

MECHANICAL SERVICE and REPAIRS

NEW EDISON DISC MOTOR

The instructions contained in this booklet are intended as an aid to those not already familiar with the mechanism of the Diamond Disc Phonograph. Moreover, it is for the use of those engaged in the handling and care of such mechanisms. Others should not try to apply the instructions contained herein if it is possible to engage the services of an experienced repairman.



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INSPECTION OF MOTOR

(1) Main spring winding. Don't expect the main spring to do its best work when it is fully wound up or when it is quite run down. Therefore advise the owner of a Phonograph to cultivate the habit of winding the instrument a little after each RE-CREATION, but not to wind up fully. A spring about three-fourths wound up is at its best.

(2) Engagement of feed rack. As the reproducer is being lowered upon the RE-CREATION, and when the control handle (6), Figure (1) is about half way from the horizontal to the vertical, look beneath the motor to see that the cross-feed sector (E), Figure (1), has fully engaged its driving worm (5), Figure (2). If it is not fully engaged follow directions for adjustment in paragraph No. 1, page 10, under "Repeating." It is very important to try the sector up and down to make certain it works freely on its hinge.

(3) Setting of reproducer. When the reproducer is down in playing position observe the limit pin on the front of the reproducer weight. The proper position of this pin is shown as in (10), Figure (1), and instructions for adjustment found on page 11 "To set height of Reproducer."

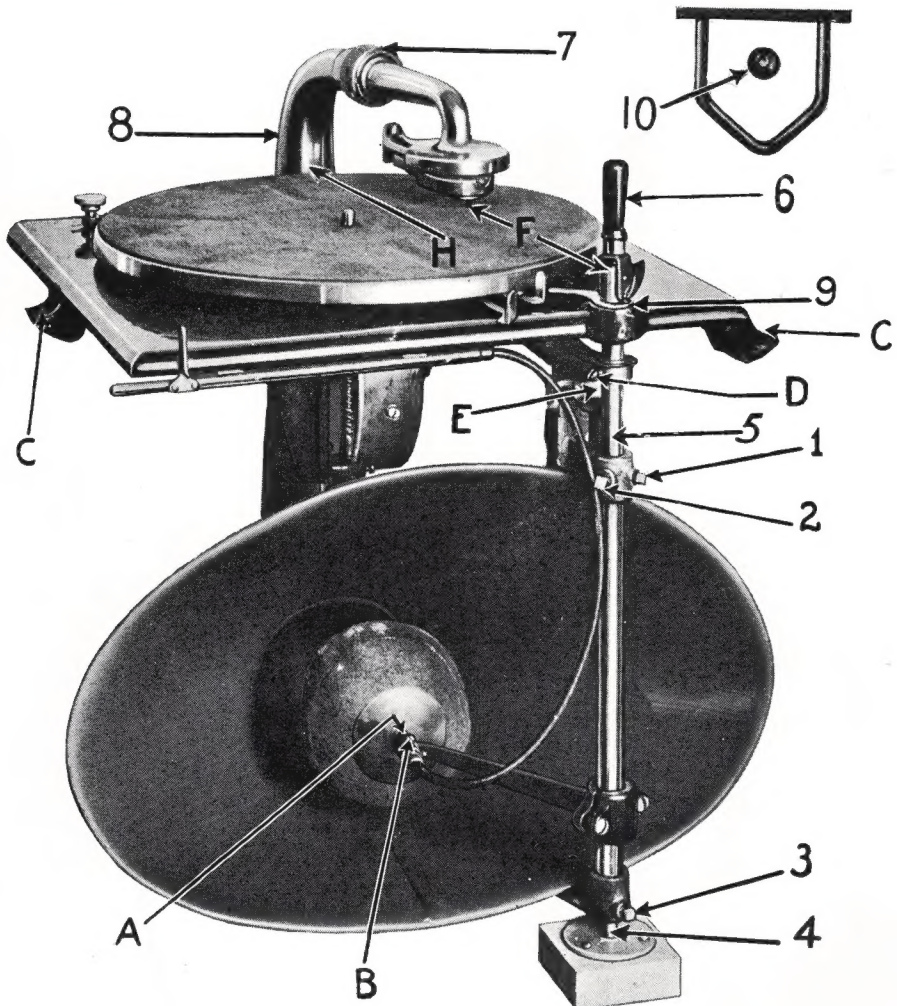


Figure 1—General Adjustment

(4) Oil all parts of the motor especially the friction pads of the governor (1), Figure (5), also bearing pivot at both ends of the governor shaft. This may be done either directly or through the oil well (3) Figure (5).

(5) **Speed Adjustment.** It is essential that the speed of the motor is correct to properly reproduce the music. Time the turntable to revolve 80 times in one minute when playing a selection. If the speed is above 80 revolutions per minute, the tone pitch raises, the Artist's performance is impaired and vibration occurs in the reproducer on the severe tones, for reason, the diaphragm is overtaxed with the increased rapidity of the tone vibrations.

The most reliable and effective way of timing and tuning the phonograph, is by use of the "Tuning RE-CREATION" and "Pitch Pipe." (Dealers can obtain these from their jobber.) The recorded "A" note on the RE-CREATION is in unison with the "A" Pitch Pipe when revolving at 80 revolutions per minute.

If a Tuning RE-CREATION and Pitch Pipe are not at hand, place a small piece of paper between the RE-CREATION and the turntable, allowing it to extend out so it will touch the finger at each turn. Count the turns by a watch, and adjust the motor speed to revolve the RE-CREATION 80 times in one minute.

(6) If the speed of the motor varies, thus causing the pitch of the music to change, it indicates loss of power somewhere in the motor due to unnecessary friction. There may be a dry bearing which the oil has failed to reach. This might even result in time in a rough bearing surface which would make a constant drag on the motor. Investigate to find this by letting motor run down and trying each shaft. Don't forget to oil the turntable spindle both at the top in the motor plate (4), Figure (5), and at the bottom bearing in which the spindle rests. Also oil the end bearings of the governor. Relieve the tension from the governor shaft by holding back with the fingers, the turntable spindle, and then test the governor shaft endwise to make certain that it has about one-sixty-fourth of an inch end play.

A change of speed may also be due to the governor weights running out of balance. In other words the weights are rotating in unequal circles. To remedy this, follow instructions in paragraph No. 2 under "Governor," page 8.

If all these inspections fail to restore the motor to uniform running so that the music is no longer subject to change of pitch, the cause is very likely in the spring case. A dry central shaft may be one of the causes. The caking of graphite on the spring coils will consume power, cause the motor to fluctuate, and very probably cause jumping or pounding of the spring while the motor is running. To eliminate these complaints it is necessary to cleanse and lubricate the main spring as per directions in paragraph (9), page 7.

(7) Occasionally we learn that a bearing is not oiled because through careless handling an oil tube was bent slightly out of position so that it fails to lead the oil into the bearing intended. Examine all oil tubes.

TO REMOVE MOTOR FROM CABINET

(1) Allow the motor to *run down completely*.

(2) Remove winding crank by winding it backward, that is in opposite direction to that of winding up the instrument.

(3) Refer to Figure (1). Remove reproducer by turning knurled collar (7) to right. After that lift off the turntable.

(4) Lift out the wooden frame which fits between the motor plate and the sides of the cabinet, after removing the two slotted head screws, one on the left and one on the right.

(5) Remove the grille from the front of the cabinet. Disconnect the mute ball in the center of the horn by loosening (not more than half a turn) the very small set screw (A). The cable of the mute ball is then unfastened by loosening set screw (B). Pull out the cable as this must be free when the motor is taken out.

(6) With a screw driver remove the three screws which hold down the motor plate, one screw on the left side (C) and one screw at each corner on the right side. There is a square nut and a washer to be looked for underneath each screw. Don't lose them.

(7) Loosen square headed screws (1) and (2), and also slotted head screw (D), which secures the friction spring. Take hold of the friction spring with one hand, with the other pull out the shaft and handle (6). This permits the horn to drop down disconnected from the motor. Some motors have a thick washer beneath the stop finger (9), don't lose this.

(8) The motor is now ready to be lifted out of place. In doing so, move motor slightly backward after starting it out of place. This is to free the rack (E) from its driving worm (5) in Figure (2). If you tip the horn forward first it will decrease the liability of catching on the driving worm.

TO REPLACE MOTOR

(1) Have the horn set over to your right hand side as far as possible. Make certain that the felt pads are in place upon each of the three supporting brackets. Place motor first upon the two brackets located at the right side and rear, raising motor slightly off left hand bracket. Holding it in this position move the horn forward and let down the motor. The object of this movement of the horn is to enable you to replace the teeth of the sector (E), Figure (1) in proper position above its driving worm (5) in Figure (2).

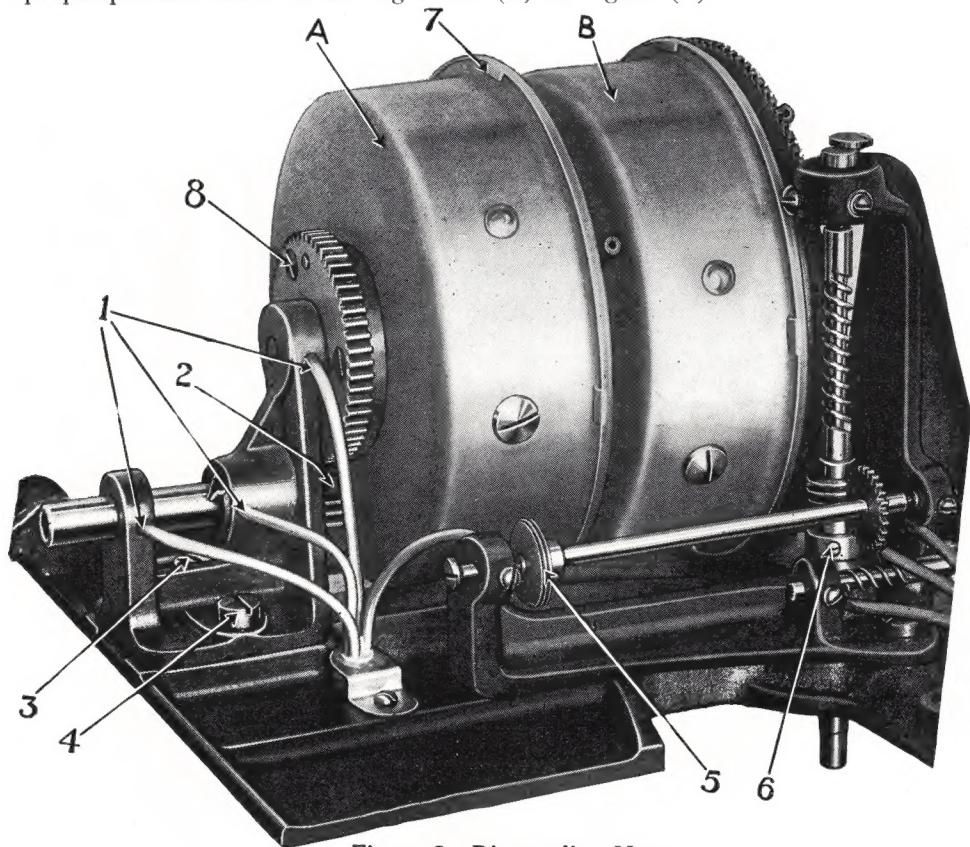


Figure 2—Dismantling Motor

(2) Replace lift shaft and handle (5) and (6), Figure (1). (If washer was found beneath finger (9), replace that also.) Pass the lift shaft (5) through friction spring (D) and into horn supporting shaft, but don't tighten up yet. Insert winding handle. Insert the three bolts at (C) which hold down the motor plate. Replace the washers and nuts from beneath and tighten up the three bolts.

(3) Push shaft (5) down as far as it will go, having handle (6) standing upright; for proper adjustment, be sure to have a piece of thick paper or business card placed underneath finger (9). Tighten first the screw (1) into slot of shaft, then tighten screw (2). Take out the card from beneath the finger (9). Raise the friction spring (D) on shaft (5), until the end of the spring is about $1/32$ of an inch from touching the underside of the motor plate, having the spring pointing in the same direction as the finger (9) above it.

(4) Replace mute ball and cable, also turntable and reproducer. Observe whether the limit pin on the front of the reproducer floating weight rides in position in the loop, when reproducer is lowered upon a RE-CREATION as indicated in (10), Fig. 1. If it is found necessary to adjust the reproducer, up or down to gain the right position of the limit pin, directions will be found on page 11, "To set the height of reproducer."

TO REMOVE MAIN SPRING

(1) When it is entirely run down, remove motor from cabinet as per instructions on page 3, and let it rest bottom up upon a bench. It is very necessary to keep the weight of the motor from resting on the turntable spindle which can be done by using two strips of wood cloth-covered and about as long as the motor-plate.

(2) Remove the three oil tubes (1), Figure (2) from the motor-plate and out of holes in the bracket. Take out screws (3) and (4), Figure (2). (In a single spring motor the bracket is secured by two additional screws which must be returned to the holes from which they were taken.)

(3) Grasp the spring cases with both hands and slide out of place (in direction of the bracket) the cases and large brass gear, together with the bracket itself. Don't lose the small washer on the shaft next to the large brass gear.

(4) It is advisable to separate the two spring cases when working on a double spring motor. Before the cover is loosened from a case, the center of the spring must be unhooked from the central hub or sleeve. To do this, grasp the case (B) with left hand and then turn case (A) in right hand direction, *clockwise*, about two or three revolutions. It is necessary to exert some force to do this and the case must be revolved until the spring is felt to suddenly release itself and is no longer in tension. Pry open the four catches on case (A) loosening the cover and the two cases can be drawn apart, using caution not to pull out the center of spring (A). To open the other case (B) hold case (B) in the left hand and turn the large brass gear *clockwise* with the right hand in same manner as directed above until the spring is unhooked from central sleeve. After taking off the case cover, the spring may now be removed safely as is shown in Figure (3), by pulling out the inner end and following instructions for removal of remainder of broken spring in chapter (8), page 7.

(5) **Broken Spring, Single Spring Motor.** Loosen the cover of the spring case after prying back its four catches (7), Figure (2). The cover and large brass gear are ready to be removed but you are cautioned to do this slowly and carefully to prevent too sudden release of the spring if any tension should remain. It is advisable to use gloves, and also to protect the clothing from any grease coming from the spring. Holding the case down inside an ordinary barrel if one is at hand will afford protection. Draw the cover and gear away from the case. The central portion of the spring will draw out attached to the hub or sleeve.

(6) **Broken Spring.** If a broken spring is to be removed from a double spring motor, determine which spring is to be replaced. To do this, grasp in left hand both the case (B) and large brass gear, and revolve the other case (A) with right hand in *direction toward you*. If right hand case (A) can be revolved freely several turns without being reversed by the tension of the spring, it indicates that spring in (A) is broken.

The spring in case (B) may also be broken; to test the spring in case (B) hold the case in the left hand, and with right hand turn the brass gear toward you. If no tension of the spring is felt, it indicates that it is broken.



Figure 3—Removing Spring from Case

(7) **Broken Spring.** When a broken spring is to be removed, it is advisable to separate the cases in order to manipulate them properly. Loosen the cover of case (A) by prying back its four catches and separating the cover from the case. If spring is broken in case (A) case (B) can now be pulled away along with the cover of (A), but you are cautioned to do this slowly and carefully to prevent too sudden release of the broken coils of the spring. It is advisable to use gloves for this operation and also to protect the clothing from oil coming from the spring. Holding the case downward inside a barrel, if one is at hand, will afford protection.

The central portion of spring in (A) will come out attached to the sleeve. A broken spring in case (B) is removed by loosening the cover and drawing both the brass gear and cover away from the case, using same precautions as above.

(8) **Broken Spring.** To remove the remainder of the broken spring from the case, grasp the case in the left hand, holding interior of spring and case as shown in Figure (3), then with a pair of pliers, grip the inner end of the spring and pull it out just a little way so that the end projects from the case. The left hand will now prevent the spring from uncoiling or unraveling all at once, while the right hand will lead out the spring slowly as the case is revolved from hand to hand.

(9) **Cleaning and Lubricating the Main Spring.** All dried and caked graphite must be cleaned from surface of spring and interior of case. This may be done by use of gasoline or naphtha and a cloth.

Wipe interior of the case and the entire spring clean and dry. Then apply a coating of graphite to the interior walls of the case, using a cloth dipped well in Dixon's Dry Flake Graphite No. 2. Then lay in the bottom of the case the large lining washer. Oil the spring its entire length with a cloth moistened with Edison oil.

Next, Wind the Main Spring Into Its Case. Make sure that the spring is not put in backwards. The illustration in Figure (4) shows the proper position of spring relative to the case. Lay the spring case flat upon a table or bench. Start the end in the case about half way round from the hook, and wind the spring in after the manner shown, about one-half a circle only. Slide the spring around in the case, letting the spring slip over the hook until the hole at the end of the spring snaps onto the hook in the case. Continue to wind the spring in as is shown until completed, at the same time, dust the spring coils lightly with Dixon's No. 2 flake (Edison) graphite, using a salt shaker or some suitable substitute. Apply a large tablespoonful of Edison Spring Lubricant to the coils of the spring. In a double spring motor, both main springs should be wound into place before coupling the two cases.

(10) The central coil of the spring (1), Figure (3) may be a little too large or a little too small in diameter. It is important to try the central sleeve or hub first to see that when you are ready to insert the sleeve it will fit tightly in the central coil of the spring. The spring is soft at this point and may be reduced or spread open in order to insure its snapping onto the hook in the sleeve.

(11) In a double spring motor, which is illustrated in Figure (2), put together case (A) first if it has been taken apart. You will observe that the center sleeve or hub of case (A) is screwed to and is carried with case (B). The cover of case (A), next the felt washer, then a large lining washer, should be passed over the sleeve of (A). Next, the sleeve is placed upon the central shaft and pushed into the central coil of the spring. To hook the sleeve and spring of case (A), hold case (B) in left hand and turn case (A) *towards you* with right hand until a snap is felt and the spring resists further turning of the case. Don't close up the cover of (A) until (B) is put together in same manner.

(12) After the spring of (B) is in the case and lubricated according to directions, and the central sleeve is also filled with lubricant, pass over the sleeve the case cover, felt washer, and a large lining washer. Then put sleeve on shaft and push it into the central coil of the spring in the same manner as applied to case (A).

(13) Close both cases by fastening the four catches upon each cover.

(14) Replace the small washer on the end of the central shaft outside the brass gear and enter the ends of the shaft into the supporting brackets. Don't forget to reinsert the oil tubes (1), Figure (2), in their respective holes in the brackets. Replace screws (3) and (4). (In a single spring motor there are two additional screws for the bracket, which must be returned to the holes from which they came.)

TRANSFERRING A NEW SPRING FROM ITS WIRE CONTAINER TO THE SPRING CASE, AND LUBRICATING THE SPRING

(1) **Lubricating the Spring.** First immerse the spring in Edison oil. Allow the spring to stand a short time so the oil will drain from it, leaving only a light film of oil on the spring. Apply Dixon's No. 2 flake (Edison) graphite over the entire surface and in the central open coils of the spring. Remove the surplus graphite from the spring, by striking the spring a few times on a flat surface, thereby leaving a thin coating of graphite on all surfaces of the spring.

(2) The new spring, still in its wire container, is laid in the case with outer end of spring in the right direction as in Figure (3) and (4). The hole in the end of the spring is elongated. The large end of the hole should be placed directly in front of the hook in the rim of the case and the spring struck a blow with a mallet, to force it down into the case and release the wire container. The hole in the end of the spring will snap over and catch on the hook.

(3) Next, complete lubricating the spring by applying a large tablespoonful of Edison Spring Lubricant to the coils of the spring.

(4) Complete assembly of the spring cases and install them in the motor as advised in paragraphs (10) to (14) on page (7).

LUBRICATION OF SPRINGS ASSEMBLED IN THE MOTOR

The following is a method of lubricating main springs in the motor, making it unnecessary to dismantle the spring cases or remove the springs:

- (1) Wind the main spring or springs fully.
- (2) Remove the grease plug screw from the side of the spring case.
- (3) Insert the spout on the tube of "Edison Spring Lubricant" into the spring case.
- (4) Squeeze the entire contents of the tube into the spring.
- (5) Return the grease plug screw to its proper place.
- (6) Run the motor fully down.
- (7) Rewind and run the motor down two or three times to distribute the lubricant through the spring coils.

After lubricating the spring as stated above, and the motor has been run a reasonable time, if this method does not prove effective the spring is caked with graphite and must be removed, cleansed and relubricated as instructed in paragraph (9), page (7).

Note:—Instruct Edison Owners to occasionally allow the motor to run fully down. This relaxes the spring coils fully and they will then pick up the lubricant that works from between the coils while in operation and redistribute it through the spring. This insures perfect lubrication.

THE GOVERNOR

(1) If the governor is not well cared for, it may give a whirring noise and a change of speed will be noticed with a consequent drop of pitch of music. The lubrication of the end bearings of the governor shaft is taken care of by oil tubes leading from oil cups (3), Figure (5). To prevent accumulation of grit upon the friction pads (1), Figure (5), clean occasionally with the use of a few drops of gasoline. Allow the motor to run a moment and then apply Diamond Oil to the pads.

(2) A whirring noise from the governor may be caused by the weights running out of balance. To make this adjustment loosen slightly (not more than one-quarter of a turn) the two small slotted screws (2), Figure (5), at the end of the governor springs. Then let the motor run and the governor weights generally will spin themselves into a balanced and quiet-running condition which is made possible by elongated holes in one end of the springs. You may find it necessary to loosen in this way the two screws at the other end of the governor springs, all four at once. When the governor has whirled itself into adjustment, tighten the screws again.

If this method should fail, hold the point of a pencil or a piece of chalk against the weights while they are revolving in order to determine which weight is running the further away from the center. Then raise the other, or shorter, running weight, springing it very slightly with a small screw driver inserted between the spring and the shaft (5).

The speed of the turntable must be tested and adjustment made if necessary by means of the knob on the motor plate whenever the governor has been adjusted.

Note:—Fluctuation in the motor speed, causing "flatting" in the tone pitch, can generally be remedied by adjusting the governor weights, as stated in paragraph (2).

(3) A second cause of this whirring noise may be found in an imperfect contact of the brass gear (6), Figure (2), with worm on governor shaft. It may also be due to a roughness of the surfaces of contact. Success in making a more quiet running depends largely upon the skill as well as the experience of the person attempting it. The adjustment consists of raising or lowering the position of the brass gear on the spindle shaft a few thousandths of an inch. The governor shaft may be shifted endwise slightly either to the right or to the left in an effort to find the most quiet point of contact with the brass gear. The position of the brass gear should be changed by loosening slightly the set screws in its hub. Caution: don't loosen screws more than a half turn, otherwise the spindle would become free and would allow the motor to run down violently.

Note:—If adjustment of the brass gear is made by raising or lowering the spindle itself, this changes the position of the turntable relative to both the reproducer and the starting and stopping levers which would require your attention.

It is advisable to have an extra gear or governor on hand, as the replacement of one or both may prove a more quiet running combination.

WINDING

(1) A phonograph can be abused by erratic handling of the winding crank such as permitting the handle to suddenly slip or fly from the hand. This may



Figure 4—Winding Spring into Case

result in the breaking of the winding pawl, thus releasing suddenly the tension of the main spring with possible breakage of this part also. The pawl (2), Figure (2) is located on inner end of winding crank shaft next to a small gear and it is there for the purpose of keeping the winding crank from turning backward.

If the crank turns backward without setting, and the pawl is found not to be broken, it indicates that the end of the coiled spring which operates and hooks into the pawl is broken. This can be seen on the opposite side of the pawl from that shown in (2), Figure (2).

(2) **Noisy Winding.** As a result of the same careless handling the pawl though not broken may be badly bruised by the gear teeth. This raises a burr on the pawl which would make a noise by scraping against the gear teeth. The burr must be removed by file and proper clearance allowed.

A buzzing noise when winding may be caused by the coils of the spring which operates the pawl (2), Figure (2), fitting the winding shaft too closely. Remove the winding shaft and take off the spring. Grip each end of the spring with a pair of pliers and twist the spring slightly as if to unravel it, thus spreading and slightly enlarging its diameter. Do this carefully, not spreading it too much, otherwise it will be too loose on the shaft to be effective. Clean this spring and shaft and lubricate with Edison grease. If the shaft has been cut by the spring, smooth the surface of the shaft with a fine file and emery cloth. A drop of oil or grease should be applied to the winding crank if it rubs against the hole in the side of the cabinet.

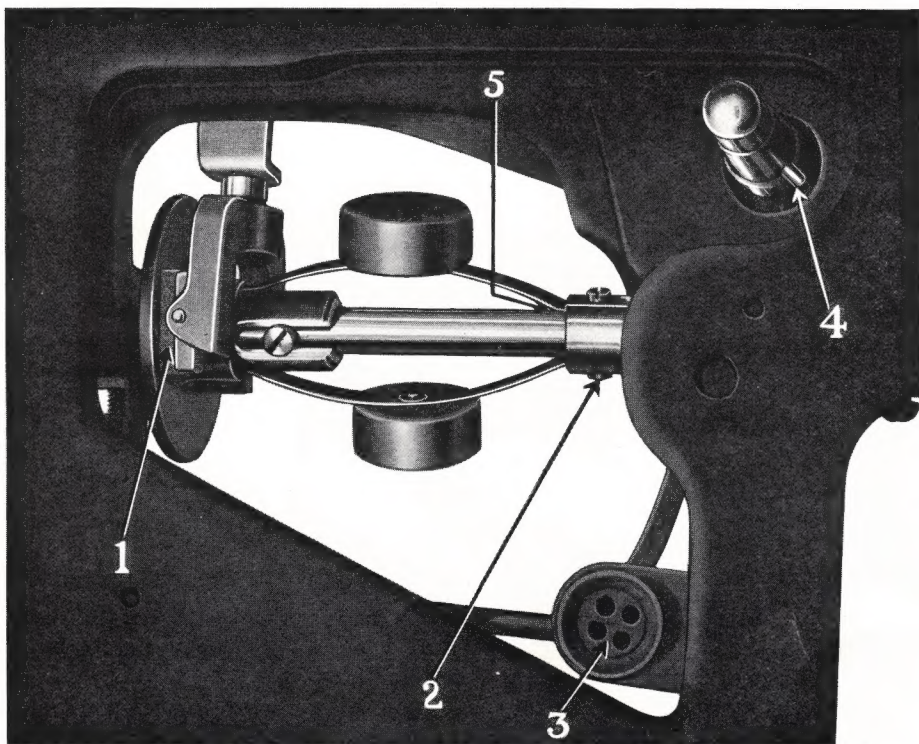


Figure 5—Governor Adjustments

REPEATING AND ITS REMEDY

(1) When lowering the reproducer, examine the feed rack (E), Figure (1). The teeth of rack (E) should mesh fully with the driving worm (5), Figure (2) before the diamond touches the RE-CREATION. This adjustment is correct if there is not more than $\frac{1}{4}$ of an inch clearance between the worm and the rack (E)

when the reproducer is raised to full height out of playing position. Adjustment of the rack is provided for if necessary by the upright stud enclosed in the spiral spring. This stud is held by a set screw located on the right side just back of screw (1), Figure (1).

(2) See that the bearings at the ends of the shaft of the worm (5), Figure (2) have not become loosened, and that the shaft has not too much play endwise. 1/64 of an inch end play is plenty.

(3) If the limit pin on the front of reproducer weight (see sketch) page 2 touches the loop surrounding it, the diamond will skip a line or two on the RE-CREATION, which will result in the repeating of some of the music. The reproducer must be lowered upon the RE-CREATION so that the diamond begins at once upon the first music lines. Don't start the diamond upon the smooth outer margin of the RE-CREATION where it may float about, as this would carry the limit pin to one side against the loop.

(4) If the limit pin floats in the loop without touching it and repeating still occurs, it indicates that the swivel joint at the rear of the reproducer floating weight, has become stiffened with rust or grit. Apply a drop of oil to the seams of the joint, also upon the head of the screw in the joint and work the weight from side to side to allow the oil to enter.

(5) The speed of the Limit Pin (see sketch, page 2) across the RE-CREATION does not change, since the diamond fits into the groove and follows the RE-CREATION. The speed of the loop which surrounds the pin, however, does sometimes change. The loop will travel faster across the RE-CREATION if the distance "F" is made longer. And vice-versa, the loop will move across the RE-CREATION more slowly if the distance "F" is made shorter.

Therefore, if when you start playing a RE-CREATION, the Limit Pin floats in the middle of the loop and you find that before the RE-CREATION is finished the pin rubs against the loop on your left hand side as you face the instrument, remove the reproducer and push or bend the horn at H slightly toward the rear of the instrument. This will increase the distance (F) and make the loop keep ahead of the Limit Pin.

If the loop moves too fast so that the pin touches the right side of the loop, bend the horn slightly forward. The horn is springy and may require several trials before becoming set.

Be very careful not to bend too far in either direction. Overbending of the horn may loosen joints and result in defective reproduction.

TO SET THE HEIGHT OF THE REPRODUCER

Refer to Figure (1). Place a RECREATION of standard thickness (that is, one that is 0.235" thick) on turntable. Lower reproducer into playing position and note position of weight limit pin. This pin should be clear of the under side of reproducer cup by a distance equal to the diameter of the pin. (Note 10 in figure 1.) With pin at this distance below cup casting, the diamond arm will be nearly parallel with RE-CREATION. If this arm is badly out of parallel with RE-CREATION it shows that diaphragm has become warped, or has some other defect, and the reproducer should be sent to your jobber for replacement.

If the height of the reproducer is not correct, it should be adjusted as follows:

Loosen the two upper set screws (1) and (2) and the lower set screw (3). Draw the lift shaft (5) out about 1/8 of an inch, by means of the lifting handle (6) and tighten set screws (1) and (2) in the order named, so that lift rod will be firm when this adjustment is being made.

Adjust the height of the reproducer by means of horn pivot screw (4), turning to the left to raise and right to lower, until the height is correct, as indicated by position of limit pin.

Tighten lower set screw (3), loosen set screws (1) and (2) and slip a piece of paper about the thickness of an ordinary visiting card beneath the automatic stop arm (9) and push the lift rod (5) down as far as it will go.

Tighten set screws (1) and (2) and remove paper. This assures free movement of the automatic stop arm.

NOISE IN MOTOR

(1) A knocking noise similar to a heavy thud will require treatment of the main spring and shaft as per directions under Lubrication of Springs Assembled in Motor, page 8, or Cleaning and Lubricating Main Spring, page 7.

(2) If a heavy squeaking noise arises it is usually due to the dryness of the shaft in the center of the spring cases. Remove motor from cabinet as directed on page 3. Remove the three set screws (8) in gear, Figure (2), after loosening tubes (1) and bracket, draw out the gear and the entire length of the shaft. Fill the central sleeves of both springs with Edison grease.

Either a groaning or tapping noise may sometimes be made by this dry spring shaft, heard when the spring is being wound up tightly.

(3) On a rare occasion a repairman will search for the cause of what we might term a low groaning sound of the mechanism, and which is intermittent and may be counted with the revolutions of the turntable. This is made by the large brass gear on the spring case being out of line with turntable spindle, due to too much end play in the central shaft of the spring case. It is easily remedied, however, by placing an extra washer on the central shaft next to and against the large brass gear on its outer side. This extra washer would therefore be placed between the brass gear and the small washer already found there (a washer of the proper thickness is found in Model "C" motor parts, No. 42099).

It may be necessary to take out and smooth the top bearing of the turntable spindle (4), Figure (5). Neglect to oil this bearing or the presence of grit may result in roughness. For smoothing it over it is advised to use nothing coarser than French emery paper No. 00, sometimes called Croakes.

(4) A whirring noise is explained in paragraphs (2) and (3) under "Governor."

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