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Instruction Manual
for

Oxygen Breathing Apparatus

Navy Type A-1 & 2

The contents of this Manual must not be revealed to any person unauthorized to receive the information.

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INSTRUCTIONS

for

PROPER USE AND MAINTENANCE OF

OXYGEN BREATHING APPARATUS-NAVY TYPE A-1 & A-2

FIGURE 1

OXYGEN BREATHING APPARATUS-NAVY TYPE A-1

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INTRODUCTION

The apparatus described and illustrated in this pamphlet are known as the Oxygen Breathing Apparatus-Navy Types A-1 & 2. They are a self-contained apparatus and operate independent of the outside air. In these respects they are similar to the conventional type of oxygen rescue breathing apparatus. In other respects they are radically different. The conventional type of apparatus employs a compressed oxygen cylinder as a source of oxygen for breathing requirements and a compartment filled with chemical for absorbing the carbon-dioxide contained in the exhaled breath. The conventional type also requires and is fitted with a reducing valve, by-pass tubing and valve, high pressure fitting, oxygen admission valve, etc., resulting in a complicated device necessitating extensive training in its use. The Oxygen Breathing Apparatus-Navy Types A-1 & 2 described herein employ a canister filled with a special chemical which absorbs carbon-dioxide and simultaneously evolves sufficient oxygen for the wearer's respiratory requirements, thus permitting the elimination of the complicated parts of old type apparatus. Instructions for their use and maintenance follow.

DESCRIPTION OF APPARATUS

The Oxygen Breathing Apparatus-Navy Types A-1 & 2 are a self-contained oxygen generating breathing apparatus designed to protect the wearer in any atmosphere that is irrespirable due to presence of harmful gases, vapors, dusts and smokes or a deficiency of oxygen. They are entirely self-contained and their operation is independent of any outside air; the wearer breathes in a closed system which forms a circuit within the apparatus. The exhaled breath which contains carbon-dioxide is purified of this gas and replenished with oxygen by passing through a chemical and is then rebreathed.

The complete Type A-1 apparatus is shown in FIGURE 1.

FIGURE 2 shows the complete Type A-2 apparatus adjusted to the body of the wearer and ready for service. This apparatus also permits the wearer to change canisters in a toxic or smoke filled atmosphere.

FIGURE 2

TYPE A-2 APPARATUS READY FOR SERVICE

Pictures of the various parts which make up the apparatus together with their corresponding names and identification numbers are shown in detail on pages 42 and 43. Assembly drawings of the complete apparatus are also provided at the rear of the manual on pages 35, 36, 37 and 38.

The Speaking-Diaphragm Facepiece is approximately similar in design to that of the U. S. Navy ND Mark III Gas Mask. The facepiece valve assembly, which is located immediately below the speaking diaphragm, is equipped with a starter valve to permit air to be drawn from the surrounding fresh atmosphere for the wearer's respiration while he is inflating the breathing bag. This assembly also contains the removable exhalation and inhalation valves which direct the flow of air through the apparatus (See FIGURE 3, 4 & 5). The latter valves are designed to control the directional flow of the exhalations and inhalations into and from the apparatus. Thus the valve arrangement, as shown in FIGURE 3 & 4, provides circulatory breathing through the apparatus and purifying canister, and prevents rebreathing of the exhaled breath before it has been purified and replenished with oxygen.

The chemical contained in the canister purifies the exhaled breath of the wearer by absorbing the carbon-dioxide and at the same time generating oxygen for normal and comfortable breathing. The resultant chemical action liberates considerable heat in the canister. However, owing to the design of and insulation provided on the canister guard and breast plate, the wearer is fully protected from the heat. The breathing bag serves as a reservoir for the evolved oxygen and at the same time, due to its large surface area, provides an adequate cooling medium for the heated air coming from the canister.

The chemical in the canister contains a high percentage of oxygen which is liberated on contact with moisture; the rate of evolution being governed by the amount of moisture and carbon dioxide present. For breathing

purposes, the water vapor and carbon dioxide in the exhaled breath is sufficient for this purpose. Any excess moisture such as water will cause a sudden reaction and a rapid liberation of oxygen. Therefore, do not introduce water into unused canisters, as a means of starting generation of oxygen.

It is a well-known fact that oxygen in contact with oil is explosive. This is as true of the oxygen confined in this chemical as it is with gaseous oxygen confined in cylinders. Personnel should be warned not to use oil or grease of any kind on the apparatus or the canister and never to introduce oil or any foreign matter in the canister. Sealed canisters should not be coated with paraffin or similar material as a means of preservation. Spare canisters should be stowed horizontally and remain sealed until required for use. Spent canisters should be thrown overboard. If oil slicks are present on the water, canisters should not be thrown overboard until the ship is underway. DO NOT THROW SPENT CANISTERS IN BILGES OR ANY SPACES WHICH MAY CONTAIN OIL OR OIL AND WATER.

The harness consists of straps of strong black cotton webbing and suitable hardware which permits its use as a safety belt. A substantial D ring is assembled to the harness, where the shoulder straps cross on the back of the wearer, for attaching a safety line.

The service time or life of a canister depends upon the extent of the wearer's exertions. The amount of chemical in the canister and its characteristics are such that it will ordinarily last one hour with intermittent hard work. If the work is continuous and extremely strenuous, this time will be reduced accordingly. Under such conditions the life of the canister may be reduced to 30 minutes. In any event approach to the end of its useful life will be evidenced by a noticeable resistance to exhalations or excessive fogging of facepiece lenses which should be construed by the wearer as a warning to leave

the compartment or space in which he is working or to insert a new canister into the apparatus.

(NOTE: Increased resistance to exhalations will also be noted when the breathing bag is overinflated. However, this condition may be relieved by depressing the starter valve for a half of one exhalation. If considerable resistance to exhalations is still present, the canister is expended.)

To indicate the length of time the canister has been in service and when it must be replaced with a fresh canister, a timer is provided in a position easily visible at all times to the wearer, and indicates the end of a previously set interval of time by the ringing of a bell. The dial of the timer is calibrated in minutes and provides interval settings up to sixty minutes. It is recommended that the pointer of the dial be set at 30 minutes rather than 60 when the apparatus has been put on and the canister started. If at the end of 30 minutes there has been no noticeable increase in resistance to exhalations, the timer may be set for an additional 15 minutes prior to returning to fresh air or to replacing the exhausted canister with a new one. By turning the pointer of the dial clockwise to the number corresponding to the number of minutes in the interval to be timed, the timer is automatically wound, and if left untouched, will unwind with continuous movement of the pointer to zero. When the pointer reaches the zero mark, the end of the interval is indicated by the alarm bell.

FIGURE 3 is a diagrammatic sketch of the Type A-1 apparatus that shows the flow of air through the apparatus. Beginning with the speaking diaphragm type facepiece and following the arrows, the exhaled air flows through the exhalation valve and left breathing tube, as viewed in FIGURE 3, into the canister, passing to the bottom of the canister through a tube located in the center. From the bottom of the canister the air passes upward

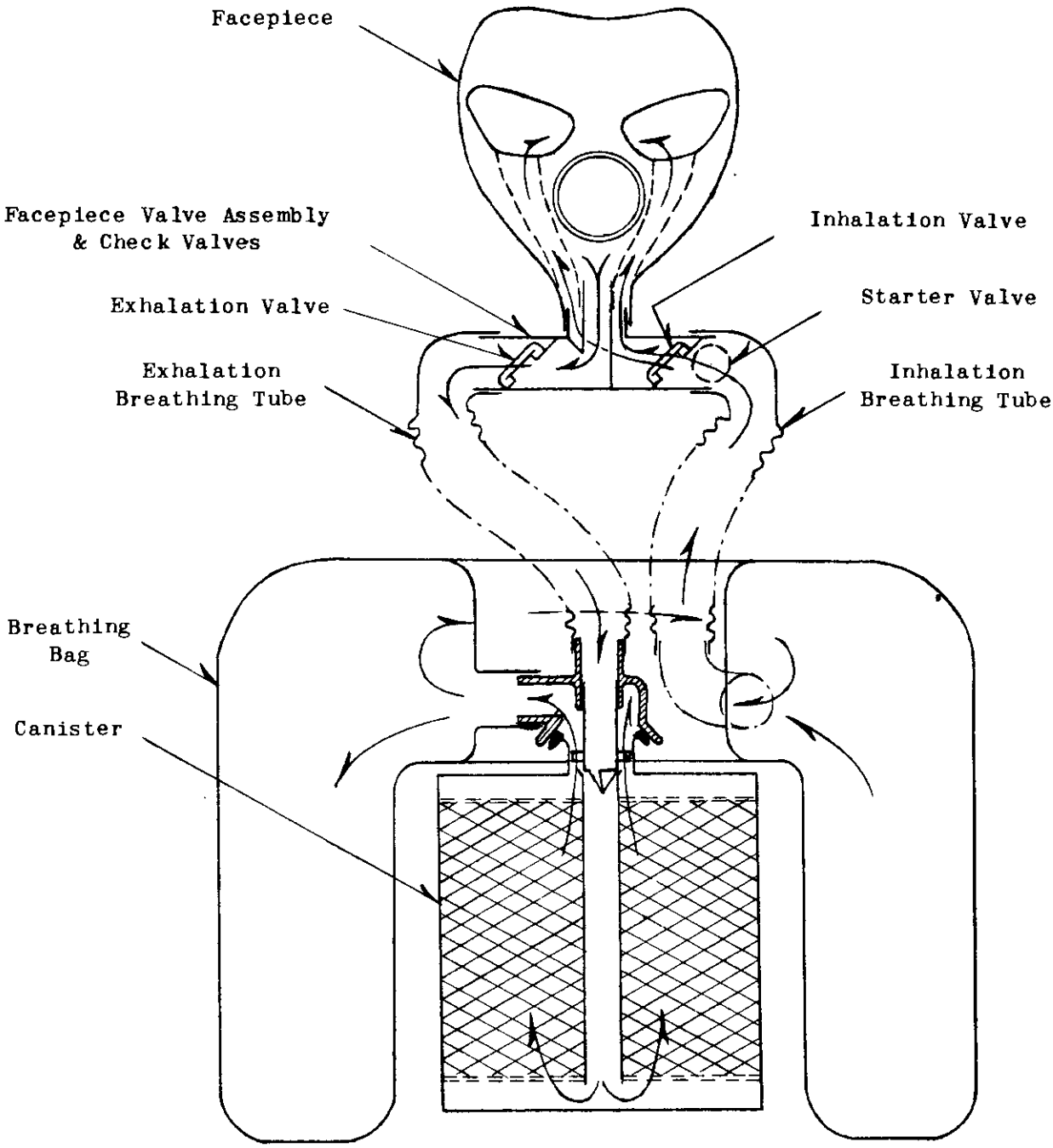

Figure 3

AIR FLOW DIAGRAM WITH CANISTER IN PLACE

TYPE A-1 APPARATUS

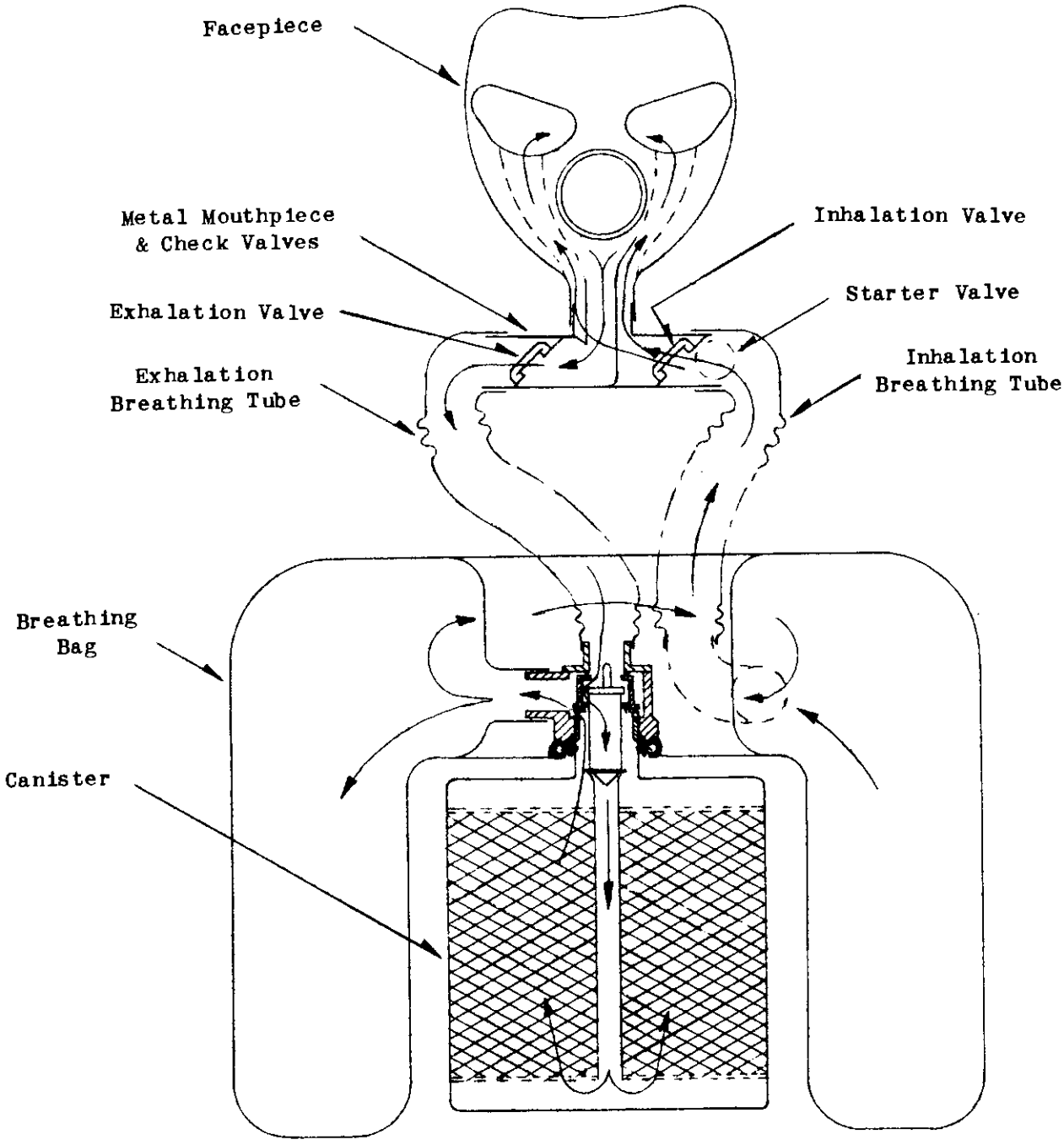

Figure 4

AIR FLOW DIAGRAM WITH CANISTER IN PLACE

TYPE A-2 APPARATUS

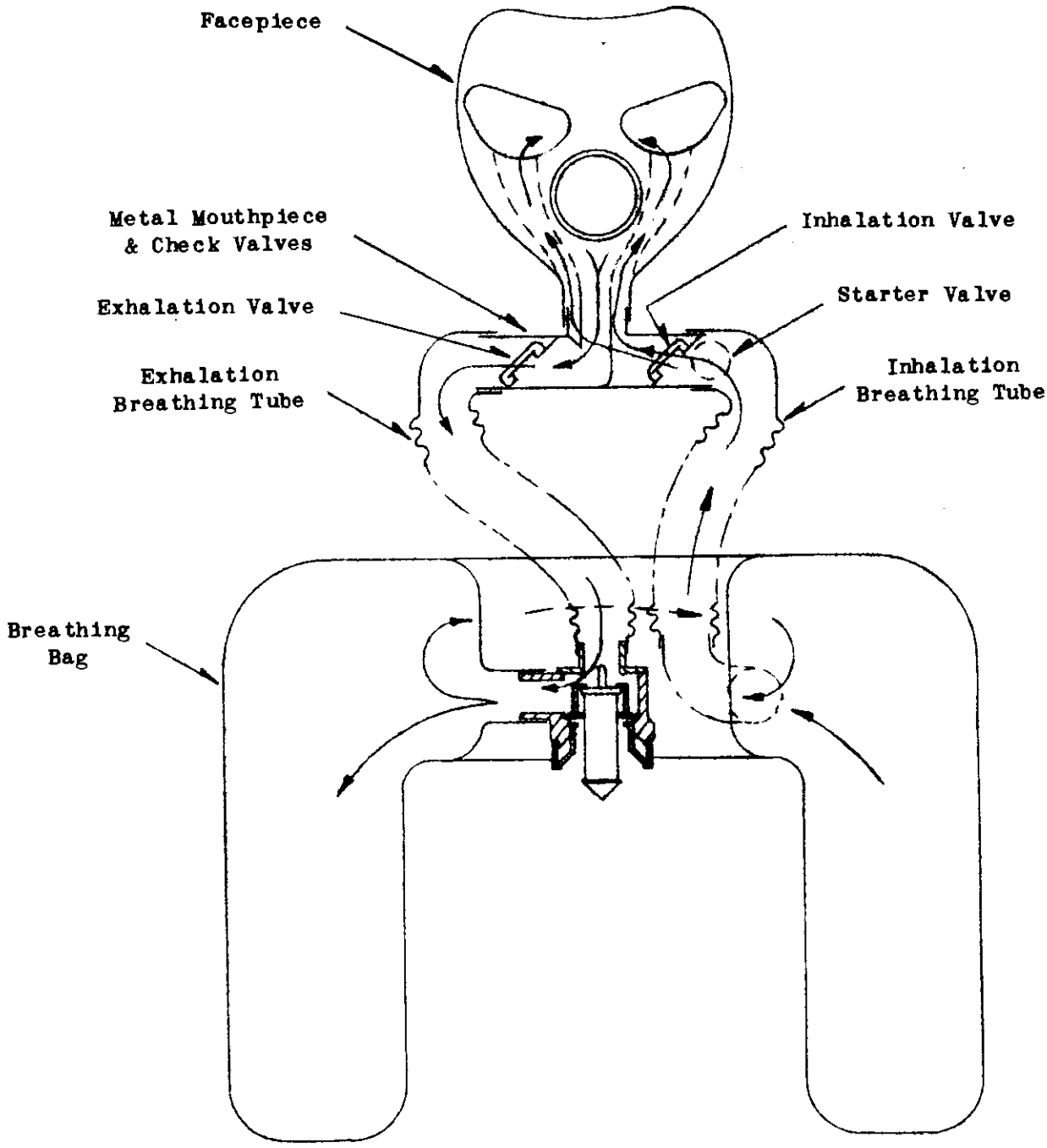

Figure 5

AIR FLOW DIAGRAM WITH CANISTER REMOVED

TYPE A-2 APPARATUS

through the layers of chemical surrounding the center tube. It is while passing through the chemical that the carbon-dioxide is removed from the exhaled breath and the oxygen replenished. Upon leaving the canister, the air passes into the left side of the breathing bag as viewed in FIGURE 3, and thence through the back portion of the bag into the right side from which it is inhaled by the wearer through the inhalation breathing tube.

Figures 4 & 5 are diagrammatic sketches of the Type A-2 apparatus that show the flow of air with the canister in and removed. With the canister removed the path of airflow is the same as in the A-1 down to the valve housing where it is directed into the breathing bag, and then back to the lungs by way of the inhalation breathing tube. Since none of the carbon dioxide is removed from the exhaled breath, it will build up in the breathing bag. Tests conducted by the Naval Research Laboratory have shown that the percentage of carbon dioxide which accumulates in the breathing bag during the 15 to 30 seconds required to change canisters, is not sufficient to have any ill effect or to cause the wearer any discomfort.

The rubber breathing bag serves as a flexible external lung and as a reservoir for the storage of respirable air for breathing requirements.

The surface of the breathing bag acts as a cooling medium and the circulatory path of the air through it reduces the temperature of the air to that comfortable for breathing.

The canister (FIGURE 6) is closed with a protective cap over an airtight metallic foil seal in the neck of the canister. A metal disc and two cardboard discs are placed between the tear-off cap and the metallic foil seal in the neck of the canister, to prevent rupture of the seal if the cap is bumped against a sharp object. New apparatus are shipped with one canister inserted in the apparatus. This canister carries a label "REMOVE TEAR-OFF CAP",

and the canister should be removed immediately from the apparatus. The tear-off cap has been left in place to insure greater safety for the apparatus and canister in transit. To prepare the canister for use, the cap only is removed by pulling the metal strip that extends beyond the edge of the cap straight out and then straight back across the top of the cap. The metal disc and the two cardboard discs are brushed off the canister neck and the canister is then placed in the canister guard with the opening upward and with the "bulged" side away from the wearer. This is done by swinging the bail outward enough to permit the canister to enter the canister guard and by inserting the canister until it is engaged by the canister stop which is located on the left side of the guard. The bail is then swung back under the canister and the handwheel turned clockwise until the canister is held firmly, but not too tightly, in place. The apparatus is now ready for "STAND-BY" service without the metallic foil seal in the neck of the canister being punctured (FIGURE 10).

Should occasion arise for actual use of the A-1 apparatus, the wearer must turn the handwheel counterclockwise sufficient to release pressure on the stop and depress the canister stop. He then turns the handwheel clockwise with the stop depressed until the canister gasket is firmly seated against the V-shaped recess in the Main Valve (FIGURE 11). The canister is now in "OPERATING" position. This action seals the apparatus against the entrance of any outside air at the canister neck and forms a closed circuit between the facepiece and the breathing bag. When the canister is removed from the Type A-1, the breathing circuit is opened to the surrounding atmosphere.

The same initial steps are required for actual use of the Type A-2 apparatus; turn handwheel counterclockwise, depress canister stop and turn handwheel clockwise until canister gasket is firmly seated. It will be noted that on the Type A-2 apparatus the canister gasket first seats against a metal insert

FIGURE 6

CANISTER

FOR USE WITH NAVY TYPES A, A-1, A-2 AND PATROL TYPE OXYGEN BREATHING APPARATUS

inside the rubber boot. As the canister forces this insert upward the boot buckles slightly and the insert then seats against the valve housing. While doing this legs on the insert have opened a valve inside of the housing which directs exhalations through the canister instead of into the breathing bag as is the case when the canister is removed. When the canister drops out the rubber boot keeps the breathing circuit sealed from the surrounding atmosphere until the valve inside is seated directing exhalations into the breathing bag.

After slipping on the facepiece, (FIGURE 12) the breathing bag should be inflated as described under "Detailed instructions for use".

Upon expiration of the service time of the canister (see page 6), the wearer must return to fresh air or insert a new canister. After returning to fresh air, remove the spent canister by turning the handwheel counterclockwise to the extreme "DOWN" position, depress the canister stop and with a quick forward motion, swing the bail from under the canister. The canister will then fall out of the guard (FIGURE 14). Since the canister is hot, due to the reaction of the chemical therein, it should not be touched without adequate protection for the hands. The canister stop will return automatically to position for the next period of service. When it is necessary to change canisters in a toxic or smoke filled atmosphere (Type A-2 only), the canister should be caught before it drops to the deck whenever there is any danger of it bouncing or dropping into water containing oil or grease. Asbestos mittens or work gloves with leather lined palms furnish adequate protection for the hands. See page **22** for further details.

DETAILED INSTRUCTIONS FOR USE

Persons who have occasion to wear the Oxygen Breathing Apparatus, Navy Type A-1 or A-2, must become thoroughly acquainted with its principle of operation and the proper procedure for wearing it prior to its actual use in service. The apparatus should be worn and the necessary operations frequently practiced by the prospective wearer under the supervision of a person thoroughly trained in the operations necessary for the use of the apparatus. It should be remembered that these apparatus are designed to protect the respiratory system of the wearer from dangerous atmospheres and that the very life of the wearer may depend upon following the correct procedures in using the apparatus.

The following are the essential consecutive steps in donning and wearing these apparatus:

1-Before donning the apparatus, unfasten and straighten all harness straps.

2-With one hand grasp the apparatus by the central casting, dropping facepiece over the hand holding apparatus. With the other hand grasp the D-ring assembly, put the breast plate of the apparatus on the chest and the head through the V-shaped opening formed by the crossing of the two straps attached to the breast plate. See FIGURE 7.

3-Continue to hold the apparatus on the chest with one hand and with the other reach around to the rear at one side and grasp the free end of the harness strap that passes over the opposite shoulder. Bring the end of this strap beneath the armpit and snap into the metal D-ring located on the top side of the breast plate. This is the same D-ring to which is attached the other end of the opposite

FIGURE 7

DONNING THE APPARATUS

strap. Repeat this procedure for the other strap.

4-Adjust the position of the apparatus on the body by means of the metal slides located on the harness straps. The position of the apparatus on the body should be such that the wearer can look up or down without having the facepiece shift or catch on the timer or main valve housing.

5-Attach the waist strap to the small D-rings on each lower side corner of the breast plate and adjust to hold the apparatus snugly to the body.

6-To place canister in apparatus, (See FIGURE 9), first remove the metal protective cap and expose the metallic foil seal in the neck. This is done by pulling the metal tab straight out and then straight back across the top of the cap (FIGURE 8). Insure that the metal disc and both cardboard discs have been brushed off the canister neck. Then, with handwheel in extreme "DOWN" position, swing bail outward far enough to permit canister to enter canister guard. Insert canister with neck up. After canister hits canister stop, swing the bail back in place under the canister and turn handwheel clockwise until canister is locked firmly, but not too tightly, in place. The Apparatus is now ready for "STAND-BY" service (FIGURE 10). BEFORE INSERTING CANISTER MAKE SURE THAT PROTECTIVE TEAR-OFF CAP, METAL AND CARDBOARD DISCS HAVE BEEN REMOVED.

7-"OPERATING" position of apparatus. To obtain this active service condition, the wearer momentarily releases the pressure on the canister by turning the handwheel counterclockwise approximately one half turn with his right hand, and with his left hand pushes the canister stop on the left hand side of the guard in as far as

FIGURE 8

REMOVING SEAL FROM CANISTER

possible. He then turns the handwheel clockwise until the canister gasket is firmly seated against the V-shaped recess in the Main Valve (FIGURE 11).

8-With the apparatus properly and comfortably positioned and with the head harness straps properly in place through the buckles of the facepiece, slip on the facepiece and adjust the head straps to fit the face and head size of the individual wearer. (See FIGURE 12).

To obtain a firm and comfortable fit against the face at all points, adjust headbands as follows:

(a) See that straps lie flat against head.

(b) Tighten lower or "neck" straps.

(c) Tighten the "side" straps. (Do not touch forehead or "front" straps).

(d) Place both hands on headband pad and push it toward the neck.

(e) Repeat operations (b) and (c).

(f) Tighten forehead or "front" straps.

(g) Test for tightness of facepiece by squeezing both breathing tubes and inhaling. (See FIGURE 15) CAUTION: DO NOT ATTEMPT TO USE ANY TYPE FACEPIECE WITH THIS APPARATUS OTHER THAN THE ONE FURNISHED WITH THE APPARATUS.

10-The chemical reaction in the canisters is caused by the moisture and carbon dioxide in the exhaled breath. The amount of moisture and carbon dioxide in the exhaled breath are proportional to the amount of work being done or performed within the previous few minutes. A man who has been performing some manner of work, such

FIGURE 9

INSERTING CANISTER IN APPARATUS

as walking rapidly, running, climbing ladders, just prior to donning an apparatus, will be able to start oxygen evolution from the chemical in a relatively short period of time. On the other hand a man who has been standing or sitting still would require a longer period to start the chemical reaction. The starting instructions listed below are applicable only to canisters which have been stowed in temperatures of 50° F. or above. For colder temperatures see cold starting procedures.

After the facepiece has been adjusted and checked for an airtight fit, start the chemical reaction in the canister by the following method:

(a) Grasp both breathing tubes with one hand, squeeze tightly, depress starter valve, and inhale deeply, release starter valve and tubes and then exhale into apparatus.

(b) Repeat this procedure until breathing bags are fully inflated (usually 3 or 4 breaths).

(c) Lift one side of facepiece and deflate breathing bags.

(d) Repeat (a), (b), and (c) until bottom of canister feels warm, then proceed with work to be done.

11-Cold Starting Procedure

As stowage temperature or the ambient temperature in which the apparatus is used decreases below 50° F., more and more effort is required to properly start oxygen evolution from the chemical due to condensation and possibly freezing of the moisture in the exhaled breath on the walls of the breathing tube.

FIGURE 10

APPARATUS IN "STAND-BY" POSITION

The following instructions apply only to canisters stowed or chilled to temperature below 50° F. immediately before starting.

Repeat (a) through (c) until bottom and top of canister are warm, then proceed with work to be done.

Excess time for filling bag and rapid deflation after filling is indicative of leakage. Do not use apparatus, but make complete check for leaks.

CAUTION: AIWAYS INFLATE BAG BY ABOVE PROCEDURE BEFORE USING THE APPARATUS SINCE SUCH PROCEDURE IS ABSOLUTELY NECESSARY TO START ACTION OF THE CHEMICAL. START OF CHEMICAL ACTION WILL BE INDICATED BY CANISTER BECOMING WARM.

12-To remove canister, spread legs apart, lean upper part of body slightly forward, turn handwheel counterclockwise to extreme "DOWN" position, depress canister stop, and with a quick forward motion swing the bail outward. The canister will then drop out of the apparatus. (See FIGURE 12).

13-Changing Canisters in Toxic or Smoke Filled Atmosphere

No firm rule can be stated for changing canisters in a toxic or smoke filled atmosphere. The following general precautions are furnished for guidance:

The life of a canister varies with the amount of work and to a limited extent the physical condition of the man wearing the apparatus. Generally, a canister will be exhausted within 30 to 45 minutes during fire fighting operations. The wearer will be warned of this by excessive fogging of the facepiece lenses and increased resistance to exhalations. If a check of the breathing bag indicates that the increased resistance is not due to over-

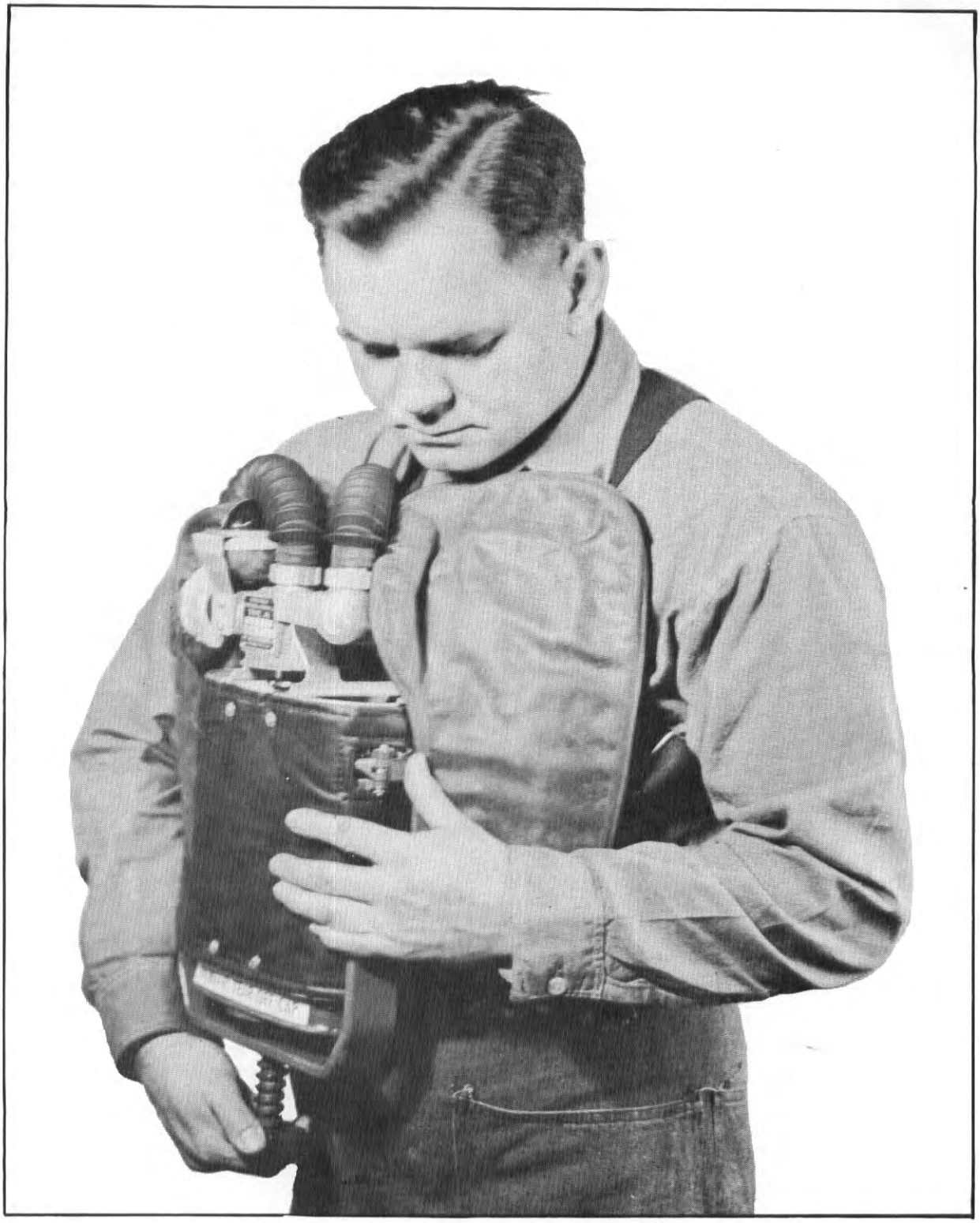

FIGURE 11

PREPARING APPARATUS FOR "OPERATING" POSITION

inflation, steps should be taken to replace the canister immediately.

(a) There is adequate oxygen in the breathing bag to support the wearers demands while changing canisters. However, the carbon dioxide in the breathing bag will start to build up when the canister is removed and cause discomfort by the end of 40 seconds unless the new canister has been installed.

(b) Never permit a canister to drop to the deck or grating, while removing it, where there is loose water on the deck or the possibility exists of the canister bouncing off a grating into the bilge.

(c) Always wear asbestos mittens, leather palmed work gloves or equivalent protection of the hands.

(d) Carrying used (opened) canisters in a pouch on the belt is not recommended during fire fighting operations or in compartments where water and oil or gasoline may be present on the deck. Loose water is frequently contaminated with oil or grease and if canisters fall into it, the open canisters may explode.

(e) Where it is not considered practical to relieve personnel, performing fire fighting or damage control operations, by the time the original canister is expended, it is suggested that a messenger equipped with an apparatus be sent in with fresh canisters and to bring out the used ones.

14 - Procedure for Changing Canisters In a Toxic or Smoke Filled Atmosphere

(a) Remove tear-off cap, metal and cardboard discs of

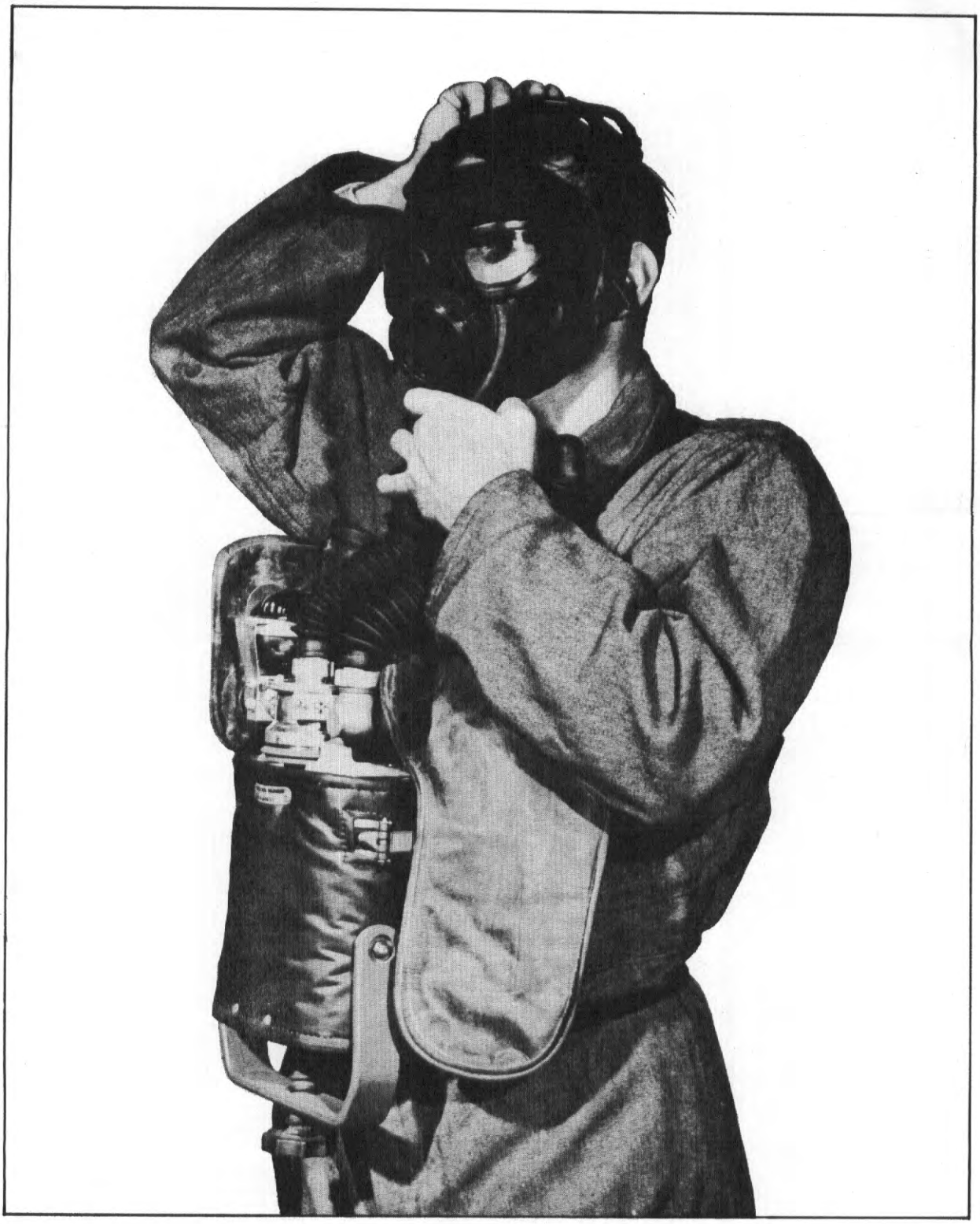

FIGURE 12

SLIPPING ON FACEPIECE

FIGURE 13

INFLATING BREATHING BAG

replacement canister and then place canister on the deck in an upright position or hold it clamped between knees.

(b) Unscrew bail of apparatus turning it counter-clockwise and swing it out from under canister holder. Depress canister stop and if necessary start spent canister out by pushing it with the thumb of one gloved hand. (FIGURE 14)

(c) Catch expended canister as it leaves the canister holder with the other gloved hand and immediately place it in a SAFE DRY place or hand it to messenger.

(d) Pick up fresh canister item (a) above and insert in apparatus, swing bail under canister and start screwing it up (clockwise) to seat canister. Meanwhile depress canister stop so canister can travel up and seat on main valve housing.

(e) Remain standing still while taking 10 complete inhalations and exhalations. Breathe deeply and slowly.

(f) Remove one glove and check bottom of canister for warmth. As soon as warmth is evident, work may be resumed.

(g) If warmth is not evident by the time the 10 inhalations and exhalations have been taken, go to a compartment where fresh air is available.

15-Immediately upon inflating bag, turn pointer on timer dial clockwise to number 30. As apparatus is used, pointer will return to zero at which point bell will sound. If there has been no noticeable increase in resistance to breathing, reset pointer for an additional 15 minutes' work.

16-Upon sounding of timer bell, indicating canister has been in use 30 or 45 minutes, or when it becomes an effort to exhale and test indicates that resistance is not due to overinflation of breathing bags, immediately return to fresh air, or change canister as described under 12 & 13. Remember the approximate life of a canister in continuous use is 45 minutes.

CAUTION: USED CANISTER IS VERY HOT. DO NOT HANDLE WITHOUT SUITABLE PROTECTION FOR HANDS.

CAUTION: DO NOT ALLOW ANY LIQUID, ESPECIALLY OIL, GREASE OR GASOLINE, ETC., TO ENTER OPENING OF USED CANISTER AND DO NOT HOLD FACE OVER CANISTER OPENING. SHOULD THE CANISTER BE OPENED DO NOT HANDLE CHEMICAL WITHOUT SUITABLE CARE AND PROTECTION TO HANDS AND BODY, AS CHEMICAL IS CAUSTIC AND IS INJURIOUS TO THE SKIN, AND SHOULD NOT BE PERMITTED TO COME IN CONTACT WITH THE PERSON. DO NOT ALLOW UNEXPENDED OR EXPENDED CHEMICALS TO SPILL ON DECK. IF ACCIDENTALLY SPILLED, CLEAN UP IMMEDIATELY AND DUMP OVERBOARD USING A METAL OR NON-INFLAMMABLE MATERIAL FOR SCOOP. THIS CHEMICAL, DUE TO THE LARGE PERCENTAGE OF OXYGEN IT CONTAINS, WILL CAUSE COMBUSTION OF ANY INFLAMMABLE MATERIALS WITH WHICH IT IS BROUGHT INTO DIRECT CONTACT ESPECIALLY IF SUCH MATERIALS ARE MOIST. EXPENDED CANISTERS SHOULD BE DUMPED OVERBOARD.

OIL, GASOLINE OR SIMILAR MATERIALS COMING IN CONTACT WITH THE CHEMICAL IN EITHER THE UNEXPENDED OR THE EXPENDED CANISTERS WILL CAUSE AN EXPLOSION.

CANISTERS SHOULD NOT BE DUMPED OVERBOARD WHERE THERE IS AN OIL SLICK PRESENT ON THE WATER. DISPOSAL OVERBOARD SHOULD NOT

BE MADE UNTIL THE VESSEL IS UNDERWAY. DO NOT THROW SPENT CANISTERS IN BILGES OR ANY SPACE WHICH MAY CONTAIN OIL OR OIL AND WATER.

FIGURE 14

REMOVING USED CANISTER

FIGURE 15

TESTING APPARATUS FOR TIGHTNESS

ASSEMBLY, MAINTENANCE AND CARE

Assemble facepiece and breathing tubes to apparatus by attaching fluted coupling nuts at ends of breathing tubes to housing, tightening with spanner wrench. After the apparatus has been used, the following maintenance and care procedure is essential.

1-Remove canister and clean apparatus. Do not use any alcohol, oil, gasoline or grease in such cleaning. Do not place apparatus in storage with canister in operating position.

2-Facepiece can be separated from apparatus for cleaning and sterilizing by detaching coupling nuts. Considering the sanitary and technical aspects, it is desirable that this is done after every period of use of the apparatus. On apparatus with removable Facepiece valves, disconnect the toggle clamps holding the breathing tubes, remove tubes and valves. Clean, sterilize, and dry valves separate from Facepiece. After sterilizing Facepiece, hang up and allow to drain and dry completely. Cloth used to sterilize facepiece should be dampened with soap and water, it should NOT be sopping wet. Facepiece valves and Breathing tubes should then be assembled. Facepiece valves are stamped "IN" for inhalation and "EX" for exhalation, and should be inserted into their respective openings, in the metal mouthpiece, which are correspondingly marked "IN" and "EX" to assure proper function and breathing condition. Care must be exercised in assembling the facepiece valves into the metal mouthpiece so that the indented sections or rivets on the metal mouthpiece surface fit into the proper corresponding slots of the facepiece valves.

3-Examine carefully the speaking diaphragm discs for their general condition and freedom from holes after use if the apparatus has been in contact with flames or subjected to extreme heat. These discs will not support combustion but will burn slowly when in contact with fire or equivalent intense heat. Any damage resulting in the puncturing of the discs destroys the gas tight integrity of the apparatus. Defective discs should accordingly be replaced before the apparatus is again used.

4-While the apparatus is not in use there should be periodic inspection in order to keep the apparatus ready for use. An important point of inspection is to see that the main valve and plunger are clean and that the plunger operates freely. Never use oil, grease or vaseline on any part of the apparatus. Check the rubber sleeve or boot on the Type A-2 to make sure it has not worked loose.

5-Stow in a cool, dry space. As far as practicable, canisters should be stored horizontally.

6-Extreme care must be taken to prevent any substance, including water or other liquids, from entering the breathing bag. This is especially true of oil, gasoline, kerosene, etc.

7-It is recommended that the breathing bag be tested for leaks periodically. A pressure of 9 inches of water by manometer should not be exceeded for this purpose.

8-(a) Rest apparatus on suitable bench or level, waist high section.

(b) Put on facepiece and inflate the breathing bag as described previously.

(c) With breathing bag fully inflated, grasp both breathing tubes tightly and twist them together so that no leakage can occur

due to tubes not being closed off.

(d) Watch breathing bag and if it deflates, check for point of leakage with soap solution and make necessary repairs to insure tightness, then retest for tightness prior to use.

(e) There should be no leakage when apparatus is to be used; therefore, the apparatus must be maintained in a leak-tight condition by periodic checks.