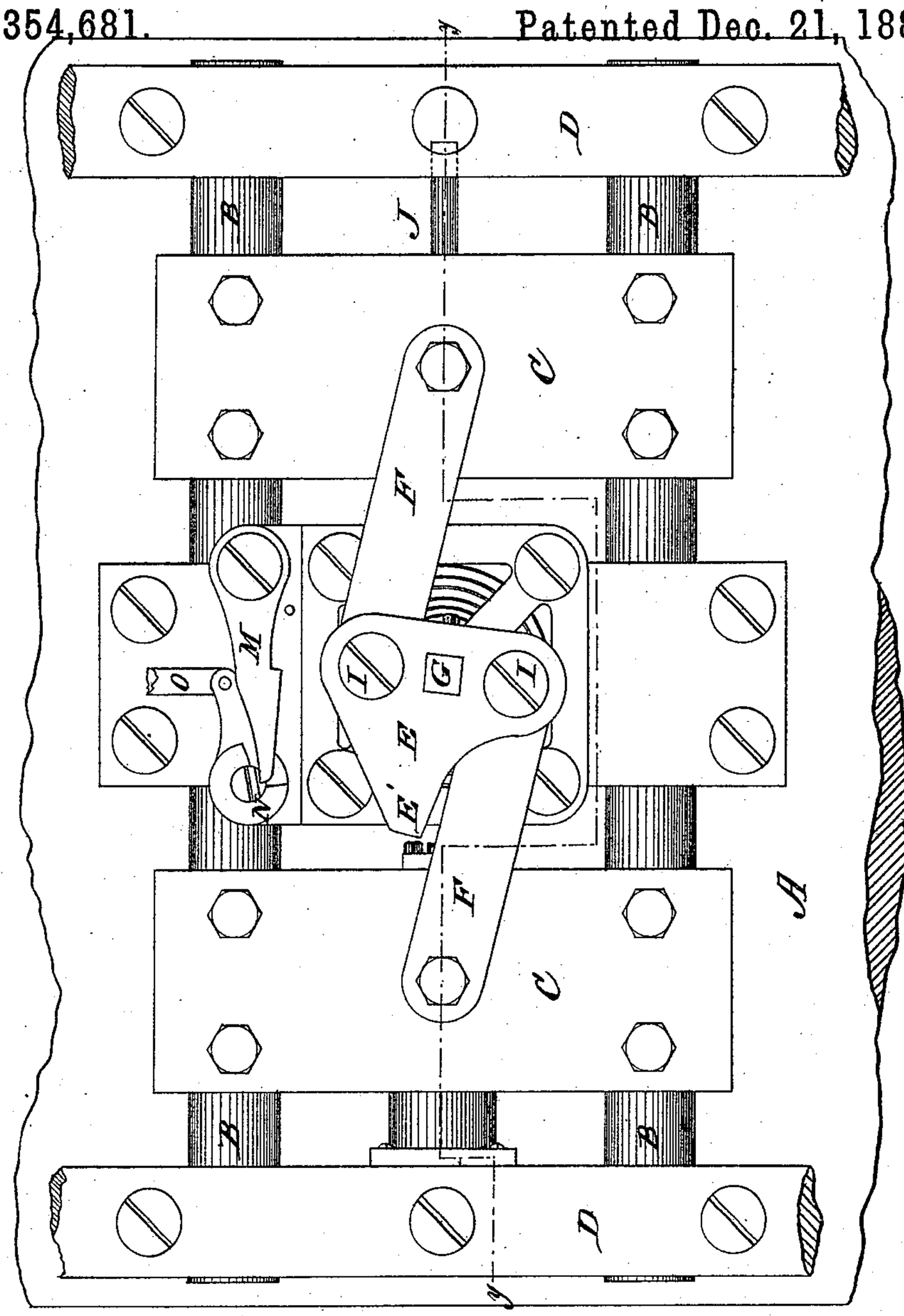
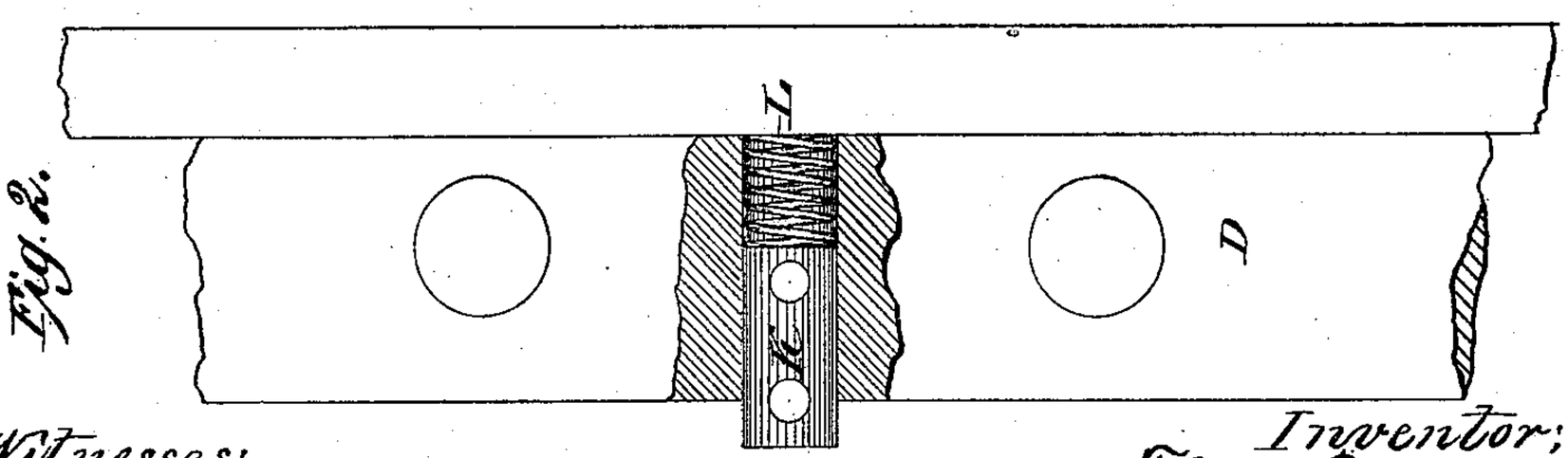
(No Model.) 5 Sheets—Sheet 1.

T. M. BRINTNALL.

AUTOMATIC SAFE BOLT WORK.

No. 354,681. Patented Dec. 21, 1886.





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(No Model.) 5 Sheets—Sheet 2.

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AUTOMATIC SAFE BOLT WORK.

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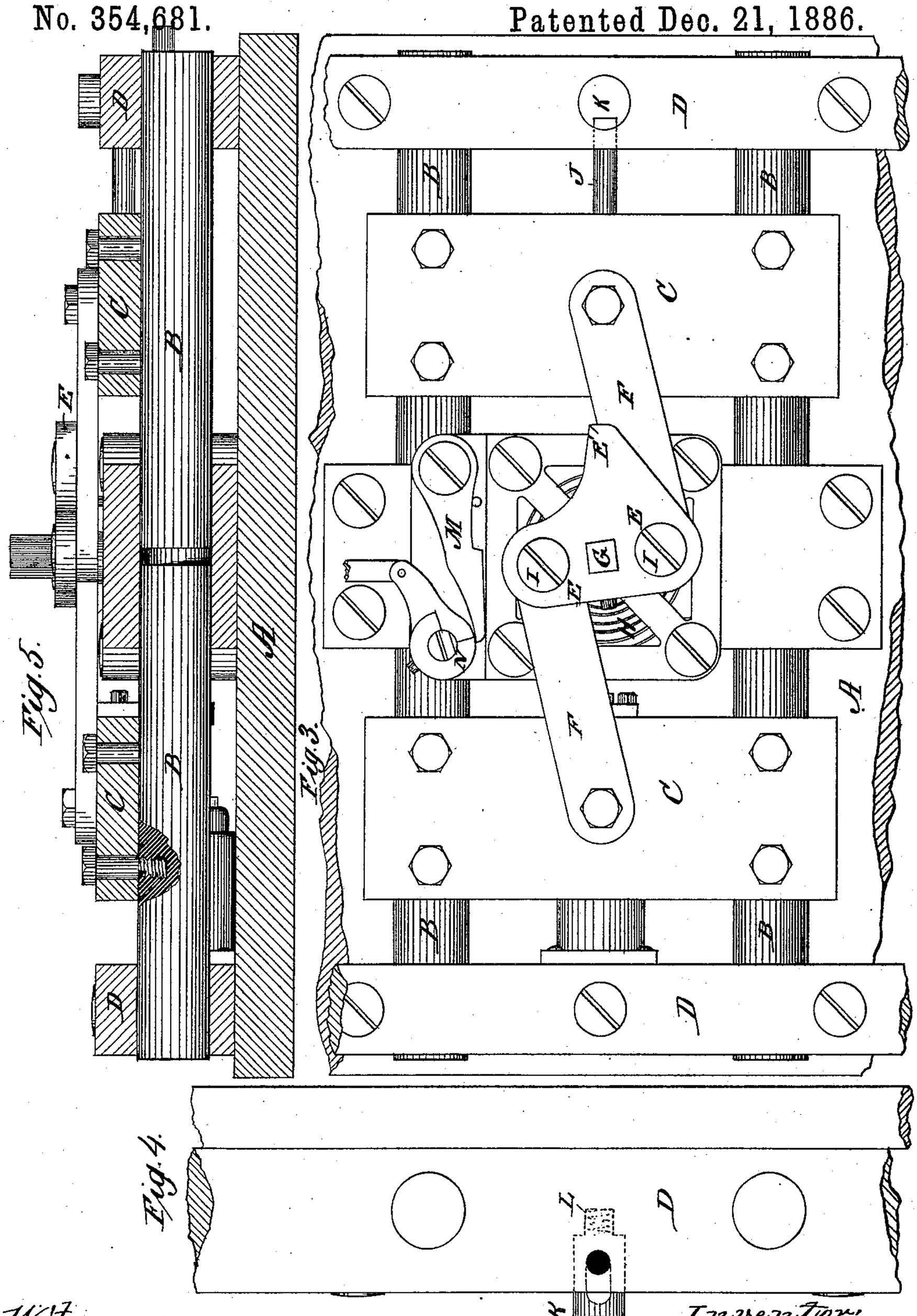

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5 Sheets—Sheet 3.

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AUTOMATIC SAFE BOLT WORK.

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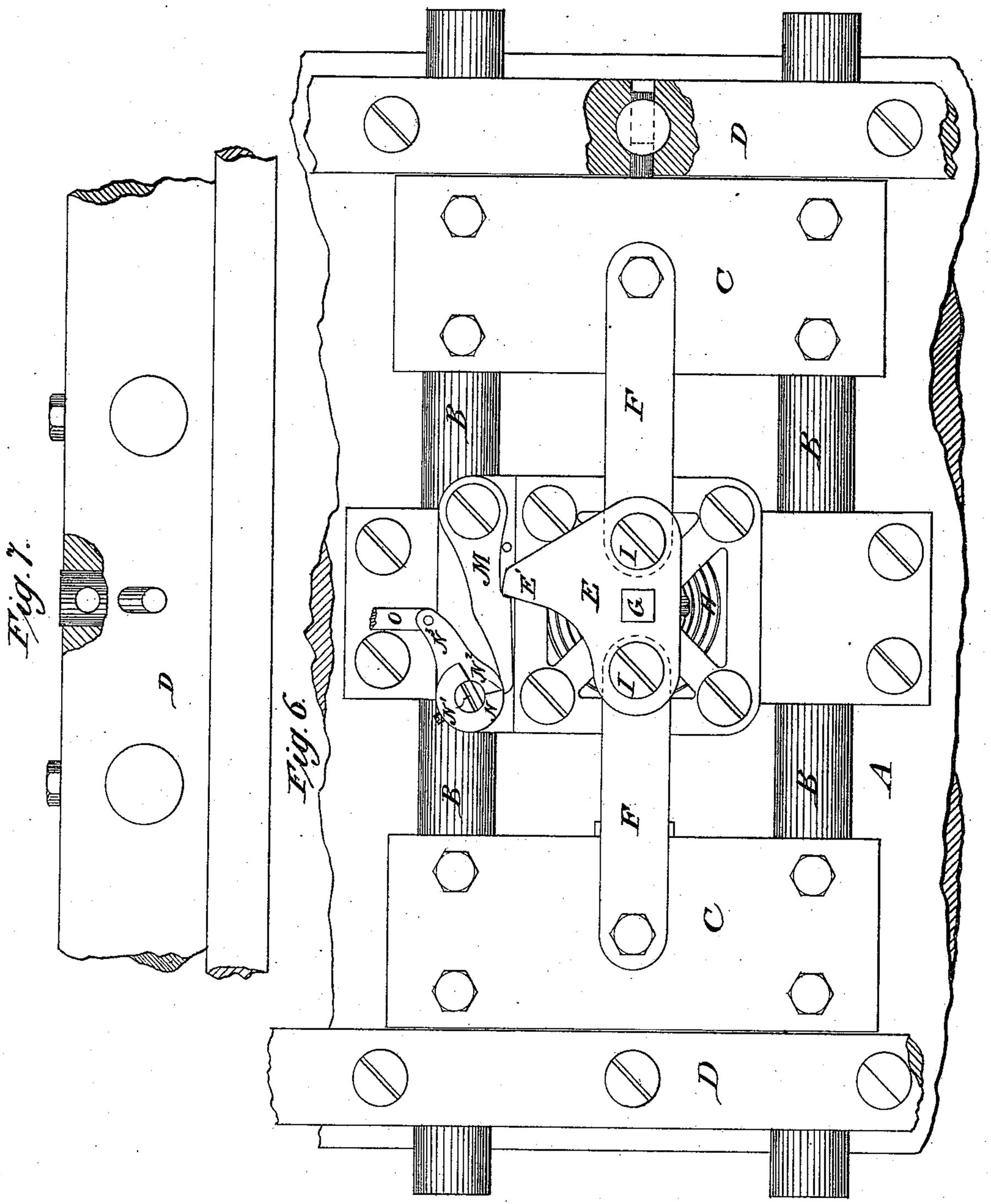

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AUTOMATIC SAFE BOLT WORK.

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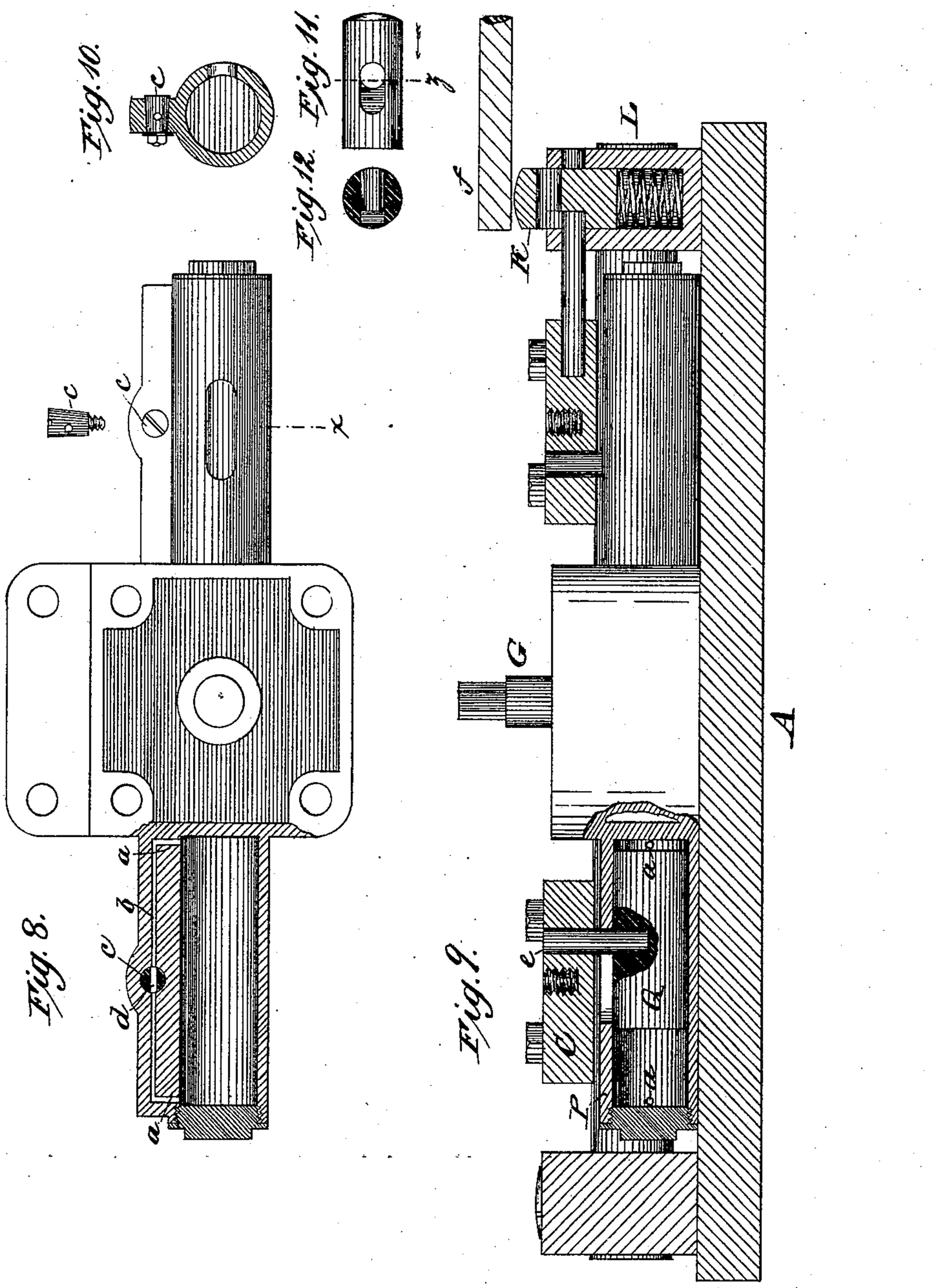

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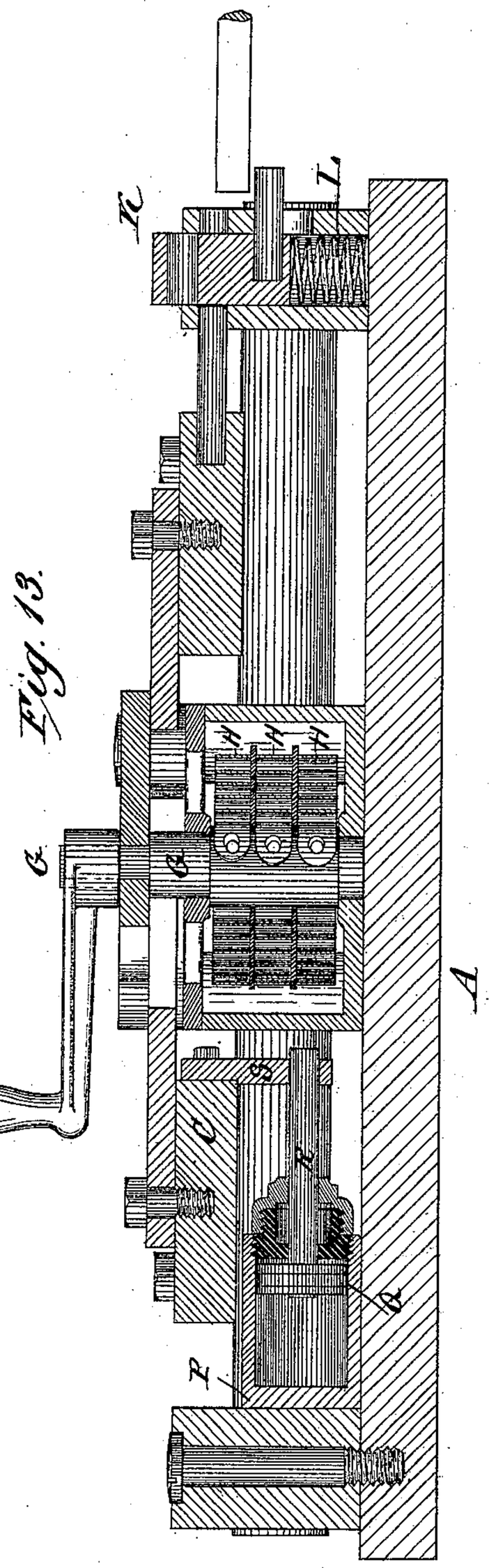

Fig. 13.

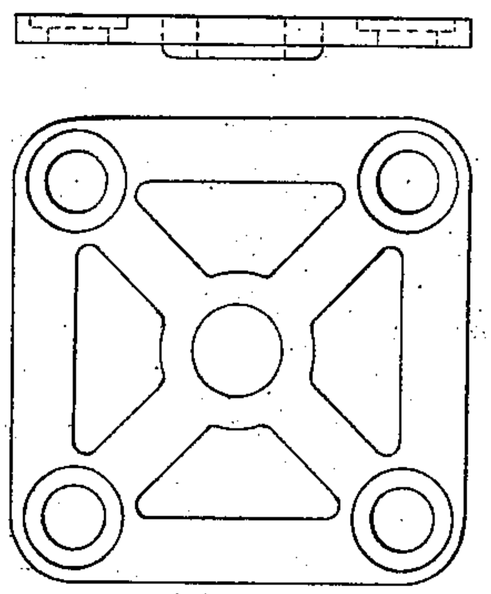

Fig. 14.

Fig. 15.

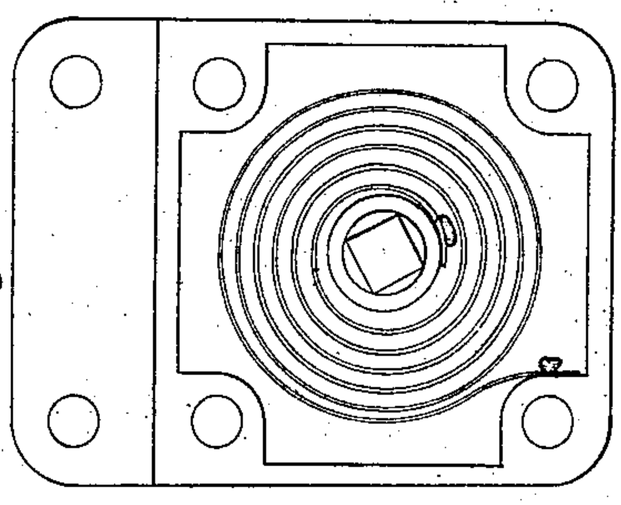

Fig. 16.

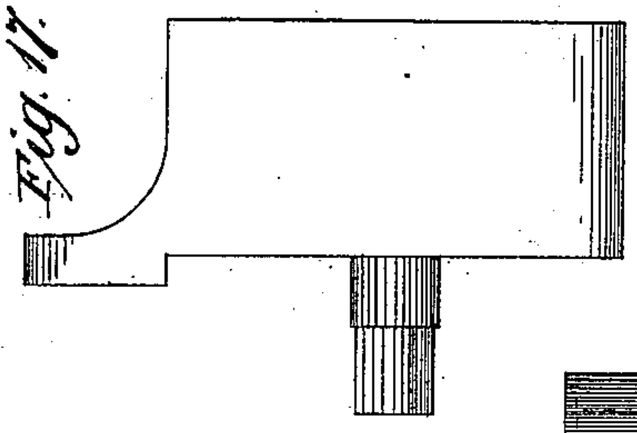

Fig. 17.

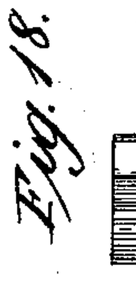

Fig. 18.

Fig. 19.

Fig. 20.

Fig. 21.

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UNITED STATES PATENT OFFICE.

THOMAS M. BRINTNALL, OF MARYVILLE, MISSOURI.

AUTOMATIC SAFE BOLT-WORK.

SPECIFICATION forming part of Letters Patent No. 354,681, dated December 21, 1886.

Application filed July 9, 1885. Serial No. 171,147. (No model.)

To all whom it may concern:

Be it known that I, THOMAS M. BRINTNALL, a citizen of the United States, residing at Maryville, in the county of Nodaway and State of Missouri, have invented a new and useful Improvement in Automatic Safe Bolt-Work, of which the following is a description.

This invention relates to that class of locks which are arranged to be opened by clock-work. In this class of locks the bolts are always retracted by springs, and in some styles of locks the bolts are both extended and retracted by springs. In order that these springs may be relied upon to do their duty under all circumstances resulting from variations by heat, cold, rust, &c., the said springs are usually made a great deal stronger than is actually required to do the work. On this account the bolts would generally be thrown with a great deal of surplus force, causing wear and endangering breakage of the parts. These objectionable effects might be to some extent alleviated by interposing well-known cushions or cushioning-springs near the end of the stroke of some adjunct of the bolts between said moving adjunct and a stationary part of the lock; but cushions of any kind for this purpose are objectionable for several reasons: first, because the farther they are compressed the more they resist, while the bolt-springs advance with continually-diminishing force, so that a cushion is likely to stop the action of the bolts before their course is completed, and the exact points at which all the parts will come to rest cannot be predicated; secondly, because where a sudden blow is struck upon a spring or cushion a portion of the force is given off as a shock to whatever supports the cushion, and a portion remains stored up in the cushion, to be given off in some indefinite way, which prevents that accuracy of results which an automatic time-lock should produce.

My invention is based on an entirely different principle from that already described.

Its object is, first, to offer continual resistance to the advance of the bolt-springs, to prevent their ever acquiring a dangerous velocity or damaging momentum; secondly, to offer a gradually-decreasing resistance to the action of the said bolt-propelling springs, whereby the springs when applying their greatest force will be met by the greatest resistance, and as the force of the springs gradually diminishes the resistance will also diminish, thus tending to even the action of the springs throughout their course and to retard the said action, however powerful it may be, to a low rate of speed, thus avoiding any shock; thirdly, to release the bolt by the act of closing the door to be locked at the instant that the door is fully closed; fourthly, to so hold the spring-retaining arm that it will release itself from its detent by the action of the bolt-springs as soon as the detent is set free by clock-work; and, fifthly, to so arrange a system of levers and catches as to enable the clock-work to restrain the bolt-springs with positive certainty, and yet with very little effort.

To this end my invention consists in the construction and combination of parts forming an automatic safe-lock, hereinafter described and claimed, reference being had to the accompanying drawings, in which—

Figure 1 is an inside view of a safe-door, showing the bolt-works of my lock in elevation, the bolts being retracted and the springs unstrained. Fig. 2 is a right-hand edge view of the same part in section. Fig. 3 is an elevation of the lock, showing the bolts and latches set with the springs under full strain ready for the door to be closed. Fig. 4 is a partial lower end view of the same. Fig. 5 is a horizontal section, partly in elevation, through the lock in the plane of one line of bolts. Fig. 6 is an elevation of the lock with the bolts extended. Fig. 7 is a right-hand end view of the same. Fig. 8 is an elevation, part in section, of a detail of the lock. Fig. 9 is a horizontal section, part in elevation, at the line *y y*, Fig. 1. Fig. 10 is a transverse section of a detail at *x*, Fig. 8. Fig. 11 is a side elevation of a detail. Fig. 12 is a transverse section at *z* of the detail shown in Fig. 11. Fig. 13 is a central horizontal section of the lock part in elevation. Fig. 14 is an edge view, and Fig. 15 a face view, of the spring-box cover. Fig. 16 is a face view of the spring in the open box, and Fig. 17 is an elevation of the spring-box with the cover removed. Figs. 18, 19, 20, and 21 are detail views.

The bolt-works of the lock here shown are

the subject of a former patent, No. 315,231, to myself, and some portion of the present invention is designed as an improvement thereon, while other portions are not only applicable thereto, but to any system of bolts which are thrown by springs.

A represents the door, to which the lock is attached. This may be the door of a safe, a vault, or any other structure.

B represents the bolts, which I have here shown as yoked together in pairs by yokes C, one pair to project from each edge of the door. These bolts are simultaneously extended or retracted by a double lever, E, which is connected at its ends with the yokes C by pitman F. The lever E is mounted on a shaft, G, to which one or more springs, H, are attached to actuate it constantly to rotate in one direction. When the two pivots I are nearly at right angles to the line of motion of the bolts, as in Figs. 1 and 3, the said bolts stand retracted, and when the pins I are in a line parallel with the line of motion of the bolts the latter stand extended in position to lock the door, as in Fig. 6. Through the rib D on the opening edge of the door I pass a small rod, J, and secure its inner end firmly in the adjacent yoke, C, so that the rod must reciprocate with the bolts B, and anything stopping the rod stops the bolts.

K is a puppet located across the path of the rod J, and fitted into the rib D, to project therefrom in the direction of motion of the closing door at a point to abut against a lug, *f*, which is stationarily secured within the safe in the path of the puppet, whereby the said puppet is pushed into the rib by the act of closing the door.

L is a spring beneath the puppet, constantly forcing it outward. Through this puppet is a hole, which is in the line of the rod J, and exactly registering therewith when the puppet is pushed in flush with the face of the door, so that the rod may slide through the puppet. When the puppet projects from the face of the door, its body is in the path of the said rod, preventing the latter and the system of bolts therewith connected from advancing. To prevent the puppet from being ejected entirely from its seat by the spring L, and to keep it from turning around so as to throw the hole in it out of registry with the rod J, I provide a shallow slot in the puppet for the end of the rod to rest in. The rod, being constantly pressed forward by the whole force of the bolt-springs, will instantly shoot through the puppet, when the closing of the door forces the latter in and brings the hole in it in line with the rod. By this means the bolts are restrained until the very instant when they arrive by the closing of the door opposite their sockets in the door-casing, when they are set free to project into the same, thus holding the door firmly closed without the necessity of any such wedging as would be likely to interrupt the withdrawal of the bolts. The value of this is the more evident from the fact that springs must be trusted to withdraw the bolts at a given time, and if they fail to operate the safe must be broken open.

The lever E is provided with a catch, E′, into the circular path of which a latch, M, drops of its own weight to hold the lever at the point of its revolution where the bolts are projected, as in Fig. 6; but a peculiarity of this latch M is, that its catch enters the path of the catch E′ at an obtuse or non-hooking angle thereto, so that of itself alone the latch M will not hold the lever E, but the lever will force the latch from its path.

N is a detent, having a cylindrical surface adapted to engage the arm of the latch M, to hold the latch in engagement with the catch E′. The arm of the latch bears upon the cylindrical surface of the detent in a line directly toward the center N′ of the latter, so that there is no action of leverage whatever between the detent and the latch. Any amount of force applied to the latch cannot move the detent in either direction, and any movement of the detent which leaves it engaged with the latch cannot move the latch on account of the cylindrical form of the bearing-surface of the detent. At N^2 a segment of the detent is radially cut out in the path of the latch, forming a recess into which the latch may escape when the detent is turned from behind it. This turning is effected by any suitable clock or time mechanism, connected with the detent by a bar, O, attached to an arm, N^3, thereof. At the time fixed for the door to be unlocked the arm N^3 is pushed down by the clock, whereby the latch M is released, and, being forced out of the path of the lever E, the latter is rotated to the position shown in Fig. 1 and retracts the bolts by the action of the springs H.

The shaft G is squared at its outer end, and a crank, G′, is removably fitted thereto, whereby the bolts may be set back against the strain of the springs. There may be any suitable number of these springs, either one strong enough to operate the bolts, so that in case one spring should, from any cause, fail to work, the others will do duty.

My bolt-retarding device or yielding stop consists of a cylinder, P, Fig. 13, provided with a piston, Q, and piston-rod R, the latter being connected with one of the bolt-yokes C by means of a lug, S. This piston may be fitted sufficiently freely within the cylinder to allow air to escape around it a little, and yet closely enough to cause the action of the bolt-springs in sliding the bolts to compress the air by the thrust of the piston, thus retarding the movement of the piston throughout its full course; but, finally, when the air all escapes, it removes all tension from the springs, leaving them free to complete their course. As the escapement of air around the piston may be little or much, the action of the springs may be more or less retarded. In case it should be desirable to regulate the action of the springs at will, I have provided a cylinder, Figs. 8 and 9, with escape-ports *a*, one at each end thereof,

connected together by a tube, *b*, in which a cock, *c*, is located. This cock is a screw to be operated by a screw-driver, whereby it may be turned to bring its aperture *d* in full registry with the tube *b*, when the least resistance will be offered to the escape of the air and to the passage of the piston; or it may be set to check the escape of the air to any degree desired.

In Figs. 8 and 9 the piston Q is connected with the bolt-works by means of a stud or pin, *e*, passing through a slot in the cylinder P, and the piston Q is long enough to cover the slot throughout the movement. Both styles of cylinders here shown are closed at each end, so as to act both ways upon the bolts, for my lock in the patent above referred to throws the bolts both forward and backward by the action of a spring. It is evident that the same device without alteration would act to retard a bolt driven by springs one way or either way, and that one end of the cylinder might be left open if action but one way only were required. Either of the air-cylinders here described and shown meet all the conditions set out in the preamble hereto. They offer resistance to the springs throughout the whole course thereof, thus preventing the accumulation of such force as will cause a concussion, and their resistance is gradually reduced as the force of the springs in advancing gradually diminishes, causing an even tension throughout the movement, and the resistance is at the last entirely removed, leaving the springs free to perfect their course. The springs at first meet a gradual resistance, like a cushion or spring, while compressing the air; then the compressed air is gradually forced out by the piston offering less and less resistance, and finally none at all, to the piston. Still greater resistance to the advance of the springs may be offered by introducing into the cylinder a denser fluid than air—such as water, alcohol, glycerine, &c.—which would sufficiently retard the springs with a very small cylinder and piston, which is very desirable, because space is a great consideration in a safe. The springs being resisted by the tension device, the connection between this device and the springs may be made through the bolts, as shown, or in any other convenient way. The spring-box may have a glass set in its cover to permit the interior to be examined.

The operation of the lock shown is as follows: The crank is applied to the shaft G when the lock is in its normal position, as in Fig. 1. The puppet K is then to be pressed in, and the lever E is to be turned backward a half-circle to the position shown in Fig. 3, which first extends and then retracts the bolts, leaving the springs strained, and the puppet, springing out in the path of the rod J, holds the bolts restrained. Time-clocks are already arranged to draw up the rod O at a fixed hour, which will move the detent N behind the latch M, holding the latter in the path of the arm E. Now, if the door be closed, the puppet K, striking the lug *f*, is slid in, bringing its hole in line with the rod J, and permitting the spring to throw the bolts forward. The arm E, being caught by the latch M, is held and the door remains locked until the clock pushes the arm N^3 downward, releasing the latch M from the arm E, thus leaving the bolts free to be withdrawn by the continued circular motion of the arm E. In both of the motions of the bolts they are resisted by the cylinder and piston tension device. Clocks are already devised which may be set to open the lock at any hour to suit the owner. A spring of from twenty-five to fifty pounds capacity is sufficient to slide the heaviest safe-bolts on this plan, because the full force of the springs is applied to doing work, the pneumatic check only forcing it to work more slowly, while, on the contrary, whatever force there is in a spring or cushion remains there to resist the bolt-springs and offers greatest resistance at the last moment of action, requiring very powerful springs to advance when their own force is weakest against this accumulating resistance.

A pneumatic check or tension such as herein described would have many advantages over an accumulating cushion, even if the check did not begin to act until the spring had advanced considerably on its course, for this check would finally set the spring free, while the cushion finally holds it strongest; but to whatever extent the spring is allowed to accumulate force from velocity before the check is applied just to that extent there is waste of power and less satisfactory results.

Heretofore hydraulic as well as pneumatic stops or checks have been used in connection with spring-actuated doors, and I therefore do not broadly claim in this application a fluid check; nor do I claim, singly, the specific construction of the check shown; neither do I herein claim, broadly, a cushion to receive the shock of bolts automatically operated by springs, as coil-spring cushions have been heretofore suggested for such purpose; but

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination, with one or more bolts, one or more springs, and intermediate mechanism whereby said bolts are forcibly operated by the springs in both their forward and backward movements, of a cylinder and piston connected with such parts, said cylinder being closed at both ends, whereby a gradually-diminishing resistance is offered to the bolts in both directions of movement, substantially as set forth.

2. The combination, with one or more bolts, one or more springs, and a slide-rod, of a puppet located across the path of the slide-rod, and having a perforation fitted to permit the passage of the slide-rod when the puppet is depressed, substantially as set forth.

3. In combination with the lock bolt or bolts,

the operating spring or springs, and a slide-rod, a puppet movable across the path of and having a longitudinal groove fitted to receive the end of said slide-rod, such puppet being adapted to permit the passage of the slide-rod when depressed, substantially as set forth.

4. The combination of one or more lock-bolts in a door, one or more springs for sliding the same, a slide-rod connected with the bolts and parallel with their line of motion, a perforated puppet located across the path of the said rod in a rib of the door, and adapted to project therefrom in the direction of motion of the closing door, a lug located in the path of the said puppet, and a spring beneath the puppet, substantially as shown and described.

5. The combination of one or more lock-bolts, springs for sliding the same, a slide-rod connected with the bolts and parallel with their line of motion, a puppet located across the path of the slide-rod, and a spring beneath the puppet, the puppet being slotted to receive the end of the slide-rod and perforated through the slot to permit the rod to pass through, substantially as shown and described, whereby the puppet is held from being ejected by its spring, as set forth.

6. The combination of one or more lock-bolts, springs for sliding the same, a rotary shaft and arm connected with the springs to be rotated thereby, a pivoted latch to engage the said arm, a detent to hold the latch, and means to connect the detent with time-works, the plane of contact of the said arm and latch being at an obtuse angle with that radius of the latch which passes through the said plane, substantially as shown and described.

7. The combination of lock-springs, a shaft and arm attached to be rotated thereby, a latch adapted to engage the arm in a plane at an obtuse angle with a radius of the latch passing through the said plane, and a detent shaped as a cylindrical segment pivoted to engage the arm of the latch on the surface of the said cylinder, substantially as shown and described.

8. The combination of one or more bolts, one or more springs, a lever connected with said bolts, a latch adapted to engage said lever, and a pivoted segmental detent having a face curved in an arc struck from its pivot and arranged to engage the latch, substantially as set forth.

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