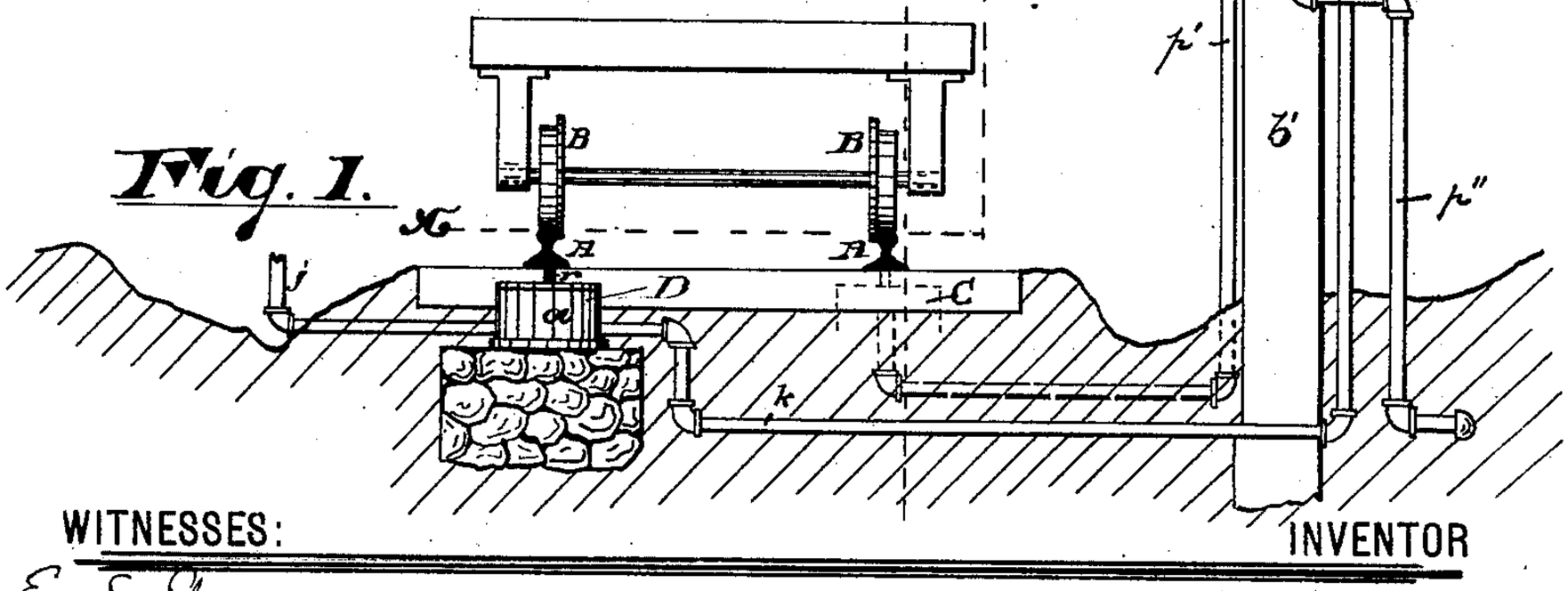


Fig. 1.



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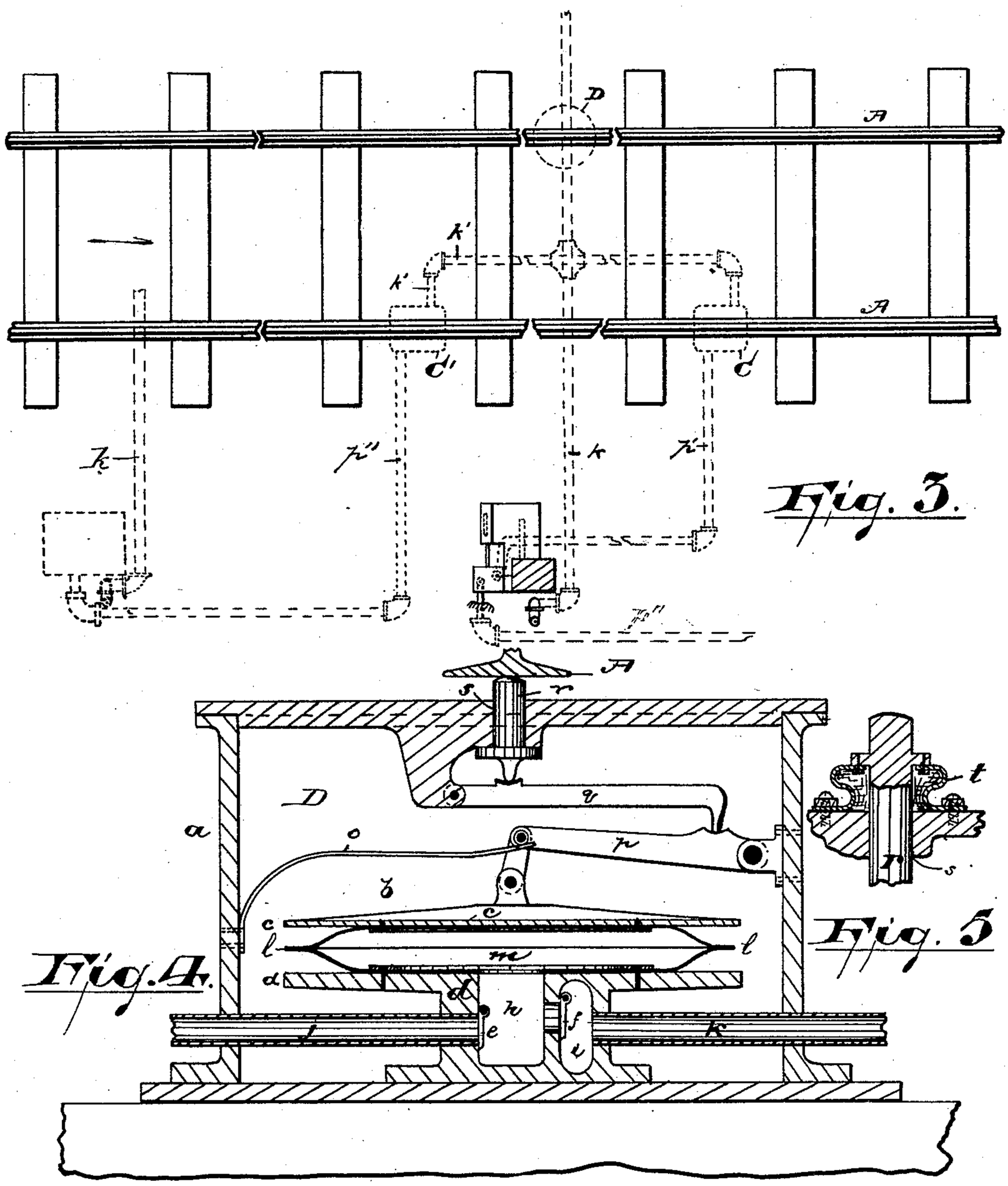

Fig. 3.

Fig. 4.

Fig. 5

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(No Model.) 6 Sheets—Sheet 3.

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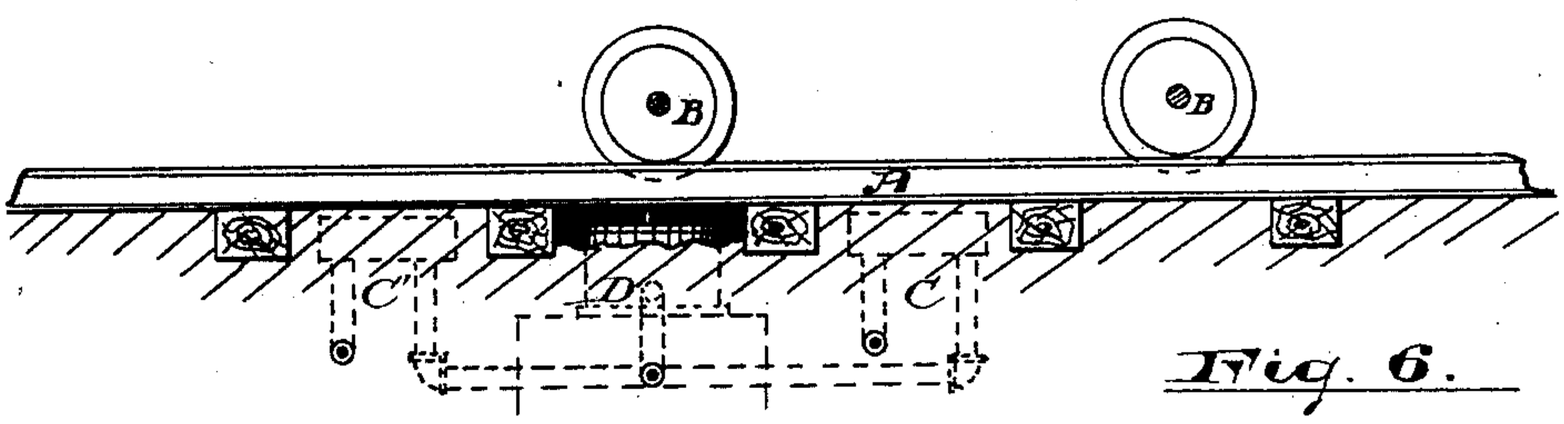

Fig. 6.

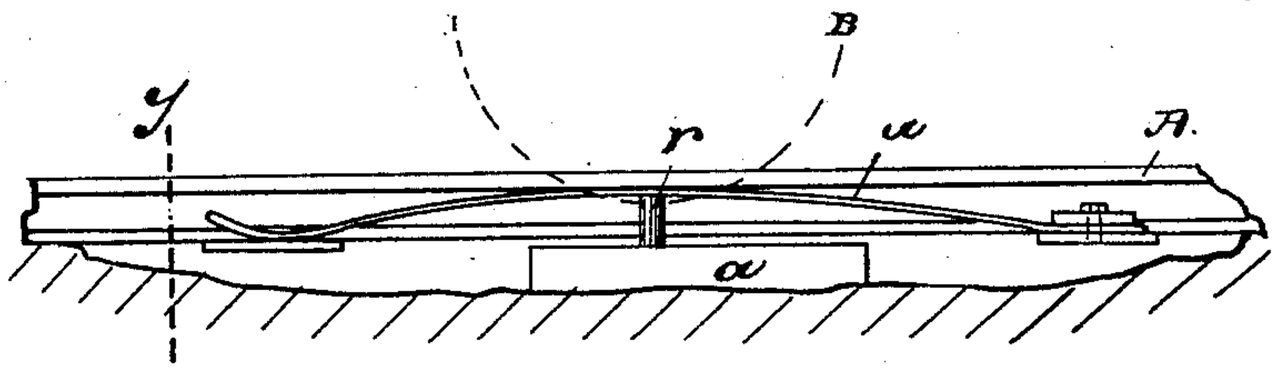

Fig. 7.

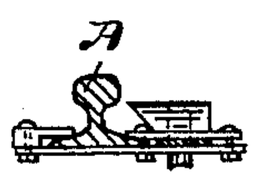

Fig. 8.

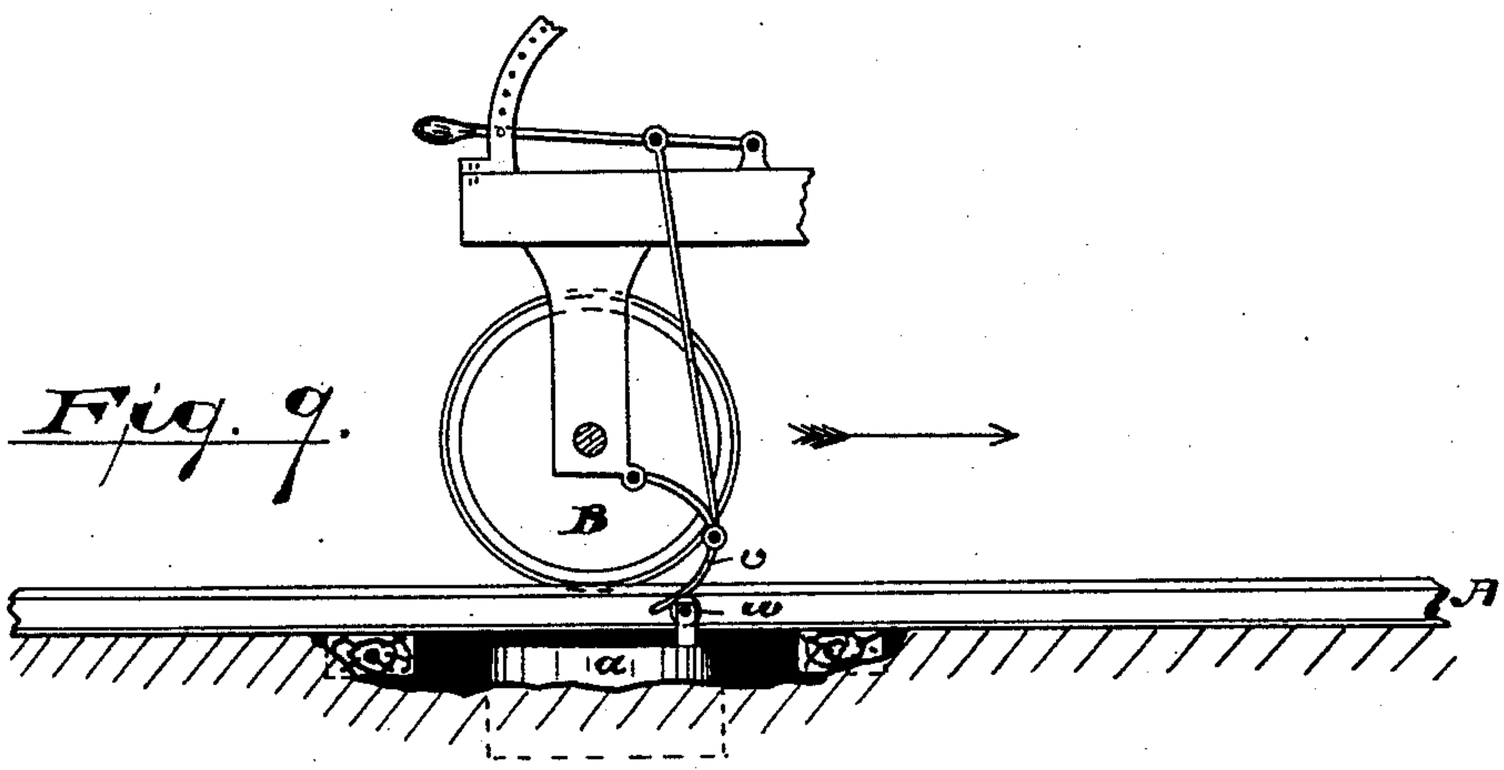

Fig. 9.

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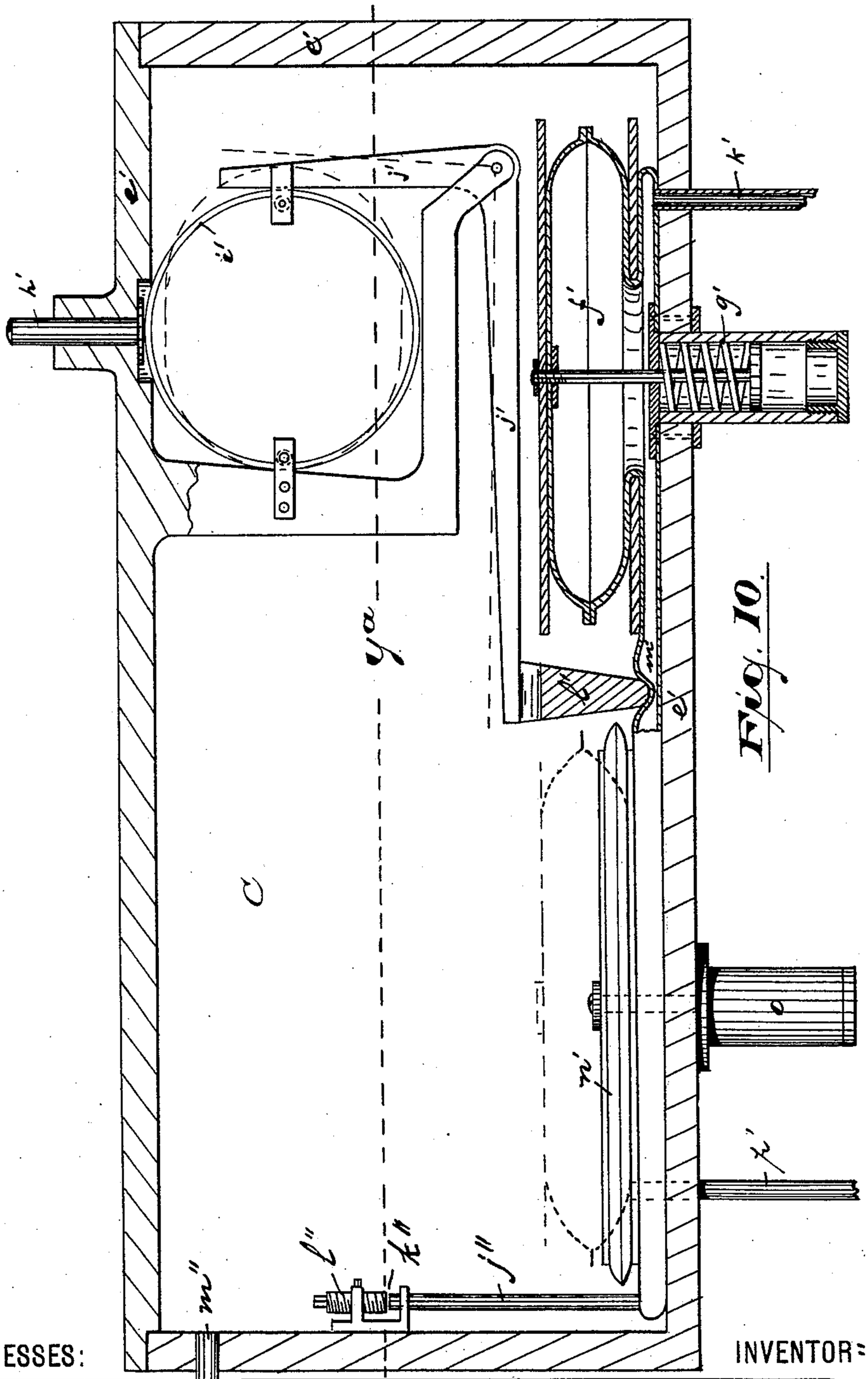

Fig. 10.

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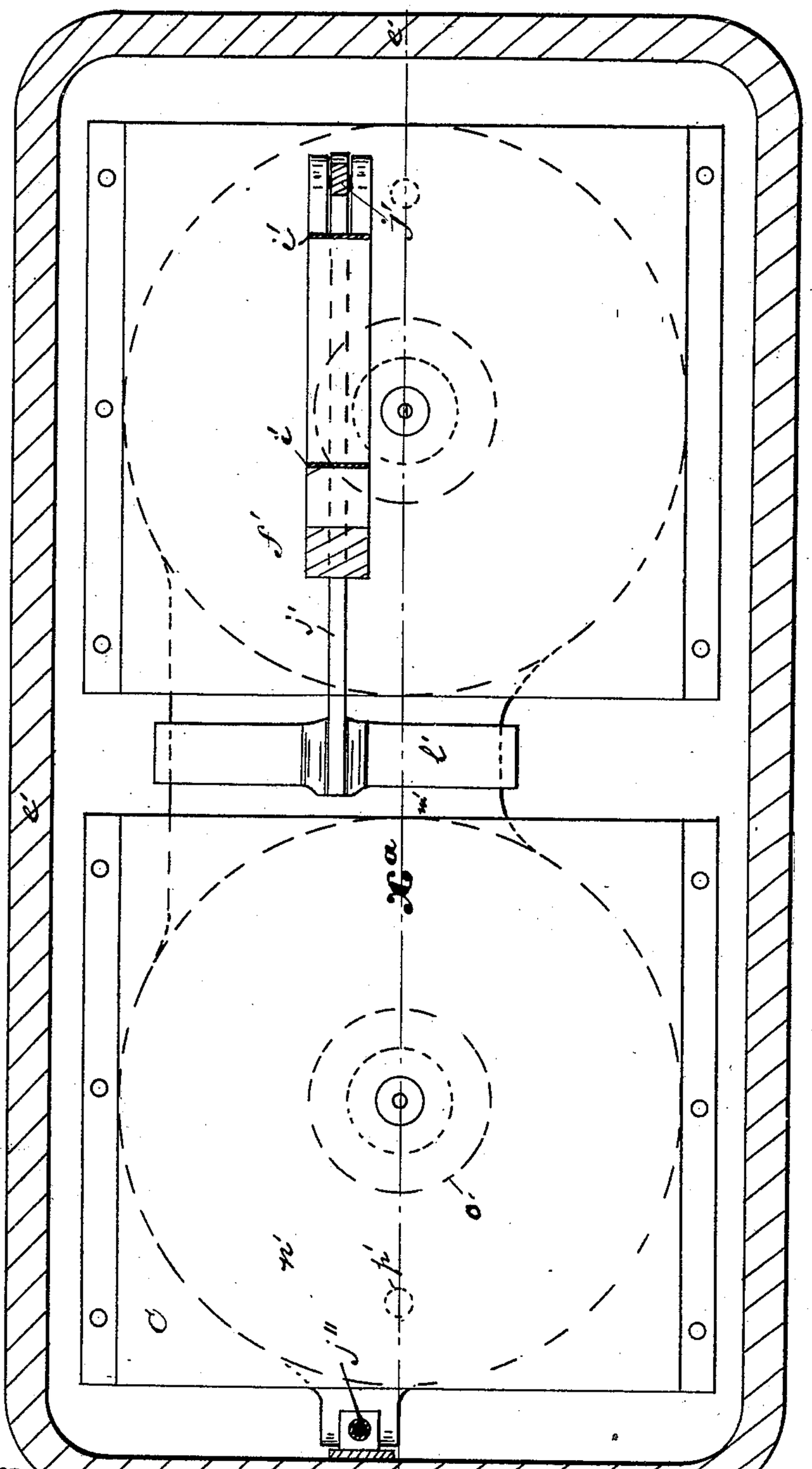

Fig. II.

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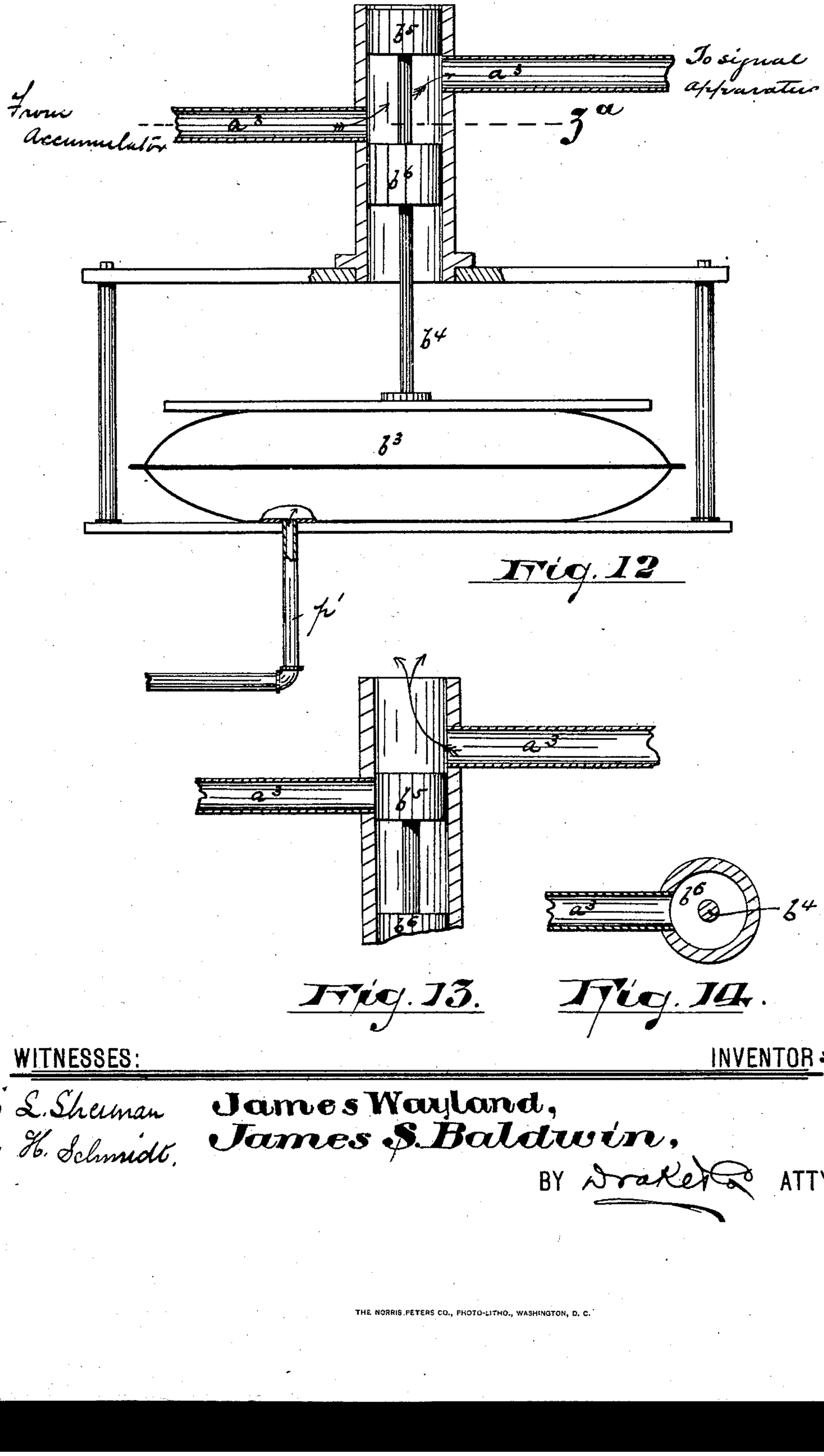

Fig. 12

Fig. 13. Fig. 14.

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UNITED STATES PATENT OFFICE.

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AUTOMATIC SYSTEM FOR OPERATING SIGNALS, &c.

SPECIFICATION forming part of Letters Patent No. 428,579, dated May 20, 1890.

Application filed June 25, 1889. Serial No. 315,517. (No model.)

To all whom it may concern:

Be it known that we, JAMES WAYLAND and JAMES S. BALDWIN, citizens of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Automatic Power Accumulating and Distributing Systems for Operating Signals and other Railway Accessories; and we 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.

Our invention relates to certain means and mechanisms whereby the pressure of a portion or the whole of the wheels of a locomotive or other railway-vehicle in passing a given point or points is caused to store up or accumulate a supply of fluid (either liquid or aeriform) under pressure, and to automatically apply said pressure to the working of signals, switches, gates, and other railway accessories.

By means of our improvements we secure results which cannot be obtained by the use of a sudden and violent impulse or by a succession of such impulses separately applied; but in our preferred system of blending a succession of such impulses into one of considerable power and duration we are enabled to direct said aggregate and collective force to any desired point with ease and certainty, thereby securing more effective results.

The invention consists in the combination, with a railway and its appliances or accessories—such as switches, signals, gates, &c.—of a pneumatic or other fluid conduit, and means for compressing the fluid contents of said conduit by the power derived from the passing or moving train or vehicle, and means for applying said compressed fluid to the said appliances or accessories to actuate or operate the same.

In its preferred form, so far as it affects the particular devices shown in the present case, the invention consists of a pump or pumps worked by the pressure of the wheel or the passage of a vehicle against the track or other suitable recipient of said pressure, an accumulator connected with said pump or pumps and adapted to receive and store up for use the air or liquid supplied by said pump, together with valves, pipes, bags, diaphragms, levers, and other suitable and efficient means of transmitting and applying and regulating the application of said power, all of which will be hereinafter more particularly described, and finally embodied in the clauses of the claim.

Referring to the accompanying drawings, embracing six sheets, in which like letters of reference indicate corresponding parts in each of the several figures, Figure 1, Sheet 1, shows in elevation and partial section a portion of a railway-track and road-bed in connection with a signal apparatus operative in accordance with our invention. Fig. 2 is an enlarged detail illustrating more clearly a system of levers, &c., for operating the signal-disk; and Fig. 2^a is a detail showing, on a still larger scale, the means for applying the compressed fluid to operate the said levers. Fig. 3, Sheet 2, is a plan of the track and section of the signal, taken on line x of Fig. 1. Fig. 4 is a central vertical section designed to illustrate an automatic air-pump adapted to receive the pressure induced by the passing train or vehicle over the railway. Fig. 5 illustrates a method which may be employed for preventing dirt or moisture from gaining access to the pump mechanism. Fig. 6, Sheet 3, is a section taken on line y, Fig. 1. Fig. 7 is a detail showing a modification in the method of applying the pressure of the car-wheel to the pump. Fig. 8 is a transverse section taken on line y of Fig. 7, and Fig. 9 illustrates another method of applying the pressure of said car. Fig. 10, Sheet 4, is a vertical section and partial elevation of a power-transferring device, the section being taken at line x^a, Fig. 11; and Fig. 11, Sheet 5, is a horizontal section and partial plan of of the same, taken at line y^a, Fig. 10. Fig. 12 is a detail section showing a modification in the method of transferring power. Fig. 13 is a portion of the same, showing a valve in a different position; and Fig. 14 is a section taken on line z^a, Fig. 12.

In said drawings, A indicates the track or

rails over which the train is adapted to pass, said rails being arranged on ties and ballast in any usual manner. B indicates a wheel of a car or vehicle moving over said rails and adapted by its pressure to cause the compression of air or other fluid, the latter being applicable to the operation of a signal, gates, switches, or other accessories of a railway. In the present application we have illustrated only a signal in connection with the means for compressing and applying the air or fluid.

D is a pump or fluid-compressor arranged adjacent to and preferably beneath the rail, as shown in Fig. 1, which said pump is operated by the passing train and preferably by the wheels, which slightly spring or depress the rails so that they operate on the pump mechanism to compress the air therein. The location of the fluid-compressor or pump with relation to the track is shown more clearly in Figs. 3 and 6, and its construction or one of its forms of construction is shown in Fig. 4, in which *a* indicates a box made of cast or sheet metal, preferably gray iron, having therein a bellows-like structure *b*, of which *c d* are separable plates, one of which has a fixed relation to the box and is provided with suitable pump-valves *e f* and chambers *h i*, adapted to allow of the introduction of air from a pipe *j* at a normal pressure and the escape of said air to an accumulator E through a pipe or conduit *k*, as will be hereinafter more fully explained. Between said separable plates is secured a flexible bag *l*, made of rubber, canvas, or any other suitable material or fabric forming an air-receptacle *m*, having communication with the chamber *h*. The plate *c* is caused to move to compress the air under the influence of the passing train, contracting the chamber *m*, so that the air therein is forced into the chamber *h*, and from thence through the valve *f* into the conduit *k*. A return movement of the plate *c* is secured by means of a spring *o*, placed either within the chamber *m* or outside thereof, as shown. Said spring inflates the bag *l* and draws a fresh supply of air from the outer atmosphere through the conduit or pipe *j*, the valve *f* then being closed by the pressure of air in the conduit *k*. The movable plate is more or less closely connected with the rail to receive the motion produced by the passing train. The slight motion of the rail is preferably increased or multiplied by levers *p q*, which receive the power from the rail through the intervention of a repression-pin *r*, which extends up through a perforation *s* in the top of the box into engagement with the rail, as shown in Fig. 4. The repression-pin may be provided with a suitable packing or guard *t*, Fig. 5, adapted to prevent moisture or dirt from entering through the perforation *s*. The repression mechanism may receive its movement directly from the wheel, as in the manner shown in Fig. 7, where the pin *r* is covered by a spring *u*, having opposite inclines, which engage the flange of the wheel. By this construction the movement will be gradual, as will be understood.

The pump may be operated by other portions of the passing car or train than the wheels, as indicated in Fig. 9, where *u* indicates a depending spring-arm especially constructed to engage the repression-pin. When this is employed, the said repression-pin may be provided with an anti-friction roller *w*, or other means may be employed to reduce friction and to secure a positive, yet easy, stroke of the repression-piece. By means of a succession of strokes of the repression-piece a considerable quantity of air may be pumped through the duct or conduit *k* to the accumulator E, where it is stored up ready for use. The accumulator consists of a tank having a weighted piston *a'*, working somewhat after the manner of an ordinary gasometer, the piston serving to regulate the pressure. Said accumulator may be arranged adjacent to the road-bed on the post *b'* or in any other suitable position. A safety-valve *c'* may be employed adapted to allow the escape of air should the supply be superabundant. The pipe *k* may be provided with a suitable stop-cock or valve *d'* for use in preventing a loss of pressure in the event of an accident and repairs being desired. The pipes *k* and *p'* connect at the double + joint shown in Fig. 3, so that communication is open between the two.

To enable the cars to release a certain quantity of air sufficient to work the signal-gate or other accessories to which the invention may be applied, I have provided releasing mechanism C C', adapted to be acted on by the moving train. In Fig. 10 is shown one form of said mechanism which may be employed. Said mechanism consists of a box *e'*, similar in construction to the box *a*. Said box is provided with a storage-reservoir *f'*, which has communication with the accumulator E through the ducts *k' k'*, Figs. 3 and 10. Said storage-reservoir consists of a bellows-like structure, which is held normally inflated by the pressure of the fluid therein contained. On the release of the body of air therein a spring *g'* serves to contract the bellows and to force the air from the reservoir.

The release of air is accomplished by means of a repression-piece *h'*, adapted to be operated upon by means of the passing train either directly or indirectly. It may be accomplished by said repression-piece operating on a spring *i'*, which in turn operates a lever *j'*, having a presser-bar or tongue *l'*, which normally closes the broad flexible exit *m'* from said reservoir, as will be understood upon reference to Figs. 10 and 11.

The repression-piece *h'* may be connected with mechanism for operating a valve of any other construction. On the opening of the valve formed in the passage *m'* the air rushes into a bellows-like chamber or receptacle *n'*, first inflating the same against the power of a spring similar to the one marked *g'*, but not

of the same power, the said spring being contained in the receptacle *o*. The said air then passes off through the conduit *p'* and operates the signal *q'* either to expose the disk or to conceal the same, or otherwise indicate the relative position of the train.

For the purpose of illustration let us assume that the pressure of the air in the accumulator E or other source of supply is at twelve pounds per square inch, that imposed by spring *g'* on the contents of the bag *f'* during its period of inflation from ten to twelve pounds, and the tension on the bag *n'* during its inflation at from eight to ten pounds. Under these conditions it is obvious that the bag *f'* will be inflated by the accumulator-pressure, and that through the free channel provided when the valve in the duct *m'* is open the contents of said bag *f'* will be promptly transferred to the second bag *n'*, raising or inflating the same against the power of its spring. The communication between the accumulator E and the bag *f'* being at all times open, the latter will fill immediately after it is emptied and will soon be ready for another transfer, as described. As the train travels forward, it first engages the releasing device C', by which compressed fluid stored therein is released and allowed to pass through the duct *p''* to reset the rear signal or to conceal or cover the danger-disk thereof, so that a following train may continue its progress, knowing the road to be clear, or persons crossing the road may do so without fear of the train. The wheel or other part of the train then engages the pumping mechanism at D, forcing air or other fluid into the accumulator E and storage-reservoirs, such as *f'*. Continuing its movement, the train engages a second releasing mechanism C, similar in construction to the device C', and enables the compressed air to pass through the duct *p'* to the adjacent signal to set or expose the same, as in Fig. 1, to prevent a following train from entering a block, or when the signal-station is situated forward of the said releasing mechanism C to enable persons to know that the train is approaching the crossing.

Various means may be employed to enable the released air still remaining under compression to operate the signal. One form of construction is shown in Fig. 2, in which the signal-disk *q'* is shown to be secured on a lever *r'*, fulcrumed at *s'* in a suitable box or disk-receptacle *t'*, carried on a bracket *u'*, secured to the post *b'*.

In connection with the duct *p'* is a bag or bellows *v'*, adapted to be inflated by the compressed air on its being released by the train at C. The inflation of the bag or bellows operates a system of rods and a lever *w' a'' b'' c''* to throw the lever *r'* forward and expose the signal-disk. To reverse the action of the disk, the air released at C' and passing up through the duct *p''* inflates the bag *d''* and operates the parts *e'' f'' g'' h''*. A spring *i''* acts to steady the movement of the lever *r'* and hold the signal in position after the air within the part *v'* or *d''* is exhausted. After the signal-disk or other accessory of or appliance to the railway to be operated has been propulsed by the compresed air confined within the structure *n'* and *v'* or *d''* the said air is allowed to escape gradually, so that the pressure thereof cannot counterbalance the pressure of the air acting to operate and reciprocate the signal or other appliance. To this end we have provided a blow-off pipe or vent *j''*, which communicates with the chamber within the structure *n'*, which vent is open at *k''* and allows the gradual escape of air, the rate of escapement being regulated or controlled by a stopper *l''* in any suitable manner. The air may escape from the box *e'* by means of an exit *m''*, opening to the outer atmosphere beyond the reach of dust, and so as to prevent moisture from entering therethrough.

We are aware that many variations or changes may be made in the construction of the apparatus herein described without departing from the spirit, pith, and scope of the invention. For example, while we consider the use of the accumulator and reservoir closely adjacent to the signal or part to be operated very desirable under some circumstances, the compressed air may be applied without intervention. Should the storage-reservoir *f'* be dispensed with for any reason, the valve in the duct *m'*, Fig. 10, would still permit of the air passing to the desired point of application, but with less perfect results, although on short lines the said reservoir may be dispensed with, and yet very effective results be secured. Again, that which we have termed the "accumulator" may be dispensed with and the fluid be pumped directly into the reservoir near the point of application to the means for working the appendages referred to. Should we desire to secure a more free and copious passage of air from the accumulator or other reservoir for compressed air than can be transmitted through the pipe *p'* to the bellows *v'* of the signal, we may arrange in connection with the bellows or structure *n'* or other portion of the apparatus a valve adapted to open or close a large duct a^3, leading directly to the signal-operating apparatus from said accumulator. Said valve is operated by a bellows or inflatable structure b^3 by air supplied through pipe or duct *p'*. To said bellows b^3 is attached a piston b^4, on which heads b^5 b^6 are arranged. On the introduction of air to the pipe *p'* the bellows b^3 are inflated and the passage or duct a^3 opened, so that a large quantity of air is transmitted directly from the accumulator to the means for operating the signal or appliance. On the collapse of the bellows the piston-heads assume the positions shown in Fig. 13, in which the duct from the accumulator is closed and the air from the signal apparatus is allowed to escape or return to normal pressure. It will be thus clearly apparent that to meet peculiar

conditions the construction may be varied and well-known valves and other mechanisms be employed in substitution for those shown.

Having thus described my invention, what I claim as new is—

1. The combination, with a pump adapted to be applied to a track or way to be actuated by the passing train, of an accumulator having communication with said pump, and a compressed-air releaser also applicable to said track or way to be engaged or operated by the passing train or vehicle for the purpose of operating an appendage or accessory of said track or way, substantially as set forth.

2. In combination with a railway-track, a pump D, accumulator E, duct *k*, reservoir *f'*, duct *k'*, air-passage *m'*, closed by a suitable valve adapted to be operated by the train or vehicle, inflatable bellows or inflatable structure *n'*, duct *p'*, bellows or inflatable structure *v'*, connected to and operating a signal, and said signal, said parts being arranged and adapted to operate substantially as and for the purposes set forth.

3. The improved railway and signaling system thereof herein described, combining with the railway-track an accumulator for gradually storing up compressed air, a pump for forcing air into said accumulator automatically by the power exerted by the passing train, an expansible vessel controlled by a spring of a given degree of power, a duct for conveying the air from said accumulator to said vessel, a second expansible vessel controlled by a spring of lower power than the first said spring, and a valve-duct connecting the first said vessel with the second, the valve of said duct being adapted to be operated upon by a passing train to release the air in said first vessel and allow a transmission of the same to the second vessel, and a duct for transmitting the released air to the signal or appendage, and said signal or appendage, substantially as set forth.

4. In combination, a flexible tube, a bar to press therein, and a compression-pin arranged to be operated by the passing vehicle to automatically relieve the pressure on said bar and permit the passage of fluid through said flexible tube, substantially as and for the purpose set forth.

5. In combination with a track or way, a flexible tube, a tongue or bar for closing the same, and means, substantially as described, for operating said tongue under the influence of a passing train, substantially as and for the purpose described.

6. In combination with a track and suitable storage-reservoirs, a flexible tube or duct *m'* and a tongue or bar adapted to be operated upon by a passing vehicle for opening said duct, substantially as and for the purposes set forth.

7. In combination, in a pneumatic device for operating a signal or similar railway appliance, a bag or similar inflatable vessel *f'*, adapted to receive air or other fluid under pressure from a suitable source, a second inflatable vessel *n'*, connected by a suitable duct *m'* with the first said vessel, and provided with a suitable outlet *p'*, whereby the air or fluid is conducted to the said signal or appliance to operate the same, and a valve for opening and closing communication through said duct *m'*, whereby air gradually accumulated in the first vessel may be transmitted to the second vessel, and from thence to the signal or appliance, substantially as set forth.

8. In a pneumatic device for operating a signal or similar railway appliance, in combination with vessels *n' f'* and duct *m'*, a repression-piece *h'*, spring *i'*, lever *j'*, and valve for closing said duct, substantially as set forth.

9. In a pneumatic device for operating a signal or similar railway appliance, the combination, with inflatable bags or vessels *n' f'*, of a flexible tube or duct *m'*, a bar *l'*, for closing said tube or duct, a lever *j'*, spring *i'*, and repression-piece *h'*, arranged substantially as and for the purposes set forth.

10. In combination with the railway-track and its appliance, the accumulator or reservoir communicating with said appliance, a pump combining with a repression-piece *r* levers *p* and *q*, and an inflatable bag *l*, interposed between suitable plates and valves *e* and *f*, and an inlet for air at normal pressure and an outlet for compressed air, substantially as set forth.

11. In a pneumatic device, substantially as set forth, the combination, with a railway-track and a pump arranged adjacent thereto, of a repression-piece *r* and a packing *t*, adapted to prevent the introduction of dust or dirt to the working mechanisms of said pump, substantially as set forth.

In testimony that we claim the foregoing we have hereunto set our hands this 11th day of June, 1889.

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JAMES S. BALDWIN.

Witnesses:
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