April 14, 1931. R. H. SHADRICK 1,800,323

CONTROL FOR HOT WATER SYSTEMS

Filed Aug. 12, 1927 2 Sheets-Sheet 1

Fig. 1.

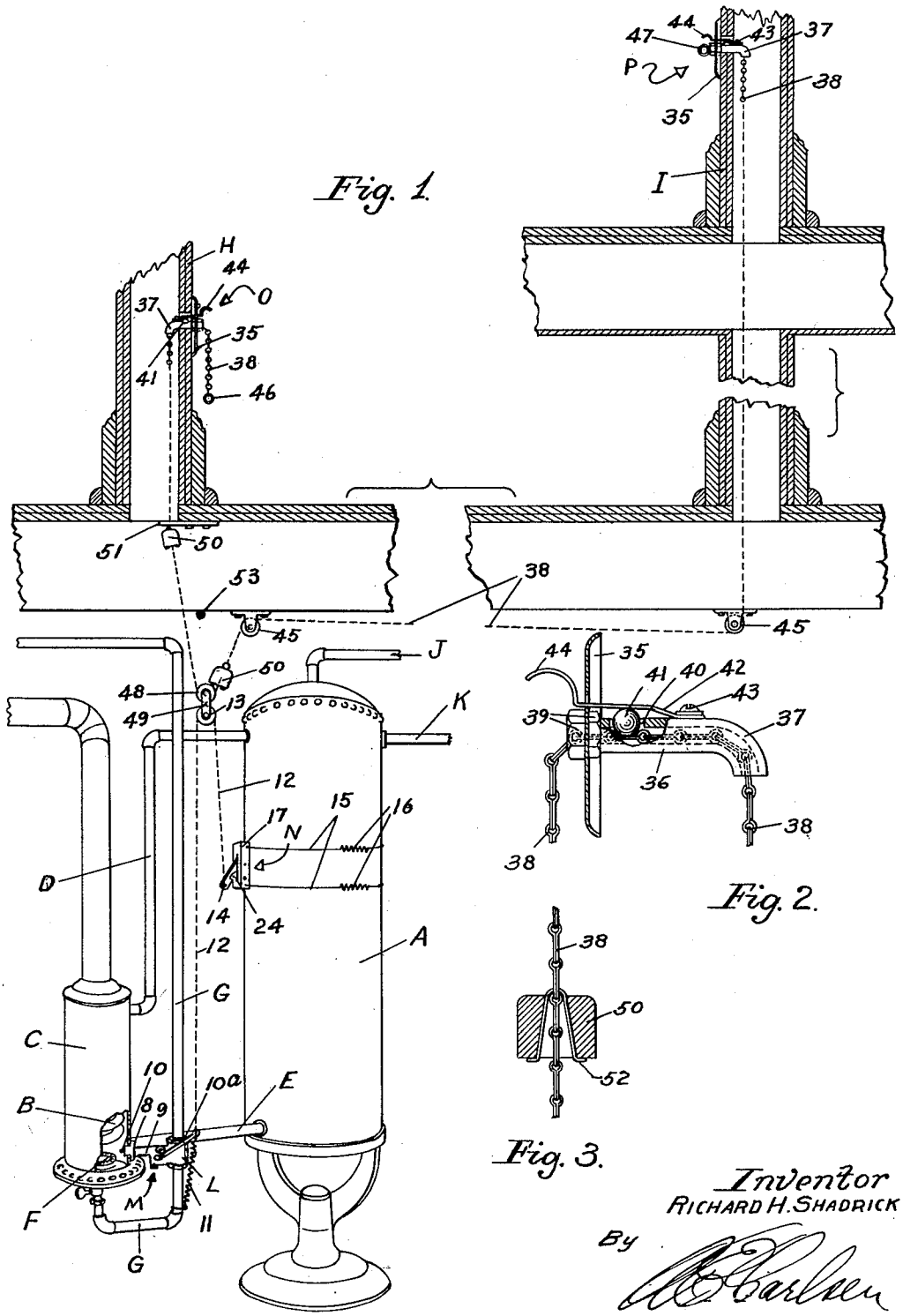






Fig. 2.




Fig. 3.

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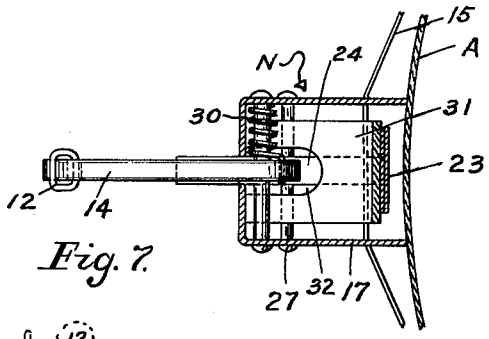



Fig. 7.

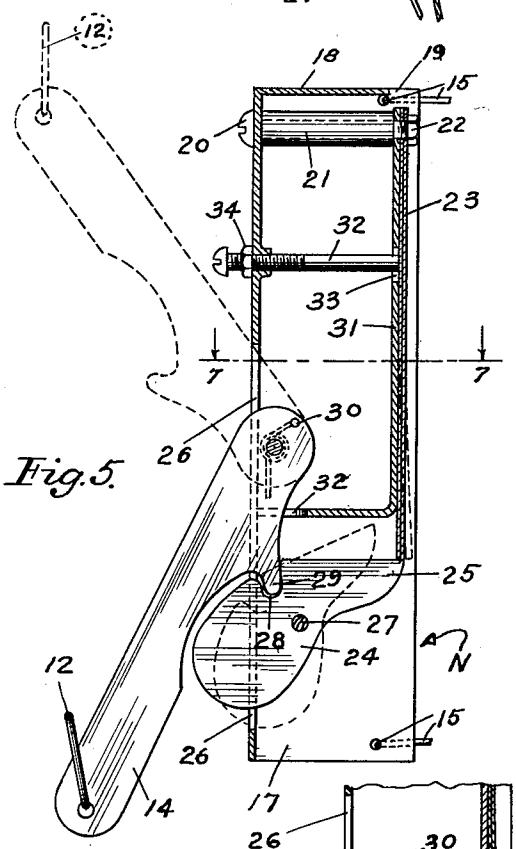



Fig. 5.

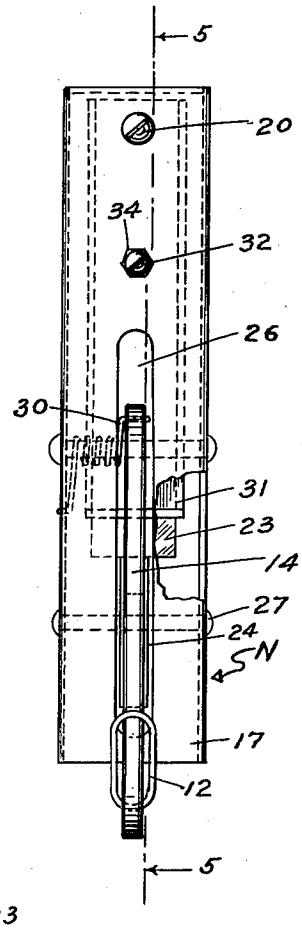



Fig. 4

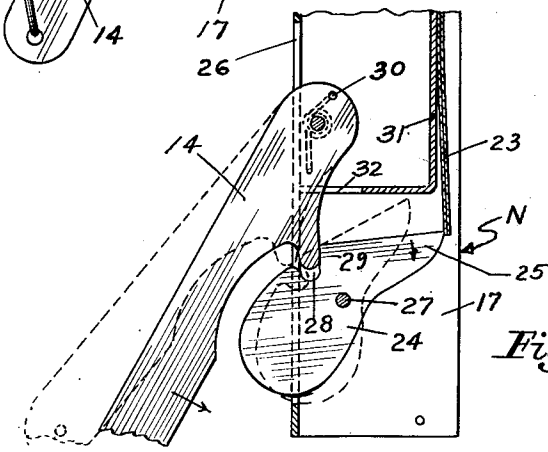



Fig. 6

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# UNITED STATES PATENT OFFICE

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## CONTROL FOR HOT-WATER SYSTEMS

Application filed August 12, 1927. Serial No. 212,498.

This invention relates to mechanisms for controlling the burners of hot water heating systems, and the primary object is to provide means of a novel, efficient and practical nature for manually lighting and extinguishing the burner, from a point remote therefrom, together with means of a novel character for automatically extinguishing the burner, after it has first been manually lighted, and at a time when a predetermined amount of water has been heated, thereby insuring the extinguishment of the burner in case the householder or operator should forget to manually extinguish the burner. Further and more specific objects will be disclosed in the course of the following specification, reference being had to the accompanying drawings, wherein:

Fig. 1 is an elevation of the major portion of the water heating system to which my device is connected, and illustrates, in sectional elevation, the parts of the house in which the system is installed.

Fig. 2 is an enlarged detail view of one of my improved operating stations, parts of which are shown in section.

Fig. 3 is an enlarged detail sectional view through one of the adjustable weight stops.

Fig. 4 is an enlarged detail elevation of the tank "cut-off" unit.

Fig. 5 is a sectional elevation on the line 5—5 in Fig. 4.

Fig. 6 is a view similar to the lower portion of Fig. 5, but showing the "cut-off" as approaching its automatic self-locked condition.

Fig. 7 is a detail section on the line 7—7 in Fig. 5.

Referring to the drawings more particularly and by reference characters A designates a water tank which is connected up, in a well known manner, with the coil B of a heater C by means of pipes D and E. The heater is provided with the usual burner F supplied with gas by a pipe G. H designates the partition or wall of a first floor room, such as a kitchen, while I designates the wall or partition of a second floor room, such as a bath room. The sinks and other fixtures (not shown) in such rooms, to which hot water is conducted, are connected by suitable pipes with the hot water system, as at J, while the cold water supply pipe to the hot water system is designated as K. The arrangement of parts A to K, inclusive, is of common and well known construction, and is shown in my Patent No. 1,563,532 issued for Heater control, and is also shown in my copending application Ser. No. 150,299, filed November 23, 1926, for Control mechanism, as a division of the application (Ser. No. 734,180) resulting in said Patent No. 1,563,532. It may here be noted that the present invention is specifically for improvements upon the control system shown in the aforesaid patent and application.

At a convenient and suitable place in the fuel supply pipe G, I place or insert a valve L, to control the flow of gas in the pipe G to the burner F. The valve is preferably placed in a vertical section of the pipe G, and near the heater, so that it can be bracketed thereto as at 8, by a bracket 9, which is also rigid with the valve L. A pilot tube 10 extends from the intake side of the valve into the heater casing C so as to always be in a lighting position with respect to the burner F. The member 9 is further provided with a lever arm 10*a*, which when permitted to drop down under the pull of a spring 11, permits the valve L to close, but, when pulled up, by a chain or cable 12, will cause the valve to open. The specific construction of the valve actuator unit 8—11, is not here shown in detail, as such will form the subject matter of a separate application. It is no doubt sufficient to state that the actuator unit shown in my former patent is a substantial equivalent and that the arm 8, there shown, corresponds to the present arm 10*a*. In either event the arm permits the valve to close, when lowered, and causes it to open, when raised, and, as far as the present invention is concerned, any kind of an actuator, which has a member adapted to open when actuated by a pull chain, and which will close or permit the valve to close, when the chain is released, may be used.

One end of the chain 12 is secured to the lever arm 10*a* of the actuator, which, as a unit may be designated by the letter M, and from there passes over a movable pulley 13,

its other or opposite end being secured to a lever 14 of a tank-cut-off unit N. This unit is held in place, in any selected position on the tank A, by a pair of straps or wires 15, which are secured about the tank and which are preferably provided with elastic spring sections 16.

The tank cut-off unit N comprises a casing 17, which is preferably V-shaped in cross section (see Fig. 7), and is secured with its open side against the tank so that the interior thereof will be directly subjected to the temperature of the tank. The upper end of the casing 17 is substantially closed by a leaf 18 so as to prevent too much updraft through it, but a restricted passage is provided near the tank surface, as at 19 (see Fig. 5), so that there will be a slight circulation of air immediately adjacent the tank surface.

In the upper end of the casing 17 is a bolt 20, having a sleeve 21 and a nut 22, between the latter two elements of which is firmly secured the upper end of a strip of thermostatic metal 23. This strip is of the well known bi-metal class, comprising two kinds of metal having different co-efficients of expansion, whereby it is caused to bend or be distorted upon being subjected to variations in temperature. When comparatively cool the strip is straight, but when heated will bend toward the tank as shown by the dotted lines in Fig. 5.

Co-operating with the lower or movable end the thermal strip 23 is a latch or dog 24 having an end tooth 25 for engagement under the end of the strip. This latch operates through a slot 26 in the front wall of the casing 17, and is pivotally secured by a pin 27, carried by the side walls of the casing. The outer end of the latch is slightly heavier than the inner end, so that when it is released from the thermal strip it will drop to the position shown by dotted lines in Fig. 6, where it stops at the lower end of the slot 26. The latch 24 is further provided with a notch 28 adapted to be engaged by a lug 29 of the lever 14.

The members 14 and 24 are normally in the positions shown in full lines in Figs. 1, 4, 5 and 7, and remain so as long as the hot water level in the tank is above the point of the cut-off device N. As the volume of hot water increases, however, this level lowers and as the tank surface adjacent the cut-off becomes heated by the water the thermal strip will also become heated, and will move to release the latch 24, and as this is done the notch 28 releases the lug 29, permitting the lever 14 to be pulled or raised to the dotted line position shown in Fig. 5. When the lever 14 is later released it drops down, aided by a spring 30, the lug 29 re-engages the notch 28 and the latch 24 is restored to its initial position. If the thermal strip 23 has cooled, in the mean time, so as also to be restored to its initial position, the tooth 25 will snap under it, as indicated in Fig. 6, the strip 23 flexing enough for this purpose. As the tooth 25 exerts some pressure upwardly against the strip 23 the resistance might frequently be sufficient to prevent the strip from snapping out to release the catch, i. e., instead of the lower end of the strip moving off of the latch its middle portion would tend to bow in the other direction or away from the tank. To overcome this difficulty I provide an L-shaped piece of metal 31 adjacent to the strip. This piece has its upper end secured, by the bolt 20, between the sleeve 21 and the strip proper, while its lower end terminates in a horizontal leg which abuts against the front wall of the casing and has a notch 32 which permits freedom of movement to the lever 14. The member 31 is rigid at all times, it not temperature influenced, and, as it backs up substantially the entire strip 23 it will be seen that the latter cannot bow, but can respond to an increase of temperature only by moving its lower end away from the latch 24 to release the same. It may here be noted that the strip 23 may be adjusted so as to effectively respond to any predetermined degree of temperature desired, by a set screw 32 which screws in the casing 17 and operates through a hole 33, in the member 31, so as to contact with the thermal metal, and is preferably provided with a lock nut 34.

It will now be seen that when the pulley 13 is raised it will not affect the lever 14 (when the tank A is cold), but will raise only the lever 10*a* of the valve actuator M. When this is done the burner F of the heater C is ignited, and as the coils B become heated, hot water will start to accumulate in the upper part of the tank. When a sufficient amount of hot water is heated the pulley 13 may be lowered, by releasing the pull chain in one of the rooms upstairs, but if this is not done within a reasonable time, or if the occupant should leave the building and forget the heater, no harm will be done, because as soon as the predetermined amount of water is heated, the lever 14 will be released, and under the action of the spring 11 will move up giving enough slack to the chain 12 so that the actuator arm 10*a* may drop, permitting the valve to close. When hot water is then drawn off or if the tank merely cools of itself, the thermal strip is restored to its original latch-holding position. Lowering of the pulley 13 will now permit the tank cut-off to return to its initial condition (under the influence of the spring 30 and the weight of the lever 14), after which the entire device is again in readiness to be operated to light the heater. It may be noted that with this hook-up it is impossible to heat more than a certain amount of hot water, regardles of how

often the device may be actuated from upstairs in the building.

The device is controlled from either of such rooms in the building as may be provided with control stations. In the present instance two stations O and P may be conveniently considered as being arranged in the kitchen and bath room respectively, of a dwelling. One of these stations is shown in detail in Fig. 2, and may be described as follows: A wall plate 35, similar to an electric light switch plate, is secured upon the wall at any suitable place such as above a sink, and is provided with a tubular member 36 which extends in through a hole in the plaster and lath so that it will terminate in the hollow part of the wall, and is there turned down in a goose neck portion 37, so as to form a curved bearing for the pull chain 38. The member 36 is secured to the plate 35 by nuts 39, and at an intermediate point between its ends is provided with a hole 40 in which is arranged a ball 41. This ball is held in place, and is yieldingly pressed down against the chain 38 by a spring 42, which has one end rigidly secured to the member 36, as at 43, while its other end is provided with a finger lift hook 44. The tension of the spring 42 against the ball 41 is such that it will normally retain the chain in its drawn position (as against the pull by the spring 11) but a greater pull than exerted by the spring 11 will cause the chain to slip under the ball. The chain 38 passes over suitable pulleys 45, and its ends are respectively threaded through the stations O and P, being provided with terminal members 46 and 47, which serve as gripping members and also act as stops to limit the retraction of the chain ends through the stations. The chain 38 also passes under a pulley 48 which is connected to the pulley 13 by a tie link 49. A pair of weights 50 are carried by the chain and while serving to take up the slack in the chain, they also assist the spring 11 to lower the chains when released at the stations; and also act as stops to prevent the upper chain to cause too hard a pull on the lower chain and thus causing any damage to the units N or M. Thus when the chain 38 is pulled through the station O, the left weight 50 (as seen in Fig. 1) stops against a plate 51 as soon as the pull on the chain 12 is sufficient to operate the valve actuator M, and, in a similar manner the right weight 50 will stop against the adjacent pulley 45. The weights are preferably cored, as shown in Fig. 3, and are secured by substantially V-shaped wires 52 which may first be secured in any desired link of the chain, after which the weight is slipped down upon it.

It will now be seen that when the hand piece 46 is pulled, at station O, until the left weight 50 meets the stop 51, the chain 38 will raise the twin pulleys 13 and 48 until the arm 10*a* is lifted to light the burner. By lifting the hook 44, at station O, the burner will be extinguished, or, as previously explained, if this is forgotten then the burner will be automatically extinguished, by the action of the cut-out N, as soon as a predetermined amount of water is heated. It will of course be understood that to vary this volume of hot water, it is only necessary to move the unit N up or down on the tank and correspondingly shorten or lengthen the chain 12.

The operation of the device is the same from station P. It is also possible to light the heater from one station and manually extinguish it from the other station, as follows: As shown in Fig. 1, the heater has been lighted from station O. To extinguish it from station P, the operator pulls the terminal member 47 until the chain has been drawn back through station O. This has no effect on the chain 12 as the pulleys 13, 48 are in their uppermost position. But when the operator then releases chain 38 by lifting the hook 44 at station P, it will be seen that the chains 38 and 12, as well as the members 13, 48, 50 and 10*a* will all be restored to their lower or initial positions.

It is frequently desired to employ only one station. In that event, if P designates such a station, then the opposite end of the chain 38 is anchored to a permanent support, as at 53 in Fig. 1.

It is understood that suitable modifications may be made in the general design and structural details of the invention as herein shown, provided, however, that said modifications come within the spirit and scope of the appended claims. Having now therefore fully shown and described my invention, what I claim to be new and desire to protect by Letters Patent is:

1. A mechanism for controlling the burner of a water heating system having a tank for containing the heated water, comprising an actuator for lighting the burner a thermostatic release unit positioned on the tank and having a strip of bi-metal one end of which is rigidly anchored to the unit and the other end of which is free to move from a predetermined position when the strip bends under the action of change in temperature, a lever member carried by the release unit and releasably associated with the said free end of the bi-metal strip, and an operative connection between the lever and actuator.

2. A mechanism for controlling the burner of a water heating system having a tank for containing the heated water, comprising an actuator for lighting the burner, a thermostatic release unit positioned on the tank and having a strip of bi-metal one end of which is rigidly anchored to the unit and the other end of which is free to move from a predetermined position when the strip bends under the action of change in temperature,

and a pair of interlocking levers carried by the release unit, one of said levers being releasably associated with the free end of said bi-metal strip, and means for connecting the other lever to the valve actuator.

3. A mechanism for controlling the burner of a water heating system having a tank for containing the heated water, comprising an actuator for lighting the burner, a thermostatic release unit positioned on the tank and having a strip of bi-metal one end of which is rigidly anchored to the unit and the other end of which is free to move from a predetermined position when the strip bends under the action of change in temperature, and a pair of interlocking levers carried by the release unit, one of said levers being releasably associated with the free end of said bi-metal strip, and the other lever being operatively connected to the valve actuator, and spring means tending to retain the levers in their normal interlocked positions.

4. A mechanism for controlling the burner of a water heating system having a tank for containing the heated water, comprising an actuator for lighting the burner, a thermostatic release unit positioned on the tank and having a strip of bi-metal one end of which is rigidly anchored to the unit and the other end of which is free to move from a predetermined position when the strip bends under the action of change in temperature, a lever member carried by the release unit and releasably associated with the said free end of the bi-metal strip, an operative connection between the lever and actuator, and spring means tending to restore the lever to operative engagement with the bi-metal strip after having been released therefrom.

5. The combination with a fuel valve actuator of a hot water heating system having a tank, of a thermostatic release mechanism comprising a frame mounted on the tank, a strip of bi-metal having one end rigidly anchored to the frame with its other end free to move from a predetermined position when the strip bends under the action of change in temperature, a latch lever carried by the frame and releasably associated with the free end of said strip, a second lever connected with the valve actuator and pivoted to the frame for interlocking engagement with the latch lever, and means tending to retain the levers with the latch lever in engagement position with the bi-metal strip.

6. The combination with a fuel valve actuator of a hot water heating system having a tank, of a thermostatic release mechanism comprising a frame mounted on the tank, a strip of bi-metal having one end rigidly anchored to the frame with its other end free to move from a predetermined position when the strip bends under the action of change in temperature, a latch lever carried by the frame and releasably associated with the free end of said strip, a second lever connected with the valve actuator and pivoted to the frame for interlocking engagement with the latch lever, and means tending to retain the levers with the latch lever in engagement position with the bi-metal strip, one of said levers having a tooth and the other lever having a notch to receive the said tooth.

In testimony whereof, I affix my signature.

RICHARD H. SHADRICK.