sprinklers, preferably not less than 25 pounds per square inch when sprinklers are open and fire streams are playing. If gravity tanks are used they should be so placed that the bottom of tank is not less than 25 feet above the highest line of sprinklers supplied. If pressure tanks are used, they should be located either on the top floor of the building or preferably on the roof. The tank must be kept two-thirds full of water and an air-pressure maintained over the water of not less than 75 pounds, so as to insure not less than 15 pounds pressure at the highest line of heads, when all water has been discharged from the tank.

Fire pumps may be operated by steam or electricity, but the suction must be from an approved source, and the entire installation must be in accord with the underwriter rules and requirements.

Whatever the water supply may be, there should also be a connection at the sidewalk, which will permit of the direct attachment of fire engines. All equipments must be provided with control check and drain valves; and it is very important that these valves be properly located. All supplies should be gated so that they may be controlled, and check valves should be so placed that when water has entered the system from one source it will be impossible to escape through connections with other sources.

In standard equipments there must also be an automatic alarm. In a wet pipe system this consists of a device which is installed in the main sprinkler riser and is arranged to actuate some form of alarm as soon as water flows through the system. These alarms are of two types: rotary gongs, operated like water-wheels, by the passage of water through them; and electric gongs, operated by the movement of a check valve or by closing of an electric circuit through the action of water pressure on a diaphragm. Alarm valves are valuable for two reasons: they give an alarm when sprinklers open on account of fire, thus acting as a fire alarm; and they give warning in case of flowage through the system for other causes, such as a broken pipe, open sprinkler head, etc.

There are two principal types of alarm valves that have been successfully used. In one a check valve is placed in the main water pipe and the movement of the clapper when water begins to flow, transmitted usually through a packed stem, is used to actuate the alarm. In the other type a check valve is also used, and this, when in its normal position, closes an outlet to a small pipe running to the alarm devices. This is accomplished by having the small pipe run from a groove in the valve seat, a horn in the water-way or an auxiliary valve outside the main water-way. Valves of the former type were used in the early days, but few are now found in the field.

A dry pipe system is installed in a similar manner to a wet pipe, except that more care is necessary in arranging all parts to drain properly and, on account of the increased difficulty of holding air under pressure, extra precaution should be taken to make all joints as tight as possible. A dry valve is installed, usually inside the building, at the lowest level, and when the system is in normal condition there is no water in the pipes above this point.

A dry-pipe valve is a device for holding back the water in a sprinkler system until fire occurs and then opening automatically and allowing the water to flow into the pipes. Air is pumped into the pipes above the dry valve and the pressure thus created holds the valve closed. These valves are always designed so that a moderate amount of air pressure will hold back a much heavier water pressure. This is done for two reasons: first, because a heavy air pressure is difficult to pump up and hard to maintain; second, because the time necessary to exhaust a heavy air pressure and the fanning effect on the fire of the escaping air both act against the quick control of a fire.

Several different types of dry valves have been invented, but those in use today are of two types, the differential and the mechanical. In the differential type there is a double-seated check valve, the upper or air seat being much larger than the lower or water seat. The difference in area between these two seats determines the differential or difference in pressure necessary to balance the valve. Valves of this type are generally designed with a differential of about 7 to 1, that is one pound of air pressure on the upper side will just hold the valve closed against seven pounds water pressure on the lower side.

In the mechanical type the check on the water side is held closed by a system of levers, these being held in place

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