No. 778,575. PATENTED DEC. 27, 1904.

H. K. GARDNER.

QUICK BREAK HIGH TENSION ELECTRIC SWITCH.

APPLICATION FILED DEC. 21, 1903.

2 SHEETS—SHEET 1.

FIG. 1.

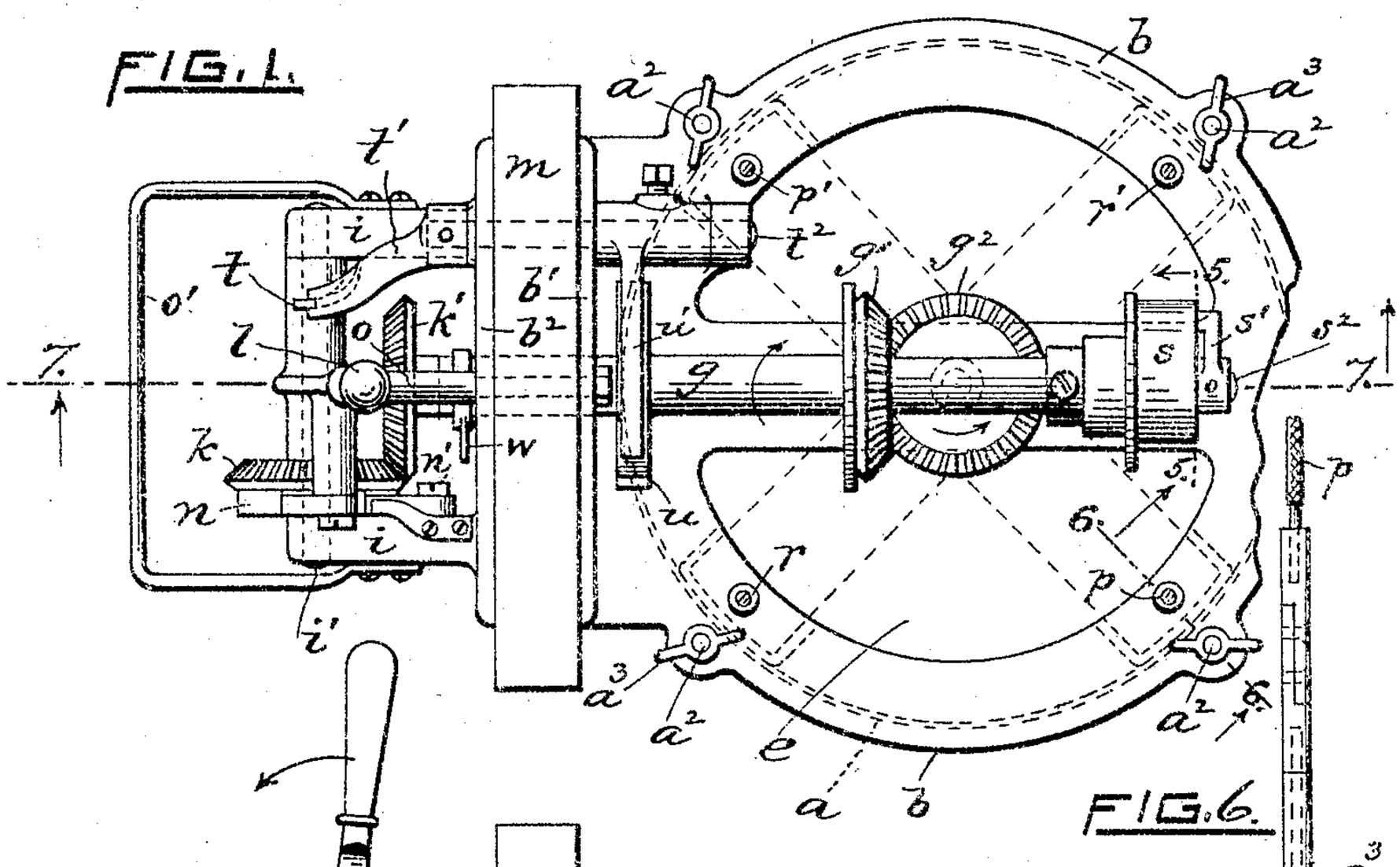

FIG. 6.

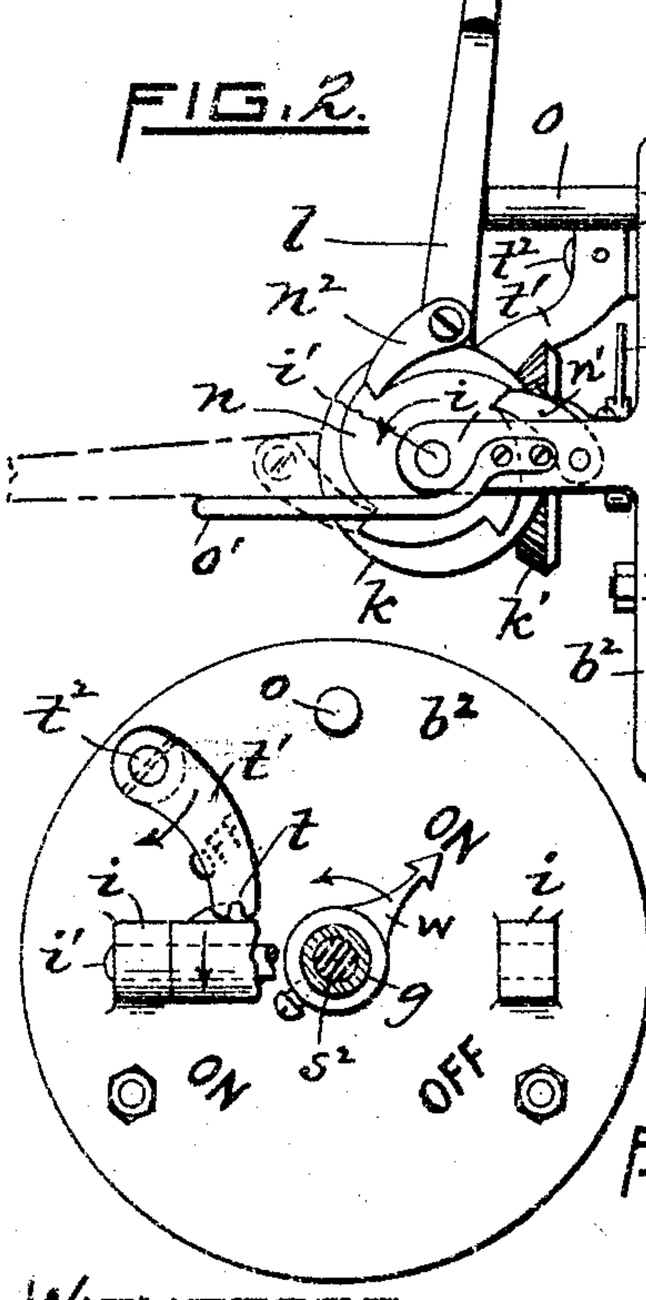

FIG. 2.

FIG. 3.

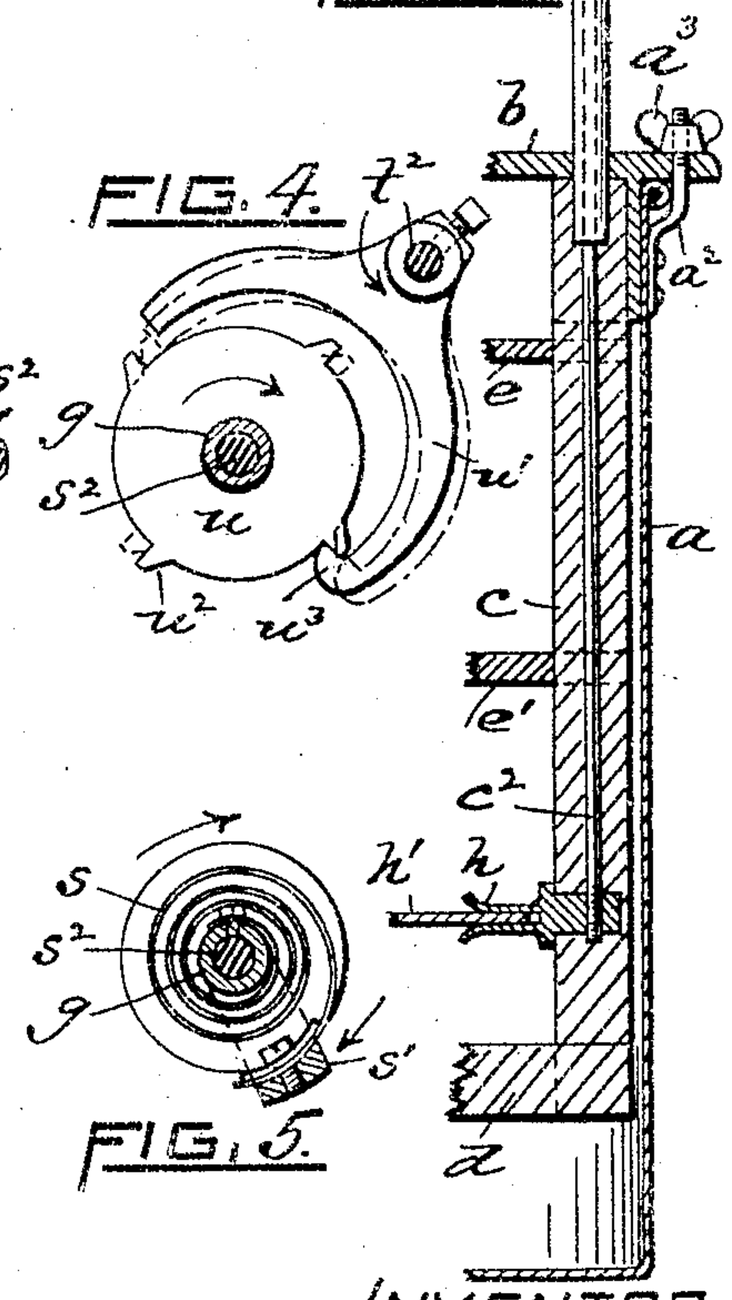

FIG. 4.

FIG. 5.

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2 SHEETS—SHEET 2.

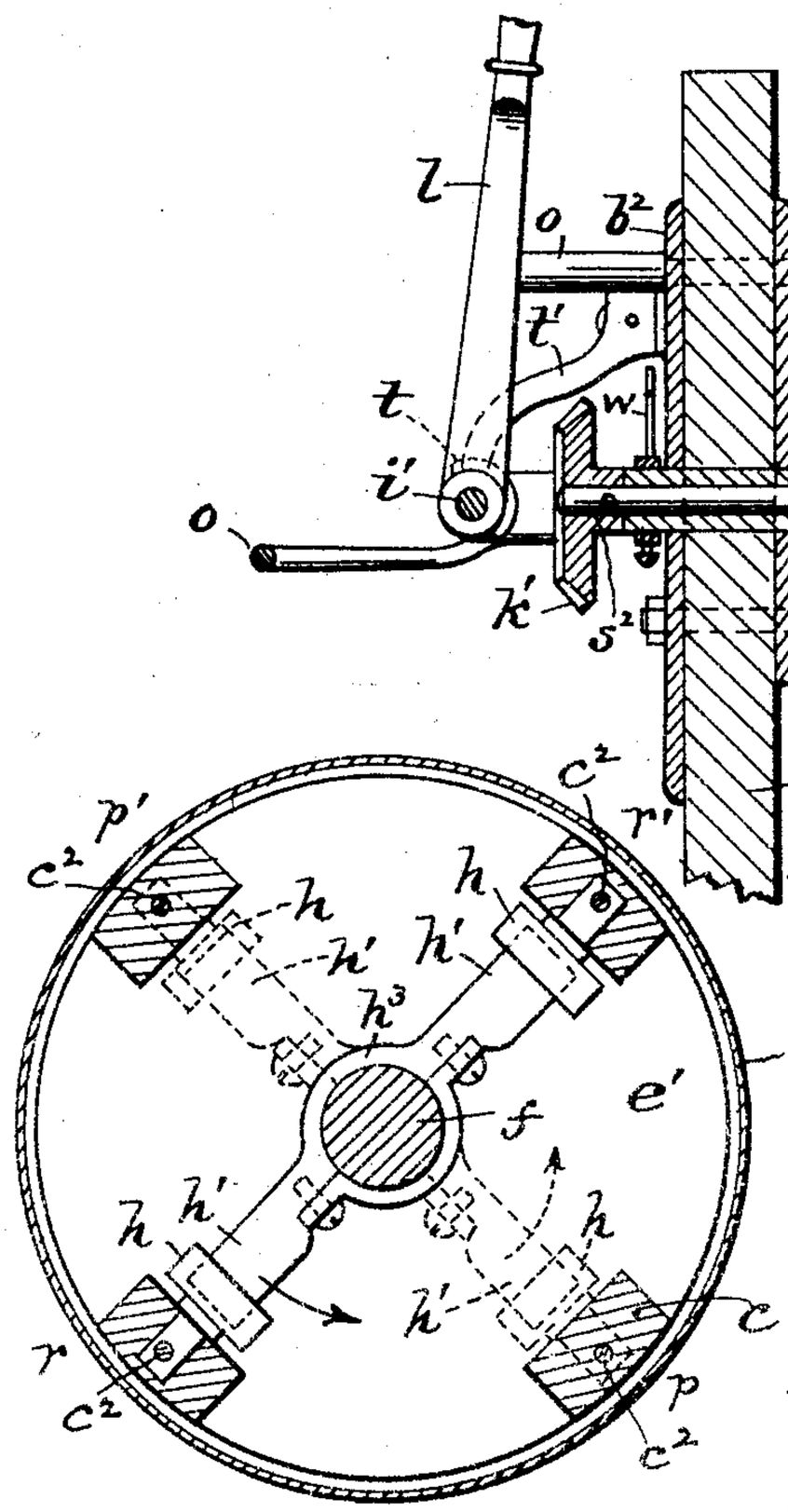

FIG. 8.

FIG. 7.

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No. 778,575. Patented December 27, 1904.

UNITED STATES PATENT OFFICE.

HENRY K. GARDNER, OF PROVIDENCE, RHODE ISLAND

QUICK-BREAK HIGH-TENSION ELECTRIC SWITCH.

SPECIFICATION forming part of Letters Patent No. 778,575, dated December 27, 1904.

Application filed December 21, 1903. Serial No. 186,004.

To all whom it may concern:

Be it known that I, HENRY K. GARDNER, a citizen of the United States of America, and a resident of Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Quick-Break High-Tension Electric Switches, of which the following is a specification.

My present invention relates to improvements in switches employed for opening and closing high-tension electric circuits, the device being what may be termed a "quick-break high-tension revoluble oil-switch."

It is well known that in order to prevent or deaden the electric flash produced in high-tension circuits when the latter are broken the switch proper, including the fixed and movable contacts, is mounted and immersed in a tank vessel containing suitable oil.

The object I have in view is to produce an electric switch of the type above referred to.

To that end my invention consists of manually-actuated mechanism embodying certain novel features in its construction which renders the switch more efficient and reliable, while at the same time capable of being more easily and quickly operated, all as will be more fully hereinafter set forth and claimed.

In the accompanying two sheets of drawings, illustrating my improved high-tension electric switch, Figure 1 is a plan view of the device. Fig. 2 is a corresponding side elevation, a portion of the apparatus, including the contact members, being omitted. Fig. 3 is a front end view, some of the operating parts or gear being omitted. Fig. 4 is a corresponding back elevation, in partial section, taken on line 4 4 of Fig. 2, showing the escapement device. Fig. 5 is a transverse section taken on line 5 5 of Fig. 1. Fig. 6 is a vertical sectional view taken on line 6 6 of Fig. 1, showing the manner of connecting a terminal with one of the contact members. Fig. 7 is a vertical central sectional view taken on line 7 7 of Fig. 1, the circuit being closed; and Fig. 8 is a horizontal sectional view of the oil-tank, &c., taken on line 8 8 of Fig. 7.

A, again referring to the drawings, designates my improved quick-break high-tension revoluble oil-switch complete. The switch or contact-breaker proper is mounted in a vertically-arranged cylinder or tank *a*, containing a quantity of suitable oil having the several contact members or current-conductors submerged therein, as clearly shown in Fig. 7.

The tank *a* is secured to the under side of a top plate or cover *b*, which in turn is rigidly fastened to a vertical support *m*, of marble or other suitable material. The said plate has a series of four stationary vertical insulator-bars *c*, of wood, secured thereto and extending downwardly therefrom into the tank. These bars are united at the bottom by a wooden tie *d*, which supports a central bearing or step *d'*. At suitable distances apart are located upper and lower horizontal partitions *e e'*, respectively. These, too, are made of wood and are secured to the bars *c*. A revoluble vertical wooden arbor or axle *f* passes freely through the center of said partitions and is supported by a pintle *f'*, mounted in said step. The upper end of the arbor is provided with a collar f^2, of rubber or other insulating material, the same extending upwardly through the partition *e* and above the surface of the oil. Intermittent rotary movement is imparted to the arbor by gearing, &c., soon to be described.

Each of the said bars *c* is bored vertically to receive a suitable current-conductor c^2, the lower end being screwed into or otherwise secured to the stationary contact member *h*, the latter, as drawn, having slightly-yielding jaws arranged to receive and be frictionally engaged by the corresponding movable contact blade or member *h'*. Each conductor c^2 is suitably insulated at its upper end and is connected to the corresponding pole or terminal of the circuit. (See Fig. 6.) As drawn, there are represented two sets or pairs of intermittingly-revoluble contact members arranged at right angles to each other in different horizontal planes. Each pair of contacts or blades *h'* are secured to or integral with an arm terminating in a central hub h^3, by means of which it is securely clamped to the wooden arbor *f*. The two conductors c^2 connected with the two lower fixed contacts are necessarily longer than the conductors which are secured to the two upper fixed contacts,

the corresponding terminals or poles being $p\,p'$ and $r\,r'$, respectively.

From the foregoing it is obvious that when the movable contacts or conductor-blades h' are in the position represented in Figs. 7 and 8—that is, in engagement with the jaws of the fixed contacts h—the circuit is closed or "on," the current then flowing freely through the four poles; but upon rotating the arbor f, say, ninety degrees, the several members h' are thereby simultaneously forcibly withdrawn from the corresponding jaws, thus breaking the circuit or "off," since no corresponding contacts h are located on the adjacent bars c. A further quarter-rotation of the arbor will again close the circuit.

The mechanism employed for operating the switch may be described as follows: To the back of said base or marble m is secured the vertically-extending flange b' of the plate or cover b, a circular flange b^2 being located at the front. These flanges are provided with suitable bearings, &c. A horizontal hollow shaft g is revolubly mounted in said flanges, the same extending rearwardly across and above the center of the tank a. To the rear end of said shaft is secured a spiral spring s, its outer convolution being fixed to a short arm or dog s', in turn secured to the corresponding end of a shaft s^2, capable of revolving in the hollow shaft. A bevel-gear g', fixed to shaft g, meshes into a fellow gear g^2, secured to a pintle g^3, extending upwardly through plate b and being fastened to the switch-arbor f. Thus it will be seen that upon rotating shaft g a corresponding movement will be imparted to the switch-arbor. Extending from the front of flange b^2 are horizontal brackets i, in which a short transversely-arranged shaft i' is revolubly mounted. To this shaft is secured a bevel-gear k, meshing into a similar gear k', fixed to said center shaft s^2. A four-toothed ratchet-wheel n is secured to the gear k, a spring-pressed pawl n' serving to prevent the wheel from moving rearwardly. A manually-controlled operating-lever l is loosely fulcrumed on shaft i' and carries a driving-pawl n^2 in engagement with the said wheel n. Upper and lower stops $o\,o'$ limit the angular movement of the lever. (See Fig. 2.) To the hollow or spring-actuated shaft g is secured a four-toothed escapement-wheel u, Fig. 4, the same being restrained from continuous rotation by means of a rocking escapement lever or yoke u', its ends being adapted to engage the teeth of said wheel, the lower member of the yoke terminating in a hook u^3. The lever u' is secured to a short shaft t^2, motion being imparted to it through the medium of an arm t', the free end of said arm being in continuous engagement with a suitable cam t, movable with the operating-lever l.

The tank is removably secured to the supporting-plate b by means of bolts a^2, passing upwardly through the plate, and clamping nuts a^3. (See Fig. 6.)

The operation of my improved quick-break high-tension electric switch A may be described as follows, first assuming that the several parts thereof have been constructed and assembled substantially as represented in the drawings, the electric circuit, say, being on or closed and corresponding to the normal working position: The operator seizes the handle of lever l and swings it downwardly to its limit, (see dotted-line position, Fig. 2,) thereby turning the center shaft s^2 and its crank s' some ninety degrees, thus further winding or increasing the tension of the spring s, the pawl n' at the same time dropping into a tooth of wheel n to prevent rearward movement of the gearing, &c. The downward movement of lever l also simultaneously actuates the cam t, thereby depressing the escapement member or yoke u' to the dotted-line position, Fig. 4, the result being to forcibly withdraw the hook u^3 from the escapement-wheel u and at substantially the same instant to interpose the other or upper arm of the yoke in the path of the wheel, the adjacent tooth then abutting the yoke, thus for the time being preventing the wheel u, its hollow shaft, &c., from axial movement. It may be noted that the electric circuit still remains closed. Now upon again returning the lever l to its vertical or normal position the cam t, &c., thereby cause the yoke to swing upwardly, thus placing the hook u^3 in the path of the wheel's teeth u^2 and at practically the same time releasing the upper arm from the wheel, as indicated by full lines in Fig. 4. At this instant, too, the reactive force or power of the mainspring s, (secured to hollow shaft g,) operating through the miter-gears $g'\,g^2$, &c., quickly rotates the arbor f and its attached parts in the arrow direction ninety degrees, or until a tooth of the previously-released wheel u is arrested by the hook of the escapement member u'. This action of the spring s also forcibly withdraws the upper and lower pairs of horizontally-movable contacts h' from the jaws of the corresponding fixed contacts h, thereby breaking the circuit, the angular movement being ninety degrees, as before stated. The device now remains at a state of rest until it becomes necessary or desirable to again close the circuit, this latter being effected by repeating the operation just described.

It may be stated that as drawn the electric circuit is or may be broken and closed twice during each complete revolution of the switch-arbor. A telltale or pointer w, secured to the shaft g and located at the front of the device, indicates the corresponding off and on positions of the switch. (See Fig. 3.)

Since the electric contacts are contained in a tank of oil, it follows that danger is to a great extent overcome, less power or force is

required to operate the switch, and "flashing" is practically eliminated.

It may be observed that the shafts i', s^2, and g are adapted to revolve intermittingly in one direction only, each action of the switch being effected by an angular movement of said members of ninety degrees.

I claim as my invention and desire to secure by United States Letters Patent—

1. As an improved article of manufacture, an intermittingly-revoluble quick-break high-tension electric switch having a normally stationary spring-pressed escapement-wheel movable in unison with the switch-contacts, an escapement-lever in engagement with said wheel member, and manually-controlled mechanism through which said yoke is actuated to release the wheel and permit a partial revolution of the switch.

2. In a quick-break high-tension electric switch, provided with fixed contact members adapted to be connected with the poles of an electric circuit, and a plurality of intermittingly-revoluble contacts arranged to engage said fixed members, a revoluble power-spring and intermediate mechanism connected therewith adapted to actuate said movable contact members, an escapement device for releasing the spring and checking its movement, and manually-controlled mechanism operatively connected with said escapement device and spring.

3. In a quick-break high-tension electric switch, the combination with fixed contacts and movable fellow contacts, of a revolubly-mounted shaft, a power-spring having an end secured to said shaft, a manually-controlled revoluble shaft having a dog secured to the other end of said spring, and an escapement device operatively connected with said first-named shaft, substantially as described and for the purpose set forth.

4. In a quick-break high-tension electric switch, the combination of a suitably-mounted hollow shaft, a power-spring s connected therewith and capable of revolving said shaft, a shaft revolubly mounted in the hollow shaft having a dog fixed to said spring, a working lever operatively connected with the dog-carrying shaft, escapement mechanism connected with the hollow shaft and controlled by the movements of said lever, and movable contact members operatively connected with and actuated by said hollow shaft, substantially as described.

5. In a quick-break high-tension electric switch, the combination with an outer shaft, a shaft mounted in said outer shaft and a power-spring secured to both shafts, of manually-controlled mechanism for actuating said inner shaft to increase the spring's tension, a combined holding and releasing device for said outer shaft operatively connected with the said mechanism that actuates the inner shaft, and contact members capable of being brought into and out of action by the force or power exerted by said spring whenever the releasing device is temporarily freed, substantially as described.

Signed at Providence, Rhode Island, this 18th day of December, 1903.

HENRY K. GARDNER.

Witnesses:
GEO. H. REMINGTON,
CALVIN H. BROWN.