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Fire Extinguishing Appliances

Standards for the Installation,
Maintenance and Use of

FIRST AID FIRE APPLIANCES

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NATIONAL FIRE PROTECTION ASSOCIATION
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National Fire Protection Association

International

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The National Fire Protection Association was organized in 1896 to promote the science and improve the methods of fire protection and prevention, to obtain and circulate information on these subjects and to secure the cooperation of its members in establishing proper safeguards against loss of life and property by fire. Its membership includes over a hundred and eighty national and regional societies and associations and nearly fifteen thousand individuals, corporations, and organizations. Membership in the National Fire Protection Association is open to any society, corporation, firm or individual interested in the protection of life or property against loss by fire.

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STANDARDS FOR THE INSTALLATION, MAINTENANCE AND USE OF FIRST AID FIRE APPLIANCES.

Prompt notice of the existence of a fire is important and the use of containers holding fire extinguishing material in readily accessible locations is of value in extinguishing fires in their incipient state.

This standard adopted by the NFPA on May 22, 1953 incorporates revisions recommended by the Committee on First Aid Extinguishers which operates under the sponsorship of the General Committee on Special Extinguishing Methods.

The present edition supersedes the edition of 1950. For prior history of this standard dating back to 1918, see National Fire Codes, Vol. IV, Extinguishing and Alarm Equipment, published by the NFPA.

Prior editions of this standard have also been adopted and published by the National Board of Fire Underwriters in NBFU Pamphlet No. 10 with identical text (except for cover and introductory matter). It is anticipated that in normal course the present edition will be similarly adopted by the NBFU.

CONTENTS.

Standards for the Installation, Maintenance and Use of FIRST AID FIRE APPLIANCES

Principles of Fire Extinguishment.

Combustion is defined as "A chemical process accompanied by the evolution of heat."

Substances when heated to a certain temperature (known as the "temperature of combustion") form a union with the oxygen of the atmosphere, resulting in combustion (fire or flame). Sufficient heat is usually liberated to raise the temperature of adjoining substances to the "temperature of combustion." Proper temperature and a supply of oxygen are necessary to cause a substance to burn.

Combustion can be suppressed by cooling (lowering the temperature of) the burning substance below the temperature of combustion, or excluding the oxygen of the atmosphere from contact with the substance or some combination of these.

Section 1.

GENERAL.

1001. First aid fire appliances are essentially first aid devices provided close at hand for immediate use when needed.

1002. It should be understood that they are designed to cope with fires in their incipiency and are considered necessary even though the property is equipped with automatic sprinklers or standpipe and hose.

1003. Various types of first aid fire appliances are described herein. Each type is of value, but all are not equally effective upon various kinds of fires. On this account consideration should be given to the class of fire which may occur on account of the nature of the processes in or contents of a building.

1004. The requirements given herein are, in general, minimum and the inspection department having jurisdiction should be consulted in all cases.

1005. While the methods of operation of the various types of appliances are generally apparent from their very nature, and are indicated prominently on each extinguisher, it is important to give instructions to employees and to occupants of the property in order that, through familiarity, they may more intelligently and more confidently handle appliances during the excitement of a fire and thus accomplish the maximum of fire extinguishment in the minimum of time. These instructions should be supplemented by yearly or more frequent demonstrations.

1006. It is extremely important that the instructions regarding maintenance be carefully followed so that the first aid fire appliances will be always fully charged; in their designated places at all times; and in a condition which will permit efficient operation at any moment without delay.

1007. In location where appliances are likely to be obscured by piles of stock, lumber, etc., or in large rooms, means should be provided to indicate conspicuously the location of the appliances.

1008. In many industries temporary hazards occur from time to time. A good practice is to maintain a few portable stands or racks consisting of a horizontal bar on uprights with feet. Locate these stands as necessary and hang on them such fire appliances as are suited to the "Special Hazard" to be protected.

Section 2.

CLASSIFICATION OF FIRST AID FIRE APPLIANCES.

In order to express the relative values of first aid fire appliances, the following classification plan has been established:—

Classification of Fires.

For all practical purposes there are three general classes of fires:

Class "A" Fires may be defined as fires in ordinary combustible materials where the **"Quenching"** and cooling effects of quantities of water, or solutions containing large percentages of water, is of first importance.

Class "B" Fires may be defined as fires in flammable liquids, greases, etc., where a **"Blanketing"** effect is essential.

Class "C" Fires may be defined as fires in electrical equipment, where the use of a **"Non-conducting"** extinguishing agent is of first importance.

Unit of First Aid Fire Protection.

Underwriters' Laboratories, Inc., has established a unit for convenience in measuring the fire protection afforded by portable fire extinguishing appliances.

The unit is composed of from one to five hand portable fire extinguishing appliances, depending upon the extinguishing value of the kind and size of appliances comprising the unit.

Classification of Fire Extinguishers.

Based on the foregoing classification of fires, and values determined by Underwriters' Laboratories, Inc., classifications have been established for hand-portable fire extinguishers as per table below. In this table the classification "A 1" signifies that the appliances so classified are suitable for use on "A" fires and that one such appliance is required to make one unit of first aid fire protection. The classification "B 2; C 2" signifies that the appliance so classified is suitable for use on Class "B" fires and Class "C" fires, and that two such appliances are required to make one unit of first aid fire protection, etc., etc.

The numeral following the Class is an indication of the size of fire which may be extinguished. For example, an extinguisher having a rating of one unit of first aid fire protection (B 1) is suitable for use on *small* fires, the numeral "2" or larger, indicates that the extinguisher is suitable for use only on *very small* fires. Where no numeral follows the letter indicating the Class, the extinguisher is suitable for use on moderately sized fires. Multiple numbers of fire extinguishers rated lower in fire extinguishing effectiveness may not be the equivalent in effectiveness of a single higher rated extinguisher. For example, two extinguishers rated "B 2" may not be the equivalent in effectiveness to one extinguisher rated "B 1."

CLASSIFICATION OF FIRE EXTINGUISHERS.

Type	Size	Classification
Chemical Solution (soda-acid)	2½-gallon	A 1
	1¼ to 1½-gallon	A 2
Water	2½-gallon (stored pressure cartridge)	A 1
	2½ to 5-gallon (pump)	A 1
	1½-gallon (pump)	A 2
	50-gallon cask with 3 12-quart pails	A 1
	25 to 40-gallon bucket tanks with 1 unit of pails	A 1
	10-quart pails	A 6
	12-quart pails	A 5
Anti-Freeze Solution	2½-gallon (stored pressure cartridge and internally generated pressure)	A 1
	2½ to 5-gallon (pump)	A 1
	1½-gallon (pump)	A 2
	50-gallon cask with 3 12-quart pails	A 1
	25 to 40-gallon bucket tanks with 1 unit of pails	A 1
	10-quart pails	A 6
	12-quart pails	A 5
Foam	2½ to 5-gallon	A 1 B 1
	1¼ to 1½-gallon	A 2 B 2
Loaded Stream	1¾ and 2½-gallon	A 1 B 2
	1-gallon	A 2 B 4
Vaporizing Liquid (carbon tetrachloride base)	1 to 3½-gallon	B 2 C 1
	1 to 2½-quart	B 2 C 2
Vaporizing Liquid (chlorobromomethane)	1 to 2-quart	B 2 C 2
	2½-quart	B 2 C 1
Carbon Dioxide	15 to 25 pounds of carbon dioxide	B 1 C 1
	7½ to 15 pounds* of carbon dioxide	B 2 C 1
	2 to 6 pounds of carbon dioxide	B 2 C 2
	2 to 2½ pounds* of carbon dioxide	B 4 C 4
Dry Chemical	10 to 30 pounds of dry chemical	B 1 C 1
	7½ to 10 pounds* of dry chemical	B 2 C 1
	2 to 6¼ pounds of dry chemical	B 2 C 2
Standpipe and Hose System	Small hose, straight stream nozzle	A
	Small hose, spray nozzle	A B C

*Differences in construction account for differences in classifications.

Classifications "A," "B," and "C" are given to wheeled extinguishers to indicate suitability for these classes of fire but unit ratings (1, 2, etc.) have not been adopted for wheeled appliances.

Classifications given to hand hose indicate classes of fire for which they are suitable. Unit ratings (1, 2, etc.) have not been adopted for hose.

Approximate Weights of Typical Hand Extinguishers.

(When charged and ready for use.)

1-quart Vaporizing Liquid (carbon tetrachloride base and chlorobromomethane)	7 pounds
2-quart Vaporizing Liquid (carbon tetrachloride base)	16 pounds
2-quart Vaporizing Liquid (chlorobromomethane)	18 pounds
2½-quart Vaporizing Liquid (carbon tetrachloride base)	21 pounds
2½-quart Vaporizing Liquid (chlorobromomethane)	23 pounds
1-gallon Vaporizing Liquid (carbon tetrachloride, base and chlorobromcmethane)	25 to 35 pounds
3½-gallon Vaporizing Liquid (carbon tetrachloride base)	75 pounds
2 to 6 pounds Carbon Dioxide	9 to 15 pounds
10 pounds Carbon Dioxide	30 to 40 pounds
15 pounds Carbon Dioxide	40 to 50 pounds
20 pounds Carbon Dioxide	50 to 65 pounds
25 pounds Carbon Dioxide	65 pounds
1¼ to 1½-gallon Chemical Solution (soda-acid)	20 to 25 pounds
1½-gallon Water (pump operated)	20 to 25 pounds
1¼ to 1½-gallon Foam	20 to 25 pounds
2½-gallon Chemical Solution (soda-acid)	35 pounds
2½-gallon Foam	35 pounds
2½-gallon Water (pump operated)	40 pounds
2½-gallon Anti-Freeze Solution	40 pounds
5-gallon Water (pump operated)	65 pounds
5-gallon Foam	70 pounds
2½ to 6¼ pounds Dry Chemical	7 to 15 pounds
7½ to 10 pounds Dry Chemical	20 to 25 pounds
20 pounds Dry Chemical	35 to 45 pounds
30 pounds Dry Chemical	50 to 60 pounds

Section 3.

DISTRIBUTION OF UNITS.

The required number of units may be obtained by providing devices of any of the types described in these standards, or a combination of two or more types, selected in accordance with the character of the fires anticipated, and their suitability for the individual property protected.

Hand Devices:

The number of units of first aid fire protection to be installed shall be determined by the inspection department having jurisdiction in accordance with the relative severity of the incipient fire anticipated, i.e., the relative rapidity with which a fire may spread and the relative intensity of the heat that may be developed. Where there are special hazards in addition to the ordinary hazards of the occupancy, additional units of suitable type shall be installed for the protection of such special hazards.

As a guide in determining the number of units which should be installed under various conditions the following recommendations are given:—

Class I. Light hazard occupancies, where because of a relatively small amount of combustibles, incipient fires of minimum severity may be anticipated.—Units shall be so located that a person will not have to travel more than 100 feet from any point to reach the nearest unit but at least one unit shall be required for each 5,000 square feet of floor area or fraction thereof.

NOTE: This class may include occupancies such as office occupancies, schools (exclusive of trade schools and shops), public buildings, etc.

Class II. Ordinary combustible occupancies, where incipient fires of average severity may be anticipated.—Units shall be so located that a person will not have to travel more than 50 feet from any point to reach the nearest unit but at least one unit shall be required for each 2,500 square feet of floor area or fraction thereof.

NOTE: This class may include occupancies such as department and dry goods stores, warehouses, miscellaneous manufacturing of average hazard, etc.

Class III. Extra hazardous occupancies, where because of character or quantity of combustibles, extra severe incipient fires may be anticipated.—Units shall be so located that a person will not have to travel more than 50 feet from any point to reach the nearest unit, plus additional units as directed by the inspection department having jurisdiction, but at least one unit shall be required for each 2,500 square feet of floor area or fraction thereof.

NOTE: This class may include occupancies such as woodworkers, paint spraying and dipping operations, etc.

Section 4.

PLAN GOVERNING THE ARRANGEMENT OF THE STANDARDS.

DEVICES SUITABLE FOR USE ON CLASS "A" FIRES.

Hand Extinguishers. Section

Classification A 1.

Method of Discharge—By Throwing
50-gallon cask or drum with 3 12-quart pails 11
25, 35 and 40-gallon bucket tanks with 1 unit of pails 11

Method of Discharge—Internally Generated Pressure
2½-gallon chemical solution (soda-acid) 12
2½-gallon foam 22
5-gallon foam 22
2½-gallon anti-freeze solution 15
2½-gallon loaded stream 24

Method of Discharge—Stored Pressure Cartridge
2½-gallon water 15
2½-gallon anti-freeze solution 15
1¾ and 2½-gallon loaded stream 24

Method of Discharge—Hand Operated
2½ to 5-gallon water 15
2½ to 5-gallon anti-freeze solution 15

Classification A 2. Section

Method of Discharge—Internally Generated Pressure
1¼ to 1½-gallon chemical solution (soda-acid) 12
1¼ to 1½-gallon foam 22

Method of Discharge—Stored Pressure Cartridge
1-gallon loaded stream 24

DEVICES SUITABLE FOR USE ON CLASS "B" FIRES.

DEVICES SUITABLE FOR USE ON CLASS "C" FIRES.

Section 11.

STANDARD FIRE PAILS; CASKS OR DRUMS WITH PAILS; BUCKET-TANKS

Fire pails of 10-quart or 12-quart capacity made of galvanized iron or steel stock at least No. 24 USS gage, with flat bottom welded in place or otherwise suitably reinforced, furnished with stamped ears welded in place and strong wire bail and with loose-fitting metal cover to exclude debris and retard evaporation; or casks and drums, preferably with covers, with proper complement of standard fire pails located therein or nearby; or bucket tanks containing largest size fire pail commensurate with capacity; extinguishing agent used is water or an antifreezing solution.

NOTE: Pails, casks, drums, or bucket tanks to be painted bright RED with the word "FIRE" stenciled in large letters on their outside with BLACK paint. If antifreezing solution is used, inside of pails, drums or bucket tanks to be coated with red lead and oil followed by a coat of asphalt-base paint—casks to be heavily pitched. (See Paragraph 1146.)

Method of Operation.

1111. Pails are designed to be carried to the fire where the cover, if any, is removed and the contents thrown or poured over the entire surface of the burning material. While the liquid is most effective if used close to the fire, in case of necessity it can be directed from a distance of 10 feet horizontally.

Suitability.

1121. These appliances are effective on incipient fires in ordinary combustible materials (such as wood, paper, textiles, rubbish, etc.), i.e., on Class "A" fires, where the quenching and cooling effect of quantities of water or a solution containing a large percentage of water is of first importance.

1122. They are not effective on fires in flammable liquids, greases, etc., in vats, open vessels, etc., where the blanketing effect is essential, but are of value on incipient fires in floors soaked with oils, greases, etc., where the quenching and cooling effect of the water (or anti-freeze solution) may be utilized.

1123. Their use in connection with fires in electrical equipment such as panelboards, switchboards, motors, and the like is not recommended.

NOTE: In some cases, fires in electrical equipment may be such that the quenching and cooling effect of large quantities of water or solutions containing large percentages of water is necessary. In such cases equipment should be made electrically dead before applying water or water solutions.

1124. Their use is limited to fires which may be readily reached by liquids thrown or poured from a pail. These appliances are readily used while being carried about.

1125. When located outdoors or in unheated sections of buildings containers must, when continued temperatures lower than 40° F. may be encountered, be protected against freezing as described in paragraph 1146.

Distribution.

1131. **Unit of Distribution;**—Five (5) filled 12-quart fire pails or six (6) similarly constructed filled 10-quart fire pails are considered as a unit for Class A fires. Units shall be provided in accordance with Section 3, Distribution of Units.

1132. **Arrangement.** Pail units shall be conspicuously located where they will always be readily accessible and so distributed as to be immediately available in event of fire. Pails should be hung on hangers or set on brackets or shelves so that their upper rims will not be higher than 5 feet nor less than 2 feet from the floor.

NOTE: Casks or drums with pails, and bucket-tanks, shall be similarly arranged except that pails are enclosed inside of bucket-tanks and may be enclosed inside of tanks or drums.

Maintenance.

1141. Pails (and casks, drums or tanks) shall be kept full at all times and be refilled immediately after use.

1142. Pails (and casks, drums or tanks) shall be examined at regular intervals—several times a year—to make sure that they have not been tampered with or removed from their designated places; when anti-freeze solution is used, to determine (with a hydrometer) whether or not the spe-

cific gravity of the solution is such as to insure against its freezing at the lowest temperatures which may be encountered; to replace liquid which has become foul; and to see that the containers are kept full and to replace the liquid which may have evaporated. Covers shall be kept on containers.

1143. At least once yearly the containers shall be examined for deterioration or injuries due to misuse. Containers which are not in good condition shall be replaced. At these inspections several pails shall be emptied as if at a fire, before an assembly of the occupants of the building. These exhibitions are valuable for the reasons outlined in paragraph 1005.

1146. When located where continued temperatures below 40° F. may be encountered, containers shall be filled with an anti-freeze solution consisting of granulated or flake calcium chloride (free from magnesium chloride) dissolved in water. The following table shows approximately the temperature at which the resultant solution will freeze when granulated or flake calcium chloride (free from magnesium chloride) is added to water in the proportions shown:—

To Make 2½ Gallons Anti-freezing Solution

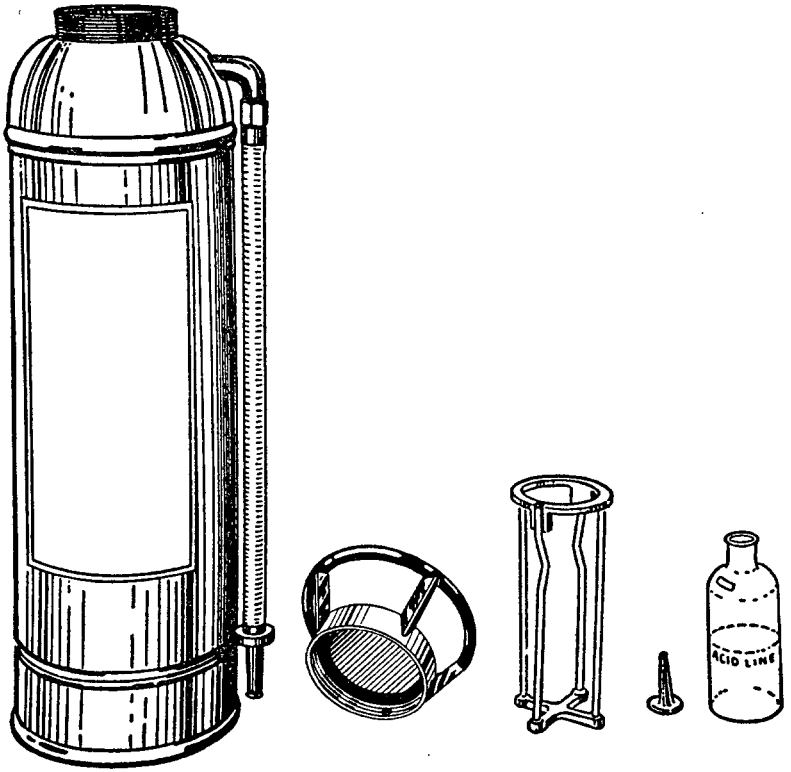
Approximate Freezing Temperature Degrees Fahrenheit	Water	Calcium Chloride	Specific Gravity	Baumé Degrees
10°	2 gals. 1 qt.	5 lbs.	1.139	17.7
zero	2 gals. 1 pt.	6 lbs. 4 oz.	1.175	21.6
10° below	2 gals.	7 lbs. 6 oz.	1.205	24.7
20° below	2 gals.	8 lbs. 6 oz.	1.228	26.9
30° below	2 gals.	9 lbs. 2 oz.	1.246	28.6
40° below	2 gals.	10 lbs.	1.263	30.2

NOTE: This table is based on granulated 75% Calcium Chloride.

Anti-freezing solutions shall be mixed thoroughly in exact accordance with proportions given above.

1147. On every property where anti-freezing solutions are employed, a quantity of granulated or flake calcium chloride (free from magnesium chloride) should be kept on hand in an airtight receptacle so that containers may be promptly refilled after use.

In an emergency common salt (not rock salt) may be used instead of calcium chloride when the solution is kept in wooden casks and where temperatures lower than zero Fahrenheit will not be encountered. Two and three-quarters pounds of salt per gallon of water produces a solution having a specific gravity of 1.205. Salt solution must never be kept in metal containers.



SODA-ACID TYPE EXTINGUISHER

The various parts of the conventional 2½-gallon loose-stopple type of soda-acid extinguisher: tank or shell; ring top or cap with gasket in place and pressure relief hole; cage for acid bottle; loose-fitting stopple for acid bottle; acid bottle showing acid line at the 4-ounce level.

Section 12.

CHEMICAL SOLUTION (SODA-ACID) EXTINGUISHERS.

(1¼ to 1½ and 2½ Gallons)

Approved hand fire extinguishers made in two principal sizes: one having liquid capacity of 1¼-1½ gallons, the other 2½ gallons to filling mark. Chemicals used are a powdered chemical (usually bicarbonate of soda) designed to be dissolved in water for extinguisher shell, and a liquid chemical (sulphuric acid) for the bottle. While the discharge contains products of the chemical reaction, the extinguishing agent is principally water. (See paragraph 1245.)

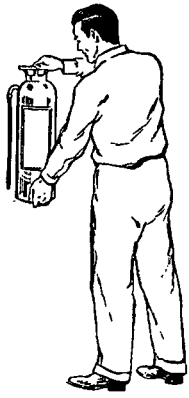
Method of Operation.

1211. Extinguishers are designed to be carried to the fire by means of the top handle and to be used must be inverted. When the chemicals mix as a result of the above operation, pressure is created within the container which expels a stream of reacted chemical solution through the hose. While the stream is usually most effective if used close to the fire, in case of necessity it can be directed effectively from a distance of 30 to 40 feet horizontally.

Suitability.

1221. These appliances are effective on incipient fires in ordinary combustible materials (such as wood, paper, textiles, rubbish, etc.), i.e., on Class "A" fires where the quenching and cooling effect of quantities of water or a solution containing a large percentage of water is of first importance.

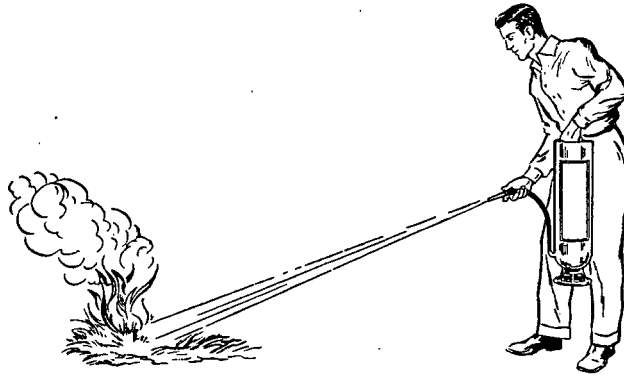
1222. They are not effective on fires in flammable liquids, greases, etc., in vats, open vessels, etc. (Class "B" fires), where the blanketing effect is essential but are of value on incipient fires in floors soaked with oils, greases, etc., where the quenching and cooling effect of the water solution may be utilized.



Lift extinguisher off hanger

Carry extinguisher to the fire

At fire, turn extinguisher over



Direct stream at base of flames

USING SODA-ACID TYPE EXTINGUISHERS

The method illustrated applies to most of the water solution types of "chemical" extinguishers. In the case of plain water, certain calcium chloride and loaded stream types operated by a carbon dioxide cartridge, there is another step: when extinguisher is turned over and held by the handle provided in the base as in lower picture, it is bumped on the floor. This releases gas from the cartridge and provides pressure for the stream.

1223. Their use in connection with fires in electrical equipment such as panelboards, switchboards, motors and the like (Class "C" fires) is not recommended.

NOTE: In some cases fires in electrical equipment may be such that the quenching and cooling effect of large quantities of water or solutions containing large percentages of water is necessary. In such cases equipment should be made electrically dead before applying water or water solutions.

1224. The force, range and duration of the stream are not dependent upon the operator. The 2½-gallon extinguisher discharges an effective stream of liquid for approximately one minute; the 1¼ to 1½-gallon device, a little over ½ minute. These appliances are readily operated while being carried about. The 1¼ to 1½-gallon extinguishers are readily handled by women.

1225. When located outdoors or in unheated sections of buildings extinguishers of this type must, when continued temperatures below 40°F. may be encountered, be protected against freezing as described in paragraph 1246.

Distribution.

1232. **Arrangement:**—Extinguishers shall be conspicuously located where they will always be readily accessible and so distributed as to be immediately available in event of fire. They shall be hung on hangers or set on brackets or shelves so that the top of the extinguisher is not more than 5 feet above the floor.

Maintenance.

1241. Extinguishers shall be kept full (to filling mark) at all times, and recharged annually as well as immediately after use. In recharging these extinguishers all parts shall be washed thoroughly with water and the water drained through the hose.

1242. Extinguishers shall be examined at regular intervals—several times a year—to make sure that they have not been tampered with nor removed from their designated places; to detect any injuries; also to see that they are not

empty; and to see that the orifice of the hoze nozzle is not clogged.

NOTE: If an extinguisher shows evidence of corrosion or mechanical injury, it may be unsafe for further use and should be either returned to the manufacturer for examination, or subjected to a hydrostatic pressure test in accordance with Section 71.

1243. At least once yearly, before emptying and recharging, the extinguishers and all their parts (including gasket and hose) shall be examined for deterioration or injuries due to misuse and the orifices of the hose nozzles examined to see that they are not clogged. Extinguishers or parts which are not in good condition shall be replaced, returned to the manufacturer for examination, or subjected to a hydrostatic pressure test in accordance with Section 71. It is important that acid bottles and their corresponding stopples when replaced should be exact duplicates of those originally provided with the extinguishers, as otherwise the discharge may be impaired or the extinguisher rendered inoperative. At these annual inspections, all extinguishers of this type shall be emptied and recharged. Recharging work shall be done under capable supervision and date of recharging and signature of the person who performed it put on the tag attached to each extinguisher. When extinguishers are to be recharged, each should, where practicable, be emptied by discharging it. At each annual inspection, one or more of the extinguishers should be discharged as if at a fire before an assembly of the occupants of the building. These exhibitions are valuable for the reasons outlined in paragraph 1005.

1244. The powdered chemical shall be thoroughly stirred until dissolved in water in exact accordance with instructions on the extinguisher or charging unit.

1245. On every property where extinguishers of this type are employed, there should be kept on hand a quantity of chemical charges supplied by the extinguisher manufacturer for use in such appliances, so that the extinguishers may be promptly recharged after use.

1246. When located where continued temperatures lower than 40° F. may be encountered, extinguishers of this type shall be placed in suitable heated cabinets. See Appendix I.

1247. Ingredients such as common salt, calcium chloride, wetting agents, etc., must not be used in extinguishers of this type, as they may either reduce the effectiveness of the discharge (and chemical reaction) or change the nature of the discharge, or they may corrode extinguishers so as to make them dangerous for use.

1249. Every five years extinguishers which have been in service should be subjected to a hydrostatic pressure test, in accordance with Section 71, to determine that they are still capable of safely withstanding the pressures which might be generated during operation.

Section 13.

WHEELED CHEMICAL SOLUTION (SODA-ACID) EXTINGUISHERS.

(17 and 33 Gallons)

Approved wheeled extinguishers made in two principal sizes: one having a liquid capacity of approximately 33 gallons (trade designation 40 gallons), and the other of 17 gallons (trade designation 20 gallons). Chemicals used are a powdered chemical (usually bicarbonate of soda) and a liquid chemical (sulphuric acid). While the discharge contains products of the chemical reaction, the extinguishing agent is principally water. (See paragraph 1345.)

Method of Operation.

1311. Extinguishers are designed to be wheeled to the fire, and, to be used, must be operated in accordance with instructions which are prominent on the extinguisher. When the chemicals mix as a result of the above operation, pressure is created within the container which expels the solution through the hose. While the stream is usually most effective if used close to the fire, in case of necessity it can be directed effectively from a distance of about 50 feet.

Suitability.

1320. The "warehouse" and "yard" types of wheeled extinguishers are suitable for use inside factory and warehouse buildings in which doorways are wide enough to per-

mit passage of extinguishers from one room or section to another, or in which the extinguisher will not be required to pass from one room to another. The "yard" type of wheeled extinguisher is suitable also for use in mill yards and similar places.

1321. These appliances are effective on fires in ordinary combustible materials (such as wood, paper, textiles, rubbish, etc.), i.e., on Class "A" fires where the quenching and cooling effect of quantities of water or a solution containing a large percentage of water is of first importance.

1322. They are not effective on fires in flammable liquids, greases, etc., in vats, open vessels, etc. (Class "B" fires), where the blanketing effect is essential but are of value on incipient fires in floors soaked with oils, greases, etc., where the quenching and cooling effect of the water solution may be utilized.

1323. Their use in connection with fires in electrical equipment such as panelboards, switchboards, motors and the like (Class "C" fires) is not recommended.

NOTE: In some cases fires in electrical equipment may be such that the quenching and cooling effect of large quantities of water or solutions containing large percentages of water is necessary. In such cases equipment should be made electrically dead before applying water or water solutions.

1324. The force, range and duration of the stream are not dependent upon the operator. They discharge an effective stream of liquid for approximately 3 minutes. They are not readily handled by women.

1325. When located where low temperatures may be encountered these appliances shall be protected against freezing, as described under "Maintenance."

Distribution.

1332. **Arrangement.** Extinguishers shall be conspicuously located where they will always be readily accessible and so distributed as to be immediately available in event of fire.

Maintenance.

1341. Extinguishers shall be kept full (to filling mark) at all times, and recharged annually as well as immediately after use. In recharging these extinguishers all parts must be washed thoroughly with water and the water drained through the hose.

1342. Extinguishers shall be examined frequently to make sure that they have not been tampered with or removed from their designated places, to detect any injuries, and to see that the hose nozzle is not clogged.

NOTE: If an extinguisher shows evidence of corrosion or mechanical injury, it may be unsafe for further use and should be either returned to the manufacturer for examination, or subjected to a hydrostatic pressure test in accordance with Section 71.

1343. At least once yearly, before emptying and recharging, the extinguishers and all their parts (including gasket and hose), shall be examined for deterioration or injuries due to misuse and the hose nozzles examined to see that they are not clogged. Extinguishers or parts which are not in good condition shall be replaced, returned to the manufacturer for examination, or subjected to a hydrostatic pressure test in accordance with Section 71. It is important that acid receptacles and lead or porcelain stopples when replaced should be exact duplicates of those originally provided with the extinguisher. At these annual inspections all extinguishers shall be emptied and recharged and date of recharging and signature of the persons who performed it written on the tag attached to each extinguisher. This work shall be done under capable supervision. On these occasions several extinguishers should be discharged as if at a fire and before an assembly of the occupants of the building. These exhibitions are valuable for the reasons outlined in paragraph 1005. Each extinguisher should, where practical, be emptied by discharging it.

1344. The powdered chemical shall be thoroughly stirred until dissolved in water in exact accordance with instructions on the extinguisher or charging unit.

1345. On every property where extinguishers of this type are employed, there should be kept on hand a quantity

of chemical charges supplied by the manufacturer for use in such extinguishers, so that extinguishers may be promptly recharged after use.

1346. When located where continued temperatures lower than 40° F. may be encountered, extinguishers shall be kept in a heated enclosure conspicuously marked to show that it contains a fire extinguisher.

1347. Ingredients such as common salt, calcium chloride, wetting agents, glycerine, etc., shall not be used in extinguishers of this type, as they may either reduce the effectiveness of the discharge (and chemical reaction) or change the nature of the discharge, or they may corrode extinguishers so as to make them dangerous for use.

1348. Aisles, at least 1 foot wider than the extinguisher, shall be maintained at all times and floors of aisles shall be kept clear of anything which would interfere with the rapid movement of the extinguisher to a fire.

1349. Every five years extinguishers which have been in service should be subjected to a hydrostatic pressure test, in accordance with Section 71, to determine that they are still capable of safely withstanding the pressures which might be generated during operation.

Section 15.

WATER TYPE EXTINGUISHERS; ANTI-FREEZE SOLUTION EXTINGUISHERS.

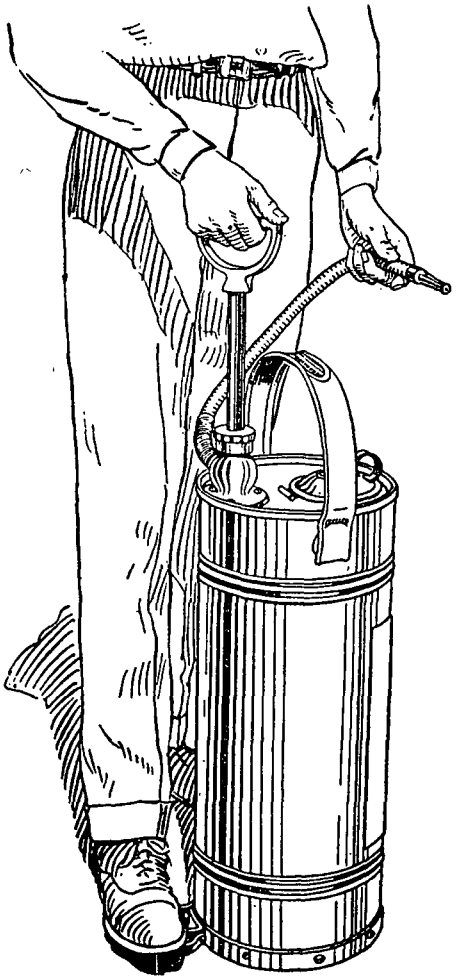
(1½ to 5 gallons)

Approved hand fire extinguishers made in a number of sizes having liquid capacity of approximately 1½ gallons to 5 gallons. Extinguishing agent used is plain water, or, when of anti-freeze type, a solution having a freezing point of 40° F. below zero—a calcium chloride base with important components for avoiding corrosion and/or deposits on operating parts.

Method of Operation.

1511. Extinguishers are designed to be carried to the fire by means of the top handle and to be used must be oper-

ated in accordance with instructions which are prominent on the extinguisher. This action expels a stream of extinguishing agent through the hose. While the stream is usually most effective if used close to the fire, in case of necessity it can be directed from a distance of 30 to 40 feet horizontally.



USING PUMP TANK EXTINGUISHER

Place foot on the foot rest at bottom of tank. The pump stroke need not be more than six or eight inches in length. Direct stream at base of flame. Follow flames and work around fire if possible.

Suitability.

1521. These appliances are effective on incipient fires in ordinary combustible materials (such as wood, paper, textiles, rubbish, etc.), i.e., Class "A" fires where the quenching and cooling effect of quantities of water or a solution containing a large percentage of water is of first importance.

1522. They are not effective on fires in flammable liquids, greases, etc., in vats, open vessels, etc. (Class "B" fires), where the blanketing effect is essential, but are of value on incipient fires in floors soaked with oils, greases, etc., where the quenching and cooling effect of quantities of water or a solution containing a large percentage of water is of first importance.

1523. Their use in connection with fires in electrical equipment such as panelboards, switchboards, motors, and the like (Class "C" fires) is not recommended.

NOTE: In some cases fires in electrical equipment may be such that the quenching and cooling effect of large quantities of water or a solution containing a large percentage of water is necessary. In such cases equipment should be made electrically dead before applying water or a water solution.

1524. Extinguishers which are pump-operated can be discharged intermittently, but the force, range and duration of the stream are dependent upon the operator. They cannot be operated while being carried about. The larger sizes are intended for use largely in industrial establishments where persons of ample strength, usually men, will employ them. The effective durations of discharge are as follows:

1½-gallon size	40 seconds
2½-gallon size	1 minute
5-gallon size	2 minutes

1525. When located outdoors or in unheated sections of buildings, unless charged with the anti-freeze solution mentioned in the introductory paragraph of this Section, extinguishers must, when continued temperatures below 40° F. may be encountered, be protected against freezing as described in paragraph 1546.

Distribution.

1532. **Arrangement.** Extinguishers shall be conspicuously located where they will always be readily accessible and so distributed as to be immediately available in event of fire. They shall be hung on hangers or set on brackets or shelves so that the top of the extinguisher is not more than five feet above the floor for sizes up to the 2½-gallons and three and one-half feet for the larger sizes.

Maintenance.

1541. Extinguishers shall be kept full (to filling mark) at all times and recharged immediately after use. Reweighing is the only method of determining whether or not the cartridge (of cartridge operated extinguishers) is fully charged. In recharging these extinguishers all parts shall be washed thoroughly with water and the water drained through the hose. It is essential, in the case of extinguishers containing the anti-freeze solution and located where freezing temperatures obtain, to remove all solution from the hose to prevent clogging by freezing.

1542. Extinguishers shall be examined at regular intervals—several times a year—to make sure they have not been tampered with nor removed from their designated places; to detect any injuries; to see that the orifice of the hoze nozzle is not clogged; also to see that they are full (to filling mark).

NOTE: If an extinguisher not of the pump type shows evidence of corrosion or mechanical injury, it may be unsafe for further use and should be either returned to the manufacturer for examination, or subjected to a hydrostatic pressure test in accordance with Section 71.

1543. At least once yearly the extinguishers and all their parts (including gasket and hose) shall be examined for deterioration or injuries due to misuse, and the orifices of the hose nozzles examined to see that they are not clogged. Extinguishers or parts which are not in good condition shall be replaced, or if of the cartridge-operated type, returned to the manufacturer for examination or subjected to a hydrostatic pressure test in accordance with Section 71. At these inspections all pumps (of pump-operated extinguishers) shall be tested by operating them several strokes, discharging the solution back into the tank, then putting

a drop of thin lubricating oil on the piston rod packing; all cartridges (of cartridge-operated extinguishers) shall be removed and examined, and carbon dioxide cartridges shall be weighed on an accurate scale to detect loss of pressure by leakage, a new cartridge being used to replace any which shows a loss of ½ ounce or more from the original weight stamped on it. At these annual inspections and when extinguishers are recharged, date of inspection or recharging and signature of person who performed it are to be put on the tag attached to each extinguisher. This work shall be done under capable supervision. On these occasions several of the extinguishers should be discharged as if at a fire and before an assembly of the occupants of the building. These exhibitions are valuable for the reasons given in paragraph 1005. When recharged, each extinguisher should, where practical, be emptied by discharging it.

1544. In recharging extinguishers with the anti-freeze solution the chemical shall be thoroughly dissolved in water outside the extinguisher in strict accordance with instructions on the extinguisher or charging unit. The water should preferably be warm and the solution should be put through a fine strainer while pouring it into the extinguisher.

1545. Property owners having cartridge-operated extinguishers shall keep on hand a quantity of the special cartridges supplied by the manufacturer for use in such extinguishers so that extinguishers may be promptly recharged after use. Property owners having extinguishers using the anti-freeze solution shall keep on hand a quantity of the special charges supplied by the manufacturer for use in such extinguishers.

1546. When not using the anti-freeze solution as an extinguishing agent and when located where continued temperatures lower than 40° F. may be encountered, extinguishers shall be placed in suitable heated cabinets. See Appendix I.

1547. Common salt must not be used in these extinguishers as it may corrode them so as to make them dangerous for use. Chemicals other than those specified in the introductory paragraph of this Section shall not be used in these extinguishers for any purpose. Cartridges other than those furnished by the manufacturer shall not be used in

cartridge-operated extinguishers. Wetting agents shall not be used in these extinguishers without consulting the manufacturers of these extinguishers.

1549. Every five years extinguishers of the cartridge-operated type which have been in service should be subjected to a hydrostatic pressure test, in accordance with Section 71, to determine that they are still capable of safely withstanding the pressures which might be generated during operation.

Section 16.

WHEELED ANTI-FREEZE SOLUTION EXTINGUISHERS.

(17 and 33 gallons)

Approved wheeled extinguishers made in two principal sizes: one having a liquid capacity of approximately 17 gallons (trade designation 20 gallons) and the other 33 gallons (trade designation 40 gallons). The extinguishing agent used is a solution with a freezing point of 40° F. below zero, having a calcium chloride base with important components for avoiding corrosion and avoiding deposits on operating parts.

Method of Operation.

1611. The extinguishers should be wheeled to the fire, and, to be used, must be operated in accordance with the instructions which are prominent on the extinguisher. As a result of the above operation the gas escapes into the tank ejecting extinguishing liquid through the hose. While the stream is usually most effective if used close to the fire, in case of necessity it can be directed effectively from a distance of about 50 feet.

Suitability.

1620. These extinguishers are "warehouse" and "yard" type devices suitable for use inside factory and warehouse buildings in which doorways are wide enough to permit passage of extinguishers from one room or section to another, or in which the extinguisher will not be required to pass from one room to another, or in mill yards and similar places.

1621. These extinguishers are effective on incipient fires in ordinary combustible materials (such as wood, paper, textiles, rubbish, etc.), i.e., on Class "A" fires, where the quenching and cooling effect of quantities of water or solutions containing large percentages of water is of first importance.

1622. They are not effective on fires in flammable liquids, greases, etc., in vats, open vessels, etc. (Class "B" fires), where the blanketing effect is essential, but are of value on incipient fires in floors soaked with oils, greases, etc., where the quenching and cooling effect of water or a solution containing a large percentage of water is of first importance.

1623. Their use in connection with fires in electrical equipment such as panelboards, switchboards, motors and the like (Class "C" fires) is not recommended.

NOTE: In some cases fires in electrical equipment may be such that the quenching and cooling effect of large quantities of water or solutions containing large percentages of water is necessary. In such cases equipment should be made electrically dead before applying water or water solutions.

1624. The force, range and duration of the stream are not dependent on the operator. They discharge an effective stream for approximately 3 minutes. They are not readily handled by women.

1625. These appliances do not need to be protected against freezing as they employ an extinguishing liquid having a freezing point of 40° F. below zero.

Distribution.

1632. **Arrangement.** Extinguishers should be conspicuously located where they will always be readily accessible and so distributed as to be immediately available in event of fire.

Maintenance.

1641. Extinguishers shall be kept full (to filling mark) at all times and recharged immediately after use. Reweigh-

ing is the only method of determining whether the cartridge is fully charged. In recharging these extinguishers, all parts shall be washed thoroughly with water and the water drained through the hose. It is essential to remove all water from the hose to prevent freezing and clogging the nozzle.

1642. Extinguishers shall be examined at regular intervals—several times a year—to make sure that they have not been tampered with or removed from their designated places; to detect any injuries; and to see that the hose nozzle is not clogged. It is impossible to indicate just how often examination should be made, but a careful inspection on the part of the plant inspector should be made at regular intervals.

NOTE: If an extinguisher shows evidence of corrosion or mechanical injury, it may be unsafe for further use and should be either returned to the manufacturer for examination, or subjected to a hydrostatic pressure test in accordance with Section 71.

1643. At least once yearly, the extinguishers and all their parts (including gasket and hose) shall be examined for deteriorations or injuries due to misuse and the hose nozzles examined to see that they are not clogged. Extinguishers or parts which are not in good condition shall be replaced, returned to the manufacturer for examination, or subjected to a hydrostatic pressure test in accordance with Section 71. Carbon dioxide cartridges shall be weighed on an accurate scale to detect loss of pressure by leakage, a new cartridge being used to replace any which shows a loss of 1 ounce or more from the original weight stamped on it. This work shall be done under capable supervision. On these occasions several extinguishers should be discharged as if at a fire before an assembly of the occupants of the building. These exhibitions are valuable for the reasons outlined in paragraph 1005. Each extinguisher should, where practical, be emptied by discharging it. The manufacturer's recharging instructions should be carefully followed.

1644. The chemical shall be thoroughly dissolved in water in exact accordance with instructions on the extinguisher. The water should be cold.

1645. On every property where extinguishers of this type are employed, there shall be kept on hand a quantity of the special charges supplied by the manufacturer for use

in such extinguishers so that the appliances may be promptly recharged after use.

1647. Common salt must not be used in these extinguishers as it may corrode them so as to make them dangerous for use. Chemicals other than those specified in the introductory paragraph of this Section shall not be used in these extinguishers for any purpose. Cartridges other than those furnished by the manufacturer shall not be used in cartridge-operated extinguishers.

1648. Aisles, at least 1 foot wider than the extinguisher, shall be maintained at all times and floors of aisles shall be kept clear of anything which would interfere with the rapid movement of the extinguisher to a fire.

1649. Every five years extinguishers of the cartridge-operated type which have been in service should be subjected to a hydrostatic pressure test, in accordance with Section 71, to determine that they are still capable of safely withstanding the pressures which might be generated during operation.

Section 17.

HAND HOSE.

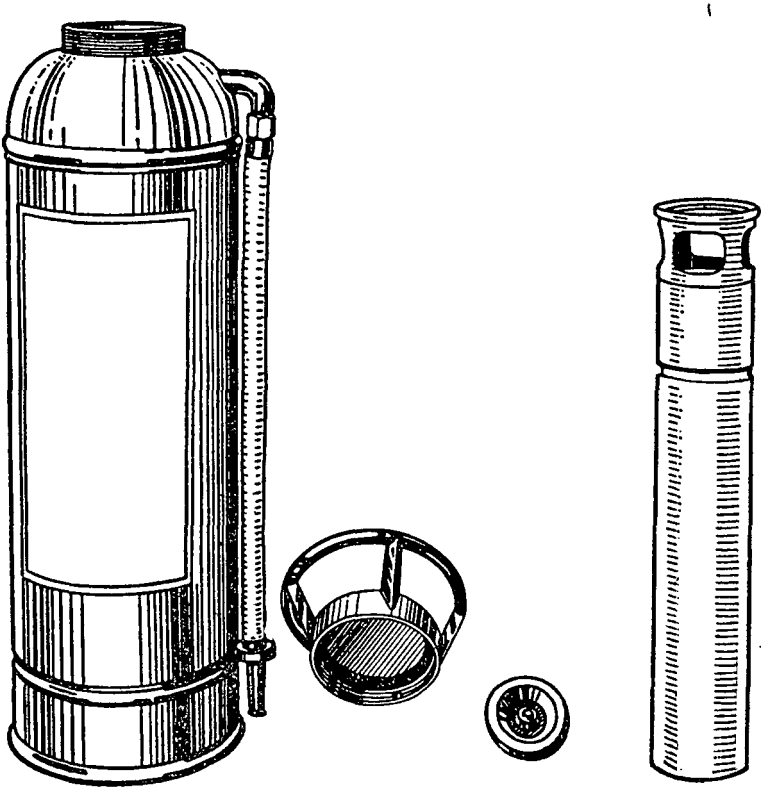
Approved hand hose equipment is attached to standpipes, sprinkler systems or other approved source of water supply.

For details of hand hose equipment refer to the Standards for the Installation of Standpipe and Hose Systems. (No. 14)

For details of equipment supplied from sprinkler systems, refer also to the Standards for the Installation of Sprinkler Systems. (No. 13)

Section 22.
FOAM EXTINGUISHERS.
(1¼ to 5 Gallons)

Approved hand fire extinguishers made in 3 principal sizes, one having liquid capacity of 1¼ to 1½ gallons, and the others 2½ and 5 gallons. Chemicals used are bicarbonate of soda and a foam stabilizing agent dissolved in water for the outer compartment and aluminum sulphate dissolved in water for the inner cylinder. The extinguishing agent is a foam which results from the reaction of the two chemical solutions. (See paragraph 2245.)



FOAM EXTINGUISHER

The various parts of the conventional 2½-gallon foam extinguisher: tank or outer container; ring top or cap with gasket in place and pressure relief hole; head stopple; inner container.

Method of Operation.

2211. Extinguishers are designed to be carried to the fire by means of the top handle and, to be used, must be inverted. When the chemicals mix as a result of the above operation, foam is produced and pressure is created within the container which expels a stream of foam through the hose. While the stream is usually most effective when directed from a distance, it may be used close to the fire. In case of necessity it can be directed effectively from a distance as great as 30 to 40 feet horizontally.

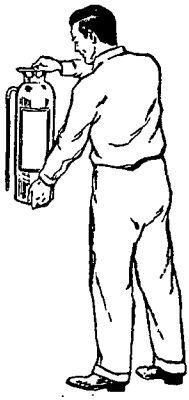
2212. On flammable liquid fires, best results are obtained when the discharge from the extinguisher is played against the inside of the wall of the vat or tank just above the burning surface, so as to permit the natural spread of the foam back over the burning liquid, or if this cannot be done, the operator should stand far enough away from the fire to allow the foam to fall lightly upon the burning surface —the stream should *not* be directed into the burning liquid. Where possible, the operator should walk around the container (fire) while directing the stream, so as to get maximum coverage during the discharge period.

2213. For fires in ordinary combustible materials the force of the stream may be used, or the foam may be used to coat the burning surface—according to conditions.

Suitability.

2221. These appliances are effective on fires in small quantities of flammable liquids, greases, etc., in vats or other open vessels or on floors, etc., i.e., on Class "B" fires, where the foam may be retained as a blanket on the burning material. Unless specifically noted on name plate, these extinguishers are not recommended for use on fires in alcohol type (polar) solvents.

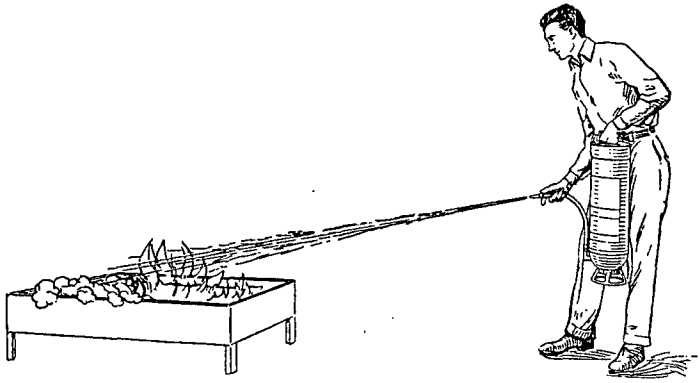
2222. While these extinguishers are primarily intended for use on Class "B" fires they are effective on incipient fires in ordinary combustible materials (such as wood, paper, textiles, rubbish, etc.), i.e., on Class "A" fires where the quenching and cooling effect of quantities of water or solutions containing large percentages of water is of first importance.



Lift extinguisher off hanger

Carry extinguisher to the fire

At fire, turn extinguisher over



USING FOAM EXTINGUISHER

Extinguisher is carried to fire and set in operation by turning over. Stream should be directed against the inside of the opposite wall of the tank or pan so as not to splash the fire. If fire is in a spill of liquid on the floor, stand back and allow the foam to fall on the fire without much force. This technique prevents spreading the flames unnecessarily.

2223. Their use in connection with fires in electrical equipment such as panelboards, switchboards, motors, and the like (Class "C" fires) is not recommended.

NOTE: In some cases fires in electrical equipment may be such that the quenching and cooling effect of large quantities of water or solutions containing large percentages of water is necessary. In such cases equipment should be made electrically dead before applying water or water solutions.

2224. The force, range and duration of the stream are not dependent upon the operator. The 2½ and 5-gallon extinguishers discharge an effective stream of foam for approximately one minute; the 1¼ to 1½-gallon device approximately two-thirds of a minute. The 1¼ to 1½-gallon extinguisher is readily handled by women.

The 5-gallon foam extinguisher is intended for special use in commercial and industrial establishments where it may be desirable to have more foam delivered by one unit than can be delivered by a 2½-gallon foam extinguisher and where persons of ample strength, usually men and especially instructed in their use, will employ them.

2225. When located outdoors or in unheated sections of buildings, extinguishers of this type must, when continued temperatures below 40° F. may be encountered, be protected against freezing as described in paragraph 2246.

Distribution.

2232. **Arrangement.** Extinguishers shall be conspicuously located where they will always be readily accessible and so distributed as to be immediately available in event of fire. They shall be hung on hangers or set on brackets or shelves so that the top of the extinguisher is not more than 5 feet above the floor for 1¼ to 1½ and 2½-gallon devices, and 3½ feet for 5 gallon devices.

Maintenance.

2241. Extinguishers shall be recharged annually as well as immediately after use. In recharging these extinguishers all parts shall be washed thoroughly with water and the water drained through the hose.

2242. Extinguishers shall be examined at regular intervals—several times a year—to make sure that they have not been tampered with or removed from their designated places; to detect any injuries; also to see that they are not empty and to see that the orifice of the hose nozzle is not clogged.

NOTE: If an extinguisher shows evidence of corrosion or mechanical injury, it may be unsafe for further use and should be either returned to the manufacturer for examination, or subjected to a hydrostatic pressure test in accordance with Section 71.

2243. At least once yearly, before emptying and recharging, the extinguishers and all their parts (including gasket and hose) shall be examined for deterioration or injuries due to misuse and the orifices of the hose nozzles examined to see that they are not clogged. Extinguishers or parts which are not in good condition shall be replaced, returned to the manufacturer for examination, or subjected to a hydrostatic pressure test in accordance with Section 71. At these annual inspections, all extinguishers of this type shall be emptied and recharged. Recharging work shall be done under capable supervision and date of recharging and signature of the person who performed it put on the tag attached to each extinguisher. When extinguishers are to be recharged, each should, where practicable, be emptied by discharging it. At each annual inspection, one or more of the extinguishers should be discharged as if at a fire and before an assembly of the occupants of the building. These exhibitions are valuable for the reasons given in paragraph 1005.

2244. The chemicals shall be thoroughly stirred until dissolved in water and in exact accordance with instructions on the extinguisher or charging unit.

2245. On every property where extinguishers of this type are employed, there should be kept on hand a quantity of chemical charges supplied by the manufacturer for use in such extinguishers so that extinguishers may be promptly recharged after use.

2246. When located where continued temperatures lower than 40° F. may be encountered, extinguishers of this type shall be placed in suitable heated cabinets. See Appendix I.

2247. Anti-freeze ingredients such as common salt, calcium chloride, etc., must not be used in extinguishers of this type, as they may either reduce the effectiveness of the discharge (and chemical reaction) or change the nature of the discharge, or they may corrode extinguishers so as to make them dangerous for use.

2249. Every five years extinguishers which have been in service should be subjected to a hydrostatic pressure test, in accordance with Section 71, to determine that they are still capable of safely withstanding the pressures which might be generated during operation.

Section 23.

WHEELED FOAM EXTINGUISHERS.

(10 to 33 Gallons)

Approved wheeled fire extinguishers are made in three principal sizes, one having liquid capacity of 10 gallons, one approximately 17 gallons (trade designation 20 gallons), and the other 33 gallons (trade designation 40 gallons). Chemicals used are bicarbonate of soda and a foam stabilizing agent designed to be dissolved in water for the outer compartment and aluminum sulphate dissolved in water for the inner cylinder. (See paragraph 2345.)

Method of Operation.

2311. Extinguishers are designed to be wheeled to the fire, and to be used, must be operated in accordance with instructions which are prominent on the extinguisher. When the two chemicals mix as a result of the above operation, foam is produced and pressure is created within the container which expels the foam through the hose. While the stream is usually most effective when directed from a distance, it may be used close to the fire. In case of necessity it can be directed effectively from a distance of about 50 feet.

2312. On flammable liquid fires, best results are obtained when the discharge from the extinguisher is played against the inside of the wall of the vat or tank just above the burning surface, so as to permit the natural spread of the foam back over the burning liquid, or if this cannot be done, the operator should stand far enough away from the

fire to allow the foam to fall lightly upon the burning surface —the stream should *not* be directed into the burning liquid. Where possible, the operator should walk around the container (fire) while directing the stream, so as to get maximum coverage during the discharge period.

2313. For fires in ordinary combustible materials the force of the stream may be used, or the foam may be used to coat the burning surface—according to conditions.

Suitability.

2320. The "warehouse" and "yard" types of wheeled extinguishers are suitable for use inside factory and warehouse buildings in which doorways are wide enough to permit passage of extinguisher from one room or section to another. The "yard" type of wheeled extinguisher is suitable also for use in mill yards and similar places.

2321. These appliances are effective on fires in considerable quantities of flammable liquids, greases, etc., in vats or other open vessels, or on floors, etc., i.e., on Class "B" fires, where the foam may be retained as a blanket on the burning material. Unless specifically noted on name plate, these extinguishers are not recommended for use on fires in alcohol type (polar) solvents.

2322. While these extinguishers are primarily intended for use on Class "B" fires they are effective on fires in ordinary combustible materials (such as wood, paper, textiles, rubbish, etc.), i.e., on Class "A" fires, where the quenching and cooling effect of quantities of water or solutions containing large percentages of water is of first importance.

2323. Their use in connection with fires in electrical equipment such as panelboards, switchboards, motors, and the like (Class "C" fires) is not recommended.

NOTE: In some cases fires in electrical equipment may be such that the quenching and cooling effect of large quantities of water or solutions containing large percentages of water is necessary. In such cases equipment should be made electrically dead before applying water or water solutions.

2324. The force, range and duration of the stream are not dependent upon the operator. They discharge an effective stream of foam for approximately 3 minutes. They are not readily handled by women.

2325. When located where continued temperatures lower than 40° F. may be encountered these appliances shall be protected against freezing as described under "Maintenance."

Distribution.

2332. **Arrangement.** Extinguishers shall be conspicuously located where they will always be readily accessible and so distributed as to be immediately available in event of fire.

Maintenance.

2341. Extinguishers shall be recharged annually as well as immediately after use. In recharging these extinguishers all parts shall be washed thoroughly with water, and the water drained through the hose.

2342. Extinguishers shall be examined at regular intervals to make sure that they have not been tampered with or removed from their designated places; to detect any injuries; also to see that they are not empty and to see that the hose nozzle is not clogged.

NOTE: If an extinguisher shows evidence of corrosion or mechanical injury, it may be unsafe for further use and should be either returned to the manufacturer for examination or subjected to a hydrostatic pressure test in accordance with Section 71.

2343. At least once yearly, before emptying and recharging, the extinguishers and all their parts (including gasket and hose) shall be examined for deterioration or injuries due to misuse and the hose nozzles examined to see that they are not clogged. Extinguishers or parts which are not in good condition shall be replaced, returned to the manufacturer for examination, or subjected to a hydrostatic pressure test in accordance with Section 71. At these annual inspections, all extinguishers of this type shall be emptied and recharged. Recharging work shall be done under capable supervision and date of recharging and signature of

the person who performed it put on the tag attached to each extinguisher. When extinguishers are to be recharged, each should, where practicable, be emptied by discharging it. At each annual inspection, one or more of the extinguishers should be discharged as if at a fire and before an assembly of the occupants of the building. These exhibitions are valuable for the reasons given in paragraph 1005.

2344. The chemical shall be thoroughly stirred until dissolved in water and in exact accordance with instructions on the extinguisher or charging unit.

2345. On every property where extinguishers of this type are used there should be kept on hand a quantity of chemical charges supplied by the manufacturer for use in such extinguishers so that extinguishers may be promptly recharged after use.

2346. When located where continued temperatures lower than 40° F. may be encountered, extinguishers shall be kept in a heated enclosure, conspicuously marked to show that it contains a fire extinguisher.

2347. Anti-freeze ingredients such as common salt, calcium chloride, etc., must not be used in extinguishers of this type as they may either reduce the effectiveness of the discharge (and chemical reaction) or change the nature of the discharge, or they may corrode extinguishers so as to make them dangerous to use.

2348. Aisles, at least 1 foot wider than the extinguisher, shall be maintained at all times and floors of aisles shall be kept clear of anything which would interfere with the rapid movement of the extinguisher to a fire.

2349. Every five years extinguishers which have been in service should be subjected to a hydrostatic pressure test, in accordance with Section 71, to determine that they are still capable of safely withstanding the pressures which might be generated during operations.

Section 24.

LOADED STREAM EXTINGUISHERS.

(1 to 2½ Gallons)

Approved hand fire extinguishers made in three principal sizes, having liquid capacity of 1, 1¾ and 2½ gallons respectively.

The chemical used is a solution of an alkali-metal-salt, which solution has a freezing point of 40° F. below zero. (See paragraph 2445.)

Method of Operation.

2411. Extinguishers are designed to be carried to the scene of the fire by means of the top handle and, to be used, must be operated in accordance with instructions which are prominent on the extinguisher. This action expels a stream of the alkali-metal-salt solution through the hose. While the stream is effective if used close to the fire, in case of necessity it can be directed effectively from a distance of 30 to 40 feet horizontally.

2412. On all fires the stream should be directed at the base of the flames. On flammable liquid fires, best results are obtained when the discharge from the extinguisher is played against the inside of the wall of the container, just above the burning surface, so as to break up the stream near the burning surface—the stream should *not* be directed into the burning liquid. Where possible, the operator should walk around the container (fire) while directing the stream, so as to get maximum coverage during the discharge period.

Suitability.

2421. These appliances are effective on incipient fires in ordinary combustible materials (such as wood, paper, textiles, rubbish, etc.), i.e., on Class "A" fires where the quenching and cooling effect of quantities of water or a solution containing a large percentage of water is of first importance.

2422. The 1¾ and 2½-gallon sizes are effective on fires in small quantities of flammable liquids, greases, etc., in vats or other open vessels or on floors, etc., i.e., on Class "B" fires.

2423. Their use in connection with fires in electrical equipment such as panelboards, switchboards, motors, and the like (Class "C" fires) is not recommended.

NOTE: In some cases fires in electrical equipment may be such that the quenching and cooling effect of large quantities of water or solutions containing large percentages of water is necessary. In such cases equipment should be made electrically dead before applying water or water solutions.

2424. The force, range, and duration of the stream are not dependent upon the operator. These appliances are readily operated while being carried about. The 2½-gallon extinguisher discharges an effective stream of liquid for approximately one minute; the 1¾-gallon device for approximately three-quarters of a minute; the 1-gallon device approximately two-thirds of a minute. The 1-gallon extinguisher is readily handled by women.

2425. These appliances when charged with the solution specified in the introductory paragraph of this Section do not need to be protected against freezing.

Distribution.

2432. **Arrangement.** Extinguishers shall be conspicuously located where they will always be readily accessible and so distributed as to be immediately available in event of fire. They shall be hung on hangers or set on brackets or shelves so that the top of the extinguisher is not more than 5 feet above the floor.

Maintenance.

2441. Extinguishers shall be kept full (to the filling mark) at all times and recharged immediately after use. Reweighing is the only method of determining whether the cartridge (of cartridge operated extinguishers) is fully charged. In recharging these extinguishers all parts shall be washed thoroughly with water and the water drained through the hose. All water should be removed from the hose to prevent clogging of hose and nozzle due to freezing.

2442. At regular intervals—several times a year—extinguishers shall be examined to make sure that they have

not been tampered with nor removed from their designated places; to detect any injuries; also to see that they are not empty; and to see that the orifice of the hose nozzle is not clogged.

NOTE: If an extinguisher shows evidence of corrosion or mechanical injury, it may be unsafe for further use and should be either returned to the manufacturer for examination or subjected to a hydrostatic pressure test in accordance with Section 71.

2443. At least once yearly, the extinguishers and all their parts (including gasket and hose) shall be examined for deterioration or injuries due to misuse and the orifices of the hose nozzles examined to see that they are not clogged. Extinguishers or parts which are not in good condition shall be replaced, returned to the manufacturer for examination, or subjected to a hydrostatic pressure test in accordance with Section 71. At these inspections all extinguishers shall be examined as to condition of "generator" or cartridge and all cartridges shall be removed and weighed on an accurate scale to detect loss of pressure by leakage—replacing with a new cartridge any which shows a loss of ½ ounce or more from the original weight stamped on it. Recharging work shall be done under capable supervision and the date of recharging and the signature of the person who performed it put on the tag attached to each extinguisher. At each annual inspection, one or more of the extinguishers should be discharged as if at a fire before an assembly of the occupants of the building. These exhibitions are valuable for the reasons outlined in paragraph 1005.

2444. The chemical (if not procured in solution form) shall be thoroughly stirred until dissolved in water and in exact accordance with instructions on the extinguisher or charging unit.

2445. On every property where extinguishers of this type are employed, there should be kept on hand a quantity of the cartridges and special chemical charges supplied by the manufacturer for use in such extinguishers so that extinguishers may be promptly recharged after use.

2447. Chemicals or cartridges other than those furnished by the manufacturer shall not be used in these extinguishers, because they are liable to render the extinguishers inoperative or make them dangerous for use.

2449. Every five years extinguishers which have been in service shall be subjected to a hydrostatic pressure test, in accordance with Section 71, to determine if they are still capable of safely withstanding the pressures which might be generated during operation.

Section 25.

WHEELED LOADED STREAM TYPE EXTINGUISHERS.

(17 and 33 Gallons)

Approved wheeled fire extinguishers are made in two principal sizes, one having liquid capacity of approximately 17 gallons (trade designation 20 gallons), and the other 33 gallons (trade designation 40 gallons). The chemical used is a solution of an alkali-metal-salt, which solution has a freezing point of 40° F. below zero. (See paragraph 2545.)

Method of Operation.

2511. Extinguishers are designed to be wheeled to the fire, and to be used, must be operated in accordance with instructions which are prominent on the extinguisher. While the stream is usually most effective if used close to the fire, in case of necessity it can be directed effectively from a distance of about 50 feet.

2512. On all fires the stream should be directed at the base of the flames. On flammable liquid fires, best results are obtained when the discharge from the extinguisher is played against the inside of the wall of the container, just above the burning surface, so as to break up the stream near the burning surface—the stream should *not* be directed into the burning liquid. Where possible, the operator should walk around the container (fire) while directing the stream, so as to get maximum coverage during the discharge period.

Suitability.

2520. The "warehouse" and "yard" types of wheeled extinguishers are suitable for use inside factory and warehouse buildings in which doorways are wide enough to permit passage of extinguisher from one room or section to an-

other. The "yard" type of wheeled extinguisher is suitable also for use in mill yards and similar places.

2521. These appliances are effective on fires in ordinary combustible materials (such as wood, paper, textiles, rubbish, etc.), i.e., on Class "A" fires where the quenching and cooling effect of quantities of water or a solution containing a large percentage of water is of first importance.

2523. Their use in connection with fires in electrical equipment, such as panelboards, switchboards, motors and the like (Class "C" fires) is not recommended.

NOTE: In some cases fires in electrical equipment may be such that the quenching and cooling effect of large quantities of water or solutions containing large percentages of water is necessary. In such cases equipment should be made electrically dead before applying water or water solutions.

2524. The force, range, and duration of stream are not dependent upon the operator. They discharge a solid stream of liquid for approximately 3 minutes. They are not readily handled by women.

2525. These appliances do not need to be protected against freezing as they employ an extinguishing liquid having a freezing point of 40° F. below zero.

Distribution.

2532. **Arrangement.** Extinguishers should be conspicuously located where they will always be readily accessible and so distributed as to be immediately available in event of fire.

Maintenance.

2541. Extinguishers shall be kept full (to the filling mark) at all times and recharged immediately after use. Reweighing is the only method of determining whether the cartridge (of cartridge operated extinguishers) is fully charged. In recharging these extinguishers all parts shall be washed thoroughly with water and the water drained through the hose. All water should be removed from the hose to prevent clogging of the hose and nozzle due to freezing.

2542. At regular intervals—several times a year—extinguishers shall be examined to make sure that they have not been tampered with or removed from their designated places; to detect any injuries; also to see that they are not empty; and to see that the hose nozzle is not clogged.

NOTE: If an extinguisher shows evidence of corrosion or mechanical injury, it may be unsafe for further use and should be either returned to the manufacturer for examination or subjected to a hydrostatic pressure test in accordance with Section 71.

2543. At least once yearly, the extinguishers and all their parts (including gasket and hose) shall be examined for deterioration or injuries due to misuse and the hose nozzles examined to see that they are not clogged. Extinguishers or parts which are not in good condition shall be replaced, returned to the manufacturer for examination, or subjected to a hydrostatic pressure test in accordance with Section 71.

At these inspections all extinguishers shall be examined as to condition of the cartridge and all cartridges shall be removed and weighed on an accurate scale to detect loss of pressure by leakage—replacing with a new cartridge any which shows a loss of 1 ounce or more from the original weight stamped on it. Recharging work shall be done under capable supervision and the date of recharging and the signature of the person who performed it put on the tag attached to each extinguisher. At each annual inspection, one or more of the extinguishers should be discharged as if at a fire before an assembly of the occupants of the building. These exhibitions are valuable for the reasons outlined in paragraph 1005.

2544. The chemical (if not procured in solution form) shall be thoroughly stirred until dissolved in water and in exact accordance with instructions on the extinguisher or charging unit.

2545. On every property where extinguishers of this type are employed, there should be kept on hand a quantity of the cartridges and special chemical charges supplied by the manufacturer for use in such extinguishers so that extinguishers may be promptly recharged after use.

2547. Chemicals or cartridges other than those furnished by the manufacturer shall not be used in these ex-

tinguishers, because they are liable to render the extinguishers inoperative or make them dangerous.

2548. Aisles, at least 1 foot wider than the extinguisher, shall be maintained at all times and floors of aisles must be kept clear of anything which would interfere with the rapid movement of the extinguisher to a fire.

2549. Every five years extinguishers which have been in service shall be subjected to a hydrostatic pressure test, in accordance with Section 71, to determine if they are still capable of safely withstanding the pressures which might be generated during operation.

Section 31.

VAPORIZING LIQUID EXTINGUISHERS.

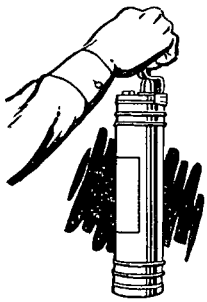
(1 Quart to 3½ Gallons)

Approved hand fire extinguishers made in many sizes having capacities from one quart to 3½ gallons. The extinguishing agent used is a specially treated nonconducting liquid having a freezing point of at least 50° F. below zero and a corrosion inhibitor ingredient. (See paragraph 3145.)

Method of Operation.

3111. Extinguishers are designed to be carried to the fire, and to be used, must be operated in accordance with instructions which are prominent on the extinguisher. This action expels a stream of liquid which is vaporized into a gas by the heat of the fire. While the stream is usually most effective if used close to the fire, in case of necessity it can be directed from a distance of approximately 20 to 30 feet horizontally (varying for different types and for different methods of operation).

3112. On all fires the stream should be directed at the base of the flames. On flammable liquid fires, best results are obtained when the discharge from the extinguishers is played against the inside of the wall of the container, just above the burning surface, so as to break up the stream near the burning surface — the stream should *not* be directed into the burning liquid. Where possible, the operator should walk around the container (fire) while directing the stream, so as to get maximum coverage during the discharge period.



Remove extinguisher from wall bracket by grasping handle and pulling outward

On way to fire, unlock handle by turning.

Direct stream at base of flames and work around fire rapidly

USING VAPORIZING LIQUID EXTINGUISHER

The pictures illustrate use of the common one-quart hand-pumped type. Some other types use stored pressure to actuate discharge of the liquid.

Suitability.

3121. These appliances are effective on fires in small quantities of flammable liquids, greases, etc., in vats or other open vessels or on floors, etc., i.e., on Class "B" fires, where the gas formed by the vaporization of the extinguishing liquid may be retained as a blanket on the burning material.

3122. They are effective on incipient fires in electrical equipment, i.e., on Class "C" fires where a nonconducting extinguishing agent is of importance.

They are suitable for use on automobiles, motorboats, etc.

3123. They are not effective on deep-seated fires of ordinary combustible materials such as wood, paper, textiles, rubbish, etc. (Class "A" fires), which require the quenching and cooling effect of water for complete extinguishment, but they may be of value for surface fires in small quantities of such material where the smothering effects of the gas may be utilized.

3124. Extinguishers which are pump-operated can be discharged intermittently, but the force, length and duration of the stream are dependent upon the operator; and the 2 and 3-gallon ones are not readily operated while being carried about. Under average usage the liquid will be completely discharged in three-quarters of a minute of continuous operation for the smaller sizes to 2½ minutes for the largest size. The 1 and 1¼-quart extinguishers are readily handled by women. The 1½ and 2-quart extinguishers are intended for use largely in industrial establishments where persons of ample strength, usually men, will employ them.

The 1, 2 and 3-gallon appliances are intended for use largely in electrical power stations and the like and in industrial establishments where persons of ample strength, usually men, and especially instructed in their use will employ them.

In using extinguishers of this type, especially in unventilated spaces, such as small rooms, closets, or confined spaces, operators and others should take precautions to avoid the effects which may be caused by breathing the vapors or gases liberated or produced.

3125. These appliances when charged with the liquid specified in the introductory paragraph of this Section do not need to be protected against freezing.

Distribution.

3132. **Arrangement.** Extinguishers shall be conspicuously located where they will always be readily accessible and so distributed as to be immediately available in event of fire. They shall be hung in the special brackets supplied with the extinguisher so that the top of the extinguisher is not more than 5 feet above the floor for the smaller devices, 3½ feet for 2 and 3-gallon devices.

Maintenance.

3141. Extinguishers shall be kept full (to filling mark on stored pressure types) at all times and be refilled immediately after use.

CAUTION—DO NOT USE WATER FOR ANY PURPOSE IN EXTINGUISHERS OF THIS TYPE.

3142. At regular intervals—several times a year—extinguishers shall be examined to make sure that they have not been tampered with, nor removed from the designated places; to detect any injuries; to see that they are full; and to see that the orifice of the nozzle is not clogged.

NOTE: If an extinguisher of the stored pressure type shows evidence of corrosion or mechanical injury, it may be unsafe for further use and should be returned to the manufacturer for examination.

3143. At least once yearly the extinguishers shall be examined as to condition of pump or pressure and for deterioration or injuries due to misuse. At these inspections all pumps shall be tested by discharging a portion of the liquid with the stream directed alternately upward and downward. Extinguishers which are not in good condition shall be replaced, or returned to the manufacturer for examination; others should be refilled by pouring in enough liquid to replace that which is discharged. Recharging work shall be done under capable supervision and date of recharging and signature of the person who performed it put on the tag attached to each extinguisher. At each annual inspec-

tion, one or more of the extinguishers should be discharged as if at a fire and before an assembly of the occupants of the building. These exhibitions are valuable for the reasons outlined in paragraph 1005.

3145. On every property where extinguishers of this type are employed, there should be kept on hand a quantity of the special fire extinguishing liquid supplied by the manufacturer for use in such extinguishers, so that extinguishers may be promptly recharged after use.

3147. Liquid other than that furnished by extinguisher manufacturers should not be used in these extinguishers, because it is liable to render the extinguisher inoperative or make it dangerous for use.

Section 41.

CARBON DIOXIDE EXTINGUISHERS.

(2 to 25 Pounds)

Approved hand fire extinguishers made in many sizes having capacities from 2 to 25 pounds of carbon dioxide.

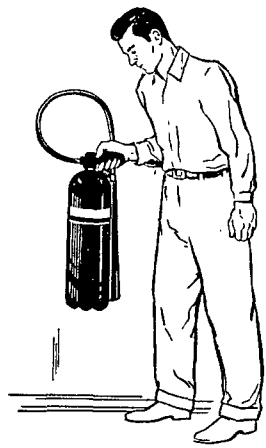
Method of Operation.

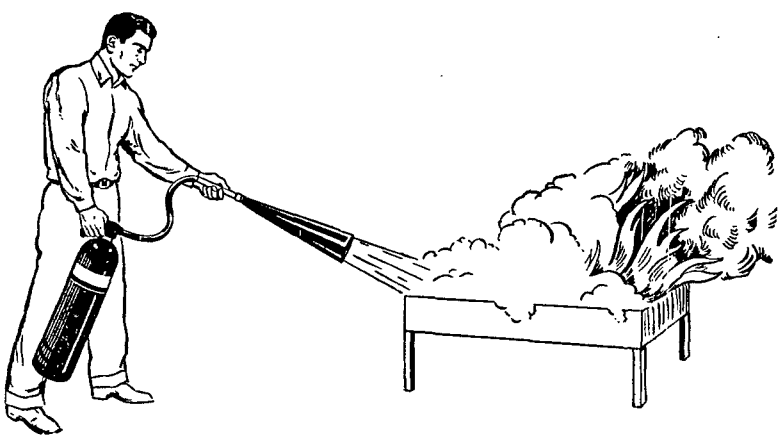
4111. Extinguishers are designed to be carried to the fire by the top handle, and to be used must be operated in accordance with instructions which are prominent on the extinguisher. This action expels a cloud of carbon dioxide gas with some "snow" through the horn. The discharge has an effective range of approximately 3 to 8 feet, depending on the size and design of the extinguisher.

4112. On all fires the discharge should be directed at the base of the flames. The discharge should be applied to the burned surface even after the flames are extinguished, to deposit carbon dioxide snow and thus tend to prevent possible reflash, by coating the hot surfaces and any glowing material present.

4113. On flammable liquid fires, best results are obtained when the discharge from the extinguisher is employed to sweep the flame off the burning surface, applying the dis-

charge first at the near edge of the fire and gradually progressing forward, moving the discharge cone very slowly from side to side.





USING CARBON DIOXIDE EXTINGUISHER

The extinguisher is lifted off its bracket by a handle. At fire, a trigger, lever, or other mechanism starts the discharge. Direct the discharge as close to the fire as possible applying it first at the edge and bottom of the fire and progressively moving it forward and upward, moving discharge horn from side to side. Continue discharge even after fire is out to cool the liquid and prevent possible reflash.

Suitability.

4121. These extinguishers are effective on fires in small quantities of flammable liquids, greases, etc., in open vessels, or on floors, etc., i.e., on Class "B" fires where the gas may be employed to separate the flames from the burning surface.

4122. They are effective on incipient fires in electrical equipment, i.e., Class "C" fires, where a nonconducting extinguishing agent is of importance. They are suitable for use on automobiles, motorboats, etc.

4123. They are not effective on deep-seated fires of ordinary combustible materials such as wood, paper, textiles, rubbish, etc., which require the quenching and cooling effect of water for complete extinguishment, but they may be of value for surface fires in small quantities of such material where the smothering effects of the gas may be utilized.

4124. The force, range and duration of the discharge are independent of the operator when the valve is open. They are readily operated while being carried about. The effective periods of discharge are approximately ¼ of a minute for the smallest size to ½ minute for the largest size. The 2 to 6-pound sizes are readily handled by women. The 20 and 25-pound sizes are intended for use largely in electrical power stations and the like and in industrial establishments where persons of ample strength, usually men, and especially instructed in their use, will employ them.

In using extinguishers of this type, especially in unventilated places such as small rooms, closets, or confined spaces, operators and others should take precautions to avoid the effects which may be caused by breathing the vapors or gases liberated or produced.

4125. These appliances do not need to be protected against freezing.

Distribution.

4132. **Arrangement.** The extinguishers shall be conspicuously located immediately available in the event of fire.

They shall be hung on the hangers supplied with the extinguishers, so that the top of the extinguisher is not more than 5 feet above the floor for 10-pound or smaller appliances, 3½ feet for larger ones.

Maintenance.

4141. Extinguishers shall be kept full at all times. Reweighing is the only method of determining whether or not the extinguisher is fully charged. They shall be refilled immediately after use even though only partly discharged.

4142. At regular intervals—several times a year—extinguishers shall be examined to make sure that they have not been tampered with nor removed from their designated places; to see that they are not empty; and to detect any injuries.

4143. At least once yearly the extinguishers shall be examined as to weight and for deterioration or injuries due to misuse. Extinguishers or parts which are not in good condition shall be replaced. At these inspections all extinguishers shall be weighed on an accurate scale to detect loss by leakage. Any extinguisher which shows a loss of 10% or more of the rated capacity stamped on it shall be recharged. Recharging work shall be done under capable supervision and date of recharging and signature of the person who performed it put on the tag attached to each extinguisher. At each annual inspection, one or more of the extinguishers should be discharged as if at a fire before an assembly of the occupants of the building. These exhibitions are valuable for the reasons outlined in paragraph 1005.

4145. Extinguishers of this type must be sent to the manufacturer, his authorized agent, or a producer of carbon dioxide, for recharging, unless recharging facilities are available on the premises. In remote localities where recharging facilities of manufacturers or producers of carbon dioxide are not available within reasonable distance, recharging facilities should be maintained on the premises so that extinguishers may be promptly recharged after use.