My invention has relation to improvements in automobile ignition devices, and it consists in the novel features of construction more fully set forth in the specification and pointed out in the claims.

The invention is primarily directed to the distributor unit which controls the spark at the spark plugs and comprises a new type of distributing arm and breaker.

The principal object of the invention is to so construct both the distributing arm and the circuit breaker cooperating therewith that they may be serviceable over a long period of time without repairs or replacements. As a contributing factor to the accomplishment of this object I employ a rotating switch for interrupting the high potential circuit to the spark plugs instead of the usual cam control breaker points. The rotating circuit breaker arm and the distributing arm are similarly constructed in that they have a compressed graphite bearing held against a seat by spring pressure so that contact will be maintained irrespective of the wear on the bearing members.

A further object of the invention is to provide simple adjustment means in the breaker arm so that the length of time the circuit is open for the production of the spark may be easily varied. Further and other advantages will be better apparent from a detailed description of the invention in connection with the accompanying drawings, in which

Figure 1 is a vertical, middle, longitudinal section taken through my improved distributor unit, some of the parts being left in elevation; Fig. 2 is a top plan looking down on the distributor cap and housing; Fig. 3 is a horizontal cross-section taken on a plane indicated by the line 2—2 in Fig. 1; Fig. 4 is a horizontal cross-section taken on a plane indicated by the line 4—4 in Fig. 1; and Fig. 5 is a vertical, longitudinal section of a modified form of my distributor unit.

Referring to the drawing, 1 represents the usual timer shaft driven by means of the gear 2 in the usual manner from the engine crank shaft at one-half the speed thereof. Loosely mounted on said shaft is a housing 3, generally known as the distributor housing, to the bottom of which is connected a lever arm 4 whereby the distributor housing 3 may be rotated to advance or retard the spark, as well known in the art. The distributor housing 3 is constructed of bakelite or similar insulating material and has an annular flange 5 formed on its inner surface to which is secured by screws or rivets a metallic disk 6 provided with a central opening 7 through which shaft 1 passes. The disk 6 is preferably made of copper and has a centrally disposed and upwardly presented boss 8 and a series of contact surfaces 9, 9, etc., adjacent the periphery of the disk, said contact surfaces lying in the same plane as the top surface 10 of the boss 8.

The contact surfaces 9 are separated by gaps 11, 11, etc., equal in number to the number of spark plugs that are to be fired. In the present instance, there are six of such gaps 11 so that the distributor illustrated would be adapted to a six-cylinder engine, assuming each cylinder to have one spark plug. The shaft 1 has oppositely disposed fins 12, 12 formed on it immediately above the disk 6 to receive the rotating switch 13 which serves as the breaker for the low potential circuit in order to cause the induced high potential current necessary to give the spark at the plugs.

The circuit breaker arm 13 comprises a bakelite disk 20, to the top of which is attached (by cementing or in some equivalent manner) a copper plate 15 and to the bottom of which is attached (in any suitable manner) a compressed graphite ring 16 which serves as a self-lubricating bearing resting 25 on the central boss 8 of the copper plate 6. Obviously, the assembled disk 14, plate 15 and ring 16 are provided with a central opening 17 to receive shaft 1, which opening has oppositely disposed notches 18, 18 to receive the fins 12, 12 formed 30 on the shaft. There should be sufficient clearance between the shaft and the opening 17 and notches 18 so that the circuit breaker arm 13 may freely slide downwardly under the tension imposed by a bifurcated spring 19 fixed inside of housing 3 35 by means of a binding post 20. The disk 14 carries an adjustable copper arm 21 securely held in contact with the copper plate 15 by means of a screw 22 screwed into a tapped opening 23 in the disk 14. Radial adjustment of the arm 21 is obtained by means of a slot 24 in the arm 21. A contact element 25 is securely fixed by means of a rivet 26 on the outer end of the arm 21, said contact element preferably being made of a composition of copper and graphite of such character as is readily procurable on the market.

The bottom surface 28 of the contact element 25 lies in the same plane as the bottom surface of the graphite ring 16 so that when said ring is resting on the boss 6 the contact element will be so disposed in the plane of one of the contact surfaces 9.

The distributor for carrying the high potential current to the spark plugs comprises the distributor cap 27 formed of bakelite or equivalent...
material and the rotating switch 28. The switch
29 comprises a bakelite disk 29 having an arm 30
extending outwardly from it, on the end of which
is riveted, or otherwise secured, a contact 31. In
the present instance the contact 31 is secured by
rivet 32 which also secures the end of the arm 30
and a spring 33. On the side of the disk 29 oppo-
site the spring 33 is a graphite ring 34 which bears
against the smooth surface of a brass 35 formed on
the inside of the bakelite cap 27. The distributor
shaft 1, in the present instance, is formed of in-
sulating material and has a socket 36 formed in
its upper end, at the opposite sides of which are
mounted switches 28. The switch 28 comprises a
metallic pin 33 having a flange 39 which rests on
the end of shaft 1 and oppositely disposed fins 40, 40
which fit into the notches 37, 37 of the socket 36. The
disk 29 and ring 34 are also provided with an
opening 41 having oppositely disposed notches
42, 42 for receiving the pins 33 and fins 40, 40. Thus,
the distributing arm will be rotated with the shaft
1, at the same time being held against the boss 35 and
the cap 27. However, there should also be clearance
between the pin 36 and the distrib-
uting arm so that as the ring 34 wears the distrib-
uting arm will be free to move upwardly under the
tension of the spring 33.

The usual metallic bushings 43 are fixed in the
hollow bosses 44 of the distributor cap 27 for the
purpose of receiving the leads from the spark
plugs. Each of the bushings 43 is also provided
with the usual contact 45 over which the contact
31 of the distributing arm 30 rides. The con-
tacting surfaces of the contacts 31 lie in the
same plane as the bearing surface of graphite
disk 34 so that as the disk 34 wears contact is
always assured between the contact 31 and con-
tacts 45. At the center of the distributor cap
27 is a hollow boss 46 also provided with a bush-
ing 47 for receiving the lead from the induction
coil, said bushing 47 having a socket 46 which
receives the pin 38. A coiled spring 48 is disposed
in the socket 46 and serves to hold the pin 38 in
the end of the distributor shaft 1. The binding
post 28 is the conductor with one of the
primary circuit from the battery (not shown),
and also has a conductor 50 leading to the usual
condenser 51 disposed beneath the disk 6. The
opposite side of the condenser, as is well under-
stood, and the metallic disk 6 have connection with
the frame of the automobile. The usual clips 52 are
provided for se-
curing the cap 37 to the housing 3.

The operation of my improved distributor unit
is on the same principle as that of other distribu-
tor units of the typical battery ignition system.
As stated above, the shaft 1 is rotated from the
crank shaft of the engine and makes one revolu-
tion to every two revolutions of the engine shaft.
With the rotation of the shaft 1 the rotating
breaker switch 13 and the distributing switch 28
are also rotated. As the contact 31 contacts suc-
essively with the contacts 43 for the respective
spark plugs, the contact 25 of the breaker arm
will be passing over the corresponding gap 11 to
break the low tension circuit causing the spark
at the spark plugs.

Obviously, after a long period of use the bear-
ing surfaces of both graphite rings 16 and 34 will
wear. But since both the distributor switch 28
and the breaker switch 13 are freely movable on
the pin 38 and shaft 1, respectively, this wear will
be taken up as rapidly as it occurs and the con-
tacts 31 and 25 will be assured of continuous con-
tact with the contacts 45 and contact surfaces 9,
respectively. Preferably the wearing qualities of
the center bearing rings and of the peripheral
contacts are equalized so that these elements will
wear uniformly.

If it should be necessary for the improvement
of the performance of the engine to shorten the
time during which the high tension circuit is open
this may be done by adjusting the arm 24 of the
breaker switch outwardly. On the other hand, if
the gap should be lengthened in point of time this
arm is adjusted inwardly. The time at which
the breaker in the circuit occurs relative to the
making of the contact to close the circuit to the
sparks is determined by accurately aligning the
arm 21 angularly with respect to a radial line.

In Fig. 5 I show a modification of the invention
in which the distributing arm 60 operates over contacts 61, 61, etc., disposed around the wall of
the distributor housing 62 instead of in the cap
63 thereof. The arm 60 is forked at its outer end
64, the branches 65, 65 of which serve solely as
bearing members, riding on the inner surfaces of
rings 66, 66. A middle arm 67 engages contacts
61 leading to the respective spark plugs (not shown). The arm 68 is pressed outwardly into a
positive contact with the contacts 61, 61 by a
spring 68.

Having described my invention, I claim:
1. An ignition timing device for internal combus-
tion engines comprising a housing, a cap
mounted thereon, a plurality of electric con-
ducting surfaces lying in a common plane in spaced
relation within said housing, a shaft in said
housing, a rotating switch arm operated by said
shaft and slideable longitudinally thereon, a sup-
porting surface for said switch arm, a bearing
surface on the switch arm having rubbing con-
tact with the supporting surface, a contact ele-
ment on the switch arm for engagement with the
aforesaid electric conducting surfaces, and a sin-
gle means for maintaining the bearing surface in
contact with the supporting surface and the con-
tact element in engagement with the conduct-
ing surfaces.
2. A ignition timing device for internal combus-
tion engines, comprising a plurality of electric
contacting surfaces, a supporting member for said conducting surfaces, a rotating switch
arm bearing on said supporting member and hav-
ing non-electrical contact therewith near the
rotating end of said switch arm, a bearing on the
outer end of said switch arm, and a means for
exerting pressure on the switch arm to con-
tinually maintain said pressure on said switch arm,
and a means for exerting pressure on said switch
arm to continuously maintain said pressure on
said switch arm,
3. An ignition timing device for internal combus-
tion engines comprising a plurality of spaced
electric conducting surfaces, a supporting mem-
ber for said conducting surfaces, a rotating switch
arm bearing on said supporting member and hav-
ing non-electrical contact therewith a
contact element carried by said switch arm, and
means for exerting pressure on said switch arm,
and means for exerting pressure on said switch
arm to continuously maintain said pressure on
said switch arm.
4. An ignition timing device for internal combus-
tion engines comprising a plurality of spaced
electric conducting surfaces, a supporting mem-
ber for said conducting surfaces, said supporting
member having a bearing surface in parallelism with said conducting surfaces, a rotary switch disposed adjacent to said supporting member, said switch having a bearing member in non-electric contact with the bearing surface, a contact element carried by the switch and making electric contact with the conducting surfaces, means for urging the bearing member and contact element of the switch against the bearing surface and conducting surfaces respectively, and means for rotating said switch.

5. An ignition timing device for internal combustion engines comprising a plurality of spaced electric conducting surfaces, a supporting member for said conducting surfaces, a rotary switch disposed adjacent to said supporting member, said switch having a bearing member in non-electric contact with the supporting member, means for urging the bearing member against the supporting member, a contact element carried by the switch and making electric contact with the conducting surfaces, means for rotating said switch, and means for regulating the time during which said switch contact engages the conducting surfaces.

6. An ignition timing device for internal combustion engines comprising a distributor and a circuit breaker, said distributor comprising a plurality of spaced contacts, a supporting member for said contacts, a distributor arm bearing on said supporting member and having non-electrical connection therewith, said arm having an electric contact element disposed in the plane of the spaced contacts, means for exerting pressure on the distributor to hold the same against the supporting member, said circuit breaker comprising a switch arm, a second supporting member for said switch arm, spaced electric contacts on said supporting member, said switch arm arranged for electrical connection with said contacts and non-electrical connection with the second supporting member, means for exerting pressure on the switch arm to hold the same against the supporting member, and means for rotating the distributor arm and switch arm in synchronism.

7. An ignition timing device for internal combustion engines comprising a housing, a plurality of circularly spaced contacting surfaces within said housing and having their contact surfaces in a common plane, a rotary switch arm mounted in said housing and having a contact at its outer end for engagement with said housing contacts, the inner end of said switch arm having an annular bearing surface about the center of said housing, an annular bearing surface carried by said housing and cooperating with the annular bearing surface of the switch arm, and a spring urging said switch arm toward said spaced contacts and the housing bearing surface.

8. An ignition timing device for internal combustion engines comprising a housing, a plurality of circularly spaced contacts within said housing and having their contact surfaces in a common plane, a rotary switch arm having a contact at its outer end for rubbing engagement with said spaced contacts and an annular bearing surface carried by said housing and lying in a plane parallel to the plane of the spaced contacts, a drive shaft for said switch arm, said shaft having means for positively rotary driving of said arm but permitting free relative axial movement thereof so that wear between the bearing surfaces and between the contacts may be automatically compensated, and a single yieldable means for pressing the bearing surfaces and contact surfaces into engagement.

9. An ignition timing device for internal combustion engines comprising a housing, a plurality of circularly spaced contacting surfaces located in a common plane within said housing, a central annular bearing surface carried by said housing and located in a plane parallel to the plane of the spaced contacting surfaces, a drive shaft extending through said housing bearing surface, a rotary switch arm having a contact at its outer end for engagement with said spaced contacting surfaces, and an annular bearing at its inner end loosely surrounding said shaft and resting on said housing bearing surface, so that said arm has free axial movement relative to said shaft, and yieldable means urging said arm toward the housing bearing surface and spaced contacting surfaces.

10. An ignition timing device for internal combustion engines comprising a housing, a plurality of circularly spaced contacting surfaces within said housing and located in a common plane, an annular bearing surface within said housing, a drive shaft extending through said bearing surface, a floating rotary switch arm having a contact at its outer end for rubbing contacts with said spaced contacting surfaces and an annular bearing surface at its inner end cooperating with said housing bearing surface, means for driving said arm from said shaft and permitting free relative axial movement between said shaft and arm, and yieldable means urging said arm toward said contacting surfaces and said housing bearing surface.

11. An ignition timing device for internal combustion engines comprising a support, a plurality of circularly spaced contacting surfaces carried thereby and located in a common plane, said support having a shaft opening there through and an annular bearing surface surrounding said opening and located in a plane parallel to the plane of the contacting surfaces, a drive shaft passing through said opening, a rotary switch arm having a contact at one end for rubbing contact with said contacting surfaces and an annular bearing surface at its other end fitting loosely around said shaft and in operative engagement with said support bearing surface, said arm having free axial movement relative to said shaft, a positive driving means between said shaft and arm and yieldable means urging said arm toward said support axially of said shaft.

ROYDEN H. TILLSON.