

(No Model.)

5 Sheets—Sheet 1.

E. STOCKWELL.  
COMBINATION LOCK.

No. 567,698.

Patented Sept. 15, 1896.

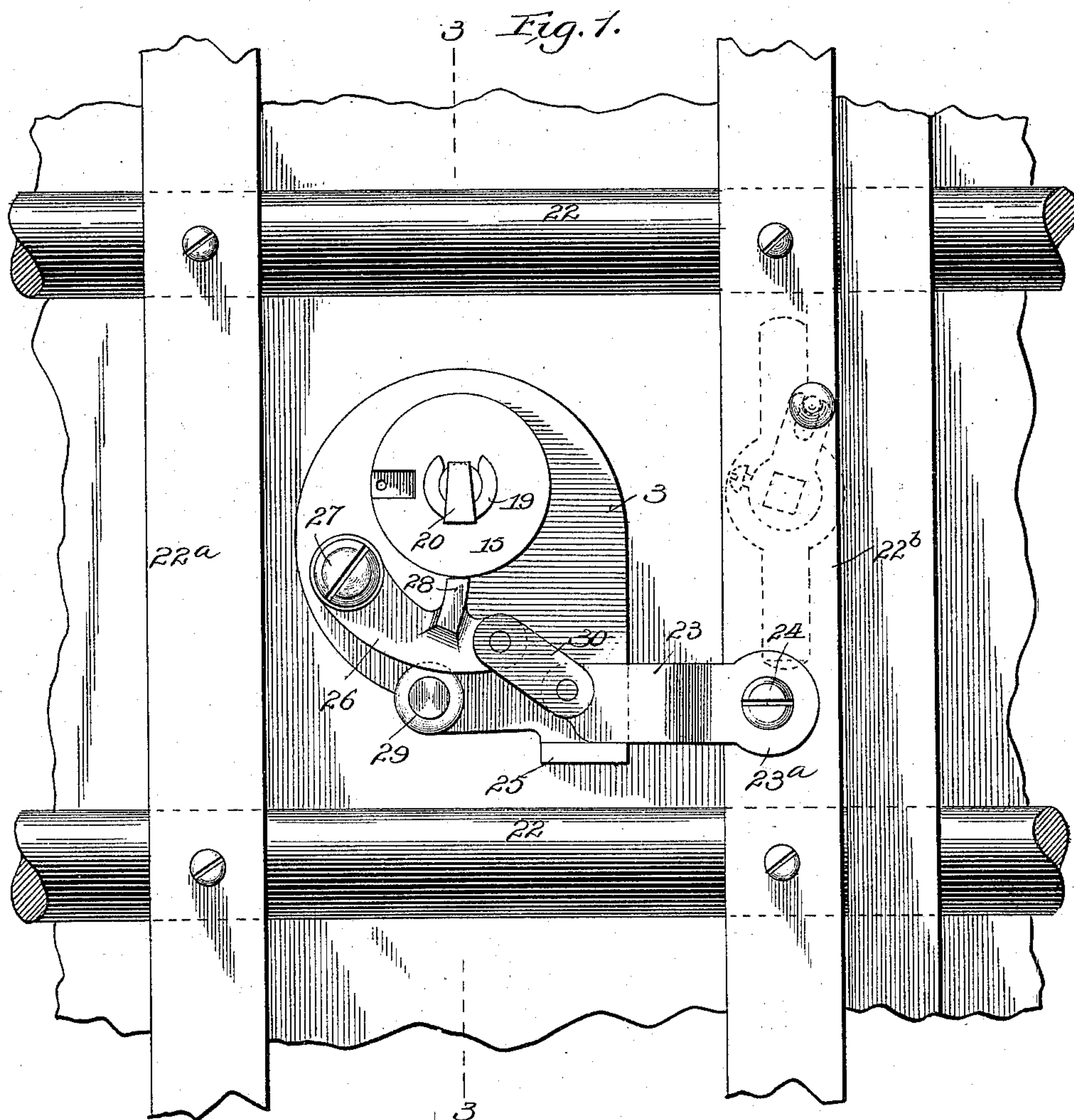


Fig. 5.

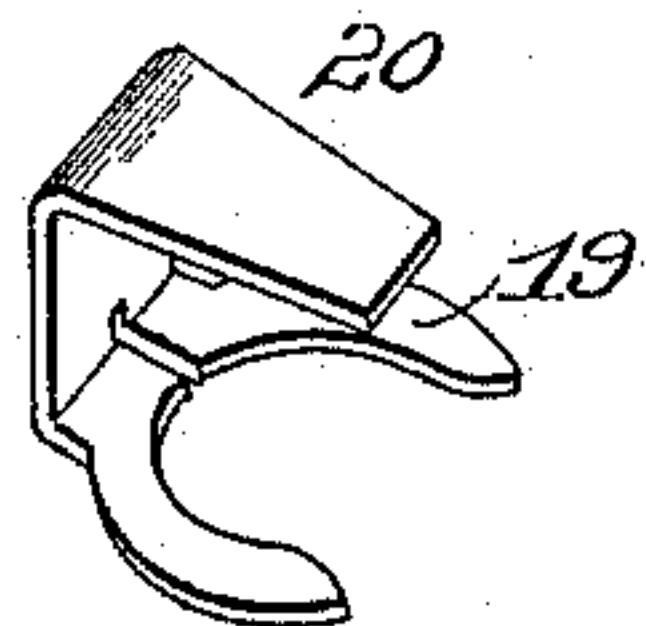


Fig. 4.

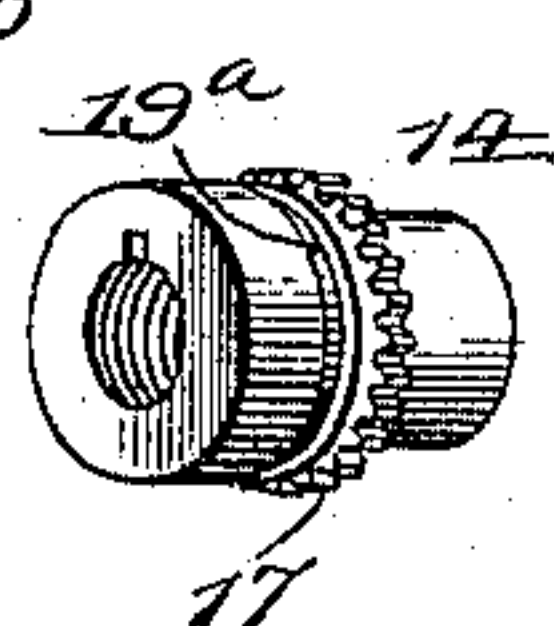
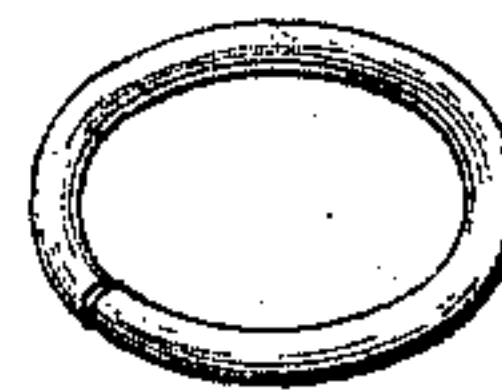


Fig. 6.



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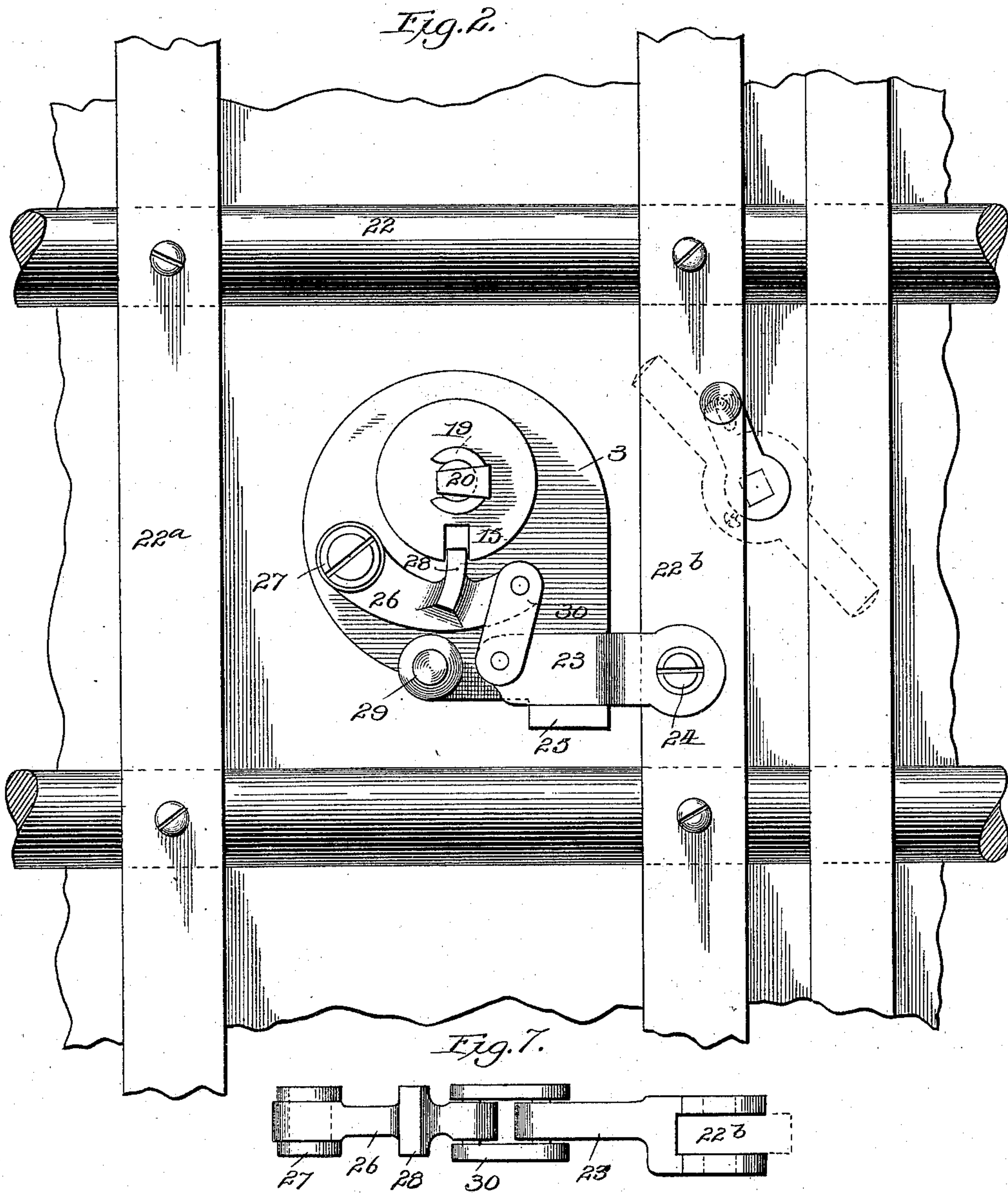
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5 Sheets—Sheet 2.

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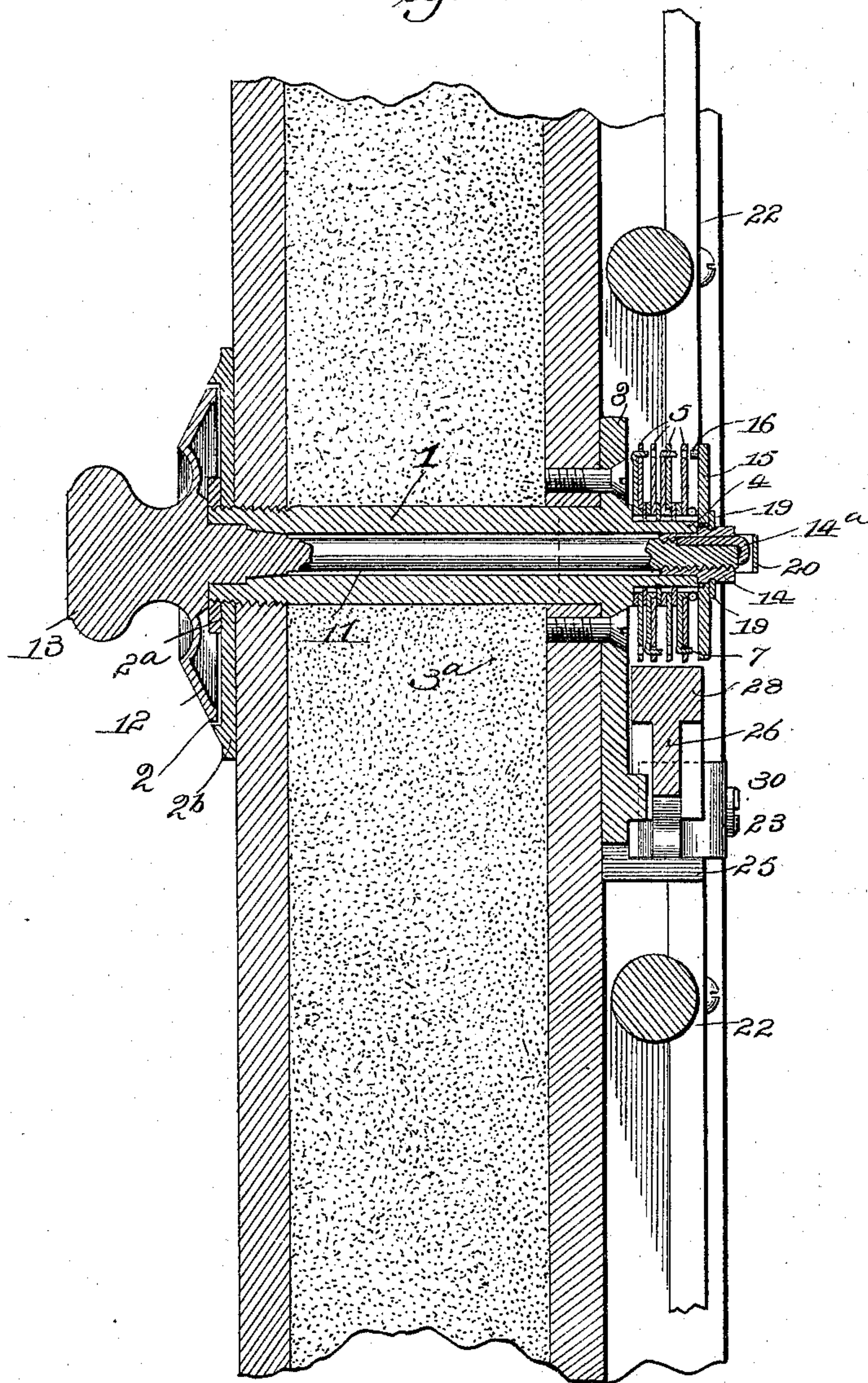
5 Sheets—Sheet 3.

E. STOCKWELL.  
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Patented Sept. 15, 1896.

*Fig. 3.*



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(No Model.)

5 Sheets—Sheet 4.

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Fig. 11.

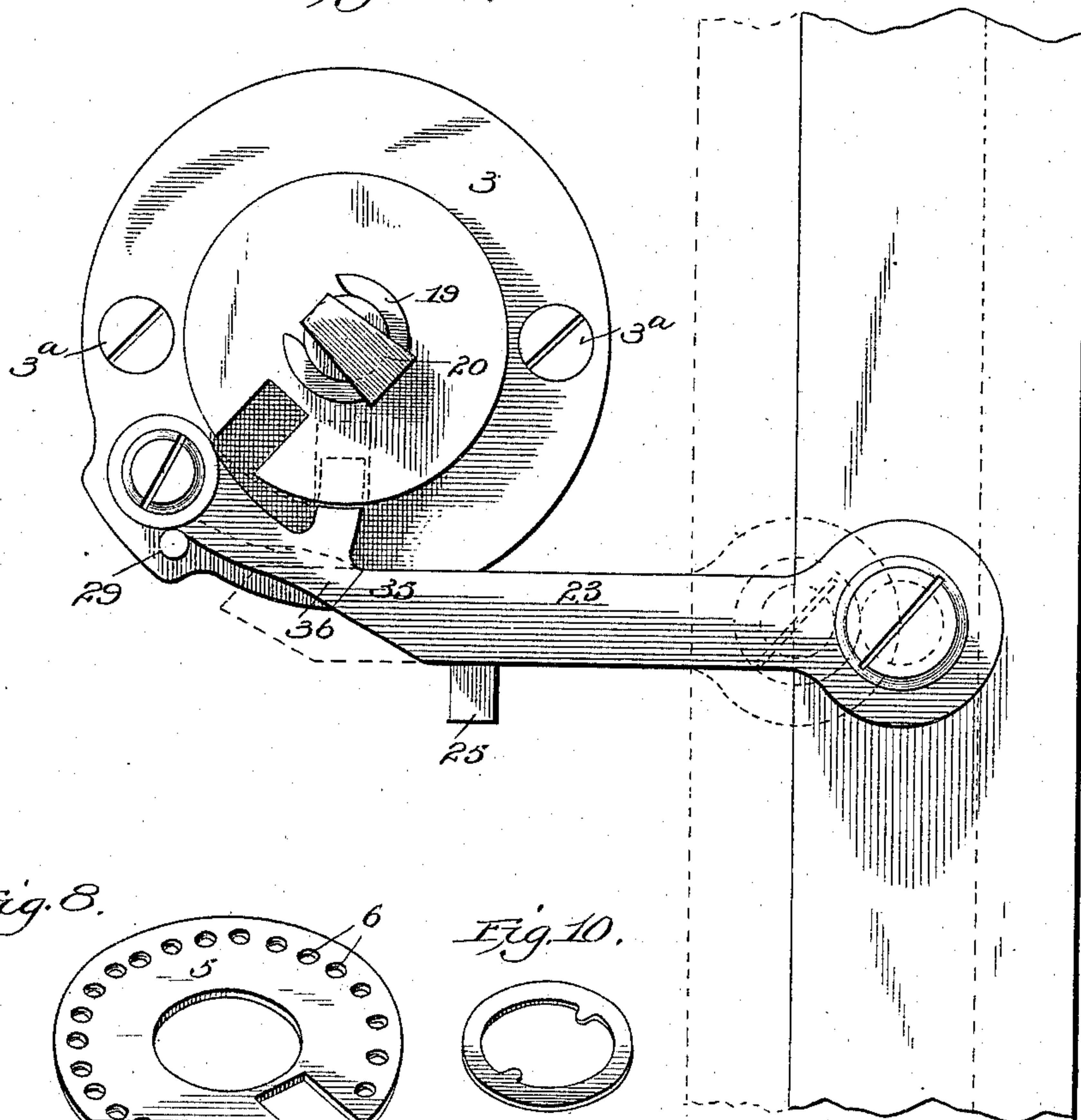


Fig. 8.

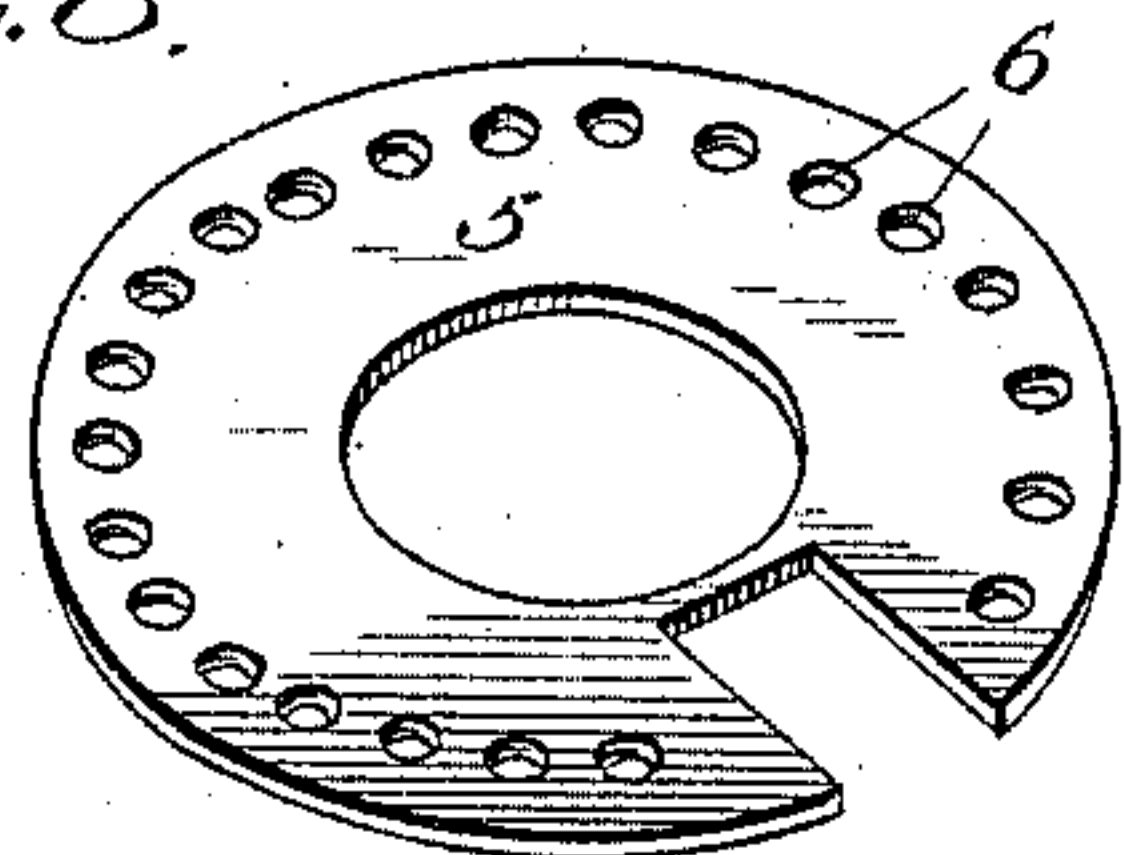


Fig. 10.

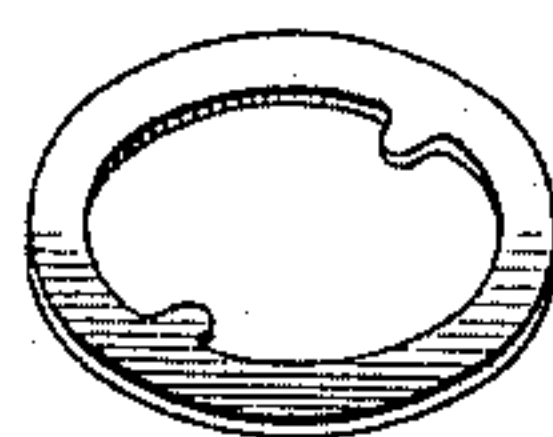
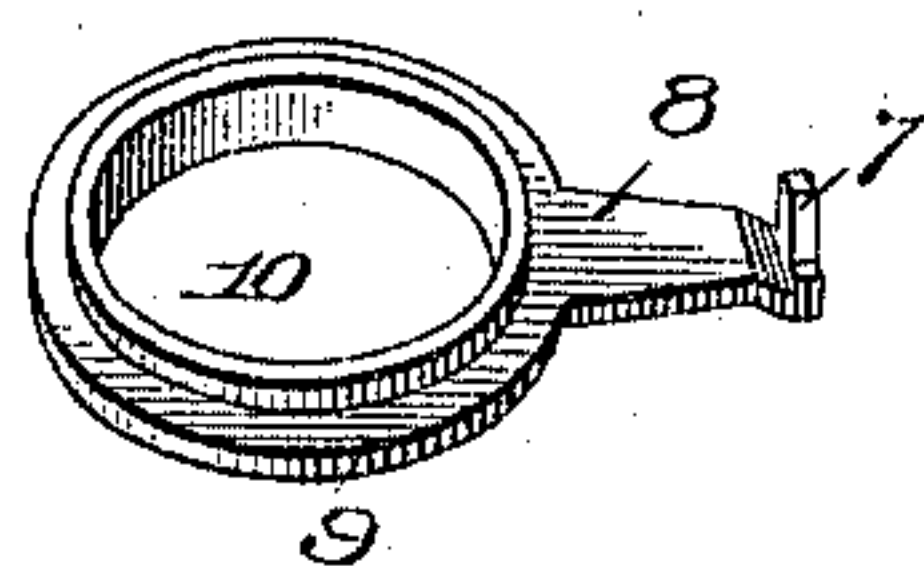


Fig. 9.



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(No Model.)

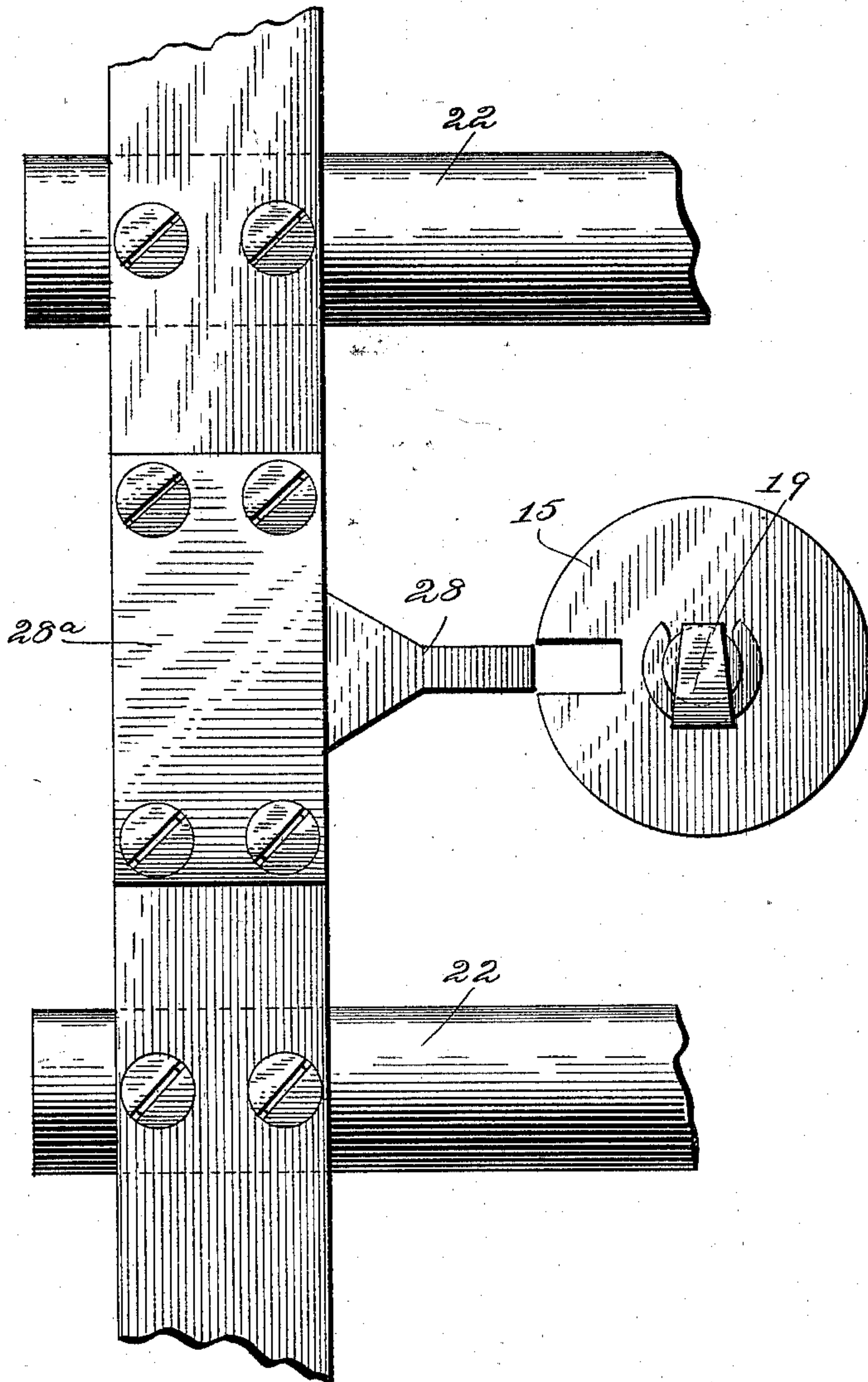
5 Sheets—Sheet 5.

E. STOCKWELL.  
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Patented Sept. 15, 1896.

*Fig. 12.*



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# UNITED STATES PATENT OFFICE.

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## COMBINATION-LOCK.

SPECIFICATION forming part of Letters Patent No. 567,698, dated September 15, 1896.

Application filed September 6, 1895. Serial No. 561,699. (No model.)

*To all whom it may concern:*

Be it known that I, EMORY STOCKWELL, a citizen of the United States, residing at Stamford, in the county of Fairfield and State of Connecticut, have invented a new and useful Improvement in Combination-Locks, of which the following specification, taken in connection with the accompanying drawings, is a full, clear, and exact description.

10 The invention relates to an improved construction of tube and tumbler-stump, to improvements in the revolving tumblers and their accessories, or in the lock proper, and to improvements in the connections between  
15 the boltwork and lock.

The invention consists, first, in constructing each of the lock-tumblers of a disk perforated in the customary manner with a concentric series of apertures for the reception  
20 of the driving-pin and with a separable hub formed with a shoulder inserted within the eye of the tumbler-disk, constituting a bushing or bearing on which the tumbler turns, and having a radial arm which carries a driving-pin, which is inserted in any one of the  
25 series of apertures, so as to determine the position of the tumbler-notch in arranging the combination of the lock.

The invention consists, second, in a new  
30 construction of driving-wheel, which enables the combination to be readily changed without taking the lock apart, and it consists of a particular construction of connection between the driving-wheel and hub so that the  
35 driving-wheel may be drawn off the hub, partially turned in relation thereto, and replaced in a new position which will effect a change in the combination on which the lock is set without rearranging the tumblers.

40 The invention consists, third, in a combined fastening and guard of peculiar construction, which holds the driving-wheel in place in connection with its hub and at the same time prevents the escape of the key or  
45 other fastening which secures the hub of the driving-wheel to the spindle.

The combined results of these improvements are to provide an effective lock which, without requiring a curb or case to contain  
50 the tumblers, possesses greater advantages

than have been obtained heretofore except by the use of a curb.

The improvements thus far referred to are applicable to either locks having a fence or dog moving in a right line in connection with  
55 the boltwork, or with an ordinary pivoted dog or fence-lever; but for some situations, and especially with tumblers which are constructed in two parts for the purpose of changing their combination, so that a deep tumbler-notch is not practicable, I prefer to employ  
60 in connection therewith the improved lever and boltwork connections hereinafter described.

The invention relates, fourth, to improvements in the fence-lever, lock, and boltwork connections, and especially to that form of combination-lock in which the safe boltwork is dogged directly against the tumblers of the  
65 controlling-lock, the object of this part of my invention being to simplify this form of locks and render such locks certain in operation and degree of security for the uses to which they are put.

It may be necessary, in order that the tumblers should not be of excessive diameter,  
75 that the motion of the safe-bolts when transmitted to the fence-lever or dog should be reduced at the point where the dog enters the tumbler-notches. This is especially true  
80 where the tumblers are constructed of an inner disk surrounded by an outer flange, which move relatively to each other for the purpose of changing the combination. In tumblers which are so constructed it is not practicable  
85 to have the fence-notches cut as deep as they may be cut in a tumbler made of one piece. For cases of this sort I provide a suitable deflecting connection between the boltwork and fence-lever, so that the boltwork will be allowed  
90 to move the requisite distance for unlocking the safe, while the fence-lever or dog moves a much shorter distance in entering the gates of the tumbler-wheels.

There are other features which assist in  
95 perfecting my improved lock, and in order that all of the features of my said invention may be fully understood I will first describe the same with reference to the accompanying drawings and afterward more particularly  
100



point out the novel features in the annexed claims.

In the accompanying drawings, Figure 1 is an interior elevation of a lock and boltwork 5 connected therewith, illustrating my invention, the parts being shown in locked position. Fig. 2 is a similar view showing the parts in unlocked position. Fig. 3 is a vertical longitudinal section through the center of 10 the lock. Fig. 4 is a perspective view of the two parts of the separable driving-wheel detached. Fig. 5 is a perspective view of the keeper employed to retain the two parts of the driving-wheel in connected position and also to 15 retain the key by which the driving-wheel hub is locked to the spindle, as hereinafter described. Fig. 6 is a perspective view of an open ring employed in customary manner to retain the tumblers on the fixed stump upon 20 which they turn. Fig. 7 is a top view of the fence-lever, the arm of the boltwork, and the connecting-link between them, the said link being shown as it appears when the safe is locked. Fig. 8 is a perspective view of one 25 the disk-tumblers with the separable hub-bearing removed. Fig. 9 is a perspective view of the separable hub with its radial arm and driving-pin. Fig. 10 is a perspective view of a customary washer, such as are interposed between the tumblers to prevent the 30 transmission of motion by friction between them. Fig. 11 is an elevation of the lock and boltwork, illustrating a modification in the deflecting device which effects the engagement between the boltwork arm and the 35 fence-lever, so as to secure the bolts in locked position, or when the tumblers are set for unlocking to drive the fence into the notches with a movement less in extent than that of 40 the bolts. Fig. 12 is a view illustrating the application of the lock to boltwork carrying a direct fence or dog projecting from the string-piece, bearing directly against the tumblers when pressure is applied to the bolt- 45 work and sliding directly into the tumbler-notches when the boltwork is unlocked.

The mechanism of the lock is preferably mounted on a fixed tube 1, secured to the door by having its outer end threaded in the front 50 plate, and having an integral flange 3, through which are passed screws 3<sup>a</sup> to prevent turning. An external nut 2<sup>a</sup> secures the dial-ring 2<sup>b</sup> in place. These features correspond substantially to my Patent No. 261,271, granted 55 July 26, 1882, and are represented in Fig. 3 of the drawings. The reduced inner end 4 of the tube is also formed integrally with the tube, constituting a fixed stump on which the tumblers 5 rotate.

60 The tumblers are constructed in general on the plan which has heretofore been used, comprising a disk 5, provided near its periphery with perforations 6, through which projects the driving-pin 7, which actuates the adjacent 65 tumbler. In my invention the driving-pin 7 is mounted by an arm 8 upon a hub 9, the im-

proved construction of hub being made with a shoulder 10, so that when combined with the disk 5 of the tumbler the shoulder passes into the central opening or eye of the tumbler 70 and forms a bearing upon which the tumbler revolves on the stump 4, the tumbler-disk itself not coming in contact with the stump. One advantage of this is that it enables the tumbler-disk to be made of cheaper metal, 75 such as iron, while the hub and driving-pin may be made of brass, so that the tumbler may run on a brass center, which will prevent it sticking on the stump, and, further, the bearing upon which the tumbler runs may be made 80 as much greater than the thickness of the tumbler as may be desired.

In cases where the tumblers are made of brass or other similar metal it is not essential that the arm which carries the driving-pin 85 should be provided with a hub fitting into the tumbler, because when the tumblers are made of brass they can safely revolve directly upon the stump formed by the inner end of the tube, and the arm which carries the pin may 90 be formed flat throughout without any hub, but with a simple perforation, so that the arm may also revolve upon the stump upon the inner end of the tube. This construction of an arm with or without a hub will not, of 95 course, affect the operation or value of other parts of my invention.

The spindle 11 is formed with the customary dial 12 and knob 13 for rotating it and projects inwardly beyond the inner end of the 100 stump 4, within which it turns, and the hub 14 of the driving-wheel 15 is permanently affixed to the inner end of the said spindle in any suitable manner. I have shown it screwed on the end of the spindle and secured against 105 rotation by a longitudinal key 14<sup>a</sup>. This driving-wheel hub 14 is made of a less diameter than the stump 4, so that when the main part 15 of the driving-wheel is removed from the hub 14, as hereinafter described, the tumblers 110 5, with their bearing-hubs 9, which run upon the stump 4, can readily be removed therefrom for the purpose of changing the combination without removing the spindle or separating the driving-wheel hub therefrom. 115 The driving-wheel 15 engages with its hub 14 adjustably by means of a series of teeth 17 on the hub, which coincide with a series of corresponding teeth 17<sup>a</sup> on the driving-wheel. The form of these teeth 17 is immaterial so 120 long as they correspond in form and dimensions and are arranged concentrically so as to permit the driving-wheel to be slipped off and readjusted on its hub with its driving-pin 16 in different angular position. 125

The teeth upon the driving-wheel are preferably formed so that they do not extend entirely through the wheel but leave on one side of the wheel a flush face which forms a web 18, against which the teeth upon the hub bear 130 when the driving-wheel is secured in place. The object of this is that the bearing of the



driving-wheel when secured in place shall be only upon its own hub and shall not bear against the end of the tube. The object of this construction is that the driving-wheel  
 5 may be always held rigidly in place, so that it will properly connect with and operate the tumblers irrespective of the endwise play which the spindle may have in its tube, the result being that we have a driving-wheel  
 10 which is capable of adjustment for the purpose of changing the combination and yet which operates precisely like a solid driving-wheel.

The driving-wheel may be held in engagement with its hub by means of a keeper 19, which may be of any form, as, for instance, a fork like that shown in Fig. 5, engaging with a groove 19<sup>a</sup> on the hub 14, or by a pin, or by a screw-cap, or in any preferred manner. It  
 20 will be seen that the inner end of the driving-wheel hub on which the wheel 15 is fixed is made of greater diameter than that portion of the hub which projects into the tube. The reason for this is to make it difficult to pull  
 25 the spindle outward, which might be possible if the only resistance to this were a flange of the thickness necessary for the teeth, and another advantage in having the inner end of the hub of a greater diameter is that when the  
 30 flange is removed from the hub of the driving-wheel for the purpose of changing the combination its approximate fit to the inner end of the driving-wheel hub enables it to be easily guided by said driving-wheel hub, so that  
 35 even in situations where there is not much light it can be readily replaced so as to form a new combination. The result of this construction thus far described is that we have a  
 40 greater facility for changing the combination of the lock than exists in any lock thus far produced except those which are provided with separate tumbler boxes or curbs, it being  
 45 merely necessary in changing the combination to withdraw the keeper or other fastening from the driving-wheel, to pull it out of engagement with its teeth and turn it to any  
 50 desired position, and fasten it in place again without removing the spindle or any other part. If it is desired to change the combination of each tumbler, then the flange of the driving-wheel is altogether removed and the tumblers taken off and the combined hubs and driving-pins are set in different positions on their respective tumblers.

A considerable advantage which has existed in favor of locks provided with tumbler-curbs is that the curb sets over the key or fastening upon the end of the spindle, so that the key cannot work loose and render the  
 60 lock inoperative by direct connection between the spindle and the driving-wheel. This may be a serious difficulty, and it is overcome in a novel way in my invention by combining with the fork 19 or other fastening which secures  
 65 the driving-wheel to its hub a guard 20, which, in any desired manner, projects over

or stands in the way of the removal of the key 16 or other fastening between the spindle and the driving-wheel hub. It is obvious that this combined fastening and guard may  
 70 be made in a great variety of forms without departing from the invention; and this device is also equally advantageous in the case of other locks where from their construction the key or other device which secures the  
 75 spindle to the driving-wheel may, through the operation of the lock, or otherwise, gradually become loosened and drop out, thus disconnecting the spindle from the driving-wheel. This is liable to happen in many  
 80 forms of side-shaft locks, that is, combination-locks where the spindle drives the tumblers through an interposed series of gears.

The improvements above described in the tumbler mechanism or lock proper are not  
 85 dependent upon the manner now to be described of constructing and arranging the fence-lever and its accessories and connecting the boltwork thereto, but may be used with any preferred and suitable form of fence  
 90 and bolt-work and their connections.

Upon the inner face of the safe-door is mounted in the usual way the boltwork, which comprises essentially the bolts 22 and the string-pieces or carrying-bars 22<sup>a</sup> 22<sup>b</sup>.  
 95

23 is an arm formed with a bifurcated end 23<sup>a</sup>, which straddles the carrying-bar 22<sup>b</sup> and is pivotally attached thereto by means of the screw 24.

25 is a guide-lug formed integral with the  
 100 flange or base-plate 3 for the purpose of supporting the guiding-arm 23. This guiding-arm 23 may, however, be made rigid, in which case there will be no necessity for the guide-lug 25.  
 105

26 is the dog or fence-lever, pivoted to the base-plate 3 at 27 and formed with the nose or fence 28, which is adapted to enter the gates or notches of the tumbler-disks 5 and drive-wheel 15.  
 110

29 is a lug which supports the dog or fence-lever 26 and prevents it falling below its normal position. When there is pressure on the bolts, the nose or fence 28 of the fence-lever is constantly in engagement with the periph-  
 115 eries of the tumbler-wheels 5, except when the combination is set and it enters the notches.

30 are connecting-links, which are pivotally connected at their opposite ends to the arm 23 and fence-lever 26 for the purpose of im-  
 120 parting a slight upward deflecting movement to the fence-lever 26 (sufficient to make the nose or fence 28 enter the gates of the tumbler-wheels) and at the same time allow the full thrust of the arm 23, which is imparted  
 125 to it by the boltwork. By this means of engagement between the arm 23 and fence-lever 26 it will be observed that the boltwork is allowed to move several times the distance traveled by the fence-lever, and also that said  
 130 fence-lever will hold the boltwork securely locked when the combination is disturbed



by reason of the engagement of the fence 28 on the peripheries of the tumbler-wheels.

In Fig. 11 I have shown a slight modification, which differs from the preferred form only in the means of engagement between the arm 23 and the fence-lever 26. In this figure similar parts are designated by the same numerals. The outer end of the arm 23 is formed with a beveled shoulder 35, which rests against a similar shoulder 36 on the end of the fence-lever 26 when the mechanism is in locked position. When the combination is set, the thrust of the arm 23 by the retraction of the boltwork raises the fence-lever 26 on its pivot, and by the action of the oblique shoulders 35 36 causes the fence to enter the gates of the tumbler-wheels, as indicated in dotted lines.

In Fig. 12 I have shown another modification. In this form the fence or dog 28 is formed integral with an attaching-piece 28<sup>a</sup>, secured to one of the carrying-bars, and it is of such length as to always bear against the peripheries of the tumblers when pressure is applied to the boltwork and sliding into the tumbler-notches when set for unlocking the boltwork.

By the term "deflecting connection" employed in this specification and claims I mean any means of engagement between the arm 23 and fence-lever 26 which will move the latter on its pivot into engagement with the gates of the tumbler-wheels sufficiently aside from the path of the arm 23 to allow for the full movement of the boltwork when it is retracted.

The operation of my improved lock will be clear from the above description.

By means of the deflecting connection of the arm 23 and fence-lever 26 I am enabled to employ tumbler-wheels of smaller diameter, as it is only necessary to provide gates or notches of sufficient depth to allow for the slight deflected movement of the fence-lever.

Having thus described my invention, the following is what I claim as new therein and desire to secure by Letters Patent:

1. A tumbler-disk for combination-locks, constructed in two parts, one of said parts being provided with a central opening and with a series of perforations near its periphery, and the other of said parts being provided with a hub which fits in the central opening, to form a bearing for that part and having a radial arm carrying a driving-pin, substantially as shown and described.

2. The combination of the hub 14 and outer member 15 of the driving-wheel connected by teeth 17 extending partially through the flange or thickness of one member thus providing a collar or web 18 against which the teeth of the other member abut endwise in pressing the parts together, as explained.

3. The combination of the spindle 11, divided driving-wheel 14, 15, key 14<sup>a</sup> for securing the driving-wheel hub in rotative connection

with the spindle, and the keeper 19 serving to retain the outer member of the driving-wheel upon its hub and to retain the key 14<sup>a</sup> substantially as set forth.

4. In a combination-lock, the combination with a driving-wheel and its retaining-key, a keeper for said key formed in a single piece and consisting of the fork 19 and the guard 20 bent from the fork 19 so as to stand in the path for removing the key, substantially as shown and described.

5. In a combination-lock, the combination of the tumblers and the lock mechanism, a spindle, a driving-wheel in the spindle and adapted to hold the tumblers in place, a key for holding the driving-wheel on the spindle and a forked keeper and guard for the key or other fastening device between the spindle and driving-wheel, substantially as shown and described.

6. In a combination-lock, the combination of the tumblers, and a driving-wheel therefor, a spindle on which said wheel is mounted, suitable means for holding the driving-wheel from rotation on the spindle, and a sheet-metal spring-fork for holding the driving-wheel on the spindle and having a spring-back approximately at right angles to the plane of the fork for holding the means for securing the driving-wheel on the spindle, substantially as shown and described.

7. In a combination-lock mechanism, the combination of suitable safe boltwork, a projecting arm pivoted to the carrying-bar of said boltwork, a guide-lug for supporting said arm in horizontal position, a stack of tumbler-wheels provided with the customary radial gates or notches, a pivoted fence-lever adapted to bear directly against the tumblers and enter the gates or notches, a lug for supporting said pivoted lever in proper relation to the projecting arm of the boltwork, and a link pivotally attached to the arm and fence-lever, substantially as set forth.

8. In a combination-lock mechanism, the combination of suitable boltwork, a stack of tumbler-wheels, a pivoted fence-lever, and an arm connected to said pivoted fence-lever and formed with a perforated bifurcated end which embraces the carrying-bar of the boltwork and is pivotally attached thereto by means of a suitable pivot-pin, substantially as set forth.

9. In a combination-lock mechanism, the combination of the spindle-tube extending through the safe-door formed on its inner end with an integral flange and a stump of reduced diameter which supports the tumbler-wheels, the tumbler-wheels mounted on said stump, the dial-spindle extending through said tube and stump, a driving-wheel removably and adjustably attached to a hub of less diameter than the stump which is secured on the end of the said spindle and engaging the tumbler-wheels, and a suitable fence-lever and boltwork, substantially as set forth.



10. In a combination-lock mechanism, the  
combination of a stack of tumbler-wheels  
which rotate on a suitable hub, a dial-spindle  
extending through the hub of said tumbler-  
5 wheels, and provided with the threaded inner  
end, a driving-wheel hub of less diameter  
than the hub of the tumbler-wheels screwed  
and keyed on the dial-spindle, a driving-  
wheel disk adapted to engage the tumbler-

wheels, suitable means for securing a rota- 10  
tive connection with the hub, and means for  
producing an angular adjustment between  
the hub and driving-wheel, substantially as  
shown and described.

EMORY STOCKWELL.

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