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WAR DEPARTMENT TECHNICAL MANUAL

ENGINE, HANDPIECE STRAIGHT

ENGINE, HANDPIECE ANGLE

WAR DEPARTMENT • *23 SEPTEMBER 1944*

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United States Government Printing Office
Washington: 1944

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WAR DEPARTMENT,

WASHINGTON 25, D. C., 23 September 1944.

TM 8–638, Engine, Handpiece, Straight; Engine, Handpiece, Angle, is published for the information and guidance of all concerned.

[A.G. 300.7 (15 Aug 44).]

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

OFFICIAL:

J. A. ULIO,
Major General,
The Adjutant General.

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For explanation of symbols, see FM 21–6.

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CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. SCOPE. a. These instructions are published for the information and guidance of all personnel to whom these items are supplied. They contain information on the operation and maintenance of the items. The instructions apply only to Medical Department Items No. 5261005, Engine, Handpiece, Angle, and No. 5263005, Engine, Handpiece, Straight.

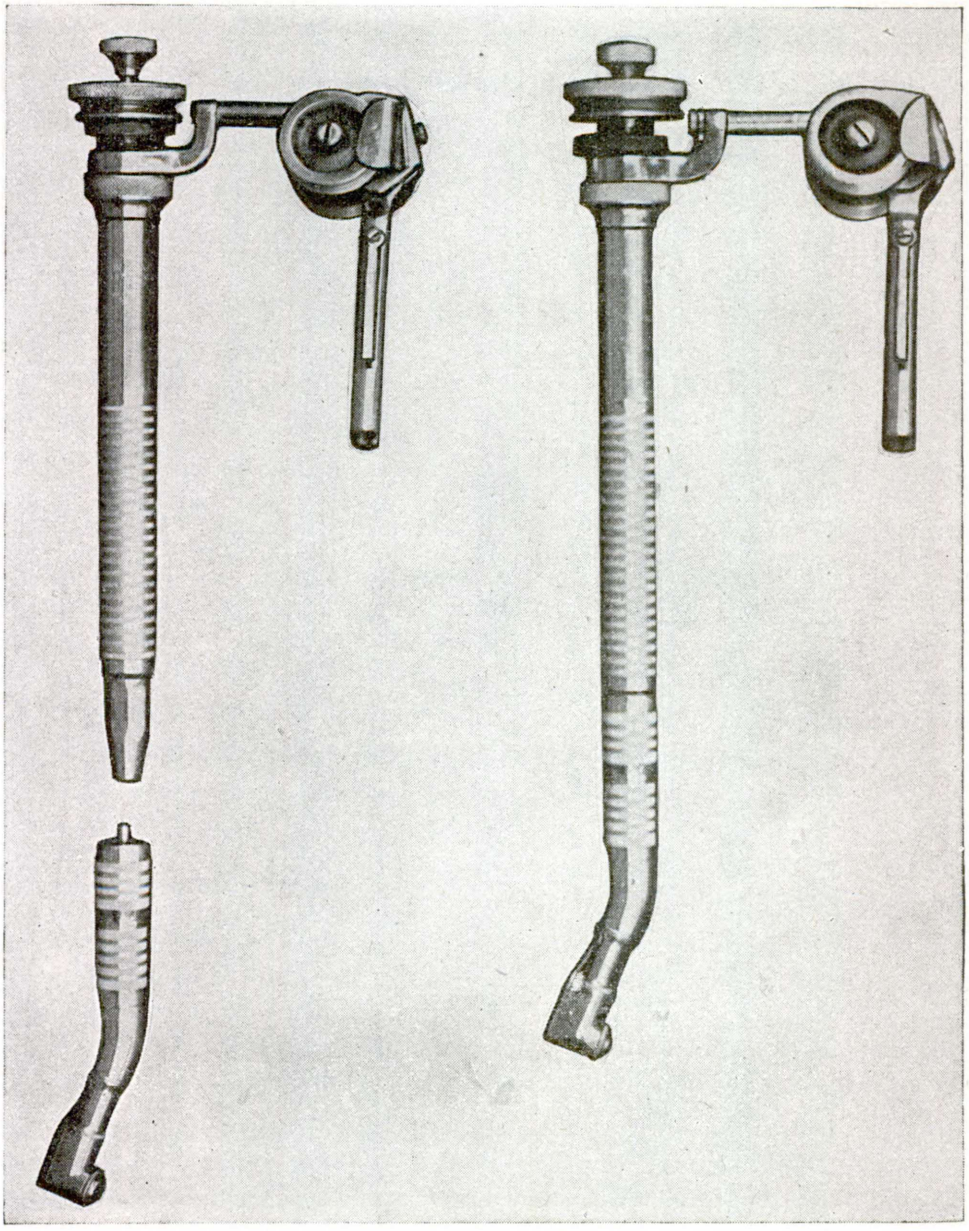


Figure 1. Engine, handpiece, straight, and engine, handpiece, angle.

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b. Illustrations concerning the various phases of operation and maintenance are included in the manual. Standard Nomenclature Lists for each item are appended.

Section II. DESCRIPTION

2. ENGINE, HANDPIECE, STRAIGHT. The Engine, Handpiece, Straight, is a device for holding and rotating dental burs and other attachments used in cavity preparation and the cutting and polishing of teeth.

3. ENGINE, HANDPIECE, ANGLE. The Engine, Handpiece, Angle, is a device used to hold and rotate dental burs and other attachments. It is attached to the Engine, Handpiece, Straight, for the purpose of reaching and working at cavities which cannot be reached readily with the Engine, Handpiece, Straight.

4. FIRST AND SECOND ECHELON REPAIR TOOLS. The following tools are necessary to the first and second echelons of maintenance:

a. Common tools. (1) Small screw driver for wrist joint screws.
(2) Light hammer for rivets.
(3) Wire cutters for cutting rivets.
(4) Small file for rivets.
(5) Pliers.
(6) Small vise.

b. Uncommon tools. (1) 5R00802 Cleaning and adjusting plate for bur latch slot.
(2) 5R00804 Dental screw driver for bur latch and pulley screws.
(3) 5R00806 Spindle wrench.
(4) 5R00808 Chuck removal rod.
(5) 5R00810 Punch for removing rivets.
(6) 5R00812 Wood clamps for disassembly and assembly of angles.
(7) 5R00814 Lapping pin.

5. FOURTH AND FIFTH ECHELON REPAIR TOOLS. In addition to the tools listed in paragraph 4, the following tools are necessary to the fourth and fifth echelons of maintenance:

a. Common tools. Pencil type soldering iron.

b. Uncommon tools. (1) 5R00816 Holding tool for the head.
(2) 5R00818 Soldering tool for inserting the back bearing into the head.
(3) 5R00820 Reamer for the left hand thread of the head in preparing for replacement of the back bearing.
(4) 5R00824 Replacement tool for replacing rivets, shafts, and gears.
(5) 5R00826 Bottom reamer for reaming bottom of head in preparation for replacement of back bearing and removal of excess solder after back bearing is inserted.
(6) 5R00828 Removal tool for removing back bearing.
(7) 5R00830 Holding pin for tinning back bearing.
(8) 5R00832 Punch for removal of gears from shafts.
(9) 5R00834 Punch A for first step in removing corroded shaft.
(10) 5R00836 Punch B for second step in removing corroded shaft.

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COMMON TOOLS

	Med Dept. No.	*Nomenclature*
1.	.....	Light hammer for rivets
2.	.....	Wire cutters for cutting rivets
3.	.....	Pliers
4.	.....	Small vise
5.	.....	Pencil type soldering iron
6.	.....	Small file for rivets
7.	.....	Small screw driver for wrist joint screws

UNCOMMON TOOLS

8.	5R00814	Pin, lapping
9.	5R00810	Punch, rivet removing
10.	5R00802	Plate, cleaning and adjusting
11.	5R00832	Punch, gear removal
12.	5R00830	Pin, holding
13.	5R00828	Removal tool
14.	5R00826	Reamer, bottom
15.	5R00824	Replacement tool
16.	5R00820	Reamer, head, left hand thread
17.	5R00818	Soldering tool
18.	5R00816	Holding tool, head
19.	5R00812	Clamp, wood
20.	5R00808	Rod, chuck removal
21.	5R00806	Wrench, spindle
22.		Special wrench for chayes straight handpiece
23.		Special wrench for chayes angle handpiece
24.	5R00804	Screw driver, dental, bur latch and pulley screw

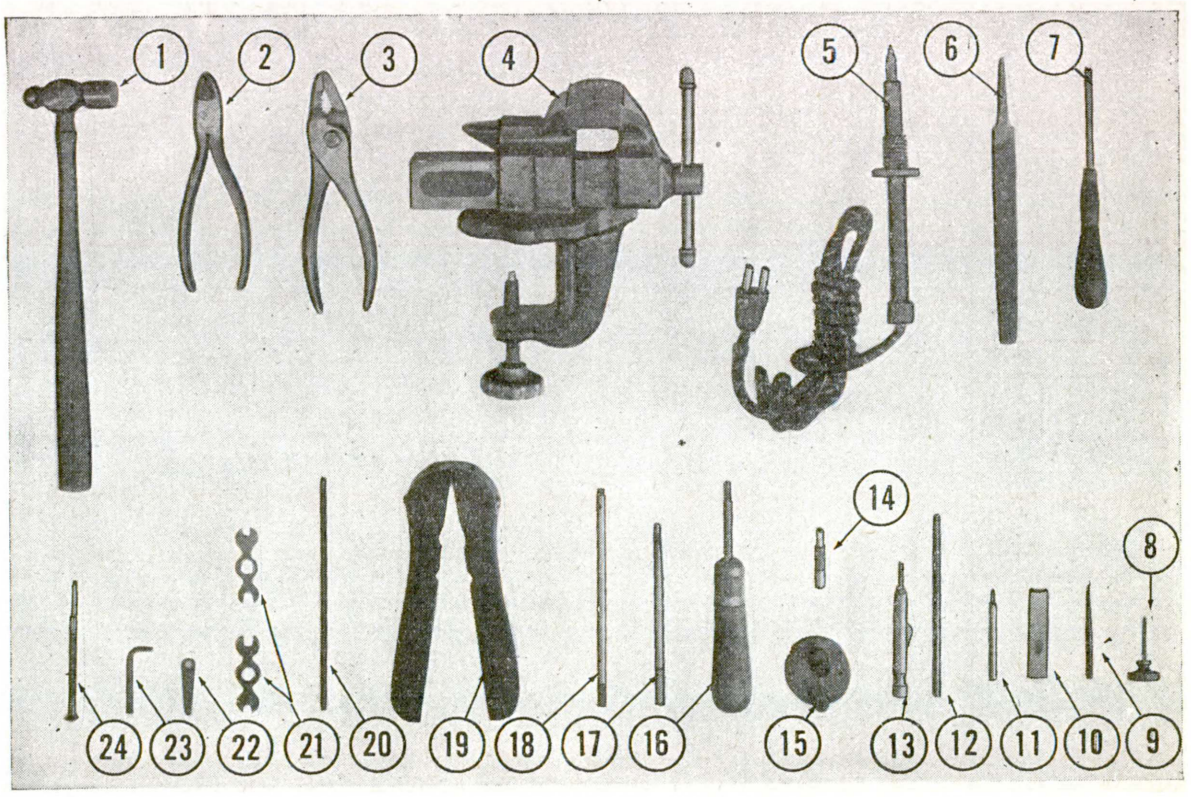


Figure 2. Tools for repair of engine, handpiece, straight, and engine, handpiece, angle.

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CHAPTER 2

OPERATING INSTRUCTIONS ENGINE, HANDPIECE, STRAIGHT

Section I. GENERAL

6. SCOPE. This chapter contains information on the unpacking and mechanical operation of the Engine, Handpiece, Straight.

Section II. SERVICE UPON RECEIPT OF EQUIPMENT

7. UNPACKING. To unpack the Engine, Handpiece, Straight, remove it from the container in which it is shipped. The instrument is shipped completely assembled and is ready to be put into immediate use and operation.

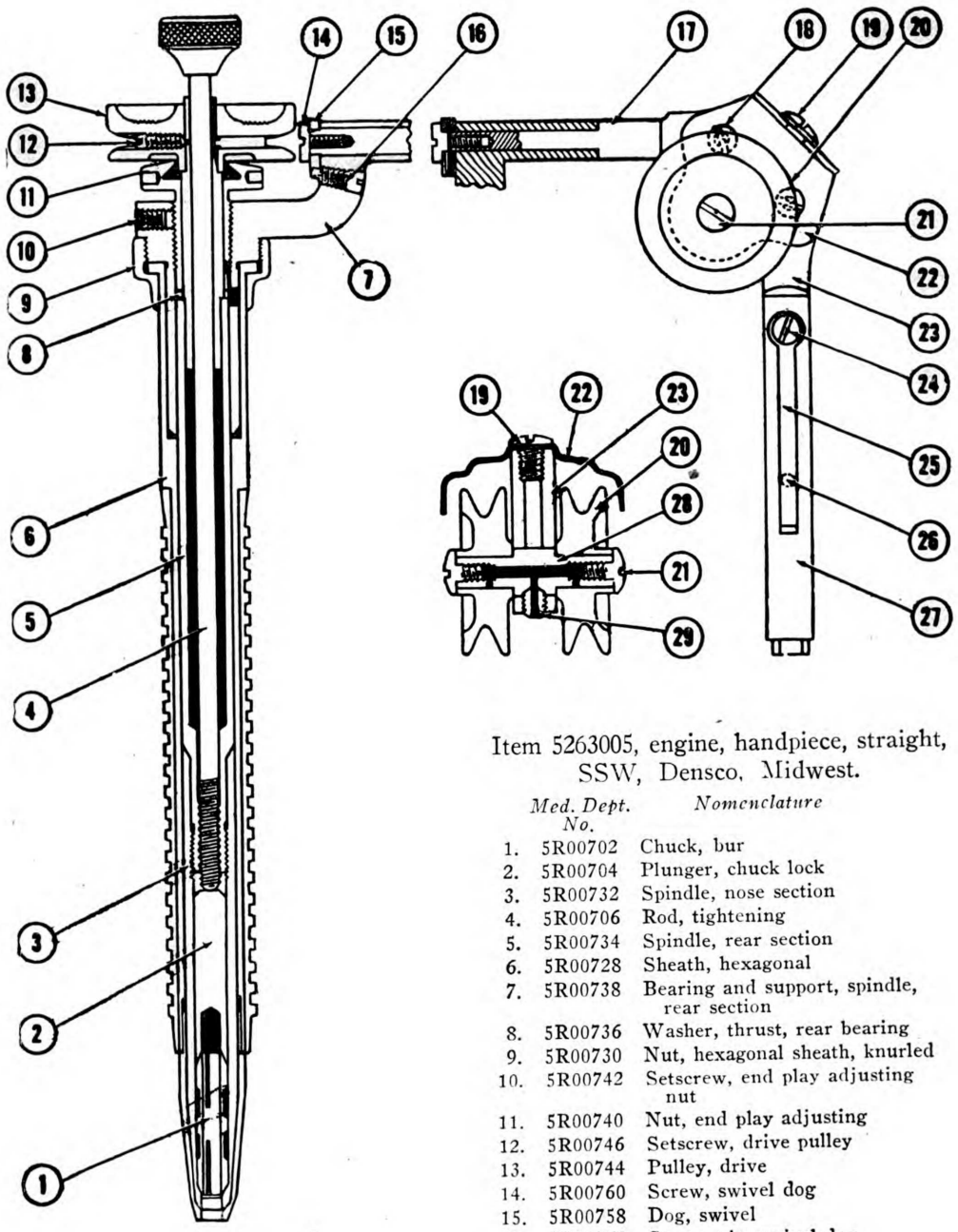
Section III. OPERATION

8. ATTACHING TO DENTAL ENGINE FOREARM. To attach the Engine, Handpiece, Straight, to the dental engine, insert the end of the engine arm into the rear swivel arm, 5R00754 (fig. 3), of the straight handpiece. Push the latch, 5R00716 (fig. 3), out by thumbnail pressure on the latch pin, 5R00720 (fig. 3), far enough to permit the engine arm to be inserted. Completely relieve pressure on latch pin and rotate until the latch snaps into notch on the engine arm. Finally, slip the engine belt over the drive pulley, 5R00744 (fig. 3), and the two wrist joint pulleys, 5R00708 (fig. 3). On placing over wrist joint pulleys, it is not necessary to remove pulley guard, 5R00712 (fig. 3), but the cord is forced between the wrist joint pulleys and the guard. Care must be exercised to place the drive belt on the desired sheave of the dental motor-drive pulley which has two belt grooves provided. Use of the larger groove provides maximum handpiece speed, while the smaller provides half of that speed. The foot controller of the motor further provides for four degrees of both forward and reverse speed.

9. INSERTING THE BUR. Loosen tightening rod, 5R00706 (fig. 3), at least two full turns and insert the rear end of the bur selected as far as it will go into the nose of the handpiece. Then hold the drive pulley, 5R00744 (fig. 3), with one hand and turn the tightening rod clockwise with the other hand until it is tight. The bur is now locked in position.

10. ADJUSTMENTS NECESSARY TO PROPER FUNCTIONING OF HANDPIECES. **a.** Engine belt must be adjusted for proper tension to provide maximum power drive of drive pulley, 5R00744 (fig. 3). The

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Item 5263005, engine, handpiece, straight, SSW, Densco, Midwest.

	Med. Dept. No.	*Nomenclature*
1.	5R00702	Chuck, bur
2.	5R00704	Plunger, chuck lock
3.	5R00732	Spindle, nose section
4.	5R00706	Rod, tightening
5.	5R00734	Spindle, rear section
6.	5R00728	Sheath, hexagonal
7.	5R00738	Bearing and support, spindle, rear section
8.	5R00736	Washer, thrust, rear bearing
9.	5R00730	Nut, hexagonal sheath, knurled
10.	5R00742	Setscrew, end play adjusting nut
11.	5R00740	Nut, end play adjusting
12.	5R00746	Setscrew, drive pulley
13.	5R00744	Pulley, drive
14.	5R00760	Screw, swivel dog
15.	5R00758	Dog, swivel
16.	5R00762	Screw, pin, swivel dog
17.	5R00756	Arm, swivel, front
18.	5R00724	Screw, wrist hinge
19.	5R00714	Screw, pulley guard
20.	5R00708	Pulley, wrist joint
21.	5R00710	Screw, wrist joint pulley
22.	5R00712	Guard, pulley
23.	5R00752	Hinge body, wrist joint
24.	5R00722	Screw, latch, wrist joint
25.	5R00716	Latch, wrist, S. S. White
26.	5R00720	Pin, latch, wrist joint
27.	5R00754	Arm, swivel, rear
28.	5R00748	Shaft, wrist joint pulleys
29.	5R00750	Setscrew, wrist joint pulley, shaft

Figure 3 Cross-section of engine, handpiece, straight.

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adjustment should be made daily, as atmospheric moisture changes will affect belt length. The tension of belt should be relieved after each daily operating period to prevent undue stretching of belt. A loosely adjusted belt will deliver more power than a tight belt, which will skid in the drive pulley groove.

b. Drive pulley must be clean and free of foreign bulk which will cause bur to pound as belt passes over bulk.

c. Belt must be free of lumps or worn spots which also cause pounding.

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CHAPTER 3

OPERATING INSTRUCTIONS ENGINE, HANDPIECE, ANGLE

Section I. GENERAL

11. SCOPE. This chapter contains information on the unpacking and mechanical operation of the Engine, Handpiece, Angle.

Section II. SERVICE UPON RECEIPT OF EQUIPMENT

12. UNPACKING. To unpack the Engine, Handpiece, Angle, remove it from the container in which it is shipped. The instrument is shipped completely assembled and is ready to be put into immediate use and operation.

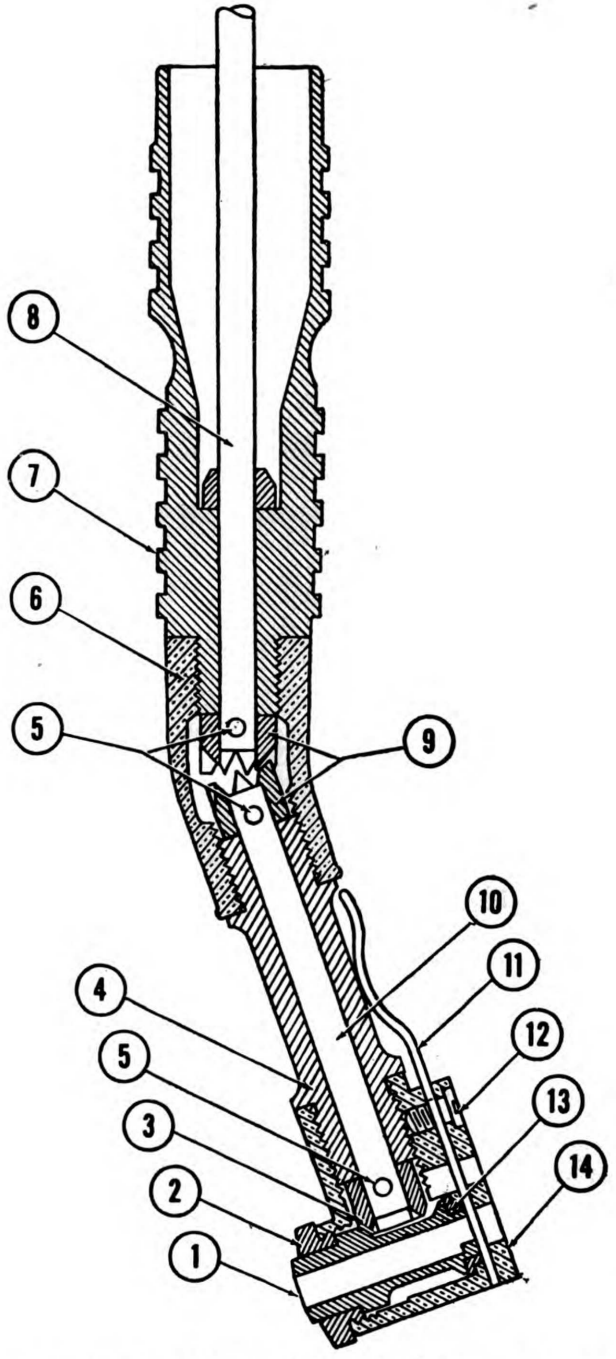
13. LUBRICATION. Angles are lubricated when leaving the factory but may be dry when they are received. It is, therefore, important that they be examined and lubricated before using. For lubrication instructions, see paragraph 35.

Section III. OPERATION

14. ATTACHING TO ENGINE, HANDPIECE, STRAIGHT. To attach the Engine, Handpiece, Angle, to the Engine, Handpiece, Straight, turn tightening rod, 5R00706 (fig. 3), of Engine, Handpiece, Straight, counterclockwise two full turns while holding drive pulley, 5R00744 (fig. 3). Insert the rear end of the angle as far as it will go onto the end hexagonal adapter of the Engine, Handpiece, Straight. Lock in place by holding the drive pulley of Engine, Handpiece, Straight, with one hand and turning the tightening rod nut clockwise with the other until it is impossible to separate angle from straight handpiece when each is held in opposite hands.

15. INSERTING THE BUR. Open the latch, 5R00618 (fig. 4), with the thumb of the hand used to hold handpiece, and with the other hand insert fully into the bur chuck the slotted end of the bur selected, rotating the half-round end of the bur so that it goes all the way in. Close the latch by snapping to the straight position again and the bur is locked in position.

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Item 5261005, engine, handpiece, straight, SSW, Densco, Clev-Dent Midwest

	Med. Dept. No.	*Nomenclature*
1.	5R00606	Burtube
2.	5R00608	Cap
3.	5R00612	Gear, shaft to head
4.	5R00624	Bearing housing, gear shaft
5.	5R00616	Rivet, brass
6.	5R00626	Knee housing
7.	5R00630	Adapter, end hexagonal
8.	5R00632	Shaft, drive
9.	5R00614	Gear, shaft to shaft
10.	5R00622	Shaft
11.	5R00618	Latch, bur
12.	5R00620	Screw, bur latch
13.	5R00610	Bearing, small, head
14.	5R00604	Head housing

Figure 4. Cross-section of engine, handpiece, angle.

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CHAPTER 4

MAINTENANCE INSTRUCTIONS ENGINE, HANDPIECE, STRAIGHT

Section I. GENERAL

16. SCOPE. This chapter contains information for the guidance of using and maintenance organizations responsible for the proper operation and repair of Engine, Handpiece, Straight. It is broken down into a section for first and second echelon maintenance and a section for fourth and fifth echelon maintenance. The maintenance authorized for the various echelons under these sections, however, should not be construed as binding. They are a guide only. Maintenance of the Engine, Handpiece, Straight, should be carried on as far forward as parts, facilities, and trained dental repair personnel are available.

Section II. FIRST AND SECOND ECHELON MAINTENANCE

17. CLEANING. The Engine, Handpiece, Straight, should be cleaned after each 10 hours of general operative usage as follows:

a. Disassemble. (1) Remove tightening rod, 5R00706 (fig. 3), by unscrewing in a counterclockwise direction while holding the drive pulley, 5R00744 (fig. 3), stationary.

(2) Remove hexagonal sheath nut, 5R00730 (fig. 3), and hexagonal sheath, 5R00728 (fig. 3).

(3) Mark the two spindle sections where they are joined as a guide to their proper relationship when reassembled. Unscrew and remove the nose section of the spindle, 5R00732 (fig. 3), by means of two special handpiece wrenches used in flat spots provided on the two sections of the spindle. Do not, under any circumstances, use pliers or any undue force, as alignment of spindle sections is delicate and the relationship of the bearing surface of the nose section must be maintained as machined, to fit the inside of the nose of the hexagonal sheath.

(4) Remove bur chuck, 5R00702 (fig. 3), and chuck lock plunger, 5R00704 (fig. 3), by inserting chuck removal rod into the nose end of the nose section and forcing the bur chuck and chuck lock plunger out the rear end of the nose section.

b. Clean. Immerse parts in any conveniently available solvent, such as kerosene. Clean spindle, inserting one end into a syringe bulb and other end into solvent, compressing bulb several times vigorously to flush inside of spindle. Sheath, 5R00728 (fig. 3), should be cleaned in the same manner.

c. Lubricate. See paragraph 19.

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d. Reassemble. Reverse the disassembly procedure, being sure to place open end of chuck lock plunger, 5R00704 (fig. 3), in contact with chuck, 5R00702 (fig. 3). Chuck itself will function end for end. Tamp these home separately with removal tool before uniting spindle sections which are to be tightened with wrenches to established scratch line, as described in a (3) above.

18. ADJUSTING. It is sometimes necessary to adjust the spindle in relation to the hexagonal sheath, 5R00728 (fig. 3), in order to prevent undue end play of the bur. To adjust, proceed as follows:

a. Be positive sheath hex nut, 5R00730 (fig. 3), is fully tight against spindle rear section bearing, 5R00738 (fig. 3).

b. Back off setscrew, 5R00742 (fig. 3), in the spindle rear section bearing and support piece, 5R00738 (fig. 3), until the end play adjusting nut, 5R00740 (fig. 3), turns freely.

c. Turn the end play adjusting nut clockwise by inserting broken bur shank in hole occurring in two places in knurled surface until it stops, indicating that the spindle has moved forward far enough to make contact with the inside of the nose of the hexagonal sheath, 5R00728 (fig. 3).

d. Back off end play adjusting nut, 5R00740 (fig. 3), one sixteenth of a turn to provide proper clearance between the nose of the spindle and the inside of the nose of hexagonal sheath, 5R00728 (fig. 3).

e. Tighten setscrew, 5R00742 (fig. 3), in the spindle rear section bearing and support piece, 5R00738 (fig. 3).

19. LUBRICATING. The Engine, Handpiece, Straight, should be lubricated once for each 10 hours of general operative usage as follows:

a. Disassemble as described in paragraph 17a.

b. Cover the bur chuck, 5R00702 (fig. 3), lightly with engine handpiece lubricating grease, Medical Department Item No. 5262700, and replace in the nose section of the spindle, 5R00732 (fig. 3). Replace the chuck lock plunger, 5R00704 (fig. 3), and the nose section of the spindle.

c. Cover rear section of the spindle, 5R00734 (fig. 3), with lubricant by inserting lubricant in spindle rear section bearing hole which is revealed when hexagonal sheath, 5R00728 (fig. 3), is removed. Lubricate by holding spindle horizontal and holding drive pulley, 5R00744 (fig. 3), as close as possible to rear section bearing.

d. Lubricate only the nose section of spindle, 5R00732 (fig. 3), as it is in contact with the inside of the nose of the hexagonal sheath, 5R00728 (fig. 3), which is the front bearing. Slightly lubricate out-

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side of rear section bearing, over which sheath is placed. Remove tightening rod, 5R00706 (fig. 3), lightly lubricate threaded end, then replace.

e. Weekly, disassemble wrist joint pulley, 5R00708 (fig. 3), and guard, 5R00712 (fig. 3). Immerse pulley shaft, 5R00748 (fig. 3), and hinge body, 5R00752 (fig. 3), in solvent; wipe off and lubricate pulley shaft and hinge actions lightly with dental engine oil.

20. INABILITY TO INSERT BUR INTO CHUCK. To correct this condition, proceed as follows:

a. Disassemble as described in paragraph 17a.

b. Enlarge the hole in the bur chuck, 5R00702 (fig. 3), by inserting a tapered broken instrument handle in the chuck and spreading the holding prongs slightly. Use care not to spread too much, since chuck must fit into the nose section of the spindle.

c. Check by inserting a bur to determine whether the hole is large enough to receive the bur.

d. Lubricate and assemble. Excessive use of lubricant will cause chuck, 5R00702 (fig. 3), to slip. Failure to relate properly the open end of the chuck lock plunger, 5R00704 (fig. 3), with relation to chuck will prevent chuck from locking. Examine chuck minutely for cracked or broken prongs. If prongs have lost temper, replace chuck.

21. FAILURE OF CHUCK TO HOLD BUR. Failure of chuck, 5R00702 (fig. 3), to hold bur is caused by a cracking or flared-out member, due to excessive tightening rod pressure on chuck lock plunger, 5R00704 (fig. 3), at open end. No repair is possible. Examine minutely and replace when indicated.

22. LOOSENING OF KNURLED HEAD ON TIGHTENING ROD, 5R00706 (fig. 3). Occasionally the knurled head becomes loose from the shaft to which it is attached. When such a condition exists, correct by proceeding as follows:

a. Separate shaft from nut.

b. Using a laboratory bunsen burner for heat, tin the tip of the shaft and drop a couple small pieces of solder into the hole in the knurled nut.

c. Holding the nut with pliers and grasping the shaft on the threaded end, insert the opposite end of the shaft into the knurled nut. Hold over the flame until the solder in the nut has melted, and the shaft has been inserted as far as it will go.

d. Permit the piece to cool.

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23. REPLACING WORN MAIN BELT DRIVE PULLEY, 5R00744 (fig. 3). When the action of the belt has rounded the V-channel in the drive pulley, the drive pulley should be replaced. To replace the drive pulley, proceed as follows:

a. Remove the setscrew, 5R00746 (fig. 3), in the V-channel of the drive pulley by turning it counterclockwise.

b. Lift the drive pulley off the shaft to which it is attached.

c. Place the new drive pulley on the shaft with the V-channel edge toward the nose end of the handpiece. Make sure the pin in the drive pulley enters the key-way in the shaft; otherwise, the pulley will not go on. Rotate the drive pulley on the shaft to find the proper position.

d. Insert the setscrew in the new drive pulley and turn clockwise until tight. This locks the drive pulley on the spindle shaft.

e. Occasionally the drive pulley will rotate without the motion being transferred to the bur. Such a condition indicates a loose or missing drive pulley setscrew, 5R00746 (fig. 3). Tighten or supply the setscrew to remedy the condition.

24. TIGHTENING LOCKING LATCH SCREW, 5R00722 (fig. 3). The locking latch screw occasionally works loose and must be tightened by turning clockwise until tight.

25. WORN LOCKING LATCH, 5R00716 (fig. 3). Remove latch screw, 5R00722 (fig. 3), and replace latch, being careful not to lose pin, 5R00720 (fig. 3), used to disengage latch.

26. ADJUSTING FOR WEAR OF HINGE ASSEMBLY. Remove pulley guard, 5R00712 (fig. 3), and pulley, 5R00708 (fig. 3). Tighten the two sets of male and female screws revealed, but allow freedom of hinge action.

27. REPLACING WRIST JOINT PULLEY PARTS. a. Replacing pulley guard, 5R00712 (fig. 3). (1) Remove pulley guard screw, 5R00714 (fig. 3), by turning counterclockwise.

(2) Lift off pulley guard.

(3) Put new pulley guard in position.

(4) Insert pulley guard screw and tighten by turning clockwise.

b. Replacing wrist joint pulley, 5R00708 (fig. 3).

(1) Remove pulley guard as described in 3 above.

(2) Remove pulley screw, 5R00710 (fig. 3), of defective pulley by turning counterclockwise.

(3) Replace with new wrist-joint pulley.

(4) Replace wrist-joint pulley screw and tighten by turning clockwise. Replace pulley guard.

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Section III. FOURTH AND FIFTH ECHELON MAINTENANCE

28. GENERAL. In addition to the maintenance outlined in section II of this chapter for the first and second echelons, fourth and fifth echelons are authorized to effect the following repairs.

29. REPLACING REAR SWIVEL ARM, 5R00754 (fig. 3). **a.** Remove wrist-joint pulley guard and wrist-joint pulleys, as described in paragraph 27.

b. This procedure reveals two wrist hinge screws, 5R00724 (fig. 3). Remove the one for the rear swivel arm by turning counterclockwise while holding hinge screw nut with a second screw driver from opposite side of hinge.

c. Replace worn rear swivel arm, 5R00754 (fig. 3), and wrist hinge screw, 5R00724 (fig. 3), and nut.

d. Replace wrist-joint pulleys, 5R00708 (fig. 3), and pulley guard, 5R00712 (fig. 3).

30. REPLACING FRONT SWIVEL ARM, 5R00756 (fig. 3). **a.** Proceed as for replacing rear swivel arm (par. 29), but remove the wrist hinge screw, 5R00724 (fig. 3), and nut which holds the front swivel arm.

b. Remove the tightening rod, 5R00706 (fig. 3), and drive pulley, 5R00744 (fig. 3). This permits removal of the swivel dog screw, 5R00760 (fig. 3), the swivel dog, 5R00758 (fig. 3), and front swivel arm.

c. Replace front swivel arm.

d. Reassemble by reverse procedure.

31. REPLACING END PLAY ADJUSTING NUT, 5R00740 (fig. 3). **a.** Remove tightening rod, 5R00706 (fig. 3), and drive pulley, 5R00744 (fig. 3).

b. Loosen end play adjusting nut setscrew, 5R00742 (fig. 3), in front of spindle rear section bearing and support, 5R00738 (fig. 3).

c. Remove end play adjusting nut by turning counterclockwise.

d. Replace defective end play adjusting nut by reversing procedure outlined above.

32. CONVERSION OF ROUND NOSE SHEATH. Replace nose and rear sections of spindle and sheath as a set as provided by manufacturer. New sheaths will be of hexagon type.

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CHAPTER 5

MAINTENANCE INSTRUCTIONS ENGINE, HANDPIECE, ANGLE

Section I. GENERAL

33. SCOPE. This chapter contains information for the guidance of using and maintenance organizations responsible for the proper operation and repair of Engine, Handpiece, Angle. It is broken down into a section for first and second echelon maintenance and a section for fourth and fifth echelon maintenance. The maintenance procedures authorized for the various echelons under these sections, however, should not be construed as binding. They are a guide only. Maintenance of the Engine, Handpiece, Angle, should be carried on as far forward as parts, facilities, and trained dental repair personnel are available.

Section II. FIRST AND SECOND ECHELON MAINTENANCE

34. CLEANING. The Engine, Handpiece, Angle, should be cleaned after each 10 hours of general operative usage as follows:

a. Disassemble. (1) Remove bur latch, 5R00618 (fig. 4), by removing bur latch screw, 5R00620 (fig. 4).

(2) Remove head assembly by gripping with wooden clamp or plier jaws, padded with friction tape to protect handpiece plated finish, and unscrewing while gripping adjoining bearing assembly with a similar tool. While holding head with clamp, remove head cap, 5R00608 (fig. 4), by unscrewing to left, using pliers. Remove burtube, 5R00606 (fig. 4).

(3) Remove bearing section, 5R00624 (fig. 4), from elbow section, 5R00626 (fig. 4), in similar manner.

(4) Remove elbow section from rear bearing section in a similar manner.

b. Clean by immersing and agitating for 10 minutes or more in any conveniently available solvent, such as kerosene. Clean bur latch slot by passing front end of latch, 5R00618 (fig. 4), through slot from end to end. Clean lubricating holes in elbow, 5R00626 (fig. 4), and head, 5R00604 (fig. 4), by inserting a broken tapered bur shank. Clean gears with a dental wire scratch brush, using solvent freely.

c. Lubricate as explained in paragraph 35.

d. Reassemble by reversing disassembly procedure, exercising care in use of tools to prevent marring the plated finish. It is important that knurled end of bearing section, 5R00624 (fig. 4), adjoin head, 5R00604 (fig. 4), and that head be properly related to the elbow, 5R00626 (fig. 4). Aligning lubrication holes in elbow and head will

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assure proper relationship. To secure proper relationship, the use of either .003 or .005 spacing washers, or both, between one or more of the component sections may be required as indicated by trial procedure. If spacing washers have previously been employed, replace them as previously used to expedite the assembly. Upon completing assembly, test with bur by drilling a piece of brass or similar metal.

35. LUBRICATION. Lubricate once for each 5 hours of general operative usage as follows:

a. Using Engine, Handpiece, Lubricating Grease, Medical Department Item No. 5262700, insert tip of tube into hole in elbow, 5R00626 (fig. 4), and squeeze tube to pack grease into elbow until it begins to escape at junction of tube tip and hole.

b. Open bur locking latch, 5R00618 (fig. 4), which blocks hole in the closed position, and repeat as in a above at hole in head.

c. When Engine, Handpiece, Angle, is disassembled for cleaning, it is preferable to lubricate by packing grease into the elbow and the head assemblies as the component sections are reassembled. This will eliminate air pockets that may occur if lubrication is performed as described in a and b above.

36. DIFFICULTY IN OPENING OR CLOSING BUR LATCH, 5R00618 (fig. 4). To correct, proceed as follows:

a. Remove latch by unscrewing bur latch screw, 5R00620 (fig. 4).

b. Pass flat end of latch through latch slot, end for end. If tight, enlarge slot by spreading with thin screw-driver blade at points of constriction or by using adjusting plate tool driven into slot with hammer.

c. Reassemble and adjust tension of latch by bending with pliers, so that comfortable thumb pressure is needed to snap the latch over the bearing housing, 5R00624 (fig. 4).

37. FAILURE OF BUR TO REVOLVE. To eliminate this condition, proceed as follows:

a. While holding Engine, Handpiece, Angle, in one hand, rotate rear drive shaft, 5R00632 (fig. 4), with thumb and forefinger of other hand. If burtube, 5R00606 (fig. 4), revolves, the chuck, 5R00702 (fig. 3), of the Engine, Handpiece, Straight, is not properly gripping rear drive shaft. Adjust or replace chuck of Engine, Handpiece, Straight.

b. If burtube, 5R00606 (fig. 4), does not revolve, remove burtube cap, 5R00608 (fig. 4), and remove any spacing washer that may be under it, as gear on burtube may have become worn and will not en-

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gage drive gear if such a spacing washer is used. Inspect burtube ring gear for separation of soldered joint with burtube. If broken, resolder or replace burtube completely.

c. If procedure outlined in b above does not correct condition, remove head as described in paragraph 34a. Repeat test, observing rotation of front gear, 5R00612 (fig. 4), of bearing section. If gear revolves, the fault is in the head assembly. Replace head assembly from spare parts stock, using latch, 5R00618 (fig. 4), and latch screw 5R00620 (fig. 4), from defective head. When head is replaced, it is generally indicated that front gear of bearing section be replaced. Reassemble as indicated in paragraph 34d.

d. If gear, 5R00612 (fig. 4), at front end of bearing section does not revolve when tested, remove bearing section, 5R00624 (fig. 4), and inspect gears for wear, cracks, rust, broken teeth, or breakage of gear rivet. Remove elbow, 5R00626 (fig. 4), and inspect gear, 5R00614 (fig. 4), on shaft of rear section for same deficiencies. Replace gears from spare parts stock as indicated, using tapered gear rivet, 5R00616 (fig. 4), from stock. When gears are replaced, care must be exercised to replace in proper relationship to each other. The two gears, 5R00614 (fig. 4), which mesh at the elbow are identical, but they are not interchangeable with the front gear, 5R00612 (fig 4), of the bearing section. Doubt as to the identity of the gears will be overcome by comparative inspection. The identical gears, 5R00614 (fig. 4), are cut with a flat end blade while the front gear, 5R00612 (fig. 4), has teeth cut with a pitch toward the gear shaft for proper engagement with the burtube gear. When all gears are in proper condition and Engine, Handpiece, Angle, is assembled (par. 34d), excluding the head, the test will cause the front gear, 5R00612 (fig. 4), of the bearing section to revolve. Reassemble head as described in paragraph 34d.

e. When necessary to replace gears, as described in d above, examine defective gear to select small end of tapered gear rivet, 5R00616 (fig. 4). Place gear in a vise, in such a position as to be able to drive out rivet by means of a punch tool for removing rivets, or a hammer and a suitable size broken straight bur with tapered shank. Remove gears from gear shaft by pulling on opposite end of shaft with pliers before releasing defective gear from vise. Thoroughly clean gear shaft with fine abrasive cloth. Clean bearing for shaft by soaking in solvent and repeatedly passing shaft through bearing. To replace shaft bearing, insert gear shaft into replacement gear, carefully aligning holes in shaft and gear. Insert small end of new gear rivet into hole and drive firmly in place with hammer. Trim excess of rivet as close as possible with nippers, and file any remaining excess to contour of gear with a small flat file until it is flush with the gear surface.

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38. FAILURE OF BUR TO ROTATE AND LOCKING OF WHOLE ASSEMBLY. This condition will be caused by one of the following—

a. Worn or broken gears which do not mesh properly may jam and prevent bur rotation. Disassemble Engine, Handpiece, Angle (par. 34a). Test as outlined in paragraph 37a. Replace defective gears as indicated in paragraphs 37d and e.

b. Rust or accumulation of foreign matter will bind moving parts. Correct by disassembling and cleaning as described in paragraphs 34 and 37e; lubricate as indicated in paragraph 35.

c. Binding of burtube, 5R00606 (fig. 4), in head assembly. Remove burtube cap, 5R00608 (fig. 4), and place spacing washer under same.

Section III. FOURTH AND FIFTH ECHELON MAINTENANCE

39. SCOPE. In addition to the maintenance outlined in section II of this chapter for the first and second echelons, fourth and fifth echelons are authorized to effect the following repairs.

40. RECONDITIONING HEAD ASSEMBLIES. Defective head assemblies returned from first and second echelons will be reconditioned as follows:

a. Disassemble and clean as described in paragraph 34a.

b. Inspect head housing, 5R00604 (fig. 4), and burtube, 5R00606 (fig. 4), carefully to determine if back bearing, 5R00610 (fig. 4), for burtube is still assembled in head housing; if not, it is necessary to supply new back bearing from stock for soldering into housing. If necessitated by condition of threads or latch slot, or general exterior appearance of housing, replace housing.

c. If back bearing, 5R00610 (fig. 4), is assembled in housing, 5R00604 (fig. 4), check its condition by assembling head complete with a bur latch, 5R00618 (fig. 4). Burtube, 5R00606 (fig. 4), should be inspected for wear of gear teeth, rust, or separation of ring gear from tube, and replaced if necessary.

d. To check assembled head, insert a bur and manually rotate it. Test for smooth easy turning and also for the amount of motion at right angles to the long axis of the bur. Check this motion by holding housing, 5R00604 (fig. 4), in a vise and endeavoring to move bur from side to side along its long axis. Any amount of motion which is visually perceptible, or can be felt by the fingers, is unsatisfactory.

e. To eliminate undue looseness of the bur revealed by this test, it is necessary to replace the burtube back bearing, 5R00610 (fig. 4), and the front bearing which is the cap, 5R00608 (fig. 4). In the event of replacement of the head housing, 5R00604 (fig. 4), at the same time, the back bearing may already be assembled with head housing;

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if it is not, or if the old housing is to be used, it is necessary to proceed as explained in paragraph 41.

41. REMOVING BACK BEARING, 5R00610 FROM HEAD, 5R00604 (fig. 4). When the old head contains a bearing to be removed, proceed as follows:

a. Insert head holding tool into right-hand thread, and hold head in a bunsen flame for about 10 seconds to melt solder. Strike open end of head on work bench to dislodge old bearing. Cool head by immersing in cold water. Insert reaming tool to prepare for new bearing, and turn with even and slight pressure to remove remaining old solder and to clean surface for new bearing.

b. Prepare new bearing, 5R00610 (fig. 4), by dipping into liquid flux and mounting on bearing holding tool. By means of pencil-type soldering iron, tin outer flat surface of bearing on side which joins the barrel. Place bearing on inserting tool and, after painting tinned surface with flux, insert tool and bearing as far as possible into left-hand thread. By means of both tools now inserted into head, hold in flame for about 10 seconds, turning left-hand thread tool slightly to seat bearing when solder is soft. Cool in water and remove inserting tool. Insert reaming tool and turn carefully to remove excess solder only.

c. Assemble with new burtube, 5R00606 (fig. 4), and new cap, 5R00608 (fig. 4), and test manually with bur latch, 5R00618 (fig. 4), open for free turning of new bur. If tight, use a very fine abrasive compound between back bearing, 5R00610 (fig. 4), and burtube into which lapping tool is inserted. Rotate lapping tool by means of a bur chuck on a lathe operated at low speed until burtube turns freely. Carefully remove abrasive with solvent. Test as before with bur latch closed. If burtube is again tight, it can be assumed that bearing has not been soldered far enough into housing and latch is binding bur at latch slot. Correct by carefully repeating soldering procedure.

d. Assemble by inserting cap, 5R00608 (fig. 4), into left-hand thread until shoulder of cap rests on housing, 5R00604 (fig. 4). Burtube, 5R00606 (fig. 4), should rotate freely when manually tested with a bur, and there should be a minimum of end play when latch, 5R00618 (fig. 4), is closed. If burtube is locked or rotates tightly when cap is in place, remove cap and place a .002, or .005, spacing washer, or both, under shoulder of cap, as indicated by trial procedure. This correction will not be necessary if back bearing has been properly installed.

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APPENDIX

STANDARD NOMENCLATURE LIST OF PARTS

1. Engine, Handpiece, Straight.

Figure No.	Med. Dept. No.	Nomenclature and description	Quantity
4	*5R00602	HEAD COMPLETE: Assembly of head, burtube, cap and small bearing	1
4	*5R00604	HEAD HOUSING	1
4	*5R00606	BURTUBE	1
4	*5R00608	CAP	1
4	*5R00610	BEARING, SMALL, HEAD	1
4	*5R00612	GEAR, SHAFT TO HEAD	1
4	*5R00614	GEAR, SHAFT TO SHAFT	2
4	*5R00616	RIVET, BRASS	3
4	*5R00618	LATCH, BUR	1
4	*5R00620	SCREW, BUR LATCH	1
4	*5R00622	SHAFT, .092 INCH	1
4	*5R00624	BEARING HOUSING, GEAR SHAFT	1
4	*5R00626	KNEE HOUSING	1
4	*5R00630	ADAPTER, END HEXAGONAL	1
4	*5R00632	SHAFT DRIVE, .092 INCH	1
	*5R00634	WASHER, STEEL, SPACER, .003 INCH	1
	*5R00636	WASHER, STEEL, SPACER, .005 INCH	1

2. Engine, Handpiece, Angle.

3	*5R00702	CHUCK, BUR	1
3	*5R00704	PLUNGER, CHUCK LOCK	1
3	*5R00706	ROD, TIGHTENING	1
3	*5R00708	PULLEY, WRIST JOINT	2
3	*5R00710	SCREW, WRIST JOINT PULLEY	2
3	*5R00712	GUARD, PULLEY	1
3	*5R00714	SCREW, PULLEY GUARD	1
3	*5R00716	LATCH, WRIST, S. S. WHITE	1
	*5R00718	LATCH, WRIST, RITTER	1
3	*5R00720	PIN, LATCH, WRIST JOINT	1
3	*5R00722	SCREW, LATCH, WRIST JOINT	1
3	*5R00724	SCREW, WRIST HINGE	2
	*5R00726	NUT, WRIST HINGE, S. S. WHITE	2
3	*5R00728	SHEATH, HEXAGONAL	1
3	5R00730	NUT, HEXAGONAL SHEATH, KNURLED	1
3	5R00732	SPINDLE, NOSE SECTION	1
3	5R00734	SPINDLE, REAR SECTION	1

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Figure No.	Med. Dept. No.	Nomenclature and description	Quantit
3	5R00736	WASHER, THRUST, REAR BEARING	
3	5R00738	BEARING AND SUPPORT, SPINDLE REAR SECTION	1
3	5R00740	NUT, END PLAY ADJUSTING	1
3	5R00742	SETSCREW, END PLAY ADJUSTING NUT	1
3	5R00744	PULLEY, DRIVE	1
3	5R00746	SETSCREW, DRIVE PULLEY	1
3	5R00748	SHAFT, WRIST JOINT PULLEYS	1
3	5R00750	SETSCREW, WRIST JOINT PULLEY, SHAFT	1
3	5R00752	HINGE BODY, WRIST JOINT	1
3	5R00754	ARM, SWIVEL, REAR	1
3	5R00756	ARM, SWIVEL, FRONT	1
3	5R00758	DOG, SWIVEL	1
3	5R00760	SCREW, SWIVEL DOG	1
3	5R00762	SCREW, PIN, SWIVEL DOG	1

* To be requisitioned, when required, from th Supply Depot. (No asterisk indicates that the item is not stocked as a spart part, but can be obtained by special requisition.)

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