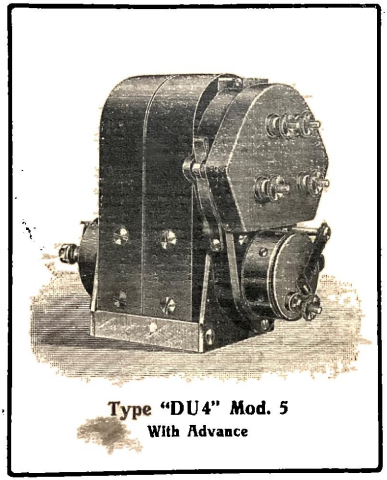
BOSCH



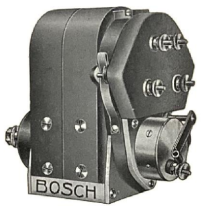
Type "DU4" Mod. 5
With Advance

High Tension Magneto

For 3, 4 and 6-Cylinder
Automobile Type Engines

TRADE MARK

BOSCH



Type "DU4" Mod. 5
With Advance

For 3, 4 and 6-Cylinder Engines

(Patented and patents pending)

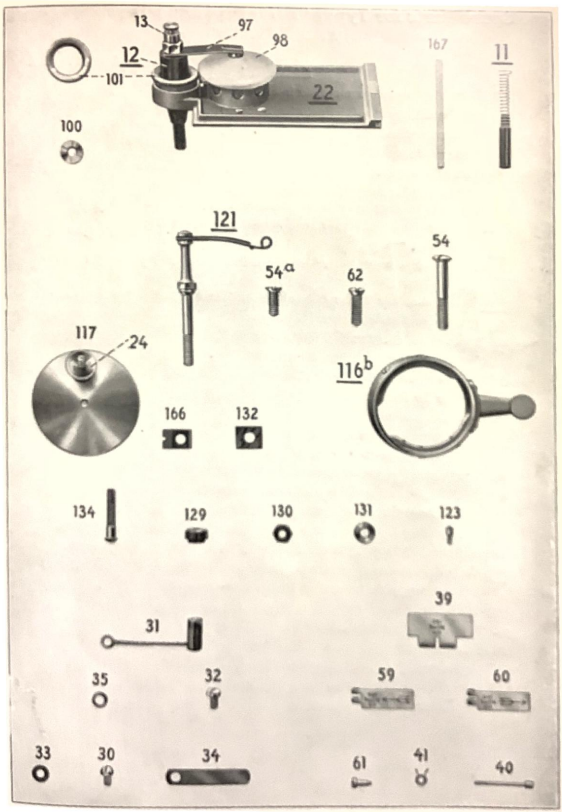
BOSCH MAGNETO COMPANY
223—225 West 46th Street, New-York, N.-Y.
DETROIT — CHICAGO — SAN FRANCISCO — TORONTO
FACTORY: SPRINGFIELD MASS.

Spare Parts for Types "DU3, DU4 and DU6 Model 5" with Advance.

Plate I.

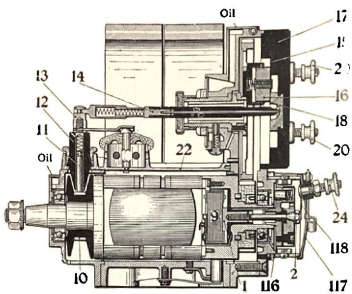
11. Carbon brush with spring for brush holder 12a.
12. Brush holder with annexed parts on dust cover 22.
12a. Brush holder only.
13. Locking nut for spring 97 and conducting bar 14.
22. Dust cover with annexed parts.
22a. Dust cover only.
24. Knurled nut on grounding terminal stud 134.
30. Fastening 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.
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.
54a 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.
62. Fastening screw for shaft end plate.
97. Holding spring for steatite cover 98.
98. Steatite cover with safety spark gap electrode.
100. Washer under nut 13.
101 Knurled lock nut for brush holder 12.
116b. Interrupter housing complete. State whether timing arm is wanted on right or left side of magneto when viewed from shaft end.
117. Cover for interrupter housing with grounding terminal stud 134.
118. Conducting spring for grounding terminal stud 134.
121. Post with holding spring for interrupter housing cover 117.
123. Stop screw on cover of interrupter end plate.
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 166.
134. Grounding terminal stud.
166. Fibre plate under conducting spring 118.
167. Felt strip for dust cover 22.

PLATE I.



When ordering *please state besides indicating the number and designation of the desired parts that they are for type "DU 3, DU 4 or DU 6 Model 5".*

Longitudinal Section of the Magneto.



½ of actual size

1. *Brass plate for connecting the end of the primary winding.*
2. *Fastening screw for magneto interrupter.*
3. *Contact block for magneto interrupter.*
4. *Magneto interrupter disk.*
5. *Long platinum screw.*
6. *Short platinum screw.*
7. *Flat spring for magneto interrupter lever 8.*
8. *Magneto interrupter lever.*
9. *Condenser.*
10. *Collector ring.*
11. *Carbon brush.*
12. *Brush holder for same.*
13. *Terminal piece for conducting bar 14.*
14. *Conducting bar.*
15. *Distributor brush holder.*
16. *Distributor carbon brush.*
17. *Distributor plate.*
18. *Central distributor contact.*
19. *Brass segment.*
20. *Knurled nut on terminal stud.*
21. *Steel segment.*
22. *Dust cover.*

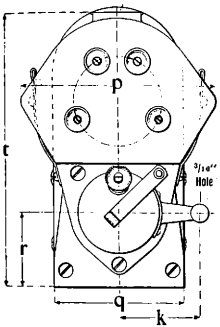
Ignition Timing. An arrangement for varying the timing of the ignition is fitted to the magneto itself, and permits a variation of 35° measured on the magneto shaft. The timing range obtained on the motor shaft will depend on the relative speed of the motor shaft and of the armature.

Efficiency in Retard Position. Former constructions of magnetos have been such that the production of a spark in the full retard position required a considerably higher speed than was necessary in the full advance. This condition has been altered, and magnetos distinguished by the addition of the title "Model 5" to the type name will produce a spark at a lower speed in the full retard than in the full advance position.

This condition is due entirely to a re-design in the internal parts of the magneto, and does not require any moving parts or any essential variation from the previous design.

As this construction will permit the starting of the engine at extremely low cranking speeds, and will also allow the engine to be run with the spark in the fully retarded position, its importance will be recognized.

The correct setting may vary ac... motor, and a more accurate setting can ... With three and four-cylinder engines, ... very satisfactory results may be obtained ... in the full retard position when the cran... over top dead centre.



Connections.

The connections of the magneto consist of a high tension cable from the distributor to each spark plug, and a low tension cable leading to the switch.

It should be observed with which one of the distributor segments the distributor brush will be in contact when the plate is in position, and the binding post attached to that distributor segment should be connected to the spark plug of the cylinder that is at the end of the compression stroke. The remaining distributor segments should be connected to the spark plugs according to the firing order of the engine, and it should be recollected in making these connections that the distributor rotates in the opposite direction to the armature.

Difficulty will be avoided if Bosch high tension cable and Bosch loop terminals are used in making these connections.

In order to permit the cutting off of the ignition, a switch should be provided, one terminal of which is to be connected permanently with some metallic portion of the engine or of the frame. The other terminal of the switch should be led to grounding terminal 24, which is insulated from the interrupter housing but in metallic connection with fastening screw 2, that conducts primary current to the magneto interrupter.

To cut off ignition, this switch is to be closed, and it will be observed that it then permits the uninterrupted flow of current from the primary winding to ground. In order to permit operation, the switch must be open.

In the wiring diagram, the numbers of the spark plugs indicate the order in which the sparks are supplied by the magneto, and not the firing order of the engine. The firing order, of course, will vary according to the arrangement of the cylinders and the order in which they come under compression.

Safety spark gap. In order to protect the insulation of the armature and of the current-carrying parts of the apparatus against excessive voltage, a safety spark gap is arranged on dust cover 22. It consists of a short pointed brass rod set on the dust cover, and a second pointed brass part supported a short distance from it in the centre of the steatite cover of the housing. The insulated point is connected into the secondary circuit, and should there be any interference with the circuit normally provided through the spark plugs, the safety spark gap provides a point of discharge.

If a spark is observed passing in the safety spark gap, it is an indication that there is an interruption in the regular secondary circuit, and the cause should be at once investigated.

It is not advisable to permit the sparks to pass in the safety spark gap for any considerable period of time.

If an engine is provided with a second system of ignition, it is necessary when running on it, to take all due precaution to ground the magneto as already explained.

The current producing a spark which causes ignition, then through the motor frame and the armature core to the grounded primary winding, thus completing the circuit.

The diagram of connections is shown on page 7.

Magneto Interrupter. The magneto interrupter is fitted into [illegible] of armature shaft which is taper bored and provided with a key-way. The magneto interrupter is held in position by fastening screw 2, and may easily be removed. In replacing it care should be taken that the key fits into the key-way and fastening screw 2 is well tightened.

Twice during each revolution of the armature, the primary circuit closes and opens, this being effected by interrupter lever 8 coming in contact with steel segment 21, these segments being supported on interrupter housing 116b. When the magneto interrupter lever 8 is not being acted upon by the steel segment 21 the platinum points 5 and 6 are in contact, thus closing the primary circuit. Then as the armature rotated further and the interrupter lever 8 again comes in contact with segment 21, the platinum points 5 and 6 (interrupter contacts) open and thus interrupt the primary circuit. At the opening of the contact the ignition spark occurs instantaneously.

The distance between the platinum points when the magneto interrupter lever is fully depressed by one of the steel segments must not exceed .4 mm. This distance may be adjusted by means of long platinum screw 5, and should be in accordance with the steel gauge that is pivoted to the adjusting wrench.

Speed of rotation.

The speed at which the magneto must be driven depends upon the number of cylinders and upon whether the cycle is two-stroke or four-stroke.

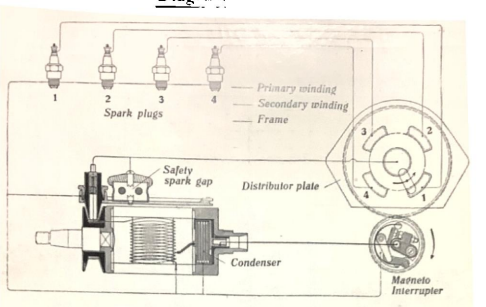
In type "D U 3", for instance, which is designed for three-cylinder motors, the armature must be driven at three-quarters of the speed of the crank shaft for a four-cycle engine; and at one and one-half times crank shaft speed for a two-cycle engine. Type "D U 4", for four-cylinder engines must be driven at crank shaft speed for a four-cycle engine and at twice crank shaft speed for a two-cycle engine.

For slow speed two and three-cylinder motors, it is frequently advisable to drive the magneto at twice the speed normally arranged for; that is, on a two-cylinder four-cycle engine, the armature may be run at crank shaft speed instead of at half crank shaft speed. To secure this result, magnetos known as "D U 4/2" are constructed. These magnetos cause the interrupter to break but once during each rotation, and the distributors have but half of the number of connections that are usually provided. The "D U 4/2" magneto will be in appearance a standard "D U 4", instrument, except that it will have but two distributor connections, and but one steel segment in the interrupter housing instead of two. The setting and wiring of these instruments is as herein described.

Distribution of Current. The distributor rotor is geared in such ratio to the armature shaft that it runs at cam shaft speed for a four-cycle motor and at crank shaft speed for a two-cycle motor. With the armature driven in the correct relation to the crank shaft, as indicated in the paragraph headed "Speed of Rotation", the distributor will be found to operate as described.

Direction of Rotation. These magnetos are designed to run in one direction only, and when ordering it is therefore essential to state whether the magneto is to run clockwise or anti-clockwise, the instrument being viewed from the shaft end.

Diagr...



Driving Methods.

The magneto will produce ignition at certain definite points in the rotation of the armuture, and the armature must therefore be driven in a fixed relation to the crank shaft.

Lost motion and play should be eliminated, and it is always advisable to drive the magneto through gears.

The magneto may be driven by a chain and sprockets if gears cannot be fitted, but the arrangement should be such that the chain will run with as little slack as possible, and at the same time place no undue side strain on the armature bearings.

The necessity for preventing slippage prohibits driving the magneto by belt or by friction.

Setting.

The magneto should be secured in position with the driving gear or coupling loose on the armature shaft to permit the armature to be rotated by itself.

The distributor plate should then be removed by depressing holding spring 25, and the magneto interrupter exposed by the removal of interrupter housing cover 117, which is permitted by holding spring 119 to one side.

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

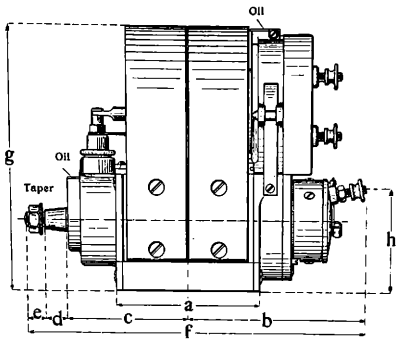
The timing control arm of the magneto should then be placed in the fully retarded position, which is accomplished by turning it and the interrupter housing as far as possible in the direction in which the armature will be driven.

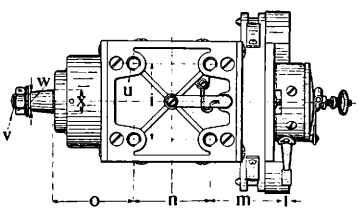
The armature should then be revolved in the direction in which it will be driven, which may be accomplished by means of the exposed distributor gear.

The interrupter should then be closely observed, and when it is seen that the platinum contacts are in the act of separating, the driving gear or coupling should be secured to the armature shaft. In tightening the nut to secure the gear or coupling in position, great care should be taken not to alter the position of the armature.

This setting will establish the desired relationship between the armature and crank shaft, and the engine may be started.

Dimensioned Drawing
of Type "DU3, DU4 and DU6 with advance Mo

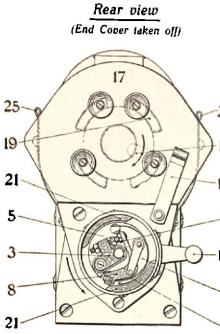




Dimensions in millimetres.
Threads are Whitworth standard.

Type	*a*	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*	*k*	*l*	*m*	*n*	*o*	*p*	*q*	*r*	*t*	*u*	*v*	*w*	*x*
DU3	93	102	78	15	12	207	169	65	50	50	5.2	50	50	53	121	80	45	164	3/8" × 16 Whitworth thread	3/8" × 16 Whitworth thread	12	15
DU4	93	115	78	15	12	220	169	65	50	50	5	49	50	53	121	80	45	164	3/8" × 16	3/8" × 16	12	15
DU6	100	127	79.5	19	15.5	240	169	65	50	50	6	61	50	52	139	60	45	179	3/8" × 16	3/8" × 16	14.25	15.88

Operation of the Magneto.



24. Knurled nut on grounding terminal stud.
25. Holding spring for distributor plate 17.
116b. Interrupter housing and timing arm.
117. Cover for interrupter housing.
118. Conducting spring for grounding terminal stud.
119. Holding spring for interrupter housing cover.

The ... dinate ... layers ... dary o... line w... winding ... core ... to ... of ... grounded ... ding is con... the primary w... continuation ...

During certain portions of the rotation of the armature the primary circuit is closed, and the variations in magnetic flux have their effect in inducing an electric current in it. When the current reaches a maximum, which will occur twice during each rotation of the armature, the primary circuit is broken, and the resulting armature reactions produce a high tension current of extreme intensity in the secondary winding. This current is transmitted to a distributor by means of which it passes to the spark plug of the cylinder that is in the firing position.

Description of the Magneto.

Primary Winding. The grounded end of the primary winding is connected to the armature core and the live end is connected to brass plate 1. Through the center of this plate passes fastening screw 2, which serves to hold the magneto interrupter in place and also to conduct the primary current to contact block 3 of the magneto interrupter. Fastening screw 2 and contact block 3 are insulated from the interrupter disk 4 which is in metallic connection with the armature core. Platinum screw 5 is located in contact block 3. Pressed against this platinum screw by means of flat spring 7 is magneto interrupter lever 8 with platinum screw 6, which is connected to the armature core, and therefore with the beginning of the primary winding. The primary circuit is thus closed as long as magneto interrupter lever 8 is in contact with platinum screw 5. The circuit is interrupted when the magneto interrupter lever 8 comes in contact with steel segment 21. The condenser 9 is connected in parallel when the platinum screws 5 and 6 (interrupter points) open.

Secondary Winding. The grounded end of the secondary winding is connected to the live end of the primary, so that one winding forms a continuation of the other. The end of the secondary winding leads to collector ring 10, on which rides carbon brush 11, held by brush holder 12. From carbon brush 11 the secondary current is conducted to terminal piece 13, from whence it passes through conducting bar 14, to the central distributor contact 18. From here its path is to distributor carbon brush 16, which rotates with the distributor gear.

Brass segments 19 are embedded in the distributor plate 17, and as the distributor carbon brush 16, rotates, it makes contact with the respective segments of the distributor plate. Connected to the segments of the distributor plate are terminal studs to which the spark plug cables are attached by means of knurled nut 20.

Care and Maintenance.

The armature shaft is fitted with ball bearings at both ends, the shaft carrying the distributor brush is fitted with plain bearings. Oil cups are provided, one at each end of the magneto, the covers being stamped with the word "Oil". The oil well at the driving end has one oil hole, while the oil well at the distributor end has two. Three to four drops of oil should be placed in each of these oil holes every two weeks for an engine that is infrequently used, or once every 1000 miles for an engine in constant use.

No other part of the apparatus requires lubrication, and it must be borne in mind that **the contact-breaker must not be lubricated.** The bearings are self-lubricating, and the contact points should be protected from oil.

Detection of Faults.

In case of defective ignition, it must be determined whether the fault is in the magneto or in the plugs. It may be pointed out that in general, when only one cylinder misses, the fault is almost invariably in the plug.

The more common defects of spark plugs are as follows:

1st. Short-circuit at the spark gap is due to small metallic beads which are melted by the heat of the intense spark and form a conducting connection between the electrodes. This defect is easily ascertained, and may be remedied by removing the metallic bead.

2nd. Too wide a gap between the electrodes. The normal width of the gap is from .5 mm to 1 mm according to the individuality of the engine. The proper width of gap may readily be obtained by bending the electrodes.

3rd. Fouling of the plug. The danger of fouling is reduced to a minimum in the new Bosch plug. If fouling should occur, the parts exposed to the burning gases may very readily be cleaned by removing the plugs from the cylinder and cleaning with gasoline.

The spark plug cables must be tested, and special attention should be paid to ascertaining that the insulation is not injured in any way. The metal terminals of the cables must not come into contact with any metal parts of the motor or with any metal parts of the magneto, except the proper binding nuts.

Testing the Magneto.

If cables and plugs are in good condition, and yet the ignition works irregularly, the defect may be in the magneto.

A simple test for the magneto is to disconnect the grounding cable from grounding terminal and also to disconnect the spark plug cables. The motor should then be cranked briskly, and the safety spark gap closely observed. If sparks are seen at this point, it is an absolute indication that the magneto is in proper operating condition. If no sparks are observed, it will be necessary to make sure that the primary circuit is properly interrupted by the magneto interrupter. Holding spring 119 must be moved sideways, interrupter housing cover 117 taken off, and it must be ascertained whether fastening screw 2 is well tightened. After this it should be observed whether the platinum points are in contact when the steel cams are not acting on magneto interrupter lever 8, also whether they separate the correct distance — .4 mm — when the interrupter lever 8 is resting on one of the steel cams 21. Otherwise the distance must be adjusted by means of platinum screw 5. The platinum contacts must be examined and any oil and dirt removed; in case the contacts are uneven **(but only then)** they must be smoothed with a fine flat file. If, after continued use, the platinum contacts are completely worn down, the two platinum screws 5 and 6 must be renewed.

If ignition fails suddenly, there may probably be a short-circuit in the cable connected to grounding terminal 24 which serves for switching off the ignition. This may be ascertained by disconnecting the cable from the terminal 24.

It is also advisable to examine distributor carbon brush 16 and distributor brush holder 15, which may be done by removing distributor plate 17.

It is to be especially noted that the magneto interrupter lever moves freely. The pivot of same works in a fibre bushing, and should not be lubricated. On new magnetos it may occasionally happen that through the swelling of the fibre the magneto interrupter lever may not operate freely. This can be remedied by reaming out the fibre bushing with a proper sized reamer.

If the examination so far has not led to the discovery of the defect, and it is absolutely impossible to start the motor, the setting of the magneto should be verified in accordance with the directions given herein. If the setting is found to be correct, the magneto should be returned to the maker.

□ □ □

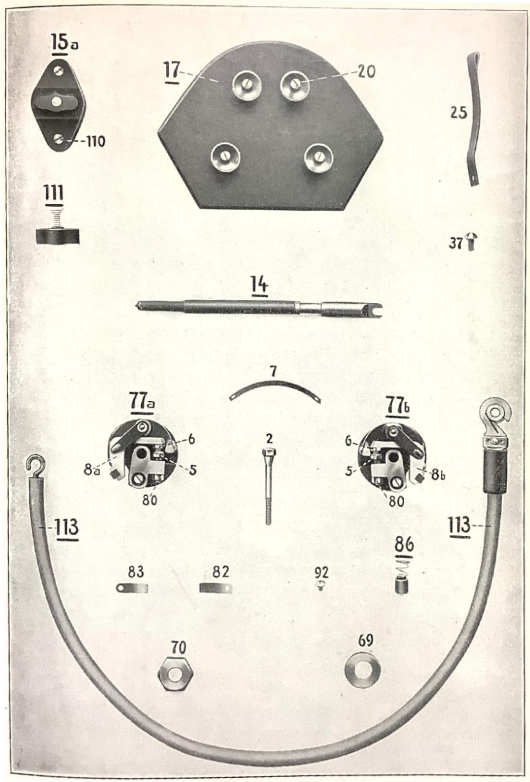
Spare Parts for Types "DU 3, DU 4 and DU 6 Model ," with Advance.

Plate II.

2. Fastening screw for magneto interrupters 77a and 77b.
3a. Contact block on magneto interrupter 77a.
3b. Contact block on magneto interrupter 77b.
5. Long platinum screw for magneto interrupters 77a and 77b.
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 77a.
8b. Magneto interrupter lever for magneto interrupter 77b.
14. Conducting bar.
15. Distributor brush holder without carbon brush and spring for distributor gear.
15a. Distributor brush holder with carbon brush and spring for distributor gear.
17. Distributor plate complete.
20. Knurled nuts for terminal studs on distributor plate 17.
25. Holding spring for distributor plate 17.
37. Fastening screw for spring 25.
69. Washer for front shaft.
70. Hexagon nut for front shaft.
77a. Anticlockwise magneto interrupter complete.
77b. Clockwise magneto interrupter complete.
80. Lock nut for platinum screw 5.
82. Auxiliary spring on boss of magneto interrupters 77a and 77b.
83. Auxiliary spring on magneto interrupter levers 8a and 8b.
84. Insulating bushing in centre of magneto interrupters 77a and 77b.
85. Insulating bushing in contact blocks 3a and 3b.
86. Carbon brush with spring for grounding magneto interrupters 77a and 77b.
90. Insulating plate for contact blocks 3a and 3b.
91. Fastening screw for contact blocks 3a and 3b.
92. Fastening screw for flat spring 7.
110. Fastening screw for brush holder 15a.
111. Carbon brush with spring for brush holder 15a.
113. High tension cable, either 32 or 42 inches long, with Bosch loop termina and Bosch Rajah hook terminal. State which length is desired.

□ □ □

PLATE II.



When ordering please state besides indicating the number and designation of the desired parts that they are for type "DU3, DU4 or DU6 Model 5".

Bosch Spark Plugs

The new Bosch High Tension Spark Plug has been designed to meet the demand for a high-class, indestructible Plug of such construction as to withstand the intense heat of the Bosch Magneto Spark and yet be suitable for Battery Systems as well as other makes of magnetos.

PERFECT INSULATION is assured by our special STEATITE insulator which has exceptional insulating properties and is absolutely free from the disadvantages of porcelain, glass or mica insulators. Owing to the special construction of the plug and the unique character of our insulator, a perfectly insulated and absolutely gas-tight plug is assured.

DURABLE NICKEL ALLOY ELECTRODES used in Bosch Plugs are made up especially to withstand the intense heat of the Bosch Magneto spark, and consequently long life of the points is secured.

Bosch Plugs have been used with the greatest success in many of the most important racing and endurance contests of the world, during which the Spark Plugs were subjected to most adverse conditions.

Supplied in $^{7}/_{8}$ inch A. L. A. M., $^{1}/_{2}$ inch and metric threads.

From your dealer or any of our Branches.

$ 1.00 each

Special Literature on Request.