COMMONWEALTH OF AUSTRALIA

POSTMASTER-GENERAL'S DEPARTMENT

MAINTENANCE CIRCULAR No. 3

Amendment No. 1

Adjustment of Dials and Replacements of Dial Parts

B.P.O. DIALS

(Distribution List C (Modified)—Serial No. 55)

SECTIONS Nos. 1 and 2

Approved—

J. M. CRAWFORD,

Chief Engineer.

29.5.1933.

Chief Engineer's Branch,
Postmaster-General's Department,
Treasury Gardens,
Melbourne, C.2.

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Chief Engineer's Branch,
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MELBOURNE, C.2.

APPROVED
J. M. Crawford,
Chief Engineer,
29. 5. 33.

M.C. No. 3.
Amendment No. 1.
Contents.

MAINTENANCE CIRCULAR No. 3.

AMENDMENT No. 1.

C O N T E N T S

SECTIONS 1 and 2.

MAINTENANCE CIRCULAR No. 3.

AMENDMENT No. 1.

ADJUSTMENT OF DIALS AND REPLACEMENT OF DIAL PARTS.

B.P.O. DIALS

SECTION 1 - GENERAL.

1.0 Cancellation of Previous Instructions.

1.1 This Circular cancels the previous instructions relating to the B.P.O. Type Dials issued in M.C. No. 3, Paragraphs 3.1 to 3.91.

2.0 Contents.

The Circular is sub-divided into the following sections:

Section	Description
1	General
2	B.P.O. Dials - Adjustment

3.0 Standard Adjustments.

3.1 The adjustments detailed herein are the standard adjustments for B.P.O. Dials and should be applied in Dial Adjustment Centres, and, where applicable, by Sub-station Maintenance Mechanics.

4.0 Alteration to the Standard Adjustments.

4.1 No alterations to the Standard Adjustments specified herein should be made without first submitting the matter for approval to Central Office. It is realised that it may be necessary to try out in practice slight modifications to the standard adjustments before furnishing a report to this Office setting out the conclusions thereon. All such local experiments, however, should be limited to three months' duration, and should be approved by the Superintending Engineer before trial. No permanent alterations should be made unless approved by the Chief Engineer.

SECTION 2 - B.P.O. DIALS - ADJUSTMENTS.

1.0 TO DISMANTLE

1.1 Figures 1, 2 and 3 show the names of the parts.
Remove the spring set assembly.
Remove the securing ring for the label.
Remove the celluloid protector for the label.
Remove the label.
Withdraw the stop screw and let the dial revolve until the main spring is unwound.
Remove the finger stop.
Remove the forked stop.
Remove the hexagonal lock and clamping nuts.
Remove the switching lever. Remove the Spring washer, and where fitted, the nickel silver washer and the two steel washers, or the fibre washer.
Remove the slipping cam.
Remove the two steel washers (if fitted).
Remove the bush.
Remove the impulse wheel.
Remove the finger plate and the main spindle complete.
Remove the spring box with the main spring from the dial frame.
Remove the securing ring for the number ring.
Remove the number ring.
Remove the governor gear bracket and the governor gear assembly.
Remove the governor cup and the bracket.
Remove the governor.
Remove the governor pivot bearing.
Remove the finger plate from the main spindle.
Remove the label holder from the finger plate.
Remove the main gear wheel from the main spindle.

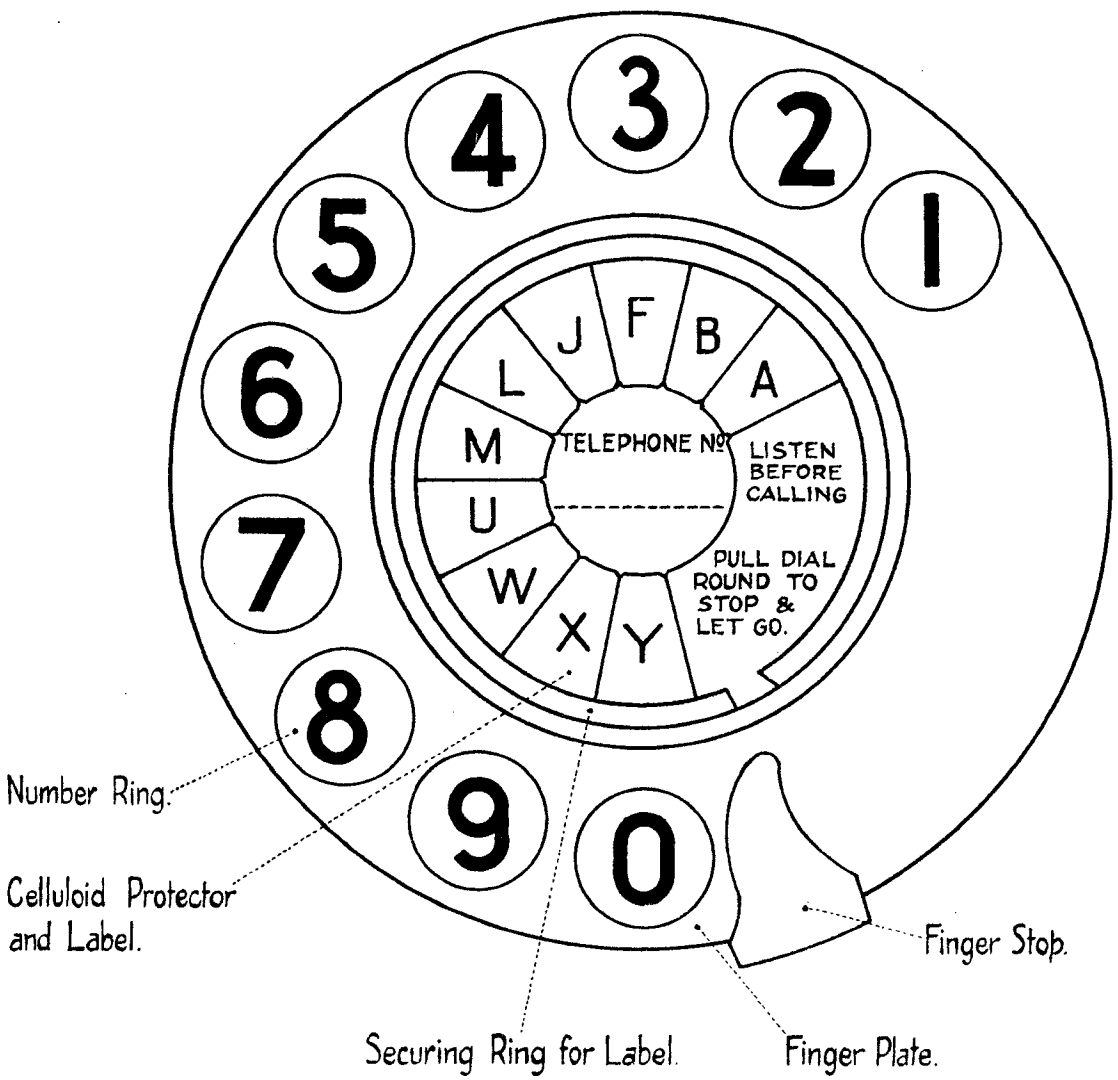


Fig. 1. Front View.
Typical Dial.

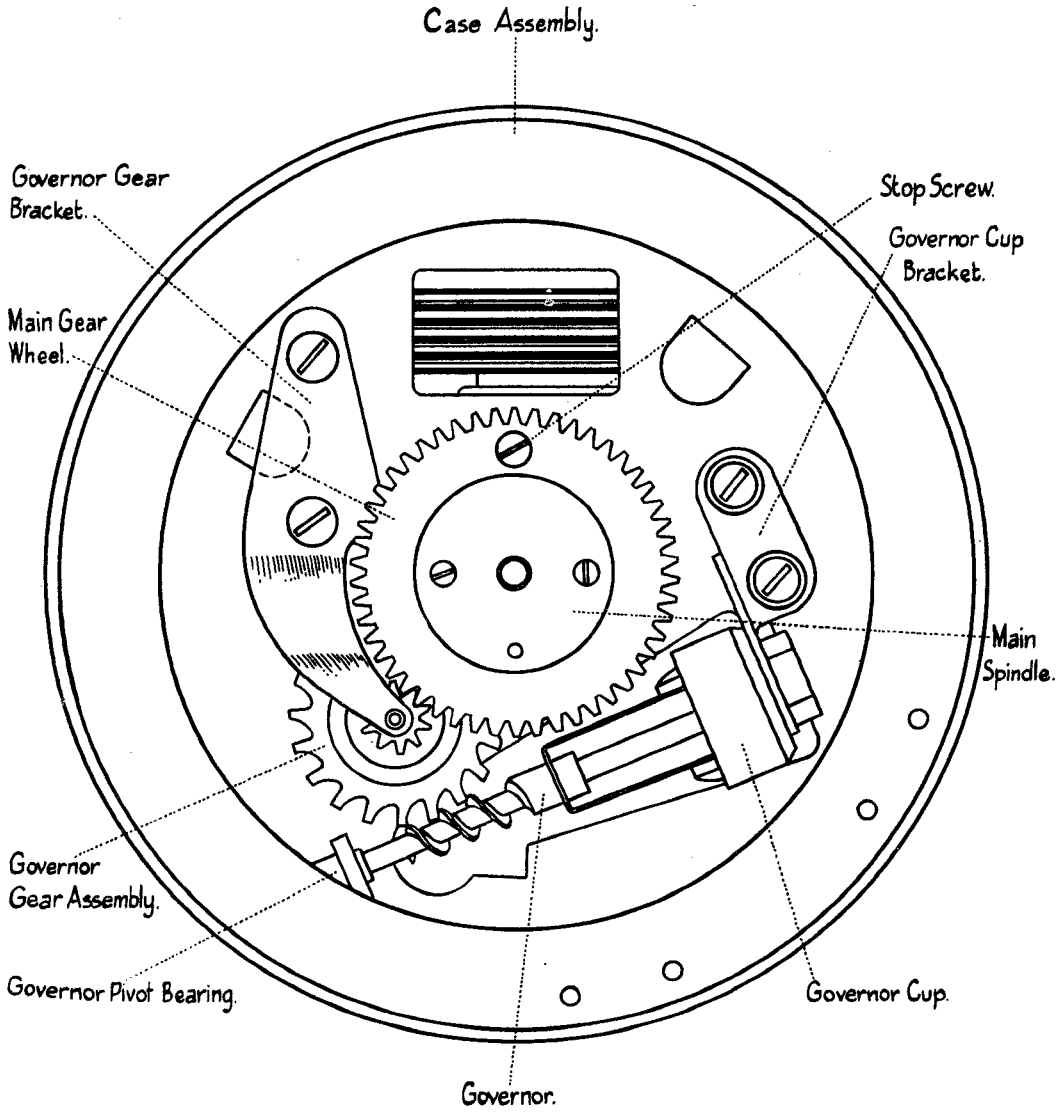


Fig.2. Front view with the Finger Plate removed.

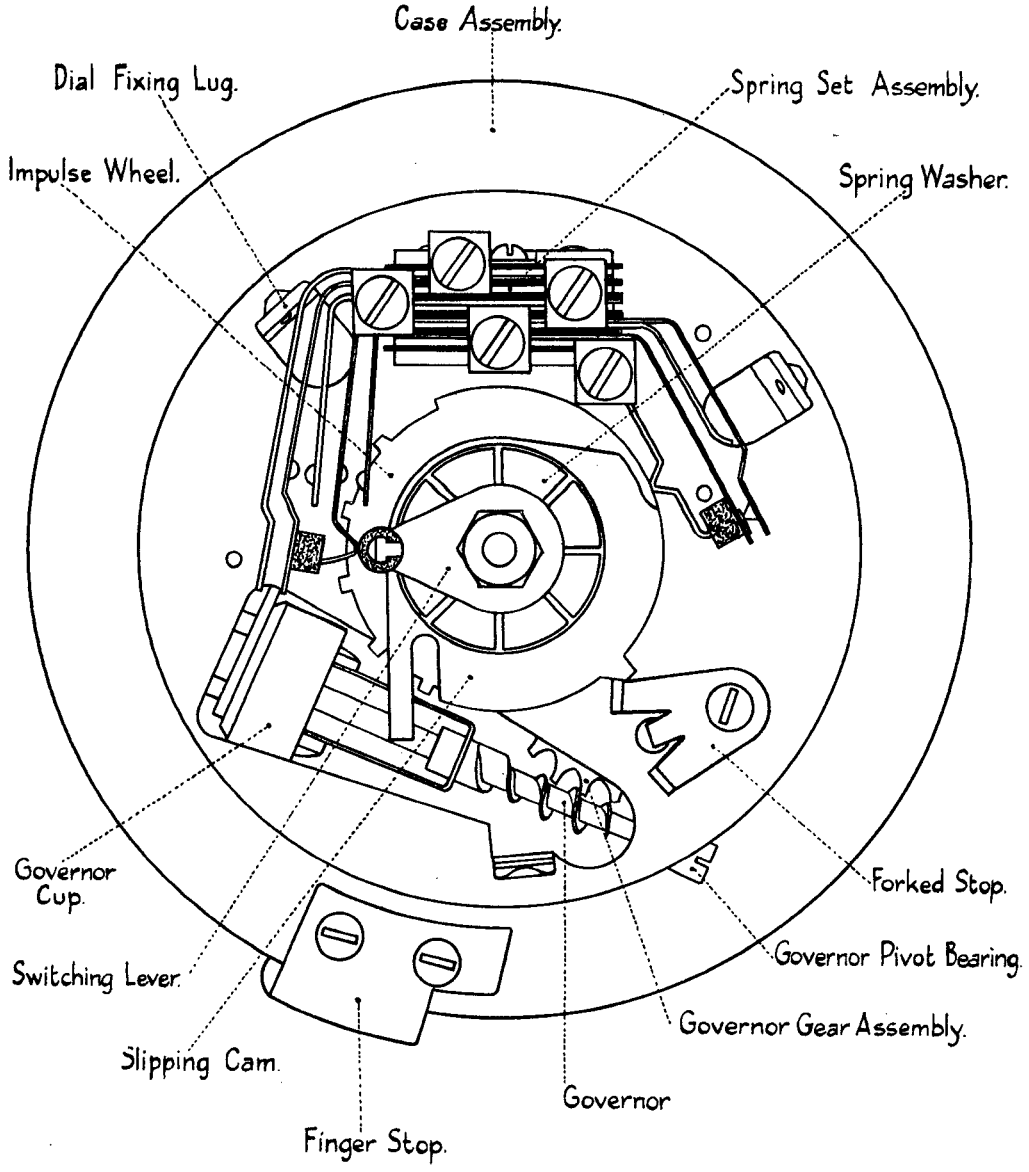
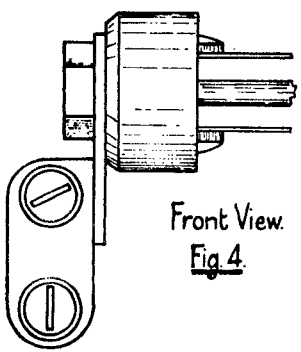


Fig.3. Rear View.

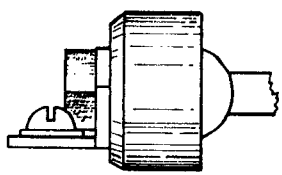
2.0 TO ASSEMBLE AND ADJUST.

2.1 Thoroughly clean all the parts and inspect for wear. See that the steel bearings in the governor pivot bearing or cup have not become worn or rusty. If wear or rust is detected, the relative governor pivot bearing or cup should be changed.
Replace the main gear wheel on the main spindle. See that the main gear wheel is fitted to the main spindle, so that the threaded hole for the stop screw is diametrically opposite the finger plate locating pin on the main spindle; otherwise the stop screw will be obscured by the finger plate.
Replace the governor pivot bearing.

2.2 The governor wings must be free from kinks or bows and should be slightly set inwards. Fine adjustments will be made later.
The Spring Adjuster - Tool No. 22 should be used for adjusting the governor wings.
Replace the governor with the governor cup and bracket.
The governor cup fixing holes are elongated to enable the cup to be positioned to give the best running position for the governor.
The best running position is when the cup is square with the governor.
Figures 4 and 5 show the angles from which the cup should be observed. The governor should run smoothly in both directions. The governor end play should be 10 mils ± 3 mils as near as can be judged by feel.



Front View.
Fig. 4.



Side View.
Fig. 5.

Governor Cup and Bracket.

Figure 6 shows that running a small screwdriver along the governor worm will test that the governor is running satisfactorily in both directions.

No attempt should be made to proceed with further assembling until the governor has been adjusted to run smoothly.

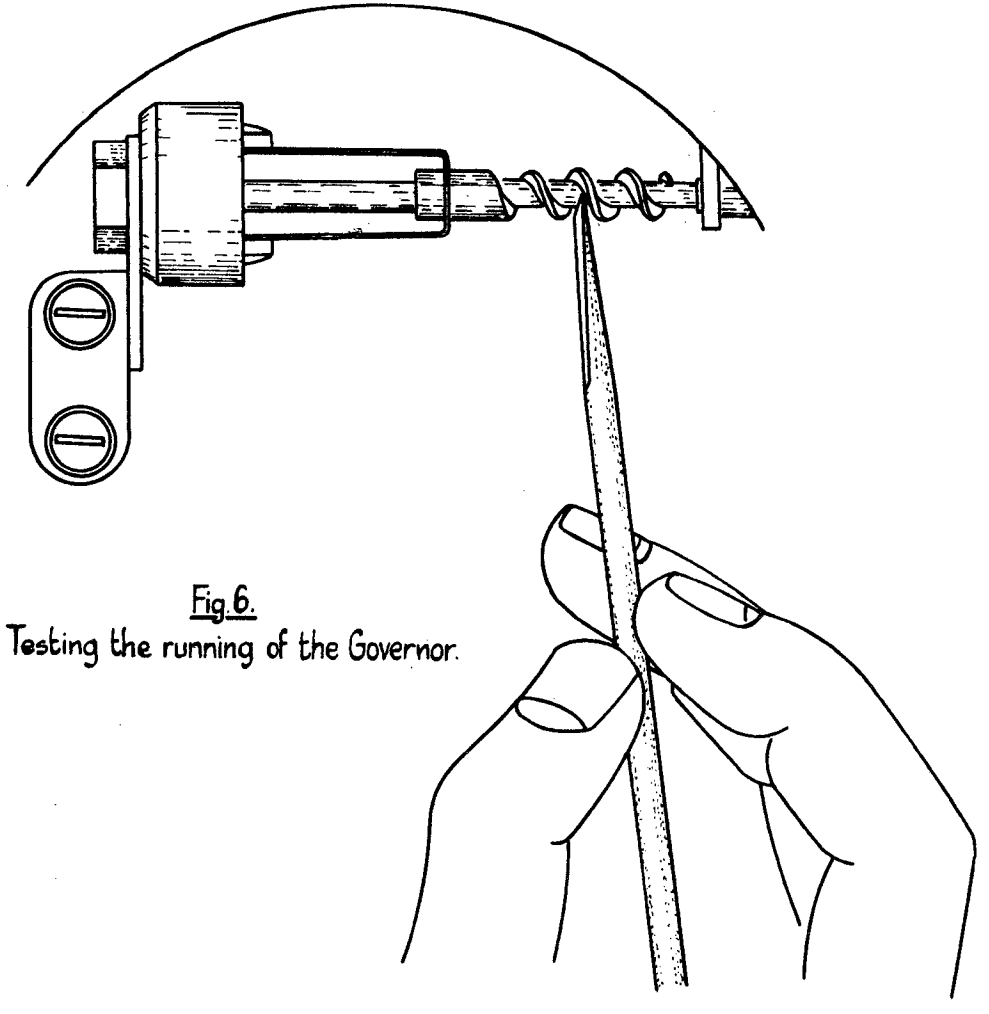
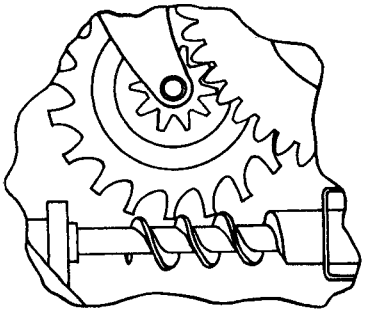


Fig.6.
Testing the running of the Governor.

2.3 Replace the governor gear assembly and the bracket.
See that the governor gear is engaging the governor worm correctly.
If the governor gear is engaging the governor worm too deeply, the governor will not run smoothly and if the governor gear is engaging the main gear wheel too deeply, vibration will set up.
Figure 7 shows how the governor gear should be set.

Fig.7.
Showing how the Governor Gear should be set.



Replace the finger plate to the main spindle.
A good method to test the running of the governor gear and governor is to replace the main gear wheel assembly temporarily and revolve the finger plate a few times.

2.4 Replace the number ring and the securing ring for the number ring.
See that the holes in the number ring are opposite the finger stop fixing holes; otherwise damage may be caused to the number ring when the finger stop fixing screws are replaced.
Replace the spring box with the mainspring.
Replace the main spindle assembly.
Replace the impulse wheel.
Replace the bush.
(Replace the two steel washers)
Replace the slipping cam.
(Replace the two steel washers)
(Replace the nickel silver washer) or (Replace the fibre washer)
Replace the spring washer.
Replace the switching lever.

Replace the clamping nut.
The clamping nut should be screwed down tightly so that the switching lever is securely fixed.
Apply the correct tension to the main spring by rotating the finger plate in a clockwise direction until the spring is felt to tighten.
Allow the finger plate to return through one complete revolution, then screw down the stop screw.
The dial should then return to its normal position, returning through not less than one half of a complete revolution.
Replace the finger stop.

2.5 The spring washer should apply sufficient tension to the slipping cam, so that the cam will not slip with a pressure of 70 grammes applied tangently at the point shown in Figure 8 but will slip with a pressure of 80 grammes (Figure 9).

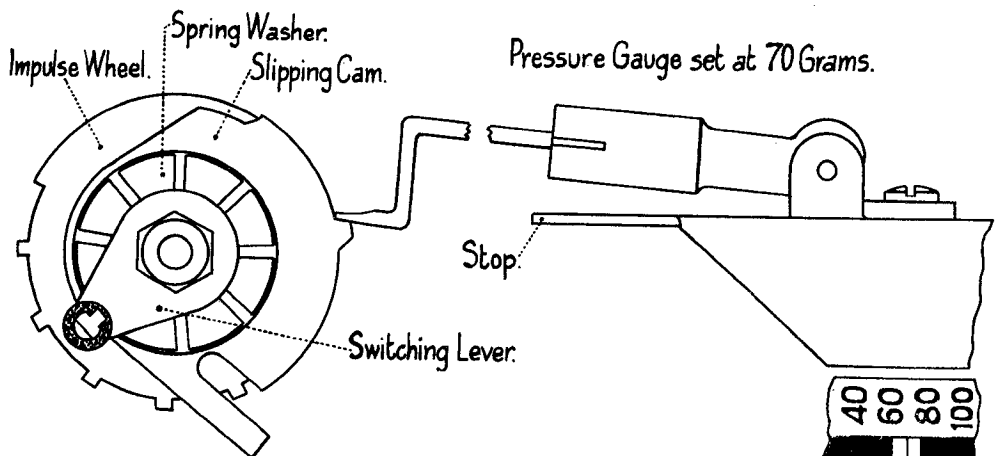


Fig.8. Showing the Spring Washer resisting a leverage of 70 grams.
Note:- The Slipping Cam should not move but the Pointer of the Gauge should leave the Gauge Stop.

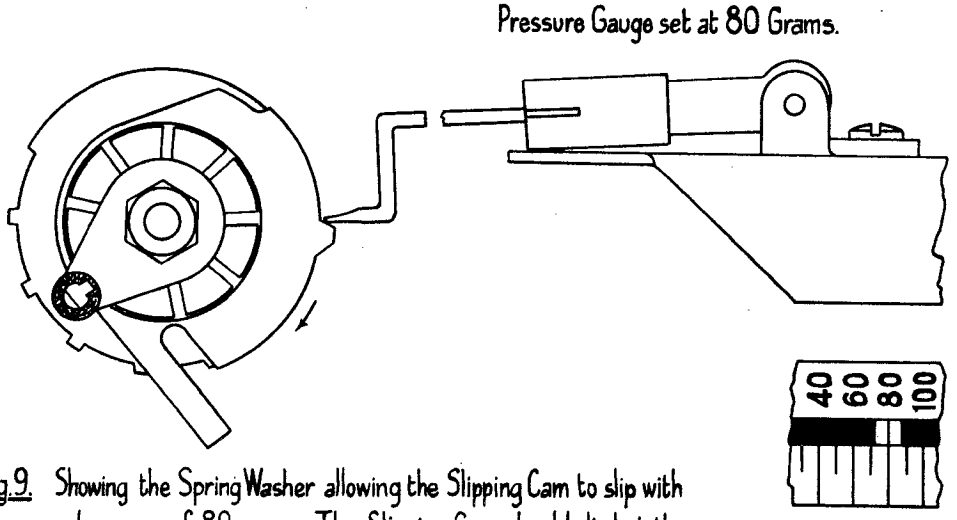


Fig.9. Showing the Spring Washer allowing the Slipping Cam to slip with a leverage of 80 grams. The Slipping Cam should slip but the Pointer of the Gauge should not leave the Gauge Stop.

If the spring is found to be too weak, no attempt should be made to increase its tension; the spring should be changed.
If the spring is found to be too stiff, first see that the friction surfaces of the spring and slipping cam are smooth. If this is found to be in order, a little tension can be taken out of the spring by placing it on a flat surface and flattening it a little by depressing it with the finger, (Figure 10).

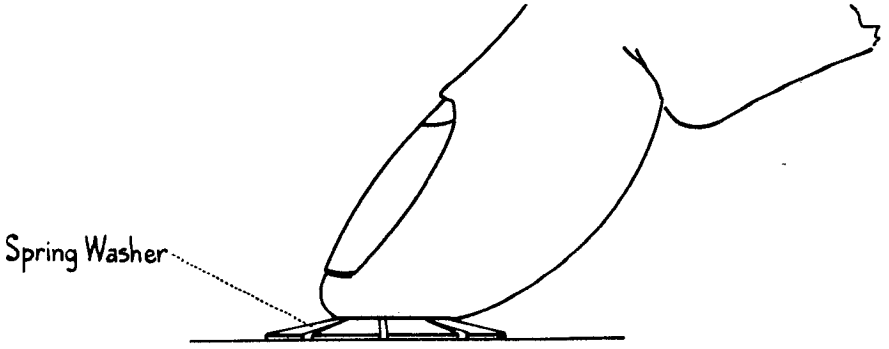


Fig.10. Showing how to decrease the tension of the Spring Washer.

Replace the forked stop.
Replace the spring set assembly.

2.6 Adjust the switching lever so that when the dial is normal it rests at the top of the set in the first lever spring, (Figure 11).

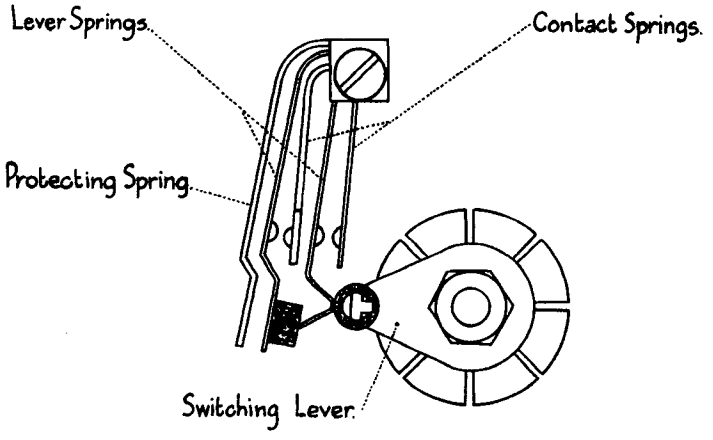


Fig 11. Adjust the Switching Lever so that when the Dial is normal the Lever Buffer rests at the top of the set of the first Lever Spring.

The minimum contact separation should be 10 mils.
Springs 1 and 2 should be adjusted to break first to ensure that the contacts of springs 3 and 4 are making good contact when the dial is off normal.
The two lever springs should be tensioned to give a distinct follow to the two contact springs.
Spring No. 5 is a protecting spring only and should be adjusted to lie parallel with spring No. 4 when the dial is normal.
The impulsing lever should be free on its bearing and should rest squarely on the impulse wheel.
The angle of the set in the impulse lever should not be altered, as any such alteration would affect the ratio of the impulses. If the lever becomes damaged, no attempt should be made to adjust it; the lever should be changed.

2.7 The inner impulse spring should be straight and should be tensioned at the base so that it will resist a leverage of 5 grammes (Figure 12) and lift from the buffer of the impulse lever with a leverage of 10 grammes (Figure 13) applied at the tip of the spring with the impulse contacts broken.

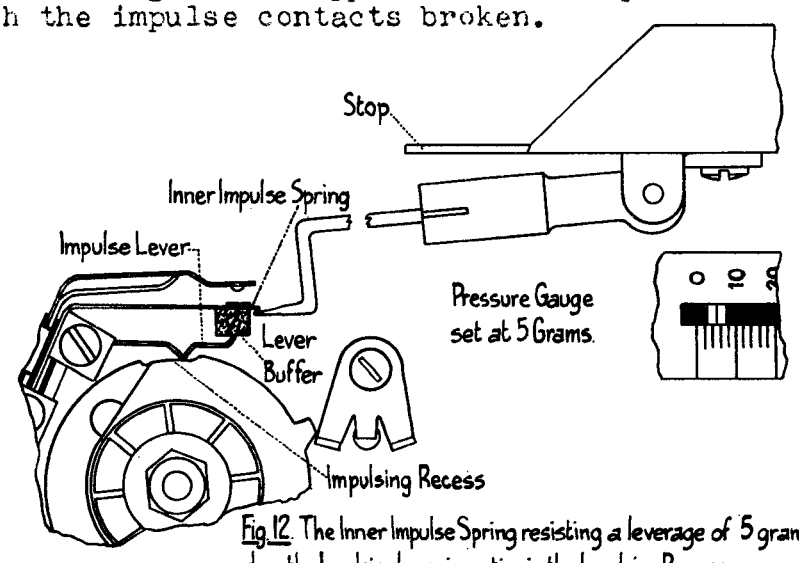


Fig 12. The Inner Impulse Spring resisting a leverage of 5 grams when the Impulsing Lever is resting in the Impulsing Recess.

Note:- The Inner Impulse Spring is resting on the Lever Buffer and the Pointer of the Gauge has left the Gauge Stop.

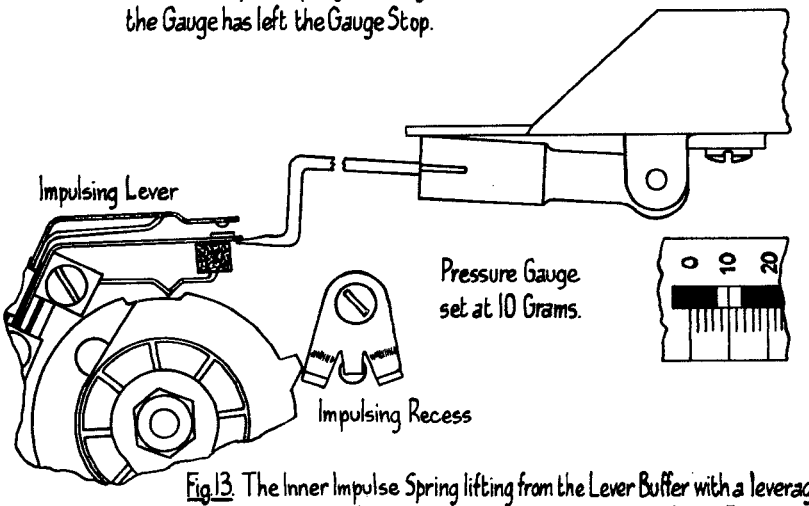


Fig 13. The Inner Impulse Spring lifting from the Lever Buffer with a leverage of 10 grams when the Impulsing Lever is resting in the Impulsing Recess.

Note:- The Inner Impulse Spring has lifted from the Lever Buffer but the Pointer of the Gauge has not left the Gauge Stop.

The outer impulse spring should be tensioned so that it will resist a leverage of 20 grammes (Figure 14) and lift from the inner impulse contact with a leverage of 25 grammes (Figure 15) applied at the tip of the spring with the dial at normal.

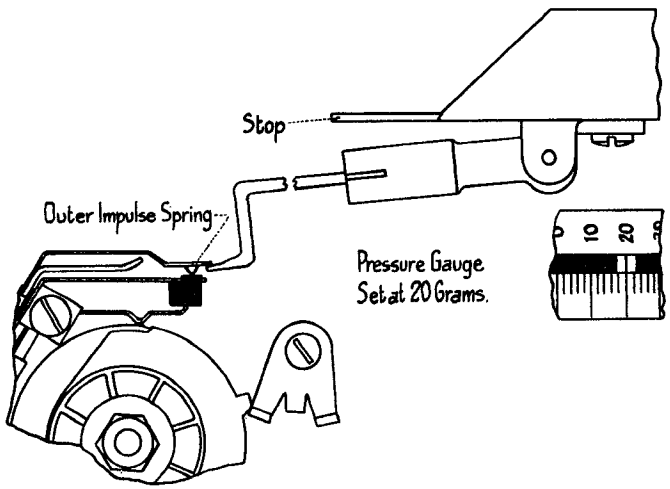


Fig.14. Outer Impulse Spring resisting a leverage of 20 Grams.

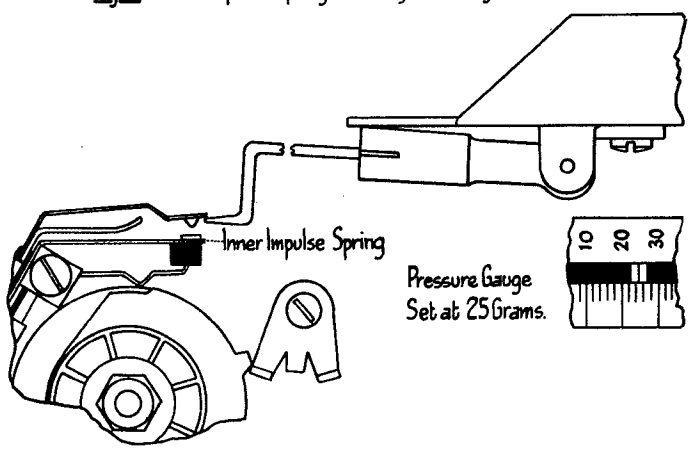


Fig.15. Outer Impulse Spring lifting from the Inner Impulse Spring contact with a leverage of 25 Grams.

2.8 The buffer spring should be adjusted so that there is a space of 6 mils. between the tip of the buffer spring and the outer impulse spring with the dial at normal. (Figure 16).

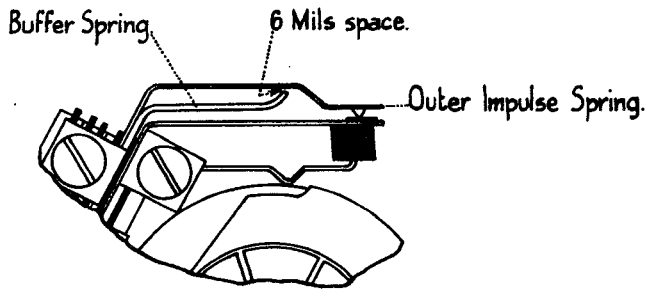


Fig.16. The Buffer Spring should be adjusted so that there is a space of 6 Mils between the tip of the Buffer Spring and the Outer Impulse Spring with the Dial at normal.

The tension of the outer impulse spring should be checked at this point.
The opening of the impulse contacts should not be less than 14 mils when the impulsing lever is resting in the impulsing recess of the slipping cam. Figure 17 shows the impulsing lever resting in the impulsing recess of the slipping cam correctly.

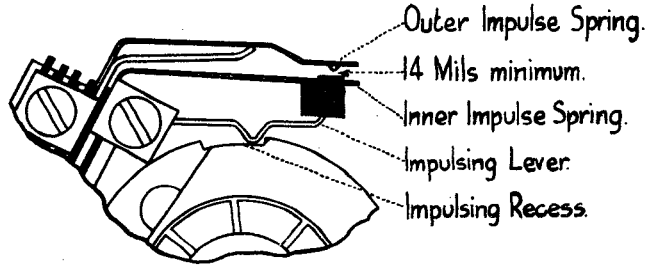
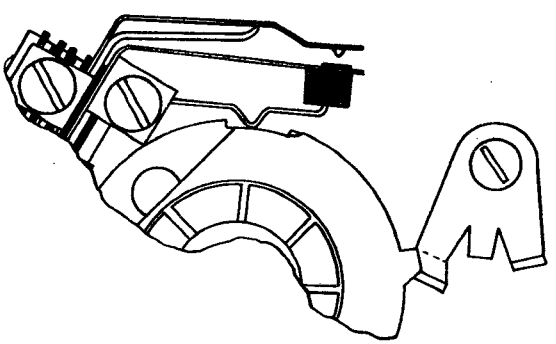


Fig.17. The opening of the Impulse Contacts should not be less than 14 Mils when the Impulsing Lever is resting in the Impulsing Recess of the Slipping Cam.

2.9 Figures 18 and 19 show incorrect positions. The correct position can be obtained by bending the forked stop.

Set of Impulsing Lever not resting correctly in Impulsing Recess of Slipping Cam.

Fig.19.



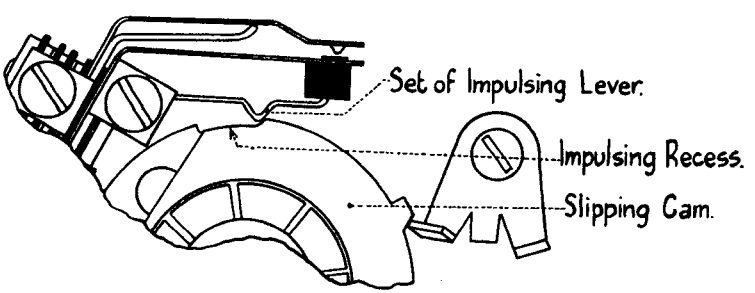


Fig.18.

Set of Impulsing Lever not resting correctly in Impulsing Recess of Slipping Cam.

2.10 To ensure that the first opening of the contacts of any digit is not shortened, the corner of the impulse tooth should be just showing in the impulsing recess of the slipping cam (Figure 20) when the hole of any digit in the finger plate is pulled round to the finger stop.

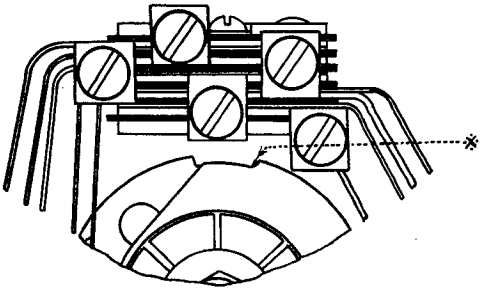


Fig.20. The corner of an Impulse Wheel Tooth should be just showing in the Impulsing Recess of the Slipping Cam * when the hole of any digit in the Finger Plate is pulled round to the Finger Stop.

If the corner of the tooth is not showing, bend the projecting tongue of the slipping cam inwards.
If too much of the tooth is showing, bend the projecting tongue outwards.

NOTE. When making this adjustment, grip the tongue firmly, using Tool No. 213, as shown in Figure 21.

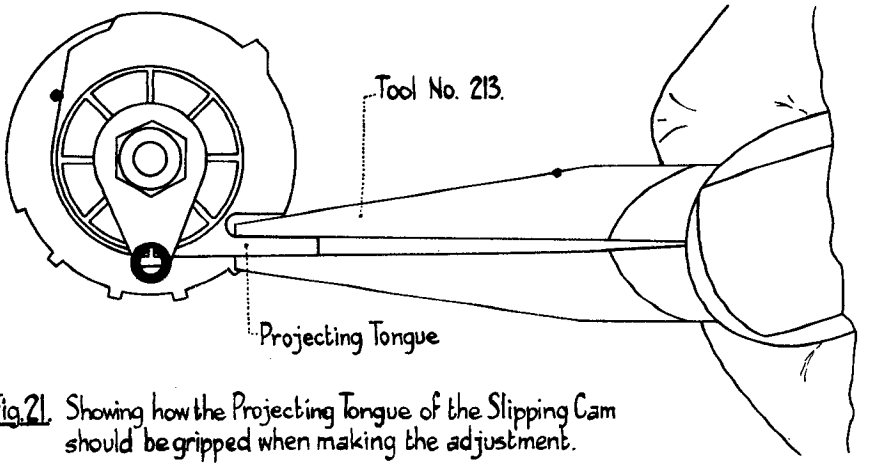


Fig.21. Showing how the Projecting Tongue of the Slipping Cam should be gripped when making the adjustment.

Replace the lock nut.

2.11 The speed of the dial can be varied by adjusting the wings of the governor.
The wings should be bent from the root only (Figure 22).

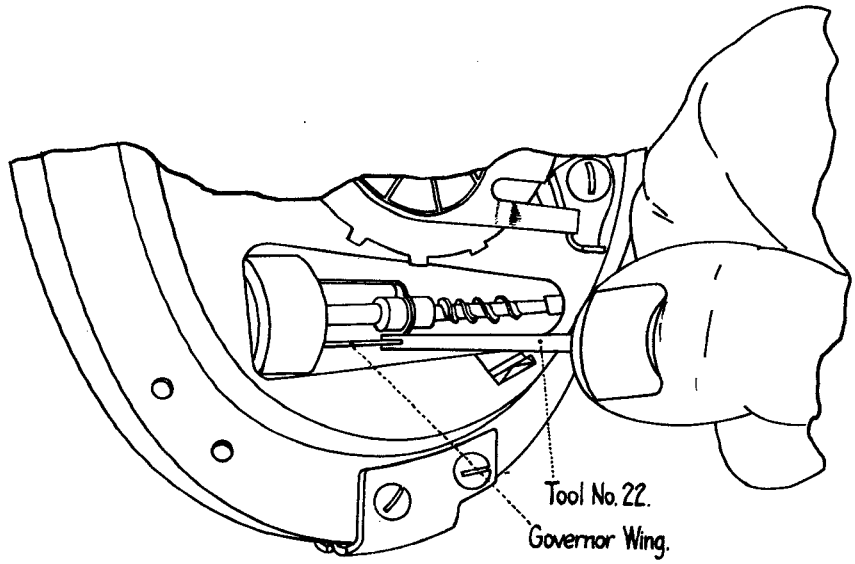


Fig 22. Showing how the Governor Wings should be adjusted. Tool No. 22 setting the Governor Wing at the root.

To <u>increase</u> the speed of the dial, bend the wings inwards.
To <u>decrease</u> the speed of the dial, bend the wings outwards.
The governor wings and weights are so proportioned that the speed of the dial is approximately 10 impulses per second, when the former are set parallel to each other and the governor spindle.
Replace the label holder to the finger plate.
Replace the label, with the lettering horizontal when the dial is in its normal position, also the celluloid protector and the securing ring.

2.12 Figure 23 snows the position of the impulsing contacts, slipping cam and switching lever when the dial is at normal.

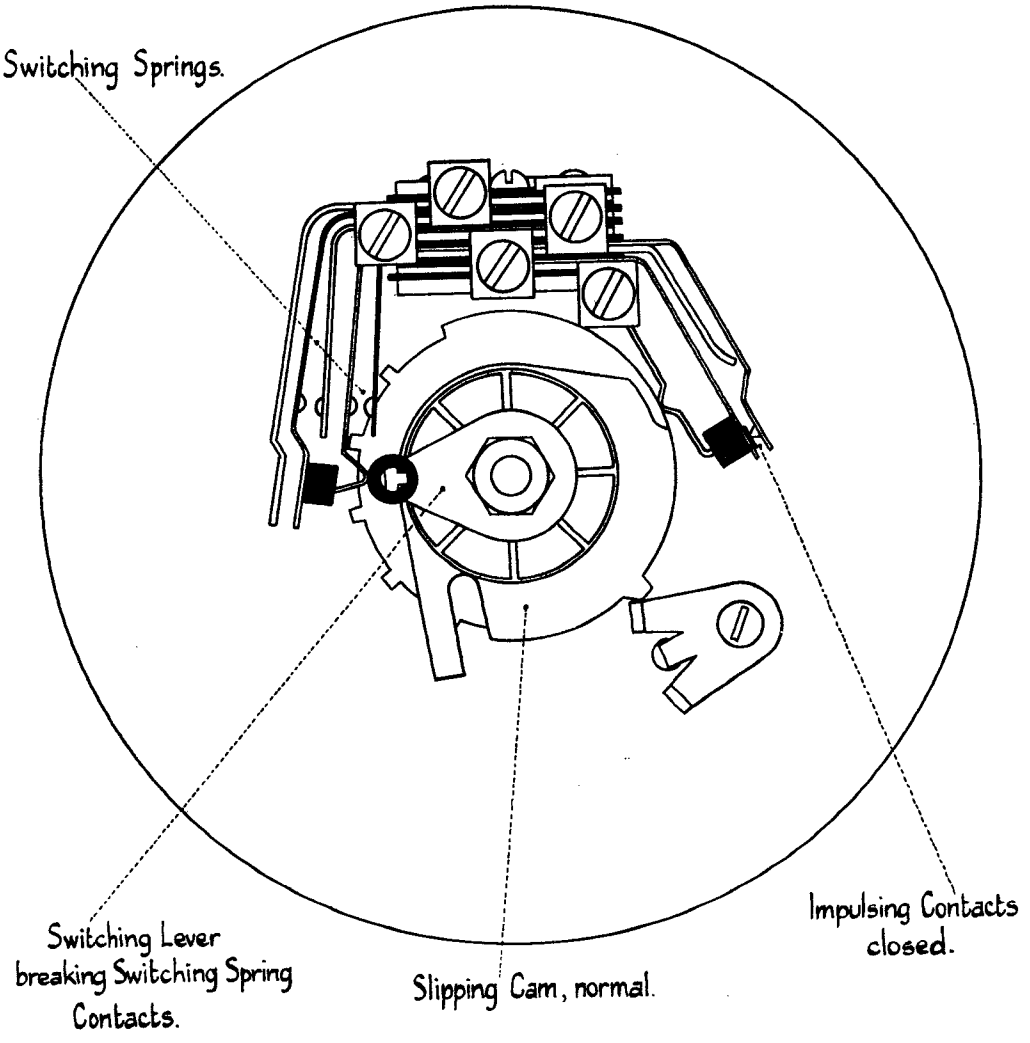


Fig.23. Normal Position.

2.13 Figure 24 shows the dial prepared for sending one impulse. Note that the corner of an impulse wheel tooth is just showing in the impulsing recess of the slipping cam, also that impulsing spring contacts and switching spring contacts are closed.

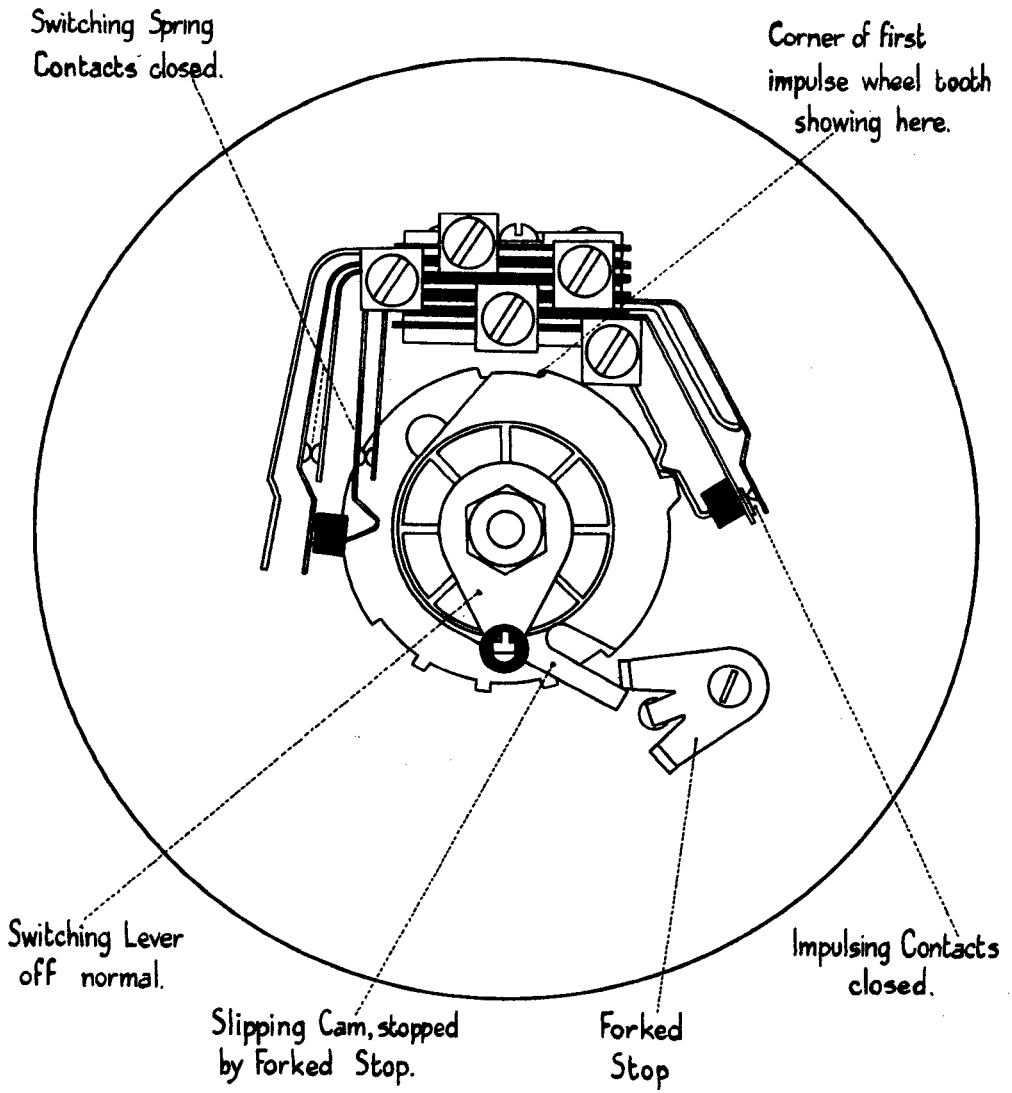


Fig. 24. One Impulse Prepared.

2.14 Figure 25 shows one impulse sending. Note that the impulse lever is resting in the impulsing recess of the slipping cam and that the impulsing contacts are broken. The switching spring contacts will be broken by the switching lever after the impulsing contacts have closed.

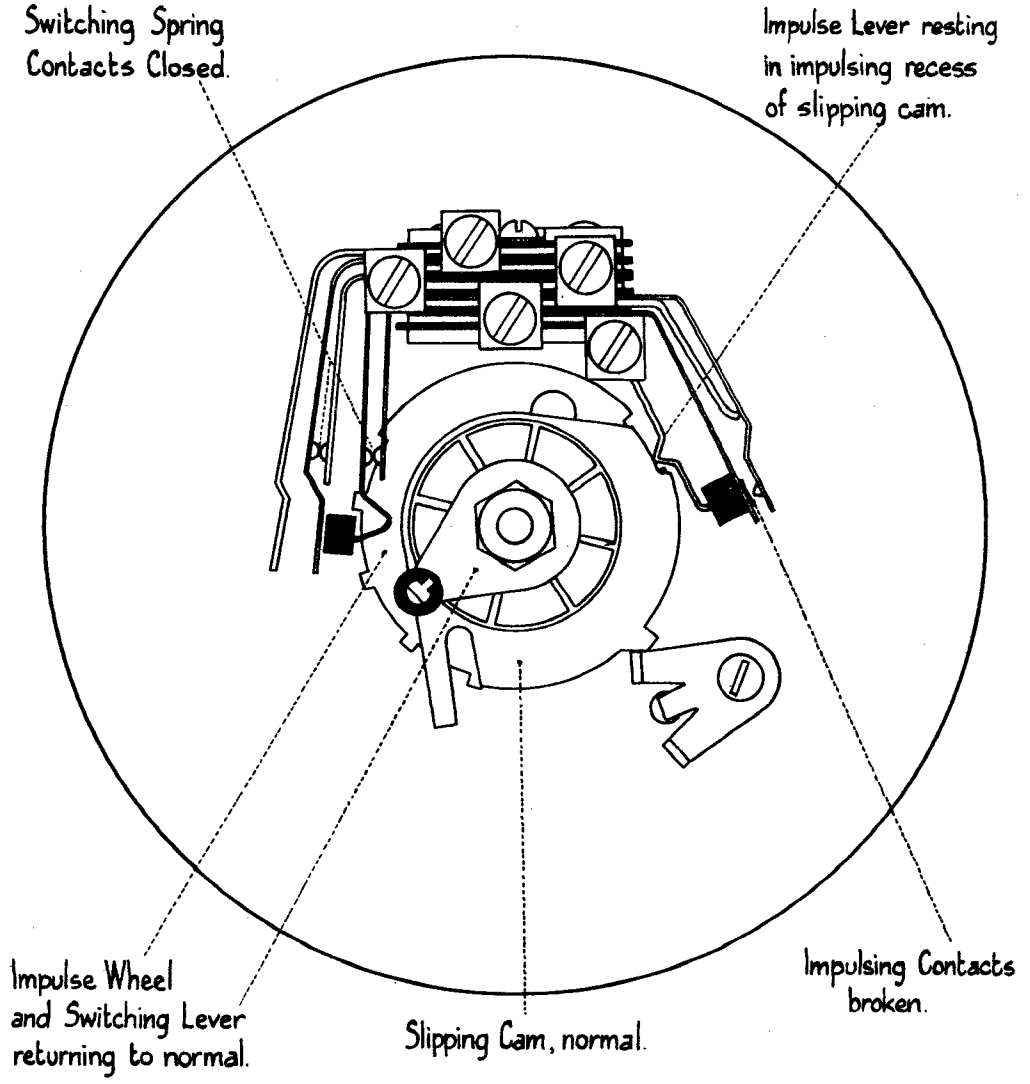


Fig. 25. One Impulse Sending.

3.0 LUBRICATION

3.1 Before making any adjustments to a dial, it should be examined to see that it is clean, as a dirty dial is sluggish in action, although the main spring may be at full tension.

3.2 A dirty dial should be dismantled and the following parts washed in clean petrol or benzine:

I. Governor.
II. Governor Pivot Bearing.
III. Governor Cup and Bracket.
IV. Governor Gear Assembly.
V. Main Spindle.
VI. Slipping Cam.
VII. Metal Springs, if fit for re-use.
VIII. Main Spring, if it is fit for re-use.

3.3 The remaining parts should be cleaned with a soft cloth. After the mechanism has been cleaned, the parts which have been washed in petrol or benzine should be wiped dry and the following parts lubricated with Commonwealth Oil No. 2 in the manner indicated below:-

I.	Governor Pivots	Apply one drop of oil to each end of the spindle.
II.	Governor Gear Spring Clutch	Apply one drop of oil.
III.	Governor Spindle	Apply one drop of oil to each end.
IV.	Governor Worm	Apply one drop of oil.
V.	Main Spindle	Apply one drop of oil to the bearing portion.
VI.	Slipping Cam	Apply one drop of oil between the slipping cam and the impulse wheel and one drop to the upper side at the extreme edge of the spring washer when it has been mounted. If steel and nickel silver washers are fitted, the oil should not be applied

to the extreme edge of the spring washer, but to the steel washers between the nickel silver washer and the upper side of the slipping cam.

3.4 A main spring which is fit for re-use should, after being washed in petrol or benzine, be replaced in the spring box, rewinding being started from the outer edge. The arrow on the inside of the Spring box indicates the direction of winding. After replacement, the spring should be lubricated by the application of 3 drops of oil, distributing them over the spring.

3.5 Spare coiled main springs should be stored in a bath of Commonwealth Oil No. 2. The springs should be drained before assembly and no further lubricant should be applied.

3.6 Spare steel washers should be stored in bath of Commonwealth Oil No. 2 and when required for use, removed with a pair of tweezers, shaken to remove the surplus oil, and assembled in the moistened condition.

3.7 Care should be taken not to use the oil in excess, especially on the Governor assembly. Each drop of oil specified should be that pendant on the end of a piece of No. 23 S.W.G. (9 lbs. bare copper wire) after it has been dipped into a reservoir of oil, the level of which is maintained at a depth of 5/8th of an inch.

3.8 Where fibre washers are fitted between the slipping cam and the spring washer, the surfaces of the fibre washer should be lightly smeared with Commonwealth Oil No. 2 before assembly.

APPROVED: J. M. CRAWFORD,
Chief Engineer,
29. 5. 1933.

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