MILLER AMMETER - PR18F

The Miller instrument was fitted to all Series A, B and C Vincents. It is a moving iron ammeter i.e. the coil is static whilst the small magnet, mounted on the needle's pivot, is displaced proportionally left or right depending on the current through the coil. It is robustly constructed, reliable, and remarkably well made for a mass-produced instrument. A substitute ammeter is available from some Vincent stockists, but it is often possible to restore an old instrument. The following description and advice, combined with the drawing, are intended to help those unfamiliar with the internals and the way they work. Bear in mind that the Miller ammeter was in production for several decades and, naturally, minor changes took place during this long production run. For instance, three different face plates were used during various periods, and there were other variations in the material of the scale and sizes of its retaining screws, etc. The drawing should therefore be regarded as a guide, although the main features remained the same over the years.

Dismantling and Inspection

Disconnect the battery before removing the ammeter from the headlamp. Unscrew the four nickel-plated 4 B.A. full nuts with their phosphor-bronze spring washers, starting with the cables, followed by the mounting bracket, but leaving the thin nuts (and washers, if any) in place. Finally, push out the instrument from the inside. There was initially a rubber ring between the ammeter and headlamp shell. This is likely to be perished or missing, and a replacement can be made using the Loctite O-ring kit. The mounting bracket is often rusted and should be cadmium- or zinc-plated. If a new bracket has to be made, note that the legs were bent so as to follow the contour of the ammeter body, as drawn.

On the bench, remove the bezel ring; this is a thin brass stamping retained by three tongues, bent over the lip of the case, and located in a recess. Straighten gently one or two tongues with a small screwdriver and ease the bezel off. A cracked or broken case can be repaired with epoxy adhesive (Araldite). If a piece is missing, the case can be built up with Araldite mixed with a little finely ground marble ("marble flour") which may then be filed to shape afterwards. Carefully remove the paper weather proofing gasket from the glass, then the glass itself and the brass faceplate. A replacement glass can be cut by a specialist glazier. The average glazier lacks the equipment to cut small diameters and is unlikely to stock the unusual thin glass (0.051 in., 1.25 mm) needed. The bezel dimensions do not allow the use of thicker glass. The face plate may be tight in situ; it is stamped from thin brass and easily distorted, especially at the top end. It should be eased out with the help of a wide strip of cardboard placed through the kidney shaped opening and bearing under the main part of the plate as the upper thin rim can easily be distorted. Do not use your fingers because, after so many years, the white 'silk-screened' lettering and black background is usually very fragile and can be easily smudged. However, a sheet of photographs of different Miller faceplates is available on the market and the desired type can be cut out and applied to the faceplate. The photograph will eventually fade but in the meantime will be an acceptable substitute. Effective waterproofing is, of course, essential.

The explanations on the faceplate of the second and most common version were intended for the benefit of riders brought up on the pre-war three-brush system, who might not appreciate the merits of the 'controlled-battery-charging-voltage-
regulated-system’. They are omitted from very early instruments, which were adorned instead with the Miller lighthouse, and from replacements supplied from the late fifties onwards which just bore the Miller diamond.

The scale was made from brass or plastic and rests on three moulded-in supports, a shoulder at each side and a rib at the top. Extract the scale after removing the two silver-plated screws (usually 8 B.A. but other sizes were also used), with their white fibre washers; here again, as for the faceplate, careful handling is necessary. This leaves the meter mechanism exposed and if the intention is purely to oil and adjust no further dismantling is required. Otherwise, proceed as follows. Remove the external thin nuts and plain washers of the nickel-plated coil mounting screws, at the same time pressing a finger on the head of one of the coil screws, in case the coil falls out. Now gently press a finger on one of the coil screws and also on the top plate of the pivot bearing assembly, and remove the two nickel-plated countersunk pivot bearing mounting screws; in view of their small size, instrument or clock makers screwdrivers are very desirable.

The next stage is more delicate; the needle passes through the middle of the coil, and therefore the plated pivot bearing assembly has to be removed together with the coil. Carefully, push upwards the coil retaining screws, taking care not to move too abruptly and bending the needle as a result. A point will be reached where the coil and the pivot bearing assemblies can be removed together. Patience and a certain dexterity are needed here.

The black plate (probably iron) is held in place by a grub screw, possibly 3 B.A. which is peened over and should not be needlessly disturbed. This plate (either rectangular or semi-circular) is often found to be rusty. As removal is risky, it is best to remove the surface rust with emery cloth and paint it black. The plate is magnetised; if it has become de-magnetised, the needle may remain stationary or fail to return to zero. See under "Possible Faults" for a cure.

Check the black paint on the needle; if it proves flaky, give it a coat of thinned model-makers’ enamel. Inspect the soldering of the coil’s lacquered or enamelled copper wire to the terminal screws with a magnifying glass; they have been known to part company. If in doubt re-solder the joint and also inspect the wire for latent fracture where the wire leaves the screw slot. The coil was made with 3 (sometimes 4) turns of 17 S.W.G. (0.056 in.) copper wire, covered with light brown or black enamel or lacquer giving an overall diameter of 0.059 in..

The needle pivot bearing is adjustable for end float but the pivot bearing grub screw, also accessible from outside the instrument, was often locked by a dab of wax and should not be needlessly disturbed. Nevertheless, adjustment may be needed. Ideally, the needle should swing easily with no slack and yet provide a certain degree of damped motion. Before checking and, if necessary, adjusting the grub screw, apply a very small drop of watchmaker’s oil to each pivot bearing, gently move the needle a few times, then mop up any surplus with a piece of blotting paper. This adjustment is best carried out with the pivot assembly in situ, i.e. in the correct location relative to the iron plate mounted in the bottom of the case.

The case mounting screws are held in place by a lock plate which is in turn retained by a cheesehead screw, all nickel-plated. The square head of each screw is prevented from turning by a moulded-in shoulder within the case. With the instrument on the bench, it is worthwhile removing these parts to check for possible corrosion and eventual re-plating. Note that the lock plate’s two dimple protrusions bear against the heads of the screws.

Re-assemble in the reverse order, using proper 4 B.A. spanners and the screwdrivers mentioned previously, and do not overtighten. The needle and pivot
assembly retaining screws can be locked with a dab of Bostik. The faceplate has to be aligned in its recess by eye, the scale retaining screws provide a useful reference. Clean the glass with methylated spirit so that no fingerprints are visible. Check that the paper gasket has not started to rot; a new one is easily made. Waterproofing is best achieved by coating the paper gasket on both sides with Hylomar before re-fitting; with care this makes it better than new. Finally ease the bezel into place and gently persuade the tongues into the locating recesses. A bezel with one or two missing tongues can sometimes be persuaded to fit and to be waterproof after a bead of solder has been sweated in the position of the missing tongue(s) and dressed with a file. The final closure is made by bending the remaining tongue(s) into position.

**Some Possible Faults -** Fortunately mostly rare

a) Perhaps the most common fault is due to overloading the instrument, designed to cope with a maximum of 8 amps., often exceeded nowadays. If the needle pivot has too much end-float, and the needle to scale clearance is excessive, the needle may overshoot on full deflection and remain jammed on the top of one of the scale fixing screws, despite the fact these were no doubt intended to act as stops. It is then necessary to open the instrument as previously explained, gently bend the needle back and possibly re-adjust the pivot grub screw. Adjustment of the fragile needle is delicate, as it must not be allowed to rub on the scale thereby removing its markings.

b) The needle hardly moves and/or does not return to zero. This can be due to a de-magnetised plate as previously mentioned. The plate can be re-magnetised by stroking it repeatedly with a small permanent magnet until the needle moves normally when a current is passed through the coil. It does not matter which way the plate is polarised, since to obtain the correct deflection, the cables connected to the ammeter need only be reversed.

c) The coil may have fractured or the soldering may have turned to a "dry joint". This is easily checked with an ohmmeter, which should read virtually zero, and if necessary, rectified by careful soldering.

d) The coil lacquer may have flaked off and one or more coils may be touching. This can be cured by opening gently the coil's turns and re-lacquering.

e) Moisture due to poor waterproofing may have caused internal corrosion and led to friction and coil lacquer problems. Often, the ammeter has to be tapped to persuade the needle to move or return to zero. This is a sure sign that the instrument needs attention, as set forth in these notes.
BRASS BEZEL:
BRIGHT CHROMIUM PLATED
2.3/16 OD x 1.13/16 ID.

PAPER GASKET:
2.1/8 OD x 1/8 WIDE
x 0.018 THICK.

GLASS:
1.63/64 OD. x 0.051" THICK.

BRASS FACEPLATE:
WHITE LETTERS ON BLACK
BACKGROUND. REFER TO
TEXT FOR DETAILS.

SCALE RETAINING SCREWS:
OFTEN 8 BA x 1/4 LONG CHEESE
HEAD WITH WHITE FIBRE
WASHERS.

BRASS OR PLASTIC SCALE:
8-0-8 AMPERE.

4 BA x 9/32 LONG CHEESE HEAD SCREW
LOCK PLATE

BRASS MOUNTING BRACKET
SCREWS:
4 BA x 7/16 LONG WITH
1/4 SQUARE HEADS.

4 BA PLAIN WASHERS
4 BA BRASS THIN NUTS

PLATE GRUBSCREW
IRON
PLATE

WHITE TRANSLUCENT CASE
MAIN BODY 2 OD.
1/16 DIA. O-RING,
TO SUIT CASE OD

MOUNTING BRACKET- STEEL,
CADMIUM-PLATED:
11/32 WIDE x 1/32 THICK
x 11/16 DEEP OVERALL

4 BA SPRING WASHERS
4 BA BRASS FULL NUTS

THE TAILS OF THE 3 OR 4
TURN COIL ARE
SOLDERED TO THE
SLOTS OF 2 BRASS
CHEESEHEAD SCREWS
4 BA x 3/4. AN ANCHOR
PLATE IS SOLDERED
UNDER EACH HEAD, AND
BEARS AGAINST THE
CASE MOULDING

ALL 4 BA ::
PLAIN WASHER
THIN NUT
SPRING
WASHER
FULL NUT

PIVOT BEARING
ADJUSTING SCREW

2 COUNTERSUNK
MOUNTING SCREWS:
8 BA x 3/16 LONG.