NEW YORK CENTRAL LINES

AND

RUTLAND R. R.

FIRE PREVENTION and PROTECTION RULES

TO BE OBSERVED

BY

OFFICERS and EMPLOYES

No. 10

Issued to H. Second

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Formulated March 1, 1923

REVISED TO AND EFFECTIVE JULY 1, 1926

GENERAL

The protection of the property of the Railroad Company against fire should be constantly kept in view. Nearly all fires cause unnecessary loss and embarrassment to operation, and are largely due to preventable causes which observation of these rules will eliminate.

Officers and employes should assume an individual responsibility in detecting conditions that may cause fire, endeavor to reduce or eliminate hazards, and co-operate with the Fire Protection Department.

Any conditions which tend to increase fire hazard should be reported at once to the officer in charge.

President

NOTE: Where reference is made to Fire Protection Department, it means the department in charge of Fire Protection matters of the particular road interested.

MISCELLANEOUS HAZARDS

Acetylene

(1) See Oxy-Acetylene.

Acids

(2) Acids must be handled with care and stored away from combustible material.

Ashes

(3) Ashes must not be placed in wooden containers, nor thrown against frame construction. Metal cans must be provided.

(4) Ashes must not be dumped from dining cars or other rolling equipment, except at places provided.

Automobiles, Motor Cars, Tractors, etc.

(5) Rules governing the handling of automobiles and other gasoline propelled vehicles in transportation must be strictly observed. (See Appendix.)

(6) Unauthorized parking of automobiles in freight houses, terminals, stations, etc., is prohibited.

The vapors from these vehicles, in combination with oxygen, produce a highly explosive mixture, and create an unnecessary hazard to the property. If the number of vehicles warrants, consideration may be given the construction of a special garage, separated from the main building by a safe distance, preferably not less than one hundred feet.

(7) Saturated waste or other open flame torch must not be used to warm cylinders nor manifolds when starting motor cars.

(8) Do not fill nor start motor cars inside of section tool houses.

(9) Carburetor, tank, feed pipe, etc., must be kept free from leaks.

(10) Wooden floors underneath motor cars in section tool houses and other places where track motor cars are used must be protected with metal or metal drip pans. Concrete floors are preferable.

(11) The use of gasoline tractors in railroad buildings, yards and on platforms, and the type selected, must be subject to the approval of the Fire Protection Department.

Batteries, Exhausted Elements

(12) Exhausted copper elements of batteries of the caustic-soda type must not be packed for shipment until thoroughly washed, dried and aerated for not less than seven days. (See Appendix.)

(13) Battery charging must be done in rooms specially ventilated, or in the open. In any event open lights and sparks from any cause must be kept from the vicinity. Charging storage batteries generates gases that in combination with oxygen form explosive mixtures.

Birds' Nests

(14) Birds' nests must be removed promptly from all buildings and structures.

Charcoal

(15) Main storage of charcoal whether in bulk or bags must be kept absolutely dry, well ventilated, and preferably at points separate from other buildings.

(16) Charcoal in bins or bags that has become wet or greasy must be removed or used at once.

Charcoal, on account of its properties of absorbing gases, is subject to spontaneous heating.

(17) Supplies of charcoal must be handled at points where least hazard to other properties will be occasioned.

(18) Small supplies of charcoal must be kept in metal-lined bins or metal cans.

(19) Charcoal bins in dining cars must be cleaned regularly and kept free from combustible material.

Charcoal Pots

(20) Charcoal fires must be extinguished at close of each day. The pots when not in use should preferably be kept outside of main buildings.

Clothing

(21) Clothing must not be hung on steam pipes, on radiators nor above stoves. If necessary to use steam pipes for drying clothing, racks of locomotive netting or other suitable construction must be provided and located not less than twelve inches from the heated surfaces.

Coal

(22) Bituminous coal must not be stored against buildings; when imperative to store it in important freight stations, on piers, etc., special fire resistive or metal-lined bins must be constructed, and piles must be limited in height to about seven feet.

Anthracite coal is preferable for structures of this character if reasonably obtainable, as it is not subject to spontaneous heating.

(23) For storage on open ground, depth of piles of bituminous coal should be limited, except in special cases, to about twelve feet. (See Appendix.)

Coaling Plants

(24) Coaling plants must be cleaned of all coal and dust at frequent intervals. (See Appendix.)

Drip Pans

(25) Drip pans for shafting boxes and machinery must be used where practicable. Flammable material must not be used as an absorbent; sand is preferable.

Dust

(26) Dust must not be allowed to accumulate on bearms, joists, machinery and electrical equipment in grain elevators, mill rooms, coal docks, etc.

Explosives

(27) Explosives must not be stored in or near railroad buildings or premises, except at points specially authorized.

(28) Explosives in transit must be removed propmtly from the premises of the Company and

in accordance with Interstate Commerce Commission rules.

Floor Oil

(29) The use of oil on wooden floors is prohibited.

Fuel Oil

(30) Where fuel oil is used, local ordinances and the rules of the National Board of Fire Underwriters must govern. In general, a supply tank must be kept outside of and at the minimum distance of thirty feet from any building, and buried in the ground with top at least three feet below the surface. The elevation of the tank must be such that surplus oil will run back to the tank.

(31) Supply pipes must be equipped with automatic shut off valves, or with outside manually-operated valve near the building, so that in case of fire the main supply to the building can be shut off. Signs indicating main control valves should be conspicuously posted.

(32) Only under special conditions will permission be given for storage of fuel oil above ground. In such cases the tank must be surrounded by a dike of strength and capacity sufficient to contain one and one-half times the tank capacity.

(33) Installation of fuel-oil devices must have the approval of the Fire Protection Department.

Fumigation of Grain

(34) Fumigation of grain inside of grain elevators is prohibited. If necessary to fumigate, the method and location of cars containing the grain are subject to the approval of the Fire Protection Department.

Fusees and Torpedoes

(35) Fusees and torpedoes must be handled with due regard to fire hazard. Local or small supplies for daily needs must be kept in covered metal or asbestos-lined boxes. (For general recommendations see Appendix.)

Gasoline Burners and Blow Torches

(36) Gasoline burners and blow torches must be handled with extreme care, and, when not in use, must have pressure released and be kept inside of ventilated metal or metal-lined containers, located preferably outside of main building.

Gasoline and Other Volatile Liquids

(37) Buildings containing volatiles or explosives should never be entered with open-flame lights. Notice to this effect should be conspicuously posted at the entrance.

(38) Main supplies of benzine, gasoline, naphtha, benzol, or similar liquids forming explosive gases must, when practicable, be stored under ground. Warning signs must be posted reading—KEEP FIRE AND LIGHTS AWAY. The vapor from these liquids when mixed with air is extremely explosive.

(39) Supplies of these liquids, not exceeding one barrel, may be stored above ground if in a structure

of fire-resistive character, and at a safe distance from other buildings or structures.

(40) If supplies cannot be drawn in daylight, only electric lights or flashlights must be used. If in emergency, it is impossible to obtain flashlights and a lantern is used, this must be placed outside of the building, in front of a closed window, or kept as far above floor level as possible. Gasoline vapor is heavier than air, and always seeks lowest points.

(41) Small supplies of these liquids, up to a maximum of five gallons, but preferably not exceeding one gallon, may be handled in approved safety cans. These should preferably be placed outside of the building, in metal cabinets ventilated at top and bottom.

(42) The installation of tanks for storage of gasoline or other volatile by railroad company or by private parties on company property, must be approved by the Fire Protection Department.

(43) If such installations are made on privately-owned land adjacent to railroad property they should be in accordance with the Interstate Commerce Commission regulations, but if served by sidetracks of the railroad company the provisions of American Railway Association Circular 2084-A, or subsequent revisions of it, must govern. Unless the land slopes away from the railroad, protective dikes should be provided near the property line, so as to prevent the oil or flammable liquid reaching railroad property, in case of failure of the tanks.

Glue Pots

(44) Glue pots used in stationery or record rooms, mill rooms, etc., must be heated by steam, hot water or electricity. Adjacent wood work must be protected with sheet metal over one-quarter inch asbestos board.

Grass and Weeds

(45) Premises around all railroad structures, lumber, ties and rolling stock must be kept clear of dry grass, weeds, straw and other combustible refuse.

Hay, Fibrous and Other Hazardous Materials

(46) When hay or fibrous materials are handled or stored, special effort must be made to prevent ignition by sparks from any possible source. Lighting of matches, carrying of open torches, or smoking on the premises are prohibited. If these materials are handled at exposed points the necessity for special guards must be considered. (See Appendix for list of hazardous materials.)

Hot Cinders

(47) Hot cinders must be thoroughly drenched before loading them into cars. Sweepings, rubbish or other combustible material must not be dumped into cars with cinders.

Hot Journals

(48) Burning waste removed from journal boxes must be immediately extinguished. Lids of journal boxes must be closed when cars are set out for hot journals.

Hydrocarbon Oil

(49) Hydrocarbon oil used for snow melting must be treated as a hazardous material, similar to gasoline, and the same rules governing the use of gasoline will apply. If underground storage cannot be arranged, the hydrocarbon oil must be kept in metal drums at a point not less than one hundred feet from nearest main line track, with sign reading "KEEP FIRE AND LIGHTS AWAY."

Incinerators

(50) Burning rubbish adjacent to railroad structures, cars, or in congested yards, is prohibited except in properly constructed incinerators located at points approved by the Fire Protection Department.

Kerosene

(51) The use of kerosene for lighting or quickening fires is prohibited.

Kindling

(52) Kindling should preferably be kept in a closed shed not exposing other property. If piled in open it must be a safe distance from tracks and buildings.

Lamp Black

(53) Lamp black must be stored or shipped in metal or metal-lined containers with tight covers, and be kept in cool, dry places.

Lime

(54) Special care must be taken in handling lime in transit or in storage to keep it thoroughly dry. Unslacked lime is a potential fire hazard as, if water obtains access to it, the resulting chemical action will produce sufficient heat to ignite surrounding woodwork.

Lockers

(55) Lockers hereafter installed must be of approved metal construction with sloping tops. Existing wooden lockers must be properly ventilated. Frequent inspection of all lockers must be made and written record of conditions must be kept. Clothing must be hung neatly, not thrown on the floor. Torches, lanterns, fusees and torpedoes must not be placed in lockers unless designed and used solely for the purpose.

Locomotives

(56) A careful and thorough inspection of every part of the spark-arresting appliances in front end of locomotives must be made at least at every washout. Ash pans, hoppers, slides, and other dumping apparatus and dampers must be inspected daily.

(57) A record of conditions must be made on an approved form, immediately following each inspec-

tion, including date of inspection, and a complete statement of any repairs or renewals required. This record is to be made and signed by the person who makes the inspection.

(58) Nettings and spark arresters must be perfectly tight and in serviceable condition before a locomotive is placed in service. Nettings and plate in front end when worn thin or defective, must be renewed instead of being patched.

(59) Locomotives must not be detained unnecessarily, have blower operated, nor ash pans cleaned while under or near coaling stations of timber construction.

(60) Ash pans must not be opened while engine is in motion, and fires must be cleaned (except in emergency) only at stated places. Care must be taken that the cinders are wet down until extinguished.

(61) Burning waste, hot cinders and flammable material must not be dropped nor thrown from the engine.

(62) Engines observed throwing sparks or starting fires must be reported at once to the Superintendent by telegraph or telephone.

(63) All openings, where pipes pass through cab, must be properly protected with metal collars or thimbles, and openings between cab floors and fire boxes must be protected with metal or asbestos. Caulking openings with waste or other flammable materials to prevent draughts is prohibited. These are minimum requirements, and local conditions or regulations requiring additional precautions are not affected thereby.

Lumber

(64) When practicable, lumber must not be stored less than one hundred feet from buildings or cars; aisles and breaks must be provided with due regard to fire hazard.

Matches

(65) The use of matches in and around buildings must be avoided as far as possible. If they are necessary, only safety matches must be used, and special care must be taken to see that they are extinguished after using.

(66) Storage of matches must be in metal or metal-lined boxes. Small current supplies must also be kept in similar containers.

Material Storage

(67) Storage of materials required to be kept under cover shall be in structures designated for that purpose. Materials may only be kept in other structures when required for the maintenance and operation thereof, and when so required, must be

piled neatly in the place designated for them, and kept free from dirt and refuse.

Oakum

(68) Oakum must be stored in metal or metal-lined containers, and away from sources of heat.

Oils

(69) (See Gasoline and Other Volatile Liquids; also Fuel Oil.)

(70) Oil for illuminating or lubricating purposes should, as far as possible, be stored outside of the main building, preferably in isolated buildings erected for the purpose. If absolutely necessary to handle small supplies of these oils in main buildings, they must be kept in metal or metal-lined boxes with self-closing covers.

Oily Waste and Rags

(71) Oily waste and rags, or rags saturated with paint, kerosene or linseed oil must be kept in metal cans with self-closing covers. They must not be placed near steam pipes, stoves nor lighting fixtures, nor in direct sunlight. They must be disposed of daily. The possibility of spontaneous ignition or of a stray spark starting a fire in this material must always be guarded against.

Oxy-Acetylene Welding and Cutting

(72) The regulations of the National Board of Fire Underwriters for the installation, operation and maintenance of oxy-acetylene welding apparatus must be carefully observed. Only approved types of appliances shall be used.

(73) Where main supply of oxygen and acetylene exceeds ten cylinders they must be stored in cool, dry places in detached building used for no other purpose, and without artificial heat.

(74) Oxygen cylinders, preferably should be stored in horizontal position. Acetylene cylinders must always be stored in a vertical position. If necessary to store the two kinds of gases in same building they must be separated by a partition of fire-resistive construction. (See Appendix.)

(75) If necessary to hoist cylinders, cradles must be used, not slings.

(76) All valves must be closed when apparatus is not in operation.

(77) Valves must not be packed with greasy packing; lamp wick and glycerine only must be used. UNDER NO CIRCUMSTANCES MAY OIL BE USED.

(78) Leaky equipment must never be used. All connections must be tight before torch is lighted.

(79) Hose other than that approved for this work must not be used.

(80) Where hose is subject to mechanical injury it should have a protective covering.

(81) Greasy hose must not be used nor hose be allowed to come in contact with grease or oil.

(82) Improper size hose clamps must not be used.

(83) Hose connection caps must be replaced when apparatus is not in use.

(84) Cutting or welding work must be kept at least ten feet from valves on the containers or pipe lines.

(85) Cutting sparks must not be allowed to fly in the direction of the gas supply tanks.

(86) Generator plant must not be left without attendant while generator is in operation. When attendant is away, generator room must be securely locked. Signs reading "POSITIVELY NO ADMITTANCE" must be placed at entrance to generator building. Only authorized employees shall have access to and operate apparatus.

(87) Open flames or smoking must not be permitted within fifty feet of generator plant, and signs to this effect must be posted.

(88) Oxygen and acetylene pipe lines must be installed in such manner that they will not be subject to injury. All pipe lines must be painted

GREEN to indicate oxygen.
RED to indicate acetylene.

(89) Pails of water, or other quickly available extinguishing facilities, must be kept convenient for immediate use where welding and cutting operations are being carried on.

(90) Tests of acetylene generators or piping for leaks must not be made with a flame, and a flame must never be applied to an outlet from which the burner has been removed. Tests for leaks should be made with soapy water.

(91) Soldering irons must not be used on acetylene generators until it is certain that all gas has been removed by steaming or flushing. Soldering irons must never be used on acetylene cylinders under any conditions.

(92) The charging of the generator, and the handling of calcium carbide must be by daylight only, and no fire nor artificial light other than incandescent electric lights with vapor-proof globes, shall be permitted within ten feet of the generator, unless separated therefrom by a brick or other non-combustible wall having no opening within ten feet of said generator.

(93) Care must be used not to strike sparks with shoe nails and other metal in generator room.

(94) Electrical apparatus, such as switches, telephones, and other apparatus that may cause a spark must not be located in any generating nor gas storage room.

(95) Portable outfits must not be used within ten feet of combustible material other than the floor. When charged they must not be moved by a crane or derrick. When not in use they must not be placed in any room in which open lights or fires are used. Storage rooms must be thoroughly ventilated. Cylinders must be mounted and securely fastened on truck.

Paints and Varnishes

(96) If necessary to maintain current small supplies of paint, paint oils, and varnishes in other than special oil or paint houses constructed for the purpose, these supplies must be stored in metal-lined bins or lockers with self-closing lids or doors. Only approved type of corks should be used in corking varnish cans; the use of waste is prohibited.

(97) In the case of such supplies not stored in paint cars nor in special buildings provided for that purpose, but held in buildings for maintenance painting, these supplies can be carried between points in metal-lined ventilated boxes provided with extended handles and self-closing cover. In this box should regularly be placed, after each day's work, all painting or varnishing material and brushes, and clothing of the workmen, unless metal lockers are provided.

Paint and Varnish Removers

(98) Paint and varnish removers are usually highly flammable and must be handled with due regard to fire hazard.

(99) Where the burning process is used for removing paint or varnish from cars all burning must stop one hour before quitting time, and if property is covered by watchman he must be given the initials and numbers of cars on which burning has been done during the day, and instructed to give these cars special attention.

Radio-Wireless Stations

(100) No radio (wireless) installations shall be made unless permitted by the official in charge of the department, and subject to the approval of the Fire Protection Department. For each installation the rules of the National Board of Fire Underwriters shall govern. (See Appendix.)

Record Storage

(101) Records must be stored in snug piles, avoiding loose edges, and if not bound in volumes nor contained in filing cases, shall be tied in bundles. They must not be placed against steam pipes nor other heated surfaces, nor in front of openings not provided with screens. Throwing of records carelessly

on floors is prohibited. Storage of records in attics and inaccessible places is not desirable practice, and must be prevented.

Rubbish

(102) Rubbish, sweepings and other flammable refuse must not be allowed to accumulate on railroad property, and must be disposed of regularly, with due regard to fire hazard. Covered metal cans, safely located, must be provided for temporary storage, pending disposal. (See Rules 45, 50.)

(103) Where it is impracticable to install incinerators, and refuse cars are used, they should preferably be of steel construction and placed so as not to endanger company property, nor rolling equipment.

Shavings

(104) If shavings are used as fuel, direct from a collector system, the installation must be such that back draught in the conveyor duct will be prevented.

(105) If shavings are used for firing up locomotives the storage and mixing must be in detached building, preferably of fire-resistive construction.

Smoking

(106) Smoking is absolutely prohibited in grain elevators, woodworking shops, paint shops, oil rooms, store rooms, freight houses, warehouses, piers and record rooms, in all buildings where flammable material is handled, and at other points where the hazard warrants.

CARELESS smoking is responsible for more fires than any other cause.

(107) In other places, if smoking is permitted, special attention must be given the careful disposition of smoking materials and matches that have been lighted. All traces of fire in these must be positively eliminated before discarding.

(108) Wooden cuspidors must not be used. Sawdust or other combustible material must not be used for filler; only sand is permitted.

Steel Chips

(109) On account of liability to spontaneous heating, steel chips must be kept free from oily waste and other combustible material, and must not be stored in wooden containers inside of buildings, nor against frame buildings and wooden fencing.

Thermit

(110) In the Thermit process of welding, preheating, involving the use of oil or gas, must be safeguarded as directed for those hazards. Combustible floor or material must be protected from runout of surplus fluid steel from the crucible. Ignition powder used in the crucible must be stored with same

precautions as fireworks, in tight metal cans, and remote from sources of heat.

Tire Heaters

(111) When tires are being set extra precaution must be taken to see that all woodwork is properly protected. Care must be exercised when lighting or starting heater. (See also Gasoline and Other Volatile Liquids.)

Torches

(112) (See Gasoline Burners and Blow Torches.)

Track Ties and Timber

(113) Track ties stored along the right-of-way must be piled in accordance with rules of the Maintenance of Way Department, and in all cases with due regard to fire hazards. Before piling, the ground for at least ten feet must be cleared of all dry grass, weeds, etc. All ties where in compact piles must be covered with dirt. Piles of ties must not exceed fifty ties each, and must be separated from each other by at least fifty feet.

(114) Other timber must not be stored near buildings nor structures. Piles must be separated a safe distance from each other.

(115) Old ties, timber, and wrecked car bodies when burned must be at a safe distance from track, structures and telegraph wires. Disposal by burning during prevalence of high winds is forbidden.

Transformers

(116) Oil-cooled transformers must be installed in accordance with the National Electrical Code.

Warming Fires

(117) Warming fires must be handled with due regard to fire hazard, and must not be built at points where they endanger company property and rolling equipment. Salamanders are safer than open fires.

Waste

(118) If clean waste is kept in large quantities it must be stored in closed bins, or separate enclosures.

(119) Small supplies of waste must be kept in metal or metal-lined containers.

(120) The practice of storing small supplies of waste in lockers, drawers, etc., is prohibited.

Waste Paper

(121) The collecting, handling and storing of waste paper constitutes a very serious fire hazard, and therefore, must be handled with extreme care and in a detached building, if possible.

(122) In large office buildings, terminals, and such property where waste paper accumulates rapidly a press may be installed, and a room must be assigned for the purpose at a point where fire hazard will be

minimum. Paper must not be allowed to accumulate, and must be disposed of daily, if possible, or at least every time two or three bales have been collected. Incineration, however, is preferable if cost of baling is not warranted.

(123) Where the supply of paper will not warrant the installation of a press or baling machine, paper must be stored in bags and disposed of periodically. The accumulation of bags in excess of six or eight will not be permitted.

(124) The room or place where waste paper is collected and baled or stored must be kept in neat condition. Smoking therein is prohibited.

Wrecks

(125) (See Appendix.)

HEATING HAZARDS

General

(126) Heating appliances must be installed with due regard for safety under the worst possible condition that can occur, such as overheating of flues due to employees leaving draughts open while not direct on the premises; or by overloading fire pot of stove, and allowing door to remain open, so that live coals may fall to supporting surface beneath.

(127) Heating apparatus, including boilers, chimneys and flues, must be inspected at least once each year and defects must be promptly corrected. Special attention must be given old brick chimneys without flue lining, in the section between ceiling and roof.

Chimneys

(128) Chimneys must be large enough to give a separate flue for each fire and should be carried as straight as possible from foundation preferably to three feet above the highest projection of the roof. They must be constructed of sound, hard brick or reinforced concrete, at least eight inches thick, and lined continuously throughout with one inch terra cotta pipe or fire clay. (For metal smoke jacks see Rule 167.)

(129) Chimneys must be built from the ground, or supported therefrom with fireproof material, and with none of their weight carried by any part of the structure.

(130) Floor joists or other woodwork must not be run into chimneys or flues. Wood casing, lathing or furring must not be allowed closer than two inches from brick work.

(131) No vent pipe from gas appliances may enter same flue as used by an open flame fire.

(132) When smoke pipe has been removed openings must be closed with a tight, metal flue cap.

Furnaces

(133) Furnaces and other heaters must be installed on non-combustible floors with top of furnace not less than 24 inches below ceiling or floor beams. If ceiling or floor beams are of combustible material they must be protected in accordance with standard practice; using metal and asbestos, with at least one inch air space.

(134) Top of furnace must have an insulating cover such as sand or asbestos, of thickness depending on size of installation.

(135) All woodwork within four feet of furnace must be protected with insulation of metal and asbestos, with at least one inch air space, in standard manner. No protected woodwork will be permitted closer than twenty-four inches to furnace.

(136) Cold air boxes or intake must be made of non-combustible material for at least six feet from furnace.

(137) Where hot air pipes pass through combustible floors or partitions, they must be of double pipe construction with one inch air space or equivalent construction.

(138) Combustible material within six inches of hot air pipe must be protected with metal and asbestos. No protected woodwork will be permitted closer than three inches to hot air pipes.

(139) Register boxes must have woodwork removed from, and be protected as recommended for hot air pipes.

(140) Pipes carrying main supply of steam or hot water must be wrapped with magnesia or asbestos covering.

(141) Where steam and hot water pipes pass through wooden floors or partitions they must be fitted with metal shields or collars providing clearance from woodwork of one inch.

Stoves

(142) Stoves, furnaces and heating boilers having defects must not be used.

(143) Smoke pipes and flues must be cleaned thoroughly, with special attention to horizontal runs. If soft coal is used the frequency of cleaning must be such as to keep these in safe condition. (See Rule 166.)

(144) Soot deposits on surfaces inaccessible for mechanical cleaning may be removed by burning common salt. About one pound will usually be sufficient for an ordinary stove, if well scattered over a hot fire.

(145) Over-filling stoves with fuel or rubbish is prohibited.

(146) When buildings are left for the night without an attendant, fires must be extinguished, or carefully banked, with draughts and checks in safe position.

(147) As far as possible stoves for heating purposes must be properly supported on iron legs resting on the floor and placed three feet from all lath and plaster or woodwork; if the lath and plaster or woodwork is properly protected by metal shield with air space, then the distance may be not less than twenty-four inches.

(148) Metal protection must be placed under and extend eighteen inches on all sides of all stoves that are placed on combustible floors.

(149) If caboose type stoves are used on combustible floors metal protection must be provided, and must extend not less than eighteen inches in front of stove. If stoves other than caboose type are not supported by legs, or with legs less than six inches in height, the supporting surface must be protected by metal and hollow tile as approved by the Fire Protection Department.

(150) Ranges with air space less than four inches between ash box and floor must be located on floor of fire-resistive construction, such as brick, tile or concrete, properly insulated from combustible material.

(151) Floors of combustible material beneath ranges must be protected by four-inch hollow tile, or by two courses of brick, placed on sheet metal or one-eighth inch asbestos board. If brick is used the lower course must be laid so as to permit free circulation of air between the brick. The protection must extend twelve inches beyond the range at sides and rear, and twenty-four inches in front.

(152) Large ranges must be provided with hoods substantially constructed of metal and large enough to collect all greasy vapors. The hood preferably should be at least eighteen inches from any combustible material or construction. If less clearance is imperative, the adjacent surfaces must be protected as will be indicated by the Fire Protection Department.

(153) If on account of limited space available, such as occurs in small crossing shanties, heated surfaces do not clear combustible material at least three feet, special protection must be afforded by heavy asbestos or magnesia board, reinforced with a sheet metal face. This device must be installed so as to enable free circulation of air between protection and pro-

tected surface. The protection must be cut off within about two inches of the floor. This also enables removal of any material that may be thrown in the insulating space.

(154) Heating apparatus for freight cars must be overhauled and put in safe condition before cold weather. Agents, car inspectors or other designated employees must examine these cars; if installation is unsatisfactory cars must not be moved.

(155) Cars equipped with heating apparatus must not be placed in train nor storage yard next to car bearing explosives or inflammable placards.

(156) Large gas appliances must be connected to an independent flue by vent pipe, installed with same care regarding clearance from combustible material or construction, as smoke pipes. The possibility for back draught must be prevented.

(157) Combustible material under or near gas appliances must be properly protected with asbestos or metal.

(158) Rubber tubing for gas cooking and heating devices must not be used; only rigid pipe connections will be permitted.

(159) Oil stoves where used must be approved by the Fire Protection Department.

(160) The use of gasoline stoves for cooking and heating is prohibited.

(161) The use of alcohol for heating is prohibited.

Smoke and Vent Pipes

(162) Smoke pipes must be of substantial riveted metal construction securely fastened to heating appliances, spark-tight, and placed not less than three diameters of pipe from combustible material or construction, unless woodwork is protected, in accordance with standard practice, with metal, asbestos and air space.

(163) Pipes should run direct to standard brick or concrete flue, and be firmly held in place through plaster and metal thimble.

(164) Pipes should preferably not run through blind attics nor other enclosed places. However, if necessary that pipes should pass through these places, and if it is not practicable to construct a brick or concrete flue, a cast iron jack must be installed, extending from ceiling to at least two and one-half feet above the highest portion of roof, with same clearance from combustible material or construction as for smoke pipes.

(165) If necessary for a smoke pipe to pass through a partition, the diameter of the opening through

combustible material must be twice that of the flue, or piping. The space thus created for insulating purposes must be effectively preserved by insertion of ventilated metal thimble and concrete slab.

(166) Long runs of pipe are objectionable, but where unavoidable must be securely supported at frequent intervals with metal straps to prevent sagging; joints must be riveted or wired together.

(167) When heating by stoves is necessary in engine houses and other buildings with high roofs, and long runs of pipe are unavoidable, pipes must connect to cast iron jacks at the roof line and extend not less than eighteen inches therein. Clearance of jacks from combustible material or construction must be same as for smoke pipes. Pipes must be riveted or wired together to prevent distortion.

(168) Vent pipes for greasy vapors must be so constructed and installed that they may burn out and become red hot without damage to the building or contents. Clearance from combustible material or construction must be same as for smoke pipes.
(See Rule 162.)

(169) Vent pipe connected with a hood over a range must be an individual pipe having no other connection, and not run near any combustible material or construction.

(170) Vent pipes must extend either outside of the building and be securely fastened to the outside wall with a clearance of at least twelve inches therefrom, and discharge preferably four feet above the roof, or be connected with a standard brick flue lined with burnt clay or terra cotta pipe, and used exclusively for ventilating pipe of the range.

(171) The diameter of vent pipes will be governed by volume of the air in the kitchen and change of air required, but in no case shall it be less than eight inches for its entire length.

(172) Fans and motors used in connection with ventilation should be installed with incombustible surroundings, and with ventilation to the open air.

Boilers

(173) If a boiler is installed in a building of ordinary construction the floor must be entirely of noncombustible material, extending eight feet in front and four feet at side and rear of boiler. The possible transmission of heat through the floor beneath the fire box must be considered. If the supporting surface is of timber, special floor construction to provide air insulation will be necessary.

(174) Safe clearance between boiler and combustible structural material must be maintained, four

feet above steam dome, four feet at side and in the rear, and eight feet in front.

(175) If this clearance cannot be observed in existing installations, exposed woodwork must be protected with a layer of asbestos board and sheet metal, with satisfactory air space.

(176) Tops of boilers must not be used for drying combustible material.

(177) Dust must not be allowed to accumulate on top of boilers.

Smoke Stacks and Breeching

(178) Outside brick or metal stacks are preferable.

(179) Inside metal stacks must have their weight supported on non-combustible foundation.

(180) For metal stacks passing through combustible roofs opening must be twice the diameter of the stack and be protected with a standard ventilated metal collar one and one-half times the diameter of the stack. Boilers for temporary installations, extending through combustible partition or wall, must be similarly guarded.

(181) The height of stack must be not less than fifteen feet above roof of building of which it is a part, or any of the nearest adjoining buildings.

(182) Metal breeching must have the same clearance on all sides from combustible material or construction, as required for smoke pipes and stacks.

Steam Pipes

(183) Main supply steam pipes must have at least one inch clearance from all combustible material or construction. Superheated steam pipes must have greater clearance. Pipes through partitions must be fitted with metal shields or collars.

LIGHTING AND ELECTRICAL HAZARDS

Electric

(184) Electric wiring and fixtures must be installed and maintained in accordance with the latest edition of the National Electrical Code, the National Electrical Safety Code, and the regulations of the National Board of Fire Underwriters and municipal authorities.

(185) Electrical installations must be inspected frequently, and changed where hazards exist.

(186) Tampering with electric light or power facilities by unauthorized persons is prohibited.

(187) Alterations and repairs must be made by an authorized electrician.

(188) New buildings for the storage and handling of volatiles or explosives must be provided with electric lights with vapor-proof globes, furnished

with keyless sockets, and with lighting switch outside of building.

(189) The bridging of or use of oversize fuses is prohibited. Fuses are safety devices to indicate overloads, and are installed for the protection of the circuits.

(190) When a fuse of the proper size constantly burns out an authorized electrician should be called to determine cause and correct it.

(191) Lighting circuits must not be used for power nor heating purposes, unless approved by the Fire Protection Department.

(192) Electric light and power circuits must be so installed that they will not come in contact with telephone and telegraph wires.

(193) Aerial lines shall generally be arranged in the order of their operating voltages, the higher voltage conductors occupying the higher position. Where conductors of lower voltage are permitted to occupy positions above conductors of higher voltage their mechanical strength shall conform to the requirements for the higher voltage lines.

(194) Where telegraph and telephone wires are subject to mechanical injury, or where passing through attics and concealed spaces, they preferably should be in grounded metal conduit from point of entrance into the building to connection to the apparatus.

(195) Pendant cords must hang freely from ceiling outlets. No cord shall be long enough to permit a lamp to be laid on combustible material, unless equipped with a suitable lamp guard, and used as an extension cord.

(196) Pendant and portable lamps must be provided with approved metal guards in record rooms, coaling stations, storehouses and similar facilities.

(197) Extension lamps must be provided with approved reinforced cord and equipped with approved metal guards.

(198) Electric lamps must be equipped with vapor-proof globes in oil houses, paint rooms and other facilities where volatile liquids are handled, and in grain elevators and other structures where explosive dust or gases are present. Keyless sockets only are to be used.

(199) Doors of fuse cabinets must be kept closed and preferably locked. No material other than fuses must be allowed in cabinets.

(200) The use of paper or other flammable shades on lighting fixtures is prohibited.

(201) Electric wires must not be covered with whitewash nor paint.

(202) When buildings are unoccupied and operations have ceased, electric current must be cut off at main switches, and fuses must be removed. On Sundays, holidays, or other times when shops or other facilities are temporarily out of service the electrical apparatus should be de-energized at main switches.

Gas

(203) Gas lights must have rigid fixtures, so placed as to be not nearer than eighteen inches to ceiling nor six inches to side walls nor combustible material, and must be protected with suitable guards. Inverted type mantles are prohibited.

(204) Pintsch gas must be handled with due regard to possibility of explosion similar to gasoline vapors. Open lights and fires must be avoided at charging points, and smoking and lighting matches are prohibited in the vicinity.

(205) The use of gas-generating devices for interior illumination is prohibited.

(206) Gas meters must be placed on non-combustible supports, and preferably where the dials can be read without use of artificial light. The use of lead piping is prohibited.

Oil

(207) Oil lamps with glass fonts are prohibited; only metal will be allowed.

(208) Burners must be securely fastened to oil receptacles and must be kept clean and properly adjusted at all times. Small vent pipe to burner must be kept open.

(209) Chimneys must be securely adjusted to burner frames. Cracked chimneys must be replaced.

(210) Suspended lamps must be securely fastened to rigid fixtures, and must be at a safe clearance from combustible material. Proper shields must be provided overhead when lamps are placed within twenty-four inches of combustible ceiling or other material above.

(211) It is preferable that oil lamps be filled only in daylight or by electric light, and never while burning nor near fire. (Gases generated from oil while heated are explosive.) Filling and trimming preferably should be done on a metal covered shelf or table. A lamp must not be filled to overflow point but an air space must be left above oil.

(212) Oil lamps in buildings and cars must not be allowed to burn until nearly empty, if possible to avoid it; excessive accumulation of explosive vapors may result.

(213) The use of paper or other flammable shades on lighting fixtures is prohibited.

(214) The supply of kerosene for lighting purposes must, as far as possible, be stored outside of main building, preferably in an isolated building. If absolutely necessary to handle small supplies of oil in the main building, they must be kept in metal or metal-lined boxes with self-closing covers.

BUILDINGS—LOCATION AND CONSTRUCTION

(215) State, municipal and other building requirements must govern, and these rules are supplemental thereto. Structures belonging to other parties, located on railroad property, must similarly conform to these regulations.

(216) Grouping of several small buildings at any location is undesirable. If possible, a single building must be provided.

(217) For the storage and handling of oils, paints, and hazardous materials, however, separate buildings must be provided when practicable, located not less than one hundred feet from other buildings.

(218) For the storage of explosives the distance from buildings or tracks must be at least two hundred feet.

(219) Placing small shanties and box cars where they will unnecessarily expose other buildings in case of fire, and attaching frame lean-to shanties to existing structures are prohibited.

(220) Unless dry kilns are entirely of fire-resistive construction, the possibility of fire in structures of this type must be kept in view when locating them with regard to other buildings.

(221) In the design of new buildings consideration must be given to location with respect to other buildings, nature of occupancy proposed, and any other conditions that may affect the fire hazard. Frequently various processes of equal hazard can be grouped to advantage at one end of a building and separated from the rest of the structure by standard fire walls. Restricting areas in which fire may be spread, by use of fire walls, tends to limit possible damage. Fire walls, however, to be fully effective, must be carried above the roof level at least three feet, and must have openings fully protected by approved fire doors or shutters. For frame buildings, fire walls must be extended longitudinally of the building as part of each main wall in form of "T" not less than nine feet to prevent fire working around between adjacent sections. Similar detail must be provided for canopy roofs and any platforms adjoining, by using concrete construction, or equiva-

lent. In long frame structures fire stops may sometimes be made by designing short sections of fire resistive construction, to prevent flames leaping around ordinary fire walls, or producing the equivalent by radiated heat. For large buildings consideration must be given to installation of standpipe outlets on roofs. If monitors or saw-tooth roof structures extend the entire width of the building, walkways should be provided. For buildings exceeding one story in height special attention must be given to adequate exit facilities such as enclosed stairways and fire-escapes. Exit doors from halls or floor areas to stairways must be of self-closing type.

(222) New buildings should be separated from other structures, as far as possible in accordance with the following general rules:

Brick or corrugated iron from brick or corrugated iron	40 ft.
Frame from frame	80 ft.
Frame from brick or corrugated iron	60 ft.

(223) If of construction other than fire-resistive, warming shanties and sand-drying facilities should never be placed at trestles, coal chutes, nor adjacent to other buildings on account of the special hazard involved.

(224) In frame buildings the general tendency of draught to carry fire must be kept in view. Spaces between studs, unless closed by girts or some form of draught stop, become flues through which fire can travel rapidly between floors. This condition needs attention particularly at junction between studs and sills, at which point the use of brick or other non-combustible filling is necessary.

(225) Exposed framing must be reduced to a minimum, as it affords space for accumulation of dust, cinders and nests of birds. Where possible install metal screening at such openings.

(226) Where building changes, such as partitions, closets, lockers or any repairs are required, notification must be given to the department having charge of maintenance. No work of this character must be done by other departments, except with the approval of that department.

(227) The use of wooden shingles is prohibited, for new construction or renewals, unless treated to the satisfaction of the fire protection department.

(228) Closets under stairs are prohibited.

(229) For large roof areas, undivided by fire walls, the construction of fire curtains at frequent intervals around the roof trusses must be considered.

(230) Interior walls with wainscoting or sheathed to part height must be closed at top with slope boards set at not less than forty-five degrees. In general, horizontal surfaces on which can be placed torches or material must be avoided.

(231) Records, stationery and similar supplies should preferably be stored on enclosed shelving.

(232) If local exposure conditions necessitate fire shutters, these must conform to the rules of the National Board of Fire Underwriters.

(233) Broken window panes, skylights, ventilators, and other defects must be promptly reported and repaired.

(234) New buildings for the general storage of paints, oils and other hazardous material or supplies, must be of fire-resistive construction.

(235) Oil houses must be provided with live steam jets, with main valve control outside of the room. All wall openings must be provided with approved wire glass in metal frames, metal shutters and doors, all self-closing, with fusible links.

(236) Buildings for storage of oils, paints and volatile liquids must be ventilated at floor as well as at roof. Floor vents should be adequately screened.

EQUIPMENT—(ROLLING)

(237) Rolling stock, including camp cars, and floating equipment, must not be stored, nor unnecessarily detained near hazardous risks, nor in or near unprotected buildings.

(238) Wooden cars must not be stored nor unnecessarily detained under bridges over tracks.

(239) If necessary to store equipment in large amount at unprotected places as many separations possible of at least one car length between groups of cars must be made. Placing steel cars between wooden cars serves partially the same purpose. All doors must be closed, and preferably sealed.

(240) Where possible open tracks for running in fire apparatus, and adequate outlets and power for moving equipment quickly, should be available at all times.

(241) Extreme caution must be observed in the handling and storage of equipment containing volatile or flammable oils, acids, explosives, lime, etc. They must be subject to frequent inspection as to the condition of contents; when necessarily held beyond usual time for forwarding, they should be on isolated track, apart from other risks, where adequate attention and fire protection are available.

(242) Cars must not under any circumstances be set on engine-standing nor ash pit tracks, nor other places where engines are authorized to clean fires.

(243) The practice of backing engines into round houses and permitting them to stand from under smoke jacks must be avoided.

(244) For installations of stoves in caboose cars, camp cars or other rolling equipment, the general principles covered under "Heating Hazards" shall govern.

FIRE PROTECTION

Care of Fire Protection Apparatus

(245) Fire protection apparatus must be kept in condition for instant use, and must be used for no other purpose than for fighting fire or fire drills. All employees are expected to know its location and use. The delay of even a few minutes in taking protective steps may mean the difference between a small fire and a disastrous one.

Color

(246) Except in special locations where conflict with signals may be possible the standard color for all fire protection equipment is red, with white lettering.

Fire Alarm

(247) The means of giving an alarm must be simple and well known.

(248) Fire alarm must be given according to posted instructions. If a fire occurs where there is a public department, it must be summoned immediately, except in electrically operated territory, which will be governed by rules of responsible local officer.

Fire Extinguishers

(249) Fire extinguishers must be placed in buildings and structures where required by the rules, and must be inspected regularly and kept free from corrosion. (For detailed rules see Appendix.)

(250) Extinguishers of approved type must be provided for cars as covered by the rules of the individual roads, and their use as well as that of all other fire apparatus must be thoroughly understood by all concerned.

Fire Hose

(251) When new hose is received, test must be made at once to insure that the couplings fit each other and also existing outlets. One nozzle, two wrenches, two spanners, and six standard gaskets must be provided for each installation of two hundred feet of hose or less. Fire hose must be tested under hydrostatic pressure at least annually. (For type and care of hose, see Appendix.)

(252) Hose houses must be located at points approved by the Fire Protection Department.

(253) In small buildings where water under pressure is available, the use of small hose for fire protection purposes may be considered.

(254) Tanks for fire protection must have automatic or other reliable gages.

Inspection

(255) Fire pumps, hydrants, alarm systems, hose reels, and all other apparatus must be tested and inspected at regular intervals so as to insure that they are ready for immediate service. Report must be rendered in writing, covering condition of equipment.

Ladders

(256) Ladders should be provided on the exterior of buildings of flat roof construction; scuttles should be placed in ceilings of enclosed attics of all new buildings, with fixed ladder. At freight stations, shops, etc., if stationary ladders are not provided, portable ladders of sufficient length to reach the roof of the tallest building to be protected must be provided.

Plans

(257) Plans showing location of hose, plugs and hydrants, size of mains, fire pumps, location of valves, fire alarms and watchmen's register stations must be furnished to those in charge of the property, and where necessary, conspicuously posted under glass.

Sand Pails

(258) Pails of clean, dry sand, with hand scoops for throwing same must be maintained where oils, paints or other flammable liquids are stored.

Switch Engines

(259) Switch engines equipped with fire fighting devices must be tested once each month.

Water Barrels and Pails

(260) If water barrels and pails are provided for fire protection, these must be furnished with covers to prevent evaporation. They must be examined at short intervals to insure that they are filled. In winter season calcium chloride is to be used in water to lower the freezing temperature. (For further details see Appendix.)

Watchmen

(261) Watchmen and company police must know the use and location of fire apparatus and alarms, and when designated must have their rounds recorded on approved clock systems.

FIRE BRIGADES

(262) The Fire Protection Department will recommend points at shops, large terminals and at other points where fire brigades are to be organized. Drills must be conducted at least monthly so that members will become familiar with the use of the apparatus.

(263) Thorough inspection as to the physical condition of apparatus must be at least weekly by the Chief of Brigade or member delegated, and conditions found must be reported in writing.

NEW YORK CENTRAL LINES

RULES COVERING THE HANDLING OF

AUTOMOBILES

AND SIMILAR VEHICLES IN TRANSPORTATION

In the shipment of automobiles and similar vehicles, all rules and provisions of the Consolidated Classification and other traffic publications will govern. This circular is issued for the purpose of emphasizing certain important features.

Interstate Commerce Commission regulations for the transportation of dangerous articles by freight, revised to January 1, 1923, authorized the acceptance of automobiles and motorcycles equipped with securely closed tanks containing gasoline, and exempt these vehicles from label and certificate requirements (See paragraph 76, Note 1, in connection with the item "Gasoline" in the list of principal dangerous articles). It is not necessary, except where requested by tariff, to require the draining of the gasoline tanks of automobiles, motorcycles or other self-propelled vehicles when offered for shipment, and **under no circumstances must tanks be filled or drained on railroad premises.**

Automobiles and other self-propelled vehicles must be carefully inspected when offered for shipment, and all apparent damages or defects must be noted on the face of the bill of lading. If tires show any breaks or defects, or if tires or other parts appear to have been used, notation to that effect must also be made.

When delivery is made to consignee, each shipment must be carefully inspected, to locate damage or defects. If these are in excess of any covered by previous notations on bill of lading, cause is to be ascertained as near as possible and statement be made as to how they might have been prevented.

If carload lot is to be loaded by shipper, agent must examine such shipment, and enumerate all detachable parts, and any defects, otherwise bill of lading must be endorsed:

"SHIPPERS LOAD AND TALLY; LOADED AND SECURED BY SHIPPER"

Automobiles loaded on open cars must have readily detachable parts removed and such parts and tools, if any, must be placed in metal strapped wooden boxes which must be securely fastened to the vehicle or the floor of the open car

or such parts may be placed in compartments under seat, such compartment to be securely closed and nailed.

If carload lot is unloaded by consignee, and any damage is discovered, agent must verify extent of damage before contents of car are disturbed. This is to insure intelligent handling of possible claim.

Railroad employes must not, under any circumstances, attempt to run machines of carload shipments to the ground, unless specifically ordered in writing to do so, unless at a particular station this is regular and approved practice, in order to release cars for other service.

For shipments refused or unclaimed by consignee, special effort should be made to secure immediate disposition. When order for disposition is received, no automobile nor truck is to be moved under its own power, but must be handled by an outside automobile or wagon, and the expense of this handling is to be charged against the property.

It is necessary to impress all employes handling motor vehicles regarding the explosive properties of gasoline. A relatively small quantity of this fluid will pass into the vapor state rapidly, and impart to a large volume of air highly explosive qualities. Gasoline vapor is heavier than air, and settles to the lowest points available.

Lanterns, or any other open-flame lights, must not be used during the process of loading automobiles, etc., in cars; electric flashlights or incandescent electric lights must be used. If absolutely necessary to use lantern it must be kept well above, and as far as possible from the automobile, as any possible vapor from gasoline will settle to lowest points.

Smoking or using lighted matches in cars or warehouses containing automobiles is **absolutely prohibited.**

Automobiles, motor trucks, motorcycles or other self-propelled vehicles using either electricity or gasoline or similar fuel should, whenever practicable, be loaded in cars by other than their own power. Valve in gasoline supply pipe must be securely closed and engine allowed to run idle until it stops, in order to exhaust gasoline from the carburetor. All batteries must be disconnected by effectively opening the electric circuit by shutting off the ignition switch or other closing device, and locking it in that position. The cap to gasoline storage tank must be tightly closed; there must be no leakage of gasoline at any point, but if any leak is detected, the shipment must be refused.

Under no circumstances must an attempt be made to drain or fill gasoline tanks of machines while on railroad premises.

In freight depots and on attached platforms, or platforms where cotton or flammable merchandise is handled, auto-

mobiles, motor trucks, etc., must be pushed from the ground to the warehouse or platforms, or from the depot and platform to the ground by hand. Only where special platforms have been erected for the handling of automobiles, motor trucks, etc., and when it is safe to do so, may such automobiles be permitted to move from the ground to the platform, or from the platform to the ground, and to or from cars under their own power. This especially applies to shipping platforms of manufacturers not exposing railroad properties where exceptions to these rules may apply only, at the risk and responsibility of the shipper.

Automobiles with finished bodies liable to damage, if not boxed, when loaded on open cars must be completely protected by fireproofed and weatherproofed tarpaulins securely fastened to the open car or automobile.

To avoid freezing, water tanks, radiators and other parts should be emptied during the season from October 1st to May 1st, and notation that this has been done must be made on shipping orders and bills of lading.

NEW YORK CENTRAL LINES

THE FIRE HAZARD OF

EXHAUSTED BATTERY ELEMENTS

In signal practice it is customary to use batteries of the "wet" type having electrodes of copper oxide and zinc, with the electrolyte of caustic soda. After batteries of this type have been in use for a considerable period the copper oxide of the plates is reduced to a state of metallic copper by the chemical action of the electrolyte. In that condition, the copper can easily reoxidize, during which process much heat can be produced.

When necessary to ship exhausted copper electrodes they must be washed carefully so as to remove all soluble matter, and then be set in a safe place where they can dry and cool for at least seven days.

Even after the plates have been thoroughly aerated and are dry and cool they must not be packed for shipment until at least two weeks after removal from service. Excelsior must not be used for packing under any circumstances; use paper bags.

The packing material, including paper wrappers, boxes, crates and barrels, must be kept thoroughly dry until the moment of packing. The words **"KEEP DRY"** must be painted on the outside of the shipping container.

Packages containing renewals must be kept in dry places while at freight stations and elsewhere, in order to prevent possibility for spontaneous heating, which occurs more readily in presence of moisture than when the plates are dry.

CALCIUM CHLORIDE

DIRECTIONS FOR LOWERING FREEZING TEMPERATURE OF WATER FOR FIRE PROTECTION

Be sure the barrels or containers are water-tight. New barrels should be coated inside with hot pitch or asphaltum before using. For barrels that have been used previously for salt solutions, examination of the hoops should be made to insure that they are sound and tight, as when calcium chloride solution is placed in such barrels the staves will probably shrink. For this reason special attention should be given the hoops of the barrels for a short time after the calcium chloride solution has been placed in them, as it may be necessary to again tighten the hoops. Metal containers, if used, should also be heavily coated with either pitch or asphaltum.

The amount of calcium chloride to be used by this railroad is .... *pounds per gallon of water. This will protect the solution against freezing to a temperature of .... *degrees below zero.

Use only fresh clear water and be sure that the crystals are entirely dissolved before ceasing stirring. If hot water is available, use this for first dissolving the crystals, as solution will be effected much quicker than with cold water. The barrels can finally be filled with cold water to within two inches from the top.

After the barrels are filled as directed, the solution must be tested with a hydrometer. If the reading obtained is not at the mark intended, i. e., ... *degrees below zero, then additional calcium chloride must be placed in the barrels and vigorously stirred until dissolved and the correct reading on the hydrometer is obtained.

The solution of calcium chloride does not deteriorate with age. With covers on the barrels very little evaporation will take place. A small amount of water added occasionally will keep the barrels filled to the level intended. During each inspection in the winter season, and when adding water to replace that evaporated, the hydrometer test should be applied to insure that the contents of the barrels have not been tampered with, such as when a mechanic in the vicinity might use some of the solution temporarily, and replace it later with clear water. Under these conditions, solution in the barrel would freeze before the designated temperature of .... *degrees had been reached. The hydrometer test takes

but a moment and insures that the solution is at correct strength.

When using the hydrometer for testing strength of solution, it is well to attach a string to it so as to keep it in control of the operator at all times, especially if the solution is weak and the hydrometer sinks below the surface of the liquid.

If about one pound of lime is added to each fifty gallons of calcium chloride solution, the solution will be kept alkaline and avoid possibility for corrosion, in the event that corrosion may possibly be anticipated. Alkalinity of solution may easily be tested by use of red litmus paper, which will turn blue if the solution is non-acid. Further lime may be added if necessary, until the change of color occurs.

Only calcium chloride shall be used as shall show magnesium chloride of content less than 0.03 per cent.

Comparative Freezing Points of Solutions Containing Calcium Chloride, Commercial 75 Per Cent.

Pounds per Gallon of Water	Freezing Point	Specific Gravity
½	29 above zero	1.025
1	27 " "	1.070
1¼	25 " "	1.085
1½	23 " "	1.100
1¾	21 " "	1.115
2	18 " "	1.130
2¼	14 " "	1.148
2½	10 " "	1.165
3	ZERO	1.200
3½	10 below zero	1.235
4	17 " "	1.270
4½	27 " "	1.295
5	40 " "	1.320
5½	52 " "	1.350

The figures shown in the table are for normal commercial 75 per cent calcium chloride. For special grades of calcium chloride the freezing temperature may, in some cases, be several degrees lower.

*Note: To be determined locally from table.

COALING STATIONS

FIRE PROTECTION RULES

(1) All unauthorized persons are prohibited from loafing in or around coaling stations. The foreman in charge is required to enforce this rule and in the event of his inability to do so, shall call for assistance from the Police Department.

(2) Bins must be thoroughly cleaned as frequently as the type and the location of coaling station will permit. At the time the chute is cleaned, special attention shall be given to the removal of coal dust from all beams and flat surfaces. All birds' nests built on the outside timbers shall be destroyed. Crevices or decayed parts where a spark might lodge, should be eliminated.

(3) The Engineer of Coal Dock or Foreman must make careful inspection each day of all bearings and electric apparatus. In making this inspection if any odor of gas is detected, careful examination of all bins shall be made. Bins throwing off this odor shall be emptied immediately, as coal before igniting spontaneously will throw off an odor of gas. A daily record shall be kept of these inspections and report shall be rendered weekly to the superior officer.

(4) Water must not be applied to coal in the cars nor in the coal chute for the purpose of laying the dust.

(5) Except where ashpits are so located, Locomotive Enginemen, Firemen or Hostlers are prohibited from cleaning locomotives, dumping ash pans or applying blower near coaling stations. The Foreman in charge of the chute will see that this rule is enforced.

(6) Smoking in and around the coaling station is strictly forbidden. Employes violating this rule will be discharged.

(7) All open lights such as torches, lighted matches and lamps are prohibited within the building. Bonfires are prohibited within fifty feet from the structure.

(8) Greasy clothing and oily waste must not be left in any part of the coaling station. All oily clothes must be hung up in standard metal lockers. Oil for lubrication or fuel shall be stored not less than thirty feet from the main coaling plant building.

(9) The fire apparatus of all description must be examined at the time the coal chute is cleaned and defects reported immediately.

(10) The operator of the coal chute shall keep book record giving date and details of each cleaning of the chute. Report of such cleanings is to be made regularly to the superior officer, who will in turn, report monthly the same information to the officer in charge.

Appendix to Fire Prevention and Protection Rules.

STORAGE OF COAL

Probably no single material in the world is so well known or necessary to civilization, and so well distributed, as coal. For this reason the problem of safe storage of coal is one of more than ordinary interest. In the process of burning coal as a fuel, the oxygen of the air unites with the carbon and compounds of carbon and hydrogen at the **critical** temperature, during which time heat is produced. If coal is stored and physical conditions make it possible for oxidation to occur, heat will be evolved spontaneously, perhaps in such manner that it may be gradually dissipated, but on the other hand it may be held within the mass, even to the extent that the coal may be ultimately destroyed. Therefore, to successfully and safely store coal certain fundamental principles must be known and observed.

Anthracite coal consists of practically all fixed carbon, to produce combustion of which requires sufficient external heat to raise it to the kindling temperature. Spontaneous heating of anthracite coal is unknown, consequently this kind of coal may be stored in any amount and by any method.

Bituminous coal, however, while containing much fixed carbon, also contains considerable volatile matter and chemical impurities that under suitable conditions may oxidize and produce rise of temperature. Of these impurities sulphur is most frequently found. In the presence of moisture, oxidation of this impurity apparently occurs more rapidly than if the coal is dry. Materials less dense than coal, such as paper, wood and other forms of cellulose, or having fibrous structure, have lower kindling temperature than coal, or in ordinary language, they are more easily ignited. The presence of such materials in stored coal increases the tendency to spontaneous ignition, as they may first become ignited and communicate additional heat units to the surrounding coal. In the case of storage of small masses of coal in bins inside of buildings, waste material and trash must not be permitted in the coal, not only with regard to spontaneous heating of the coal that may occur, but also the possibility of ignition of this combustible material by carelessly disposed match or smoking materials, the heat from which may in turn set fire to the coal itself. For storage of coal in greater quantities the removal of all grass, trash and similar materials is clearly necessary. Damp ground affords poor foundation for safe storage on account of the possibilities for more rapid oxidation of the chemical impurities in the presence of moisture, as previously stated.

The item of **critical** temperature has been mentioned. Any associated condition that will raise the temperature of bituminous coal adds to the fire hazard. The contact of coal with hot steampipes for example has resulted in spontaneous ignition in numbers of cases, as through this means the processes of self-oxidation are accelerated.

It will also be realized that an increase of surface for oxidation means correspondingly increased tendency to spontaneous heating. Therefore, very finely divided coal is more likely to heat spontaneously than lump coal, from which radiation of the heat generated may more easily occur. In railroad coaling plants the accumulation of dust or slack of bituminous coal in wooden bins has been the means, ultimately, of setting fire to the structure itself. Similarly, accumulations of this character, in contact with wooden posts supporting trestle and other structures may increase the fire hazard. The general principle involved can be applied intelligently to the storage of coal in large masses. As usually dumped while placing for storage, the large lumps tend to roll to the foot of the slope, leaving large accumulations of fine or slack coal at a single point where it may heat later and cause trouble. Actual observations also indicate that to store lumps so that air can pass freely through the pile to the slack is undesirable practice, but if the sizes are fairly uniformly distributed heating is least likely to occur. Attempts to secure ventilation for the bottom of the coal piles have frequently resulted in fire around the ventilation openings, due undoubtedly to permitting access of oxygen to coal that was subject to spontaneous heating. If radiation could occur at the same rate as the creation of heat units due to oxidation, the temperature of the entire mass would remain constant. Deep piling of coal tends to permit accumulation of heat units, whereas in shallow piles the heat can be more readily dispersed. A limit of height of twelve feet has usually been found satisfactory for coal in outside storage.

It has been shown that the rate of rise of temperature has distinct influence on the ultimate ignition of the mass. A slow rate of rise may not be cause for apprehension. If the temperature of the coal reaches 120 degrees Fahrenheit and then rapidly rises to 140 degrees, and over, it will be advisable to pay special attention to this section of the coal, and possibly to arrange for overhauling it at the points where heating is observed. Experience indicates that heating of bituminous coal, if it is to occur, will take place probably during the first three months after it is mined. This period can reasonably be considered as the **critical** state of coal in storage, during which time its behavior should be watched more carefully than is necessary after that time. If coal can be permitted to season about six weeks after mining and before storing, tendency to spontaneous heating will be appreciably reduced.

Evidences of spontaneous heating of stored coal can be obtained in various ways. Usually a smell of burning sulphur is a positive indication that trouble may be expected. Snow will melt on coal at a point where heating is in progress. An iron rod thrust into the pile may be tested by feeling it after it has been in place long enough to permit it to absorb heat. A thermometer may be inserted in an iron pipe with closed end driven down into the pile. Pyrometers may be buried in the pile during storage operations, arranged to read automatically at the same central point. In special cases, but only where the values involved warrant, however, special watchman, or one from adjacent plant, may be assigned to take temperature readings at stated intervals.

If coal is found to have heated to an extent that safety of the entire pile is in question, only overhauling it can be relied on to limit the amount of coal that may be damaged. The use of water is not recommended until other methods have not proved satisfactory. The value of sodium bicarbonate as an extinguishing medium has not been thoroughly demonstrated. Pouring small quantities of water over the top of the pile does not usually result in extinguishing the fire beneath the surface, as the water does not penetrate the crust over the burning section and reach the seat of the fire. Large quantities of water applied during the overhauling may, however, act effectively in reducing the temperature of the coal. Coal that has spontaneously heated may burst into flame when exposed to the air, so that overhauling should not be undertaken until extinguishing water is available, unless it is realized in advance that loss by ignition of a certain quantity of coal will occur.

Coal is now stored successfully in several ways. Dumping from a trestle is convenient, but tends to allow the large lumps to roll toward the edges of the pile, leaving the slack nearer the trestle, and providing flues for admission of air to the pile. This feature can be overcome by keeping each dumping leveled off. Coal placed by means of a clam shell bucket can more easily be kept leveled. Dumping from cars and raising the track on the coal pile has been frequently used but introduces the undesirable condition of breaking the coal and compacting the mass. Vent pipes embedded in the pile are not desirable for the reasons previously stated. A track in position adjacent to the pile is always advocated, to permit quick handling of any coal that may show signs of undue heating.

NEW YORK CENTRAL LINES

TRANSPORTATION OF DANGEROUS ARTICLES, OTHER THAN EXPLOSIVES, BY FREIGHT

EXTRACT FROM REGULATIONS OF INTERSTATE COMMERCE COMMISSION

IN CASE OF A WRECK

¶1071. In case of a wreck involving a car containing inflammable freight it should be assumed that packages are broken and that leakage has occurred which may cause fire if lighted lanterns or other flames are taken into or near these cars. As much of the train as possible should be moved to a place of safety. A car containing inflammable freight should be opened for ventilation and packages protected by red labels and cylinders of compressed gases should be removed to a safe place. Substances spilled from broken packages protected by yellow label should also be carefully removed. Cylinders of compressed gases may be exploded if they are exposed to fire or struck a sharp blow and the flying fragments would then be dangerous. Inflammable liquids spilled from broken packages or tank cars should be well covered with dry earth before a lighted lantern, torch, or an engine is used in the vicinity. Acids spilled in cars should be covered with dry earth and the car floor should be thoroughly swept.

LEAKING TANK CARS

¶1044. Action in any particular case will depend upon existing conditions, and good judgment will be necessary to avoid disastrous fires on the one hand and the useless sacrifice of valuable property on the other.

Volatile, inflammable and combustible liquids, such as gasoline, naphtha, petroleum oils, etc., in large quantity and spread over a large surface will form vapors that will ignite at a considerable distance, depending on the kind and quantity of liquid and the direction and force of the wind. Many of the liquids, regarded as safe to carry under ordinary conditions and transported in tank cars without the inflammable placard, should still be treated as dangerous in handling a wreck.

¶1045. When oil cars are leaking, all lights or fires near them that can possibly be dispensed with should be extinguished or removed. Incandescent electric lights or portable electric flashlights should be used when available. Whenever practicable the work of handling a wrecked oil car should be done during daylight.

¶1046. Lanterns necessarily used for signaling should be kept on the side from which the wind is blowing and at as high an elevation as can be obtained. The vapors will go with the wind but not against it. The ash pan and fire box of a locomotive or steam derrick, especially on the side of a wrecked or leaking tank car toward which the wind is blowing, is a source of danger. Wrecks involving oil cars should in no case be approached with lighted pipes, cigars, or cigarettes, and all spectators should be kept away from the vicinity.

¶1047. Effort should be made to prevent the spread of oil over a large surface by collecting it in any available vessels or draining it into a hole or depression at a safe distance from the track. When necessary, trenches should be dug for this purpose.

It is not safe to drain inflammable oil in large quantities into a sewer, since vapors may thus be carried to distant points and there ignited. Care should be exercised also not to permit oil to drain into streams of water which may be used by irrigation plants or for watering stock. Dry earth over spilled oil will decrease the rate of evaporation and the danger. A stream of oil on the ground should be dammed and dry earth be thrown on the liquid as it collects.

¶1048. Sudden shocks or jars that might produce sparks or friction should be avoided. When possible, the wrecked cars should be jacked carefully into position after removing other cars and freight that might be injured by fire. Only as a last resort, to meet an emergency, should a wrecked car be moved by dragging, and when this is done all persons should be kept at a safe distance.

¶1049. (a) No unnecessary attempt should be made to transport a damaged tank car from which inflammable liquid is leaking. Safety in short movements may be secured by attaching a vessel under small leaks to prevent spread of inflammable liquid over tracks. Tracks at intervals in rear of a moving car should be covered with fresh earth to prevent fire overtaking the car. Engines should be kept away; also spectators who may be smoking. If wrecked or derailed, and not in a position to obstruct or endanger traffic, leaks should be stopped as far as possible, and the car should be left under guard until another tank car or sufficient vessels can be provided for the transfer of the liquid, which should be transferred by pumping when practicable.

(b) Highly volatile products such as casinghead gasoline cannot be transferred in the usual way by a vacuum pump. The pump can only be used when placed so that liquid flows to it from the tank by gravity.

(c) Whenever the leaking condition of a tank car is such that transfer of lading is necessary, the car must have sten-

ciled on it, in letters three inches in size, adjacent to the car number, the words "Leaky tank. Do not load until repaired," and the owner must be immediately notified. This stenciling must not be removed until the tank is repaired.

Even a tank that is not leaking is liable to be ruptured by the use of slings, and slipping of chain slings may produce sparks. Saving of the contents of the tank is not as important as the prevention of fire.

(d) An empty or partially empty tank car, with or without placards, is very liable to contain explosive gases, and lights must not be brought near it.

¶1073. **Water will not quench an oil fire.**—If the fire cannot be smothered by use of earth, steam, or wet blankets, effort should be concentrated on confining it and saving other property.

¶1074. Should a leak occur by the breakage or displacement of the unloading valve and pipe at the bottom of the tank car, it may be stopped by removing the dome cap on the top of the tank and dropping the plunger into the plunger seat, as a shock sufficient to damage the outlet valve and pipes may have unseated also the plunger.

The dome cover should be unscrewed by placing a bar between the dome cover lug and knob. The dome cover should not be hammered, and should not be unscrewed until the absence of vapor pressure in the tank is verified by lifting the safety valve.

To ascertain whether the valve is properly seated, the valve-rod handle in the dome should be moved back and forth a few times.

NEW YORK CENTRAL LINES

EXTINGUISHERS

GENERAL RULES GOVERNING INSTALLATION, USE AND MAINTENANCE OF

HAND FIRE EQUIPMENT

IN BUILDINGS AND STRUCTURES

NEW EQUIPMENT

Extinguishers purchased **must be** of an approved type and bear the label of the Underwriters' Laboratories.

Types recommended:

(a) 2½ gallon tip over acid-soda.
(b) Hand pump tank.
(c) 2½ gallon "foam."
(d) 1 and 1½ quart carbon-tetrachloride.

Water barrels and pails, and sand, may be used in place of fire extinguishers in specific locations, if recommended by the Fire Protection Department.

PRESENT EQUIPMENT

Sub-standard chemical and powder tube extinguishers **must be** taken out of service, and if necessary, be replaced by one of the above types dependent upon the service for which it may be required.

SUITABILITY

2½ GALLON ACID-SODA EXTINGUISHER:

This type is recommended for use on incipient fires in ordinary combustible or freely-burning material, where the cooling effect of water, or solution containing water, is effective.

It **must not be** used on fires in nor around electrical equipment, nor on flammable liquids, greases, etc.

HAND PUMP TANK:

This type is recommended for use on incipient fires, as noted under "acid-soda extinguisher" but also may be used where continuous heat, or protection from freezing is not provided.

2½ GALLON FOAM:

This type is recommended for use on incipient fires in flammable liquids, greases, etc., where foam generated is

utilized to form a covering over the burning surface. This type is also recommended for use on incipient fires where the acid-soda and hand pump tank types are indicated.

It **must not be** used on fires in nor around electrical equipment.

1 AND 1½ QUART CARBON TETRACHLORIDE:

These types are **only** recommended for incipient fires in and around electrical equipment, and may also be used in locations where the gases generated are not affected by drafts or air currents.

LOCATION

All extinguishers **must be** conspicuously located where they will always be readily accessible. They should preferably be located in stair halls, corridors, or rooms at or near the exits. They **must be** suspended on hangers, or set on brackets or shelves so that the tops of extinguishers are about five feet above the floor.

Acid-soda and foam extinguishers **must be** located where there is continuous heat. Where no heat is provided, such extinguishers should be enclosed in standard heated frost-proof boxes. Where it is not possible to provide continuous heat, or where the standard heated frost-proof box is not adapted, hand pump tanks (with calcium chloride solution during season of freezing temperatures) in place of acid-soda extinguishers, and sand pails or boxes with scoops, in place of "foam" extinguishers, are recommended.

One extinguisher **must be** provided, unless otherwise herein noted, for each 2500 square feet, floor area, figuring each room, etc., separately. Additional units should be provided where the special hazards upon which they are effective, exist in an unusual degree or warrant such additions.

Where the hazard or fire risk is limited or lessened by the occupancy, the area to be protected may be modified if approved.

OPERATION

ACID-SODA AND FOAM TYPES:

These extinguishers should be carried to the fire by means of the top handle and inverted to operate, in accordance with the instructions on the extinguishers. While they are usually most effective when used close to the fire, they may be directed and used efficiently within distances up to thirty feet. Extinguishers may be recharged and used immediately, if the necessary charging chemicals are available.

HAND PUMP TANK:

This extinguisher should be carried to the fire by means of the top handle. The extinguisher will deliver contents

when the pump is operated. While the stream is usually most effective close to the fire, it may be directed and applied effectively within distances up to twenty feet. While operating, this extinguisher may be kept filled without interrupting continuous operation.

1 AND 1½ QUART CARBON TETRACHLORIDE:

These extinguishers, in order to be used effectively, should be operated in accordance with the instructions on the extinguishers. They are most effective when used close to the fire, but their efficiency is materially decreased if used a greater distance than fifteen feet.

MAINTENANCE

(a) GENERAL

2½ GALLON ACID-SODA AND FOAM EXTINGUISHERS:

These extinguishers **must be** recharged annually in any event, and immediately after using, recording date on extinguishers with paint, or on a tag attached to the extinguishers. The manufacturer's directions **must be** strictly adhered to in recharging, to insure greatest efficiency. All parts must be thoroughly washed and cleaned with warm water and defective parts replaced before refilling.

If possible, soda should be dissolved first in a separate vessel, and the solution should be poured into the extinguisher through a muslin cloth as strainer to insure that no undissolved particles remain that might clog the hose in nozzle later. (A lesser quantity of hot water used first will dissolve the soda more rapidly than cold water, after which enough cold water can be added to secure the correct amount.)

A quantity of chemical charges must be kept in stock at all times. It is recommended that, in isolated locations, at least two extra charges be kept ready for use in the box under extinguisher as shown on standard drawing.

These extinguishers **must not be** allowed to remain where they will freeze. Where electricity is available, the use of the frost-proof box as shown on standard drawing is recommended in unheated locations.

SALT, CALCIUM CHLORIDE AND OTHER SUBSTANCES **must not be** used under any condition to lower the freezing point of the solution.

HAND PUMP TANK:

This extinguisher **must be** kept filled at all times, and refilled immediately after using. In normal temperatures water may be used for filling. During season of low temperatures calcium chloride must be used, of such strength as is necessary to prevent freezing, using hydrometer to test the strength of solution. Calcium chloride should be mixed in accordance with the manufacturers' directions. A quantity

must always be kept on hand in tight boxes or cans for recharging. If the tank has contained calcium chloride it **must be** washed with warm water before refilling. Clear water must be drained through the hose to insure that it is in operating condition. In isolated locations, or where there is a limited water supply, it is recommended that the pump tank be supplemented by a fire barrel with tight cover, filled with calcium chloride solution.

1 AND 1½ QUART CARBON TETRACHLORIDE:

These extinguishers **must be** kept filled at all times and recharged immediately after using. No liquid other than that furnished by the manufacturer must be used in recharging.

(b) INSPECTION:

All extinguishers **must be** inspected at least monthly, by local authorities and record entered on tags attached to the extinguishers. Inspection by division officials or their representatives is recommended every three months.

Extinguishers which have patched cylinders or appear weakened **must be** discarded, defective hose or nozzles **must be** replaced, and nozzles and orifices kept free from obstructions. Mechanical defects in pumping devices and parts of extinguishers **must be** corrected and adjusted.

(c) TEST:

Acid-soda and "foam" extinguishers **must not be** tested except as noted under conditions below:—

All acid-soda extinguishers in which salt water has heretofore been used, or which appear to have structural defects must be subjected to a hydrostatic pressure of 350 lbs. per square inch. Extinguishers not meeting this requirement must be rejected.

Pump type extinguishers must be tested monthly by operating pump once or twice, to discover any mechanical defect.

Extinguishers in which compressed air is used for expulsion of liquid, must be tested by opening valve or release, and closing immediately upon determining condition.

All defects must be reported to the authorities having jurisdiction, and immediate action must be taken to place the equipment in perfect working order.

EXTINGUISHERS

INSTRUCTIONS FOR USE

It is suggested that the following rules for handling fire extinguishers be published individually, so that each extinguisher may have adjacent to or attached to it the rules pertaining only to that extinguisher.

HAND PUMP TANK EXTINGUISHER

This extinguisher is for use on incipient fires in ordinary combustible or freely-burning material, where the cooling effect of water, or solution containing water, is effective.

Directions

Carry hand pump tank by top handle to the fire. When within 10 to 20 feet from the fire, place the tank on the floor, take hold of hose in one hand and pump with the other hand, directing the stream on the fire.

This extinguisher **must not be used** on fire in or around electrical equipment nor on flammable liquids, oils, greases or similar materials.

TWO AND ONE-HALF GALLON ACID-SODA EXTINGUISHER

This extinguisher is for use on incipient fires in ordinary combustible or freely-burning material, where the cooling effect of water, or solution containing water, is effective.

Directions

Carry fire extinguisher by top handle to fire. When 10 to 20 feet from fire, turn extinguisher upside down. Take hose in one hand and steady extinguisher with the other hand. Direct the stream on the fire.

This extinguisher **must not be used** on any fires in nor around electrical equipment, nor flammable liquids, greases or similar materials.

TWO AND ONE-HALF GALLON FOAM TYPE EXTINGUISHER

This extinguisher is for use on incipient fires, flammable liquids, greases and similar materials where foam generated is utilized to form a covering over the burning surface. It is also for use on incipient fires where the acid-soda and hand pump tank types are indicated.

Directions

Carry fire extinguisher by top handle to fire. When 10 to 20 feet from fire, turn extinguisher upside down. Take hose in one hand and steady the extinguisher with the other hand. Direct the stream on the fire.

This extinguisher **must not be used** on fires in nor around electrical equipment.

WATER BARRELS AND PAILS

Directions

Carry pails of water to within the nearest possible distance of the fire, throwing the water directly on the fire.

Pails of water **must not be used** on fires in nor around electrical equipment, flammable liquids, oils, grease or similar materials.

SAND

Dry sand may be used on any fire where it will lie, so as to blanket or smother the flame.

Directions

Carry sand pail to within the nearest possible distance of the fire. Throw the sand directly on the fire, using a scoop or the hands to place the sand at seat of the blaze.

ONE QUART AND ONE AND ONE-HALF QUART CARBON TETRACHLORIDE EXTINGUISHER

These extinguishers are **only** for incipient fires in and around electrical equipment, and may be used in locations where the gases generated are not affected by drafts nor air currents.

Directions

Take extinguisher in one hand, catch hold of the handle with the other hand, turning handle around to unlock it; pull on handle and pump the extinguisher as if using a hand pump, directing the stream on the fire.

FIRE WALLS

It is an elementary principle in fire protection engineering that the magnitude of a fire is proportional to the area over which a fire can act. In accordance with this principle, it has been customary to subdivide large buildings or structures by constructing at intervals fire stops of some character. A modern fire wall is such an example. To properly serve the purpose, a fire wall must be planned in such a way that flames can neither pass through nor around the wall. For the former condition it is customary to provide fire doors for openings. These have reached a state of perfection as to practically withstand the fiercest conflagration, if constructed and placed in accordance with recommendations of the Underwriters' Laboratories. The "standard" door consists of three-ply seven-eighth inch boards placed in accordance with well-defined plan, and covered with sheet metal, all as described in detailed specifications. Other forms of doors consist of sheet metal with non-combustible filling between sheets.

To prevent fire reaching the roof level from passing over the fire wall, experience has indicated the necessity for carrying this wall at least three feet above the roof level. Even with the precautions mentioned, an additional condition is frequently overlooked. If the cornice or roof overhanging structure is continuous throughout the building, fire can communicate around the fire wall and defeat the purpose for which it was installed. To care for this detail, it is possible to construct a small section of brick or similar fire-resisting wall for the main wall of the structure at its junction with the fire wall. This section should be at least nine feet in length. This construction is frequently referred to as a "T" fire wall. For the roof structure adjacent to the fire-wall, fire resistive construction of some type may be used, such as brick, steel or concrete.

Frequently it is possible to design a frame structure with a complete section of fire-resistive construction.

At large freight houses and piers operating conditions may be such that fire walls cannot be built at sufficiently frequent intervals to properly subdivide the areas. For such points full fire walls may be constructed where the space can be best afforded. At intermediate points where ideal conditions would require additional fire walls, part fire walls may be built, allowing them to approach within reasonable clearance distance of the floor level, supporting these walls on columns of fire-resistive construction, to the floor level,

and supplying the opening with fire shutters of approved type. In this manner operating conditions will not be interfered with to any appreciable degree, whereas additional fire stops may be operated when they are needed.

In some buildings where, for reasons of economy, the installation of standard fire walls cannot be considered, the use of even a cheaper form of construction will serve to partly reduce the extent to which a fire can progress before it is attacked with fire-fighting appliances. A partition with face boards of asbestos lumber, of wire lath and concrete plaster, or similar construction, can serve to hold a fire in temporary check by preventing draught and affording a shield from which point the flames may be attacked. Even an ordinary board partition treated with flame-resisting coating will stay the spread of flames for a certain length of time, but to far less degree than the types of construction outlined. A real stop must necessarily be constructed of fire-resistive materials such as brick or concrete.

Fire walls have proved their worth in so many cases that no argument as to necessity for their use should be necessary.

OTHER FIRE STOPS.

Certain large shop properties, such as locomotive erecting shops, boiler shops and other facilities where traveling cranes operate constantly, furnish a condition under which it is impossible to construct fire walls. Usually buildings of this character are largely of fire-resistive construction, but frequently have a vulnerable feature in that the roof planking is of wood and subject to considerable fire damage, even to the point of total destruction, with consequent damage to the supporting trusses. For such buildings fire curtains constructed of fire-resistive materials around the roof trusses will at least serve to limit the roof area over which a fire will probably act, or retard its progress until fire protection equipment can be called into action. Further deterrent to spread of roof fires may be secured by the use of automatic sprinklers so arranged that water from the heads is distributed entirely against the roof planking. If the values to be protected are sufficiently great it may even be desirable to substitute for the roof planking, for a section of the building, a fire-resistive construction.

Having in view the general principle that the extent to which a fire can penetrate depends to a considerable degree on the character of the occupancy, it might be possible in special cases to delay the progress of fire by concentrating at a certain section of the building only those materials that are not as flammable as for the remainder of the building, or at least are of "slow-burning" type. For storage outside of buildings, lumber and timber for ties are frequently arranged with considerable spaces between piles, and these

spaces serve as fire breaks. Standard rules frequently call for separation of not less than fifty feet between piles. In congested territory, however, it may not be possible to secure open space. For such points a series of monitor or turret nozzles concentrated at a particular section of the property so that there is secured a zone in which the material handled may be thoroughly drenched with water, will serve as a fairly effective fire break.

FUMIGATION OF GRAIN

General Rules

In order to destroy insect life in grain various chemicals have been used, but of these carbon disulphide has been found so much more efficient than the others that it is now nearly exclusively used for the purpose. This volatile liquid passes rapidly into the gaseous condition, and is chemically of such nature that it breaks down readily at temperatures that could be considered ordinary. On a warm day, for example, the vapors from this liquid have been known to dissociate, with resulting explosion and fire. For this reason, Underwriters do not view favorably the use of this chemical for fumigating purposes, in fact the use of it inside grain elevators should be absolutely prohibited. In order to use this chemical for fumigating grain in railroad cars certain fundamental condition, as follows, must be strictly adhered to:

(a) The cars must be taken to a siding well removed from other cars, buildings, switchlights, and track over which locomotives are constantly operated, so as not to expose property to possibility of fire in the event that fire occurs in the cars under treatment. If several cars are fumigated at the same time, they must be separated into small groups.

(b) In selecting the point for treatment this possibility must constantly be kept in view, so that fire protection equipment, especially a good hose stream, will always be available.

(c) About twenty-five pounds or two and one-half gallons of carbon disulphide per car is usually ample. This liquid is placed in small shallow pans containing about one quart each, and the pans are placed on top of the grain in the car being treated. During the process the car doors are closed tightly during the twenty-four to thirty-six hours that grain is subjected to the fumes. Complete evaporation of the liquid takes place in from twelve to twenty hours, depending upon the temperature of the air, and the vapor penetrates through the grain.

(d) After fumigation the doors must be opened and kept open for at least forty-eight hours before the cars are moved, so that air may pass freely through, in order to permit diffusion of the fumes.

(e) Note the instability of carbon disulphide under high summer temperatures, especially where a car is placed in the hot sun for an entire day, and that dissociation of the carbon and the sulphur forming the chemical may occur with consequent explosive effects.

(f) **For the reasons stated, fumigation with carbon disulphide is positively prohibited inside of railroad buildings, especially in grain elevators.**

In addition to carbon disulphide another chemical, hydrocyanic acid gas, is fully as efficient, but cannot be used generally on account of its toxic qualities. It is extremely dangerous to human life particularly because it is colorless and almost odorless, so as not to give warning of its presence. The United States Department of Agriculture expects at some future date to be able to make commercially available a process for generating this gas simultaneously with tear gas, so that the presence of the more toxic gas may be evident by the irritating quality of the tear gas, and fatalities to operators may be avoided. At present, however, this process is not available for fumigating purposes unless used by experts.

NEW YORK CENTRAL LINES

REGULATIONS FOR STORING AND HANDLING

FUSEES AND TORPEDOES

ADAPTED FROM RECOMMENDATIONS OF RAILWAY FIRE PROTECTION ASSOCIATION, 1920

FUSEES

Handled in Original Unbroken Shipping Packages in Quantities at Distribution Centers

Fusees should be stored in a small magazine apart from any other building and preferably forty feet from other buildings or lumber storage. Local conditions at all storage points must be considered. The magazine is to be constructed of light material, covered inside and outside with non-combustible material, so as to keep out rain, snow and sparks. It is to be provided with a ventilator. No artificial means of heating or lighting is to be employed. Dryness may be promoted by having the magazine elevated a foot or more above the ground, supported on posts or pilings, and so arranged that there is free circulation of air between the bottom of the magazine and the surface of the ground.

Local Supplies of Fusees for Distribution over Storehouse Counter

Not more than four gross of fusees are to be kept in general storehouse at any time. Any broken packages are to be kept in a tight metal-lined, or one-quarter inch asbestos-board lined wood box, with a spring hinge or self-closing cover. Box is to be used for no other purpose, and is to be kept in a dry place, not adjacent to artificial source of light or heat.

TORPEDOES

Handled in Original Unbroken Shipping Packages in Quantities at Distribution Centers

Torpedoes are to be stored in a separate magazine similar to that used for fusees.

Local Supplies of Torpedoes for Distribution over Storehouse Counter

Not more than ten gross of torpedoes are to be kept in general storehouse at any time. Broken packages or loose torpedoes shall be kept in a tight wood box, lined with one-quarter inch asbestos, with sliding cover, used for no other purpose. A sliding cover is recommended in preference to a

drop-hinged cover to prevent the possibility of a premature explosion of torpedo in case a torpedo should rest over the edge of box. Box is to be kept in a dry place, not near artificial source of light or heat. Care must be observed to prevent the accidental dropping of torpedoes on floors, where they might be exploded by stepping on them, or being run over by trucks.

GENERAL

Placard all magazines and storage boxes:

"EXPLOSIVES—HANDLE CAREFULLY—KEEP FIRE AWAY"

Do not store fusees and torpedoes in same magazine or box.

Do not store fusees and torpedoes with other explosives nor inflammables.

Do not carry torpedoes on the person, or in the clothing.

Exercise care in keeping fusees dry; improperly made fusees if damp are liable to spontaneous ignition. Broken, wet, or oily fusees must be destroyed by burning. Broken or defective torpedoes must be destroyed by immersing in water.

FUSEES AND TORPEDOES—Miscellaneous Supplies

Such loose supplies as have been obtained by trainmen from storehouses are frequently found in trainmen's clothes lockers, engine cabs, cabooses, towers and stations, with no designated receptacle, but loosely placed. A suitable receptacle for these small supplies is a small rectangular-shaped, asbestos-lined wood box, with a sliding cover. Box should be only large enough to hold the requisite number of fusees, with one end of box partitioned off for storage of the torpedoes. For fusees in cabooses, racks may be used to advantage.

FUSEES AND TORPEDOES—Trainmen's Supplies

Small supplies carried by trainmen should be guarded as carefully as the hazard of these articles warrants. They should preferably be carried in metal cases where they will be quickly obtainable when needed, yet not likely to be left around loosely in cars. This applies particularly to trainmen in passenger service. The possibility for serious personal injury due to explosion of torpedoes must always be remembered.

COMPRESSED GASES

For Railroad Shops and Elsewhere

Some General Precautions Necessary

The use of compressed gases stored in metal receivers has become so nearly universal around railroad properties that an appreciation of some of the hazards involved will decrease possibility for accidents.

Gases used commercially are usually furnished in metal cylinders into which the gas has been forced under high pressure, thus enabling storage of what would be a relatively large volume of gas at atmospheric pressure, in the comparatively small space afforded by the metal receiver The volume of any gas tends to increase with increase of temperature. If the volume is held constant, as in a cylinder, any given mass of gas will increase in pressure with rise of temperature. If the heating of the gas contained is carried out to undue degree, and for any reason the container should be of insufficient strength, an explosion could occur, with possible damage to property, and even injury or death to persons.

For reasons of safety it is urgently necessary that compressed gases in cylinders be kept remote from sources of heat. A frequent violation of this fundamental principle is the storage of gas cylinders in section tool houses adjacent to stoves. Cylinders of gases should be stored, if possible, in a separate shed or enclosure, well sheltered from direct rays of sun and provided with openings for natural ventilation.

Oxygen tanks are usually of cylindrical shape and of a height many times greater than the diameter. Unless racks are provided in which such cylinders can be firmly held in vertical position, they should be stored horizontally. In falling, a tank may have the main valve injured and thus permit escape of the gas contained. In case of fire the falling of an oxygen tank, and possible release of gas, will add materially to the fierceness of the fire. If hydrogen or acetylene cylinders are in a fire these gases will contribute directly to the conflagration, if released.

Acetylene tanks not only are of more stable proportions than usual gas containers, but should positively be stored in a vertical position on account of the acetone-saturated asbestos filling placed in these cylinders for safety reasons, as will be explained later.

Oxygen cylinders and acetylene cylinders should be separated in storage as far as possible, but not less than ten feet, or by wall of corrugated iron or of fire-resistive material.

Oxygen is one of the component gases of the atmosphere upon which human life depends, but which unites readily with organic matter under proper conditions. The use of oil on the valves or fittings of tanks or devices through which oxygen is to be conducted should be **positively prohibited.** The union of oxygen with the oil may cause explosive conditions. No lubrication of valves or fittings should be attempted. If tanks cannot be operated satisfactorily, return them to the charging station with complaint card attached.

Containers found to be leaking should be removed from the building promptly and placed in the open air. In the case of leaks from acetylene tanks, special care should be taken to avoid open flame lights or smoking, as mixtures of this gas and air are extremely explosive.

Welding equipments are usually sent out by the manufacturers in first-class condition for operation. If during service any trouble is experienced the gas should be immediately shut off at the point of supply to avoid possibility for accident while investigation of the trouble is being made. Only experienced operators should be permitted to use welding torches, as serious accidents can be caused by improper use of a facility thoroughly safe in experienced hands.

ACETYLENE

Acetylene is a colorless, pungent gas containing chemically in each molecule two atoms of carbon and two atoms of hydrogen. At atmospheric pressure this gas burns freely, producing an unusually white light, due to the incandescence of the particles of carbon released in the process. The gas is non-poisonous. Its action on the human system has proved to be adverse only in that by displacing an equal volume of air it deprives the subject of oxygen in the same way as carbon dioxide gas. Exhaustive experiments by the British Government in connection with the use of this gas for small miners' torches have proved this point.

Acetylene, when subject to pressure in excess of fifteen pounds per square inch, possesses the peculiar quality that it is possible to explode it by heat or percussion, without the presence of oxygen. For this reason, acetylene should never be generated or used in apparatus at pressures in excess of fifteen pounds per square inch.

Acetylene possesses another quality taken advantage of in a commercial sense, it dissolves in acetone. Metal cylinders in which acetylene gas is to be stored are first solidly packed with asbestos filling, which is then saturated with acetone. When the gas is forced into the cylinder under pressure it is absorbed safely by the acetone.

As stated above in the general remarks relative to gases, cylinders containing acetylene should be stored out of the

main building in a ventilated shed protected from the direct rays of the sun, placing in the shops only those tanks of gas immediately needed.

With increasing demand for acetylene for welding purposes, many shops now generate the gas as needed. Until recently generators for this purpose have been to a considerable extent, and preferably so, of the low-pressure type, or such as to maintain pressure of 1 lb. per square inch. This type is highly approved by underwriting authorities. If excess pressure is created the gas simply escapes through a water seal. To secure ample amount of gas, a number of generators of the low-pressure type may be installed, feeding into a reservoir tank or gasometer of water-seal type. If the pipe lines to be served by the gas are of considerable length it is possible to raise the low pressure in these lines to about six pounds by the use of a booster pump. Such a system is about as safe as any acetylene-using device can be made.

The National Board of Fire Underwriters have approved also a generator which permits fifteen pounds per square inch working pressure. This form of installation is very common among automobile establishments for welding purposes, where large quantities of the gas are necessary. Underwriting authorities, however, prefer generators working at the low pressure first described.

In any installation for generating and conveying acetylene to welding points, flash-back device or water-seal must be used at each generator and at each welding point to insure that in the event of a backfire of the blow pipe, the backfire cannot pass the water seal. This likewise prevents flow-back of oxygen into the acetylene line.

All installations of acetylene equipment must be made strictly in accordance with the regulations of the National Board of Fire Underwriters, which also include rules for the safe handling of calcium carbide used in the generators.

Acetylene apparatus should be inspected regularly and frequently by competent employes, who should make written report relative to conditions. If any defects are found, these should be given immediate attention.

The observance of these few fundamental principles will very much decrease the possibility for accident due to the use of gases under pressure.

NEW YORK CENTRAL LINES

HAZARDOUS MATERIALS

As Listed By New York Board of Fire Underwriters to Be Excluded From Low-Hazard Warehouses

NON-FIBRE MERCHANDISE

Acetate of Lime
Acids—Carbolic—
  Phenol Crystals
  Muriatic
  Nitric
  Picric
  Sulphuric
Alcohol (grain) if more than 500 barrels
Alcohol (Methyl)
Benzine
Benzine Cement
Benzol
Bromine
Calcium Carbide
Camphene
Carbon Bisulphide
Celluloid (Pyroxylin plastic) unmanufactured or in sheets
Chlorates of all description and nature
Coal (Bituminous)
Ethers
Explosives
Fireworks
Formaldehyde
Fulminates
Gasoline
Gun Cotton
Gun Powder
Guttapercha Cement
Household Goods, used
Junk (old)
Kerosene
Lamp Black and Carbon Black
Lime, Unslacked or Quick
Motion Picture Films, Nitrocellulose
Naphtha
Nitrates of all description and nature
Nitrites
Oxygen, compressed
Paper Stock (waste paper in bales)
Petroleum
Petroleum Barrels (Empty)
Phosphorus
Polishes (Volatile inflammable)
Potash, Permanganate of
Potassium, Metallic
Pyroxylin Plastic (Celluloid, etc.) Unmanufactured or in sheets
Rags (loose)
Resin
Resin Oil
Rubber Cement
Saltpeter
Scrap or Reclaimed Rubber, Chemically treated
Scotch Soot
Shoddy
Sodium, Metallic
Sodium Peroxide
Sparklets
Sweet Spirits of Nitre
Waste of all description and nature, except fur waste and silk waste
Zinc, Precipitated Resinate of
Zinc Dust
Zylonite

HAZARDOUS MATERIALS
(Cont'd)

The following merchandise is excluded, except in "Fibre" Warehouses.

FIBRES

Bass Wood
Broom Corn
Coir Fibre
Corn Silk
Corn Stalks
Cotton (including linters)
Cotton Batting
Excelsior
Flax
Grasses
Hemp (sisal, istle)
Hay
Jute
Kapok
Moss, except peat and edible
Oakum
Palmyra
Pampas Plumes
Piassava
Raffia
Rice Root
Straw (including bottle wrappers)
Straw covers
Tampico
Tow

HOSE FOR FIRE PROTECTION

Careful Selection of New Equipment, Maintenance and Periodical Testing

For the protection of railroad properties against fire, various types of equipment are usually provided, including the well-known First-Aid facilities, water barrels, hand extinguishers and small hose, but especially the standard two and one-half inch cotton rubber-lined hose for general service in attacking fires that have passed beyond the incipient stage. To control fires of that magnitude, no extinguishing medium is as effective as large quantities of water delivered at the point where needed. Small quantities of water when thrown against heated surfaces are promptly dissipated, either in the form of spray, or vaporized to steam, which in turn may be broken up into component elements, hydrogen and oxygen, if the heat is sufficiently intense. The energy of a fire stream is frequently partly consumed by striking obstructions such as wires, projecting corners of buildings, etc., before reaching seat of the fire. It is therefore very important that the water actually reaching the fire should be of sufficient mass and velocity to accomplish the desired result of extinguishing the fire.

To convey water from the point of storage or supply, either reservoir or pipe line, adequate supply and pressure may be available, but if the means for conveying the water are defective the desired result cannot be secured. For example, sufficient hose of the necessary strength, and a directing nozzle are essential features of fire-fighting equipment. Either, without the other, may produce embarrassment at a time when this equipment is most needed. Therefore, in considering fire protection of buildings and other structures, careful consideration should be given these details in the order mentioned, and care should be taken in selecting hose of adequate strength and quality, so that when needed it will be in condition for use.

All fire hose should be purchased subject to inspection by competent parties. Usually the railroad companies have been in position to take care of this inspection with their own organization. Others have preferred to depend upon the very efficient inspection service afforded by the Underwriters' Laboratories. As certificate of such inspection, their label is placed on all articles inspected.

For general railroad service where hose will be dragged over rough surfaces, such as will exist outside of buildings,

cotton rubber-lined hose, with double jacket, should be used. For special use inside of buildings where smooth floors exist, the single jacket type will be sufficient. For exclusively inside use where the atmosphere will be constantly dry and warm, unlined linen hose may be used. It should be remembered that for a two and one-half inch diameter hose the friction loss for a one hundred foot length of unlined linen hose is more than double that for a good quality rubber-lined hose. The selection of type of hose for any given condition should be subject to the approval of the Fire Protection Department.

For switch engines equipped with fire-extinguishing appliances, the intense heat to which fire hose is subjected rapidly vulcanizes ordinary cotton rubber-lined hose. Unlined linen hose is unsatisfactory for this service. Special type of rubber-lined hose, designed for high temperatures, should be used.

After the proper type and quality of hose have been supplied for the protection of any plant, the maintenance of this equipment is equally important. Hose that lies indefinitely in a single position may become defective due to the creases being constantly at the same place. The usual cotton rubber-lined hose should be taken from its rack at frequent intervals and have water run through it to keep it in first-class condition. Linen unlined hose, however, must not be subjected to wetting unless it can be thoroughly dried in a vertical tower before again placing it on the rack. Generally, this type of hose is examined only for superficial defects.

Hose that has been used at a fire or a fire drill should be cleaned from dirt that may adhere to it, and then drained and dried thoroughly before restoring it to the racks or reels. A tower in which hose can be extended vertically at full length is ideal for this purpose. If sufficient vertical height is not available, however, the hose may be suspended doubled from some convenient support, or it may be placed on a rack slightly elevated at one end to permit drainage. Sunlight is preferable to artificial heat for drying hose that has been wet.

As an additional safeguard to insure that the lined hose is capable of withstanding the pressure to which it will be subjected when in actual use, it should be tested by hydrostatic means at least once each year. A single outfit for this purpose can be assembled so simply that no company can afford to be without such testing equipment. For the purpose there will be required:

A small pressure pump, hand operated;

Check valves, one each end of pump;

Fittings to build up suction end of pump to female 2½-in. threaded connection to fit the male end of hose extending from the hydrant available for the testing work;

Fittings to build up delivery end to male 2½-in. connection similar to that of the suction end, but to fit the corresponding first length of hose to be tested;

One cast-iron nozzle, threaded at outlet, to take short nipple and tee;

One short nipple from straight end of tee to engage one globe valve;

One short nipple from stem of tee to engage one pressure gauge with graduations at least 50% in excess of the desired working pressure, to enable reasonable reading of the working pressure.

The pressure to which hose should be tested will preferably be slightly in excess of the working pressure desired at the location.

It is suggested that test equipment of the type described can be preferably placed in charge of one man, who would be able to test all hose and make repairs to hose partly damaged, such as might involve replacing of a coupling at one end. This would necessitate the purchase of an expanding tool as part of the initial equipment, and a number of new expansion rings, to care for the number of repairings of this kind to be handled.

The installation and carefully supervised use of a complete equipment as has been described will result in having hose effective for service in time of emergency.

PAILS AND BARRELS

FOR FIRE PROTECTION

General Rules Governing Installation, Use and Maintenance

NEW EQUIPMENT

Barrels hereafter installed for fire protection shall be of capacity not less than forty gallons (fifty gallons is more desirable), preferably constructed of galvanized steel or iron, not less than No. 20 gauge, reinforced at the top edges with one-quarter inch diameter rods. Covers shall be constructed of galvanized steel or iron, not less than No. 20 gauge, in a conical shape, and with suitable handles. Covers shall have edges overhanging barrels not more than one-half inch and be provided with not less than three lugs or a frame secured to the underside to fit into the top of barrels. Wood covers, reinforced on the underside with battens, and provided with suitable handles, may be used, if so desired. Covers shall fit snug so as to prevent evaporation. Barrels and covers shall receive one heavy coat of asphaltum paint on interior surfaces; and one coat of pure red lead and linseed oil paint, followed by two coats of pure white lead and linseed oil paint (color, red), on exterior surfaces. The barrels shall have stencilled on their sides in white block letters six inches high **"FOR FIRE USE ONLY, KEEP CLEAR."** Barrels located along the right-of-way, which might interfere with train operation in any way due to being painted red, shall be of subdued color, with white letters.

Wooden barrels, heavily coated on the inside and outside with asphaltum paint, and finished on the outside with paint as previously noted for metal barrels, may be used in special locations, if approved by the Fire Protection Department. Barrels which were previously used for heavy oils and like materials must be cleaned and burned out before the asphaltum paint is applied to the interior surface. Paint barrels having a heavy paint skin coating on the interior surface need not be cleaned nor coated with asphaltum paint, provided the coating is not cracked nor removed so as to expose the wood staves to water solution in barrels.

Pails for water or sand shall be of capacity not less than twelve quarts, and constructed of galvanized sheet steel or iron not less than No. 20 gauge, reinforced at the top edges with one-quarter inch diameter rods and with heavy gauge round steel handles. Bottoms of pails shall receive one heavy

coat of asphaltum paint on interior surface and shall be painted on exterior surface as previously noted for metal barrels. Pails shall have stencilled on their sides in white block letters, not less than two and one-half inches high—**"FOR FIRE USE ONLY."** Wooden or fibre pails are not recommended and must not be used. Where pails are required to be filled with water they shall be provided with tight covers to prevent evaporation.

Bucket tanks of metal, with six pails submerged in the liquid, are highly recommended, especially where space is limited. Sand, for extinguishing fires in oil, paint and flammable liquids, shall be kept in boxes and provided with a large scoop for distributing the sand over the burning liquid. Sand boxes are preferable to barrels, although barrels may be used if available. Pails for sand shall be constructed the same as water barrels, previously described, and be provided with a small metal scoop for distributing the sand.

Boxes with lattice or glass fronts may be provided where pails are subject to theft, of sufficient size to accommodate two or three pails. The boxes shall have stencilled on their sides, in white block letters, two inches high: **"FIRE PAILS."** If glass is provided in front of box, the glass shall have stencilled on its face, in block letters: **"BREAK GLASS."**

PRESENT EQUIPMENT

Existing pails and barrels may be retained in service in their present locations, but when replacements are required due to leakage, breakage, theft, etc., equipment in accordance with the requirements specified above shall be procured.

SUITABILITY

Pails and barrels, while the simplest extinguishing equipment known, are among the most efficient portable types, and in almost any location, where space permits, form a valuable auxiliary to other and more elaborate devices. They should always be considered at open platforms, wharves, lumber or tie yards, roofs, or where the risk is such that flying brands or embers from fire in adjacent properties might cause damage to property of the Railroad Company. This equipment is especially indicated for properties where the expense of installing other equipment is not warranted.

The field of usefulness of a water pail lies particularly in attacking fire below the level of the operator, although it is possible to throw water fairly effectively to quite a few feet above that level. For fires at still higher level some other form of extinguisher is necessary. (The pump tank extinguisher, previously recommended, is adapted to that service and can be safely maintained in exposed locations in winter season by using calcium chloride solution to prevent freezing.)

Water should never be used on electric machinery nor conductors carrying high voltages, on account of danger to operator from possible shock.

LOCATION

Pails and barrels shall preferably be located outside of buildings in a clear, unobstructed space, except where large interior areas at or above the ground level are to be protected. Free access to this equipment must be maintained at all times. No freight or other material must be allowed to be piled at or near it, so as to prevent instant use. When operating conditions will not permit placing pails and barrels outside of buildings on platforms where they will be accessible at all times, they shall be installed inside of the building in as close proximity to exits, stairways or elevators as possible. If pails and barrels are installed on roof of a building or structure, access shall be provided to the roof by means of stationary iron ladders placed on the outside of the building.

The distribution of all pails and barrels shall be subject to the approval of the Fire Protection Department. Pails shall be placed over the barrels and hung on racks, or enclosed in boxes with lattice or glass fronts. Pails shall be placed not lower than two feet, nor higher than five feet above the floor, and under no circumstances may they be placed on the floor, window sills, under work benches, on top of one another nor in tiers. (In special cases pails may be hung inside of barrels, if approved by the Fire Protection Department.)

Barrels on coaling trestles or coaling docks shall be placed not over fifty feet apart, with two pails for each barrel. Barrels on bridges or trestles shall be placed not over one hundred feet apart. Where bridges or trestles are less than seventy-five feet in length, one barrel shall be placed at one end. Wooden barrels at the ends of bridges or trestles may be set in the ground with the top of barrel about one foot above the surrounding grade. Where the clearances are limited, barrels placed on bridges or trestles shall be on offset platforms. Camp cars shall have one barrel and two pails for every three cars, placed at least ten feet distant from the cars. Buildings used as labor camps shall have barrels and pails placed as directed by the Fire Protection Department.

Sand pails with small scoops for distributing sand shall be installed in paint or oil rooms, or where flammable liquids are kept or stored, supplemented by a sand box and large scoop if the magnitude of the risk so warrants.

MAINTENANCE

The custodian of the property shall be held responsible

for the proper maintenance of pails and barrels so that they shall be kept in condition for immediate service at all times.

When pails and barrels are located where the water may be frozen, calcium chloride shall be placed in the water to retard freezing. The density of the solution required will depend upon temperatures which prevail in the particular localities during the Winter.

Directions for using calcium chloride are given elsewhere in this book.

Sodium chloride (common salt) must not be used. It cannot protect against freezing for temperatures less than —8.5 degrees Fahrenheit, for saturated solution, even if the solution is constantly stirred. It also corrodes the metal work of the containers. Calcium chloride, however, affords maximum protection at a reasonable cost, with none of the disadvantages of common salt.

Only calcium chloride shall be used as shall show magnesium chloride of content less than 0.03 per cent.

RADIO (WIRELESS) APPARATUS

(From National Electrical Code, Section 3702.)

For Receiving Stations Only

(a) Antenna and counterpoise outside buildings shall be kept well away from all electric light or power wires of any circuit of more than 600 volts, and from railway, trolley or feeder wires, so as to avoid the possibility of contact between the antenna or counterpoise and such wires under accidental conditions.

(b) Antenna and counterpoise, where placed in proximity to electric light or power wires of less than 600 volts, or signal wires, shall be constructed and installed in a strong and durable manner, and shall be so located and provided with suitable clearances as to prevent accidental contact with such wires by sagging or swinging.

(c) Splices and joints in the antenna span shall be soldered unless made with approved splicing devices.

(d) The preceding paragraphs, (a), (b) and (c), shall not apply to light and power circuits used as receiving antenna, but the devices used to connect the light and power wires to radio receiving sets shall be of approved type.

(e) Lead-in conductors shall be of copper, approved copper-clad steel or other metal which will not corrode excessively, and in no case shall they be smaller than No. 14, except that bronze or copper-clad steel not less than No. 17 may be used.

(f) Lead-in conductors on the outside of buildings shall not come nearer than four inches to electric light and power wires unless separated therefrom by a continuous and firmly fixed non-conductor which will maintain permanent separation. The non-conductor shall be in addition to any insulating covering on the wire.

(g) Lead-in conductors shall enter the building through a non-combustible, non-absorptive insulating bushing slanting upward toward the inside.

(h) Each lead-in conductor shall be provided with an approved protective device (lightning arrester) which will operate at a voltage of 500 volts or less, properly connected and located either inside the building at some point between the entrance and the set which is convenient to a ground, or outside the building as near as practicable to the point of entrance. The protector shall not be placed in the im-

mediate vicinity of easily ignitable stuff, or where exposed to inflammable gases, or dust, or flyings of combustible materials.

(i) If an antenna grounding switch is employed, it shall in its closed position form a shunt around the protective device. Such a switch shall not be used as a substitute for the protective device.

It is recommended that an antenna grounding switch be employed, and that in addition a switch rated at not less than thirty amperes, 250 volts, be located between the lead-in conductor and the receiver set.

(j) If fuses are used, they shall not be placed in the circuit from the antenna through the protective device to ground.

Fuses are not required.

(k) The protective grounding conductor may be bare and shall be of copper, bronze or approved copper-clad steel. The grounding conductor shall be not smaller than the lead-in conductor and in no case shall be smaller than No. 14 if copper, nor smaller than No. 17 if of bronze or copper-clad steel. The grounding conductor shall be run in as straight a line as possible from the protective device to a good permanent ground. Preference shall be given to water piping. Other permissible grounds are grounded steel frames of buildings or other grounded metal work in the building, and artificial grounds such as driven pipes, rods, plates, cones, etc. Gas piping shall not be used for the ground.

(l) The protective grounding conductor shall be guarded where exposed to mechanical injury. An approved ground clamp shall be used where the grounding conductor is connected to pipes or piping.

(m) The grounding conductor may be run either inside or outside the building. The protective grounding conductor and ground, installed as prescribed in the preceding paragraphs (k) and (l), may be used as the operating ground.

It is recommended that in this case the operating grounding conductor be connected to the ground terminal of the protective device.

If desired, a separate operating grounding connection and ground may be used, the grounding conductor being either bare or provided with an insulating covering.

(n) Wires inside buildings shall be securely fastened in a workmanlike manner and shall not come nearer than two inches to any electric light or power wire not in conduit unless separated therefrom by some continuous and firmly fixed non-conductor, such as porcelain tubes or approved flexible tubing, making a permanent separation. This non-conductor shall be in addition to any regular insulating covering on the wire. Storage battery leads shall consist of conductors having approved rubber insulation.

It is recommended that the circuit from the storage battery be properly protected by fuses as near as possible to the battery.

NEW YORK CENTRAL LINES

INSTRUCTIONS FOR OPERATING

STOVES, HOT WATER HEATERS and LOW PRESSURE STEAM BOILERS

IN PASSENGER AND FREIGHT STATIONS
AND SIMILAR BUILDINGS

FIRE RISK

1. Attendants should be alert to notice conditions that might be unsatisfactory, take such immediate action as they can for protection of the property, report conditions, and suggest remedies.

2. The man in charge should be most familiar and best qualified to perform this service and should instruct assistants regarding their obligations to the Company in preventing fire hazards. Judgment and care are required to protect the property.

3. Heater, breeching and flues should be far enough from surrounding objects to prevent any chance of overheating, charring and eventually igniting when plant is being run to full capacity.

4. Flues, breeching and heaters should be kept clean. Soot and dust are a fire menace, retard the heat from reaching the water, and increase the amount of fuel required to produce heat.

a. When soft coal is used, the flue or chimney should be cleaned every two months, the breeching once a month, and the heater once in two weeks, or oftener if accumulation of soot or dirt requires.

b. When hard coal is used, the flue or chimney should be cleaned once a year. Breeching and heaters and any other accessible places should be inspected at least once a month, and cleaned if necessary.

c. Accumulations of soot on inaccessible surfaces may be decreased materially by sprinkling over the surface of a bright fire a pound of common salt, repeated as often as necessary, to remove the accumulation. This method, however, is not designed to supplant periodical mechanical cleaning, but is an added safeguard.

5. Soft coal should not be stored in bins other than those lined with metal, or constructed of fire-resistive materials, and not adjacent to buildings during the Summer when the

heating plant is not in use. During the heating season soft coal should not be stored more than six feet deep in any bin. This is to avoid danger of spontaneous combustion.

6. Premises around heater should be kept clean and neat; combustible material must not be allowed to accumulate.

7. Ashes should not be allowed to stand (even in cans) against wooden buildings or structures. No cloth, clothing, papers nor waste should be allowed to rest on nor become lodged behind radiators. This is to avoid scorching which might develop into fire.

CARE OF APPARATUS

1. Special instructions by manufacturers accompanying hot water boilers, heaters, stoves and hot air furnaces should be followed. If, in the opinion of the attendant, they do not give proper results, or they can be improved upon, he should communicate with his superior officer. Local conditions may have very important bearing on performance of a heater.

2. In caring for low pressure steam boilers, the following general rules should be observed:

Never start fire until boiler is filled with water to indicated level.

Never feed water into an empty boiler if sections are HOT. Sudden generation of steam may cause violent explosion.

a. Maintain water level in steam boilers as shown in the gage glass, from one-half to three-quarters full. When no water shows in the glass, nor can be drawn from the bottom gage cock, **dump grate immediately, and do not put water in boiler UNTIL COOL.**

b. Radiator valves should be wide open if the radiator is in use, or should be tightly closed if the radiator is not in use. Valves partly open cause the radiator to fill with water. In case of vacuum (vapor) steam systems, the valves are so designed that they may be opened part way or full, without in any way affecting the radiator or heating system.

c. If there are shut-off valves on main or return pipes, see that one line of piping at least (main and return) is open to circulate steam, **before starting fire.**

d. Air valves on radiators should be opened frequently, to prevent radiators from becoming air-bound and thereby losing heating capacity.

e. At the end of the heating season, put one to five pounds of soda ash in the boiler, depending on the size, and fill the boiler with water up to the safety valve, allowing the water to stand there during the Summer. A shovel of unslacked lime should be placed in ash pit. Oil

the hinges of the doors and leave them open. Thoroughly clean the heater breeching and all inner surfaces of boilers. If cement or other filling material has dropped out of spaces between sections, it should be replaced.

f. Before putting the heater in service in the Fall, drain off the water which has been in the boiler through the Summer, flush thoroughly, and fill it with clean water. In starting a fire the inlets and dampers should be open, to furnish all possible air to the fuel to produce heat as quickly as possible. As the fire gets under way, the air through the inlets may be decreased so that the greatest amount of heat can be obtained from the smallest opening. See that steam gage and safety valve are working properly. If not familiar with the operation of these, ask for instructions before starting fire.

The above applies directly to steam boilers and should not as a general rule apply to hot water heating systems.

ECONOMY OF FUEL CONSUMPTION

General:

The following instructions govern hot water heaters as well as steam boilers. The operation of hot air furnaces and stoves should be based on the same rules, as far as size of grates will permit.

Exterior conditions of weather and temperature are important in regulating fires, even more so than any regular hours for tending fires.

The amount of heat given off by a heating appliance depends on the rate of combustion. In a coal-burning device this rate depends on the amount of air permitted to reach the fuel; hence the necessity for draught inlets and dampers. With inlets and dampers wide open, therefore, maximum heat will be generated. This is the condition when a fire has been recently lighted, but is not economical for constant operation. After a fire is burning well the main damper can be closed, permitting the hot gases to remain in contact with the metal sections as long as possible in order that the heat may be transferred to the water, or to warm the air in a hot air furnace. If the outside temperature is normal, the bottom draught door can usually be closed, regulating the amount of air passing to the fire by means of the openings provided in bottom door. During extremely low temperatures it may be necessary to open the bottom door wide, to permit maximum rate of combustion, yet retaining the heated gases in the heater until they have parted with their heat units.

When adding fresh fuel to the fire, or when firing up on wood kindling, damper draughts should be open until the new fuel has become heated and the rate of production of

gases has become uniform. Otherwise, especially in the case of soft coal, enough gas may be accumulated to cause an explosion in the fire box.

Hard Coal:

SEVERE WEATHER—Keep fire box full of coal and regulate fire by dampers. Carry coal a little higher at rear of fire. **Thoroughly clean grates twice a day.**

MILD WEATHER—Keep two to six inches of ashes between live coals and grate, running slicing bar through slice door (if such door is provided) over the grate at times, instead of stirring up the fire by shaking the grate. As weather grows colder, keep grates cleaner.

BANKING FIRES AT NIGHT—In very cold weather, when there is a special danger of water lines freezing, fires should be banked carefully. Where there is no danger of water lines of any kind freezing, fire should be extinguished over night, or over Sunday or holidays when the building may be closed. The object of banking a fire is to save fuel consumption when heat is not required for regular service, yet to preserve the fire in such condition that it can be quickened to normal in a short time. Clean the fire so that grates are covered with clear, burning, red-hot coals. Then fill fire box with fuel. Draught fire so that excess gases will have opportunity to burn off before setting dampers. Finally adjust draughts for the night. Do not entirely shut off draughts on a smoldering fire. Large accumulation of unburned gases may result in an explosion.

In mild weather use less fuel to bank and do not clean fire as much before applying it.

FIRST FIRE IN MORNING—If fire is low in mild weather do not attempt to clear ashes, but open draughts wide to allow fire to brighten up before adding coal. Then spread a thin layer of fresh coal. After fire is well started, add as much coal as is necessary. Do not shake nor slice much—just enough to give space for more fuel. The bed of ashes prevents too rapid combustion.

In severe weather if fire has been heavily banked, the draughts can be turned on early in the morning and fire brightened, adding but very little fuel at a time to avoid chilling the fire. When sufficient hot coal bed has been secured the fire may be shaken and the building heated before putting in the usual amount of coal, as a large quantity of coal naturally cools the fire and requires time to become well ignited.

Do not slice nor poke hard coal fire from top. Only use fire door for removing large clinkers.

If hard clinker lodges between grate bars, do not use

force in shaking. Dislodge clinker with slicing bar, then grate will operate without breaking.

Pea Coal:

The same general conditions affecting the regulation of hard coal fire apply to pea coal with the following exceptions:

A good draught is essential to the combustion of pea coal, and judgment must be exercised in regulating draughts so that too much heat is not generated, nor too little so that fire goes out.

Grates must be shaken only enough to allow air to reach the fire. Too much shaking will result in loss of unburnt coal, as without supporting bed of ashes this fine coal will fall through the grates.

With a mixture of pea and hard coal, or pea and soft coal, the pea coal should be added after the other so that it will not reach the grates until nearly burned out.

Care must be exercised to avoid melting out grates. To permit ashes to accumulate in ash pan so that they touch the grates will almost invariably mean warped and ruined grates.

Soft Coal:

The general conditions stated for hard coal and pea coal also apply to bituminous (soft) coal.

In charging or putting fresh fuel on a soft coal fire, first remove clinkers (if any) through furnace door, then push live coals to end of fire box, leaving enough live coals, however, on grate to prevent the fresh coal from falling through. Then place fuel, leaving live coals exposed at far end. This method of firing properly executed will eliminate dense smoke and give good heating results. The smoke and gases generated from the fresh fuel will be consumed in passing over the incandescent mass.

Final:

Ashes must not be allowed to accumulate in ash pans in quantity. For convenient operation ashes that have cooled should be removed from the ash pan before fire is again shaken. If the ashes are sprayed with water to keep down the dust, care must be used that hot metal surfaces are not wetted, as cast iron may crack if suddenly chilled.

Masses of slack coal must never be thrown on a bed of hot coals. The gases suddenly released may cause an explosion. If used, it must be scattered in a very thin layer that must be coked before the next layer is placed.

Oil must not be used to kindle nor quicken fires.

Fuel will be conserved and work lessened in attending fires where intelligent study is made of conditions at every individual location, including strict attention to weather and temperature.

Any practical suggestions that will aid in economy of fuel and labor should be promptly shared in bettering the service.

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