

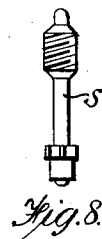
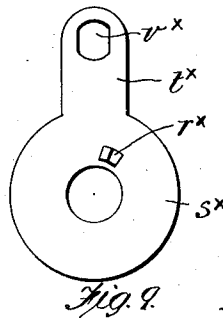
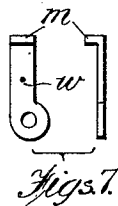
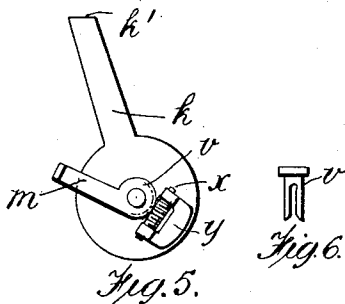
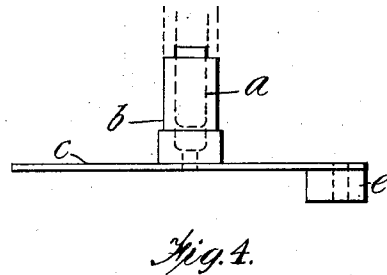
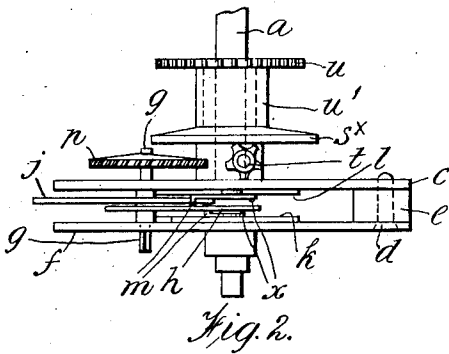
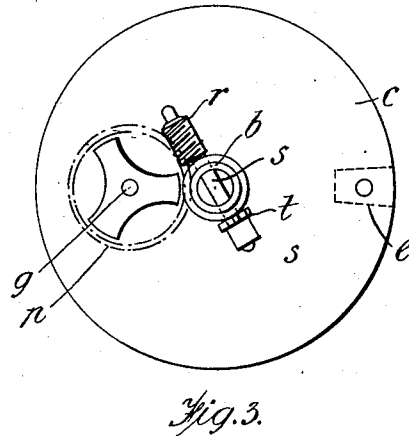
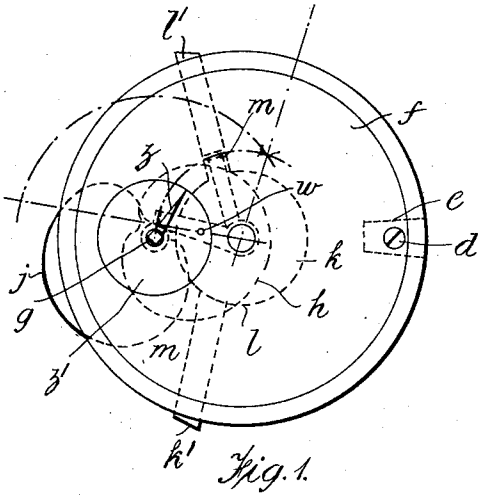
A., G. O. H., E. H. & S. A. HORSTMANN & W. T. EDGAR.
TIMING DEVICE.

APPLICATION FILED DEC. 30, 1909.

1,027,652.

Patented May 28, 1912.

2 SHEETS-SHEET 1.



Witnesses

R. C. Braddock.
Emory L. Groff.

Inventors

Albert Horstmann
Gustav Otto Henry Horstmann.
Ernst Hermann Horstmann.
Sidney Adolph Horstmann
William Thomson Edgar
J. T. Chapman
Their Attorney.

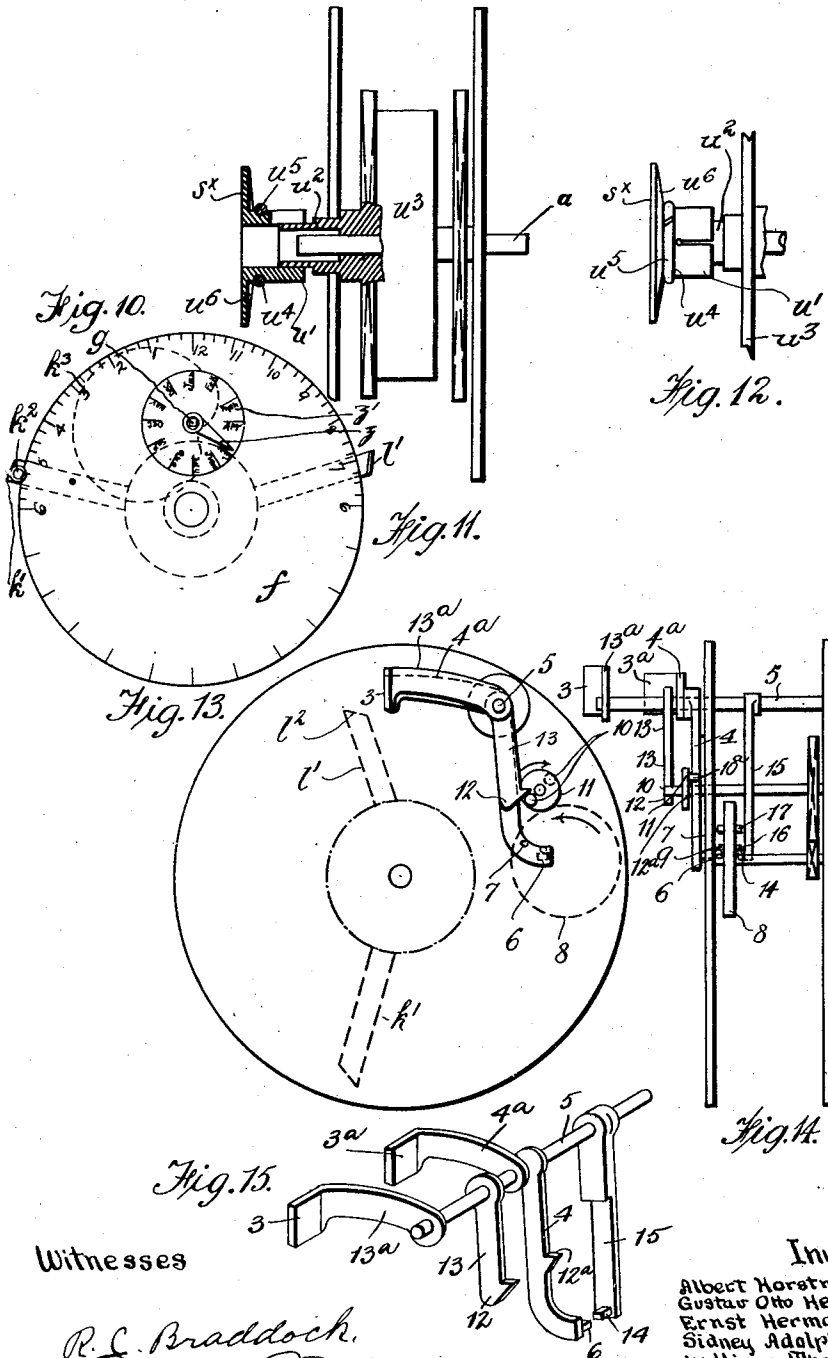
A., G. O. H., E. H. & S. A. HORSTMANN & W. T. EDGAR.
TIMING DEVICE.

APPLICATION FILED DEC. 30, 1909.

1,027,652.

Patented May 28, 1912.

2 SHEETS—SHEET 2.



Witnesses

R. C. Braddock.
Emory L. Goff.

Inventors.

Albert Horstmann,
Gustav Otto Henry Horstmann,
Ernst Hermann Horstmann,
Sidney Adolph Horstmann,
William Thomson Edgar.

By *S. P. McLaughlin*,
Their Attorney

UNITED STATES PATENT OFFICE.

ALBERT HORSTMANN, GUSTAV OTTO HENRY HORSTMANN, ERNST HERMANN HORSTMANN, SIDNEY ADOLPH HORSTMANN, AND WILLIAM THOMSON EDGAR, OF BATH, ENGLAND.

TIMING DEVICE.

1,027,652.

Specification of Letters Patent.

Patented May 28, 1912.

Application filed December 30, 1909. Serial No. 535,561.

To all whom it may concern:

Be it known that we, ALBERT HORSTMANN, GUSTAV OTTO HENRY HORSTMANN, ERNST HERMANN HORSTMANN, SIDNEY ADOLPH HORSTMANN, and WILLIAM THOMSON EDGAR, subjects of the King of Great Britain and Ireland, and residents of Bath, county of Somerset, England, have invented certain new and useful Improvements in Timing Devices, of which the following is a specification.

This invention relates to clockwork gas controllers and time switches of the kind fitted with cam equation mechanism for varying the point or points of discharge in relation to a time dial, and particularly to that type of mechanism which comprises a mechanism revolving on its own axis and carrying discharging pins whose angular position in relation to the axis is varied automatically by means of two cams mounted on separate axes to which are imparted regular motion by means of a worm.

The main object of this invention is to avoid certain inconveniences associated with the use of cams on separate axes, such for example as back-lash and the difficulty of assembling and maintaining the cams in their proper relationship.

Further objects of this invention are the provision of a dial revolving with the mechanism, but unencumbered with the component parts thereof, in order that such dial may be used in conjunction with a fixed pointer for indicating the actual passing of time; and also the mounting of the cams (or cam, if one only be used) in such a way that it shall be possible to employ cams of greater eccentricity than was possible heretofore, without increasing the size of the whole mechanism.

In order to attain the main object of our invention we mount the two cams rigidly on one axis which is provided with a dial also rigidly mounted on or connected thereto by means of which dial and a fixed pointer the angular position of the cams may be ascertained. The common axis of the cams receives motion from a worm, but suitable means are provided by means of which the position of the axis and cams may be varied and adjusted without having to turn the worm. The method herein described is to mount the wheel with which the worm engages frictionally on the shaft and to square

the end of the shaft to allow of the use of a key, but any suitable analogous means may be employed. The arrangement of the two cams on one shaft insures that their relationship is permanent and that there is no back-lash between them such as results from previous arrangements. Moreover, in assembling the parts no skill is required to insure the correct relationship between the cams to start with.

In order to obtain the other objects of our invention we mount the cams or cam and discharging levers between two disks which are rigidly connected at a point or points near the circumference of each, and only one of the disks is mounted directly on the axis upon which the mechanism revolves. The outside of the other disk then becomes available for use as a dial which, in conjunction with a fixed pointer, may indicate the passing of time, and as the disks are connected at their circumferences a wide intervening space is available for the arrangement of cams of greater eccentricity.

In order that the said invention may be readily understood reference is to be had to the following description and accompanying sheets of drawings which illustrate a practical method of carrying out the said invention and in which:—

Figure 1 is a front elevation; and, Fig. 2 a plan view. Figs. 3 and 4 are elevation and plan views of the back plate detached. Fig. 5 is a front view of one of the discharging levers. Fig. 6 is a view of a split pin. Fig. 7 represents front and side view of one of the cam pins. Fig. 8 is a view of the worm spindle. Fig. 9 is a front view of the disk and its projection thereon for actuating the star wheel. Fig. 10 is a front view of the dial plate showing the use of one cam only. Figs. 11 and 12 are views illustrating the frictional mounting of the controller upon the main wheel of the clock. Fig. 13 is a front view; and, Fig. 14 a side view showing the discriminating device. Fig. 15 is a detail perspective view of the arbor and associated levers shown in Figs. 13 and 14.

In carrying out the present invention, reference being had first to Figs. 1 to 9, there is mounted, free to revolve upon a common stud or spindle *a* by means of the sleeve *b*, the circular disk *c* (hereinafter called the "back plate"). Rigidly attached to the

back plate *c*, by means of the screw *d*, which passes through the block *e*, is the circular disk *f* (hereinafter called the "dial plate"), the arrangement being such that the dial plate *f*, together with the back plate *c*, rotate as one piece on the spindle *a* concentrically. Freely pivoted between the dial plate *f* and the back plate *c*, at a point opposite the block *e*, and at a given radius from the center of the said dial and back plates *f* and *c*, is the spindle *g* (hereinafter more fully described) which carries the two cams *h* and *j* rigidly mounted on said spindle. Centrally pivoted and flat against the inner sides of the dial plate *f* and the back plate *c* are the disks *k* and *l*, provided with arms *k'* and *l'*—Fig. 1—(hereinafter called the "discharging levers"). One of such disks *k* is shown detached in Fig. 5. Also rigidly attached to the disks *k* and *l* are the cranked arms or pins *m*—Figs. 1 to 7—(hereinafter called the "cam pins"), which rest against the peripheries of the cams *h* and *j* respectively and thus determine the circumferential position of the discharging levers *l'* and *k'* in relation to the dial plate *f* and back plate *c*.

On the outer side of the back plate *c* and attached to the cam spindle *g* is the worm wheel *p*—Figs. 2 and 3—which gears with the worm *r*. The worm *r*—Figs. 3 and 8—is rigidly attached to, or in one piece with the spindle *s* which is mounted freely through the sleeve or shaft *b*—Fig. 3. On same spindle *s*, but on the opposite end of the worm *r*, is rigidly mounted the star wheel *t*.

In operation, the whole mechanism is made to rotate on the spindle *a* by means of a suitable clock (not shown), the connection being the wheel *u*—Fig. 2. The sleeve or shaft *b* is fitted frictionally inside the sleeve *u'*, *u'* being in one piece with the wheel *u*, or any other suitable coupling may be employed.

Once in every 24 hours (or other suitable period of time) and in its rotation, the star wheel *t* coming into contact with a suitable projection (such for instance as *r** on disk *s**—Fig. 9—this disk being held to frame of clock by means such as a screw passing through the hole *v** in the arm *t** of said disk) motion is imparted to same. The turning of the star wheel *t* imparts movement to the worm *r* which, being in gear with the worm wheel *p*, which is provided with a suitable number of teeth, causes the same to make one revolution in a year (or other given period of time), the worm wheel *p* being attached to the spindle *g* on which the two cams *h* and *j* are mounted. These cams are caused to rotate at a similar rate as said worm wheel *p*. Each of the said cams is attended by its respective cam pin *m* which is caused to press against its cam whenever its attendant discharging lever *k'* or *l'* comes

in contact with any resistance, such as the direct or indirect discharge of a gas tap or electric switch, in the daily or annular rotation of the whole mechanism.

It will be readily seen that with cams suitably shaped for, and fixed in relation to each other in accordance with a predetermined time chart (such as a lighting and extinguishing schedule as used by gas corporations and other lighting authorities) the circumferential position of the discharging levers *k'* or *l'* in relation to the dial plate *f* or the back plate *c* will depend upon the radii of their respective cams *h* or *j* at the immediate point of contact with their respective cam pins *m*. If, then, a hand *z* or other suitable index is attached to the spindle *g* on which the two cams *h* and *j* are rigidly mounted, this hand or index will indicate on a suitable dial *z'*—Fig. 1—the time of year (or other period) to which the peripheries of the two cams immediately in contact refer: the date to which this hand *z* points will always determine the circumferential position and therefore the time of operation of the two discharging levers *k'* and *l'*. It will also be seen that where the mechanism rotates once in 24 hours, and in its rotation movement is imparted to the star wheel *t* once every revolution, and same is suitably geared to rotate the cam once in 365 days, every revolution of the mechanism will impart movement to the hand $\frac{1}{365}$ th of the circumference of the dial, or one day, and this hand will accordingly daily record the date of year to which the peripheries of the two cams immediately in contact with their cam pins refer.

Although the two cams are rigidly mounted on the common spindle *g*, and their daily movement is effected by the worm wheel *p* as above described, and also by means of the star wheel *t* the position of the cams and indicating hand can be altered at will, yet the worm wheel *p* may be attached to the spindle *g* either frictionally or rigidly; and, if frictionally, the spindle *g* may be provided with a key square or other suitable means whereby the position of the cams may be altered in relation to the worm wheel for the purpose of setting them readily to date in the same manner as the hands of a clock may be altered at will in relation to the gear work which drives them. Also, as lighting authorities vary in their requirements as to the time after sunset and before sunrise when the lamps shall be lighted or extinguished respectively, the cam pins *m* may be made so as to be capable of adjustment in relation to the discharging levers *k'* and *l'*.

It will be seen by an inspection of Fig. 5 that the cam pins *m*, only one of which is illustrated in detail Fig. 7, are also pivoted to the dial and back plates *f* and *c* respec-

tively over the disks k and l respectively by means of the split pins v , one of said pins v being shown detached in Fig. 6. Each cam pin can thus be set to any angle in relation to its respective discharging lever and when it is secured by a pin or screw w —Figs. 1 and 7—forms one piece with same as before described. It will thus be seen that should a lighting authority decide to alter their time of lighting or extinguishing earlier or later than previously arranged, it is possible to do so, and if the circular part of the disks k and l are micrometered for the purpose for hours and portions of an hour, the exact amount of alteration required can be at once ascertained and corrected, by drilling another hole in the disk to receive the pin or screw w , or by having holes provided to receive same. Further, any suitable form of adjustment may be employed, such as that set forth in Fig. 5, in which the hollow worm spindle x , which is provided with bearings y gears with the tail end of the cam pin m , which, being provided with suitable worm wheel teeth, forms a segment of a worm wheel and the cam pin is thus capable of adjustment by inserting a needle-pointed key into the hollow worm spindle x , which, gripping frictionally in same, enables the worm to be turned and the angular relation of the discharging lever k' or l' and the cam pins m to be altered, and with them also will be altered the time of lighting or extinguishing before or after schedule time. It will also be seen that as both cams are fixed on one spindle the only thing to limit their size or eccentricity through being impeded in their path of rotation, is the block e , which allows a very much larger cam (or one of much greater eccentricity) to be used, than is possible when cams are mounted on individual spindles.

When one cam (k^3) only is employed as shown by way of example in Fig. 10 its function is to automatically adjust one of the discharging levers only, viz:—the lever l' . The other discharging lever k' , instead of being automatically adjusted, may be used to operate at a fixed constant time, such lever k' being secured in its required position by means of the set nut k^2 (or other equivalent means) and is only capable of adjustment by hand; or, conversely, the lever l' may be fixed and the other lever k' automatically adjustable. Also by this method the dial plate may remain unencumbered by any mechanism and save for the presence of the year dial, and hand, leaves the plate plain to be used as a 24 hour clock dial to show time by means of a fixed hand or other index exterior of same, or may carry a fixed hand recording time on a 24 hour dial exterior of same. Further, it is also provided that the two cams k and j

on their spindle g can be removed in one piece by releasing the worm wheel p , unscrewing the screw d and removing the dial plate f , when the cams and their spindle can be exchanged for other cams of the desired periphery on their spindle and the mechanism again put together.

To prevent back-lash and insure the perfect maintaining of the power, the sleeve u' —see Figs. 11 and 12—is split and frictionally engaged with the hollow ended arbor u^2 of the main wheel u^3 of the clock mechanism, said hollow end u^2 forming part of the main wheel u^3 . On the exterior of said sleeve u' is formed a groove u^4 for the reception of a split ring u^5 which keeps the dished spring plate u^6 against the face of the disk s^* , the arbor a fitting loosely within the arbor u^2 so that no loss of power occurs when winding up the clock-work mechanism.

In order that the tap or switch actuating mechanism may be automatically controlled when two discharging levers are employed, a discriminating device comprising the following elements is used in conjunction with the discharging levers. The discharging levers l' and k' which rotate in different planes and operate the release wheel mechanism which actuates the gas cock or switch, are so arranged that each discharge lever shall operate a separate release lever; these two releasing levers releasing the same tap actuating mechanism, but each being provided with distinct locking and warning devices.

In operation, the inclined face l^2 of the discharging lever l' comes into contact with the cranked nose 3^a of the back release lever 4^a which is pivotally mounted upon the arbor 5 of the clock mechanism, causing an angular displacement of the levers 4^a and 4 and bringing the locking stop 6 of the lever 4 free from the locking pin 9 and into the path of the warning pin 7 of the wheel 8. On the lever l' clearing the cranked nose 3^a the combined levers 4^a and 4 being spring or gravity actuated return to their normal position, moving the locking stop 6 free of both the warning pin 7 and the locking pin 9, leaving the tap or switch mechanism to operate. At the close of this operation the pin 10 of the wheel 11 will have raised the nose 12 of the release lever 13 and caused the locking stop 14 of the arm 15 carried by the arbor 5 to come into engagement with the pin 16 of the wheel 8 and thus stop the tap actuating mechanism. It will thus be seen that although the discharging lever l' operated the combined release lever 4^a and 4 and caused the actuating mechanism to move the gas tap or switch, it was the combined levers 13^a , 13 and 15 which stopped said mechanism, and in so doing was prepared to be the next to be operated by a

following discharging lever, and 13^a can only be operated by k' which is the next discharging lever in rotation. In similar manner the discharging lever k' in its path of rotation releases lever 13^a by its engagement with the cranked nose 3^a of said release lever 13^a and through the arbor 5 swings lever 15 so as to release pin 16 of the wheel 8 from its engagement with stop 14 of the said lever 15 which being now in the path of pin 17 of wheel 8 causes it to "warn" on same. On the discharging lever k' clearing the cranked nose 3^a the release lever 13^a will resume its normal position, swinging stop 14 of lever 15 free of both the locking pin 16 and warning pin 17 of wheel 8 and allowing the switch or tap to perform its operation and at its close to raise nose 12^a of lever 4, bringing its stop 6 into the path of pin 9 of wheel 8.

The discharging lever k' in its path of rotation will raise the release lever 13 by its engagement with the nose 3 of said release lever 13 and through the arbor 5 swing lever 15 so as to release pin 16 from its engagement with the stop 14 on the wheel 8, thus giving warning, and so on, each release lever preparing for the discharge of the other in turn.

The discharging levers may be used to operate either directly or indirectly the opening or closing of any known cock, plug or valve for any agent such as gas or any electric switch.

From the foregoing description it is to be understood that a distinguishing feature of the present invention over the applicants' former British Patent No. 27,849 of 1904, resides in the improvement of rigidly mounting the two cams on one spindle, so that the setting of the two cams is accurately and reliably accomplished with one operation. In explanation of the advantages of this construction it should be noted that since the two cams are mounted on one spindle and are adjusted in relation to each other before insertion in the controller, no special adjustment is required by the assembler. It was found that in the construction of the former British patent, where the cams were mounted on separate spindles or axes, the relation of one cam to another was sometimes seriously upset by the presence of back-lash or shake between the worm wheel teeth and the worm, thus giving a discrepancy of many minutes in the times of lighting and extinguishing, which discrepancy cannot prevail where the cams are rigidly mounted on one spindle. Also, since the cams are mounted on the one spindle in accordance with a given chart, (for instance the lighting schedule of a certain latitude), a series of these sets of cams could be produced so that they could be exchanged for cams of other latitudes when required.

Having now described our invention, what we claim as new and desire to secure by Letters Patent of the United States is:—

1. In a device of the class described, the combination of a rotary part, a shaft mounted upon the rotary part and arranged eccentrically thereto, a pair of cams rigid with said shaft, means actuated by the rotation of the rotary part for operating the shaft to vary the position of the cams, and a pair of discharge levers carried by the rotary part and having operative engagement with the cams whereby the position of the discharge levers is determined by the positions of the cams.

2. In a device of the class described, the combination with an arbor, a single eccentrically arranged supporting element rotated with the arbor, a pair of cams rigidly carried by said element, and a pair of suitably supported discharging arms also rotated with the arbor and operatively related to the cams for automatic and simultaneous adjustment thereby, one of said cams being for lighting and the other for extinguishing purposes.

3. In a device of the class described, the combination of a support mounted to have a rotary movement, a pair of discharge levers carried by the support and arranged in different planes, a pair of rigidly connected cams actuated by the rotation of the support for varying the positions of said levers, and a discriminating device arranged in the path of the two discharge levers whereby one of such levers will always operate to open the switch while the other lever will always operate to close the switch.

4. In a device of the character described, the combination of a plate mounted to have a rotary movement, a shaft mounted upon the plate and arranged eccentrically thereon, a cam upon the shaft, means actuated by the rotation of the plate for turning the shaft to vary the position of the cam, a discharge lever pivoted upon the plate, a cam pin pivotally mounted upon the discharge lever and constructed to engage the periphery of the cam to determine the position of the discharge lever, the said cam pin being formed with worm teeth, and a worm mounted upon the discharge lever and meshing with the said worm teeth to admit of the cam pin being adjusted with respect to the discharge lever.

5. In a device of the character described, the combination of a pair of spaced plates rigid with each other and mounted to have a rotary movement, a shaft mounted upon the plates and arranged eccentrically with respect thereto, a pair of cams rigid with the shaft, means actuated by the rotation of the plates for turning the shaft to vary the position of the cams, a discharge lever mounted upon each plate, and cam pins car-

ried by said levers and engaging the periph-
eries of the cams whereby the position of
the discharge levers is determined by the
position of the cams.

5 6. In a device of the character described,
the combination of a pair of spaced plates
rigid with each other and mounted to have
a rotary movement, a shaft mounted upon
the plates and arranged eccentrically with
10 respect thereto, a pair of cams rigid with
the shaft, means actuated by the rotation of
the plates for turning the shaft to vary the
position of the cams, a discharge lever piv-
oted upon each plate, and manually adjust-
15 able means carried by each of the discharge
levers for engaging one of the cams to de-
termine the position of the discharge lever.

7. In a device of the character described,
the combination of a pair of spaced plates
20 rigid with each other and mounted to have
a rotary movement, a shaft mounted upon

the plates and arranged eccentrically with
respect thereto, a pair of cams rigid with
the shaft, means actuated by the rotation
of the plates for turning the shaft to vary 25
the position of the cams, a discharge lever
pivoted upon each of the plates, and a cam
pin adjustably mounted upon each of the
discharge levers and adapted to engage the
periphery of the respective cam to deter- 30
mine the position of the discharge lever.

In testimony whereof we have affixed our
signatures.

ALBERT HORSTMANN.
GUSTAV OTTO HENRY HORSTMANN.
ERNST HERMANN HORSTMANN.
SIDNEY ADOLPH HORSTMANN.
WM. THOMSON EDGAR.

In presence of—

ERNEST BRINGMANN,
ALBERT EDWARDS SMITH.

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