

A. M. CUMMING & W. RHODES.

Boiler-Attachments.

No. 149,030.

Patented March 31, 1874.

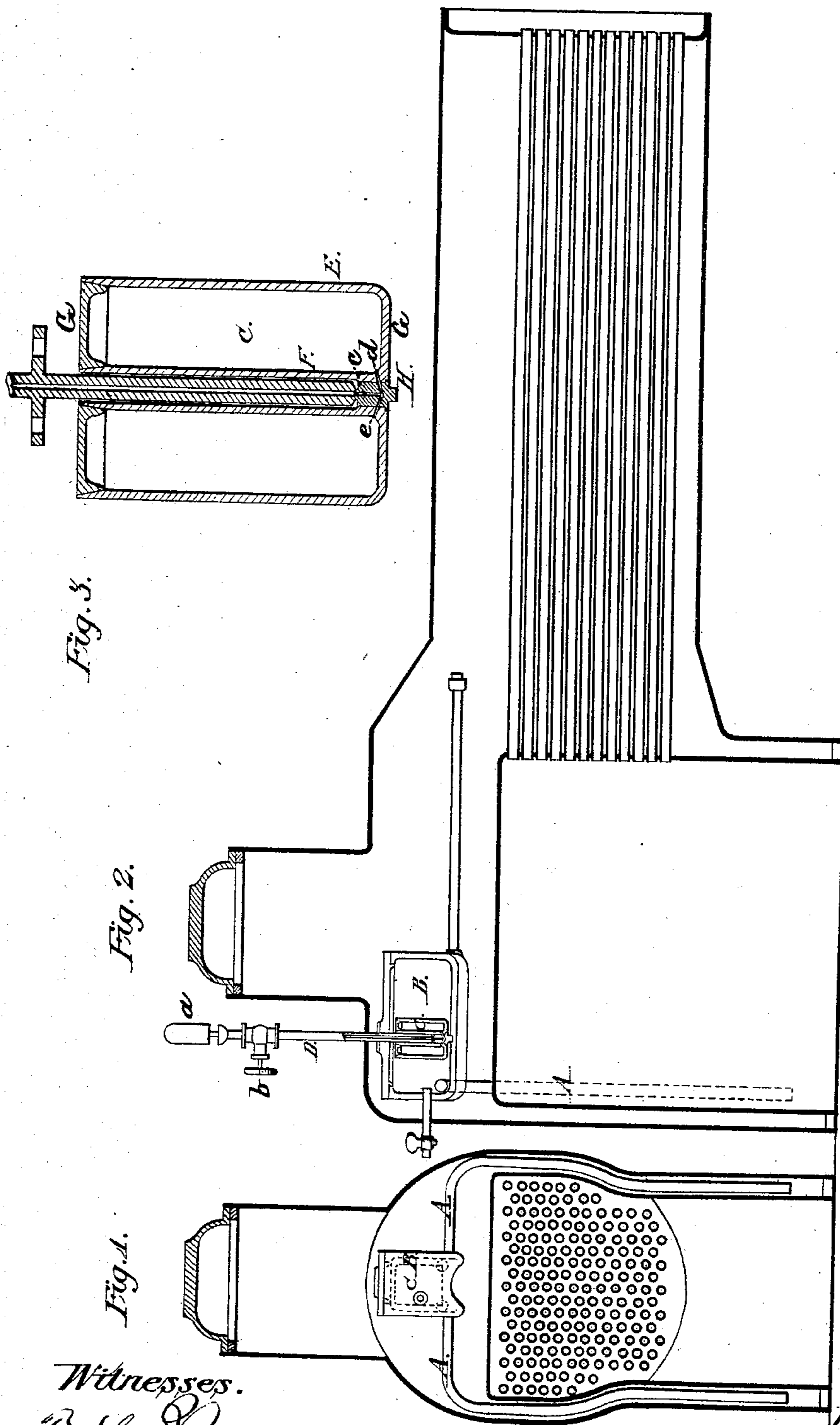


Fig. 3.

Fig. 2.

Fig. 1.

Witnesses.

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## IMPROVEMENT IN BOILER ATTACHMENTS.

Specification forming part of Letters Patent No. **149,030**, dated March 31, 1874; application filed February 27, 1874.

*To all whom it may concern:*

Be it known that we, ALEXANDER M. CUMMING, of the city of Elizabeth, in the county of Union, in the State of New Jersey, and WILLIAM RHODES, of the city, county, and State of New York, have invented certain new and useful Improvements in Steam-Boilers, of which the following is a specification:

This invention has reference to certain new and useful improvements in steam-boilers, whereby means are provided for heating the water admitted at the lower part of the boiler by conducting the cold water into a reservoir or receiver located in the steam-space of the boiler, or partially below the water-line and partially within the steam-space, the water being forced into said receiver through pipes, arranged one on each side of the boiler, by the steam-pressure in the boiler, so as to cause it to be heated to such an extent as will insure the generation of steam, which then forces the heated water back into the lower part of the boiler. The invention further consists in arranging within the reservoir receiving water from the bottom of the boiler a float, which slides vertically on a pipe in such a manner that, when the reservoir is filled with water, the float will close said pipe to enable the generation of steam to take place, and as soon as the steam has reached its maximum pressure, to force the heated water back again into the boiler, the float will fall and expose the discharge-orifice in the pipe on which it slides, so as to enable the steam to pass off into the external atmosphere, thus creating a partial vacuum in the reservoir, which is immediately filled by the influx of cold water from the boiler. The invention further consists in constructing the float of two concentric cylinders or shells closed at the top and bottom, and placed in such relation to each other as to form an intervening space, which is filled with cork or other light material, the base of the inner cylinder being provided with apertures which are always in direct communication with the hollow stem or relief-pipe, so as to enable such water or steam as may penetrate the float to pass off through the relief-pipe.

In the accompanying drawings, Figure 1 is

a longitudinal sectional view of a steam-boiler representing our invention applied thereto. Fig. 2 is a transverse section of the same. Fig. 3 is a detail vertical sectional view, representing the float and relief-pipe.

The letter B designates a reservoir or chamber, which may be located entirely in the steam-space of the boiler, or partially below the water-line and partially within the steam-space, the latter arrangement being preferred in order to locate the reservoir as near the crown-sheet or tubes of the boiler as is practicable, to absorb all the heat as rapidly as possible when the water falls below its proper or usual level. The reservoir, located as described, is provided with pendent tubes A, arranged one on each side of the boiler, and extend to the lower part of the boiler for conducting the cold water from the bottom into the reservoir, the elevation of the water being effected through the medium of the surface steam-pressure in the boiler. The cold water admitted into the reservoir, becoming highly heated, is measurably or entirely evaporated, and upon the occurrence of this result the heated water is automatically conducted into the boiler by the pressure of the steam in the reservoir, which pressure is then removed after having performed its function by means of a relief or escape pipe, D. Said pipe is surrounded by a float, C, which operates in such a manner that when the water from the boiler is forced into the reservoir the float will be raised so as to act as a valve for closing the lower end of the relief-pipe. The heating of the water and the generation of steam are then permitted to take place in the reservoir, and as soon as the steam has attained its maximum pressure it will tend to drive the heated water back into the boiler, which causes the float to fall, thus uncovering the lower end of the relief-pipe for permitting the steam in the reservoir to pass out through the relief-pipe into the external atmosphere, a gage or whistle, *a*, and stop-cock *b* being also combined with said pipe, together or separately. The removal of the steam-pressure from the reservoir will create a partial vacuum in the same, which is immediately filled by the efflux of fresh water from the boiler, and thus a con-

tinuous circulation of the cold water from the bottom of the boiler into the reservoir is permitted to take place.

By means of this invention, it will be perceived that an automatic forcing up of the colder water from the boiler into the reservoir, and return of the same water when heated or evaporated, is continued so long as the water in the lower part of the boiler is colder than the steam in the steam-chamber. Furthermore, by our invention, an equal expansion is also produced in all parts of the boiler, thereby preventing leakage, ruptures, and explosions, and insuring a more general diffusion of heat, and enabling more steam to be generated by a stated quantity of fuel to prevent what is termed "framing" and the superheating of steam.

The float C, operating on the hollow stem or relief-pipe D for the object above stated, is composed of two concentric cylinders or shells, E F, which are connected at top and bottom by heads G, so as to form an intervening space between the two cylinders, which is designed to be filled with cork or other light material. The inner cylinder is made smaller than the outer one, and its internal diameter is somewhat larger than the diameter of the relief-pipe so as to enable the float to rise and fall freely on the latter, and to form a space for the downward passage of the steam from the reservoir into the relief-pipe. A valve or plug, H, constitutes the bottom of the inner cylinder of the float, the same being arranged in such relation to the relief-pipe that when the float is in a raised position, due to the presence of the water in the reservoir, the bottom of the relief-pipe is closed, so as to prevent the escape of steam; but at other times the steam is permitted to escape freely. The plug or valve H, at the base of the inner cylinder, is provided with an axial bore, *c*, and with two horizontal or diagonal passages, *d*, which communicate with said bore, and with openings *e* in the lower end of the inner cylinder of the float.

The object of this construction is to permit such steam or water as may possibly enter the pores or joints of the float to escape through the openings into the relief-pipe.

The object in using two pipes, one on each side of the boiler, as illustrated in the drawing, is that a column of water descending through one pipe will return in the same pipe, and will act and react in the same direction. The hot water or steam, descending from the

reservoir to the bottom of the boiler, will also heat the conducting-pipes and the water in the boiler surrounding the pipes; and, further, when the water descends through one pipe, a current will be formed, and colder water will ascend in the opposite pipe, thus producing a continuous circulation of the water. This circulation is effected by reason of the fact that one side of the boiler is always hotter than the other—caused by the direction the flame or products of combustion takes.

It will be evident that the same result may be obtained by using two concentric pipes, or one within the other, the water, in this instance, descending through the inside pipe and ascending through the outer pipe.

Having thus fully described our invention, what we claim is—

1. A reservoir or chamber located in the steam-space of a steam-boiler, and communicating with the water-space of the boiler by pipes A A, arranged on each side of the boiler, and provided with means for relieving the pressure in said receiver, substantially as and for the purpose described.

2. The combination of the reservoir, located partly below the water-line and partly within the steam-space, of pipes A, arranged one on each side of the boiler, extending from said reservoir into the water-space, and means for relieving the pressure in said reservoir, substantially as and for the purpose described.

3. The combination of a reservoir, located partly below the water-line and partly within the steam-space, of the pipes A A, extending on each side of the boiler from said reservoir into the water-space, a float provided with a valve, and a relief-pipe or stop-cock, substantially as and for the purpose described.

4. The float C, constructed of two concentric cylinders, having top and bottom heads filled with cork, in combination with the relief-pipe D, substantially as and for the purpose described.

5. The float C, constructed of two concentric cylinders or sections, having an apertured plug or valve at its lower end, communicating with the interior of the float and with the relief-pipe, substantially as and for the purpose described.

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