

International Western Electric Company

INCORPORATED

EUROPEAN ENGINEERING DEPARTMENT

DIVISION No. 1

No. 7002 TYPE DIAL

THESE INSTRUCTIONS ARE ISSUED FOR THE USE OF THE EMPLOYEES
OF THE WESTERN ELECTRIC CO. AND ARE NOT FOR PUBLICATION

1. GENERAL

The instructions hereafter for the maintenance and adjustment of the 7002 type dials are intended for bench work only. It is recommended that no attempt be made to dismount or repair dials at the subscriber's premises. The lineman commonly lacks sufficient skill for this kind of work. His work should only consist in replacing the dial out of order or out of adjustment, by a correct one which he should carry enclosed in a suitable box. He should remove the dial using a screw driver with a blade of $\frac{5}{32} \times .020$ " ($4 \text{ mm} \times 0,5 \text{ mm}$) for the removal of the screws fixing dial to mounting and for disconnecting the cord conductors. He should be warned against the use of a larger screw driver, the use of which would be harmful to the screw slots and screw thread, and which might be the cause of excessive strain being applied to the terminals.

To a skilled lineman might be allowed the work of correcting the adjustment of the governor in accordance with paragraphs 15.11 and 15.12 using a stop watch to check the speed of the dial.

2. DEFINITIONS

2.1. The following terms have been adopted as standard and are used when referring to the function of the dial and the type of dial.

Impulse

An impulse is any sudden change of brief duration produced in the current of a circuit.

Make Impulse

A make impulse is an impulse due to a temporary flow of current.

Break Impulse

A break impulse is an impulse due to a temporary interruption of current.

Impulse Frequency

The impulse frequency is the number of impulses occurring per second. The reciprocal of this is the impulse period.

Impulse Period

The impulse period is the period of time included between the corresponding points in periodically recurring impulses. It thus corresponds to the period of alternating current.

Impulse Ratio

Impulse ratio is the ratio of duration of an impulse to the impulse period.

Uniform Break Impulse Dial.

Produces 10 uniform break impulses in one revolution. Ratio of impulse to impulse period : 2 to 3.

Short and Long Break Impulse Dial.

Produces 9 short and 1 long or final break impulse. Ratio of impulse to impulse period for short impulse : 1 to 5.

Ratio for short to long impulse : 1 to 5.

3. CODE NUMBERS

3.1. Herebelow are listed the different codified dials and their distinctive features.

3.2. Unless otherwise specified, the code number of the dial does not include the back cover, which commonly forms a part of the dial mounting differing in form according to the type of subscriber set for which the dial is intended.

3.3. The dial number plate is always to be specified in the order, the denominations of the digits being dependent on the number scheme of the exchange in connection with which the dial is to be used.

Apart from lettering and other special markings, the dials are numbered in two ways :

- a) 0.9.8. ———— 2.1. in clockwise direction and
- b) 0.1.2. ———— 8.9. in clockwise direction.

List of Code Numbers.

Code Numbers	Kind of Impulse	Remarks
7002-A	Uniform break	Does not include back cover.
7003-A	Uniform break	Provided with cover with two fixing holes.
7004-A	Short and long break.	Does not include back cover.
7006-A	Short and long break.	Provided with back cover. Arranged for mounting on dial mountings in place of the earlier 7001 dial.

4. DESCRIPTION

4.1. The N° 7002 type dial is illustrated on plate 1 which shows a front view, a rear view and also shows the dial dismounted.

4.2. The dial consists of two main assembly units. The rotating unit consists of the fingerplate on which the rotating parts are mounted ; these are :

(a) The governor and governor bearings which are fixed on two lugs formed in the finger plate.

(b) The pinion and worm wheel assembly which are mounted on a small bracket attached by means of screws to the back of the finger plate. This pinion assembly is provided with a spring clutch which clamps the pinion spindle when the pinion is rotating in one direction, and slides on the spindle when the pinion rotates in the opposite direction.

This prevents the governor from being strained when the dial is operated too brusquely.

(c) The number plate which is a metal horseshoe plate porcelain enamelled and mounted on a support which itself is secured to the finger plate by means

of screws. The number plate is provided with two studs which fit two holes on the number plate support, two spring clips at the back of the latter clamp the two shouldered pins of the number plate and thus keep the latter in place.

4.3. The fixed assembly unit consists of the back plate on which are mounted the following parts :

(a) The impulse and short circuiting springs with the connection terminals.

(b) The kicker which causes the opening and closing of the impulse contact when its end is sliding over the teeth of the impulse wheel during the return motion of the dial.

(c) The main spring which is a flat spiral clock spring and is protected by a shield.

(d) The main gear mounted at the inside of the back plate and forming a housing for the main spring.

(e) The finger stop which is so constructed that it can be swung away from the body of the dial when dismounting the latter.

4.4. The plate illustrates two different interrupter wheels.

P-19193 - is used on dials producing uniform break impulses.

P-19236 - is used on dials producing short and long break impulses (see paragraph 1.)

4.5. The instruction card is contained in the governor cap and is held inside the cap by means of a spring. No screws are used to fix the cap to the finger plate, it being held in place by the catch spring inside the finger plate. This spring fits a slot in a projecting tongue at the back of the governor cap.

4.6. The plate also illustrates the back cover of the dial and which forms a part of the dial mounting. That shown on the plate is provided with two fixing studs to mount on a wall set and is known as 7009 A dial mounting.

5. HOW TO DISMOUNT THE DIAL FROM A SUBSCRIBER SET.

5.1. When the dial is mounted on a subscriber set, it suffices to remove the two screws, right and left, which fix the dial to its mounting. The dial is then turned slightly in clockwise direction ; this will free the finger stop from the bayonet joint in which it is engaged. The dial is then pulled away from the mounting. After disconnecting the dial conductors from the terminals, the dial can be removed.

6. HOW TO REMOVE THE SPIRAL MAIN SPRING.

6.1. Unscrew the central screw which holds the interrupter wheel to the main shaft. Lift the interrupter wheel from the shaft taking care to hold the short circuiting spring out of the way. Remove the spring shield by unscrewing the two small screws by which this part is attached to the back plate.

6.2. Remove the small cap on which the spiral spring is hooked at its inner end. Unhook the outer end of the spiral spring from the pin in the body of the spring chamber and pull the spring out of its housing.

7. HOW TO PUT A MAIN SPIRAL SPRING IN PLACE.

7.1. The spiral springs are supplied wound up and ready to be placed in the spring chamber. To this effect force the spring in its housing, removing at the same time the wire which holds the spiral closed.

Put the small cap over the main shaft and turn the finger plate, to which the shaft is attached, in right hand direction until the cap is in such a position that the inner end of the spiral spring can be hooked to the small projecting tongue of the cap.

7.2. Continue to turn the finger plate. This will wind the spiral spring up and make it slide until its outer end can be hooked in the pin which is attached to the wall of the spring housing. Put the shield in place and lubricate the spring as described under paragraph 18.

7.3. To wind up the dial hold the fixed unit in the left hand and the rotating unit in the right hand. Hold the latter unit so that it will have to move about $3/4$ of a turn clockwise to reach its normal position. Move the rotating unit in clockwise direction until it is felt that the two stops of both fixed and rotating units meet. Pull the latter unit a little away from the former so as to allow the stops to slide the one over the other. Then press the 2 units together. Place the interrupter wheel in position and lock with screw and washer.

7.4. The tension of the main spring in the assembled dial shall be between 90 and 150 grams measured with a weight hung at the third hole, right hand side, and the finger wheel at about 10° off normal (to remove tension of short circuiting spring).

8. HOW TO SEPARATE THE MOVABLE UNIT FROM THE FIXED UNIT.

8.1. To reach the pinion assembly or to dismount the governor, it will be necessary to separate the two main units. Proceed as follows :

8.1.1. After having removed the governor cap, unscrew the screw in the center of the finger plate.

8.1.2. Hold the back-plate in one hand, pres-

sing with the finger in the center of the interrupter wheel. With the other hand, pull the finger plate off the center shaft. As soon as the shaft is free from the finger plate, the main spring will tend to unwind itself. This should be damped by the pressure of the finger on the interrupter wheel.

9. HOW TO REMOVE THE GOVERNOR AND PINION ASSEMBLY.

7.1. After having separated the fixed and movable units as per paragraph 8, remove the number plate support, from the finger plate to which it is attached by means of 5 small screws. The finger plate carries the governor and pinion assembly ; to remove the governor, remove the lower pivot screw. The governor can now be taken out of its principal bearing by drawing it out from the front of the finger plate.

9.2. To remove the pinion assembly remove the two fixing screws by which the pinion bracket is held to the finger plate.

10. HOW TO REPLACE THE CLUTCH SPRING OF THE PINION ASSEMBLY.

10.1. Assuming a clutch spring is to be replaced, remove this spring by unhooking its end out of the holes in the worm wheel. Lift, by means of a sharp instrument, the small washer off the pinion shaft above the wormwheel bearing. When this washer is removed, it will be possible to take the wormwheel from the pinion spindle.

10.2. Slip the new clutch spring over the spindle. Put the wormwheel in place inserting the straight end of the spiral in one of the small holes in the wormwheel. Fold the wire over by means of a plier (2049 Tool) inserting at the same time the end in the second hole. Draw the wire through the hole and

fold the end over, cutting off the excess. Flatten the folded portion. Care to be taken that the spring end is not crushed. The bend in the wire, after being attached, to be free from cracks and to have a smooth curvature. See plate 2.

10.3. Ascertain that the spring clamps satisfactorily to the spindle in one direction of rotation of the wormwheel and smoothly slides over it in the opposite rotation.

10.4. Put the small washer back in place on top of the pinion spindle forcing it by means of tool No 7027 (This is a rod with a hole fitting the end of the pinion spindle). This operation is performed by placing the pinion on a flat surface and fitting the rod end on the spindle upper end, so that it rests on the washer. Give a slight blow with a hammer on top of the rod. This will force the small washer back in place where it will be held by means of the three pricks the pinion spindle.

11. HOW TO PUT THE GOVERNOR IN POSITION.

11.1. From the front of the dial insert the governor upper end in the barrel bearing and slide the other end in the slot provided in the finger plate. Then screw the bottom pivot screw in the bracket forming a part of the finger plate guiding at the same time the governor pivot in the bearing. Tighten the lock nut. For adjustment see paragraph 21.1.

12. HOW TO MOUNT THE PINION ASSEMBLY TO THE FINGER PLATE.

12.1. The pinion assembly is attached to the finger plate by means of the two screws. When placing the pinion assembly in position do not tighten the fixing screws, but ascertain first that the governor engages the governor worm by not less than 50%,

of the depth of the teeth and that the pinion turns freely in its bearings. Then lock the screws. Rotate the pinion both ways to ensure that free rotation is obtained of both governor and pinion shaft. If the governor has a tendency to stick or operates only in one direction, the trouble may be due to the following causes :

- (a) The teeth do not mesh sufficiently.
- (b) The teeth mesh too deeply.
- (c) The wormwheel is not rotating in the same plane as the governor spindle.
- (d) The pinion spindle is not free in its upper bearing in the finger plate or binds in the lower bearing in the pinion bracket.

Correct the fault by loosening the pinion bracket and change its position, and see that the pinion bearings are free from burrs and dirt. To clean the bearings dip the parts in benzine.

13. HOW TO REMOVE THE DIAL NUMBER PLATE.

13.1. When the dial number plate support, is dismantled from the finger plate, as described in paragraph 9, the dial number plate can easily be removed by disengaging the two pins projecting at the back of the dial number plate from the two springs clips.

14. HOW TO REASSEMBLE THE TWO MAIN UNITS.

14.1. When the two main units have been separated as described in paragraph 8, for the repair of pinion assembly unit or governor, reassemble the two units as follows :

Hold the fixed unit in the left hand, wind up the spiral spring by turning the interrupter wheel in such a position that the ebonite stop is brought

above the bend of the short circuiting springs. Hold the interrupter wheel in this position by pressing with the finger against the ebonite stop.

14.2. Hold the rotating unit in the right hand inserting the projecting end of the main shaft in the oblong hole of the finger plate, such that the rotating unit is in the position which it normally takes when the dial is assembled.

14.3. Push the finger plate well home on the main spindle and ascertain that the stop of the rotating unit rests against the stop of the fixed unit so that the main spring does not unwind. Then screw in place the central screw which attaches the finger plate to the main shaft.

15. HOW TO REMOVE THE GOVERNOR CAP.

15.1. This cap is provided with a projecting tongue at its upper end which fits a slot in the finger plate and is held by a catch spring at the inside of the finger plate. To remove the cap insert a sharp instrument, such as a knife, underneath the upper edge and lift the cap up.

After the tongue is free from the catch spring, the cap will be disengaged at its lower end by pressing it slightly down whilst removing it.

16. HOW TO PUT THE GOVERNOR CAP BACK IN PLACE.

16.1. Hook the cap over the lower edge of the finger plate fitting the central projecting part in the slot adapted for this purpose. Insert the projecting tongue at the upper end of the cap in the slot of the finger plate and press the cap close to the plate. The spring at the inside of the finger plate will snatch the tongue of the cap.

16.2. Should it happen that the spring does not

catch the cap tongue, remove the rotating unit as per paragraph 8, and readjust the catch spring hook using a small plier until proper fitting of the cap is obtained.

17. ADJUSTMENT OF DIAL.

17.1. How to adjust the speed of the Dial:

17.1.1. Remove the governor cap and adjust the position of the wings of the governor until it is found by operating the dial that the required speed is obtained. To adjust the position of the wings use a sharp tool, such as a knife, to open the wings insert it between the shaft of the governor and the wings and force the latter slightly away from the shaft or bring them closer to the shaft by pressing at the outside of the wing. The adjustment should be such that the governor balls are at the same distance from the inner edge of the governor barrel. See plate 3.

After adjustment the dial is to be rotated a few times and the speed checked as described in paragraph 17.1.2.

17.1.2. To check the speed of the dial it will be found quite convenient for an experienced person to compare the speed of the dial under test with that of a standard dial or with two dials, the one having the minimum speed allowed, the other having the maximum speed allowed.

The use of a ordinary stop watch or preferably a stop commercial watch indicating 3 seconds per revolution of the needle will be found quite convenient.

17.1.3. The speed of a dial having uniform break impulse should be between 9 and 11 steps per second. The speed of a dial having the short and long break impulse should be between $10\frac{1}{2}$ and 13 steps per second.

17.1.4. For checking the speed of the standard dials, we also supply a N° 7001-A dial testing fork. The principle upon which the test with the fork is based consists in the comparison of the speed of the dial (as indicated by a target rotating with the dial) with a known constant speed of an interrupter of vision forming a part of the vibrating testing fork. The 7001 target attached to the dial is provided with two circles having a number of black printed triangles. According to whether, in looking through the vibrating vision interrupter of the fork, whilst the dial is operated, the inner or outer circle of the target is noticed to move either clock or counter-clockwise, it is deducted that the dial operates either too fast or too slow.

By this method the speed can be measured in the following manner :

(a) Place the N° 7001 dial target on the dial so that the finger hole in the mounting comes over the dial finger hole nearest to finger stop. For uniform break impulse dials this target shall have 125 points on the inner circle and 152 points on the outer circle. It is known as N° 7001-B dial target. For the short and long break impulse dial it shall have 105 points on the inner cycle and 131 on the outer cycle and is known as 7001-A dial target.

(b) Hold the N° 7001 dial testing fork below the clamp and tap the end of the fork to start it vibrating freely.

(c) The dial shall then be rotated a full turn and the two rows of circles on the target shall be observed through the slots in the shutter of the vibrating fork while the dial is on its return, or free stroke. Best results are obtained when observing with the fork as close as convenient to the eye, and the dial about an arm's length away.

The speed of the dial is within working limits if the inner circle of points appear to revolve in a clockwise direction and the outer circle in a counter-clockwise direction. The speed of the dial is too slow if the outer circle of points appears to revolve in a clockwise direction. The speed of the dial is too fast if the inner circle of points appears to revolve in a counter-clockwise direction. The N° 7001 dial testing fork has a period of 55 cycles per second which gives 110 glimpses per second through the shutter.

The speed shall be determined only after the dial has been operated by hand at least a dozen times and with a finger pressure assisting the spring, that is, slightly forcing the dial.

17.2. How to adjust Impulse Contact :

17.2.1. This is done by means of flat nose plier, N° 2049 tool, or its equivalent, and the adjustment consists in :

(a) Tensioning the impulse spring so that a tension of 30 to 40 grams is obtained on the interrupter contact. This tensioning is obtained by holding the impulse spring by means of a flat nose plier close to the bent of the spring, and twisting the spring slightly outwards or inwards to decrease or increase the tension. See plate 4. Measure tension by means of 7002-B gauge. Apply the pressure gauge to the end of spring near contact so that the reed spring forms an approximate straight line with the relay spring, and by moving the gauge determine the gram pressure ; see plate 5.

(b) Adjusting the relative position of the short spring in regards to the extreme position of the impulse spring when the kicker is sliding on the outer periphery of the interrupter cam, so that the required period of opening of the interrupter contact

is obtained for every digit when this period is measured in the 7001-A dial test box as described in paragraph 17.2.2.

17.2.2. The dial is placed in the centre of the 7001-A test box and held by means of a specially adapted lever which presses on the dial finger stop. The test box has 4 contact springs which correspond to the position of the dial terminals. The dial is then fitted with a pointer supplied with the test box. The switch lever is placed in position 1. In this position of the switch, the buzzer is connected in a circuit composed of a dry cell, the dial impulse spring and the lever switch. The dial is now wound up and the ring of the test box, which can be moved around the dial is put in such a position that for the first impulse which the dial will make when slowly allowed to return home, the impulse contact opens at the moment the pointer indicates the 0 line engraved on the movable ring. This is noticed by the interruption of the buzzer. See plate 9.

17.2.3. The dial is allowed to move further and the buzzer should again operate when the pointer is within the two engraved lines marked « Min » and « Max ». This indicates that the impulse contact opens for the required length of time. See plate 10.

If the buzzer starts operating before the « Min » line is reached or after the « Max » line has been passed, the airgap between impulse contact springs should be corrected as described in paragraph 17.2.1.

The above operation is repeated for every digit and an adjustment of the impulse contact obtained which will be within the required limits for every digit.

17.2.4. Care is to be taken that the contact point lies within the flat disc. The contact opening to be minimum .008" (0.2 mm). Measure with the feeler of 2002-A gauge. See plate 7.

17.2.5. On plates 9 and 10 the dial under test is of the 7002, (uniform break impulse) type.

It will be seen that the ring of the test box is also engraved for the test of the 7006, (short and long break impulse) type, dial.

17.3. How to adjust the short Circuiting

Contact :

17.3.1. Proceed for the adjustment of this contact in the same way as described under paragraph 17.2.1, for the impulse contact. The tension on the contact shall be from 30 to 40 grams. See plates 6 and 7.

17.3.2. The short circuiting contact shall be so adjusted that the contact closes as soon as the finger plate is moved in clockwise direction, and shall open just before the finger plate comes to rest when the dial is returning to its normal position. This opening of the short circuiting contact shall occur after the impulse contact is closed for the last digit. This is necessary to prevent that the closure of the impulse contact causes a click in the subscriber's telephone. The above sequence in closure of the impulse contact and opening of the short circuiting contact can be verified when the dial is being tested in the 7001-A test box. By placing the switch in position 2, it must be found that the buzzer which is not operating when the impulse contact is open for the last digit, shall operate for a short moment and again stop buzzing just before the finger-plate reaches its normal position. With the lever in position 2 the two contacts, impulse and short circuiting, are placed in series with buzzer and battery.

17.3.3. The contact point shall lie entirely within the flat disc and the opening between

contact shall be between .010" and .020" (0.25 m/m - 0.5 m/m). Measure with a feeler of 2002-A gauge. See plate 8.

18. LUBRICATION.

18.1. The rotating parts of the dial are lubricated when the dial is delivered. If the dials are stored for some length of time, it is advisable that an inspection be made before placing the dials in service to ascertain that there is still sufficient lubricant present. Excessive lubrication is to be guarded against as it may be harmful in that the oil may extend over the contacts and insulating parts. The oil used should be first class watch mineral oil free from acids and liable to stand the normal range of temperature differences without alterations.

18.2. The parts to be oiled are :

- (a) The governor barrel and bearings.
- (b) The pinion bearings.
- (c) The governor worm and pinion worm wheel.
- (d) The pinion teeth and large gear teeth.
- (e) The kicker pivot and the end rubbing on the interrupter wheel ; the interrupter edge in contact with the kicker.
- (f) The main spring.
- (g) The main shaft bearing. To lubricate this part, remove the screw fixing the finger wheel to the shaft. The shaft is hollow and contains a wick. Through a small hole in the wall of the shaft, the oil is sucked in the shaft bearing.

19. HOW TO CLEAN A DIAL.

19.1. Under normal conditions, a dial may remain in service for a few years without requiring any cleaning. However, when installed in an abnormally dusty place, it may be found necessary to

periodically clean the rotating parts. This should be done by dismounting the governor, pinion assembly and main spring and dip these parts in benzine or alcohol. The bearings and spring housing are also to be thoroughly cleaned with benzine.

When reassembled the parts are again to be lubricated as per paragraph 18.

20. REPLACING PARTS.

20.1. Plate 1 illustrates the piece numbers of the different parts of which the dial is composed. As described in paragraph 1 there is a variety of dial number plates. To prevent confusion it is recommended that in ordering these plates the kind of numbering or, if the plate has combined letters and figures, the area for which the dials are intended is specified. Order as follows :

100 - Main Springs P. 19896

100 - 7001 Dial number plates numbered 09...1 clockwise or

100 - 7001 Dial number plates for "X" area.

21. MECHANICAL REQUIREMENTS.

21.1. Governor :

The end play of the governor in its bearings shall be minimum .010" (0.25 m/m) and the governor shall rotate with absolute freedom. The governor wings, shall when the governor is pressed as far as possible in the barrel, not touch the bottom of the barrel. When inspecting a dial, ascertain that the governor wings are not loose on the spindle. The governor barrel and governor bearing screw shall be securely held in the finger-plate.

21.2. Pinion Assembly :

The pinion shaft shall have at least .005" (0.12 m/m) end play, and the teeth shall mesh properly with

the teeth of the larger gear in any position of the pinion. The pinion shall not have the slightest tendency to bind with the larger gear. The clutch spring must form a close spiral and clamp the pinion shaft so that when the finger plate is rotated in counter-clockwise direction, there shall never be any tendency of the clutch spring to slide on the pinion shaft.

On the other hand, when preventing with the finger the rotation of the governor, and rotating the finger-wheel in clockwise direction, it must be felt that the clutch spring slides smoothly on the pinion shaft.

21.3. Finger Stop :

The finger stop end shall not touch the lower edge of the governor cap. It shall not be possible, when turning the dial, to have the kicker engage over one tooth too many. The stop shall be so located that the impulse contact shall close for every digit when the forward edge of the corresponding finger hole is at approximately $1/8"$ (3 m/m) away from the stop.

21.4. Kicker :

The kicker shall normally point towards the center of the dial. It shall not have a tendency to bind on the interrupter wheel when the dial is rotated either in clockwise or in counterclockwise direction. It shall move quite freely on the pivot. The kicker spring shall have sufficient tension to bring safely the kicker back in its normal position when leaving one of the teeth of the impulse wheel. The kicker end shall be smooth and nicely rounded.

21.5. Interrupter Wheel :

This wheel shall be concentric on the shaft. The outer periphery shall be quite smooth, and the edges of the cut teeth shall be sharp so that the kicker end shall not be able to stop on this edge, but shall

slide on the outer edge or fall in the space between the teeth for both clockwise or counter-clockwise rotation of the dial.

21.6. Number Plate Support :

When the dial is rotated, the number plate support which overlaps the upper part of the dial mounting shall in no position of the finger-plate rub against the dial mounting.

21.7. Main Spring :

The main spring shall be free from kinks. It shall not show any sign of rust. Loose springs shall be kept properly vaselined and shall not be touched with the fingers.

21.8. Governor Cap :

The governor cap shall have a close fit on the finger plate and it must be felt to be snatched by the spring inside the finger plate.

2 . TOOLS AND GAUGES FOR USE ON 7002 TYPE DIALS.

- 22.1. Screw driver - $5/32" \times 0.20"$ ($7 \text{ m/m} \times 0.5 \text{ m/m}$). blade.
- 22.2. 2049-A Tool - Plier for tensioning springs.
- 22.3. 7027-A Tool - For reassembling pinion and worm gear.
- 22.4. 2002-B Gauge - To measure contact airgaps.
- 22.5. 2001-A Gauge - To measure spring tensions.
- 22.6. 7001-A Dial test set - To measure length of impulse periods.
- 22.7. 7001-A Dial Test fork - To check speed of dial.
- 22.8. 7001 Dial target -

A = for uniform break impulse.

B = For short and long break impulse.

To check speed of dial in conjunction with 7001-A Dial Test Fork.

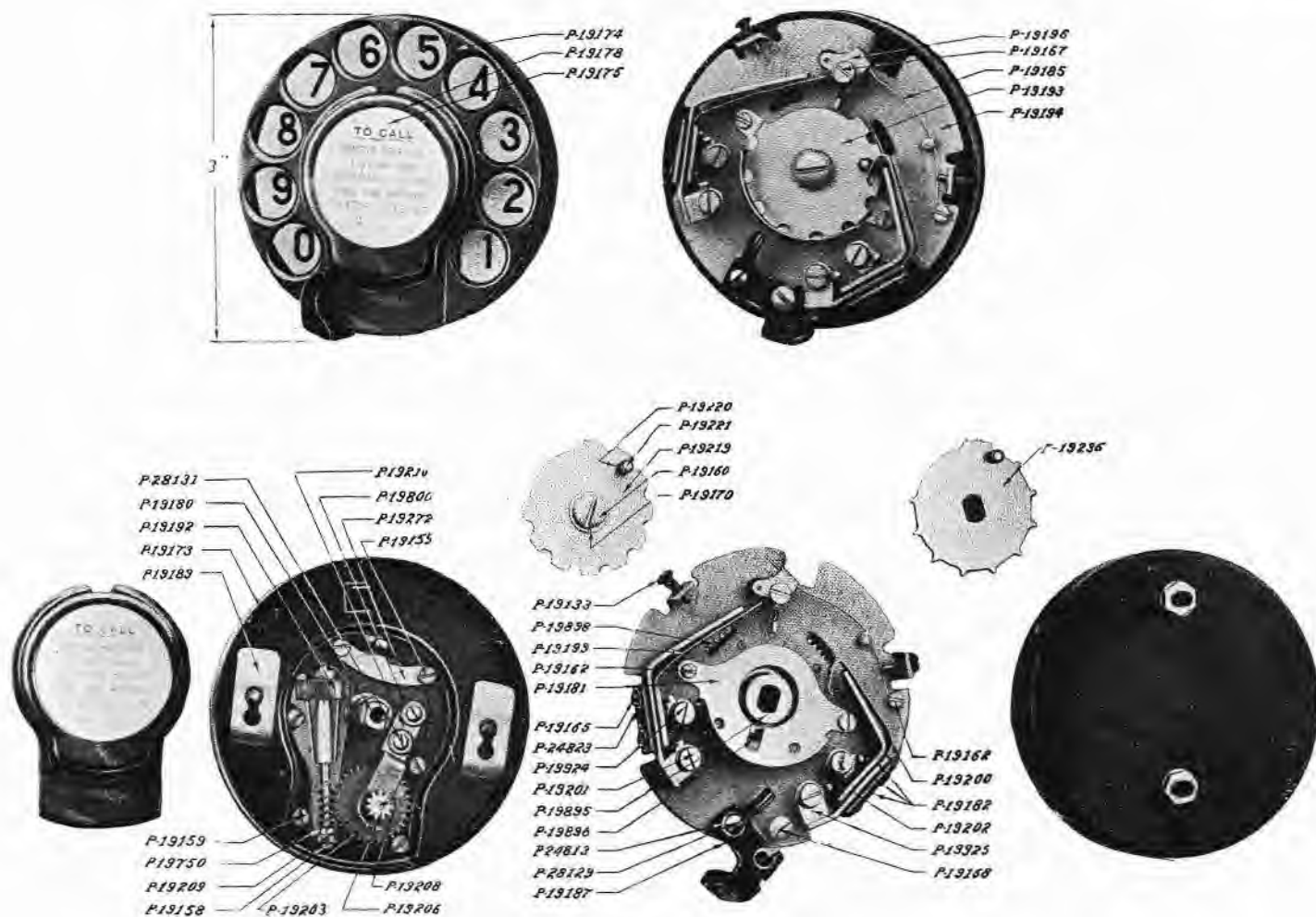


PLATE 1

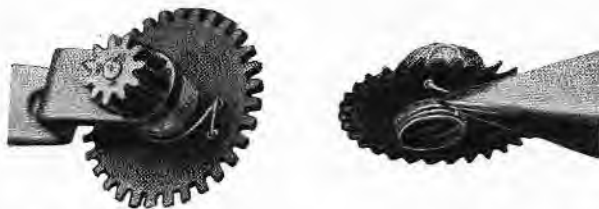


PLATE 2 see Paragraph 10.1
 Showing method of fixing the clutch spring to the worm wheel.



PLATE 3 see Paragraph 7.1
 Method of adjusting governor wings.

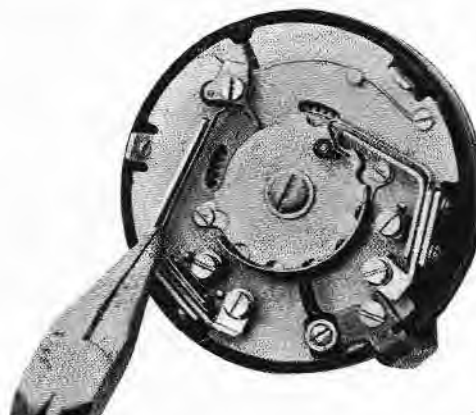


PLATE 4 see Paragraph 17.2.1
 Method of tensioning the impulse contact spring.
 Using 2049 tool.

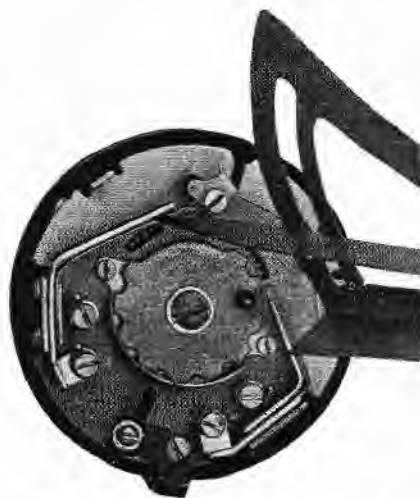


PLATE 5 (see Paragraph 17.2.1.)
Method of measuring tension of impulse contact.
Using 7002 B gauge.

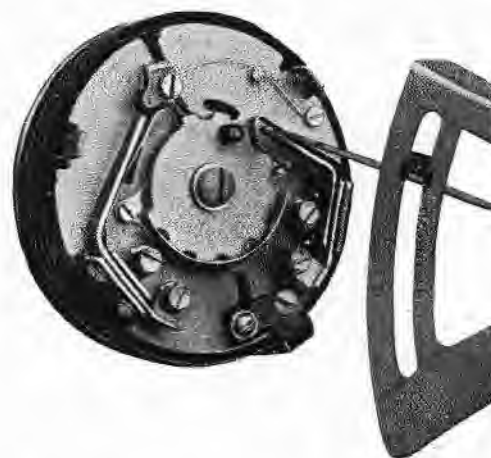


PLATE 6 (see Paragraph 17.3.1.)
Method of measuring tension of short circuiting spring.
Using 7002 B gauge.

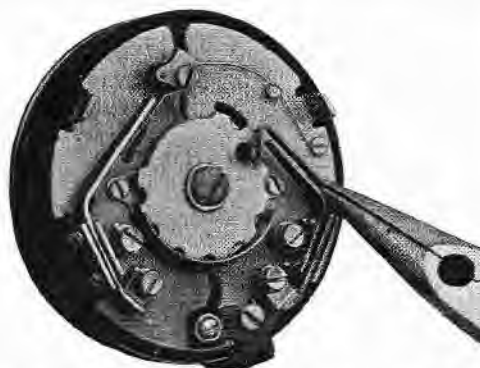


PLATE 7 (see Paragraph 17.3.)
Method of tensioning the short circuiting spring.
Using 2049 tool.

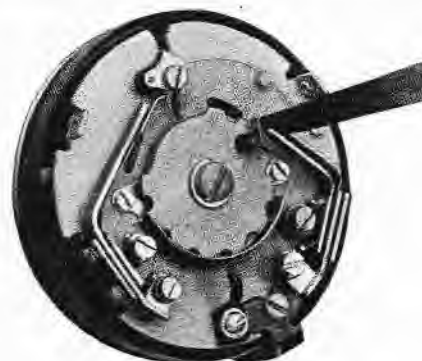


PLATE 8 (see Paragraph 17.3.3.)
Method of measuring contact airgaps.
Using 2002 A gauge

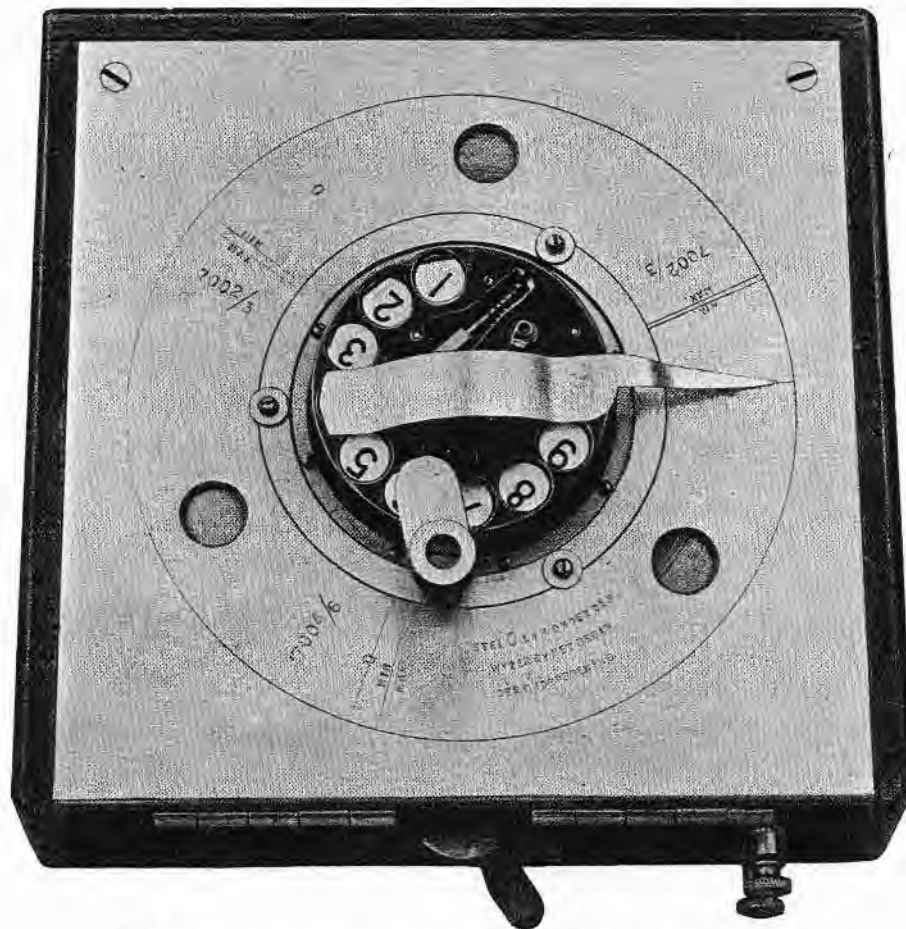


PLATE 9

Method of testing for time of opening of impulse contact
Using 7001 A dial test set.

(see Paragraph 17.2.2.)

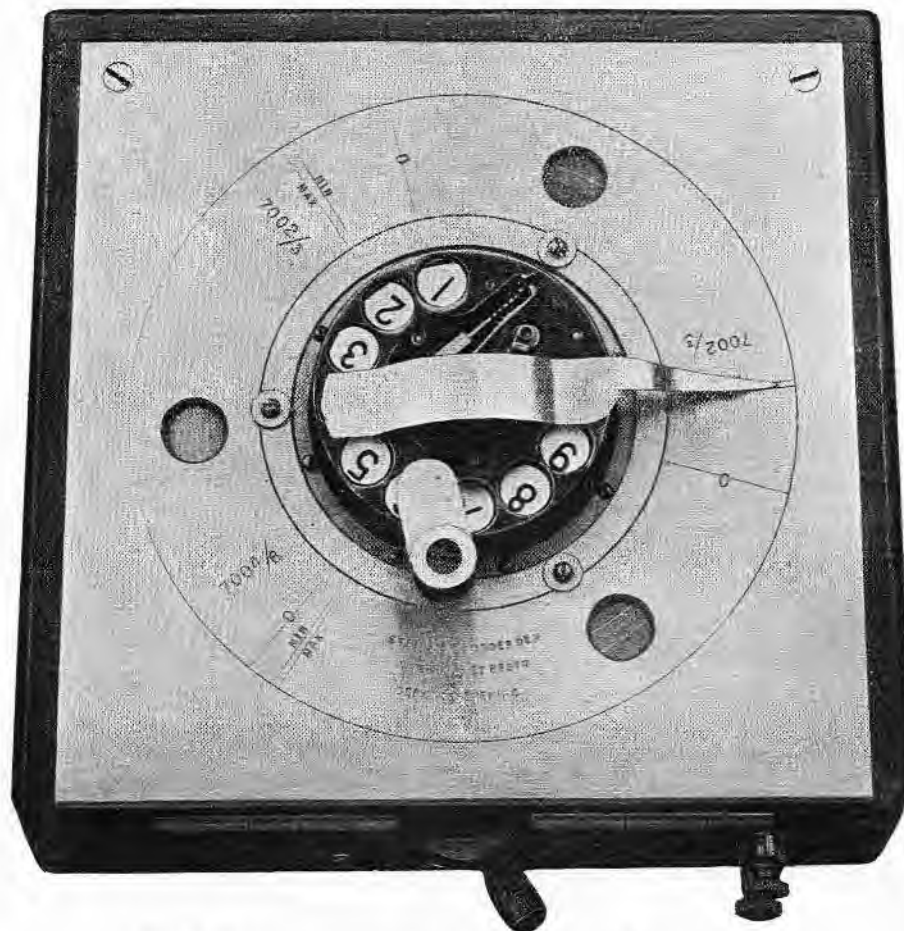
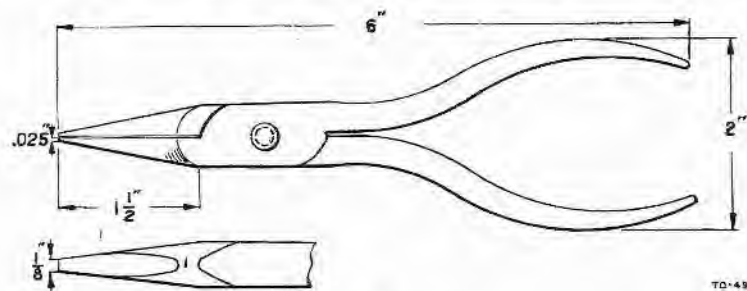


PLATE 10
 Method of testing for time of closure of the impulse contact.
 Using 7001 A dial test set. (see Paragraph 17.2.3.)

TOOLS AND GAUGES FOR USE ON No. 7002 TYPE DIAL.



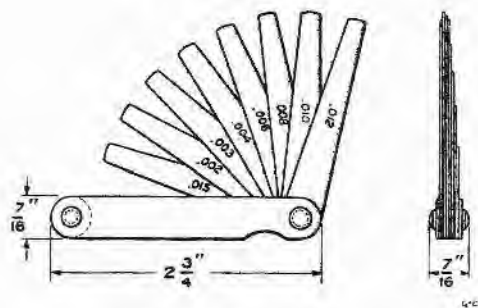
TD-49

No 2049 A Tool.

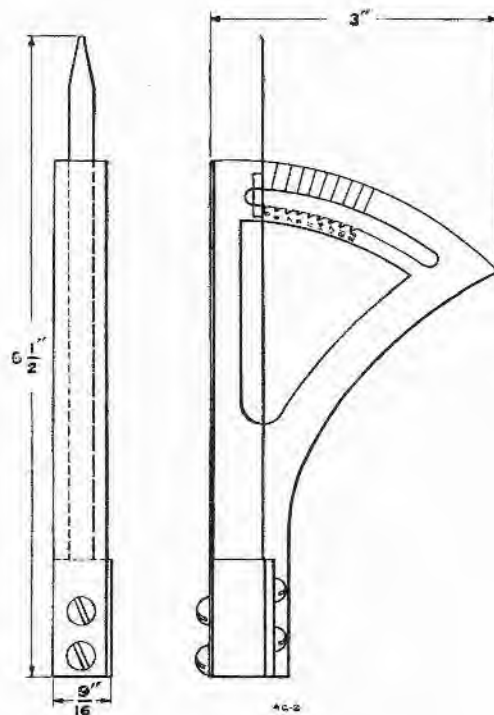


TD-27

No 7027 Tool.

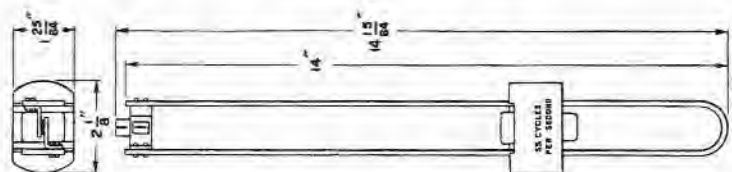


No 2002 A Gauge.

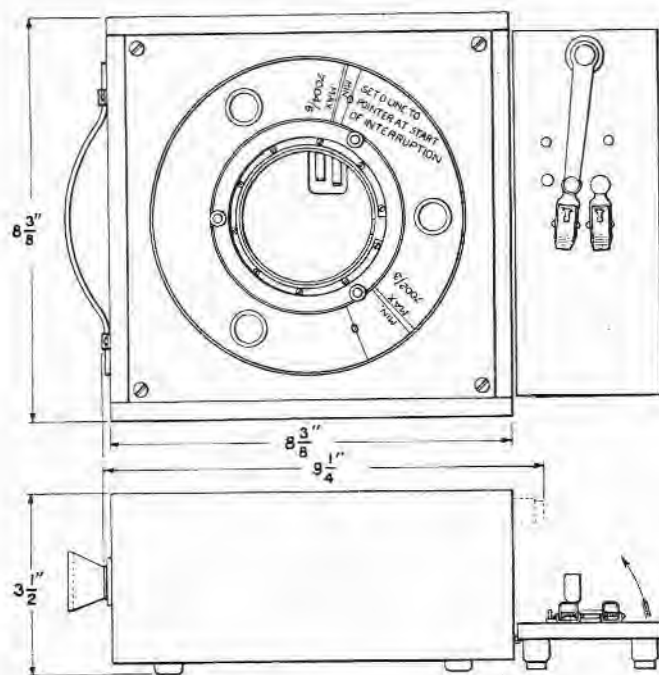


No 7002 B Gauge.

N° 7001 A Dial Test Fork.



N° 7001 A Dial Test Set.



N° 7001 A Dial Target.

