

THROWING LIGHT ON SOME OBSCURE COMPONENTS

E.M.G. Stevens and F.J. Griffin

MPH 520

Page 16

PR21 and PR21 E - Lucas Horn and Bracket

1. Series "A", "B" and "C"

The Lucas "Altette" horn, Type HF1234, was fitted to Series "A", "B" and "C" Vincents and to the majority of British motor cycles of the period. Although a louder horn is necessary under present day conditions, there are many of us who like it for its looks on the bicycle, or still rely on it to give a warning to those unable to hear the "rustle of Vincent valve gear". However, the instrument can be persuaded to give an acceptable note by careful overhaul and the wiring modification detailed below.

After many years of use or neglect, some original horns fail whilst others, purloined from derelict machines of other makes, may need restoration. The absence of the Altette horn is perhaps not very noticeable on "B" and "C" Twin machines, but the single looks "wrong" without it. For this reason alone, if it helps some of you to make a successful repair, this article will have served its purpose and is dedicated to those in search of *le bon ton*.

Operating principle

The principle of operation remained the same over the years, but construction details varied. When not in use, the horn's internal contacts are closed, while the horn button's contacts are open. On pushing the button, the circuit is completed, the horn coil is energised and the resulting magnetic force pulls the armature/diaphragm assembly towards the central pole piece of the coil. After moving a small distance, the internal contact is broken by a pin or the adjustment screw, mounted on the armature, bearing against a fibre tongue. The current therefore stops, the diaphragm returns to the static position due to its spring action, whereupon the contacts close and the cycle repeats itself until the horn button is released.

The resulting vibrations of the diaphragm/armature assembly are amplified by a "tone disc" mounted on the armature. This disc vibrates in unison with the diaphragm assembly and, besides intensifying the sound produced, adds its own natural harmonics to the fundamental frequency, giving a more pleasant, if not truly musical, note. The value of the tone disc is easily shown, without it the horn still works, but only gives out a pathetic bleat, barely audible.

The current needed to operate the horn is not critical and it will, therefore, work on 12 volts without modification. Nevertheless, adjustment is advisable when changing over to 12 volt in order to avoid using an excessively high current, and to retain a good note.

The various versions

On Series "A", "B" and "C" machines the Altette horn was mounted on a flat steel U-shaped bracket, PR21E, black enamelled, easily copied if an original one cannot be found. In the absence of welding equipment, the four spot welds can be replaced by 2 BA countersunk screws and Loctite 270.

The drawing of the horn is based on the later Altette, but can be used as a guide, together with these notes, for dismantling and overhaul of all models.

The illustration of the rear of the horn in figure 67 of Vincent Motor Cycles shows a central nut and the location of the adjustment screw. However, according to the Lucas booklet Maintenance Instructions for Lucas Electric Lighting and Ignition Equipment, this nut only appeared in 1951; earlier models were supplied without it, while still having the adjustment screw at the rear. The drawing of the horn shown in M036 of the Series "B" and "C" Spares List would appear to confirm this. The Lucas publication also states that: "A few horns made during 1950-51 were not provided with the adjustment screw. No adjustment is therefore possible with these horns."

The dome nut at the front of the horn holds the tone disc in place; this disc was usually finished with a black semi-matt crackle-finish paint.

Later in the 50s the adjustment screw and a round locknut 3/8 inch diameter, were located under the dome nut in the centre of the instrument, as described in Vincent Motor Cycles; this version was used on models fitted to the later Series "C". Note that this dome nut is used only for covering the adjustment screw and is shallower than the earlier version in order to accommodate a separate thin nut, which holds the tone disc. For details refer to the drawing. This nut is "washer-faced" (ie, features a machined shouldered face) to avoid scoring the tone disc when it is tightened.

The contact assembly consists of layers of insulation material, the contact leaves and solder connection tabs. It is fixed to an internal cast-in lug by two rivets, the heads of which can be seen in the recess at the rear of the body, as shown in figure 67 of Vincent Motor Cycles.

The terminal block, also clearly detailed in the same drawing, has two brass posts, either round or square. Each one is fitted with a 2 BA brass cable clamp screw with a hexagonal head and a screwdriver slot. Press-fit fibre insulation plates, one with a cable retaining slot, are slipped over the posts, and the assembly is fixed to the body by a 4 BA cheese- or round-head screw. Inside the horn, one lead from the coil is soldered to the waisted extension of one of the terminal posts. The second coil lead is soldered to the nearest contact tab and a third lead, soldered to the other contact tab, connects it to the second terminal post.

PR 21 LUCAS ALTETTE HORN (LATER VERSION)

DOME NUT, BRASS

TOPE DISC NUT, BRASS

ACORN NUTS, BRASS

TOPE DISC, ALUMINIUM, 3/32 THICK,
2.5/8 OD, 9/16 CLEARANCE ID.
FINISH: BLACK CRACKLE FINISH PAINT
ON OUTER FACE AND FLANK.

4 off 1 BA x 5/8 LONG BEZEL STUDS
2 off 0 BA x 1.5/16 LONG BEZEL/BACKET STUDS
STEEL, SCREWDRIVER SLOTTED
CADMIUM - PLATED

BEZEL, STEEL OR BRASS, WITH 2 DRAINAGE
HOLES ORIENTED WITH LETTERING AS SHOWN,
4 EQUI-SPACED HOLE VERSIONS ALSO EXIST.
POLISHED CHROMIUM-PLATING.
(POLISHED ALUMINIUM BEZELS ALSO EXIST)

BRASS LOCKNUT 1 BA, 3/8 DIA., 3/16 LONG,
WITH SCREWDRIVER SLOT 1/16 X 1/16.
FINISH: UNPLATED

ADJUSTING SCREW, 1 BA, BRASS OR STEEL,
SCREWDRIVER SLOTTED 1/16 x 3/32 DEEP.
FINISH: CADMIUM-PLATING

DIAPHRAGM NUT, STEEL, 1 A/F x 3/16 LONG,
SHOULDERED 11/16 DIA. x 1/16 (TOP),
WASHER-FACED FOR 1/32 (BOTTOM).
FINISH: UNPLATED

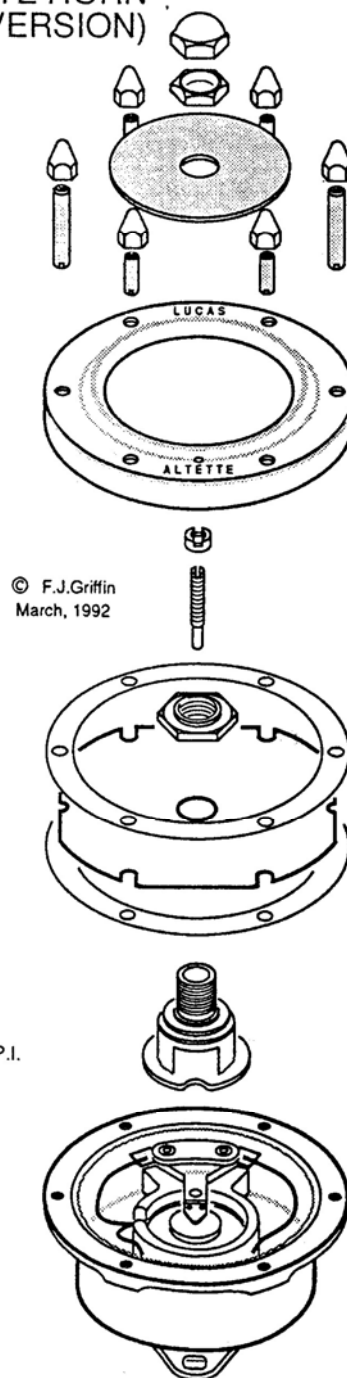
DIAPHRAGM, STEEL, 4 in. SQUARE, CORNERS
RADIUSED TO MATCH BODY.
FINISH: BLACK CELLULOSE PAINT, USUALLY
ON OUTER FACE ONLY.

PAPER GASKETS, 0.015 THICK, 4.13/32 OD x 3.5/8 ID
WITH 6 x 5/16 OD HOLES SPACED TO SUIT STUDS.
PERHAPS ONE OR TWO EACH SIDE, AS INITIALLY
FITTED.

ARMATURE, STEEL: WITH CONTACT BRIDGE,
ADJUSTMENT SCREW HOUSING AND DIAPHRAGM
MOUNTING SHOULDER. BOSS THREADED 9/16 x 32 T.P.I.
BASE PLATE RELIEVED IN TWO PLACES.
FINISH: UNPLATED

HORN BODY, CAST IRON, WITH CAST-IN COIL
HOUSING RECESS, CONTACT MOUNTING BOSS &
FLANGE STUD BOSSES. FLANGE IS MACHINED
ON TOP AND SIDE FACES. FINISH: USUALLY
SEMI-MATT BLACK CRACKLE PAINT, ON OUTSIDE
ONLY - INNER SURFACES LEFT AS CAST.

TERMINAL BLOCK, SEE TEXT



Dismantling

Disconnect the battery and horn leads and remove the horn together with its bracket from the bicycle. If necessary, take off the bracket after unscrewing the two 0 BA nuts. Unscrew the central dome nut followed by the thin disc nut, if fitted, and

remove the disc. (Both nuts are threaded 9/16 inch diameter x 32 tpi.) If working on a later model, remove the horn's 1 BA adjustment screw and its locknut. Then, unscrew the six acorn nuts and their studs. These bezel ring studs are usually rusted; they should be re-plated and reassembled with Copaslip. The shape of the acorn nuts has varied over the years; it appears that fluted (or "cruciform") nuts were often used on pre-war models; post war models normally used nuts turned from hexagon bar, as shown in the drawing. All six nuts had the same external shape, whether threaded 0 BA or 1 BA.

It is not necessary to unscrew the diaphragm nut (9/16 inch diameter x 32 tpi) nor to remove the diaphragm from the armature, provided that both are in good condition. Ease the bezel ring upwards and remove it from the body; tapping with a soft drift may be necessary if it is corroded. The bezel ring usually has two small drainage holes in line with the "Lucas" and "Altette" embossed lettering; sometimes two additional equi-spaced holes were used. Carefully remove the paper gaskets; these are easily copied if damaged.

Ease up the armature/diaphragm assembly and move it away from the contact mounting lug. The armature's lower disc is relieved to allow it to clear the fibre tongue of the contact. Slightly tilt the assembly and work it upwards. There is just enough room to do this and no force should be necessary, though the diaphragm may need to be flexed carefully against the body flange to allow removal.

Reassembly is not difficult. If the diaphragm shows traces of rust, it should be lightly sprayed with cellulose paint; enamel or powder-coating might not allow it to vibrate freely. To replace the diaphragm, clamp the armature in a vice, with the diaphragm the correct way up, properly seated on its shoulder; tighten the nut (washer-face down) after coating the threads and the washer-face with Copaslip. Note that the diaphragm has to be aligned with the armature, usually with two diaphragm holes square to the axis of the contact bridge. This alignment can be achieved by eye as the final position is not critical.

Some common faults and repairs

a. Burnt-out coil. Coil resistance should be 1-2 ohms. Unfortunately, a burnt-out coil is difficult and expensive to repair. It is usually caused by the horn button short circuiting to earth and overheating the coil, which is not designed to pass current for long periods. A cure for this horn button fault is described in *Know Thy Beast*. A company which specialises in the full overhaul of Lucas Altettes and also provides an exchange service is: The Pre-War MG Parts Centre, 1A Albany Road, Chislehurst, Kent, England, telephone 081-467 7788. Note that Lucas Altettes were also fitted to early MG and other British sports cars.

b. Dirty or corroded contacts. Usually caused by moisture within the horn body. Clean the points using a piece of emery cloth or a contact cleaning spray until the contact resistance is virtually zero, let the internals dry thoroughly and use light grease or Vaseline on the gaskets when reassembling to minimise future problems.

c. Diaphragm nut rusted solid with the boss thread. This is not a problem with the Altette, provided that the diaphragm itself is sound, because the assembly can still be removed from the body as described above.

d. Damaged adjustment screw or locknut (later models). Usually caused by the "previous owner" attempting to turn the adjustment screw without slackening the locknut, using a pin punch or perpetrating some other butchery on the locknut. In extreme cases the nut may have to be turned off on a lathe and a copy made. Make up an angled sheet-steel slotted "screwdriver" that fits the nut snugly, while still allowing access to the adjustment screw using a second screwdriver. A replacement adjustment screw can be made (preferably in brass or stainless steel) using a 1 BA screw. Saw the head off, cut a screwdriver slot with a hacksaw and, using a Swiss file followed by fine emery cloth, shape the other end so that it is nicely rounded (the original has a 1/8 inch diameter spherical end).

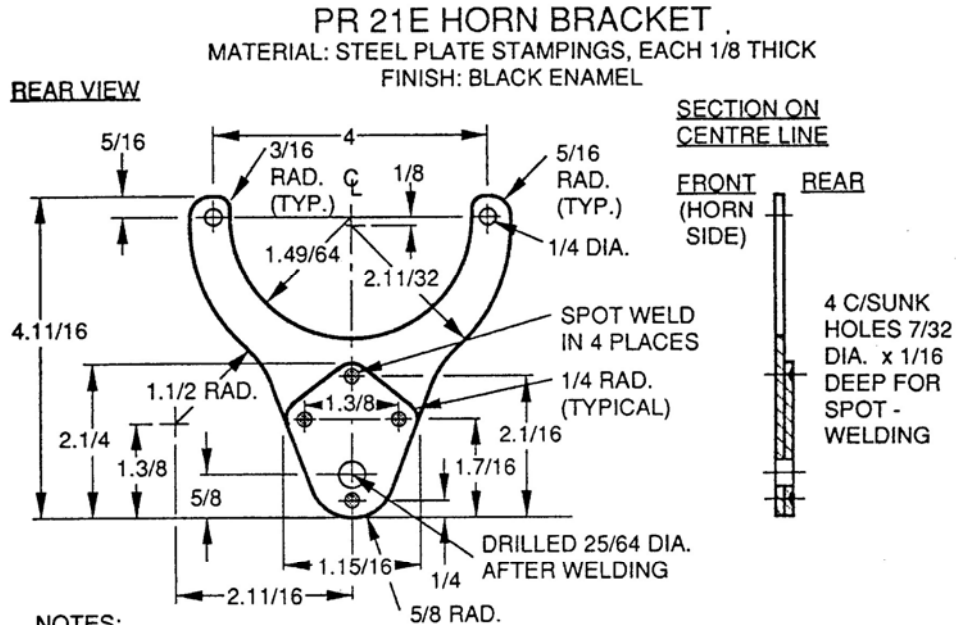
e. High resistance earth path. The horn button is supposed to provide an earth path for the horn current. However, as originally wired, the current has to follow a tortuous path via the handlebars, the clips, the fork links etc, to reach, eventually, the headlamp shell, where there is, or should be, a direct earth lead to the earth screw at the back of the UFM (unless, of course, the current has preferred a shorter path via the steering head ball races!). Moreover, the components on the way are enamelled and enamel is an excellent insulator. Fortunately, in practice, trouble is only encountered with newly-enamelled handlebars, where a little enamel has to be scratched off to ensure electric contact with the horn button clip.

Nevertheless, perfectionists who dislike scratching enamel and refuse to contemplate the possibility - indeed, the likelihood - of some current flowing through the head races whenever the horn is sounded, can easily run a separate earth lead between the UFM earth screw and, via a soldered or crimped eyelet, the lower clamp screw of the button. If this is done carefully, using heat shrink sleeving or a suitably trimmed piece of black sheathed twin core cable, the modification is unobtrusive. Circuit resistance will be minimal and the improvement of the horn note can be impressive, especially with a 12 volt system.

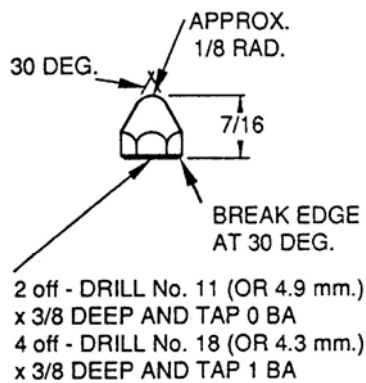
f. the diaphragm may have been fitted the wrong way round. It is slightly dished and, on assembly it should be slightly convex when looked at from above, to ensure that the armature has sufficient room to move.

g. Roughness of tone may also be a result of a slack diaphragm nut, loose tone disc nut or dome nut. Check these first before readjusting the horn.

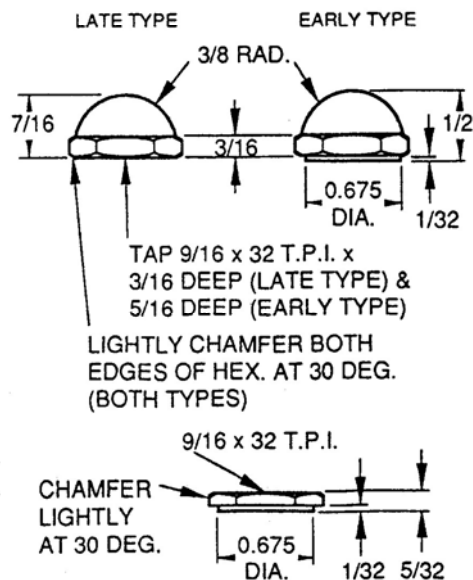
Unfortunately, spares are now very difficult to obtain, the main source seeming to be autojumbles.



BEZEL RING ACORN NUT
 2 off TAPPED 0 BA - 4 off TAPPED 1 BA
 MATERIAL: BRASS HEX. ROD 0.375 A/F
 FINISH: BRIGHT CHROMIUM - PLATING



DOME & TONE DISC NUT
 MATERIAL: BRASS HEX. ROD 0.710 A/F
 FINISH: BRIGHT CHROMIUM - PLATING



Adjustment

For initial adjustment it is best to mount the bracket on the horn and clamp the bracket firmly in a vice, thus letting the horn work as mounted on the bicycle. Tests should be done with a fully charged battery, the average battery charger is usually inadequate. The adjustment of the horn is described in the *Instruction Sheets* which advise 3-4 amps (at six volts) to be used for a continuous tone. However, it may be worthwhile to quote again from the Lucas pamphlet mentioned earlier:

"Adjustment - The following adjustment will not alter the pitch of the note. It will take up any wear of the moving parts which, if not corrected, may result in roughness of tone and loss of power.

Accurate adjustment requires the use of a 0-10 amp dc ammeter - the maximum permissible horn current being 6 amperes at 6 volt - but the owner-rider, who may not possess one of these instruments, can carry out the following procedure if the horn performance is considered to have deteriorated.

Operate the horn push and turn the adjustment screw (at the back of the horn) anti-clockwise until the horn just fails to sound. Release the horn push and turn the adjustment screw clockwise for six notches, ie, a quarter of a turn, when the original performance should be restored. If further adjustment seems to be necessary, turn the screw one notch at a time clockwise" (or equivalent for later model horns).

In any case, the ideal should be a clear penetrating note, with no "roughness" in tone, without exceeding the current limits indicated above. Even so, it is still worthwhile doing the final adjustment with the instrument mounted *in situ* on the bicycle. Once correctly adjusted, the horn should not require any attention for many years.

2. Series "D"

The Altette horn could not conveniently be fitted on the Series "D" enclosed models for want of a suitable mounting point and lack of space. Accordingly, a smaller, and probably cheaper, Lucas horn was selected and fitted behind the steering head casting. This is referred to in the Series "D" Spares List as PR21/15, "Horn complete with bracket", Type H11441.

The horn is shown on MO 110 in the Series 'U' Spares List and in figure 1 of *Know Thy Beast*. Although smaller, its operating principle, basic construction and internals are the same as the Altettes and, apparently, the terminal block is also the same. It does not have a flanged body and bezel ring, but instead uses a "Pan"-shaped diaphragm slipped over the outer diameter of the body and located by triple bayonet points. The three pins, fixed to the body, mate with slots cut in the side wall of the diaphragm, which is held in place with a strip, centrally dished to accommodate the protruding pins. This clamping strip is tightened using a 2 BA round-head screw and Simmonds locknut.

The aluminium tone disc is gently convex (flat on early models) and is unpainted. The horn body is tapped 3/8 inch BSF at the rear to accept a bolt which attaches the instrument to two spring steel mounting "brackets". In fact, these are more like strips and have been known to break off, leaving the horn dangling on the leads, with the possibility of a potentially disastrous short circuit. Dismantling is straightforward, remembering that the clamping strip has to be removed to free the diaphragm. To withdraw it from the body, the diaphragm nut has to be removed from the armature, because the side walls of the diaphragm prevent radial movement and it must therefore be lifted upwards. If, however, the diaphragm nut is rusted solid on the armature boss thread, it can be freed with penetrating oil and/or heat and patience. Common faults are likely to be the same as those which affect the Altette, and repair or restoration work should be carried out as outlined earlier on. The body and clamp were thinly painted black, whilst the brass dome and tone disc nuts were sometimes left unplated.

After de-rusting and treating the diaphragm, cleaning and polishing the contact points etc., reassembly should not present any problems. Removal of the central dome nut gives access to the adjustment screw and locknut. Adjustment, if necessary, is carried out as on the Altette.

Errata

The thread of the horn adjusting screw and its brass locknut, located under the central dome nut, together with the armature is not always 1BA as shown, but can also be 13/64 inch x 36 TPI; thank you Trevor Southwell for drawing this to our attention. This thread is most unusual, to say the least - does anyone have an idea which branch of British industry perpetrated this oddity on an unsuspecting world?

Apparently, replicas of the chromium-plated dome and acorn nuts are available from Custom Fasteners, Unit 64, Mochdre Industrial Estate, Newtown, Powys SY16 4LE, Gt Britain. If anyone has bought these items, do they have any comments on their quality.

Finally, note there are misprints in the text: a) page 17, line 8, should read: "adds its own natural harmonics,...", ie, the word "less" should be deleted; b) page 22, penultimate paragraph, last two lines should read: whilst the brass dome and tone disc nuts were sometimes left unplated.", ie, the word "nuts" has been omitted.