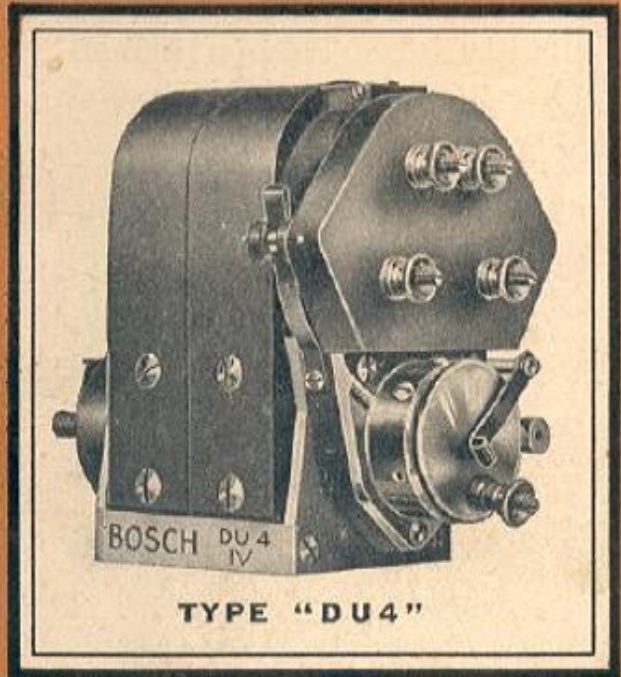




BOSCH
IGNITION
LIGHTING
STARTING
■ **SYSTEMS** ■
■ **SATISFY** ■

BOSCH



TYPE "DU4"

MAGNETO IGNITION

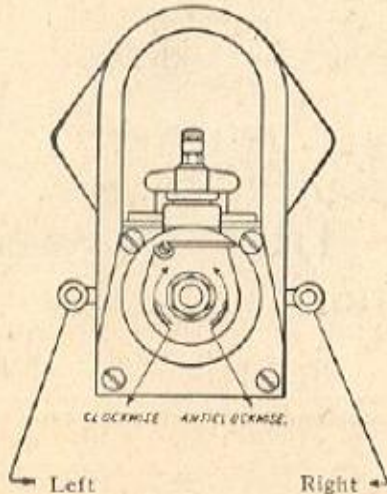
for

**GASOLINE ENGINES
OF 1, 2, 3, 4 AND 6
CYLINDERS !!!**

716

To Avoid Delay in Delivery

Orders should be placed direct with Bosch Branches, Official Bosch Distributors, or Bosch Service Stations (see inside back cover for locations). When ordering, the following details must be mentioned:

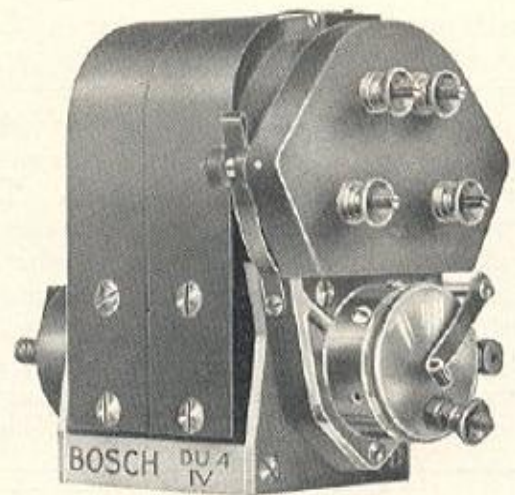


FOR MAGNETOS

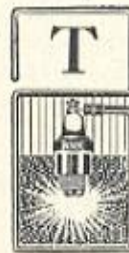
1. Type of magneto.
2. Direction of rotation, clockwise or anticlockwise, viewed from driving shaft end of magneto.
3. Position of timing arm, whether on left or right hand side of magneto, viewed from its driving shaft end.
4. Whether or not magneto is exactly as described in this booklet.

FOR SPARE PARTS

1. Type and number of the magneto.
2. Catalogue number and designation of the spare part.
3. Whether or not magneto and part are exactly as described in this booklet.



Instructions For Bosch High Tension Magnetos DU Types



THE Bosch Magnetos, Types DU1, DU2, DU4/2, DU3, DU4 and DU6, are of the high tension series, and are used respectively on one, two, two, three, four and six-cylinder engines of the automobile type, in motor car, marine, tractor and stationary service.

The type DU magnetos are usually employed as sole ignition on an engine, or, in some cases, in connection with a battery system operating on a separate set of spark plugs. The DU magnetos, without alteration, are also employed to provide battery and magneto ignition on one set of spark plugs, this being accomplished by means of the Bosch Vibrating Duplex Ignition System, a separate booklet describing which may be had on request. The Bosch Independent Magnetos, DU Types, are those described in this booklet.

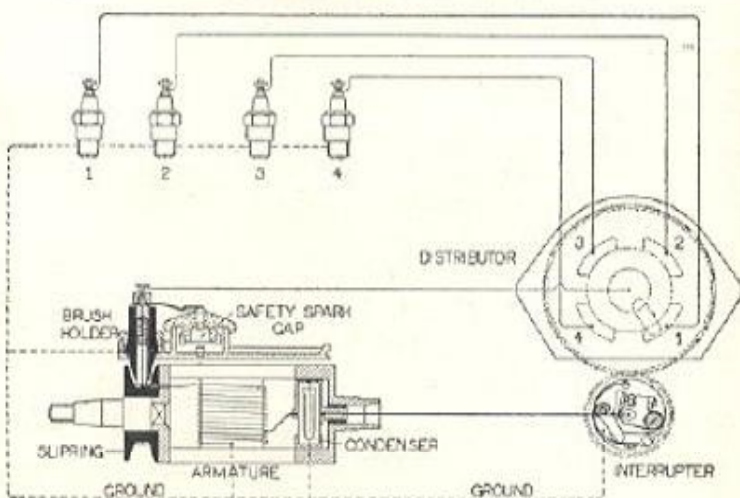
Generation of Current

Like other Bosch High Tension Magnetos, the types DU generate their own high tension current directly in the magneto armature (the rotating member of the magneto), without the aid of a separate step-up coil, and have their timer and distributor integral.

The armature winding is composed of two sizes of wire, one size comparatively heavy and the other very fine. The heavy wire constitutes the primary or low tension circuit, and the very fine wire the secondary or high tension circuit.

The rotation of the armature between the poles of strong permanent magnets sets up or induces a current in the armature primary circuit, and this is further aug-

mented at regular intervals in the rotation of the armature shaft by the abrupt interruption of the primary circuit by means of the magneto interrupter. At the opening of the primary circuit, the resulting discharge of current from that circuit induces a current of high voltage in the armature secondary circuit. The high tension current thus created is collected by the slipping brush, then to the various magneto distributor terminals, each of which is connected by cable to the spark plug in its respective cylinder. The operation of the instrument will be more clearly understood from a study of the complete circuits, primary and secondary, which follow.

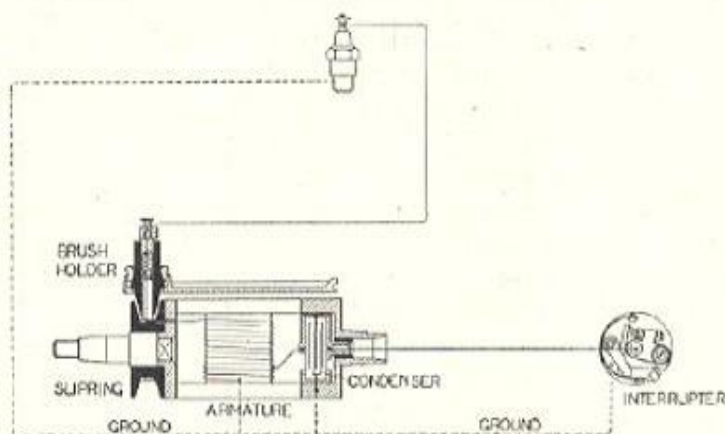


Circuit Diagram Type DU4 Bosch Magneto

Primary or Low Tension Circuit

The beginning of the armature primary circuit is in metallic contact with the armature core, and the end of the armature primary circuit is connected, by means of the interrupter fastening screw, to the insulated contact block supporting the long platinum contact on the magneto interrupter. The interrupter lever, carrying a short platinum contact, is mounted on the interrupter disc which, in turn, is electrically connected to the armature core. The primary circuit is completed whenever the two platinum interrupter contacts are brought together, and interrupted whenever these contacts are separated. The separation of the platinum contacts is controlled by the action of the interrupter lever as it bears against the steel segments secured to the inner surface of the interrupter housing; the types DU1 and DU4/2, 360°, are each provided with but one interrupter segment, while all other DU types have two such segments.

The high tension current is generated in the secondary circuit only when there is an interruption of the primary circuit, the spark being produced at the instant the platinum interrupter contacts separate.



Circuit Diagram Type DU1 Bosch Magneto

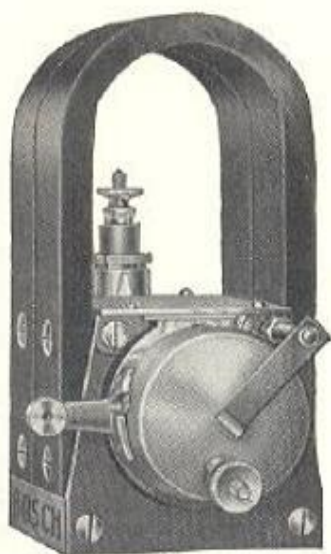
Secondary or High Tension Circuit

The armature secondary circuit is a continuation of the armature primary circuit, the beginning of the secondary being connected to the primary, while the end of the secondary is connected to the insulated current collector ring, or slipring, mounted on the armature just inside the driving shaft end plate of the magneto. This form applies in all DU types except the DU1 two-spark magneto.

IN TYPES DU4/2, DU3, DU4 AND DU6, the slipping brush, which is held in contact with the slipring by the brush holder at the shaft end of the magneto, receives the high tension current collected by the slipring and, by means of the connecting bar under the arch of the magnets, passes the current to the metal contact in the center of the distributor plate. From the latter point the high tension current passes to the distributor brush, which is held in a brush holder mounted on the distributor gear and, consequently, rotates with the gear.

Metal segments are imbedded in the distributor plate, and as the distributor brush rotates, it makes contact successively with the segments in the distributor plate. The segments in turn are connected with the terminal studs on the face of the distributor plate, and the latter are connected by cables to the spark plugs in the various cylinders. In the cylinders, the high tension current produces a spark which causes ignition and then returns through the engine to the magneto armature, thus completing the circuit.

IN TYPE DU2, the slipring groove is provided with a sectional metal segment, and the end of the armature secondary circuit is connected to this segment. The metal segment acts not only as a current collector, but also as a high tension distributor, for, at every 180° revolution of the armature, the segment alternately comes into contact with, and delivers high tension cur-



Bosch Magneto Type DU1

rent to, one of the two slipping brushes which are horizontally mounted in the brush holders on opposite sides of the shaft end plate. High tension cables from the brush holder terminals connect the slipping brushes with the spark plugs in the cylinders.

IN TYPE DU1, SINGLE-SPARK, for one-cylinder engines, no distributor is required, and the high tension current from the armature secondary circuit is passed by the slipping to a single brush, which is supported by a brush holder at the shaft end of the magneto. A high tension cable between the brush holder terminal and the spark plug in the cylinder completes the secondary circuit.

IN TYPE DU1, TWO-SPARK, the armature secondary circuit is insulated from the armature primary circuit, and the two ends of the secondary are connected to two sectional metal segments, diametrically opposite on a single slipping. Two slipping brushes are provided which, as in the type DU2, are horizontally mounted in brush holders on opposite sides of the shaft end plate; during that portion of the armature rotation when high tension current is being delivered, each of the two slipping segments will be in contact with one of the brushes. The secondary circuit is completed by a high tension cable from each brush holder terminal to a spark plug, and a spark will pass at both plugs simultaneously.

Safety Spark Gap

In order to protect the armature and other current carrying parts, a safety spark gap is provided.

Under ordinary conditions, the current will follow its normal path to the spark plug, but if for any reason

the electrical resistance in the secondary circuit is increased to a high point, as when a cable becomes disconnected or a spark plug gap too wide, the high tension current will discharge across the safety gap.

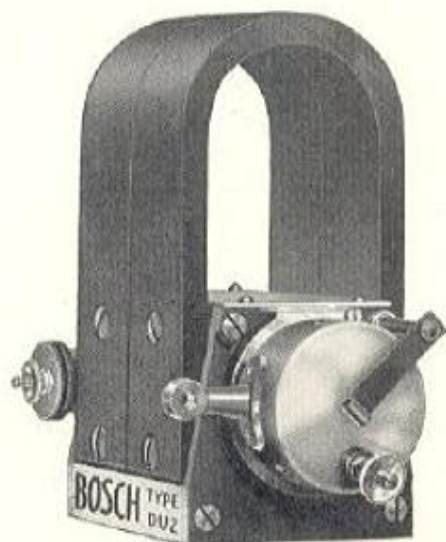
The current should never be allowed to pass across the safety spark gap for any length of time, and if the engine is operated on a second or auxiliary ignition system, the magneto must be grounded in order to prevent the production of high tension current. The snapping sound by which the passage of the current across the safety gap may be noted should always lead to an immediate search for the cause of the difficulty.

IN TYPES DU4/2, DU3, DU4 AND DU6, the safety spark gap is arranged on the dust cover over the armature, and consists of two short pointed electrodes supported a short distance from each other; one electrode is set on the dust cover itself and inclosed by a metal and wire gauze housing, while the other, or insulated electrode, is set in the center of the steatite cover of the safety spark gap housing and connected into the secondary circuit of the magneto.

IN TYPES DU1 AND DU2, the safety spark gap consists of a short pointed wire projecting from the armature insulating material, the end of this wire extending to within a short distance of the armature cover at the driving shaft end.

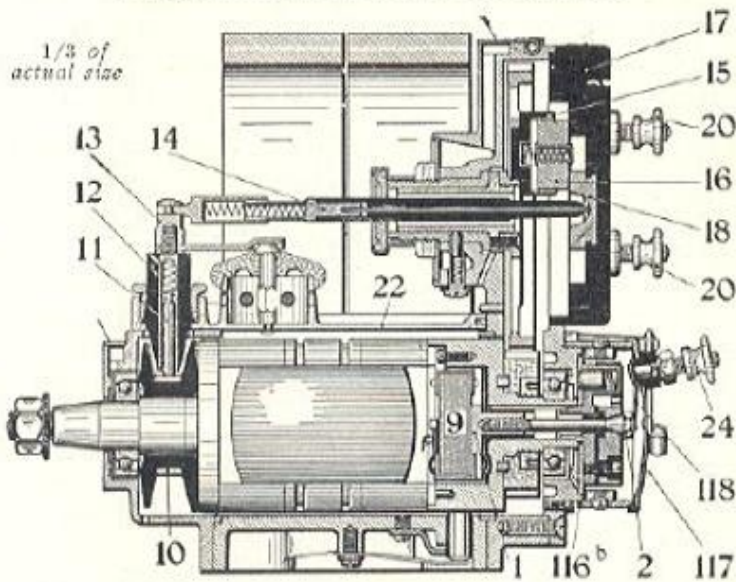
Timing Range

The magneto interrupter housing is arranged so that it may be rotated through an angle of 35° with respect to the armature shaft. The movement of this housing in one direction or the other causes the interrupter lever



Bosch Magneto Type DU2

Longitudinal Section of DU4 Magneto



- | | |
|--|---|
| 1. Brass plate for connecting the end of armature primary circuit. | 17. Distributor plate. |
| 2. Fastening screw for magneto interrupter. | 18. Central distributor contact. |
| 3. Condenser. | 20. Terminal nut for distributor plate. |
| 10. Slipring. | 22. Dust cover over armature. |
| 11. Slipring brush. | 24. Terminal nut for grounding terminal. |
| 12. Slipring brush holder. | 116b. Interrupter housing and timing arm. |
| 18. Cap nut for slipring brush holder. | 117. Cover for interrupter housing. |
| 14. Connecting bar. | 118. Contact spring for grounding terminal. |
| 15. Distributor brush holder. | |
| 16. Distributor brush. | |

The above numbers apply only to the sectional illustration.

to strike the steel segments earlier or later in the revolution of the armature, the spark occurring correspondingly earlier or later in the stroke of the piston.

The spark can be advanced by moving the interrupter housing, by means of the timing control arm, in the direction opposite the rotation of the armature, and can be retarded by moving the interrupter housing in the same direction as the rotation of the armature. The armature rotation is indicated by the arrow on the oil well cover at the driving shaft end of the magneto.

Cutting Out the Ignition

Since high tension current is generated only on the interruption of the primary circuit, it is evident that in order to cut out the ignition it is necessary merely to divert the primary current to a path which is not affected by the action of the magneto interrupter. This is accomplished as follows:

An insulated grounding terminal is provided on the cover of the magneto interrupter housing with its inner end, consisting of a spring with carbon contact, pressing against the head of the interrupter fastening screw. The outer end of the grounding terminal is connected

by low tension cable to one side of a switch, and the other side of the switch is grounded by connecting another cable between it and the engine or chassis.

When the switch is open, the primary current follows its normal path across the platinum interrupter contacts and is interrupted at each separation of these contacts; however, when the switch is closed, the primary current passes from the head of the interrupter fastening screw to the carbon contact of the grounding terminal, thence through the switch to the engine and back to the magneto, and as the primary current remains uninterrupted when following this path, no ignition current is produced.

II

Care and Maintenance

Aside from keeping the magneto clean externally, practically the only care required is the oiling of the bearings; of these, there are two ball bearings supporting the armature, and, in the types with gear driven distributor, a single plain bearing supporting the shaft of the distributor gear.

Any good, light machine oil may be used for this purpose (never cylinder oil), and each of the bearings should receive not more than two or three drops about every 500 miles, applied through the oil ducts under the covers marked "Oil" located at both ends of the magneto.

The interrupter is intended to operate without lubrication, and as oil on the platinum interrupter contacts will prevent good contact, cause sparking and burning, as well as misfiring, care should be exercised to prevent the entrance of oil to these parts.

STARTING THE ENGINE: When cranking an engine equipped with a DU magneto as sole ignition, the spark lever should be fully retarded if the magneto is of the Model 5 or Model 6 construction (most of the DU1 and DU2 magnetos are of these models), but should be slightly advanced with all other models. In the latter case, if the magneto has been timed according to instructions, the spark lever may be safely advanced about one-third, or even one-half on starter equipped engines, and in this position will permit easier starting (see also "Plug Gap Too Wide," on page 8).

III

Trouble—Cause and Remedy

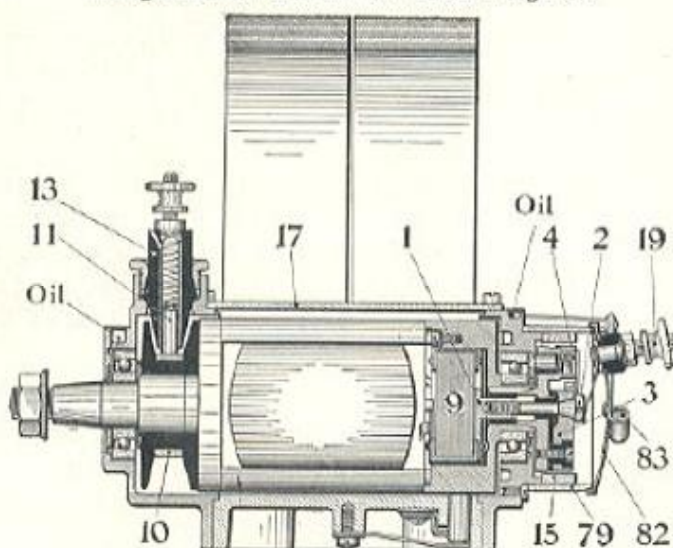
Ignition difficulties may be divided into two main classes, one, the most common, due to spark plugs and cables, and the other, comparatively infrequent, due to

the magneto. In case of defective ignition, therefore, it must first be determined whether the fault is in the magneto or, as is more probable, elsewhere.

In general, when only one cylinder misfires the fault is in the spark plug, the most common plug difficulties being as follows:

PLUG GAP TOO WIDE: The distance between the electrodes of the spark plugs varies according to the individuality of the engine, but normally this distance should not be less than $\frac{1}{50}$ th inch. On the other hand, however, too wide a gap increases the electrical resistance, and interferes with the proper generation of current at low speed. Difficulty in starting an engine and missing at low speeds are very often due to the spark plug gaps being too wide and, as the spark will

Longitudinal Section of DU1 Magneto



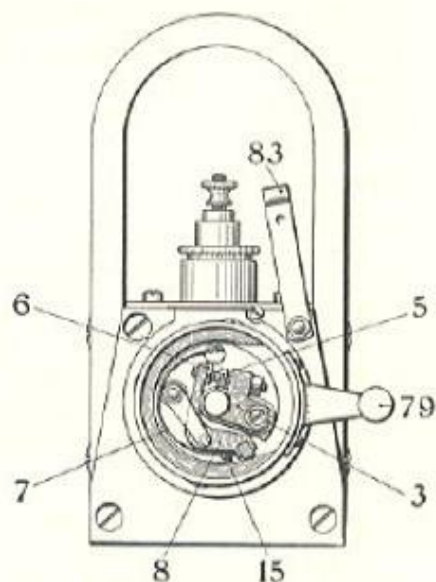
have a tendency to burn the electrodes and thereby gradually increase the gap, it is especially important that the plugs be examined occasionally for assurance that the gap is not too great; any difficulty due to this cause may be readily overcome by readjusting the electrodes.

PLUG SHORT-CIRCUITED: This is usually caused by a cracked or porous insulator, or by fouling of the electrodes or insulator. Any of these conditions will cause misfiring by permitting the current to stray from its intended path. In Bosch Spark Plugs the possibility of trouble from such causes is reduced to a minimum.

Other Faults

CABLES: Misfiring of one cylinder, either continuous or intermittent, may be due also to a chafed or broken cable or to a loose cable connection. The cables should

Rear View of DU1 Magneto
(Interrupter Housing Cover Removed)



- | | |
|--|---|
| 1. Brass plate for connecting the end of armature primary circuit. | 10. Slipring. |
| 2. Fastening screw for magneto interrupter. | 11. Slipring brush. |
| 3. Contact block for magneto interrupter. | 12. Slipring brush holder. |
| 4. Magneto interrupter disc. | 13. Steel segment for interrupter housing. |
| 5. Long platinum screw. | 17. Dust cover over armature. |
| 6. Short platinum screw. | 19. Terminal nut for grounding terminal. |
| 7. Long flat spring for magneto interrupter lever. | 79. Interrupter housing and timing control arm. |
| 8. Magneto interrupter lever. | 82. Cover for interrupter housing. |
| 9. Condenser. | 83. Spring for holding interrupter housing cover. |

The above numbers apply only to the sectional illustrations.

be carefully examined, special attention being paid to the insulation. The metal terminals of the cables must not come into contact with any metal parts of the engine or of the magneto, except those designated as being correct according to the instructions given.

IGNITION FAILS SUDDENLY: A sudden failure of ignition may indicate a short circuit in the low tension cable, due either to a defect in the cable, to a faulty connection at the switch, or to the presence of dirt or moisture. A test for trouble in the switch or low tension cable can be made by removing the cable from the grounding terminal on the cover of the magneto interrupter housing and endeavoring to start the engine on the magneto. If the engine runs with this wire disconnected but stops when the wire is connected, it is evident the magneto is in good order and that the trouble is due to some fault in the switch or grounding wire permitting the low tension current to escape to ground.

IRREGULAR FIRING: If the cables and plugs are in good condition, and yet the ignition is irregular, the

trouble is probably with the magneto, and the interrupter should be carefully examined. It should be seen that the interrupter lever moves freely on its pivot, that the hexagon headed fastening screw in the center of the interrupter is properly tightened, and also that the two platinum interrupter contacts are properly secured in position.

If the interrupter lever does not move freely on its pivot, which is sometimes possible, particularly with new magnetos, the hole in the fibre bushing in which the lever pivots may be slightly enlarged by means of a reamer or small round file; this work, however, should be carefully done as very little reaming accomplishes the desired result.

PLATINUM INTERRUPTER CONTACTS: The platinum interrupter contacts should be examined for the correctness of their adjustment, and they should be so set that they are separated by a distance of 0.4 of a millimeter (about $\frac{1}{64}$ th inch) when the interrupter lever is resting on either of the segments in the interrupter housing. The strip of steel attached to the Bosch magneto adjusting wrench, which is furnished with each magneto, is to be used as a gauge for this distance. The adjustment of the platinum interrupter contacts may be made by loosening the lock nut of the long contact screw, which passes through the interrupter contact block, and turning the hexagon head of the screw itself by means of the before mentioned Bosch adjusting wrench. When the adjustment is made, care should be taken to tighten the lock nut firmly.

The platinum contacts of the interrupter should be clean and in proper alignment with each other, and any oil, grease or dirt that is deposited on them should be removed. If they are uneven or in bad condition (but only then) they may be smoothed by means of a fine, flat, jeweler's file. The platinum contacts should be kept clean, and in that condition and with proper attention they will last a considerable length of time.

The interrupter itself may be taken out as a unit by removing the interrupter housing and withdrawing the hexagon headed fastening screw in the center of the interrupter by means of the Bosch adjusting wrench. Should the interrupter stick on its seat after the fastening screw is withdrawn, it may be pried loose by means of two small screw drivers inserted back of the interrupter disc, one on each side. When replacing the interrupter, care must be taken that the key on the interrupter disc fits exactly into the keyway on the armature shaft.

DAMAGED INSULATING PARTS: As it sometimes happens that brush holders and other insulating parts of the magneto are damaged through accident or carelessness, these parts should also be carefully examined for possible disarrangement or damage of the insulation which might permit leakage of current.

Summary of Troubles

In brief, providing the magneto is properly timed to the engine, trouble due to ignition may be as follows:

ENGINE WILL NOT START: Switch closed, switch or switch wire short-circuited, interrupter lever sticks; also, with single and two-cylinder types, defective or dirty spark plug, broken or disconnected high tension cable, defective cable insulation, damaged brush holder.

ENGINE STOPS ABRUPTLY: Switch closed, switch or switch wire short-circuited; also, with single and two-cylinder types spark plug cable disconnected.

MISFIRING AT LOW SPEED: Spark plug gap too wide.

MISFIRING AT ALL SPEEDS: Defective or dirty spark plug, improper spark plug gap, cable insulation chafed, cable connections loose, brush holder cracked, platinum interrupter contacts dirty or oily, interrupter lever sticks.

Returning the Magneto

If an examination of the ignition system fails to uncover the trouble, the timing of the magneto to the engine should be carefully verified. Should that not lead to the discovery of the difficulty, the magneto should be returned to the Bosch Magneto Company, or its nearest official representative (see inside back cover for locations, up to date of printing, of Bosch Branches, Distributors and Service Stations).

It should be noted that the parts of the magneto intended for removal may be removed easily without the use of special tools other than the Bosch adjusting wrench. The magnets and end plates are not intended to be removed, and the guarantee on a magneto returned for repair will not be upheld if the screws securing such parts have been withdrawn.

Spark Plugs

It may be pointed out that inasmuch as ignition defects are due largely to dirty or defective spark plugs, most such trouble can be avoided by using plugs which are properly designed and constructed.

trodes of such metal as will resist burning and a design which will tend to operate irrespective of the effects of excessive oiling and sooting. The Bosch Plug meets all these requirements.

IV

Installation of Magneto

DRIVING METHOD—DRIVING SPEED

Since the magneto produces an ignition spark only at certain definite points in the rotation of its armature, it must be connected to the engine in such a manner that the spark is available always at the instant when required in the cylinder, i. e., about top dead center of the compression stroke. The magneto, therefore, must be positively driven from the engine by a method of drive that will eliminate slippage; belt or friction drive can not be used.

THE TYPE "DU6" magneto, producing two sparks per revolution of its armature shaft, must be driven at one and one-half times engine speed for six-cylinder, four-cycle engines, and at three times engine speed for six-cylinder, two-cycle engines. The type "DU4" must be driven at engine speed (crank shaft speed) for four-cylinder, four-cycle engines, and at twice engine speed for four-cylinder, two-cycle engines. The type "DU3" must be operated at three-quarter engine speed for three-cylinder, four-cycle engines, and at one and one-half times engine speed for three-cylinder, two-cycle engines.

THE TYPE "DU4/2, 360°", is intended to be operated at engine speed on two-cylinder, four-cycle engines, the cylinders of which fire alternately every 360° revolution of the crank shaft; for two-cylinder, two-cycle engines, this type must be driven at twice engine speed. The type "DU4/2, 180°", for two-cylinder, four-cycle engines, the cylinders of which fire at intervals of 180° and 540°, must be operated at engine speed.

THE TYPE "DU2" must be driven at half engine speed (camshaft speed) for two-cylinder, four-cycle engines where the cylinders fire alternately every 360° revolution of the crank shaft; for two-cylinder, two-cycle engines, this type must be driven at engine speed.

THE TYPE "DU1" must be driven at camshaft speed for single-cylinder, four-cycle engines, and at engine speed for single-cylinder, two-cycle engines. Where the type "DU1", two-spark, is used on two-cylinder, four-cycle engines, the Bosch Magneto Company, New York, or any of its Branches, should be consulted as to proper driving speed.

DIRECTION OF ROTATION: The type "DU" magnetos are designed to run in one direction only, that is, clockwise or anticlockwise, as viewed from the shaft end of the magneto. The direction in which each magneto is designed to run is indicated by an arrow on the oil well cover at the shaft end of the magneto.

Timing the Magneto

With the average four or two-cycle engine, the proper operating results are obtained by timing the magneto as follows:

FOR TYPES "DU4/2", "DU3", "DU4", AND "DU6": The crank shaft is rotated to bring the piston of No. 1 cylinder (in automobile practice this is the cylinder nearest the radiator) exactly on top dead center of the compression stroke, and the piston is to be maintained in that position. The magneto is then to be secured to its bracket or bed on the engine, and the timing control arm on the interrupter housing placed in the fully retarded position.

With that done, the magneto distributor plate should be removed by withdrawing the two holding screws, or depressing the two catch springs, as the case may be, thus exposing the distributor gear and brush. The cover of the magneto interrupter housing is also to be removed to permit observation of the interrupter.

The armature should then be rotated by means of the exposed distributor gear in the direction in which it is to be driven until the platinum interrupter contacts are just about to separate, which occurs when the interrupter lever begins to bear against one of the steel segments of the interrupter housing.

The armature should be held in that position while the magneto drive is connected to the engine, due care being taken that the piston of No. 1 cylinder is still exactly on top dead center of the compression stroke. The installation is completed by replacing the interrupter housing cover and distributor plate, and connecting the cables between the magneto and spark plugs (see page 14).

FOR TYPES "DU2" AND "DU1": These types should be timed to the engine in the same manner as described above for the types with gear driven distributor, except that with the "DU2" and "DU1", the dust cover over the armature should be removed to facilitate rotation of the armature by hand during the timing; the dust cover should be replaced as soon as the magneto has been connected to the engine.

EXACT MAGNETO TIMING: The foregoing will establish the desired relationship between the magneto

EXACT MAGNETO TIMING: The foregoing will establish the desired relationship between the magneto armature and the engine crank shaft. It should be noted, however, that while these instructions cover the average engine, the exact magneto timing for individual engines is best determined by trial. Where specific instructions for magneto timing are given by the engine manufacturers, it is recommended that such instructions be followed in preference to those herein given.

High Tension Cable Connections

FOR TYPES DU₄/2, DU₃, DU₄ AND DU₆: After timing and connecting the magneto to the engine in accordance with the foregoing instructions, and while the piston of No. 1 cylinder is still on top dead center of the compression stroke, it should be observed with which one of the metal distributor segments the distributor brush will be in contact when the distributor plate is returned to position, and the terminal stud attached to that distributor segment is to be connected by a high tension cable to the spark plug of No. 1 cylinder.

The remaining distributor terminals should be connected to the spark plugs in the other cylinders according to the firing order of the engine and the order in which the rotating distributor brush makes contact with the metal segments in the distributor plate. Thus the second distributor segment to receive contact is to be connected to the second firing cylinder, the third distributor segment to receive contact is to be connected to the third firing cylinder, etc. In making these connections it should be borne in mind that the distributor brush rotates in the direction opposite to the rotation of the armature.

FOR TYPE DU₂: With the magneto interrupter and piston of the first firing cylinder in the position above described, the spark plug of that cylinder should be connected with the brush holder, the brush of which is in contact with the metal segment of the slipring, and this can be seen by removing one of the brush holders. If the metal segment of the slipring is not visible through the opening of the brush holder thus removed it is evidently in contact with the brush in the opposite holder, and the latter must in such case be connected to the spark plug of the first firing cylinder. The spark plug of cylinder No. 2 is then to be connected to the remaining brush holder.

FOR TYPE DU₁: With the type DU₁, the installation is completed by connecting a high tension cable from the brush holder terminal to the spark plug (or from both brush holder terminals to both spark plugs, in the two-spark type).

SPARE PARTS SECTION

WHEN ordering spare parts for replacements, the following details must be mentioned:

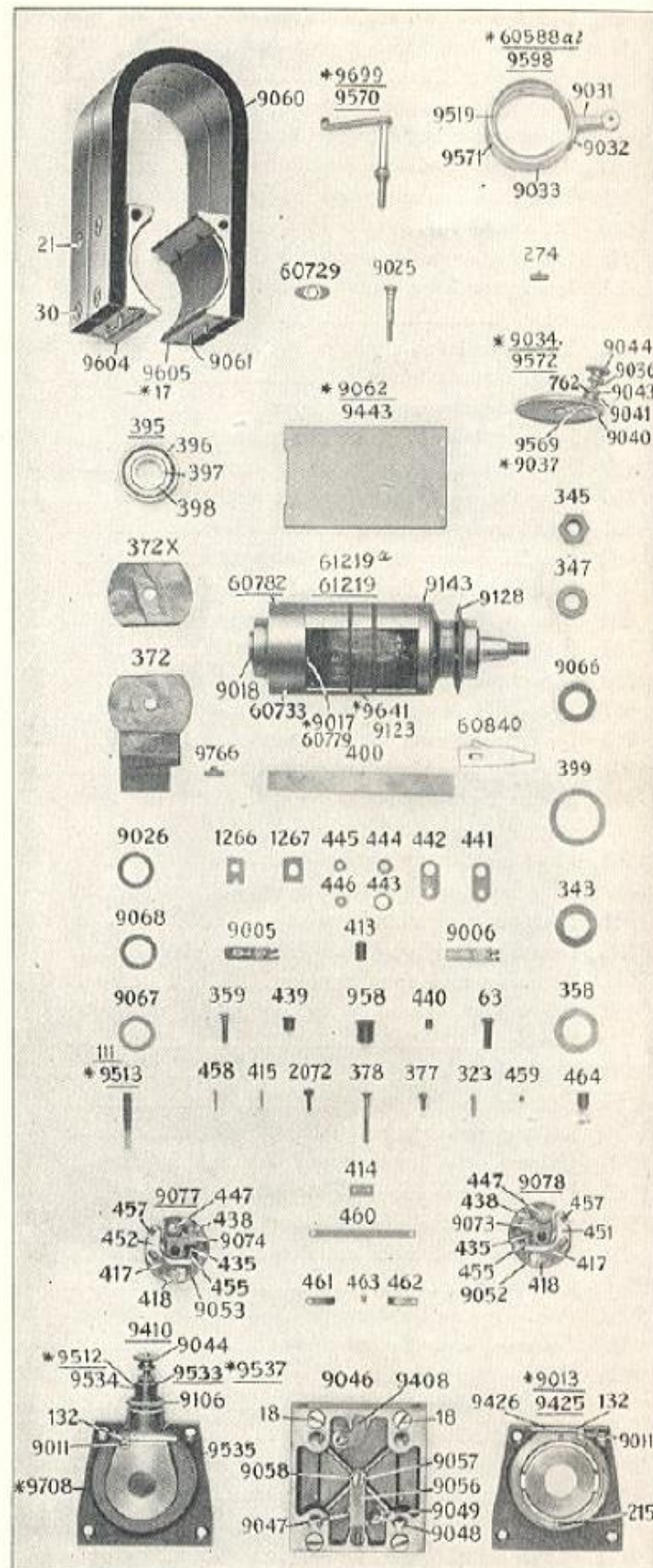
1. Type and number of magneto (these will be found engraved on one side of the magneto base plate).
2. Catalogue number and designation of the spare part.
3. Whether or not magneto and part are exactly as described in this booklet.

In case of doubt, it is advisable to specify the make and model of car or engine, the number of cylinders, bore and stroke, and whether four or two-cycle.

*Numbers marked thus, indicate DU₁ Ed. 7, DU₂ Ed. 7, and DU₁ Ed. 2 Two-Spark parts which are slightly different from those shown.

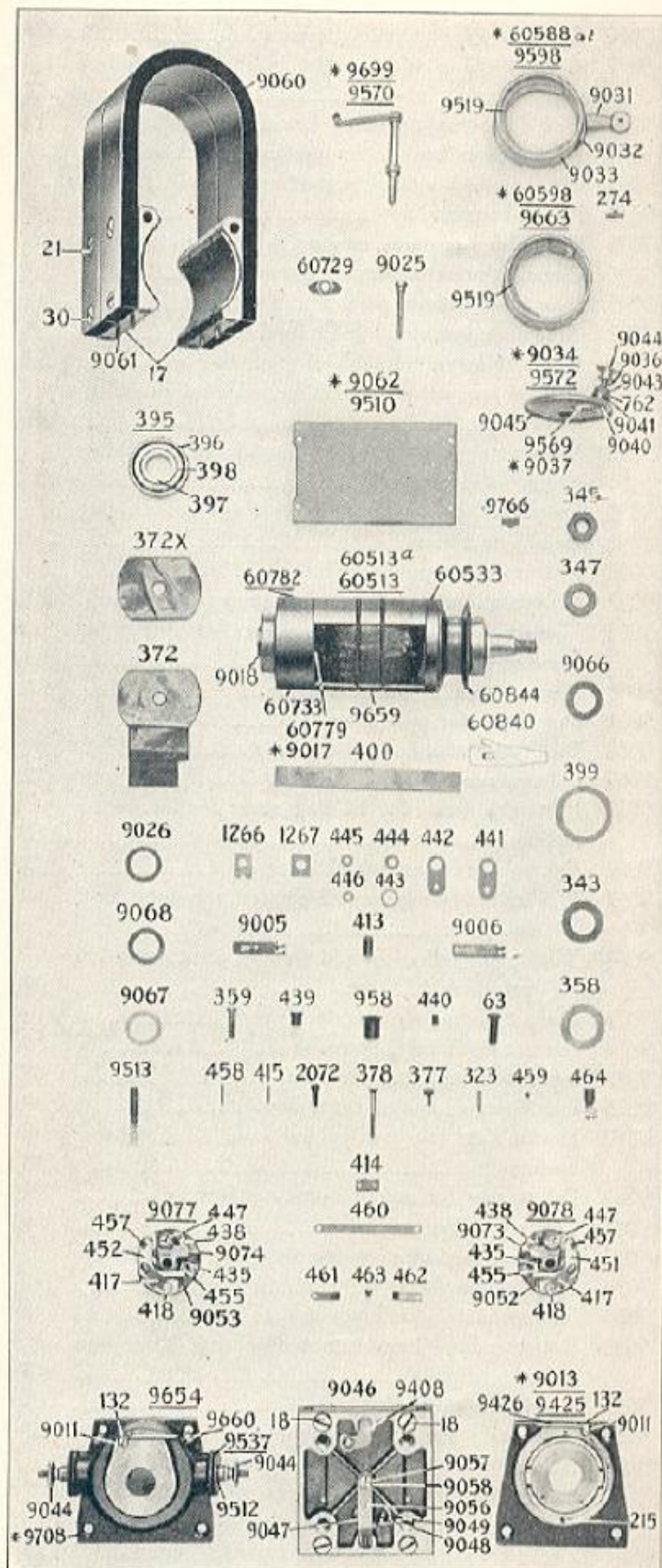
Spare Parts for Bosch Independent Magnets DU Types

17	One pair of pole shoes	\$ 1.08
18	Fastening screw for pole shoes .....	.03
21	Top magnet fastening screw .....	.03
30	Bottom magnet fastening screw .....	.03
35	Dowel pin for end plates .....	.03
63	Fastening screw for end plates .....	.03
111	Slipping brush and spring .....	.09
132	Spring for oil well covers .....	.03
179	Pivot pin for catch spring for distributor plate.....	.03
215	Stop screw for interrupter housing .....	.03
232	Segment with felt wick for interrupter housing.....	.24
233	Segment for interrupter housing .....	.24
236	Segment with felt wick for interrupter housing.....	.24
237	Segment for interrupter housing .....	.24
274	Felt wick for segment .....	.03
323	Dowel pin for armature core .....	.03
343	Spring washer between slipping and ball bearing....	.03
344	Spring washer between slipping and ball bearing....	.03
345	Hexagon lock nut on armature driving shaft.....	.03
346	Hexagon nut for armature driving shaft.....	.03
347	Washer for armature driving shaft .....	.03
358	Washer under spring washer for slipping.....	.03
359	Fastening screw for armature cover on driving end	.03
372	Linen insulation strip for condenser.....	.03
372x	Linen insulation (stamped) for condenser.....	.03
376	Insulating bushing for condenser .....	.05
377	Fastening screw for condenser .....	.03
378	Fastening screw for interrupter end armature cover	.03
379	Dowel pin for armature gear .....	.03
393	Press pan washer for outer ball race ring in end plates .....	.03
394	Press pan strip for outer ball race ring in end plates	.03
395	Ball bearing complete for end plates	2.16
396	Outer ball race ring for end plates .....	.90
397	Inner ball race ring for both armature shafts.....	.78
398	Cage with balls for ball bearings for end plates....	.48
399	Press pan washer for outer ball race ring in end plates .....	.03
400	Press pan strip for outer ball race ring in end plates	.03
413	Fibre bushing for interrupter lever .....	.03
414	Fibre plate for boss on interrupter disc.....	.03
415	Rivet for fastening fibre plate on interrupter boss....	.03
417	Holding spring for interrupter lever.....	.03
418	Washer for holding spring for interrupter lever.....	.03
435	Long platinum screw	2.00
438	Hexagon lock nut for long platinum screw.....	.03
439	Center bushing for interrupter .....	.03
440	Hard rubber bushing in contact blocks.....	.03
440a	Hard rubber bushing in contact blocks, old style....	.03



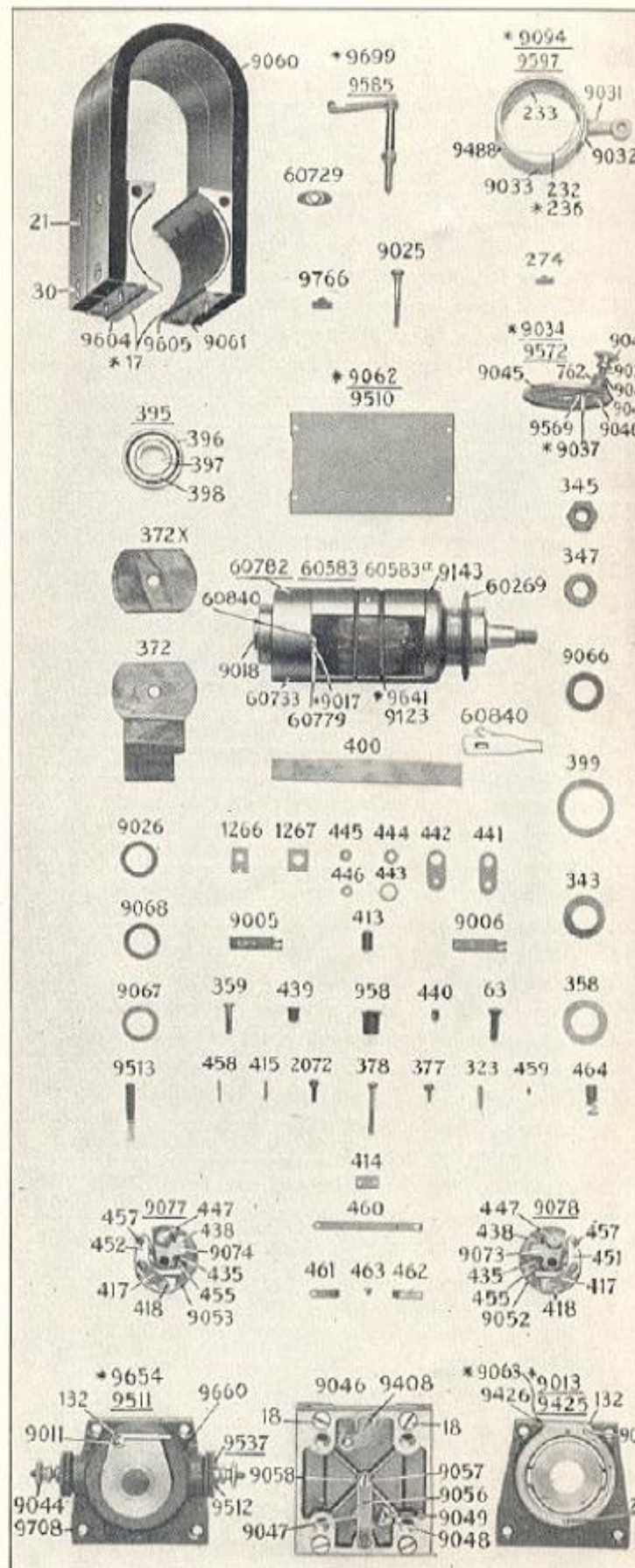
Spare Parts for DUI Model 6 and DUI Ed. 7 Magnets

441	Thick mica insulating plate under contact blocks..\$	.03
441a	Hard rubber insulating plate under contact blocks, old style .....	.03
442	Thin mica insulating plate under contact blocks....	.03
443	Brass washer under contact blocks .....	.03
444	Thick mica insulating washer for contact blocks....	.03
445	Thin mica insulating washer for contact blocks.....	.03
446	Brass washer on contact blocks .....	.03
447	Fastening screw for contact blocks .....	.03
451	Interrupter lever, anticlockwise, without platinum screw	1.05
452	Interrupter lever, clockwise, without platinum screw	1.05
455	Short platinum screw	2.00
457	Fibre block on interrupter lever .....	.03
458	Rivet for fibre block on interrupter lever.....	.03
459	Fibre pin in interrupter lever .....	.03
460	Long flat spring for interrupter lever.....	.03
461	Auxiliary spring on interrupter lever .....	.03
462	Auxiliary spring on boss of interrupter disc.....	.03
463	Fastening screw for springs for interrupter.....	.03
464	Brush with spring for back of interrupter.....	.09
762	Brass washer for grounding terminal.....	.03
850	Dowel pin for lock pin for distributor plate.....	.03
867	Washer for spring washer for slipping.....	.03
958	Insulating bushing for condenser .....	.06
997	Linen insulation strip for condenser.....	.03
1052	Bottom fastening screw for interrupter end plate cover .....	.03
1266	Fibre insulating plate for grounding terminal.....	.05
1267	Mica insulating plate for grounding terminal.....	.03
1861	Lock pin for distributor plate .....	.06
1862	Dowel pin for lock pin on distributor plate.....	.03
2072	Fastening screw for dust cover.....	.03
3153	Screw with felt wick and spring for distributor bearing .....	.15
3154	Screw for felt wick only .....	.06
3155	Felt wick and spring .....	.06
3156	Leather washer for screw for felt wick.....	.03
9005	Oil well cover for shaft end plate, anticlockwise....	.12
9006	Oil well cover for shaft end plate, clockwise.....	.12
9011	Pivot screw for oil well covers.....	.03
9013	Interrupter end plate complete	3.75
9017	Condenser	3.15
9018	Auxiliary ring for interrupter end armature shaft....	.03
9025	Fastening screw for interrupter .....	.06
9026	Washer for taking up end play on armature shaft, 0.3 mm. thick .....	.03
9030	Interrupter housing ring only .....	.90
9031	Timing control arm for interrupter housing.....	.75
9032	Brass rivet for timing control arm.....	.03
9033	Fastening screw for segments on interrupter housing .....	.03
9034	Cover for interrupter housing complete with grounding terminal .....	.45
9035	Grounding terminal complete .....	.36



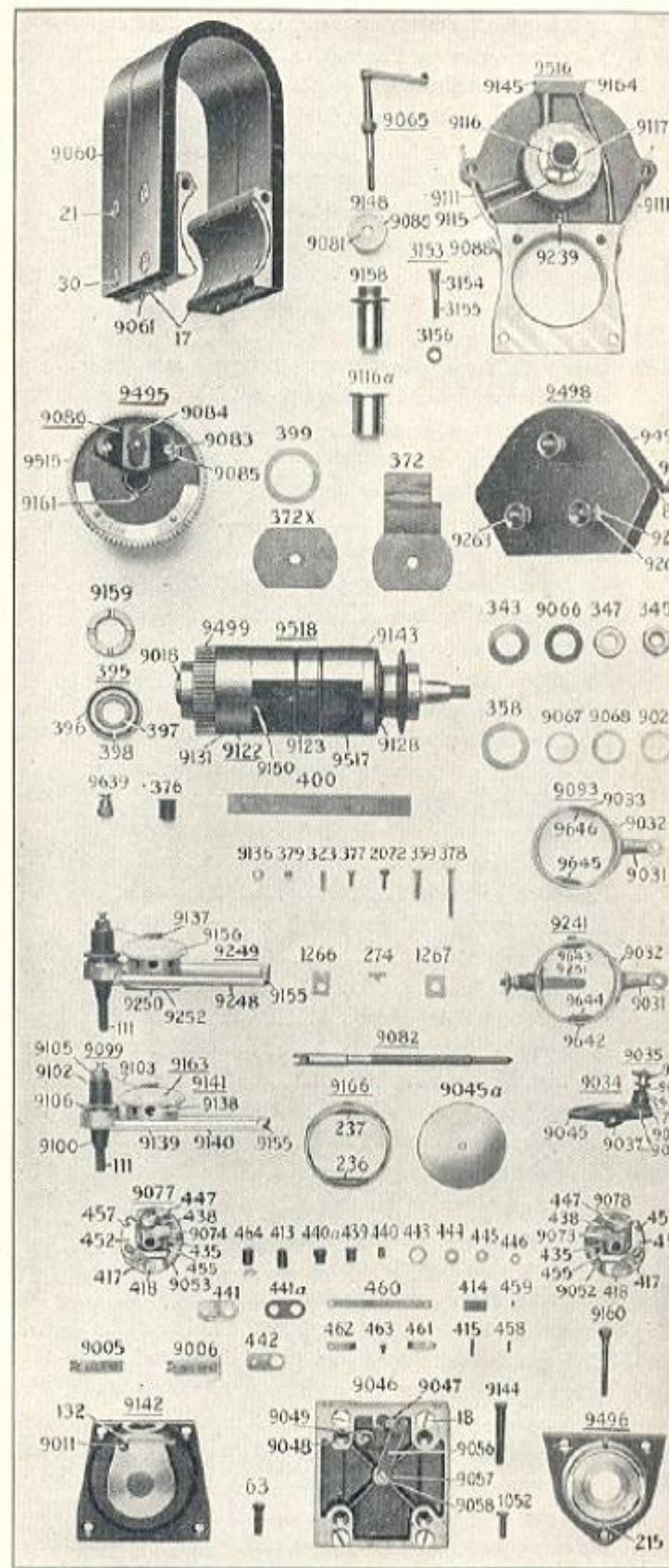
DUI Model 4 and DUI Ed. 2, Two-Spark Magnetos

9036	Screw stud for grounding terminal.....	\$.03
9037	Contact spring with contact brush for grounding terminal .....	.12
9040	Dowel pin for grounding terminal insulation.....	.03
9041	Hard rubber bushing for grounding terminal.....	.03
9043	Hexagon lock nut for grounding terminal.....	.03
9044	Knurled terminal nut .....	.03
9045	Cover for interrupter housing, with dowel pin only .....	.15
9045a	Cover only for interrupter housing.....	.15
9046	Base plate without parts	1.65
9047	Grounding brush with cable for base plate.....	.15
9048	Fastening screw for cable of grounding brush.....	.03
9049	Washer for fastening screw for cable on grounding brush .....	.03
9052	Interrupter disc with fibre bushing and holding spring, anticlockwise .....	.78
9053	Interrupter disc with fibre bushing and holding spring, clockwise .....	.78
9056	Flat spring for grounding brush .....	.03
9057	Fastening screw for flat spring for grounding brush .....	.03
9058	Washer for fastening screw for flat spring for grounding brush .....	.03
9060	Magnet	3.00
9061	Dowel pin for pole shoes .....	.03
9062	Dust cover with oil well cover.....	.60
9063	Oil well cover for dust cover 9062.....	.12
9065	Post with spring for holding cover for interrupter housing .....	.18
9066	Felt washer for armature driving shaft.....	.03
9067	Washer for taking up end play on armature shaft, 0.1 mm. thick .....	.03
9068	Washer for taking up end play on armature shaft, 0.2 mm. thick .....	.03
9073	Contact block only, anticlockwise .....	.18
9074	Contact block only, clockwise .....	.18
9077	Interrupter complete, clockwise	6.88
9078	Interrupter complete, anticlockwise	6.88
9080	Holder for felt washer for end of distributor bearing .....	.15
9081	Felt washer for end of distributor bearing.....	.03
9082	Connecting bar .....	.39
9083	Fastening screw for rotating distributor brush holder .....	.03
9084	Rotating distributor brush and spring.....	.15
9085	Rotating distributor brush holder .....	.48
9086	Rotating distributor brush holder with brush and spring .....	.63
9087	Distributor gear complete	3.00
9088	Fastening screw for catch springs.....	.03
9091	Interrupter housing complete, timing arm right, anticlockwise, for magnetos with variable ignition.....	2.25
9092	Interrupter housing complete, timing arm left, anticlockwise, for magnetos with variable ignition.....	2.25
9093	Interrupter housing complete, timing arm left, clockwise, for magnetos with variable ignition.....	2.25



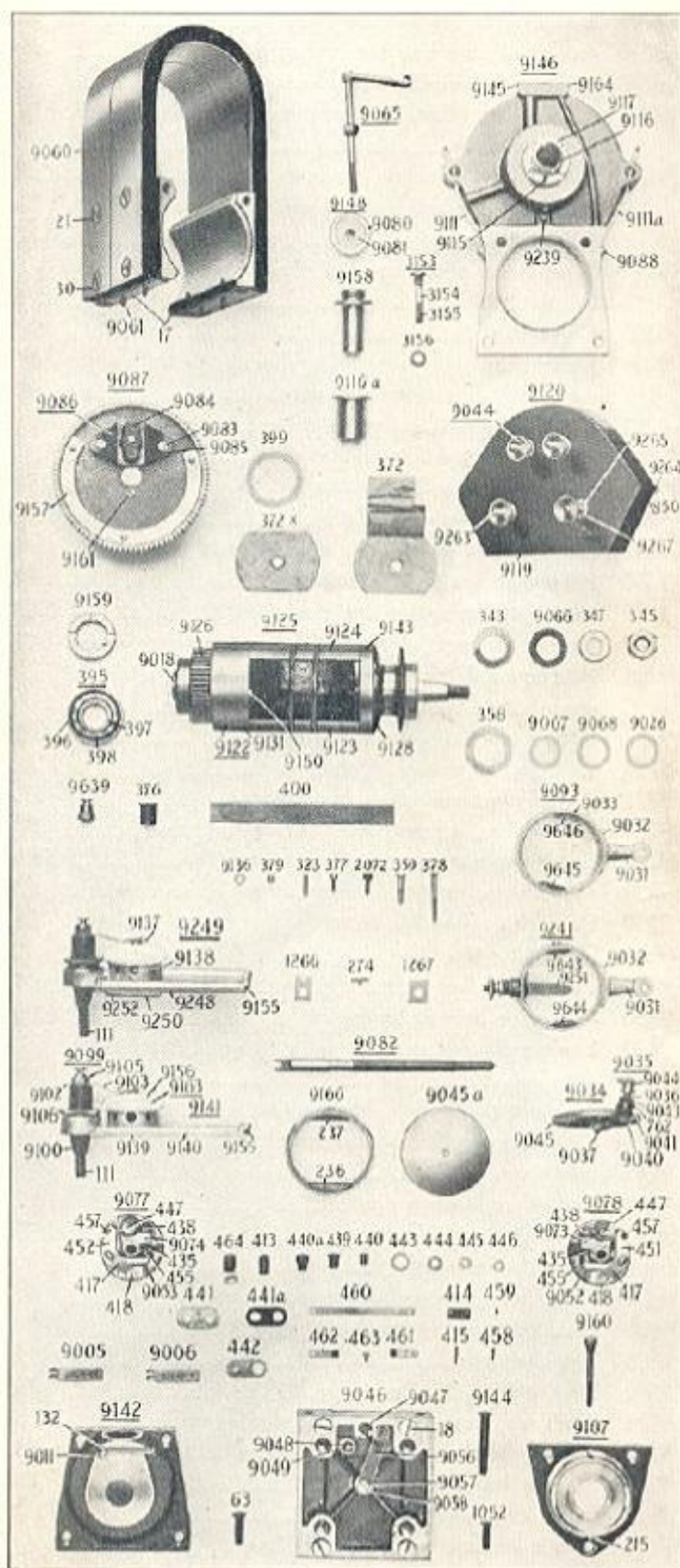
Spare Parts for DU2 Model 6 and DU2 Ed. 7 Magnetos

9094	Interrupter housing complete, timing arm right, clockwise, for magnetos with variable ignition.....	\$ 2.25
9099	Slipping brush holder complete .....	.75
9100	Slipping brush holder only .....	.39
9102	Washer for slipping brush holder.....	.03
9103	Flat spring for holding steatite cover for safety spark gap .....	.06
9105	Cap nut for slipping brush holder .....	.06
9106	Knurled lock nut for slipping brush holder.....	.12
9107	Cover for interrupter end plate complete.....	3.90
9111	Catch spring for distributor plate, left.....	.09
9111a	Catch spring for distributor plate, right.....	.09
9115	Set screw for spanner nut for distributor bearing....	.03
9116	Distributor bearing .....	.54
9116a	Distributor bearing, old style .....	.36
9117	Spanner nut for distributor bearing.....	.15
9119	Distributor plate without terminal nuts.....	3.60
9120	Distributor plate complete	3.72
9122	Armature cover on interrupter end with condenser..	4.80
9123	Armature core and winding	6.00
9123a	Armature core and winding, two connections.....	6.00
9124	Armature complete with slipping, gear, and both ball bearings without outer ball race rings.....	20.46
9125	Armature complete with slipping, gear, and both ball bearings	22.20
9126	Armature gear .....	.57
9128	Slipping	1.23
9131	Armature cover for interrupter end only.....	1.65
9135	Washer for safety spark gap electrode in steatite cover .....	.03
9136	Spring ring for safety spark gap electrode in steatite cover .....	.03
9137	Safety spark gap electrode for steatite cover.....	.06
9138	Wire gauze for safety spark gap housing.....	.09
9139	Safety spark gap lower electrode for dust cover....	.09
9140	Dust cover only with safety spark gap lower electrode and wire gauze for safety spark gap housing..	1.05
9141	Dust cover complete with safety spark gap steatite cover and slipping brush holder complete.....	2.25
9142	Shaft end plate complete	3.15
9143	Armature cover for driving end with taper shaft....	1.86
9144	Top fastening screw for interrupter end plate cover	.03
9145	Pivot screw for oil well cover on interrupter end plate .....	.03
9146	Interrupter end plate with oil well cover, distributor bearing, felt wick screw and catch springs for distributor plate	5.70
9148	Holder with felt washer for end of distributor bearing .....	.18
9150	Condenser	3.15
9155	Felt strip for dust cover .....	.03
9156	Steatite cover only for safety spark gap housing....	.24
9157	Distributor gear only	2.25
9158	Shaft for distributor gear .....	.84



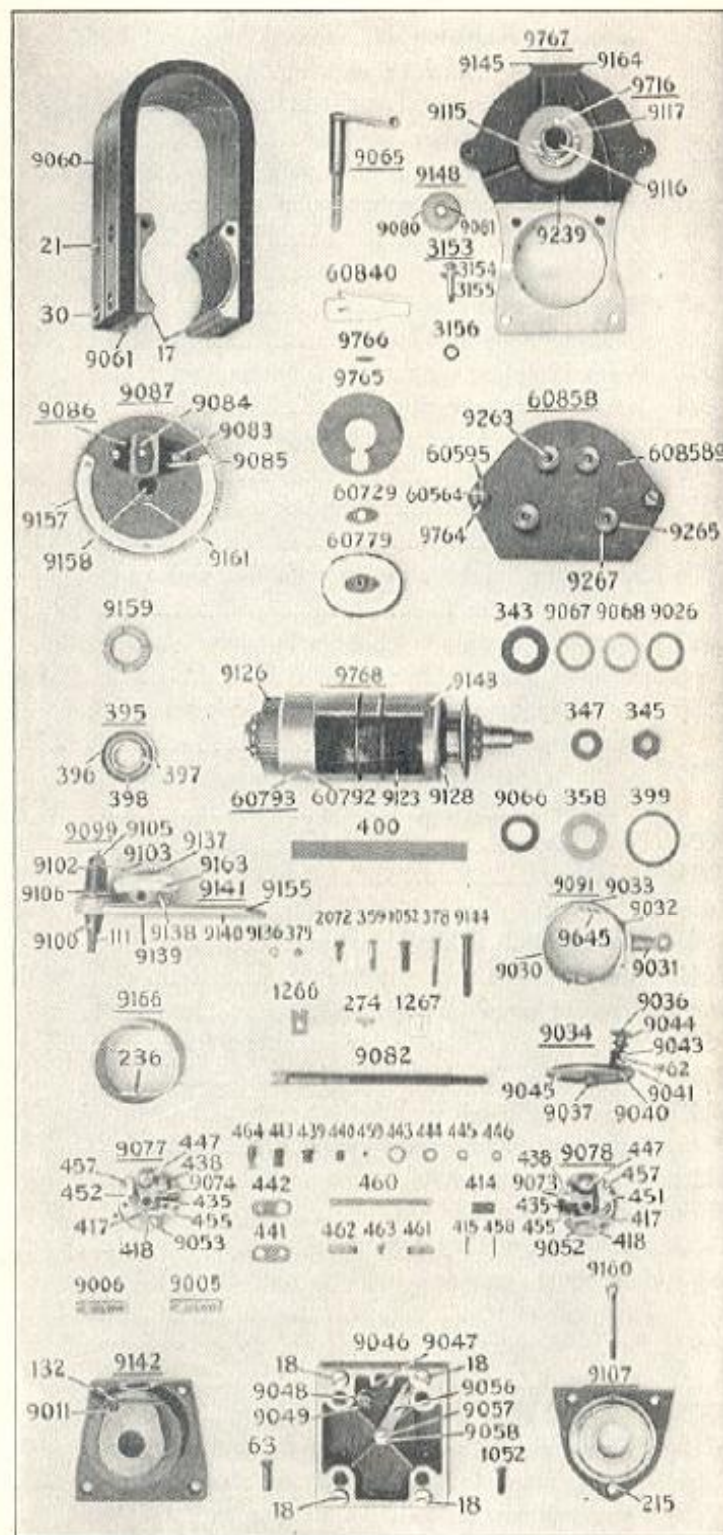
Spare Parts for DU3 Model 4 Magneto

9159	Spanner nut for armature gear.....	\$.15
9160	Fastening screw for interrupter .....	.06
9161	Set screw for distributor gear shaft.....	.03
9163	Steatite cover complete for safety spark gap housing with electrode .....	.33
9164	Oil well cover for interrupter end plate.....	.06
9166	Interrupter housing complete, clockwise, for magnetos with fixed ignition	1.50
9167	Interrupter housing complete, anticlockwise, for magnetos with fixed ignition	1.50
9239	Dowel pin for holding dust cover.....	.03
9240	Interrupter housing complete with timing arm right, anticlockwise, and grounding terminal, for magnetos with variable ignition	2.55
9241	Interrupter housing complete with timing arm left, anticlockwise, and grounding terminal, for magnetos with variable ignition	2.55
9242	Interrupter housing complete with timing arm left, clockwise, and grounding terminal for magnetos with variable ignition	2.55
9243	Interrupter housing complete with timing arm right, clockwise, and grounding terminal for magnetos with variable ignition	2.55
9248	Dust cover only with safety spark gap lower electrode and wire gauze for safety spark gap housing and with ball clips	1.44
9249	Dust cover complete with safety spark gap steatite cover, slipping brush holder complete and ball clips	2.55
9250	Rivet for ball clip .....	.03
9251	Contact spring for grounding terminal on interrupter housing .....	.12
9252	Ball clip .....	.15
9253	Base plate without parts	1.95
9254	One pair of pole shoes	1.08
9255	Shaft end plate complete	3.45
9256	Oil well cover for shaft end plate, anticlockwise....	.12
9257	Oil well cover for shaft end plate, clockwise.....	.12
9258	Pivot screw for oil well cover .....	.03
9259	Outer ball race ring for end plates.....	.99
9260	Distributor gear complete	3.60
9261	Shaft for distributor gear .....	.90
9262	Fastening screw for interrupter .....	.06
9263	Terminal stud for distributor plate.....	.09
9264	Lock pin for catch spring on distributor plate.....	.09
9265	Spanner nut for terminal stud for distributor plate..	.06
9267	Dowel pin for spanner nut .....	.03
9268	Armature complete with both ball bearings.....	25.15
9269	Armature complete with both ball bearings without outer ball race rings.....	23.27
9270	Armature cover for interrupter end with condenser	5.55
9271	Armature cover for interrupter end only.....	2.40
9272	Armature cover for driving end only.....	3.60
9273	Fastening screw for interrupter end armature cover..	.03
9274	Armature gear .....	.51



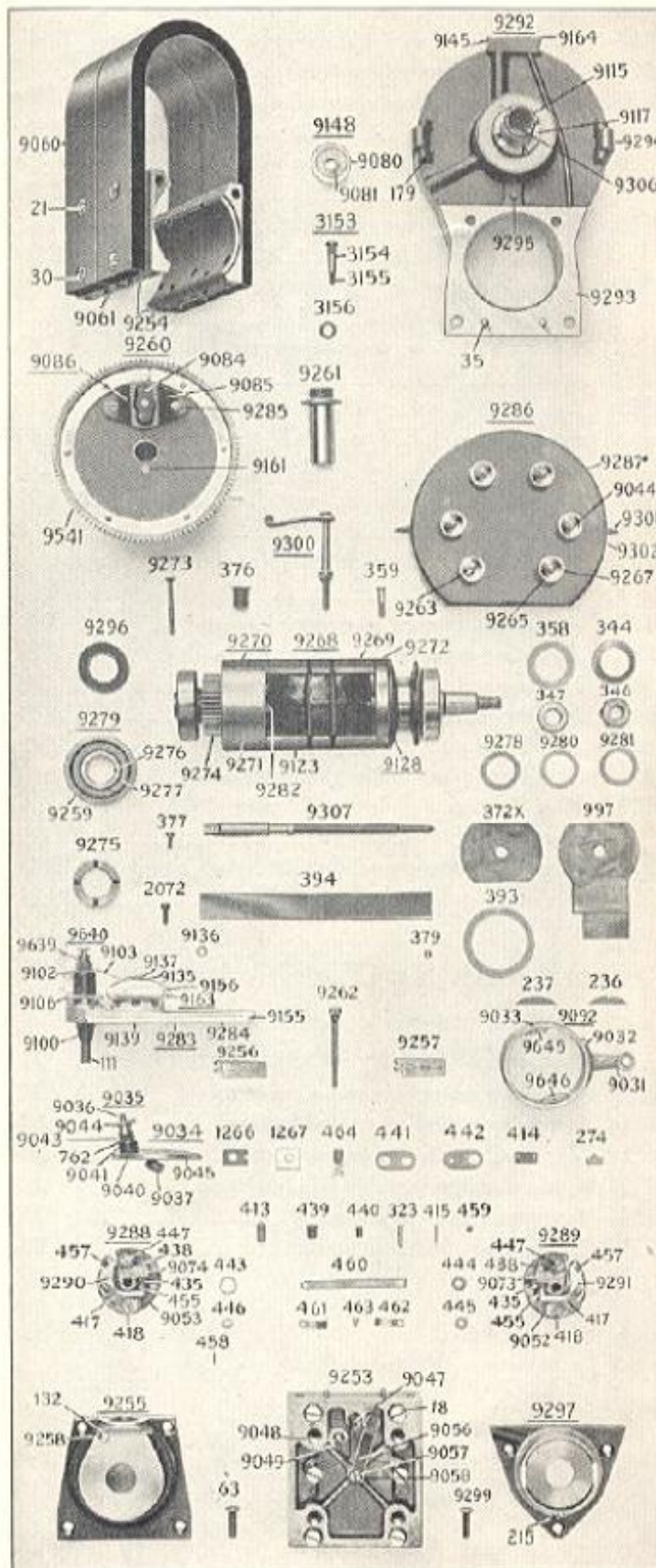
Spare Parts for DU4 Model 4 Magneto

9275	Spanner nut for armature gear	\$.24
9276	Inner ball race ring for armature shafts.....	.84
9277	Cage with balls for ball bearings.....	.75
9278	Washer for taking up end play on armature shaft, 0.3 mm. thick .....	.03
9279	Ball bearing complete for both armature shafts.....	2.58
9280	Washer for taking up end play on armature shaft, 0.2 mm. thick .....	.03
9281	Washer for taking up end play on armature shaft, 0.1 mm. thick .....	.03
9282	Condenser	3.15
9283	Dust cover complete with slipping brush holder complete and safety spark gap.....	2.40
9284	Dust cover with lower safety spark gap electrode, wire gauze and felt strip only.....	1.29
9285	Fastening screw for rotating distributor brush holder	.03
9286	Distributor plate complete	7.14
9287	Distributor plate without terminal nuts	6.96
9288	Interrupter complete, clockwise	6.88
9289	Interrupter complete, anticlockwise	6.88
9290	Interrupter lever, clockwise, without platinum screw	1.05
9291	Interrupter lever, anticlockwise, without platinum screw	1.05
9292	Interrupter end plate complete.....	9.60
9294	Catch spring for distributor plate.....	.12
9295	Dowel pin for holding dust cover.....	.03
9296	Felt washer for armature driving shaft.....	.03
9297	Cover for interrupter end plate complete.....	3.25
9299	Fastening screw for interrupter end plate cover.....	.03
9300	Post with spring for cover for interrupter housing..	.21
9306	Distributor bearing .....	.60
9307	Conducting bar .....	.45
9408	Cover for hole in base plate.....	.06
9410	Shaft end plate complete with slipping brush holder complete	3.33
9425	Interrupter end plate complete	3.93
9426	Oil well cover for interrupter end plate.....	.09
9443	Dust cover .....	.15
9488	Interrupter housing ring .....	.90
9495	Distributor gear complete	2.70
9496	Cover for interrupter end plate.....	3.90
9497	Distributor plate without terminal nuts.....	3.60
9498	Distributor plate complete	3.69
9499	Armature gear .....	.66
9510	Dust cover .....	.15
9511	Shaft end plate complete with slipping brush holders	4.25
9512	Slipping brush holder only .....	.45
9513	Slipping brush and spring .....	.09
9515	Distributor gear only	2.00
9516	Interrupter end plate with oil well cover, distrib- utor bearing, felt wick screw and catch springs for distributor plate	5.40
9517	Armature complete with slipping, gear and both ball bearings without outer ball race rings.....	20.46



Spare Parts for DU4 Ed. 7 Magneto

9518	Armature complete with slipping, gear and both ball bearings	\$22.20
9519	Segment .....	.60
9533	Slipping brush holder complete .....	.72
9534	Slipping brush holder without parts .....	.39
9535	Shaft end plate complete without slipping brush holder	2.58
9537	Slipping brush holder complete .....	.60
9541	Distributor gear only	2.75
9569	Contact spring with contact .....	.12
9570	Post with spring for interrupter housing cover .....	.21
9571	Interrupter housing ring only .....	.90
9572	Cover for interrupter housing complete with grounding terminal .....	.45
9585	Post with spring for holding cover for interrupter housing .....	.21
9596	Interrupter housing complete with timing arm right, anticlockwise	2.25
9597	Interrupter housing complete with timing arm right, clockwise	2.25
9598	Interrupter housing complete with timing arm left, anticlockwise	2.25
9599	Interrupter housing complete with timing arm left, clockwise	2.25
9604	Pole shoe .....	.60
9605	Pole shoe .....	.60
9639	Cap nut for slipping brush holder .....	.03
9640	Slipping brush holder complete .....	.75
9641	Armature core with winding	6.00
9642	Fastening screw for segments .....	.03
9643	Segment with felt wick for interrupter housing .....	.24
9644	Segment for interrupter housing .....	.24
9645	Segment with felt wick for interrupter housing .....	.24
9646	Segment for interrupter housing .....	.24
9654	Shaft end plate with brush holders	4.25
9659	Armature core and winding	6.00
9660	Pointed screw for safety spark gap .....	.05
9663	Interrupter housing complete for magnetos with fixed ignition	1.50
9699	Post with spring for holding cover for interrupter housing .....	.18
9708	Shaft end plate without brush holders	3.05
9716	Spanner nut with set screw for distributor bearing ..	.18
9764	Washer under lock washer for distributor plate .....	.03
9765	Press pan washer between slipping and armature driving shaft .....	.05
9766	Felt strip in armature cover on interrupter end .....	.03
9767	Interrupter end plate complete	5.60
9768	Armature complete with slipping, gear, and both ball bearings without outer ball race rings	21.80
60269	Slipping	1.23
60513	Armature complete without outer ball race rings	18.00
60513a	Armature complete with both ball bearings	19.80
60533	Armature cover for driving end	1.86



Spare Parts for DU6 Model 4 Magneto

60564	Fastening screw for distributor plate.....	\$.03
60583	Armature complete without outer ball race rings..	17.45
60583a	Armature complete with both ball bearings.....	19.25
60588al	Interrupter housing complete with timing arm left, anticlockwise	2.25
60588cl	Interrupter housing complete with timing arm left, clockwise	2.25
60588cr	Interrupter housing complete with timing arm right, clockwise	2.25
60588ar	Interrupter housing complete with timing arm right, anticlockwise	2.25
60595	Lock washer for fastening screw for distributor plate .....	.03
60598	Interrupter housing complete for magnetos with fixed ignition (DUI and DUI two-spark).....	1.50
60729	Insulating bushing for condenser .....	.10
60733	Armature cover for interrupter end only.....	1.65
60779	Condenser	2.65
60782	Armature cover for interrupter end with con- denser	4.35
60792	Armature cover on interrupter end only.....	2.40
60793	Armature cover on interrupter end with condenser	5.25
60840	Holding spring for condenser.....	.10
60844	Slipring	1.50
60858	Distributor plate complete with terminal nuts.....	3.62
60858a	Distributor plate without terminal nuts.....	3.50
61129	Plug for extra hole for slipring brush holder, type DUI (not illustrated).....	.25
61219	Armature complete without outer ball race rings..	17.45
61219a	Armature complete with ball bearings.....	19.25

Spare Parts for DU4 Model 2 Only

These parts not shown in illustrations
All other parts same as DU4 Model 4

9108	Cover for interrupter end plate complete.....	\$ 4.50
9151	Rivet for grounding terminal spring.....	.03
9152	Terminal stud for grounding terminal.....	.15
9153	Grounding spring with brush holder.....	.12
9154	Interrupter housing complete	1.25
9238	Fastening screw for segments03

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1. The insulator is of Steatite, an almost unbreakable, artificial stone, absolutely free from the disadvantages of porcelain, glass or mica insulators commonly used in other plugs. Steatite is neither brittle nor subject to deterioration by undue heat, extreme pressure or excessive oil; a slip of the wrench will not break it, excessive vibration will not crack it.

2. The electrodes 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.

3. The electrodes are knife edged to offer the least possible resistance to the passing of the spark. 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.

4. Sooting of the plug when the engine is working is practically impossible, first, because of the double insulating air space provided by the recess in the steatite insulator, and second, because of the electrodes being at a high enough temperature to burn away any oil which may be splashed upon them.

5. 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.

6. All Bosch Plugs are made with three heavy nickel alloy electrodes, assuring long life and minimum adjusting.



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