CHAPTER 9

CHOBERT RIVETING TOOLS

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LIST OF ILLUSTRATIONS

General

1. The Chobert riveting tool, type A (*see* fig. 1) is a single-acting, hand-operated machine which is used in the Service for minor riveting operations during the repair of riveted components of aircraft. Special types of hollow rivets are used with the machine, one rivet being inserted and headed at a time. It weighs approximately 2½ lb. and has an overall length of 15 in. and is specially suited for use when only one side of the work is accessible, or in positions which are difficult of access. Interchangeable fittings are provided, by means of which the range of rivet sizes handled by the machine is extended; a detachable flexible extension is also provided in order that rivets can be fitted in positions where the riveting tool cannot be held in line with the axis of the rivets.

Description

2. The tool consists of a tubular body, knurled on the outside for convenience in holding, in which a cam-operated spring-loaded plunger is housed. The cam is fixed to a spindle mounted transversely on the body, a handle being provided on the spindle for the operation of the cam which engages with a roller attached to the upper end of the plunger. At the lower end of the tool, a chuck and cone are fitted to the plunger and body respectively, the cone being screw-threaded to receive the cone tips or alternatively

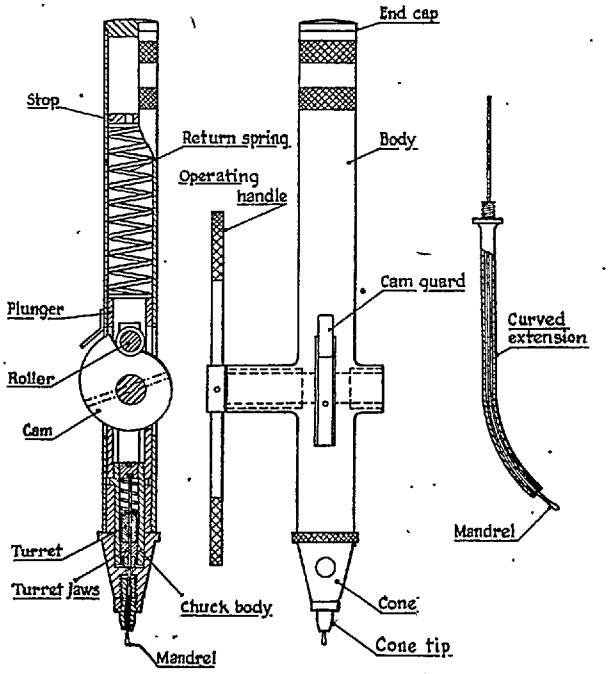


Fig. 1.—Chobert riveting tool, Type A

the extensions. The end fittings are interchangeable and are made in varying sizes to fit the rivets which are the deciding factor in the selection of the appropriate fittings to be used. Held within the chuck body are a turret and hardened-steel turret jaws and, when working on different sizes of rivets, these items and the cone tip require exchanging accordingly. The turrets differ only in the size of the bore which is larger for the $\frac{3}{16}$ in. to $\frac{1}{4}$ in. range of rivets than for the $\frac{1}{8}$ in. to $\frac{5}{32}$ in. rivets. The hardened-steel turret jaws are serrated and are carried by the turret in pairs, which are made in sizes corresponding to the three sizes of mandrel shanks. The mandrels have an enlarged pear-shaped end which, when drawn by the riveting tool through a rivet of special construction, forms a head on the rivet and clinches it; a single turn on the tool handle in a clockwise direction completes the operation.

Chobert rivets

3. The rivets inserted by means of the Chobert riveting tool are hollow and have a stepped or tapered bore which is capable of being expanded by means of the tool, so forming a head on the end of the rivet. The rivets are made in various lengths and diameters and have either snap or countersunk heads, the lengths of snap-head rivets being measured from under the head and countersunk head rivets over the head, in sixteenths of an inch, whilst the diameters are $\frac{1}{8}$ in., $\frac{5}{32}$ in., $\frac{3}{16}$ in. and $\frac{1}{4}$ in. In instances where additional shear strength or water-tightness is required, sealing pins, of the same materials as the rivets, are provided. The following details will be found useful when determining the sizes of drills and mandrels for use with the rivets:—

(i) *Rivet lengths.*—The correct length of rivet for $\frac{1}{8}$ in. and $\frac{5}{32}$ in. dia. taper-bore rivets is equal to the total thickness of materials to be riveted, plus 0·10 in. ± 0·032 in. For rivets of a larger diameter, the length should be equal to the thickness of the materials, plus a minimum of half the diameter of the rivet up to a maximum of one diameter. In the stepped bore type of rivet, the length is equal to the thickness of the materials to be joined, plus 0·08 in. ± 0·004 in.

(ii) *Drill and mandrel sizes.*—Chobert rivets are made with a tolerance of + 0·002 in. oversize and in order to obtain the correct clearance for rivets of various sizes the sizes of drills should be used as given in the following table together with the correct size of mandrel:—

Dia. of rivet	*Drill size*		*Mandrel dia.*
	S.W.G.	Inches	
$\frac{1}{8}$ in.	No. 10	−0·128 in.	0·087 in. ± 0·001 in.
$\frac{5}{32}$ in.	No. 8	−0·160 in.	0·106 in. ± 0·001 in.
$\frac{3}{16}$ in.	No. 6	−0·192 in.	0·141 in. ± 0·001 in.
$\frac{1}{4}$ in.	No. 3	−0·252 in.	0·187 in. ± 0·001 in.

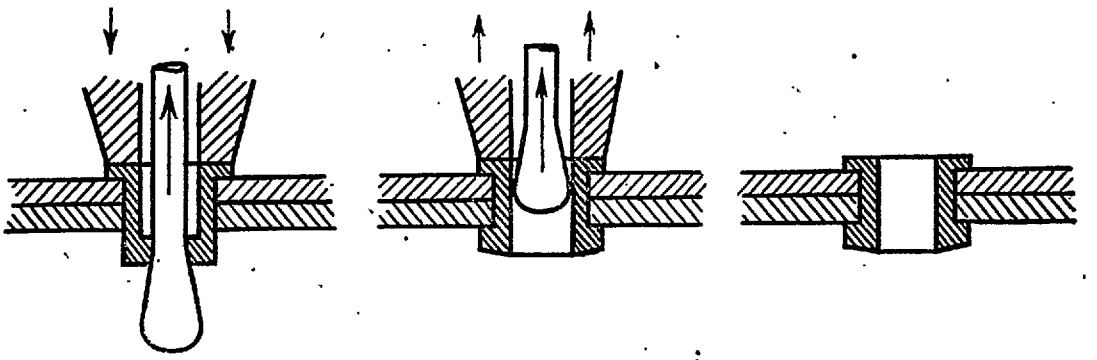
Length of mandrels—

For use with cone tip ... ... $3\frac{3}{8}$ in.

For use with 6 in. curved extension ... ... 9 in.

Operating the riveting tool

4. To operate the riveting tool, the appropriate sizes of turret, turret jaws, cone tip and mandrel for the rivet to be inserted, should be selected and fitted to the tool. The mandrel should be inserted or removed when the operating handle is in line with the body of the tool, at the beginning of the stroke; in this position the turret is in contact with the cone by means of which it is depressed, so releasing the turret jaws. When inserting the mandrel the appropriate rivet should first be



I.—Press tool downward II.—Pull tool away from work III.—Completed rivet

Fig. 2.—Formation of head on stepped-type rivet

threaded over the stem and the head of the mandrel lubricated with the special paste. The rivet should now be inserted in the rivet hole (see fig. 2) and pushed well home; the holes should be in alignment and on no account should an attempt be made to lever holes into alignment by means of the mandrel or the rivet.

5. End pressure on the rivet should be maintained whilst holding the tool steady and square to the face of the work, meanwhile turning the tool handle in a clockwise direction, then, when it is felt that the mandrel is gripped by the turret jaws and is being withdrawn through the rivet, the tool should be pulled away from the work during the remainder of the stroke, otherwise, when at the completion of the full stroke of the tool handle, the mandrel would strike the work and damage it. During the operation of the tool the following points should be observed:—

(i) Lubricate the head of the mandrel before threading the rivet on to the stem.

(ii) Keep the mandrel head polished, free from scores, and clear of metal swarf (see para. 7).

(iii) Ensure that the turret protrudes by the correct amount (see fig. 3).

(iv) Lubricate the taper bore of the chuck body to prevent the jaws from sticking.

(v) If the mandrel slips unduly, examine the turret-jaw serrations and the mandrel stem for wear, also check the turret protrusion.

(vi) The length of a working stroke is $\frac{1}{2}$ in. and if the mandrel head projects for a greater distance, it will not be pulled clear of the rivet. In the event of a rivet being longer than $\frac{1}{2}$ in. one working stroke should be completed, after which the tool should be pushed forward to enable the mandrel to be gripped higher up the stem, when a second turn of the handle will withdraw the mandrel completely. On the other hand, if the head of the mandrel does not project sufficiently, it will damage the cone tip at the end of the working stroke.

Maintenance

6. The riveting tool should be kept clean and in a serviceable condition and lubricated frequently when in use. New parts should be fitted when wear is indicated by slip and lost motion in the working stroke. The tool should be partly or wholly dismantled, according to its condition, then cleaned and examined, appropriate action being taken as required to remedy the defect. Details of maintenance operations required to remedy specified defects are given in the following sub-paras.:—

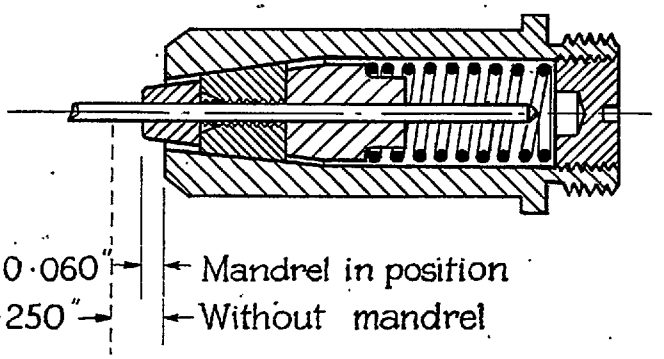


Fig. 3.—Correct turret projection

(i) *Dismantling.*—In order to dismantle the tool completely, the cone should be unscrewed from the body by hand and the chuck removed from the plunger. A serviceable mandrel should be inserted in the chuck, the turret checked for protrusion (see fig. 3), and worn parts noted for replacement purposes, after which the end plug should be unscrewed from the chuck, and the chuck spring, turret and turret jaws extracted. The plunger should not usually be removed, except for wear and breakages; for this operation, the sides of the cam at the largest radius should be gripped in a vice, the jaws of which are protected by tin or copper clams. The taper pin which secures the cam to the shaft should then be removed by means of a fine flat-nosed punch; the cam shaft, the plunger and its spring can now be withdrawn.

(ii) *Cleaning, examining and repairing dismantled parts.*—The dismantled components should be cleaned in paraffin and examined for wear. The turret-jaw teeth should be cleaned by means of a steel-wire brush, ensuring that they are free from particles of metal and, if it is seen that the teeth are badly worn, the jaws should be replaced by new ones. The jaws should be checked for side and end clearance which should be 0·006 in. and 0·020 in. respectively; excessive clearances will cause the jaws to stick in the chuck body. The upper edge of the jaws should be examined and if worn sharp, it should be stoned down to a slight radius to obviate any tendency for it to score the taper bore of the chuck body. The central hole in

the cone tip should be slightly countersunk if worn to a sharp edge by the mandrel head. The taper bore of the chuck body should be polished free from corrosion and scores.

(iii) *Re-assembling.*—The riveting tool should be re-assembled in the reverse order to that given for dismantling. When the taper pin has been replaced in position in the cam, the ends should be smoothed off by means of a dead-smooth file or an oilstone. Care should be taken when screwing the chuck body into position, it should be screwed home by hand only, otherwise damage to the webs of the plunger will ensue. All working parts should be lightly lubricated when they are being assembled.

Mandrels

7. The mandrels should be kept in a servicable condition, the heads polished and free from scores. The heads should be polished in a revolving drill-chuck using a piece of fine emery cloth; the head should not be reduced to more than 0·005 in. undersize, and only that part of the head should be polished where scoring or swarf is present. The mandrel stem is produced during manufacture with a waved surface, in order that the turret jaws may take a firm grip on the mandrel during the working stroke; in some instances new mandrels may be slightly oversize on the stem and some difficulty will be experienced in extracting them. A mandrel will also be difficult to remove if the cone has become partly unscrewed from the body; in such instances the cone should be screwed into the body before attempting to remove the mandrel. Mandrels should always be extracted from the chuck by hand; pliers, etc., must not be used.

8. Mandrels are made of such a length that the end abuts against the plug in the chuck body, leaving the correct length projecting at the head. If for any reason a mandrel is shortened there is a danger of the head being withdrawn too far into the cone tip, where it will become wedged or broken. The end of the mandrel stem should be ground to a point at an angle of 60° when there is any difficulty in inserting it in the chuck.

Curved extensions

9. Curved extensions should be kept clean in the bore and lubricated periodically. They are normally curved to a 20 in. radius, and if bent more acutely, increased breakages of mandrels will result.

Chobert riveting tool, type R

10. The Type R riveting tool (see figs. 4 and 5) operates on the same principle as the Type A, but whereas the latter is only single-acting, the Type R has automatic rivet-feed. The number of rivets loaded at a time depends upon the length of the rivets required for use, a total length of 11¾ in. being available on a mandrel 18¾ in. in length for the accommodation of rivets placed end to end,

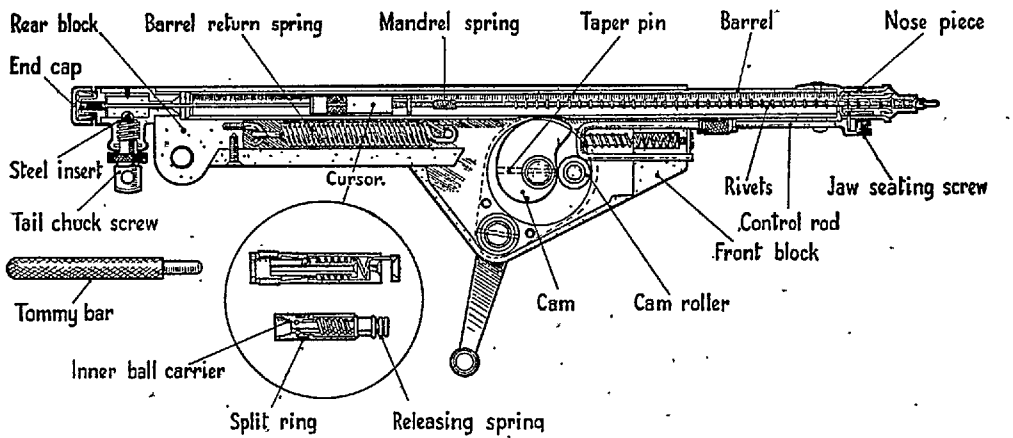


Fig. 4.—Early pattern Type R Chobert riveting tool

thus 94 rivets, ⅛ in. in length, or 62 rivets, 5/16 in. in length, may constitute one full load. The maximum length of single rivets handled by the tool is ½ in. and the maximum diameter ¼ in. For rivets up to 5/16 in. dia. it is possible on straightforward work to maintain a continuous production speed of over 1,000 rivets inserted per hour; with ¼ in. dia. rivets, however, this speed is reduced somewhat.

Rivet mandrel, and drill sizes for Type R riveting tool

11. The sizes of rivets, mandrels and drills to be used for riveting operations with the Type R tool are similar to those given in para. 3 for the Type A.

Description of Type R riveting tool

12. The Type R riveting tool comprises a metal casing which houses a cam-operated sliding

barrel, driven through a three-to-one reduction gear operated by hand from a cranked handle. A mandrel on which the rivets are carried passes through the barrel, where it is held in a chuck anchored at the rear end of the casing. At the front end of the barrel a two-jaw chuck is secured which slides on the mandrel with a rivet in front of the jaws of the chuck, when the tool is operated. Since the barrel moves in and out of the casing to which the mandrel is anchored, it will be seen that the rivet is pushed forward as the barrel moves outward and, the mandrel head being enlarged, the rivet is expanded as the rivet passes over the head.

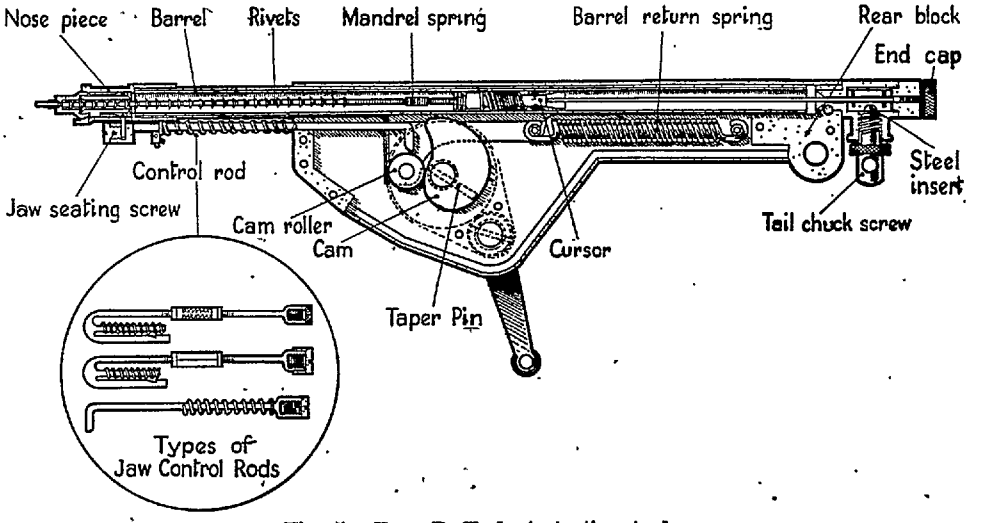


Fig. 5.—Type R Chobert riveting tool

13. A control rod (see inset in fig. 5) engages with the front jaws and with the barrel operating cam, so that the front jaws are opened to allow another rivet to feed forward on the mandrel by the action of a spring-loaded cursor or free-wheel slide. The cursor (see inset in fig. 4) is a sliding fit in the barrel and is free to be carried forward by any forward movement of the barrel, but is restrained by the gripping action of three balls in a tapered bore of the cursor body when the barrel returns under the action of its return spring.

14. The front chuck has a conical seat formed in the end of the barrel to accommodate the two jaws which fit over a guide-tube for the rivets (see fig. 6), the whole being encircled by a "figure 8" spring which serves to open the jaws when they leave the conical seat, and also provides a means of attachment to the control rod.

15. The rear chuck is operated by a square-headed screw, the head of which is drilled for the reception of a tommy bar. The inner end of the screw is fitted with a hemispherical hardened steel insert which engages with the jaws which are retained endwise in the tail piece by means of a screw-in plug. A handle is provided at the tail end of the tool by means of which it can be steadied whilst the crank handle is rotated.

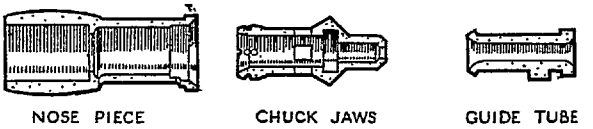


Fig. 6.—Details of front jaws

Preparation for riveting

16. After the rivet holes have been drilled and any burrs and metal cuttings removed from the holes, particularly between the sheets to be riveted, the work should be held together by means of sheet grippers. The work should be arranged with the rivet holes horizontal, but if this is not possible then the work should be positioned on a bench so that the operator can steady the butt of the vertically held tool against his shoulder at a convenient working height. Before the riveting tool can be used it should be loaded with rivets of the correct type, length and diameter to suit the

work in hand, and for this purpose the correlative mandrel, spring jaws, and guide tube should be selected and fitted to the tool as detailed below.

Removing and replacing jaws

17. The jaws are held together by a "figure 8" spring; they fit round the rivet guide tube and are marked to the diameter of the rivet with which they are intended to be used. The head of the rivet should be an easy fit in the guide tube, and for this reason guide tubes for use with snap or countersunk rivets respectively are different for $\frac{1}{8}$ in. dia. rivets.

18. To remove the jaws from the tool, the mandrel must first be removed (see para. 30) then, holding the crank handle in the position where the front jaws are just opening, the jaw-seat screw should be removed. The halves of the jaws should now be gripped through the aperture between them by the thumb and forefinger and pulled outward until the loop of the "figure 8" spring is seen to be out of the cup at the end of the control rod. The jaws should then be tilted (see fig. 7) when they may be readily removed.

19. To fit the jaws, the correct size of jaws and guide tube should be selected and, keeping the jaws open, they should be inserted into the nose piece by tilting them at an angle and then centralising them, when the loop of the "figure 8" spring should be seen to enter the cup at the end of the control rod. The jaw-seat screw should now be inserted loosely and the crank handle rotated clockwise to ensure that the jaws are seating correctly, then tighten the jaw-seat screw.

Loading the mandrel

20. The mandrel of the size to suit the rivets should be threaded with rivets with the rivet heads remote from the mandrel head to a length of not more than $11\frac{3}{4}$ in. After loading the mandrel with rivets a small quantity of lubricating paste should be smeared on the mandrel, and the rivets moved up and down with a rotary motion to ensure that the bores of the rivets are evenly lubricated. This lubrication of the mandrel is essential to prevent swarf building up on the head, so increasing the effort required to broach the rivets and resulting in mandrel breakages.

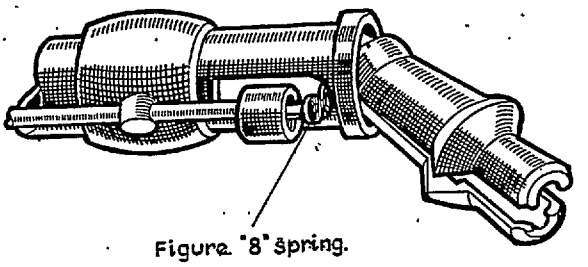


Fig. 7.—Removing front jaws

21. After lubricating the mandrel spring, it should then be placed over the tail end of the mandrel down to the rivets. The spring should slide freely on the mandrel without falling off; if the spring is too slack it should be bent slightly to make it grip the mandrel more firmly; on the other hand when the spring is too tight it should be straightened or exchanged for another one. If the larger end of a spring is distorted it should be rejected and a new one fitted, otherwise it will damage the releasing spring.

22. Springs for mandrels used with $\frac{3}{16}$ in. and $\frac{1}{4}$ in. dia. rivets have ends of the same diameter, but those for $\frac{1}{8}$ in. and $\frac{5}{32}$ in. dia. rivets have a larger diameter at one end. Springs for use with $\frac{1}{8}$ in. dia. snap-head rivets have a smaller intermediate collar than those used with countersunk rivets.

Fitting a loaded mandrel

23. To fit a loaded mandrel in the riveting tool the rear jaw-tightening screw should be slackened a quarter of a turn by means of the tommy-bar provided, then, holding the tool by the hand-grip, the crank handle should be gently rotated in an anti-clockwise direction until it will not turn any further, thus opening the jaws. The riveting tool should now be held in the left hand, the barrel being level with the operator's chest and inclined towards his face. With the tool in this position the tail of the loaded mandrel should be inserted through the partly opened jaws and through the central hole in the cursor. When the mandrel spring makes contact with the cursor, resistance is felt which should be overcome to force the cursor down the barrel. The tail of the mandrel is pushed through the hole in the end of the barrel into the chuck jaws.

24. The mandrel is correctly positioned in the tool when the jaws close approximately $\frac{1}{64}$ in. behind the head of the first rivet. At this position the crank handle should be rotated a quarter of a turn in an anti-clockwise direction and back again to ensure that the jaws open and close freely over the head of the first rivet. When the mandrel position has been adjusted correctly the rear jaw-tightening screw should be tightened firmly; if the mandrel slips, undue force should not be used but the tail jaws should be examined to ascertain whether they close freely or not, or for any damage sustained.

Operating the Type R riveting tool

25. With the work set up as described in para. 16, and the riveting tool loaded as described in paras. 20 to 24, the actual riveting operation may be commenced. For this purpose, when operating the tool in a horizontal position, it should be steadied by holding it against the left side of the operator, the left hand holding the hand grip. If, however, it is found to be more advantageous to arrange the work in a horizontal position, the operator should stand well over the work so that he can steady the butt of the tool against his shoulder.

26. It is of great importance to see that the tool is held normal to the surface being riveted; If the rivet is broached and the tool is not held firmly and squarely to the work there is a danger of breakage of the mandrel head as well as a badly formed rivet.

27. Before inserting the rivet in the hole the riveting tool handle should be rotated about a quarter of a turn in a clockwise direction to take up the play between the end of the jaws and the head of the rivet. This amount of a quarter of a turn is given as a guide and it may vary slightly with the type of rivet used; if the handle is taken too far expansion of the rivet will occur and this must be avoided.

28. The rivet should be inserted and pushed well down in its hole and, with the tool held firmly and squarely, the handle should be turned clockwise until the mandrel head has been pulled through the rivet; immediately resistance ceases, the tool should be withdrawn from the face of the work, otherwise damage to the mandrel and the work will be sustained when the head re-emerges.

29. When the riveting tool is away from the face of the work the crank handle should be rotated through two more complete revolutions, during which the jaws open, permitting the next rivet to emerge and the jaws to close again. The tool is then ready for the next hole, the cycle being repeated until the mandrel spring is seen to be emerging from the jaws, then the mandrel requires reloading.

Removing the mandrel

30. In order to remove an empty mandrel or one fully or partly threaded with rivets, the jaw tightening screw should be unscrewed a quarter of a turn by means of the tommy bar provided. The jaws should not be opened too much or the mandrel will not centralise itself when being replaced. The tool should be held by the hand-grip and the crank handle rotated in an anti-clockwise direction until it will not rotate any further, thus opening the jaws. The crank handle should be held in this position by the thumb of the left hand, and the mandrel withdrawn by pulling the head forward, pulling with it the cursor until the releasing spring (mounted on the end of the inner ball carrier) pushes against the restricted portion of the nose piece. The mandrel should then come away freely, but if not, do not persist in pulling; push it back a little way instead and then, giving the mandrel a slight twist, pull again.

Note.—The head of the mandrel must not be gripped by pliers or it will be damaged.

Notes for the operation of the riveting tool

31. To operate the Type R riveting tool as efficiently as possible the mandrel should be supplied to the operator already threaded with rivets and lubricated correctly. The mandrel head should be kept well polished and free from scores and swarf. Swarf is the result of the softer metal of the rivets building up on the mandrel head at the points of extreme pressure during the broaching operation, and should be removed by polishing the head of the mandrel by means of fine emery cloth while the mandrel is mounted in a lathe or drilling machine chuck. The head must not be reduced in diameter by more than 0·003 in.

Note.—The riveting tool handle must not be rotated in an anti-clockwise direction except as detailed in preceding paragraphs for specific purposes.

SERVICING THE TYPE R RIVETING TOOL

General

32. The riveting tool should be handled carefully, kept clean, and lubricated periodically and, provided that the operating instructions given in the preceding paragraphs are followed, very little other maintenance will be required. The faults detailed below, together with their causes and

remedies may, however, be found useful when the tool has been in use for some time or has been misused or damaged.

Defective automatic rivet feed

33. The rivets may fail to feed forward for a variety of reasons, a number of which are detailed below, with suggestions for rectifying the faults as they arise:—

(i) *Rivets tight on mandrel.*—This defect may be caused by lack of lubrication on the rivets and mandrel, or a bent mandrel. The remedy is obvious.

(ii) *Incorrect guide-tube for rivet head.*—It should be ensured that the correct guide-tube is fitted, as these are only to be used for countersunk or snap-head rivets of the same respective diameters. If the wrong size of guide-tube is fitted, change the jaw assembly and fit the correct guide-tube.

(iii) *Cursor choked with dirt or metal swarf.*—It may be possible to remedy this fault by washing the part in paraffin, at the same time ascertaining that the plunger is free in the body, and thus allowing the balls to rise and fall in the tapered portion of the cursor body. If it is found necessary to remove the cursor, the light-alloy handle and four short setscrews securing the tail assembly should be removed; it will then be found possible to withdraw the tail bracket and push out the cursor from the exposed end of the barrel, for which purpose the mandrel may be used. To replace the cursor, the above procedure should be reversed, taking care to see that the split ring is retained in its groove when the cursor body enters the barrel.

(iv) *Split ring detached from cursor body.*—This condition may be caused by attempting to load too many rivets in the mandrel; the total length occupied by rivets should not exceed 11¾ in. The end of the barrel has a wide chamfer into which a split ring should be guided if it should at any time be pushed clear of the barrel.

(v) *Cursor too slack in barrel.*—If the cursor is too slack in the barrel, this will be caused by a weak split ring, and can be remedied by fitting a new and stronger split ring. For this purpose the cursor must be removed as already detailed in (iii), the new ring fitted, and the whole re-assembled in the reverse order.

(vi) *Damaged or worn balls.*—If the rivet feed is defective as a result of wear or damage to the balls, these (of which there are three) should be replaced by new ones. To do this, first remove the cursor as detailed in (iii), then unscrew the cursor release spring and push the ball carrier out to the full extent. Remove the defective balls and replace by new ones held in position by means of petroleum jelly or yellow grease, after which re-assemble in the reverse order.

(vii) *Damaged barrel.*—If the barrel is damaged it should be exchanged for a new one, together with a new cursor and split ring, if these parts have also been affected, although it may be possible to make them serviceable by the removal of any burrs, etc., that would otherwise score the new barrel. In order to exchange the barrel for a new one, the front jaws and the tail assembly should be removed as described in (iii). The split pin and the six setscrews, together with the front block, should be removed, when it will be possible by means of a hook to lift the barrel return-spring free from its anchor pin; this anchor pin should not be removed on any account. It should now be possible to remove the barrel from the front end, but it may be found necessary to rotate the operating cam slightly to clear the return-spring. *The cam must not be rotated when the front block or the rear block is removed and the spring is still in position, or the barrel will be damaged.* The return-spring, cam roller, pin, and nose-piece should now be transferred to the new barrel, and the riveting tool assembled in the reverse order to that given for dismantling.

Failure of barrel to move forward when handle is rotated

34. This defect is caused by the shearing of the taper pin which secures the cam to the shaft, and a new pin must be fitted. To extract the defective pin, the dome nut and cranked handle should be removed; a slot is provided at the opposite end of the shaft to assist in unscrewing the domed nut. Next, the gear case, secured by two long setscrews, should be removed, after which the barrel should be dismantled as detailed in para. 33 (vii), then the shaft and cam can be withdrawn and the sheared portions of the taper pin punched out. When the new pin is fitted it should be ascertained that it is a good fit in the taper and, after it has been tapped home, the pin should not protrude at either end; the pin can be punched in or out through the opening left by the removal of the front block.

Sticking jaw-control rod

35. A sticking jaw-control rod may be the result of (*a*) wrongly adjusted jaws, (*b*) damaged control rod, (*c*) weak or damaged springs. The remedy for (*a*) is re-adjustment of the jaws. A damaged control rod (*b*) is usually caused by forcing the handle in an anti-clockwise direction; and

requires the rod to be either strengthened or, if badly damaged, replaced with a new one. For either purpose, the rod should be removed. A defective control rod spring (*c*) also entails the removal of the control rod, when the replacement spring can be slipped over the bent end of the rod. After dismantling for the defects (*b*) or (*c*) the riveting tool should be assembled in the reverse order to dismantling.

Sticking barrel

36. Sticking of the barrel is caused by damage sustained through dropping the tool, or by otherwise denting the casing. If any such damage has occurred the tool should be dismantled as far as necessary and the dents or high spots removed.

Shearing or bending of the mandrel at tail end

37. When this fault appears it may be caused either by the mandrel not centring in the jaws or by damaged jaws. In both cases the tail cap must be removed and the tail jaws examined to see that they operate correctly and are not closing on broken portions of the mandrel. Broken jaws should be replaced by new ones and bent mandrels straightened.

Slipping mandrel

38. If normal tightening of the rear jaw-tightening screw fails to hold the mandrel an attempt should not be made to effect a cure by overtightening; the jaws should be dismantled and examined. The jaws may fail to grip the mandrel tightly enough and allow slip to take place, for one or more of the following reasons:—

(i) *Undersize rivet holes.*—If the rivet holes in the work are undersize, excessive strain is imposed on the mandrel in broaching the rivet. It should be ensured that the holes are of the correct size as indicated in para. 3 (ii).

(ii) *Lack of lubricant.*—The mandrel and rivets should be lubricated as detailed in para. 20, using the correct high-pressure lubricating paste.

(iii) *Defective jaws.*—Worn or broken tail jaws will cause mandrel slip, and the only remedy is to remove the damaged jaws and replace by new ones.

(iv) *Defective insert pin.*—A damaged insert pin should be replaced by a new one and to do this the tail cap and jaws should be removed, after which the insert pin should be driven out of the jaw tightening screw by punching down through the centre of the screw, when the pin will drop out into the jaw housing. *An attempt should not be made (for any purpose) to remove the jaw tightening screw.* A new pin should be held over the end of the screw by a pair of pliers and punched back through the hole in the tail jaw housing. When this operation has been completed, assemble the tail jaws and replace the tail cap in position.

Riveting tool creaks when in operation

39. When obvious sounds of distress come from the tool when in operation, this may be due to a variety of reasons, of which any of the following may be responsible:—

(i) Rivets too hard.

(ii) Rivet holes undersize.

(iii) Rivet too short.

(iv) Lack of lubricant on mandrel.

(v) Mandrel head rough or scored.

(vi) Swarf on mandrel head.

Removal of jaw tightening screw

40. Type R riveting tools after Serial No. 860 may have the jaw tightening screw removed and, to do this, the tail assembly should be removed and dismantled as far as possible. The rivets securing the tail jaw housing should now be removed and the housing slipped off the tail block, after which the jaw tightening screw can be exchanged for a new one. The riveting tool should then be assembled in the reverse order to that given for dismantling. The new rivets fitted during this operation should be high tensile steel, as soft iron rivets will not stand the strain, and undue stress would be thereby imposed on the welded joints of the tail jaw housing.

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