

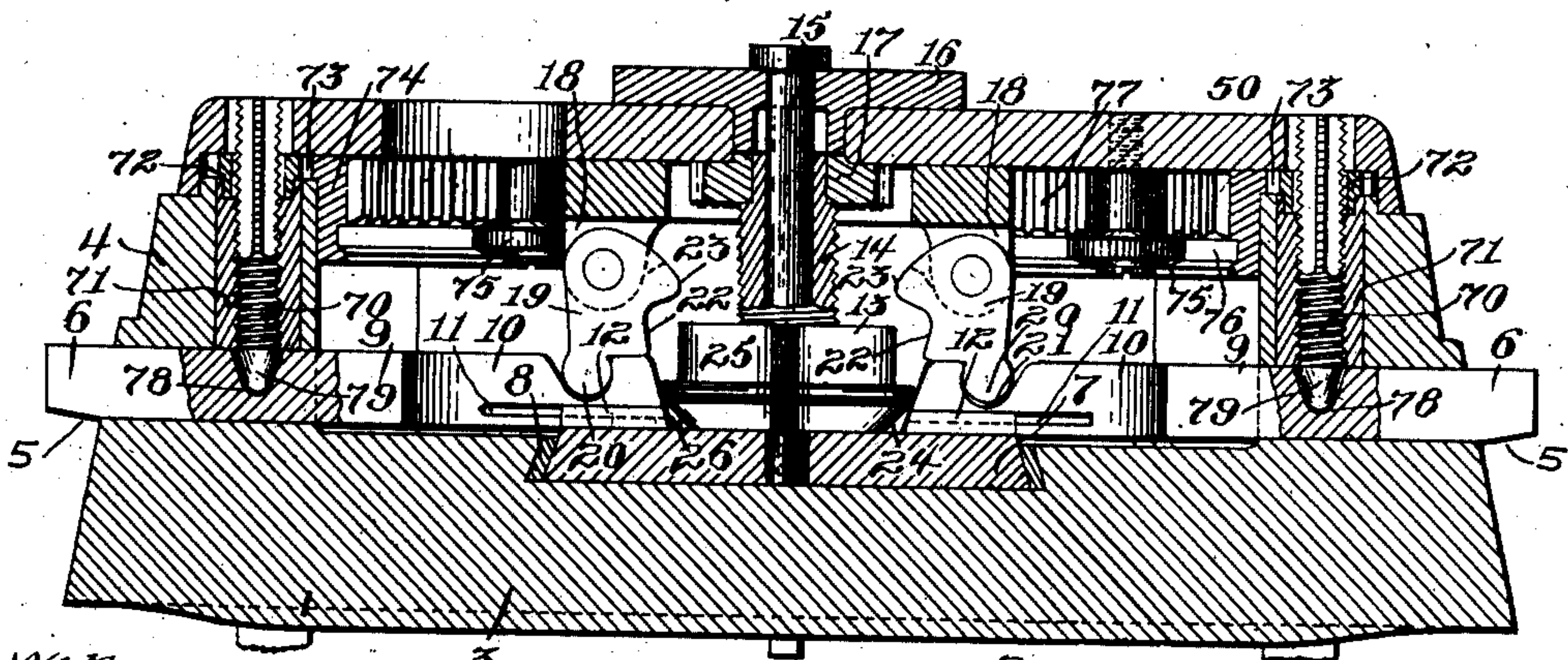
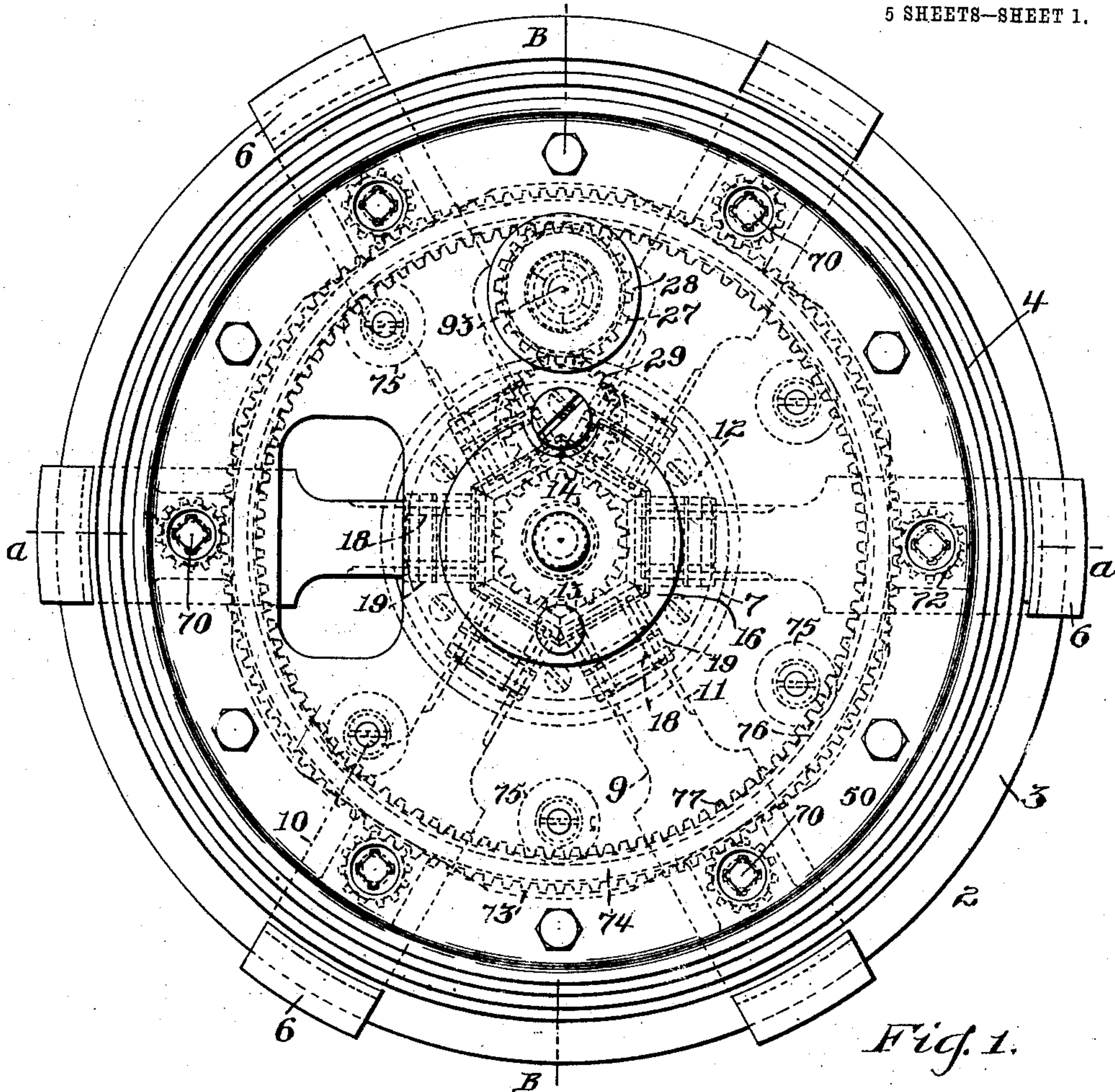
No. 826,607.

PATENTED JULY 24, 1906.

O. PRICE.
SAFE DOOR LOCKING MECHANISM.

APPLICATION FILED MAY 23, 1904.

5 SHEETS—SHEET 1.



Witnesses:

G. F. Fuss

R. M. Pittman

Fig. 2.

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Orvey Price;
By his Attorney,

J. H. Richards.

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5 SHEETS—SHEET 2.

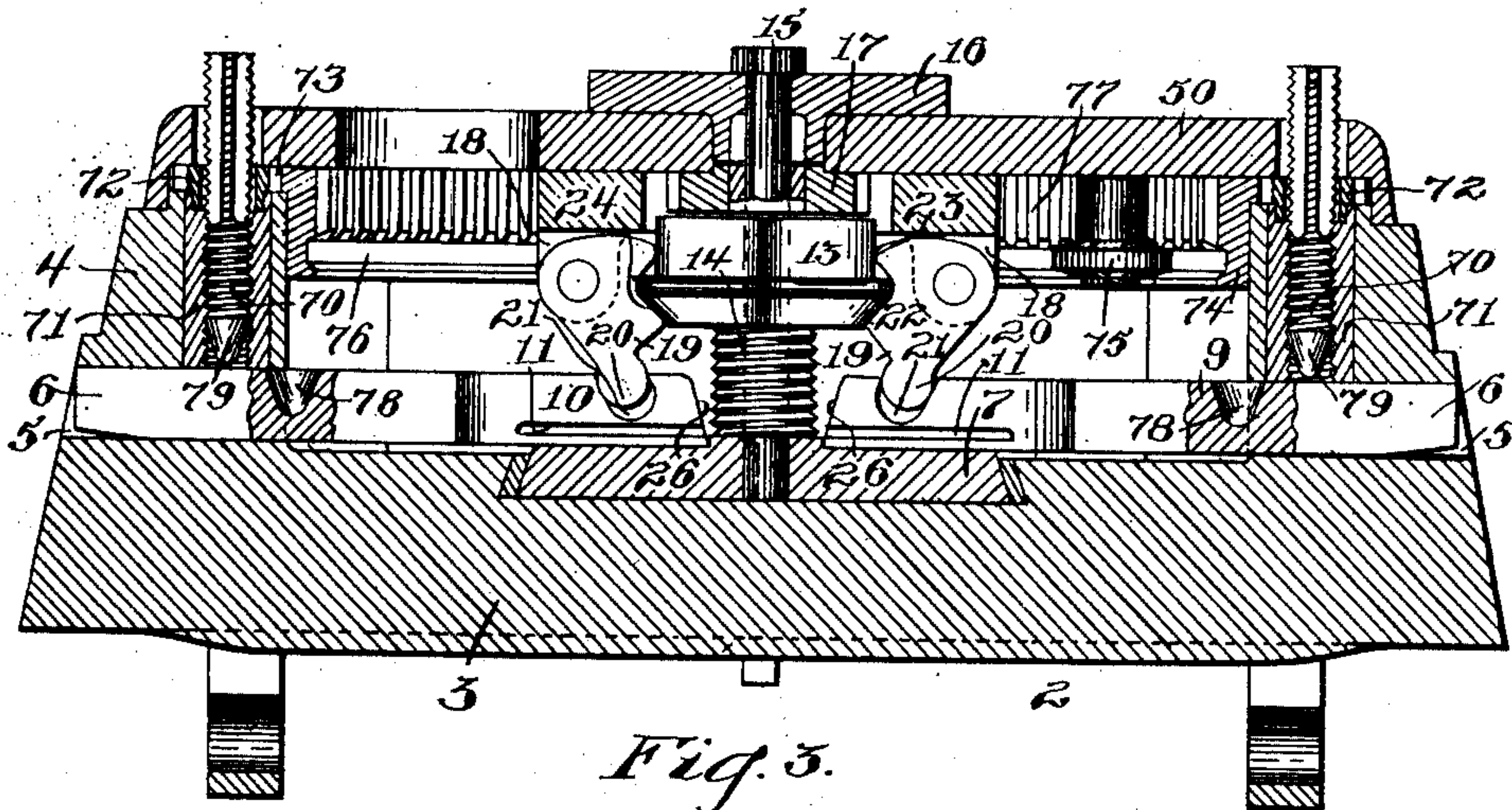


Fig. 3.

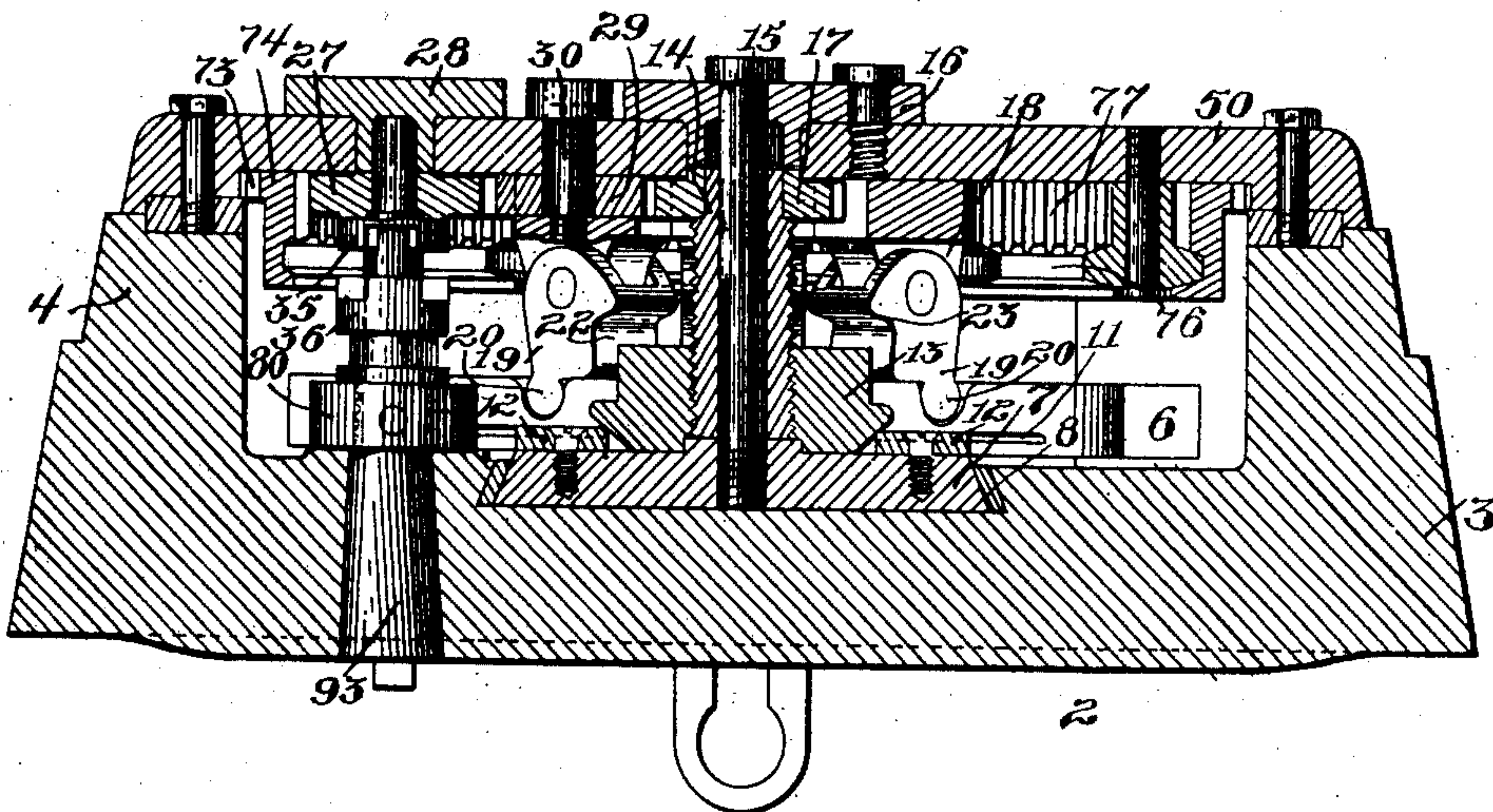


Fig. 4.

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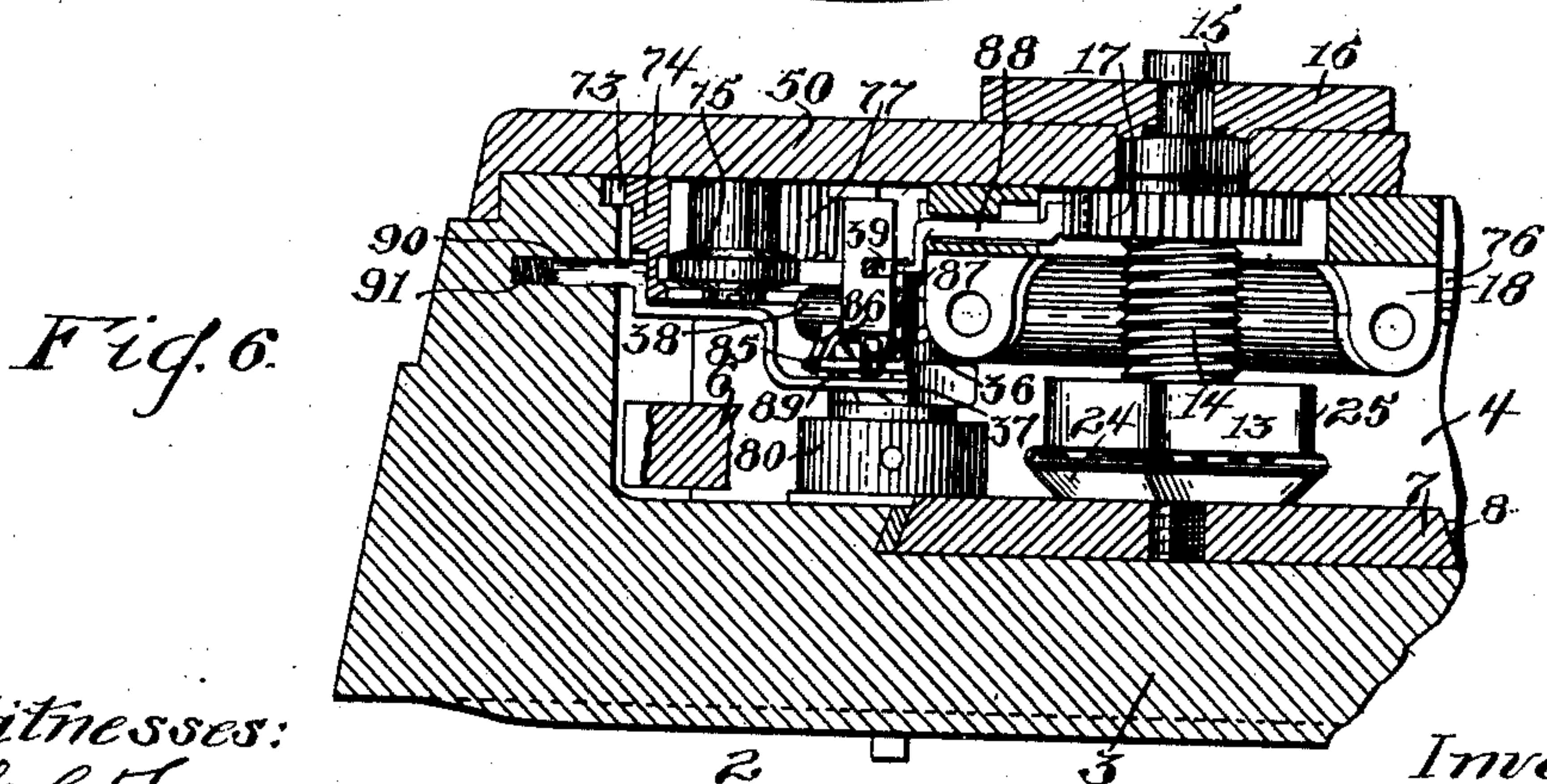
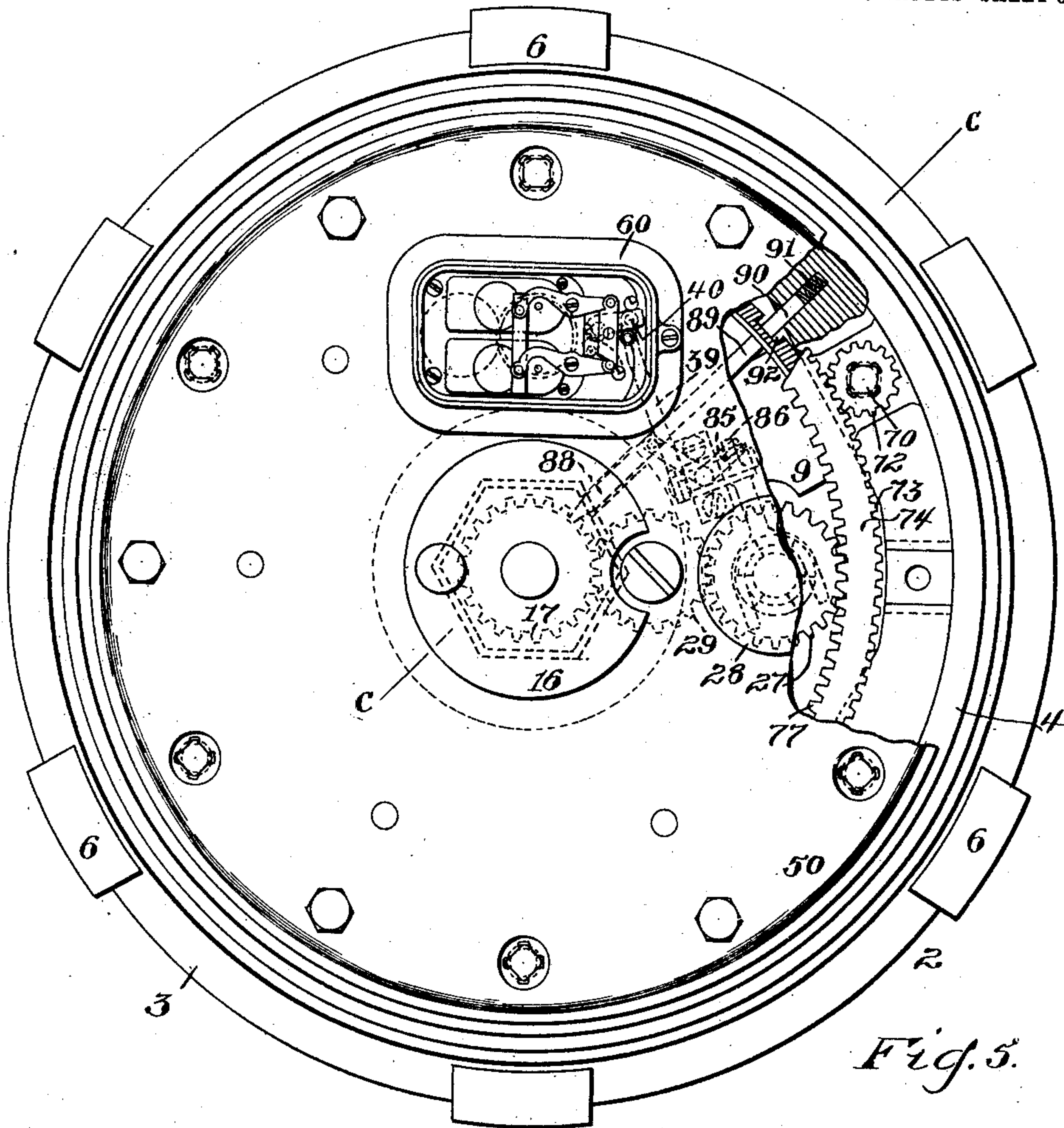
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Witnesses:
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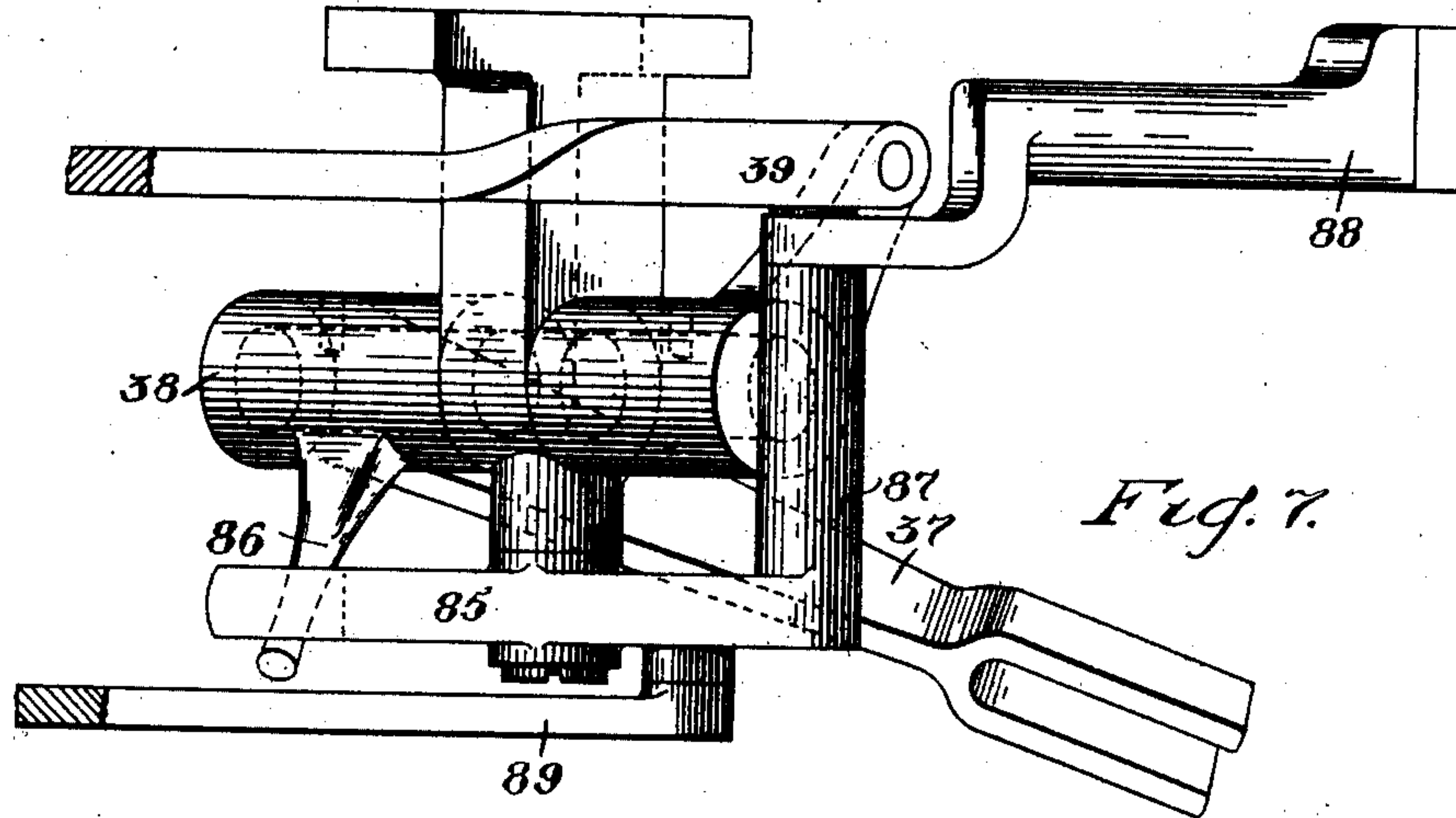


Fig. 7.

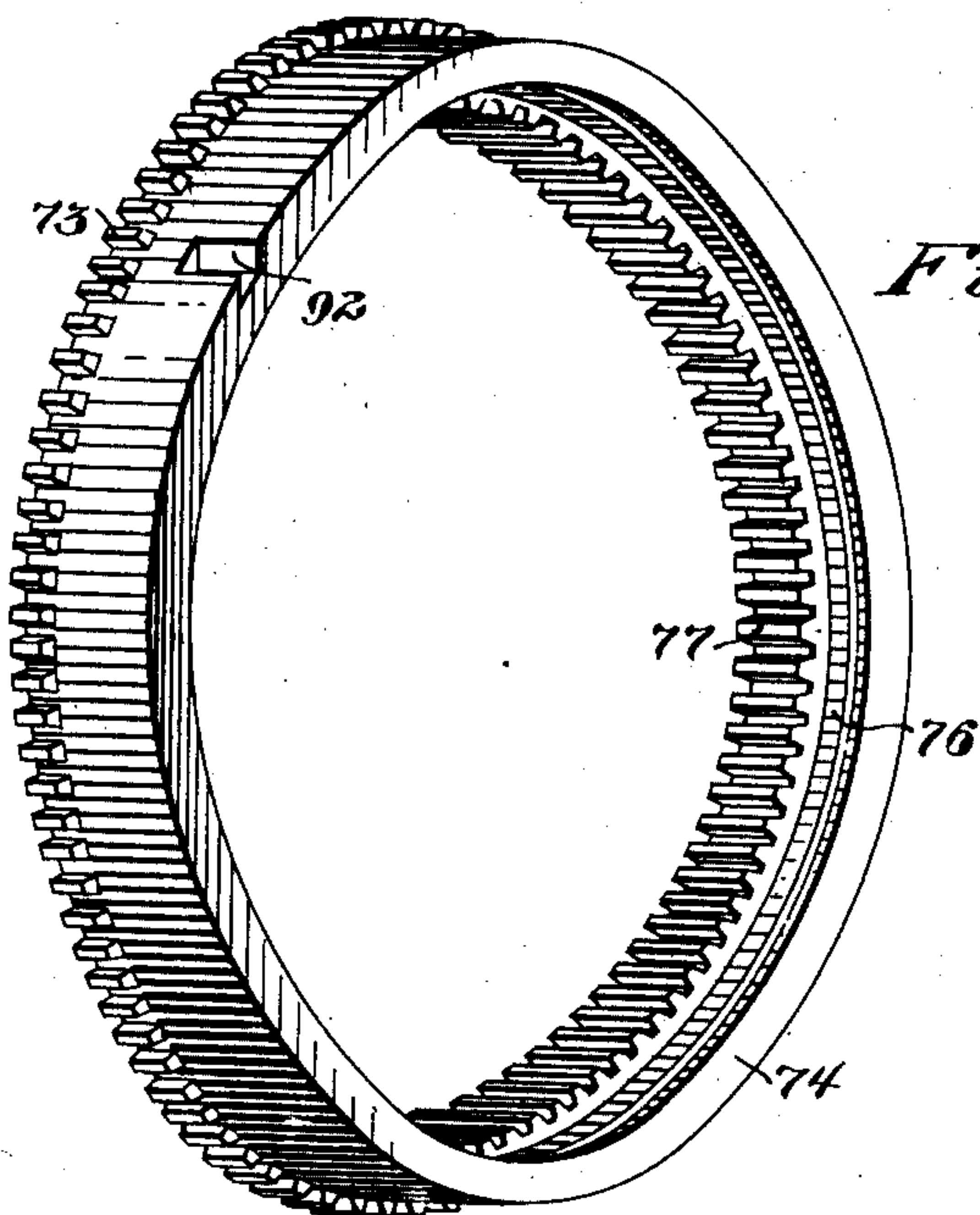


Fig. 8.

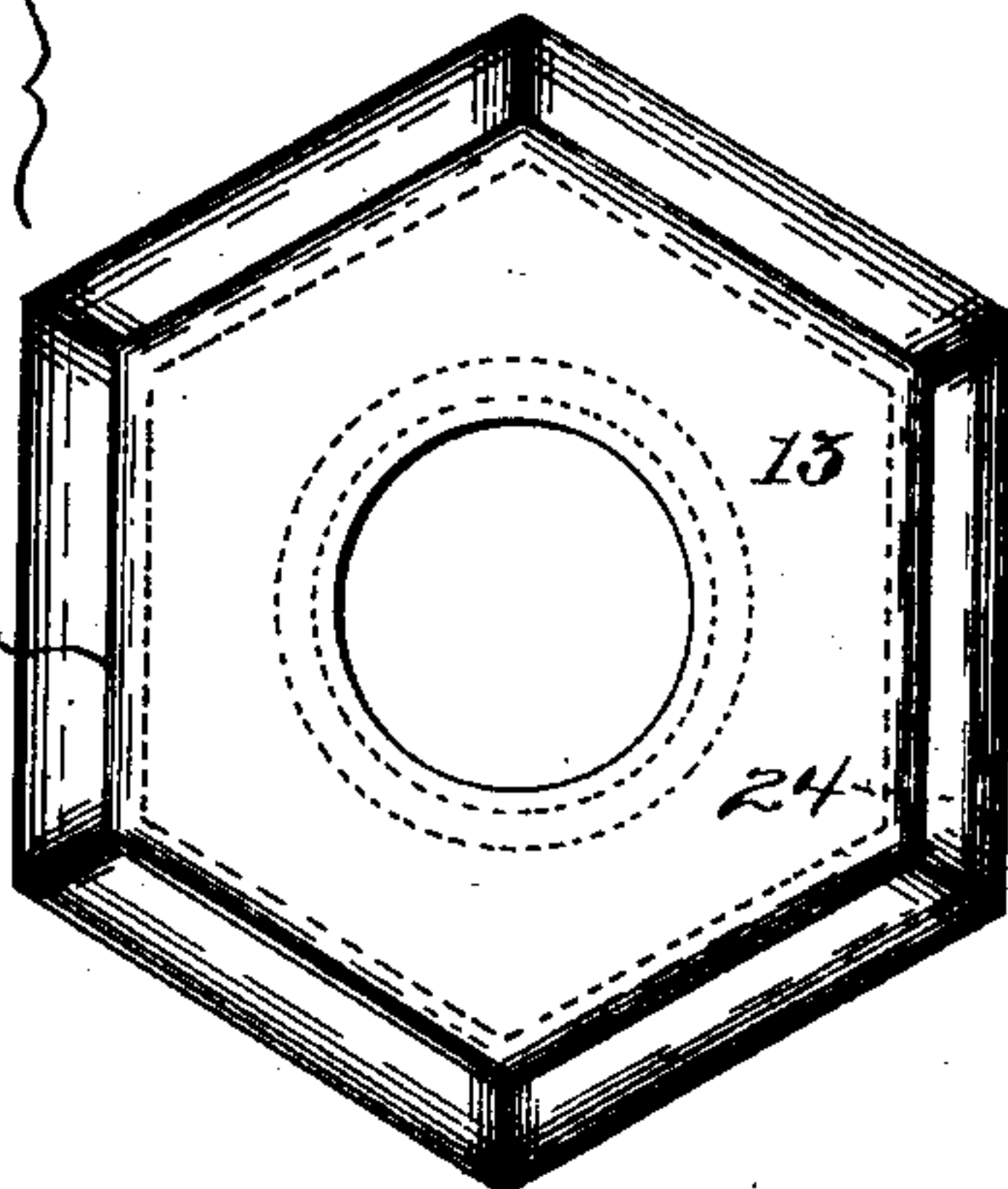
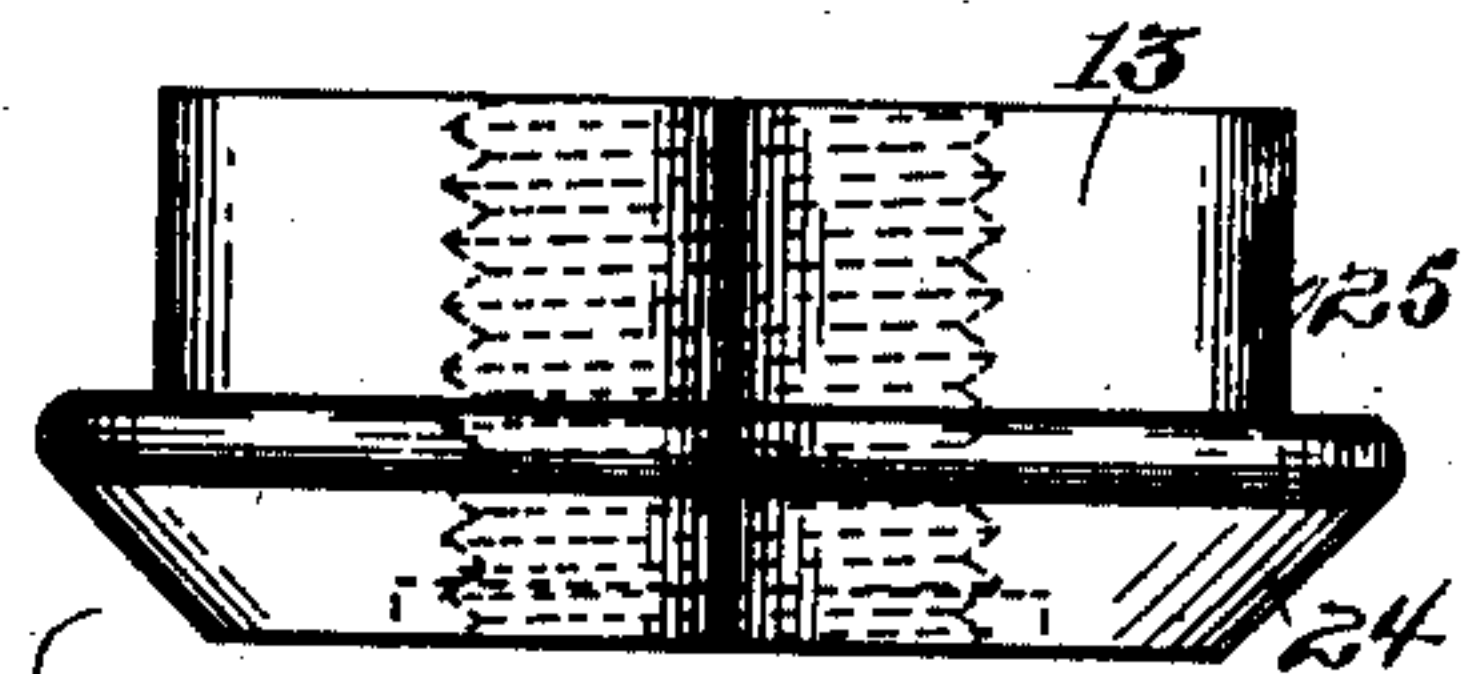


Fig. 9.

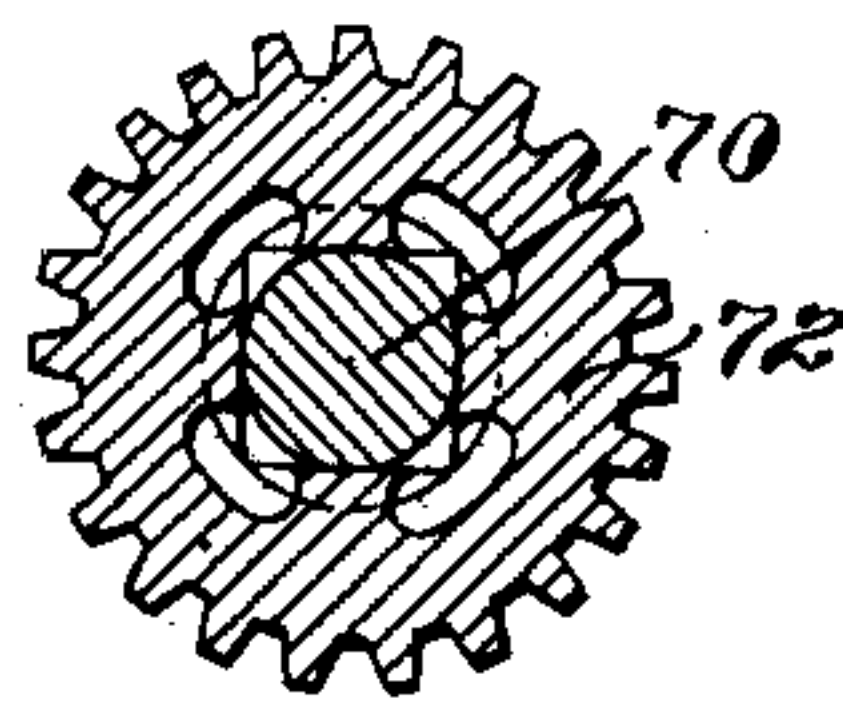


Fig. 11.

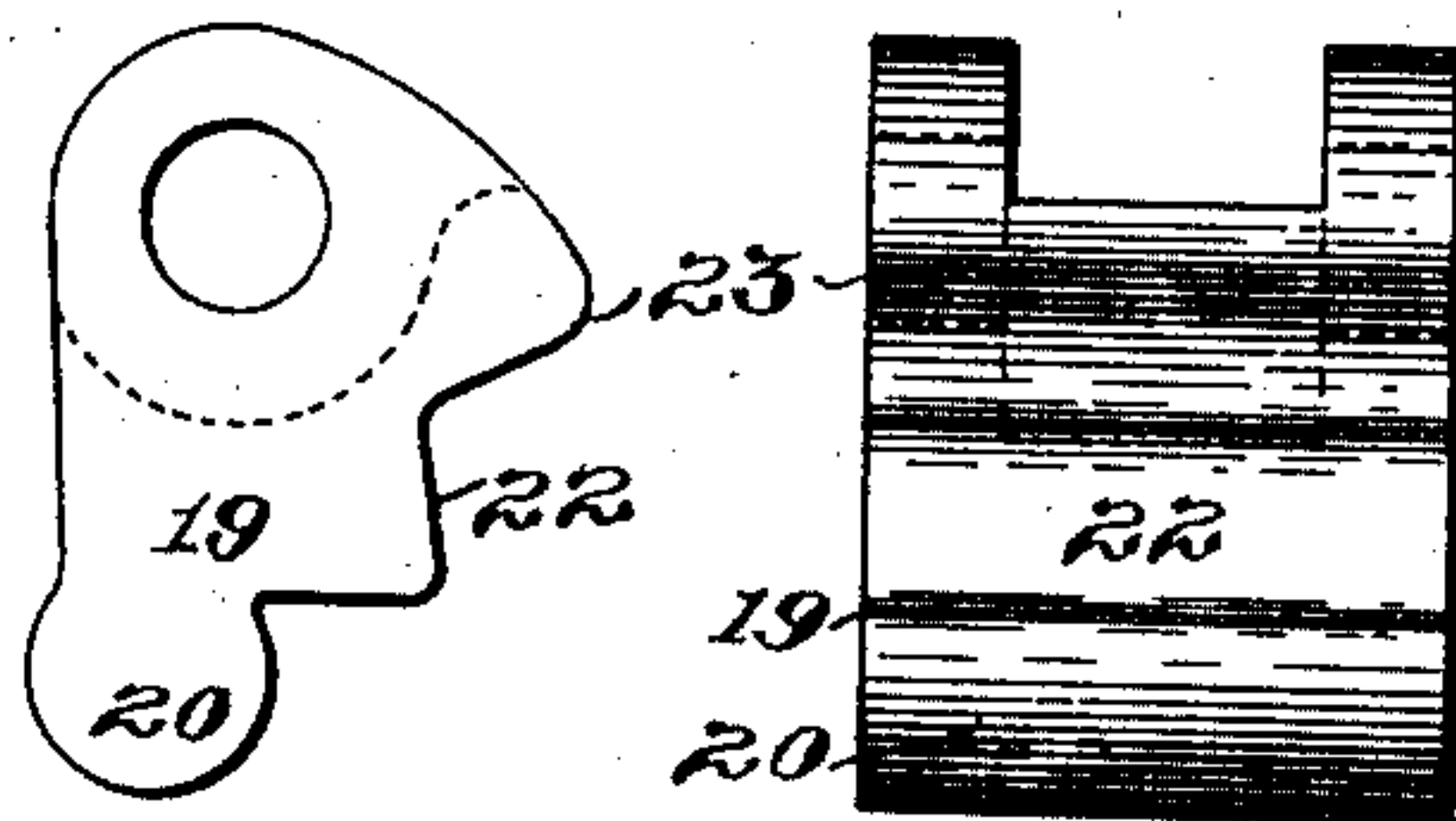


Fig. 10.

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5 SHEETS—SHEET 5.

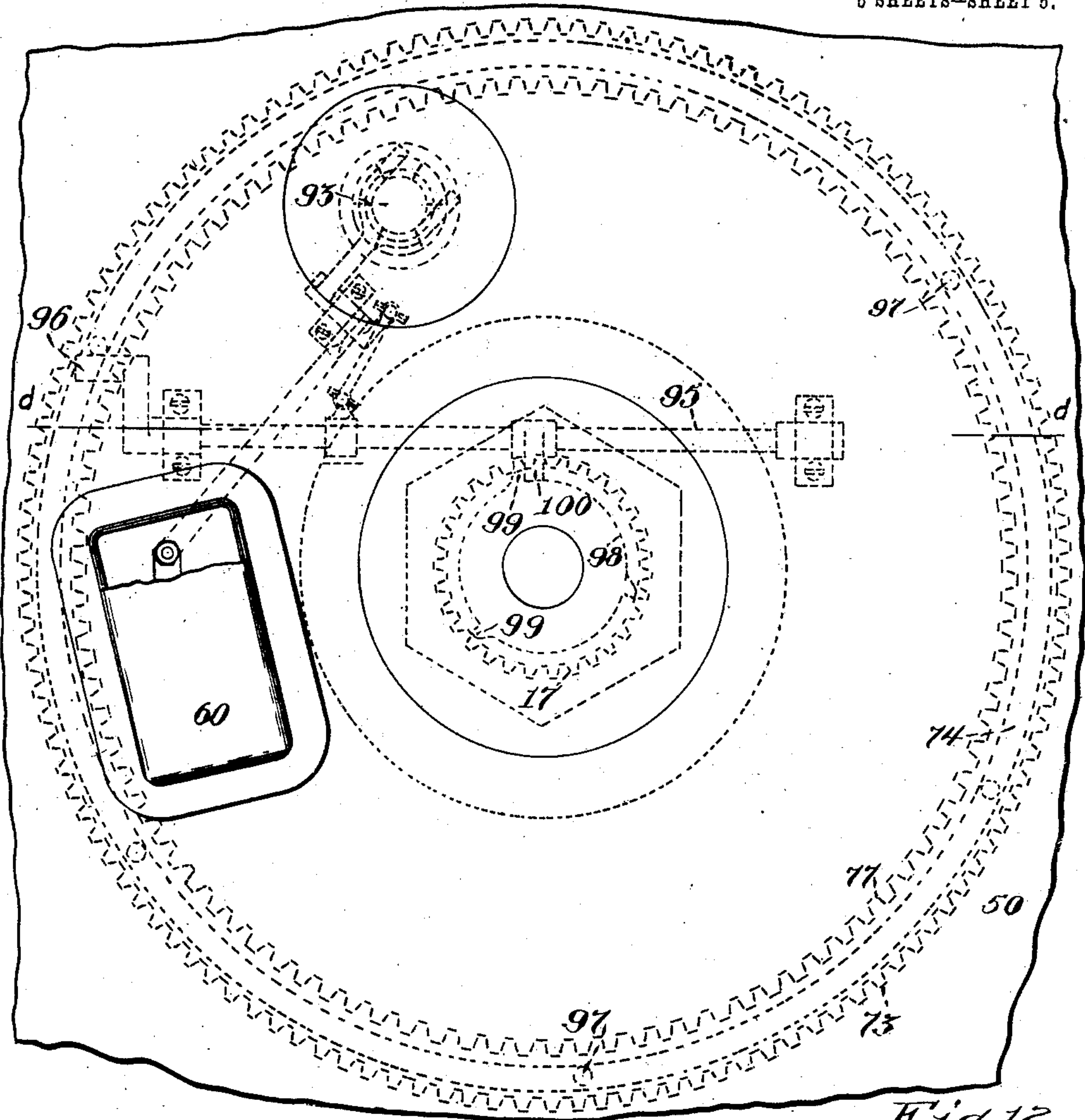


Fig. 12.

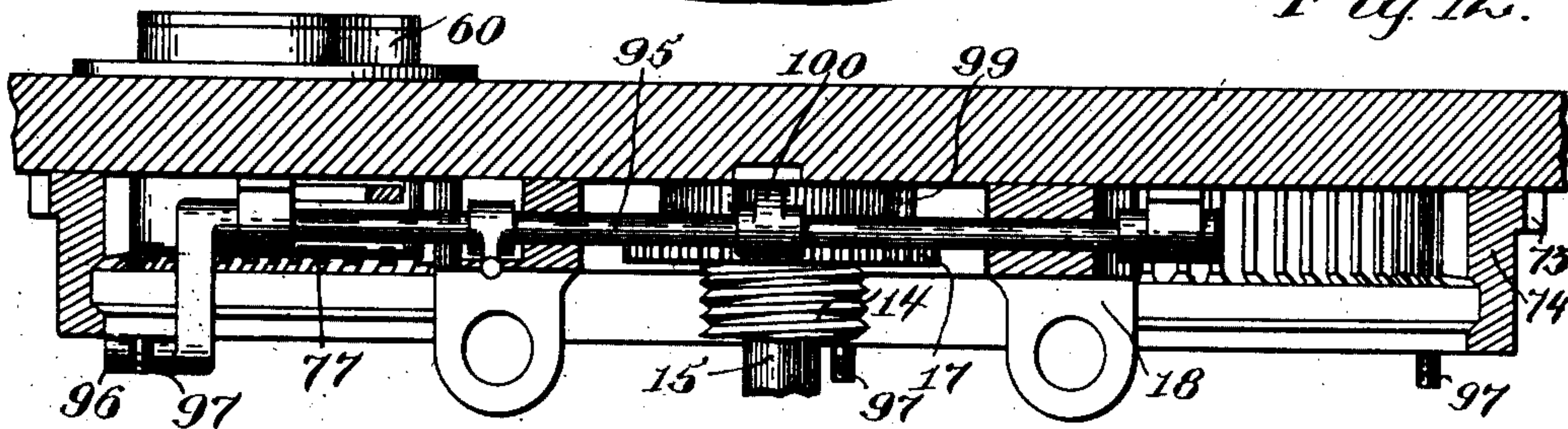


Fig. 13.

Witnesses:

C. G. Fuss.

R. W. Pittman

Inventor

Orvey Price

By his attorney,

F. W. Richards.

UNITED STATES PATENT OFFICE.

ORVEY PRICE, OF PLAINFIELD, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO TAYLOR IRON & STEEL COMPANY, OF HIGH BRIDGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

SAFE-DOOR-LOCKING MECHANISM.

No. 826,607.

Specification of Letters Patent.

Patented July 24, 1906.

Application filed May 23, 1904. Serial No. 209,156.

To all whom it may concern:

Be it known that I, ORVEY PRICE, a citizen of the United States, residing in Plainfield, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Safe-Door-Operating Mechanism, of which the following is a specification.

This invention relates to bolt mechanism for safes or vaults, the object of the invention being to provide an improved system of safe or vault door bolt mechanism.

Another object of the invention is the provision of improved means for blocking the bolt mechanism against retraction.

Another object of the invention is the provision of improved means for operating such bolt mechanism.

Another object of the invention is the provision of improved bolt mechanism effectively locked and blocked by independent means, the operation of which independent means and the actuation of the bolt mechanism itself being obtained through the medium of a single spindle supported independently of the blocking means.

A further object of the invention is the provision of an improved bolting mechanism the bolts of which are effectively wedged in their protracted position without swinging such bolts and dogged and blocked in such position against retraction and which mechanism is simple in its construction, organization, and operation, but powerful in its action.

In the drawings accompanying and forming a part of this specification, Figure 1 is a rear view of the safe or vault door with its back plate in position, the bolting mechanism being shown in dotted lines. Fig. 2 is a cross-sectional view taken in line *a a*, Fig. 1, the bolts being shown protracted. Fig. 3 is a similar view to Fig. 2, but with the bolts shown retracted. Fig. 4 is a partly-perspective sectional view taken in line *B B*, Fig. 1. Fig. 5 is also a rear view of the door with a part of its back plate broken away and showing one form of a combination and time lock in position. Fig. 6 is an enlarged sectional detail view taken in line *c c*, Fig. 5. Fig. 7 is an enlarged detail view of the operating means for the detents and clutch. Fig. 8 is a perspective view of the gear-ring. Fig. 9

is a side and top face view of the traveling head. Fig. 10 illustrates end and side views of the link by means of which the traveling head operates the bolts. Fig. 11 is an enlarged cross-sectional view of the dogging-bolt and its operating-pinion. Fig. 12 is a detail view of an improved form of dogging or locking means for the ring and traveling head, and Fig. 13 is a sectional view taken in line *d d* of Fig. 12.

Similar characters of reference indicate corresponding parts in the different figures of the drawings.

The present invention is in part an improvement upon the bolting mechanism patented by Henry D. Hibbard and in part an improvement upon the dogging mechanism shown and described in the application of myself and Walter Gaston, filed April 11, 1904, Serial No. 202,491, now Patent No. 792,072, dated June 13, 1905.

The present improvement is designed in part to provide a bolting mechanism in which the bolts may be shifted lengthwise or radially into their protracted position in such manner that a powerful wedging action thereof is obtained without the necessity of swinging the bolts in order to accomplish this desirable result whereby the door will be drawn firmly to its seat and wedged therein, while the bolts when in such position will be dogged and blocked against retraction by vibration or otherwise and which bolts should the actuating means be displaced will still be maintained in their locking position against retraction.

The door 2 may be of various constructions, but in the preferred form shown it is a one-piece or integral circular structure which will be preferably formed of unmachineable metal, such as manganese steel, and comprises a body 3, having a flange 4, the latter provided with bolt-openings 5 for the passage of radial bolts 6, the shanks or inner ends of which are shown in the present instance guided by guiding devices which act to maintain the bolts against displacement. For this purpose when the door is made of unmachineable metal—such, for instance, as manganese steel, which is hard and when heat-treated very tough—as it is not practicable to drill the same to provide threaded openings for screws or bolts, the body of the

door is shown fitted with a machineable-metal part, preferably in the form of a soft-metal insert 7, shown maintained in position by a wedge or wedges, such door-body having a dovetailed recess 8 centrally located, in which the insert is located. A plurality of inserts could be used, if desired, in place of the single insert shown. Each bolt 6 comprises a head 9 and a shank 10, each side of which shank is provided with a groove 11 for the reception of guiding-blocks 12, forming tracks screwed or bolted to the soft-metal insert. By this means the bolts are maintained against sidewise movement, as well as retained in position against displacement, during their in and out movements. It will of course be obvious that the reverse of this construction could be used, if desired—that is to say, the guides or tracks could be formed on the bolts and the ways on the blocks.

In the present instance, as hereinbefore stated, the bolts are not shifted or swung sidewise in order to obtain the radial movement thereof, and consequently the bolt-heads may be fitted with precision in the bolt-openings formed in the flange of the door and, in fact, may be ground to a matching fit.

For sliding the bolts improved means is provided, comprising a traveling member or head 13. This traveling head is mounted upon a rotatable screw 14, journaled upon a spindle 15, screwed into the soft-metal insert at one end and headed in the rear of the back plate 50 at the other end, preferably passing through a cap 16, fitting into an opening in the back plate and bolted to such back plate. Fixedly secured to this screw 14 is a pinion 17 for rotating such member to shift the traveling head. Pivotaly secured to brackets 18, carried by the back plate, is link mechanism comprising a plurality of links 19, one for each bolt. Each of these links has separable connection with its bolt, the connection being such that on the displacement of the back plate under an explosive charge or otherwise the links will be withdrawn from the bolts without shifting such bolts. For this purpose the bolts and links are provided with protuberances 20 and recesses 21, in the present instance the recesses 21 being formed in the bolts, while the protuberances 20 are carried by the links, forming a joint somewhat similar to a ball-and-socket joint. Each of these links has a cam formation, being provided with a pair of cam-faces 22 and 23, co-operating with a pair of cam-faces 24 and 25, formed on the traveling head, one of such faces, as 24, being wedge-shaped to engage the inner ends of the bolts, which are inclined or beveled, as at 26.

Referring to Fig. 3, when the head or "actuator," as it may be termed, is moved toward the body of the door the inclined cam-face 24 engages the cam-face 22 of the link 19 and slowly but powerfully moves the links on

their pivots to shift the bolts into their retracted positions, as shown in Fig. 2, and when such bolts have been partly forced home the inclined cam-face 24 of the traveler then comes into engagement with the inclined inner ends 26 of the bolts and by such direct engagement forces the bolts outwardly with a wedging action, the bolt-recess in the jamb of the safe-body and the ends of the bolts being formed to secure this highly-important result. When such bolts are firmly seated home and the traveler at rest, the rib or cam-surface 25 acts to block the retraction of such bolts. This traveling head is thus not only a bolt-actuator but a bolt-blocking device. On the reverse movement of the traveling head it first releases or unblocks the bolts and then by the engagement of its cam-face 25 with the cam-faces 23 of the links shifts the bolts inwardly into their retracted position. (See Fig. 3.) From the foregoing it will be seen that this traveling head is a non-rotatable reciprocatory actuator effective indirectly through the links at one period to shift the bolts outwardly and to retract them inwardly and at another period by direct engagement with the bolts to force them outwardly and wedge them in position and finally effective to block the bolts by its direct engagement therewith against retraction and that, owing to the inclined or beveled surfaces of the traveling head and the inner ends of the bolts, such bolts will be forced home and held in such position with the door wedged in its jamb against the possibility of inserting nitroglycerin into the joint around such door, and thus insure a fluid-tight joint. For the purpose of shifting this traveling head a spindle 93, projecting through the body of the door and located at one side of, and therefore independently of, the traveling head, is provided. On this spindle is loosely mounted a gear 27, preferably formed as one member of a clutch 35, the spindle having its inner end mounted in a cap 28, bolted to the back plate 50. This gear 27 is in mesh with another gear 29, mounted on a stud 30, projecting from the back plate, and which latter gear is in mesh with the pinion 17, fixedly secured to the screw on which the traveling head is mounted. The other member 36 of this clutch is splined to the spindle for rotation therewith, and when said clutch members are in engagement the rotation of the spindle will through the medium of the gearing rotate the screw, and thus shift the traveling head to actuate the bolts.

For the purpose of shifting the splined clutch member 36 into and out of engagement with the loosely-mounted member 35 a clutch-shifter 37 is provided, it being connected to a short rock-shaft 38, to one end of which the clutch-shifter is secured and to the other end of which a lever 39 is connected,

the opposite end of which is pivoted to the bolt 40 of the combination-lock 60, so that when the combination-lock tumblers are properly set and the bolt 40 shifted the clutch-shifter will be operated to throw the splined clutch member 36 into engagement with the loosely-mounted clutch member 35. Then on the rotation of the spindle the traveling head will be moved to shift the bolts.

For the purpose of adding additional security to the safe or vault a dogging mechanism independent of the blocking means is provided. This dogging mechanism is substantially similar to that shown and described in the joint application hereinbefore referred to, it comprising a plurality, preferably one for each bolt, of rotatable bolts 70, threaded into soft-metal inserts 71, fitted in the flange 4 of the door, so that it comprises what may be properly termed "rim dogging" mechanism. The outer ends of these bolts carry pinions 72 in mesh with the teeth 73 of a gear-ring 74, supported by the door, in the present instance by means of the back plate 50, from which project a series of antifriction-rolls 75, working in a track or way 76, located on the inner side of such gear-ring 74. By this means the ring is not only supported, but its rotary movement facilitated. For rotating this gear-ring it is provided on its interior with teeth 77, which are in mesh with the gear 27, loosely mounted on the spindle 93. Each of the door-locking bolts is provided with a tapered opening 78, into which the tapered end 79 of its dogging-bolt fits. From the foregoing it will be seen that on the operation of the single spindle, which is shown tapered and tightly fitting into an opening in the door-body, being wedged therein by a threaded and pinned collar 80, the gear-ring will be rotated, provided the clutch members are in engagement, through the medium of the gear 27 to rotate the dogging-bolts, and at the same time the gear mechanism connecting this spindle with the screw on which the traveling head is mounted will be operated to shift the traveling head.

The dogging-bolts and the traveling head are so organized and timed that such dogging-bolts will enter the openings in the locking-bolts at the proper moment and will be withdrawn therefrom before the bolts are retracted by the traveling head, as will be readily seen from an inspection of Fig. 2, since the traveling head must move from the position shown into position to engage the cam-surfaces 23 of the links before said bolts are started. During this movement the dogging-bolts are rotated and withdrawn.

In order to prevent any possible premature withdrawal of the dogging-bolts or shifting of the traveling head, and thus unlock the main bolts, suitable locking means is provided. In one form it is shown in the nature of detent mechanism comprising a pair of

locking fingers or detents, one for locking the dogging mechanism and the other for locking the blocking mechanism against movement. Both of these locking-fingers are preferably operative at the same time and by the same means, in the present instance by the combination-lock. For this purpose an arm 85 is pivotally mounted on the bracket which carries the clutch-shifter rock-shaft, one end of which arm is connected with a projection 86, carried by such rock-shaft, the other end carrying a short shaft 87, to the free end of which is secured a detent device 88, adapted to engage a part of the blocking mechanism, shown in the present instance as the pinion 17, fixed to the screw, such detent device projecting between the teeth thereof, and thus preventing rotation of such pinion, and thereby movement of the screw and the traveling head. Also connected to this pivoted arm 85 is a lever 89, connected at its opposite end with a spring-actuated detent 90, working in a recess 91 of the flange of the door. This detent device in its normal operative position projects into a recess 92 of the gear-ring, and thus prevents rotation thereof. On the proper setting of the combination-lock the movement of the bolt thereof shifts the splined clutch member 36 into engagement with the loosely-mounted clutch member 35 on the spindle, and at the same time the means just described operates to withdraw the detent device 88 from the gear 17 and to shove the gear-ring detent 90 inwardly against the action of its spring, and therefore away from the gear-ring, thus simultaneously releasing both the pinion and the gear-ring, so that on the turning of the spindle at this time both the gear-ring and the pinion will be operated to release the dogging-bolts and unblock the main bolts and retract such bolts to permit the door to be opened.

Since the movement of the traveler is limited at one point by the body of the door and at the other point by the gear 17 and as this traveler is shifted through the medium of the spindle and the gear carried thereon and as this gear also operates the gear-ring, it follows that the movement of the rotary dogging-bolts is also limited, so that such bolts must necessarily have a certain limited movement and cannot, therefore, be rotated into position where they would fail to cooperate with the main bolts at the proper time. Furthermore, the tapered recesses in the main bolts and tapered ends of the rotating bolts cooperate in such manner that the dogging-bolts will properly fit into such main bolts at a predetermined period, or if they should not the cooperating tapered surfaces will enable the dogging-bolts to work their way into proper position.

From the foregoing it will be seen that the same spindle which is effective to operate the main bolts is also effective to control the dog-

ging and blocking of such bolts, so that this main bolt locking and blocking means is controlled by a single spindle, while at the same time a very powerful and effective bolt-operating means is provided and which means cannot be vibrated so as to shift the main bolts from their protracted positions if perchance the back plate and operating means should be displaced or blown inwardly into the body of the safe under the action of high explosives, for, as will be seen, the back plate, the traveling head, and connecting-links could all be displaced, together with the gear-ring, but the rotary dogging-bolts would still lock the main bolts against retraction.

In conclusion it is to be understood that the various details may be more or less changed without departing from the spirit or scope of this invention. For instance, the screw upon which the traveling head moves may be so secured in position that the displacement of the back plate by an explosive charge or otherwise would not interfere with such head, as the outer end of the bolt now supported by the cap which is bolted to the back plate may be supported on the inner side of such plate in some suitable manner, so that when the back plate is displaced the opposite end of the bolt, being supported in the soft-metal insert, would maintain the blocking member in position to assist securing the bolts against retraction.

In Figs. 12 and 13 is shown what I consider a very desirable dogging or locking means for the traveling head and gear-ring, which dogging or locking means, like that hereinbefore described, are simultaneously operated through the medium of the clutch-shifter and combination-lock in a manner previously set forth. This means, however, instead of comprising a detent mechanism can be more properly considered a stop mechanism, since it includes a plurality of stop devices. A rock-shaft 95 is suitably supported in position by the back plate and is provided at one end with a locking stop or lug 96, shown in the form of a crank-arm projecting into position to engage one of several projections or stops 97, carried on the inner side of the gear-ring. When these stop members are in engagement, further rotation of the ring is prevented. The ring is provided with a number of these projections 97, so that some one of them may come into engagement with the stop-arm at the proper time. The foregoing comprises the stop mechanism for dogging the gear-ring. The stop mechanism for dogging the traveling head comprises a disk 98, having a plurality of projections or stops 99, this disk being fixed either to the screw upon which the traveling head is mounted or fixedly secured to the pinion or gear 17. Coöperating therewith and carried by the rock-shaft 95 is a stop or stop-arm 100, which when the stop devices 96 and 97

of the gear-ring and rock-shaft are in engagement are also in engagement to prevent the rotation of the screw. On the proper manipulation of the clutch-shifter the rock-shaft will be rocked and the stops 96 and 100 thrown out of engagement with the stop devices 97 and 99 to permit the gear-ring and screw to be rotated.

I claim—

1. In a safe or vault door, the combination of bolting mechanism comprising one or more sliding bolts, and means for retracting or shooting said bolt or bolts and comprising a reciprocatory traveler, means for reciprocating said traveler, a spindle projecting through the door at one side of said reciprocating means, and means for effecting operative connection between said spindle and said reciprocating means to permit the traveler to be actuated.

2. In a safe or vault door the combination of a plurality of bolts, and means for shifting said bolts and comprising a reciprocatory, cam-formed member, rotary means for reciprocating said member, said rotary means comprising a screw upon which said member travels, gearing for rotating said screw, all located interiorly of the door when closed, and means passing through the door for imparting movement to the gearing.

3. In a safe or vault door, the combination of a plurality of lengthwise-shiftable bolts, a screw carried by the door, a reciprocatory member mounted upon said screw, devices supported independently of said member for imparting movement from said member to said bolts to throw or retract the same, all located in the inner side of the door, and means for rotating said screw thereby to reciprocate said member and including a spindle passing through the door.

4. In a safe or vault door, the combination of a plurality of lengthwise-shiftable bolts, a screw carried by said door, a reciprocatory member mounted upon said screw, pivoted links connecting said member with said bolts to retract or protract the same, all located interiorly of the door and means for rotating said screw and including a spindle passing through the door.

5. In a safe or vault door the combination of a plurality of radially-shiftable bolts, a screw carried by said door, a reciprocatory traveling head mounted upon said screw, links connecting said head with said bolts to retract or protract the same, gearing for rotating said screw, and a spindle carried by the door for operating said gearing.

6. In a safe or vault door the combination of a plurality of shiftable bolts, a screw carried by the door, a reciprocatory traveler mounted upon said screw, means for imparting movement from said traveler to said bolts, a spindle carried by the door at one side of and operatively connected at certain

periods with said traveler-screw, and means for controlling said connection thereby to prevent movement thereof by the spindle at certain times.

5 7. In a safe or vault door the combination of a plurality of shiftable bolts, a screw carried by the door, a reciprocatory traveler mounted upon said screw, means for imparting movement from said traveler to said
10 bolts, a spindle carried by the door and operatively connected with said traveler-screw, and clutch mechanism for controlling the operation of said traveler.

15 8. In a safe or vault door the combination of a plurality of shiftable bolts, a screw carried by the door, a reciprocatory traveler mounted upon said screw, means for imparting movement from said traveler to said bolts, a spindle carried by the door, and operatively connected with said traveler-screw,
20 clutch mechanism for controlling the operation of said traveler, and locking mechanism for controlling the operation of said clutch mechanism.

25 9. In a safe or vault door the combination of a plurality of sliding bolts, a screw carried by the door, a reciprocatory traveler mounted upon said screw, pivoted links for imparting movement from said traveler to said
30 bolts, a rotary spindle carried by the door, gearing connecting said spindle with said traveler-screw, and means for controlling the movement of said gearing.

35 10. In a safe or vault door, the combination of a plurality of radially-shiftable bolts, a screw carried by the door, a reciprocatory traveler mounted upon said screw, links for imparting movement from said traveler to said bolts a rotary spindle carried by the
40 door, gearing connecting said spindle with said traveler-screw, and means including a combination-lock for controlling the movement of the said gearing.

45 11. In a safe or vault door the combination of a plurality of radially-shiftable bolts, a screw carried by the said door, a reciprocatory traveler mounted upon said screw, a series of oscillatory links one for each bolt for imparting movement from said traveler to said
50 bolts, a rotary spindle carried by the door, gearing connecting said spindle with said traveler-screw, a clutch mounted upon said spindle, and means for throwing the members of said clutch into and out of engagement
55 thereby to control the operation of said gearing, and thereby the movement of the bolts.

60 12. In a safe or vault door the combination of bolts, a reciprocatory traveler located at the inner side of the door for shifting said bolts, means independent of and located at one side of said traveler and operated from the outside of the door for actuating said traveler, and means operatively connecting

said means and traveler at predetermined periods. 65

13. In a safe or vault door, the combination of a plurality of shiftable bolts, a traveling head having cam-faces, means for shifting said traveling head and means also having
70 cooperating cam-faces for imparting movement from said traveling head to said bolts, thereby to retract or protract the same.

14. In a safe or vault door, the combination of a plurality of radially-shiftable bolts,
75 a plurality of links pivotally carried by the door, one for each bolt, a traveling head in engagement with said links, all located interiorly of the door and means for shifting said head and including a spindle passing through
80 the door, the organization being such that through the movement of said head the links are shifted to protract or retract the bolts.

15. In a safe or vault door, the combination of a plurality of radially-shiftable bolts,
85 a plurality of pivoted links one for each bolt, a traveling head cooperating with said links, each of said links having a pair of cam-engaging faces cooperating with corresponding faces on said head, and means for shifting
90 said head.

16. A safe or vault door having a back plate, a plurality of shiftable bolts, a plurality of cam-faced links pivotally supported by said back plate and having substantially
95 a ball-and-socket connection with said bolts, a cam-faced traveling head in engagement with said links, and means for shifting said head to throw or retract the bolts.

17. A safe or vault door having a back
100 plate, a plurality of shiftable bolts each having a recess, a plurality of cam-faced links pivotally supported by said back plate and loosely and detachably fitting into the recesses of said bolts, a cam-faced traveling
105 head in engagement with said links, and means for shifting said head to throw or retract the bolts, the organization of the bolts and links being such that the links are readily separable from the bolts on the displacement
110 of the back plate.

18. In a safe or vault door the combination of a plurality of shiftable bolts, a plurality of members supported by said door and cooperating with said bolts to shift the same,
115 the organization being such that on the displacement of such members they are readily disconnected from the bolts, a traveling head cooperating with said members to actuate the same, and means for operating said traveling
120 head.

19. In a safe or vault door the combination of a plurality of radially-shiftable bolts, a back plate, a plurality of pivoted links carried by said back plate, each having a part
125 thereof in engagement with one of said bolts, the organization being such that on the displacement of the back plate the said links

will be readily withdrawn without the shifting of such bolts, and means for actuating said links thereby to shift the bolts.

20. In a safe or vault door the combination of a plurality of bolts, a reciprocating traveler, means connecting said traveler with said bolts for actuating the latter, said means having separable connection with said bolts to permit of the ready detachment thereof, and means for actuating said traveler.

21. In a safe or vault door, the combination of a plurality of radially-shiftable bolts, a back plate, a plurality of pivoted cam-faced links carried by said back plate each in engagement with one of said bolts, a screw carried by said door, a cam-faced traveling head mounted upon said screw and cooperating with said links to protract or retract the bolts, a rotary spindle, gearing connecting said spindle and traveling-head screw, and means for controlling the operation of said gearing and thereby the traveling head.

22. In a safe or vault door, the combination of a plurality of radially-shiftable bolts, a back plate, a plurality of pivoted cam-faced links carried by said back plate each in engagement with one of said bolts, a screw carried by said door, a cam-faced traveling head mounted upon said screw and cooperating with said links to protract or retract the bolts, a rotary spindle, gearing connecting said spindle and said traveling-head screw, and means for controlling the operation of said gearing and thereby the traveling head, said means including clutch mechanism.

23. In a safe or vault door, the combination of a plurality of radially-shiftable bolts, a back plate, a plurality of pivoted cam-faced links carried by said back plate each in engagement with one of said bolts, a screw carried by said door, a cam-faced traveling head mounted upon said screw and cooperating with said links to protract or retract the bolts, a rotary spindle, gearing connecting said spindle and said traveling-head screw, and means for controlling the operation of said gearing and thereby the traveling head, said means including clutch mechanism and locking mechanism.

24. In a safe or vault door, the combination of a plurality of sliding bolts, guiding means for the shanks of said bolts and comprising grooves and tracks located at the side of each of said bolts, and means for actuating said bolts.

25. A safe or vault door bolting mechanism comprising a plurality of shiftable bolts, a screw-actuated traveler for shifting the bolts, means independent of such screw for imparting motion to said screw, and means for transmitting motion from said means to said screw.

26. A safe or vault door formed of unmachineable metal, a machineable-metal insert fixed therein, a bolt carried by said door and

guiding means for said bolt, a part thereof carried by said insert.

27. A safe or vault door formed of unmachineable metal having machineable-metal means secured thereto, in combination with a plurality of bolts, guiding means for such bolts, comprising grooves, and guiding devices cooperating with such grooves, one part of each such guiding means carried by each bolt and another part by the machineable-metal means.

28. A safe or vault door formed of unmachineable metal having a centrally-located machineable part in combination with a plurality of radially-shiftable bolts each having one or more grooves located therein, and guiding means secured to said machineable part and cooperating with said grooves to guide the bolts during their movements.

29. An integral safe or vault door formed of unmachineable metal and comprising a body and a flange, the latter having bolt-openings, and a machineable part secured to the body of the door in combination with a plurality of radially-shiftable bolts located in said bolt-openings, the shank of each having a pair of guide-grooves, a pair of guide devices for each bolt secured to said machineable part, means for shifting said bolts and comprising a traveling head and links readily displaceable from said bolts, for shifting said bolts.

30. In a safe or vault door the combination of a plurality of lengthwise-shiftable bolts, means for maintaining the inner ends of said bolts against displacement, means independent of said first-mentioned means for shifting said bolts and including means readily detachable from the bolts.

31. In a safe or vault door, the combination of bolts, means for actuating said bolts and including a reciprocatory traveling head and rotary means for shifting said traveling head, and means movable into and out of engagement with said rotary means for dogging it.

32. In a safe or vault door the combination of bolts, means for actuating said bolts and including a reciprocatory traveling head, means movable into and out of engagement with said actuating means for dogging it and a combination-lock mechanism for controlling said dogging means.

33. In a safe or vault door, the combination of bolts, a traveling head for shifting such bolts, gear mechanism for shifting said head, means between said gear mechanism and head for imparting motion to the head and dogging means for dogging part of the actuating means, thereby to prevent the shifting of said head.

34. In a safe or vault door, the combination of bolts, a screw carried by said door, a traveling head mounted upon said screw, links cooperating with said traveling head for

shifting the bolts, and means for dogging the screw to prevent the rotation of said screw and thereby movement of the head.

35. In a safe or vault door, the combination of bolts a screw carried by said door, a traveling head mounted upon said screw, links cooperating with said traveling head for shifting the bolts, means for dogging the screw to prevent the rotation of said screw and thereby movement of the head, and combination-lock mechanism for controlling said dogging means.

36. In a safe or vault door having a back plate, the combination of a plurality of radially-shiftable bolts, a plurality of cam-faced pivoted links carried by said back plate and cooperating with said bolt to shift the same, a screw carried by the door, a cam-faced traveling head mounted upon said screw and cooperating with said links, a gear fixed to said screw, a spindle, gearing connecting said spindle with said screw-gear, and means for dogging said screw to lock said traveling head against movement.

37. In a safe or vault door having a back plate, the combination of a plurality of radially-shiftable bolts, a plurality of cam-faced pivoted links carried by said back plate and cooperating with said bolts to shift the same, a screw carried by the door, a cam-faced traveling head mounted upon said screw and cooperating with said links, a gear fixed to said screw, a spindle, gearing connecting said spindle with said screw-gear, and stop mechanism for dogging said screw to lock said traveling head against movement and means for controlling the operation of said dogging means.

38. In a safe or vault door, the combination of bolts, means for shifting the same and including a traveling device, gearing for actuating said traveling device, means between said gearing and traveling device for imparting motion to such device and dogging means for preventing movement of said traveling device during a predetermined period, said dogging means cooperating with a part of said shifting means.

39. In a safe or vault door having a back plate, the combination of a plurality of radially-shiftable bolts, means for guiding and for preventing the displacement of the shanks of said bolts, a screw carried by the door, a cam-faced traveling head mounted upon said screw, a plurality of cam-faced pivoted links carried by said back plate and cooperating with the bolts, a gear fixed to said screw, a spindle mounted in the door, gearing connecting said spindle with said screw for rotating the same, a clutch carried by said spindle for controlling the movement of said gearing, dogging means for preventing the movement of said traveling head, and a combination-lock for controlling said clutch and dogging means.

40. In a safe or vault door the combination of a plurality of sliding bolts, a traveling head movable transversely of such bolts to actuate said bolts without direct contact therewith and then movable into position to directly engage the bolts and to block the retraction of said bolts, all located at the inner side of the door when closed, and mechanism effective to prevent during a predetermined period movement of such traveling head when the door is bolted.

41. In a safe or vault door the combination of a plurality of sliding bolts, means effective to retract or protract said bolts and also movable transversely of the plane of movement of such bolts to block the retraction thereof, all located at the inner side of the door when closed, and means independent of said transversely-movable means and passing through the door at one side of said transversely-movable means for actuating the same.

42. In a safe or vault door, the combination of a plurality of sliding bolts, and means effective at a predetermined period to shift said bolts by a linkage connection therewith at another period and when free of such linkage connection to wedge said bolts in their protracted position, and then effective to prevent the retraction thereof.

43. In a safe or vault door, the combination of a plurality of sliding bolts, and means effective at a predetermined period to shift said bolts through means connected therewith at another period and when free of said last-mentioned means to wedge said bolts in their protracted position, and then effective to prevent the retraction thereof, said means comprising a traveling head and means cooperating therewith and with said bolts all located at the inner side of the door when closed.

44. In a safe or vault door, the combination of a plurality of bolts each having an inclined inner end, a screw carried by said door, a cam-faced traveling head mounted upon said screw, a plurality of cam-faced links pivotally supported for imparting movement from said traveling head to said bolts, the organization being such that the traveling head after protracting the bolts through the medium of said links is effective to further protract the bolts by direct engagement therewith and to block said bolts against retraction.

45. In a safe or vault door, the combination of a plurality of bolts, and means for shifting said bolts including an actuator having linkage connection with the bolts, the organization being such that the bolts are first shifted by the actuator indirectly through the medium of such linkage connection and then independently of such linkage connection further shifted by the direct engagement of said actuator with the bolts.

46. In a safe or vault door, the combina-

tion of a plurality of bolts, and means for shifting said bolts including an actuator having linkage connection with the bolts, the organization being such that the bolts are first
 5 shifted by the actuator indirectly through the medium of such linkage connection and then independently of such linkage connection further shifted by the direct engagement of said actuator with the bolts, said actuator
 10 also being effective to prevent retraction of the bolts.

47. In a safe or vault door, the combination of a plurality of bolts, a traveling actuator, connecting devices between said actuator and bolts by means of which the bolts are
 15 shifted during a predetermined period by said actuator, said actuator directly engaging said bolts at another period to further shift and wedge the same, and also effective
 20 to prevent the retraction of said bolts.

48. In a safe or vault door, the combination of a plurality of bolts, and means for shifting said bolts and embodying a combined actuator and blocking device effective
 25 at one period by indirect connection therewith to shift the bolts and at another period by engagement therewith to block movement thereof, said actuator comprising a traveling member, a screw carried by said
 30 door for supporting said member, and means for rotating said screw.

49. In a safe or vault door, the combination of bolting mechanism, dogging means therefor, and actuating means for said dogging means and comprising an antifriction-roll-supported member.
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50. In a safe or vault door, the combination of bolting mechanism, dogging means therefor comprising one of more rotatable
 40 bolts, and an antifriction-roll-supported gear-ring for rotating said dogging-bolts.

51. A safe or vault door comprising a body and a back plate, a plurality of radially-shiftable bolts, a plurality of rotatable dogging-bolts one for each radially-shiftable bolt, a gear-ring for rotating said dogging-bolts, and a series of antifriction-roll supporting members supported by the back plate for supporting said gear-ring.
 45

52. A safe or vault door comprising a body and a back plate, a plurality of radially-shiftable bolts, a plurality of rotatable dogging-bolts one for each radially-shiftable bolt, a gear-ring for rotating said dogging-bolts, a series of antifriction-roll supporting members supported by the back plate for supporting said gear-ring, means for rotating said gear-ring comprising a spindle and gear mounted thereon and means for controlling
 55 the movement of said gear-ring.
 60

53. A safe or vault door comprising a body and a back plate, a plurality of radially-shiftable bolts, a plurality of rotatable dogging-bolts one for each radially-shiftable
 65 bolt, a gear-ring for rotating said dogging-

bolts, a series of antifriction-roll supporting members supported by the back plate for supporting said gear-ring, means for rotating said gear-ring comprising a spindle and gear mounted thereon and means for controlling
 70 the movement of said gear-ring, said means comprising clutch mechanism.

54. In a safe or vault door, the combination of a plurality of bolts, dogging mechanism therefor, and an antifriction-roll-supported gear member for operating said dogging means.
 75

55. In a safe or vault door, the combination of bolting mechanism, one or more rotatable dogging-bolts therefor, each having a
 80 shank partly threaded, a threaded sliding gear mounted upon said shank, and gearing for rotating said gear and thereby dogging said bolt or bolts.

56. A gear-ring for actuating locking or dogging means in a safe or vault having teeth on its inner and outer surfaces and having on one of its surfaces a roll-track bolting mechanism operated by said gear-ring, and means for actuating said gear-ring.
 85 90

57. A gear-ring for actuating locking or dogging means in a safe or vault having teeth on its inner and outer surfaces and having on its inner surface a roll-track bolting mechanism operated by said gear-ring, and means
 95 for actuating said gear-ring.

58. A gear-ring for actuating locking or dogging means in a safe or vault having teeth on its inner and outer surfaces, a roll-track on its inner surface, and a detent-receiving recess on its outer surface bolting mechanism operated by said gear-ring, and means for actuating said gear-ring.
 100 105

59. In a safe or vault door, the combination of a plurality of bolts, means for actuating the same, and two independent means for locking said bolts against retraction, one comprising a device locking all of the bolts, and the other comprising a plurality of devices each engaging a bolt.
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60. In a safe or vault door, the combination of one or more bolts, means for actuating the same, and a pair of independent means for locking said bolts against retraction, one of said means being located to engage the bolt or bolts adjacent to the outer end or ends thereof.
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61. In a safe or vault door, the combination of one or more bolts, means for actuating the same, and a pair of independent means for locking said bolts against retraction, one of said means being located to engage the bolt or bolts adjacent to the inner end or ends thereof.
 120

62. In a safe or vault door, the combination of one or more bolts, means for actuating the same, and a pair of independent means for locking said bolts against retraction, one of said means being located to engage the bolt or bolts adjacent to the outer
 125 130

end or ends thereof, and the other located to engage the bolt or bolts adjacent to the inner end or ends thereof.

63. In a safe or vault door, the combination of a body having a flange provided with bolt-openings, a plurality of bolts working therein, one or more dogging devices located in said flange for engaging said bolts, and blocking means engaging the inner ends of said bolts to block the retraction thereof.

64. A safe or vault door having a rearwardly-extending flange forming a part of the periphery of the door, a plurality of bolts projecting through said flange, rim dogging means located in said flange for dogging said bolts, and means adjacent to the center of said door for blocking said bolts.

65. A safe or vault door bolting mechanism comprising a plurality of sliding bolts, means for shifting said bolts and comprising a reciprocatory traveler, all located interiorly of the door, a spindle projecting through the door and independent of said traveler, and lock mechanism and means controlled thereby for effecting operative connection between said spindle and traveler to permit the traveler to be shifted on the rotation of the spindle.

66. In a safe or vault door, the combination of a plurality of bolts, independent locking means for preventing the retraction of said bolts, one comprising a rotary bolt and the other a reciprocatory member.

67. In a safe or vault door, the combination of bolting mechanism, two independent means for locking said bolts against retraction, and means for operating said independent locking means simultaneously.

68. In a safe or vault door, the combination of bolting mechanism, independent means for locking said bolts against retraction, a spindle, and gearing controlled by said spindle for operating both of said locking means.

69. In a safe or vault door, the combination of a plurality of bolts, means for dogging said bolts, means for blocking said bolts, a single spindle effective to control the operation of both of said means, and means through which said spindle acts to accomplish such control.

70. In a safe or vault door, the combination of a plurality of bolts, means for dogging said bolts, means for blocking said bolts, a single spindle effective to control the operation of both of said means, and means through which said spindle acts to accomplish such control, said blocking means being also effective during a part of its operation by means of said spindle to actuate the door-locking bolts.

71. In a safe or vault door, the combination of bolts means for dogging said bolts, means for blocking said bolts, means for op-

erating said dogging and blocking means, and means for dogging said blocking means.

72. In a safe or vault door, the combination of bolts, means for dogging said bolts, means for blocking said bolts, means for operating said dogging and blocking means, and means for dogging said dogging means.

73. In a safe or vault door, the combination of bolts, means for dogging said bolts, means for blocking said bolts, means for operating said dogging and blocking means, means for dogging said blocking means, and means for dogging the dogging means.

74. In a safe or vault door, the combination of bolts, means for dogging said bolts, means for blocking said bolts, means for operating said dogging and blocking means, means for dogging said blocking means, and a combination-lock for controlling the operation of said several dogging and blocking means.

75. In a safe or vault door, the combination of a plurality of bolts, a screw carried by the door, a traveler mounted upon said screw, a plurality of links cooperating with said traveler to shift the bolts, a gear fixed to said screw, one or more rotary dogging-bolts carried by the door for engaging the door-locking bolts, a pinion carried by each of said rotary bolts, a gear-ring carried by the door and in mesh with said pinion or pinions, and a spindle carried by the door and provided with a gear in mesh with said gear-ring, said spindle-gear also having gear connection with a pinion mounted upon said screw, the organization being such that the same spindle is effective to operate the rotary bolts and shift the traveler to throw or retract the bolts, and to lock the same in their protracted position.

76. In a safe or vault door, the combination of a plurality of bolts, a screw carried by the door, a traveler mounted upon said screw, a plurality of links cooperating with the said traveler to shift the bolts, a gear fixed to said screw; one or more rotary dogging-bolts carried by the door for engaging the door-locking bolts, a pinion carried by each of said rotary bolts, a gear-ring carried by the door and in mesh with said pinion or pinions, a spindle carried by the door and provided with a gear in mesh with said gear-ring said spindle also having a gear connection with a pinion mounted upon said screw, the organization being such that the same spindle is effective to operate the rotary bolts and shift the traveler to throw or retract the bolts, and to lock the same in their protracted position, and controlling means effective on the operation of said spindle to permit the spindle to actuate said gearing.

77. In a safe or vault door, the combination of a plurality of bolts, a screw carried by the door, a traveler mounted upon said

screw; a plurality of links cooperating with said traveler to shift the bolts, a gear fixed to said screw; one or more rotary dogging-bolts carried by the door for engaging the door-locking bolts, a pinion carried by each of said rotary bolts, a gear-ring carried by the door and in mesh with said pinion or pinions, a spindle carried by the door and provided with a gear in mesh with said gear-ring, said spindle-gear also having gear connection with a pinion mounted upon said screw, the organization being such that the same spindle is effective to operate the rotary bolts and shift the traveler to throw or retract the bolts, and to lock the same in their protracted position, controlling means effective on the operation of said spindle to permit the spindle to actuate said gearing, said controlling means comprising clutch mechanism, and lock mechanism for controlling the same.

78. In a safe or vault door, the combination of a plurality of bolts, a screw carried by the door, a traveler mounted upon said screw, a plurality of links cooperating with said traveler to shift the bolts, a gear fixed to said screw; one or more rotary dogging-bolts carried by the door for engaging the door-locking bolts, a pinion carried by each of said rotary bolts, a gear-ring carried by the door and in mesh with said pinion or pinions, a spindle carried by the door and provided with a gear in mesh with said gear-ring, said spindle-gear also having gear connection with a pinion mounted upon said screw, the organization being such that the same spindle is effective to operate the rotary bolts and to shift the traveler to throw or retract the bolts and to lock the same in their protracted position, controlling means effective on the operation of said spindle to permit the spindle to actuate said gearing, and means for locking said gear-ring and said traveler against movement at a predetermined period.

79. In a safe or vault door, the combination of a plurality of bolts, a screw carried by the door, a traveler mounted upon said screw, a plurality of links cooperating with said traveler to shift the bolts, a gear fixed to said screw; one or more rotary dogging-bolts carried by the door for engaging the door-locking bolts, a pinion carried by each of said rotary bolts, a gear-ring carried by the door and in mesh with said pinion or pinions, a spindle carried by the door and provided with a gear in mesh with said gear-ring, said spindle-gear also having gear connection with a pinion mounted upon said screw, the organization being such that the same spindle is effective to operate the rotary bolts and shift the traveler to throw or retract the bolts, and to lock the same in their protracted position, controlling means effective on the operation of said spindle to permit the spindle to actuate said gearing, said control-

ling means comprising clutch mechanism, combination-lock mechanism for controlling the same, means for locking said gear-ring against movement, and means for locking said screw against movement, both of said means being controlled by said combination-lock mechanism and thrown into its inoperative position on the meshing of the clutch members of the clutch mechanism.

80. In a safe or vault door, the combination of one or more bolts having incline-ended shanks, a traveling head having an inclined face cooperating with the inclined ends of said bolts and effective to force said bolts outwardly and wedge the same in their protracted position, means for shifting said head, and means independently of said traveling head for directly engaging and dogging the bolt or bolts to prevent the withdrawal thereof.

81. In a safe or vault door, the combination of bolts, a screw, a traveling head mounted upon said screw for actuating the bolts, means for rotating said screw, dogging means for preventing the rotation of said screw and comprising a member in operative connection with said screw, and a rock-shaft, said member and rock-shaft having cooperating stops, and means for rocking said shaft.

82. In a safe or vault door, the combination of bolts, means for dogging said bolts and including a gear-ring actuator, and means for dogging said gear-ring and comprising stop devices.

83. In a safe or vault door, the combination of bolt mechanism, means for dogging said bolts and including a gear-ring actuator, means for dogging said gear-ring and comprising one or more stops carried by said ring, and a rock-shaft having a stop cooperating with said stop or stops, and means for operating said rock-shaft.

84. In a safe or vault door, the combination of bolt mechanism, means for actuating said bolt mechanism, means for dogging said bolt mechanism, and dogging means for said actuating means and said first-mentioned dogging means and comprising stop mechanism.

85. In a safe or vault door, the combination of bolt mechanism, means for actuating said bolt mechanism and comprising a screw and a traveler mounted upon said screw and cooperating with said bolts, means for dogging said bolts, actuating means for said dogging means and comprising a gear-ring, a rock-shaft carrying a plurality of stops, a stop or stops carried by said ring, a stop or stops in operative connection with said screw, said stop devices effective to prevent rotation of the ring and screw, and means for operating said rock-shaft.

86. In a safe or vault door, the combination of a plurality of bolts, a screw carried by the door, a traveler mounted upon said

screw, a plurality of links coöperating with said traveler to shift the bolts, a gear fixed to said screw; one or more rotary dogging-bolts carried by the door for engaging the door-
 5 locking bolts, a pinion carried by each of said rotary bolts, a gear-ring carried by the door and in mesh with said pinion or pinions, a spindle carried by the door and provided with a gear in mesh with said gear-ring, said
 10 spindle-gear also having gear connection with a pinion mounted upon said screw, the organization being such that the same spindle is effective to operate the rotary bolts and shift the traveler to throw or retract the
 15 bolts and to lock the same in their protracted position, controlling means effective on the operation of said spindle to permit the spindle to actuate said gearing, and means for locking said gear-ring and said traveler
 20 against movement at a predetermined period, and means comprising a plurality of stop devices, a part carried by the ring and a part in operative connection with the screw.

87. A safe or vault door bolting mechanism comprising a plurality of shiftable bolts, a screw-actuated traveler for shifting the bolts, a spindle passing through the door and independent of such screw for imparting
 25 movement to the traveler, and means for transmitting motion from said spindle to said screw.

88. In a safe or vault door, the combination of a plurality of bolts, a rotatable screw, a reciprocal member mounted on said screw,
 35 means for imparting movement from said rotatable screw to said bolts, a spindle carried by the door, means for operatively connecting the spindle and screw to permit the rotation of the screw by the spindle, and
 40 means for making and breaking such connection.

89. In a safe or vault door, the combination of a plurality of bolts, a rotatable screw,

a reciprocal member mounted on said screw, means for imparting movement from said
 45 screw to said bolts, a spindle carried by the door, means operatively connecting said spindle with said rotatable screw, and means for locking the bolts against movement without locking the spindle.
 50

90. In a safe or vault door, the combination of a plurality of bolts, a rotatable screw, a reciprocal member mounted on said screw, means for imparting movement from said
 55 screw to said bolts, a spindle carried by the door, means operatively connecting said spindle with said rotatable screw, means for locking the bolts against movement without locking the spindle, and means for making
 60 and breaking the connection between said spindle and said rotatable screw.

91. In a safe or vault door, the combination of a plurality of bolts, a rotatable screw, a reciprocal member mounted on said screw, means for imparting movement from said
 65 rotatable screw to said bolts, actuating means for said rotatable screw, means connecting said actuating means with said screw, and means for making and breaking connection
 70 between said actuating means and said screw.

92. In a safe or vault door, the combination of a plurality of bolts, a rotatable screw, a reciprocal member mounted on said screw, means for imparting movement from said
 75 rotatable screw to said bolts, actuating means for said rotatable screw, means connecting said actuating means with said screw, and means for making and breaking connection
 80 between said actuating means and said screw and comprising clutch mechanism and lock mechanism.

ORVEY PRICE.

Witnesses:

C. A. WEED,
 JOHN O. SEIFERT.