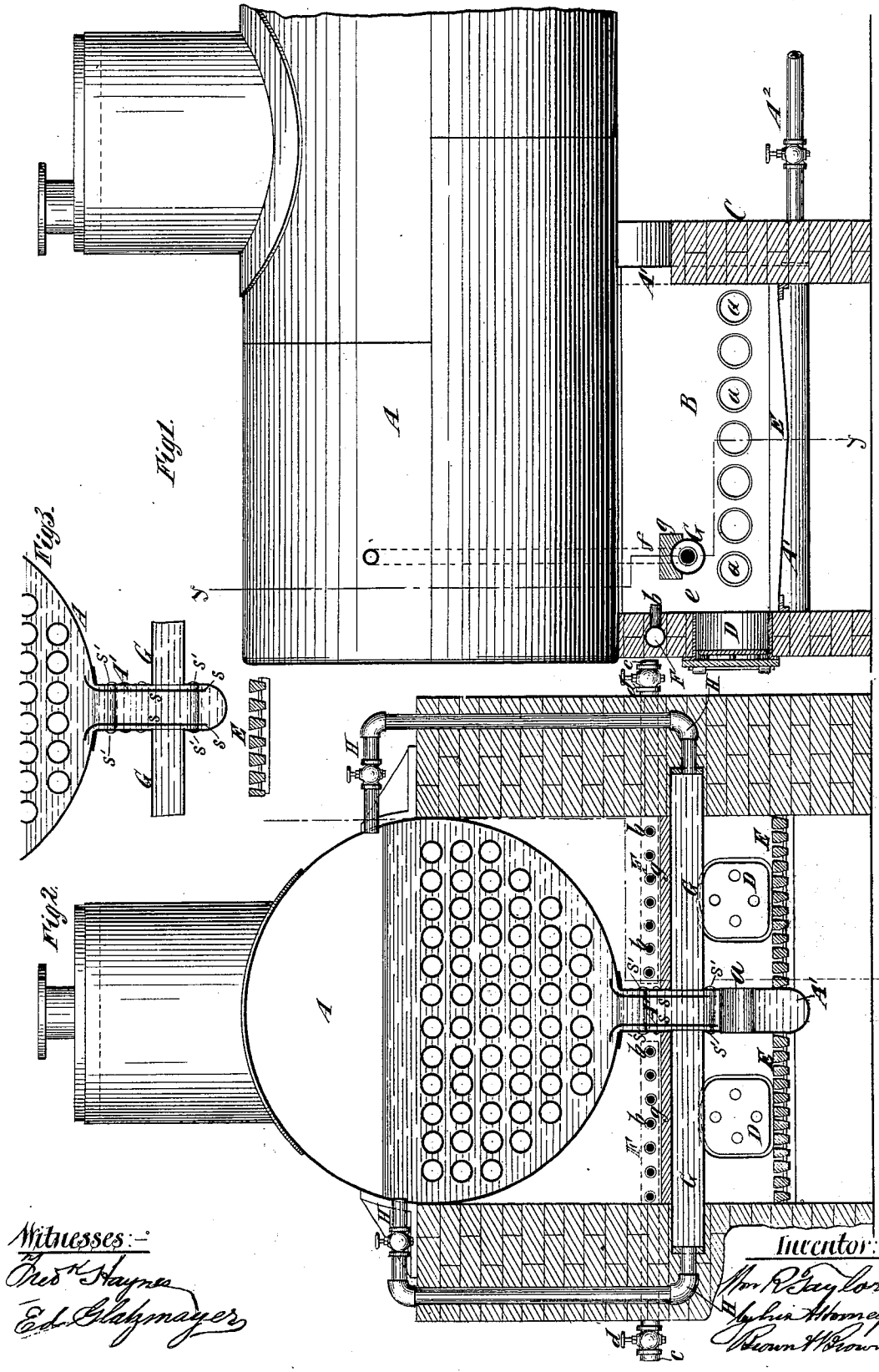
(No Model.)

W. R. TAYLOR.

STEAM BOILER AND FURNACE.

No. 246,837. Patented Sept. 6, 1881.



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UNITED STATES PATENT OFFICE.

WILLIAM R. TAYLOR, OF BROOKLYN, NEW YORK, ASSIGNOR OF TWO-THIRDS TO WRIGHT DURYEA AND PHEBE L. ENNIS, AS ADMINISTRATRIX, BOTH OF GLEN COVE, NEW YORK.

STEAM-BOILER AND FURNACE.

SPECIFICATION forming part of Letters Patent No. 246,837, dated September 6, 1881.

Application filed November 30, 1880. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM R. TAYLOR, of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Steam-Boilers and Boiler-Furnaces, of which the following is a specification.

The principal object of my invention is to produce a more perfect and complete combustion of the smoke and gases generated in a steam-boiler furnace, and at the same time to increase the steam-producing power of the boiler.

My invention consists in the combination, with a horizontal tubular cylindric steam-boiler and a furnace underneath the same, of a hanging water-leg depending lengthwise of the boiler, from the under side thereof, and extending nearly to or below the grate, whereby the furnace is divided longitudinally. The furnace so divided may be fed with fuel alternately upon opposite sides of said leg, and if a stronger draft be produced by a steam-jet or other devices on the side of said leg upon which the fire is brightest, the gases and smoke from the green fuel last fed into the furnace on the opposite side of said leg will be drawn under the leg when its bottom is above the grate, or through openings, tubes, or flues provided therein when it extends below the grate, toward the hottest fire, and will there be consumed. I also preferably combine with the above-described water-leg of the boiler, circulating-plates, arranged longitudinally of said leg, one nearer to each side thereof than to each other, and extending nearly to the bottom thereof; and when so constructed a constant circulation of water will take place down the center of the leg and up between each circulating-plate and the adjacent side of the leg.

The invention also consists in the combination, with a horizontal steam-boiler and a furnace below the same, of a transverse bridge or partition consisting of one or more water cylinders or tubes arranged above the fire-door and forming in the upper front part of said furnace communicating upward and rearward passages, and a pipe or pipes for injecting air or steam into said rearward passage or passages, and thereby producing a draft upward from the forward portion of the furnace and thence backward directly under the boiler, whereby the entering air or steam is thoroughly mixed with the gases and smoke and the latter are consumed, and the production of steam is increased by the heating of the water in said transverse water-bridge. Where the said water-bridge is used in connection with the longitudinal depending leg, the cylinders or tubes forming said bridge communicate with and extend upon opposite sides of said leg, and I preferably connect the outer ends of said bridge with the upper part of the boiler, so as to provide for an active circulation of water down the longitudinal leg of the boiler, outward through the water-bridge, and upward through said pipes into the boiler.

In the accompanying drawings, Figure 1 represents a longitudinal section through a boiler-furnace and an elevation of the front-end portion of a horizontal boiler embodying my invention. Fig. 2 represents a transverse section upon the irregular dotted line *y y*, Fig. 1; and Fig. 3 represents a sectional detail view of a portion of the boiler, its longitudinal water-leg, and a portion of the grate, showing a slight modification of the said leg.

Similar letters of reference designate corresponding parts in all the figures.

A designates a horizontal cylindric boiler, (here represented as of the return tubular type,) which is set in brick-work in the ordinary or any other suitable manner; and B designates the furnace below the same, having the ordinary bridge, C, at the rear thereof, and having two fire-doors, D, and a grate, E.

Upon the under side of the boiler A, depending therefrom and extending longitudinally thereof, is a water-leg, A′, which divides the furnace B from front to rear. By reference to Fig. 2 it will be seen that this water-leg projects below the grate E, and is provided with transverse flues, tubes, or openings *a*, through which the two parts of the divided furnace communicate with each other. Instead of projecting below the grate and being provided

with the flues, tubes, or openings *a*, the said leg might be of less depth and terminate above the grate, as seen in Fig. 3, and in such case the two parts of the furnace will communicate with each other below the leg.

In firing the boiler the fuel is intended, preferably, to be introduced to the furnace alternately upon opposite sides of the water-leg A′, and hence upon one side or the other of said leg will always be a bright fire and upon the opposite side a green fire, from which emanate large quantities of gas and smoke. Ordinarily the gases and smoke from the green fire would pass over the bridge-wall C and escape through the chimney; but to provide for completely consuming them I produce a stronger draft on the side of the leg A′ where is the bright fire, and this increased draft draws the smoke and gases from the green fire through the openings or flues *a* in the leg A′, if said leg extends below the grate, or under said leg if it terminates above the grate, as in Fig. 3. By such bright fire the said smoke and gases are consumed, and hence the fuel is burned to much better advantage than in an ordinary boiler, and an important economy is effected.

The feed-water pipe preferably communicates with the water-leg A′, and at the rear end of the leg is a blow-off pipe, A^2. It will be observed that the water-leg will form a sediment-chamber, and may be conveniently cleaned from time to time. I may produce this increased draft upon opposite sides of the leg A′ alternately by dividing the ash-pit below the leg A′ and supplying air by a blower in greater quantity to one side than the other; or I may produce said increased draft, as here represented, by injecting air or steam into the furnace in a greater quantity upon one side of the leg A′ than on the other.

F designates a pipe extending across in front of the furnace B, above the fire-doors D, and, as here shown, built into the brick front thereof. From this pipe extend inward a number of jets, *b*, through which are injected hot or cold air or steam, superheated or not.

Although I have described a single pipe, two pipes may be employed, as seen in Fig. 2, one for each part of the divided furnace; or the pipe might be divided transversely opposite the leg A′, and each of the two pipes or each end of the divided pipe receives its supply of air or steam through a separate pipe, *c*, controlled by a separate valve, *d*, (see Fig. 2,) so that the supply of air or steam to the furnace on either side of the leg A′ may be increased or diminished without affecting the supply to the other side of said leg A′.

In order to provide for an efficient circulation in the water-leg A′, I preferably arrange therein circulating-plates *s*, extending lengthwise of the leg, nearer to each side of the leg than to each other, and terminating near the bottom thereof. These circulating-plates (shown in Figs. 2 and 3) are held in proper position by means of stay-bolts *s′*, and as the water upon the sides of the leg A′ will be most exposed to the fire, a downward circulation will take place in the center of the leg between said plates, and an upward circulation between each plate and its adjacent side or wall of the leg.

Extending transversely across the furnace B, above the top of the fire-doors D, is a bridge, G, whereby are formed in the front and upper part of the furnace an upward passage, *e*, and a rearward passage, *f*, communicating therewith. The steam or air is injected by the jet-pipes *b* directly into the rearward passage, *f*, and thereby the smoke and gases from the fuel are drawn upward through the passage *e* and pass rearward through the passage *f*, and are thoroughly mingled with the air and steam, producing a mixture which is readily consumed.

I am aware that this arrangement of a bridge, G, broadly considered, is not new; but the novel feature in my bridge consists in the fact that it is a water-bridge composed of a cylinder or cylinders or a tube or tubes extending transversely across the furnace and communicating by pipes H at the ends with the boiler A. The pipes H terminate at about the water-level in the boiler, but one may terminate slightly above the other, as shown in Fig. 2.

Where the water-bridge G is used in connection with the depending leg A′ it is composed of two cylinders communicating with and extending transversely from opposite sides of the said leg, as clearly shown in Fig. 2. When so constructed the fire in the furnace will produce a rapid outward and upward circulation of steam and hot water through the cylinders G and the pipes H, and consequently greatly assist in the production of steam. Where the water-leg A′ is not used a single cylinder may take the place of the two here shown and form the water-bridge. Upon the top of said bridge is a cap or crown, *g*, of fire-brick or clay, to protect the cylinders of which it is composed.

I am aware that it is not new to provide a boiler-furnace with a transverse bridge extending across above the fire-door and forming communicating upward and rearward passages, and hence I do not claim this broadly as of my invention; but where such bridge is composed of water tubes or cylinders connected by pipes with the boiler the water is made to circulate through them and the steaming capacity of the boiler is increased.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination, with a horizontal tubular cylindric steam-boiler and a furnace underneath the same, of a hanging water-leg arranged lengthwise of the boiler, depending from the under side thereof and dividing the furnace longitudinally, substantially as and for the purpose specified.

2. The combination, with a horizontal steam-boiler and a furnace underneath the same, of a water-leg depending lengthwise of the boiler

from the under side thereof and dividing the furnace longitudinally, and pipes for injecting air or steam upon each side of said leg, and adapted to be independently controlled to produce alternately a stronger and a weaker draft upon opposite sides of said leg, substantially as and for the purpose specified.

3. The combination, with a steam-boiler and a water-leg depending from the bottom thereof longitudinally of the boiler, of circulating-plates arranged lengthwise of said leg within the same, and nearer to each side thereof than to each other, and extending nearly to the bottom of said leg, whereby a downward circulation is produced between said plates, and an upward circulation is produced between each plate and the adjacent side of the leg, substantially as specified.

4. The combination, with a horizontal steam-boiler and a furnace underneath the same, of a hollow water-bridge extending across the furnace above the fire-door, and forming in the upper front part of the furnace communicating upward and rearward passages, a pipe or pipes for injecting steam or air into said rearward passage, and a pipe or pipes through which said water-bridge communicates with said boiler, substantially as and for the purpose specified.

5. The combination, with the boiler A and furnace B, of the longitudinal depending water-leg A′ and the transverse water-bridge, composed of cylinders or tubes G, extending on opposite sides of said leg, and pipes H, connecting the outer ends of said cylinders or tubes with the boiler, substantially as specified.

6. The combination of the boiler A, the furnace B, the depending longitudinal water-leg A′, the transverse water-bridge G, composed of cylinders or tubes extending from opposite sides of said leg and forming in the upper front part of the furnace upward and rearward passages, *e f*, pipes H, and injecting jet-pipes *b*, all substantially as specified.

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Witnesses:
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