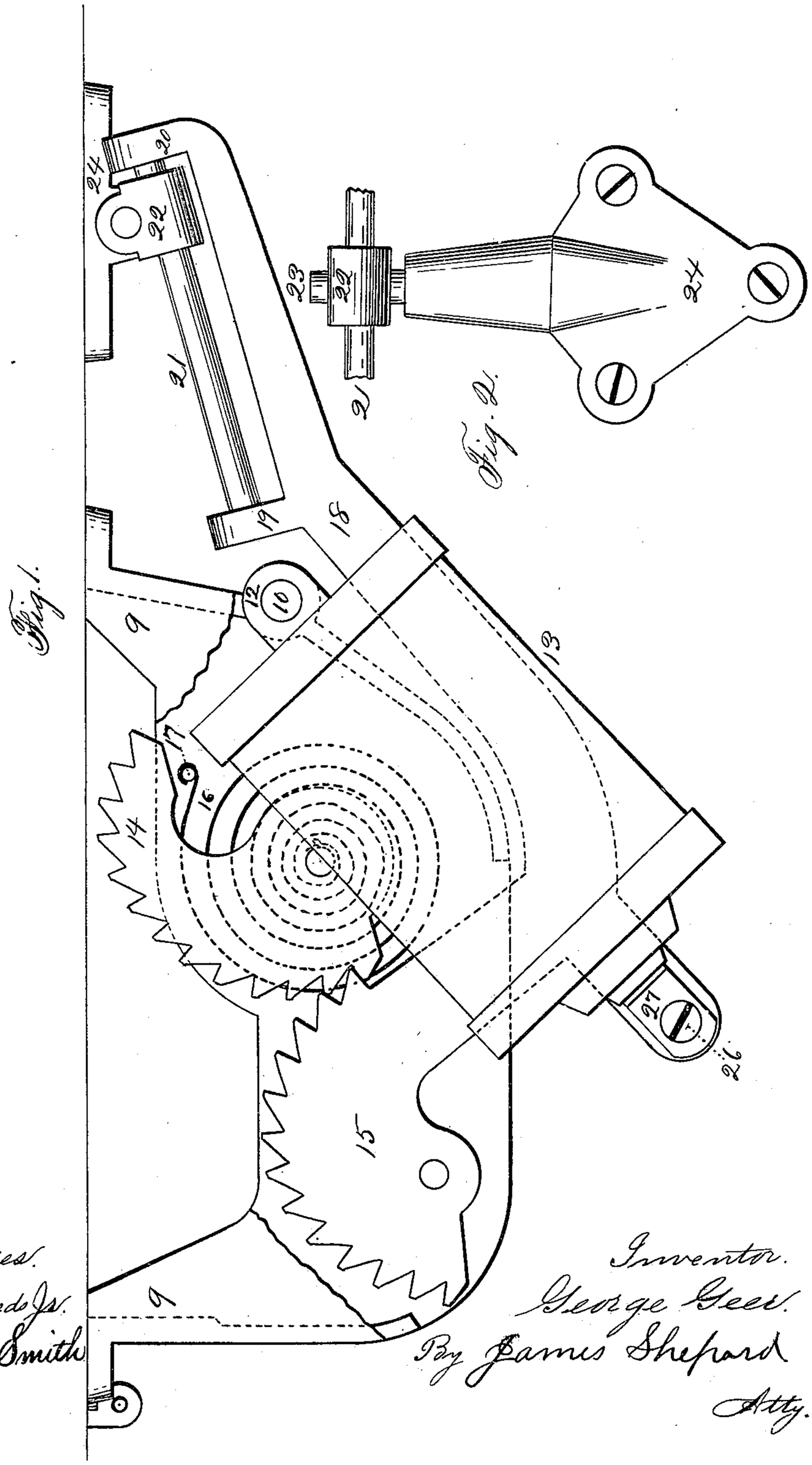
(Model.) 3 Sheets—Sheet 1.

G. GEER.

PNEUMATIC DOOR CHECK.

No. 335,575. Patented Feb. 9, 1886.



Witnesses.
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Eddy N. Smith

Inventor.
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By James Shepard
Atty.

(Model.)

3 Sheets—Sheet 2.

G. GEER.

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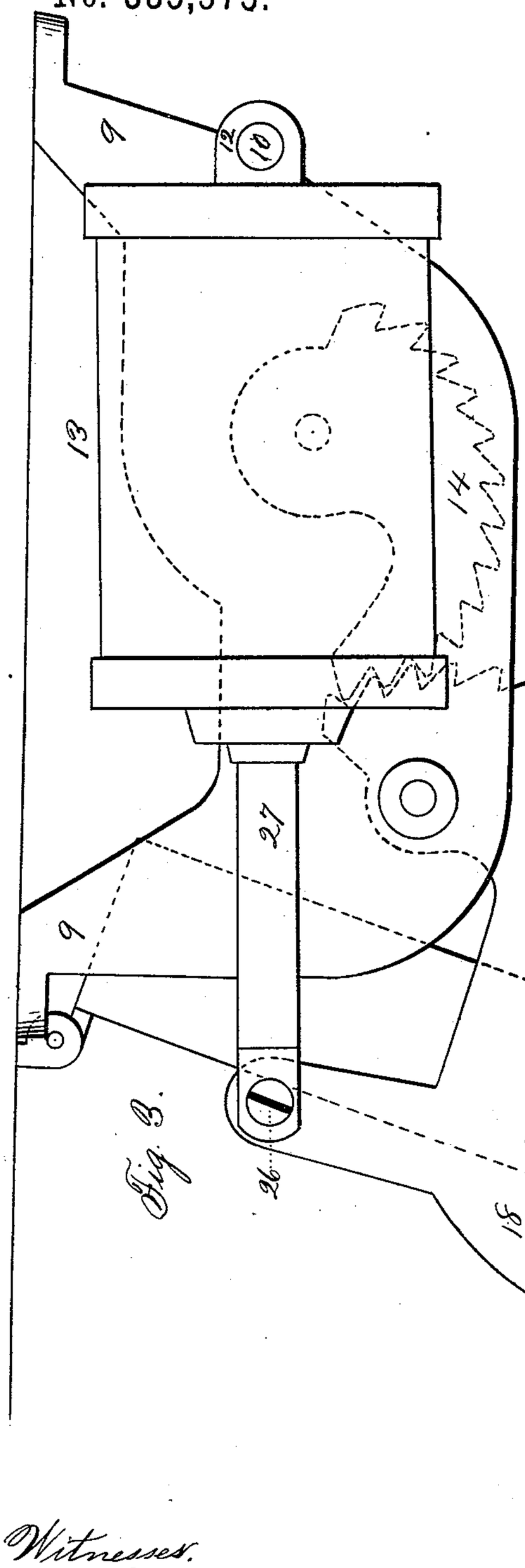

Fig. 3.

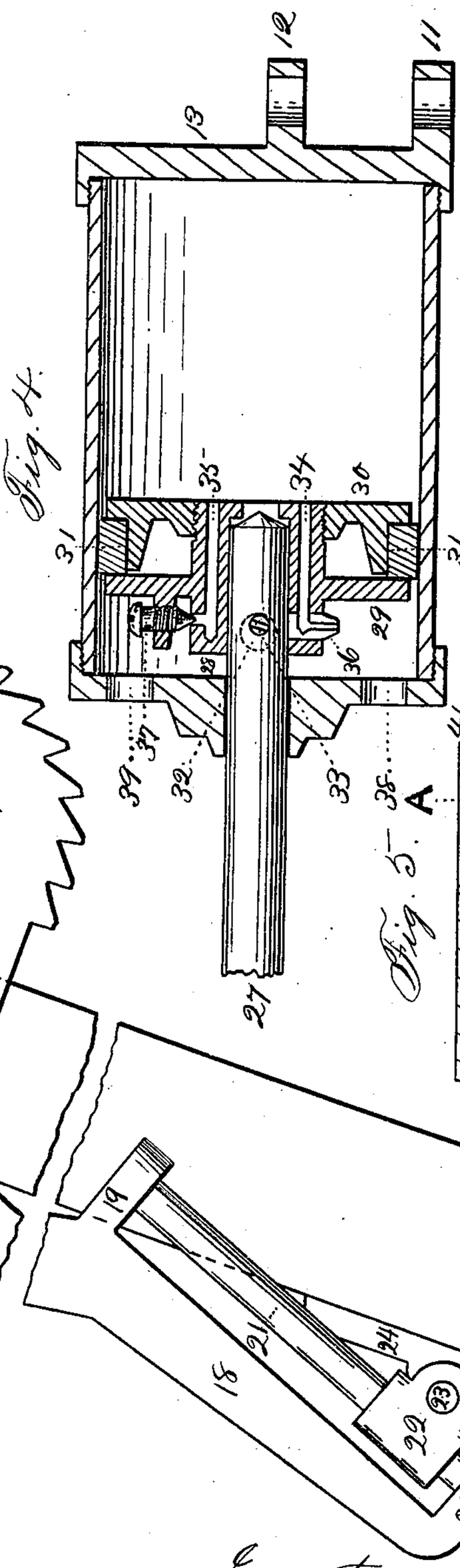

Fig. 4.

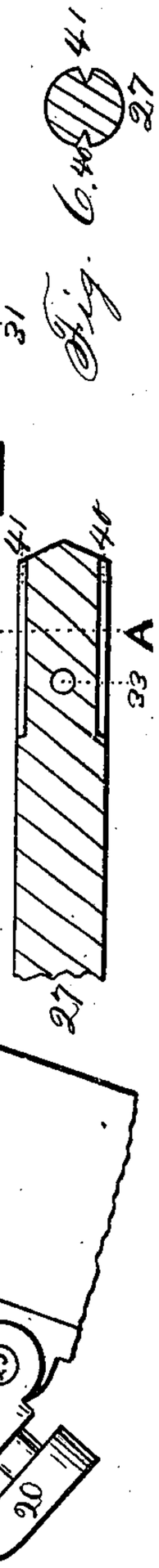

Fig. 6.

Fig. 5.

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3 Sheets—Sheet 3.

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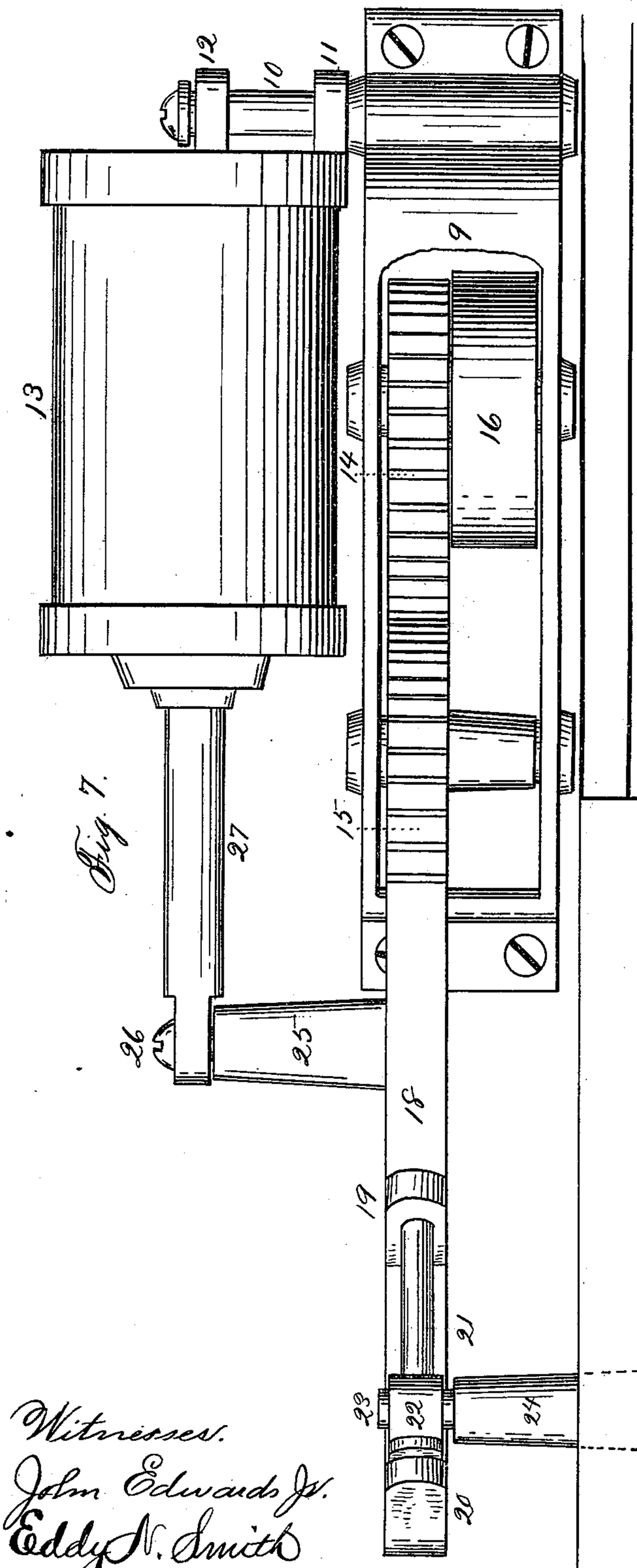

Fig. 7.

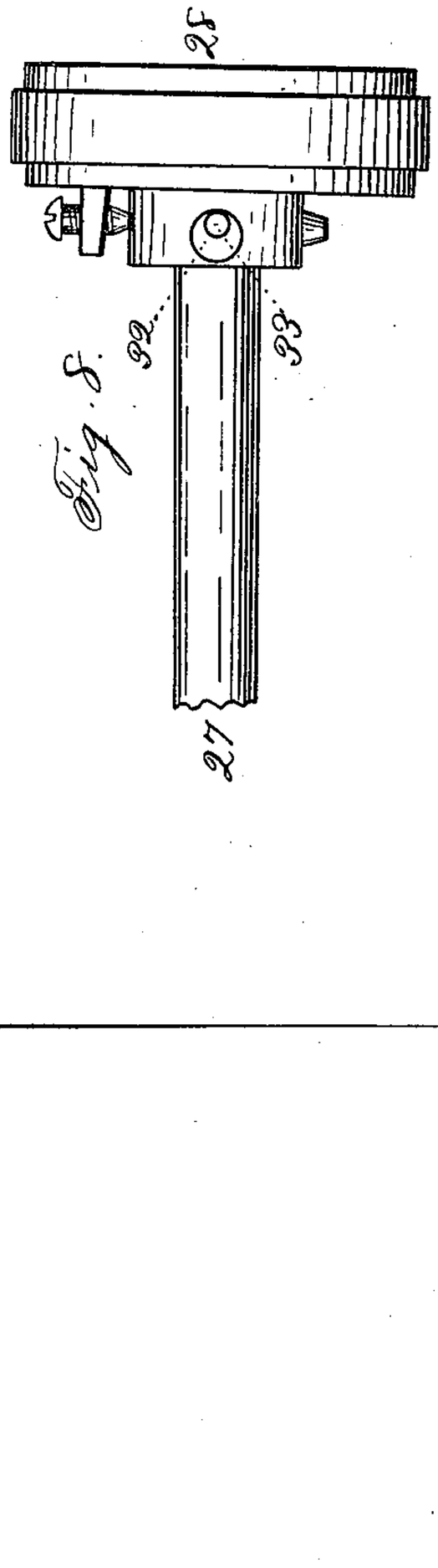

Fig. 8.

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UNITED STATES PATENT OFFICE.

GEORGE GEER, OF PETERBOROUGH, NEW HAMPSHIRE.

PNEUMATIC DOOR-CHECK.

SPECIFICATION forming part of Letters Patent No. 335,575, dated February 9, 1886.

Application filed February 23, 1884. Serial No. 121,647. (Model.)

To all whom it may concern:

Be it known that I, GEORGE GEER, of Peterborough, New Hampshire, have invented certain new and useful Improvements in Pneumatic Door-Checks, of which the following description and claims constitute the specification, and which is illustrated by the accompanying three sheets of drawings.

This apparatus closes a door gently by means of the joint operation of a scroll or other spring acting upon certain devices, hereinafter described, and a partly-confined column of air, which acts as a cushion to moderate the action of the spring.

Figure 1 in the accompanying drawings is a plan view of the apparatus as attached to a door-case and a closed door. Fig. 2 is a front elevation of the bracket 24, by which the apparatus is attached to the door. Fig. 3 is a plan view of the apparatus as attached to a door-case and an open door. Fig. 4 is a central vertical longitudinal section of the air-cylinder 13. Fig. 5 is a central vertical longitudinal section of the right-hand part of the piston-rod. Fig. 6 is a cross-section of the piston-rod on the line A A of Fig. 5. Fig. 7 is a front elevation of the apparatus attached to a door-case and an open door. Fig. 8 is a view of the piston and piston-rod and their connection.

9 is a casing screwed to the door-case just above the door. It supports the upright pivot 10, upon which the journals 11 and 12 of the cylinder 13 are fitted to turn. The upper and lower walls of the casing 9 are furnished with bearings for the arbors of the eccentric segmental gears 14 and 15, both of which turn within that casing. The gear 14 is worked by a coiled spring, 16, the inner end of which is attached to the arbor of the gear, and the other end of which is attached by the pivot 17 to the casing 9. The gear 15 is one piece with the arm 18. That arm is provided with the brackets 19 and 20, and those brackets are connected by the rod 21. Upon that rod the traveler 22 reciprocates as it turns correspondingly upon the pivot 23, which constitutes the upward projection of the bracket 24. The stud 25 projects up and from the arm 18, and is itself surmounted by a pivot, 26. Upon that pivot the left-hand end of the piston-rod 27 turns. That rod is not rigidly attached to the piston, but has a slight longitudinal play therein. The piston is composed of the shell 28, furnished with the flange 29, and of the gland 30, which, being screwed upon the shell 28, compresses the packing 31 against the inner circumference of the cylinder 13. The piston-shell 28 is perforated axially for the admission of the piston-rod. Near the right-hand end of the perforation it becomes abruptly smaller, thus furnishing an annular shoulder, against which the conical end of the piston-rod presses when making its inward stroke. The shell 28 is also provided with the diametrical perforation 32, in which the cross-stud 33 of the piston-rod reciprocates. It is this reciprocating which allows the longitudinal play of the piston-rod in the piston. The shell 28, which forms one of the walls of the air-cushioning chamber, is also provided with the vents 34 and 35, or one of them. Both of these vents are adjustable in respect to the extent of their outer openings, but on variant plans. The outer end of the vent 34 passes through the plug 36, which plug is composed of lead or other soft metal, and the opening in which may therefore be readily lessened in extent by a slight blow of a hammer, or readily increased in extent by the action of a reamer inserted and worked therein. The outer end of the vent 35 is partly closed by the conical end of the screw 37, and the opening in that end of that vent may therefore be increased or diminished by raising or lowering the screw, respectively. The piston-rod does not require an air-tight fit where it passes through the left-hand head of the cylinder, and, indeed, that cylinder-head is furnished with one or more perforations, 38 and 39, in order to provide for free communication between the external air and the air in the left-hand end of the cylinder. The right-hand end of the piston-rod is provided with one or more grooves, 40 and 41, for a purpose to be explained hereinafter.

The mode of adjustment is as follows: The casing 9 is screwed to a door-case just above the door and at such a position laterally as that its left-hand end is on a line with the hinges of the door, or approximately so. The bracket 24 is then screwed to the upper border of the door in such a position that the trav-

eler 22 is nearly at the right-hand end of 21 when the door is opened. The left-hand cylinder-head is then unscrewed from the cylinder and slipped along the piston-rod, and the vent is then adjusted and the cylinder-head partly screwed in place, and the door allowed to close, so as to test the strength with which the air-cushion resists the action of the spring. If that resistance is too great, the vents 34 and 35, or one of them, are enlarged; or, if that resistance is too little, they are lessened in extent by the means heretofore explained in that behalf. Then the cylinder-head is screwed into place again, and the adjustment is complete.

The mode of operation is as follows: As the door is opened, the arm 18 of the gear 15 is forced outward with the door, the traveler 22 sliding along the rod 21 to permit the operation. At the same time the gear 15, meshing with the gear 14, winds up the spring 16, and the piston-rod 27 is drawn out, so as to bring the piston into the position shown in Fig. 4. This drawing out of the piston does not create any vacuum in the cylinder, because air may freely pass through the grooves 40 and 41, and thence between the conical end of the piston-rod and the annular shoulder in the axial perforation in the piston, and thence into the cylinder itself. When the door is released from the force which opened it, the spring 16, operating upon the arbor of the gear 14, and thus upon that gear and upon the gear 15 and the arm 18, will quickly close the door. This movement is moderated, however, by the action of the piston and cylinder, and in the following manner: The inward movement of the arm 18 soon forces the piston-rod into the piston, so that the conical end of the rod presses against the annular shoulder in the axial perforation of the piston, thus closing the air-channel through that perforation. Then the piston-rod forces the piston inward in the cylinder; but inasmuch as the vents 34 or 35, or both of them together, furnish but small air-channels for the escape of the air in the right-hand end of the cylinder, that movement is necessarily retarded by the partly-confined column of air, and in return it retards and moderates the shutting of the door.

The eccentric shape of the gears 14 and 15 enables a given force in the spring 16 to exert about four times as much power just before the door is fully closed as it exerts just after the door begins to close. This advantage is not suddenly acquired, but gradually grows with the movement of the door, and thus compensates for the gradually-diminishing force of the spring as it uncoils.

In door-checks of this class it is important that the valve which cuts off the flow of air from one side of the piston to the other shall act very quickly upon the return-stroke of the piston, and thereby confine as large an amount of air as possible, so as to obtain the best cushioning effect.

As heretofore constructed, the valves of pneumatic door-checks, so far as I am aware, have been those that are closed by the pressure of the air upon the return movement of the piston, and in many cases the air would not so act until the piston had moved quite a distance on its return-stroke, and consequently a sufficient amount of air would not be confined in front of the piston to properly cushion the door. If the piston-rod is moved slowly on the return-stroke, the valve will not close so quickly as when said rod, by reason of strong drafts of air or from other causes, moves more rapidly, and consequently the cushioning-power is variable.

In my door-check the closing of the valve does not depend upon pressure of the air, as the friction of the piston upon the cylinder holds it stationary when the piston-rod begins to return, and so soon as the piston-rod has moved a distance equal to the play of the cross-stud 33 in the diametrical perforation 32 the valve is closed; in other words, the valve which confines the air is always closed upon a given movement of the piston-rod, whether said rod is returned slowly or otherwise.

I am aware that a prior patent shows a pneumatic door-check consisting of a pivoted cylinder, a piston fitted thereto, a spring-actuated arm, and a bracket for connecting one end of said arm with the door in such manner as to permit said arm to slide upon the bracket; also, that another prior patent shows a door-spring consisting of a frame, a torsional wire spring, two eccentric gears, and an arm connected to one of said gears, with the end of said arm provided with a friction-roller. Both of said prior devices are hereby disclaimed.

I claim as my invention—

1. The combination of the casing 9, spring 16, the eccentric gears 14 and 15, the arm 18, turning on the same axis with the gear 15, the cylinder, and the piston, the latter being pivoted to the arm 18 at a point between the axis of said arm and the end which is connected or designed to be connected with the door, substantially as described, and for the purpose specified.

2. The combination of the spring-pressed angular arm 18, pivoted upon an axis, as that of the gear 15, the cylinder set paralled to the longest end of said angular arm when in their normal position, the piston-rod with its end pivoted directly to the angle of said arm, and means for connecting said parts with a door, substantially as described, and for the purpose specified.

3. In a pneumatic door-check, the combination of a cylinder and piston-rod having the longitudinal grooves with means for operatively connecting them to a door and its jamb, and a piston which fills the cylinder, having an annular shoulder in its axial bore and fitted upon the grooved end of the piston-rod, with the latter having a slight longitudi-

nal play thereon, said grooves and axial bore forming an air-passage through the piston when the door is being opened and the piston is drawn backward, which passage is closed on the return movement of the door and piston by the end of the piston-rod acting against the annular shoulder in the piston, substantially as described, and for the purpose specified.

4. The combination of the spring, the eccentric gears 14 and 15, the arm 18, connected to one of said gears, and having the rod 21, the bracket 24, traveler 22, pivoted to said bracket and fitted upon the rod 21, the piston-rod cylinder, and means for pivoting the cylinder, substantially as described.

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Witnesses:
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M. L. MORRISON.