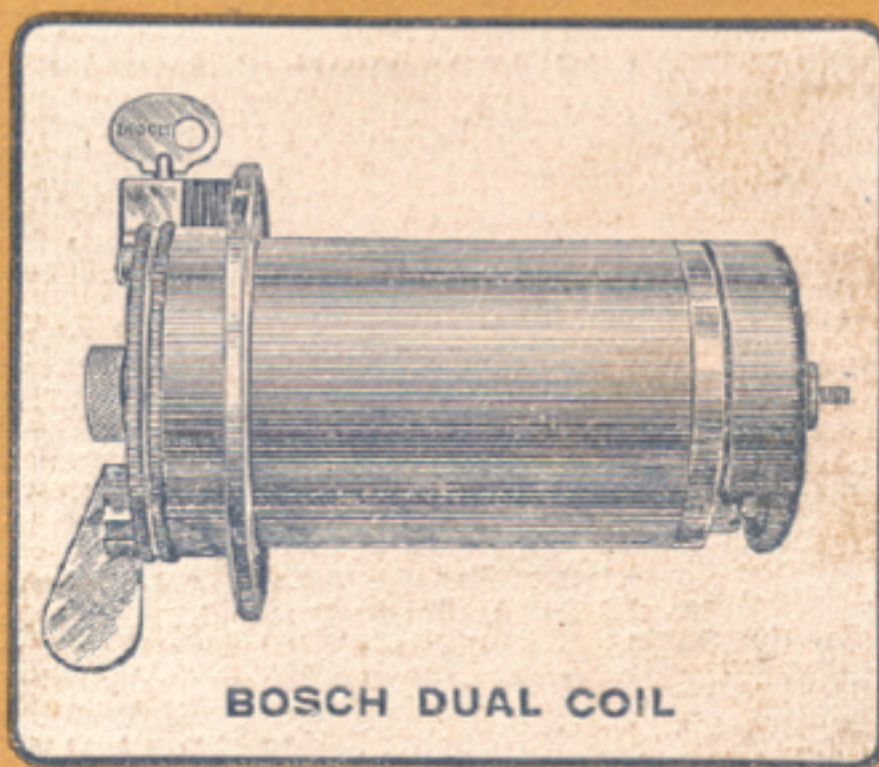


BOSCH



BOSCH DUAL COIL

DUAL IGNITION

FOR "DU" and "ZR" TYPES OF BOSCH MAGNETOS

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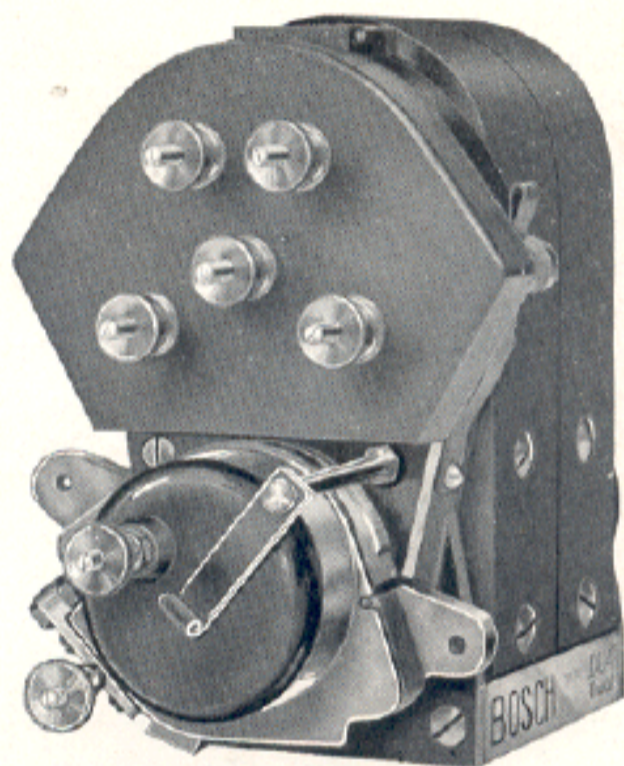
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BOSCH



Dual Ignition Instruction Book

With directions for operation, care
and setting; dimensions and spare
parts for types "DU" and "ZR"

BOSCH MAGNETO COMPANY

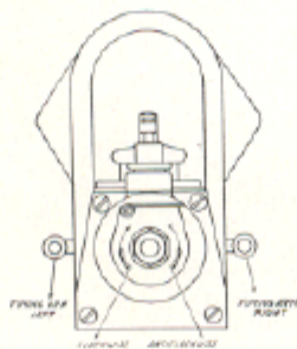
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CHICAGO DETROIT SAN FRANCISCO TORONTO

Factories, Springfield, Mass. and Plainfield, N. J.

Important.

In ordering a magneto, it is necessary to specify the direction of rotation; that is, whether the magneto is to be driven clockwise or anti-clockwise. It is necessary to state also whether the timing control arm is to be located on the right or left side of the magneto. In both cases, the magneto is to be viewed from the driven end.



To insure the selection of a magneto of the correct type, the bore and stroke of the engine should be stated as well as the minimum and maximum speed, and whether the cycle is two or four stroke. If these details are not known, it will be necessary to state the make and power of the engine, or the make, model and year of the automobile.

The illustrations accompanying the matter in this booklet are of the "DU4" and "ZR4" Dual Magnetos; they indicate the principle of the Bosch Dual System, and the application of this system to the "DU3," "DU6," and that to "ZR3," "ZR6," etc., is identical.

BOSCH DUAL IGNITION SYSTEMS

The Bosch magneto of the Independent type is capable of producing ignition of the most satisfactory character, but as it generates a current only when the armature is in motion, it is necessary to crank an engine in order to start it in operation.

It follows that there are certain advantages in providing an engine with a system of ignition having a battery as a source of current in addition to the magneto, for this enables the engine to be started at a low cranking speed, and, with certain modifications, makes it possible to set the engine in operation by the simple throwing of the switch or the pressing of a button. An arrangement of this sort makes a special appeal to the woman who drives.

When two sources of current are used, the maximum reliability is secured by providing two entirely distinct sets of apparatus—each source of current thus having its own timing device, transformer, spark plugs, etc. It is not always possible to provide locations for two spark plugs in a cylinder, however, or to arrange for two shafts by which the magneto and the battery timer may be driven. For such designs, the Bosch Dual System is offered, and this provides the engine with two ignition systems that, while they make use of the same spark plugs and distributor, are otherwise absolutely distinct.

As reliability is the most essential feature to be considered in an ignition system, an outfit providing two sources of current should be so constructed that the circuits of the magneto and of the battery are as independent of each other as it is possible to have them, for then the breakdown of one system will least affect the operation of the other. The Bosch Dual Ignition System is designed along these lines, and offers great advantages with a minimum number of parts used in common by the two sources of current. It may be pointed out that in many of the so-called "dual" systems on the market, the magneto and battery circuits include practically the same parts, and in consequence, a breakdown of one part will render both systems inoperative.

To be satisfactory for its purpose, a dual ignition system should make it possible to operate on battery or on magneto at ordinary engine speeds without interference with engine efficiency.

This end cannot be attained with the ordinary vibrator coil, because the uncertain lag in the battery side will not permit the synchronizing of the battery and magneto sparks.

The battery side of the Bosch Dual Ignition System is so arranged that there is no lag in the production of the battery spark, and in consequence, the battery and the magneto may be perfectly synchronized.

The system consists of a magneto of the "ZR," or "DU" type of the Dual model and includes a special synchronized battery coil.

The Dual Magneto

The Bosch Dual Magneto is of the standard Bosch type, and produces its own sparking current, which is timed by the revolving interrupter with which all users of Bosch apparatus are familiar. The

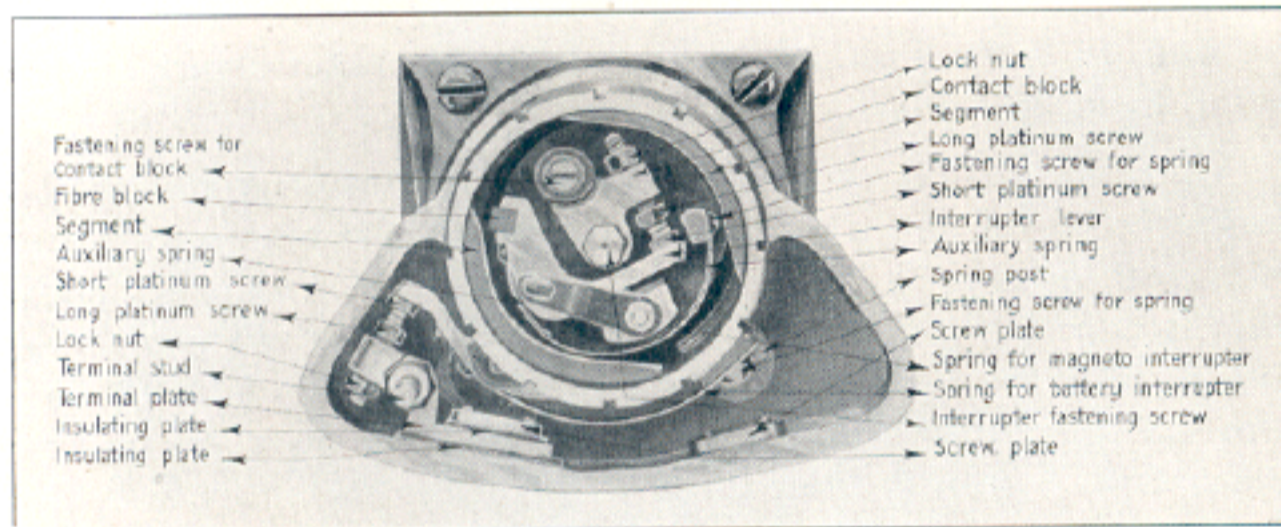


Fig. 1—INTERRUPTER AND BATTERY TIMER
FOR TYPE "ZR4" DUAL

parts of this interrupter are carried on a disc that is attached to the armature and revolves with it, the segments that serve as cams being supported on the interrupter housing.

In addition, the magneto is provided with a steel cam having two projections, which is built into the interrupter disc. This cam acts on a lever that is supported on the interrupter housing, the lever being so connected in the battery circuit that it serves as a timer to control the flow of battery current through the coil. These parts may be seen in Fig. 1.

It is obvious that the sparking current from the battery and from the magneto cannot be led to the spark plugs at the same time, and a further change from the magneto of the Independent form is found in the removal of the conducting bar between the collecting ring and the

distributor. The collecting ring brush is connected to the switch, and a second wire leads from the switch to the terminal that is centrally located on the distributor.

When running on the magneto, the sparking current that is induced thus flows to the distributor by way of the switch contact. When running on the battery, the primary circuit of the magneto is grounded, and there is, therefore, no production of sparking current by the magneto; it is then the sparking current from the coil that flows to the distributor connection.

It will thus be seen that of the magneto and battery circuits, the only parts used in common are the distributor and the spark plugs.

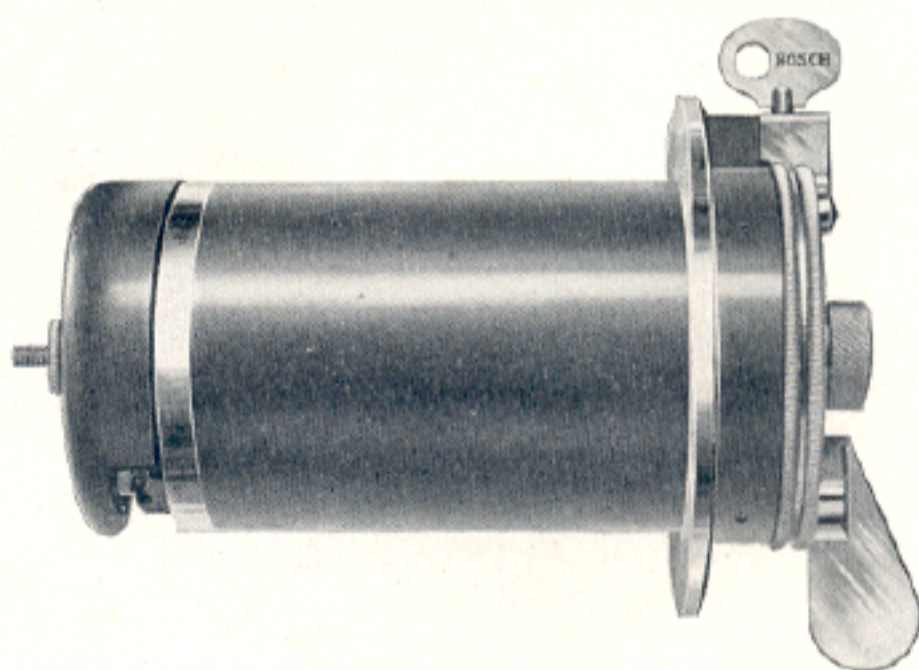


Fig. 2—COIL COMPLETE

The Bosch Synchronous Coil

The Bosch Synchronous Dual Coil is of special design, and embodies several unique features that add greatly to its usefulness. As may be seen in Fig. 2, the coil consists of a cylindrical housing bearing a brass casting, the flange of which serves to attach the coil to a dashboard, bulkhead, or other support.

The coil is provided with a key and lock, by which the switch may be locked when in the "Off" position. This is a point of great advantage, for it makes it unlikely that the switch will be left in the battery position when the engine is brought to a stop. The absence of such an attachment is responsible in a large measure for the accidental running down of the battery. This locking device also prevents the unauthorized operation of the engine.

The parts of the coil may be seen in Fig. 3 and in addition to the housing and end plate, they consist of the coil itself, the stationary switch plate, and the connection protector.

When the engine is running on battery ignition, a single contact spark is secured at the instant when the battery interrupter breaks its circuit, and the intensity of this spark, as well as the accuracy with which it occurs, permits the continued and efficient operation of the engine on the battery system.

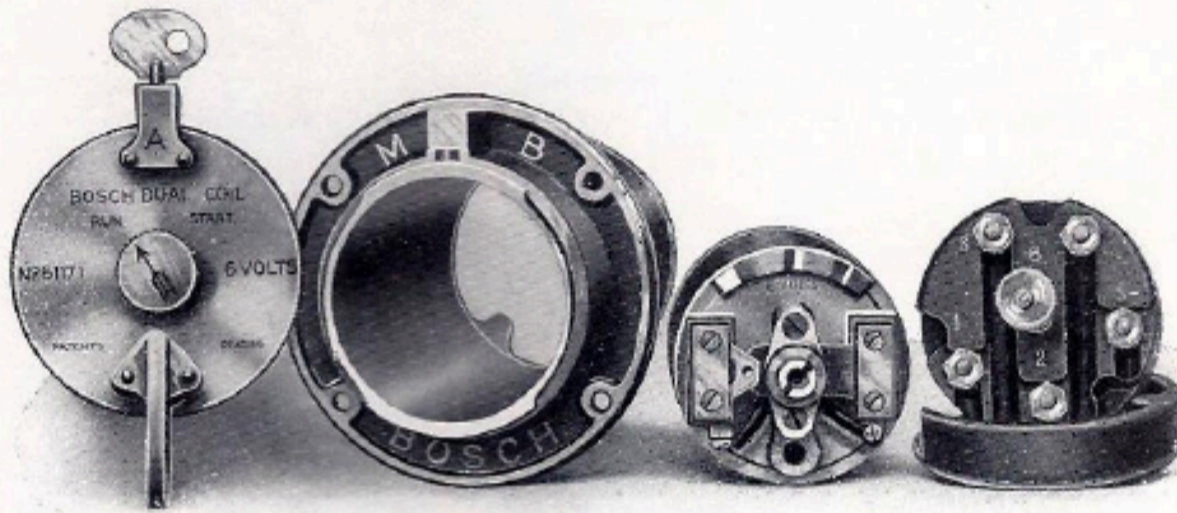


Fig. 3—PARTS OF THE COIL

Switch

The end plate of the housing carries a handle by which the switch may be operated. By means of this switch either the magneto or the battery may be employed as the source of ignition current, and in its operation the entire coil is rotated within the housing. The inner side of the stationary switch plate is provided with spring contacts that register with contact plates attached to the base of the coil.

Independence of the Systems

It will thus be seen that with the exception of the distributor and spark plugs the magneto and battery circuits are absolutely distinct, each possessing its source of current and its timing apparatus. It is obvious, therefore, that an injury to the parts of one circuit will not prevent the production of an ignition current by the other, and the value of this patented and exclusive feature of the Bosch Dual Ignition System cannot be overestimated.

Starting on the Spark

For the purpose of starting on the spark, a vibrator may be cut into the coil circuit by pressing the button that is seen in the center of the

end plate in Fig. 2 and on the coil body in Fig. 3; normally, this vibrator is out of circuit, but the pressing of the button brings together its platinum contacts and a vibrator spark of high frequency is produced.

It will be found that the distributor on the magneto is then in such a position that this vibrator spark is produced at the spark plug of the cylinder that is performing the power stroke; if mixture is present in this cylinder, ignition will result and the engine will start.

Connections

The wiring diagram of this system is shown in Fig. 4. It will be noted that while the Independent magneto requires but one switch wire in addition to the cables between the distributor and spark plugs, the

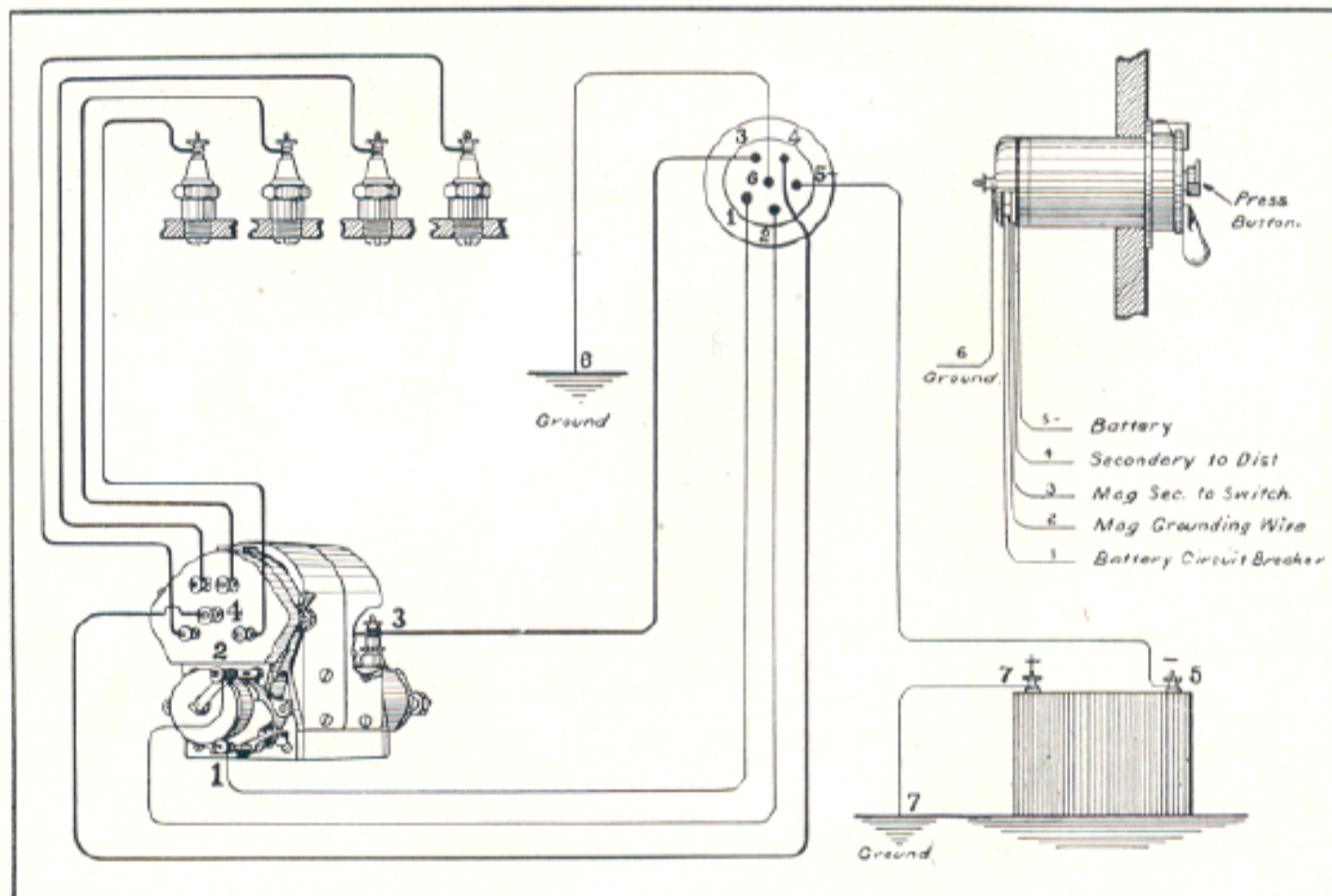


Fig. 4—WIRING DIAGRAM OF THE "DU4" DUAL SYSTEM

(In some magnetos of the Model 4 class, the grounding terminal is located on the side of the circuit breaker housing, as shown in Plate 1, Page 23)

Dual system requires four connections between the magneto and the switch; two of these are high tension and consist of wire No. 3 by which the high tension current from the magneto is led to the switch contact, and wire No. 4 by which the high tension current from either magneto or coil goes to the distributor. Wire No. 1 is low tension, and conducts the battery current from the primary winding of the coil to the battery interrupter. Low tension wire No. 2 is the

grounding wire by which the primary circuit of the magneto is grounded when the switch is thrown to the off or to the battery position. Wire No. 5 leads from the negative terminal of the battery to the coil, and the positive terminal of the battery is grounded by wire No. 7; a second ground wire No. 6 is connected to the coil terminal. The simplicity of this wiring requires little comment.

It is advisable to use Bosch Loop Terminals for all connections for which special terminals are not provided, as these present a maximum protection against the straying of wire strands and consequent short-circuiting.

Setting the "DU" Magneto

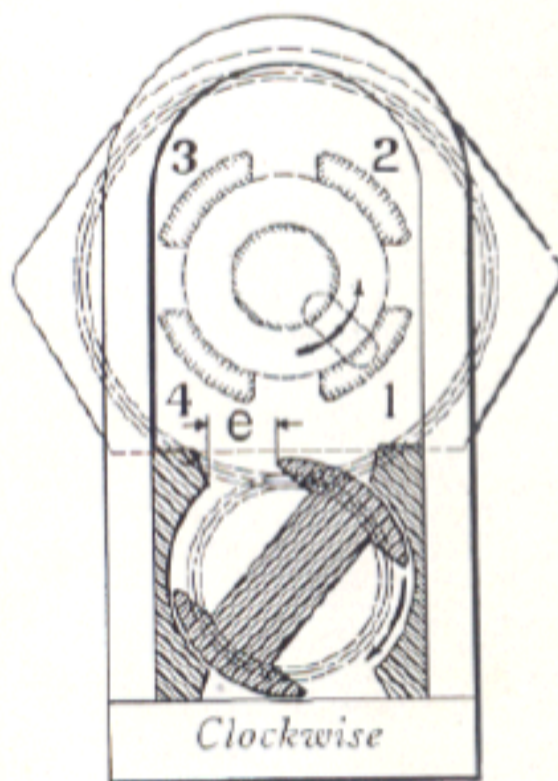


Fig. 5

The timing of the Bosch Dual Magneto is identical with that for the standard type. The dual magneto is so arranged that the battery interrupter breaks its circuit approximately 10 degrees later than the magneto interrupter; this feature gives the full timing range of the magneto. With the timing lever fully retarded and the switch in the battery position,

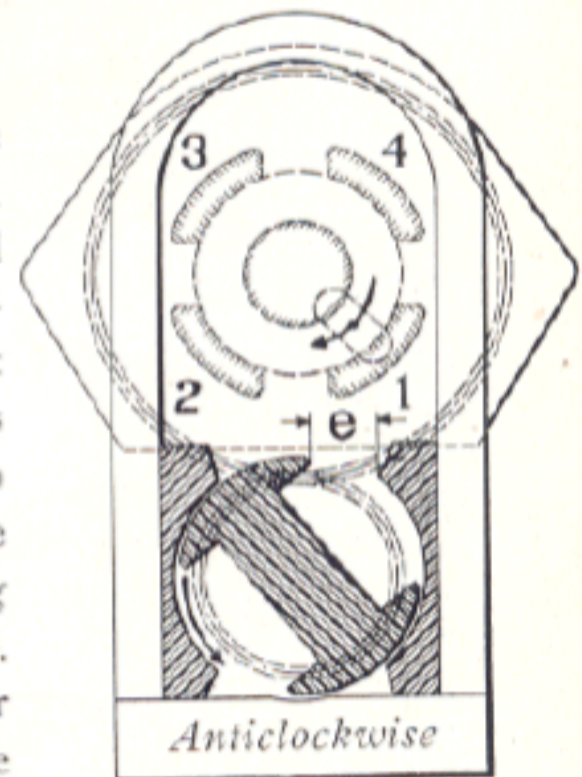


Fig. 5

the battery spark will occur after the piston has passed dead center and is moving down on the power stroke. The possibility of a back kick is thus eliminated.

With the exception of the magnetos of the class known as "Model 5," the timing of the Bosch Dual Magneto to the engine is identical with the timing of the standard Independent type. The process here described should be adhered to as far as possible, although variations in engines may make it advisable to alter the procedure somewhat.

The magneto should be placed in position on the bed plate or bracket provided for it, the bolts or straps being properly secured; the driving gear or coupling, however, should be loose on the armature shaft.

The dust cover, which is an aluminum plate located under the arch of the magnets, should then be removed, and this is accomplished according to the design of the various types of magneto.

In some designs it will be found that the dust cover is secured in position by means of screws, while in others it is held by means of spring catches. If the latter is the case, the cover may be sprung off by the use of a screw driver. The operation should be attended with the greatest possible care, in order to guard against the possibility of injuring the winding through the slipping of the tool; it is also essential to prevent the small screws or any other foreign body from falling into the armature tunnel while the dust cover is off.

The engine should now be cranked until one of the pistons—preferably that of cylinder No. 1—is at the top of the compression stroke.

With the engine in this position, the armature should be rotated by hand in the direction in which it will be driven until it is approximately in the position illustrated in Fig. 5.

The setting of the armature is determined by the dimension marked “c,” Fig. 5, as follows:

<i>For Four-Cycle Engines</i>	<i>For Two-Cycle Engines</i>
“DU3” Model 4... 11 to 14 mm.	“DU3” Model 4... 8 to 11 mm.
“DU4” “ “... 13 to 15 mm.	“DU4” “ “... 10 to 13 mm.
“DU6” 16 to 20 mm.	“DU6” 12 to 16 mm.

These settings represent an advance of from 10 to 15 millimeters on engines of 130 millimeters stroke.

With the armature held in the proper position, the gear or coupling should be secured. The greatest care should be exercised to prevent the slipping of the armature during this operation.

The driving shaft of a Bosch Magneto is tapered, and if the part that is attached to it is accurately tapered to correspond, the setting up of the nut should be sufficient to retain the armature in the proper relation. The driving shaft is provided with a keyway, and a Woodruff key may be used if it is considered advisable.

This operation of setting establishes a definite relationship between the armature and the crank shaft, the result being that the current produced by the magneto will be at its maximum when the piston is in the firing position.

It should be noted that an exact setting cannot be indicated in these instructions because of the variation in engines. The above settings will permit an engine to be started and operated, however, and finer settings may be obtained by experiment.

Setting the "ZR" Magneto

In the "ZR" magneto it is unnecessary to remove either the interrupter housing cover or the distributor plate in order to determine the setting of the instrument, or to locate the distributor terminal with which contact is being made.

The magneto having been bolted into position, the crank shaft is to be turned to bring one of the pistons, preferably that of cylinder No. 1, to the firing position for full advance. This point may be determined by the table and diagram given in the "ZR" instruction book, or by inquiry from the manufacturer of the engine.

The armature is then rotated until the figure "1" can be seen through the window in the face of the distributor plate. The cover of the oil well on the distributor end of the magneto is then to be raised, and the armature is to be turned a few degrees in one direction or the other until the red mark on one of the distributor gear teeth is brought into register with the red marks on the side of the window located between the two oil ducts.

The magneto is then in time for the full advance position, and the gear or coupling is to be secured to the armature shaft. Great care should be taken not to disturb the position either of the crank shaft or of the armature shaft when fitting the driving member.

Making the Connections for the "DU" Dual Magneto

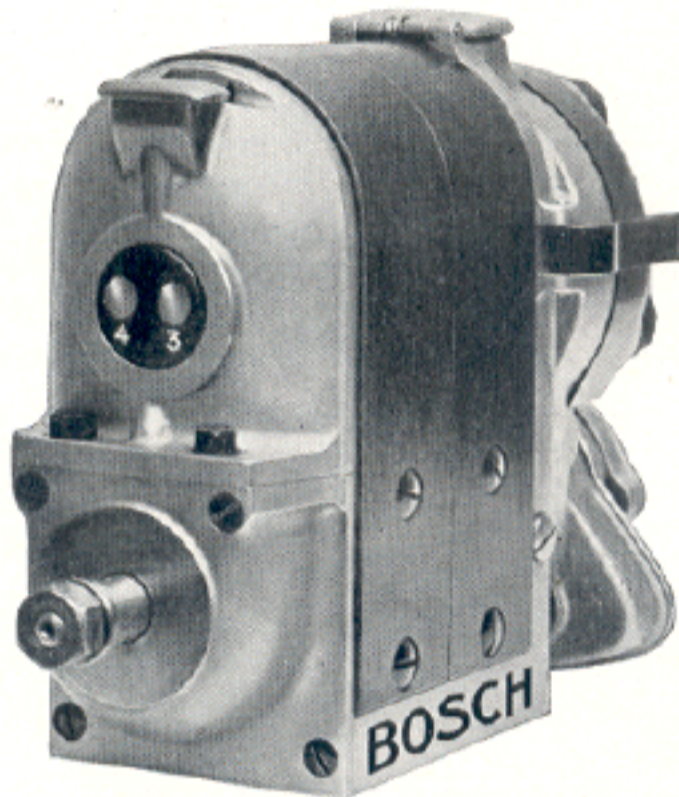
The connections between the distributor and the spark plugs should then be made and to permit this the distributor should be uncovered. On the "DU" types the pressing of the two flat springs that are observable on each side of the distributor gear housing will permit the removal of the distributor plate.

Cylinder No. 1 having completed compression, the distributor contact on which the distributor brush is resting should be connected to the spark plug of this cylinder. The spark plug of the second cylinder to fire should then be connected to the distributor terminal that will next be brought into the circuit by the movement of the distributor brush, and it should be borne in mind that the distributor brush rotates in the direction opposite to the rotation of the armature. The remaining cylinders should be connected to the distributor terminals according to their firing order. If the firing order is unknown, it may be ascertained by cranking the engine and observing the order in which the inlet or exhaust valves operate.

When these connections are complete, the dust cover, and the distributor cover or distributor plate, should be returned to position.

Making the Connections for the "ZR" Magneto

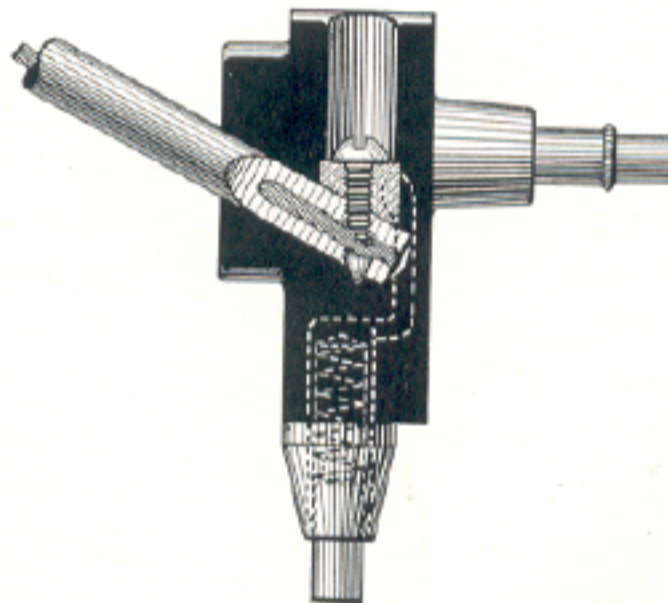
In the "DU" Dual magneto, the magneto current is led from the collector ring connection to the coil, and back to the distributor terminal that is located in the center of the distributor plate.



SHAFT END OF THE "ZR" DUAL
MAGNETO SHOWING THE CABLE
OUTLETS No. 3 and No. 4

The ends of the high tension wires No. 3 and No. 4 leading to the coil are then to be cut off square, and after being led through the hole in the hood, are to be pressed to the bottoms of the slanting holes in the boss. The pointed screws are then to be replaced in the vertical holes, and in being driven home, they will pierce the cables (and their insulation) and make the required connections. It is essential to use a screw driver of the proper size, for a tool with too large a blade will crack the vulcanite. Great care must be taken to apply the screw driver to the screws vertically, in order to avoid cracking the vulcanite by side pressure. When the connections are made the hood is to be replaced.

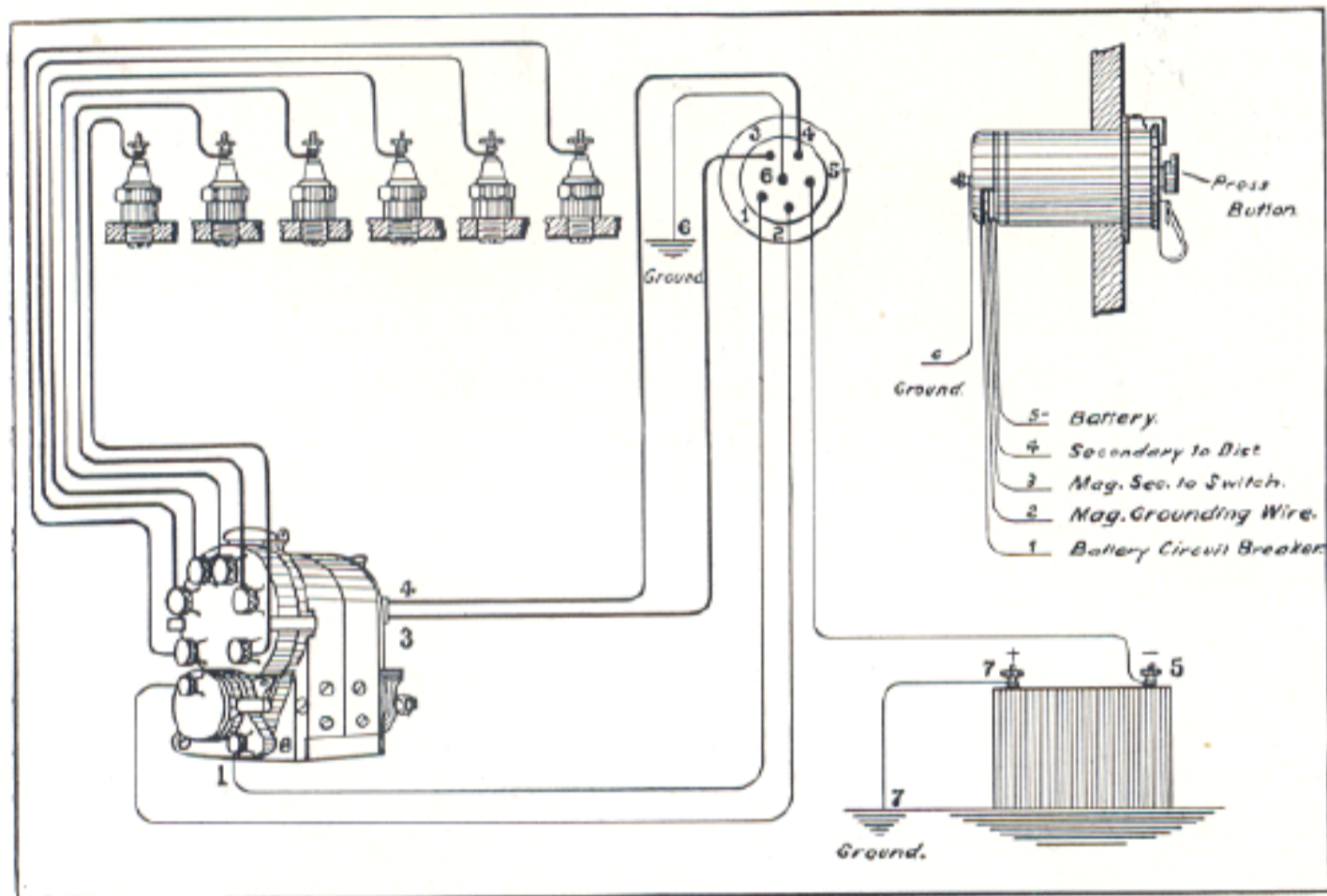
In the "ZR" Dual magneto this central distributor terminal is eliminated, and the current is led internally to the distributor from a connection on the shaft end of the magneto. To expose this terminal, the shaft end hood should be removed, which is done by withdrawing the two screws in its lower flange, and sliding the hood backward. The terminal will then be seen to be a vulcanite post, with a boss that projects through a hole in the hood. In the top of this post are two vertical holes, in the bottom of each of which is a screw. These screws are to be withdrawn.



CROSS SECTION OF THE INSULATED
STANDARD, SHOWING CABLE IN
POSITION, ALSO FASTENING
SCREW

All other connections to the magneto or coil should be provided with Bosch Loop Terminals. If Bosch Terminals are not at hand, the insulation is to be stripped from the cable to expose a sufficient length of wire to form a loop around the terminal screw, and no more. The wire is then to be twisted hard and bent to a circular or loop shape, after which the wire should be slightly tinned.

When the thumb nuts on the distributor plate are screwed into position, the edge should press on the end of the cable insulation, thus expanding it and making a tight, moisture-proof fit in the recess of the circular boss.



WIRING DIAGRAM OF THE "ZR6" DUAL SYSTEM

Starting the Engine

In order that the engine may be started on the spark, it must be in good mechanical condition and the cylinders must contain mixture. Starting the engine may be assured to the greatest possible degree if the engine is stopped by cutting off the ignition with the throttle wide open.

When a four-cylinder engine comes to a stop, the crank shaft will be approximately horizontal, and the pistons at the mid-point of their strokes; in this position of the crank shaft, the battery interrupter on the magneto will be open. As the battery interrupter and coil vibrator

are in parallel, a pressure on the starting button of the coil will close the battery circuit through the vibrator and coil, and high tension currents will be induced. The distributor brush at that instant will be in contact with the distributor terminal that is connected to the spark plug of the cylinder that is on the firing stroke. The ignition of the charge in this cylinder will follow and the engine will start.

If for any reason the engine comes to a stop with the pistons near the end of their strokes, the battery interrupter will be closed, and pressure on the button will not induce a vibrator spark, because the battery circuit will already be complete.

The connections of the push button are such that on the releasing of the button the circuit through the battery interrupter will be momentarily broken, and this will, of course, result in the production of a single contact spark. With this arrangement it is possible to secure a starting spark at any point in the rotation of the crank shaft, regardless of whether the battery interrupter is open or closed.

It is possible that the engine may occasionally come to a stop with the pistons in such a position that ignition cannot result in the rotation of the crank shaft, and in such an event, and also in the event of the cylinders not containing mixture, it will be necessary to crank the engine.

It will be noted that the press button is arranged to be set in either of two positions, which are indicated by an arrow engraved on its surface, or projecting from its edge. When the button is in such a position that the arrow is pointing to the word "run," a single contact spark will be produced when the engine is cranked, or when the engine is running with the switch in the battery position. Under all ordinary conditions, this button position should invariably be used.

When the engine is chilled, however, or under poor mixture conditions, starting can frequently be facilitated by pressing down the button and turning it slightly to the right so that the arrow is pointing to the word "start." This will lock the vibrator in circuit, and a shower of vibrator sparks will be produced in place of the single contact spark.

The reliability of the Bosch Magneto is such that the battery system is considered only as a means of starting, but in cases of emergency the engine may be operated on the battery. To secure the greatest possible life of the battery, however, it is advisable to switch over to the magneto as soon as the engine is started.

Battery

The standard Bosch coils are wound for a battery current of six volts, and either a storage battery or dry cells may be used. Good results will be obtained with a six-volt, sixty ampere hour storage battery, and when dry cells are used it is advisable to install ten for three and four-cylinder engines and twelve for six-cylinder engines, connected in multiple series.

The cells should be divided into two groups of five the cells of each connected in other words, the cell being connected in series, or, in carbon of one zinc of the next. This will leave terminal and one zinc terminal of each group free,

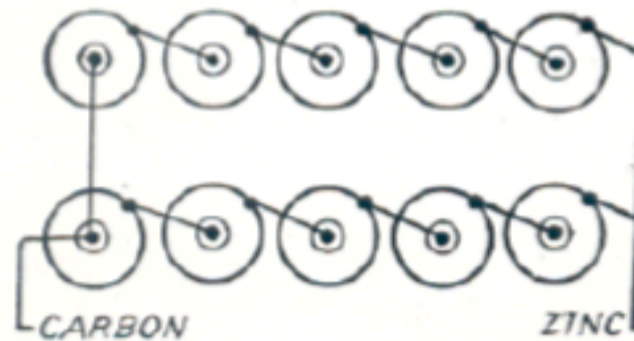


Fig. 6—BATTERY CONNECTION

or six cells each, group being series, or, in carbon of one zinc of the next. This will leave terminal and one zinc terminal of each group free,

and the two groups should be connected by leading the wire from the carbon of one group to the carbon of the other, and a second wire from the zinc of one group to the zinc of the other. This arrangement for ten cells is shown in Fig. 6. As has been explained, the wire from the carbon terminal should then be grounded, while the wire from the zinc terminal should be led to switch contact No. 5.

General Care

The magneto should be lubricated with a few drops of good oil once every four weeks or every 1000 miles, and the injurious effects of an excess of oil should be guarded against.

The platinum points of the magneto interrupter should be kept clean and smooth and so adjusted that they are open about 0.35 millimeter, or the thickness of the gauge attached to the adjusting wrench, when the magneto interrupter lever is wide open on one of the rollers or segments. It should not be necessary to clean or to readjust these points oftener than once a season, and it is not advisable to readjust them until their condition and the missing of the engine show it to be absolutely necessary.

Each coil is stamped with the voltage of the battery current for which it is wound, and if this voltage is not exceeded, the platinum contacts of the battery interrupter will not require attention for long periods. When the battery interrupter lever is being operated by the rollers or segments, the platinum points should be slightly wider open than the contact points of the magneto interrupter—the proper distance being about 0.4 mm.

Detection of Faults

In the event of a failure of ignition, it should be determined whether the defect exists in both the battery and the magneto side of the system, or in either one of them. This may be determined by throwing the switch from one position to the other.

If there is a continual miss in one cylinder on the magneto as well as on the battery, the fault usually lies in the spark plug, which will be found to be fouled, broken, or to have too wide a gap; the gap should be from .5 mm. to 1 mm. according to the characteristics of the engine.

If a failure is found in all cylinders on the battery as well as on the magneto, the probable fault will be a short circuit due to a failure of insulation of the cables, to improper contact, or to the grounding of the terminals; the fault may also be due to a broken cable. High tension cables Nos. 3 and 4 should be examined.

Magneto Faults—If the switch shows that the magneto is at fault, all the cables and terminals should be examined for improper connections. The coil and battery system may then be disconnected by removing the wires from terminals Nos. 3 and 4 of the magneto, and with a short piece of wire magneto terminal No. 3 may be connected directly with magneto terminal No. 4. This will conduct the high tension current induced in the magneto direct to the distributor. The grounding wire should then be disconnected from terminal No. 2 of the magneto. With this arrangement it should be possible to start the engine on the magneto, and it will be necessary to follow this plan should any accident happen to the coil.

To ascertain if the magneto is generating current, the grounding wire should be disconnected from terminal No. 2 on the magneto, and the high tension wire should be disconnected from terminal No. 3 on slip-ring brush holder. If the engine is then cranked briskly, a spark should appear at the safety spark gap that is located under the arch of the magnets on the dust cover, provided the magneto is in proper condition. The grounding wire should then be reconnected to terminal No. 2, and the engine cranked. If no spark appears at the safety spark gap, the trouble may be determined as a leakage of the primary magneto current to ground by chafed insulation, incorrect connections, or an injury to the switch parts.

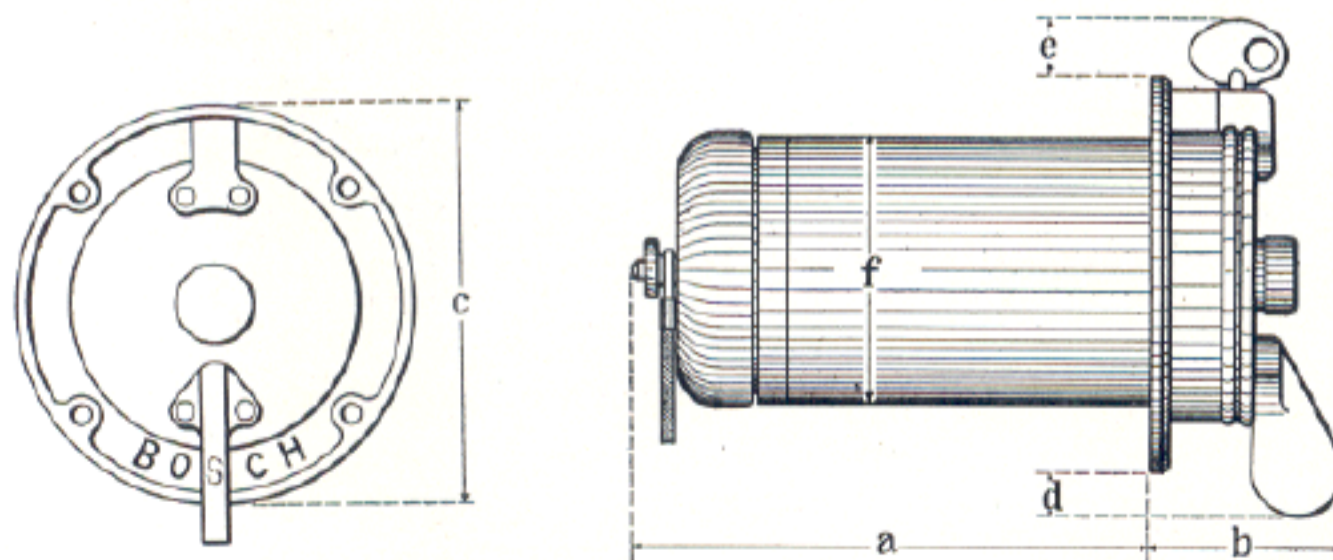
Should trouble with the magneto persist, the instruction book of the type in question should be consulted. This instruction book may be obtained from the main office or from any of the branch offices of the company.

Battery System Faults—If the engine misses on the battery and runs correctly on the magneto, the fault will usually be found in the battery itself, the voltage having dropped too low. Should the battery show the proper voltage, the battery interrupter should be examined to observe whether the lever is moving freely and whether the platinum points are clean and properly adjusted.

The design and construction of the coil are such that it very rarely causes trouble and users are warned against dismounting it. It may be tested by disconnecting wire No. 4 from the magneto and throwing the switch to the battery position, operating the press button with terminal No. 4 four mm. from the metal of the engine. If the coil is in good condition, a brilliant spark should be observed. If the spark does not appear, the test should be repeated with wire No. 3 disconnected. If the fault persists, the coil body may be removed from the housing by withdrawing the holding screw that is located close to the supporting flange; the switch should then be unlocked and the end plate given a quarter revolution. This will release the bayonet lock and the coil body may then be withdrawn to permit the inspection of the switch contacts both of the coil and of the stationary switch plate. It may be that the spring contacts are bent or otherwise in bad condition. The withdrawing of the coil body and its handling should be performed with extreme care. No work should be done on the coil in the way of withdrawing screws, etc., and if the inspection does not disclose the fault, the coil should be returned to its housing and the whole returned to the Bosch Magneto Company, or its nearest official representative (see inside back cover for locations of Bosch Branches, Distributors and Supply Stations).

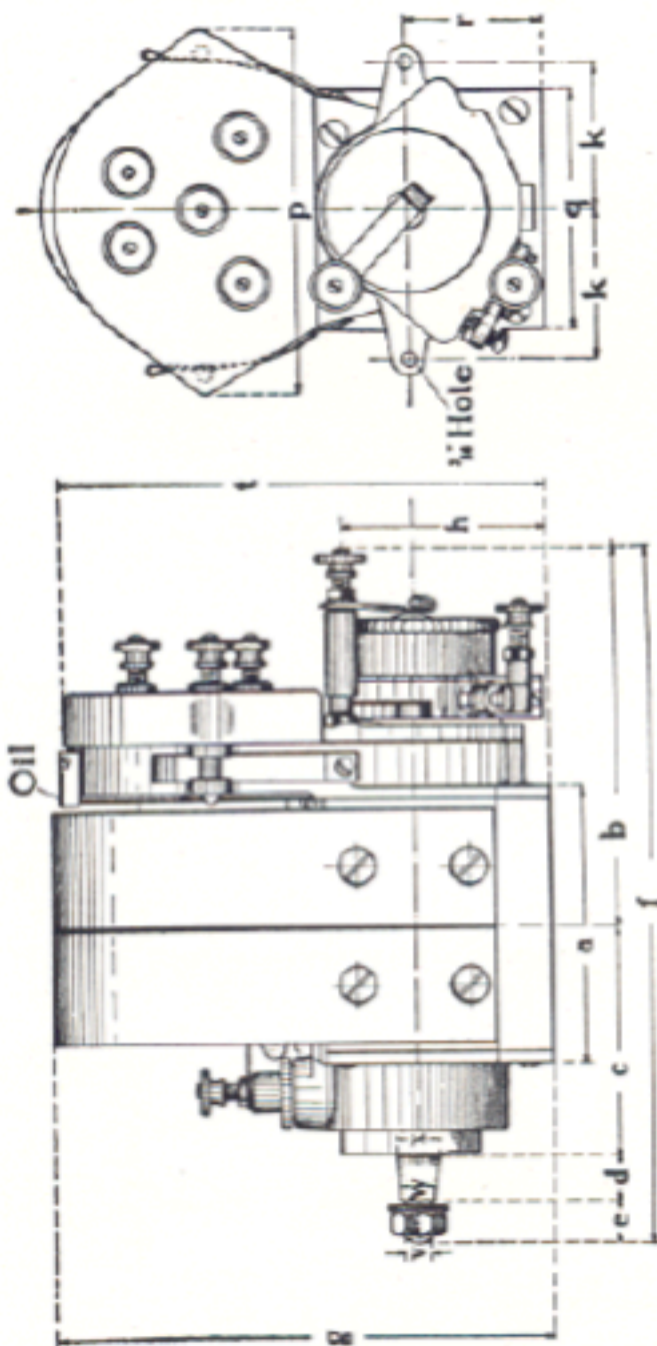
Dimensions of Dual Coils

<i>a.</i>	<i>b.</i>	<i>c.</i>	<i>d.</i>	<i>e.</i>	<i>f.</i>
135	48	105	10	17	71

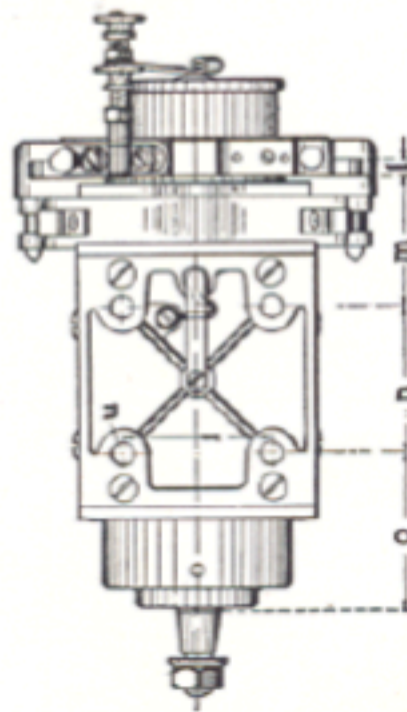


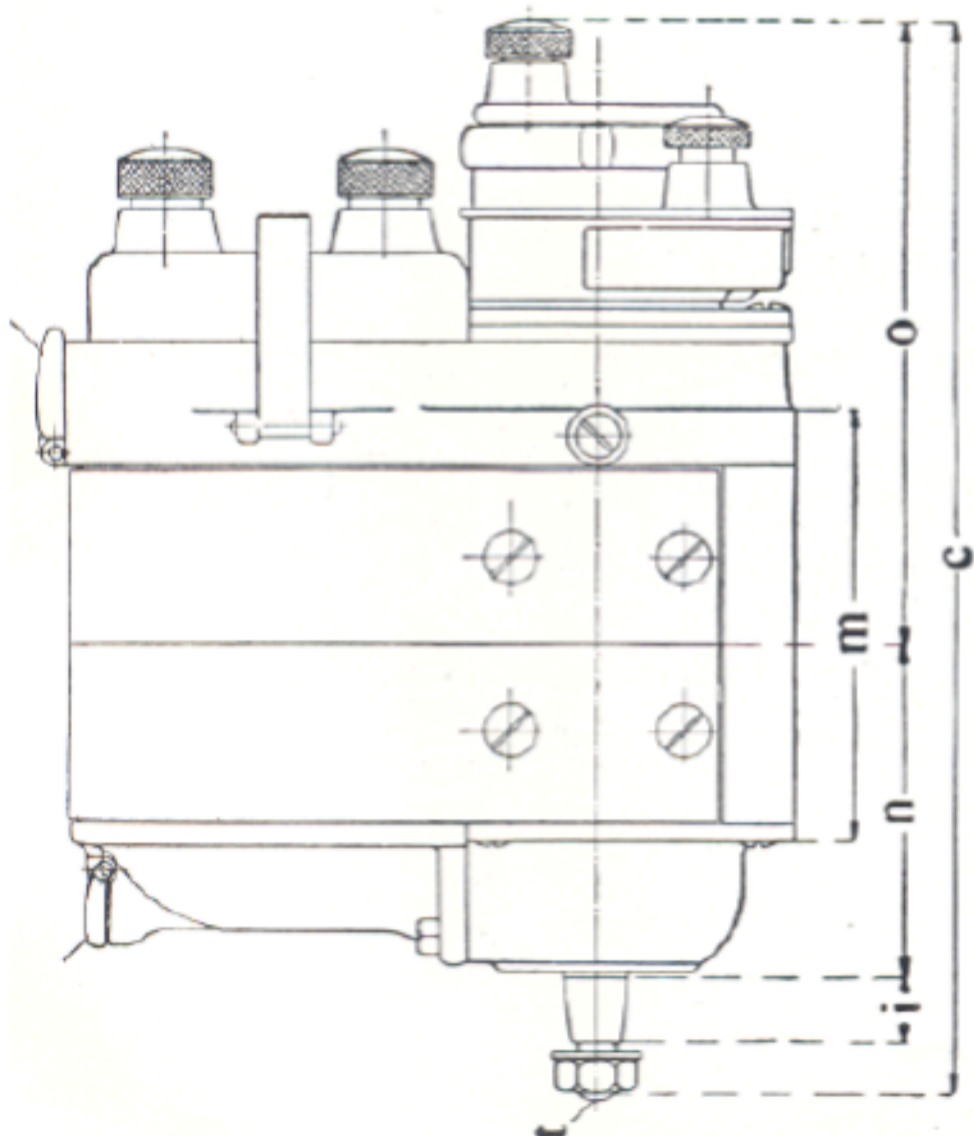
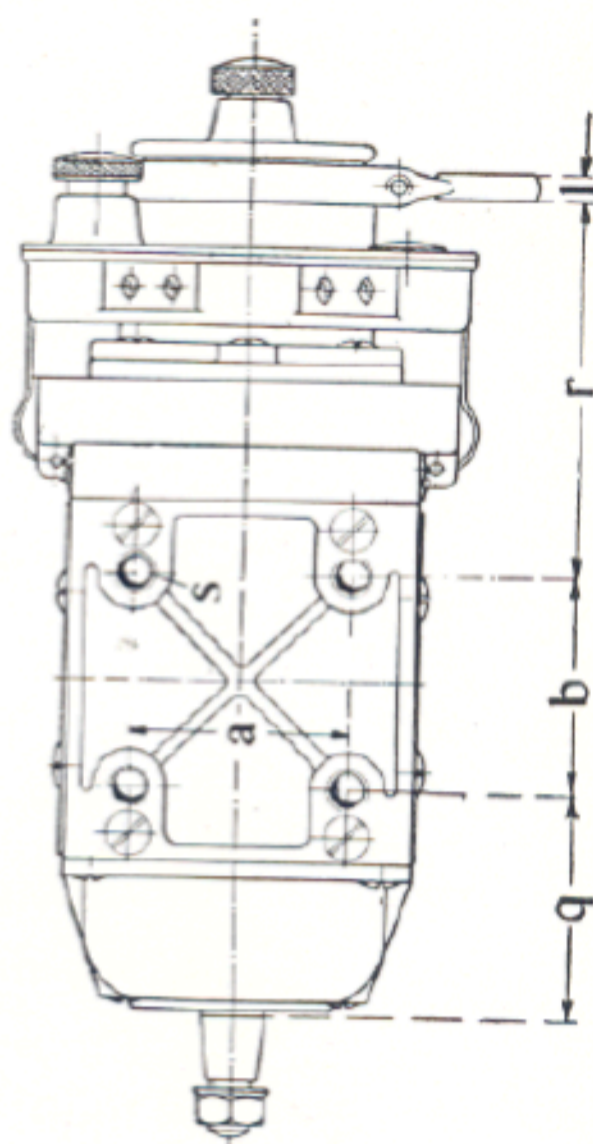
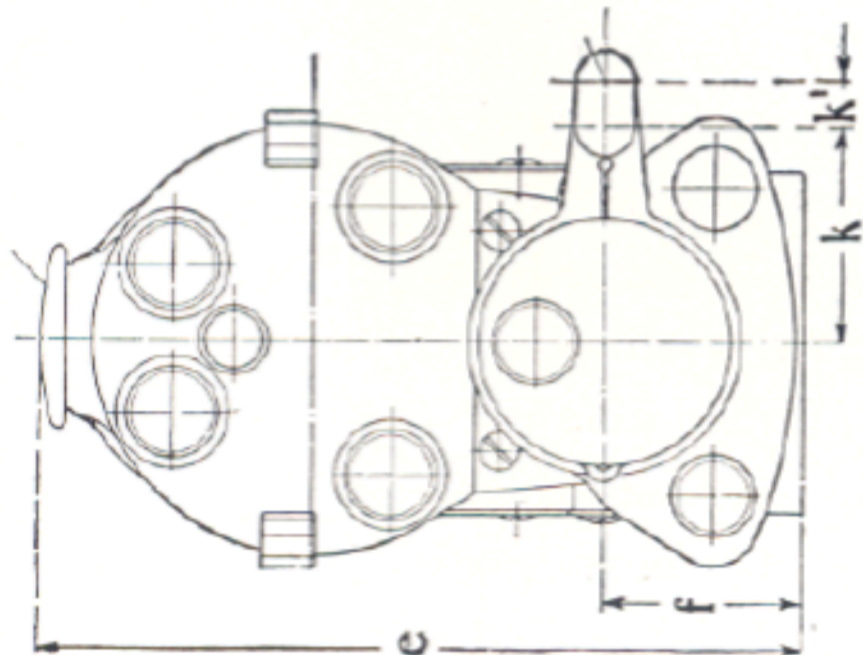
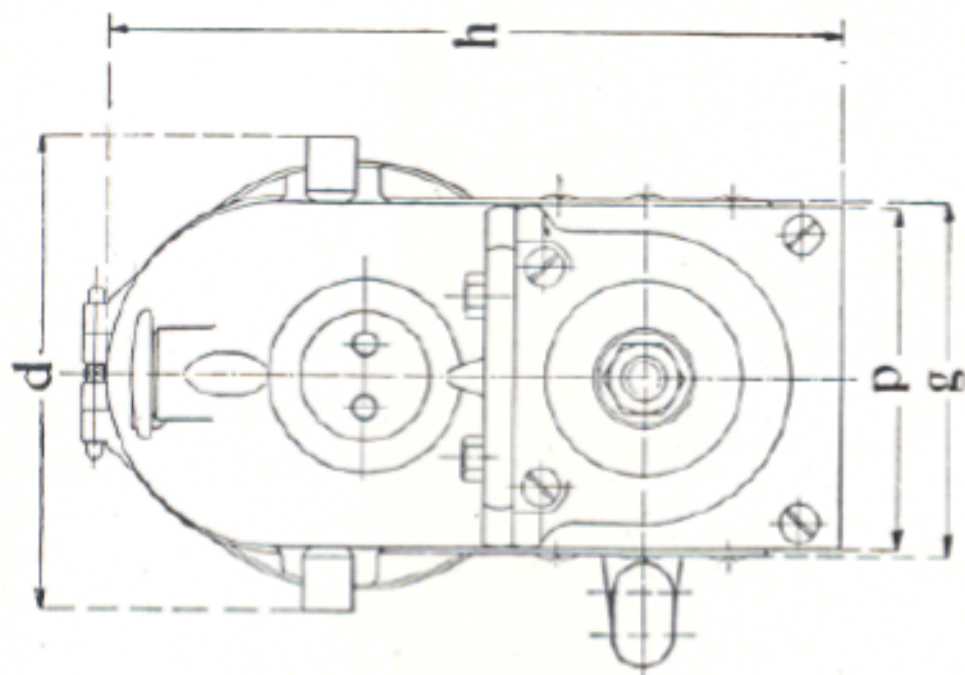
Dimensions

Type	DU4	DU6
a	93	100
b	123	135
c	78	79.5
d	15	19
e	12	15.5
f	228	249
g	168	168
h	60	69
i	50	50
k	50	50
l	5.2	5
m	44	58
n	50	50
o	53	53
p	121	138
q	80	80
r	45	45
t	164	179
u	$\frac{3}{8}$ " x 16 Whitworth Thread $\frac{3}{8}$ " x 16	
v	$\frac{3}{8}$ " x 16 Whitworth Thread $\frac{3}{8}$ " x 16	
w	12	14.25
x	15	15.88



*DIMENSIONS OF
DUAL
MAGNETOS
TYPES DU4, DU6*



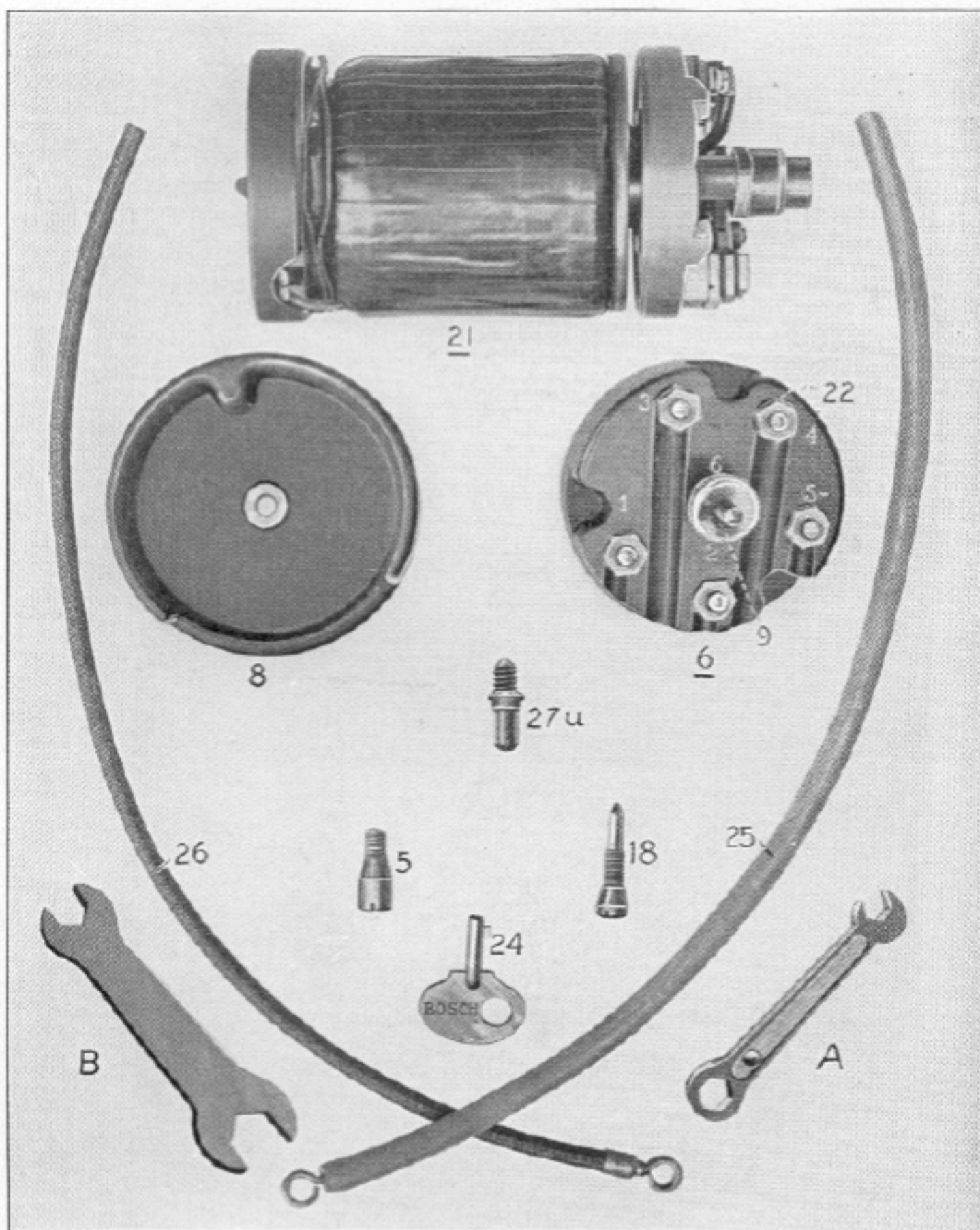


DIMENSIONS
ZR4, ZR6

Type	ZR4	ZR6
a	50	50
b	50	50
c	249	256
d	109	127
e	175	180
f	45	45
g	82	82
h	169	169
i	15	19
k	50	50
k ¹	10	10
l	6	6
m	103	103
n	78	78
o	144	144
p	80	80
q	53	53
r	88	87
s	$\frac{3}{8}$ "x16 Ww.thread	$\frac{3}{8}$ "x16 Ww.thread
t	$\frac{3}{8}$ "x16 Ww.thread	$\frac{3}{8}$ "x16 Ww.thread

SPARE PARTS SECTION

WHEN ordering spare parts for replacements the order should be accompanied by the type symbol and number of the magneto: these will be found engraved on the base plate of the magneto. If this can not be ascertained, information should be given of the bore and stroke of the engine, whether the cycle is two or four stroke, the number of cylinders and its make and model.



Spare Parts for Bosch Horizontal Dual Coil

- A. Magneto interrupter wrench. B. Battery interrupter wrench.
 5 Fastening screw for cover.
 6 Stationary switch plate with knurled and hexagon nuts.
 8 Connection protector.
 9 Knurled nut for centre post of connecting plate.
 18 Stop screw.
 21 Coil body with starting device and switch plate.
 22 Hexagon nut for terminal studs on stationary switch plate 6.
 24 Key.
 25 High tension cable. } with Bosch Loop Terminal on either or both ends.
 26 Low tension cable }
 27u Stop screw for cover.

Spare Parts for Types DU3, DU4, DU5 and DU6 Dual Magnetos

When ordering, state the type of magneto for which the parts are desired.

PLATE I

- *3a Contact block on magneto interrupter 143a.
- *3b Contact block on magneto interrupter 143b.
- 5 Long platinum screw for magneto interrupters 143a and 143b.
- 6 Short platinum screw for magneto interrupter levers 8a and 8b.
- 7 Flat spring for magneto interrupter levers 8a and 8b.
- 8a Magneto interrupter lever for magneto interrupter 143a.
- 8b Magneto interrupter lever for magneto interrupter 143b.
- 8u Fibre block on magneto interrupter levers 8a and 8b.
- 24 Knurled nut on grounding terminal stud 134.
- 79 Holding spring for magneto interrupter levers 8a and 8b.
- 80 Lock nut for platinum screw 5.
- 82 Auxiliary spring on magneto interrupter levers 8a and 8b.
- 83 Auxiliary spring on boss of magneto interrupters 143a and 143b.
- *84 Insulating bushing in center of magneto interrupters 143a and 143b.
- *85 Insulating bushing in contact blocks 3a and 3b.
- 86 Carbon brush with spring for grounding magneto interrupters 143a and 143b.
- *90 Insulating plate for contact blocks 3a and 3b.
- 90u Thin mica plate under insulating plate 90.
- *91 Fastening screw for contact blocks 3a and 3b.
- 92 Fastening screw for flat springs 7, 139 and 139a.
- 118 Conducting spring for grounding terminal stud 134.
- 129 Insulating bushing for grounding terminal stud 134.
- 130 Hexagon nut on grounding terminal stud 134.
- 131 Brass washer on grounding terminal stud 134.
- 132 Thin mica plate under fibre plate 148.
- 134 Grounding terminal stud.
- 136 Cover for interrupter housing 137.
- 137 Interrupter housing complete
- 137a Interrupter housing complete
- 138 Battery interrupter lever on interrupter housing 137.
- 138u Battery interrupter lever on interrupter housing 137a.
- 139 Flat spring for battery interrupter lever 138.
- 139a Flat spring for battery interrupter lever 138u.
- 140 Short platinum screw on battery interrupter levers 138 and 138u.
- 141 Long platinum screw on battery terminal plates 142 and 142a.
- 142 Battery terminal plate with two insulating bushings 158u, nut 164 and terminal stud, on interrupter housing 137.

(Continued)

*When ordering parts marked with * it is necessary to state whether insulating plate 90 (not 90u) is of mica or hard rubber.*

Spare Parts for Types DU3, DU4, DU5 and DU6 Dual Magnetos

When ordering, state the type of magneto for which the parts are desired.

PLATE I—Continued

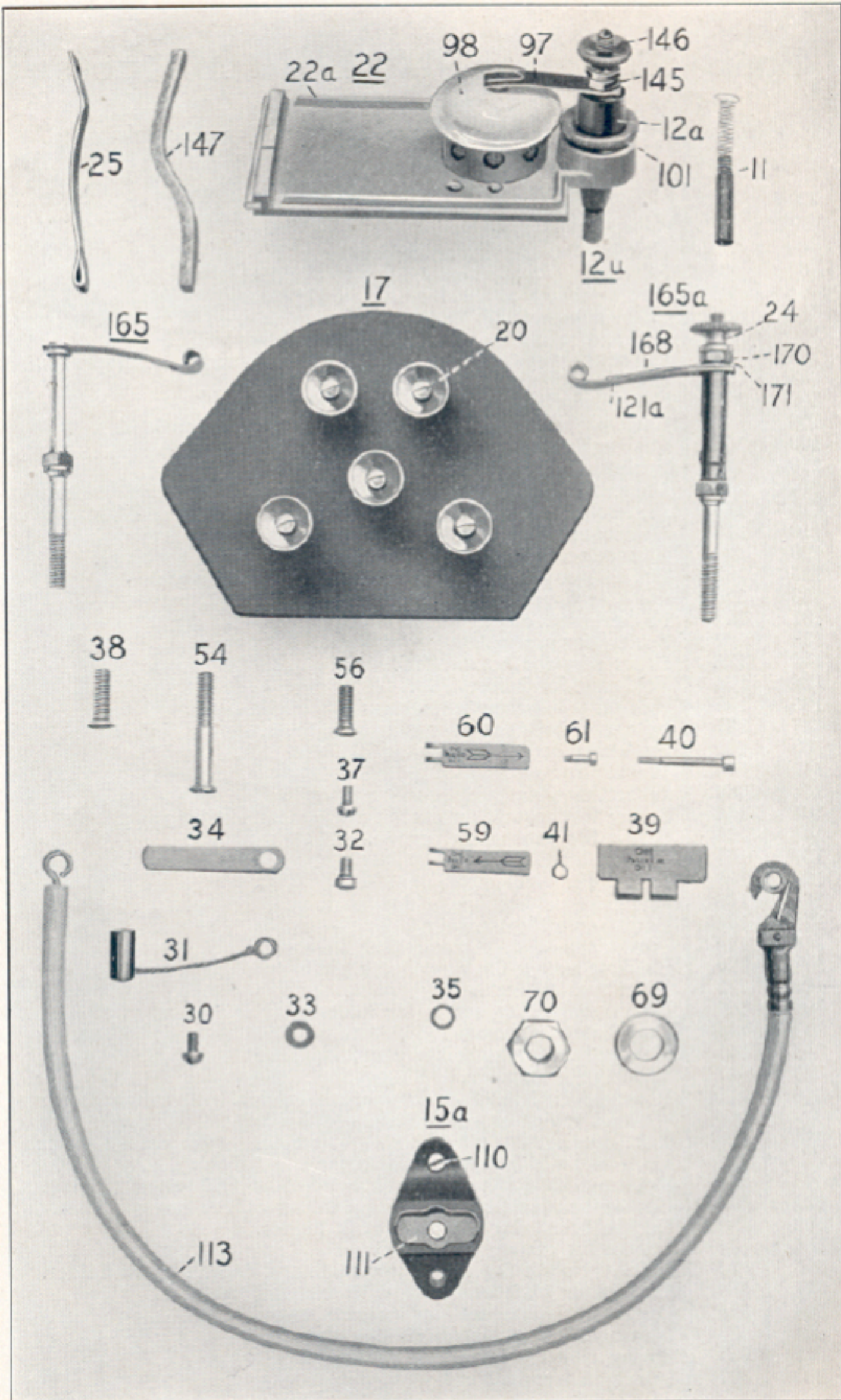
- 142a Battery terminal plate with insulating bushings 175u, nut 164 and terminal stud 174, on interrupter housing 137a.
- 143a Anticlockwise magneto interrupter complete.
- 143b Clockwise magneto interrupter complete.
- 144 Fastening screw for magneto interrupters 143a and 143b.
- 148 Fibre plate under conducting spring 118.
- 150 Lock nut for platinum screw on battery terminal plate 142a.
- 152 Block for fastening spring 139.
- 153 Fastening screw for block 152.
- 154 Fastening screw for pivot piece 155.
- 155 Pivot piece for battery interrupter lever 138.
- 156 Washer for flat springs 139 and 139a.
- 157 Insulating plate under battery terminal plate 142.
- 158 Fastening screw for battery terminal plates 142 and 142a.
- 158u Insulating bushing in battery terminal plate 142.
- 159 Lock nut for platinum screw on battery terminal plate 142.
- 160 Fastening screw for flat spring 139 to block 152.
- 161 Insulating plate for plate 162.
- 162 Brass plate on battery terminal plate 142.
- 163 Washer for pivot pieces 155 and 178.
- 164 Knurled nut on battery terminal stud.
- 172 Brass cover for interrupter housing 137a.
- 173 Fibre cover for interrupter housing 137a.
- 174 Terminal stud for battery terminal plate 142a.
- 175 Long fastening screw for battery terminal plate 142a.
- 175u Insulating bushing in battery terminal plate 142a.
- 176 Slotted fastening post for flat spring 139a.
- 177 Fastening screw for post 176.
- 178 Pivot piece for battery interrupter lever 138u.
- 179 Fastening screw for pivot piece 178.
- 180 Thick mica plate under battery terminal plate 142a.
- 181 Thin mica plate under battery terminal plate 142a.
- 182 Thick mica washer on battery terminal plate 142a.
- 183 Thin mica washer on battery terminal plate 142a.
- 184 Brass washer for screws 158 and 175.
- 190u Locating pin for cover 172.
- 191u Fibre block on battery interrupter levers 138 and 138u.

Spare Parts for Types DU3, DU4, DU5 and DU6 Dual Magnetos

When ordering, state the type of magneto for which the parts are desired.

PLATE II

- 11 Carbon brush with spring for brush holder 12a.
- 12a Brush holder only on dust cover 22a.
- 12u Brush holder with annexed parts on dust cover 22a.
- 15a Brush holder with carbon brush and spring for distributor gear.
- 17 Distributor plate complete.
- 20 Knurled nut for terminal studs on distributor plate 17.
- 22 Dust cover with annexed parts.
- 22a Dust cover only.
- 24 Knurled nut for grounding terminal post 165a.
- 25 Holding spring for distributor plate 17.
- 30 Fastening screw for grounding carbon brush 31.
- 31 Grounding carbon brush with cable.
- 32 Fastening screw for spring 34.
- 33 Washer for screw 30.
- 34 Flat spring for holding carbon brush 31.
- 35 Washer for screw 32.
- 37 Fastening screw for spring 25.
- 38 Fastening screw for shaft end plate and bottom of interrupter end plate.
- 39 Oil hole cover for interrupter end plate.
- 40 Fastening screw for oil hole cover 39.
- 41 Spring for oil hole covers 39, 59 and 60.
- 54 Top fastening screw for cover of interrupter end plate.
- 56 Bottom fastening screw for cover of interrupter end plate.
- 59 Oil hole cover for anticlockwise magneto.
- 60 Oil hole cover for clockwise magneto.
- 61 Fastening screw for oil hole covers 59 and 60.
- 69 Washer for front shaft.
- 70 Hexagon nut for front shaft.
- 97 Holding spring for steatite cover 98.
- 98 Steatite cover with safety spark gap electrode.
- 101 Knurled lock nut for brush holder 12a.
- 110 Fastening screw for brush holder 15a.
- 111 Carbon brush with spring for brush holder 15a.
- 113 High tension cable with Bosch Loop Terminal and Bosch Rajah Hook Terminal.
- 121a Holding spring for fibre cover 173.
- 145 Fastening nut for spring 97.
- 146 Knurled nut for terminal stud on brush holder 12a.
- 147 Felt strip for dust cover 22a.
- 165 Post with holding spring for interrupter housing cover 130 (state model of magneto).
- 165a Grounding terminal post with holding spring for interrupter housing cover 173.
- 168 Auxiliary spring on grounding terminal post 165a.
- 170 Fastening nut for springs 121 and 168.
- 171 Washer under nut 170.



PARTS FOR TYPES DU3, DU4, DU5 and DU6 DUAL MAGNETOS, PLATE II

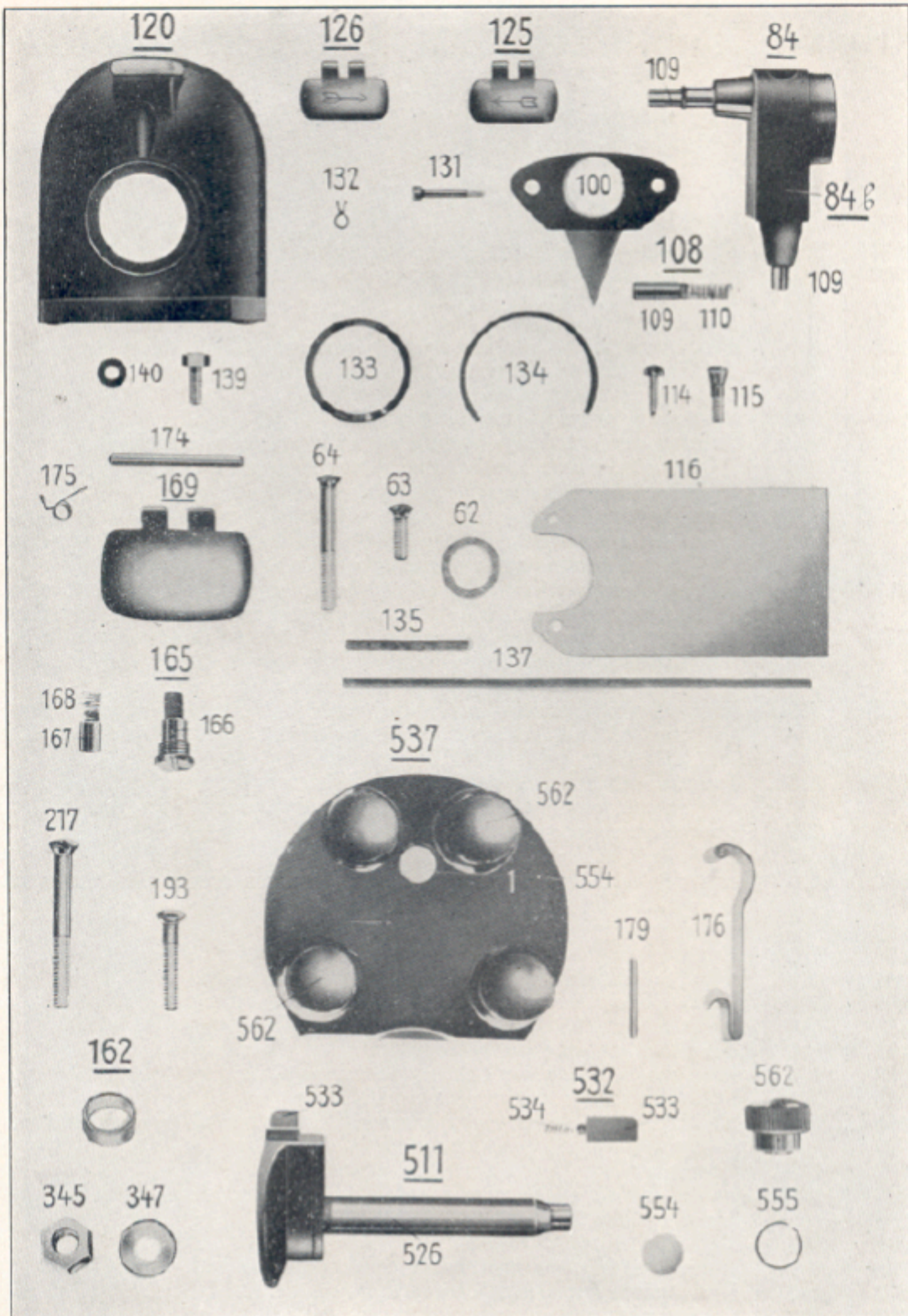
Spare Parts for ZR Dual Magnetos

When ordering, state the type of magneto for which the parts are desired.

ZR4 ZR6

PLATE III

62	80	Felt washer for armature driving shaft.
63	63	Bottom fastening screw for shaft end plate.
64	64	Top fastening screw for shaft end plate.
84	85	Connecting carbon holder complete with carbons and springs and safety spark gap tongue-shaped electrode.
84a	85a	Connecting carbon holder complete with carbon and springs.
84b	85b	Connecting carbon holder only.
100	101	Safety spark gap tongue-shaped electrode.
108	108	Carbon brush and spring for connecting carbon holder.
109	109	Carbon brush for connecting carbon holder.
110	110	Spring for carbon brush 109.
114	114	Pointed cable fastening screw in connecting carbon holder.
115	115	Fastening screw for connecting carbon holder and bonnet.
116	116	Dust cover.
120	120	Bonnet complete with oil hole cover and felt packings.
125	125	Oil hole cover complete for anticlockwise magnetos.
126	126	Oil hole cover complete for clockwise magnetos.
131	131	Fastening screw for oil hole covers 125, 126.
132	132	Spring for screw 131.
133	133	Brass ring for bonnet 120.
134	134	Felt ring for bonnet 120.
135	135	Felt strip between bonnet and shaft end plate.
137	137	Felt strip between bonnet and magnets.
139	139	Fastening screw for bonnet 120.
140	140	Washer for screw 139.
162	162	Inspection glass with mounting.
165	165	Screw for grounding carbon with carbon and spring.
166	166	Screw for grounding carbon.
167	167	Carbon brush for screw 166.
168	168	Spring for carbon 167.
169	169	Complete oil hole cover for interrupter end plate.
174	174	Pivot for oil hole cover 169.
175	175	Spring for oil hole cover 169.
176	176	Holding spring for distributor plate.
179	179	Pivot for holding spring 176.
193	193	Bottom fastening screw for interrupter end plate.
217	216	Top fastening screw for cover for interrupter end plate.
345	346	Hexagon nut for armature driving shaft.
347	347	Washer for nut 345.
510	512	Rotating distributor carbon brush holder with carbon, spring, and indicator plate, anticlockwise.
511	513	Rotating distributor carbon brush holder with carbon, spring, and indicator plate, clockwise.
526	527	Rotating distributor carbon brush holder (rubber part only).
532	532	Carbon brush and spring for rotating carbon brush holder.
533	533	Carbon brush for rotating brush holder.
534	534	Spring for carbon brush 533.
535	535	Indicator plate for distributor plate and carbon brush holder.
537	539	Distributor plate complete with terminal nuts.
543	544	Distributor plate without terminal nuts.
554	554	Inspection glass for distributor plate.
555	555	Spring ring for inspection glass 554.
562	562	Insulated terminal nut.



SPARE PARTS FOR ZR DUAL MAGNETOS

PLATE III

Spare Parts for ZR Dual Magnetos

When ordering, state the type of magneto for which the parts are desired.

ZR4	ZR6	PLATE IV
215	215	Stop screw for interrupter housing.
216	216	Bottom fastening screw for cover on interrupter end plate.
232	232	Interrupter segment with felt wick.
233	233	Interrupter segment.
239	239	Fastening screw for interrupter segments 232, 233.
243	243	Spring ring in interrupter housing for holding cover.
245	245	Timing arm complete.
249	249	Fastening screw for timing arm.
252a	252a	Interrupter housing complete with battery interrupter, segments, cover for battery interrupter and timing arm, anticlockwise, for magnetos with variable ignition.
252b	252b	Interrupter housing complete with battery interrupter, segments and cover for battery interrupter, anticlockwise, for magnetos with variable ignition.
252c	252c	Interrupter housing with complete battery interrupter and segments, anticlockwise, for magnetos with variable ignition.
253a	253a	Interrupter housing complete with battery interrupter, segments, timing arm, and cover for battery interrupter clockwise, for magnetos with variable ignition.
253b	253b	Interrupter housing complete with battery interrupter, segments, and cover for battery interrupter, clockwise, for magnetos with variable ignition.
253c	253c	Interrupter housing with complete battery interrupter, and segments, clockwise, for magnetos with variable ignition.
268	268	Interrupter housing.
273	273	Felt wick in segment 232.
276	276	Battery terminal plate with long platinum screw and terminal stud.
277	277	Battery terminal plate.
278	278	Long platinum screw for battery interrupter.
281	281	Thick mica plate under battery terminal plate.
282	282	Thin mica plate under battery terminal plate.
283	283	Thin mica plate on battery terminal plate.
284	284	Thick mica plate on battery terminal plate.
285	285	Iron screw plate for battery terminal plate.
287	287	Screw stud for battery terminal plate.
288	288	Insulated nut for battery terminal and grounding terminal on magneto interrupter cover.
289	289	Fastening screw for terminal plate 276.
290	290	Fastening screw for spring post 300 and pivot piece 299.
291	291	Hard rubber bushing for screw 289.
292	292	Battery interrupter lever complete.
298	298	Fibre bushing for battery interrupter lever 292.
299	299	Pivot piece for battery interrupter lever.
300	300	Spring post for interrupter spring 807
419	419	Cam for battery interrupter
420	420	Nut for cam 419.
421	421	Adjusting screw for nut 420.
438	438	Hexagon lock nut for long platinum screw 278.
463	463	Fastening screw for flat spring 807.
818	818	Magneto interrupter cover with short-circuiting terminal.
822	822	Short-circuiting terminal complete.
826	826	Spring on short-circuiting terminal with contact.

(Continued)

Spare Parts for ZR Dual Magnetos

When ordering, state the type of magneto for which the parts are desired.

ZR4 ZR6

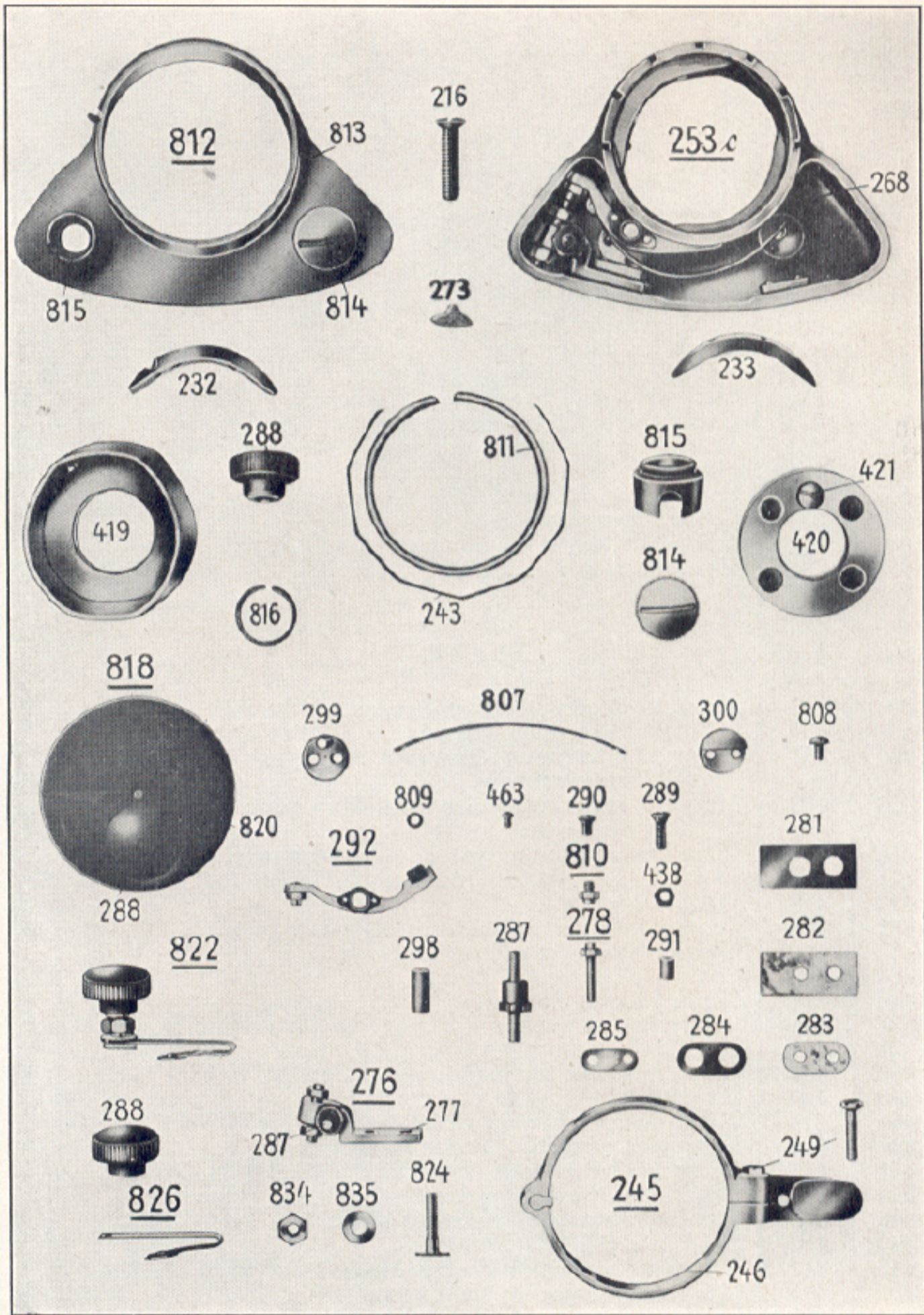
PLATE IV—Continued

807	807	Long flat spring for battery interrupter lever 292.
808	808	Fastening screw for flat spring 807.
809	809	Washer for screw 463.
810	810	Short platinum screw for battery interrupter lever 292.
811	811	Spring ring in interrupter housing.
812	812	Cover complete for battery interrupter.
813	813	Cover for battery interrupter.
814	814	Screw cap for cover on battery interrupter 812.
815	815	Hard rubber bushing on cover for battery interrupter 812.
816	816	Spring ring for screw cap 814 and bushing 815.
820	820	Cover for magneto interrupter.
824	824	Screw stud for short-circuiting terminal.
834	834	Hexagon lock nut for screw stud 824.

ZR4 ZR6

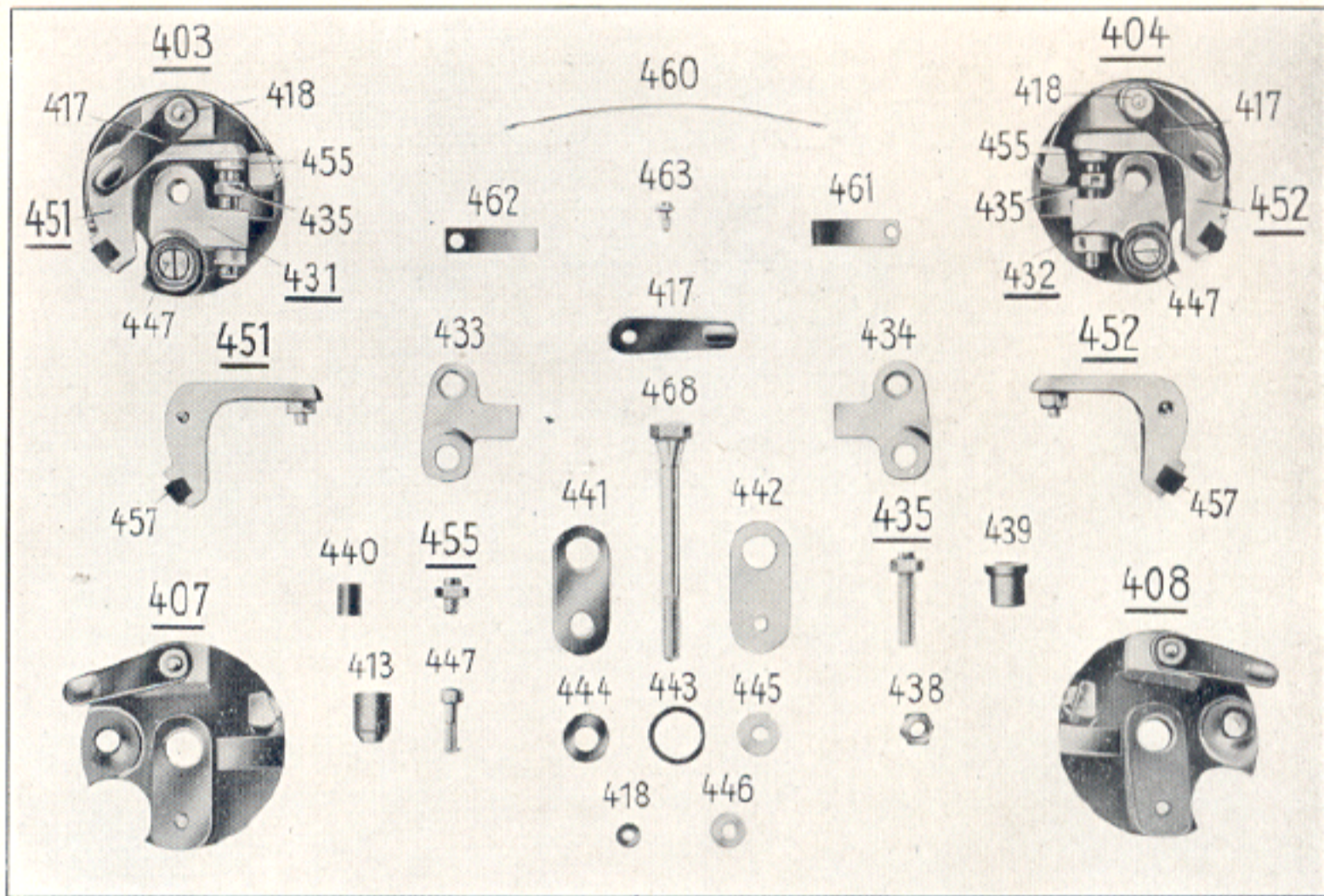
PLATE V

403	403	Magneto interrupter complete, anticlockwise.
404	404	Magneto interrupter complete, clockwise.
407	407	Magneto interrupter disc with fibre plate and holding spring 417, anticlockwise.
408	408	Magneto interrupter disc with fibre plate and holding spring 417, clockwise.
413	413	Fibre bushing for magneto interrupter lever.
417	417	Flat spring for holding interrupter lever.
418	418	Washer for spring 417.
431	431	Contact block complete, anticlockwise.
432	432	Contact block complete, clockwise.
433	433	Contact block, anticlockwise.
434	434	Contact block, clockwise.
435	435	Long platinum screw for magneto interrupter.
438	438	Hexagon lock nut for long platinum screw 435.
439	439	Centre bushing for magneto interrupter.
440	440	Insulating bushing in contact block.
441	441	Thick mica insulation under contact block.
442	442	Thin mica insulation under contact block.
443	443	Brass washer in contact block.
444	444	Thick mica washer in contact block.
445	445	Thin mica washer in contact block.
446	446	Washer under contact block.
447	447	Fastening screw for contact block.
451	451	Magneto interrupter lever complete, anticlockwise.
452	452	Magneto interrupter lever complete, clockwise.
455	455	Short platinum screw for magneto interrupter lever.
457	457	Fibre contact block in magneto interrupter lever.
460	460	Long flat spring for magneto interrupter lever.
461	461	Auxiliary spring on magneto interrupter lever.
462	462	Auxiliary spring on boss of magneto interrupter disc.
463	463	Fastening screw for interrupter flat spring 460, 461 and 462.
468	468	Magneto interrupter fastening screw.



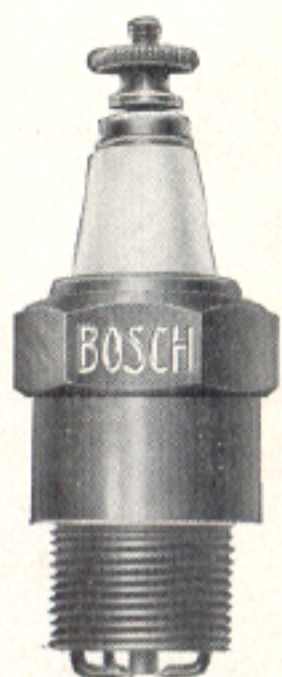
SPARE PARTS FOR ZR DUAL MAGNETOS

PLATE IV



SPARE PARTS FOR ZR DUAL MAGNETOS. PLATE V

BOSCH Spare Parts can be obtained from all Bosch Distributors and all Bosch Supply Stations. These are located in all the prominent centers of the United States and Canada. Bosch Service is World-Wide



BOSCH Spark Plugs



Defective spark plugs are the cause of most ignition troubles. The Bosch Plug is recommended because it reduces this possibility to a minimum.

The electrodes of the Bosch Plug are crescent shaped so that the spark does not jump across at one particular point but forms a ribbon of flame between the electrodes. In this way the effective surface of the electrical discharge is considerably increased so that the gases are ignited much more rapidly.

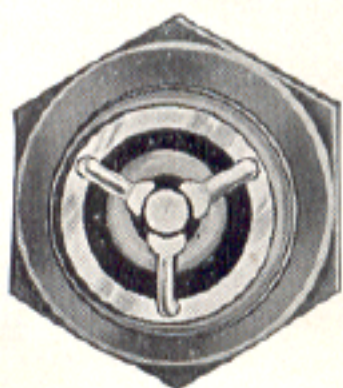
Another advantage of these electrodes is that they offer less electrical resistance. This means that the spark jumps more easily across the gap and enables the engine to be started more readily than with other makes of plug.

Sooting of the plug when the engine is working is practically impossible on account of the electrodes being at a high enough temperature to burn away any oil as soon as it is splashed on them. Extensive experiments have shown that there is no risk of preignition in spite of the sharp edge of the electrodes.

The Bosch Plug is absolutely gas-tight and can be guaranteed to retain its insulating properties on account of the unique method of securing the insulation.

No nuts or threaded washers are used, but the plug is made gas-tight by means of special metallic packing and the rolling over of the steel body under very heavy hydraulic pressure.

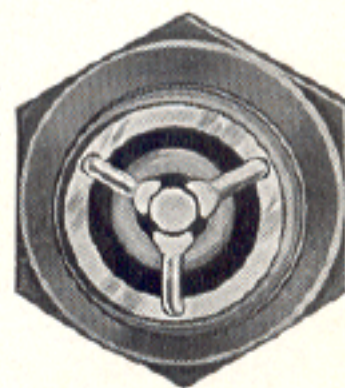
Supplied in $\frac{7}{8}$ inch S. A. E. (A. L. A. M.), $\frac{1}{2}$ inch and metric threads.



From your dealer, Bosch Distributors,
Bosch Supply Stations or Bosch Branches.

\$1⁰⁰ each.

Special literature on request.



BOSCH SERVICE

BOSCH BRANCHES

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CHICAGO,	Bosch Magneto Company
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TORONTO,	Bosch Magneto Company Limited

BOSCH DISTRIBUTORS ARE IN THESE CITIES

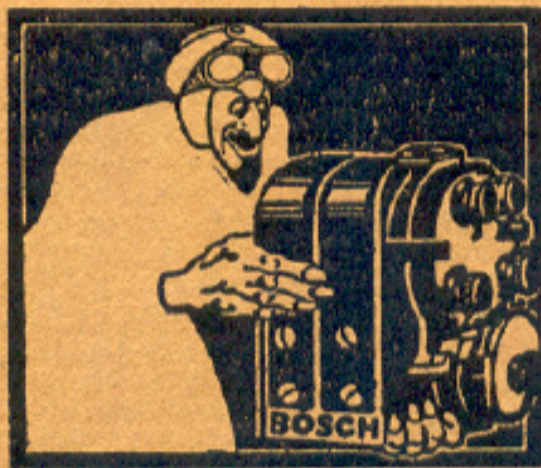
Atlanta, Ga.	Cleveland, O.	Los Angeles, Cal.	Philadelphia, Pa.	Salt Lake City, Utah
Baltimore, Md.	Denver, Colo.	Manila, P. I.	Pittsburgh, Pa.	San Juan, P. R.
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Cincinnati, O.	Kansas City, Mo.	Omaha, Neb.		

BOSCH SUPPLY STATIONS ARE IN THESE CITIES

Aberdeen, Wash.	Cumberland, Md.	Huntington, N. Y.	Newark, N. J.	San Jose, Cal.
Akron, Ohio	Dallas, Texas	Hutchinson, Kan.	New Bedford, Mass.	Santa Barbara, Cal.
Albany, Ga.	Danville, Va.	Idaho Falls, Idaho	Newburgh, N. Y.	Santa Cruz, Cal.
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Amsterdam, N. Y.	Dixon, Ill.	Johnstown, Pa.	Newport, R. I.	Scranton, Pa.
Anaconda, Mont.	Dothan, Ala.	Joliet, Ill.	Newport News, Va.	Sheridan, Wyo.
Annapolis, Md.	Dover, N. H.	Kalamazoo, Mich.	New Rochelle, N. Y.	Shreveport, La.
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