Dec. 19, 1950 H. SCHLAICH 2,534,378

SAFETY CONTROL FOR SHOWER HEADS AND OTHER HOT WATER OUTLETS

Filed Feb. 15, 1947 4 Sheets-Sheet 1

Fig. 1.

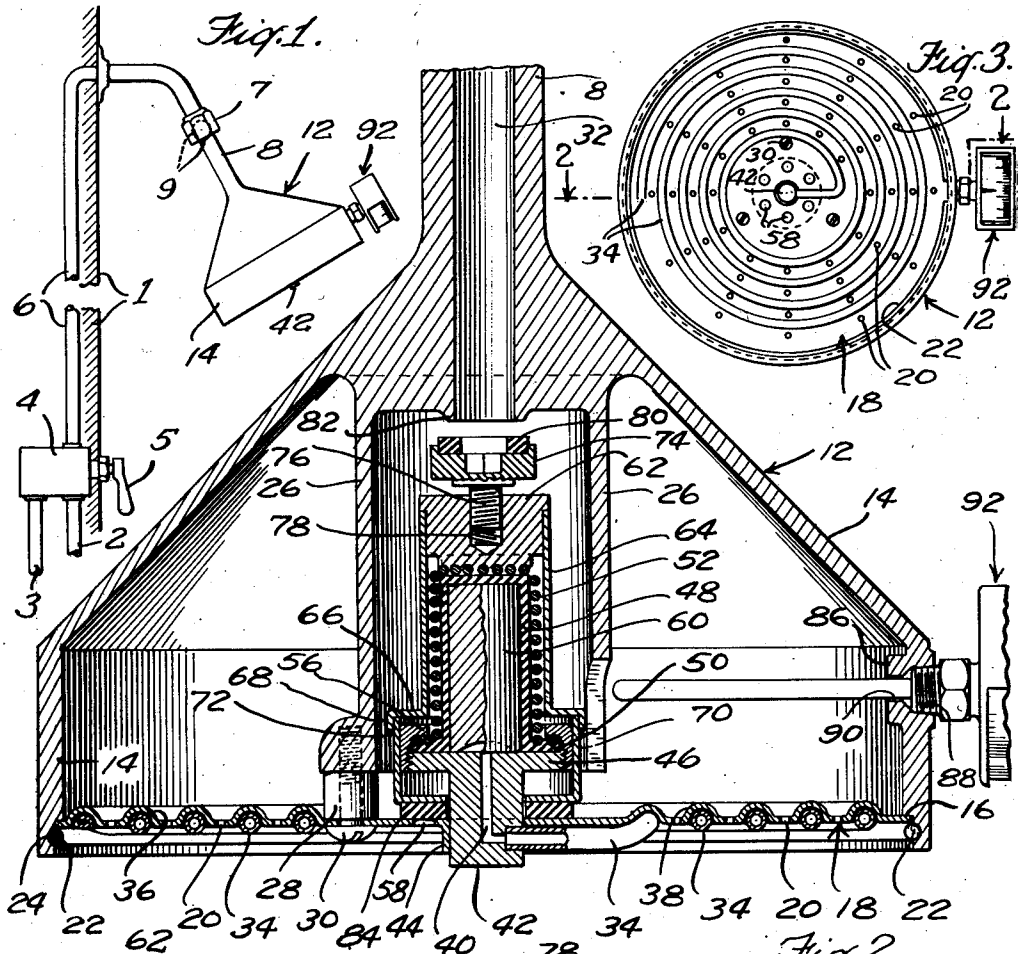
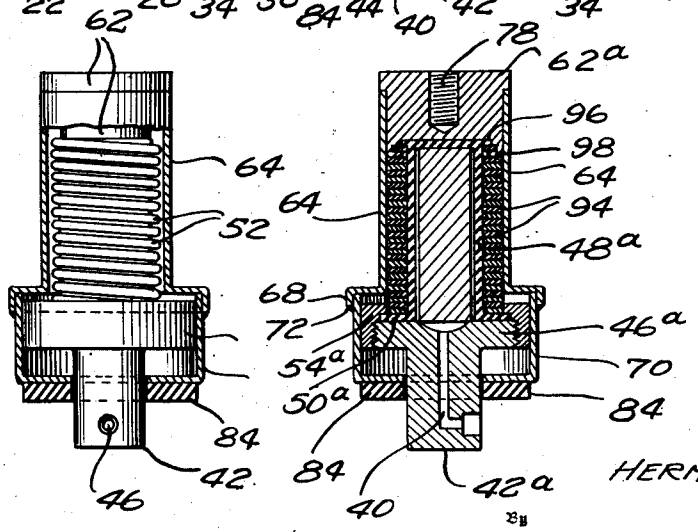


Fig. 3.

Fig. 2.



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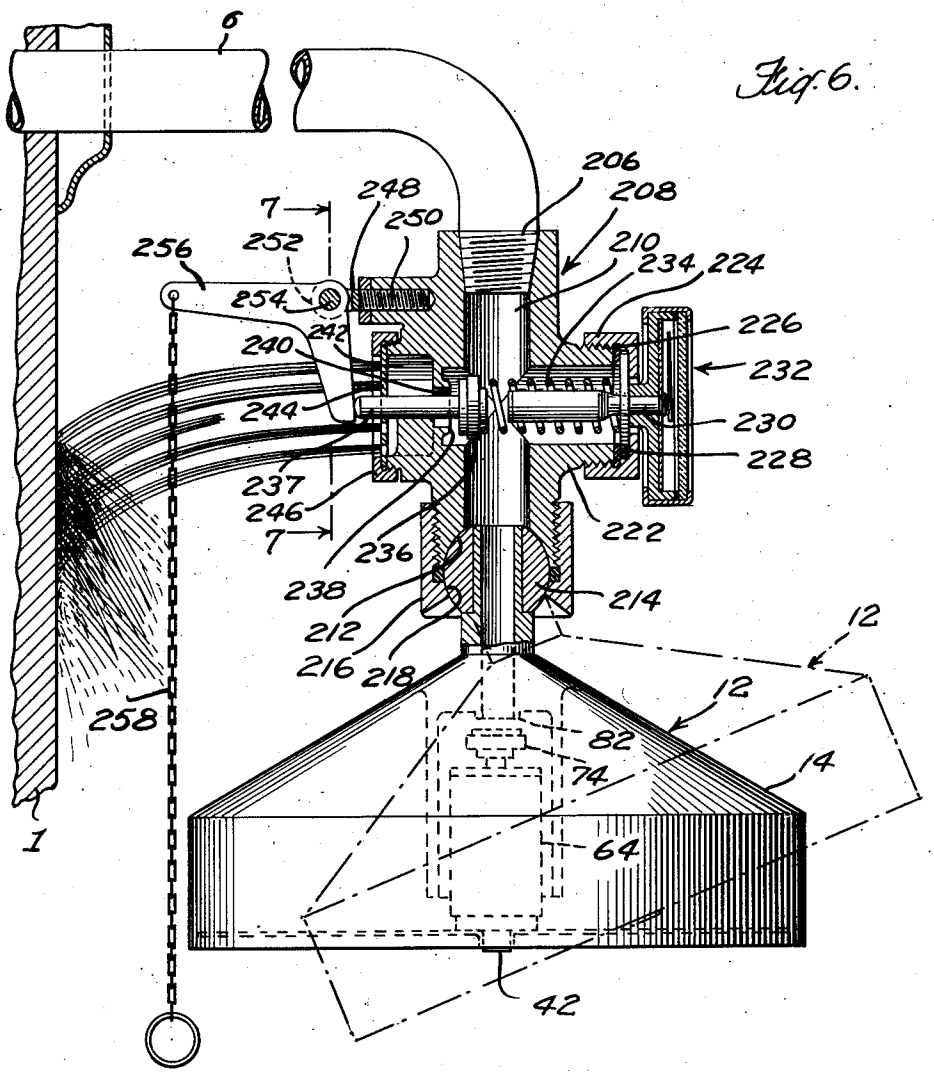
Fig. 4. Fig. 5. Moses, Nolte, Crews & Berry
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Dec. 19, 1950 H. SCHLAICH 2,534,378

SAFETY CONTROL FOR SHOWER HEADS AND OTHER HOT WATER OUTLETS

Filed Feb. 15, 1947 4 Sheets-Sheet 2

Fig. 6.



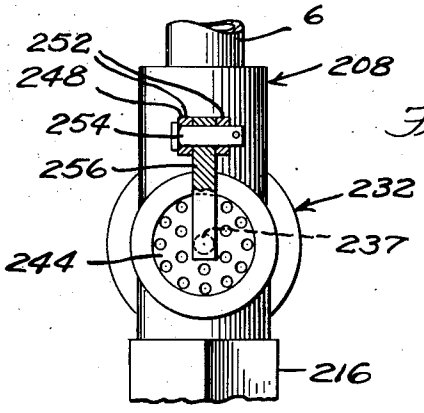


Fig. 7.

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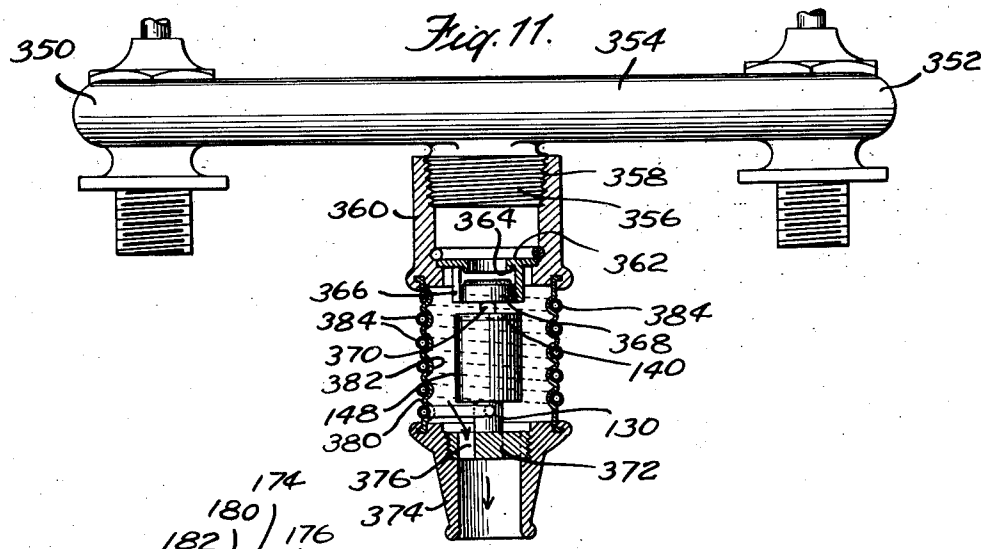
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SAFETY CONTROL FOR SHOWER HEADS AND OTHER HOT WATER OUTLETS

Filed Feb. 15, 1947 4 Sheets-Sheet 3

Fig. 11.



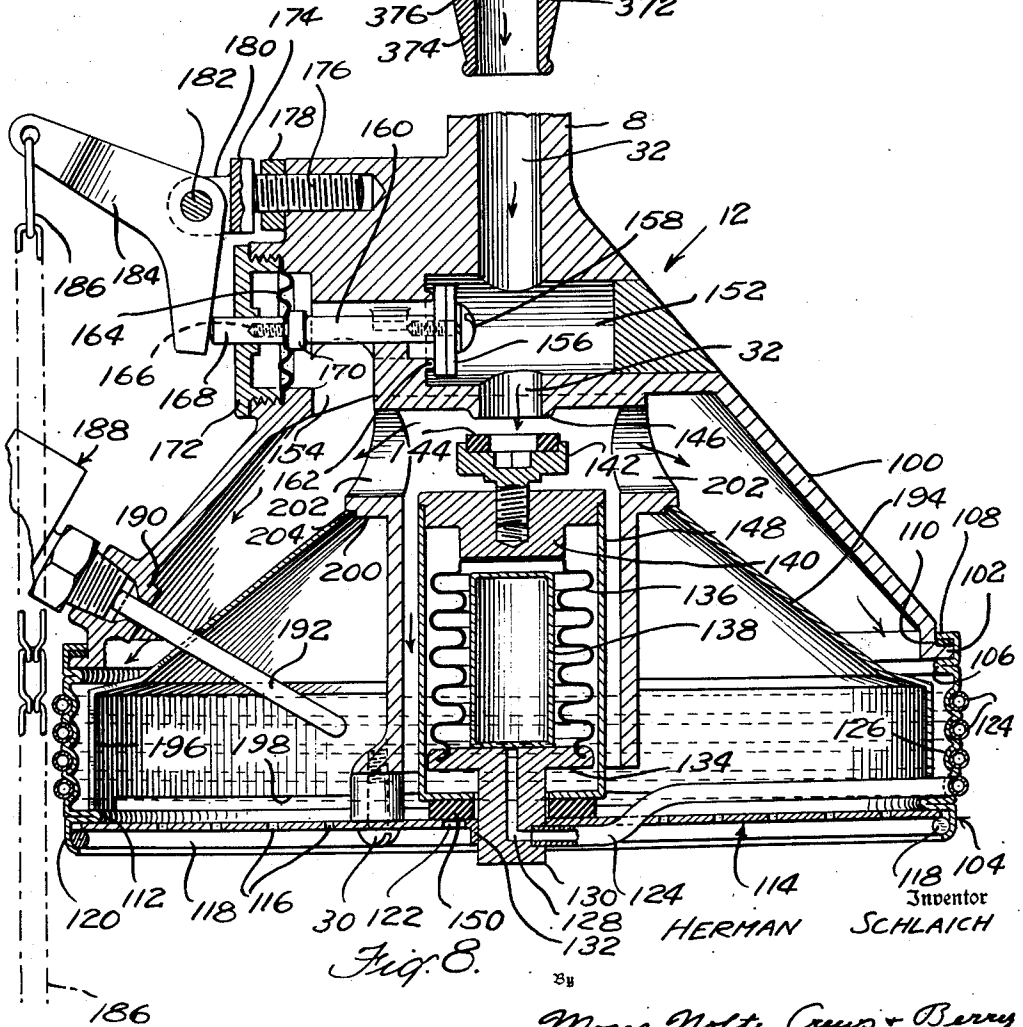


Fig. 8.

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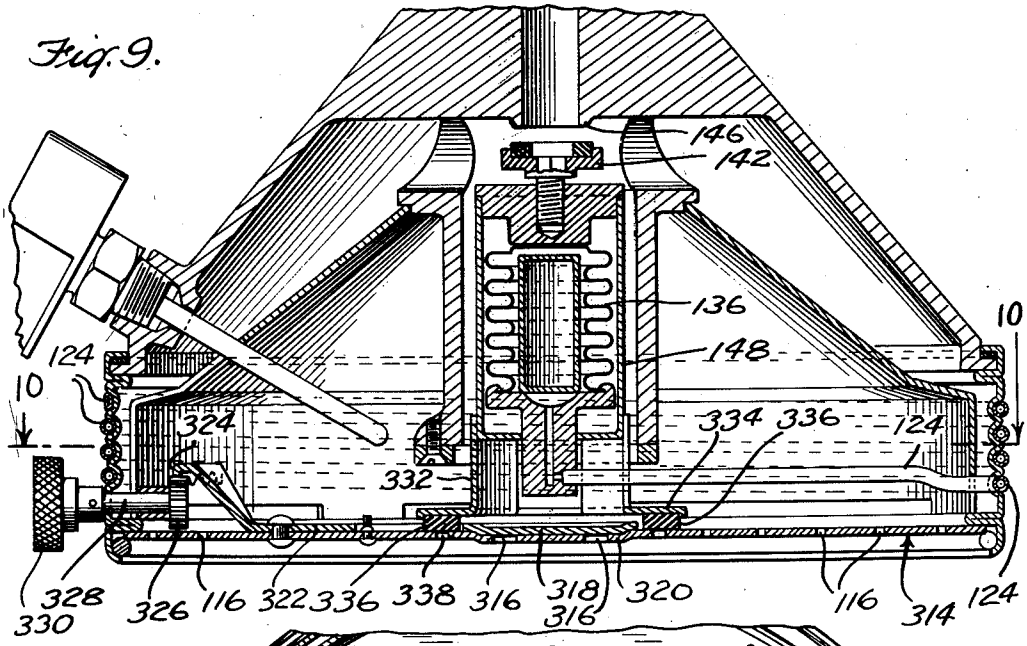
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SAFETY CONTROL FOR SHOWER HEADS AND OTHER HOT WATER OUTLETS

Filed Feb. 15, 1947 4 Sheets-Sheet 4

Fig. 9.



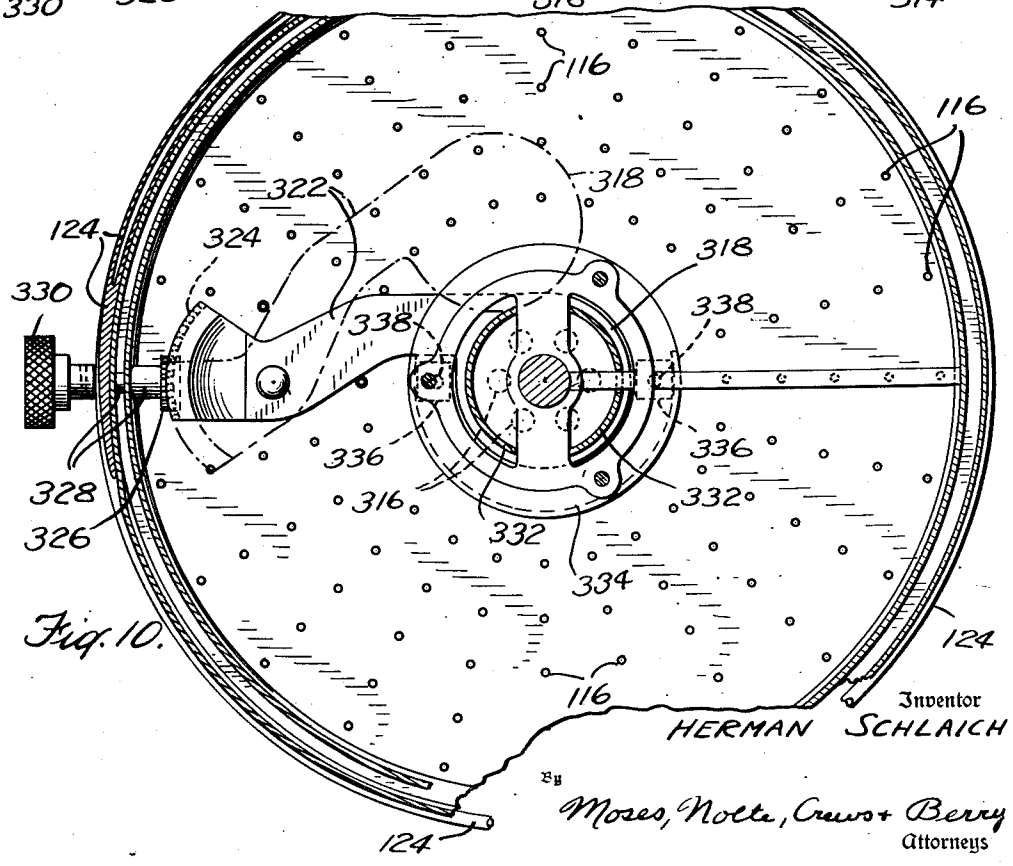


Fig. 10.

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UNITED STATES PATENT OFFICE

2,534,378

SAFETY CONTROL FOR SHOWER HEADS AND OTHER HOT-WATER OUTLETS

Herman Schlaich, Elmhurst, N. Y.

Application February 15, 1947, Serial No. 728,774

14 Claims. (Cl. 236—93)

1

This invention relates to hot water outlets and more particularly to hot water outlets having thermostatically responsive means designed to protect the user against being scalded. The invention finds especial utility as embodied in shower heads.

It is a common experience in hotels and apartment houses for the user of a shower to be scalded when the temperature of the water delivered by the shower head is suddenly increased. Such a sudden increase of temperature may be brought about when water which has been standing in the hot water pipe long enough to be cooled off is followed by the freshly supplied hot water, or when the proportion of cold water supplied to the shower falls due to reduction of pressure through opening of other outlets in the line. Even when the temperature of the water is not high enough to produce actual scalding, severe discomfort may be caused by a sudden rise of temperature of the delivered water.

Safety shower heads have been proposed in the past, but the devices proposed all have the drawback that they respond too slowly to the water temperature so that the damage is apt to be done before the protective mechanism can get into action.

Such prior devices have also had the drawback in most instances that once the thermostatic cut-off mechanism had become heated to a temperature to function, the shower was out of operation for too long a period before becoming sufficiently cool to permit further flow of water. For example, in some of the prior art structures in which provision is made for cutting off the supply of water to the shower head automatically when the temperature of the water is too high, the shower head is left full of hot water. This water does not drip away readily. The shower head delivery orifices are of almost capillary fineness, and they tend to close up in use as deposits form on the walls. There is no pressure behind the trapped water and air cannot enter the shower head readily to facilitate the discharge of the water. As a consequence, the shower is interrupted until the water has slowly seeped away and the shower head has had an opportunity to cool.

In another form of prior art structure the supply of water is not cut off, but when the water becomes too hot a bypass is opened so that the water is diverted and discharged in a stream against the shower wall or curtain. This type of construction, if it were quickly responsive to temperature might partially protect the body of the user except for splashing, but might permit the

2

feet to be severely scalded by the water which flows down the floor of the shower.

It is the primary object of the present invention to provide a safety shower or other hot water outlet in which all of the drawbacks referred to are eliminated.

It is another object of the present invention to provide a shower head or other hot water outlet having safety devices which can be counted on to function effectively over long periods of time, irrespective of the character of the water supply. In many devices of the prior art the thermoresponsive elements which have been proposed stand at all times or throughout the greater part of the time immersed in the water. If it be attempted to use these devices where the water supply contains a substantial percentage of minerals, a scale will be deposited upon the thermoresponsive devices which will slow up their operation to such a degree that they are no longer effective to perform their safety function. In accordance with the present invention this objection is overcome, and the construction is such that there will be no substantial deposit of scale upon the thermoresponsive elements irrespective of the character of the water or duration of use.

In accordance with the present invention automatic mechanism is desirably provided for cutting off or diverting the water supply to the shower head or other outlet when a predetermined temperature is reached. Any type of thermoresponsive mechanism may be used which is very quick in operation and positive in action, having sufficient power to effectively stop or divert the flow of water. For example, properly designed vapor tension or bimetallic thermostatic devices could be employed. The most suitable mechanism which I have devised at the present time, however, is of the liquid filled type comprising a bulb portion and an expansible chamber portion. In order to make this mechanism quickly responsive to temperature changes, the bulb portion is made of very large surface area in proportion to its volume and is located in intimate heat exchanging relation with the water flowing through the shower head. This arrangement is desirably brought about by making the bulb in the form of an elongated tube and disposing the tube throughout its length in contact with a wall or walls of the shower head, these walls being desirably made of thin heat conductive metal.

It is a very important feature of the preferred form of the invention that the mechanism oper-

ated by the thermostatic device not only shuts off the water supply to the shower head but that it also opens a bleeder opening or openings which are effective to drain the shower head in a very short time.

With a shower head of the construction described, the supply of water may be cut off at a time when there is an accumulation of hot water in the pipe supplying the shower head. This accumulation of hot water can be discharged through the bleeder openings of the shower head rapidly enough to be practical for most purposes. Owing to the construction and arrangement of the parts and particularly to the larger exposed area of the thermoresponsive tube or bulb, the cooling of the latter in the surrounding air will produce a very quick reopening of the shut off valve.

In accordance with a further feature of the invention, however, provision is made of alternative or supplementary means through which the accumulated hot water in the pipe may be caused by the user to be discharged independently of the influence of the thermostatic device.

Other objects and advantages of the invention will hereinafter appear.

In the drawings forming part of this specification:

Fig. 1 is a fragmentary diagrammatic view illustrating a portion of a shower bath which includes a shower head embodying features of the invention;

Fig. 2 is a vertical sectional view on a larger scale than Fig. 1 of the shower head illustrated in Fig. 1, the section being taken on line 2—2 of Fig. 3;

Fig. 3 is a face view of the shower head of Fig. 1, the view being upon a larger scale than Fig. 1 but a smaller scale than Fig. 3;

Fig. 4 is a view in elevation, partly broken away, showing the expansible chamber structure of the thermostatic device and mechanism associated therewith;

Fig. 5 is a fragmentary sectional view showing a modified form of the mechanism illustrated in Fig. 4;

Fig. 6 is a view in elevation, partly in section, illustrating a modified structure which embodies features of the invention;

Fig. 7 is a fragmentary sectional view taken upon the line 7—7 of Fig. 6 looking in the direction of the arrows;

Fig. 8 is a sectional view similar to Fig. 2 illustrating a modified structure which embodies features of the invention;

Fig. 9 is a vertical sectional view similar to Fig. 1 showing another modified construction of shower head embodying features of the invention;

Fig. 10 is a horizontal sectional view of the head shown in Fig. 9 taken on line 10—10 of Fig. 9; and

Fig. 11 is a view in elevation of a combined hot and cold water fixture having a safety cutoff valve embodied therein, the cutoff valve being shown in vertical section.

In Fig. 1 a stall shower wall 1 is illustrated as having hot and cold water pipes 2 and 3 within it for supplying water to a mixing valve 4 which is operated by a handle 5. From the body of the mixing valve 4 a single supply pipe 6 extends upward and out through the wall, being connected through a conventional socket connection 7 with a stem 8 having a ball 9 thereon, the stem being attached to a novel shower head 12 as shown in Figs. 1 to 4. The ball and socket connection is of conventional construction and may be like the ball and socket connection illustrated and hereinafter described in connection with Fig. 6.

The stem 8 is attached to or is an integral part of the shower head casing 14. This casing may be of any suitable type but in the form illustrated includes a conical portion and a cylindrical portion. The lower end of the cylindrical portion is formed with a shoulder 16 against which a perforated disc 18, in which are a large number of small holes 20, is seated, the disc being held in place by a split ring 22 which is lodged in a groove 24 formed in the inner face of the cylindrical portion of the shower head casing. The casing is desirably of cast metal and has a depending skirt member 26 which serves as a further anchoring means for the perforated disc 15. Spacing sleeves 28 are interposed between the disc 18 and an enlarged lower end portion of the skirt 26 and beaded screws 30 are passed through the disc 18 and respective sleeves 28 and are threaded into the skirt 26.

The stem 8 is formed with a bore 32 which constitutes a conduit for delivering water to the shower head. Normally the water flows freely through the bore 32 into the shower head and out of the shower head through the perforations of the disc 18.

A thermostatic mechanism is provided for shutting off the delivery of water by the shower head when the temperature of the water is objectionably or dangerously high. This mechanism may be set to shut off the delivery of water at any desired temperature throughout a considerable range. It is usually considered desirable, to set it to cut off the delivery of water at a temperature in the neighborhood of 130 degrees F. At that temperature water is uncomfortably hot, although far from scalding. By designing and setting the mechanism to shut off at such a temperature the mechanism will be caused to act very quickly when scalding water comes through.

In the preferred embodiment of the invention here illustrated, the temperature responsive element comprises a bulb of extended area shown in the form of an elongated spiral tube 34. The tube 34 is of small diameter, thin walled, highly conductive metal, such as copper and is set into a spiral 36 formed in the face of the disc 18. The tube is welded or soldered to the disc, as indicated at 38, so as to be in sealed metallic contact with the disc. The groove is preferably of such depth and contour that the disc 18 is adapted to engage substantially half the circumference of the tube throughout the length of the tube so as to insure instant transfer of heat to the tube. The formation of the disc with the spiral groove therein and with the tube welded or soldered thereto, so stiffens the plate that the latter may be made of very thin metal, thus facilitating the transfer of heat from the inside of the shower head to the tube. The tube, though small in cross section, is of such length that its total volume is quite substantial. As an example of dimensions which may be used, but without limiting the invention to any particular dimensions, a tube several feet long may be employed having a wall thickness of one one-hundredth of an inch (.01"), and a bore of six or eight one-hundredths of an inch (.06" or .08") more or less. The tube is closed at its outer end, but its inner end communicates with means forming an expansion chamber or bellows so that

thermal expansion of liquid filling the tube and bellows will cause the latter to expand and operate the device as will be explained. The volume of liquid in the expansion chamber is preferably kept as small as possible so as to make the device quicker acting. In the particular construction shown in Figs. 1 and 4, the inner end of the tube has a sealed communication with a bore 40 of a fitting or stem 42. The fitting 42 is secured in a flange 44 in the center of the disc 18. The fitting 42 includes a flange 46 at the upper end thereof, the periphery of which is threaded.

A bag 48 of synthetic rubber or other suitable impervious flexible material is provided with a flange 50 at its lower end, the flange being supported upon the upper face of the flange 46. A coil spring 52 starts from a point above the center of the upper end of the bag 48 and is wound in the form of a volute spiral to cover the upper end of the bag. The spring is then continued as a helical spiral to surround the bag, and finally has its lowermost turn surrounded by an additional turn, the two lower turns being supported upon the flange 50 of the bag 48.

A coupling 54 is threaded onto the flange 46 of the fitting 42. The coupling 54 is formed with an internal flange 56 which overlies the flange 50 of the bag and the outer lower turn at least of the spring 52. The coupling serves to clamp the spring and the bag flange firmly against the fitting 42. The bag communicates with the bore 40 of the fitting 42 and is adapted to be expanded by expansion of liquid with which the bag 48 and the tube 34 are filled. The helical turns that surround the sidewall of the bag limit radial expansion of the bag, so that as the pressure increases the bag expands axially but not substantially in a radial direction. The volute turns of the spring are engaged by the upper end of the bag so that as the pressure within the bag tends to elongate the bag, the surrounding spring is also elongated. The expansible liquid, acting through the bag 48, serves by its expansion to drive upward an associated mechanism whereby the water supply to the shower head is shut off and a series of bleeder openings 58 in the disc 18 are opened. The openings 58 are of sufficiently large diameter to allow the water in the shower head to run out freely. A filler plug 60 is preferably placed inside of the bag 48 so as to nearly fill the same and reduce the amount of liquid in the bag. The filler may be made of metal, either solid or hollow, or it may be made of plastic or other suitable material. A hollow metal filler from which the air has been exhausted is very suitable for the purpose as it has low heat capacity and, therefore, does not retard the speed of operation.

A generally cylindrical block 62 rests upon the volute turns of the spring 52. The block has its lower end reduced in diameter and fitted into the upper end of the sleeve 64, the sleeve and block being made unitary by welding or in any other suitable manner. The sleeve 64 has successive out-turned and down-turned flanges 66 and 68 at the lower end thereof, through the latter of which it is fitted upon and connected to a cup-like member 70 by a weld 72. The member 70 is slidable upon the coupling 54 and guides the sleeve 64 and the block 62 for movement axially of the shower head. A valve 74 has its threaded stem 76 screwed onto a bore 78 of the block 62. A washer 80 is secured in the upper end of the valve 74 for engagement with a seat 82 formed around the lower end of the bore 32. The temperature at which the washer 80 will engage the seat 82 to shut off delivery of water to the shower head may be adjusted by adjusting the valve 74 relative to the block 62.

The thermostatic device, as described, is very quickly responsive to the temperature of the water in the shower head casing because the tube 34 has great surface area in proportion to its volume, and because a large portion of the surface of the tube is in intimate metallic contact with the disc 18 which is disposed in direct heat exchanging relation with the water in the shower head. The hot water passing through the small holes 20 also flows on both sides of the tube 34. The entire length of the tube is thus heated at once. The valve 74 is instantly responsive to temperature changes because the volume of liquid in the tube 34 is large in relation to the volume of liquid in the bag 48. The bag is also surrounded by water, but the liquid in the bag is not heated so rapidly as that in the tube as the surface exposed is so much less. However, the filler block in 5h3 bag or bellows reduces the thickness of the liquid body and thereby helps in raising the average temperature of the liquid in the bellows.

The cup-like member 70 has affixed to its lower face a valve washer 84. The washer 84 normally seats against the disc 18 closing the bleeder openings 58. When the water comes through hot enough to close the valve 74, the valve washer 84 is carried upward away from the bleeder openings 58 to uncover them. Water trapped in the shower head is thereby permitted to escape, the bleeder openings serving both to conduct the water out of the shower head and to admit air for facilitating the escape of water through the perforations 20 in the disc 18.

A rapid discharge of water from the shower head is important as it permits the thermostatic elements to cool quickly, thereby restoring the shower head to an operative condition. Clearly if the shower head holds its heat for substantial periods of time, the thermostatic cut off remains effective and operation of the shower is impossible Rapid cooling off is therefore secondary in importance only to instantaneous closing in a successful safety shower head. With the construction described the extended area of the thin walled tube 34 exposed to the air is very important because it will cool off as rapidly as it heated up, or almost as quickly, and therefore will cause the cut off valve to open and permit further operation of the shower. If the operator has adjusted the temperature of the water to a proper one by means of the manual control valve, the shower can then be continued with water at proper temperature without any delay. Owing to the arrangement of applicant's shower, the parts are so quickly cooled that it is unnecessary to provide for a flow of cold or cool water into or through the shower head in order to restore the thermostatic mechanism to an operative condition.

It is highly desirable to provide a shower head with means of indicating the temperature of the water. For this purpose, the cylindrical portion of the shower head casing 14 is formed with an internal boss 86 and in this area the wall is formed with a threaded bore 88 and an unthreaded reduced bore 90 in which a quick-acting thermometer 92 of suitable construction is mounted.

The safety shower head described is adapted to

be substituted as a unit for a shower head of conventional construction which it is designed to replace.

In Fig. 5 disclosure is made of an alternative bag supporting structure designed to be employed instead of the structure illustrated in Fig. 4. In general, the disclosure of Fig. 5 is a duplicate of that of Fig. 4, and corresponding reference characters have been added to corresponding parts with the subscript "*a*" added in each instance and the differences only will be described. A series of washers **94** is employed around the bag **48***a*. The washers **94** are broad and flat and are inexpansible radially and lie in engagement with one another when the spring is in a collapsed condition. The upper end of the bag **48***a* is formed with a flange **96** which is located in a recess provided in the lower end of the block **62***a*. The uppermost of the washers **94** is lodged within the recess of the block and is trapped in place by a flange **98** which is turned inward to underlie such washer. The inturned flange of the coupling **54***a* does not cover the lower washer, but merely clamps the flange **50***a* of the bag **48***a* against the flange **46***a* of the block **42***a*.

An alternative shower head is illustrated in Fig. 8. This shower head like the shower head of Figs. 1 and 2 is adapted to be substituted as a unit for the conventional shower head which it is designed to replace.

The shower head includes a casing **100** of conical shape. At the bottom of the conical wall portion of the casing is an outwardly projecting flange **102**. Secured to this flange is a cylindrical casing portion **104** which is preferably made of thin sheet metal of good heat transmitting properties. The cylindrical member **104** may be secured to the flange at the bottom of the casing **100** in any suitable manner as by having a bead **106** therein which fits under the flange and is clamped against the flange by flange **108** on the top of the cylindrical member, a packing ring **110** being preferably interposed to prevent leakage. At the bottom of the cylindrical member **104** is another bead **112** against which is placed a perforated disc **114** in which are small holes **116** for the passage of the shower spray. The disc **114** is secured in position in any suitable manner as by means of a split ring **118** fitting inside of a marginal flange **120** on a cylindrical member **104**.

A thermostatic device is provided as before for shutting off the supply of water to the shower head and for opening bleeder openings **122** in the disc **114**. The bulb portion of the thermostatic device consists of a long small bore, thin-walled tube **124** of highly conductive metal, such as copper which is wound around and embedded in a helical groove **126** in the cylindrical portion **104** of the casing. The tube is closed at its outer end but communicates at its inner end with a bore **128** of a fitting **130**. The fitting **130** is mounted centrally of the disc **114** being welded to a downturned flange **137** which is provided in the center of the disc. The fitting **130** carries a flange **134** at its upper end to which is attached the lower end of a flexible metal bellows **136**. The lower margin of the bellows is lodged in a recess of the flange **134** and a marginal portion of the flange is spun into place to seal and clamp down the margin of the bellows. A filler or hollow casing **138** rests freely upon the upper end of the fitting **130** but does not obstruct communication of the passage **65** with the interior of the bellows, the purpose of the filler **138** being to reduce the capacity of the bellows and thereby increase the quickness of response of the bellows to temperature changes. The tube **124** and the bellows **136** are completely filled with liquid which is adapted to expand in response to increase of temperature. The upper end of the bellows is desirably connected to a block **140** into which the stem of the valve **142** is threaded. The valve **142** carries a washer **144** for engaging a valve seat **146** to cut off the delivery of water to the shower head when the water temperature exceeds a predetermined value.

A sleeve **148** connected to the block **140** extends down around the fitting **130** and has a valve plate or washer **150** attached to its lower end for normally closing the bleeder openings **122** in the disc **114**. As in the apparatus of Fig. 1, the bleeder openings are normally closed, but are uncovered by the valve plate **150** when the water temperature is high enough to cause the valve **142** to be closed against the seat **146**.

In this form of the invention provision is made of manually controlled means for draining hot water from the supply pipe **6** when the valve **142** is closed. Water entering the bore **32** passes into a cross bore **152**. These bores are constantly in communication with the supply pipe **6**. The bore **152** communicates through the passage **154** with the interior of the shower head. A valve **156** secured by a screw **158** to a valve stem **168** is normally held against a seat **162** at the entrance to the passage **154** to close off the passage and require all water delivered to the shower head to pass the valve **142**. The valve stem **160** is connected to a resilient diaphragm **164** being provided with a reduced threaded portion **166** which is passed through the center of the diaphragm. An extension stem **168** is threaded onto the reduced threaded end **166** to clamp the center of the diaphragm against a collar **170** which is formed on the stem **160**. The margin of the diaphragm is clamped to the shower head casing by a threaded plug **172**. The stem extension **168** is adapted to be thrust inward to push the valve **156** away from the seat **162** against the resistance of the diaphragm **164**.

A fulcrum bracket **174** has a stem portion **176** threaded into a recess in the upper portion of the casing and fixed in place by a lock nut **178**. Ears **180** of the bracket carry a pivot pin **182** upon which a bell crank lever **184** is pivotally mounted. One arm of the bell crank lever **184** engages the stem extension **168** while the other arm is connected to a chain **186** whereby the bell crank may be turned in a counterclockwise direction to thrust the valve stem **160** toward the right as the parts are viewed in Fig. 8.

When the shower has been shut off by the closing of the valve **142**, the user may cause the hot water in the pipe **6** to be quickly disposed of by opening the valve **156**. Since the valve **156** is not under the control of the thermostatic mechanism, the hot water may be discharged independently of the thermostatic mechanism. As soon as the excessively hot water has been disposed of, the flow of water of normal temperature past the valve **156** through the shower head causes the valve **142** to be reopened. The chain **186** may thereupon be released to permit the valve **156** to be automatically closed by the diaphragm **164** and the regulating handle **5** may then be manipulated to secure the water temperature desired for resumption of the shower bath.

A thermometer **188** is mounted in a socket **190**

of the casing portion 190 with the bulb 192 of the thermometer disposed inside the casing.

In the construction described in which the thermo-responsive tube is located around the outside of a portion of the casing, it is desirable to provide means which will surely direct a substantial part of the water coming to the shower head into direct contact with part of the casing wall surrounded by the thermoresponsive tube. For this purpose, I have provided a water diversion baffle in the form of a cone 194 carrying a depending skirt portion 196 located near to the cylindrical part of the casing. The skirt 196 is provided with openings 198 extending throughout most of its circumference so as to permit the water which comes down outside of the baffle to be discharged through the perforated shower plate. The central depending skirt portion of the shower casing is shown as provided with an annular flange 200 which is recessed at 204 to receive the upper edge of the conical baffle 194 which is thereby held in position. Above the flange 200 are large holes 202 for discharging the water above the baffle.

In the construction illustrated in Figs. 6 and 7, the shower head may be the same as that illustrated and described in and in connection with Figs. 1 to 4.

There is provided between the shower head and the supply pipe 6 a separate unit which may be utilized if desired for effecting a quick discharge of water in the pipe 6. In this construction the normal bell and socket joint is removed from the end of the pipe 6 and a bell and socket connection is provided between the new unit and the shower head.

The pipe 6 terminates in a threaded end 206 on which a valve fitting 208 is screwed. The fitting is formed with a passage 210 through which water may flow to the shower head. The lower end of the fitting is formed with a parti-spherical seat 212 in which a ball 214 on the shower head is mounted. A union nut 216 is screwed onto the lower end of the fitting 208. The union nut is also formed with a parti-spherical seat 218 for engaging the bell.

The purpose of the fitting 208 is to provide a means for quickly discharging hot water from the pipe 6 when the flow of water through the shower head has been temporarily interrupted by the hotness of the water. The fitting 208 is formed with a threaded nipple 222. A cap 224 is threaded onto the nipple and clamps in place a gasket 226 and a disc 228. The disc 224 is made fast with the stem 230 of a thermometer 232. A coil spring 234 surrounds the stem 230 bears at one end against the disc 228 and at its opposite end against a valve 236. The valve 236 is normally held in engagement with a seat 238 for preventing discharge of water through a passage 240. The valve 236 is provided with a stem 237 which is mounted in a chamber 242 and which passes through a perforated plate 244. The plate 244 is clamped in place by a threaded cap 246. A pivot bracket 248 has its stem 250 threaded into the fitting and is provided with ears 252. A pin 254 carried by the ears 252 pivotally supports the bell crank 256. One arm of the bell crank engages the valve stem 237 while the other arm is connected to a pull chain 258. The spring 234 normally maintains the valve 236 closed. A downward pull upon the chain 258 is effective, however, to rock the bell crank 256 in a counterclockwise direction and to push the stem 237 toward the right for opening the valve 236. The parts are illustrated with the valve in an open condition in Fig. 6.

By use of the pull chain and the valve 236, assuming that the user has adjusted the mixing valve so as to supply a cooler mixture, the small amount of hot water contained in the pipe 6 can be instantly discharged, thereby permitting the cooler water to reach the shower head and help cool off the thermostatic element which has also been cooling off owing to the fact that the liquid in the discharge head itself has run out. This permits the shower to be returned to use with the water at its proper temperature. As the valve 236 is ordinarily only opened long enough to discharge the very small amount of hot water in the pipe, no danger of scalding results. Only a cupful or so of water is discharged in this manner. As an added precaution, however, it is desirable to discharge the water through the perforations in the plate 244 in a direction where it will not strike a person standing under the shower. For instance, the water may be discharged against the wall where it will cool off sufficiently before it reaches the floor.

In the construction shown in Figs. 9 and 10, a modified form of shower head is illustrated which, in addition to thermostatic cutoff means such as already described, is provided with an adjustable valve by which the shower may be changed from a fine spray to a coarse spray, or vice-versa. Any suitable construction may be used for this purpose. As shown, the disc 314 is provided with a plurality of small perforations 116 and with a few large central perforations 316. An adjustable valve 318 may be moved to cover or uncover these large perforations at will. The perforations 316 may be formed in a depressed area 320 and a valve 318 is preferably formed so as to rest in this depression but to be capable of being moved out of it by a sidewise movement. For this purpose the valve 318 is mounted on or formed integrally with a spring metal arm 322 which will yield sufficiently to permit the valve to slide in and out of the depression. For moving the arm 322 any suitable means may be employed. As illustrated, the outer end of the arm is bent up and over and terminates in a toothed rack 324. The teeth of the rack are engaged by a pinion 326 mounted on a shaft 328 projecting through the side of the shower head casing and having affixed thereto a knob or handle 330 by which the pinion may be rotated, thus causing the valve to be moved to a position either to open or close the holes 316. When the valve is open, the bulk of the water will flow out through the large hole 316 in preference to the smaller holes 116. This will give a coarse spray. Also, by using this coarse spray the water will flow out of the shower head in a large volume and a low pressure and may be used as a means for filling the bathtub if the shower is mounted in customary position above the tub. This has the great advantage that only one outlet and one set of hot and cold water valves or mixing valve is necessary to supply both the shower and the tub. This results in a substantial saving in cost both of installation and maintenance. Also, the same thermostatic safety cutoff may be used for avoiding the danger of scalding from hot water for both the shower and for filling the tub. This gives protection for both of these purposes with the use of but a single thermostatic device, thereby resulting in a further saving. Also, because of the construction of the automatic cutoff as a part of the self-draining shower head, danger of the cutoff

becoming ineffective because of the accumulation of scale, if the water supply is hard, is avoided and an effective safety device is provided irrespective of the character of the water.

The construction of the thermostatic device comprising the coiled tubular bulb 124, bellows 136, valve 142 and associated parts is the same as shown in Fig. 8 and will not, therefore, be further described. The sleeve 148 which is moved by the bellows carries at its lower end an extension 332 which terminates in a flange 334 carrying a pair of diametrically located valve pads 336 that open drain holes 338 in the disc 314 when the bellows are expanded to close the valve 142 against its seat 146. Of course, when the large holes 316 are open, they will serve to drain the water quickly from the shower head irrespective of the opening of the holes 338.

While the construction of the thermostatic safety cutoff so far described in this application has been illustrated in connection with shower heads, where it finds the greatest utility, it may also be adapted to use as a safety device in connection with any hot water or hot and cold water outlet. For example, in Fig. 11, a usual form of hot and cold water fixture is illustrated, comprising two valves 350 and 352, one of which may control a hot water supply and the other a cold water supply. These two valves discharge into a single connection 354 having an outlet 356 which may be provided with the usual external screw thread 358. Screwing on the thread 358 is the upper fitting 360 of a thermostatic safety cutoff device embodying features of the present invention. Mounted in the fitting 360 is a valve plate 362 which has an outlet opening in the center thereof surrounded by a valve seat 364. Projecting downwardly from the valve plate, three or more guide lugs 366 may be provided between which slides a valve 368 adapted to seat against the valve seat 364. The valve is mounted on a stem 370 carried by a block which may be of any suitable construction, such as that of the block 140 shown in Fig. 8. This block is mounted on top of a movable sleeve 148 in which is mounted a bellows as shown in Fig. 8 and which need not, therefore, be again illustrated in detail. From the bottom of the sleeve projects a hollow stem or fitting 130 which is shown as mounted on a plug 372 carried by the lower fitting 374 of the automatic safety cutoff device. The block 372 is provided with suitable openings 376 for the passage of water. The lower fitting 374 is connected to the upper fitting 360 by means of a thin metal shell 380 which may be of copper or other good heat conducting metal and which is preferably provided with helical corrugations 382. The bulb member of the thermostatic device is in the form of a helical tube 384 sealed at its upper end and soldered or welded into the corrugations in the casing 380 and having its lower end sealed into the hollow stem 130 as in the case of the thermostatic device shown in Fig. 8. Water coming from the faucets passes out under the valve 368 and through the casing 380 and out through the fitting 374. If the water is too hot, its heat will be instantly transmitted to the bellows and through the thin casing wall to the tube 384 and will cause the liquid in the latter to expand, thereby operating the bellows and closing the valve 368. Owing to the extended area of the tube 384 and to its intimate contact with the thin wall of the casing, the operation will be so quick as to almost be instantaneous thereby preventing the user from possible scalding. As soon as the water is shut off, the very small amount in the casing will run out through the large holes 376 thereby draining the casing. Owing to the large area of the tube 384 exposed to the atmosphere, this tube will very quickly cool through the few degrees necessary to permit the valve 368 to reopen. Presumably, in the meantime, the user will have adjusted the hot and cold water faucets (or mixing valve) to a point where water of a proper temperature will be supplied thereby permitting the faucets to be used. If, however, the user has not sufficiently cut down the hot water supply to a point where the temperature is safe, the valve 368 will again close.

In the construction shown in Fig. 11 just as with the constructions of the shower head illustrated the tube or bulb of the thermostatic device is not left submerged at all times in water and, therefore, is not subject to becoming encrusted with scale in the case of a hard water supply. Therefore, the device will retain its effectiveness for long periods of time irrespective of the character of the water supply.

While I have illustrated and described in detail certain preferred forms of my invention, it is to be understood that changes may be made therein and the invention embodied in other structures. I do not, therefore, desire to limit myself to the specific constructions illustrated, but intend to cover my invention broadly in whatever form its principles may be embodied.

What I claim is:

1. A safety shower head having a shut-off valve associated therewith for shutting off the supply of water to the head, and a thermoresponsive device for closing said valve when the water temperature rises to a predetermined value, said thermoresponsive device including an element for actuating the valve and a thermosensitive element, said thermosensitive element having a large area in intimate heat exchanging contact with a wall of the head which is contacted by the water entering the head, and having an extended area exposed to the air outside of said head so that said element will be air cooled when the supply of water to the head is cut off by said valve.

2. A safety shower head comprising a casing having a wall portion of thin metal of good heat conducting properties, a valve for cutting off the supply of water to said head when the water temperature rises beyond a predetermined value, and a thermoresponsive device operatively connected to said valve, said thermoresponsive device having a long, small bore, thin walled tube of metal in intimate thermo-conductive contact with the thin walled portion of the casing, said tube containing a thermosensitive fluid, said tube and the contents thereof and the thin casing wall portion in contact therewith constituting a thermosensitive element responding to the temperature of the water in the casing until the predetermined temperature is reached and the valve closed and presenting an extended area to the outer air so that it will be air cooled after closing of the valve.

3. A safety shower head having a casing including a perforated spray plate of good heat conducting material, a valve for cutting off the supply of water to the shower head when the water temperature reaches a predetermined value, and thermostatic means for actuating said valve, said thermostatic means having a thermosensitive element in the form of a small bore,

thin walled, metal tube containing a thermoresponsive liquid, said tube being disposed in intimate thermo-conductive contact with said spray plate.

4. A safety shower head having a casing including a perforated spray plate of good heat conducting material, a valve for cutting off the supply of water to the shower head when the water temperature reaches a predetermined value, and thermostatic means for actuating said valve, said thermostatic means having a thermosensitive element in the form of a small bore, thin walled, metal tube containing a thermoresponsive liquid, said tube being disposed in spiral form and metallically secured throughout at least the greater part of its length in intimate thermo-conductive contact to the outer face of said spray plate.

5. A safety shower head having a casing including a perforated spray plate of good heat conducting material, a valve for cutting off the supply of water to the shower head when the water temperature reaches a predetermined value, and thermostatic means for actuating said valve, said thermostatic means having a thermosensitive element in the form of a small bore, thin walled, metal tube containing a thermoresponsive liquid, said tube being disposed in intimate thermo-conductive contact with said spray plate, and bleeder valve means operatively connected to said thermostatic means for discharging the water left in said casing when the supply of water to the shower head is cut off.

6. A safety shower head comprising, in combination, a casing, a thermostatic device associated with said casing and disposed to be in intimate heat exchanging relation with the water therein, a valve controlled by the thermostatic device to cut off the delivery of water to the head when the water temperature is increased to a predetermined value, said casing being formed with a bleeder opening and a bleeder valve normally obstructing the bleeder opening and operative connections between said thermostatic device and said bleeder valve for opening said bleeder valve upon the closing of the first-mentioned valve.

7. A safety shower head having a thermostatic device forming part of said head and disposed to be in intimate heat exchange relation with the water in the head, and a valve controlled by the thermostatic device to cut off the delivery of water to the head when the water temperature is increased to a predetermined value, the thermostatic device including a bulb portion in the form of a long, small bore, thin walled tube of metal, said tube being wound into spiral form and embedded to a substantial depth in a thin wall of the shower head to induce it to be heated rapidly by the water, said tube containing a thermoresponsive fluid.

8. A safety shower head having a thermostatic device forming part of said head and disposed to be in intimate heat exchanging relation to the water in the head, said device including a bulb portion in the form of a long, small bore, thin walled tube of metal wound into spiral form, and an expansible chamber connected therewith, said chamber having a filler plug occupying the middle part thereof so as to reduce its capacity, the tube and chamber being filled with liquid, and valve means operatively connected with said chamber operable to shut off the delivery of water to the head when the water temperature exceeds a predetermined value.

9. In combination, a safety shower head unit comprising a casing and a normally open valve for controlling the delivery of water from a supply pipe to said casing, a thermostatic device responsive to the temperature of the water in said head to close said valve when the water temperature exceeds a predetermined value and a further unit inserted between the supply pipe and said safety shower head, said unit comprising a conduit having a discharge opening at one end thereof, a bypass valve mounted in said discharge opening, a second opening in said conduit opposite the discharge opening, a thermometer having an indicating dial outside of said conduit, the stem of said thermometer extending into said second opening so as to be exposed to water passing through the conduit, a spiral spring surrounding said thermometer stem and engaging said bypass valve to normally maintain said bypass valve in closed condition, and manual means for opening said bypass valve.

10. A safety shower head comprising a casing having an inlet for water and having means for discharging water therefrom in the form of a spray, a valve for closing said water inlet, a thermostatic device including an expansible chamber mounted in said casing, a sleeve enclosing said expansible chamber and adapted to be movable by said chamber when said chamber is expanded, a valve carried by said sleeve for closing the water inlet, a bleeder opening into said casing, a valve for opening and closing said bleeder opening operatively connected to said sleeve so as to open said bleeder opening when the sleeve moves to close the inlet valve and a thermosensitive element connected to said thermosensitive device, said thermosensitive element responding to the temperature of water entering the shower head so as to actuate said chamber to cause the closing of the inlet valve when a predetermined temperature is reached, said thermosensitive element also responding to outer air temperatures when the water supply valve is closed and the bleeder opening is opened so as to discharge water left in the shower head.

11. A safety shower head comprising a hollow casing and having a shut-off valve associated therewith for shutting off the supply of water to the head, a power device for opening and closing said valve, and temperature responsive means for actuating said power device, said temperature responsive means including a thin metal wall portion forming a part of the casing wall, and a thermosensitive element formed of thin metal having good heat conducting properties and joined throughout an extended area to the thin wall portion of the shower head, one side of said united thin wall portion and thermosensitive element being exposed to the water in the shower head and the other side thereof presenting an extended area exposed to the outer air.

12. A safety shower head comprising a hollow casing and having a shut-off valve associated therewith for shutting off the supply of water to the head, a power device for opening and closing said valve, and temperature responsive means for actuating said power device, said temperature responsive means including a thin metal wall portion forming a part of the casing wall, and a thermosensitive element formed

of thin metal having good heat conducting properties and joined throughout an extended area to the thin wall portion of the shower head, one side of said united thin wall portion and thermosensitive element being exposed to the water in the shower head and the other side thereof presenting an extended area exposed to the outer air, and bleeder valve means for discharging the hot water when the shut-off valve is closed.

13. A safety shower head having a thermoresponsive device forming part of said head and disposed to be in intimate heat exchanging relation to the water in the head, said device including a bulb portion in the form of a long, small bore, thin walled, tube of metal, and an expansible chamber forming member connected therewith, the tube and chamber containing a liquid, a valve carrier operated by the expansible member, and valve mechanism operable by the carrier to shut off the delivery of water to the head when the water temperature exceeds a predetermined value, said expansible chamber forming member consisting of a bag of impervious elastic material having a spiral spring surrounding the bag to limit radial expansion thereof, said spring having its ends anchored to be substantially co-terminal with the bag.

14. A safety shower head having a thermoresponsive device forming part of said head and disposed to be in intimate heat exchanging relation to the water in the head, said device including a bulb portion in the form of a long, small bore, thin walled, tube of metal, and an expansible chamber forming member connected therewith, the tube and chamber containing a liquid, a valve carrier operated by the expansible member, and valve mechanism operable by the carrier to shut off the delivery of water to the head when the water temperature exceeds a predetermined value, said expansible chamber forming member consisting of a bag of impervious elastic material having a series of washers surrounding the bag to limit radial expansion, while permitting longitudinal expansion thereof.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
769,429	Caldwell	Sept. 6, 1904
985,146	Clorius	Feb. 28, 1911
994,994	Gold	June 13, 1911
1,290,249	Lawler	Jan. 7, 1919
1,652,216	Replogle	Dec. 13, 1927
1,707,109	Blair	Mar. 26, 1929
1,712,653	Egloff	May 14, 1929
2,076,406	Kern	Apr. 6, 1937
2,210,188	Smith	Aug. 6, 1940