3 Sheets--Sheet 1.

N. WIARD.

Steam-Boiler Attachments.

No 157,051. Patented Nov. 17, 1874.

FIG. II.

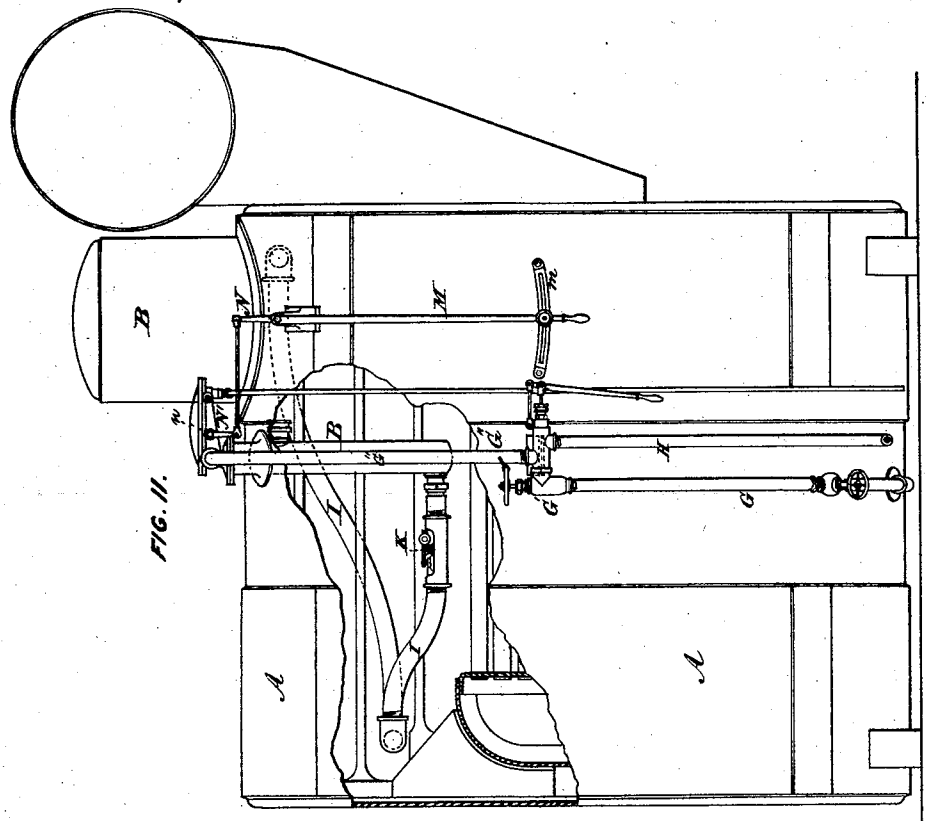

FIG. I.

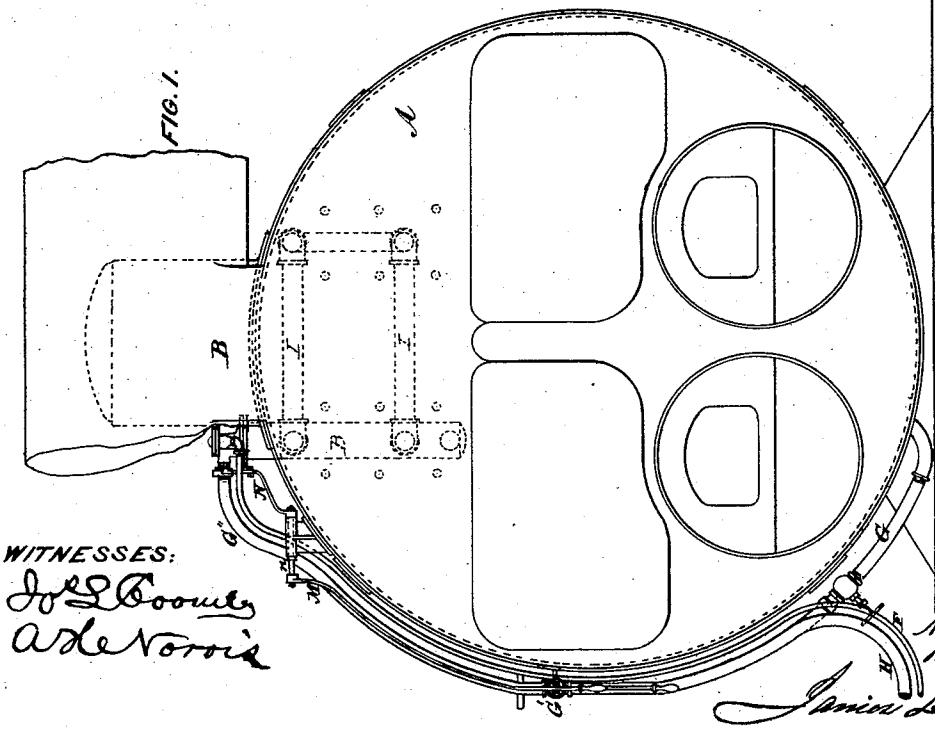

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FIG. III.

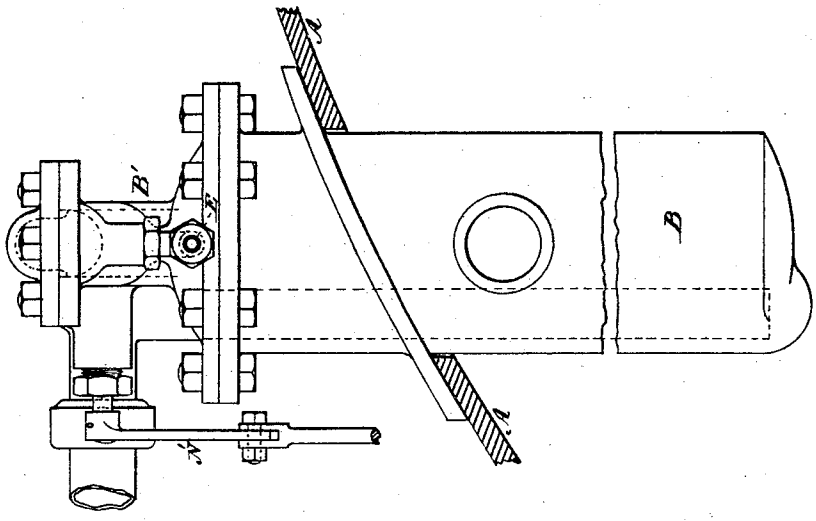
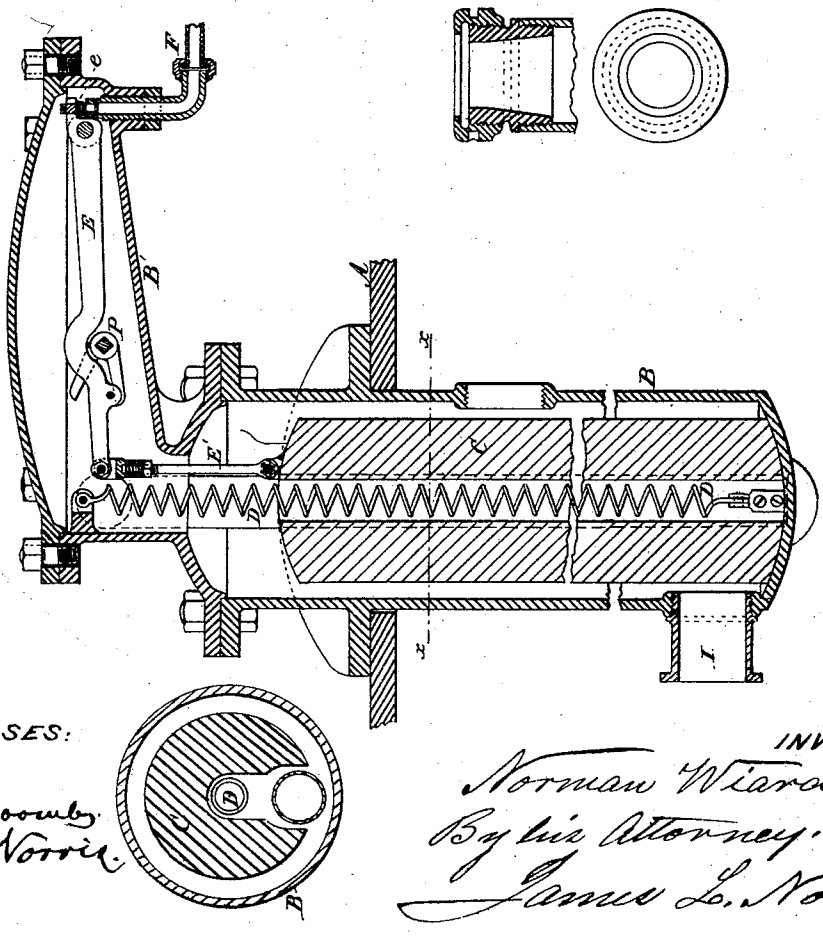


FIG. IV.



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3 Sheets--Sheet 3.

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Steam-Boiler Attachments.

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FIG. V

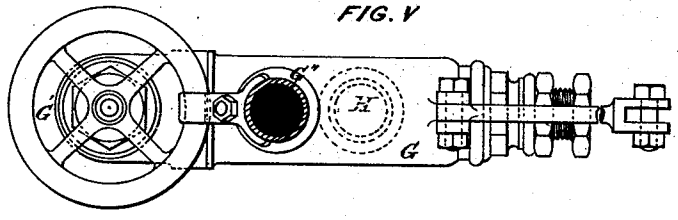


FIG. VI.

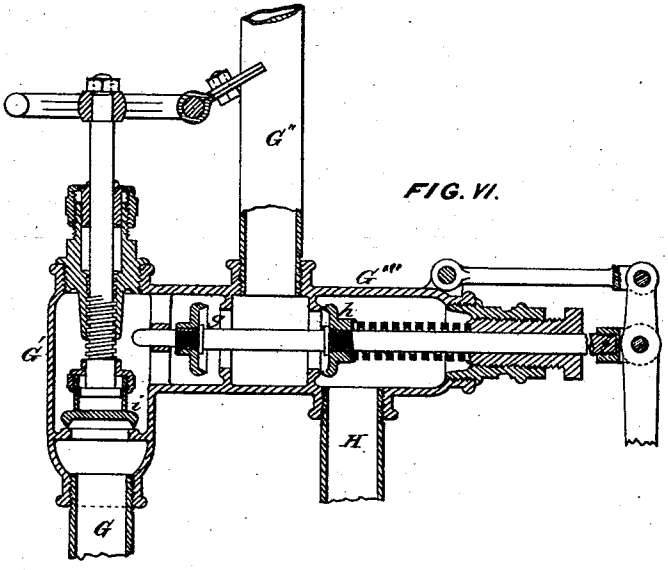


FIG. VII.

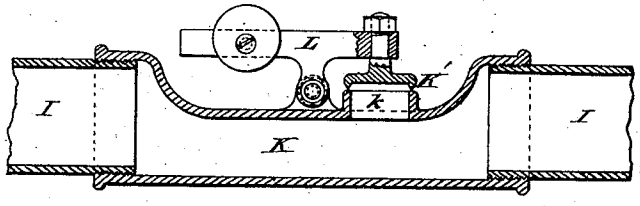
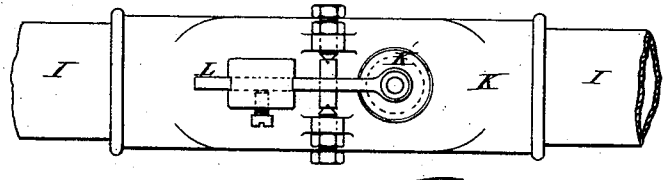


FIG. VIII.



WITNESSES:

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By his Attorney.

James L. Norris.

UNITED STATES PATENT OFFICE.

NORMAN WIARD, OF WASHINGTON, DISTRICT OF COLUMBIA.

IMPROVEMENT IN STEAM-BOILER ATTACHMENTS.

Specification forming part of Letters Patent No. **157,051**, dated November 17, 1874; application filed November 2, 1874.

To all whom it may concern:

Be it known that I, NORMAN WIARD, of Washington, in the District of Columbia, have invented certain new and useful Improvements in Steam-Boiler Attachments, of which the following is a specification:

My invention has for its object the equalization of the temperature of the different parts of steam-boilers, in order to prevent strains, ruptures, and explosions, and regulate, automatically, the required superheating of the steam above the point of saturation, and maintain such temperature uniformly.

The practice of superheating steam, except to a few degrees above saturation, at which point the steam is thoroughly dried and in best condition for economical use, is dangerous and unnecessary. There are but few boilers, as at present constructed, that do not allow the steam to become highly heated, especially when no steam is being drawn off when the engine is stopped. In saturated steam the temperature corresponds uniformly with the pressure; but with superheated steam the temperature is always in excess of the pressure. The heated steam, like hot air and other fluids, has a tendency to seek the highest part of the boiler; therefore, while the lower part of the boiler, filled with water, is at the normal temperature, the upper part or steam-space down to and in immediate contact with the water-line, is heated to a higher temperature by contact with the superheated steam. This unequal heating, which causes unequal expansion and tension in the boiler, is believed to be the cause of many explosions, and the strains and ruptures which injure and ultimately destroy the boiler.

My invention, therefore, relates to certain devices, hereinafter described, by which the steam is prevented from becoming unduly heated, and restored to the condition of saturated steam automatically, without attention from the person in charge. This is accomplished by taking a quantity of water at intervals from the lowest part of the boiler, where it is least heated, and, carrying it up into the steam-space, either discharging it directly into the steam-space from time to time, or retaining it above the water-line in a suitable chamber, so that the heat from the steam will be transferred to the water, and the water afterward discharged into the boiler below the water-line. The first of these methods is preferable when saturated steam is required; but when any degree of superheating is desired, it may be more conveniently accomplished by the latter method.

In the drawings, Figure 1 represents a front elevation of a boiler with my improvements attached. Fig. 2 represents a side elevation with a portion of the boiler removed, showing the interior. Fig. 3 shows a side view of the water-chamber, and Fig. 4 a vertical and horizontal section of the same. Fig. 5 represents a top view; and Fig. 6, a vertical section of the valve-box, connected to the pipe leading from the lower part of the boiler to the water-chamber. Fig. 7 is a vertical section, and Fig. 8 a side view, of the circulating valve and chamber in the pipes.

A represents an ordinary tubular boiler, with steam-space, and provided with steam-dome, as usual. B represents a cylinder or water-chamber, extending through the top of the boiler into the steam-space, and provided on its upper end with a box or casing, B′. Within said cylinder or chamber is a float, C, bored vertically through the center, through which bore extends a spiral spring, D, secured at a point near the top of the cylinder, and at its bottom to the float. The float is suspended by a spring, as illustrated in Fig. 4, so as to just take its weight when surrounded by either steam or air. When surrounded by water, the extension of said spring is reduced in proportion to the difference of the specific gravity between the water and float, thereby causing the float to rise and open the valve *e*, as clearly shown in Fig. 4. The float C is attached to a lever, E, by means of a link, E′. Said lever is pivoted in the casing B′, near the end at which the exhaust-pipe F enters, and is provided with a valve, *e*, which falls directly on the end of the said exhaust-pipe F, which extends downward below the boiler, and is provided with a valve-seat. G represents a pipe extending from the lower part of the boiler upward to a valve-box, G′, which connects said pipe with the pipe G″, which passes upward above the boiler and down into the cylinder B, terminating near its bottom. From

the valve-box G''' an exhaust-pipe, H, extends downward under the boiler. The valve-box is provided with spring valves or cocks *g h* and a stop-valve, *i*, as shown particularly in Fig. 6, by means of which the communication between the pipe G and G' may be cut off when desired, and the communication between pipes G'' and H established. I represents a circulating-pipe extending through the steam-space of the boiler, and communicating at its ends with the cylinder B at its upper and lower parts. Said pipe is provided with an opening, *k*, over which is seated a valve, *k'*, secured upon the end of a balanced lever, L, attached to said pipe, as shown particularly in Figs. 7 and 8. M represents a lever, connected by means of a link to a lever, N, attached to a shaft, *n*, extending into the casing B' immediately below the lever E. To this shaft is secured a forked lever, P, arranged to operate the lever E in either direction, at the will of the engineer, by means of lever M and N, as will be readily understood.

The operation of my apparatus is as follows: The first action of any pressure of steam will nearly fill the chamber B with water from the lower part of the boiler through pipes G and G', raising the float until the exhaust-valve on the end of lever E closes the exhaust-pipe. As the chamber B fills, the circulating-pipe I also becomes filled with the water. While the chamber B is filling the water attains a great momentum, which creates sufficient pressure to open valve K' and throw a quantity of water into the boiler. This will occur whenever the chamber B is filled, causing a circulation throughout the water in the boiler, and tending to equalize the temperature. When the force acquired by the momentum of the water is expended the valve K' drops and shuts communication between pipe I and the boiler. While in this condition, should the steam in the steam-space become superheated, such heat will be immediately transferred by the circulating-tubes to the chamber B, until the pressure amounts to sufficient to throw the water back into the boiler through opening *k* in valve-case K, by forcing open the valve K', the valve *i* in casing G' acting as a check-valve. When said chamber is empty the float C falls, opening the end of exhaust-pipe H, relieving the pressure in chamber B. Water from the lower part of the boiler will be immediately thrown into chamber B, and through the circulating-pipes I I, raising the float C to operate the lever, thereby closing the valve *e*, thus automatically equalizing the temperature throughout.

The above operation may be made to take place at the will of the engineer by means of the levers M and N, which operate the lever E, as will be readily understood. The sediment which may collect, having a tendency to fall to the lower part of the boiler, will be carried over from time to time by the water into the chamber B, from which it may be discharged when desired, through the exhaust-pipe H and pipe G', by simply opening communication between the same.

What I claim is—

1. The combination of a valve-box, G', spring-valves *g h*, stop-valve *i*, and pipe G G'', valve-box G''', constructed substantially as shown and described.

2. The combination of a circulating-valve chamber, K, and weighted valve K' with the circulating-pipe I and water-chamber B, all constructed substantially as and for the purpose described.

3. The combination, with pipes G G'' and valve-box G''', valves *g h*, and its operating-lever, of the exhaust-pipe H, for the purpose of removing sediment, substantially as described.

4. The combination, with a steam-boiler, of a water-chamber, B, casing B', float C, spring D, circulating-pipe I, circulating-valve K', pipes G G'', and valve-box G', all constructed and arranged for operation substantially as shown and specified.

In testimony that I claim the foregoing I have hereunto set my hand.

NORMAN WIARD.

Witnesses:
ALBERT H. NORRIS,
JAMES L. NORRIS.