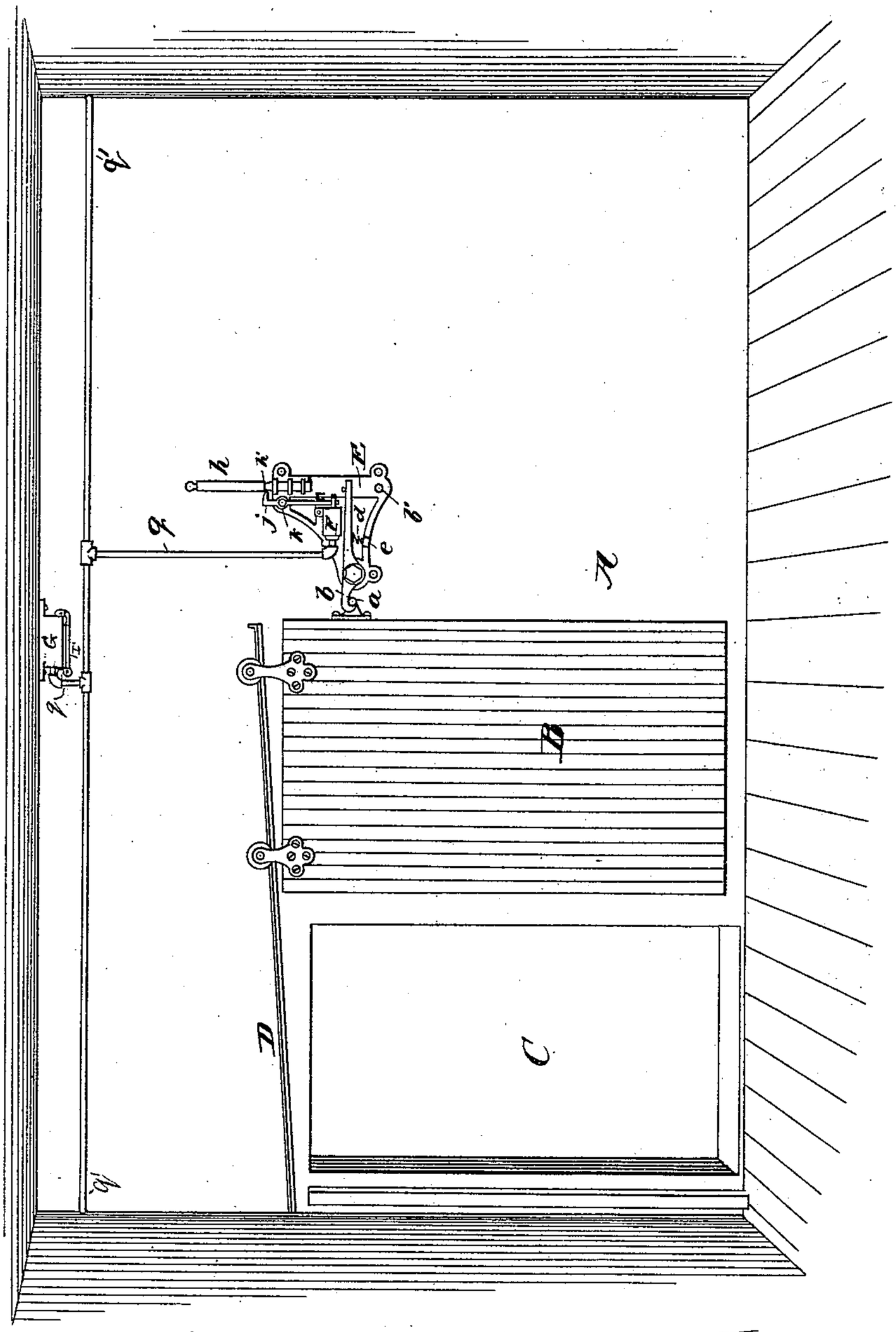
(No Model.) 3 Sheets—Sheet 1.

C. A. TUCKER.

PNEUMATIC APPARATUS FOR OPERATING DOORS.

No. 446,195. Patented Feb. 10, 1891.

Fig. 1.



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(No Model.) 3 Sheets—Sheet 2.

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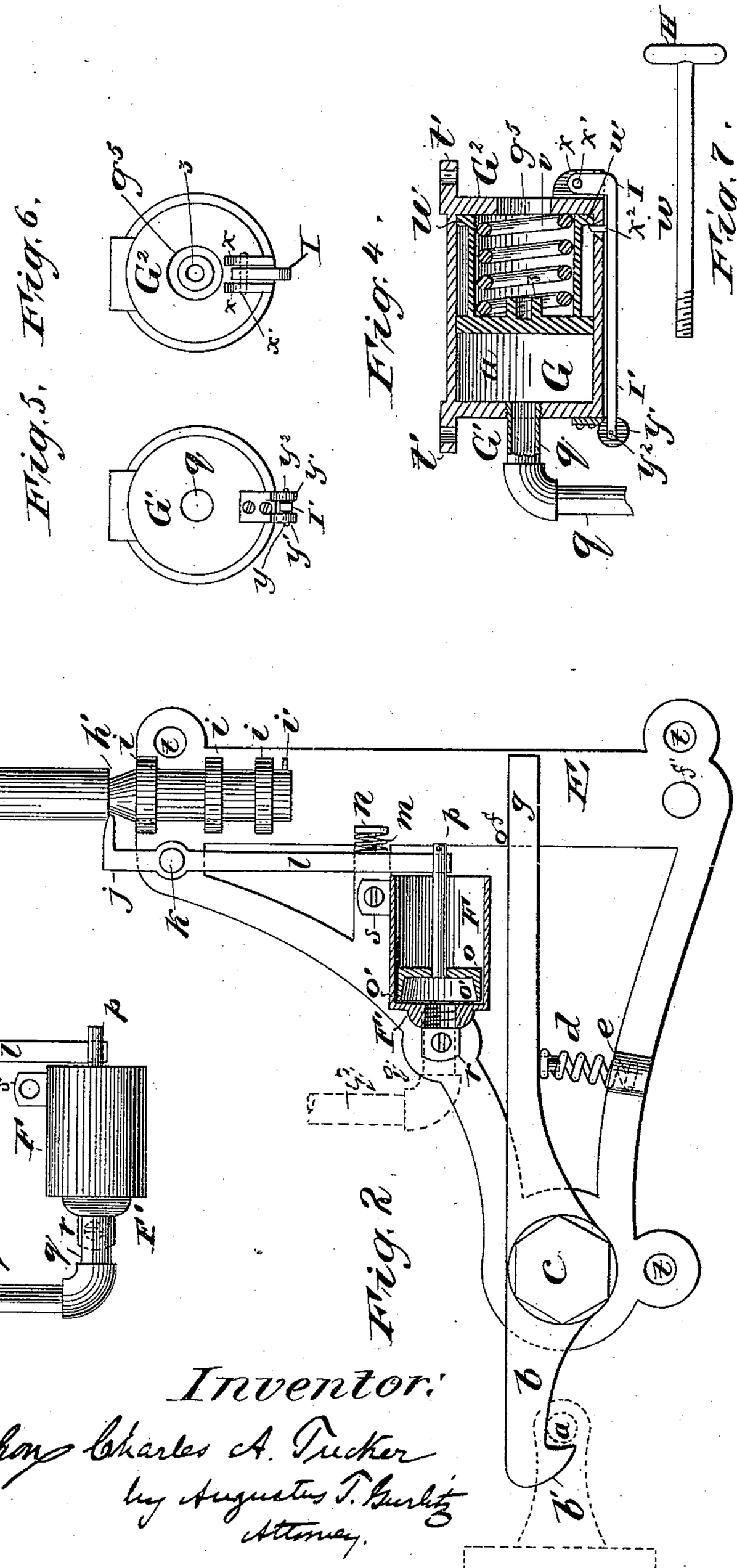

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(No Model.) 3 Sheets—Sheet 3.

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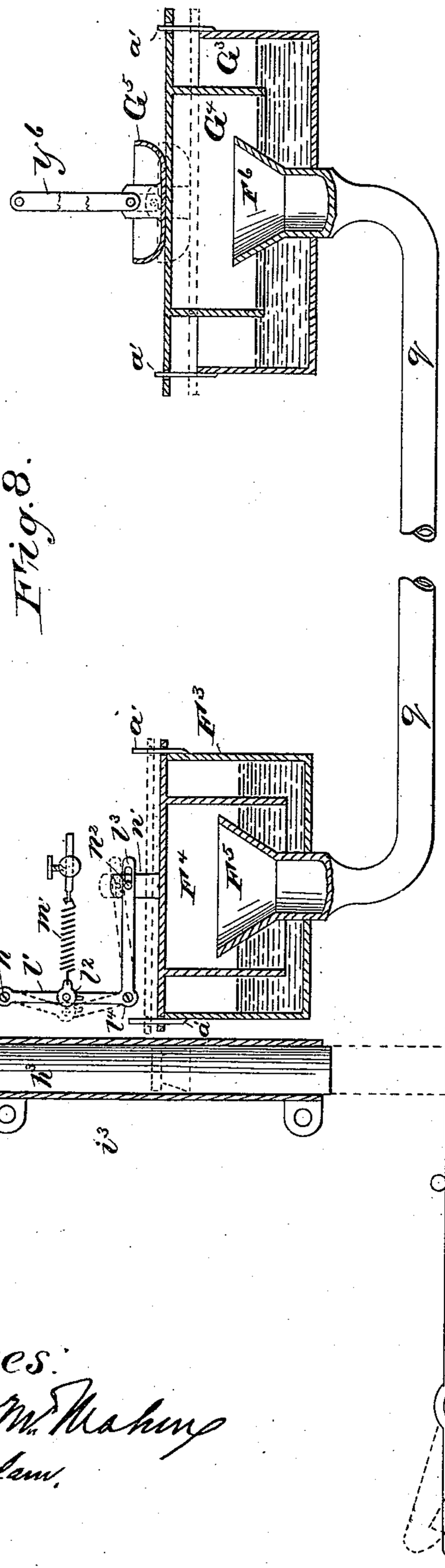

Fig. 8.

Fig. 9.

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UNITED STATES PATENT OFFICE.

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PNEUMATIC APPARATUS FOR OPERATING DOORS.

SPECIFICATION forming part of Letters Patent No. 446,195, dated February 10, 1891.

Application filed April 26, 1890. Serial No. 349,593. (No model.)

To all whom it may concern:

Be it known that I, CHARLES A. TUCKER, a citizen of the United States, residing in East Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Pneumatic Apparatus for Operating upon Doors and other Closing Devices; and I do hereby declare that the following is a full, clear, and exact description of the invention, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

The object of this invention is a very simple device especially fitted to act upon doors, &c., in buildings pneumatically in such manner that when the door has been arranged in the desired position, either open or closed, the catch or bolt can be operated from a distance, by means whereof doors may be disposed to open or close automatically when free, and by the use of my invention may be released to operate according to such disposition.

In the drawings, Figure 1 shows a door provided with one example of my invention disposed so that by means of my invention the door may be closed automatically. Fig. 2 is an enlarged view of the locking device with its weight, the pneumatic chamber F being shown in section. Fig. 3 is a plan view of the pneumatic chamber F and its connections corresponding to the view in Fig. 2. Fig. 4 is a section of the pneumatic chamber G. Fig. 5 is an end view of the discharging-head G′ of the chamber G. Fig. 6 is a plan view of the head G^2 of the chamber G. Fig. 7 is a plan view of the handle H. Fig. 8 is a plan view of another example of my invention in which a pair of pneumatic chambers or cups are disposed to act upon the releasing-weight. Fig. 9 is a top view of the cover of the cup F^3. Similar letters of reference indicate like parts in all the drawings.

A is the wall of a room.

B is a door adapted to close the opening C. The door B is hung in a suitable manner to move upon an incline D, so that when it is at a high point of the incline it will close its opening C automatically when free to act.

On the edge of the door B a suitable engaging-hook *a* is to be attached to engage with the catch-lever *b*. The edge *b′* of the catch-lever *b* may be sloped or curved, so that when the door, and with it the hook *a*, are moved back against the edge *b′* the hook *a* will strike against that edge, throw up the end of the catch-lever, and pass under it and into engagement therewith.

E is a suitable frame upon which the parts shown in Fig. 2 may be conveniently mounted, and it may be secured to the wall by means of screws through the holes *t t*. The catch-lever *b* is pivoted to such frame at *c*. A spring *d*, resting in a projection *e* of the frame E, acts to throw up the long arm *g* of the catch-lever *b*, its upward movement being limited by the pin *f* and its downward movement by the pin *f′*. Above the end of the long arm *g* of the catch-lever *b* a weight *h* is disposed to slide in guides or rings *i i*, which are also attached to the frame E. The weight *h* may consist of a suitable rod of metal provided with a shoulder *h′*, conveniently made by cutting away a portion of the rod or weight *h*. A weight-support *j* is pivoted to the frame E at *k*, and a long arm *l* extends from the pivot *k* and against a spring *m*, held in place by a projection *n* on the frame E, the parts being so arranged relatively to each other that the spring *m* will push the arm *l* away from the weight *h* and the support *j* against that weight, so that when the weight is raised up the end of the support *j* will bear against it and be forced under the shoulder *h′* to hold up the weight *h* in the position shown in Fig. 2. The top of the top ring-guide *i* may be countersunk to prevent the shoulder *h′* engaging with it and retarding the downward movement of the weight.

For actuating the weight-support a pneumatic chamber F is employed, which is shown in section in Fig. 2 and in plan in Fig. 3. In this example of my invention this pneumatic chamber consists of a tube open at one end, provided with a trunk-piston *o* and piston-rod *p*. The trunk-piston *o* is a light disk fitting snugly in the chamber F, but not too tightly to move easily therein, having a projecting rim *o′* fitting against the inner face of the chamber, which provides an enlarged bearing-surface for the edge of the piston against the inner face of the chamber F to steady and keep it true in its movement. The piston-rod *p* has a short longitudinal slot at its outer end

to take in the lower end of the arm *l* of the weight-support *j*, such slot being only long enough, however, to permit the lower end of the arm *l* to set far enough from the path of the weight to permit the support *j* to enter under the shoulder *h'* of the weight, and so that the edge of the arm *l* will abut against the end of such slot when the support *j* is under the shoulder *h'*. It is evident that if the piston *o* is moved toward the open end of the chamber F, which will push out the piston-rod *p*, that rod will push the arm *l* toward the path of the weight, thereby withdrawing the support *j* from the shoulder *h'* and allowing the weight to fall. The weight *h* will then pass through its guides *i i*, strike the long arm *g* of the catch-lever and force it down until it and the weight rest upon the pin *f'*, and so release the door B, which will move down its incline D and close the opening C. A pin *i'* may be attached to the lower end of the weight *h*, if desired, to prevent it being drawn out of its guides when it is lifted up.

The closed end of the pneumatic chamber F is provided with a suitable head F', to which is fitted a pipe *q*. The chamber F may be held in place (attached to the frame) E by means of lugs *r s*, or may be screwed to the frame E in any suitable manner to keep these parts securely in position. If desired, of course I may attach all the parts directly to the wall and omit the frame E; but by the use of such a frame the parts can all be very conveniently mounted and more readily and accurately secured in place and with much less trouble than when they are to be separately fitted to the wall.

For operating the piston *o* and therewith its rod *p* in this example of my invention, I provide a pneumatic chamber G, which is a cylindrical chamber larger than the chamber F, and is shown in section in Fig. 4 and in end views in Figs. 5 and 6.

G is a cylindrical chamber having heads G' G^2 and a disk *u* fitting snugly therein and operated by a strong spring *v*. The spring *v* is disposed in a case or cup of which the disk *u* forms the bottom, and the spring acts against the inner side of the head G^2 of the chamber G and against the disk to drive the disk *u* to the inner side of the head G' when the spring is free to act. The disk *u* is to be provided with a handle H to pull it toward the head G^2 against the action of the spring *v*. This can be conveniently done by means of a teat *z*, screw-threaded, into which the stem *w* of the handle H, Fig 7, is screwed, and the stem *w* passes through a hole g^5 in the head G^2 large enough to admit abundant air into the spring-cup and prevent any retarding vacuum when the disk *u* is driven forward. The head G' is fitted with a pipe and connects with or is a part of the pipe *q*, carried to the chamber F, as already described.

To the outside of the head G^2 of the chamber G suitable bearings *x x* are attached, and to these a lever I is pivoted by the pin *x'*. This lever rests against the outside of the lower face of the case G when the apparatus is set, and is provided with a tooth x^2, which passes through a hole in its path into the case G and there impinges against the rim *u'* of the cup containing the spring *v*. The outer circumference of this rim *u'* is of the same size as the disk *u* and fits snugly against the inner face of the chamber G, the disk *u*, rim *u'*, and the tubular part or cup inclosing the spring *v* thus forming a trunk-piston. When the disk *u* is drawn by the handle H toward the head G^2 until the rim *u'* abuts against the inner face of the head G^2 and the lever I is raised up parallel with and against the lower outside face of the chamber G, the tooth x^2 will project into that chamber, impinge against the rim *u'*, and hold the disk in position at its farthest point from the head G' against the action of the spring *v*. The lever I is made of metal and of sufficient weight to have its free end drop by its own weight, swing in the pivot *x'*, and draw out the tooth x^2 from engagement with the rim *u'*, and thereby to release the spring *v*, which will then drive the disk *u* with force and suddenly against the inner face of the head G', expelling the air in the chamber G and driving it through the pipe *q* into the chamber F and against the piston *o*, thereby driving that piston and its rod *p* outward, releasing the weight *h*, &c., as already described. By arranging the fulcrum of the lever I above the plane of engagement between the tooth x^2 and the rim *u'* the pressure of the spring aids in forcing the long arm I' of the lever I downward, and by such arrangement less weight is required in the lever itself for that purpose. To hold the free end I' of the lever I in position against the chamber G, and thereby to compress the spring *v*, as already described, suitable supports *y' y'* are attached to the head G', between which the end I' of the lever rests. The free end of the lever has a hole y^2 passing through it transversely, and corresponding holes are provided in the supports *y' y'* to receive a suitable detent or pin *y*, which holds the parts in place. This detent is conveniently made in the form of a pin *y*, of such sensitive material as will become flexible or lose its retaining power when a certain degree of temperature is reached, and it may be made of fusible alloy made fusible at the temperature desired to set the apparatus in action, which will be about 120° for general use, and when that melts the free end I' of the lever is released, drops down, releases the spring *v*, and the apparatus performs its work.

The ram G may be secured on or near the ceiling of the room by means of suitable lugs *t' t'*, and it may be disposed to discharge into a horizontal pipe *q'*, which may run through a number of rooms and have vertical branches running to a series of chambers F. In this way a number of doors, &c., may be connected, and all in the series will be operated

by the releasing of the mechanical driving part of any one ram in the series.

Fig. 8 is a plan view of another example of my invention. In this the pneumatic chamber F^3 consists of a cup partially filled with glycerine and another cup F^4, inverted, extending into the glycerine. A pipe q, terminating in a mouth-piece F^5, which extends above the level of the glycerine, enters the cup F^4 through the bottom of the cup F^3. A weight h^3 is disposed in a guide i^3 to act upon the free end g of the catch-lever b. The weight is provided with a shoulder h^4 and has a support j', pivoted at k'. It has a stem l', with a knee-joint l^2, and a spring m', disposed to draw the knee-joint into a vertical position. The lower arm of the knee-joint is pivoted at l^4 and ends in a lever l^3, which is attached to an upright n', projecting from the cup F^4, by means of a pin n^2, passing through a suitable slot. When the cup F^4 is at its lowest point in the cup F^3 and the weight h^3 is raised up and its support j' in engagement with the shoulder h^4, the spring m' draws the knee-joint into line, and thus supports the weight; but when air is forced into the cup F^4, and that cup is raised up, as indicated by the dotted lines, the long end of the lever l^3 is forced upward and the knee-joint l^2 is forced toward the weight against the action of the spring m', and the weight-support j' is withdrawn from the shoulder h^4, leaving the weight to drop, as in the other instance of my invention. For forcing the air into the cup F^4 a ram is provided similar to that already described, but larger. G^3 is a cup partially filled with glycerine. Another cup G^4, inverted, extends into the glycerine. A mouth-piece F^6 from the pipe q extends through the bottom of the cup G^3 above the level of the glycerine and into the cup G^4. To the top of the cup G^4 a tray G^5 is attached, which may be filled with shot, &c., to give it weight. A rod y^6, of suitable fusible alloy, is secured to the upper part of the room or ceiling and supports the cup G^4 and weighted tray G^5. When the fusible alloy melts, the cup G^4 is released, and the weighted tray bearing down upon it drives it with force downward and into the glycerine. The air therein is driven through the mouth-piece F^6, pipe q, and mouth-piece F^5 into the cup F^4, which is thereby raised, raising with it the lever l^3 and releasing the weight, as before explained.

Fig. 9 is a top view of the cup F^4. The ends containing the pins a' a' extend beyond the outer cup, and these pins retain the inverted cup in position. The top of the cup G^4 is similar, but larger, and in place of the upright n' is provided with the tray G^5, &c.

Neither the piston o in the chamber F nor the disk u in the chamber G nor the cups F^4 and G^4 in the glycerine form absolutely air-tight connection; but enough vent is permitted to allow for the ordinary expansion and contraction of the air in the system by the changes in temperature, and only the sudden impulse imparted to the confined air by releasing the mechanisms described will set the apparatus in action. These devices are exceedingly simple, and by the use of ordinary gas-pipe for the pipe q can be readily and conveniently set up, and are not liable to get out of order.

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

1. The pneumatic apparatus described, consisting of an air-chamber provided with a suitable device, including a detent of fusible alloy, to expel the air from such chamber automatically into a suitable pipe, in combination with a corresponding air-chamber communicating with such pipe and having a projectble part adapted to be displaced by such expelled air, substantially as described.

2. In a pneumatic device adapted to expel the air from a suitable chamber, a forwarding part to reduce the air-space, a suitable mechanism, as the spring v, to project such forwarding part automatically when free to act, and a detent, consisting of fusible alloy, to hold such mechanism in check, substantially as described.

3. In a pneumatic apparatus, an air-chamber, as G, having a suitable outlet and provided with a disk u and spring v, in combination with a suitable catch, as the lever I, adapted to be held in place by a detent of fusible alloy, as the pin y, substantially as described.

4. In a pneumatic apparatus, an air-chamber provided with a piston adapted to actuate a locking device and a suitable pipe extending from such air-chamber and connecting the same with a corresponding air-chamber provided with a device adapted to expel the air therefrom and held in check by a detent of sensitive material adapted to be released by change of temperature, substantially as described.

5. In a pneumatic apparatus, an air-chamber with a suitable outlet, a movable part adapted to contract the air-space in such air-chamber and expel the air therefrom, a mechanism, as the spring v, adapted to operate such movable part automatically when free to act, and a check for such mechanism, embracing a detent of fusible alloy, substantially as described.

6. In a pneumatic apparatus, an air-chamber with a suitable outlet, a movable part adapted to contract the air-space in such air-chamber and expel the air therefrom, a mechanism adapted to operate such movable part automatically when free to act, and a check for such mechanism embracing a detent of fusible alloy, in combination with an air-chamber having a suitable inlet, a movable part adapted to enlarge the air-space in such chamber, and a suitable pipe connecting such outlet and inlet, substantially as described.

7. In a pneumatic apparatus, a suitable air-chamber, as F, one part of which consists of

a piston, as *o*, and its rod *p*, a weight-support *j*, adapted to be operated by such piston, a movable weight, as *h*, disposed in the path of such support and adapted to be sustained thereby, and a catch, as *b*, disposed in the path of such weight and adapted to receive the impact of the same when free to act, in combination with a suitable device to force air into such chamber and thereby to move such piston, substantially as described.

8. In a device such as described, a frame, as E, adapted to be attached to a wall provided with suitable guides adapted to receive a movable weight, a support for such weight, and a catch adapted to engage with a detent on a door projecting into the path of such weight, in combination with an air-chamber, as F, provided with a piston *o* and rod *p*, substantially as described.

9. In a pneumatic apparatus such as described, a locking device, as the suspended weight *h*, an upset for the same, consisting of a suitable support, as *j*, and a door-catch, as *b*, disposed in the path of such weight, and an air-chamber having a movable part adapted to be displaced pneumatically and thereby to actuate such upset, in combination with another air-chamber connected therewith and provided with an air-expelling portion embracing a detent of fusible alloy and disposed to actuate such movable part automatically, substantially as described.

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