

(No Model.)

2 Sheets—Sheet 1.

I. IVERSON.
COMBINATION LOCK.

No. 563,039.

Patented June 30, 1896.

Fig. 5

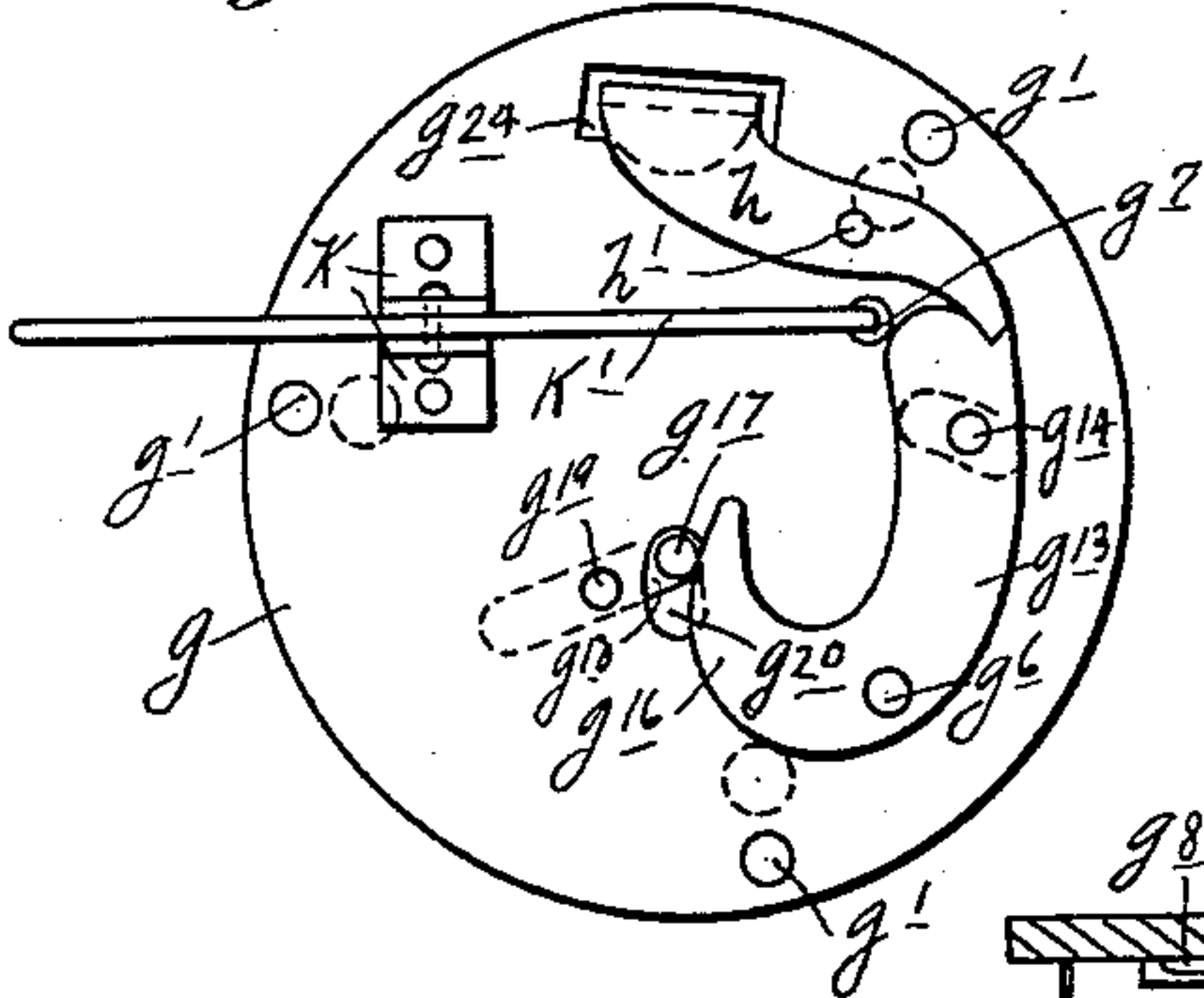


Fig. 10.

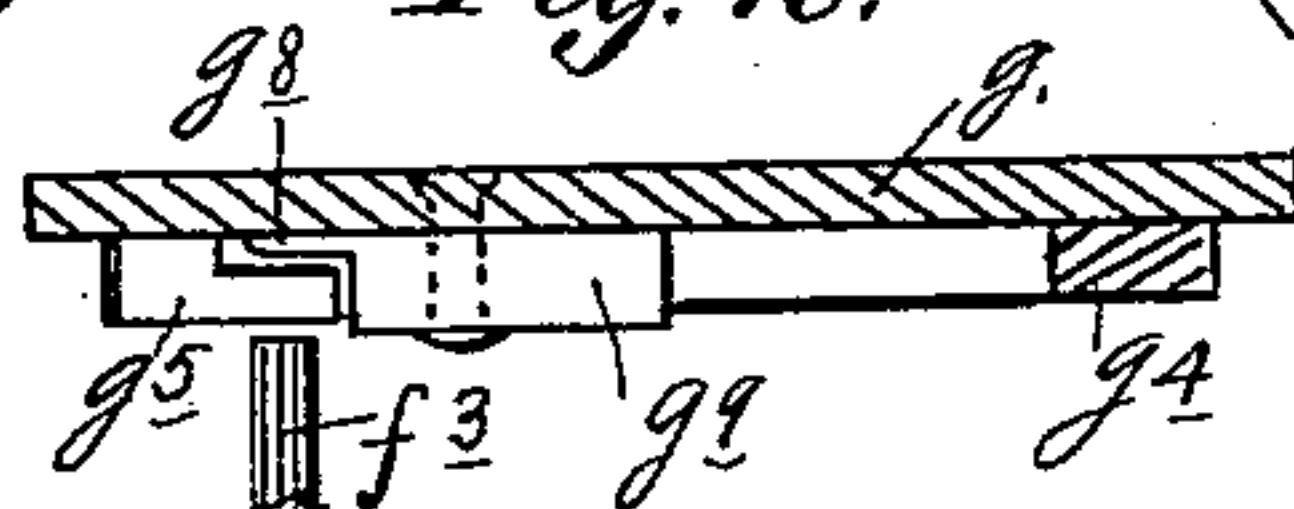


Fig. 6.

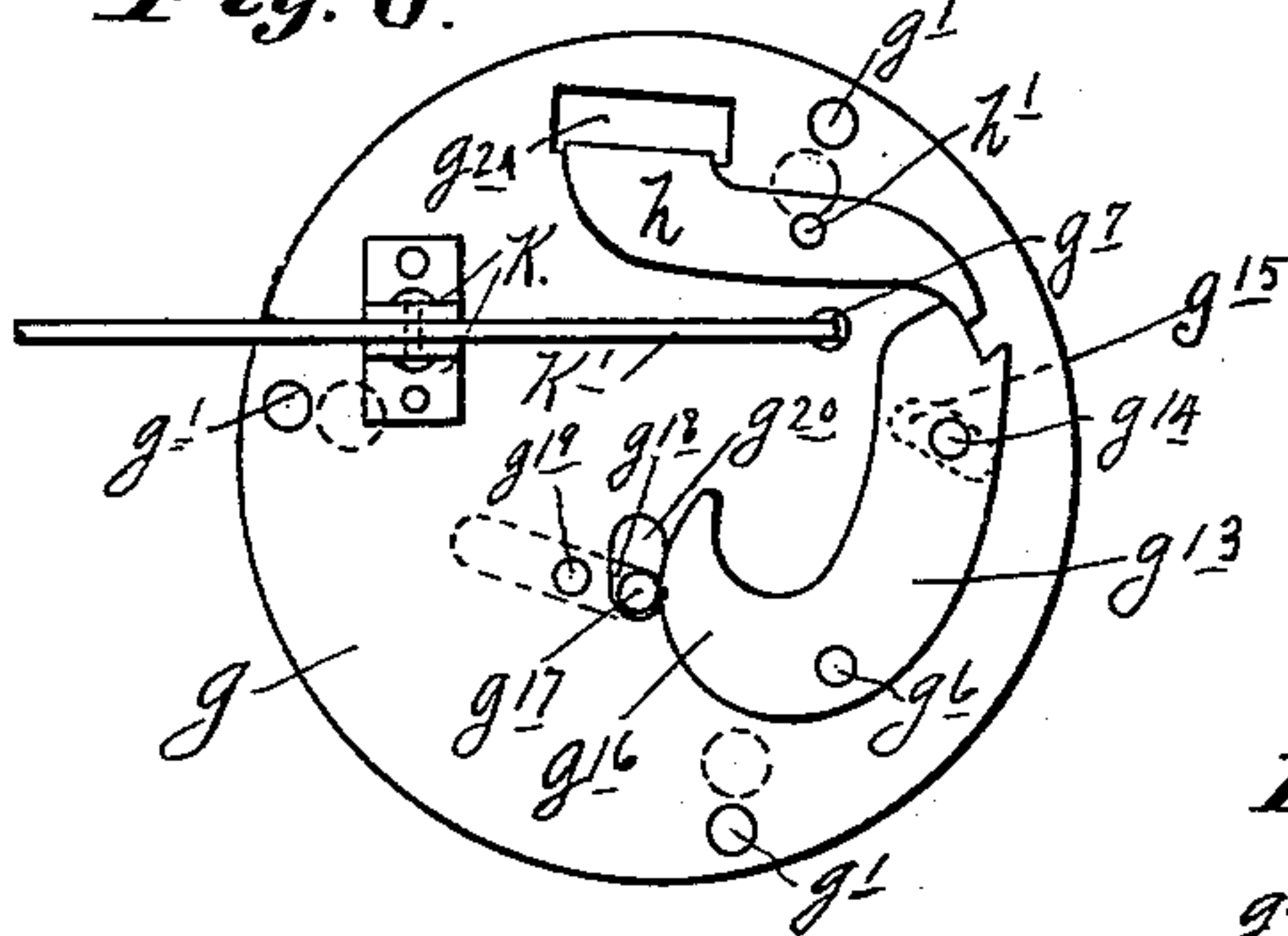


Fig. 11

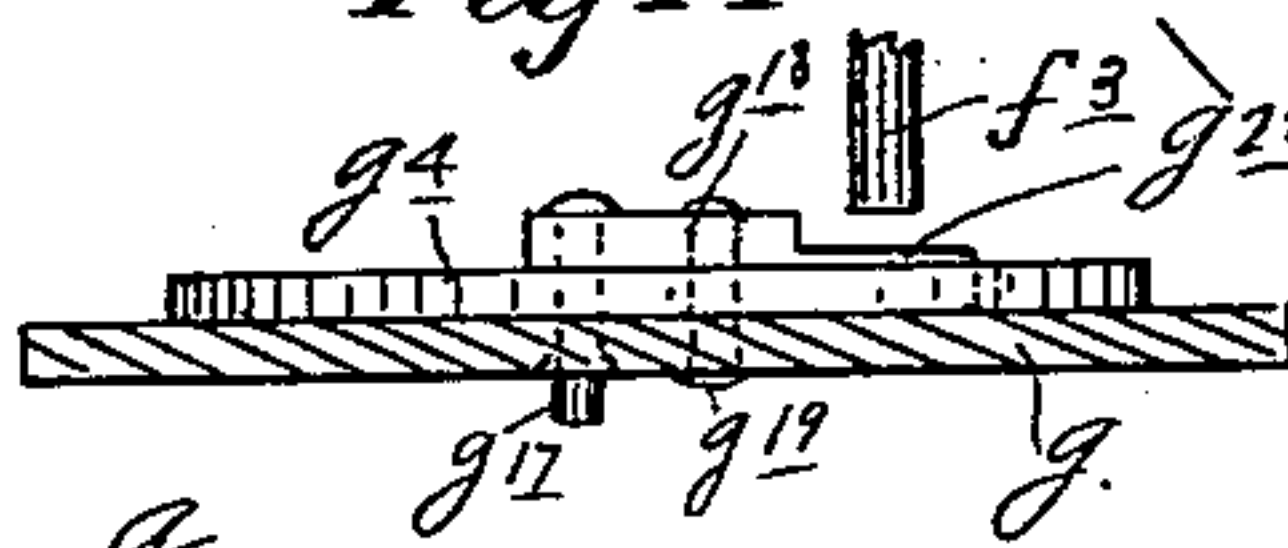


Fig. 7.

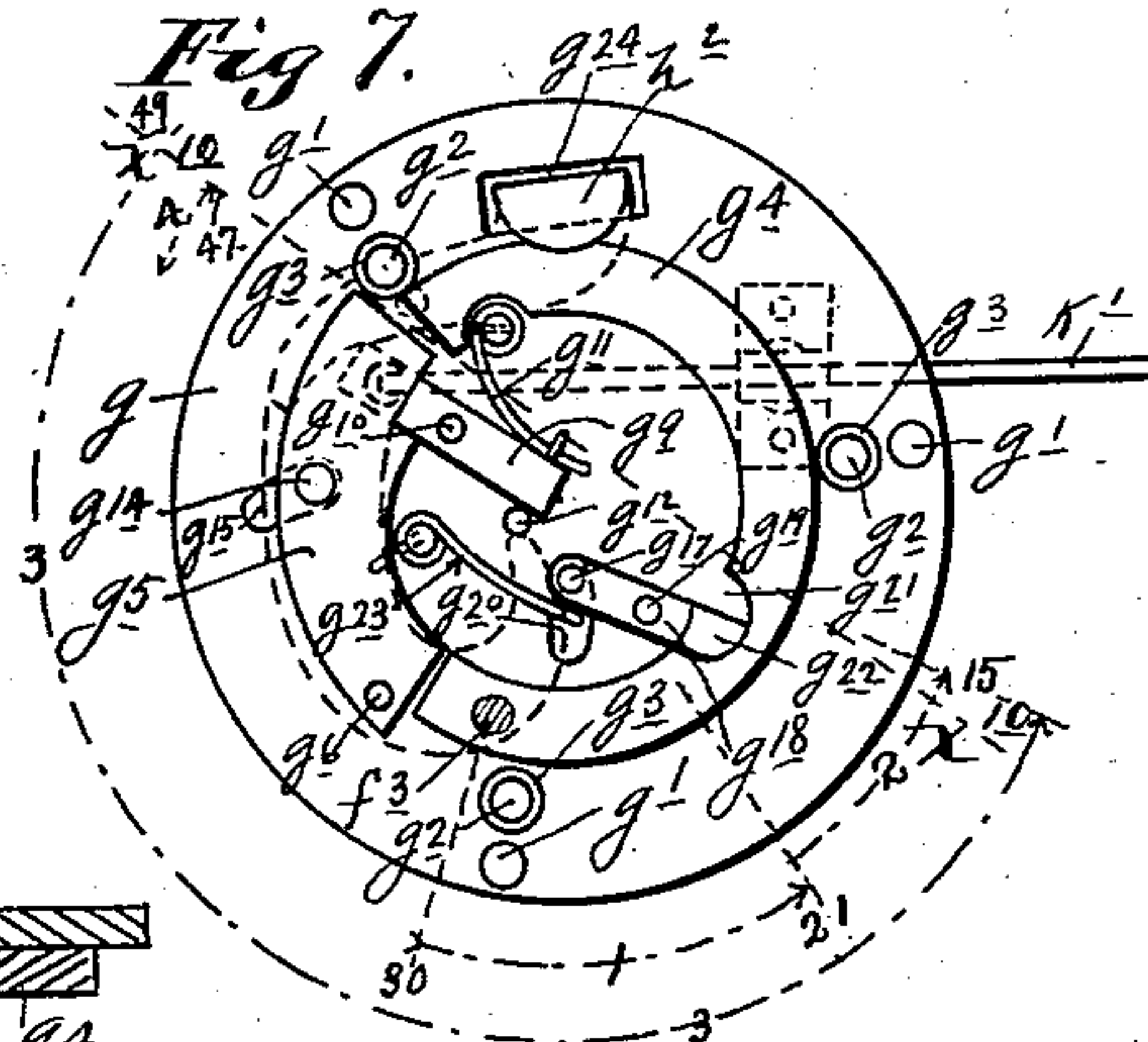


Fig. 8.

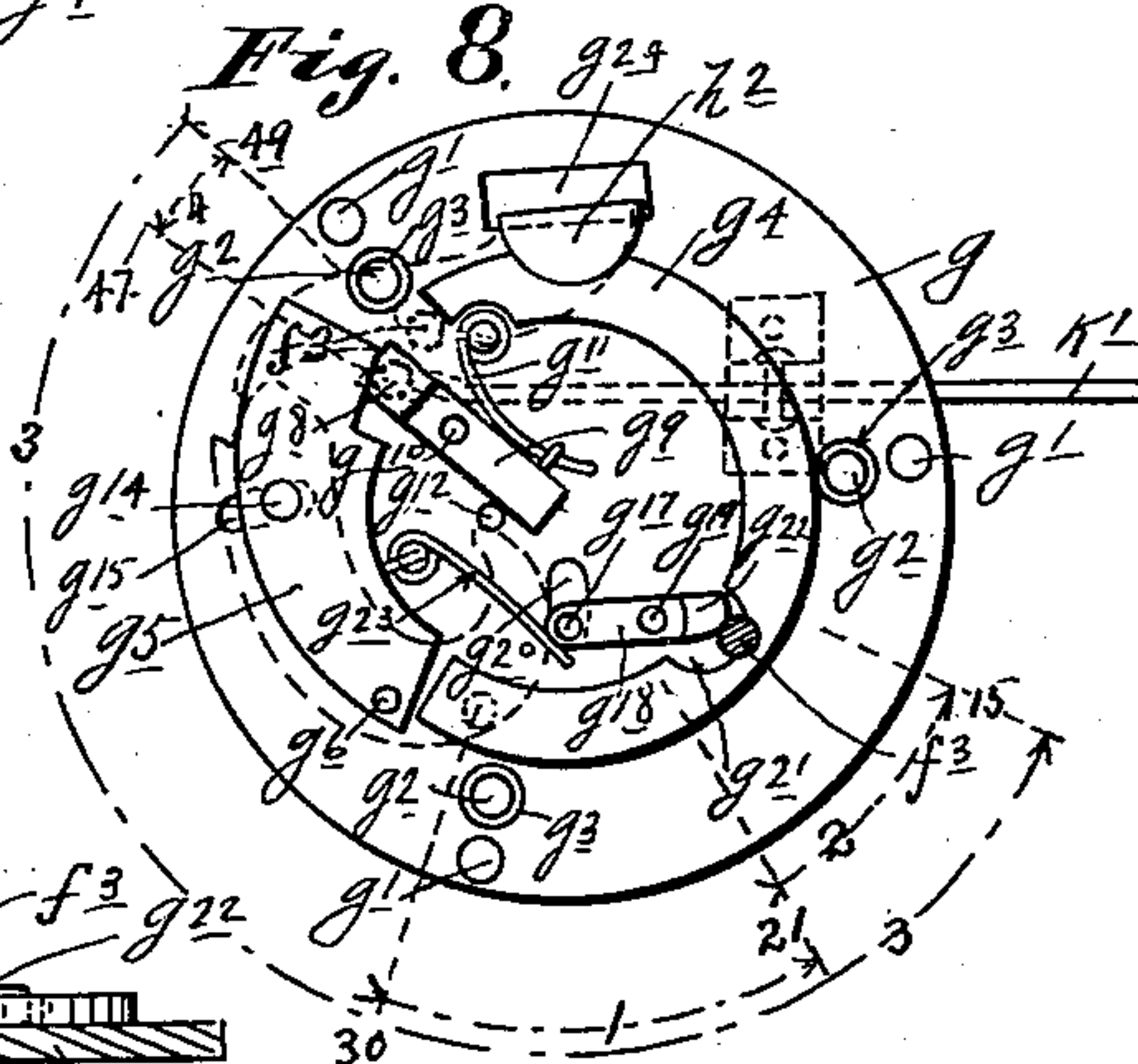


Fig. 9.

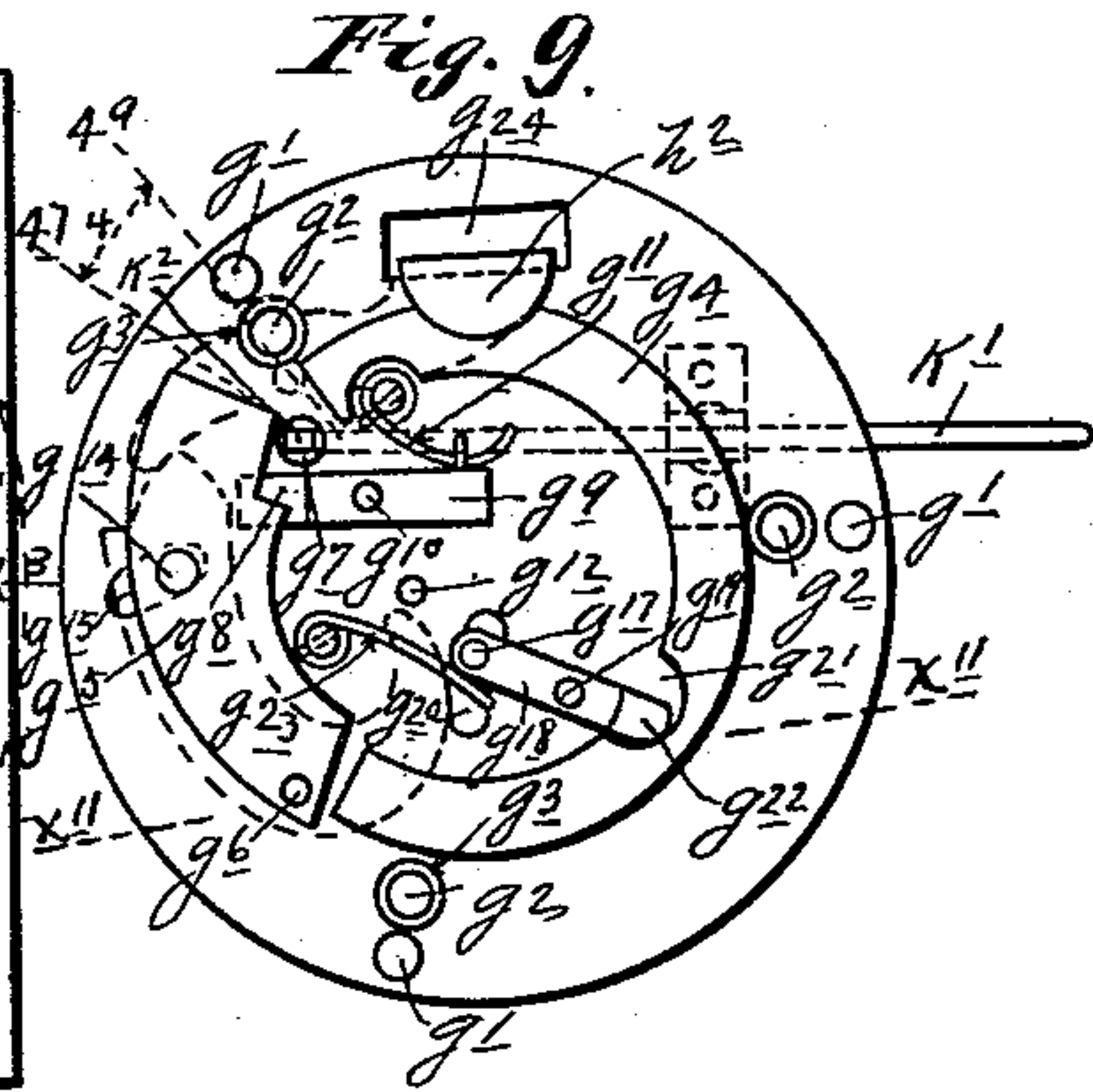
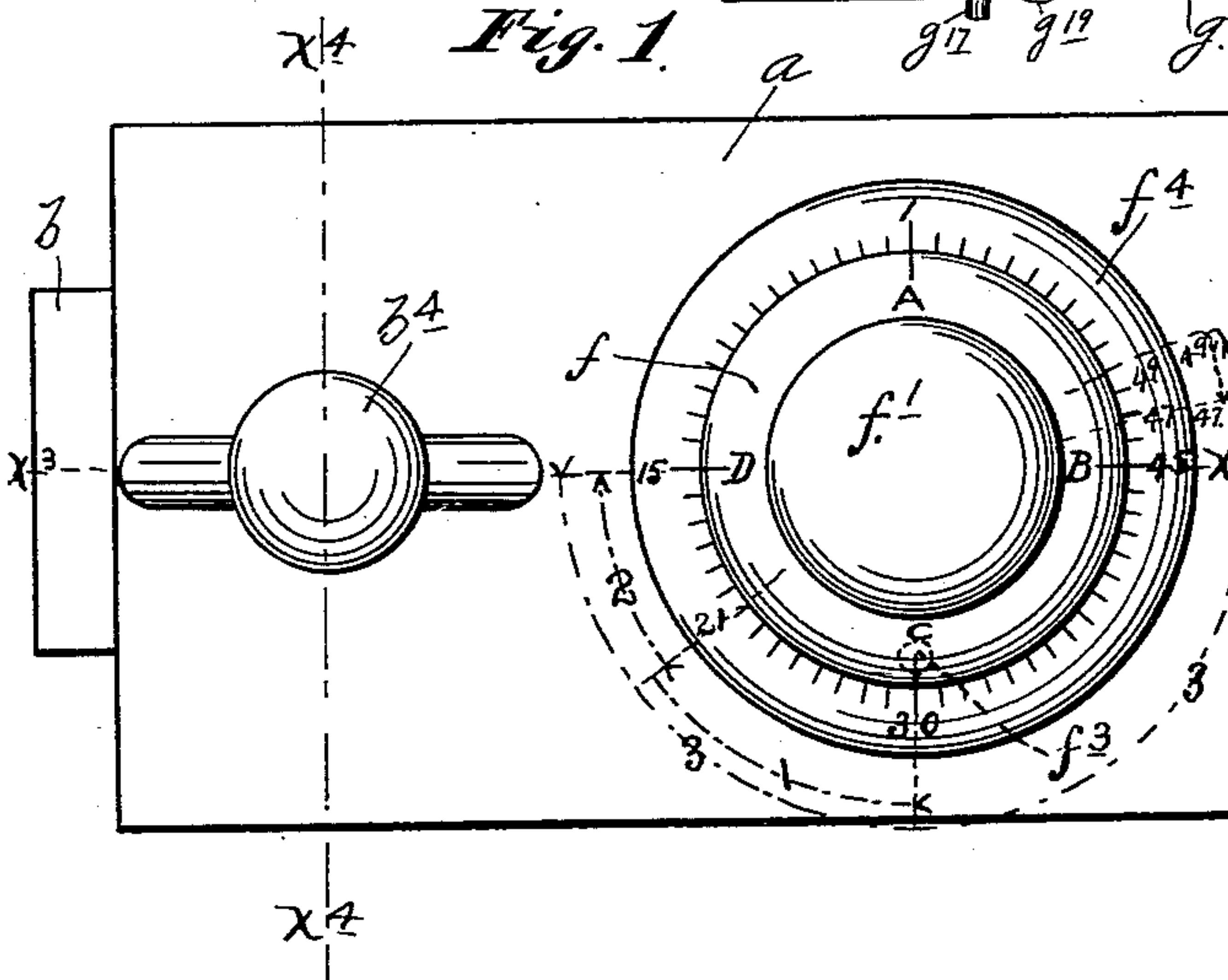


Fig. 1.



Witnesses.

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(No Model.)

2 Sheets—Sheet 2.

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Fig. 2.

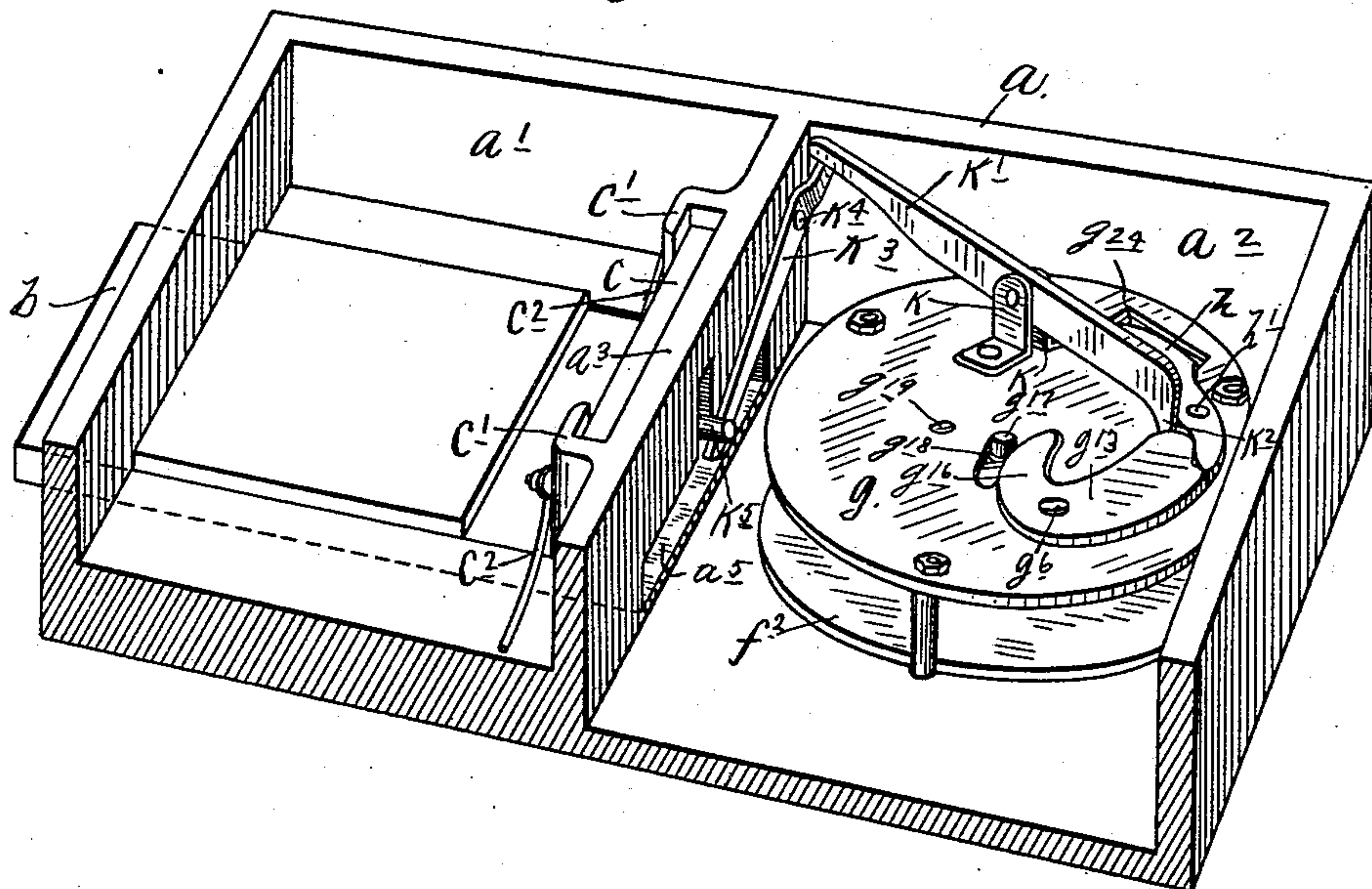
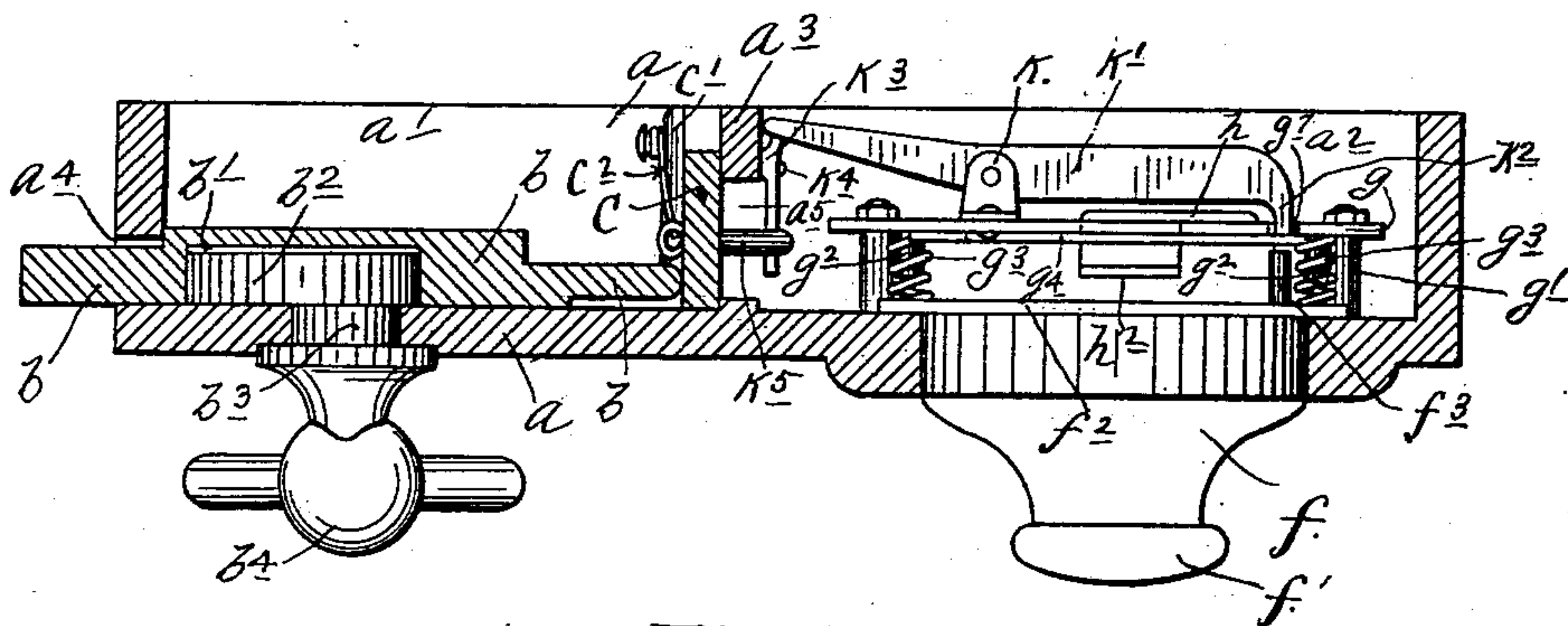


Fig. 3.



UNITED STATES PATENT OFFICE.

IVER IVERSON, OF MINNEAPOLIS, MINNESOTA.

COMBINATION-LOCK.

SPECIFICATION forming part of Letters Patent No. 563,039, dated June 30, 1896.

Application filed May 4, 1896. Serial No. 590,106. (No model.)

To all whom it may concern:

Be it known that I, IVER IVERSON, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Combination-Locks; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention has for its object to provide an improvement in combination-locks.

To this end my invention comprises the novel devices and combinations of devices hereinafter described, and defined in the claims.

The preferred form of my invention is illustrated in the accompanying drawings, wherein, like letters referring to like parts throughout the several views—

Figure 1 shows my improved combination-lock in front elevation. Fig. 2 is a view in perspective, some parts being shown in section and others removed, looking into the interior of the lock-case. Fig. 3 is a horizontal section taken substantially on the line $X^3 X^3$ of Fig. 1. Fig. 4 is a vertical transverse section taken substantially on the line $X^4 X^4$ of Fig. 1. Figs. 5 and 6 are views in rear elevation, showing portions of the internal mechanism of the lock removed from the case, but illustrating different positions of said parts. Figs. 7, 8, and 9 are views in front elevation, showing the parts indicated in Figs. 5 and 6, but showing the parts thereof in different positions. Fig. 10 is a view in diagram, illustrating the relative dimensions of certain parts found in the vicinity of the line $X^{10} X^{10}$ of Fig. 7; and Fig. 11 is a view in diagram, indicating the relative dimensions of certain parts found in the vicinity of the line $X^{11} X^{11}$ of Fig. 9.

a indicates the lock-case, which, as shown, is divided into two compartments a' and a^2 by means of a central partition a^3 . The face of the compartment a' is provided with a lock-bolt seat a^4 , in which reciprocates a lock-bolt b . The lock-bolt b is provided with a vertically-elongated seat b' , in which works an eccentric b^2 , fixed on the inner end of a short trunnion b^3 , journaled in the face-wall of the

lock-case, and provided, at its outer end, with a hand-operated knob b^4 . By means of the eccentric b^2 and the knob b^4 , the locking-bolt b may, when free to move, be reciprocated into and out of its locking position.

The dividing-partition a^3 of the lock-case is cut away, as shown at a^5 , to permit the inner end of the locking-bolt b to pass, so that said bolt may be moved into its inner or unlocking position.

The inner movement of the locking-bolt b may be prevented, and the same held in its locking position, by means of a reciprocating stop-plate c , which is mounted for movement in keepers c' , formed on the partition a^3 . The stop-plate c is under strain from springs c^2 to move toward the outer face of the case, and when said locking-bolt b is in its inner or unlocking position is spring-held against the inner or tail end of said bolt. When the locking-bolt b is moved outward into its locking position, the stop-plate c will be thrown in behind the same by the action of the springs c^2 , thereby holding said bolt b from return movement.

The stop-plate c is moved from behind the locking-bolt b by means of lock-controlling mechanism, which will now be described.

In a suitable seat formed in the face-wall of the case-compartment a^2 is mounted, with freedom for both rotary and lateral movement, a loose operating-tumbler f , provided, on its exterior, with a knob f' , and on its interior with an enlarged disk f^2 , from the face of which a trip finger or projection f^3 extends inward. The outer margin of the tumbler f is provided with one or more (as shown, four) index-marks, which may be indicated by characters, such as "A," "B," "C," and "D," for example. These index-marks "A B C D" coöperate with graduations marked on a fixed indicator-ring f^4 , which is rigidly secured to the lock-case a , immediately surrounding said tumbler f . As shown, the graduations of the indicator-ring f^4 run from "1" to "60."

Located parallel to the tumbler-disk f^2 , just inward of the end of the trip-finger f^3 , is a supporting plate or disk g , rigidly secured to the front wall of the case-compartment a^2 , by means of studs or pins g' . The plate g is provided with short pins g^2 , which

project toward the tumbler-disk f^2 , but terminate a considerable distance short of the same. On these pins g^2 are coiled springs g^3 , which are compressed between the support g and the tumbler-disk f^2 , and serve to normally hold the tumbler f and disk f^2 in their outermost positions, and also serve to hold the same under a light friction against rotary motion.

The supporting-plate g is provided, on its forward side, with a circular track, made up of a fixed section g^4 and a movable section g^5 , pivoted on a pivot-pin g^6 . This annular track $g^4 g^5$ extends on a line adjacent to the line of travel of the trip-finger f^3 , carried by the tumbler f .

The supporting-plate g is provided, at a point immediately under the free end of the pivoted section g^5 when in its normal position, and at a point which is adapted to register with the trip-finger f^3 when properly turned, with a trip-finger passage g^7 . The pivoted section g^5 , in its normal position, closes this finger-passage g^7 and serves as a shield to prevent the trip-finger f^3 from being forced through said finger-passage, as will later more fully appear. When, however, the shield-section g^5 is moved outward, the free end of the same will be removed from over the finger-passage g^7 , as shown best in Fig. 9. Normally the finger-passage g^7 is also closed or shielded by the thin or reduced end g^8 of a short lever g^9 , pivoted to the plate g at g^{10} . The reduced end g^8 of the lever g^9 works under or between the free end of the shield-section g^5 and the face of the plate g , while the opposite end of the lever g^9 is subject to the action of a spring g^{11} , which tends to hold the same against a stop-pin g^{12} on said plate g .

The shield-section g^5 is secured for a common pivotal motion with a lever g^{13} , which works on the rear face of the supporting-plate g , is pivoted also on the pivot-pin g^6 , and is connected near its free end, by a stud or rivet g^{14} , with the free end of the shield-section g^5 . This stud or rivet g^{14} works in a slot g^{15} , formed in the plate g , on the arc of a circle having for its center the center of the pivot-pin g^6 . The lever g^{13} is provided with a cam end or tail portion g^{16} , which is subject to the action of the projecting pin g^{17} of a short lever g^{18} , pivoted to the plate g by a pivot-pin g^{19} . The pin g^{17} works through a slot g^{20} , formed in the plate g , and the opposite end of said lever g^{18} is reduced and works in a notched or cut-away portion g^{21} of the fixed track-section g^4 . The reduced portion g^{22} of the lever g^{18} , it will be noted by reference particularly to Fig. 11, is somewhat thicker than the track-section g^4 , and stands a little outward from the same. The purpose of this construction will more fully appear in the description of the operation. The lever g^{18} is yieldingly held in the position shown in Figs. 7 and 9 by means of a flat spring g^{23} .

In addition to the connections just described, I provide a restoring-lever h , which is pivoted to the rear face of the supporting-plate g by a pivot-pin h' . One end of this lever h works against the outer edge of the free end of the lever g^{13} , and the other end of the same works through a slot g^{24} in the plate g , and terminates in a cam-shaped lip h^2 , which lies normally in the path of the trip-finger f^3 .

Between a pair of brackets k , secured to the rear face of the supporting-plate g , is pivoted a releasing-lever k' , one end of which terminates in the laterally-projecting point k^2 , which stands in line with and partially inserted into the trip-finger passage g^7 . The free end of the lever k' bears against the short end of another lever k^3 , pivoted at k^4 to the dividing-partition a^3 of the lock-case a . The long or free end of the lever k^3 , in turn, works against a pin k^5 , carried by the stop-plate c .

Before proceeding to the description of the operation, attention is called to the fact that in Fig. 1 the different movements which the operating-tumbler f and parts carried thereby must necessarily be given in order to unlock the lock are indicated, in diagram, by radial lines and arc-shaped arrows; also, that only the particular graduations which are necessary to illustrate the combination for which the lock is set are numbered on the indicator-ring f^4 , and also that in Figs. 7, 8, and 9 the movements which the operating-tumbler f and parts carried thereby are given are indicated by diagram-lines corresponding to those used in connection with Fig. 1. Attention is also called to the fact that, in the particular construction shown, the trip-finger f^3 stands at a point on the tumbler-disk f^2 in radial line with the index-marking "C" of the tumbler f . Hence, in working out the following combination, we may use the index-marking "C."

The combination of movements which is necessary to be performed in order to unlock the lock, and which must, of course, be known to the operator in order to enable him to perform the same, will appear from the following description of the operation.

In their locking positions the parts of the lock will normally stand in the position shown in Figs. 1, 2, 3, 5, and 7. Let it be assumed that the operating-tumbler stands in any position, (as shown, the mark "C" stands opposite "30.") From this initial position, whatever it may be, first turn the mark "C" opposite to the indicator-marking "21." Second, press in on the tumbler f , so as to force the end of the trip-finger f^3 against the fixed track-section g^4 , and then turn the mark "C" from "21" backward to "15." By reference to Fig. 8 it will be noted that the finger f^3 , in passing from "21" back to "15," engaged the reduced portion g^{22} of the lever g^{18} , and thereby caused the pin g^{17} , by its cam engagement with the cam g^{16} of the lever g^{13} , to throw the

free end of the pivoted shield-section g^5 outward and from over the trip-finger passage g^7 . (See also Fig. 6.) At this time it will be noted, by reference again to Fig. 8, that the trip-finger passage f^3 is closed only by the reduced portion g^8 of the lever g^9 . Third, let the tumbler f move outward to its limit, and then turn the same forward in the direction of the increasing numbers to "49." At "49" the trip-finger f^3 will stand in such position that it may be forced against the plate g , between the end of the fixed track-section g^4 and the reduced end g^8 of the lever g^9 . Fourth, press inward on the tumbler f and force the trip-finger f^3 against the plate g , as just described, and then turn the tumbler-mark "C" from "49" backward to "47." At "47" the trip-finger f^3 will register with the finger-passage g^7 , and it will be noted, by reference to Fig. 9, that in the movement of the tumbler from "49" to "47" the reduced end g^8 of the lever g^9 was moved off from the finger-passage g^7 by the engagement of the trip-finger f^3 therewith. Fifth, press the tumbler f inward to its limit against the springs g^3 , and thereby force the trip-finger f^3 through the finger-passage g^7 into engagement with the point k^2 of the lever k' . This inward movement of the tumbler and finger f^3 will move the lever k' , which in turn, through the intermediate lever k^3 operating on the pin k^4 of the stop-plate c , will cause said stop-plate c to move inward out of the path of the inner end of the locking-bolt b , and will thereby permit said locking-bolt b to be moved into its unlocking position.

It will thus be seen that even after the combination has been worked out the operating-tumbler f must be held in its extreme innermost position until the locking-bolt b has been drawn inward into its unlocking position, for otherwise the stop-plate c would return behind the bolt b and the combination would be scattered. It will also be noted that upon the withdrawal of the trip-finger f^3 from the passage g^7 the lever g^9 , under the action of the spring g^{11} , will immediately assume its normal position, with its reduced end g^8 over said passage g^7 .

To return the guard-section g^5 to its normal position with its free end over the passage g^7 , it is only necessary to give the tumbler f one complete turn, so as to cause the trip-finger f^3 to engage the cam-lip h^2 of the lever h . The movement of the lever h , caused by the engagement of the finger f^3 with its lip h^2 , will force the free end of the lever g^{13} inward to its normal position, and this movement of the lever g^{13} must, of course, carry the section g^5 also into its normal position. It is also very important to here note that the action just described, which causes the return of the shield-section g^5 to its normal position, would take place after the combination has been partly worked if by an improper move the trip-finger f^3 should be thrown in contact with the cam-lip h^2 . This restoring

device therefore adds materially to the efficiency of the lock.

It will be understood, of course, that various alterations in the above details of construction may be made without departing from the spirit of my invention.

What I claim, and desire to secure by Letters Patent of the United States, is as follows:

1. In a combination-lock, the combination with the locking-bolt, of lock-controlling mechanism involving, bolt-releasing connections, a tumbler mounted for both rotary and lateral movements, a trip finger or projection carried by said tumbler and operative on said releasing connections, and a shield device, normally interposed between said bolt-releasing connections and said trip-finger, adapted to be temporarily displaced by the combined pivotal and lateral movements of said tumbler and trip-finger, substantially as described.

2. In a combination-lock, the combination with a locking-bolt, of lock-controlling mechanism involving, bolt-releasing connections, a tumbler mounted for both rotary and lateral movements, a trip finger or projection carried by said tumbler and operative on said releasing connections, a shield device normally interposed between said bolt-releasing connections and said trip-finger, connections to said shield device operative by the proper manipulation of said tumbler and trip-pin, to temporarily displace said shield device, and a restoring device operative by a movement not forming a step of the combination, to restore said shield device to its normal position, substantially as described.

3. In a lock, the combination with a sliding locking-bolt, of a stop-plate movable into and out of the path of said bolt, lever connections for moving said stop-plate, an operating-tumbler mounted for both rotary and lateral movements, a trip-finger carried by said tumbler and operative on the lever connections to said stop-plate, by lateral movement of said tumbler, a shield device normally interposed between said trip-finger and said lever connections, adapted to be temporarily displaced by the combined rotary and lateral movements of said tumbler, substantially as described.

4. In a lock, the combination with the sliding locking-bolt b , of the reciprocating stop-plate c with lever connections involving the lever k' with end k^2 , the supporting-plate g , the spring-held lever g^{22} g^{18} , the trip-finger passage g^7 in said plate g , the spring-held lever g^8 g^9 pivoted to said plate g with its reduced end g^8 normally closing said passage g^7 , the shield-section g^5 pivoted to said plate g with its free end normally over said passage g^7 , the lever g^{13} pivoted for common movement with said shield-section g^5 , the tumbler f f^2 mounted for both rotary and lateral movements and subject to the action of the springs g^3 , and the trip-finger f^3 carried by said tum-

bler $f f^2$ operative on said levers $g^{18} g^{22}$, $g^8 g^9$ and $k' k^2$, by the proper manipulation substantially as described.

5 In a lock, the combination with the sliding bolt b , of the reciprocating stop-plate c with lever connections involving the lever k' with end k^2 , the supporting-plate g , the spring-held lever $g^{18} g^{22}$, the trip-finger passage g^7 in said plate g , the spring-held lever $g^8 g^9$ pivoted
10 to said plate g with its reduced end g^8 normally closing said passage g^7 , the shield-section g^5 pivoted to said plate g with its free end normally over said passage g^7 , the lever g^{13} pivoted for common movement with said
15 shield-section g^5 , the tumbler $f f^2$ mounted for

both rotary and lateral movements and subject to the action of the springs g^3 , the trip-finger f^3 carried by said tumbler $f f^2$ operative on said levers $g^{18} g^{22}$, $g^8 g^9$ and $k' k^2$, by the proper manipulation, and the restoring-lever h with the cam-lip h^2 subject to the action of the trip-finger f^3 , and operative on said lever g^{13} , substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

IVER IVERSON.

Witnesses:

JAS. F. WILLIAMSON,
F. D. MERCHANT.