

(No Model.)

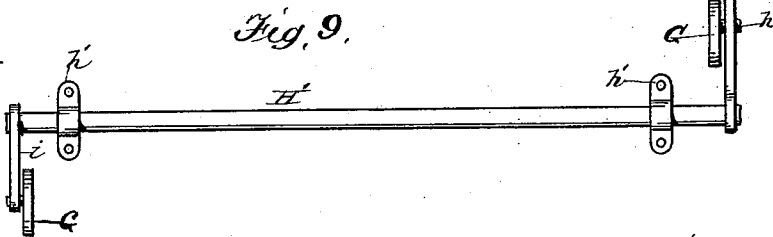
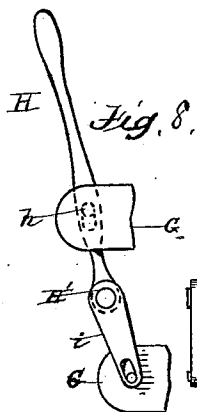
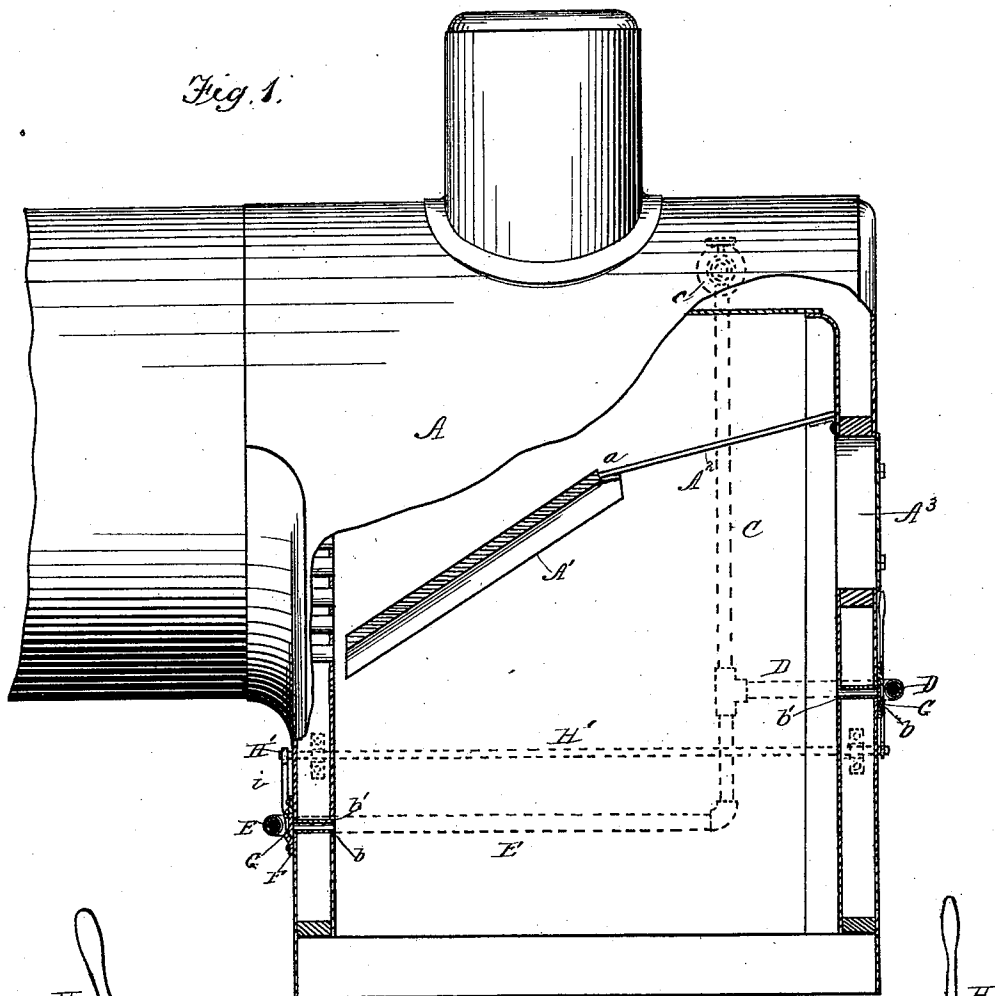
3 Sheets—Sheet 1.

C. H. GREWCOX & F. YEITER.

FURNACE.

No. 340,502.

Patented Apr. 20, 1886.



Attest:
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(No Model.)

3 Sheets—Sheet 2.

C. H. GREWCOX & F. YEITER.

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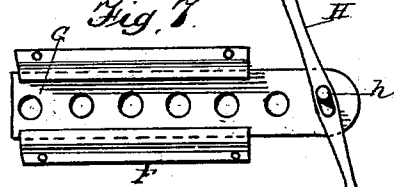
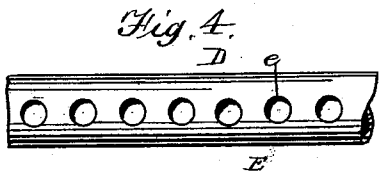
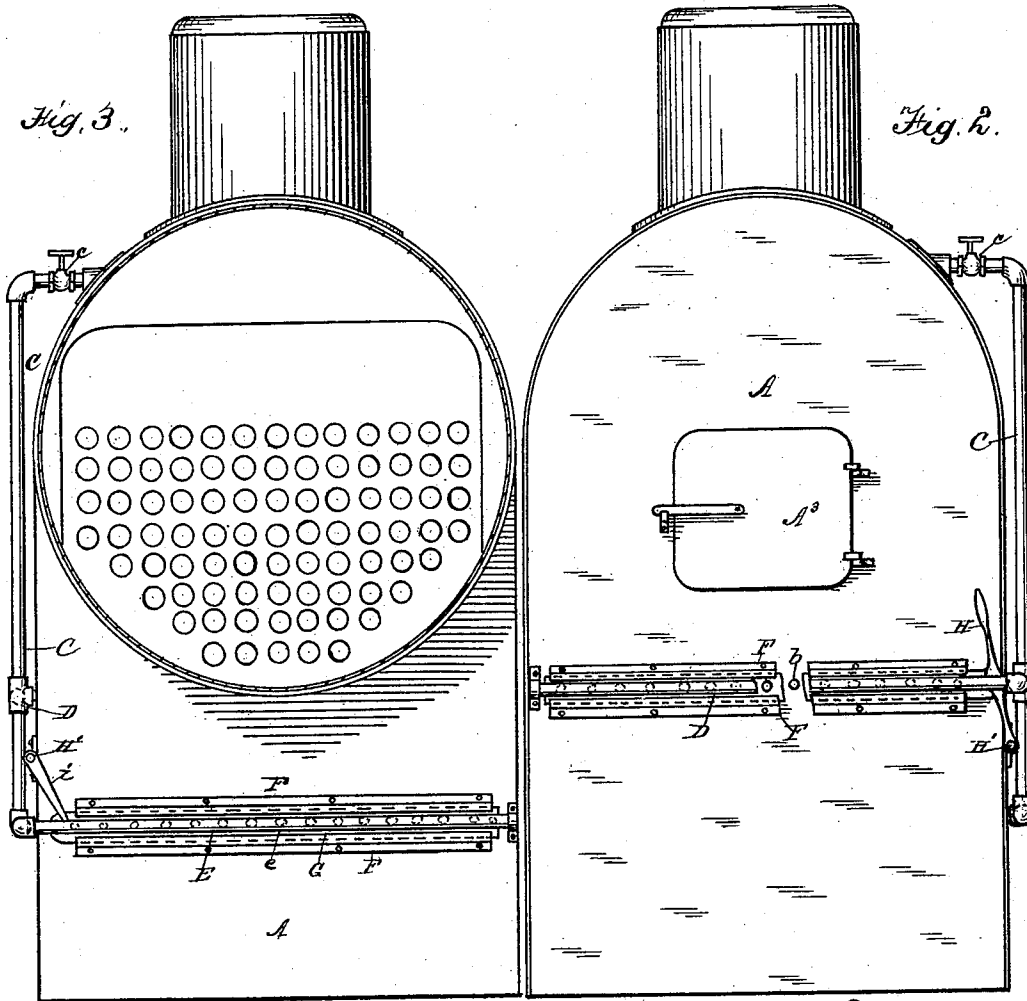
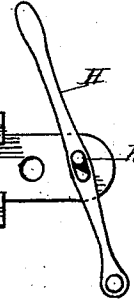


Fig. 6.



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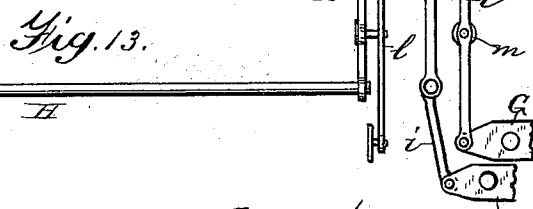
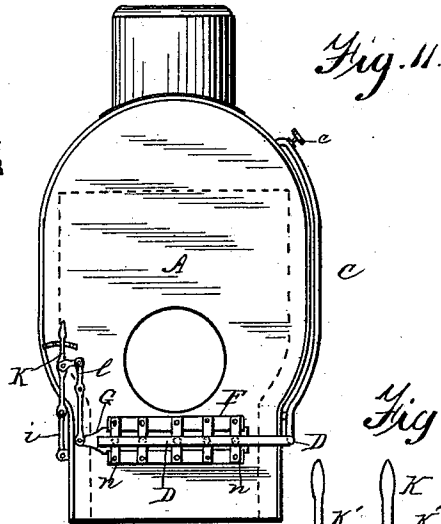
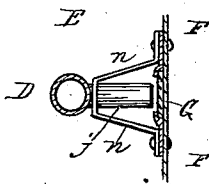
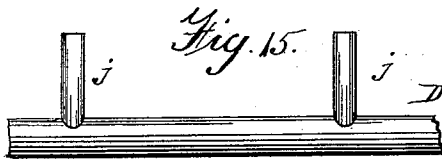
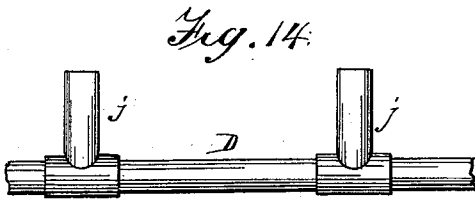
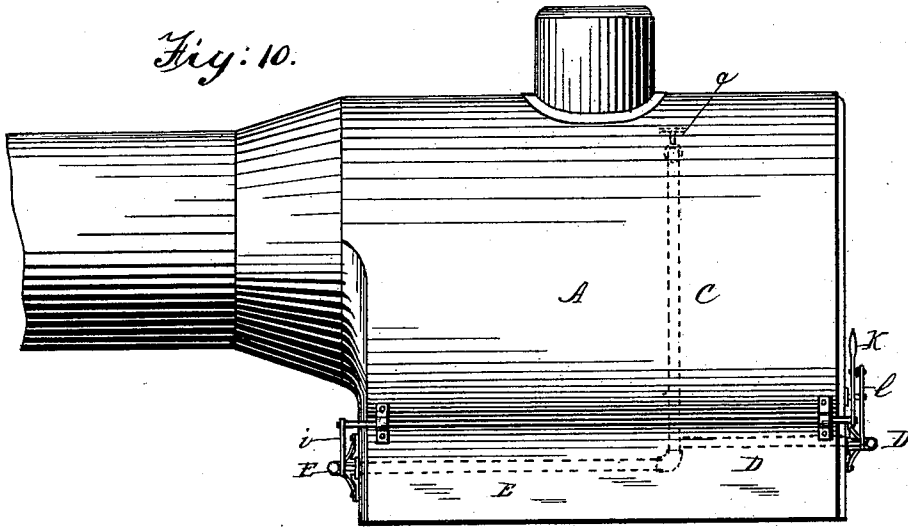
3 Sheets—Sheet 3.

C. H. GREWCOX & F. YEITER.

FURNACE.

No. 340,502.

Patented Apr. 20, 1886.



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 C. H. Grewcox & F. Yeiter
 By their Attorneys
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UNITED STATES PATENT OFFICE.

CHARLES H. GREWCOX AND FRED YEITER, OF BRAINERD, MINNESOTA.

FURNACE.

SPECIFICATION forming part of Letters Patent No. 340,502, dated April 20, 1886.

Application filed December 22, 1884. Serial No. 150,935. (No model.)

To all whom it may concern:

Be it known that we, CHARLES H. GREWCOX and FRED YEITER, citizens of the United States, residing at Brainerd, in the county of Crow Wing and State of Minnesota, have invented certain new and useful Improvements in Furnaces; and we do 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 appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

Our invention relates to improvements upon the steam-boiler furnace patented to us September 30, 1884, numbered 305,918, and has for its object to more thoroughly and intimately commingle a blast of steam or air with the smoke and other products of combustion, and to increase the draft, thereby promoting combustion and intensifying the heat, while at the same time the smoke and other products of combustion are consumed, thus effecting a saving in time and fuel.

In the patent hereinbefore referred to the furnace was provided with steam-pipes located at each end of the fire-box in the same plane or on the same level, and provided with short upwardly and inwardly extending tubes, through which the steam was injected into the fire-box.

Subsequent experiments have shown us that the construction and arrangement above set forth were defective in that the steam being injected into both ends of the fire-box on the same plane did not increase the draft and combustion to the desired extent, and the short tubes of the steam-pipe obstructed the entrance of air into the fire-box when the valve or slide was open and the steam-blast closed, the locomotive in the latter case being in motion to cause the entrance of the air.

Our improved construction is designed to obviate these objections; and it consists in the provision of a fire-box with perforated pipes having connections with the steam-space of the boiler and located at the front and rear of

the said fire-box, one of said pipes being arranged in a plane below that of the other, substantially as hereinafter fully set forth and claimed.

The invention is fully illustrated in the accompanying drawings, which form a part of this specification, and in which—

Figure 1 is a side elevation of a stationary steam-boiler, partly broken away, with our improvements applied thereto. Fig. 2 is a rear end elevation thereof, looking toward the front of the boiler, and Fig. 3 is a vertical cross-section taken through the flues and looking toward the rear end of the boiler. Figs. 4 and 5 are a side elevation and cross-section of the fire-box steam-pipe. Figs. 6 and 7 are detail views in cross-section and elevation, respectively, of the slide valves or gates and their securing-cleats. Figs. 8 and 9 are detached detail views in side elevation of the operating-lever and rock-shaft. Figs. 10 and 11 are a side and end elevation, respectively, of a locomotive-boiler embodying our improvement. Figs. 12 and 13 are views of a modification of the rock-shaft and lever when applied to a locomotive. Figs. 14, 15, and 16 are detail views of the fire-box steam-pipe and means for supporting the same.

Similar letters of reference in the several drawings denote like or corresponding parts.

Referring to the drawings, A designates the fire-box of a locomotive or stationary steam-boiler, in which is arranged in an inclined position a deflector, A', of fire-clay or other suitable material, said deflector extending from a point near the flues to a point a little beyond the center line of the said fire-box and suitably supported therein, and provided with a notch or ledge, a, in which fits one end of a plate, A², while the opposite end of said plate rests against the casing of the door-opening A³, or other suitable support.

C designates a pipe arranged in a vertical position on the side of the boiler, and having its upper end provided with a globe-valve, c, and in communication with the steam-space of the boiler, the lower end of said pipe being connected to branch pipes D E. The pipe D extends around the rear end of the fire-box,

where it is suitably supported on a plane above its fellow pipe E, which extends from said pipe C to and around the front end of the said fire-box, below the flues thereof, and suitably supported, as seen in Figs. 1, 2, and 3, each of said pipes D E being perforated, as at *e*.

We attach the branch pipes D and E to the outside of the front and rear walls of the fire-box by means of suitable supports or brackets secured to the latter, whereby said pipes are protected from the direct heat of the fire, which is objectionable in this class of furnaces.

The fire-box is provided in its end walls with a series of apertures, *b*, in which are located short tubes *b'*, arranged coincidentally with the apertures *c* of the pipes D E, the apertures in the front wall of the fire-box being located below the plane of the series in the rear wall, as clearly shown.

F designates cleats secured to the end walls of the fire-box contiguously to the series of apertures therein, in which are located and adapted to slide perforated valves or gates G, arranged between the steam-pipes and the series of apertures in the fire-box. These valves are operated by a lever, H, arranged at the rear end of the fire-box, and pivoted to the valve G at that end, as at *h*, said lever having its lower end connected to a rock-shaft, H', journaled in suitable supports, *h'*, secured to the side of the fire-box, the forward end of said rock-shaft having a link, *i*, pivoted to one end of the valve or gate at that end of the fire-box.

Our improvements are shown in the accompanying drawings as applied to a stationary boiler; but it is obvious that the improvements can be applied to the fire-box of a locomotive or other class of steam-boilers with equal advantages.

In a boiler of the stationary class the operating-lever and rock-shaft are preferably located at the right-hand side, so as to be within easy reach; but when applied to a locomotive the said lever and shaft are located at the left-hand side, in view of the numerous appliances which are located on the right-hand or opposite side of such boiler, as clearly shown in Figs. 10 and 11.

When a locomotive having our improvements is in rapid motion, it is obvious that the steam-blast can be cut off and the valves or gates opened to admit air to the fire-box through the apertures therein to maintain and promote combustion, the slides in such a case being thrown wide open, or only partially so, according to the temperature of the atmosphere.

The operation of our invention is as follows: The globe-valve *c* being opened, steam from the dome of the boiler will be admitted to the pipes C D E, and the apertures of the slide valves or gates being moved so as to register with the series of apertures in the end walls of the fire-box, steam will be injected into the

said fire-box, at the rear end thereof, through the pipe D and the apertures therein above the plane of the steam entering at the front of said fire-box, whereby an increased circulation and draft from the upper rear end of the fire-box toward the flues are created, while at the same time the steam admitted at the front end through the pipe E and apertures acts directly upon the fire, thus promoting the combustion of the fire and intensifying the heat.

When the plate A² of the deflector is closed, as shown in Fig. 1, the furnace is adapted for use as a smoke-consuming furnace; but it is obvious that the same can be readily converted into a non-smoke-consuming furnace by simply elevating said plate, thereby allowing the smoke and other products of combustion to pass out at the rear end of the fire-box over and above the deflector A'.

It will be observed that by dispensing with the short tubes of the pipes D E we are enabled to arrange the same close to the fire-box and inject the steam directly therefrom into the said fire-box.

In Figs. 10, 11, 12, and 13 we illustrate a modification of the means for operating the valves, which is especially adapted for locomotive-boilers, and consists of a lever, K, having the rock-shaft secured to its lower end, and connected by a link, K', with a rod, *l*, pivoted at *m* to the boiler-casing, and connected at its lower end to one end of the valve or gate G.

The rock-shaft and operating-levers in a locomotive-boiler are located at the left-hand side, the rock-shaft being located beneath the running-board in contact with the "back jaw" of the frame and above the springs of the locomotive.

If preferred, the steam-pipes D E may be arranged at a distance from the fire box and provided with a series of tubes or nozzles, *j*, and, also, the said pipes may be supported by brackets *n*, of the form shown in Figs. 11 and 16, said brackets being secured to the wall of fire-box in close proximity to the valves or gates, and the tubes or nozzles bearing therein and projecting forward close to the valves or gates G.

Without confining ourselves to the exact details of construction shown and described, what we claim as new, and desire to secure by Letters Patent of the United States, is—

In a steam-boiler furnace, in combination with a fire-box provided with a series of apertures and short tubes in its front and rear walls, the series of apertures in the rear wall being arranged in a plane above the series in the front wall, a valved steam-pipe communicating with the steam-space of the boiler, perforated branch pipes secured to the outside of the front and rear walls of the fire-box, and connected to said steam-pipe and arranged contiguously to the series of apertures of the

5 fire-box, sliding perforated valves or gates adapted to move in cleats arranged between the pipes and apertures of the fire-box, an operating-lever pivoted to the rear valve, and a rock-shaft connected at one end to said lever, and at its other end provided with a link pivoted to the front valve or gate, all arranged and adapted to serve as herein set forth.

In testimony whereof we affix our signatures to in presence of two witnesses.

CHARLES H. GREWCOX.
FRED YEITER.

Witnesses:

W. E. ENTRIKIN,
F. L. MATTESON.