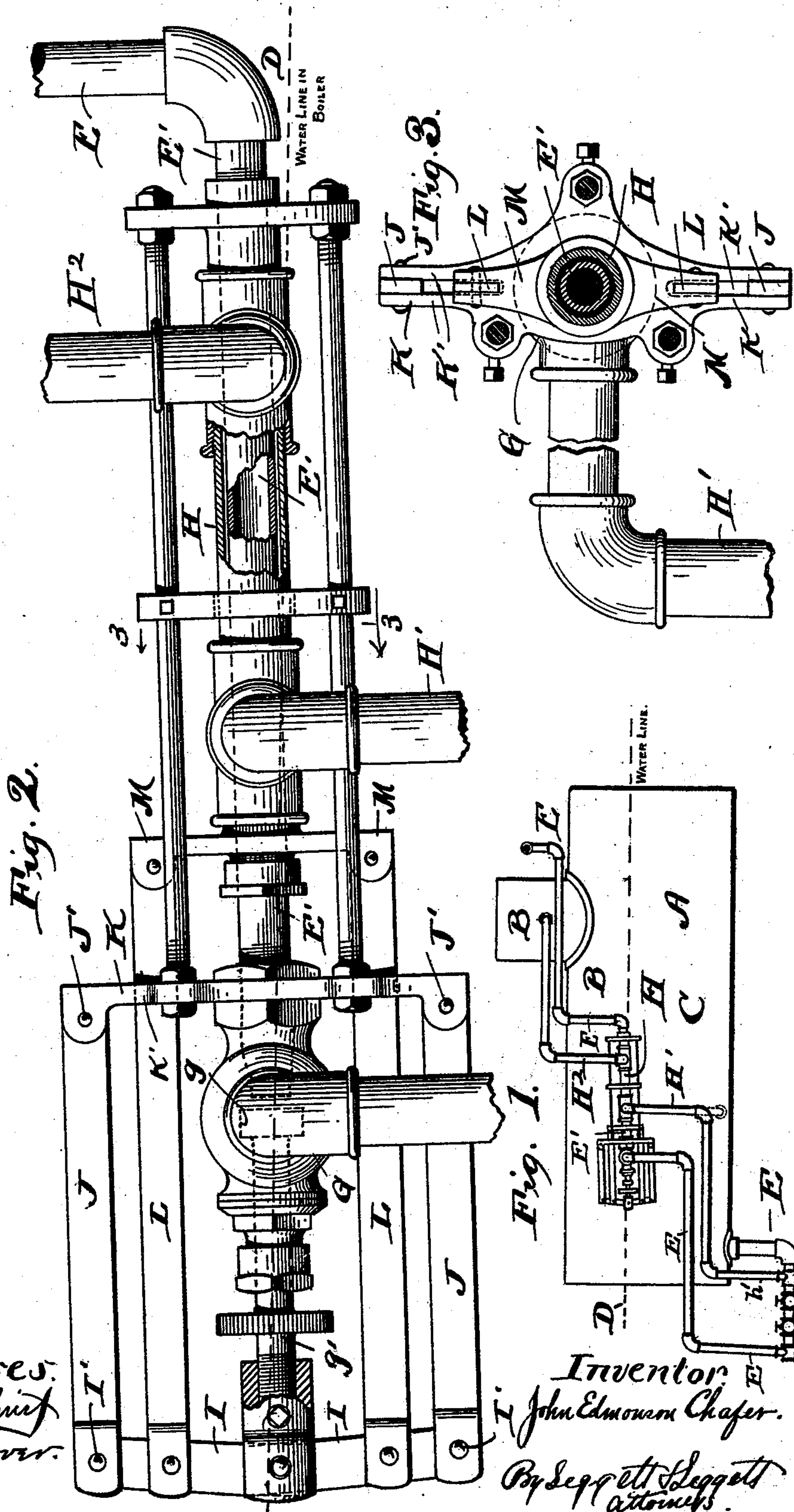


(No Model.)


J. E. CHAFER.
AUTOMATIC FEED WATER REGULATOR.

No. 512,804.

Patented Jan. 16, 1894.



Witnesses:
E. Byron Gilchrist
Ward Hoover.

Inventor 
 John Edmonson Chapin.
 By Leggett Leggett
 Attorneys.

UNITED STATES PATENT OFFICE.

JOHN EDMONSON CHAFER, OF CLEVELAND, OHIO.

AUTOMATIC FEED-WATER REGULATOR.

SPECIFICATION forming part of Letters Patent No. 512,804, dated January 16, 1894.

Application filed September 25, 1893. Serial No. 486,494. (No model.)

To all whom it may concern:

Be it known that I, JOHN EDMONSON CHAFER, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Automatic Feed-Water Regulators; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same.

My invention relates to improvements in automatic feed water regulators for steam-boilers or generators; and it consists, primarily, in the combination with the feed-water-supply-pipe, and a valve located in the line of the passage of the feed-water for regulating the supply of feed-water to the boiler, of a metallic tube or sleeve suitably mounted upon the feed-water-pipe, a pipe connected with said tube and opening into the dome or steam-space of the boiler; another pipe connected with said tube and extending to and opening into the lower portion of the water space of the boiler, or into the feed-water-pipe, and suitable means or apparatus operatively connecting the aforesaid tube or sleeve with the valve in such a manner that when the water within the boiler falls below the water line the expansion of the sliding-tube or sleeve resulting from the heat imparted thereto by means of the pipe connecting it with the steam-space of the boiler, will operate the aforesaid valve-actuating mechanism to open or still farther open the valve and thereby permit more water to pass to the boiler and so that when the water in the boiler has again reached the desired level the water shall have ascended within the pipe connecting said sliding-tube or sleeve with the water-space in the boiler or feed-water-pipe and cool and contract said tube or sleeve, thereby actuating the latter in the direction to operate the valve-actuating mechanism to close the valve.

My invention consists also in certain features of construction and in combinations of parts hereinafter described and pointed out in the claims.

In the accompanying drawings, Figure 1 is a side elevation of a boiler provided with my improved automatic feed-water-regulating apparatus. Fig. 2 is a side elevation of the

feed-water apparatus detached, partly in section to more clearly show the construction and showing the same also in its position relative to the desired level of water in a steam-boiler or generator. Fig. 3 is a section on line 3—3, Fig. 2, looking in the direction of the arrow.

Referring to the drawings, A represents a steam-boiler or generator; B the steam-space thereof; C the water-space, and D the water-line or level that it is desired to maintain within the boiler.

E designates the feed-water-pipe that leads from the pump (not shown) to and opens into the bottom of the boiler. The feed-water pipe comprises a section, E', that is located in approximately the same horizontal plane with the water-line or water-level that it is desired to maintain in the boiler. Pipe-section E', at one end, is provided with a valve-casing G, and g designates the valve located within said valve-casing, said valve being adapted to regulate or control the supply of water to the boiler. Said valve is automatically opened or closed according as the level of the water in the boiler falls below or assumes the water-line desired to be maintained within the boiler, and the means or mechanism for thus automatically actuating said valve is as follows:— Upon section E' of the feed-water-pipe is suitably mounted a tube or sleeve, H, the latter being situated a suitable distance from valve-casing G. A pipe H' rigidly connected with tube or sleeve, H, preferably with the portion of the tube or sleeve that is located nearest to valve-casing G, leads to and opens into the lower portion of the water-space of the boiler as shown in dotted lines at h, Fig. 1, or into the feed-water-pipe as shown in solid lines at h' in same figure. A pipe H², rigidly connected with tube or sleeve, H, preferably to the portion of said tube or sleeve that is located farthest from valve-casing G, leads to and opens into the steam-space of the boiler. (See Fig. 1.) Section E' of the feed-water-pipe being located approximately in the same horizontal plane with the water-line desired to be maintained in the boiler, it follows that when the water in the boiler is up to the desired level, pipe H' is approximately filled with water and consequently tube or sleeve H is kept in a comparatively cool condition. But when the water in the boiler falls below the

level required, the water also descends in pipe H' permitting the portion of tube or sleeve H located next adjacent valve-casing G to be expanded from the heat imparted to the same by means of pipe H² that, as already indicated, communicates with the steam-space of the boiler. From the construction just described, it follows that if valve *g* were operatively connected with the adjacent end of tube or sleeve H, said valve would be opened or closed according as tube H were expanded or contracted, and would thereby automatically regulate the supply of feed-water to the boiler, so that the desired level of water in the boiler would always be had. Suitable means or mechanism for establishing operative connection between said valve and tube or sleeve H is therefore provided, and a preferable construction is shown very clearly in Figs. 2 and 3 of the drawings, wherein the valve-stem *g'*, at its outer end, is operatively connected, in any suitable manner, with two levers, I, that extend approximately in opposite directions, respectively, and are fulcrumed at their outer ends, as at I', to the one end of links or bars, J, arranged parallel with the valve-stem and pivoted at their other end, as at J', to and between the outer forked extremities K' of a yoke, K, rigidly secured to valve-casing G. Levers I, at any suitable point between their fulcrum and their connection with the valve-stem, are operatively connected, respectively, by means of a link L, (that extends preferably through the adjacent forked extremity of yoke K,) with a yoke M in common, yoke M being rigidly secured or operatively connected with tube or sleeve H. By the construction just described, it will be observed that any tendency to pull the valve-stem laterally during the actuation of the valve is avoided. Section E' of the feed-water pipe and the valve-actuating mechanism operating-tube mounted on said pipe declines preferably somewhat toward the valve as shown, so that all sides of the tube or sleeve shall be more uniformly contracted or expanded in the operation of the device.

What I claim is—

1. The combination with the feed-water-pipe for a steam-boiler or generator and a valve located in the line of said pipe for regulating or controlling the supply of water to the boiler, of an expansible and contractible member located in the same or approximately the same plane with the water level desired to be maintained in the boiler, a pipe in open relation with the steam space of the boiler and rigid with said expansible and contractible member, another pipe in open relation with the water-space of the boiler or feed-water-pipe and also rigid with the aforesaid expansible and contractible member, a stationary yoke, K, two bars, J, secured to opposite ends of the yoke, respectively, and arranged parallel or approximately parallel with the valve-stem, levers operatively connected with

the valve-stem and fulcrumed to said bars, a yoke operatively connected with the aforesaid expansible and contractible member and links operatively connecting the aforesaid levers with said yoke, the arrangement of parts being substantially as and for the purpose set forth.

2. The combination with the feed-water-pipe for a steam-boiler or generator and a valve, located in the line of said pipe, for regulating or controlling the supply of water to the boiler, of an expansible and contractible tube or sleeve mounted on the feed-water-pipe at the elevation of the water-level or water-line desired to be maintained within the boiler; a pipe, rigidly connected with said sleeve or tube, in open relation with the steam-space of the boiler, another pipe, in open relation with the water-space of the boiler or feed-water-pipe, rigidly connected with said tube or sleeve, and suitable means or mechanism operatively connecting said tube or sleeve with the valve in such a manner that the valve shall be actuated to open or close according as said tube or sleeve is expanded or contracted, substantially as set forth.

3. The combination with the feed-water-pipe for a steam-boiler or generator, said pipe comprising a section located in the same or approximately the same plane with the water-level or water-line desired to be maintained within the boiler, and a valve located at one end of said pipe section for regulating or controlling the supply of water to the boiler, of an expansible and contractible tube or sleeve mounted upon said pipe-section; a pipe, rigid with said sleeve or tube, in open relation with the steam-space of the boiler; another pipe, rigid with said sleeve or tube, in open relation with the water-space of the boiler or feed-water-pipe, and suitable lever-mechanism operatively connecting said tube or sleeve with the valve in such a manner that the latter shall be actuated to open or close according as said tube or sleeve is expanded or contracted, substantially as set forth.

4. The combination with the feed-water-pipe for a steam-boiler or generator and a valve located in the line of said pipe for regulating or controlling the supply of water to the boiler, the feed-water-pipe comprising a section located in the same or approximately the same plane with the water-line or water-level desired to be maintained within the boiler but declining somewhat toward the valve, of an expansible or contractible tube or sleeve mounted on said pipe-section; a pipe, rigid with said tube or sleeve, in open relation with the steam-space of the boiler; another pipe, rigid with said sleeve or tube, in open relation with the water-space of the boiler or feed-water-pipe, and suitable means or mechanism operatively connecting the tube or sleeve with the valve in such a manner that the valve shall be actuated to open

or close according as said tube or sleeve is expanded or contracted, substantially as set forth.

5 The combination with the feed water-
pipe for a steam-boiler or generator and a
valve located in the line of said pipe for regu-
lating or controlling the supply of water to
the boiler, of an expansible or contractible
tube or sleeve mounted on the feed-water-
10 pipe in the same or approximately the same
plane with the water-level desired to be main-
tained in the boiler; a pipe, rigid with said
tube or sleeve, in open relation with the steam-
space of the boiler; another pipe rigid with
15 said sleeve or tube, in open relation with the
water-space of the boiler or feed-water-pipe,
a stationary-yoke, K, two bars, J, secured to

opposite ends of said yoke, respectively, and
arranged parallel or approximately parallel
with the valve-stem, levers operatively con- 20
nected with the valve-stem and fulcrumed to
said bars, a yoke operatively connected with
the aforesaid expansible and contractible
tube or sleeve and links operatively connect-
ing the aforesaid levers with said yoke, the 25
arrangement of parts being substantially as
and for the purpose set forth.

In testimony whereof I sign this specifica-
tion, in the presence of two witnesses, this 27th
day of May, 1893.

JOHN EDMONSON CHAFER.

Witnesses:

C. H. DORER,
WARD HOOVER.