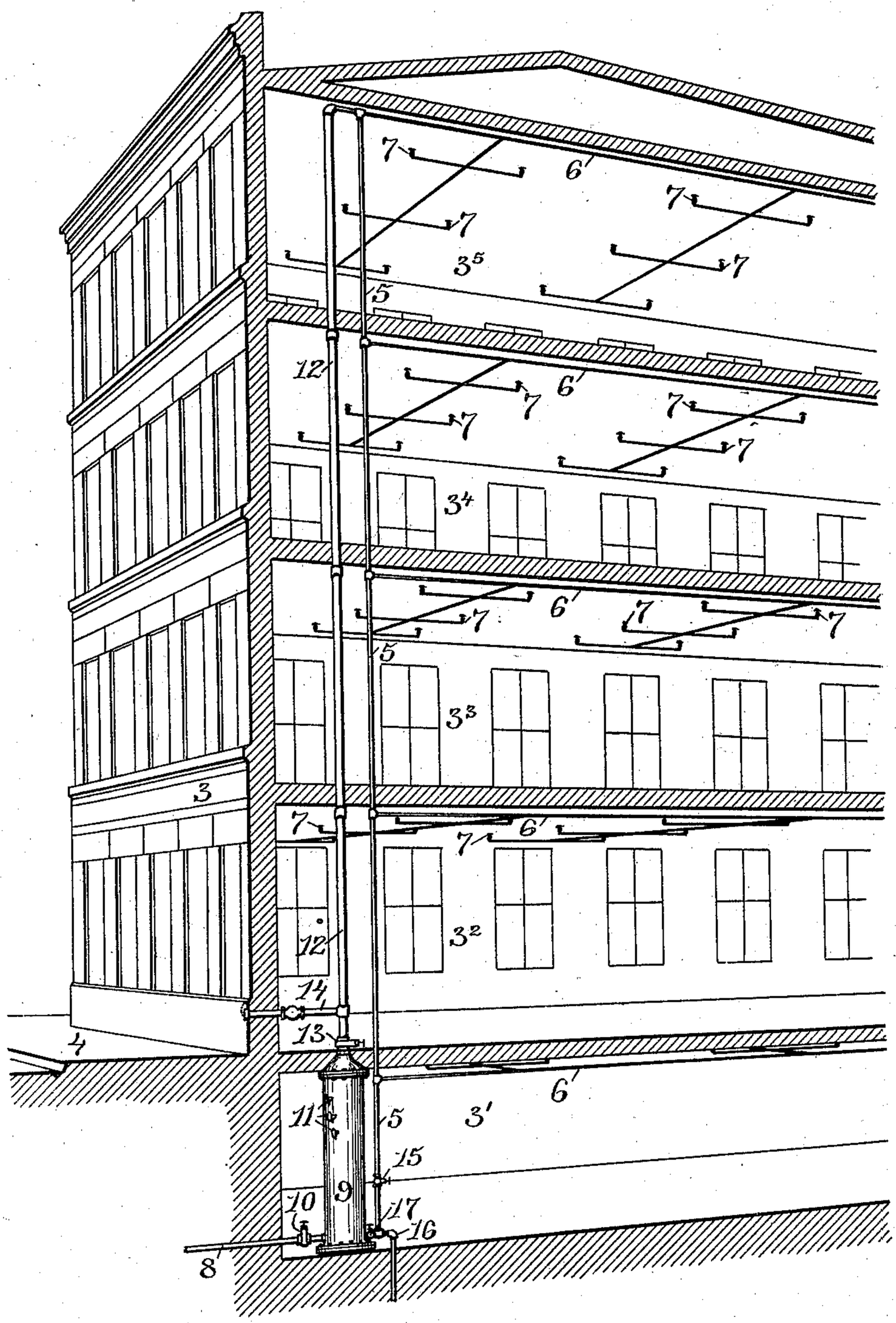
(No Model.) 2 Sheets—Sheet 1.

J. A. MILLER.

AUTOMATIC FIRE EXTINGUISHER INSTALLATION.

No. 558,653. Patented Apr. 21, 1896.

Fig. 1.



WITNESSES:

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(No Model.) 2 Sheets—Sheet 2.

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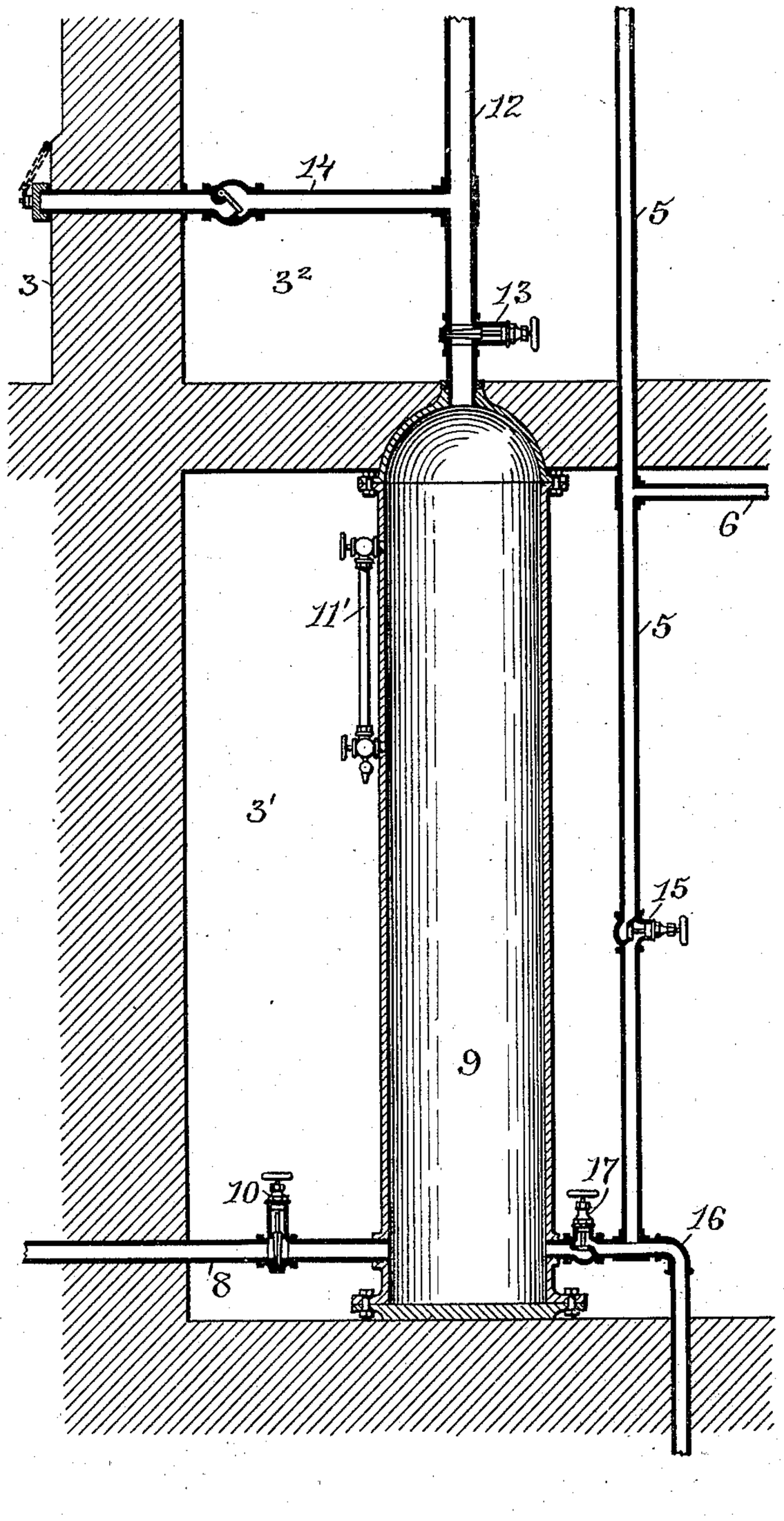
Fig. 2.



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INVENTOR:

Joseph A Miller.

UNITED STATES PATENT OFFICE.

JOSEPH A. MILLER, OF PROVIDENCE, RHODE ISLAND.

AUTOMATIC FIRE-EXTINGUISHER INSTALLATION.

SPECIFICATION forming part of Letters Patent No. 558,653, dated April 21, 1896.

Application filed October 5, 1892. Serial No. 447,917. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH A. MILLER, of the city and county of Providence and State of Rhode Island, have invented a new and useful Improvement in Automatic Fire-Extinguisher Installations; and I hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification.

This invention has reference to an improvement in the system of pipes of a sprinkler installation and their connection with the water supply; and it consists in the peculiar and novel arrangement by which the sprinkler installation can be readily changed from a water to a compressed-air system, as will be more fully set forth hereinafter.

In nearly all places protected by automatic fire-extinguishers or sprinklers the water in the system of pipes is liable to freeze in winter. The water is usually drawn from the pipes, air is pumped into the same, and a check-valve is placed between the air and the water supply. When this water supply is furnished by a tank placed at a point sufficiently above the highest sprinklers and used only to supply the sprinkler installation, this air system answers all practical purposes, provided the air-pressure is carefully watched, and any shrinkage of the air-pressure from a fall in temperature or leakage is quickly remedied by pumping air under pressure into the system. When the water supply for a sprinkler system is furnished from the city main or from an underground water-main connected with other supply-pipes, a differential check-valve is used, held to its seat against the water-pressure by air pumped under pressure into the sprinkler system. Such a system is defective because when in a cold night the air in the system contracts by the cold the pressure is diminished, the water-pressure lifts the check-valve, enters the system, and freezing in the pipes bursts the same, as well as the sprinkler-heads. It is also defective because the water-hammer in the city main or similar supply-main causes the check-valve to raise and the water to enter the system. It also frequently causes the differential check-valve to leak. It is also defective in that the differential check-valve obstructs the free passage of the water.

The object of my invention is to construct and arrange a sprinkler system that in cities or other places having a sufficient water supply under a sufficient pressure stores, warehouses, and other structures can be efficiently protected against fire without the use of an elevated tank.

Another object of the invention is to so construct a sprinkler system that no matter how great the shrinkage of the air from cold the water will enter the system proper.

Another object of the invention is to utilize the water-pressure in compressing the air in the system, and another object of the invention is to so construct the sprinkler system that the water can enter the same freely through an unobstructed conduit when a sprinkler is opened by the heat of a fire.

Figure 1 is a sectional perspective view of part of a building protected by my improved sprinkler system. Fig. 2 is a sectional view, on an enlarged scale, of the air-compressor and its connections with the sprinkler system.

Similar numbers of reference indicate corresponding parts in both figures.

In the drawings, 3 indicates a building having the basement $3'$ below the sidewalk 4, the first story 3^2, the second story 3^3, the third story 3^4, and the fourth story 3^5 equipped with the system of automatic fire-extinguishers, consisting of the usual rising main 5, connected at the ceiling of the basement and each of the stories with the horizontal mains 6, from which lateral branch pipes extend to the sprinklers 7 in the usual manner. The rising main has heretofore been connected either with the water supply formed by the city main or the main connecting with an elevated tank, and the water was kept from entering the rising main and the system of pipes by a check or other valve.

In my improved installation I connect the main 8 with the air-compressing chamber 9 near its bottom and place the valve 10 into the main. The air-compressing chamber 9 I prefer to place in the vertical position shown in the drawings and provide the same with gages 11 (shown in Fig. 1) or the glass gage $11'$. (Shown in Fig. 2.) The air-compressing

chamber may, however, be a larger cylinder and may be placed horizontal.

From the upper part of the air-compressing chamber 9 I extend the auxiliary rising main 12 and connect the same with the system of pipes forming the sprinkler system, preferably at the highest point, as shown in Fig. 1; but this connection may be made at a lower point.

The lower part of the auxiliary rising main is provided with the valve 13, and usually with the pipe 14, extending to the outside of the building, so that the fire department can connect with the same and force water into the sprinkler system. The main 5 is provided with the valve 15 and is connected with the discharge-pipe 16, which discharge-pipe 16 is also connected with the lower part of the air-compressor 9, the valve 17 controlling the outlet to the discharge-pipe.

I will now more fully describe the operation of my improved installation.

When the system of pipes are properly connected and the automatic fire-extinguishers or sprinklers are secured, I close the valves 15 and 17, open the valve 13, and then open the valve 10 to admit the water to the system. The air-vents usually placed into the distributing-pipes at points away from the rising main are opened to allow the air in the system of pipes to escape. After the system is filled with water I let the water stand in the pipes for a longer or shorter time, according to the season of the year, and then close the valve 10 and open the valves 15 and 17 until all the water is drawn from the system. I now close the valves 15 and 17 and keep all the air-vents closed. The main valve 10 is now opened, and the water under pressure enters the air-compressing chamber 9, gradually filling the same and compressing the air in the system of pipes until the compressed air counterbalances the pressure of the water. If the air-compressing chamber 9 is large enough, no other manipulation will be required. If it is not large enough to sufficiently compress the air, the valves 10 and 13 are closed. The water is drawn from the air-compressing chamber 9 by opening the valve 17, which is again closed when the water has been drawn off. The valve 10 is again opened to allow the water to enter the air-compressing chamber and compress the air, and when the air is compressed the valve 13 is opened.

To facilitate the discharge of the water from the air-compressing chamber 9, the gages 11 may be opened, or the upper part of the chamber 9 may be provided with an air-vent of the usual well-known construction.

The effect of cold on a system of pipes filled with air under pressure causes the air to shrink and thereby diminish. The water from the main 8, flowing under pressure, will follow up the shrinkage of the air and maintain the pressure. To prevent the water under these conditions entering the system of pipes is the object of extending the main 12 upward to as high a point as possible. An additional advantage is secured by extending the main 12 upward, for if the water-pressure in the water-supply main is, say, sixty pounds at the floor of the basement, then if the water fills the air-compressor and extends upward in the main 12 at a height equal to thirty feet, the water-pressure will be about forty-five pounds, and an air-pressure of forty-five pounds will counterbalance the water-pressure. If the air shrinks sufficiently to allow the water to rise in the main 12 sixty feet, the air-pressure required to balance the water-pressure will be only about thirty pounds. This is an important feature, as it prevents the water from entering the sprinkler system and freezing in the same. The main 12 and the air-compressing chamber may be covered with felting or other non-conducting material to prevent the freezing of the water in the same.

As the air in the pipes expands by an increase of temperature the pressure of the air increases and acting on the column of water forces the water down, diminishing the height of the column and increasing the pressure, so that, therefore, this compensating action of the air and water automatically adjusts the air-pressure to the water-pressure and secures a system in which the water passage or conduits are always wide open and unobstructed and in which, when one or more sprinklers are opened, the full water supply is at once turned on by the escape of the air from the sprinklers and the full flow of water under pressure secured. The water-hammer does not affect the system. No air-pump, compound check-valve, or other complicated devices liable to stick or become otherwise deranged are used, and the system can be changed any time from an automatic wet-pipe to an automatic dry-pipe system by any one able to operate the valves.

Many establishments have a power-pump adapted for use in case of a fire. Such a pump may be connected with the auxiliary rising main in place of or in the same manner as the pipe 14 and form the auxiliary water supply.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination with a system of pipes forming the sprinkler installation, of an auxiliary vertical rising main connected at its lower part with the water supply and at its upper part with the highest series of horizontal distributing-pipes of the sprinkler installation, adapted to compress the air in the sprinkler system by the water-pressure, as described.

2. In an automatic fire-extinguisher installation the combination with the system of pipes and sprinklers, of an air-compressor chamber connected with the water supply and a vertical auxiliary rising main, con-

nected with the air-compressor and the highest of the horizontal distributing-pipes in the system of pipes, adapted to compress the air and counterbalance the water-pressure, as described.

3. An automatic fire-extinguisher installation consisting of a connected system of distributing-pipes, a series of automatic fire-extinguishers or sprinklers, a vertical chamber connected with the water-supply main, and an auxiliary rising main, connected at its upper end with the highest of the horizontal distributing-mains in the system of pipes and at its lower end with the vertical chamber, adapted to compress the air in the system of pipes and automatically supply the water to the same when one or more of the sprinklers are opened, as described.

4. In an automatic fire-extinguisher installation, the combination with the distributing-pipes and sprinklers of the several stories and the vertical main connecting the same, of a vertical main connected only at its upper end with the highest of the horizontal distributing-mains of the system of pipes, at or near its lower end with the water-supply main, and at an intermediate point with an auxiliary supply-pipe, adapted to supply the water to the system of pipes through the auxiliary main, as described.

5. In an automatic fire-extinguisher installation the combination with the system of distributing-pipes, the connecting-main, the automatic sprinklers and the water-supply main of an air-compressor chamber connected with the water-supply main, of an auxiliary rising main connected at its lower end with the air-compressor and at its upper end with the highest of the horizontal distributing-mains of the system of pipes, a valve controlling the inlet to the air-compressor chamber, a valve controlling the outlet from the air-compressor to the auxiliary rising main, and a discharge-valve at the lower portion of the air-compressor adapted to compress the air in the system of pipes, as described.

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