

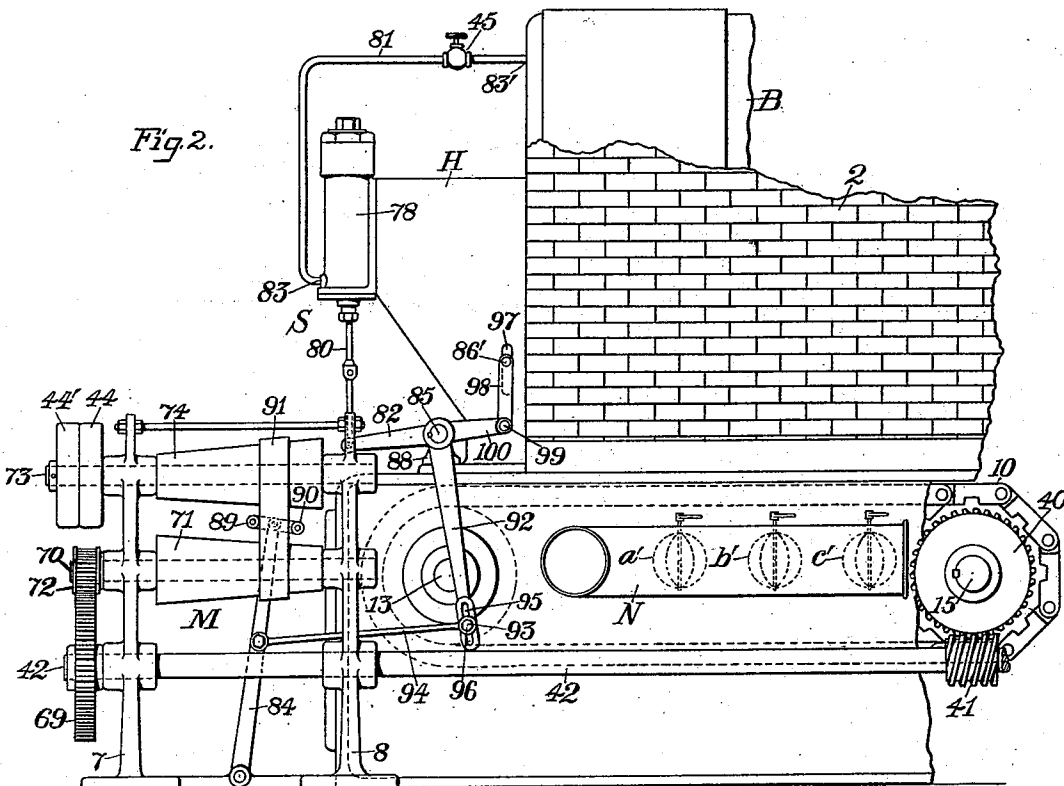
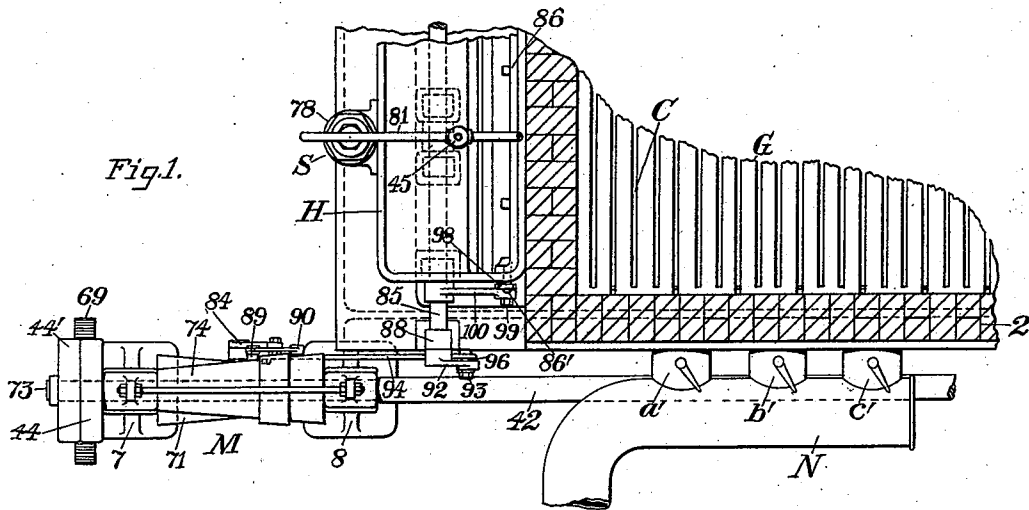
(No Model.)

2 Sheets—Sheet 1.

E. B. COXE.
STEAM PLANT.

No. 510,585.

Patented Dec. 12, 1893.



Witnesses:

John L. Edwards Jr.

Fred. J. Dole.

Inventor:

Eckley B. Cox.

By his Attorney,

F. A. Richards

(No Model.)

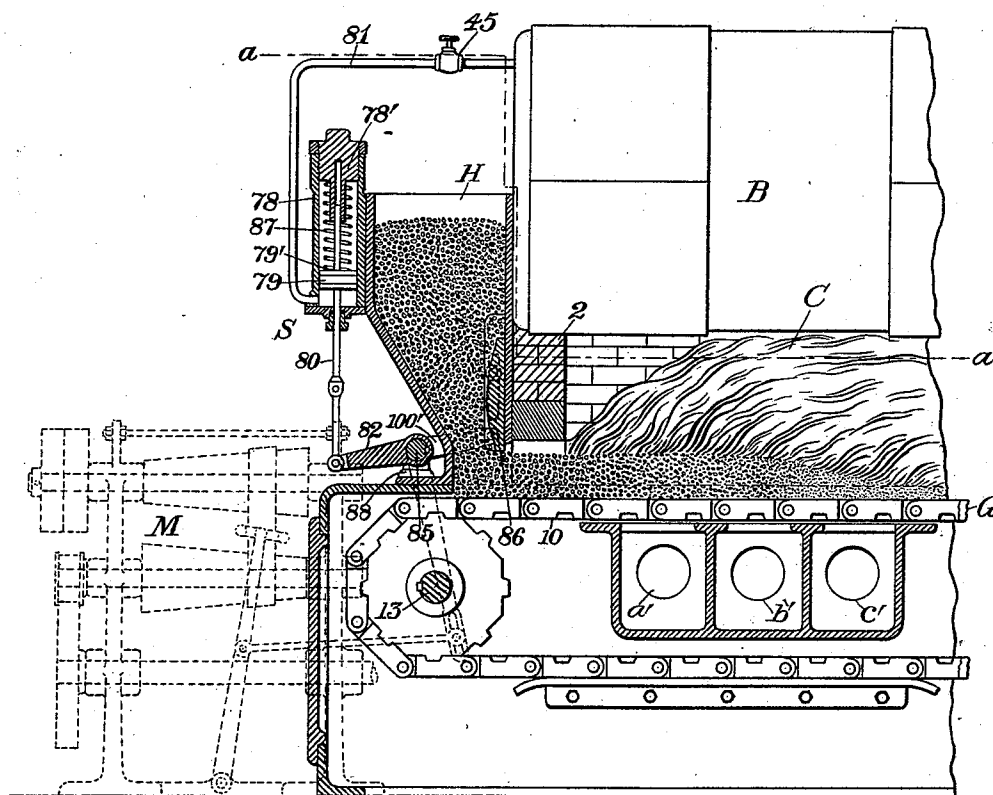
2 Sheets—Sheet 2.

E. B. COXE.
STEAM PLANT.

No. 510,585.

Patented Dec. 12, 1893.

Fig. 3.



Witnesses:

John L. Edwards Jr.

Fried. J. Dole.

Inventor:

Eckley B. Coxe.

By his Attorney,

J. H. Richards

UNITED STATES PATENT OFFICE.

ECKLEY B. COXE, OF DRIFTON, PENNSYLVANIA.

STEAM PLANT.

SPECIFICATION forming part of Letters Patent No. 510,585, dated December 12, 1893.

Application filed October 16, 1893. Serial No. 488,275. (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; the object being to provide means for automatically regulating the supply of fuel to the grate, and at the same time control the traveling-movement of the same, according to the variation in the pressure of the steam.

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 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 plan view, with the generator removed, of a portion of a steam-plant of the class specified, furnished with my present improvements. Fig. 2 is a side elevation of the same, as seen from below in Fig. 1, and showing a portion of the generator in place. Fig. 3 is a sectional elevation, otherwise similar to Fig. 2, for further illustrating certain features of the apparatus; in this view the grate is shown supplied with fuel as when in use.

Similar characters designate like parts in all the figures.

The improved steam-plant herein described comprises a steam-generator, a furnace therefor having a traveling grate, a fuel-supply for the grate having a fuel-gate or valve, changeable-speed driving-mechanism operatively connected with the traveling grate for actuating the same, and a pressure-controlled regulator-device in communication with the generator and operatively connected with the driving-mechanism and the fuel-gate for controlling the same to simultaneously regulate the traveling-movement of the grate and the supply of fuel thereto.

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 walls as 2. Under the furnace-chamber C, is placed the traveling-grate, 55 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.

For supplying the fuel to the endless grate G, the usual hopper, H, is shown placed at the forward end of the furnace, and 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, 70 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 for the purpose of effecting the combustion of the fuel by means of a particular process therein referred to.

The grate-actuating shaft 42, is operated by a changeable-speed driving-mechanism which is herein designated in a general way by M, and comprises ordinary driving-shafts and gearing, or like apparatus, operatively connected with the pressure-controlled regulator which is designated in a general way by S. Said driving-mechanism comprises some suitable frame-work, as, for instance, the uprights, 7 and 8, in which one end of said shaft 42 is journaled. This shaft 42, is shown provided with a gear, 69, meshing with a pinion, 72, on a shaft, 70, supported by bearings in said uprights; another shaft, 73, is similarly supported in said uprights, and is shown provided with the ordinary tight and loose pulleys, 44, 44', whereby it may be actuated from any convenient source of power by means of a belt. Not shown.

The two shafts 70 and 73, are provided with the oppositely-disposed conical pulleys, 71, 74, respectively, over which runs the ordinary driving-belt, 91. When the driving-shaft 73 is revolving at a uniform rate of speed, the

speed of the driven-shaft 70, will, of course, be increased or reduced accordingly as the belt 91 shall be moved toward the larger or smaller end of said conical pulley 74. By this means, the endless grate being connected as set forth to said shaft 70, the speed of the grate may be increased or reduced as required within limits depending upon the proportion of the several parts. For the purpose of effecting such variation in the speed of the grate-mechanism, the changeable-speed apparatus M, is connected with the speed-changing regulator or pressure-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, having a piston, 79, which is connected by a rod, 80, with a lever, 82, on a rock-shaft, 85, that is intermediate to said cylinder and a fuel-gate or valve, 86, in the hopper H, and is also intermediate to said cylinder and the aforesaid driving-belt 91 of the driving-apparatus. The lever 82 is fixed to said shaft 85, and this is carried in bearings, 88, on the framework of the furnace. The shaft 85 is connected by a lever, 92, and a rod, 94, (pivoted to said lever at 93,) with the belt-shifting lever-arm, 84, of the driving-apparatus. Said regulator-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 belt shifter. The lever 84 carries at its upper end, the belt-engaging fingers, 89 and 90, between and by which the belt 91 is controlled.

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 provided at the ends thereof with the studs 86', which project outwardly through slots, 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.

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. A valve at 45, 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 is shown provided with a resistance-spring, 87, which bears against one end, 79', of the piston, and the cylinder-head, 78'; this head 78', is shown threaded and provided with a check-nut for adjusting the spring to the required pressure, for properly determining the range of movement of the fuel-gate with a given variation in the steam-pressure.

When the apparatus is in operation, any increase in pressure in the cylinder 78 forces forward the piston until the force thereof is counter-balanced by the increased resistance of the spring 87; this movement by means of the connection with the fuel-gate, operates through those connections to close the gate and reduce the supply of fuel delivered to the furnace-grate. In like manner, but reversely, a reduction of pressure within the generator B and consequently within the cylinder 78, permits the spring 87 to force down the piston thereby opening the fuel-gate to admit a larger supply of fuel to the furnace-chamber.

The same operation of the apparatus just described serves by means of the engagement of the lever 84 with the belt 91, to shift said belt in one case toward the left-hand, and in the other case toward the right-hand, or toward the larger or smaller end of the driving-pulley 74, thereby increasing the speed of the driven-shaft 70 or reducing the same as the case may require, and in accordance with the increase or decrease of the fuel supply. In this manner and by means of an apparatus of substantially the character set forth, the fuel-supply is regulated in accordance with the regulation of pressure in the generator, and at the same time the speed of the traveling-grate may be correspondingly regulated so as to control the feeding-in of the fuel in accordance with the varying depth or supply thereof. By this means the steam-plant is made self-regulating as to the fuel-supply.

Having thus described my invention, I claim—

1. In a steam-plant, the combination with the generator and a furnace therefor having a traveling grate, of changeable-speed driving-mechanism operatively connected with the grate for actuating the same, a fuel-supply having a fuel-gate or valve, and a pressure-controlled regulator-device in communication with the generator and operatively connected with the fuel-gate and with the driving-mechanism, whereby the supply of fuel to the grate and the traveling-movement of the grate are regulated, substantially as described.

2. The combination with the generator and

a furnace therefor having a traveling grate, of changeable-speed driving-apparatus operatively connected with the grate for actuating the same, a fuel-supply having a fuel-gate or valve, and a regulator-device for the driving-mechanism, comprising a steam-cylinder in communication with the generator, a piston in said cylinder and operatively connected

with the driving-mechanism, and a resistance-spring opposing the piston, substantially as described and for the purpose specified.

ECKLEY B. COXE.

Witnesses:

E. B. ELY,

ED. V. LANSDALE.