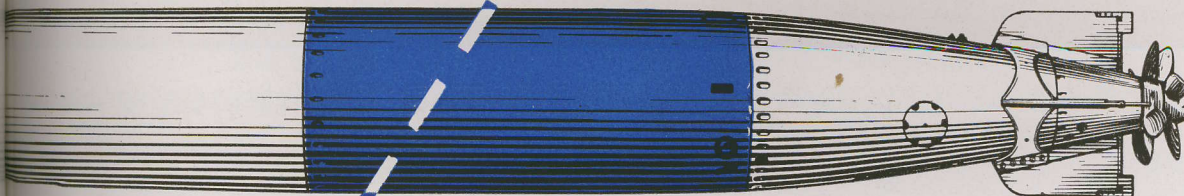


CHAPTER 3

AIR FLASK



| | |
|---|----|
| General Description and Distribution of Air, Fuel and Water | 48 |
| Air Flask Detail | 50 |
| Water Compartment Bulkhead Fittings, General Description | 52 |
| Stop and Charging Valve, Blow Valve, Blowout Plug | 53 |

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| Fuel and Water Strainers and Check Valves | 54 |
| Connections to Afterbody | 54 |
| Air Check Valves | 55 |
| Parts and Tools | 56 |
| Notes | 60 |

THIS IS THE AIR FLASK

THE "BOILER ROOM" OF THE TORPEDO

The air flask, with which is combined the water compartment and midship section, is the main body of the torpedo and carries the compressed air, the fuel and the water which release the energy necessary to drive the mechanisms which propel and guide the torpedo. The forward and by far the greater portion of the air flask is for all practical purposes a storage tank for air at 2800 pounds pressure. Air alone, however, cannot propel the torpedo for any useful distance at a sustained speed. But by combining the air with a highly volatile fuel and with water, in pre-determined proportions, a gas is produced which may be likened to steam, and which provides sufficient energy to propel a Mark 13-1 torpedo approximately 6000 yards at a consistent speed of $33.5 \pm .2$ knots per hour.

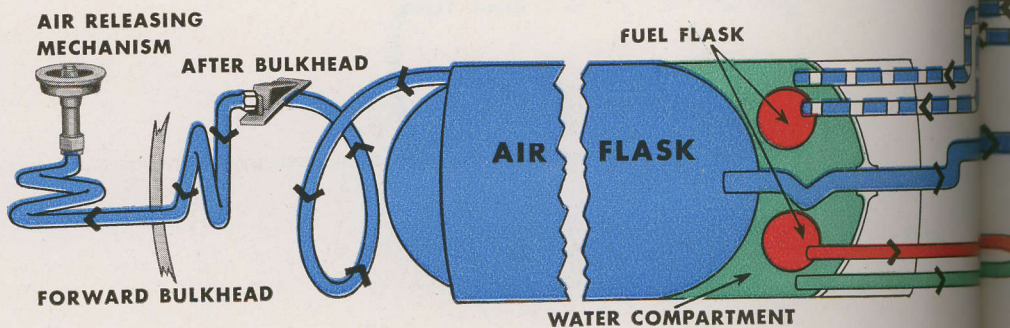
The air flask is of welded construction, machined to a high finish externally and cadmium plated internally. All bulkheads and fittings not made of bronze are likewise cadmium plated to resist corrosion. For about 80% of its length, from the forward joint line to the juncture of the water compartment and midship section, the air flask is of maximum diameter (22.42"); the midship section tapers aft to meet the extreme diameter of the afterbody.

The illustration in color to the right shows where the fuel, air and water which are stored in the air flask are carried. There is no connection or relationship between the water in the water compartment and in the midship section.

- AIR at 2800 pounds pressure. At this tremendous pressure, leakage must be constantly guarded against.
- FUEL in fuel flask. This is alcohol of type specifically supplied for torpedo fuel; use no other without authority.
- WATER. Stored in water compartment to serve as ingredient of gas which drives turbine. Midship section water is for cooling only.

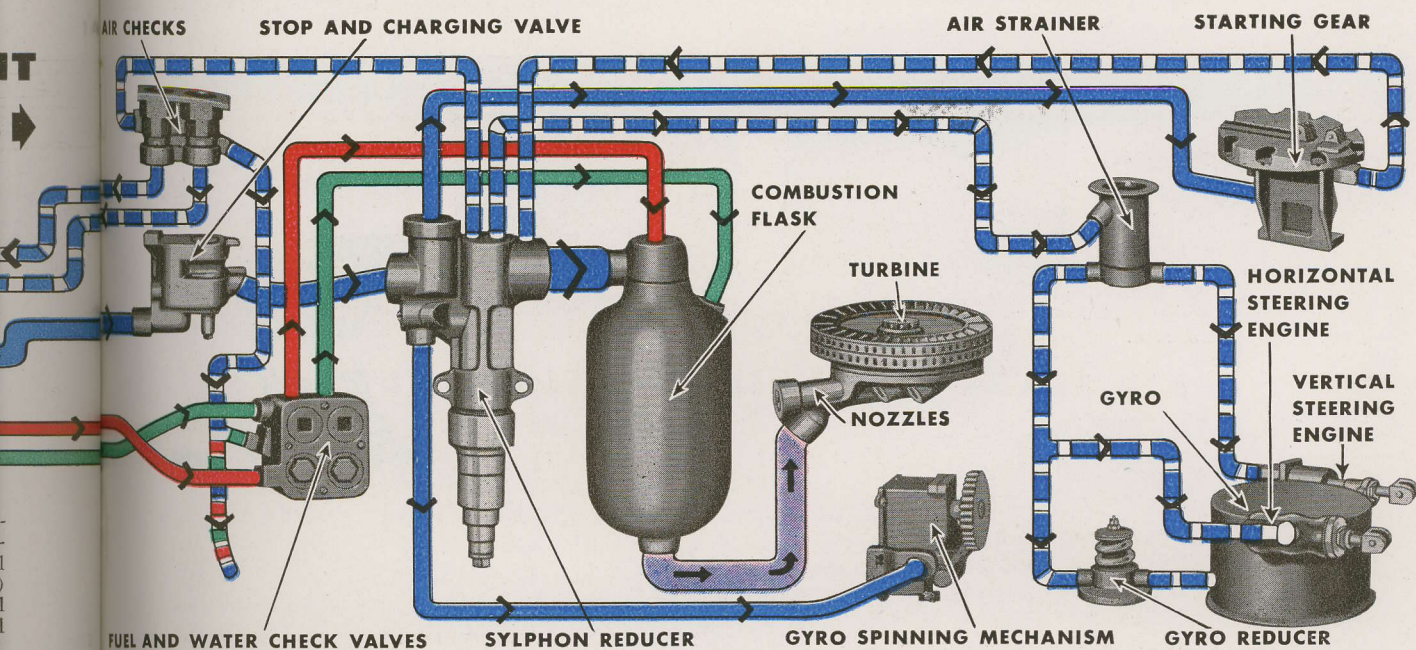
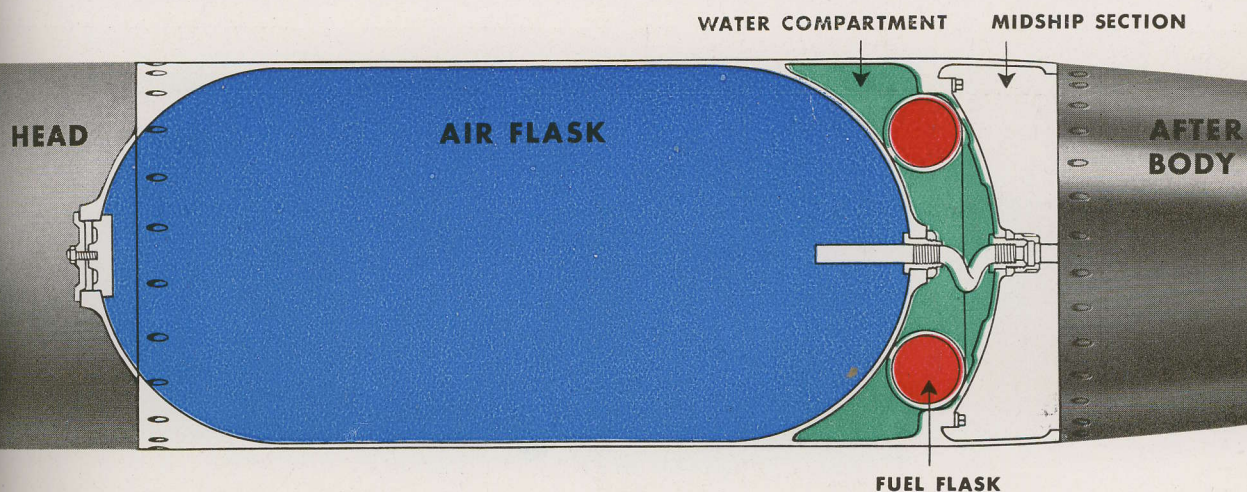
AIR FLASK, FUEL FLASK AND WATER COMPARTMENT SUPPLY THESE DEVICES

Study of illustration at right will familiarize reader with the distribution of the air, fuel and water to the various devices and mechanisms of the torpedo, which are reproduced photographically in sufficient detail to be readily identified when seen in their proper positions within the actual torpedo. When war head is mounted there is no air connection to flask.



- AIR AT FLASK PRESSURE (2800 POUNDS)
- - - AIR AT REDUCED PRESSURES
- LIQUID FUEL
- WATER FROM WATER COMPARTMENT
- GAS (Air, Water and Fuel mixed)

NOTE: Igniter water trip, a device in the experimental stage at the time of this Manual's preparation, is not shown here. If made standard, it will function between the regulator (syphon reducer) and the igniter, and instructions concerning it will be made available. Furthermore, its operation will be simple and readily understandable.

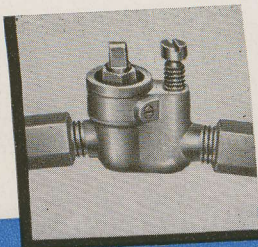


AIR FLASK DETAIL

On these two pages is displayed the air flask in "x-ray" to show the positions of the various fittings, and the fittings themselves, carried away from the flask and described as to their general functions and characteristics. Flask

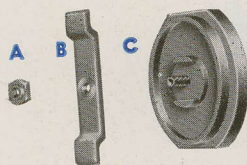
THE BLOW VALVE

Releases air from flask to air releasing mechanism of exercise head. Operates from exterior of flask by use of No. 49 socket wrench.

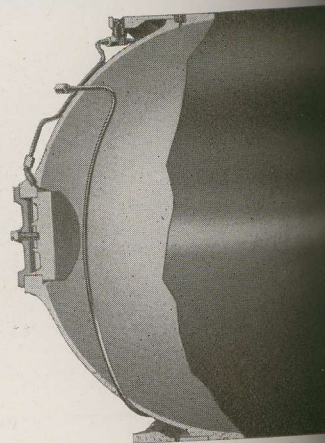
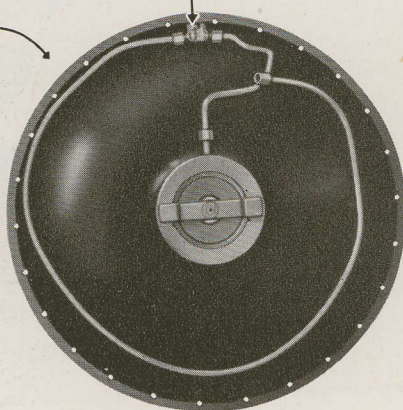


AIR FLASK, FORWARD

Free end of pipe leading from blow valve connects to nipple in pad on after bulkhead of exercise head; pipe is disconnected when war head is mounted.

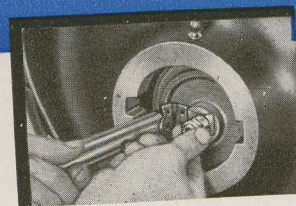
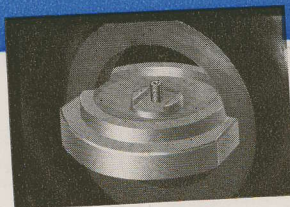


- A** Forward bulkhead lock nut.
- B** Forward bulkhead clamp.
- C** Forward bulkhead. Note "flats" for passage through slots in seat.



INSERTING BULKHEAD

"Flats" pass through slots in seat. Seated bulkhead must be turned so that flats are seated clear of slots. Take extreme care not to damage seat faces. *Remove this bulkhead only in the event of leakage around it.*



BULKHEAD SEATING

In the event leakage removal and replacement forward bulkhead, a tool drawing the bulkhead place on seat may be devised by sweating small hinge to handle, drilling free flap of hinge to receive bulkhead

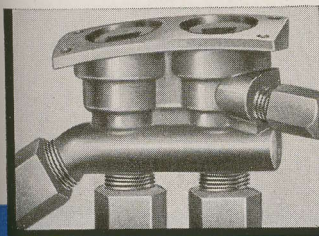
AIR FLASK DIMENSIONS, WEIGHTS, ETC.

| | |
|---|----------|
| Length, Joint Line to Joint Line . . . | 52.89" |
| Diameter at Forward Joint Line . . . | 22.42" |
| <i>Slight taper at after end reduces diameter at after joint line to correspond to diameter of afterbody at its forward joint line.</i> | |
| Weight, Exclusive of Air, Fuel and Water | 622 lb. |
| Weight of Fuel | 16.8 lb. |

| | |
|---|-----------|
| Weight of Water | 48.0 lb. |
| Weight of Air Charge at 2800 lb. pressure, 62° Fahrenheit | 130.4 lb. |
| Capacity Air Flask, Charged | 9.16 c. |
| Capacity Fuel Flask | 20 p. |
| Capacity Water Compartment | 46 |
| Air Flask Pressure, Test | 4000 |
| Air Flask Pressure, Working | 2800 |

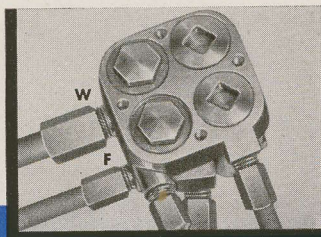
AIR CHECK VALVE

Located directly aft of stop and charging valve. Fastens to midship section shell, opposite access hole which is directly aft of and parallel to the hole giving access to stop and charging valve. Air check valve somewhat resembles the latter and care should be taken not to confuse the two valves.



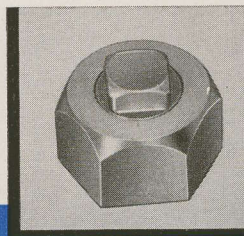
FUEL AND WATER STRAINERS AND CHECK VALVES

Valve body fastens to top of midship section shell directly aft of water compartment bulkhead, to right of center and opposite access hole of "4-leaf clover" shape. Must be positioned so face carrying nipples W and F for water and fuel connecting pipes points aft. See P. 54 for details and assembly.



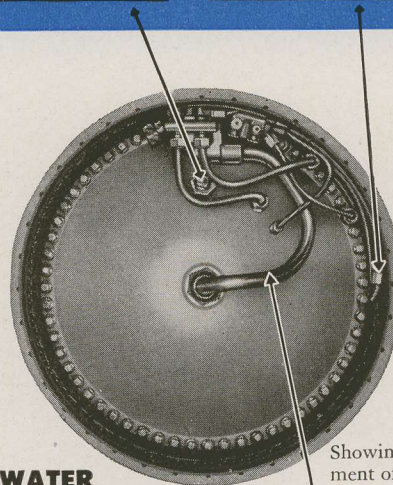
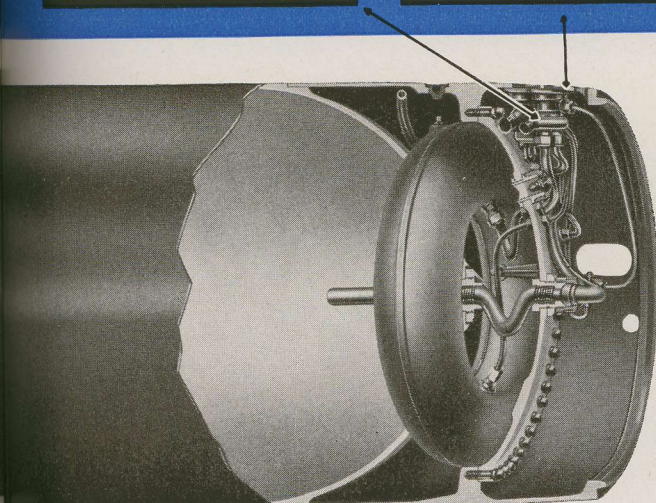
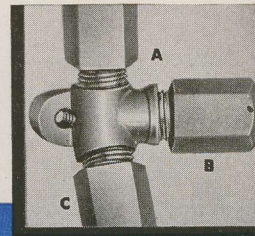
BLOWOUT PLUG

Assembles on nipple on upper, after face of water compartment bulkhead (see P. 52). Air at pressure exceeding 1200 pounds escaping into water compartment will blow out this plug, passing the water into the midship section before destructive pressures can be built up.



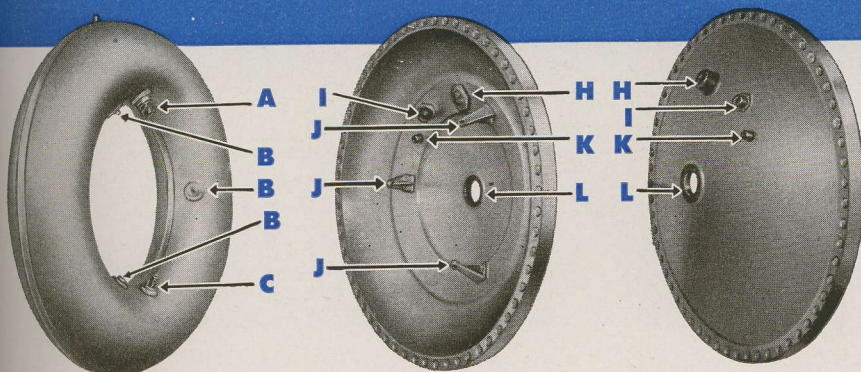
VENT FITTING

Fastens to midship section right side between water compartment bulkhead and joint ring. Receives surplus fuel and water at C, surplus air at B, and vents them through A into pipe connecting with afterbody, through which vented matter is carried to exhaust in tail.



WATER COMPARTMENT BULKHEAD AFT

Showing general arrangement of connecting pipes, location of blowout plug and vent fitting.

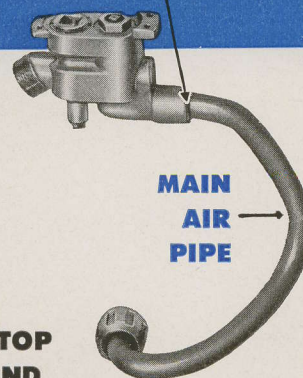


FUEL FLASK

A: nipple for pipe from air check valve. BBB: bosses for mounting flask on water compartment bulkhead brackets JJJ. C: nipple for pipe to fuel check valve.

WATER COMPARTMENT BULKHEAD

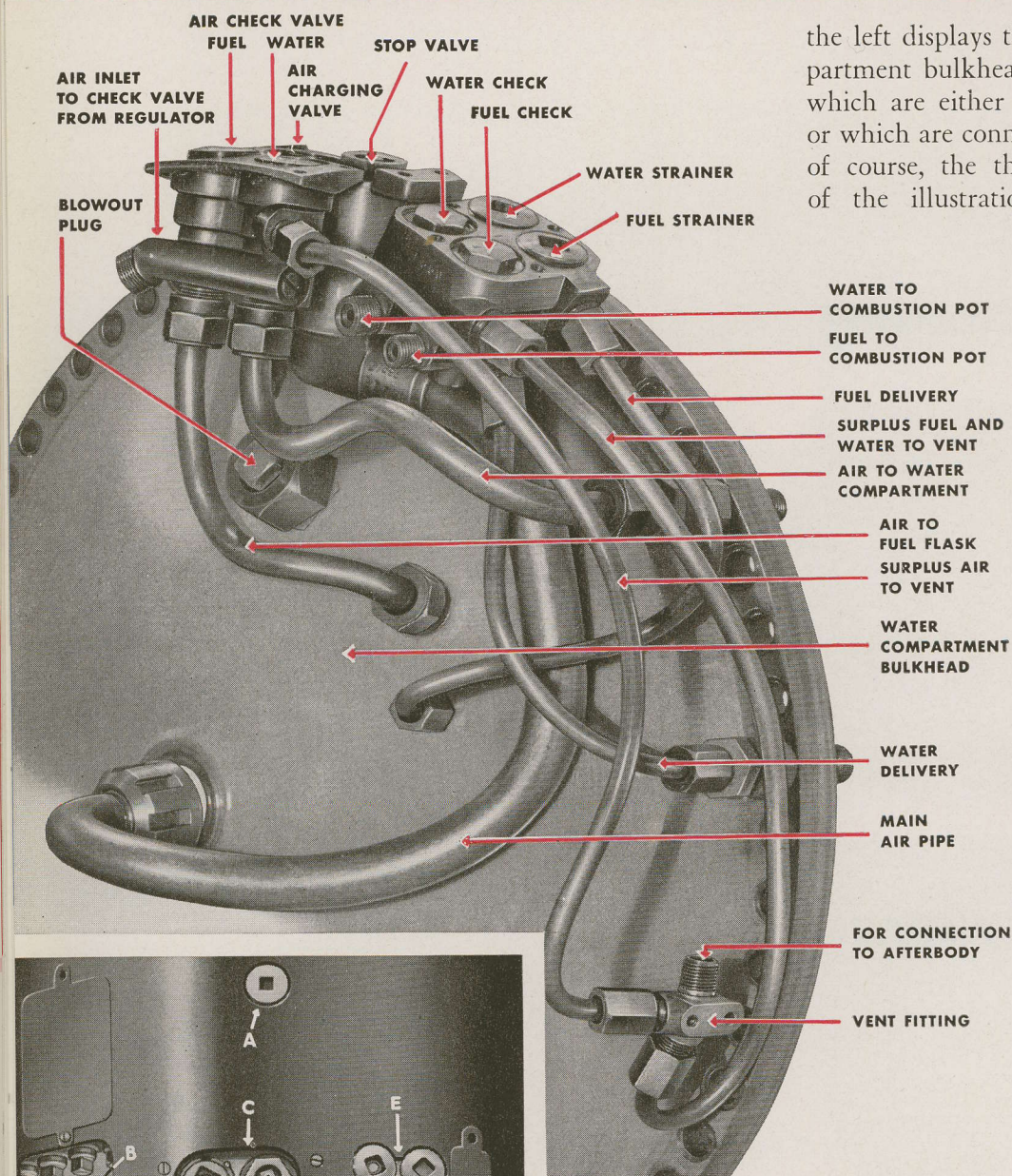
(Left) *Forward face*. H: opening to blowout plug. I: nipple for air to fuel flask. JJJ: Fuel flask brackets. K: nipple for fuel to fuel check. L: opening for main air pipe. (Right) *After face*. H: blowout plug nipple. I: nipple for air to fuel flask. K: nipple for fuel to fuel check. L: opening for main air pipe.



STOP AND CHARGING VALVE

Fastens to midship section shell at after side of water compartment bulkhead, opposite access hole through which valve is adjusted. (See P. 53.) Main air pipe is screwed and sweated into valve body.

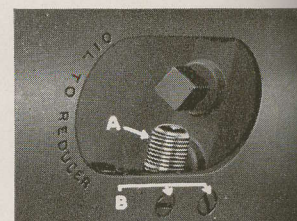
MAJOR FITTINGS CARRIED BY THE AFTERSIDE OF THE WATER COMPARTMENT BULKHEAD



The main illustration to the left displays the afterside of the water compartment bulkhead, with the fittings and pipes which are either directly carried on this head, or which are connected to it by piping. Actually, of course, the three valves at the upper side of the illustration, and the vent fitting at lower right, are held to the midship section by screws, and would be disassembled from the midship section one by one.

IMPORTANT

When dismantling pipes from water compartment bulkhead, tag them by name or stock part number as you go; this is only way you can be sure of returning them to their proper places. Follow this procedure with all parts similar to other parts.



Vent fitting A (see lower right, large illustration) screws to midship section shell opposite rectangular-shaped access hole. Vent pipe is attached through access hole. Reducer is oiled through this access hole, also.

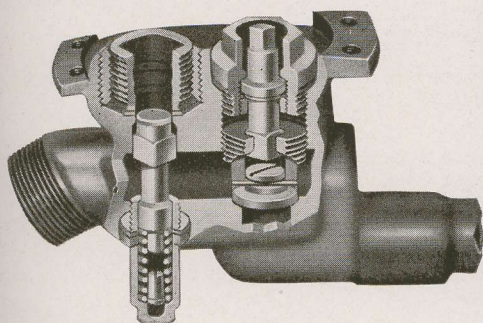
THE MIDSHIP SECTION TOPSIDE, WITH VALVES IN PLACE

A is fuel and water filling plug. Access hole B, with cover swung back, permits connecting air pipe to air check and main air connection to fuel flask after assembly of afterbody to air flask. C is stop and charging valve in place, D is air check valve, E is fuel and water strainer and check valves, F is access hole (with cover swung back) to fuel and water connections.

THE STOP AND CHARGING VALVES

The charging valve receives air charging line to convey air into air flask at desired pressure, and is also a check valve which prevents escape of air outboard. Stop valve, operated manually, is opened when air flask is charged and closed before charging line is removed; with stop valve closed, torpedo may be completely disassembled and overhauled while air flask remains fully charged.

ASSEMBLED CHARGING VALVE STOP VALVE

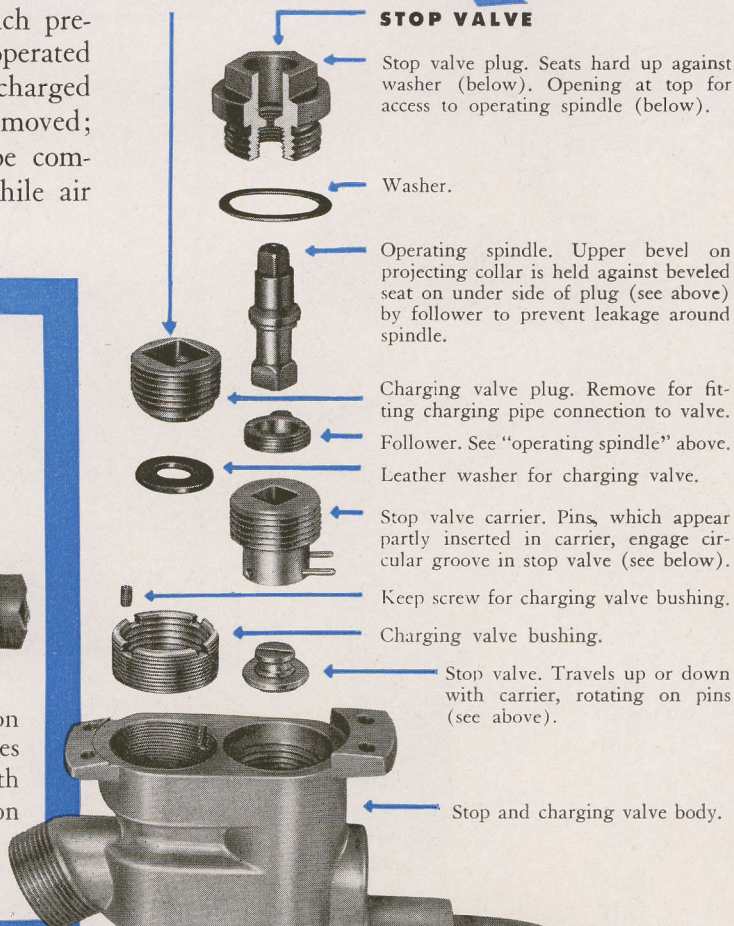


Check parts in this cutaway illustration of assembled stop and charging valves against "exploded" view at right; both the assembly process and the operation of the two valves should thus be readily grasped.

DISASSEMBLED

CHARGING VALVE

STOP VALVE



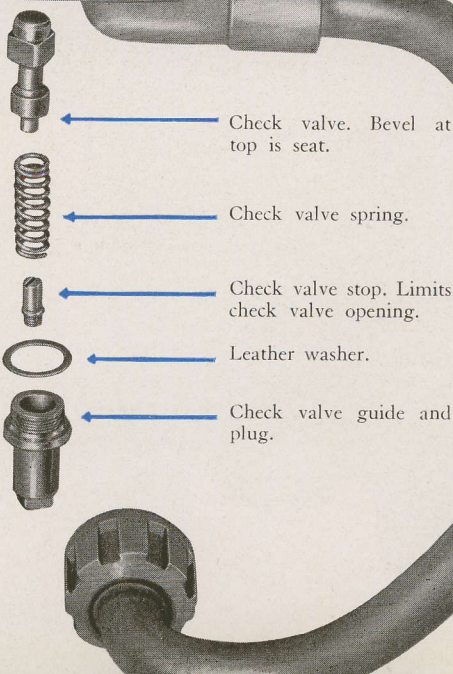
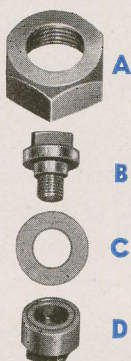
BLOW VALVE

Positions at forward end of air flask (see page 68), and supplies air releasing mechanism in exercise head when latter is fitted. A: Retainer. B: Washer. C: Valve. D: Holding screw. E: Valve body.



BLOWOUT PLUG

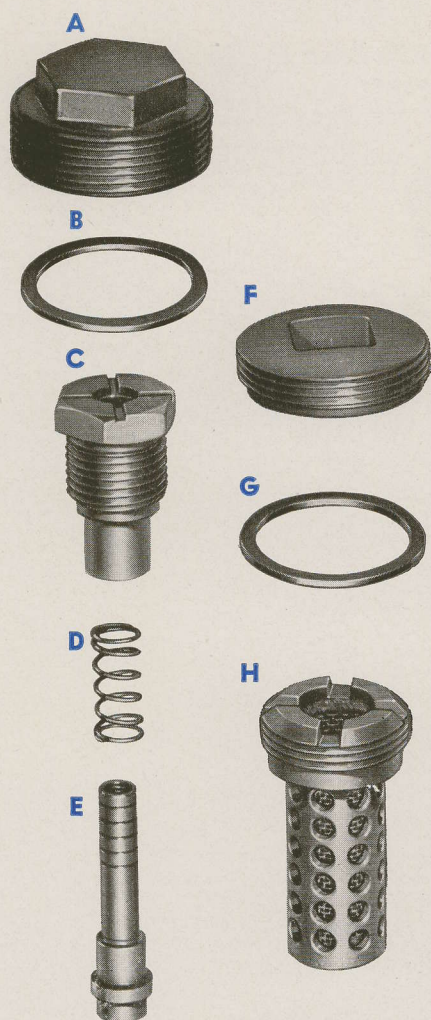
See opposite page for position on water compartment bulkhead. A: Cap. B: Plug screw. C: Copper shear disc; replace only with disc made from sheet copper furnished by Torpedo Station for this purpose. D: Plug nut.



FUEL AND WATER STRAINERS

AND

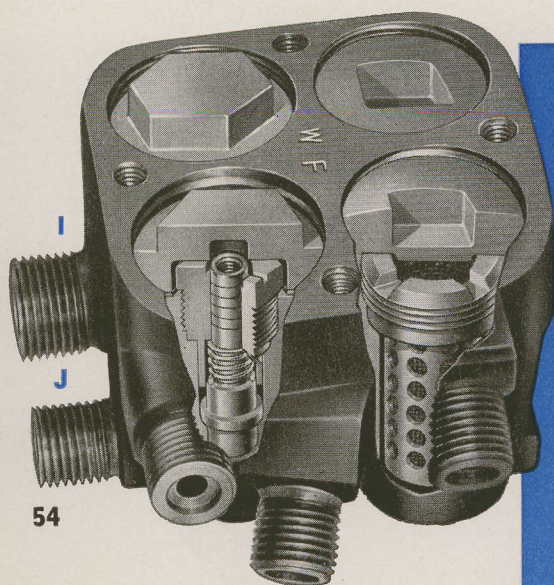
CHECK VALVES



- A Check valve plug
- B Check valve washer
- C Check valve guide
- D Check valve spring
- E Check valve
- F Strainer plug
- G Strainer washer
- H Strainer

This group of four valves housed in one body casting performs two functions: the strainers pick up any foreign matter present in fuel or water which might clog sprays in the combustion flask; the check valves automatically prevent leakage from fuel and water compartment to sprays until valves are opened by reduced air pressure when torpedo is launched. Check valves are double acting, preventing leakage outboard when open, as well as to sprays when closed.

NOTE that each of these parts is paired in the cut-away view (lower left) of the assembled valve and strainer in the portion of the valve body nearest you. "I" is fuel inlet, "J" is water inlet. Thorough cleaning of strainers at overhaul must never be neglected.



CONNECTIONS

AIR FLASK TO AFTERBODY

Despite the maze of pipes on both the after compartment bulkhead and the forward bulkhead of the afterbody, these are interconnected at only five points: (A) stop and charging valve to reducer; (B) reducer to air check valve; (C) water to igniter pot; (D) fuel to igniter pot; (E) vent fitting to afterbody.

AIR CHECK VALVES

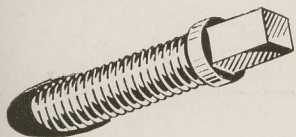
These valves, identical in assembly, lie between the reducing valve ("regulator") and the fuel and water compartments, closing each compartment against each other and both against the reducing valve, opening only when the torpedo is in operation. The check valves serve also to vent pressure caused by air leaks into the water compartment; without this venting feature, pressure would accumulate above outboard ends of check valves and cause them to open sluggishly.

Something to Remember

When assembling torpedo sections, remember that joint screws for war and exercise heads are not interchangeable with joint screws for afterbody and tail. Note differences in joint screws at right, and avoid damage to threads of either joint screws or holes tapped to receive them. NEVER FORCE JOINT SCREWS.



EXERCISE AND WAR HEAD JOINT SCREW
Slotted head;
18 threads to inch.



AFTERBODY AND TAIL JOINT SCREW
No slot in head;
24 threads to inch.

A Screw plug

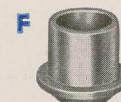
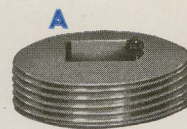
B Washer

C Valve plug and guide sleeve

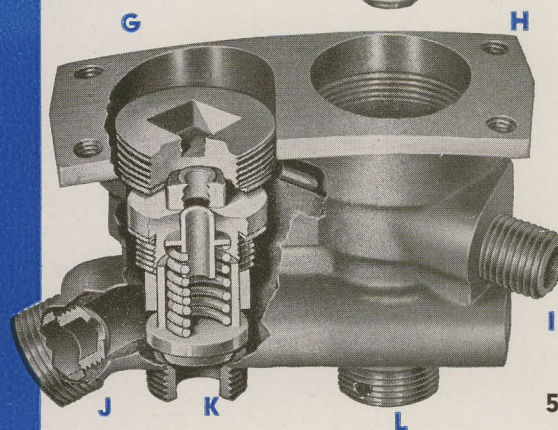
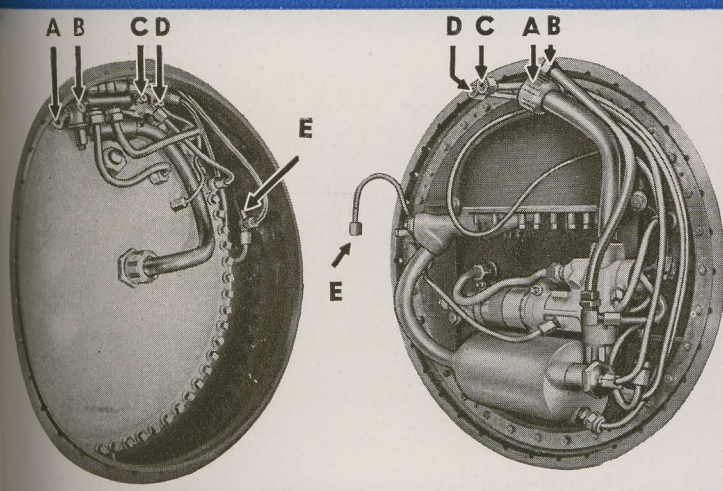
D Bushing for centering valve spring

E Valve spring

F Check valve


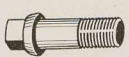
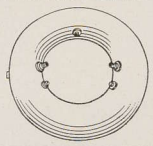
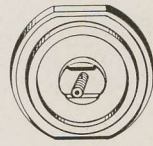


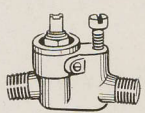
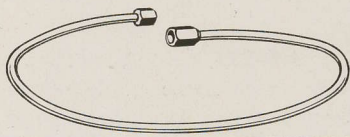
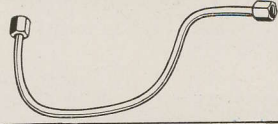
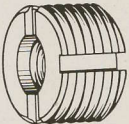



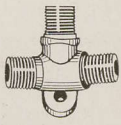
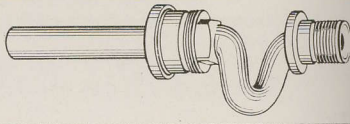



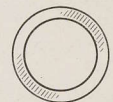
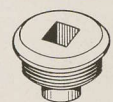
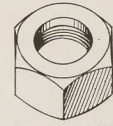

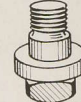
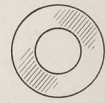




NOTE: Valve assemblies on fuel (G) and water (H) sides of check valves are identical; see left side of illustration. Note passage above valve plugs from fuel to water side; accumulated pressure due to air leakage vents through this passage to outlet (I) which connects with vent fitting. Restriction at (J) checks any sudden flow of air which might rupture fuel flask. (K) is outlet to fuel flask, (L) is outlet to water compartment.



PARTS WELDED TYPE AIR FLASK

KEY: SG—STOCK GROUP • SP—STOCK PART

| NUMBER OF PIECES | | NUMBER OF PIECES | |
|--|----|---|---|
| WATER COMPARTMENT BULKHEAD (FUEL FLASK NOT MOUNTED) SG 3483 | 1 |  | 1 |
| SCREWS SP 3438 | 58 |  | 1 |
| FUEL FLASK (WITH NIPPLES AND BRACKET STUDS) SG 3488 | 1 |  | 1 |
| FORWARD BULKHEAD (WITH CLAMP SCREW) SG 4093 | 1 |  | 1 |
| CLAMP SP 15467 | 1 |  | 2 |
| CLAMP NUT SP 15204 | 1 |  | 1 |
| BLOW VALVE (ASSEMBLED) SG 3349 | 1 |  | 1 |
| PIPE-BLOW VALVE TO EXERCISE HEAD SG 3769 | 1 |  | 1 |
| PIPE-VENT ELBOW TO BLOW VALVE SG 4092 | 1 |  | 1 |
| AIR VENT BUSHING SP 15300 | 1 |  | 1 |
| AIR VENT VALVE SP 15301 | 1 |  | 1 |
| AIR VENT KEEP SCREW SP 15302 | 1 |  | 3 |
| FILLING FLANGE PLUG SP 11442 | 1 |  | 5 |
| VENT FITTING SP 7408 | 1 |  | 1 |
| MAIN AIR CONNECTION SG 4101 | 1 |  | 1 |
| LOCK NUT SP 6999 | 1 |  | 1 |
| LOCK NUT SP 6997 | 1 |  | 1 |
| NUT SP 6448 | 2 |  | 1 |
| WASHER SP 5148 | 1 |  | 1 |
| PLUG SP 6693 | 1 |  | 1 |
| BLOWOUT PLUG CAP SP 6998 | 1 |  | 1 |
| BLOWOUT PLUG NUT SP 7000 | 1 |  | 1 |
| BLOWOUT PLUG SCREW SP 7001 | 1 |  | 1 |
| COPPER SHEAR DISC SP 7002 | 1 |  | 1 |
| SCREW FOR MOUNTING FUEL FLASK SP 2910 | 3 |  | 1 |
| SCREW SP 15623 | 5 |  | 1 |

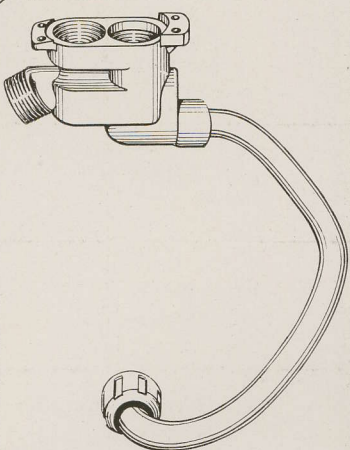
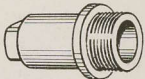



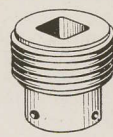

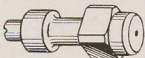




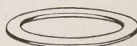

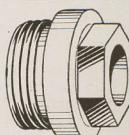


PARTS WELDED TYPE AIR FLASK

KEY: SG—STOCK GROUP • SP—STOCK PART

| NUMBER OF PIECES | | NUMBER OF PIECES | |
|---|---|------------------------------------|---|
| NIPPLE SP 11152 | 1 | STRAINER SG 2446 | 2 |
| NIPPLE SP 6446 | 1 | PLUG SP 2449 | 2 |
| PIPE-WATER CHECK TO VENT SG 3764 | 1 | VALVE GUIDE SP 2466 | 2 |
| PIPE-WATER HEAD TO FUEL FLASK SG 3768 | 1 | VALVE SPRING SP 4465 | 2 |
| PIPE-AIR CHECK TO VENT SG 3765 | 1 | VALVE SP 2467 | 2 |
| PIPE-AIR CHECK TO FUEL SG 3767 | 1 | AIR CHECK VALVE BODY SG 3484 | 1 |
| PIPE-AIR CHECK TO WATER SG 3766 | 1 | VALVE SP 2902 | 2 |
| PIPE-FUEL CHECK TO FUEL SG 3771 | 1 | SPRING SP 3592 | 1 |
| PIPE-WATER CHECK TO WATER SG 3773 | 1 | BUSHING SP 3537 | 2 |
| FUEL AND WATER STRAINER AND CHECK VALVE BODY SG 3491 | 1 | GUIDE PLUG SP 2899 | 2 |
| PLUG SP 2448 | 2 | WASHER SP 2477 | 2 |
| WASHER SP 2465 | 2 | RING SP 2474 | 2 |

PARTS WELDED TYPE AIR FLASK

KEY: SG—STOCK GROUP • SP—STOCK PART

| NUMBER OF PIECES | | NUMBER OF PIECES | |
|--|---|---------------------------------|---|
| STOP AND CHARGING VALVE BODY SP 11479 SCREW PLUG SP 181 PIPE SG 3487 |  | VALVE GUIDE SP 1492 |  |
| | | WASHER SP 890 |  |
| | | PLUG SP 1512 |  |
| | | VALVE SP 1633 |  |
| | | VALVE CARRIER SP 1923 |  |
| | | PIN SP 551 |  |
| CHARGING VALVE SP 1956 |  | FOLLOWER SP 1327 |  |
| VALVE SPRING SP 856 |  | STOP VALVE SP 1930 |  |
| VALVE STOP SP 243 |  | WASHER SP 312 |  |
| WASHER SP 906 |  | PLUG SP 4852 |  |
| BUSHING SP 3446 |  | | |
| KEEP SCREW SP 172 |  | | |

TOOLS WELDED TYPE AIR FLASK

| NUMBER OF PIECES | | NUMBER OF PIECES | |
|--|---|--|---|
| SOCKET WRENCH No. 11 | 1 | OPEN END WRENCH No. 404 | 1 |
| LIFTING SCREW No. 74 | 1 | DOUBLE SOCKET WRENCH Round end No. 13 Square end No. 14 | 1 |
| OPEN END WRENCH No. 150 | 1 | PLUG WRENCH No. 405 | 1 |
| DOUBLE-END SPANNER WRENCH Large end No. 181A Small end No. 181 | 1 | SPANNER No. 134A | 1 |
| SOCKET WRENCH No. 217 | 1 | STRAINER REMOVING TOOL No. 372A | 1 |
| EYE BOLT No. 234 | 2 | SOCKET WRENCH No. 12 | 1 |
| SCREW ROD No. 245 | 1 | SOCKET WRENCH No. 49 | 1 |
| SCREW DRIVER No. 39 | 1 | DOUBLE SOCKET WRENCH Round end No. 227 Square end No. 227A | 1 |
| SOCKET WRENCH No. 406 | 1 | SPANNER WRENCH Square studs No. 151 Round studs No. 151A | 1 |
| SOCKET WRENCH No. 246B | 1 | | |

This image shows a single sheet of white, lined notebook paper. The paper has horizontal blue ruling lines spaced evenly across its surface. There are no vertical margin lines or other markings. The paper appears slightly aged or off-white.

This image shows a single sheet of white, lined notebook paper. The paper has horizontal blue ruling lines spaced evenly across its surface. There are no vertical margin lines or other markings. The paper appears slightly aged or off-white. The edges of the paper are visible against a dark background.

This image shows a single sheet of white, lined notebook paper. The paper has horizontal blue ruling lines spaced evenly across its surface. There are no margins, text, or other markings on the page. The lighting is even, and the paper appears slightly textured.