(No Model.) 3 Sheets—Sheet 1.

E. B. COXE.

FURNACE.

No. 510,584. Patented Dec. 12, 1893.

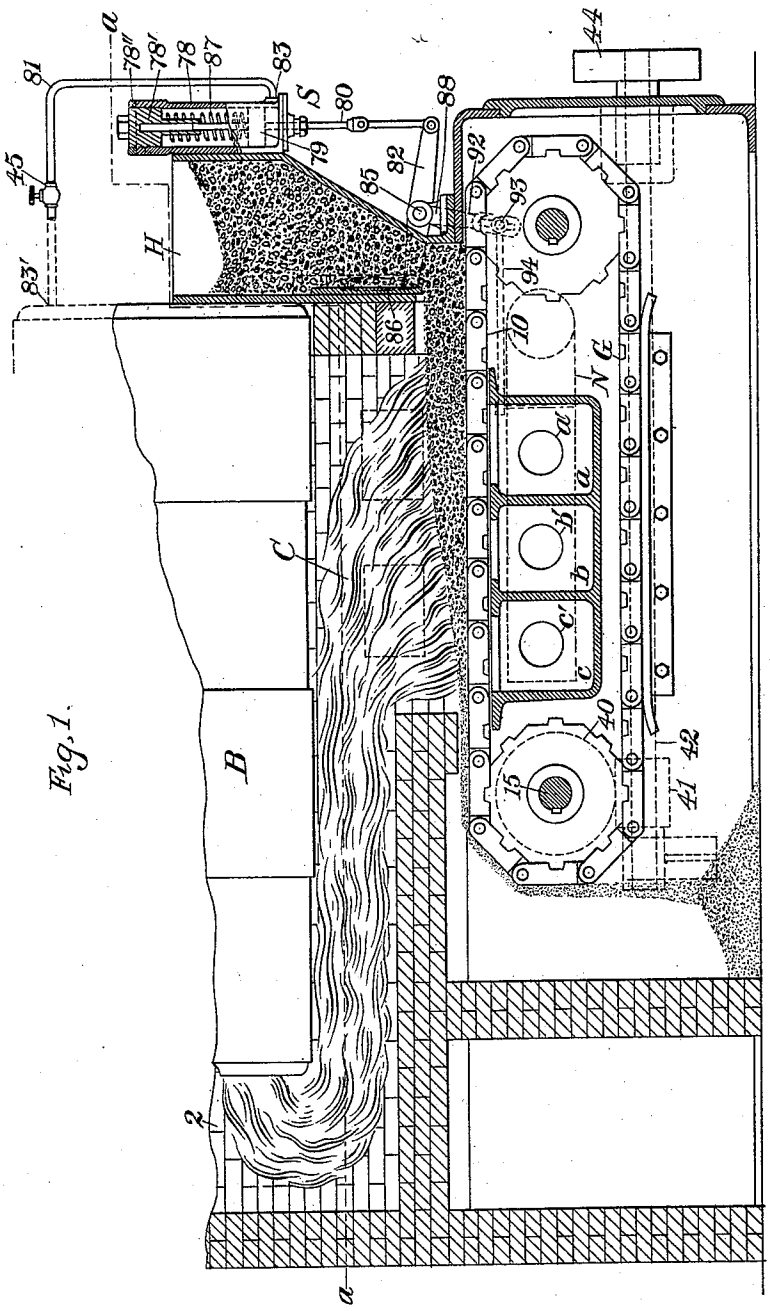

Fig. 1.

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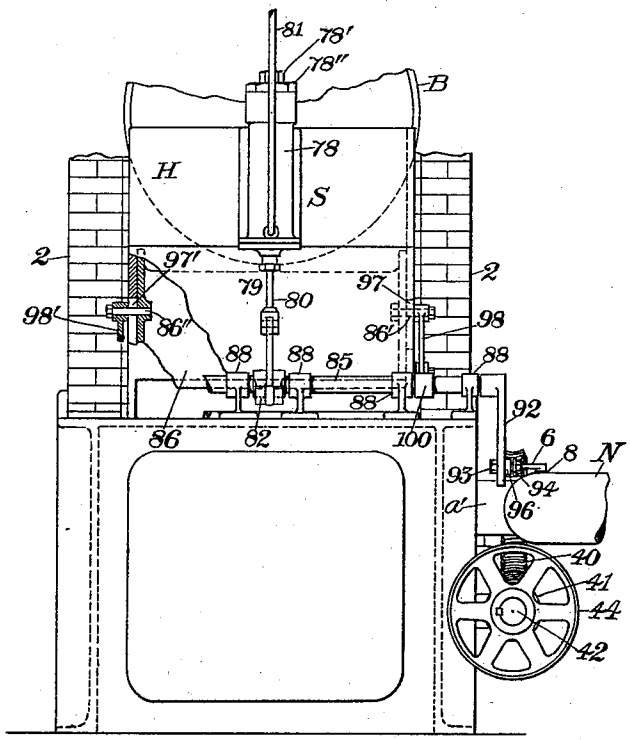
Fig. 2.



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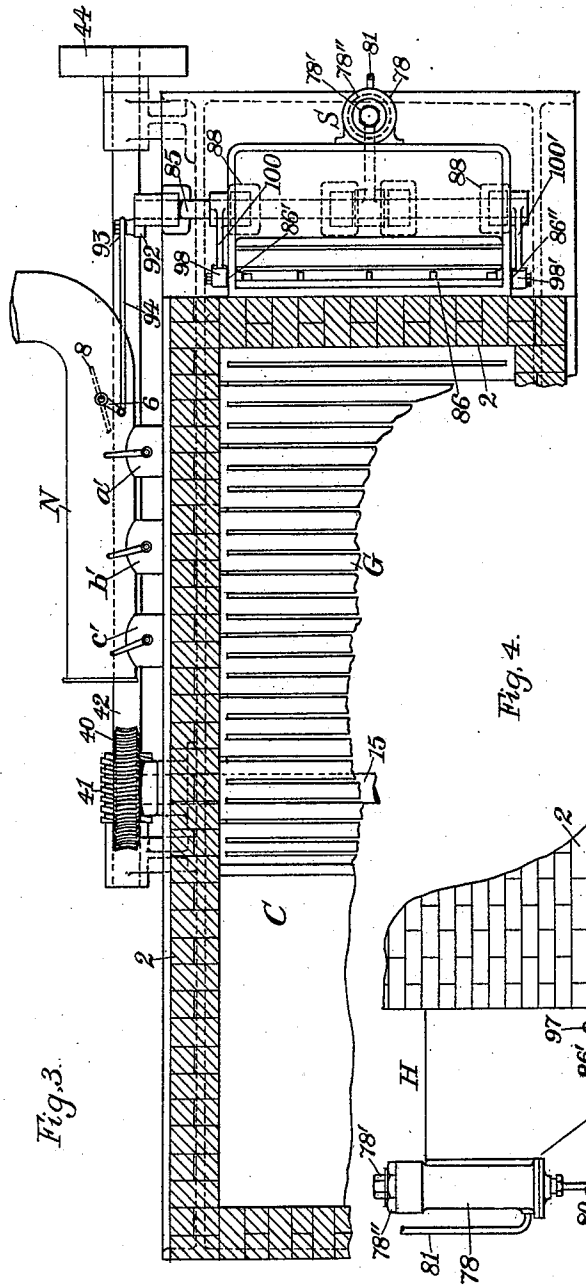

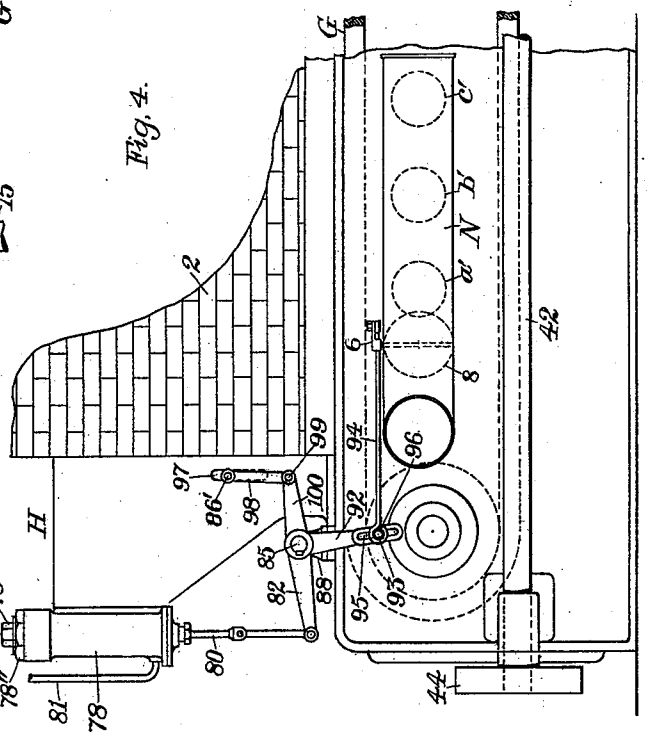

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UNITED STATES PATENT OFFICE.

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FURNACE.

SPECIFICATION forming part of Letters Patent No. 510,584, dated December 12, 1893.

Application filed October 16, 1893. Serial No. 488,274. (No model.)

To all whom it may concern:

Be it known that I, ECKLEY B. COXE, a citizen of the United States, residing at Drifton, in the county of Luzerne and State of Pennsylvania, have invented certain new and useful Improvements in Steam Plants, of which the following is a specification.

This invention relates to that class of steam-plants in which the furnaces are provided with traveling-grates and are supplied with air through air-pipes communicating therewith.

The object of the invention is to provide means for automatically regulating the traveling-movement of the grate, according to the variation in the pressure of the steam; and also, in some cases to simultaneously regulate the pressure of the air-blast.

My present improvements being especially intended for use in connection with the traveling-grate furnace described in Letters Patent No. 499,716, granted to me June 20, 1893, I have herein shown my present invention applied to a furnace of that kind, which is only partially shown in this application.

In the drawings accompanying and forming a part of this specification, Figure 1 is a sectional side elevation of a portion of a steam-plant of the class specified, furnished with my present improvements. Fig. 2 is an end elevation, partially in section, as seen from the right-hand in Fig. 1. Fig. 3 is a plan view of the parts shown in Fig. 1 with the exception that the steam-generator B (partially shown in Figs. 1 and 2) is omitted. Fig. 4 is a partial side elevation as seen from the right-hand in Fig. 2.

Similar characters designate like parts in all of the figures.

The improved steam-plant herein described comprises a steam-generator, a furnace therefor having a traveling-grate and having an air-pipe with a regulator valve therein for supplying and controlling the admission of air to the grate, driving-apparatus for actuating the grate, a fuel-supply for the grate having a gate or valve, and a pressure-controlled regulator for operating the fuel-gate and also (when the air-pressure is to be regulated) for controlling said air-supply.

Referring to the drawings, B designates any well-known type of steam-generator or boiler, this being shown set in position over the furnace-chamber C, and inclosed, in practice, by suitable side-walls as 2. Under the furnace-chamber is placed the traveling-grate, G, which may, together with its actuating-wheels and shafts, be of the kind described in my aforesaid Letters Patent. One of said shafts, 15, is herein shown furnished with the worm-wheel, 40, whereby the grate-mechanism is actuated from the worm, 41, which is carried by a driving-shaft, 42, located at one side of the furnace structure, and which may be driven by a pulley, 44, fixed thereon.

For supplying the fuel to the endless grate G, the hopper, H, is shown placed at the forward end of the furnace in position for delivering the fuel onto the grate, as indicated in Fig. 1. For supplying air to the grate, the furnace is shown provided with the main air-pipe, N, which communicates with the furnace-chamber underneath the grate through one or more pipes, as, for instance, the series of pipes a', b', c', which are so designated and are more fully described in said Letters Patent No. 499,716. It will be remembered that this arrangement of pipes is employed in the furnace shown in said Letters Patent, in connection with separate variable-pressure air-blast apparatuses, as for instance, the chambers, a, b, c, for the purpose of effecting the combustion of the fuel by means of a particular process therein referred to. For regulating the admission of air to the furnace through the pipe N this is provided with an ordinary regulating-valve, 8, whose operating lever, 6, is connected with the aforesaid pressure-controlled regulator, the preferred form of which is hereinafter more fully described.

For regulating the supply of fuel to the grate, the hopper H is provided with a fuel-gate, 86, located on the rearward side of the discharge-outlet thereof and adapted to have a vertical movement toward and from the upper run, 10, of the endless grate G, as will be understood by comparison of the several figures of drawings. The fuel-gate 86, is shown provided at the ends thereof with the studs, 86′ and 86″, which project outwardly through slots at 97 and 97′, in the end-walls of the hopper H, and there connect with rods 98 and 98′, that are pivoted at 99 and 99′, to

rocker-arms, 100 and 100′, fixed on the regulator-shaft, 85. By this means, the operation of said shaft actuates the fuel-gate to increase or diminish the admission of fuel to the furnace-chamber.

Of course, the particular arrangement of the connecting-devices here described, also the particular character of the devices, will depend, in practice, upon the location and position of the pressure-controlled regulator-device S relatively to the fuel-gate and to the other operative details of the steam-plant; and it will be understood that said device S, either in the form thereof herein shown or in other well-known forms thereof, may be located at other points relatively to the steam-plant, and in a horizontal or inclined position instead of in a vertical position as herein shown.

For the purpose of operating one or both of the regulator-valves 86 and 8, for the fuel and air, respectively, the steam-plant is provided with the pressure-controlled regulator-device hereinbefore referred to. This device, designated in a general way by S, consists, in the preferred form thereof herein shown, of an ordinary steam-cylinder, 78, in which is a piston, 79, that is connected by a rod, 80, with a lever, 82, intermediate to said cylinder and the aforesaid air-supply valve and also intermediate to said cylinder and the aforesaid fuel-gate 86. The lever 82 is fixed to a shaft, 85, that is journaled in bearings, 88, on the framework of the apparatus, and is connected by a rod, 94, pivoted at 93, to the arm 92, thereof; which rod connects with the aforesaid lever-arm 6 of the regulator-valve 8. Said regulator-shaft lever 92, has therein a slot, 95, in which the stud, 96, is adjustable for the purpose of varying the relative movements of the piston 79 and said air-valve 8. Steam or water under the same pressure is supplied to the cylinder 78 by means of a pipe, 81, which connects at 83, with said cylinder and whose upper end communicates at 83′, with the steam-generator B. An ordinary valve at 45, (Fig. 1) in said pipe 81, serves as a means for shutting-off communication between the boiler and the pressure-device S whenever this may be required. For resisting the action of the piston 79, the cylinder 78 is shown provided with a resistance-spring, 87, which bears against one end, 78′, of the cylinder and the piston-head, 79′; said end 78′ is shown threaded and provided with a check-nut, 78″, for adjusting the spring to the required pressure, for properly determining the range of movement of the fuel-gate and air-valve with given variations of steam-pressure. In this manner and by means of an apparatus of substantially the character set forth, the air-supply is regulated in accordance with the regulation of pressure in the generator, and at the same time the fuel-gate may be correspondingly regulated so as to control the feeding-in of the fuel in accordance with the varying air-supply. By this means the entire steam-plant is made self-regulating both as to the air-supply and the fuel-supply.

Having thus described my invention, I claim—

1. In a steam-plant, the combination with the generator and the furnace therefor having a traveling grate, of a fuel-supply apparatus having a fuel-gate or valve, and a pressure-device, substantially as described, in communication with the generator and connected with the fuel-gate, whereby the supply of fuel to the furnace is regulated in accordance with the variation of pressure in the generator, substantially as described.

2. In a steam-plant, the combination with the generator and with a furnace therefor having a traveling grate and having a regulator-valve in the air-supply conduit, of a fuel-supply apparatus having a fuel-gate or valve, and a pressure device in communication with the generator and connected with said fuel-gate, and also connected with said air-supply regulator-valve, whereby the admission of air to the furnace and the supply of fuel to the traveling grate are simultaneously regulated, substantially as described.

3. In a steam-plant, the combination with the generator, and with a furnace therefor having a traveling grate, of a fuel-supply apparatus having a fuel-gate or valve, a steam-cylinder in communication with the generator and having a piston and a resistance-spring therefor, and a rocker-shaft intermediate to said cylinder and the fuel-gate and operatively connected with the same, substantially as set forth.

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