J. HARRINGTON.

THERMOSTATIC VALVE FOR WATER BACKS.

APPLICATION FILED APR. 23, 1906.

951,439.

Patented Mar. 8, 1910.

2 SHEETS—SHEET 1.

Fig. 1.

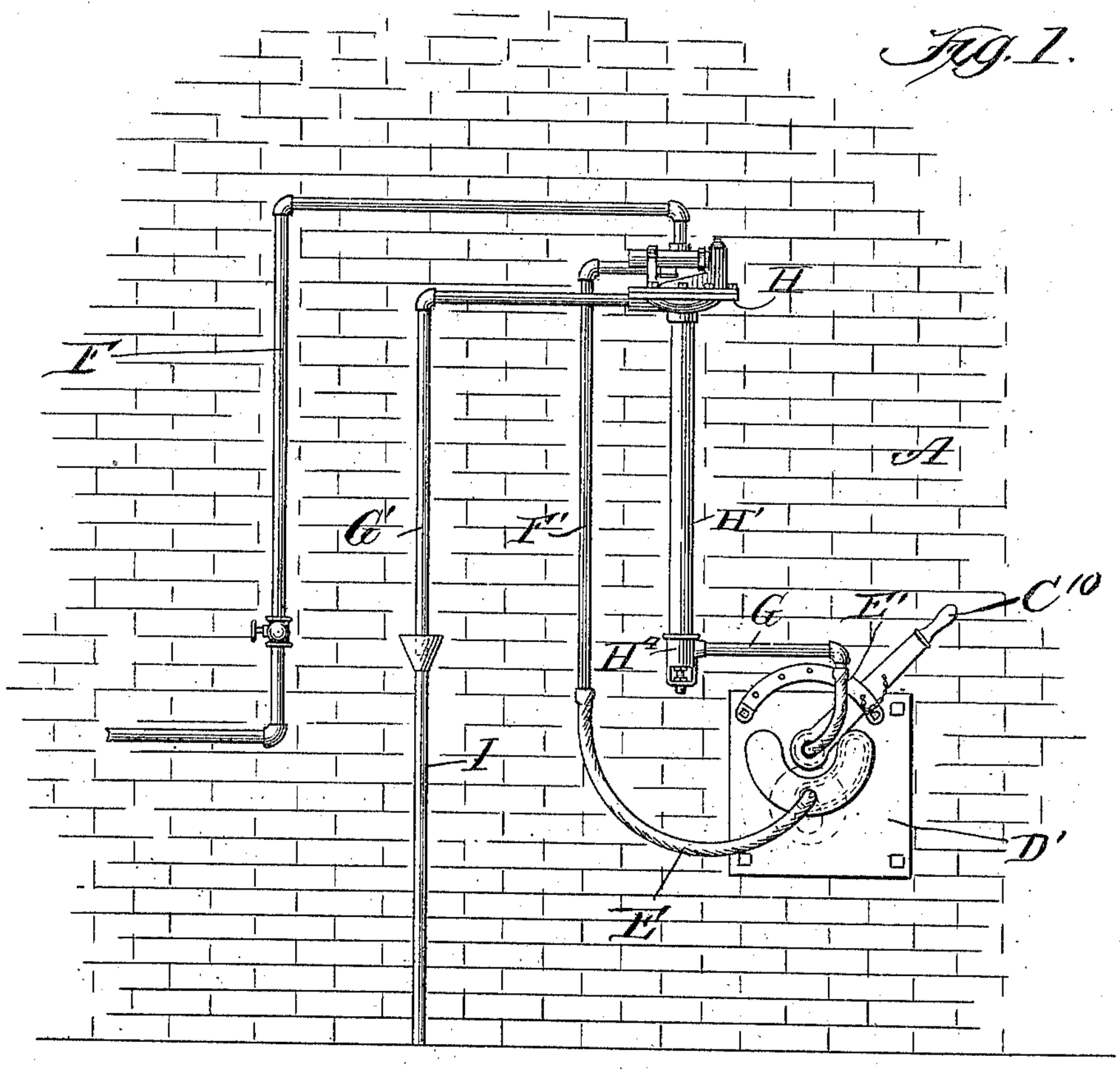
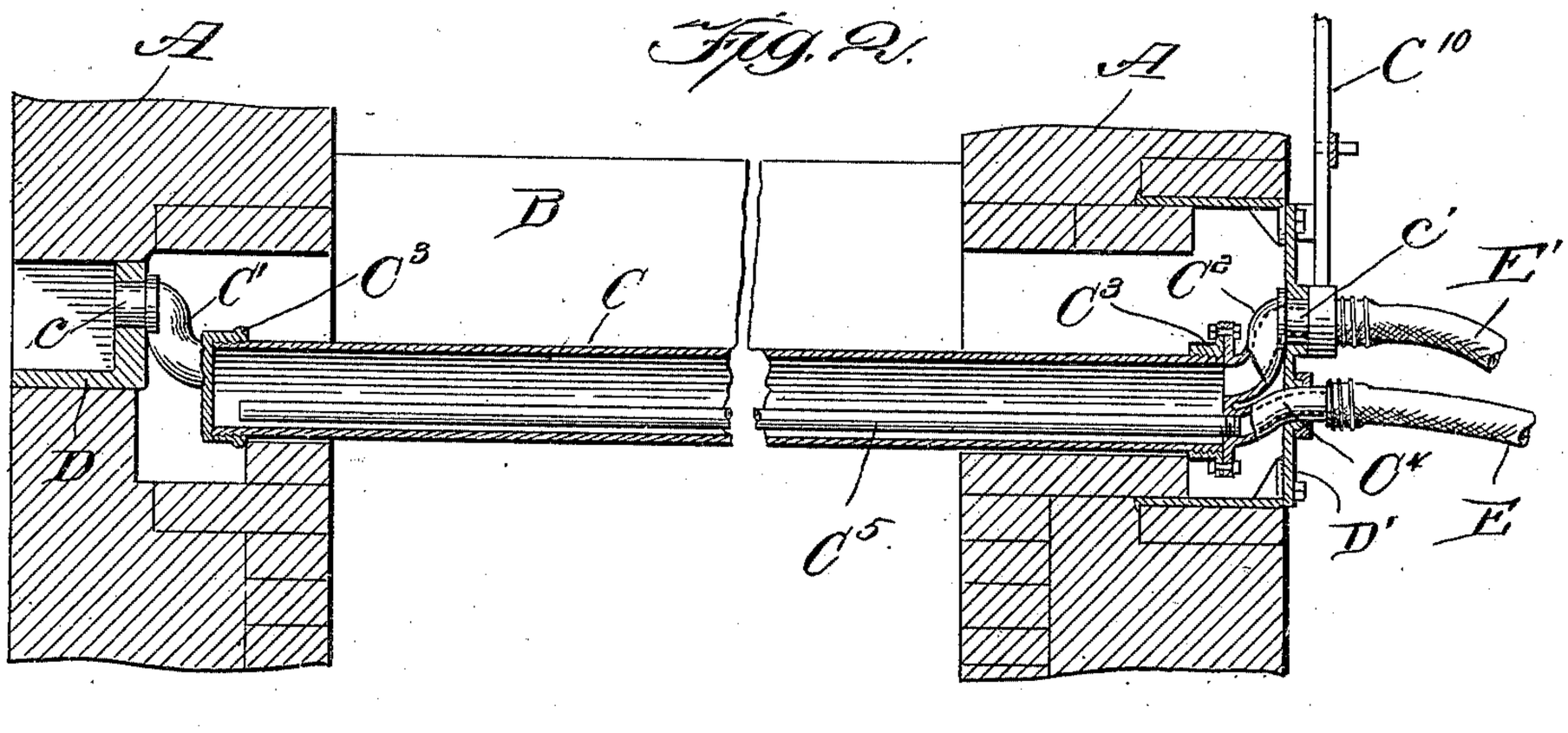


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 3.

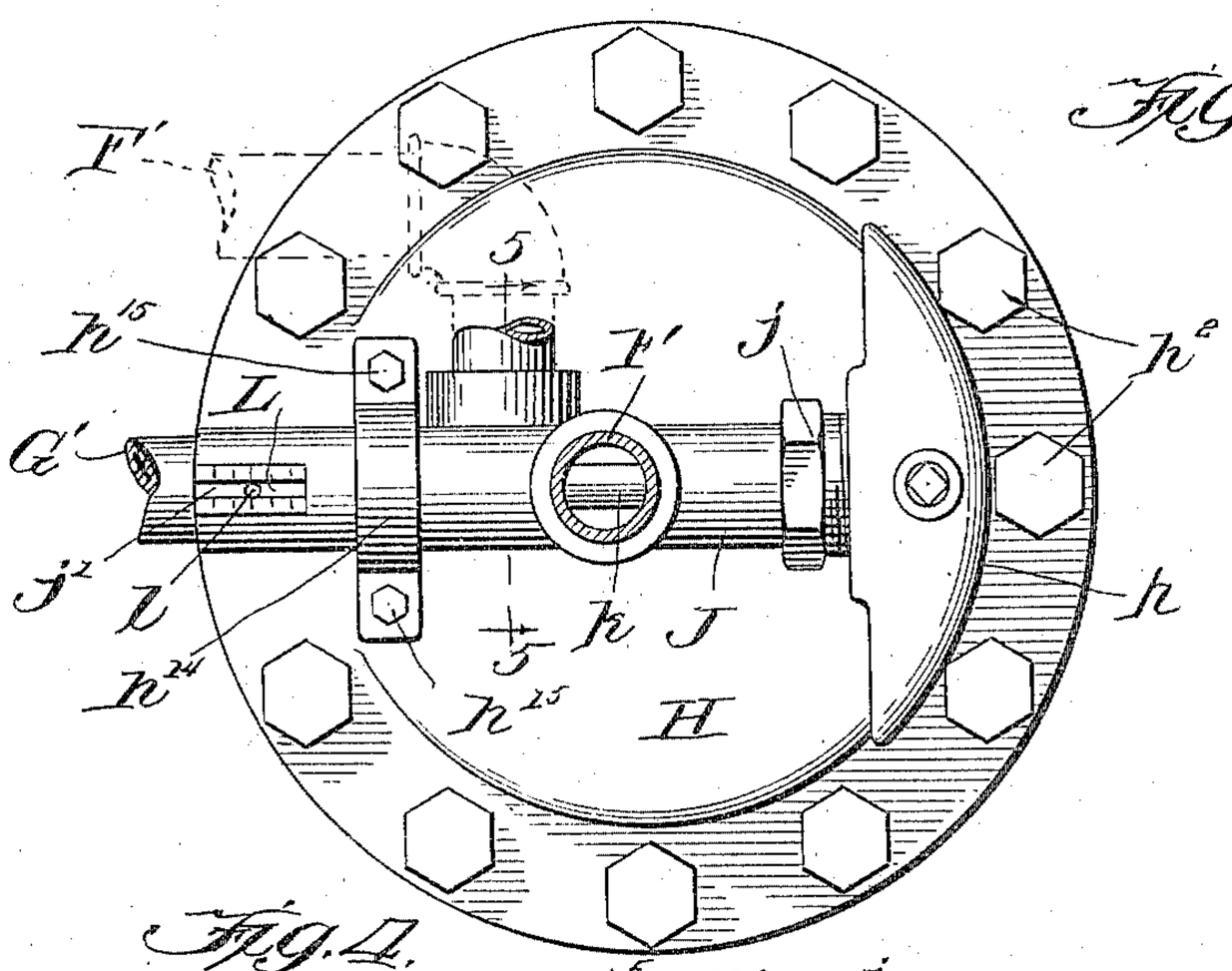

Fig. 4.

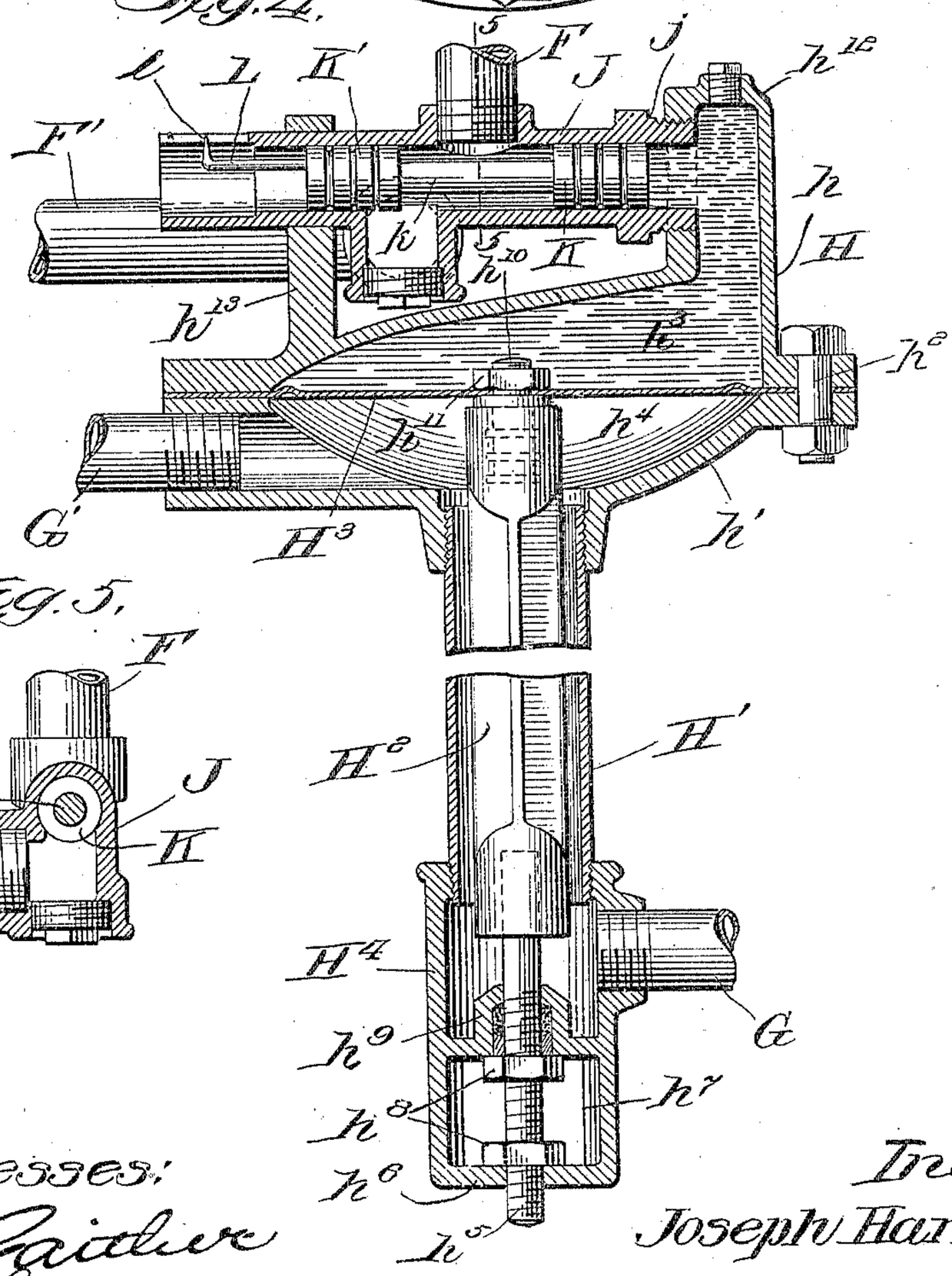

Fig. 5.

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UNITED STATES PATENT OFFICE.

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THERMOSTATIC VALVE FOR WATER-BACKS.

951,439. Specification of Letters Patent. Patented Mar. 8, 1910.

Application filed April 23, 1906. Serial No. 313,245.

To all whom it may concern:

Be it known that I, JOSEPH HARRINGTON, a citizen of the United States, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Thermostatic Valves for Water-Backs; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to a novel apparatus for controlling the supply of cool water to the water cooled member of a boiler furnace, such for instance, as the bridge wall of the furnace, and the invention consists in the matters hereinafter set forth and more particularly pointed out in the appended claims.

Among the objects of the invention is to provide an apparatus for this purpose which will economize the use of water employed to cool the water cooled member of the furnace.

A further object of the invention is to provide an apparatus which operates responsively to the temperature of the water passing through the water cooled member to maintain said water cooled member and the water therein at a substantially uniform temperature. To this end I propose to deliver the cool water to the water cooled member through a pipe provided with a thermostatically controlled regulating valve, the thermostatic controlling member of which operates under the influence of the heated water discharged from the water cooled member to vary the amount of water delivered to the water cooled member.

In the present instance my improvements are shown as applied to a movable bridge-piece of a bridge-wall of that character set forth in my pending application, Serial No. 226,417, filed September 28th, 1904, but said improvements may be applied to any water cooled member of the furnace to which it may be adapted.

As shown in the drawings:—Figure 1 is a side elevation of a furnace showing a plate set in the furnace wall for supporting one end of the bridge-piece and illustrating my improved apparatus for directing cool water to and conducting hot water away from the water cooled member. Fig. 2 is a transverse section through the furnace, showing the bridge-wall and the bridge-piece partially in section. Fig. 3 is a top plan view of the thermostatic device for controlling the supply of water to the hollow bridge-piece. Fig. 4 is a central, vertical section thereof, partially broken away. Fig. 5 is a transverse section, taken on line 5—5 of Fig. 4.

As shown in the accompanying drawings, A A designate the side walls of a boiler furnance, B the overhanging part of the bridge-wall thereof, and C designates, as a whole, a tubular water cooled bridge-piece, which extends across the furnace beneath the bridge-wall, and is shown as made like the bridge-piece illustrated in my aforesaid application, Serial Number 226,417. Said bridge-piece is provided at its ends with trunnions c c^1 which are offset out of line with the axis of the bridge-piece, and which have rotative bearing in plates D D^1 fixed in any suitable manner in the side walls A A, respectively. Said trunnions are connected with the hollow bridge-piece by offset arms C^1, C^2, said arms being herein shown as made integral with said trunnions and with heads C^3 C^3 which are removably fixed to the ends of the tubular bridge-piece. Said bridge-piece swings, in the manner described in my aforesaid application, in contact with the bridge-wall toward and from the grate of the furnace, and is swung to an adjusted position and locked therein through the medium of a suitable hand-lever C^{10}.

The trunnion c^1 and the associated arms C^2 are made hollow and constitute one of the water passages through which passes the water that cools the bridge-piece, this passage constituting, as herein shown, the outlet passage. The head C^3 adjacent to the hollow trunnion C^2 is provided with a hollow nipple C^4 which extends laterally outwardly through a curved elongated opening in the supporting plate D^1 disposed concentric with the axes of the trunnions. The passage in said hollow nipple constitutes the inlet water passage. The said inlet nipple C^4 is connected with a pipe C^5, that is located within the tubular bridge-piece and extends to the end of said bridge-piece remote from the nipple C^4, whereby the in-

coming or cool water is delivered to said remote end of the bridge-piece. Communicating with said hollow nipple C^4 and the hollow trunnion c^1 are pipes E E^1, herein shown as made flexible, through which water is directed to and conducted from the hollow bridge-piece.

My improved mechanism for controlling the flow of water through said hollow bridge-piece is shown in operative position in Fig. 1, and in detail in Figs. 3 to 5, inclusive. The form of apparatus herein shown comprises a thermostatically controlled valve located in the supply pipe F which supplies cool water to the hollow bridge-piece, and the outgoing or heated water conducted from the hollow bridge-piece flows in contact with the thermostatic member of the valve, whereby the supply of cool water to the bridge-piece is regulated responsively to the temperature of the water after it has passed through the bridge-piece. The part of the water supply pipe between the said thermostatically controlled valve and the flexible inlet pipe E leading to the inlet passage of the bridge-piece is designated by the reference letter F^1. A pipe G is connected with the flexible pipe E^1, which conducts the heated water from the bridge-piece to the chamber containing the thermostatic member of the thermostatically controlled apparatus. The said thermostatically controlled, cool water inlet valve comprises, in general terms, a hollow head H which supports the valve mechanism, and a tube H^1 which extends downwardly therefrom and incloses the thermostatic member of the valve, consisting, as herein shown, of a bar H^2. The head H is divided into upper and lower members h h^1, respectively, secured together by bolts h^2 extending through the margins of the members. H^3 designates a diaphragm which divides said hollow head into upper and lower chambers h^3 h^4, and the margins of said diaphragm are confined between the margins of the members of the head. The thermostatic member H^2 is anchored at its lower end in a fitting H^4 rigid with the tube, and is connected at its upper end centrally with the diaphragm H^3. The hot water pipe G communicates with the lower end of the tube H^1 through said fitting H^4 and said tube is in open communication at its upper end with the lower chamber h^4 of the head, whereby the hot water conducted from the water cooled member flows over and through the thermostatic member. Said chamber h^4 is provided with an outlet pipe G^1 which conducts the heated water away from the apparatus to a waste pipe I, as herein shown. The fitting H^4 which has screw-threaded engagement with the lower end of the tube H^1 and said thermostatic bar is provided with a stem h^5 that extends downwardly through registering apertures in the bottom wall of said fitting and the horizontal member h^6 of a depending yoke, and the stem is fixed thereto by means of nuts h^8 h^8 screw-threaded on the stem and bearing against said yoke and the lower wall of the fitting. A suitable stuffing box h^9 prevents the escape of water around the stem. The means for attaching the upper end of the bar to the diaphragm consists of a screw-threaded stud h^{10} cast in the upper end of said bar and extending through the diaphragm H^3 and attached thereto by means of a nut h^{11}.

The valve mechanism for controlling the supply of cool water to the water cooled member is made as follows: J designates a tubular member, constituting a valve casing, supported on or made part of the head. Said casing is provided with an opening at its top to receive the cool water pipe F, and with an opening at its side to receive the pipe F^1. One end of said casing is provided with a screw-threaded partition j and the upper member of the head is provided with a vertical hollow extension h^{12} having a lateral screw-threaded opening which receives the screw-threaded end of said hollow member J. The other end of said tubular valve casing J rests on a flange or web h^{13} rising from the upper wall of the said upper member of the head on the side thereof remote from the extension h^{12}. Said web or flange is provided with a concave seat on which the tubular valve casing rests and the latter is fixed in place by means of a clip h^{14} that extends over said casing and is fastened to the web h^{13} by bolts h^{15}. Contained within said tubular valve casing J is a valve having the form of a balanced piston valve comprising two pistons K K^1 located one at each side of the inlet opening and a connecting stem k. The end of said tubular valve casing remote from the connection thereof with the vertical extension of the upper chamber of the head is open, so that the end of the piston valve K^1 is subject to atmospheric pressure.

The operative connection herein shown between the thermostatic member H^2 and the cool water regulating valve comprises the diaphragm H^3, and a body of liquid contained within the upper chamber of the head, said liquid filling the said chamber and that part of the tubular valve casing J in rear of the piston valve K. The position of the parts shown in Fig. 4 may be assumed to be the normal position of the parts when no water is being fed through the valve to the water cooled member of the furnace. Upon the admission of water to said water cooled member the water heated by its passage through said member is discharged through the tube H^1 over the thermostatic member and thence through the lower chamber h^4 of the head and pipe G^1. The said

thermostatic member is adjusted to operate the inlet valve to increase the flow of water to the water cooled member, when the temperature of the water flowing through said member is raised to a predetermined temperature. In other words, it is the purpose of the regulating apparatus herein shown to maintain the water passed through the water cooled member at a substantially uniform temperature and thereby avoid wide ranges of temperature in the water cooled member, tending, on the one hand, to subject the same to undue high temperature by reason of a lack of cooling water, and tending, on the other hand, to wasteful use of water by allowing cool water in too great quantities to pass through the water cooled member. To this end, therefore, the thermostatic member is so adjusted that when the water passing thereover reaches a given temperature, the said bar is expanded or elongated and thereby raises the diaphragm with the result of shifting the body of liquid in the chamber h^3 and moving the regulating valve outwardly to uncover to a greater or less extent the outlet port or opening of the valve casing J, with which communicates one portion F^1 of the cool water inlet pipe. This automatic adjustment provides for a greater inflow of cool water, with a result of correspondingly reducing the temperature of the water cooled member. As the temperature of the water is reduced in the water cooled member, such reduction of the temperature of the outflow reacts on the thermostatic bar with a result of contracting the same and depressing the diaphragm, and shifting the body of liquid downwardly, whereupon the regulating valve follows the receding liquid, due to the atmospheric pressure acting on the outer end thereof, with a result of limiting the supply of cool water to the water cooled member.

In the usual operation of the apparatus, when the furnace heat is maintained substantially uniform, the regulating valve varies but little from either side of a central or normal position. The apparatus is sensitive, however, to respond to increasing temperatures in the furnace tending to overheat the water cooled member and thereby avoids burning out said water cooled member. By reason of the regulation described only the amount of water required to economically cool the water cooled member is used, thereby effecting a great saving of water as compared to apparatus of this character provided with no regulating means.

If desired an indicating device may be employed designed to indicate the amount of water passed through the water cooled member, as well as also indicating the approximate temperature of the water discharged from the water cooled member. Such indicating device consists, as herein shown, of an arm L extending horizontally outwardly from the regulating valve and provided with an upturned finger l that extends upwardly into a longitudinally arranged groove j^1 formed in the open end of the tubular valve casing J. The said casing is provided at the sides of said slot with graduated marks with which the pointer or indicating finger l coöperates for the purpose set forth.

I claim as my invention:—

1. Means for controlling the flow of fluid through one passage, operated by changes in the temperature of fluid flowing through a second passage, embracing a valve-casing, a valve therein adapted to control the passage of fluid through said first passage, a casing provided with a flexible diaphragm dividing said casing into two chambers, one of said chambers being in communication with the valve casing and filled with liquid, and a thermostatic member located in the other of said chambers and connected with said diaphragm, the chamber in which said thermostatic member is located forming part of said second passage.

2. A regulating device for controlling the passage of liquid through a pipe, comprising a valve-casing connected with said pipe, a valve member in said casing adapted to control the passage of fluid through said pipe, a casing provided with a flexible diaphragm dividing the said casing into two chambers, one of which is in communication with said valve casing and is filled with liquid, and the other of which is provided with inlet and outlet passages, and a thermostatic member located in the latter chamber, said thermostatic member being connected with and adapted to actuate said diaphragm.

3. A thermostatic regulating device comprising a valve-casing, a casing provided with a diaphragm dividing the same into two chambers, one of which is in communication with one end of said valve-casing and is filled with liquid, a valve-piston in said valve-casing adapted to control the passage of fluid therethrough, and which is subject to the pressure of the liquid in said chamber, and a thermostatic member in the other of said chambers, connected with and adapted to actuate said diaphragm, said latter chamber being provided with inlet and outlet passages.

4. A thermostatic regulating device comprising a valve-casing having inlet and outlet ports, a casing provided with a flexible diaphragm dividing the casing into two chambers, one of which is filled with liquid and is in communication with one end of said valve-casing, a balanced valve-piston in said valve-casing, which is subject at one end to the pressure of liquid in the said

chamber and at its other end to atmospheric pressure, and a thermostatic member located in the other of said chambers and connected with said diaphragm, said latter chamber being provided with inlet and outlet passages.

In testimony, that I claim the foregoing as my invention I affix my signature in presence of two witnesses, this 20th day of April A. D. 1906.

JOSEPH HARRINGTON.

Witnesses:

C. CLARENCE POOLE,

G. R. WILKINS.