(No Model.) 2 Sheets—Sheet 1.

F. G. CHAPMAN & F. M. DEARING.

ARC LAMP.

No. 414,141. Patented Oct. 29, 1889.

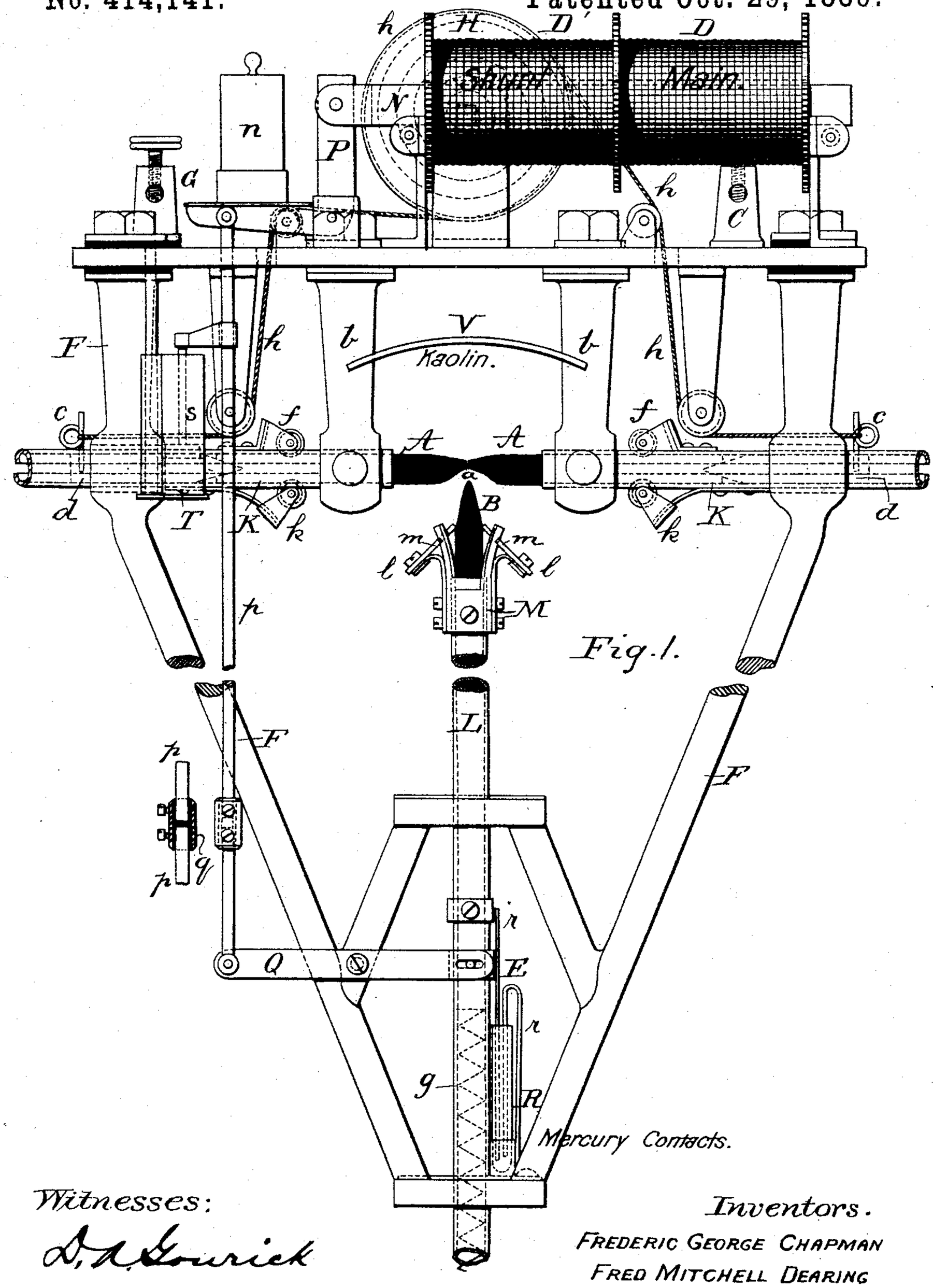

Fig. 1.

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(No Model.) 2 Sheets—Sheet 2.

F. G. CHAPMAN & F. M. DEARING.

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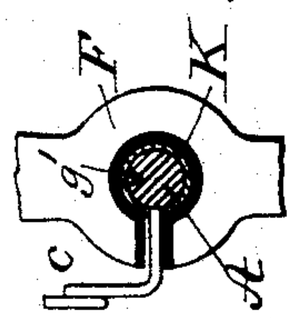
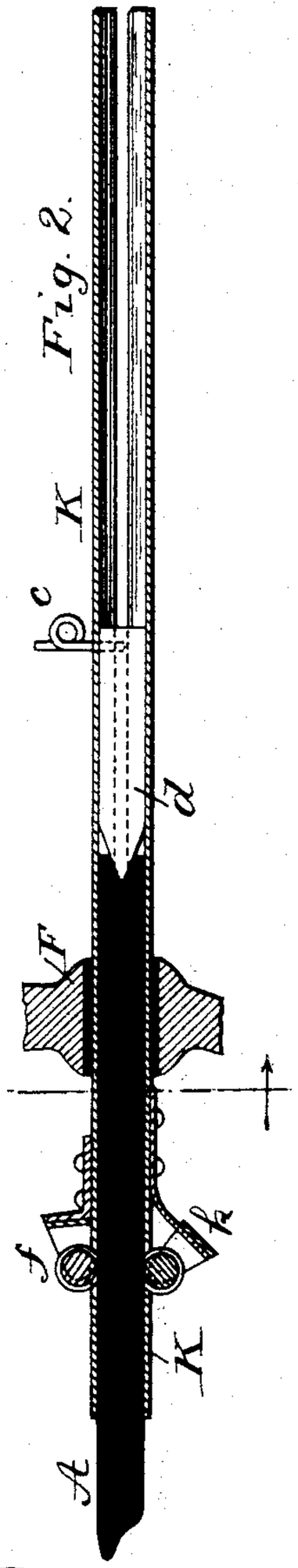


Fig. 2.



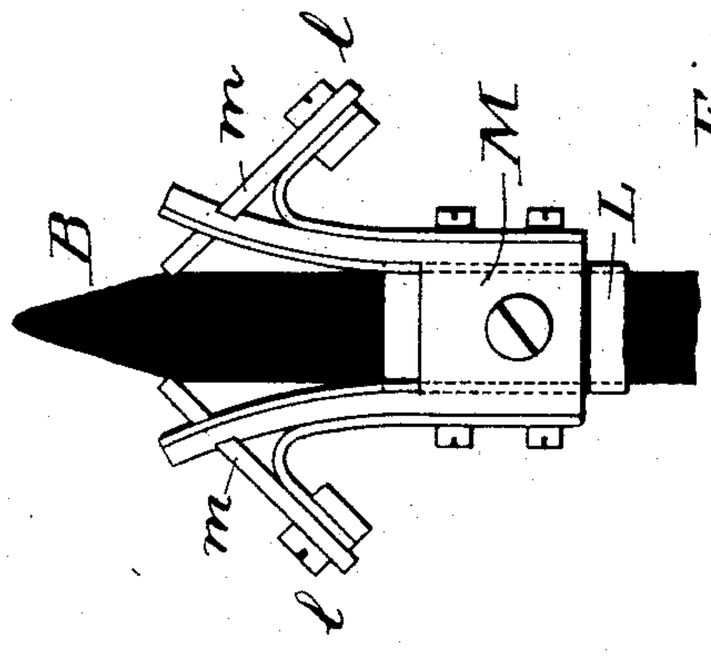
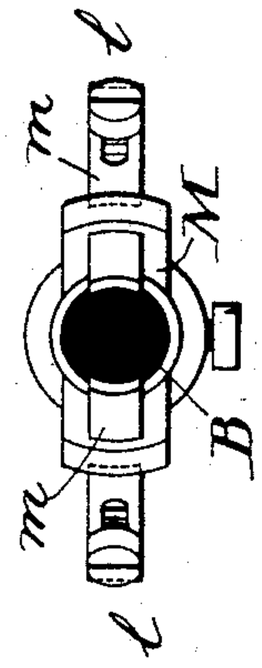


Fig. 3.



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UNITED STATES PATENT OFFICE.

FREDERIC GEORGE CHAPMAN AND FRED MITCHELL DEARING, OF LONDON, ENGLAND, ASSIGNORS OF ONE-THIRD TO WILLIAM GEORGE CHAPMAN, OF SAME PLACE.

ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 414,141, dated October 29, 1889.

Application filed September 27, 1888. Serial No. 286,497. (No model.) Patented in England May 13, 1887, No. 7,042; in France March 13, 1888, No. 189,332; in Belgium March 13, 1888, No. 81,012, and in Germany April 4, 1888, No. 46,725.

To all whom it may concern:

Be it known that we, FREDERIC GEORGE CHAPMAN and FRED MITCHELL DEARING, both residents of London, England, and subjects of the Queen of Great Britain, have invented an Improvement in Electric-Arc Lamps, (patented to ourselves and W. G. Chapman in England under date of May 13, 1887, No. 7,042; in France March 13, 1888, No. 189,332; in Belgium March 13, 1888, No. 81,012, and in Germany April 4, 1888, No. 46,725,) of which the following is a specification.

Our invention relates to electric-arc lamps. Its objects are to give a better distribution of light horizontally and downward by a peculiar shape of the arc, and at the same time to afford a steady light with a fixed position of arc, so as to facilitate exact focusing in searchlights and the like, and to render the life or duration of the positive and negative carbons equal or substantially equal, also to offer less resistance to the current within the lamp and to afford more reliable self-acting provisions for feeding and adjusting the respective carbons. To effect these objects we construct our lamp as follows, and in order that our invention may be the better understood we now proceed to describe the same in relation to the drawings hereunto annexed, reference being had to the letters and figures marked thereon.

Like letters refer to like parts in the several figures.

Figure 1 represents a general elevation of our improved lamp. Fig. 2 represents a longitudinal section and a cross-section of one of the positive guiding-tubes. Fig. 3 is an elevation and plan of the retaining-collar of the negative guiding-tube.

A A represent the positive carbon divided into two parts meeting above the negative pole and arranged horizontally.

B is the negative carbon, placed vertically and underneath the point of contact of the two positive carbons, so that the poles meet one another at right angles in the form of a letter T. The current introduced at the binding-screws C, Fig. 1, passes round one part of the solenoid D, and thence is divided in parallel either by suitable wires or by the standards *b b* to the two parts of the horizontal poles, respectively, and thence to the negative carbon B, thus forming the electric arc between their respective points. The current returns from the negative pole through the mercury contacts E and the insulated framing F to the binding-screw G. As a consequence of this arrangement of poles, a peculiarly-shaped crater *a* is formed on the under side of the center of the positive pole, where the two ends of the parts join. This causes a fan-shaped arc exceptionally effective for the distribution of light horizontally and downward in a diffused manner and to a much greater extent than in the ordinary arrangement of vertical poles. The position of the arc, by reason of the character of the feed of the negative pole being always toward the fixed position of the positive pole, remains always in an absolutely fixed position, which is of great value where the light has to be focused or reflected. Moreover, as the ratio of the rate of burning of the positive carbon to that of the negative carbon is as two to one about, it follows that with carbons of a given length one set of the positive carbons will just last out the single negative carbon, which prevents waste and materially simplifies renewing the carbons.

The two parts of the positive pole A A are fed together by the pressure of a spring conveniently coiled in the drum H, the cords *h h* being taken from the periphery of the said spring-drum and attached to pins *c c*, which are inserted into metallic plugs *d d*, traveling in the metal guiding-tubes K K. The points of the plugs *d d* are wedge-shaped and press into suitable recesses in the rear of the positive carbons A A, and prevent the latter from turning on their axes. The guiding-tubes K are slotted, so as to permit the pins *c c* to travel along the said tube, and thus transmit the pressure of the spring-drum H by the metallic plugs *d d* to feed home the two positive carbons A A, so that their extremities always remain in contact with one another. We may equivalently operate the

automatic feed of these positive carbons by a weight or weights or other similarly-applied spring-pressure. These carbons are provided at top with a groove *g'*, Fig. 2, which is advantageous in preventing an obstructive "skin" on the positive carbons above the crater, and thus adapting them to feed easily and so as to maintain the required shape of crater. Rollers *f f k k* press on the upper and under sides of the carbons, providing smoother travel to the carbons, and one pair *k k* is fitted with springs pressing upon the carbons, which helps to insure exceptionally good contact between the carbons and the guiding-tube. By reason, also, of the position of the carbons not being directly above the electrical arc they and their connections are not exposed to such excessive heat, and we are enabled to bring the metallic contact of the guiding-tubes much nearer to the arc than is usual in the ordinary vertical pole arrangement, thus reducing the internal resistance of our lamp. For the same reason, also, we can, if desired, use, without danger of their splitting, carbons of any desired sectional area, so as to enable us conveniently to use lamps of great power and to provide carbons with the least possible resistance. The lower negative carbon B is also "self-fed" conveniently by the pressure of the spring *g* within the metallic holding-tube L. The said metallic holding-tube L is provided with a retaining collar or device M, of which we find the most convenient form is provided with a pair of end extensions, as shown, in which small metallic strips *m m*, passing through holes in the said end extensions of the retaining-collar M, are readily adjusted and secured by screws *l l*, working in slots in the said strips, so that they can be pushed forward to press against the end of the negative carbon, as may be found desirable, and are readily replaced when burned or worn. The spiral spring *g* presses the negative carbon B as it consumes always home against this retaining device, similarly to the action of a self-feed candle; or we may adopt any other equivalent arrangement.

The regulation for making and breaking the arc and for the adjusting of the same as to distance is effected by the solenoid D D', Fig. 1, part of which D is wound in series in the main current, and the other part D' is wound in a shunt-circuit therefrom. The differential action is thereby obtained upon the solenoid-core for any changes in the resistance of the main circuit by break in the light or by variations in the distance of the poles from one another. The movement of the core N of the said solenoid is communicated by the bell-crank lever P, the vertical rod *p*, and the rocking arm Q to the vertically-moving negative-pole tube L. The bell-crank P is provided with a balance-weight *n*, and the vertical rod *p* is insulated by a non-conducting coupling *q*. (Shown by an appended section in Fig. 1.)

In order to insure reliable electric contact between the vertically-moving negative-pole tube and the fixed frame F, through or along which the current is conducted to the said pole, we provide a mercury-cup R, Fig. 1, with metallic wire *r* therein of sufficient length to permit of the necessary vertical movement of the said tube without break of metallic contact. We apply also a piston *s*, attached to the vertical rod *p*, working in a cup of oil T, to act as a dash-pot to control any sudden movement of the regulating device. We may use a deflector or protector V, of kaolin, asbestus, or other refractory substance, above the arc to protect the upper framing and parts from the heat of the arc.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is—

1. In combination with a vertical negative carbon, its guide and feeding and adjusting devices, a two-part positive carbon provided with notches in its outer ends, tubular horizontal guides for the same, each provided near the arc position with a pair of contact-rollers, one of which is spring-pressed, plugs working in said guides having wedge-shaped ends fitted to said notches, a feed-drum and connections, and conducting-supports for said guides, substantially as described.

2. In combination with a vertical negative carbon, its guide and feeding and adjusting devices, the two-part cylindrical positive carbon having a skin-preventing groove along its top and provided with notches in its outer ends, and tubular horizontal guides for the same extending laterally from points near the arc position, plugs working in said guides having wedge-shaped ends fitted to said notches, a feed-drum and connections, and supports for said guides, substantially as described.

3. In an electric-arc lamp, the apparatus for feeding and controlling the negative pole, consisting of guide-tube L, adjustable retaining device M *m m*, mercury contacts E, and feed-spring *g*, the whole tube operated for adjustment by the solenoid D D' and connections, substantially as described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

FREDERIC GEORGE CHAPMAN.
FRED MITCHELL DEARING.

Witnesses:
RICHARD A. HOFFMANN,
SAM P. WILDING.