

No. 859,531.

PATENTED JULY 9, 1907.

E. A. STRAUSS.  
SAFE BOLT WORK.

APPLICATION FILED FEB. 20, 1905.

3 SHEETS—SHEET 1.

Fig. 1.

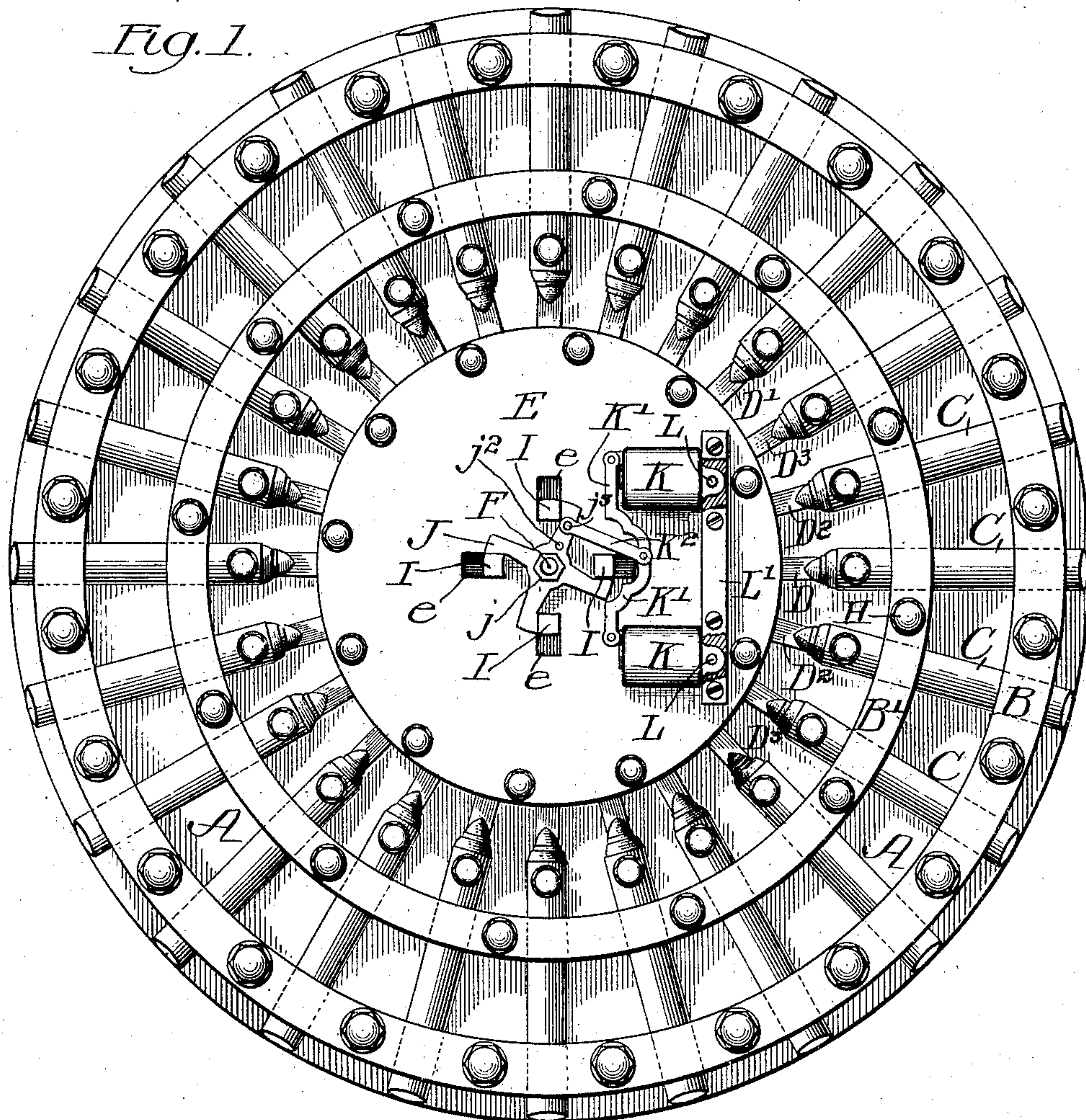


Fig. 11

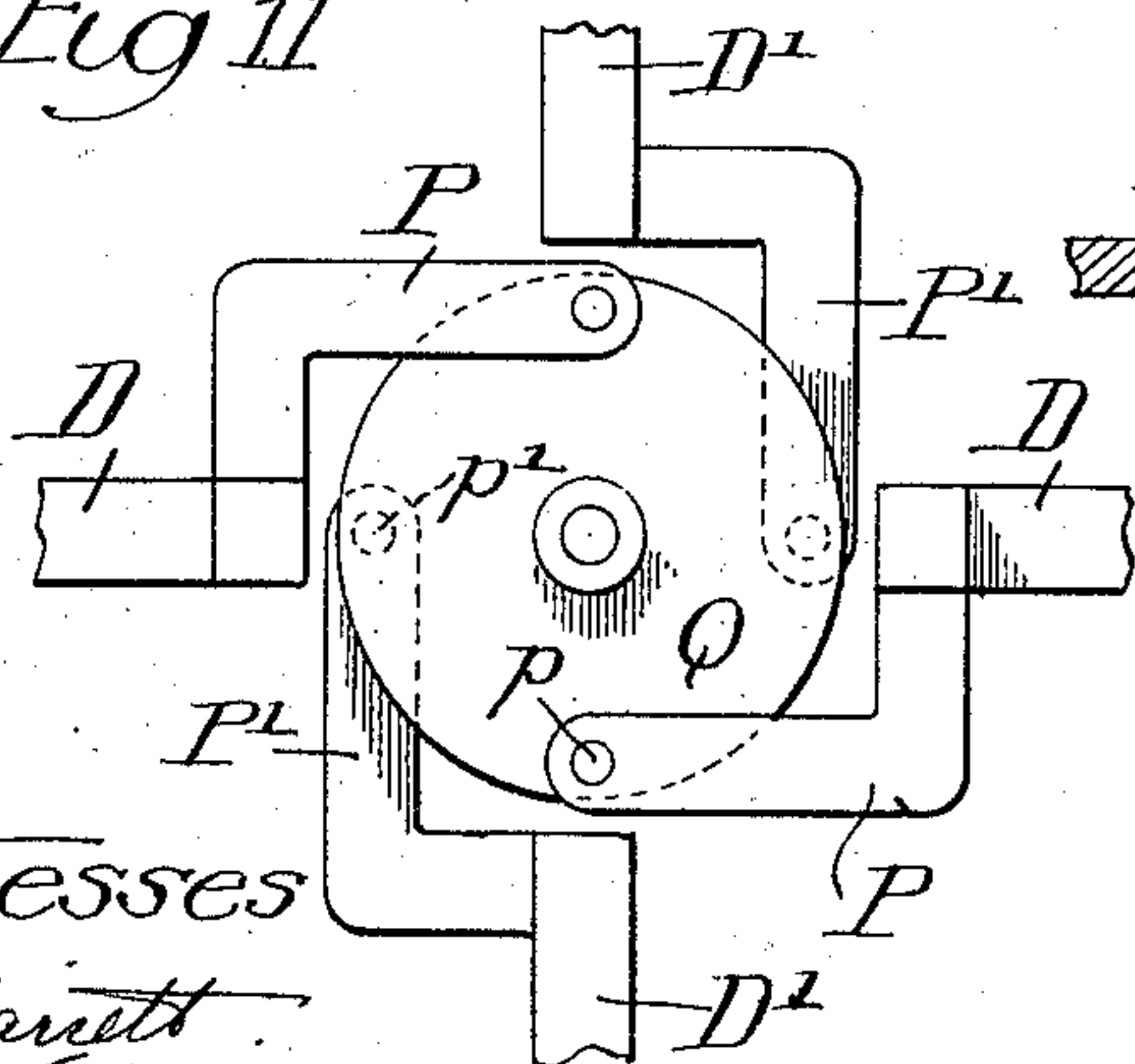


Fig. 12

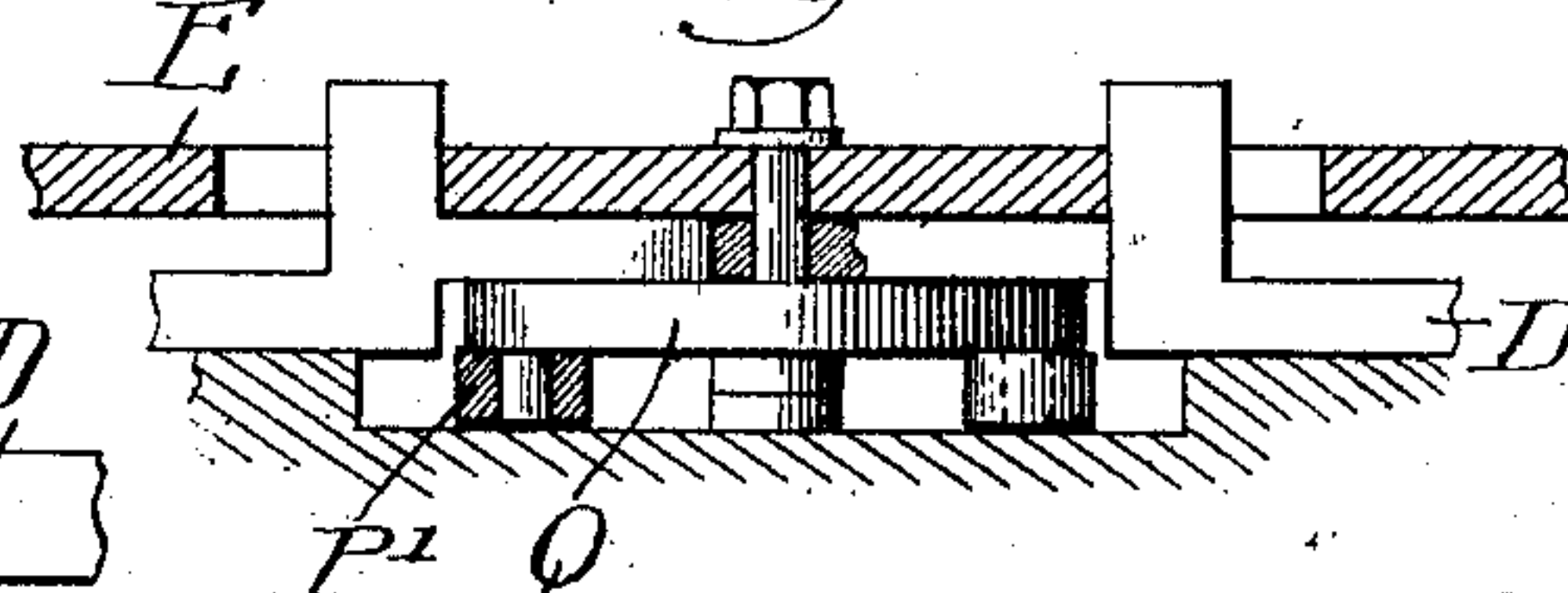
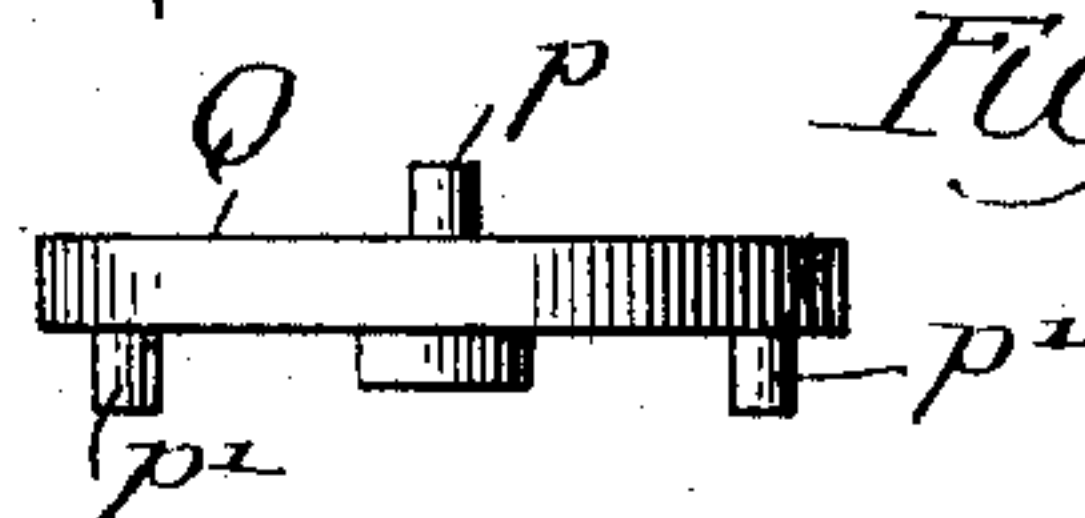


Fig. 13



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3 SHEETS—SHEET 2.

Fig. 2.

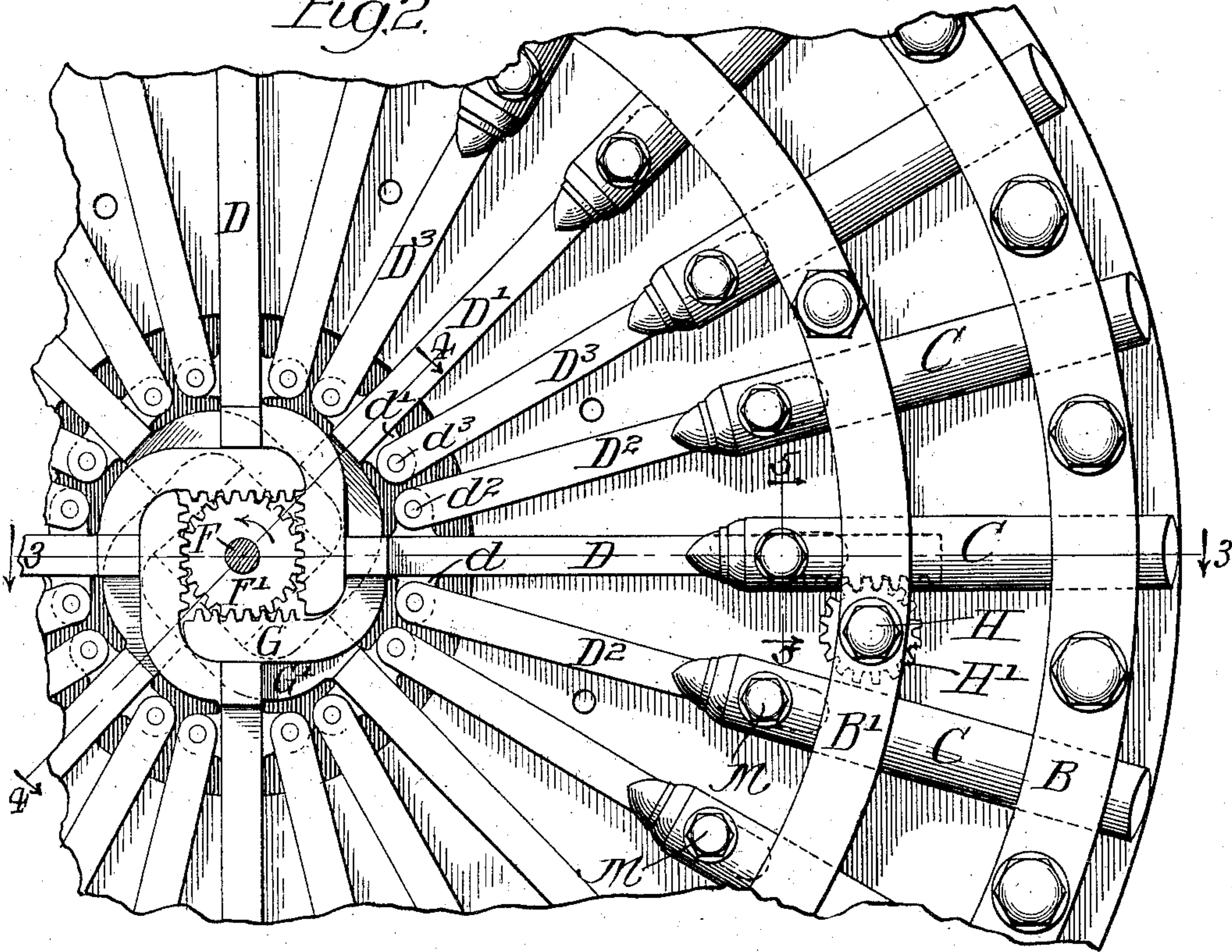


Fig. 3.

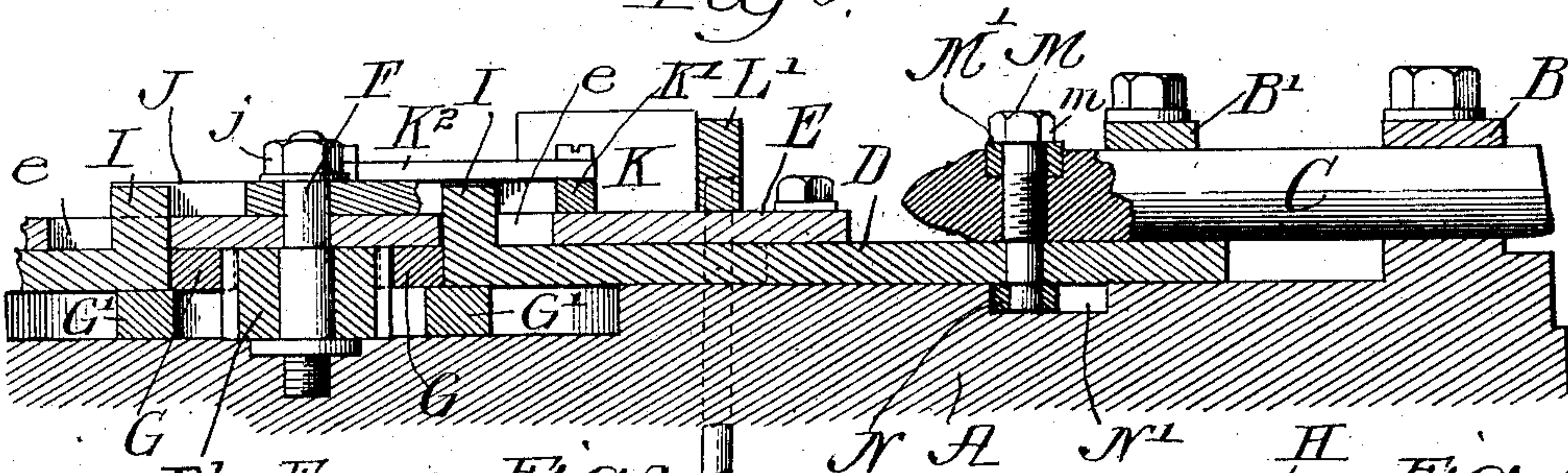


Fig. 4.

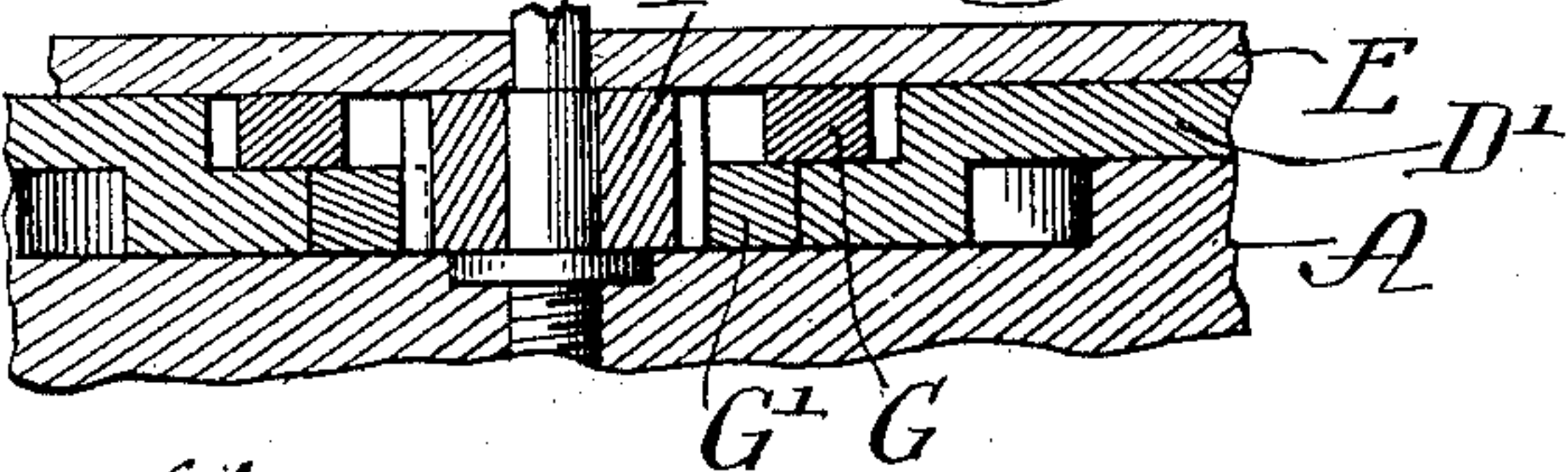
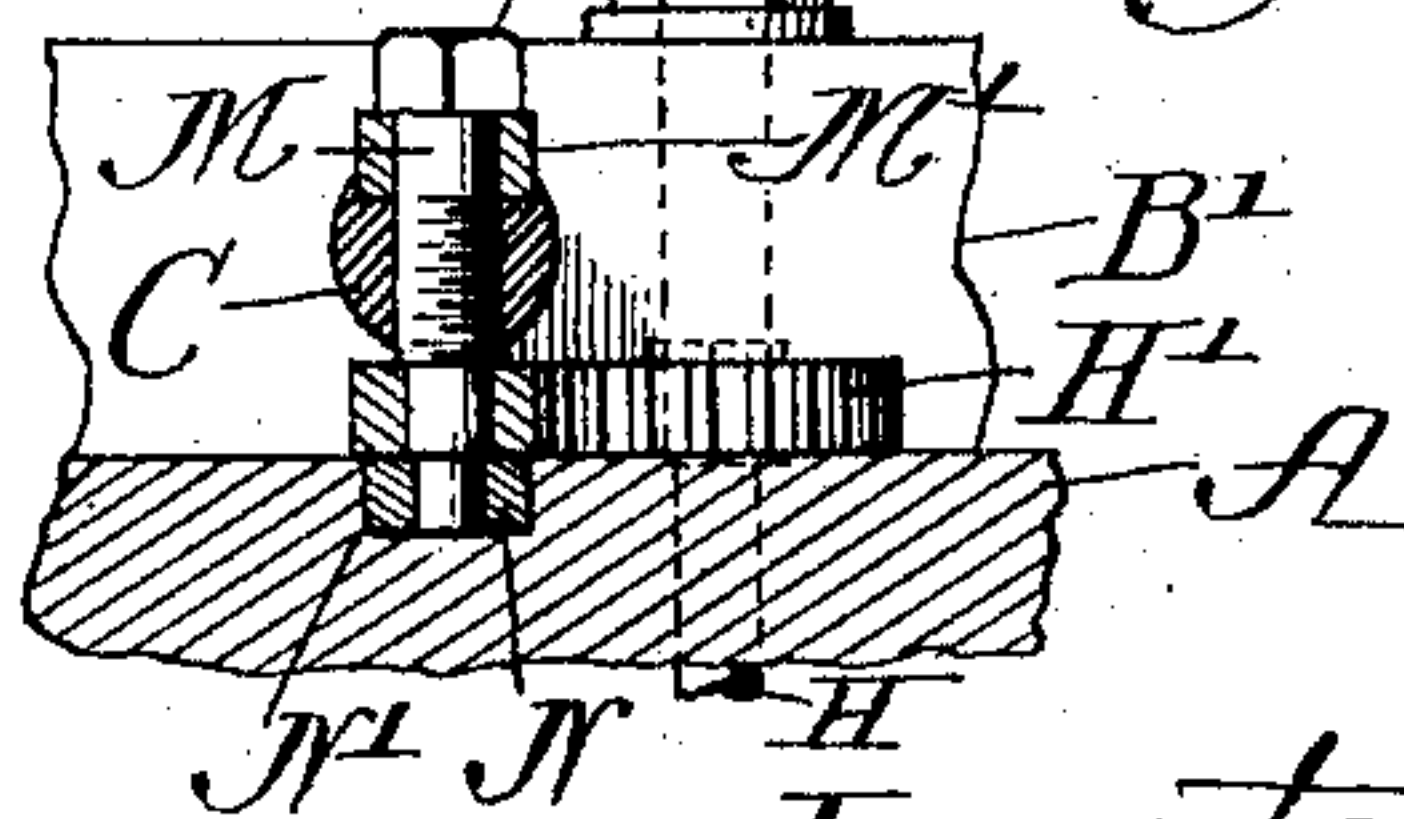


Fig. 5.



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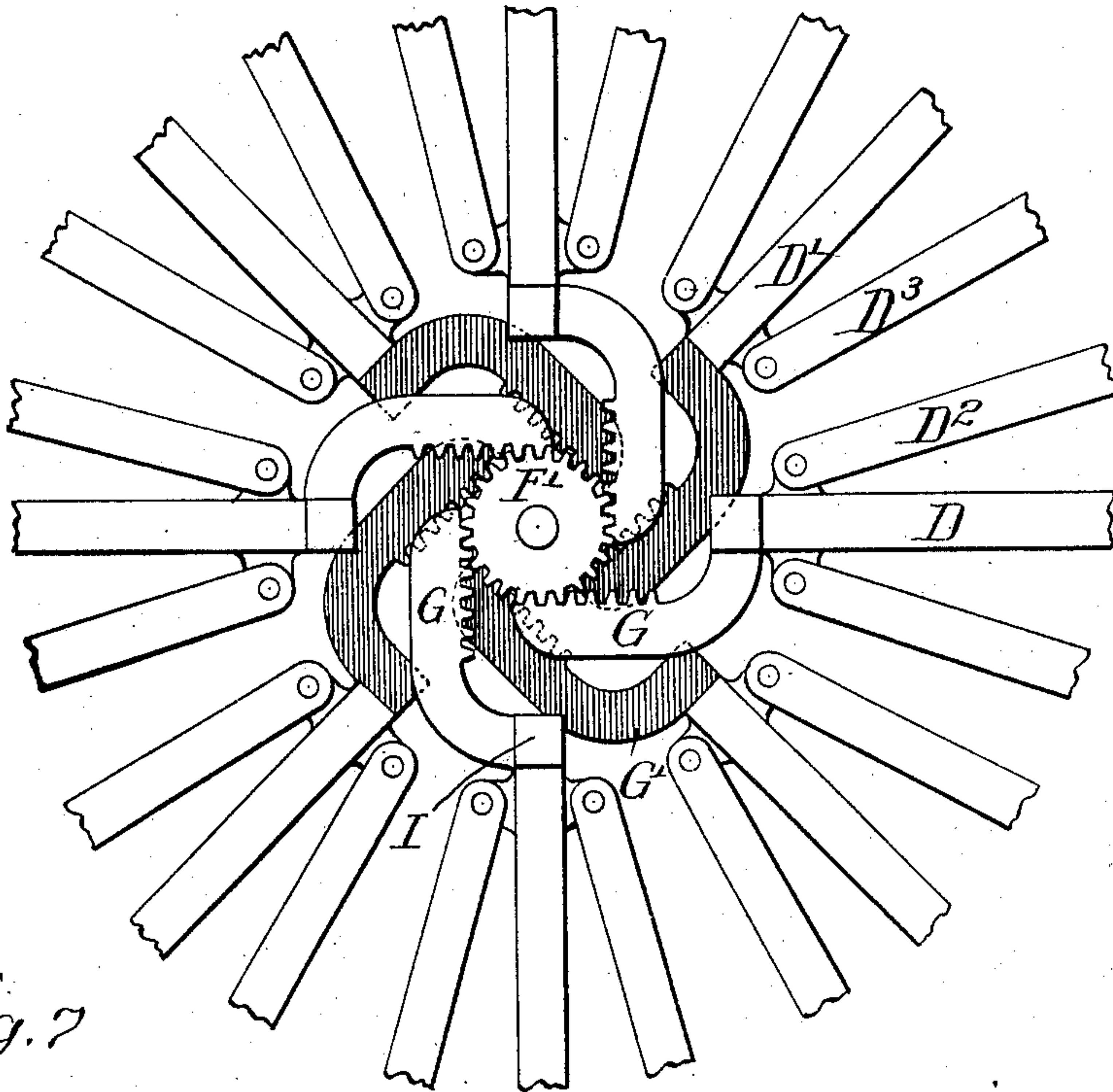
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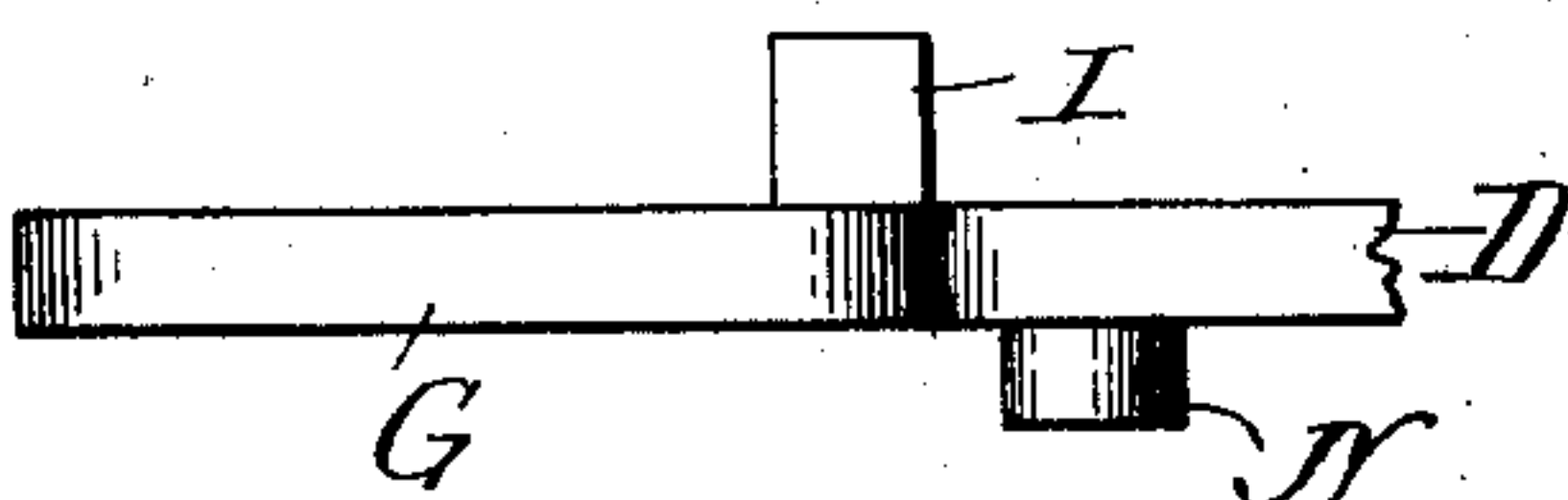
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3 SHEETS—SHEET 3.

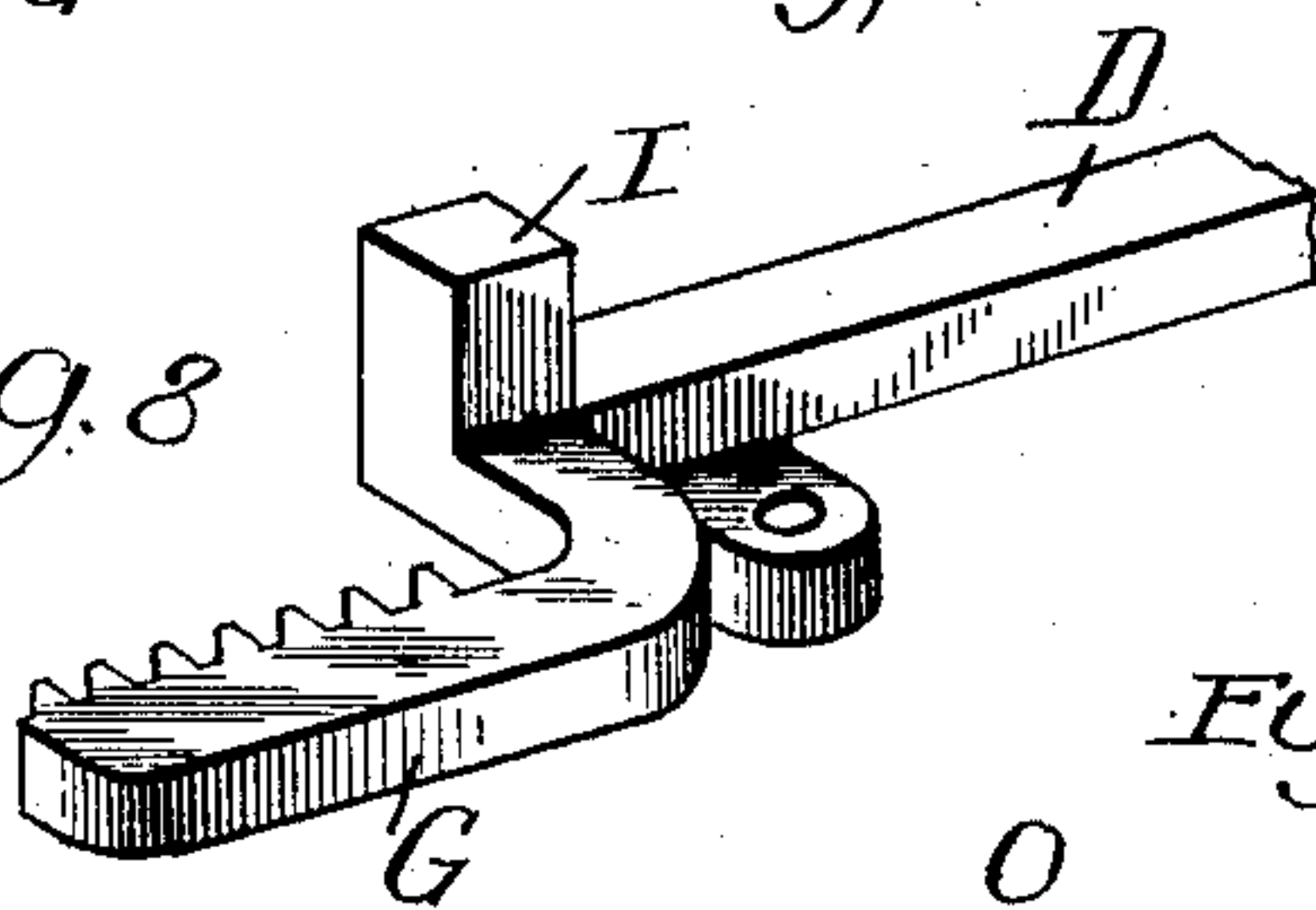
*Fig. 6*



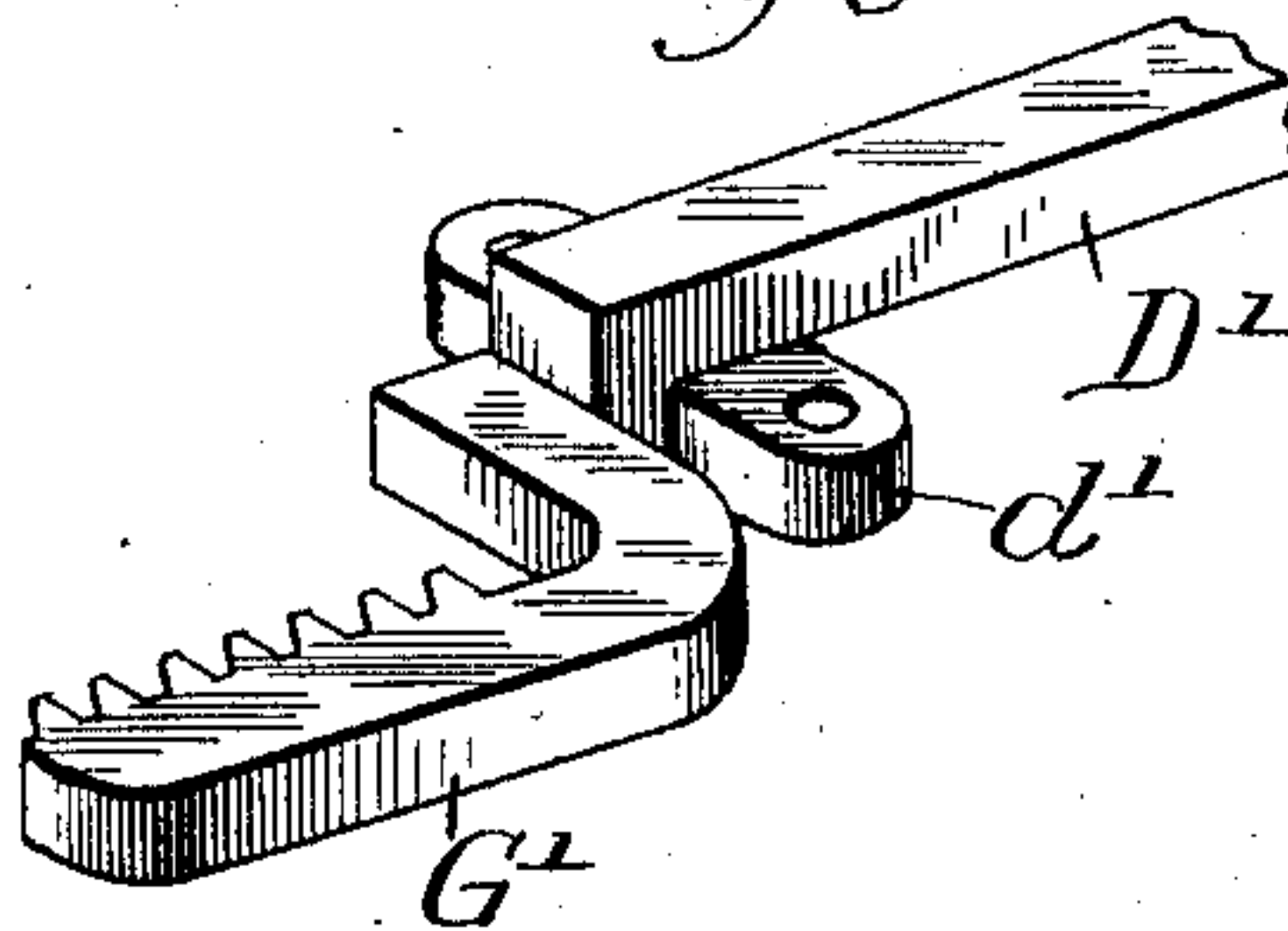
*Fig. 7*



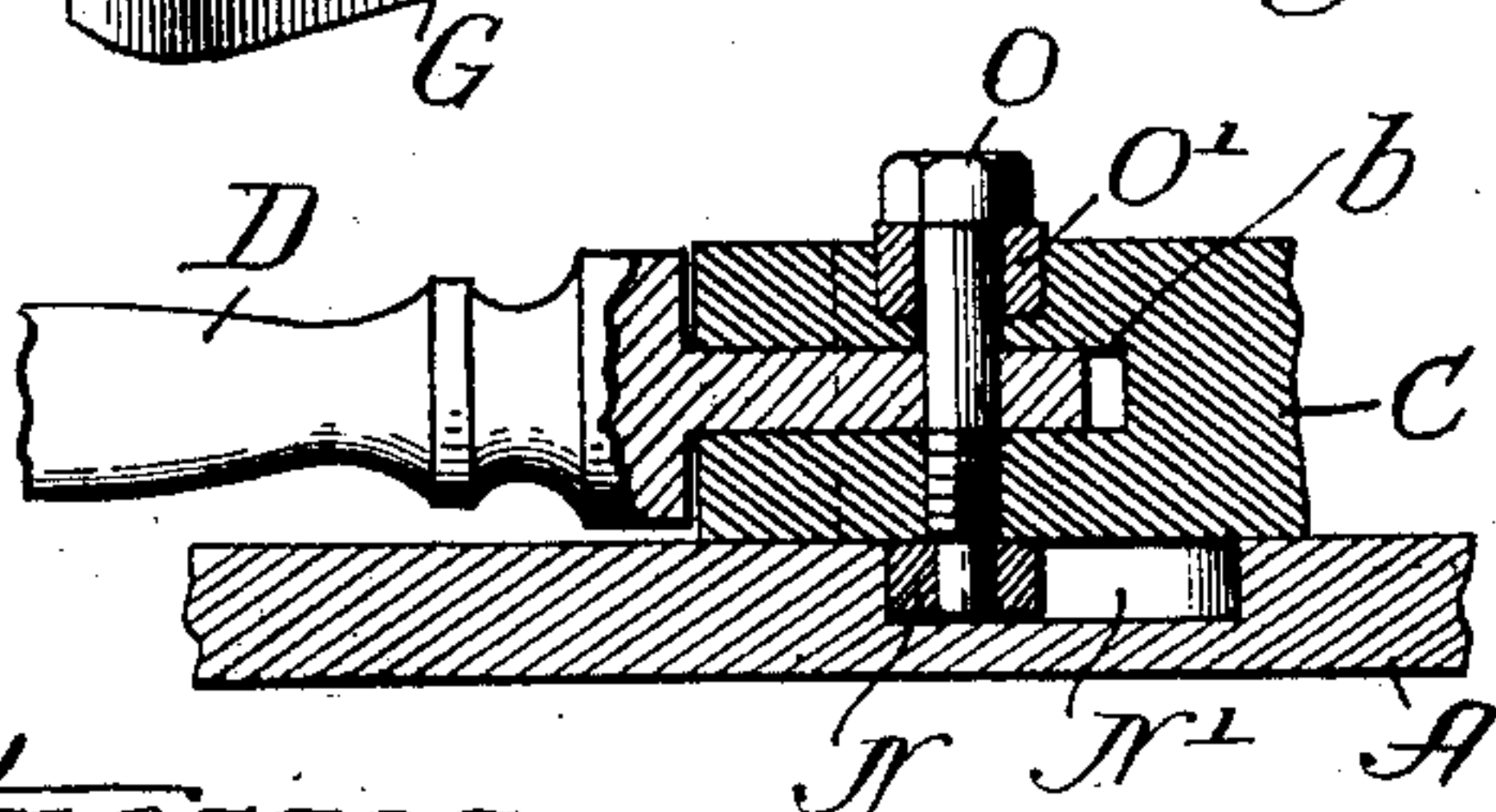
*Fig. 8*



*Fig. 9*



*Fig. 10*



Witnesses:

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# UNITED STATES PATENT OFFICE.

EMIL A. STRAUSS, OF CHICAGO, ILLINOIS.

## SAFE-BOLT WORK.

No. 859,531.

Specification of Letters Patent.

Patented July 9, 1907.

Application filed February 20, 1905. Serial No. 246,604.

*To all whom it may concern:*

Be it known that I, EMIL A. STRAUSS, a citizen of the United States, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Safe-Bolt Work; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in actuating devices for systems of radially arranged bolts, such as are commonly used on circular safe doors, and it consists in the matters hereinafter described and pointed out in the appended claims.

In the accompanying drawings:—Figure 1 is an interior face view of the safe door provided with radially arranged bolt work and actuating devices therefor embodying my invention. Fig. 2 is an enlarged fragmentary view of the inner face of the door with the central, circular supporting plate thereof removed. Fig. 3 is a detail section, taken on line 3—3 of Fig. 2. Fig. 4 is a detail section taken upon line 4—4 of Fig. 2. Fig. 5 is a detail section taken upon line 5—5 of Fig. 2. Fig. 6 is a detail view of the central actuating pinion and the rack bars engaged therewith, showing said parts in the position occupied by the same when the bolts are thrown outwardly. Fig. 7 is a side view of the inner end of one of the actuating bars. Fig. 8 is a perspective view of the same. Fig. 9 is a perspective view of the inner end of another one of the actuating bars. Fig. 10 is a detail, longitudinal section through the inner end of one of the bolts and actuated bar connected therewith, showing a modified construction of the means for connecting said parts. Fig. 11 is a view showing a modified form of construction in the central, rotative actuating member for giving endwise movement to the bolt actuating bars. Fig. 12 is a side view of the parts shown in Fig. 11. Fig. 13 is a detail side view of the rotative disk shown in Figs. 11 and 12.

As shown in said drawings, A indicates a safe door of circular form, B B<sup>1</sup> two rings attached to the inner face of the door, one near the outer margin thereof and the other somewhat inside of said margin, and C C a plurality of radially arranged cylindric bolts which fit and slide endwise in bearing apertures formed in the rings B B<sup>1</sup>.

D D indicate radially arranged, endwise movable bolt actuating bars, of which four are shown in the drawings, arranged at equal angular distances apart, or at an angle of ninety degrees from each other, and D<sup>1</sup> D<sup>1</sup> are like bolt actuating bars arranged at equal angular distances apart and in position intermediate to the bars D D. The bars D D and D<sup>1</sup> D<sup>1</sup> constitute primary actuating bars for all of the bolts and are engaged

at their inner ends with a device by which endwise movement is given thereto. Each of the primary actuating bars D D and D<sup>1</sup> D<sup>1</sup> are attached at their outer ends to one of the bolts C C. At opposite sides of each primary actuating bars D D are located associated or secondary bars D<sup>2</sup> D<sup>2</sup> which are pivotally connected at their inner ends with the bar D, near the inner end of the latter and pivotally connected at their outer ends with two of the bolts C C. At the opposite sides of the primary bars D<sup>1</sup> D<sup>1</sup> are likewise located associated or secondary bars D<sup>3</sup> D<sup>3</sup> similarly pivoted at their inner ends to the bars D<sup>1</sup> D<sup>1</sup> and connected at their outer ends with two of the bolts C C. Each primary actuating bar D or D<sup>1</sup>, with its two associated or secondary bars D<sup>2</sup> D<sup>2</sup> or D<sup>3</sup> D<sup>3</sup>, constitute means for actuating or giving endwise movement to three of the bolts C C, of which the intermediate bolt is connected with and actuated by the primary bar D or D<sup>1</sup>, and the two external bolts C C are connected with and actuated by the secondary bars D<sup>2</sup> D<sup>2</sup> or D<sup>3</sup> D<sup>3</sup>. As many sets or groups of said primary and secondary bars may be employed on a safe door as may be required, in accordance with the number of bolts with which the door is equipped, the particular safe door shown being provided with eight of such groups of primary and secondary bars.

The pivotal connection between the several primary bars and the inner ends of the secondary bars are formed, as shown, by means of lugs *d d*<sup>1</sup> projecting from the opposite sides of the primary bars D D<sup>1</sup> and pivot pins *d*<sup>2</sup> *d*<sup>3</sup> inserted through the inner ends of said secondary bars and through said lugs.

Centrally located mechanism for giving endwise movement to the primary bars D D and D<sup>1</sup> D<sup>1</sup> is provided as follows: E indicates a central supporting plate which is rigidly connected with the door a short distance from the inner face of the same and which covers the inner ends of the several actuating bars, and F is a centrally arranged spindle which extends through said plate E and is attached rigidly to the inner face of the door. Mounted on said spindle F is a rotative actuating member, which, as shown in Figs. 1 to 10 of the drawings, consists of a gear pinion F<sup>1</sup>. Said gear pinion is located between the plate E and the inner face of the door, which latter is provided with a central, shallow recess affording space for the pinion and other parts hereinafter described.

The primary actuating bars D D<sup>1</sup> are provided at their inner ends with offset extensions through which they are connected with the central actuating member. Said offset extensions, as shown in Figs. 1 to 10, have the form of rack-bars G and G<sup>1</sup> having gear teeth which intermesh with the gear pinion F<sup>1</sup>. The several rack-bars G G<sup>1</sup> are arranged in parallel relation to the actuating bars to which they are attached and arranged relatively to the pinion in opposite pairs, as shown



(Fig. 2). The rack-bars G on the set of actuating-bars D D are shown as arranged in the same plane with the said actuating bars D D (as clearly seen in Figs. 7 and 8), while the rack-bars G<sup>1</sup> on the actuating bars D<sup>1</sup> are not only offset laterally from the center lines of the bars, but are also offset from the plane of the rack-bars G G towards the face of the door, so that they will come into overlapping relation with the rack-bars G G, or between the latter and the bottom of the recess in the door, as clearly seen in Figs. 3 and 4, and shown in detail in Fig. 9.

From the construction described it will be manifest that the rotative actuating member or pinion F<sup>1</sup> has geared connection with all of the primary actuating bars D and D<sup>1</sup> and that rotation of the said pinion in one direction or the other will give simultaneous and equal movement to all of such primary actuating bars. Such endwise movement, thus given to the primary actuating bars, is communicated to all of the secondary actuating bars, so that by the turning of the said central pinion F<sup>1</sup>, all of the bolts may be given simultaneous inward or outward movement.

Casting and retracting movement may be given to the bolt work described through the medium of an operating spindle extending through the door to the outside of the same, or through the medium of a spring actuated, automatic bolt-actuating device located on the inner face of the door and controlled by a clock or timing mechanism. Moreover, when an operating spindle extending through the door is employed for giving movement to the bolt work, a time lock mechanism may be used in connection therewith for controlling the time of opening the door. I have shown in the drawings, as a means of actuating the bolt work, an actuating spindle H (Fig. 5) which extends through the door and has operative connection with one of the actuating bars D, so as to give endwise movement to the same, and, through the central rotative actuating member, to the other actuating bars. In the construction illustrated, said spindle has bearing at its inner end in the inner ring B<sup>1</sup> and has attached thereto a gear pinion H<sup>1</sup> which intermeshes with gear teeth formed on the adjacent side edge of the primary actuating bar D; said pinion H<sup>1</sup> being located adjacent to the inner face of the door and in the same plane with said actuating bar. When the spindle H is turned endwise movement is given to the actuating bar D and the rack-bar G on the latter, acting on the gear pinion F<sup>1</sup> turns the latter and gives endwise movement to all of the actuating bars to an extent corresponding with that given to the primary bar D by the turning of the said spindle H.

The drawing shows a bolt dogging device adapted for actuation by combination locks operated by spindles extending through the door; the same being constructed as follows:

The four primary actuating bars D D D D are severally provided at their inner ends with stop lugs I I which project through radial slots e e in the supporting plate E. Mounted on the end of the central spindle F, which projects through the plate E, are four radial dogging arms J, the same being rigidly connected by a central disk or hub j which turns freely on the spindle F. Said stop lugs and dogging arms J J are so arranged that when the bolts are thrown, and the actuating bars

are at the outward limit of their movement, the dogging arms may be swung in line with said lugs and will then lock the same from inward movement, but when the said dogging arms are turned into position to bring their outer ends to one side of the paths of said lugs, the latter will be free to move inwardly.

K K indicate two combination locks, which are secured to the plate E, and L L the operating spindles for the said locks, which extend through the door and are adapted to be turned from the exterior of the door in the usual manner. Said spindles are shown as arranged in line with a bar L<sup>1</sup> which is attached to the plate E and covers the ends of said spindles, so as to prevent the same being driven inwardly through the door in an effort to open the safe by violence. An actuating lever K<sup>1</sup> extends between the combination locks K K and is connected at its ends with the same in the usual manner. The lever K<sup>1</sup> is connected at a point between its ends with one of the dogging arms J by means of a link K<sup>2</sup>. The combination locks K and the lever K<sup>1</sup> are so arranged that when the dogging arms are in their holding position, operation of one or both combination locks will retract the said lever and thereby effect the turning of the dogging arms to carry them out of line with the stop lugs. When the dogging arms are thus shifted to carry their outer ends out of the paths of the several lugs I I, the several bolt actuating bars will be free to be moved by the actuating spindle H for unlocking the safe. The link K<sup>2</sup> is shown as pivoted by a pivot pin j<sup>3</sup> to one of the dogging arms J at a point so far from the pivotal axis of the several dogging arms that movement of both ends of the lever K<sup>1</sup> in a direction away from the said pivotal axis is required to effect a movement of the dogging arms sufficiently to release the same from the stop lugs I. If, however, the pivot connecting the said link with the dogging arm be inserted in the hole j<sup>2</sup>, which is located in the said arm nearer the central axis thereof near the pivot j<sup>3</sup>, then the operation of either combination lock will move one end of the lever far enough to effect the shifting of the end of the link connected with the lever a sufficient distance to disengage the dogging arms from the stop lugs.

Devices are provided for connecting the outer ends of the several actuating bars D D<sup>1</sup> D<sup>2</sup> D<sup>3</sup>, with the several bolts C C, as follows: As shown in Figs. 1 to 9, the outer ends of the said actuating bars are located beneath the bolts or between the end of the same and the adjacent inner face of the door. The actuating bars are connected with the bolts by means of pivot studs M which are inserted through the bolts and through said actuating bars. In the novel arrangement of these bars illustrated and more clearly seen in Fig. 3, the pivot stud M has screw-threaded engagement with the bolt, and is provided with a smooth or cylindric part which projects from the inner side of the bolt and is engaged with the bearing aperture in the actuating bar; said stud having a flat sided head m by which it is turned in inserting it in the bolt, and which is located at the outer side of said bolt. The outer end of said stud M is surrounded by a sleeve or washer M<sup>1</sup> which fits in a seat or recess formed therefor in the bolt and provided with a flat outer face against which bears the said head m of the stud. The bolt being round or cylindric, the washer M<sup>1</sup>, located in a seat or recess formed in the convex sur-



face of the bolt, affords a flat surface against which the head *m* of the stud rests or bears. By the construction described, therefore, a flat bearing surface is formed on the cylindric bolt for engagement with the inner face of the head on the pivot stud, and a neat finish is given to these parts.

For guiding the outer ends of the several actuating bars *D D<sup>1</sup> D<sup>2</sup> D<sup>3</sup>* in the endwise movement of the same, said bars are provided with guiding projections engaged with radial guide slots formed in the inner face of the door. These guide projections, as shown in the drawings, are formed by means of guide rollers *N*, mounted on the outer ends of actuating bars and projecting therefrom towards the door, while the door is provided in its inner face with radial slots *N<sup>1</sup>* located beneath the outer ends of said actuating bars. In the particular construction illustrated in the drawings, moreover, said guide rollers *N* are mounted on the inner ends of the pivot studs *M*, which are extended inwardly past the inner surfaces of said actuating bars to receive said rollers. By the use of such guide rollers and guide slots, the outer ends of the several actuating bars are guided or held from lateral movement independently of the locking bolts, so that the latter are not depended upon to hold in position laterally or guide the outer ends of the actuating bars in their radial movement, but said bolts are left free to move endwise in their bearings uninfluenced by any lateral pressure of the actuating bars thereon. Moreover, when the bolts are of cylindric form, as common in bolt work of this character, the bolts will be liable to turn or rotate in their bearings and thus permit the sidewise shifting of the outer ends of the actuating bar, which is prevented by the employment of the separate guiding devices for said outer ends of the bars arranged and operating as described.

In Fig. 10 I have shown a modified form of construction in means for connecting the actuating bars with the lock bolts. In this instance the bolt is provided at its inner end with a longitudinal slot *b* extending parallel with the inner face of the door, and the outer end of the actuating bar is flattened or provided with parallel flattened sides adapted to fit within said slot. The bar is connected with the lock bolt in this instance by means of a pivot bolt *O* inserted through the lock bolt and the interposed end of the actuating bar. In this instance also, a countersunk washer *O<sup>1</sup>* is employed in connection with the bolt *O* and a guide roller *N* like that hereinbefore described is applied to the end of the bolt *O* which projects inwardly past the inner face of the bolt, said guide roller being engaged with a radial slot *N<sup>1</sup>*, as in the case of the construction hereinbefore described. By the use of the combination shown in Fig. 10, the bolt may be arranged close to the inner face of the door, and as the actuating bar is in line with the bolt and stands at some distance from the door, its exposed part, or that not covered by the central supporting plate *E*, may be made circular in cross section and of ornamental form, as represented in said Fig. 10.

In Figs. 11, 12 and 13, I have shown another form of connection between the central rotative actuating member and the primary actuating bars of the bolt operating mechanism. As illustrated in said Figs. 11 to 13, two oppositely arranged primary bars *D D* and two oppositely arranged primary bars *D<sup>1</sup> D<sup>1</sup>* only are illus-

trated, but it will be understood that four primary bars *D D* and four primary bars *D<sup>1</sup> D<sup>1</sup>* may be employed as in the construction hereinbefore described. In this modified construction the bars *D D* are provided at their inner ends with offset extensions *P P* while the bars *D<sup>1</sup>* are provided with offset extensions *P<sup>1</sup> P<sup>1</sup>*. The central rotative actuating member in this case consists of a disk *Q* interposed between the supporting plate *E* and the adjacent face of the safe door, which latter is provided with a recess beneath the central part of said plate, as in the construction hereinbefore described. The extensions *P P* are not only offset laterally but also offset towards the plate *E* so as to extend between the marginal part of the disk *Q* and the plate *E*, and the offset extensions *P<sup>1</sup>* are likewise offset towards the door so as to extend between the marginal part of the said disk *Q* and the face of the door. The said several offset extensions *P P<sup>1</sup>* are pivotally connected at their ends with the disk by means of pivots *p p<sup>1</sup>*. The disk *Q* thus pivotally connected with the offset extensions on the inner ends of the primary actuating bars, serves to communicate endwise movement from one of said bars to all of the others or to give simultaneous endwise movement to all of the bars, in the same manner as does the gear pinion *F<sup>1</sup>* hereinbefore described. It will be observed, in connection with the devices illustrated in said Figs. 11 to 13, that the inner ends of the primary actuating bars will be given a slight lateral movement, by reason of the curve path traversed by the pivot pins *p p<sup>1</sup>* when the rotative actuating member *Q* is turned, but the turning movement of said rotative actuating member required for casting and retracting the bolts is so small and the resulting lateral movement of the inner ends of the actuating bars will be so slight, that it will have no appreciable effect either upon the operation of the secondary connecting bars, nor upon the geared connection of the outer end of one of the primary actuating bars *D* with the pinion *H<sup>1</sup>* on the actuating shaft *H* by which movement is given to said rotative actuating member.

I claim as my invention:—

1. The combination with three radially arranged bolts, of a radially arranged endwise movable primary actuating bar connected with the intermediate bolt and two secondary actuating bars pivoted to the two exterior bolts and to the said primary actuating bar.
2. The combination with radially arranged bolts, of a plurality of groups of radially arranged endwise movable, actuating bars, each embracing a primary actuating bar and two secondary actuating bars pivoted thereto and to two of the bolts, and a central, rotative actuating member connected with and giving endwise movement to said primary actuating bars.
3. The combination with radially arranged bolts, of two sets of radially arranged endwise movable actuating bars arranged severally in line with the bolts, and a central, rotative actuating member, the said actuating bars being provided on their inner ends with offset extensions by which they are connected with the central actuating member and the offset extensions on one set of actuating bars being also offset from the plane of those of the other set, to bring the extensions of the two sets in overlapping relation.
4. The combination with a safe door, of radially arranged bolts, two sets of radially arranged endwise movable, actuating bars connected with and adapted to give endwise movement to said bolts, a central, rotative actuating member, and offset extensions on the inner ends of the actuating bars connecting the same with the rotative actuating member, said extensions on one set of bars



being offset toward the door from the plane of those of the other set and the door being provided on its inner face with a recess to receive said offset extensions.

5. The combination with radially arranged bolts, of an endwise movable, primary actuating bar arranged in line with one of said bolts, a secondary endwise movable actuating bar pivoted to the primary actuating bar, said bars being connected with and adapted to give endwise motion to said bolts and a central, rotative, actuating member, said primary actuating bar being provided with an offset extension at its inner end by which it is connected with the central actuating member.

6. The combination with radially arranged bolts, of a plurality of groups of radially arranged endwise movable actuating bars, each group consisting of a primary actuating bar and two secondary actuating bars pivoted at their inner ends to the primary actuating bar and at their outer ends to two of the bolts, and a central rotative actuating member, said primary actuating bars being provided at their inner ends with offset extensions by which they are connected with the said rotative actuating member.

7. The combination with radially arranged bolts, of two sets of radially arranged endwise movable, actuating bars provided with rack-bars on their inner ends and operatively connected at their outer ends with said bolts, and a single, central gear pinion intermeshing with said rack bars, the rack bars on the two sets of actuating bars being arranged in overlapping relation.

8. The combination with radially arranged bolts, of an endwise movable primary actuating bar, a secondary radial endwise movable actuating bar pivoted at its inner end to the primary actuating bar and at its outer end to one of the bolts, a rack-bar on the inner end of the primary actuating bar, and a gear pinion intermeshing with said rack bar.

9. The combination with radially arranged bolts, of a plurality of groups of radially arranged endwise movable actuating bars, each group embracing a central, primary actuating bar and two secondary actuating bars, pivoted at their inner ends to the primary actuating bars and at their outer ends to two of the bolts, said primary actuating bars being provided with rack bars, and a single, central pinion engaging the rack bars on the several primary actuating bars.

10. The combination with a safe door, of a radial cylindric bolt, a non-rotative endwise movable actuating bar connected at its outer end with the inner end of the bolt and a guide projection on the bolt engaging a guide groove in the door, to hold the bolt from turning in its bearings.

11. The combination with a safe door, of an endwise sliding cylindric bolt, a stud projecting from the bolt toward the door, and a guide roller on the stud, said door being provided with a guide groove which is engaged by said roller.

12. The combination with a safe door, of a cylindric endwise sliding bolt, an endwise movable actuating bolts, a pivot stud connecting the said bolt with said actuating bar, and a guide roller mounted on the said stud, said door being provided with a guide groove which is engaged by said roller.

13. The combination with a cylindric endwise sliding bolt, of an endwise movable actuating bar, a headed pivot

stud inserted through the bolt and actuating bar, and a washer surrounding the stud and provided with a flat outer surface for contact with the bolt head, said bolt having a recess forming a seat for said washer.

14. The combination with radially arranged bolts, of a plurality of radially movable actuating bars, and operating means acting on the inner ends of said actuating bars and connecting said bars with each other, one of said bars being provided with a stop lug, and a centrally pivoted dogging arm adapted for engagement with said stop-lug.

15. The combination with radially arranged bolts, of a group of radially movable actuating bars embracing a primary actuating bar and two secondary bars pivoted thereto, said bars being connected with and adapted to give endwise movement to said bolts said primary bar being provided with a stop lug, and a centrally pivoted dogging arm adapted for engagement with said stop lug.

16. The combination with radially arranged bolts, of a plurality of groups of radially movable actuating bars, each group embracing a primary actuating bar, and two secondary bars pivoted thereto, said bars being connected with and adapted to give endwise movement to said bolts two or more of said primary bars being provided with stop lugs, and a plurality of rigidly connected, centrally pivoted dogging arms, adapted to severally engage the said stop lugs.

17. The combination with a safe door, of radially arranged bolts, a plurality of radially movable actuating bars, one of which is provided with a stop lug said bars being connected with and adapted to give endwise movement to said bolts, a supporting plate attached to the door and provided with a radial slot through which said lug extends, a pivoted dogging arm mounted on the said plate and adapted to engage said lug, and means mounted on said plate for actuating said dogging arm.

18. The combination with a safe door, of radially arranged bolts, radially arranged endwise movable actuating bars connected with and adapted to give endwise movement to said bolts, a central, rotative actuating member connected with and giving simultaneous movement to the several actuating bars, and means for throwing and retracting the bars, embracing a spindle passing through the door and acting on one of the said actuating bars to give endwise movement to the latter and to the central actuating member.

19. The combination with a safe door, of radially arranged bolts, radially arranged endwise movable actuating bars connected with and adapted to give endwise movement to said bolts, a central, rotative actuating member connected with and giving simultaneous movement to the several actuating bars, and means for throwing and retracting the bolts consisting of gear teeth on one of the actuating bars, a gear pinion intermeshing therewith and a spindle extending through the door for turning said gear pinion.

In testimony that I claim the foregoing as my invention, I affix my signature in presence of two witnesses, this 17th day of February, A. D. 1905.

EMIL A. STRAUSS.

Witnesses:

C. CLARENCE POOLE,  
G. B. VILKINS.