

The specific gravity of the acid in fully charged cells should be within .010 (10 points) above or below the values given in the tables in par. 13 opposite "fully charged."

(24) Temperature Permissible.—

(a) *Batteries with "normal" gravity acid* (see par. 1).—The maximum permissible temperature of the acid at any period of the charge or discharge is 110° F. (43° C.).

(b) *Batteries with "low" gravity acid* (see par. 1).—The maximum permissible temperature of the acid may be increased to 125° F. (52° C.), provided the working specific gravity at the end of charge does not exceed 1.210 *after* correction for temperature (see par. 12).

(25) Despatch of Battery.—If the battery is to be despatched by rail any distance within the British Isles, first give it a full charge, then pack in a box so that the tops of the terminals are level with the top of the box. Fix narrow strips of wood across the top, but leave spaces between the strips so that the tops of the cells are plainly visible.

Label the case "CONTAINS ACID, KEEP THIS SIDE UP," and despatch at owner's risk. Before putting the battery again into use, give it a freshening charge.

(26) A battery which is to stand idle should first be fully charged. A battery not in active service may be kept in condition for immediate use by giving it a freshening charge at least once every two months, but should preferably also be given a thorough charge after an idle period before it is replaced in service.

A battery which has stood idle for more than two months should be charged at normal rate to maximum gravity before being replaced in service.

It is not wise to permit a battery to stand for more than three months without charging.

Disconnect the wires from a battery that is not in service, so that it may not lose charge through any slight leak in car wiring.

(27) If in doubt consult the nearest EXIDE Service Station. Advice, testing, and topping-up with distilled water may be obtained at any EXIDE Service Station. There are 13,000 EXIDE Service Stations throughout the world, of which 600 are in Great Britain. A complete list of addresses may be obtained on request.

Instructions

for the Care and Maintenance of the

PETO & RADFORD

DAGENITE

12-Volt Accumulators

Types 6-TBD7-E, 6-TBS7-E and 6-TBS7-A

for the

20/25 H.P. ROLLS-ROYCE CAR

INSTRUCTIONS

Specification.

Model	.. .. .	.. .. .	20/25 H.P.
Accumulator, Types	.. .. .	.. .. .	{ 6-TBD7-E 6-TBS7-E, 6-TBS7-A.
Voltage	.. .. .	.. .. .	12 volts.

CLIMATE.	SPECIFIC GRAVITY AT 60° F.		
	Filling in First Charge.	Fully Charged.	Fully Discharged.
Temperate ...	1.320	1.280	1.150
*Tropical ...	1.250	1.210	1.080

Charging current	.. .. .	5 ampères.
Capacity at 20-hour rate	.. .. .	50 ampère hours.

Giving :—

Starting current—for 5 minutes	.. .. .	180 ampères.
Lighting current—for 17 hours	.. .. .	3 ..

Initial Charge if Battery is received Unfilled with Acid. When an accumulator is received in a dry condition, it has not been charged, and it will be necessary to fill the cells with acid solution, and charge the accumulator properly before it is put into use.

The first charge must be carried out exactly in accordance with the instructions below, otherwise the battery will not work satisfactorily. *This is most important.*

THE ACID SOLUTION

The acid solution must not be put into the cells until the arrangements for charging are available.

The acid mixture consists of pure concentrated brimstone sulphuric acid (accumulator acid) diluted with *distilled* water to a strength

* Tropical climates are where the temperature is frequently 90° F. or over.

or specific gravity of 1.320* at 60° F. This specific gravity is obtained by adding one volume of concentrated acid to approximately 2.7 volumes of distilled water.

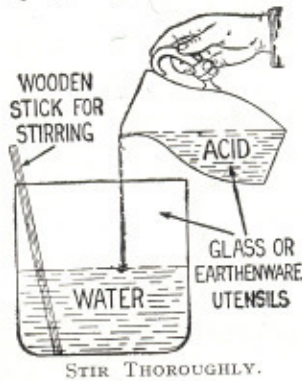


DIAGRAM 1.

Purity and correct strength of the acid mixture are of the greatest importance. The acid must be as specified above. Ordinary commercial sulphuric acid is not suitable, as it contains impurities which would be harmful to the accumulator plates.

On no account must spring, river, or pump water be used to dilute the acid, as these usually contain impurities such as iron, lime, etc.

Mixing the Acid. When mixing, add the acid very slowly to the water; *never add the water to the acid*, except for the purpose of slight adjustment of the specific gravity after testing with the hydrometer.

Heat is produced by the chemical action between the acid and the water, therefore great care should be taken to comply with these instructions.

The mixing vessel must be of glass or earthenware, and the mixture should be well stirred with a wooden stick.

Metal vessels must not be used, as all common metals except lead are affected by sulphuric acid, which will absorb impurities and cause damage to the battery.

After mixing, the solution should be allowed to cool to the temperature of the surrounding atmosphere, approximately 60° F. in temperate climates and 90° F. in tropical climates, and the specific gravity read by means of a hydrometer, specially constructed for the purpose (Diagram 2).



DIAGRAM 2.

* For temperate climates. Throughout the text, refer to table opposite for tropical climate values.

If the specific gravity is not exactly 1.320, add a little more acid or water as required to correct it before putting into the cells.

Filling the Cells. To fill the cells, remove the vent plugs or caps and fill each compartment, using a glass funnel and a small earthenware or glass jug for the purpose, or similar convenient method.

Each cell should be filled up until the acid solution has covered the plates by about $\frac{1}{2}$ inch (or $\frac{1}{3}$ inch above the tops of the separators), and the battery allowed to stand for about 12 hours before commencing the first charge.

The vent plugs or caps should not be replaced until after the first charge is completed.

THE FIRST CHARGE

The first charge must be commenced about 12 hours after filling the cells with the acid solution. Before connecting up, inspect the acid level, which may have been lowered owing to the plates and separators having absorbed some of the acid solution. If necessary, therefore, restore to the correct level given above, by adding more of the acid solution.

A uni-directional current is necessary.

If the supply be alternating, suitable rectifying apparatus must be used. There are reliable types of valve and metal rectifier apparatus of suitable ampère capacity on the market. Instructions for the operation of these will normally be supplied by their makers.

If the current from the public supply main, or other source, be direct, the charging current must necessarily be supplied through a suitable switch and a variable resistance, or set of lamps, preferably carbon filament, suitably arranged to act as a variable resistance.

Incandescent lamps or radiator elements are convenient for this purpose. To find the size in watts of lamps or radiators required for use as resistances, multiply the voltage of the mains by 5. If carbon filament lamps are used, the candle power required may be determined by dividing this value by 4. For example, on 200 volt mains, the watts taken by the lamps or elements connected in parallel

(Diagram 3) should be 1,000, or the total candle power of carbon filament lamps

$$\frac{1000}{4} = 250 \text{ C.P.}$$

Note that values lower than the above may be used, thereby reducing the number of lamps required and the demand on the mains, but, if this is adopted, the time required for charging will, of course, be proportionately increased.

It is, of course, only the current taken by the lamps or elements and not their brightness, that determines their suitability for use as resistances.

Assuming the supply to be D.C., connect up the cell or cells as in Diagram 3.

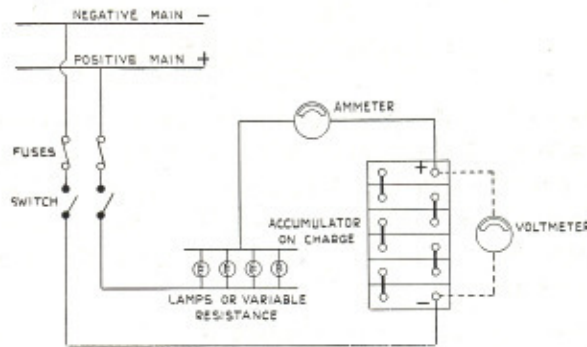


DIAGRAM 3.

It is most important that the negative (—) charging main be connected to the negative (—) terminal of the battery, and the positive (+) charging main to the positive (+) terminal of the battery.

The polarity of the charging wires to the battery may be tested by dipping their ends in a glass of water, to which a teaspoonful of salt has been added. In doing so, it is assumed that a charging or limiting resistance, or lamp of "mains" voltage, is already in series so as to avoid trouble from short circuiting (Diagram 4). Bubbles of gas will form on the negative wire.

Diagram 3 assumes the negative main or neither main being earthed. If the positive main is earthed, then the ammeter (to read the current) and the resistance must be placed in the negative lead, all other connections being as indicated.

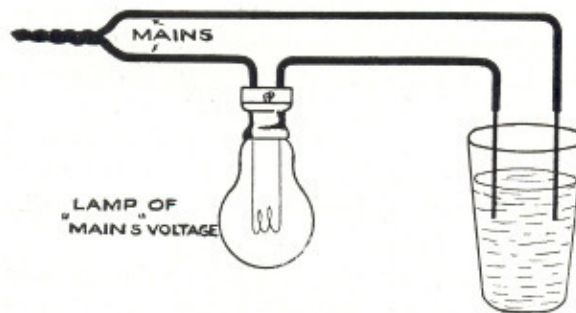


DIAGRAM 4.

The mains may be tested by connecting a wire from a water pipe or other "earth" to a lamp of "mains" voltage, the other wire from the lamp being connected to each of the mains in turn (Diagram 5). (Be particularly careful not to short circuit the mains when testing in this manner. Unless one has some familiarity with matters of this kind, it is preferable to call in an electrician.) If the lamp lights to full brilliancy on one main and not on the other,

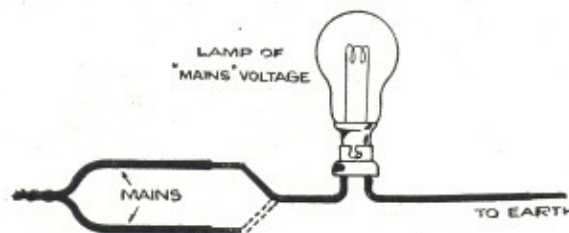


DIAGRAM 5.

the main on which it does *not* light is the one which is earthed, and the battery should be connected to it. If the lamp does not light on either main, or it glows dimly on both mains, neither of the mains is earthed, and it is preferable in these circumstances to connect the battery to the negative main as shown in Diagram 3.

Now charge the battery at a rate of 5 ampères for 48 hours at least, but in any case until all plates, both positives and negatives, gas freely, voltmeter and hydrometer readings showing no increase during 5 hours.

The charging rate may be reduced overnight, but the time extended accordingly.

If the charge cannot be carried out in one period, an interval of rest should not exceed the immediately preceding period of charge at the specified rate, nor should it exceed twelve hours as a maximum.

No rest, however, may be given until the battery has had at least 24 hours charging.

If, during the charge, the electrolyte temperature reaches 110° F. (43° C.)—in tropical climates this figure may be increased to 125° F. (52° C.)—reduce rate of charge, but extend time accordingly. It is most important that during the life of a battery this temperature should never be exceeded.

As temperature rates are not easily taken, on account of the only access to the acid being through the vents of the cells, a special thermometer should be obtained suitable for inserting through the vent into the acid on top of the plates (see Diagram 6).

Limit the current to a value not exceeding 5 ampères by varying the lamps or other resistances (page 5) in series with the battery (Diagram 3).

Completion of Charge. The charge should be continued until the conditions detailed in the following paragraph are fully complied with. Note above *re* temperature permissible. Avoid overcharging either in quantity or time.

A battery charge is complete, when, with charging current flowing at the normal charging rate all cells are gassing (bubbling) freely and evenly, and the gravity of the acid in all cells has reached a maximum ; that is, has shown

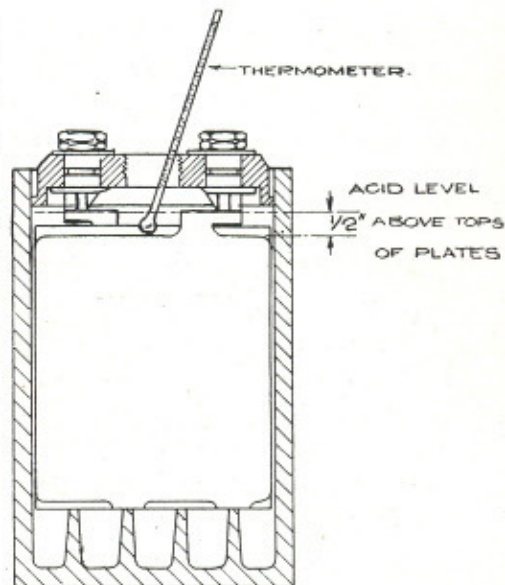


DIAGRAM 6.

no further rise during five hours. The battery is fully charged when all the plates in all the cells have given back all the acid, of which the best indication is that charging will produce no further rise in gravity; the gravity has reached a maximum.

The specific gravity of the acid in fully charged cells should be within .010 (10 points) above or below the values given in the table on page 2.

Charging in Garage from External Source. Proceed as for first charge, but in this case it will be found that the battery will reach a fully charged condition in a much shorter time than 48 hours, nor should it be found necessary to suspend the charge owing to excessive temperature. The limiting figures for temperature still apply.

Acid Level and Specific Gravity. At the end of the charge the acid level should be inspected, and if it has become low it should be levelled up while the plates are gassing by adding pure distilled water only, unless any of the acid has been spilt, in which case a little dilute acid may be added to bring the specific gravity to the correct figure.

On the completion of the charge, this should be about 1.280 at a temperature of 60° F. after levelling up the acid.

During this first charge, watch the acid density in each cell, using a syringe hydrometer.

The density should not be allowed to exceed 1.285.

If it does, withdraw some acid and replace with distilled water, allowing time for mixing.

Ordinarily, the acid in the hydrometer must be allowed to return to the cell from which it was drawn.

In order to facilitate the use of various hydrometers when determining the density of the electrolyte, we give opposite a conversion table of the principal readings required :—

Density or Specific Gravity.	Twaddell's Hydrometer Degrees.	Baumé Degrees (approx.).
1.080	16	10.5
1.150	30	19
1.180	36	22
1.210	42	25
1.250	50	29
1.275	55	31
1.280	56	31.5
1.285	57	32
1.320	64	35
1.840	168	66

Effect of Temperature on Specific Gravity of Acid. The figures given for the specific gravity of acid are based on the temperature of the acid being 60° F.

At higher temperatures the specific gravity of acid is lower than at 60° F. and vice versa, therefore a certain figure must be added to or deducted from the readings obtained at other temperatures to ascertain their equivalent specific gravity values at 60° F. for comparison with figures specified in the instructions, as these are based on 60° F.

The adjustments tabulated below are for any strength of acid, and will give approximately the equivalent specific gravities which would be obtained at 60° F. :—

Acid at 32° F.—Deduct .011 from readings to obtain equivalent S.G. at 60° F.

35° F.—	.010	"	"	"	"
40° F.—	.008	"	"	"	"
45° F.—	.006	"	"	"	"
50° F.—	.004	"	"	"	"
55° F.—	.002	"	"	"	"
60° F.—	—	"	"	"	"
65° F.—	.002	"	"	"	"
70° F.—	.004	"	"	"	"
75° F.—	.006	"	"	"	"
80° F.—	.008	"	"	"	"
85° F.—	.010	"	"	"	"
90° F.—	.012	"	"	"	"
95° F.—	.014	"	"	"	"
100° F.—	.016	"	"	"	"

The first charge and all subsequent charges of a battery removed from the car should be carried out with the vent plugs or caps removed.

After the first charge, swirl the acid in the cells by rocking or carefully shaking the battery, drain it all out and immediately refill

with fresh acid at 1.280 density (as before); charge for another hour, then the battery will be ready for use.

The vent plugs or caps should be replaced, and any acid that may have got out in the form of spray on to the tops of the cells should be carefully wiped off.

The battery is then in a suitable condition for being placed on the car and connected up to the electrical system.

It should be securely packed in its box (by means of the wedges provided) so that it cannot move, and the cable terminals, after being connected up, should be thoroughly smeared all over with pure vaseline (not grease).

See that the cell-to-cell connections are quite tight, and afterwards vaselined.

Maintenance of Battery in Service. The top of the battery should always be kept clean and, as far as possible, dry; attention should be given immediately to the least sign of corrosion occurring on the terminals.

A useful adjunct in connection with keeping the top of the battery free from acid is a small sponge, which should be used in conjunction with a bowl of clean water to remove acid from the top of the battery. Water wetness, unlike acid wetness, is non-corrosive and will quickly dry.

Keep the terminals and connections well vaselined, clean on their surfaces in contact and firmly screwed up, but do not use abrasives for cleaning, i.e. file, emery paper, sand paper.

Do not allow metal tools or other metal to short circuit any terminals of the cells.

Do not inspect the battery with the aid of a naked light, and on no account disconnect any of the battery terminals or connections when any charge or discharge current is passing, for such a course incurs risk of an explosion, destructive to one or more cells, and involves personal risk.

See that vent-plug passages are kept clear.

A battery should not normally be allowed to continue discharging when the voltage of any cell has fallen below 1.8 (except momentarily for the purpose of tracing a faulty cell, as described on page 12).

It is important that the battery be kept fully charged, but be not overcharged at a high rate of current, as this may cause the

temperature limit of 110° F. to be exceeded, and the cells may suffer, due to evaporation from the electrolyte and by disintegration of the plates.

Too much charging is indicated by the specific gravity of the acid being generally about the "fully charged" value and by unusually frequent "topping up" being required.

Too little charging causes an unhealthy condition of the plates; *too much charging* results in abnormal wear and tear.

Batteries must never be allowed to remain in a discharged condition.

Inspection and Renewal of Electrolyte. The levels of electrolyte in the cells should be inspected once a week in hot weather and once a fortnight at other times.

It is very important that the solution should always be maintained at its correct level (about $\frac{1}{8}$ inch above the tops of the plates) by the addition of distilled water, or damage to the plates will result.

The battery may appear to work efficiently even though the acid level has fallen, but before long the portions of the plates standing out of the solution will be damaged.

Use a syringe-type hydrometer to take densities, which should be 1.280 for fully charged condition.

If, in these circumstances, the densities are low, give a special charge if possible from an external source (see page 8), at the normal charge rate (5 ampères), until the density has remained constant in every cell for three hours. If still below 1.265, it is important to remove some electrolyte and replace with electrolyte of about 1.350 density, until the required increase is secured, after which again pass charging current for a short while.

Unless acid has been lost by spilling, such replacement should never be required.

As far as possible, arrange to make adjustments in the electrolyte just previous to charging.

Every twelve months, or, at most, two years, the acid electrolyte should be renewed. Charge the battery fully, empty out the old acid, allow to drain, then immediately replace with new acid of density 1.280.

Testing for Condition of Charge. We recommend that a small voltmeter be carried. The reading of a voltmeter when the battery is on open circuit is no real indication of the condition of the battery.

For voltmeter readings to be of any real value, a battery must be discharging at a moderate current, e.g., lighting the head lamps, at the time the readings are taken. If in these circumstances each cell shows 2 to 2.1 volts, it is unlikely that there is anything wrong with the battery.

If the battery is in ordinarily good working order, and care is taken to keep the densities, when in a fully charged condition, round about 1.280, as already described, the state of charge of the battery will be very well indicated by density readings taken with the syringe hydrometer.

If the readings are 1.210, the battery may be considered to be half discharged.

If the readings are down to 1.150, the battery must be considered in a completely discharged condition.

Failure of one or more Cells. If, when the battery is supplying current, its voltage becomes prematurely low, it may be due to one or more cells having become faulty.

This condition is best ascertained by the use of the voltmeter, with which each cell should be tested independently, whilst the head lamps are lighted, and the faulty cell or cells located.

Ordinarily, it may be expected that all six cells will work together in much the same condition.

In such a case of failure, the makers of the battery should be consulted.

It should be understood, however, that failure is considered *most unlikely* within a period of three years' service, if proper care be taken of the battery.

Battery out of Commission. If it is desired at any time to put the battery out of use, it is preferable to store it in a fully charged condition in a cool, dry place, and give it a freshening charge at half-rate at least once a month until all plates gas freely, topping up with distilled water if necessary.

Despatch of Battery. If the battery is to be despatched by rail any distance within the British Isles, first give it a full charge, then pack in a box so that the tops of the terminals are level with the top of the box. Then fix narrow strips of wood across the top, but leave spaces between the strips so that the tops of the cells are plainly visible.

Use, if possible, a packing box the shape of a pyramid, so that it is almost impossible for the battery to be set down other than in the upright position.

Label the case, "CONTAINS ACID, KEEP THIS SIDE UP," and despatch at owner's risk.

Before putting the battery again into use, give it a freshening charge.

Battery Stored or Despatched Unfilled. If it is not possible in storing the battery to give it the necessary freshening charges, or if the battery is to be despatched a long way, or if not desired to send it at owner's risk, the best procedure, which is not, however, as good as keeping the battery in a charged condition, is as follows:—

- (1) Fully charge the battery.
- (2) Empty out electrolyte and replace with pure distilled water.
- (3) Allow battery to discharge slowly through resistances until it shows only about 11 volts.
- (4) Remove terminals, clean, re-vaseline, and store or despatch these separately.
- (5) Empty out water and allow battery to drain.
- (6) For storage, place in a cool, dry place, with vent plugs well tightened up.
- (7) On no account leave battery stored away with water in the cells at any time or under any conditions.

To put the battery again into commission, it should preferably be treated in the same way as a battery received unfilled (page 2), except that particular care should be paid to the density, which is likely to finish higher than in an ordinary first charge.

PETO & RADFORD

(Proprietors: Pritchett & Gold and E.P.S. Co., Ltd.)

50, Grosvenor Gardens

LONDON, S.W.1

Telephone Sloane 7164

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WORKS Dagenham Dock, Essex

LONDON SERVICE & REPAIR DEPOT - 107a, Pimlico Road, S.W.1
Telephone: SLOANE 6114

GLASGOW 158, Clyde Street
Telephone: CENTRAL 4886

MANCHESTER 18, Princess Street
Telephone: CENTRAL 6167

Name of nearest Service Agent will be supplied on request.

MAINTENANCE AND ADJUSTMENT

OF THE

KLAXON

A.S. 1 MODEL

AS FITTED ON

Rolls-Royce 20/25 H.P. Cars

QUOTE IN ALL CORRESPONDENCE
NUMBER FOUND ON NAMEPLATE

(H)

(For Books No. XII and XIV Comb.)

1. **PLEASE NOTE.**—Klaxons are properly adjusted when fitted to cars, and it is strongly recommended that no attempt be made to improve the note by adjustment, or so-called tuning up.

2. **MAINTENANCE.**—In order that the construction and working of the Klaxon may be easily understood, a section is illustrated in Fig. 4.

It is operated by an electric motor rotating at 2,000 r.p.m., which occasionally requires lubrication. A few drops of any lubricating oil once a month (see Fig. 1) will suffice. No other attention should be necessary.

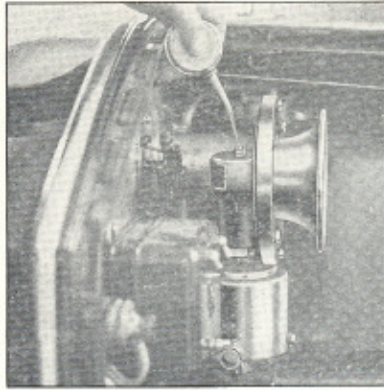


Fig. 1.

3. **FAILURE.**—It must be remembered that the Klaxon note may be affected by trouble with battery, wires or push buttons; these can be tested by applying a voltmeter to the terminals of the instrument, at the same time operating the Klaxon by pressing the button (see Fig. 2).

The voltmeter should indicate the full battery voltage.

If this is found to be correct, it is possible that the six screws securing the projector may have worked loose. Tighten them (see Fig. 3).

If still unsatisfactory, adjustment may be necessary. If so, proceed as in paragraph 5.

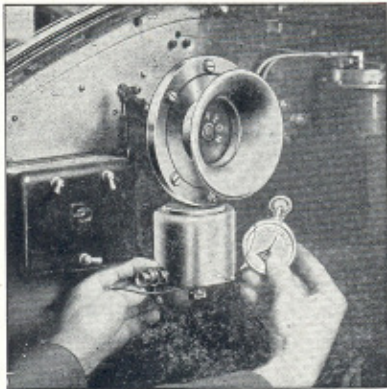


Fig. 2.

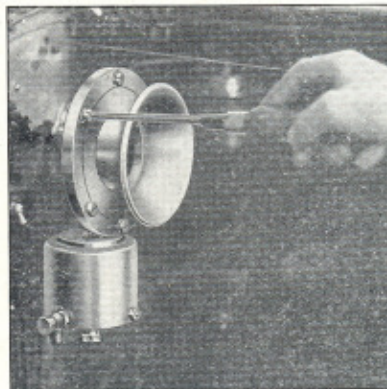


Fig. 3.

4. **OPERATION.** — Revolved by reason of its being attached to the armature shaft is the hard steel rotor **R** (see Fig. 4), which engages a hardened steel stud **S** fixed in the centre of the chrome vanadium steel diaphragm **D**.

The note emitted by the Klaxon depends on the pressure between the rotor and the stud.

The object of adjustment is to obtain the correct pressure.

5. **ADJUSTMENT.** — First loosen the lock-nut by a spanner, as shown in Fig. 5. This lock-nut can also be seen at **L** in Fig. 4. Then, after lock-nut is loose, start the current by pressing push-button. In other words, sound the Klaxon.

While it is sounding, twist the motor case until no sound is heard except the buzzing of the motor.

Continue twisting—in either direction—until note is loud and clear.

When the note is loud and clear, tighten lock-nut. Be sure to keep nut tight always.

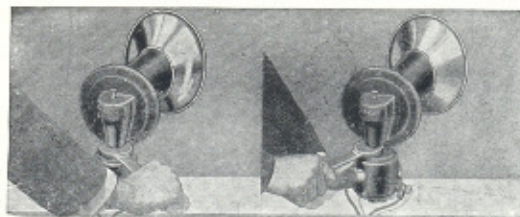
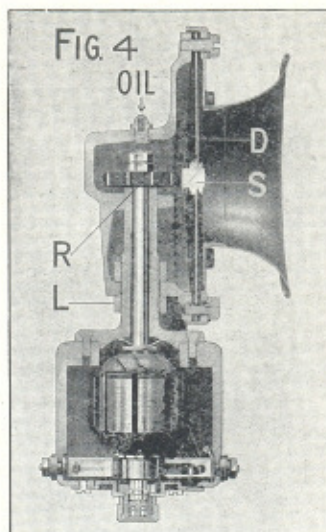


Fig. 5.

6. **GUARANTEE.**—Messrs. Klaxon, Ltd., guarantee their Warning Signals, and should the instrument be considered unsatisfactory, a call should be made to their Service Dept., at 36, Blandford Street, Marylebone, London, W.1, or Warwick Road, Greet, Birmingham, where complaints will be dealt with.

If this is not possible, the instrument should be removed from the car, labelled with the owner's name and address, carefully packed, and sent, carriage paid, to Messrs. Klaxon, Ltd., 36, Blandford Street, London, W.1, writing them at the same time, stating the nature of the complaint.

Quote the instrument number in all correspondence.

KLAXON TYPE A1. SPARE PARTS

PART NAME	REF. NO.	PRICE	
		£	d
PROJECTOR - LONG	EK 110	30	0
D° - SHORT	EK 104	20	0
D° - GUNB'R'L	EK 108	25	0
PROJ. SCREWS	EK 54		2
D° SPG WASHER	EK 135		1
FELT WASHER	EK 62		2
DIAPHRAGM	EK 79	4	6
OILER	EK 95	1	0
ROTOR NUT	EK 39		2
ROTOR	EK 40	3	0
E.P. SCREW - SHORT	EK 3/9		2
D° - LONG	EK 8		2
CHECK SPRING	EK 43		2
ARMATURE			
REWINDING 6x12v	EK 124	10	0
D° D° 110v	EK 123	15	0
ARM: COMPLETE 6x12v	EK 76	21	0
D° D° 110v	EK 136	25	0
FIELD COIL 6x12v	EK 125	7	0
D° D° 110v	EK 126	9	0
BRUSH 6x12v	EK 29	1	0
D° 110v	EK 157	1	3
BRUSH HOLDER 6x12v	EK 77	1	3
D° D° 110v	EK 169	1	3
D° LEVER	EK 22		2
D° SPRING	EK 21		2
D° FIBRE WSHR 6x12v	EK 25		1
D° MICA D° 110v	EK 148		2
D° SPG D°	EK 117		1
D° NUT	EK 19		2
B.P. SCREW	EK 3/9		2
BOTTOM PLATE	EK 127	5	0
CAP NUT	EK 187	1	0
BALL	EK 6		1
TERM: FIBRE WSHR 6x12v	EK 34		1
D° MICA D° 110v	EK 151		2
D° SPG D°	EK 118		2
D° NUT	EK 31		2
SPLIT TERMINAL	EK 30	1	0
EBONITE NUT	EK 103		6
D° SCREW	EK 102		6
PUSH COMPLETE 110v	EK 139	5	6
PUSH D° 6x12v	P 22	5	6
COVER & KNOB	P 20	1	6
CONTACT SPRING	P 8		3
CLAMP PLATE	P 16		3
D° D° SCREW	P 17		1
COVER BUSH	P 6		3
FLEX: WIRE TWIN ²² / ₃₆	EK 99	1	6

NOTE !!
 IF THE PART YOU REQUIRE IS NOT
 ENUMERATED ON THE LIST ABOVE,
 PLEASE INDICATE BY A CROSS ON
 THE ILLUSTRATION AND SEND IT
 TO US WITH YOUR ORDER.
 THE ABOVE PRICES ARE FOR BLACK
 ENAMEL FINISH: EXTRA FOR NICKEL PLATING PROJECTORS ETC: ABOUT 10%

KLAXON LTD. WARNING SIGNALS

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Where all correspondence should be addressed

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BIRMINGHAM: Warwick Road, Greet