

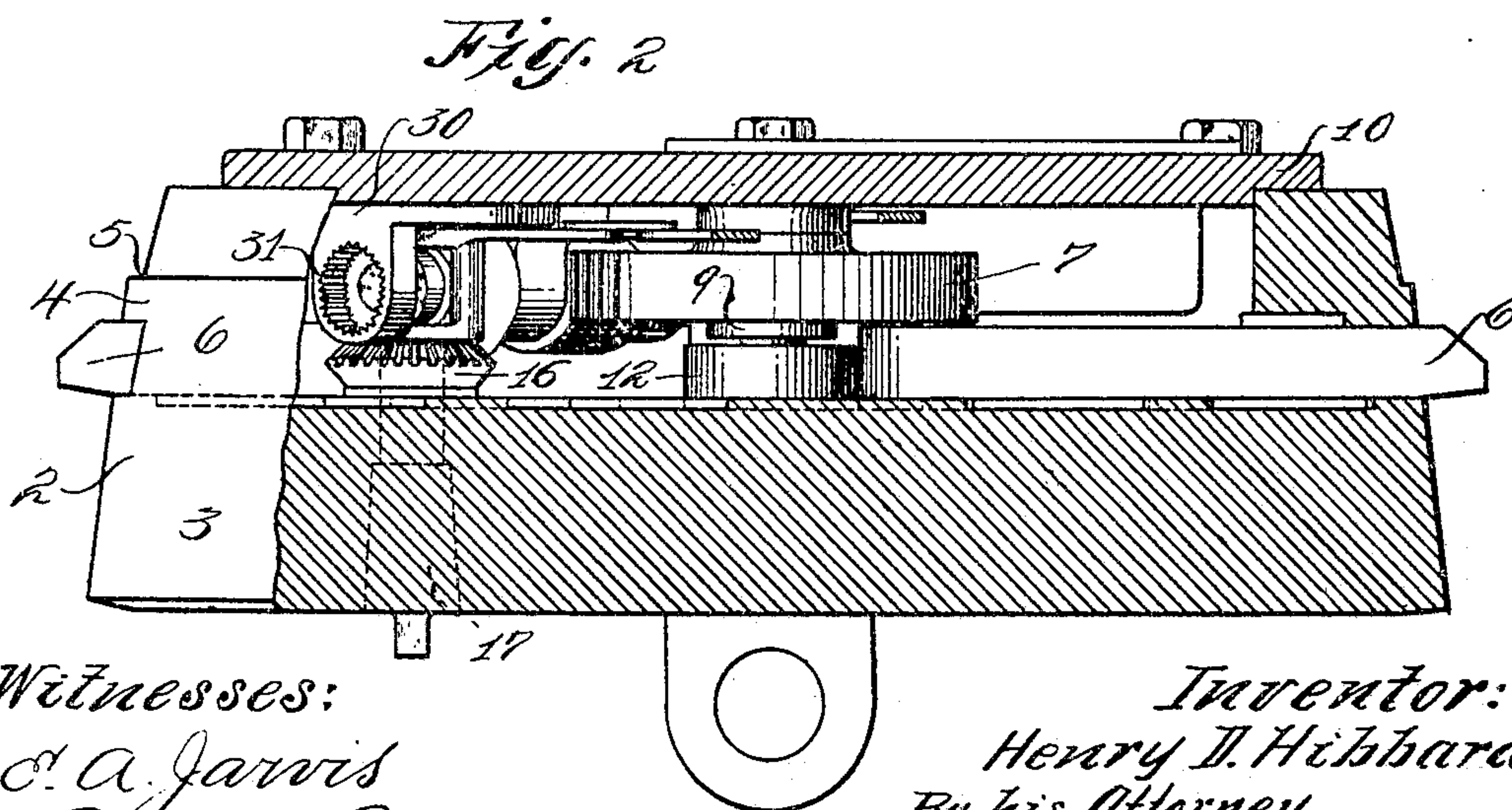
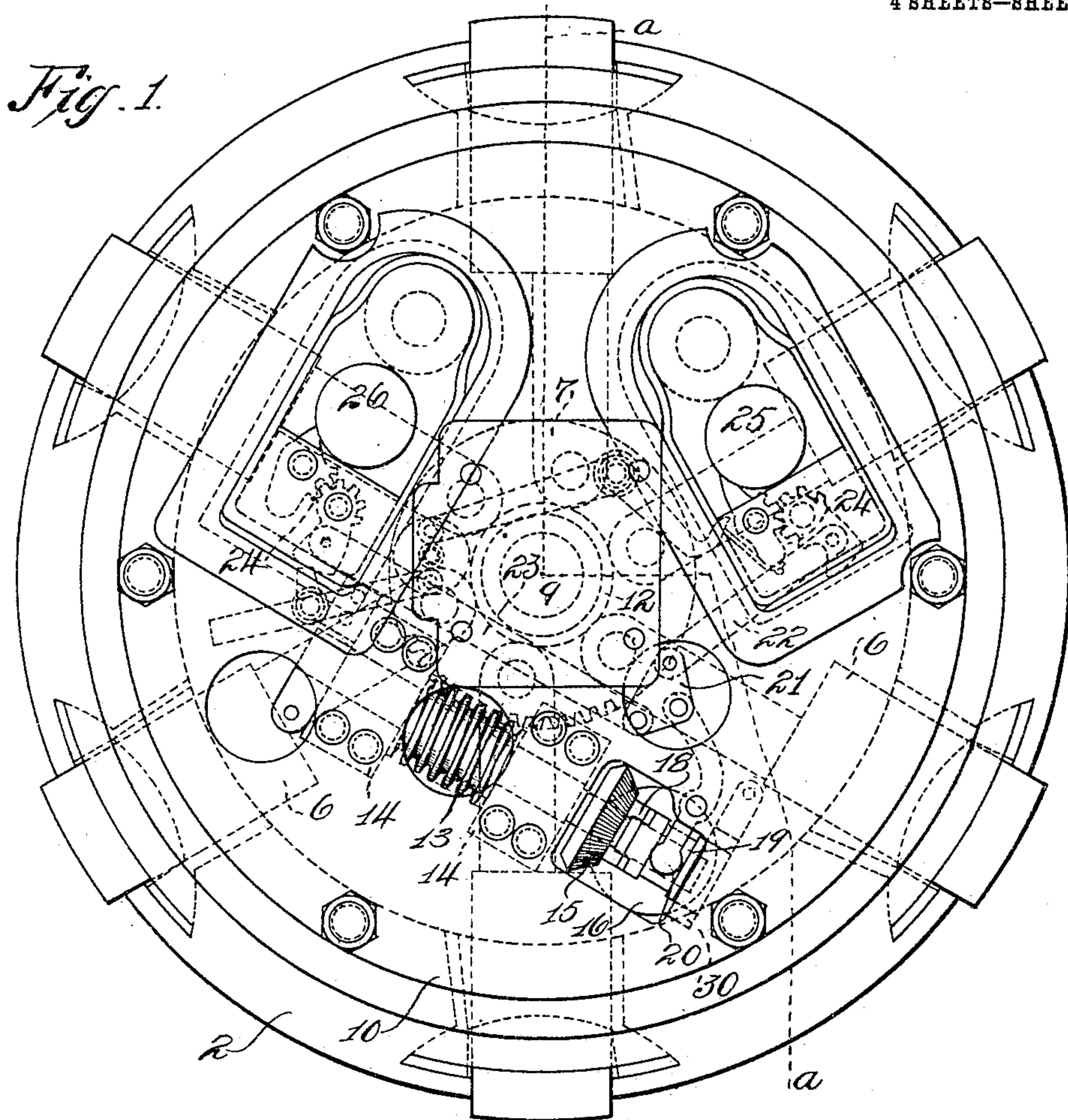
No. 788,104.

PATENTED APR. 25, 1905.

H. D. HIBBARD.
ACTUATING LOCKING MEANS FOR SAFES OR VAULTS.

APPLICATION FILED SEPT. 15, 1903.

4 SHEETS—SHEET 1.



Witnesses:

C. A. Jarvis
Robert Adt

Inventor:
Henry D. Hibbard.
By his Attorney,
F. A. Richards

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4 SHEETS—SHEET 2.

Fig. 3.

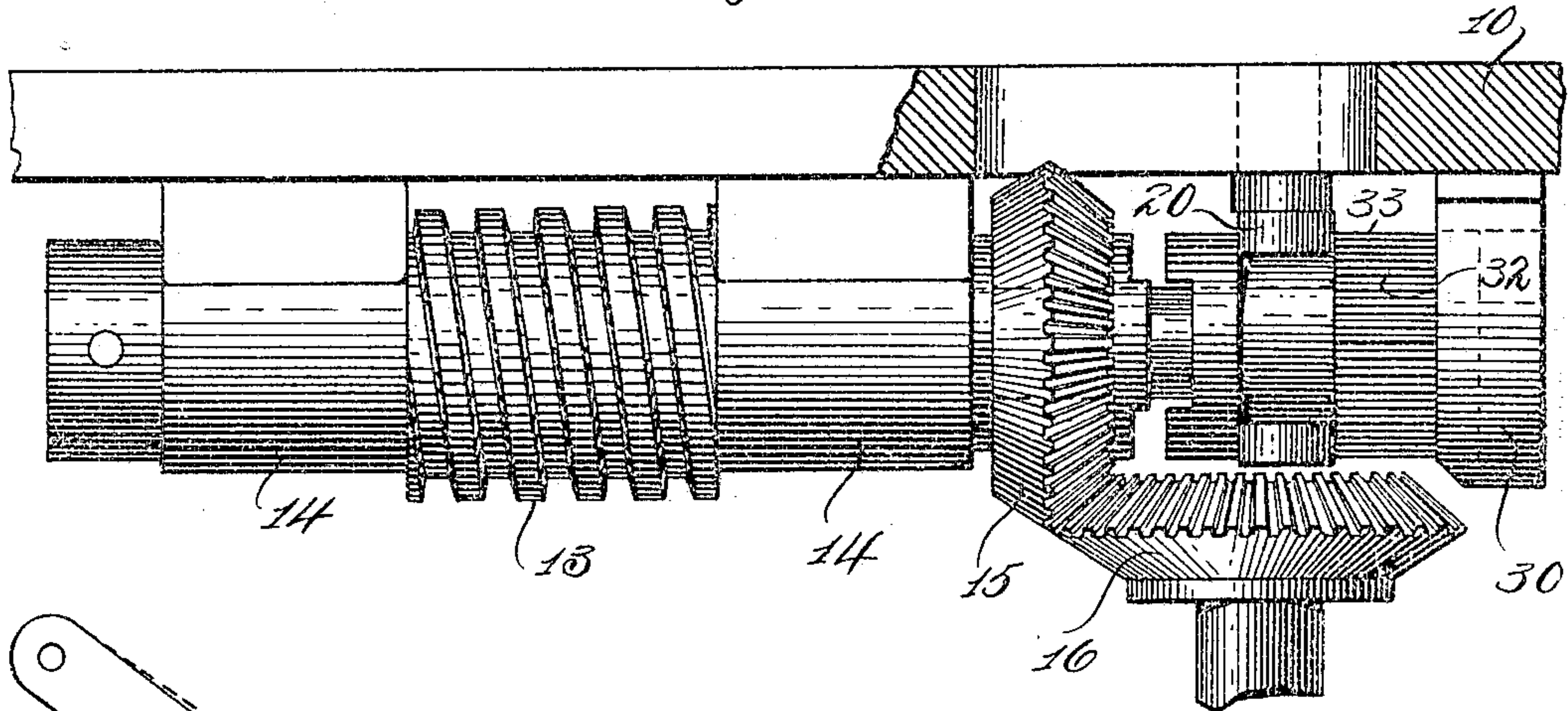


Fig. 4.

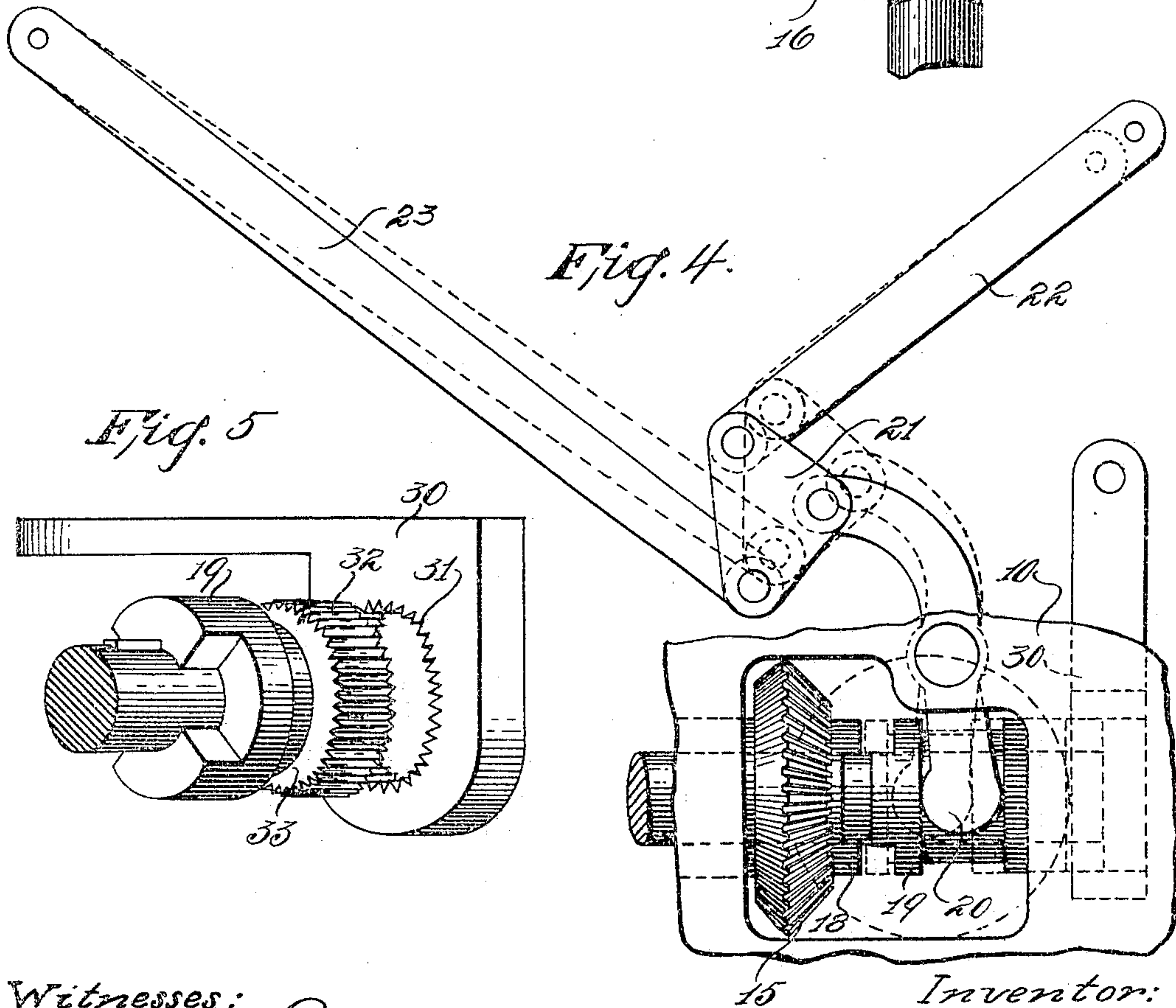
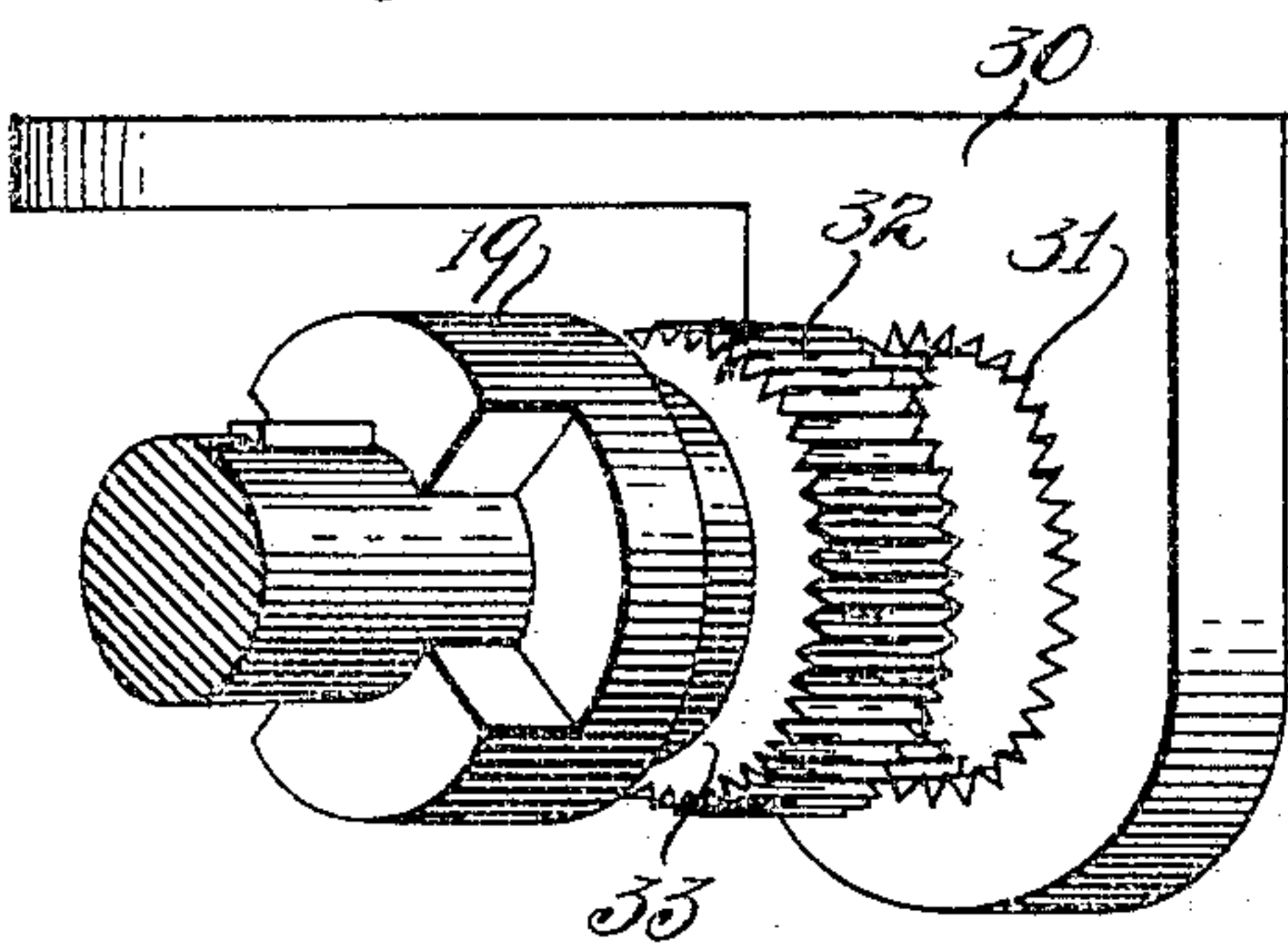


Fig. 5.



Witnesses:
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C. A. Jarvis

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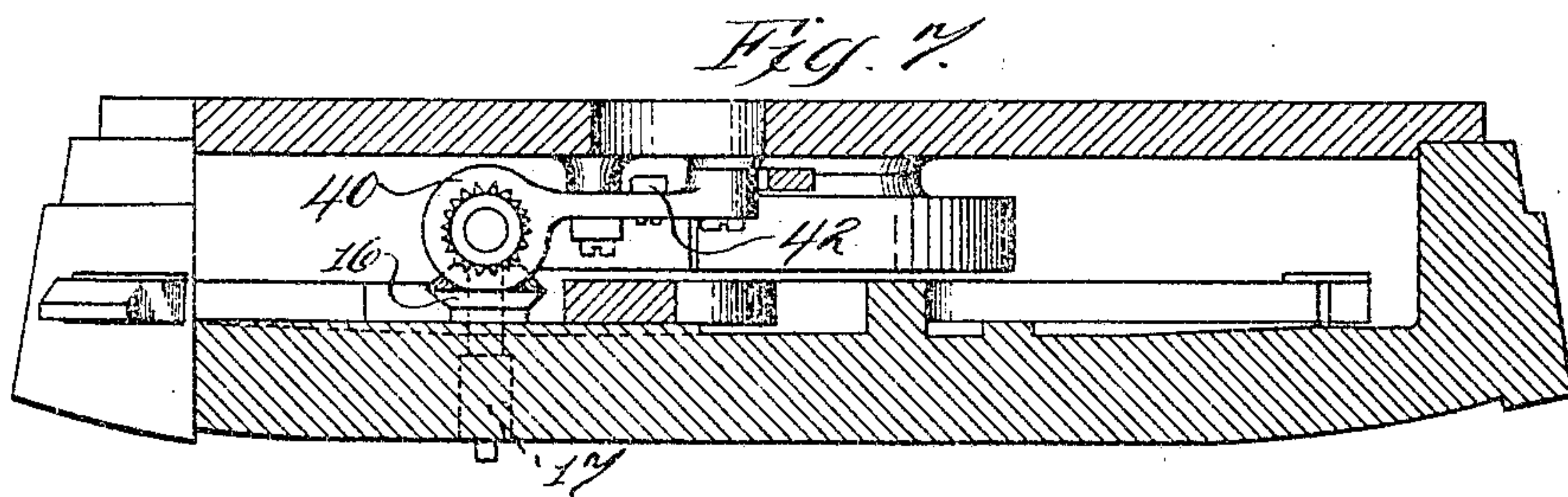
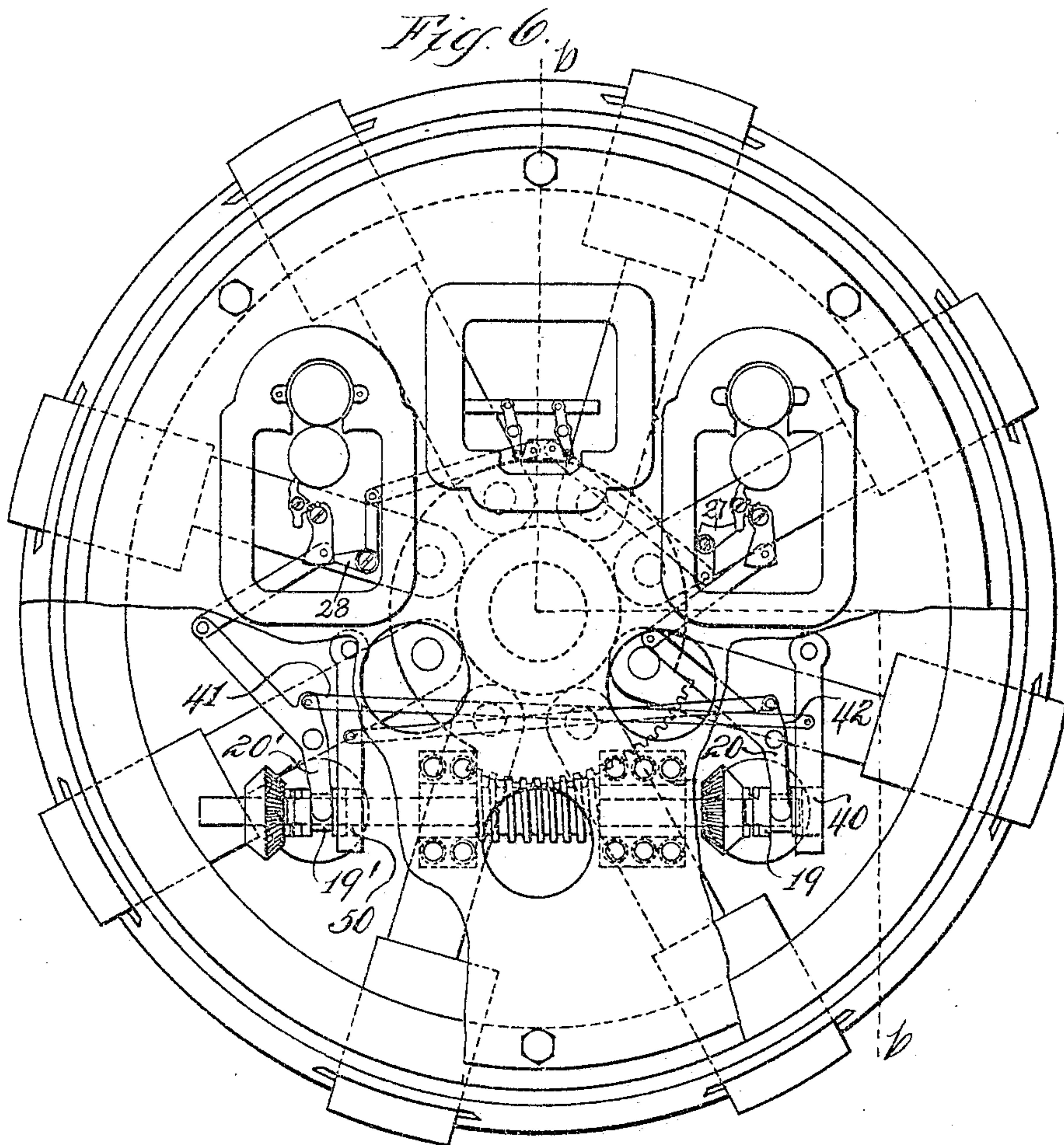
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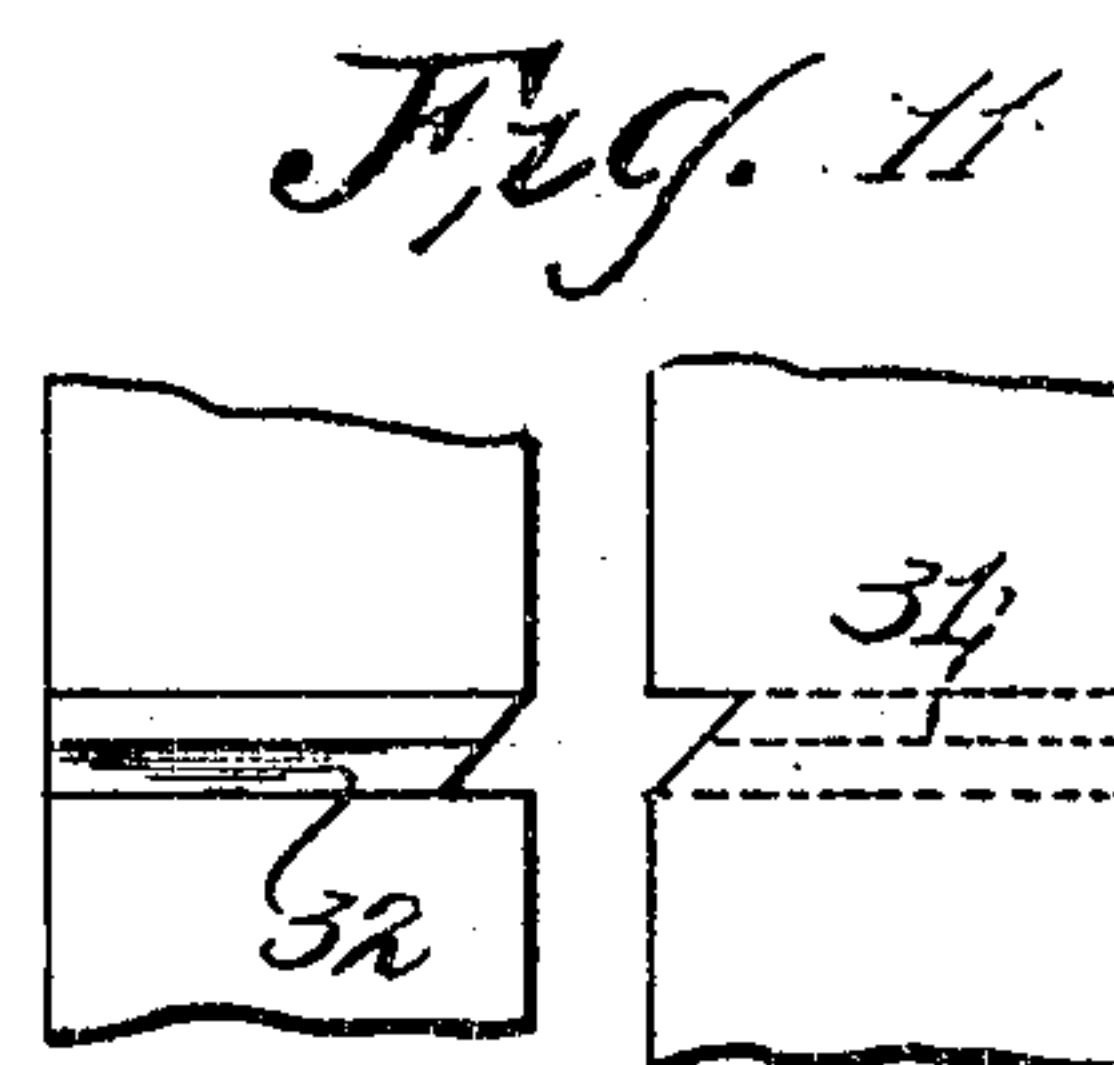
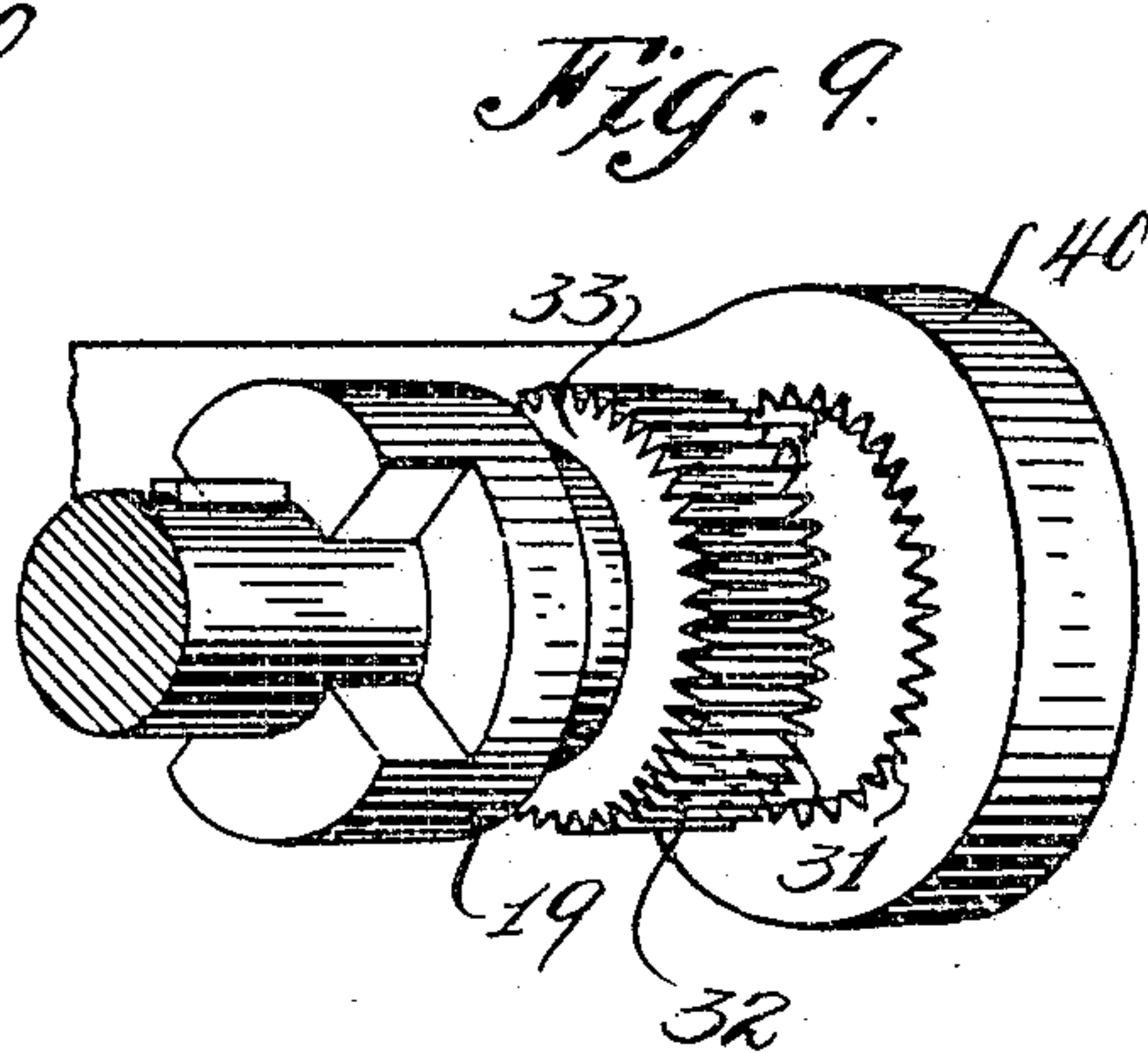
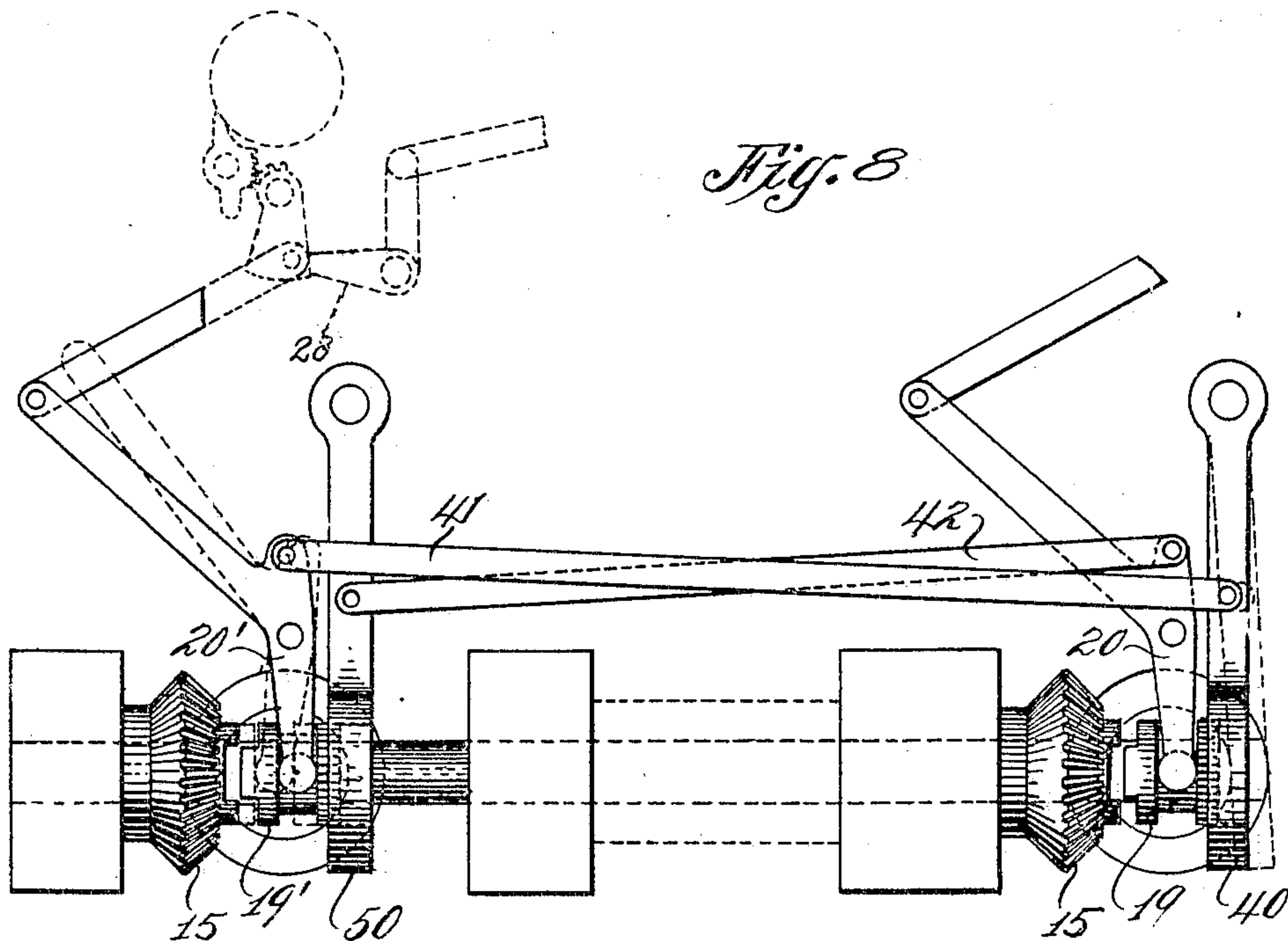
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4 SHEETS—SHEET 4.



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By his Attorney,
F. A. Richards

UNITED STATES PATENT OFFICE.

HENRY D. HIBBARD, OF PLAINFIELD, NEW JERSEY, ASSIGNOR TO MANGANESE STEEL SAFE COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

ACTUATING LOCKING MEANS FOR SAFES OR VAULTS.

SPECIFICATION forming part of Letters Patent No. 788,104, dated April 25, 1905.

Application filed September 15, 1903. Serial No. 173,237.

To all whom it may concern:

Be it known that I, HENRY D. HIBBARD, 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 Actuating Locking Means for Safes or Vaults, of which the following is a specification.

This invention relates to the locking or bolting mechanism for safes or vaults, the object of the invention being to provide means for positively locking such bolting means against movement after the throwing of the bolts, thereby to prevent shifting of such bolts by concussion or vibration or in any way other than by the proper manipulation of the actuating means.

A further object of the invention is the provision of means for controlling the movement of the bolts by locking the bolt-actuating means against movement at a predetermined time.

In the drawings accompanying and forming part of this specification, Figure 1 is an interior or rear view of a single-spindle safe or vault door, showing its bolting mechanism, its actuating means, and the means for locking such actuating means against movement. Fig. 2 is a cross-sectional view taken in line *a a*, Fig. 1. Fig. 3 is a detail view of a part of the actuating means and the locking means. Fig. 4 is a detail view of a part of such actuating means, showing the clutch mechanism. Fig. 5 is a perspective view of the locking means. Fig. 6 is a view similar to Fig. 1, illustrating an organization particularly adapted to a double-spindle safe or vault. Fig. 7 is a cross-sectional view taken on a line *b b*, Fig. 6. Fig. 8 is a detail view of a part of the actuating means, showing the locking means. Fig. 9 is a detail view of the locking means; and Figs. 10 and 11 are detail views of the locking devices, illustrating the formation of the teeth thereof.

Similar characters of reference indicate like parts throughout the several figures of the drawings.

The locking or bolting mechanism in the

present organization may be similar, if desired, to that shown and described in several of the Letters Patent heretofore granted to me—for instance, Letters Patent No. 662,435, dated November 27, 1900, and No. 679,378, dated July 30, 1901—and therefore a general description thereof sufficient only to illustrate the present improvement is deemed necessary.

The door 2 of circular formation comprises a body 3, provided with a flange 4, having an offset or step 5, adapted to coöperate with a similar formation in the jamb of the body. The flange 4 is provided with a series of openings for the passage of locking-bolts 6, the inner ends or shanks of which are pivoted to a rocking plate 7 in the form of a worm-wheel 8, located on a stud 9, shown in the present instance carried by a back plate 10, bolted to the flange, such bolts usually extending into soft-metal inserts cast into the flange when the door and its flange are formed of one piece of un-machineable metal—such, for instance, as manganese steel. A suitable boss 12 has heretofore been provided to engage the inner ends or shanks of the bolts when thrown into bolting position. For operating these bolts to throw or retract them a suitable actuator is provided, shown in the form of a worm or worm-shaft 13, suitably mounted in bearings 14, carried by the back plate, the worm-teeth of which are in mesh with the worm of the worm-wheel 7. This worm-shaft is provided with a bevel-gear 15, loosely mounted thereon, which is in mesh with a bevel-gear 16, carried by a spindle 17, projecting through the body of the door and squared on its outer end for the reception of a crank to turn the same, and thereby the gear 15, carried by the worm-shaft. For positively connecting this loosely-mounted bevel-gear 15 with the shaft, thereby to rotate the worm-shaft, suitable means is provided, shown in the present instance as a clutch or clutch mechanism one member, 18, of which is preferably formed as a part of or secured to the hub of the bevel-gear 15, while the other member, 19, is splined to the worm-shaft, so that when the clutch members are in engagement the bevel-gear 15 is positively connected to the

worm-shaft, and this being in mesh with the gear 16 the turning of the spindle 17 will rotate the worm-shaft, and so rock the worm-rocking plate and shift the bolts as required.

5 For shifting the splined clutch member 19 into and out of engagement with the clutch member 18 suitable means is provided, which may be substantially similar to that shown and described in my said Patent No. 679,378, it
10 comprising a clutch-shifter 20, the bifurcated end of which is in engagement with the shift-able clutch member 19. Its opposite end is pivoted to a floating lever 21, connected with a pair of levers 22 and 23, the opposite ends
15 of which are respectively pivoted to the bolts 24 of a pair of combination-locks 25 and 26 and which may be dogged by time-lock mechanism in the manner shown and described, if desired, in my said patent just referred to,
20 in which a pair of dogging devices 27 and 28, controlled by the time-lock, engage, respectively, the fence of one and the bolt of the other combination-lock, although both fences or both bolts could be dogged, if preferred.
25 When the time-lock mechanism runs down, on the operation of either combination-lock the clutch-shifter will be shifted to shift the splined clutch member 19 into engagement with the clutch member 18 and permit the
30 operation of the worm-shaft on the rotation of the spindle 17.

From the foregoing it will be seen that when the time-lock is set and the door bolted the clutch members 18 and 19 are disengaged, so
35 that the worm-shaft is free from connection with the combination or time lock mechanisms. The actuating mechanism, owing to its organization and being, as it is, in the form of worm-gearing, is so powerful that the bolts
40 are thrown outwardly with tremendous force, and consequently draw the door to its seat with corresponding pressure, so that up to the present time the possibility of opening this door by nitroglycerin or dynamite, large
45 quantities of which have been repeatedly used, has not been found to be practicable in any possible manner. In the smaller sizes of safes, however, where it is possible to jack the safe over on its back, so as to enable the continuous
50 use of a considerable number of sledges on the door at one time, it may be possible in time, provided sufficient force can be used, to release the strain upon the bolts, and so jar the worm-shaft to gradually rotate it to withdraw the bolts.
55 To obviate this possible procedure, I have provided suitable means for locking or dogging the bolts, or, more particularly, locking or dogging the actuating means of such bolts. This locking means comprises in the present
60 instance a pair of cooperating members, one member, 30, having interiorly-located projections or teeth 31, adapted to cooperate with similar projections or teeth 32, exteriorly located on the other member, 33, shown carried
65 by or formed as a part of the shiftable clutch

member 19. The member 30 is in the form of a bracket shown bolted to the back plate 10. In practice when the splined clutch member is disengaged from its companion clutch member the projections or teeth 32 thereof will be
70 in engagement with the projections or teeth 31, carried by one of the members 30, so that the turning of the worm-shaft is not possible. This position of the parts—that is, the locking engagement of the teeth 32 with the teeth
75 31—is maintained so long as the time-lock is running and, in fact, until the combination-lock is properly operated, since until this step is performed it is not possible to shift the clutch-shifter, so that as the combination-lock
80 prevents movement of this clutch-shifter it also prevents the separation of the interlocking faces 32 and 31. When, however, the clutch member 19 has been shifted to engage its companion clutch member 18, the teeth of
85 the locking devices will be disengaged, so that on the proper turning of the spindle 17 by its crank the worm-shaft can be operated, and thereby the bolts withdrawn or shifted.

From the foregoing it will be seen that by
90 this simple and efficient locking means, comprising merely a pair of members and one of which may be formed as a part of or connected with the splined clutch member, while the other may be formed as a bracket provided
95 with an annular row of interiorly-located teeth in the form of a ring, the actuating means, and thereby the bolts, are positively locked against movement, and so effective is this locking means that it was not possible to un-
100 lock the door notwithstanding many thousands of continuous blows upon the door by a considerable number of sledge-hammers, covering a period of many hours.

The teeth of the locking members have ta-
105 pered or beveled ends, preferably of the character illustrated in Figs. 10 and 11, so that these tapered ends will enable the teeth of the two locking members to freely slide into engagement with each other without difficulty
110 regardless of the position in which the worm-shaft may be. By making these locking teeth or notches of the two locking members relatively small in size and of considerable number the dead-locking of the worm-shaft is
115 readily accomplished at any point in its rotated position, thus facilitating the locking of the worm-shaft, and thereby dogging the bolts, so as to fix such actuating or worm shaft positively against accidental or unintentional
120 movement in any desired position, with a high degree of efficiency.

The mechanism shown in Figs. 6, 7, 8, and 9 is substantially similar to that shown in Figs. 1 to 7, inclusive, and 10 and 11, except
125 that the actuating means in the former figures is particularly adapted to a two-spindle door, and therefore embodies a pair of clutch mechanisms. The locking means in this instance is similar to that hereinbefore described, ex-
130

cept that two locking members 40 and 50 are provided, both shiftable, being pivoted in the present instance to the back plate in the organization shown. The shiftable clutch members 19 and 19' are operated in a similar manner to that hereinbefore described by a pair of clutch-shifters 20 and 20', connected with the bolts of combination-locks. In this organization, however, it is necessary that both shiftable clutch members 19 and 19' be unlocked, or otherwise the operation of the worm-shaft by either of its spindles 17 would not be possible, since so long as one of the splined clutch members is locked against movement the turning of the worm-shaft would not be possible. Therefore suitable means is provided to accomplish this purpose and to permit which the members 40 and 50 are pivotally secured, as hereinbefore described. Pivotaly connected to the clutch-shifters 20 and 20' are levers 41 and 42, one to each, the opposite ends of which are jointed, respectively, to the members 40 and 50, so that when the clutch-shifter of the particular combination-lock which may be operated is moved to shift its splined clutch member into engagement with the clutch member carried by the bevel-gear the lever connected with this clutch member will swing the locking member, locking the other splined clutch member free thereof and so permit the worm-shaft to be turned. In other words, when the clutch-shifter 20' is moved to throw its splined clutch member 19' into engagement with its companion clutch member, and thereby disconnect such clutch member 19' from its locking member 50, the lever 42 will swing the locking member 40 away from the teeth of the splined clutch member 19, so that the worm-shaft may be rotated, and when the other combination-lock is operated to swing the clutch-shifter 20 and its splined clutch member 19 into engagement with the bevel-gear clutch member the lever 41, connected with such clutch-shifter 20 will pull the pivoted locking member 40 away from the teeth of the clutch member 19, and so unlock the worm-shaft and permit it to be turned. From the foregoing it will be seen that by this means the locking of the worm-shaft is positively effected whenever the bolts are in their protracted locking position.

Having thus described my invention, I claim—

1. A safe or vault door bolting mechanism comprising bolts, a worm-shaft, a pair of locking members having cooperating locking faces or devices, one secured to said worm-shaft against independent rotary movement and the other supported independently of said shaft, and one movable toward and from the other and effective when in engagement therewith to prevent movement of said shaft, and means for shifting said movable member.

2. A safe or vault door having bolts, actuating means therefor having a part connected

with said bolts and having an actuator interlocked with said part in such manner that the dogging or locking of the actuator will prevent the retraction of the bolts, and a pair of locking members having cooperating locking faces for locking such actuator against movement, one of said members forming part of said actuating means and shiftable from its companion locking member into position to effect connection between parts of such actuating means to permit the actuator to be shifted.

3. A safe or vault door having bolts, actuating means therefor having a part connected with said bolts and having an actuator interlocked with said part in such manner that the dogging or locking of one of said parts will prevent the retraction of the bolts, and means comprising a pair of devices one having a circular series of teeth, and one shiftable laterally into and out of engagement with the other for locking said part and thereby the bolts against retraction.

4. A safe or vault door having bolts, actuating means having a part connected with said bolts for shifting them and having an actuator interlocked with said part in such manner that on the dogging or locking of the actuator, the retraction of the bolts is prevented, and means for locking said actuator against movement, and comprising a pair of laterally-engaging devices each having a circular series of interlocking faces.

5. A safe or vault door having radially-movable swinging bolts, actuating means therefor embodying a member pivotally connected with said bolts, and a rotary shaft carrying teeth or threads interlocked with the teeth or threads of said pivotally-connected member so that on the locking or dogging of the shaft the retraction of the bolts is prevented, and means comprising a pair of interlocking toothed devices one carried by and rotatable with said rotary shaft and shiftable into and out of engagement with the other, for locking said actuator against movement.

6. In a safe or vault door, the combination of bolts, a rocking plate to which the bolts are connected, an actuator for said rocking plate, means for operating said actuator, a combination-lock for controlling the operation of the bolts and effective to disconnect certain of the parts thereby to prevent the operation of such bolts, and means for locking said actuator against movement when the bolts are protracted and when the combination-lock effects such disconnection of the parts.

7. In a safe or vault door the combination with bolting mechanism, a worm-wheel-rocking plate to which said bolts are pivoted, a worm in engagement with said worm-wheel, and locking means for locking said worm against movement.

8. In a safe or vault door the combination with bolting mechanism, a worm-wheel-rock-

ing plate to which said bolts are pivoted, a worm in engagement with said worm-wheel, and locking means for locking said worm against movement; said locking means comprising a pair of members one shiftable relatively to the other.

9. In a safe or vault door the combination with bolting mechanism, a worm-wheel-rocking plate to which said bolts are pivoted, a worm in engagement with said worm-wheel, and locking means for locking said worm against movement; said locking means comprising a pair of members one shiftable relatively to the other, and having a plurality of cooperating projections or teeth.

10. In a safe or vault door the combination of bolts, actuating means for shifting said bolts, clutch mechanism for controlling the operation of said actuating means, and locking means for locking said actuating means against movement.

11. In a safe or vault the combination with a door having a plurality of bolts, of actuating means for throwing the same, clutch mechanism for controlling the operation of said actuating means, and locking means cooperative with such clutch mechanism to prevent at a predetermined time the operation of said actuating means.

12. In a safe or vault door the combination of a plurality of bolts, a worm-wheel-rocking plate connected therewith, a worm in engagement with said rocking plate, clutch mechanism for controlling the operation of said worm, and locking means for locking said worm against movement at a predetermined time.

13. In a safe or vault the combination with a door having a plurality of bolts, of a worm-wheel-rocking plate connected therewith, a worm-shaft in mesh with said rocking plate, a bevel-gear loosely mounted on said worm-shaft and having a clutch member connected therewith, a splined clutch member mounted on said worm-shaft, a clutch-shifting means for controlling the engagement of said clutch members, and locking means for locking said worm-shaft against movement.

14. In a safe or vault the combination with a door having a plurality of bolts, of a worm-wheel-rocking plate connected therewith, a worm-shaft in mesh with said rocking plate, a bevel-gear loosely mounted on said worm-shaft and having a clutch member connected therewith, a splined clutch member mounted on said worm-shaft, a clutch-shifting means for controlling the engagement of said clutch members, and locking means for locking said worm-shaft against movement; said locking means cooperating with the splined clutch member.

15. In a safe or vault the combination with a door having a plurality of bolts, of a worm-wheel-rocking plate connected therewith, a worm-shaft in mesh with said rocking plate,

a bevel-gear loosely mounted on said worm-shaft and having a clutch member connected therewith, a splined clutch member mounted on said worm-shaft, a clutch-shifting means for controlling the engagement of said clutch members, and locking means for locking said worm-shaft against movement; said locking means comprising a pair of members one shiftable relatively to the other and provided with engaging surfaces.

16. In a safe or vault the combination with a door having a plurality of bolts, of a worm-wheel-rocking plate connected therewith, a worm-shaft in mesh with said rocking plate, a bevel-gear loosely mounted in said worm-shaft and having a clutch member connected therewith, a splined clutch member mounted on said worm-shaft, a clutch-shifting means for controlling the engagement of said clutch members, and locking means for locking said worm-shaft against movement; said locking means comprising a pair of members one shiftable relatively to the other and provided with engaging surfaces comprising teeth.

17. A safe or vault door bolting mechanism comprising bolts, worm-gearing for shifting said bolts, a spindle in operative connection with said worm-gearing, lock-controlled means for rendering said spindle effective or ineffective to shift the bolts, and means for locking or dogging said worm-gearing against movement when the bolts are protracted, thereby to prevent the retraction of the bolts by vibration, and means effective to unlock or undog said worm-gearing to permit the shifting of the bolts.

18. In a safe or vault the combination with a door having door-locking mechanism, of rotary actuating means therefor, and locking means for locking said rotary actuating means against movement at a predetermined time, said locking means comprising a pair of members one shiftable into and out of engagement with the other and having locking-faces, the shiftable member having connection with the rotary actuating means for rotary movement therewith.

19. In a safe or vault door the combination with door-locking means, of rotary actuating means therefor, a clutch for controlling the operation of said rotary actuating means, and locking means for locking the rotary actuating means against movement.

20. In a safe or vault door the combination with door-locking means, of rotary actuating means therefor, a clutch for controlling the operation of said rotary actuating means, and locking means for locking the rotary actuating means against movement and comprising a pair of members having locking-faces and one shiftable with a member of said clutch.

21. In a safe or vault door the combination with door-locking means, of rotary actuating means therefor, a clutch for controlling the operation of said rotary actuating means, and

locking means for locking the rotary actuating means against movement and comprising a ring-shaped member having internal teeth and a member having peripherally-located teeth.

22. In a safe or vault the combination of a door having door-locking means, actuating means therefor, embodying a rotary member, and a pair of bevel-gears one having a clutch member connected therewith, and a shiftable clutch member splined to said rotary member and locking means for locking said rotary member against movement at a predetermined time.

23. In a safe or vault the combination of a door having door-locking means, actuating means therefor, embodying a rotary member, and a pair of bevel-gears one having a clutch member connected therewith, and a shiftable clutch member splined to said rotary member and locking means effective to lock the shiftable clutch member against rotary movement and thereby the rotary actuating means against movement at a predetermined time.

24. In a safe or vault the combination of a door having door-locking means, actuating means therefor, embodying a rotary member, and a pair of bevel-gears one having a clutch member connected therewith, and a shiftable clutch member splined to said rotary member and locking means effective to lock said rotary actuating member against movement at a predetermined time and comprising a pair of members having locking-faces and one connected with such rotary member for movement therewith.

25. In a safe or vault the combination of a door having door-locking means, actuating means therefor, embodying a rotary member, and a pair of bevel-gears one having a clutch member connected therewith, and a shiftable clutch member splined to said rotary member, and locking means for locking said rotary member against movement, and comprising a pair of locking members having teeth and one connected with said rotary member for movement therewith and for movement independently thereof.

26. A safe or vault door having a plurality of bolts, actuating means therefor embodying a rotary member and locking means for said actuating means, and comprising a pair of members, one secured to said actuating means for rotation therewith and for movement independently thereof.

27. A safe or vault door having a plurality of bolts, actuating means therefor embodying a rotary member and locking means for said actuating means, and comprising a pair of members, one secured to said actuating means for rotation therewith and for movement independently thereof, said members having tooth-engaging surfaces.

28. A safe or vault door bolting mechanism comprising bolts, means for operating said

bolts and embodying a rotary member, lock mechanism for controlling the operation of said member, independent means for locking said bolts against movement when protracted and comprising a pair of devices one mounted on said rotary member and one supported independently thereof, and one shiftable into and out of engagement with the other, and means for shifting said member.

29. A safe or vault door having bolts, of actuating means for shifting said bolts, and embodying a rotary member, and means for locking said rotary member against movement, one part of said locking means formed as a clutch member.

30. A safe or vault door having a plurality of bolts, an actuator therefor, a clutch for transmitting motion to the actuator and embodying a shiftable member, and means for locking said shiftable clutch member and thereby the actuator against movement.

31. A safe or vault door having a plurality of bolts, an actuator therefor, a clutch for transmitting motion to the actuator and embodying a shiftable member, and means for locking said shiftable clutch member and thereby the actuator against movement, said means comprising a pair of toothed surfaces.

32. A safe or vault door having a plurality of bolts, an actuator therefor, a clutch for transmitting motion to the actuator and embodying a shiftable member, and means for locking said shiftable clutch member and thereby the actuator against movement, said means comprising a pair of toothed surfaces, one formed as a part of said clutch member.

33. In a safe or vault the combination of a door having a plurality of bolts, actuating means therefor comprising a worm-wheel-rocking plate, and a worm in mesh therewith, a clutch embodying a shiftable member, a clutch-member-locking device, and means for shifting said clutch member out of its operative position and into engagement with the said locking device and vice versa.

34. In a safe or vault, the combination with a door having a plurality of bolts, of a worm-wheel-rocking plate connected therewith, a worm-shaft in mesh with said rocking plate, a gear loosely mounted on said worm-shaft, means for rotating said gear, a clutch for positively connecting said gear with said worm-shaft, a locking device, means for throwing one member of said clutch into engagement with its companion member, or into engagement with said locking device.

35. In a safe or vault, the combination with a door having a plurality of bolts, of a worm-wheel-rocking plate connected therewith, a worm-shaft in mesh with said rocking plate, a gear loosely mounted on said worm-shaft, means for rotating said gear, a clutch for positively connecting said gear with said worm-shaft, a locking device, means for throwing one member of said clutch into engagement

with its companion member, or into engagement with said locking device, and a combination-lock connected with said clutch-member-operating means.

5 36. A safe or vault door having bolts, actuating means having a part connected with said bolts for shifting them and an actuator interlocked with said part in such manner that the
10 prevent retraction of the bolts, means for locking said actuator against movement and comprising a pair of devices having a circular series of interlocking faces, and a combination-lock for operating said locking means.

15 37. In a safe or vault the combination with a plurality of bolts, actuating means therefor embodying a clutch mechanism, a combination-lock for controlling the operation of the clutch mechanism, and locking means for lock-
20 ing said actuating means against movement at a predetermined time.

38. In a safe or vault the combination with a door having a plurality of bolts, of actuating means therefor, a clutch, means for shifting
25 one member thereof out of its engaging position with the other member thereof, and into position to be locked and vice versa, and a device for locking the shiftable clutch member in its inoperative position.

30 39. In a safe or vault the combination with a door having a plurality of bolts, of actuating means therefor, a clutch, means for shifting one member thereof out of its engaging position with the other member thereof, and into
35 position to be locked and vice versa, and a device for locking the shiftable clutch member in its inoperative position, said clutch-shifting means being controlled by locking mechanism.

40 40. In a safe or vault door, the combination with bolting mechanism comprising bolts and actuating means therefor, of a combination-lock effective to disconnect parts of such mechanism thereby to prevent the withdrawal of
45 the bolts, and means controlled by said combination-lock for dogging a part of said mechanism on the disconnection of such parts by the combination-lock to prevent the withdrawal of the bolts prematurely.

41. A safe or vault door having a plurality
50 of bolts, means for actuating said bolts, and means for locking said bolts against movement during a predetermined time, said locking means comprising a pair of toothed members, and means for engaging and disengag-
55 ing said members, the bolts being locked or dogged against retraction when such members are in engagement, and unlocked or undogged when out of engagement.

42. In a safe or vault the combination of a
60 circular door having a plurality of bolts, a worm-wheel-rocking plate to which the inner ends of said bolts are pivotally secured, a worm-shaft the worm of which is in mesh with said worm-wheel, a bevel-gear loosely mount-
65 ed on said worm-shaft and having connected

therewith a clutch member, a spindle project-
ing through the door and having a bevel-gear carried thereby and in mesh with said worm-shaft bevel-gear, a clutch member splined to
70 said worm-shaft and provided with a peripheral set of locking-teeth, a locking device having an interiorly-located set of teeth cooperating with the teeth of said clutch member, a clutch-shifter for throwing said splined
75 clutch member into engagement with the bevel-gear clutch member and out of engagement with the locking device and vice versa, and means for operating said clutch-shifter.

43. In a safe or vault the combination of a circular door having a plurality of bolts, a
80 worm-wheel-rocking plate to which the inner ends of said bolts are pivotally secured, a worm-shaft the worm of which is in mesh with said worm-wheel, a bevel-gear loosely mounted on said worm-shaft and having connected
85 therewith a clutch member, a spindle projecting through the door and having a bevel-gear carried thereby and in mesh with said worm-shaft bevel-gear, a clutch member splined to
90 said worm-shaft and provided with a peripheral set of locking-teeth, a locking device having an interiorly-located set of teeth cooperating with the teeth of said clutch member, a
95 clutch-shifter for throwing said splined clutch member into engagement with the bevel-gear clutch member and out of engagement with the locking device and vice versa, means for operating said clutch-shifter, said means comprising a combination-lock having a part connected with said clutch-shifter. 100

44. In a safe or vault the combination of a circular door having a plurality of bolts, a
105 worm-wheel-rocking plate to which the inner ends of said bolts are pivotally secured, a worm-shaft the worm of which is in mesh with said worm-wheel, a bevel-gear loosely mounted on said worm-shaft and having connected
110 therewith a clutch member, a spindle projecting through the door and having a bevel-gear carried thereby and in mesh with said worm-shaft bevel-gear, a clutch member splined to
115 said worm-shaft and provided with a peripheral set of locking-teeth, a locking device having an interiorly-located set of teeth cooperating with the teeth of said clutch member, a
120 clutch-shifter for throwing said splined clutch member into engagement with the bevel-gear clutch member and out of engagement with the locking device and vice versa, means for operating said clutch-shifter, said means comprising a combination-lock having a part connected with said clutch-shifter, and means for preventing the disengagement of such clutch member from its locking device and comprising time-lock mechanism. 125

45. In a safe or vault door the combination with a plurality of bolts, actuating means therefor, locking means for preventing the movement of such actuating means at a predetermined time, means for controlling the opera- 130

tion of said locking means, and means for preventing the controlling means from being operated.

46. In a safe or vault door the combination with a plurality of bolts, actuating means therefor, locking means for preventing the movement of such actuating means at a predetermined time, means for controlling the operation of said locking means, and means for preventing the controlling means from being operated and comprising time-lock mechanism.

47. In a safe or vault the combination of a door having locking means, actuating means embodying a rotary actuator, and a pair of locking means for locking said actuator against movement, and means for throwing said locking means into operative and inoperative positions, the organization being such that when one of said locking means is thrown into an inoperative position the other is shifted into a similar position.

48. In a safe or vault door, the combination with a plurality of bolts, actuating means therefor embodying a worm-shaft, a pair of clutches mounted on said shaft, a pair of clutch-shifters, and a pair of locking devices cooperating with said clutches, one clutch having connections with the locking device of the other clutch so that when the clutch members of one clutch are in engagement both of said locking devices are in position to permit the rotation of the worm-shaft.

49. In a safe or vault, the combination of a circular door, a plurality of bolts carried thereby, a worm-wheel connected with said bolts, a worm-shaft in mesh with said worm-wheel, a pair of clutches mounted on said shaft one member of each being splined thereto, a clutch-shifter for each splined clutch member, and a pair of locking members shiftably secured to said door each connected with a clutch-shifter, the organization being such that when one pair of clutch members are in engagement the worm-shaft is free for rotary movement.

50. A safe or vault door having a plurality of bolts, rotary actuating means therefor, a pair of clutches for controlling the movement of said actuating means, one member of each pair having toothed locking-faces, shiftable locking members cooperating with said toothed clutch member, a pair of clutch-shifters, the clutch-shifter of one clutch being connected with the locking member of the other clutch so that both shiftable clutch members will be unlocked at the same time thereby to permit movement of the rotary actuator.

51. A safe or vault door having bolts, actuating means therefor having a part connected with said bolts for shifting them and having an actuator interlocked with said part in such manner that the dogging or locking of the actuator will prevent the retraction of the bolts, and a plurality of locking means for locking said actuator against movement, each

having a circular series of interlocking faces or teeth.

52. A safe or vault door having bolts, actuating means therefor having a part connected with said bolts for shifting them and having an actuator interlocked with said part in such manner that the dogging or locking of the actuator will prevent the retraction of the bolts, and a plurality of locking means for locking said actuator against movement, each having a circular series of interlocking faces or teeth, said locking means being operatively connected so that on the operation of one of such locking means the other will be correspondingly operated to permit the actuator to be operated.

53. In a safe or vault door the combination of door-locking means, actuating means therefor, a pair of clutch mechanisms, and a pair of locking means for positively locking said clutch mechanisms and thereby the actuating means against movement.

54. In a safe or vault door the combination of door-locking means, actuating means therefor, a pair of clutch mechanisms, and a pair of locking means for locking a pair of said clutch mechanisms and thereby the actuating means against movement, said locking means being operatively connected so that both clutch mechanisms will be unlocked simultaneously.

55. A safe or vault door having bolts, actuating means therefor having a part connected with said bolts for shifting them and having a rotary actuator interlocked with said part in such manner that the dogging or locking of the actuator will prevent the retraction of the bolts, and a plurality of interlocking toothed-formed locking means for locking said actuator, one splined to the actuator for preventing rotation thereof.

56. In a safe or vault door the combination of door-locking means therefor, actuating means for said locking means, a plurality of locking means for locking said actuating means against movement at a predetermined time, and a combination-lock for controlling each of said locking means.

57. In a safe or vault door the combination of door-locking means therefor, actuating means for said locking means, a plurality of locking means for locking said actuating means against movement at a predetermined time, and a combination-lock for controlling each of said locking means, said locking means being operatively connected so that both of said locking means are controlled simultaneously on the operation of either combination-lock.

58. In a safe or vault door the combination of a plurality of bolts, a worm-wheel-rocking plate connected therewith, a worm-shaft for rocking said plate, a pair of clutches carried by said shaft, a pair of clutch-shifters, a combination-lock in connection with each clutch-shifter, and a pair of locking devices for locking the worm-shaft against movement, each

of said locking devices being controlled by one of said combination-locks.

59. In a safe or vault door the combination of a plurality of bolts, a worm-wheel-rocking plate connected therewith, a worm-shaft for rocking said plate, a pair of clutches carried by said shaft, a pair of clutch-shifters, a combination-lock in connection with each clutch-shifter, and a pair of locking devices for locking the worm-shaft against movement, each of said locking devices being controlled by one of said combination-locks, and said locking devices being operatively connected whereby the operation of one combination-lock controls both of said locking devices.

60. A safe or vault door having a plurality of bolts, actuating means therefor comprising a worm-wheel connected with said bolts, and a worm-shaft, a pair of clutches mounted on said shaft, a pair of combination-locks controlling said clutches, and duplex locking means for locking said bolts against movement when the clutch members are disengaged through the medium of the combination-locks.

61. A safe or vault door having a plurality of bolts, actuating means therefor comprising a worm-wheel connected with said bolts, and a worm-shaft, a pair of clutches mounted on said shaft, a pair of combination-locks controlling said clutches, and duplex locking means for locking said bolts against movement, said duplex locking means being controlled by said combination-locks.

62. A safe or vault door having a plurality of bolts, actuating means therefor comprising a worm-wheel connected with said bolts, and a worm-shaft, a pair of clutches mounted on said shaft, a pair of combination-locks controlling said clutches, and duplex locking means for locking said bolts against movement, said duplex locking means being controlled by said combination-locks, and said locking means being operatively connected so that both are controlled on the operation of either combination-lock.

63. A safe or vault door having a plurality of bolts, actuating means therefor comprising a worm-wheel connected with said bolts, and a worm-shaft, a pair of clutches mounted on said shaft, a pair of combination-locks controlling said clutches, and duplex locking means for locking said bolts against movement, said duplex locking means being controlled by said combination-locks, and said locking means being operatively connected so that both are controlled on the operation of either combination-lock, the locking of said bolts being effected through the locking of a part of the actuating means.

64. A safe or vault door having a plurality of bolts, actuating means therefor comprising a worm-wheel connected with said bolts, and a worm-shaft, a pair of clutches mounted on said shaft, a pair of combination-locks con-

trolling said clutches, and duplex locking means for locking said bolts against movement, said duplex locking means being controlled by said combination-locks, and said locking means being operatively connected so that both are controlled on the operation of either combination-lock, the locking of said bolts being effected through the locking of a part of the actuating means, such part comprising the worm-shaft.

65. A safe or vault door having a plurality of bolts, actuating means therefor comprising a worm-wheel connected with said bolts, and a worm-shaft, a pair of clutches mounted on said shaft, a pair of combination-locks controlling said clutches, and duplex locking means for locking said bolts against movement, said duplex locking means being controlled by said combination-locks, and said locking means being operatively connected so that both are controlled on the operation of either combination-lock, the locking of said bolts being effected through the locking of a part of the actuating means by locking the clutch member of each clutch against rotary movement.

66. In a safe or vault door the combination of locking means therefor, actuating means for said locking means, locking means for said actuating means and comprising a pair of toothed members the teeth of which are beveled so that they will effectively engage each other in whatever position such members may be relatively to each other.

67. A safe or vault door having a plurality of bolts, actuating means therefor, and locking means for locking the bolts against retraction comprising a pair of toothed members, one formed to receive the other, the teeth of said members being beveled thereby to permit the engagement of such members in whatever rotative position they may be relatively to each other.

68. The combination of a plurality of bolts for a safe or vault door, actuating means for throwing said bolts radially and laterally, locking means for preventing the withdrawal of said bolts and comprising a pair of toothed members, and means for controlling the engagement of said toothed members.

69. A safe or vault door having a plurality of bolts, actuating means embodying a rotary actuator, means for rotating said actuator, and locking means for preventing the rotation of said actuator and comprising a pair of toothed surfaces one rigidly secured thereto and shiftable longitudinally thereof and the other in position to receive said shiftable member at a predetermined time and means for shifting one of said members into engagement with the other.

70. A safe or vault door bolting mechanism comprising bolts, actuating means including worm-gearing for shifting said bolts, means

for rendering said worm-gearing ineffective to shift the bolts, means, comprising a pair of toothed members, for preventing movement of said worm-gearing when idle thereby to prevent the retraction of the bolts by vibration, and means for disengaging said toothed members to permit the retraction of said bolts.

71. A safe or vault door bolting mechanism comprising bolts, actuating means including worm-gearing for shifting said bolts, means for rendering said worm-gearing ineffective to shift the bolts, means for locking or dogging a part of said worm-gearing against movement when idle thereby to prevent retraction of the bolts by vibration, and means effective to unlock or undog said part to permit the shifting of the bolts.

72. A safe or vault door bolting mechanism comprising bolts, a worm-shaft for shifting said bolts, means for rendering said worm-shaft ineffective to shift the bolts, means for locking said worm-shaft against movement when idle, thereby to prevent retraction of the bolts by vibration, and means for unlocking the said shaft to permit the shifting of the bolts.

73. A safe or vault door bolting mechanism comprising bolts, a worm-shaft for shifting said bolts, means for rendering said worm-shaft ineffective to shift the bolts, means for locking said worm-shaft against movement when idle, thereby to prevent retraction of the bolts by vibration, and means for unlocking the said shaft to permit the shifting of the bolts, said locking means comprising a pair of toothed members one shiftable into and out of engagement with the other.

74. The combination with safe or vault door bolts and actuating means therefor, of a pair of independent combination-locks each effective to disconnect parts of such mechanism thereby to prevent the withdrawal of the bolts, and means controlled by each of said combination-locks for dogging a part of the

mechanism on the disconnection of such parts by said locks.

75. The combination with safe or vault door bolts and actuating means therefor, of a pair of independent combination-locks each effective to disconnect parts of such mechanism, thereby to prevent the withdrawal of the bolts, and means controlled by each of said combination-locks and comprising a pair of toothed members for dogging a part of the bolt mechanism on the disconnection of such parts.

76. A safe or vault door bolting mechanism comprising bolts, a worm-shaft connected with said bolts, a pair of independent combination-locks for controlling the operation of said bolts through said worm-shaft and each effective to effect the disconnection of parts of the mechanism to prevent the withdrawal of the bolts, and locking means controlled by each of said combination-locks for dogging a part of the bolt mechanism on the disconnection of such parts, said dogging means comprising a pair of members mounted on said worm-shaft, and one supported independently thereof, and one shiftable into and out of engagement with the other.

77. A safe or vault door bolting mechanism comprising bolts, and actuating means therefor, including a spindle, lock-controlled means for connecting up or disconnecting said spindle with another part of said actuating means, thereby to respectively permit or prevent the shifting of the bolts through said spindle, and means also controlled by said lock for dogging a part of said bolt mechanism to prevent the premature retraction of the bolts on the disconnection of the parts by said lock.

Signed at Nos. 9 to 15 Murray street, New York, N. Y., this 14th day of September, 1903.

HENRY D. HIBBARD.

Witnesses:

C. A. WEED,

JOHN O. SEIFERT.