UNITED STATES PATENT OFFICE.

CHARLES THOMAS MASON, OF SUMTER, SOUTH CAROLINA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO SPITZDORF ELECTRICAL COMPANY, OF NEWARK, NEW JERSEY, A CORPORATION OF NEW JERSEY.

INTERUPTER MECHANISM FOR IGNITION-DYNAMOS.

1,216,151.


Application filed June 30, 1915. Serial No. 37,130.

To all whom it may concern:

Be it known that I, CHARLES THOMAS MASON, a citizen of the United States, residing at Sumter, in the county of Sumter and State of South Carolina, have invented certain new and useful Improvements in Interrupter Mechanisms for Ignition-Dynamos, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to ignition systems, apparatus and methods, and has for its object the improvement thereof in such manner as to increase the efficiency and at the same time lengthen the life of the interrupter contacts and their operating parts, to obviate certain difficulties which have heretofore arisen from the high speed of operation of some of these parts, and to reduce sparking at the contacts.

The method commonly employed in ignition systems of the high tension jump spark type has been to provide a pair of contacts in the interrupter, with a cam opening or closing the same at the proper point on the E. M. F. wave in the generating coil, so as to render the secondary discharge circuit operative for an instant. For ordinary speeds this method has been found satisfactory, but when the speed of the magneto rotor is increased beyond the critical point, or when the cam is given several raised operating surfaces so as to produce several operations of the contact lever for each revolution of the rotor, then difficulty is experienced. In my prior application filed June 19, 1915, Serial No. 35,155, I have described and claimed a system, method and apparatus, whereby four current changes are produced in the generating coil per revolution of the rotor, and the cam which is driven with the rotor has four raised operating surfaces. If this rotor makes 3000 revolutions per minute, the interrupter contacts will obviously open and close 12,000 times per minute, and the lever carrying the movable contact will make 24,000 movements per minute, or 400 per second. If the rotor is speeded up to 4500 revolutions per minute, the number of lever movements rises to 600 per second. While it is true that the contacts must remain open for an appreciable length of time in order to permit a proper spark and the ignition of a charge of gas thereby, yet owing to the rapidity with which the lever movements follow each other, its vibration is practically continuous, and the only effect of obstructing or dampening its free vibration by the cam surfaces is to produce additional wear and cut down the actual time of travel, thereby increasing the actual speed of travel for each movement.

Under the conditions stated, it cannot be expected that the contact levers and contacts will be either highly efficient or long lived. By dint of care in the selection of the materials and in the craftsmanship employed, the parts requisite for practising this method can be made fairly satisfactory for a short time, but with certainty of breakage to follow, however.

I attain my objects heretofore stated by multiplying the number of contact levers and providing a corresponding number of cams so arranged that the contact levers will make or break the circuit successively, the makes or breaks alternating, so that I may at once divide the number of elevated surfaces required on the cam by the number of cams and levers employed. I shall specifically describe herein a structure in which two levers, two pairs of contacts, and two cams are employed, each cam having two elevated surfaces and the two cams being arranged with their raised surfaces in quadrature, while the anvil contacts of the two pairs are connected. Obviously, each of the levers by this arrangement need only vibrate half as rapidly as one would be forced to do. Similarly, if I should increase the number of cams and levers to three or four, the speed of vibration would be reduced to one-third or one-fourth, and so on. I am well aware that it is not new to provide a magneto interrupter with more than one pair of contacts, or with more than one contact lever. I am not aware, however, of any case in which a plurality of contacts or of levers are used for my purpose, and I
shall therefore claim the same, as well as the system employing them, and their method of use, broadly as well as specifically.

My invention is illustrated in the accompanying drawings in which—

Figure 1 is a front view of the interrupter embodying the invention.

Fig. 2 is a diagram of the preferred arrangement showing the circuits, and interrupter parts in exaggerated perspective.

Fig. 3 is a diagram of another arrangement.

Fig. 4 is a side view partly in section of a dynamo with my improved interrupter attached thereto.

While this invention may be used to advantage with any type of magneto in such a system and for the purpose herein described, it is particularly designed for use with the type of ignition dynamo described in my prior Patents No. 1,031,760 dated December 16, 1913, No. 1,105,361, dated July 28, 1914, and No. 1,126,676 dated January 26, 1915, the same being fully developed in my prior application Serial No. 35,155, filed June 19, 1915, in which I have described a rotor with two U-shaped oppositely polarized elements, the prongs of the U's bridging each other from opposite directions and alternating in position, each opposite pair being angularly displaced by 90° so that the four prongs are in quadrature. The fixed or armature poles in this arrangement are separated by an angular distance equal to the distance between the poles of a pair and the rotor, and when this four-pronged rotor is turned with relation to said fixed poles, there will be four reversals of polarity and therefore four E. M. F. and current waves produced in the generating coil whose magnetic core structure terminates in said fixed poles.

Fig. 4 shows partly in section the generator described in my said prior application, with the interrupter I mounted upon it.

The structure of this interrupter is better shown, however, in Figs. 1, 2 and 3. On the base 3& are pivoted the two contact levers 2& and 2", which are respectively held against their anvils 3 and 3" by the springs 5& and 5", each lever carries a bumper 1 or 1", and the two levers 2& and 2", as well as the two contacts 3 and 3", may conveniently be connected together, the two contacts being insulated, however, from the base in the same manner that the single anvil contact of my prior cases has been insulated. The connection of the levers and anvils is very well indicated in Fig. 2, both levers being shown as grounded or connected metallically to the frame of the machine, while both anvils, being insulated, are connected to the common conductor to which one end of the primary coil is connected.

With this arrangement, that is to say, with the lever contacts and the anvil contacts in parallel, the cams are formed as shown in Fig. 1 to maintain both pairs of contacts open during a brief portion of each quarter revolution, and to maintain one of the contacts open while the other is closed during another portion of each quarter revolution, the closing and opening of each contact alternating, and each being repeated twice in a complete revolution. The two cams employed are marked 3& and 3", the upper one 3& being shown in full lines and the contour of the latter one being indicated thereon in dotted lines. It should be particularly noted that the elevated operating surfaces 2& and 2" overlap at their ends. This means that one or the other of the pairs of contacts controlled by the levers 2& and 2", is always open, and that for a brief period in each quarter revolution when the overlapped portions of the operating surfaces are passing under the bumpers 3& and 3", both levers are held up and both pairs of contacts are open. After such a joint opening, one only is closed by the dropping of either the bumper 3& or the bumper 3" into a following depression. At the end of this depression said bumper will rise again and for a brief period both pairs of contacts are again opened, whereupon the other bumper will drop into a depression and so on. During each depression, the corresponding pair of contacts is closed for a portion of a fourth revolution of the cam, so that we have four short breaks per revolution, and by properly adjusting the cams on the rotor shaft, or if these are fixed, then by properly adjusting the interrupter casing and contact levers around the cams, we can time the four makes so that they will come precisely at the correct points on the four E. M. F. or current waves produced by the generating coil for each revolution of the rotor and its shaft. This rotor shaft is indicated by 9 in the drawings.

In Fig. 3 I have shown a modified circuit arrangement, in which the anvil contacts are connected as before, but are included in series with the contact levers 2& and 2", one of which is connected to ground and the other through conductor c to the coil 9, which on its other side is grounded. In this modification the contact levers must be insulated from each other, while the anvils are connected together, but insulated from both levers. Also, the cams are arranged without any overlap, so that one of the levers will always be closed. As a matter of fact, the best results in this form require the cutaway portions of the two cams to overlap, so that both levers will be closed during a part of each fourth revolution. The effect produced by closing both levers is supposed to be to shunt or disable the primary coil, the shunt being broken when either lever is raised through its anvil. As
each lever is raised by one face of its cam twice in a revolution, there are four breaks in the control circuit or shunt in a revolution and again by adjusting the levers and contacts with respect to the cams, we may time the interruptions so that they will come precisely at the proper points on the E. M. F. and current waves.

I wish it clearly understood that a number of changes and modifications in matters of detail can be made in this device without departing from the spirit of my invention, and I contemplate as my own all such non-essential changes and modifications as fairly fall within the scope of the appended claims.

Having thus described my invention, what I claim and desire to secure by Letters Patent is—

1. The method of controlling discharges at a relatively high frequency in a current generating coil, consisting in effecting a joint control through a plurality of pairs of contacts operating individually and independently to produce a discharge, said contacts being operated in succession whereby the time interval between any two contact operations of a single pair of contacts is equal to the time interval between discharges in the generating coil multiplied by the number of pairs of contacts.

2. The method of controlling discharges at a relatively high frequency in a current generating coil, consisting in effecting a joint control through a plurality of pairs of contacts arranged in multiple, operating said contacts in succession, and closing and opening a pair of contacts while the other contacts are open.

3. In an ignition system, a current generating coil, and devices for causing discharges at a relatively high frequency in the current generating coil, said devices including a plurality of pairs of contacts, and means for operating said contacts in succession, said means being timed so as to open and close a pair of contacts while the other contacts are open whereby each pair of contacts individually and independently control the discharge.

4. In an ignition system, a dynamo having a generating coil, a rotor adapted to produce a determinate number of E. M. F. changes in the coil for each rotation, a discharge circuit connected to said coil, and a governing device consisting of an interrupter having a plurality of pairs of contacts, and means for operating said pairs of contacts in succession and for closing and opening a pair of contacts while the other contacts are open whereby each pair of contacts individually and independently controls the discharge.

5. In an ignition system, a dynamo having a generating coil and a rotor adapted to produce a determinate number of E. M. F. changes in the coil for each rotation, a discharge circuit connected to said coil, and a governing device consisting of an interrupter having a plurality of pairs of contacts, each pair of contacts adapted to completely control the discharge and the two pairs acting in alternation, and means driven with the rotor to actuate said pairs of contacts alternately.

6. In an ignition system, a dynamo having a generating coil and a rotor adapted to produce a determinate number of E. M. F. changes in said coil for each revolution, a discharge circuit connected to said coil, and an interrupter comprising a plurality of pairs of contacts, and a plurality of cams for actuating said contacts driven with the rotor, the cams having their actuating surfaces angularly displaced from each other so that the pairs of contacts will be opened and closed alternately, said contacts being connected for separate and alternate active control of the discharge.

7. In an ignition system, a dynamo having a generating coil and a rotor adapted to produce a determinate number of E. M. F. changes in said coil for each revolution, a discharge circuit connected to said coil, an interrupter having a plurality of pairs of contacts connected in series in a control circuit rendering the discharge circuit normally inoperative, and a corresponding plurality of cams driven synchronously with the rotor, adapted to open and close said pairs of contacts in alternation, the number of actuating surfaces on each cam being such that the total number of operations of the associated pair of contacts in a given period of time will be equal to the total number of E. M. F. and current changes in the generating coil, divided by the number of pairs of contacts.

8. In an ignition system, a dynamo having a primary and a secondary generating winding, a field, and a rotor adapted to produce a determinate number of E. M. F. and current changes in said windings for each revolution, the two windings being connected to a common conductor at one end, the other end of the primary being grounded and the other end of the secondary connected to a discharge circuit, and an interrupter comprising a plurality of pairs of contacts connected to said common conductor, and a corresponding plurality of cams set in alternation and driven with the rotor, to actuate said pairs of contacts alternately and at each actuation to produce a discharge through the secondary winding into the discharge circuit.

9. In an ignition dynamo, an interrupter comprising a plurality of cams with their actuating surfaces angularly displaced so as to come alternately into working position, a
plurality of contact levers, one for each cam, a movable contact on the end of each lever, and a plurality of fixed or anvil contacts, one for each movable contact, said contacts and cams being adjusted so that when one pair of contacts is opened the others will be closed, and vice versa, and each pair when actuated will produce one complete interrupter operation.

10. In an ignition dynamo, a generating coil, means for producing E. M. F. and current changes in said coil, and an interrupter comprising a plurality of contact members acting in rotation, and each in its action completely and exclusively controlling the circuit of the dynamo, the number of actions of each contact member being equal to the total number of changes in the generating coil divided by the number of contact members.

11. In an ignition dynamo, an interrupter comprising a plurality of contact members arranged for alternate control of the dynamo circuit, and means for driving said members collectively at a speed such that the number of individual actions of each contact member for a given time will be less than the total number of current changes in the dynamo in the same time.

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

CHARLES THOMAS MASON.

Witnesses:

H. R. VAN DEVENTER,

EDNA ISLER.