J. STORR, JR.

COMBINATION LOCK.

APPLICATION FILED MAY 25, 1911.

1,084,764.

Patented Jan. 20, 1914.

3 SHEETS—SHEET 1.

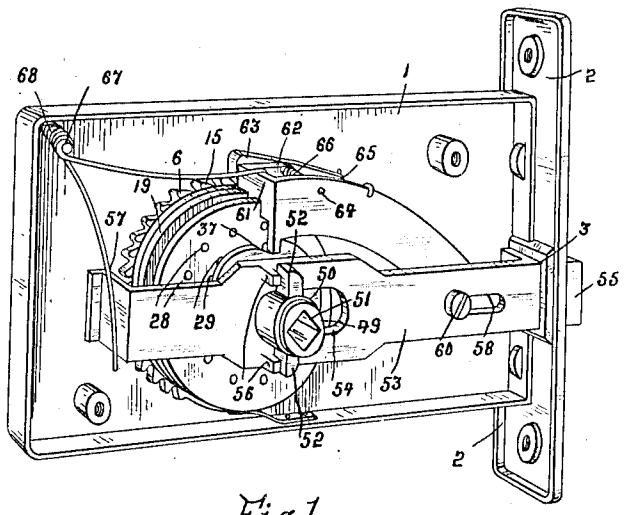


Fig. 1.

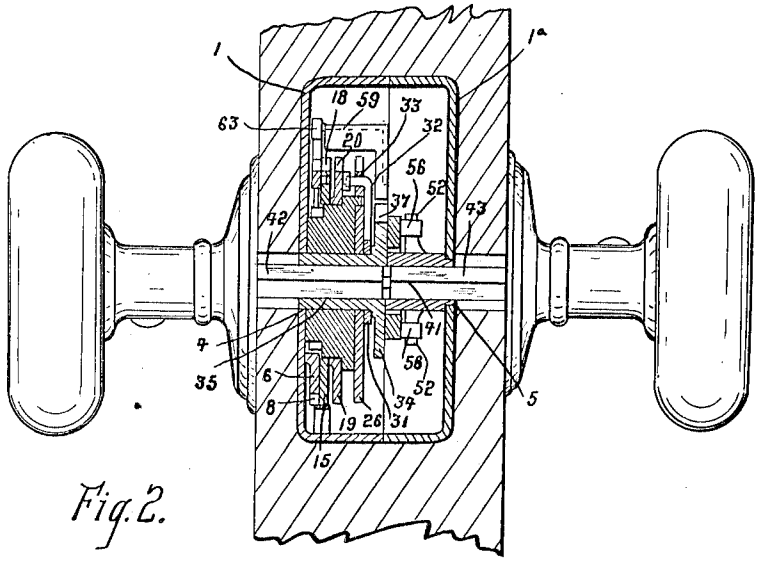


Fig. 2.

Witnesses.

Thomas A. Balmer.

Charlie Eckstein.

Inventor.

John Storr, Jr.

by Lloyd Blackmore Atty

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

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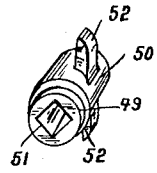


Fig. 13.

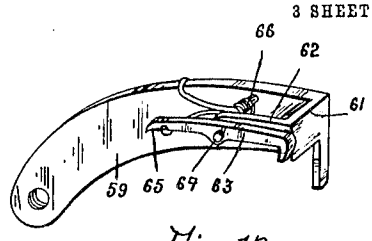


Fig. 12.

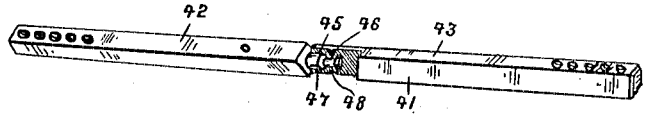


Fig. 15.

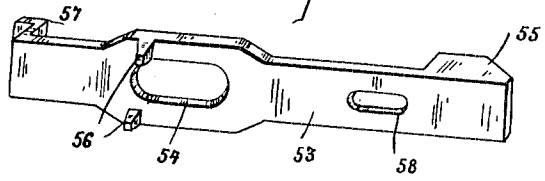


Fig. 14.

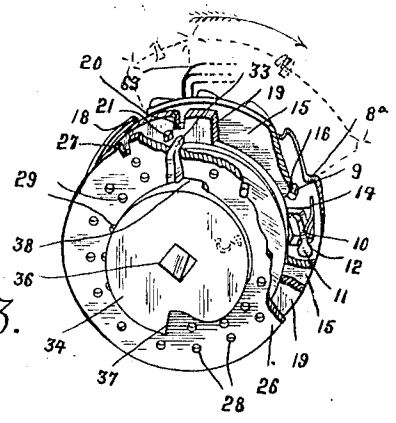


Fig. 3.

Witnesses.

Thomas A. Balmer

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3 SHEETS—SHEET 3.

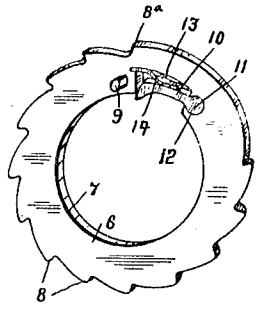


Fig. 4.

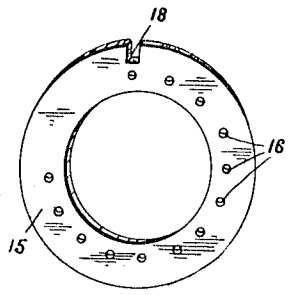


Fig. 5.

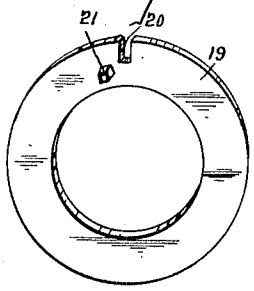


Fig. 6.

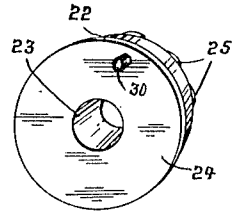


Fig. 7.

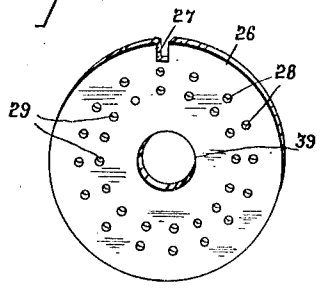


Fig. 8.

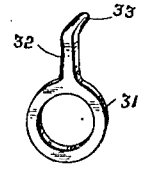


Fig. 9.

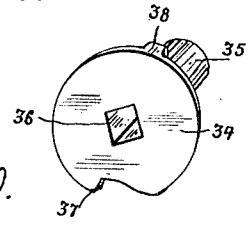


Fig. 10.

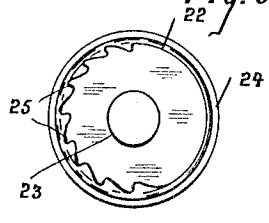


Fig. 11.

Witnesses.

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UNITED STATES PATENT OFFICE.

JOHN STORR, JR., OF OTTAWA, ONTARIO, CANADA.

COMBINATION-LOCK.

1,084,764. Specification of Letters Patent. Patented Jan. 20, 1914.

Application filed May 25, 1911. Serial No. 629,482.

To all whom it may concern:

Be it known that I, JOHN STORR, Jr., of 404 Bank street, city of Ottawa, Ontario, Canada, a subject of the King of Great Britain, have invented certain new and useful Improvements in Combination-Locks, of which the following is a specification.

The invention relates to improvements in combination locks, as described in the present specification, and illustrated in the accompanying drawings, that form part of the same.

The invention consists essentially of the novel arrangement and construction of parts, whereby a disk rotatable in one direction has a second disk mounted on the face thereof, and rotatable in relation to the first disk in the opposite direction only, and a cam disk rotatably mounted on the face of said second disk, and limited in rotation with respect to said second disk, and turning with a handle bar, said disks having registering parts which coact with a dog operatively connected to a bolt bar.

The objects of the invention are to devise a combination lock of few parts and simple construction, which may be readily set to operate any desired combination, and will in no manner indicate the respective positions of the parts before being in complete arrangement for operation of the bolt bar.

A further object of the invention is to devise a lock of this class, which may be operated by either the sense of touch or the sense of sound, without reference to any indicating disk or plate.

In the drawings, Figure 1 is a perspective view of the lock with the face plate removed. Fig. 2 is a cross sectional view of the lock mechanism. Fig. 3 is a perspective detail view, showing the several disks and ratchet wheels partially broken away. Fig. 4 is a perspective detail view of the ratchet wheel with pawl secured thereto. Fig. 5 is a perspective detail view of the outer ring. Fig. 6 is a perspective detail view of the free ring. Fig. 7 is a perspective detail view of the ratchet barrel. Fig. 8 is a perspective detail view of the front disk. Fig. 9 is a perspective detail view of the washer bolt bar. Fig. 15 is a perspective detail view of the cam plate and sleeve. Fig. 11 is an end elevation view of the ratchet barrel, showing the ratchet teeth thereof. Fig. 12 is a perspective detail view of the dog. Fig. 13 is a perspective detail view of the roll-back. Fig. 14 is a perspective detail view of the bolt bar. Fig. 15 is a perspective detail view of the handle bar partially broken away.

In the present drawings, the mechanism is shown and described with reference to standard types of mortise locks, as used on doors, though it must be understood that the casing in which the lock mechanism is contained, as also the shape and connections of the bolt bar or the lock mechanism is unimportant, and may be altered at will either for the purposes of a latch lock, door lock, safe lock, deposit box lock, or may be operated to merely release further locking bolts or locking mechanism.

Like numerals of reference indicate corresponding parts in each figure.

Referring to the drawings, 1 is the back plate of the casing and 1^a the front half or cover portion, said back plate having the front plate 2 secured thereto, and the bolt bar orifice 3 extending through said front plate 2.

4 and 5 are journal orifices in the back and front plates 1 and 1^a respectively.

6 is a ratchet wheel, having the concentric circular opening 7 therethrough.

8 are teeth formed on the outer edge of the ratchet wheel 6. The teeth 8 are twelve in number, as shown in the accompanying drawings, and extend around three-fourths of the periphery of the wheel, leaving one-fourth clear.

9 is a pin extending laterally from the inner face of the ratchet wheel 6 immediately beneath the first tooth 8^a.

10 is a pawl, having the circular shaped end 11 fitting the correspondingly shaped recess 12 formed at one end of the recess 13 formed on the inner periphery of the ratchet wheel 6.

14 is a spring suitably pressed into position in the recess 13, and contacting with the pawl 10, whereby the tooth of said pawl is spring-held projecting beyond the inner periphery of the said ratchet wheel 6.

15 is an adjustable ring substantially equal in diameter to the ratchet wheel 6, and fitting thereagainst, said ring having the orifices 16 circularly arranged there-

around, and corresponding in number and radial position to the indentations formed by the teeth 8 of said ratchet wheel 6, the pin 9 projecting through an orifice determined by the combination desired as hereinafter fully explained.

It may be here mentioned that the teeth referred to on the ratchet wheel 6 are intended to indicate and include each portion of said wheel where an indentation is made to form a shoulder or tooth of serrated shape; that is, there are thirteen indentations in all, having immediately next thereto a shoulder or, as termed in the present specification, a tooth.

18 is a radial notch in the periphery of the wheel 15.

19 is a second and free ring similar in size to the wheel 15, and having the peripheral notch 20, and the lug 21 projecting from the inner face thereof immediately beside said notch 20.

22 is a ratchet barrel, having the central journal orifice 23, and the circumferential flange 24 at the inner end thereof.

25 are teeth formed in the periphery of the ratchet barrel 22 at the inner end thereof, said teeth being shown as nine in number, and spaced radially to correspond to the teeth 8 of the ratchet wheel 6. The teeth 25 of the barrel hub face in the opposite direction to the teeth 8 formed on the outer edge of the ratchet ring 6 when the several parts of the lock are assembled as hereinafter described.

30 is a pin projecting from the inner end of the ratchet barrel 22 adjacent the edge thereof. The free ring 19 fits onto the ratchet barrel 22 against the flange 24, and the ring 15 with the ratchet wheel 6 are fitted on the ratchet barrel 22, so that the pawl 10 of the said ratchet wheel 6 engages with the teeth 25 of said ratchet barrel.

26 is a front disk, having the central journal orifice 39 therethrough, and fitting against the inner end of the ratchet barrel 22.

27 is a notch extending radially into the front disk 26, and corresponding to the notches 18 and 20 in the rings 15 and 19 respectively.

28 and 29 are orifices arranged in two circular rows around the front disk 26, and spaced radially to correspond to the teeth of the ratchet wheel 6 and the ratchet barrel 22, the said disk 26 fitting against the inner end of the hub 22 as above mentioned, whereby the pin 30 projects through one of the orifices 29 according to the combination desired as more particularly hereinafter explained.

31 is a washer, having the arm 32 extending radially therefrom, and turned inwardly at the end thereof to form the pin 33.

34 is a cam disk having the hub 35 and the squared orifice 36 centrally arranged therein, and the notch 37 on the periphery thereof, said notch being beveled on one side to form substantially a tooth.

38 is a lug projecting inwardly from the inner face of the cam disk 34.

The hub 35 of the cam disk 34 is inserted through the washer 31, disk 26 and orifice 23 of the ratchet barrel 22, as particularly shown in Fig. 2, and extends into the journal orifice 4 of the back plate 1, whereby the several parts as hereinbefore described are rotatably supported.

41 is the handle bar squared in cross section, and formed of the two sections 42 and 43, one section 42 being inserted through the hub 35 of the cam disk 34.

The inner end of the section 42 of the handle bar is reduced to form the pin 45, having the circumferential groove 46, said pin 45 fitting the corresponding orifice 47 in the inner end of the section 43 of the said handle bar; the handle bar 43 immediately over the groove 46 being pressed inwardly at 48, whereby the sections 42 and 43 of said handle bar are united together, but may rotate on their longitudinal axis the one free of the other.

49 is a roll-back formed as customary with the sleeve 50, having the squared orifice 51 therethrough, and into which the inner end of the section 43 of the handle bar fits.

52 are lugs projecting radially from diametrically opposite points on the sleeve 50 of the roll-back 49.

53 is the bolt bar, preferably formed of a flat piece of sheet metal, and having the elongated slot 54 intermediate of the length thereof.

55 is an enlarged beveled end of the bolt bar, said bar being inserted in the lock casing, so that the beveled latch end 55 projects through the opening 3 in the face plate 2, and the slot 54 fits over the inner end of the sleeve 50 of the roll-back 49.

56 are lugs projecting outwardly from the outer face of the bar 53 immediately next the lugs 52 of the roll-back 49, whereby one or other of the lugs 52, when the roll-back is rotated in either direction, will engage with one or other of the lugs 56 on the bolt bar, and withdraw the same into the lock, as customary in the construction of such locks, the inner end of the roll-back forming the support for said bolt bar. The inner end of the bolt bar 53 is angularly offset at 57, and meets the back plate 1 of the casing.

58 is a longitudinally extending slot formed in the bolt bar 53 immediately inside the latch end 55.

59 is a curved dog lever, having one end thereof pivotally secured in the slot 58 by

the screw 60 inserted through said slot and into a correspondingly threaded orifice in the end of the dog lever 59. The upper and free end of the dog lever 59 is turned inwardly at 61, the under side of said inwardly turned end being cut away in step form, the under step resting upon the top or peripheral edge of the cam disk 34, the second step resting upon the peripheral edge of the front disk 26 and rings 15 and 19.

62 is an extension from the inwardly turned end 61 paralleling the lever 59.

63 is a pawl having the pin 64 extending laterally therefrom, and through corresponding orifices in the piece 62 and the dog lever 59, whereby the toothed end of said pawl 63 is supported immediately alongside the upper step of the end 61, said pawl engaging with the teeth 8 of the ratchet wheel 6. The pawl 63 has the tail-piece 65 extending rearwardly therefrom, and 66 is a spiral spring encircling the pin 64 of said dog, and having one end thereof caught over the edge of the dog lever 59, and the other end caught under the tail-piece 65, whereby an upward spring pressure is maintained on the tail-piece 65 of the dog, holding the toothed end thereof into contact with the teeth 8.

67 is a stud pin projecting outwardly from the back plate 1.

68 is a spiral spring encircling the stud pin 67, and having the ends thereof elongated, one end extending and bearing upon the inwardly turned end 61 of the dog lever 59, and the other end of said spring extending over and bearing against the inwardly offset end 57 of the bolt bar 53. By this means the bolt bar is spring-held to its outer position with the beveled latch end 55 extending beyond the face plate of the lock, and the same spring presses the dog lever 59 against the peripheries of the several disks as hereinbefore mentioned.

It will of course be understood that the bolt-bar spring held to its outer position as above explained is always in position to recede into the lock when closing against a door jamb, the dog lever 59 remaining stationary due to the arrangement of the screw 60 in the slot 58, but when the several parts of the lock as described hereinbefore which are connected to the handle are brought into operative position to draw on the dog lever, the bolt-bar is always moved therewith, said dog lever being spring held and consequently normally returning to the position shown in Fig. 1 independent of the bolt-bar, the only operative connection of the dog lever being to draw the bolt-bar into the lock as hereinafter fully explained.

In the operation of the lock, it will be understood that the handle secured to the section 43 of the handle bar is placed on the inside of the door, where it may be turned at will to rotate the roll-back 49, and always withdraw the bolt bar into the lock casing to open the door as common in locks of this type, and it may be here mentioned that this inner handle in the case of a lock for a safety deposit box or the like, may be eliminated, and the lock operated on the outside only through the handle attachment to the section 42 of the handle bar, and by means of the combination as hereinafter described.

The combination to be used in opening the lock is determined by the position of the ring 15 on the ratchet wheel 6 and the disk 26 on the ratchet barrel 22 respectively, and in addition thereto the position of the pin 33 of the washer 31 governs the movements of the free ring 19. It is well, however, to consider the free ring 19 in following out the operation and arrangement of the combination, as being entirely subsidiary to the operation of the ratchet wheel 6, that is to say, the ratchet wheel 6 is the member which marks or denotes the first and last counts of the combination when the knob is being turned clockwise to the right, and the ratchet wheel 6 must be first turned to the right the first count, after which it is returned to the left to make the second count on the teeth of the barrel ratchet, and finally again turned to the right to make the last count. In this manner the actual progress of the member turning the free ring is equal only to the total number of teeth of the first and last counts of the combination, minus the number of teeth of the second count. In this manner the free ring, which is of a very simple construction, makes it necessary for three distinct counts to be used in opening the combination, namely the first and last on the ratchet wheel 6 and the middle count on the teeth 25 of the barrel ratchet.

In the drawings, and in particular Fig. 3, the arrangement of the several parts is shown with the combination set at 431. To accomplish this the ring 15 is set with the notch thereof opposite the fifth tooth of the ratchet wheel 6, which makes the total of both the first count of 4 and the last count of one in the combination. The free ring 19 is then placed over the ring 15, and the ratchet barrel 22 inserted through the openings in said rings. The ratchet barrel 22 is now turned until the pawl 10 of the ratchet wheel 6 passes over the third tooth 25 of the ratchet barrel, indicating the second count of the combination. The front disk is now placed on the face of the ratchet barrel 22, so that the notch of said front disk registers with the notch in the ring 15, that is, is in longitudinal alinement with said notch. The free ring may then be turned until the notch is in longitudinal

alinement with the fourth tooth of the ratchet 6 and the washer 31 placed against the front disk with the pin 33 extending through the orifice in the said front disk, which comes directly in alinement with the notch of the free ring, as also in alinement with the fourth tooth of the ratchet wheel 6, which, as above mentioned, is the first count. The cam disk 34 is then placed in position with the hub thereof extending through the orifice 23 of the ratchet barrel, and the lug 38 projecting on one side of the arm 32 of the washer 31.

In opening the lock, it will of course be understood, as shown and described with reference to Fig. 2, that the square handle bar connected to the outside handle of the door extends through the square orifice 36 of the cam disk 34, whereby in turning the handle in either direction the cam disk will be rotated until the lug 38 contacts with the arm 32 of the washer 31 on one side or the other. Furthermore, it must be understood that when the handle is turned to rotate the cam disk in the direction of the arrow indicated in Fig. 3, the lug 38 of the cam disk will contact with the arm 32 on the side opposite to that shown in the drawing, and rotate the front disk with the ratchet barrel, until the pawl 10 engages with one of the teeth 25 of said ratchet barrel, and immediately upon this occurring the ratchet wheel 6 is rotated with the ratchet barrel in the direction of the arrow, and also the free ring, providing the lug 21 comes into contact with the pin 33 of the arm 32. When the handle is turned in the opposite direction, the ratchet wheel 6 will be held by the pawl 63 engaging with one of the teeth 8, and the ratchet barrel 22 must then turn inside the ratchet wheel 6, the teeth 25 of the ratchet barrel 22 readily passing in this direction under the pawl 10. The ratchet barrel when turned in a reverse direction to the arrow, of course, carries the front disk with it, and as above mentioned the pin 33 may engage with the lug 21 of the free ring, and carry it with the ratchet barrel.

In Fig. 3, the parts are shown in the position assumed at the end of the second operation in opening a lock, the dog lever 59 being shown in dotted lines engaging the fourth tooth of the ratchet wheel 6.

In describing the operation of the several parts to open the lock, it must be understood that the several disks are likely to have been turned to any chance position by the person turning the handle to upset the combination, and leave the parts in locked position.

The first step in opening the lock is to turn the handle to rotate the cam disk 34 in the direction of the arrow, whereby the ratchet wheel 6, which will be carried therewith as above explained, is turned until the first four teeth have passed under the pawl 63. This position is readily known by counting the first four clicks of the pawl 63 after it has passed over the plain circumferential portion of the ratchet wheel 6. After the ratchet wheel 6 has been turned to the fourth tooth the handle is turned in the reverse direction of the arrow, turning with it the cam disk 34 which engages the arm 32, thereby turning the front disk ratchet barrel and free ring until the third tooth of the ratchet barrel is heard to pass the pawl 10, which is the second count of the combination, and brings the several parts to the position shown in Fig. 3. In the third step, the handle is turned again in the direction of the arrow, until one additional tooth of the ratchet wheel 6 passes under the pawl 63, completing the last count of the combination, and bringing the notches of the ring 15 and front disk 26 into registration with the notch in the free ring, and at the same time under the stepped end of the dog lever. The combination is now arranged for the lock to be opened, and the handle is turned in the reverse direction to the arrow until the notch 37 of the cam disk comes under the stepped end of the dog lever, which allows the dog lever to drop into the registering notches of the rings 15 and 19 in the front disk 26, and co-incidently the notch 37 of the cam disk, which notch will catch the stepped end of the dog lever and move the same to draw the bolt bar of the lock, in which position the several parts are shown in Fig. 1.

In again placing the parts in locked position, the handle is turned in the direction of the arrow, the cam disk 34 will raise the dog lever clear of the notches, and eventually turn the ratchet wheel 6 until the notch of the ring 15 is moved out of register, which of course is quite sufficient to upset the entire combination, and require the several steps of operation as above described to again open the lock.

The lock as hereinbefore described, is very simple to manufacture, being for the most part made of stamped pieces, and very readily assembled, and during the operation of opening the lock, there is no indication of the registration of the several notches of the disk until they are all in proper registering position for the stepped end of the dog lever to drop thereinto. For this reason it is practically an endless task for a person who does not know the combination, to work the lock open.

What I claim as my invention is:

1. In a device of the class described, the combination with a casing and a bolt bar slidably arranged therein, of a ratchet wheel, a pawl pivotally supported within said cas-

ing engaging with said ratchet wheel, a ratchet barrel, a pawl carried by said ratchet wheel and engaging with the ratchet of said ratchet barrel, a handle operatively connected with one of said ratchets, and a dog lever operatively connected to said bolt bar said ratchet members co-acting one with the other and with said dog lever for operating said bolt bar.

2. In a device of the class described, the combination with a casing and a bolt bar slidably arranged therein, of a ratchet wheel having teeth formed on the periphery thereof, a ratchet barrel having teeth formed on the periphery thereof and facing in the opposite direction to the teeth of the said ratchet wheel, a pawl carried by said ratchet wheel and engaging the teeth of said ratchet barrel, a cam disk having a tooth-shaped notch formed in the peripheral edge thereof and operatively engaging with said ratchet barrel, a handle operatively connected to said cam disk, a dog lever operatively connected to said bolt bar, a pawl carried by said dog lever and engaging with the teeth of said ratchet wheel and means carried by said ratchet wheel and said ratchet barrel and registering one with the other to place said dog lever in operative engagement with said cam disk.

3. In a device of the class described, the combination with a casing and a bolt bar slidably arranged therein, of a ratchet wheel having teeth formed on the peripheral edge thereof, an adjustable ring having a notch in the periphery thereof and adjustably secured on the face of said ratchet wheel, a ratchet barrel having teeth formed on the edge periphery thereof, a pawl carried by said ratchet wheel and engaging with the teeth of said ratchet barrel, a front disk having a notch in the peripheral edge thereof and adjustably secured to said ratchet barrel, a cam disk having a tooth-shaped notch formed on the peripheral edge thereof and operatively engaging on rotation with said front disk, a handle operatively connected to said cam disk, a dog lever operatively connected to said bolt bar and having a stepped end adapted to engage with the notches in said adjustable ring, said front disk and said cam disk and a pawl carried by said dog lever and engaging with the teeth of said ratchet wheel.

4. In a device of the class described, the combination with a casing and a bolt bar slidably arranged therein, of a ratchet wheel having teeth formed on the peripheral edge thereof, an adjustable ring having a notch in the periphery thereof and adjustably secured on the face of said outer ratchet wheel, a ratchet barrel having teeth formed on the edge periphery thereof, a pawl carried by said ratchet wheel and engaging with the teeth of said ratchet barrel, a front disk having a notch in the peripheral edge thereof and adjustably secured to said ratchet barrel, a cam disk having a tooth-shaped notch formed on the peripheral edge thereof and operatively engaging on rotation with said front disk, a handle operatively connected to said cam disk, a dog lever operatively connected to said bolt bar and having a stepped end adapted to engage with the notches in said adjustable ring, said front disk, said free ring and said cam disk and a pawl carried by said dog lever and engaging with the teeth of said ratchet wheel.

5. In a device of the class described, a ratchet barrel having ratchet teeth formed on an arc of the periphery thereof, a ratchet wheel having ratchet teeth formed on an arc of the outer periphery thereof, a spring-held dog secured to said ratchet wheel and projecting from the inner periphery thereof and engaging with the teeth of said ratchet barrel, a notched ring mounted on said barrel and adjustably secured to said ratchet wheel and having a notch in the periphery thereof, a front disk adjustably secured to the face of said ratchet barrel and having a notch in the periphery thereof and a row of orifices circularly arranged therearound, a handle operatively connected to said disk for rotating the same, a free ring rotatably mounted on said ratchet barrel between said adjustable ring and said front disk and having a notch in the periphery thereof, a lug extending outwardly therefrom and a washer having an arm extending therefrom and terminating in a pin adapted to be inserted through an orifice in said front disk, and contacting on the rotation thereof with the lug of said free ring.

6. In a device of the class described, the combination with the casing, of a bolt bar slidably arranged therein, a handle bar extending through said casing, a roll-back operatively connecting said handle bar with said bolt bar, a plurality of notched members operatively connected to said handle bar, a plurality of coöperative ratchet members adjustably connected to said notched members, a dog lever having a limited sliding movement on said bolt bar and operatively engaging with the notches of said notched members and a pawl carried by said dog lever and operatively engaging with the teeth of one of said ratchet members.

7. In a device of the class described, the combination with the casing having a bolt bar slidably arranged therein, a plurality of rotatable toothed ratchet members and a plurality of rotatable notched members suit-

ably journaled therein, of a dog lever having one end thereof slidably secured to said bolt bar and the other end thereof formed with steps adapted to engage the notches of said notched members and a spring-held pawl carried by said dog lever and engaging the teeth of one of said ratchet members.

Signed at the city of Ottawa, Canada, this 28th day of April, 1911.

JOHN STORR, JR.

Witnesses:
K. F. MACGIBBON,
CHARLIE ECKSTEN.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."