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NAVSHIPS 250-688-3

INSTRUCTION MANUAL

FOR

NAVY OXYGEN BREATHING APPARATUS TYPE B

JANUARY 1946

BUREAU OF SHIPS
NAVY DEPARTMENT
WASHINGTON 25, D. C.

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This manual is issued for the guidance of personnel whose duties may require the use of Type B oxygen breathing apparatus.

The Type B oxygen breathing apparatus is a self-contained apparatus which operates independently of the surrounding atmosphere. The source of respirable air is a canister forming a part of the apparatus, the chemical in which, when subjected to the wearer's exhalations, evolves oxygen and absorbs CO_2. To this extent, the principle of operation is similar to that of the Type A–1 breathing apparatus.

The Type A–1 oxygen breathing apparatus is a "heavy duty" apparatus designed to meet the respiratory requirements of the wearer in performing extremely hard work and constructed to withstand the rough usage attendant on strenuous work such as fire-fighting, handling of planes and ammunition, or clearing wreckage.

The Type B apparatus was designed for respiratory protection of ship's personnel in emergencies where Type A–1 apparatus may not be at hand or available in sufficient quantities. It is of lighter construction than the Type A–1 and the life of the canister is about one-half of the Type A–1 apparatus. It should not be worn when performing hard work.

For additional copies apply to Bureau of Ships, Washington, D. C.

(s) E. L. COCHRANE,
Vice Admiral, USN,
Chief, Bureau of Ships.

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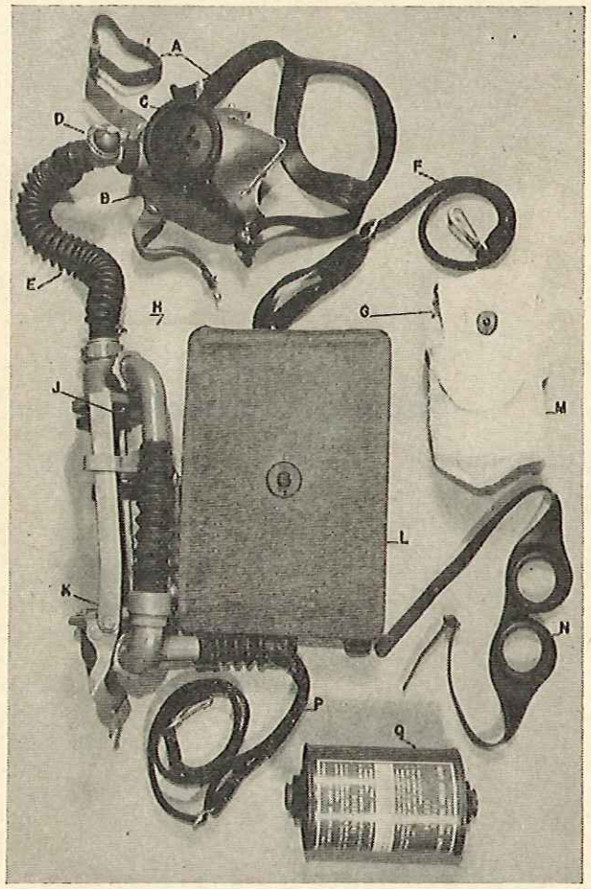

FIGURE 1—Type B Oxygen Breathing Apparatus.

A. Headharness.
B. Facepiece.
C. Diaphragm.
D. Facepiece valve.
E. Corrugated tube.
F. Neck strap.
G. Spare canister.
H. Breast plate.
J. Bypass.
K. Canister holder clamp and links.
L. Breathing bag.
M. Canister pouch.
N. Goggles.
P. Waist strap.
Q. Canister.

DESCRIPTION OF APPARATUS

The Type B oxygen breathing apparatus is a self-contained oxygen generating breathing apparatus designed to protect the respiratory system of the wearer in any irrespirable atmosphere. In operation it is self-contained, the wearer breathing in a circulatory system which is closed to the surrounding atmosphere. The wearer's exhalations, which contain carbon dioxide, are purified of this gas during their passage through the chemical in the canister, the chemical simultaneously evolving oxygen. The exhalations then flow into the breathing bag to be rebreathed during the next inhalation.

The complete apparatus is shown in figure 1.

Facepiece.—The apparatus is equipped with an aviator's type half mask which has been modified by the addition of a speaking diaphragm. The speaking diaphragm is used in lieu of a microphone in order to permit conversation between personnel as well as use of the ship's communication system. The facepiece is equipped with elastic head straps which serve to hold it in place. A wire located near the upper edge of the half mask serves to vary the shape of the facepiece where it passes over the nose of the wearer, thus permitting an effective seal regardless of facial contours.

Valve assembly.—A valve assembly is located in the breathing tube immediately below the facepiece; when depressed the valve permits air to be drawn from the surrounding atmosphere. When released this valve directs the exhaled air through the canister and into the breathing bag, from which it is inhaled via the canister bypass located alongside the canister holder. The inhalations are not passed through the canister since a heat generating reaction takes place during the passage of air through the canister which would cancel the cooling effect obtained by circulating the air through the breathing bag.

A front view of the apparatus being worn with the valve assembly depressed is shown in figure 2.

Canister holder.—The canister holder is equipped with a toggle clamp. When swung to the down position the clamp and connected links separate the canister receptacles permitting installation of the canister. The upper of these receptacles is equipped with a spring actuated closing valve which remains closed except when a canister is actually installed. The lower receptacle contains a similar valve and is also provided with a check valve which prevents inhalations from being drawn through the canister.

FIGURE 2—Front view, facepiece valve depressed permitting wearer to breathe from surrounding atmosphere.

Breastplate.—A flat metal breastplate serves as a support for the canister holder assembly and the breathing bag. In addition to the above, the

neck and waist straps used to secure the apparatus to the body of the wearer, are also fastened to the breastplate.

Breathing bag.—The breathing bag is a moulded rubber accordion type bag reinforced on the exterior surface with stockinet. In a deflated condition the bag lies flat against the breastplate. When inflated the bag projects out about 5 inches from the breastplate.

Canister.—The canister furnished for use in the Type B apparatus is a circular can approximately 7 inches in length. Each end is equipped with a neck and during storage is sealed with a tear-off cap. The chemical contained in the canister is commonly known as oxygen-producing oxide. In the state furnished it is inactive. However, in contact with moisture in the exhaled breath it will evolve oxygen to replace that used by the wearer. It also acts as a carbon dioxide absorbent and effectively removes this gas from the exhaled breath. In contact with OIL, GREASE, GASOLINE, or MIXTURE OF OIL AND WATER the chemical is violently explosive. In this respect it reacts in the same manner as gaseous oxygen under high pressure.

Goggles.—A pair of rubber goggles are furnished with each apparatus to protect the wearer's eyes from smoke or whatever gas may be present in the atmosphere. A small well is moulded into the rubber frame inside of each lens opening. Where time permits a small quantity of water may be placed in these wells to be used as a defogging agent when the goggles are being worn. A tube of fogproof paste is furnished with each apparatus to provide a more effective means of preventing lenses from fogging.

Canister pouch.—A pouch suitable for carrying one extra canister is fitted on the waist strap. The canister carried in this pouch should not be opened until it is required for use in the apparatus. The canisters furnished with the Type B apparatus are not equipped with a metallic foil seal such as is used in the Type A–1 apparatus canisters. They are, however, fitted with metal "tear-off" caps.

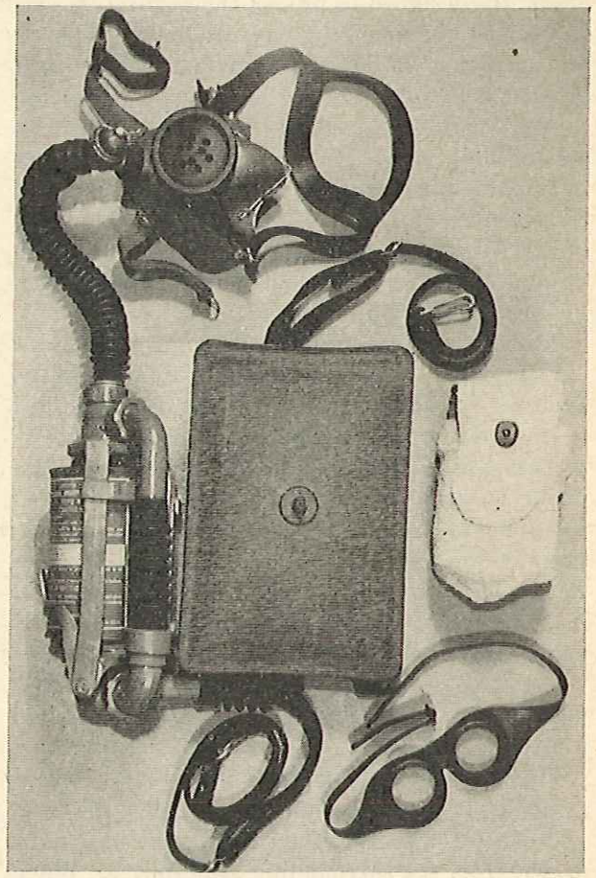

FIGURE 3—Ready stowage, canister installed and facepiece valve closed. Neck strap is shown unhooked from breastplate for clarity.

INSTRUCTIONS FOR USE

All personnel should be familiar with the proper procedure for using the Type B oxygen breathing apparatus and its limitations. Personnel whose duties will normally include use of this apparatus should become thoroughly acquainted with its principle of operation. The method of donning the apparatus will necessarily vary depending upon conditions which exist in each instance. It is considered that the following will permit the apparatus to be put into continuous operation in the shortest period of time:

1. Stow apparatus (see figure 3) with canister installed and facepiece valve closed (bail in place over knob on valve), and neck strap hooked

to breastplate. NOTE: Tear-off caps must be removed prior to installing the canister in the apparatus.

2. Remove apparatus from stowage and release facepiece valve.

3. Drop neck strap over head, take a deep breath, place facepiece over nose and mouth and exhale into apparatus, while holding facepiece in position. Remove facepiece, deflate breathing bag, replace facepiece over nose and mouth and exhale a second breath into the apparatus to reinflate the breathing bag. Start normal breathing into the apparatus.

4. Continue holding facepiece with one hand and slip upper head harness over crown of head. The lower straps may then be secured behind the neck.

5. Don goggles and adjust for a smoketight fit.

6. Secure waist strap and adjust length to hold apparatus snugly against body. The spare canister pouch should be adjusted to a comfortable position on one hip.

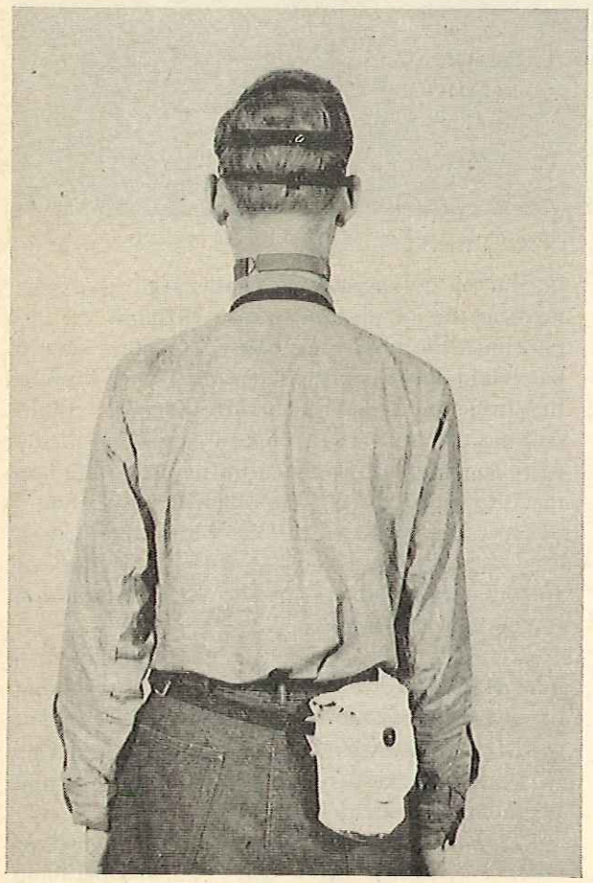

FIGURE 4—Rear view of apparatus in operating condition.

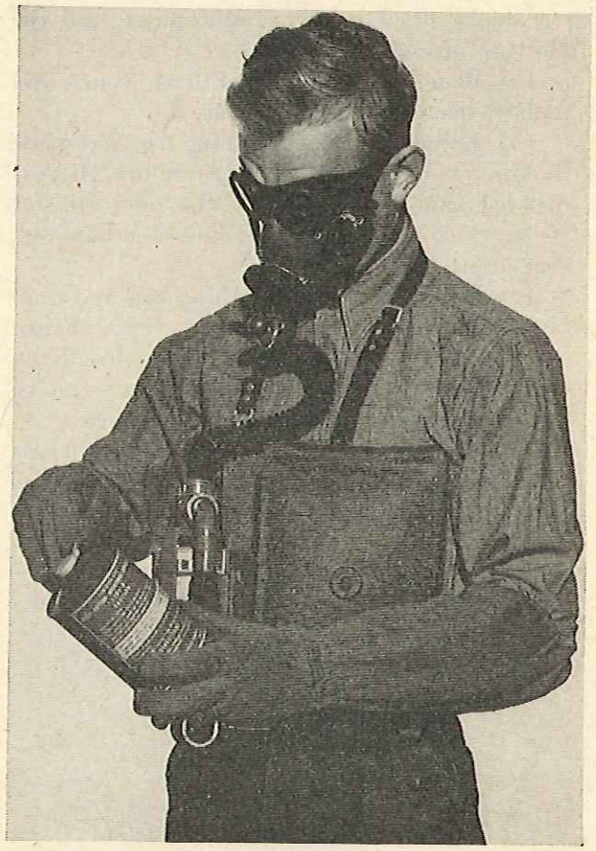

FIGURE 5—Removing tear-off caps from canister prior to installation in apparatus.

7. The wearer will be warned of the approaching end of the useful life of a canister by increased resistance to each exhaled breath. In addition to the resistance to exhalations, the breathing bag may have a tendency to partially deflate. However, increased resistance to exhalations and accelerated rate of breathing are the most definite signs of canister exhaustion. The accelerated rate of breathing is caused by a progressive build-up of the percentage of carbon dioxide within the system which starts as the canister begins to become exhausted. Breathing bags which deflate as a result of improperly fitted facepieces should not be considered as indicating expended canisters.

8. When a canister becomes exhausted and it is necessary to install a second one while remaining

in a smoke filled or toxic atmosphere, use the following procedure:

(*a*) Remove spare canister from pouch and remove tear-off caps. See figure 5.

(*b*) Exhale into the breathing bag and while holding your breath, quickly remove the expended canister and insert the new canister from which the tear-off caps have been removed. See figure 6.

(*c*) Inhale from the breathing bag and commence normal breathing again. This change can normally be made in 15 to 30 seconds by inexperienced personnel and the time can be cut down to 5 to 10 seconds with practice.

(*d*) It is possible to inhale from, and exhale into, the breathing bag via the canister bypass while changing canisters. When the toggle clamp is swung to the down position, a spring

FIGURE 6—Removing expended canister with new canister ready for installation.

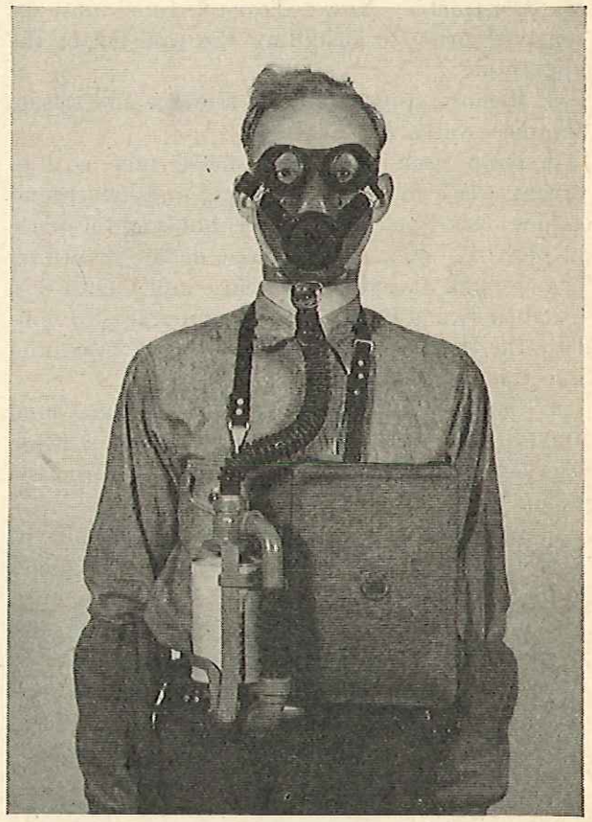

FIGURE 7—Front view of apparatus in operating position.

inside the corrugated tube opens a valve permitting the exhalation to flow through the bypass into the breathing bag. Canisters should be changed as rapidly as possible, since breathing into and from the breathing bag without passing exhalations through a canister will deplete the supply of oxygen in the breathing bag in 20 to 30 seconds. The breathing bag should be 50 to 75 percent full of air when a new canister is installed in order to provide sufficient air for breathing and to start the chemical reaction in the new canister.

(*e*) ANTI-FLASH GAUNTLETS furnish adequate protection to permit handling the hot expended canister while inserting the new canister. The expended canister may be carried in the spare canister pouch until conditions permit proper disposal.

(*f*) Used canisters should be jettisoned as soon as possible after use. When operating

conditions do not permit jettisoning, they should be kept in a clean dry loosely covered container. UNDER NO CONDITION SHOULD OIL, OIL AND WATER, GASOLINE OR SIMILAR SUBSTANCES BE ALLOWED TO ENTER EITHER NEW OR USED CANISTERS.

It will be noted that in using the type of stowage specified in subparagraph 1, page 4, that the canister is open and any air trapped in the breathing bag will pass in and out of the canister as the volume of air in the breathing bag expands due to increases in the temperature of the surrounding atmosphere. The system is closed from the surrounding atmosphere by the facepiece valve. Surveillance tests conducted by the Bureau indicate that there is no appreciable detrimental effect on canisters stowed in this manner. However, as a precautionary measure canisters stowed in this manner should be replaced every 6 months and the old canister used for training or disposed of. After each use of the apparatus the canisters should be replaced with a new canister.

NOTE.—This type of stowage should NOT be used for the present model Type A–1 oxygen breathing apparatus, since no positive closing valve is provided in that apparatus which will effectively seal the canister from the surrounding air.

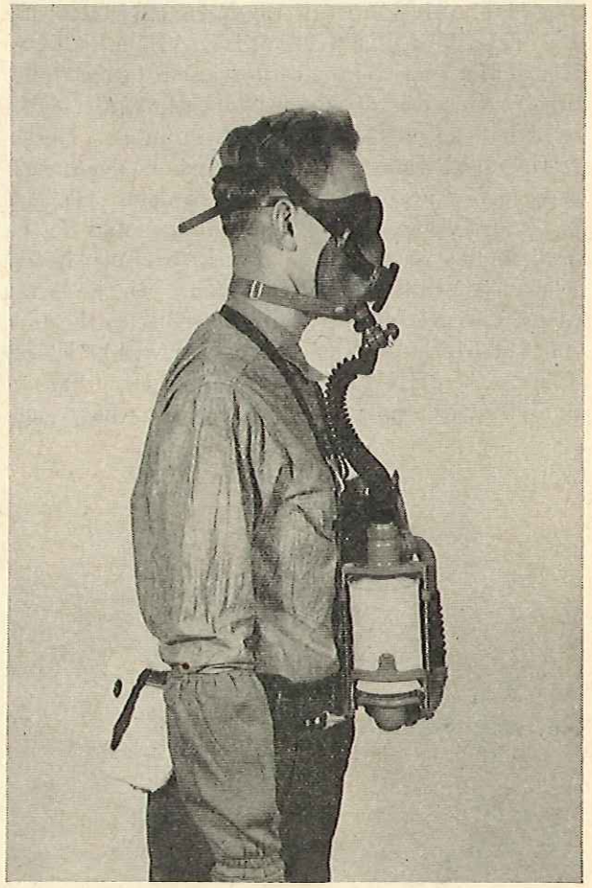

FIGURE 8—Side view of apparatus in operating condition.

LIMITATIONS

The longevity of a single canister will vary in proportion to the wearer's exertions and the care which he exercises with the apparatus to conserve oxygen. Tests at the Naval Research Laboratory have shown that, with all fittings including the facepiece, tight, a canister will normally last about 30 minutes. The following is the schedule used for the performance acceptance test:

(1) Walk at the rate of 3 miles per hour over a level measured course, taking 2 minutes.

(2) Crawl for a distance of 25 feet taking 5 minutes.

(3) Lie down on side, taking 2 minutes.

(4) Lie down on back, taking 1 minute.

(5) Walk at the rate of 3 miles per hour over a level measured course, taking 7 minutes.

(6) Allow 2 minutes for taking air samples and temperature readings.

(7) Carry a 50-pound weight over an overcast, making one complete trip every 2 minutes, for two times.

(8) Walk at the rate of 3 miles per hour over a level measured course taking 2 minutes. Air and temperature readings shall be taken at completion of test.

The above schedule requires 25 minutes exclusive of the time required to take samples at the end of the test.

Tests have shown that one canister will last from 25 to 35 minutes when tested according to the above schedule. THE LIFE OF ONE CANISTER WILL BE PROPORTIONATE

TO THE AMOUNT OF WORK PERFORMED BY THE WEARER OF THE APPARATUS. Hence, if a Type B apparatus is used for fire fighting or some other strenuous work, the canister can be exhausted within 10 or 15 minutes. Under resting conditions where no work is performed tests have shown that a single canister will last 2½ hours. The Type B apparatus should not be used in lieu of the Type A–1 to perform heavy work, except in cases of emergency. In the latter case the wearer should be impressed with the fact that the life of the Type B canister will be LESS THAN 30 MINUTES and to be sure that an unused spare canister is available in the pouch.

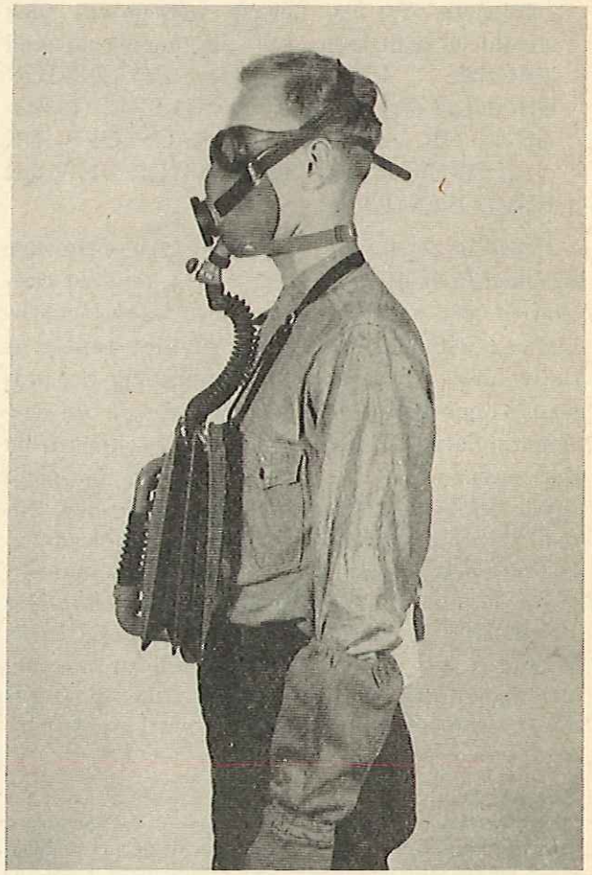

FIGURE 9—Side view of apparatus in operating condition.

MAINTENANCE

Stowage, apparatus.—No special lockers are required for the stowage of the apparatus except in cases where the stowage location will result in exposure of the apparatus to the weather.

Stowage, canisters.—Canisters must be stowed in a dry location. Watertight ready stowage should be provided for canisters which are stowed in exposed places. Any water coming in contact with the chemical in the canister will activate the chemical thereby expending the canister before it is ever used. A pouch which is attached to the waist strap is provided with each apparatus to permit one extra canister to be carried whenever the apparatus is worn. The tear-off caps should NOT be removed from this canister until it is necessary to install it in the apparatus.

Cleaning and disinfecting apparatus.—The facepiece and corrugated tube should be disconnected at the canister holder prior to disinfecting. A soap and water solution should be used. DO NOT use alcohol. If the apparatus should become contaminated with OIL, GASOLINE, GREASE, or MIXTURE OF OIL AND WATER, it should be thoroughly scrubbed with soapy water and allowed to dry prior to re-use. Oil will cause rubber parts of the apparatus to deteriorate. Of more importance, any oil on the apparatus constitutes a hazard to the wearer, if permitted to come in contact with the chemical in the canister.

Replacement parts.—Spare or replacement parts will initially be furnished all shore based oxygen breathing apparatus repair shops. Minor

repairs such as the replacement of corrugated breathing tubes, breathing bags, or canister holders complete can be effected by the ship's force. When replacing rubber breathing tubes, a light layer of rubber cement should be applied to the inside of the ends of the new part prior to installation. The tube should then be secured with tape, wire and a finish layer of tape to protect the wire. Repairs to the diaphragm assembly and the valves in the canister holder will be made by regular breathing apparatus repair shops. Parts should be requisitioned from the nearest repair shop.

Spare canisters.—Ten spare canisters will be furnished with each apparatus. Replenishment canisters to replace those used in training or emergencies should be requisitioned from the nearest supply activity.