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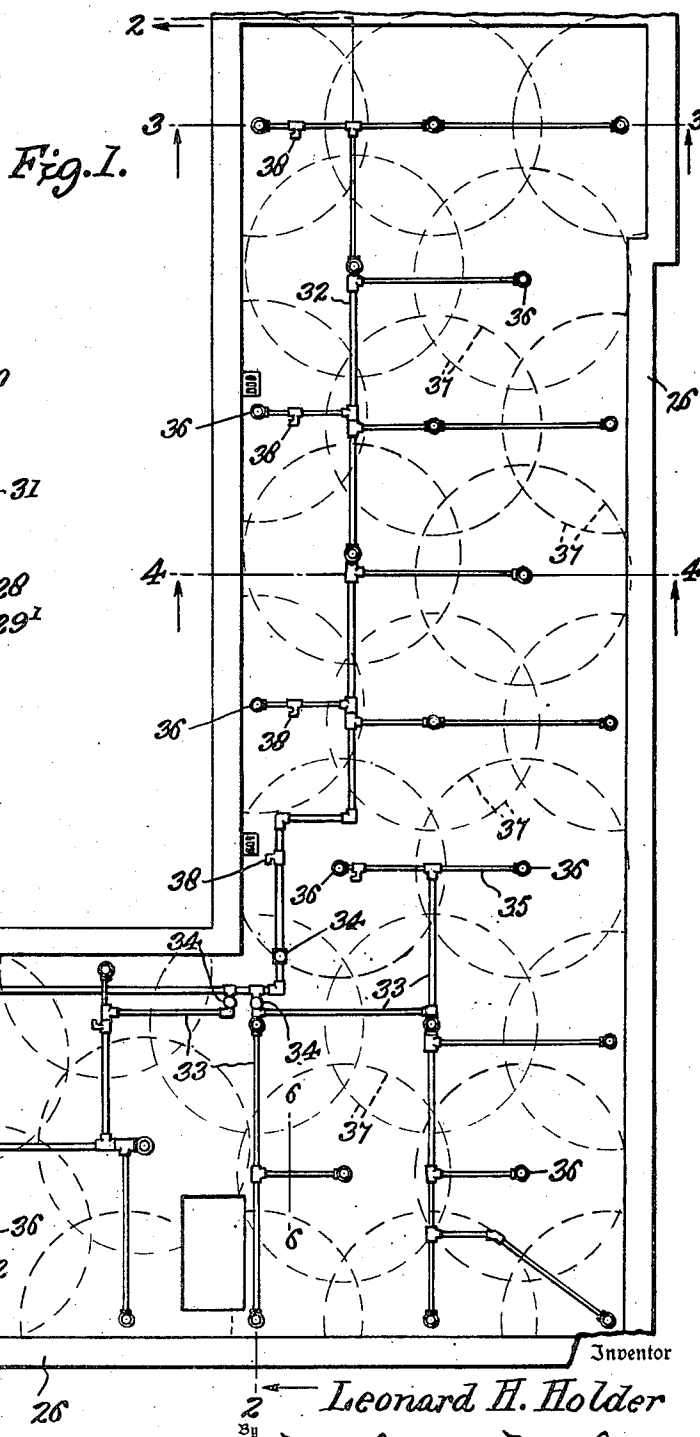
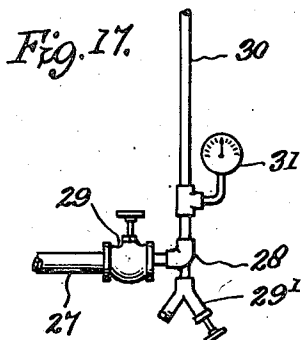
L. H. HOLDER

2,069,150

ROOF COOLING DEVICE

Filed July 22, 1935

3 Sheets-Sheet 1



Inventor
Leonard H. Holder
Mawhinney & Mawhinney
Attorneys.

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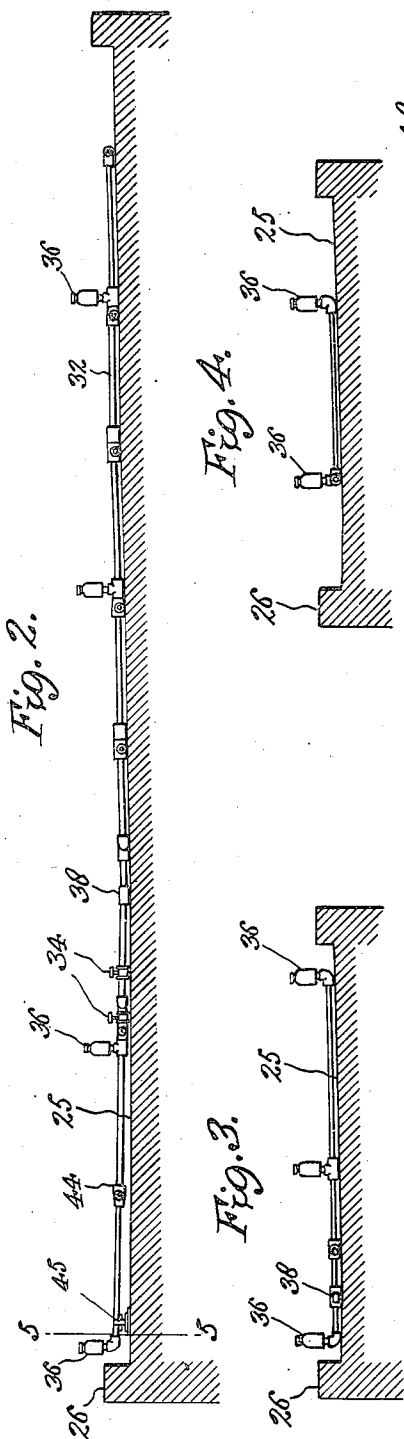
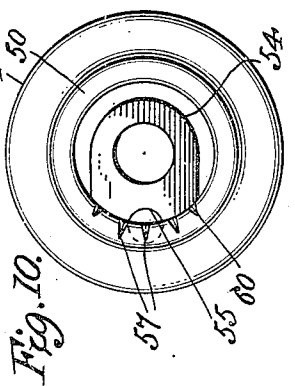
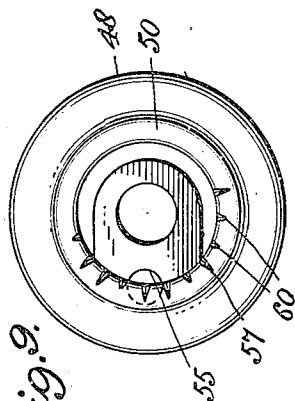
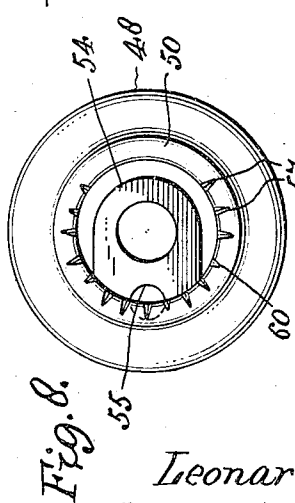
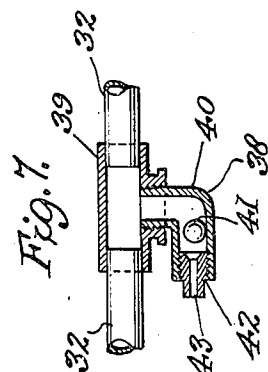
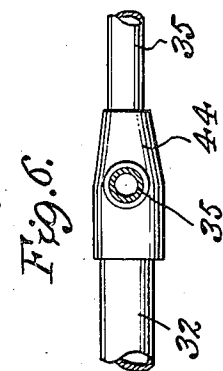
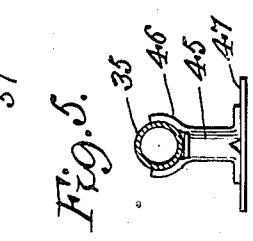
L. H. HOLDER

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ROOF COOLING DEVICE

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3 Sheets-Sheet 2



Inventor
Leonard H. Holder
By *Mawhinney & Mawhinney*
Attorneys.

Jan. 26, 1937.

L. H. HOLDER

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ROOF COOLING DEVICE

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3 Sheets-Sheet 3

Fig. 11.

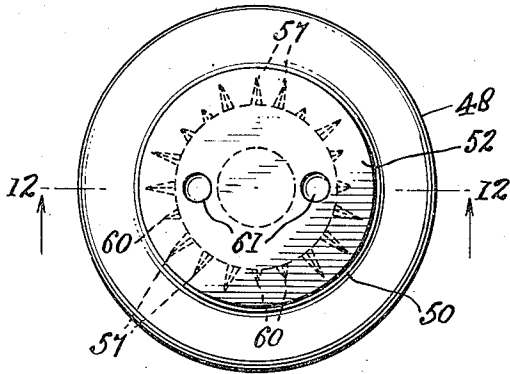


Fig. 13.

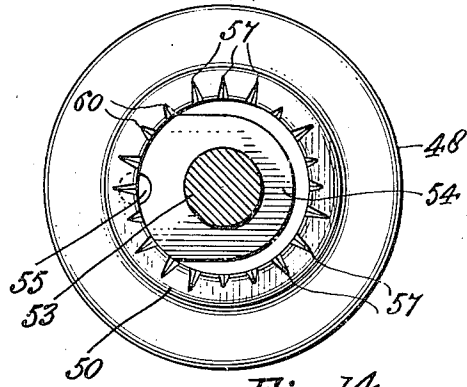


Fig. 12.

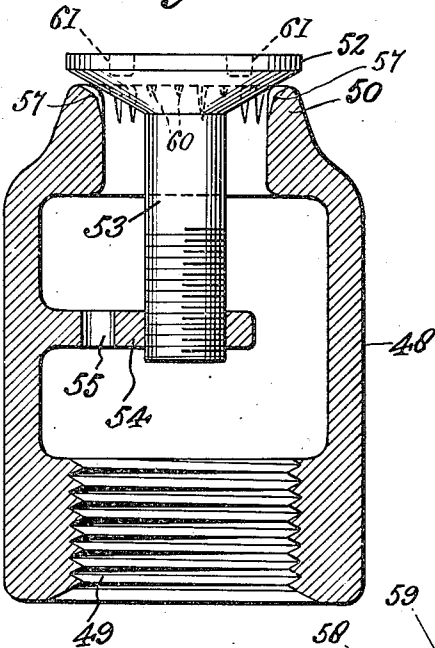


Fig. 14.

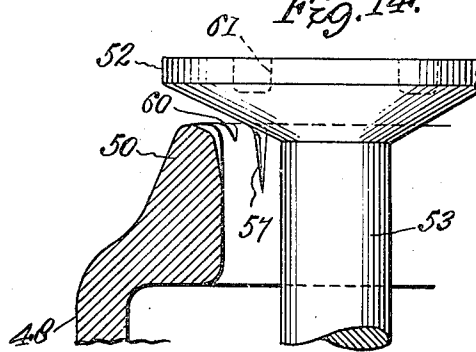


Fig. 15.

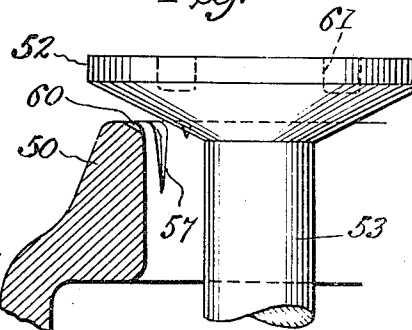
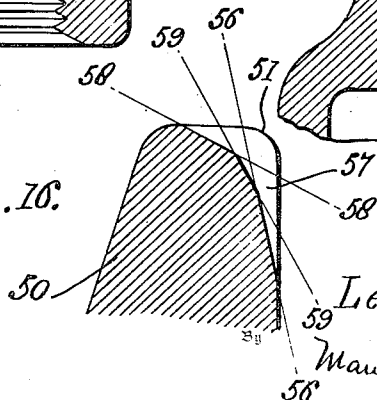


Fig. 16.



Inventor
Leonard H. Holder
Mawhinney & Mawhinney
Attorneys.

UNITED STATES PATENT OFFICE

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ROOF COOLING DEVICE

Leonard H. Holder, Washington, D. C.

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2 Claims. (Cl. 299—141)

The present invention relates to means for cooling roofs of buildings and the like, large and small, and has for an object the provision of a nozzle which may be connected to a source of water supply to maintain a roof and the adjacent upper floor or floors of the building at an even relatively cool temperature and maintain the upper part of the building habitable, the nozzle being so constructed that the water ejected there-through will not damage the roof.

Another object of the invention is to provide a roof cooling means which operates on the principle of evaporation for the dissipation of heat rather than on the principle of merely cooling by water.

In carrying out this object of the invention the present means supplies water continuously in a quantity sufficient only to maintain the roof damp so that by evaporation heat will not be absorbed by the roof and consequently will not get below the roof.

Various systems and devices have heretofore been used for cooling roofs but are found faulty in cost of maintenance, consumption of water and also by reason of mechanical defects.

A further object of the invention therefore is to overcome these difficulties and provide cooling means for this particular purpose which is efficient and economical to provide an ever present mist or fine spray of water in proportion substantially to the rate of evaporation; which has means for adequately controlling the sprays to prevent puddling and waste of water and which also reduces the rate of evaporation with a consequent reduction in the efficiency of the system; wherein the water spray may be confined solely to the roof area to be cooled; to completely cover the surface area of the roof; which is readily adaptable to various roof installations; and which prevents roof fires from sparks and the like which may fall from fires in adjacent buildings or the like.

A still further object of the invention is to provide the roof cooling means with a novel type of spray head by means of which the distance volume and pressure of the spray streams may be controlled so that the system may be operated at low water pressure and the spray streams directed to the particular roof area within the zone of the spray head; which is provided with V-shape jet openings which may be varied in size and contour to control the character of the jets from the spray head and a spray head which is of such construction that it may be quickly and easily flushed or cleansed without interfering with the operation of the device.

Another feature of the present invention is to provide a structure of spray head which may be cut with a desired number of jet openings of desired size and sizes and which may also be disposed in any desired axial position on the spray head to direct the jets from the spray head entirely thereabout or to any fractional distance required around the spray head to adapt the same to installations at the edges of the roof, in corners or other places where full spray heads are not desired.

With the foregoing and other objects in view, the invention will be more fully described hereinafter, and will be more particularly pointed out in the claims appended hereto.

In the drawings, wherein like symbols refer to like or corresponding parts through the several views.

Figure 1 is a top plan view of the roof cooling means installed on a roof, the view being broken away to indicate that the system may be extended to cover roofs of different areas and different contours.

Figure 2 is a longitudinal section taken through the roof and cooling means on the line 2—2 of Figure 1.

Figure 3 is a transverse section taken through the roof with the cooling means thereon on the line 3—3 of Figure 1.

Figure 4 is a similar transverse view taken on the line 4—4 of Figure 1.

Figure 5 is a detail enlarged section taken through a length of pipe showing the foot or stand secured thereto for elevating the pipe to effect drainage, the section being taken on the line 5—5 of Figure 2.

Figure 6 is a fragmentary side elevation partly in section taken on the line 6—6 of Figure 1 showing one of the reducer connections with a T-branch therein.

Figure 7 is a fragmentary longitudinal sectional view taken through a section of the pipe line showing a drain valve mounted therein.

Figure 8 is a detail enlarged top plan view of the body portion of one of the spray heads, showing the jet openings extending substantially three-quarters way around in the valve seat.

Figure 9 is a similar view showing the jet openings extending substantially half way around the valve seat.

Figure 10 is a similar view showing the jet openings extending substantially one-quarter way around in the valve seat.

Figure 11 is a top plan view of one of the

spray heads, showing the jet openings extending entirely about the valve seat.

Figure 12 is a vertical section taken through the same on the line 12—12 of Figure 11.

Figure 13 is a transverse section taken through the spray head immediately beneath the stem head.

Figure 14 is a fragmentary sectional view showing the stem head raised from the valve seat and with jet openings formed in the latter, the section being taken through one of the larger openings.

Figure 15 is a similar view with the section taken through one of the smaller openings.

Figure 16 is a fragmentary sectional view, enlarged, taken through the valve seat showing by the broken lines the angles of cut in forming one of the larger jet openings, and

Figure 17 is a fragmentary side elevation of the connection and control means between the water supply main and the stand pipe leading to the roof cooling means.

Referring now to the drawings and first to Figures 1 to 4, 25 designates a roof of a building which may be of slag or other suitable construction and which is to be cooled. The roof 25 may be bound by a coping 26 and the area of the roof to be cooled lies within the coping 26, and as the latter is disposed along the marginal edges of the roof the roof surface lying within the coping is the area to be cooled and the sprays or jets of the device must be confined within the coping or edges of the roof to be efficient and to prevent any damage which might occur incident to sprays projecting beyond the edges of the roof.

Referring now to Figures 1 and 17, the water supply main 27 has connected to it a supply pipe 28 in which is placed a control valve 29 and the supply pipe 28 leads to a stand pipe 30 having at its lower end a pressure gauge 31 so that the valve 29 may be regulated to supply water at the desired pressure into the stand pipe 30.

The stand pipe 30 is carried upwardly of the building, at any suitable point thereof and is shown in Figure 1 as rising against an outer wall of the building adjacent the chimney or stack 31. The stand pipe 30 is connected at its upper end to the supply pipe 32 of the device, the pipe 32 being arched upwardly over the adjacent coping 26 so as to dispose the supply pipe 32 directly upon or adjacent the upper surface of the roof 25. The supply pipe 32 may extend as shown in Figure 1 across the width of the roof 25 and is suitably branched to extend in a general lengthwise direction of the roof throughout all of the wings or sections thereof as shown and the supply pipe 32 is gradually reduced in diameter throughout its sections to maintain an even volume and pressure of the water throughout the system.

Figure 1 shows one-half of the substantially U-shape roof and consequently one-half of the roof cooling means is illustrated as applied to the half portion of the roof. Branch pipes 33 are connected, by T-couplings or the like, to the supply pipe 32 at spaced points throughout the length of the supply pipe 32 and each branch pipe 33 is provided with a controlling valve 34, and there is also placed a control valve 34 in the outer section of the supply pipe 32 so that the entire section may be cut off and controlled by operation of the valve 34.

These valves 34 may be of the usual hand operated type so that the system may be manually controlled and adjusted. Each branch pipe 33 may be provided with a plurality of small branch pipes 35 of less diameter than the branch pipes 33 and the service pipe 32 so as to equalize the pressure and volume of the water in the device. The small branch pipes 35 are extended to desired portions on the roof 25 and are proportioned in length so as to dispose spray heads 36, mounted on the small branch pipes 35 at desired spaced apart points and with the spray heads 36 so relatively disposed as to define the corners of diamond shape figures substantially throughout the system. It will be noted that the spray heads 36 disposed near the edges of the roof are spaced inwardly a slight distance from the coping 26 and the broken line circles 37 in Figure 1 illustrate approximately the zone or field of coverage of the sprays or jets from the respective spray heads 36.

It will also be noted that the spray heads 36 which are located adjacent the corners and edges of the roof cover areas proportionate to their locations so that the jets or streams of water ejected from the heads will not pass over the coping or wet other objects about the roof which are not to be sprayed.

For the purpose of drainage the service pipe 32 and branch pipes 33 are provided at their lowest points with drain valves 38 and Figure 7 discloses in detail one of the valves mounted in the service pipe 32. The pipe 32 is provided with a T-coupling 39 which may extend downwardly or more or less approach a horizontal position with respect to its shank. The T-coupling 39 is soldered or otherwise suitably secured to the adjacent end portions of the pipe 32 while an elbow shape valve casing 40 is threaded at one end in the shank of the coupling 39, carries a ball check valve 41 and is provided in its other end with a plug 42. The plug 42 has a central opening 43 therethrough leading to the atmosphere while the inner end of the opening is flared to provide a shoulder or seat for the ball valve 41 when the latter is moved against the seat by water pressure in the pipe 32. When the supply of water is cut off from the service pipe 42 the pressure falls sufficiently to release the ball check valve 41 so that the remaining water in the service pipe 32 and its various branches is permitted to flow out through the block opening 43, thus draining the pipes.

These drain valves 38 are located at the lowermost points of the device so as to insure proper drainage when the system is not in use and so that in cold weather the water will not accumulate in the pipes and thus freezing of the water and bursting of the pipes is offset.

As shown in Figure 6, the various sections of the service pipe 32 and also of the branch pipes 33 and 35 are connected together by reducer couplings 44 which may also be of T-shape so as to take care of the connection of reduced branch pipes 35. The normal slope of the upper surface of the roof 25 is taken advantage of in installing the device so as to determine the lowest point of the piping at which to locate the drain valves 38. However, in some instances it is necessary to elevate the outer portions of the pipes to effect the desired drainage. In such cases the adjacent pipe 33 is provided at its under side with a shank 45 which may comprise a section of the pipe suitably split and overturned to form a socket 46 within which the pipe 35 is

may rest. The shank 45 is preferably soldered or otherwise permanently attached to the pipe 35 so as to prevent accidental displacement of the support.

5 The lower end of the shank 45 is split and spread apart and soldered or otherwise suitably secured to a foot plate 47 adapted to rest upon the upper surface of the roof 25 so as not to injure the surface of the roof and at the same time to ably support the branch pipe 35 and the spray head 36 carried thereby.

Referring now more particularly to Figures 8 to 16, the spray head used preferably in connection with the present roof cooling means comprises a body portion 48 which, as shown in Figure 12, is hollow with a reduced threaded opening 49 in its lower end adapted to receive the riser or upper end of one of the pipe sections 32 and 33. The upper end of the body 48 is provided with an outlet opening having a marginal upstanding control flange 50 which, as shown in Figure 16, is provided with an inner rounded edge 51 against which is adapted to seat the under side of a conical or tapering valve head 52. The head 52 has a central stem 53 of considerably less diameter than that of the opening through the flange 50, and the lower end of the stem 33 is threaded or otherwise secured to a web 54 projecting inwardly from one or more walls of the body portion 48 so as to hold the head 52 firmly against the flange 50 when the spray head is in position for operation.

The web 54 is provided with one or more openings 55 therethrough disposed at the side of the stem 53 to permit the free and unimpeded flow of water upwardly through the body portion 48 from the riser to the conical head 52. It will be noted that the flange 50 is offset inwardly with respect to the wall of the body portion 48 so as to provide a constricted opening within the flange so that water under pressure delivered to the interior of the body 48 is accelerated and increased in pressure as it passes upwardly through the flange.

45 The water passing from the body portion 48 of the spray head is delivered from the upper end thereof in radially extending fine jets or streams, and these jets or streams may be regulated as to pressure and size for proper distribution of the water in fine sprays about the head. To this end, as shown in Figures 14, 15, and 16, particularly, the inner rounded shoulder 51 of the flange 50 is recessed or cut away first on a line 56, as shown in Figure 16, to give depth and extend downward of the groove or serration 57 which is formed in the inner shoulder 51.

The general plane of this initial cut 56 is shown by the broken line in Figure 16 and is at an angle to the inclined face of the conical head 52. The groove 57 is further formed by a second cut 58, shown by the broken line in Figure 16, and which is across the shoulder 51 in substantially parallel relation to the adjacent surface of the conical head 52 so as to provide an inner wall to the groove or recess 57 which is substantially parallel to the surface of the conical head 52. The groove or recess is further formed by a third cut 59 which is intermediate of the cuts 56 and 58 and which is adapted to remove to a more or less extent the edge or shoulder formed within the groove 57 at the juncture of the faces provided by the cuts 56 and 58. This third cut 59 is the cut which controls the volume and pressure of the water spray passing upwardly through the groove 57 and against the under side of the

conical head 52. It is apparent that the deeper the cut 59 the greater will be the volume of the jet or spray passing upwardly through the groove 57 and consequently the pressure will be reduced proportionately and the spray will not be projected as far from the spray head as in the case of a relatively shallow cut 59.

A shallow cut 59 constricts the passage of the water through the groove 57 and projects the water under pressure to a more or less extent against the conical surface of the head 52. The force and size of the jet or stream of water may thus be controlled by the cutting of the groove 57 and when conditions of installation are known the grooves 57, of any practical number throughout the annular flange 50, may be constructed of the desired depth and dimensions as to the cuts 56, 58 and 59 to obtain the prior determined results.

The diminishing size of the groove 57 serves to constrict the stream of water, and by having the groove 57 V-shape a stream of water of like shape will be ejected from the nozzle. Due to the thin lower edge of this ejected stream of water, the stream will gradually lose drops of water until the end of the stream is reached, and at this point the remaining portion of the stream will be broken up into water drops. The head 52 acts as a directing means for the streams of water, and as the cut 58 is parallel with the under surface of the head 52, the head 52 will not break up the water into a fine spray but will close the outer or upper portion of the groove 57 so that no water can issue from the nozzle except through the grooves 57. When the depth of the grooves 57 has been determined the head 52 is tightened on the flange 50. The cuts 56, 58, and 59 have the bottoms thereof disposed in obtusely related planes, with the plane of the bottom of cut 58 parallel to the underside of the truncated head 52. The cut 56 merges into the inner surface of the flange 50, the bottom thereof being disposed on an obtuse angle to the inner surface of the flange 50. By cutting the grooves 57 in this manner there will be an increased quantity of water entering the inner end of the cut 58 so that the velocity of the water in the cut 58 will be increased.

As shown in Figure 13, the grooves 57 may be disposed entirely about the flange 50 so that the spray head will project streams or jets of water of the desired character entirely about the spray head.

In Figure 8, the grooves 57 are shown as extending throughout substantially but three-fourths of the annular flange 50. In Figure 9, one-half of the flange is utilized for the grooves 57, and in Figure 10 but substantially one-fourth of the annular flange 50 has the grooves 57 therein. The degree of the spray head may thus be varied without changing the construction thereof merely by leaving off a desired number of the grooves 57 so that, as shown in Figure 1, the spray head may be provided with a number of grooves suitable for the particular location or installation of the spray head such as in the corners, or adjacent objects on the roof which are not to be sprayed.

It will also be noted that the grooves 57 extend down into the inner wall of the flange 50 for a considerable extent, and that these grooves will be arranged in any desired order with respect to small grooves or cuts 60 which are provided in the shoulder 51 and preferably in parallel relation to the conical face of the head 52 so

that short or fine sprays or jets may be intermingled with the larger jets from the grooves 57. In this manner the surface area of the roof surrounding the spray head may be covered with a fine spray readily determined by the cutting of the grooves 57 and 60.

The control valves 34 also effect the pressure of the water in the one or more spray heads under the control of the particular valve 34. By determining the size, positions and relative arrangements of the grooves 57 and 60, and the positioning of the spray heads in substantially diamond formation, as shown in Figure 1, the entire surface area of the roof may be covered with a fine or light spray with the consumption of but a relatively small amount of water as compared with ordinary spray heads, and the volume of the spray may be controlled directly proportional to the rate of evaporation, dependent upon the temperature and wind conditions at the roof.

The conical head 52 of the spray head may be provided with socket openings 61 for the reception of a spanner wrench or the like adapted for use in screwing the stem 53 into and out of the web 54. This adjustment is desirable not only from the standpoint of economy in manufacture and assembling the parts of the spray heads, but also in admitting of the quick and easy cleansing of the grooves 57 and 60 which may be effected by raising the conical head 52 slightly from the flange 60 to admit a volume of water to pass over the shoulder 51 of the flange and against the under side of the conical head 52. This flushing out of the spray head removes particles which may lodge in the grooves 57 or 60 and thus provides a quick, easy and economical means for flushing or cleaning out the roof cooling device.

A further feature of the invention is in the characteristic cross sectional shape of the grooves 57 and 60. The inner wall portions of these grooves are relatively narrow as the lateral faces of the grooves converge inwardly to substantially a single line point of convergence. This provides for a stream or jet of water which as projected is relatively thin or fine at its outer lower edge and which stream or jet is accelerated or increased in flow at the fine lower edge to assist in supporting and carrying the larger volume portion of the jet.

The result is that the jets or streams are projected in layers or strata and the result is that the sprays liberate at spaced points throughout their lengths relatively large drops of water which distribute the water or moisture closely about the spray head as well as throughout the entire radial distance from the head.

The flange 50 of the spray head is made of a suitable non-corrosive material such as brass or bronze or any other suitable material as this

material is sufficiently soft to admit of the cutting of the grooves or serrations 56 and 60 therein individually for the different spray heads by use of a file or other suitable tool.

From Figure 17, it will be noted that the lower end or foot of the riser 30 is provided with a boiler drain valve 29 which may have a screw threaded nipple or projection for attachment of a hose or the like when it is desired to drain the riser. It will also be observed from Figure 1 that where the riser 30 is connected to the supply pipe 32 a main controlling valve 62 is provided and this valve controlling the volume and pressure of the water throughout the entire system and may be adjusted and left in such position so that fluctuations in the city water pressure or incident to various adjustments of the valve 29 at the bottom of the riser will not affect the operation of the cooling device.

This valve 62 when once adjusted remains in such position and the independent section valves 34 may be independently adjusted so as to take care of the desired volume and pressure of the water in the various groups of spray heads employed.

It is obvious that various changes and modifications may be made in the details of construction and design of the above specifically described embodiment of this invention without departing from the spirit thereof, such changes and modifications being restricted only by the scope of the following claim.

What is claimed is:—

1. A spray member comprising a hollow body in communication with a source of water supply under pressure, said body having a flanged opening at one end, and an inverted frustro-conical head resting on said flange, said flange having a plurality of V-shaped grooves, the bottom of each groove being disposed in at least three obtusely related planes with the outermost plane disposed in parallel relation to the adjacent surface of said head.

2. A spray member comprising a hollow body in communication with a source of water supply under pressure, said body having a flanged opening at one end, and an inverted frustro-conical head resting on said flange, said flange having a plurality of V-shaped grooves, certain of said grooves having the entire bottom thereof parallel with the under surface of said head and certain others of said grooves having the bottom thereof disposed in at least three obtusely related planes with the outermost plane disposed in parallel relation to the adjacent surface of said head and the innermost plane intersecting the vertical inner surface of said flange at an obtuse angle.

LEONARD H. HOLDER.