F. W. GORDON.

Improvement in Steam-Boilers.

No. 114,666. Patented May 9, 1871.

Fig. 1

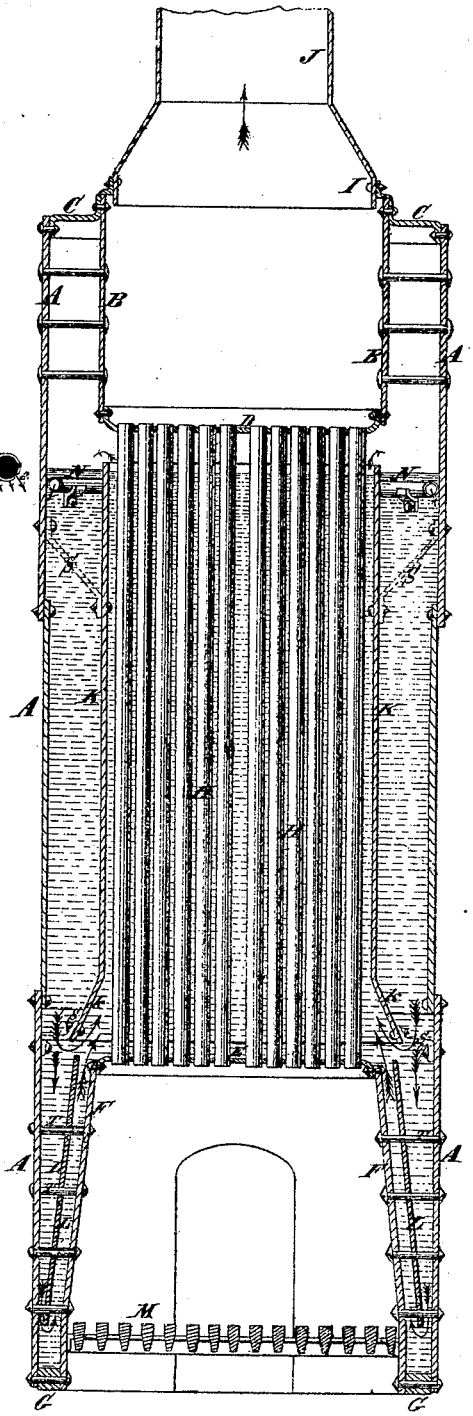


Fig. 3

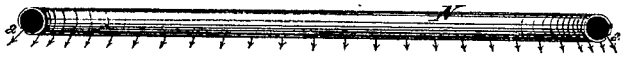
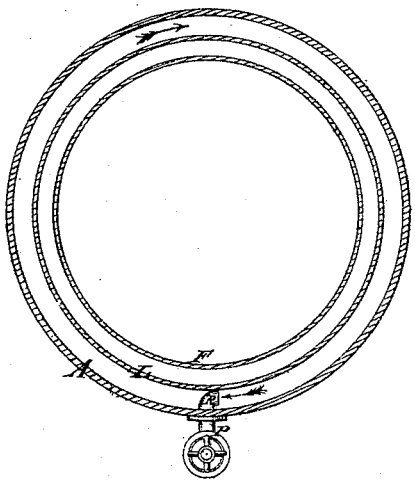


Fig. 2



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UNITED STATES PATENT OFFICE.

FREDERICK WILLIAM GORDON, OF IRONTON, OHIO.

IMPROVEMENT IN STEAM-BOILERS.

Specification forming part of Letters Patent No. **114,666**, dated May 9, 1871.

To all whom it may concern:

Be it known that I, FREDERICK WILLIAM GORDON, of Ironton, Lawrence county, State of Ohio, have invented a certain new and useful Improvement in Steam-Boilers; and I hereby declare the following to be a sufficiently full, clear, and exact description thereof to enable one skilled in the art to which my invention appertains to make and use it, reference being had to the accompanying drawing, making part of this specification.

Nature and Objects of Invention.

My invention relates to the class of upright multitubular boilers; and consists of a combination of peculiarly-formed diaphragm-shells and feed-water device, which induces a rapid circulation of water by a supply of cold water at the point of commencement of the descending current, and serves to prevent the descending current from conflicting with the upward current from the fire-box. By the arrangement of the circulation-inducing shells, moreover, the cold feed-water cannot mix with the rising current until heated, serving, while being heated, to keep the outer shell of the boiler at a low temperature, and thus prevent extreme loss of heat by radiation.

My invention further consists of a peculiar construction of the upper part of the boiler to form the steam-chamber in such a way that ample space is provided for steam, provision made for unequal expansion of boiler, shell, and tubes, and the tube-sheet located in such a position that the water can splash against it in the operation of the boiler.

My invention further consists in combination, with the circulation-inducing plates, of devices for the collection and discharge of sediment from the boiler.

Description of the Accompanying Drawing.

Figure 1 is a vertical section of my improved boiler. Fig. 2 is a horizontal section near the sediment-discharging device. Fig. 3 is a view of the feed-water ring in section.

General Description.

A is the outer shell of the boiler, and B an inner shell, the latter being connected to the outer shell by double-flanged head C, and supporting, at its lower end, the upper tube-sheet, D. The two shells are stay-bolted to prevent the collapse of the inner shell.

The lower tube-sheet, E, is secured to the top of the fire-box shell F, which is of conical form, as shown, and connected to the shell A by the customary ring G and rivets.

H are the tubes, connected to the tube-sheets D E in the ordinary way.

The base I of the chimney J rests upon the top of the sheet B.

K is a circulation-inducing diaphragm, circular in horizontal section, and cylindrical for nearly its entire length. Near the bottom the form of this diaphragm changes to the conical or flaring shape, as shown at *k*.

This provision of a conical bottom to the diaphragm enables it to be constructed of a diameter small enough to closely surround the group of tubes H, and thus compel the upward current of water to distribute itself uniformly throughout the spaces between the tubes, and yet give ample space for the reception of water at the bottom.

The flaring bottom also forms a funnel-mouth for the reception of the rising current from the fire-box, and prevents the same from interfering with the downward current from the top of the boiler.

The exterior of the flaring part *k* also serves to separate the sediment from the pure water at that point, directing the sediment by deflection to the exterior of the boiler, and permitting only the pure water to pass into the flaring mouth.

A conical shell, L, surrounds the fire-box in the manner shown, and causes a circulation of water, as indicated by arrows.

The conical fire-box gives ample space at the top for the circulation of the currents, as shown by arrows, and, at the same time, affords room for a large fire-grate, M.

The inner shell, B, is larger in diameter than the circular diaphragm K, and the tube-sheet D is close enough to the top of the shell K to permit the water, when in violent ebullition, to splash against the tube-sheet and keep the same cool. The shell B being larger than the shell K, no water can splash up into the steam-chamber.

The annular space between the shells A B

constitutes the steam-chamber, and the top of it (the head C) is sufficiently elastic to permit the expansion and contraction of the tubes H without submitting their fastenings at the ends to injurious strains.

This provision of the inner shell, therefore, gives a steam-chamber of ample capacity, and, at the same time, locates the upper sheet so low down that the tubes are fully protected against extreme heat by the splashing of the water against the tube-sheet D.

The feed-water is carried around at the top of the water in the boiler in pipe N, and is discharged through small perforations *a* downwardly, and in the direction of the outer shell. The natural flow of the water between the sheets A and K is downward, and this discharge of the feed-water at the point and in the manner specified increases the velocity of it, and thus renders the supply for the upward current inside the sheet K more positive.

The blow-off pipe P has fitted to it, inside the boiler, an elbow, R, turned to one side to receive water horizontally in the direction of the arrow shown near it. This provision creates, when the boiler is being blown off, a circular motion in the annular space, which is sufficiently violent to carry off any accumulated sediment in the bottom of the boiler into the discharge-pipe, and thus thoroughly clean out the boiler.

The diameter of the top of the diaphragm L is considerably smaller than the diameter of the lower edge of the flaring mouth *k*, for the purpose of preventing the upper current from the fire-box from interfering or conflicting with the descending current from the top of the boiler, or retarding the inflow of water to the pipes H.

It will be seen that, owing to the reception of the feed-water at the water-line, and the presence of the diaphragm K, the feed-water cannot touch the tubes until thoroughly heated to the maximum temperature, or nearly so, of the water in the boiler, and that for the same reason the outer shell, A, of the boiler is preserved at a sufficiently low temperature to prevent the customary great radiation of heat from the outer shell.

Owing to the peculiar arrangement of the plates K L, and the location of the fire-grate higher than the lower edge of plate L, the sediment is all collected, or nearly so, at the bottom of the boiler before the water which carries it enters the tube-space.

Stays S support the diaphragm K in place, and the stay-bolts T support diaphragm L.

Claims.

1. The combination of funnel-mouthed circulation-inducing diaphragm K *k* and diaphragm L, substantially as described, and for the purpose specified.

2. The combination of circular feed-tube N *a*, diaphragm K *k*, and diaphragm L, substantially as and for the purpose specified.

3. In the described combination with the tubes H, shell A, and diaphragm K, the inner shell, B, elastic head C, and tube-sheet D, constructed and located in the described relation to each other, as and for the purpose specified.

4. In the described combination with the elements of the second clause of claim, the bent blow-off pipe P R, as and for the purpose described.

In testimony of which invention I hereunto set my hand.

FREDK. WM. GORDON.

Witnesses:
J. L. WARTMANN,
FRANK MILLWARD.