NAVSHIPS 316-0041

INSTRUCTION BOOK FOR QUICK ACTING DOORS

●

TYPES

TLD-2 (crs)

TLD-3 (ms)

As designed for

NAVY DEPARTMENT, BUREAU OF SHIPS

by **EDWARD G. BUDD MFG. CO., Philadelphia, Pa.**

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INTRODUCTION

This instruction book presents all information necessary for installation of TLD-2(crs) and TLD-3(ms) doors and their maintenance by shore activities and forces afloat. Through its use these doors can be kept in smooth, easy and efficient operating condition.

SHIPS USING TENSION LINK DESIGN (TLD) DOORS

Type Ship	*Number*
AM	104, 105, 107-112, 114, 116-120, 122-124, 126-128, 131, 322-324, 341, 371-390
AKA	21-52, 64-93, 101-108
AP	135-159
APA	49-51, 57-88
ASR	13-14
DD	410, 411, 425, 427-432, 435, 437-443, 445-450, 465, 466, 468, 470-476, 478-481, 484, 486-488, 497-502, 507-511, 513-517, 519-521, 527, 528, 530-532, 534-541, 544-547, 550-556, 558, 561-578, 580-583, 585-590, 592-594, 596, 597, 619, 623, 624, 626, 628-631, 638, 639, 641-647, 649-694, 696-716, 721-725, 727-732, 734, 742-748, 752-770, 774-800, 802, 804-808, 817-853, 857-890.
DE	13-44, 102-105, 112, 113, 129-135, 137-142, 144-152, 162-173, 176, 180-197, 238-265, 316-318, 320-322, 330-338, 357-372, 382-387, 395-401, 420-422, 424, 438-450, 508-510, 531-542, 739-750, 763-771.
DM	23-34
DMS	19-21, 23-42
CVE	55, 57-62, 64, 65, 67, 69, 71, 75, 77, 81, 83, 85, 87. 89, 91, 93, 97, 99, 101, 103, 105-123
PF	17-20, 23, 24, 28-33, 56-69, 71

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SECTION 1

WHAT IS THIS QUICK ACTING DOOR?

All watertight doors must perform satisfactorily in emergencies. Quick-acting doors furnish rapid access, and yet withstand specified sea pressure due to flooding, when they are in good condition.

The inside view of TLD-2(crs) door, with sheathing removed, is shown in Fig. 1. Fig. 2 illustrates the TLD-2(crs) door with various assemblies pulled out.

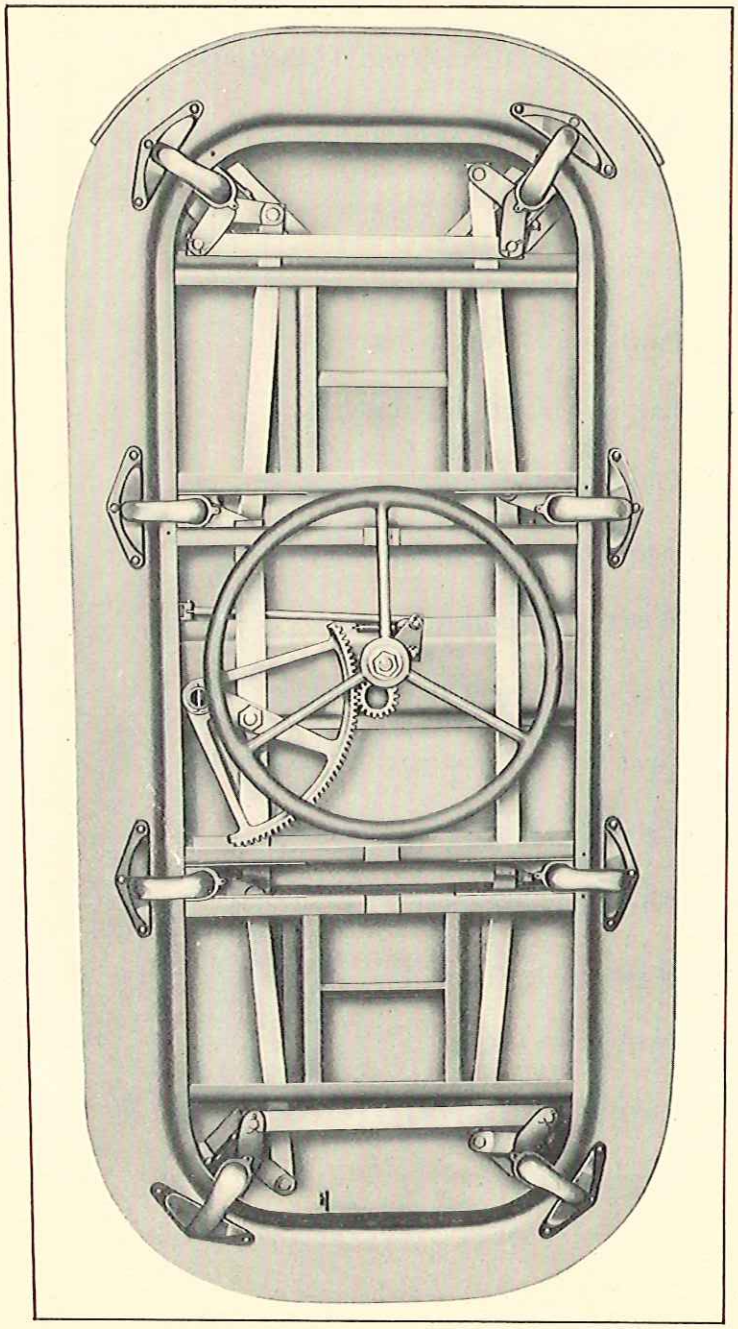

Fig. 1—Inside view, TLD-2(crs) left-hand door, in secured position in frame.

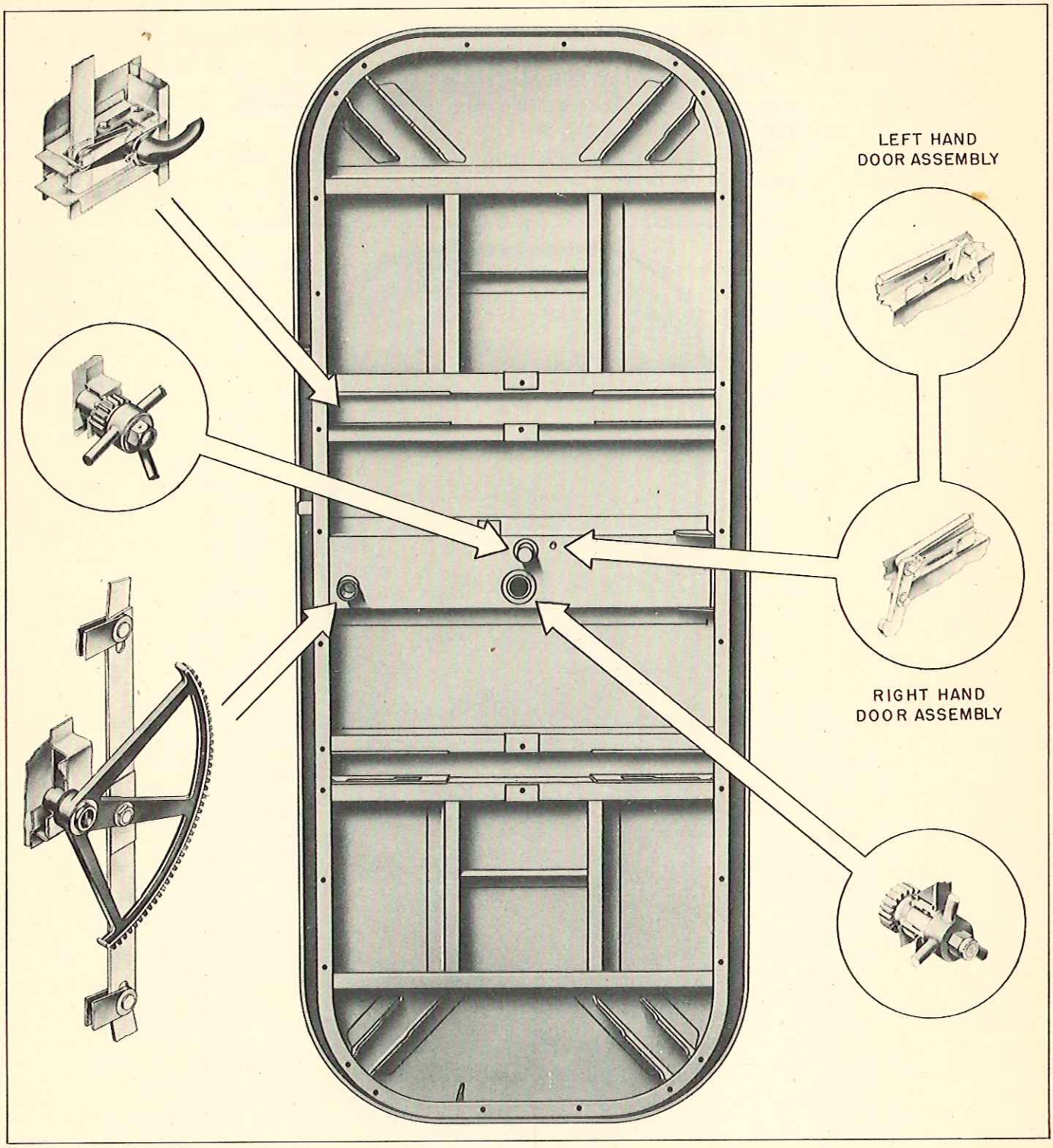

Fig. 2—Inside view, TLD-2(crs) door, showing shell with main assemblies pulled out.

Ships may have either the TLD-2(crs) door or the TLD-3(ms) door, or both.

The inside view of the TLD-3(ms) door, with sheathing removed, is shown in Fig. 3. The same view, with the important assemblies pulled out, is shown in Fig. 4.

The slight differences between the two types of doors are fully covered in this book.

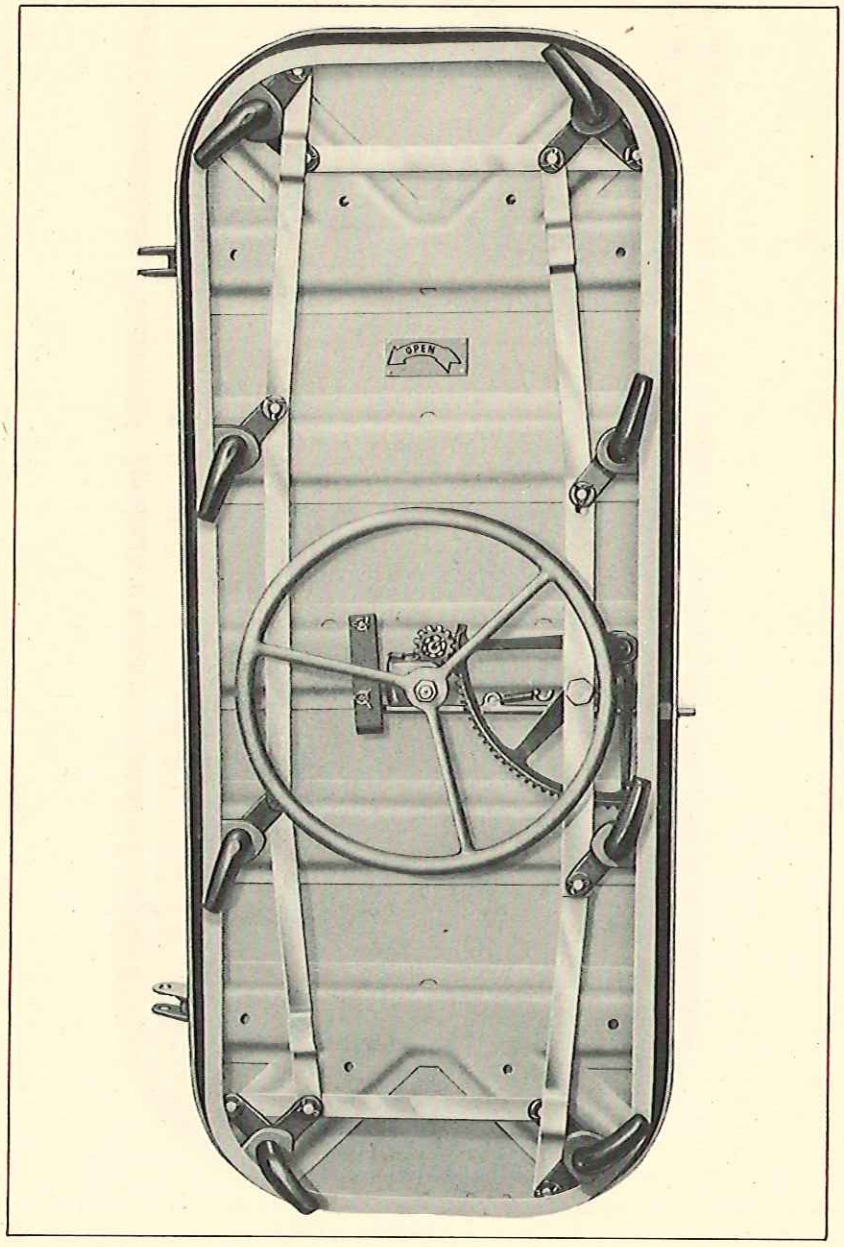

Fig. 3—Inside view, TLD-3(ms) right-hand door, removed from frame.

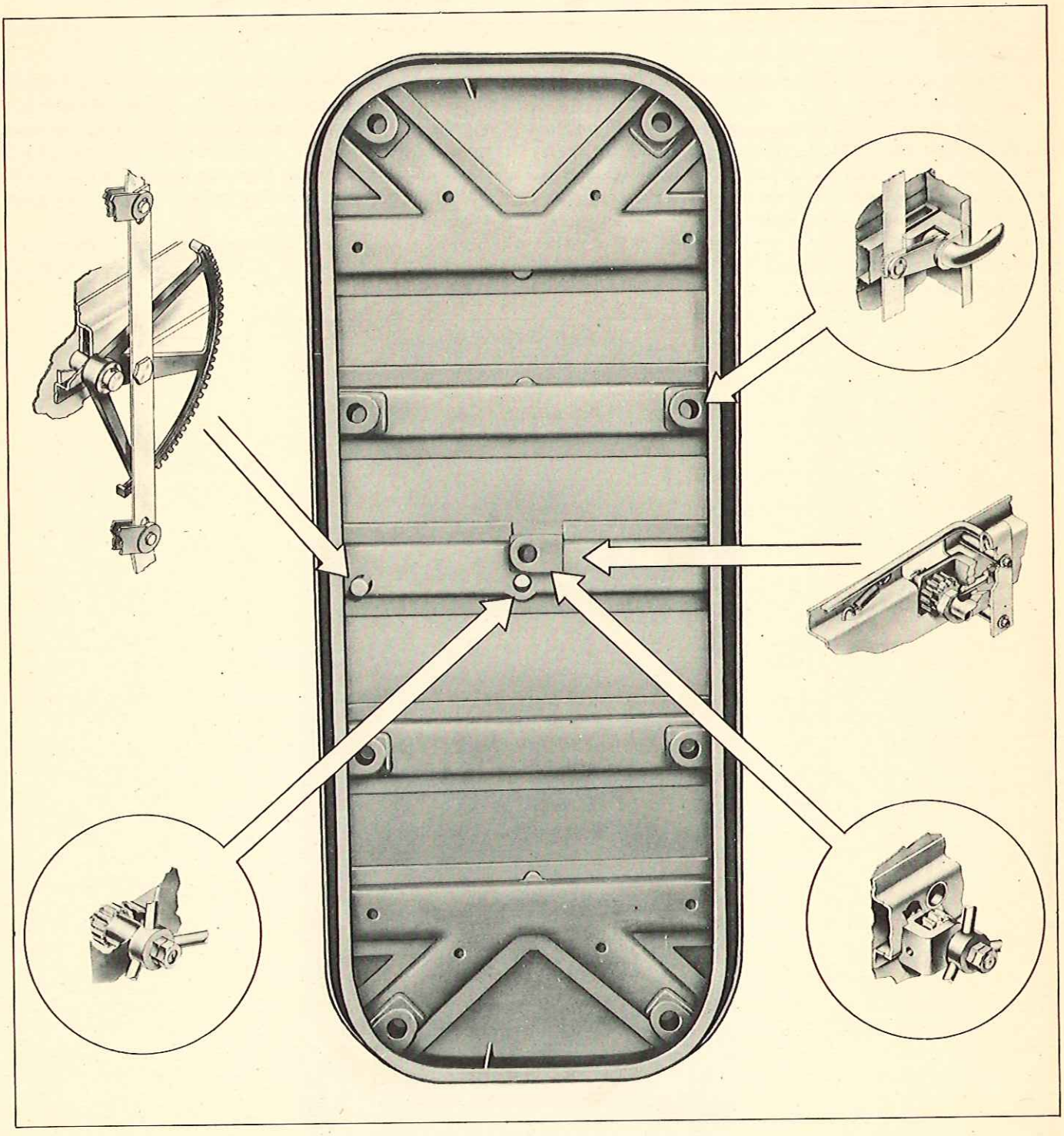

Fig. 4—Inside view, TLD-3(ms) door, showing shell with main assemblies pulled out.

SECTION 2

WHAT IS TLD-2 (crs) and TLD-3 (ms)?

TLD-2 (crs)

TLD means "tension link design," and 2(crs) indicates "corrosion-resisting steel."

All of the materials in this type of door were on the critical list. The TLD-2(crs), through the use of these materials, has various features that are desirable, such as resistance to rust and corrosion; it is also non-magnetic. Generally, the TLD-2(crs) door is built of stainless steel; the gear parts and bushings are of brass or bronze. The frame on this door may be either corrosion-resisting steel or medium carbon steel.

TLD-3 (ms)

TLD-3(ms) indicates the door is of "tension link design," "medium carbon steel." This door was created during the emergency period and most of the materials were non-critical. Unlike the other type it is subject to rust and corrosion, and does not have the non-magnetic feature. This door is built of medium carbon steel, and the gears are of alloy steel or bronze.

For guidance, specifications have been included in a separate section covering the parts it may be necessary to replace.

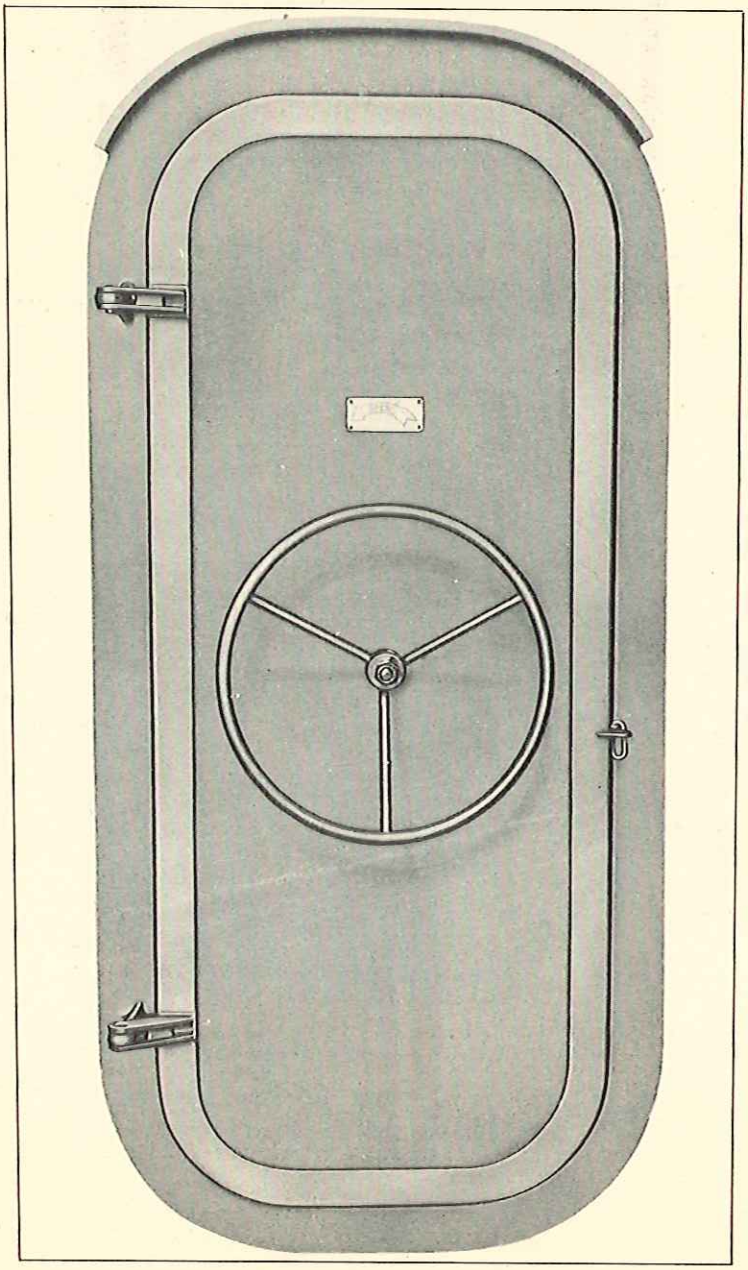

Fig. 5—Outside view of Quick Acting Door.

SECTION 3

HOW DOOR IS INSTALLED

The door is precision built and accordingly must fit to a specified degree of accuracy. It must be installed in a prescribed manner, particular attention being paid to each of the two types which are of dissimilar metals and require different installation methods.

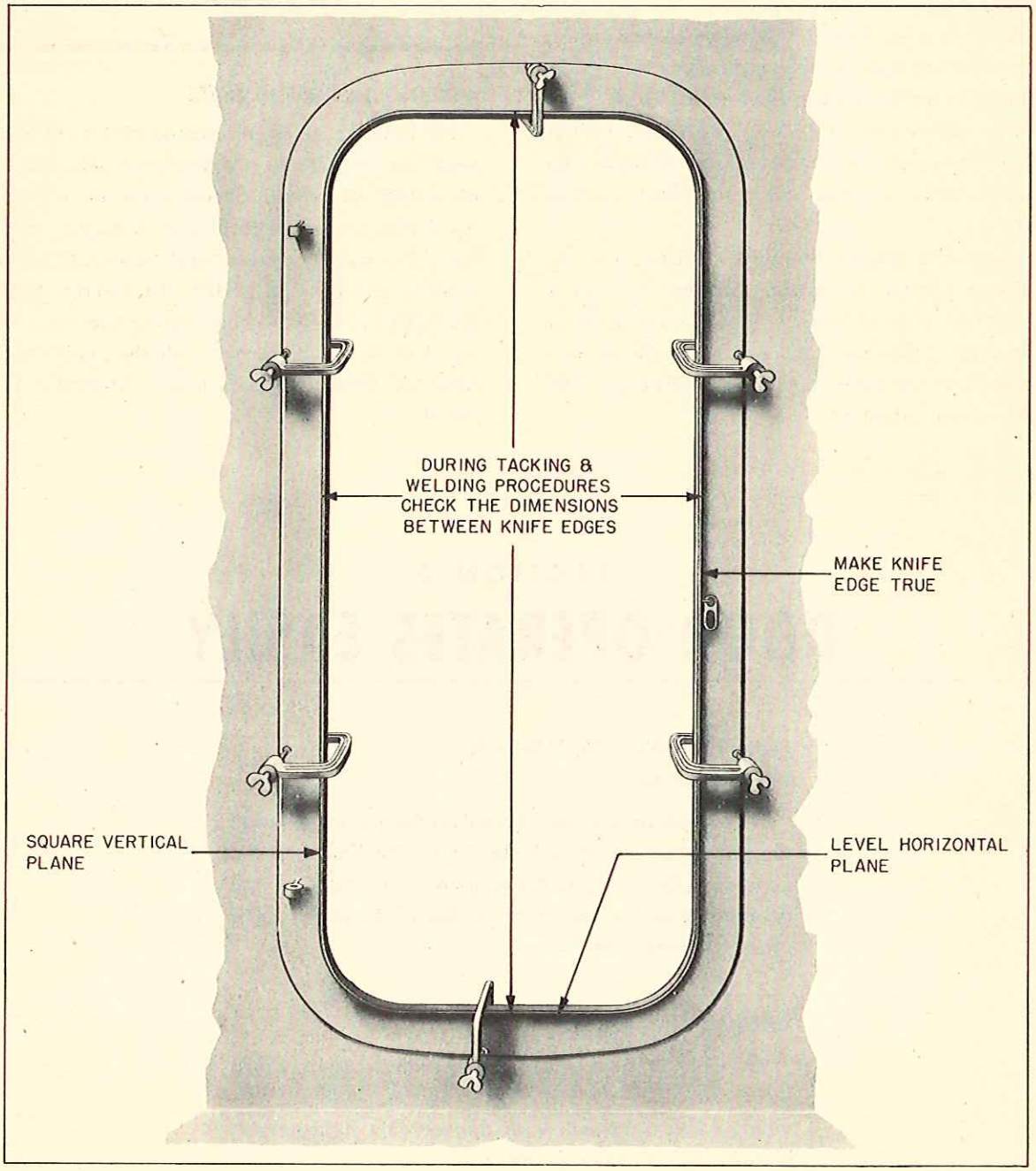

Fig. 6—Outside view, door frame clamped in bulkhead ready for tacking.

INSTALLATION PROCEDURE (Fig. 6)

The first step in installing either door is to straighten the bulkhead, being sure it is in a reasonably true plane by checking with a straight edge across and along edges of door opening to the exclusion of a 3/32" feeler.

Secure door frame in place, using heavy "C" clamps, check width and height of clear opening and square up.

Now the frame is ready for tacking and welding. Tack and weld with proper arc welding rods (never gas weld). See welding rod note on this page.

Tack door frame in place, following prescribed tacking procedure. During tacking operation, check dimensions of opening between knife edges for shrinkage and expansion. Upon completion of tacking procedure, recheck knife edge dimensions of clear openings. If knife edge dimensions check, continue with prescribed welding procedure.

After frame is permanently welded in place, it is suggested that a wooden or rawhide hammer be used to straighten knife edge to assure a good contact between knife edge and gasket. Straighten to the exclusion of a 1/16" feeler between knife edge and straight edge. This will assure a water-tight fit.

Lift door onto hinges, placing washer on top of each hinge blade on frame. Insert hinge pins and peen end.

NOTE: ***Do not pinch hinge blades; this will cause binding. Use shim! Test installation for easy operation, and chalk test for contact between knife edge and gasket.***

WELDING ELECTRODE NOTE:

For welding corrosion-resisting steel frame to any bulkhead, use only 25-20 welding electrode, Grade IV-DC BUSHIPS Ad Interim Specification 46E4 (INT) of 15 April 1944 and amendment 2 of 15 August 1944 or later issue. For medium carbon steel frame, use medium steel welding electrode BUSHIPS Ad Interim Specification 46E3 (INT) of 1 November 1945 or later issue. All welding shall be in accordance with the applicable requirements of General Specifications, Appendix 5, Parts I and II.

SECTION 4

DOOR OPERATES EASILY

PRINCIPLE OF DOOR, TLD-2 (crs) AND TLD-3 (ms)

Turning either handwheel revolves the pinions, rotating the gear sector which pulls the links. The links pull the dogs onto the wedges, pressing the knife edge of the door frame against the rubber gasket of the panel, creating a water-tight fit.

TENSION LINK DESIGN

The links in the door are always under tension, which insures that the dogs will move in unison. This will provide a water-tight seal, with the use of a light-weight, high-strength linkage system.

SECTION 5

INSPECTION, MAINTENANCE and REPAIRS

The Quick Acting Water-Tight Door will be water-tight only if it is regularly inspected and kept in good operating condition.

It is recommended that each door be inspected weekly and that the necessary repairs be made without delay.

Check These Points . . .

Materials needed for a good maintenance job will be found in ship's stores. Following is a suggested list: carbon-tetrachloride or kerosene for removing grease, etc.; rust-inhibitive grease for lubricating moving parts; paint thinner for ease in scraping paint off tumbler and moving parts; steel wool and some clean rags.

TO DO A ROUTINE MAINTENANCE JOB

Remove sheathing screws on inside of door (if sheathing is now installed). Back off nuts on inside handwheel (on TLD-2(crs) remove taper pin before removing nut), slide off handwheel and pry off sheathing (if installed) with screwdriver. Using a wiping rag soaked in carbon-tetrachloride or kerosene, clean off all dirt and excess grease on the inside of door.

Scrape rust off all sections of door that have been attacked, namely, panel, rim zee, stiffeners, etc. Clean off any paint or rust around the tumbler.

Inspect all the moving parts for wear or failure and replace if necessary. Check the rubber gasket, too. It should be clean and pliable.

Paint the interior of the door if necessary. (DO NOT PAINT THE MECHANISM.)

Using rust-inhibitive grease, lubricate teeth of gear sector, pinion and ratchet, pawl, and crank of each dog.

Use steel wool to clean the contact surface of wedge and dog, removing all rust spots. Wipe both surfaces with an oily cloth, leaving a thin film of oil for lubrication.

Clean foreign matter or paint from the knife edge where it meets the rubber gasket.

Generally, regular inspection and good maintenance are all that Quick Acting Doors need, but remember this: IF A PART IS WORN OR FAULTY, REPLACE IT WITHOUT DELAY.

NOTE: ***In replacing the dogs and gear sector it is necessary to relieve and restore link tension.***

RELIEVING AND RESTORING LINK TENSION, TLD-2(crs) AND TLD-3(ms) DOORS (Fig. 7)

To Relieve Tension:

(1) Insert metal block between upper corner dog crank (opposite gear sector) and inside the top of door.

(2) Pull and hold handwheel in open direction.

(3) Remove cotter pin.

(4) Remove link pin.

(5) Turn handwheel slightly in closed direction (pushing tumbler to disengage interlock mechanism) and tension is relieved.

To Restore Link Tension:

(5) Turn handwheel in open direction, holding metal block in position.

(4) *Line up dog crank and link holes,* insert link pin.

(3) Replace cotter pin.

(2) Turn handwheel in closed direction (pushing tumbler to disengage interlock mechanism) and tension is now restored.

(1) Remove block.

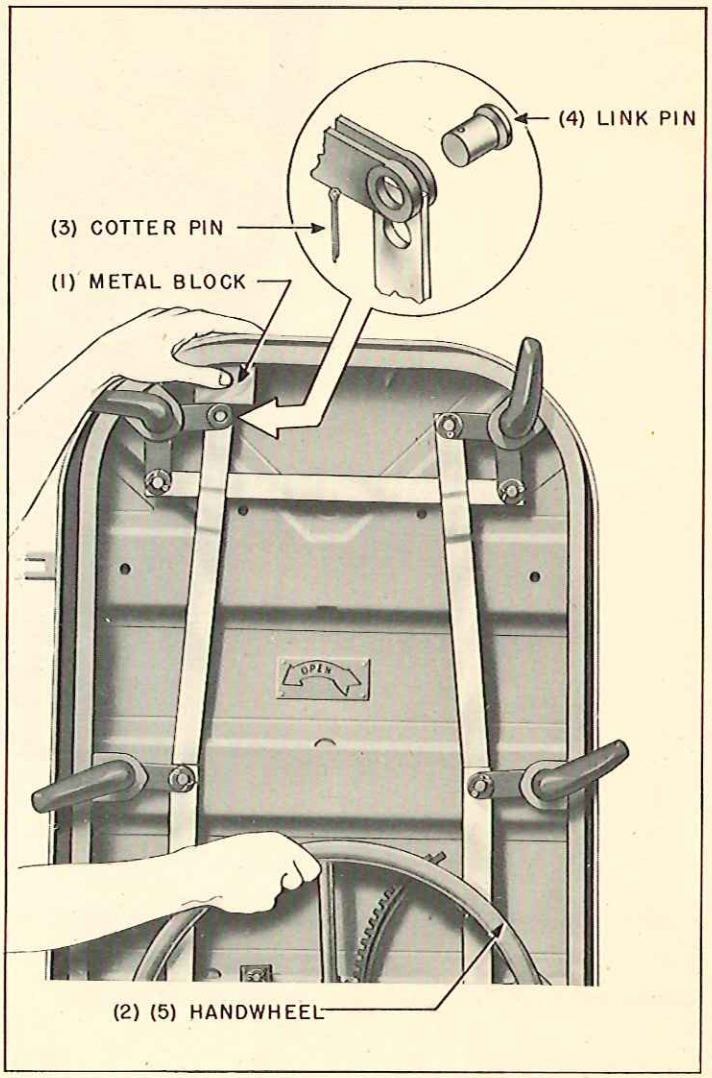

Fig. 7—Relieving link tension.

SECTION 6

PAWL (CATCH) REPLACEMENT

PAWL (Catch), TLD-2(crs) DOOR (Fig. 8)

The pawl, or catch, on the TLD-2(crs) door is a hook that drops between the teeth of the ratchet when door is open; this keeps the dogs from being turned beyond the edge of door. Push the tumbler in and out and see this action.

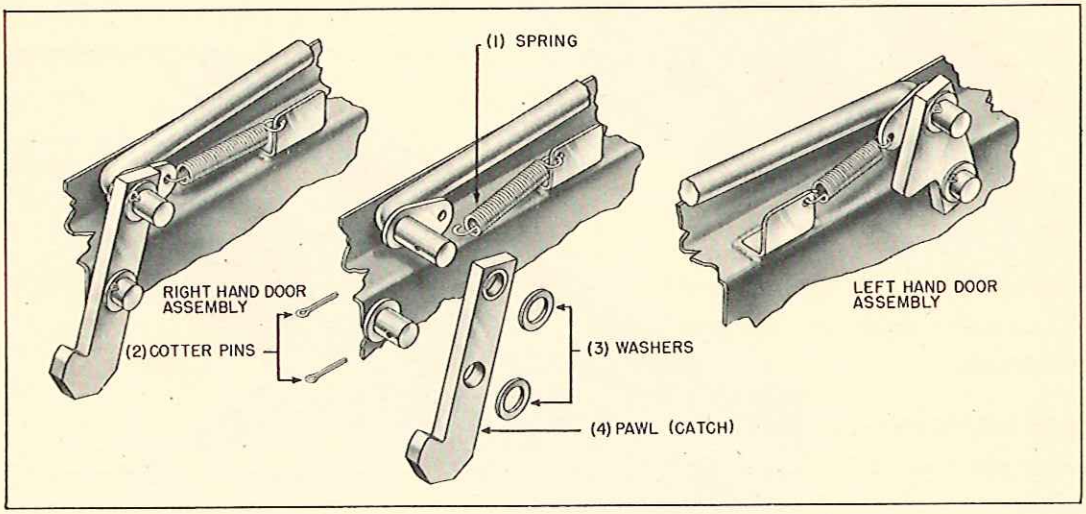

Fig. 8—Pawl (catch) (right- and left-hand), assemblies, right-hand exploded, TLD-2(crs) door.

HOW TO REPLACE PAWL (Catch), TLD-2(crs) DOOR (Fig. 8)

TO DIS-ASSEMBLE:

(1) Unhook spring from anchor.

(2) Remove two cotter pins.

(3) Remove two washers.

(4) Slide pawl off shaft.

TO RE-ASSEMBLE:

(4) Grease shaft and replace new pawl.

(3) Replace two washers.

(2) Insert two cotter pins.

(1) Hook spring to anchor.

Grease pawl and push tumbler in and out to test for positive action.

PAWL, TLD-3(ms) DOOR (Fig. 9)

The pawl on the TLD-3(ms) door is a plunger that drops into teeth of the ratchet when door is open, keeping the dogs in their proper place.

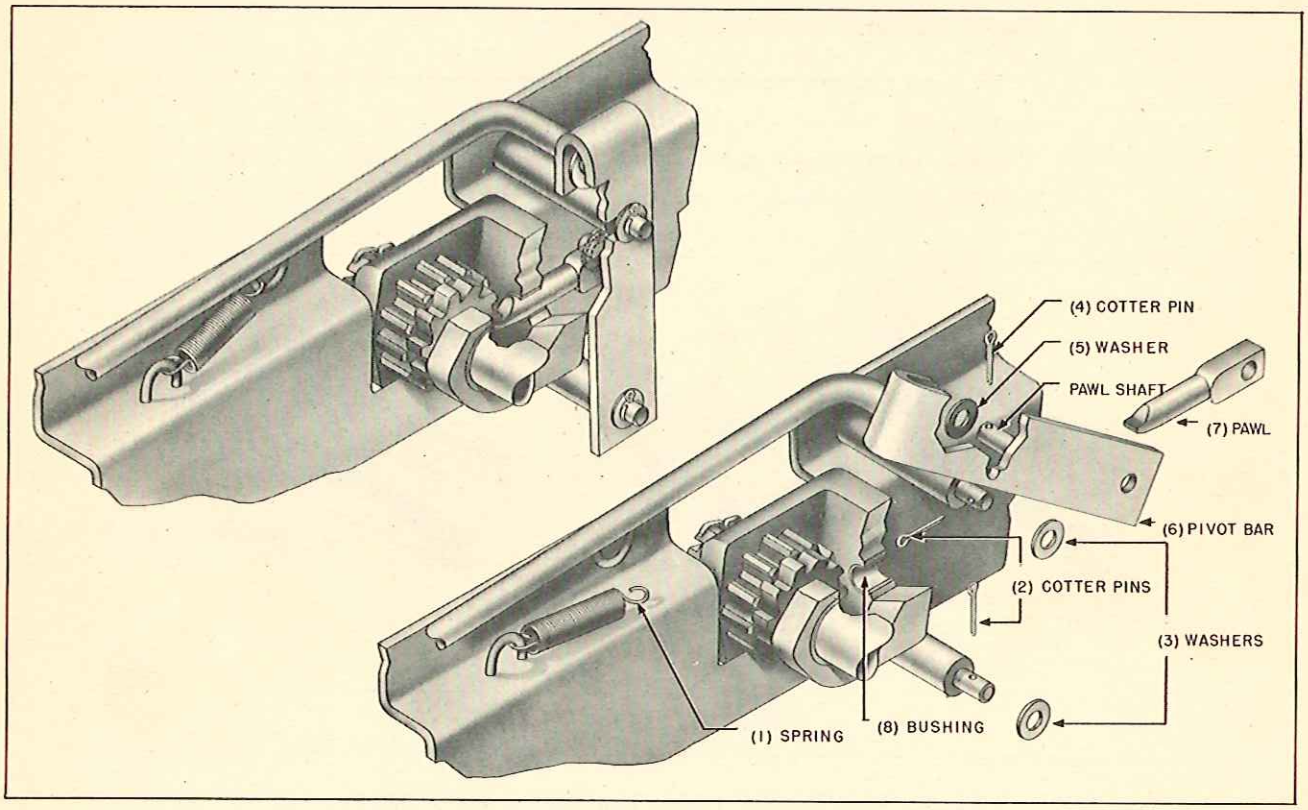

Fig. 9—Pawl, assembly and exploded views, TLD-3(ms) door.

HOW TO REPLACE PAWL, TLD-3(ms) DOOR (Fig. 9)

TO DIS-ASSEMBLE:

(1) Unhook spring from anchor.

(2) Remove two cotter pins.

(3) Remove two washers.

(4) Remove cotter pin from pawl shaft.

(5) Remove washer from pawl shaft.

(6) Lift up pivot bar.

(7) Pull out pawl.

(8) Inspect bushing, replace if necessary.

TO RE-ASSEMBLE:

(7) Grease new pawl and replace. (NOTE: Insert pawl so flat surface of pawl bears on flat surface of ratchet tooth.)

(6) Replace pivot bar, guiding pawl shaft into pawl.

(5) Replace washer on pawl shaft.

(4) Insert cotter pin in pawl shaft.

(3) Replace two washers.

(2) Insert two cotter pins.

(1) Hook spring to anchor.

Grease pawl contact point and test for positive action by pushing tumbler in and out.

SECTION 7

RATCHET (INSERT) REPLACEMENT

The ratchet is keyed to the pinion; when door is opened the pawl, or catch, drops into teeth of the ratchet preventing the hand-wheels being turned in the closed direction.

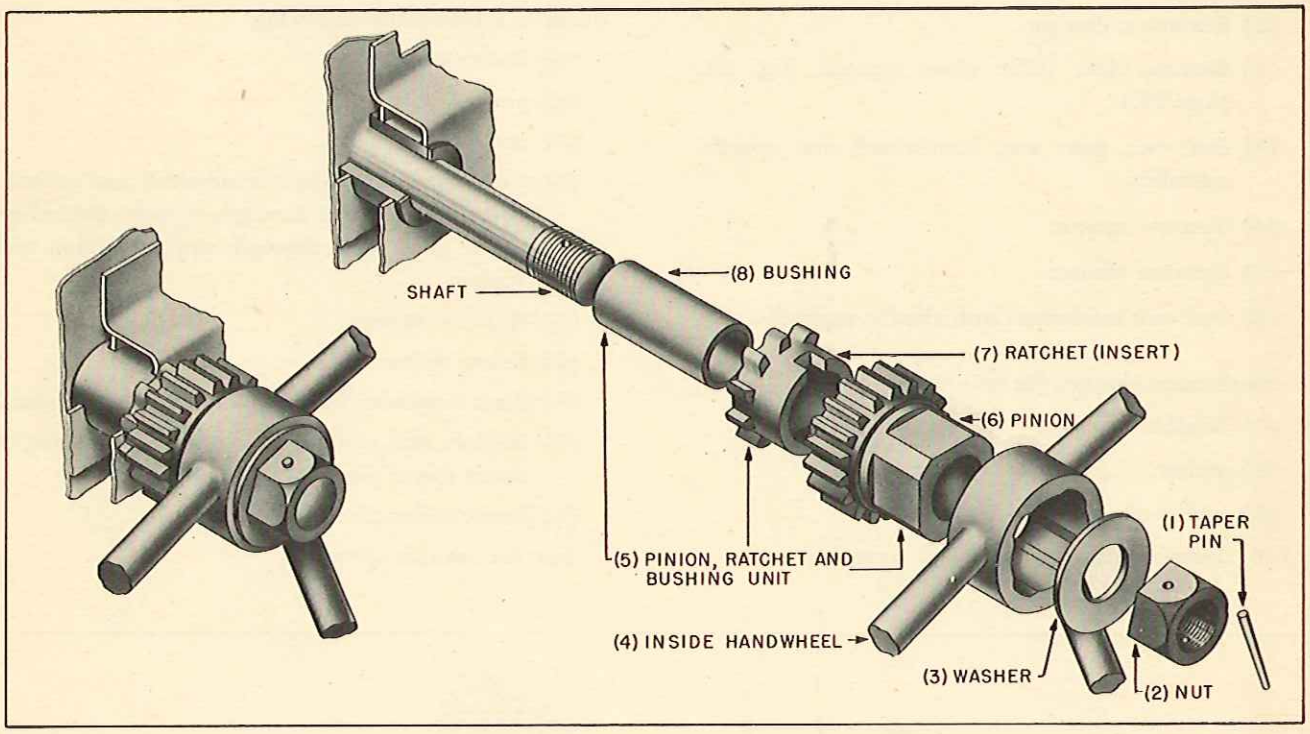

Fig. 10—Ratchet (insert), assembly and exploded views, TLD-2(crs) door.

HOW TO REPLACE RATCHET (Insert), TLD-2(crs) DOOR (Fig. 10)

TO DIS-ASSEMBLE:

(1) File off peen and remove taper pin.
(2) Remove nut.
(3) Remove washer.
(4) Slide off inside handwheel.
(5) From shaft, slide off pinion, ratchet and bushing as a unit.
(6) Remove pinion from unit.
(7) Pull ratchet from bushing.
(8) Inspect bushing, replace if worn.

TO RE-ASSEMBLE:

(7) Slide new ratchet on bushing.
(6) Insert pinion on bushing fitting into ratchet. (It is recommended new pinion be used.)
(5) Grease shaft and replace pinion, ratchet and bushing as a unit.
(4) Slide on inside handwheel.
(3) Replace washer.
(2) Pull nut on tight until hole of nut and shaft line up.
(1) Insert new taper pin and peen over small end.
Grease assembly and test for easy operation.

NOTE: ***The ratchet and pinion to be assembled, then the I. D. reamed to 1.128 inches $^{+.003}_{-.000}$ which will allow a press fit of the bushing when it is inserted.***

HOW TO REPLACE RATCHET, TLD-3(ms) DOOR (Fig. 11)

TO DIS-ASSEMBLE:

(1) Remove cotter pin.

(2) Remove nut. (Use offset wrench, Fig. 24, page 24.)

(3) Pull out, part way, handwheel and spindle assembly.

(4) Remove spacer.

(5) Remove washer.

(6) Pull out handwheel and spindle assembly.

Remove from support the following:

(7) Washer,

(8) pinion,

(9) and ratchet.

(10) Inspect bushings, replace if necessary.

TO RE-ASSEMBLE:

Insert in support the following:

(9) New rachet,

(8) pinion,

(7) and washer.

(6) Grease spindle, insert handwheel and spindle assembly part way through support, threading spline of spindle through ratchet, pinion and washer.

(5) Replace washer.

(4) Insert spacer.

(3) Push handwheel and spindle assembly in place.

(2) Replace nut, pull tight. Do not back off nut to insert cotter pin.

(1) Insert cotter pin.

Test for smooth operation.

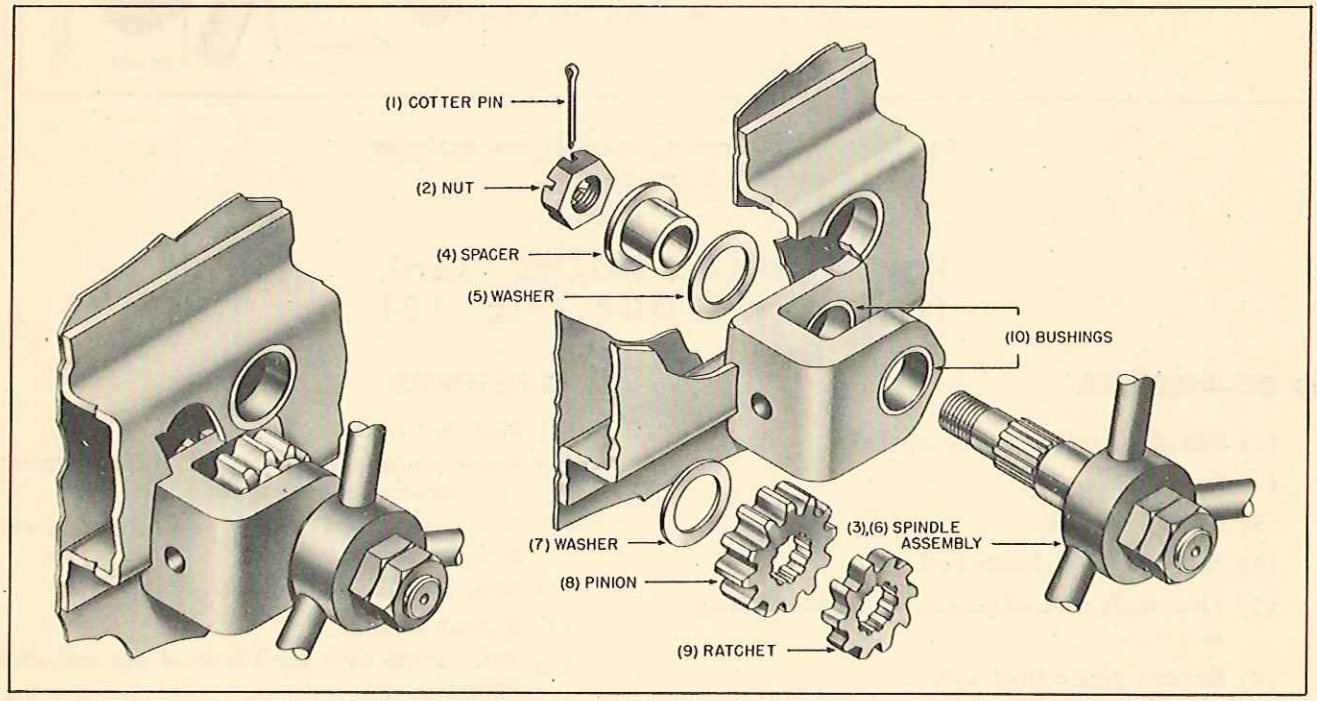

Fig. 11—Ratchet, assembly and exploded views, TLD-3(ms) door.

SECTION 8

PINION REPLACEMENT

PINIONS, TLD-2(crs) AND TLD-3(ms) DOORS

Both handwheel pinions are geared to the gear sector. Turning either handwheel rotates the gear sector. It is the reduction in gear ratio at this point that makes possible the easy operation of the door.

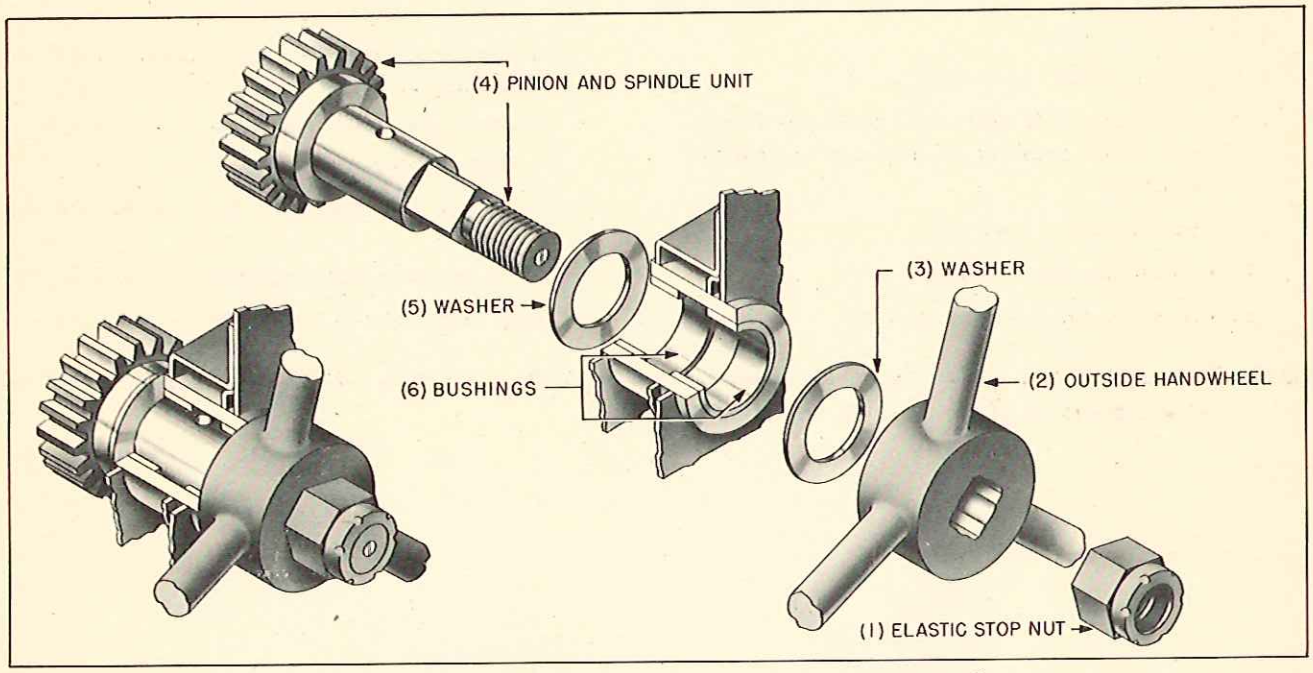

Fig. 12—Pinion (outside handwheel), assembly and exploded views, TLD-2(crs) door.

HOW TO REPLACE PINION (Outside Handwheel), TLD-2(crs) DOOR (Fig. 12)

TO DIS-ASSEMBLE:

From outside of door:

(1) Remove elastic stop nut.

(2) Slide off outside handwheel.

(3) Remove washer.

From inside of door:

(4) Pull out pinion and spindle unit (one piece).

(5) Remove washer.

(6) Inspect bushings and replace if worn.

TO RE-ASSEMBLE:

(5) Slide washer on new pinion and spindle unit.

(4) Grease spindle and replace new pinion and spindle unit.

From outside of door:

(3) Replace washer.

(2) Slide on outside handwheel.

(1) Screw on new elastic stop nut tight.

Grease gear of new pinion and test for smooth action.

Replace packing. (Fig. 23, page 23.)

HOW TO REPLACE PINION (Inside Handwheel), TLD-2(crs) DOOR (Fig. 13)

TO DIS-ASSEMBLE:

(1) File off peen and remove taper pin.

(2) Remove nut.

(3) Remove washer.

(4) Slide off inside handwheel.

(5) From shaft, slide off pinion, ratchet and bushing as a unit (bushing holds pinion and ratchet together).

(6) Remove ratchet from unit.

(7) Pull pinion from bushing.

(8) Inspect bushing, replace if worn.

TO RE-ASSEMBLE:

(7) Slide new pinion on bushing.

(6) Insert ratchet on bushing and fit into pinion (it is recommended new ratchet be used).

(5) Grease shaft and replace pinion, ratchet and bushing as a unit.

(4) Slide on inside handwheel.

(3) Replace washer.

(2) Pull nut on tight until hole of nut and shaft line up.

(1) Insert new taper pin and peen over small end.

Grease assembly and test for free action.

NOTE: ***The ratchet and pinion to be assembled, then the I. D. reamed to 1.128 inches $^{+.003}_{-.000}$ which will allow a press fit of the bushing when it is inserted.***

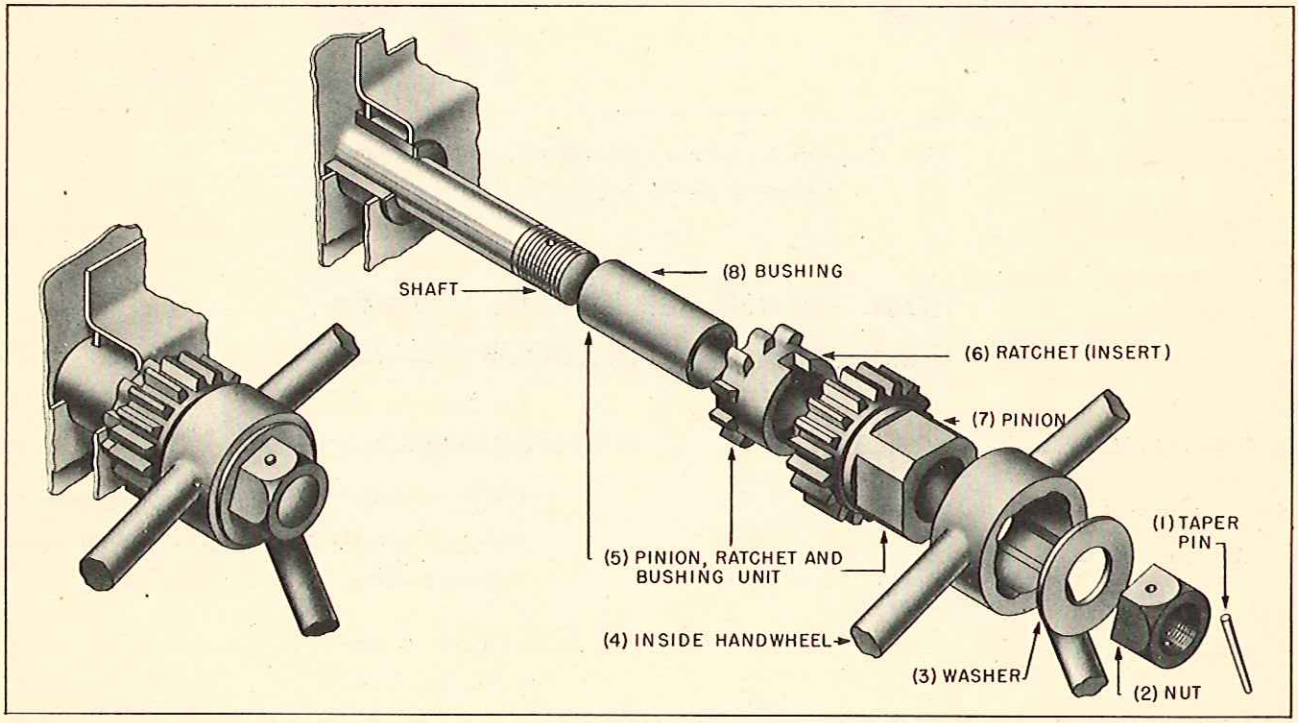

Fig. 13—Pinion (inside handwheel), assembly and exploded views, TLD-2(crs) door.

HOW TO REPLACE PINION (Outside Handwheel), TLD-3(ms) DOOR (Fig. 14)

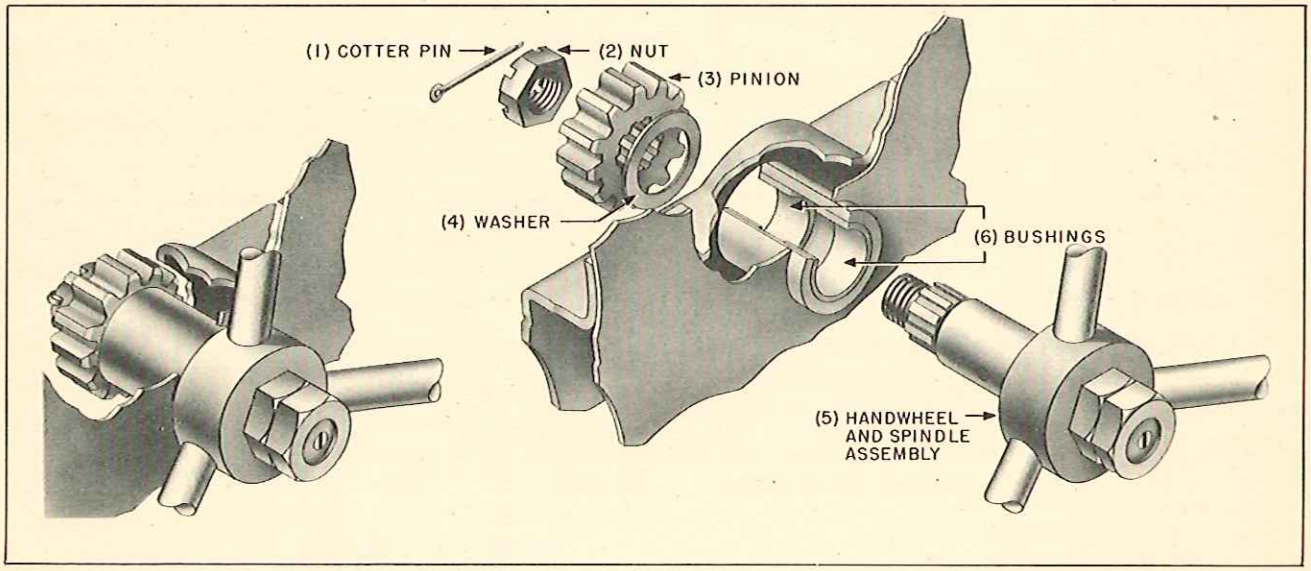

Fig. 14—Pinion (outside handwheel), assembly and exploded views, TLD-3(ms) door.

TO DIS-ASSEMBLE:

From inside of door:

(1) Remove cotter pin.

(2) Remove nut.

(3) Pull out pinion.

(4) Remove washer.

From outside of door:

(5) Pull out handwheel and spindle assembly.

(6) Inspect bushings, replace if necessary.

TO RE-ASSEMBLE:

(5) Grease spindle and replace handwheel and spindle assembly.

From inside of door:

(4) Replace washer.

(3) Slide on new pinion.

(2) Replace nut, pull tight.

(1) Insert cotter pin.

Grease pinion teeth and test for smooth operation.

Replace packing. (Fig. 23, page 23.)

HOW TO REPLACE PINION (Inside Handwheel), TLD-3(ms) DOOR (Fig. 15)

TO DIS-ASSEMBLE:

(1) Remove cotter pin.

(2) Remove nut. (Use offset wrench, Fig. 24, page 24.)

(3) Pull out, part way, handwheel and spindle assembly.

(4) Remove spacer.

(5) Remove washer.

(6) Pull out handwheel and spindle assembly.

Remove from support, following:

(7) Washer,

(8) pinion,

(9) and ratchet.

(10) Inspect bushings, replace if necessary.

TO RE-ASSEMBLE:

Insert in support, and hold in place, following:

(9) Ratchet,

(8) new pinion,

(7) and washer.

(6) Grease spindle, insert handwheel and spindle assembly part way through support, threading spline of spindle through ratchet, pinion and washer.

(5) Replace washer.

(4) Insert spacer.

(3) Push handwheel and spindle assembly in place.

(2) Replace nut, pull tight. Do not back off nut to insert cotter pin.

(1) Replace cotter pin.

Test for easy operation.

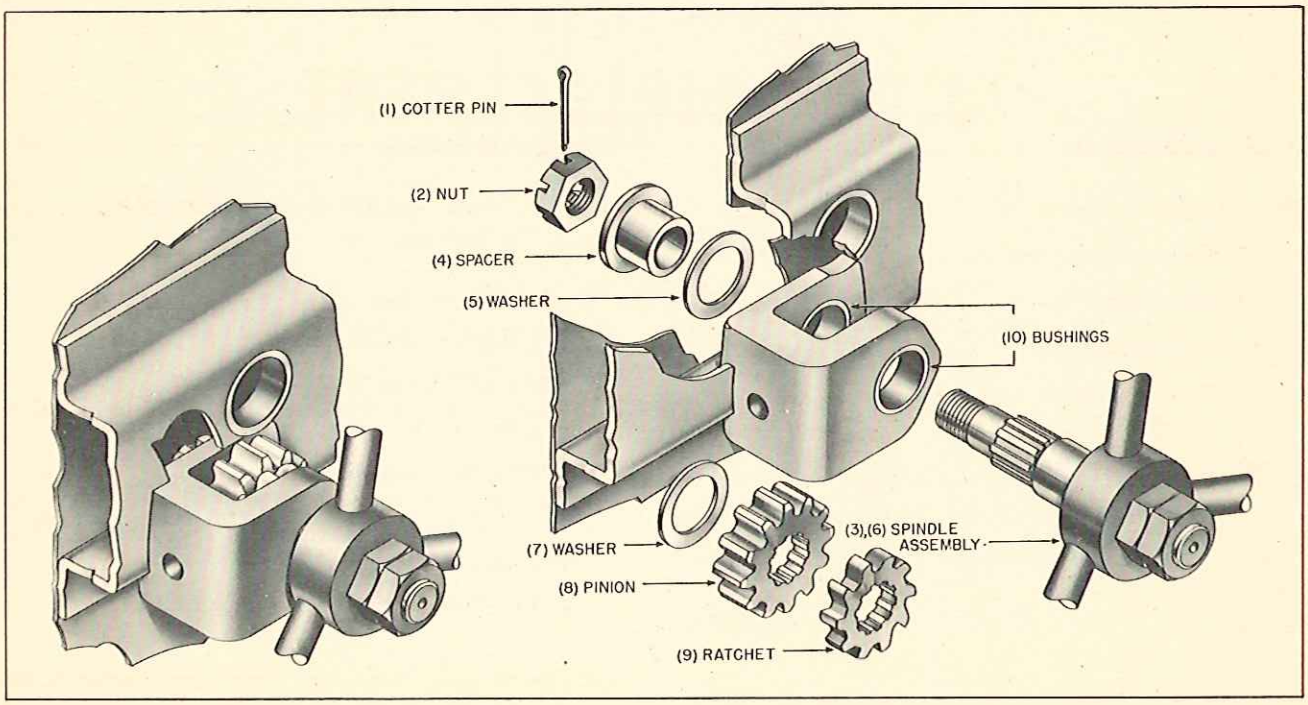

Fig. 15—Pinion (inside handwheel), assembly and exploded views, TLD-3(ms) door.

SECTION 9

BUSHING REPLACEMENT

BUSHINGS, TLD-2(crs) AND TLD-3(ms) DOORS

The bushings on both doors act as bearings for the moving parts. The bushings are made of oil-impregnated metals, and are self-lubricating.

In replacing all parts, inspection of bushings should be routine. Replacement of a faulty bushing is necessary to eliminate excessive play.

HOW TO REPLACE BUSHING, TLD-2(crs) AND TLD-3(ms) DOORS (Fig. 16)

To remove bushing:

Inspect bushings for wear, cracks, breaks, or sloppy fit.

Remove bad bushing. (NOTE: Bushings are pressed fit; some may be pulled out with the fingers; others must be driven out.)

To replace bushing:

Insert new bushing; see spare parts list, pages 25 and 26, for proper bushing. (NOTE: The bushing sets illustrated in Fig. 24, page 24, are helpful in setting bushings. Always hold bushing set in bushing before hammering in place. Fig. 16.)

Always test for neat fit after setting new bushing.

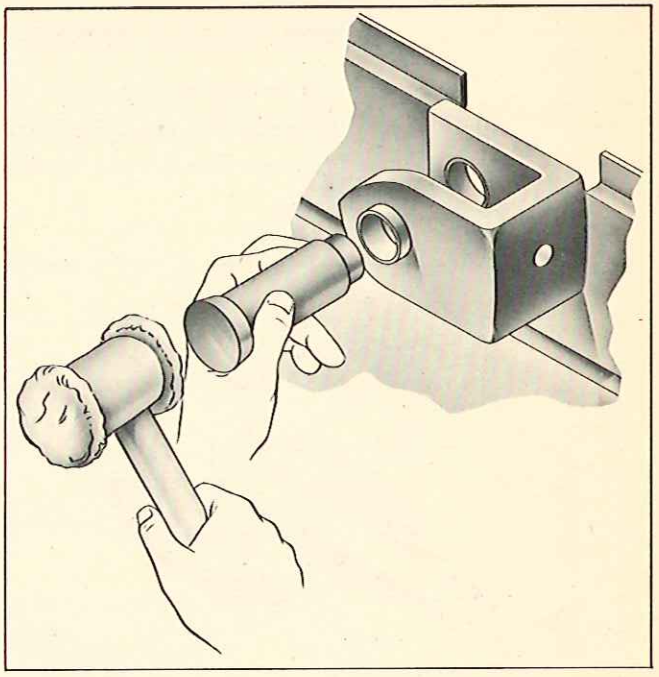

Fig. 16—Replacing bushing.

SECTION 10

WEDGE REPLACEMENT

WEDGE, TLD-2(crs) AND TLD-3(ms) DOORS (Fig. 17)

The wedge has a sloping surface upon which the dog slides; here is where the pressure originates which forces the knife edge of frame into the rubber gasket, making the door water-tight.

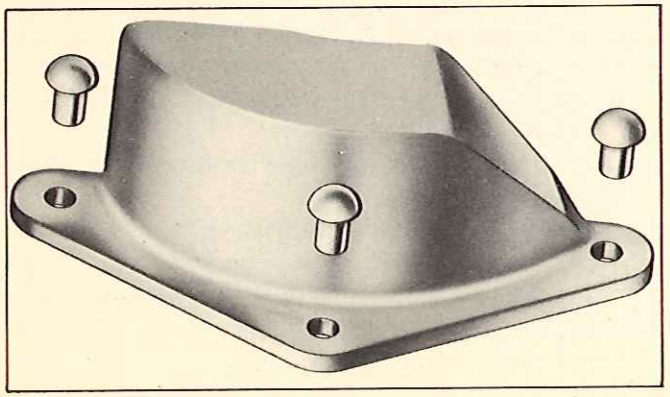

Fig. 17—Wedge and rivets, TLD-3 (ms) doors.

HOW TO REPLACE WEDGE, TLD-2(crs) AND TLD-3(ms) DOORS

To dis-assemble:

First—Chip off the heads of the three rivets.

Next—Remove wedge.

Now—Clean surface of frame where wedge seats.

To re-assemble:

Next—Replace with new wedge that has been filled with calking compound, Type I, N. D. Specification 52C12.

Finally—Insert new rivets and head over.

NOTE: ***Be sure rivets are tight and wedge is snug in place. (Some of the wedges may be of malleable iron which was used during the "critical material" period; all wedge replacements are now of bronze.)***

SECTION 11

DOG REPLACEMENT AND ADJUSTMENT

DOG, TLD-2 (crs) AND TLD-3 (ms) DOORS

The dog moving up on the wedge creates the water-tight seal. If the door is operating correctly, all the dogs move together and exert an even pressure between the frame knife edge and rubber gasket.

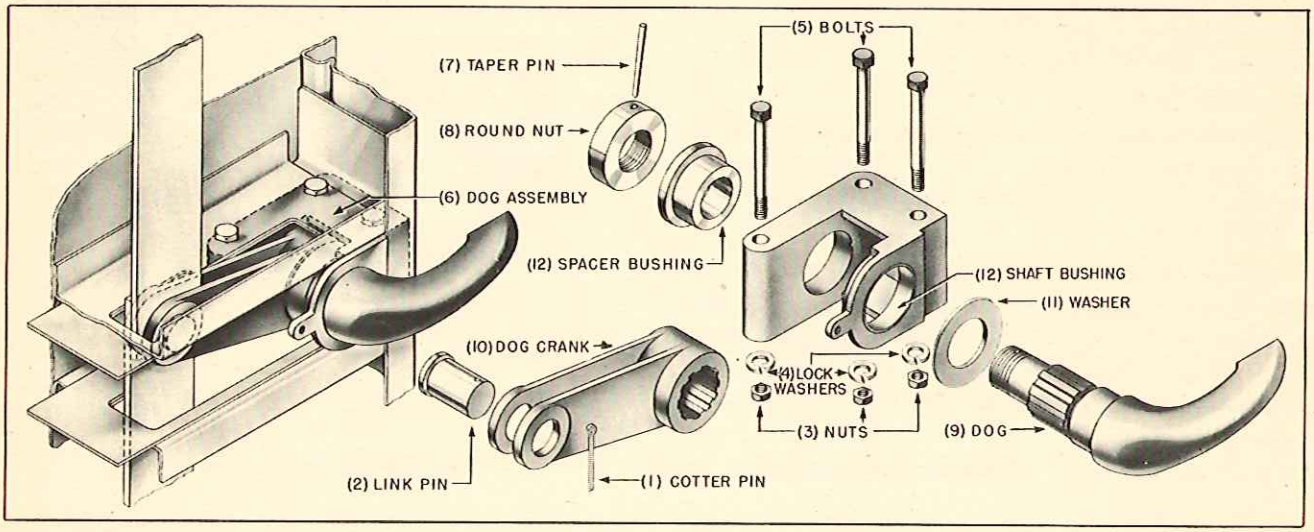

Fig. 18—Dog, assembly and exploded views, TLD-2 (crs) door.

HOW TO REPLACE DOG, TLD-2 (crs) DOOR (Fig. 18)

TO DIS-ASSEMBLE:

First relieve link tension (Fig. 7, page 9).

(1) Remove cotter pin.
(2) Pull out link pin.
(3) Back off three nuts.
(4) Remove three lock washers.
(5) Pull out dog support bolts.
(6) Lift out dog assembly.
(7) File off peen and remove taper pin.
(8) Remove round nut.
(9) Pull out dog.
(10) Remove dog crank.
(11) Remove washers.
(12) Check spacer bushing and shaft bushing. Replace if worn.

TO RE-ASSEMBLE:

(11) Put washer on dog.
(10) Replace dog crank in support.
(9) Grease shaft of new dog and insert in dog support, guiding spline of dog shaft through dog crank and spacer bushing. Be sure that dog angle is in proper relationship to the wedge.
(8) Replace round nut, pull tight until hole of nut and shaft line up.
(7) Insert new taper pin and peen over small end.
(6) Replace dog assembly.
(5) Replace three dog support bolts.
(4) Slide three lock washers on bolts.
(3) Replace and tighten three nuts on bolts.
(2) Grease and replace link pin.
(1) Insert cotter pin in link pin.

Replace link tension (Fig. 7, page 9).
Test for positive action.

HOW TO REPLACE DOG, TLD-3(ms) DOOR (Fig. 19)

TO DIS-ASSEMBLE:

First relieve link tension (Fig. 7, page 9).

(1) Remove cotter pin from link pin.

(2) Remove link pin.

(3) Remove cotter pin from dog spindle.

(4) Remove nut (use offset wrench, Fig. 24, page 24).

(5) Pull out dog.

(6) Pull out spacer, crank, spacer and crank.

(7) Remove spacer.

(8) Remove washers.

(9) Inspect bushings, replace if worn.

TO RE-ASSEMBLE:

(8) Replace washers.

(7) Replace spacer.

(6) Insert in support spacer, crank, spacer and crank.

(5) Grease shaft of new dog and insert in dog support, guiding spline of dog shaft through dog cranks, spacers and spacer crank. Be sure that dog angle is in proper relationship to the wedge.

(4) Replace nut and pull tight to line up cotter pin holes. Do not back off nut to insert cotter pin.

(3) Insert cotter pin.

(2) Replace link pin.

(1) Insert cotter pin in link pin.

Restore tension (Fig. 7, page 9).

Test mechanism for positive action.

NOTE: ***Cranks replace spacers on all corner dogs.***

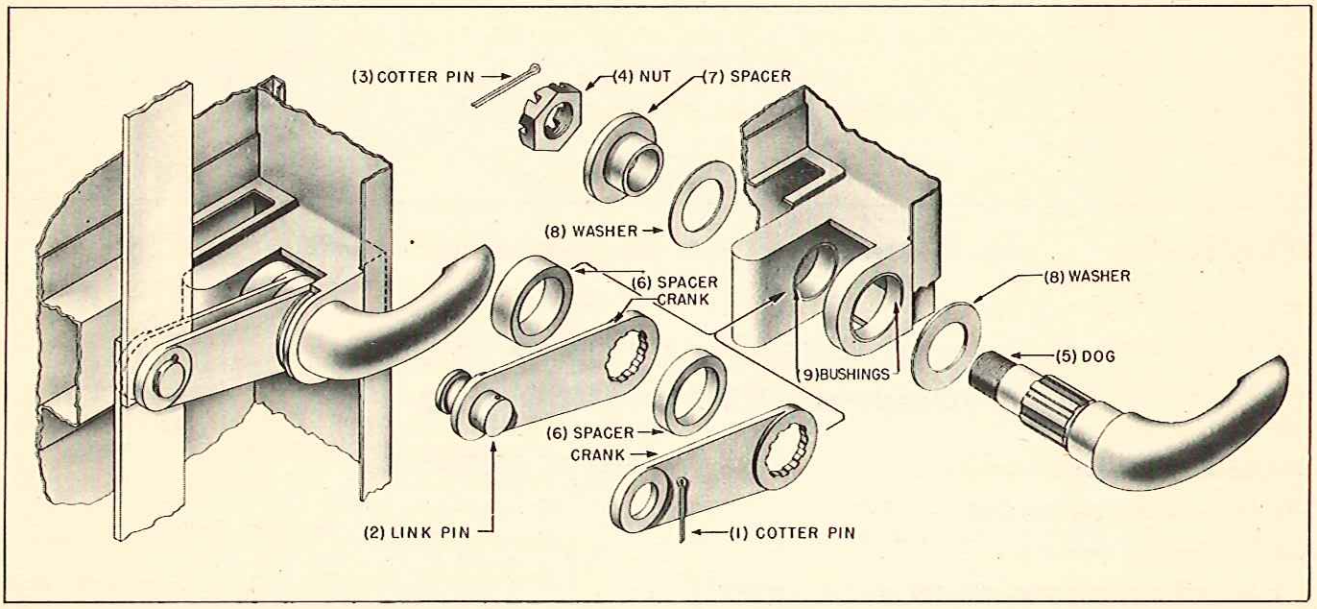

Fig. 19—Dog, assembly and exploded views, TLD-3(ms) door.

NOTE: ***When adjustment of dogs is necessary, it can be effected by rearrangement of washer (11) on Figure 18 or washers (8) on Figure 19.***

SECTION 12

GEAR SECTOR REPLACEMENT

GEAR SECTOR (Quadrant), TLD-2(crs) AND TLD-3(ms) DOORS

The gear sector is the direct drive that pulls the links which drag the dogs into securing, or water-tight, position.

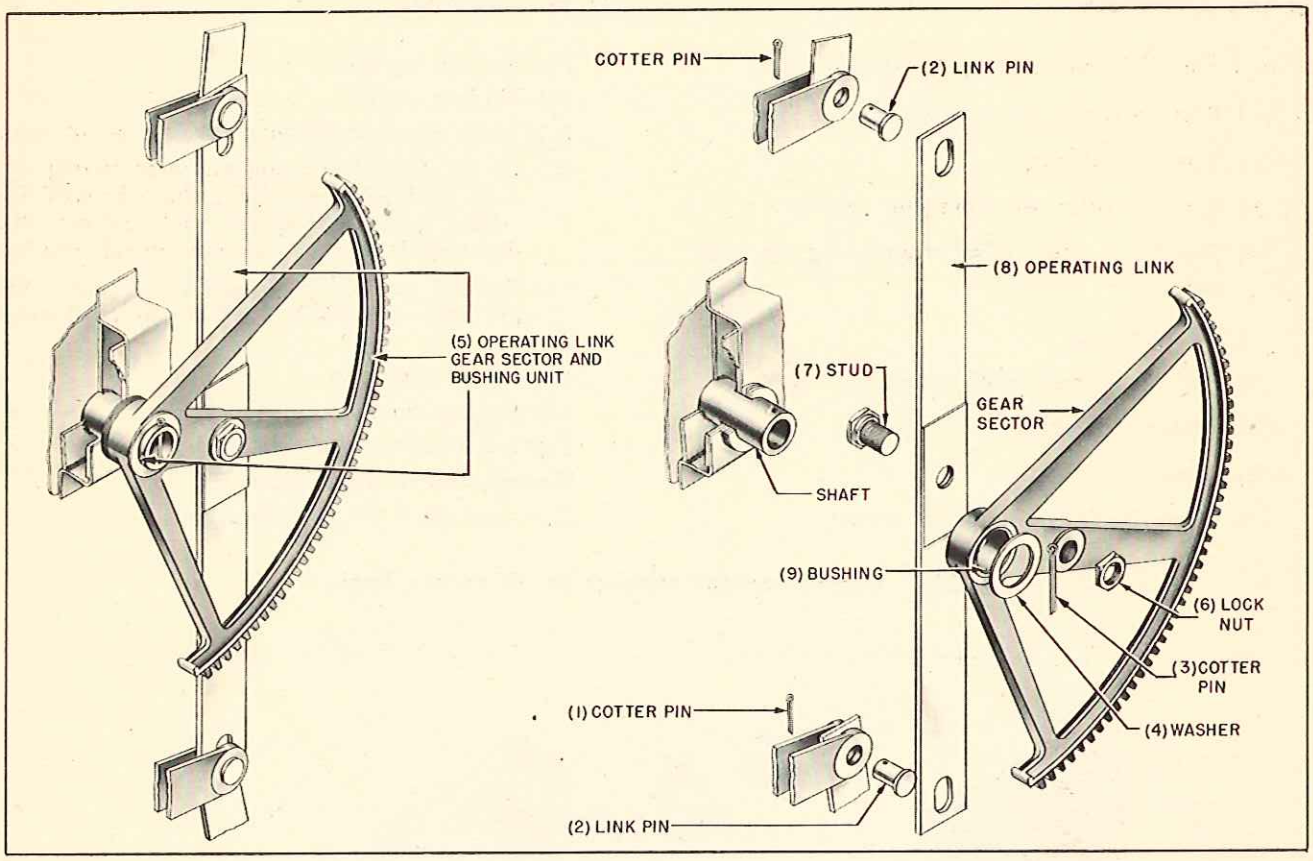

Fig. 20—Gear sector (quadrant), assembly and exploded views, TLD-2(crs) doors.

HOW TO REPLACE GEAR SECTOR (Quadrant), TLD-2(crs) DOOR (Fig. 20)

TO DIS-ASSEMBLE:

First relieve link tension (Fig. 7, page 9).

(1) Remove cotter pin from each end of operating link.
(2) Pull out link pin from each end of operating link.
(3) Remove cotter pin from shaft.
(4) Pull washer off shaft.
(5) From shaft, lift out operating link, gear sector and bushing as a unit.
(6) Back off lock nut.
(7) Back out stud.
(8) Lift operating link off gear sector.
(9) Check bushing, replace if worn.

TO RE-ASSEMBLE:

(8) Replace operating link on new gear sector.
(7) Grease and replace stud. Pull tight.
(6) Screw on lock nut, pull tight.
(5) Grease shaft and replace bushing, gear sector and operating link as a unit.
(4) Replace washer on shaft.
(3) Insert cotter pin in shaft.
(2) Grease and replace link pin in each end of operating link.
(1) Insert cotter pin in each link pin.

Replace link tension (Fig. 7, page 9).

Grease teeth of new gear sector and test for smooth operation.

HOW TO REPLACE GEAR SECTOR (Quadrant), TLD-3(ms) DOOR (Fig. 21)

TO DIS-ASSEMBLE:

First relieve link tension (Fig. 7, page 9).

(1) Remove cotter pin from each end of operating link.

(2) Remove link pin from each end of operating link.

(3) Back out stud set screw.

(4) Back off gear sector stud.

(5) Lift off operating link.

(6) Remove cotter pin from shaft.

(7) Remove washer from shaft.

(8) Lift out gear sector and bushing as a unit.

TO RE-ASSEMBLE:

(8) Grease shaft, insert new gear sector and bushing as a unit.

(7) Replace washer on shaft.

(6) Insert cotter pin in shaft.

(5) Replace operating link.

(4) Grease and replace gear sector stud. Pull tight.

(3) Replace stud set screw, turn tight.

(2) Grease and replace link pin in each end of operating link.

(1) Insert two cotter pins in two link pins.

Replace link tension (Fig. 7, page 9).

Grease teeth of new gear sector and test for easy operation.

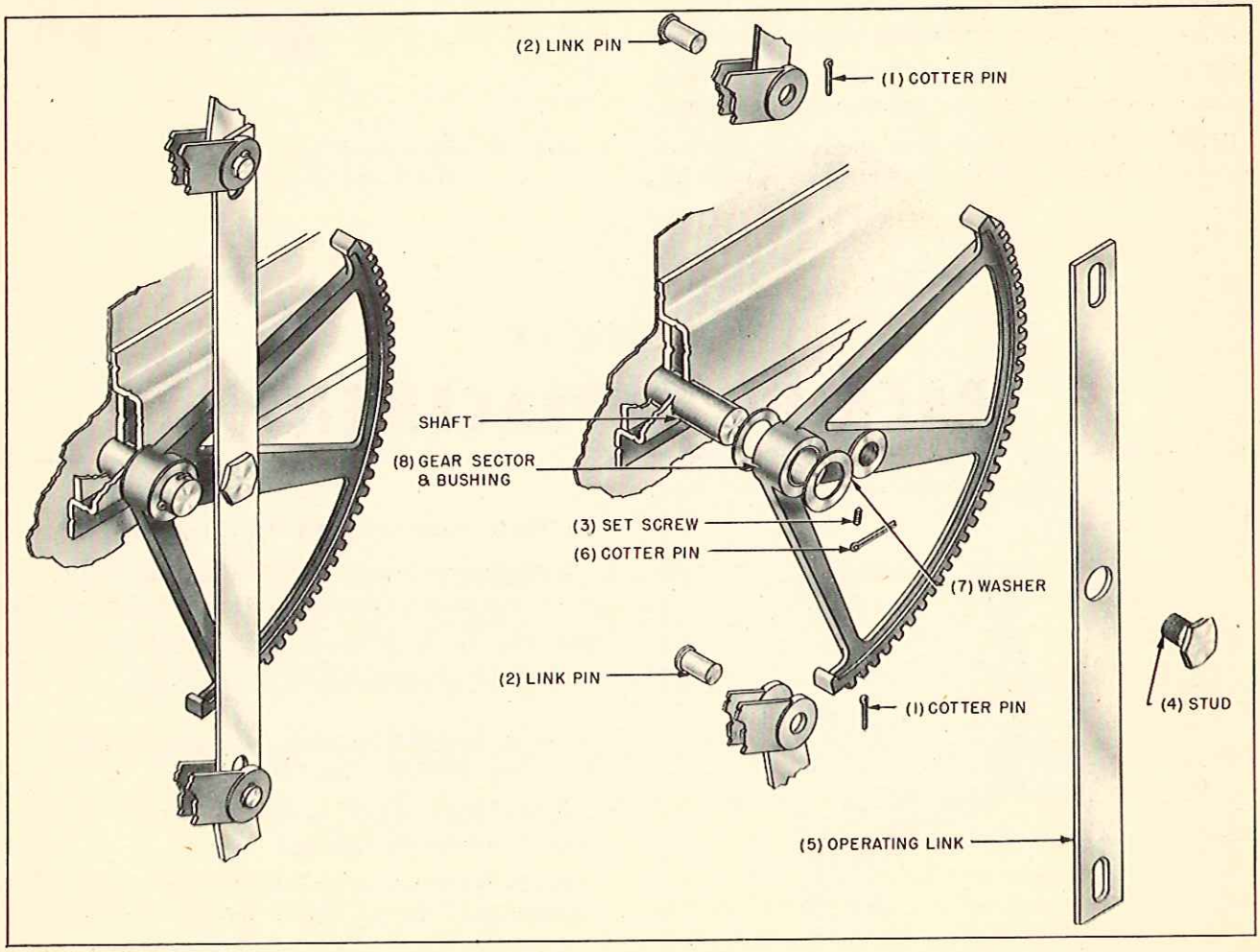

Fig. 21—Gear sector (quadrant), assembly and exploded views, TLD-3(ms) door.

SECTION 13

RUBBER GASKET REPLACEMENT

RUBBER GASKET, TLD-2(crs) DOOR AND TLD-3(ms) DOOR (Fig. 22)

The rubber gasket on the door is the seal that insures a water-tight door. Keep it free from grease, rust and paint. If it is dead and needs replacement, don't neglect it, REPLACE IT WITHOUT DELAY. (½" x 1¼" for both doors.)

RUBBER GASKET REPLACEMENT, TLD-2(crs) DOOR AND TLD-3(ms) DOOR (Fig. 22)

To remove rubber gasket:

Insert screwdriver at gasket joint (gasket joint should be under dog on hinge side of door), pry out one end, pull out old gasket.

To replace rubber gasket:

Make sure gasket seat in door is clean.

Replace gasket, using soft hammer and wooden wedge.

NOTE: Do not stretch gasket when replacing. Make gasket 1" longer than required and then force it in place.

HINT: Wipe gasket with water and it will slide into place easily. Test all around to be sure gasket is under lip.

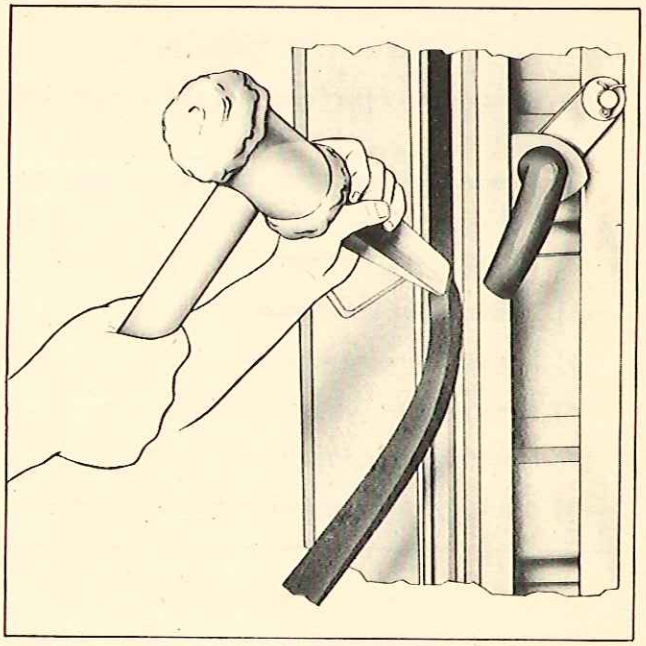

Fig. 22—Replacing rubber gasket, TLD-2(crs) and TLD-3(ms) doors.

SECTION 14

PACKING REPLACEMENT

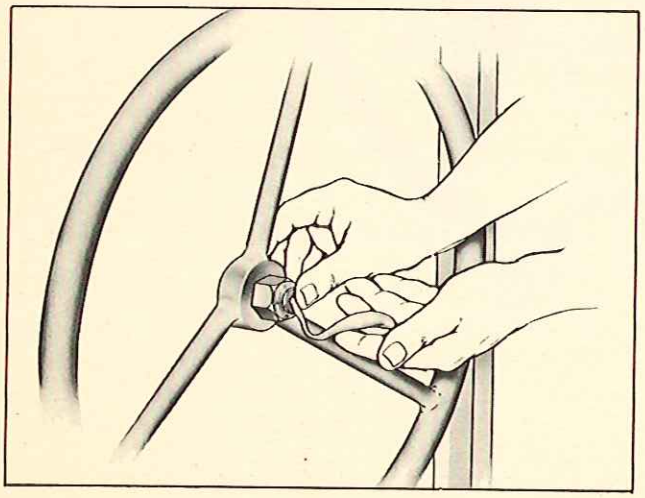

Fig. 23—Replacing packing.

PACKING, TLD-2(crs) AND TLD-3(ms) DOORS

The packing creates the water-tight seal at the point where the outside handwheel spindle enters the door.

(NOTE: Its condition should be checked every two weeks.) (N. D. Spec. 33P29, symbol 1425.)

HOW TO REPLACE PACKING, TLD-2(crs) AND TLD-3(ms) DOORS (Fig. 23)

First—From outside handwheel spindle, outside of door, remove packing plunger.

Next—Roll packing by hand into string form of correct size and force into hole of spindle.

Finally—Replace packing plunger, screw flush to handwheel spindle, forcing packing in place.

SECTION 15

SPARE PARTS AND AIDS

Wear, tear, and salt air wage a continuous attack upon the door and make repairs and part replacements necessary at sea. In emergencies it may be necessary to fabricate a part; therefore, there is included a list, with description, specification and heat treatment of spare parts.

Specifications of spare parts are covered under Section 17.

Abbreviations used throughout book are shown in Section 18.

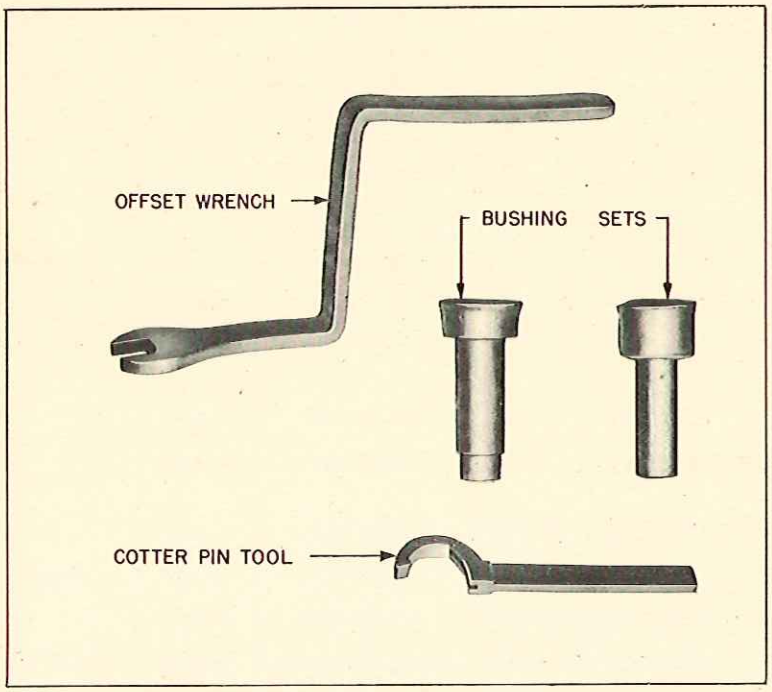

Fig. 24—Helpful tools.

The tools shown in Fig. 24 are helpful. They can be fabricated aboard ship. The wrench is made of 3/8" stock, 1 1/4" wide, has a 1 1/4" throat, 6 1/4" extension on the horizontal, 6 1/4" vertical rise and a 7 1/4" handle. The bushing sets are merely pieces of steel bar. The cotter pin tools may be made in various sizes and shapes.

SECTION 16

SPARE PARTS LIST

TLD-2(crs) SPARE PARTS, ALPHABETICALLY ARRANGED

PART	MFR'S PART NUMBER	MATERIAL	NAVY SPEC.	REMARKS	MFR'S DWG. NO.
Bushings					
bushing, dog ..... (Fig. 18)	465338	Oil-impregnated bronze	Com.	Oilite A1210-3	465318
bushing, gear sector ..... (Fig. 20)	461316	Oil-impregnated bronze	Com.	Oilite A1604-1	465318
bushing, outside pinion... (Fig. 12)	461314	Oil-impregnated bronze	Com.	Oilite A1320-1	465318
bushing, inside pinion.... (Fig. 13)	461315	Oil-impregnated bronze	Com.	Oilite A1108-5	465318
bushing, dog spacer..... (Fig. 18)	465339	Oil-impregnated bronze	Com.	Oilite (special)	465342
Dog ..... (Fig. 18)	491291	COMP MA-c	note 3	Casting	491289
Gear sector (quadrant)..... (Fig. 20)	465309	COMP Al-c	note 2	Precision casting	491384
Pawl (catch)					
pawl, left-hand door ..... (Fig. 8)	471071	Alloy steel	note 4	5/16"	471071
pawl, right-hand door.... (Fig. 8)	471070	Alloy steel	note 4	5/16"	471070
Pinion					
pinion, outside handwheel. (Fig. 12)	487721	COMP MA-c	note 3	Casting	491264
pinion, inside handwheel.. (Fig. 13)	465234	COMP Al-c	note 2	Precision casting	491299
Ratchet (insert) ..... (Fig. 10)	465233	Alloy steel	note 5	F. A. O.	465233
Rivet, wedge..... (Fig. 17)	490059	Brass, dead soft	note 9	5/16" dia. x 5/8" long	489456
Wedge ..... (Fig. 17)	465305	COMP Al-c	note 1	Precision casting	465305

NOTE: *TLD-2(crs) Door, Mfr's Drawing Numbers, N-2208-081 and N-2208-082*
References to notes will be found in Section 17, Pages 27 and 28.

TLD-2(crs) SPARE PARTS, NUMERICALLY ARRANGED

MFR'S PART NUMBER	PART
461314	Bushing, pinion
461315	Bushing, shaft
461316	Bushing, gear sector
465233	Ratchet (insert)
465234	Pinion, inside handwheel
465305	Wedge
465309	Gear sector (quadrant)

MFR'S PART NUMBER	PART
465338	Bushing, dog
465339	Bushing, spacer
471070	Pawl, right-hand door
471071	Pawl, left-hand door
487721	Pinion, outside handwheel
490059	Rivet, wedge
491291	Dog

TLD-3(ms) SPARE PARTS, ALPHABETICALLY ARRANGED

PART	MFR'S PART NUMBER	MATERIAL	NAVY SPEC.	REMARKS	MFR'S DWG. NO.
Bushings					
bushing, dog.....(Fig. 19)	493140	Oil-impregnated metal	Com.	Oilite S-1310	493141
bushing, gear sector.....(Fig. 21)	493140	Oil-impregnated metal	Com.	Oilite S-1310	493141
bushing, pawl.....(Fig. 9)	495069	Oil-impregnated metal	Com.	Oilite S-603	493141
Dog.....(Fig. 19)	495068	Alloy steel	note 6	Forging	495025
Gear sector (quadrant)....(Fig. 21)	493118	COMP Al-c	note 2	Precision Casting	493116
Pawl.....(Fig. 9)	495771	Alloy steel	note 7	½" dia.	495808
Pinions					
pinions, outside handwheel. (Fig. 14)	493125	Carbon steel	note 8		493125
pinion, inside handwheel..(Fig. 15)	493125	Carbon steel	note 8		493125
Ratchet.....(Fig. 11)	495769	Alloy steel	note 5		495811
Rivet, wedge.....(Fig. 17)	490060	Brass, dead soft	note 9	5/16" dia. x 11/16" long	489456
Wedge.....(Fig. 17)	495526	COMP Al-c	note 1	Precision casting	617849

NOTE: *TLD-3(ms) Doors, Mrf's Drawing Numbers, N-2208-026 and N-2208-028.*
References to notes will be found in Section 17, Pages 27 and 28.

TLD-3(ms) SPARE PARTS, NUMERICALLY ARRANGED

MFR'S PART NUMBER	PART
490060	Rivet, wedge
493118	Gear sector (quadrant)
493125	Pinion, outside and inside handwheel
493140	Bushing, dog and gear sector

MFR'S PART NUMBER	PART
495068	Dog
495069	Bushing, pawl
495526	Wedge
495769	Ratchet
495771	Pawl

SECTION 17

SPECIFICATIONS

NOTE #1
NAVY SPEC. 46-B-18 modified as follows:

CHEMICAL	Copper . . . . . 81½% to 83½% Aluminum . . . . . 10½% to 11½% Manganese . . . . . 1 % to 1½% Iron . . . . . 4½% to 5½%
PHYSICAL	Ultimate tensile . . . 70,000 #/sq. in. min. Yield point . . . . . 40,000 #/sq. in. min. Elongation in 2" . . . . . 7% min. Brinell No. . . . . 160 min.

NOTE #2
NAVY SPEC. 46-B-18 modified as follows:

CHEMICAL	Copper . . . . . 63% to 68% Aluminum . . . . . 4% to 6% Manganese . . . . . 4% to 6% Iron . . . . . 2% to 3½% Zinc . . . . . 19% to 25%
PHYSICAL	Ultimate tensile . . 100,000 #/sq. in. min. Yield point . . . . . 60,000 #/sq. in. min. Elongation in 2" . . . . . 7% Brinell No. . . . . 190 min.
HEAT TREATMENT	After machining, casting to be given the following normalizing treatment: Insert casting in oven heated to 750° F, hold for 30 minutes, then cool in still air.

NOTE #3
NAVY SPEC. 46-B-29 modified as follows:

CHEMICAL	Copper . . . . . 61% to 68% Aluminum . . . . . 3% to 6% Manganese . . . . . 2½% to 5% Iron . . . . . 2% to 4% Zinc . . . . . remainder
PHYSICAL	Ultimate tensile . . 110,000 #/sq. in. min. Yield point . . . . . 60,000 #/sq. in. min. Elongation in 2" . . . . . 12% min.
HEAT TREATMENT	After machining, casting to be given the following normalizing treatment: Insert casting in oven heated to 750° F, hold for 30 minutes, then cool in still air.

NOTE #4
SAE X4130

CHEMICAL	Carbon . . . . . .28% to .33% Manganese . . . . . .40% to .60% Phosphorus . . . . . .040 max. Sulphur . . . . . .040 max. Silicon . . . . . .20% to .35% Chromium . . . . . .80% to 1.10% Molybdenum . . . . . .15% to .25%
HEAT TREATMENT	Quench in oil from 1525° F to 1575° F and temper to 40-50 Rockwell C. To be performed in a controlled atmosphere or by immersion to keep scale to an absolute minimum.

NOTE #5
SAE 3140

CHEMICAL	Carbon . . . . . .38% to .43% Manganese . . . . . .70% to .90% Phosphorus . . . . . .040% max. Sulphur . . . . . .040% max. Silicon . . . . . .20% to .35% Nickel . . . . . 1.10% to 1.40% Chromium . . . . . .55% to .75%
HEAT TREATMENT	Quench in oil from 1475° F to 1525° F and temper to 40-50 Rockwell C. To be performed in a controlled atmosphere or by immersion to keep scale to an absolute minimum.

NOTE #6
SAE 1340

CHEMICAL	Carbon . . . . . .38% to .43% Manganese . . . . . 1.60% to 1.90% Phosphorus . . . . . .040% max. Sulphur . . . . . .040% max. Silicon . . . . . .20% to .35%
HEAT TREATMENT	Quench in oil from 1525° F to 1575° F and temper to the following physical properties: Yield point . . . . . 110,000 min. Ultimate tensile, 113,000 to 140,000 #/sq. in. Rockwell C. . . . . 25-30 Elongation in 2" . . . . . 18% to 22%

NOTE #7
SAE 4140

CHEMICAL	Carbon ..... .38% to .43% Manganese ..... .75% to 1.00% Phosphorus ..... .040 max. Sulphur ..... .040 max. Silicon ..... .20% to .35% Chromium ..... .80% to 1.10% Molybdenum ..... .15% to .25%
HEAT TREATMENT	Quench in oil from 1550° F to 1600° F and temper to 38-43 Rockwell C.

NOTE #8
SAE 1045

CHEMICAL	Carbon ..... .43% to .50% Manganese ..... .60% to .90% Phosphorus ..... .040 max. Sulphur ..... .050 max.
HEAT TREATMENT	Quench in oil from 1475° F to 1550° F and temper to 20-30 Rockwell C. To be performed in a controlled atmosphere or by immersion to keep scale to an absolute minimum.

NOTE #9
NAVY SPEC. 43-R-4
Rivets, nonferrous, for hull construction

No chemical
No physical
Material as specified in order

SECTION 18

ABBREVIATIONS

Com	Commercial
Comp Al-c	Aluminum Bronze Casting
Comp MA-c	Aluminum Manganese Bronze Casting
crs	Corrosion-resisting Steel
dia	Diameter
dwg	Drawing
FAO	Machine Finish All Over
max	Maximum
mfr's	Manufacturer's
min	Minimum
ms	Medium Steel (Navy—Grade M)
quad	Quadrant
SAE	Society Automotive Engineers
Spec	Specification
TLD	Tension Link Design
° F	Degrees Fahrenheit
#/sq. in.	Pounds Per Square Inch

NOTES