(No Model.)

E. B. COXE.

STEAM PLANT.

No. 510,583. Patented Dec. 12, 1893.

Fig. 2.

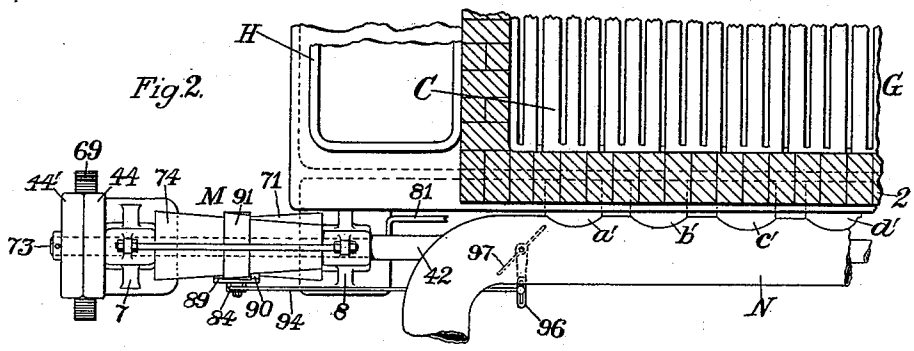
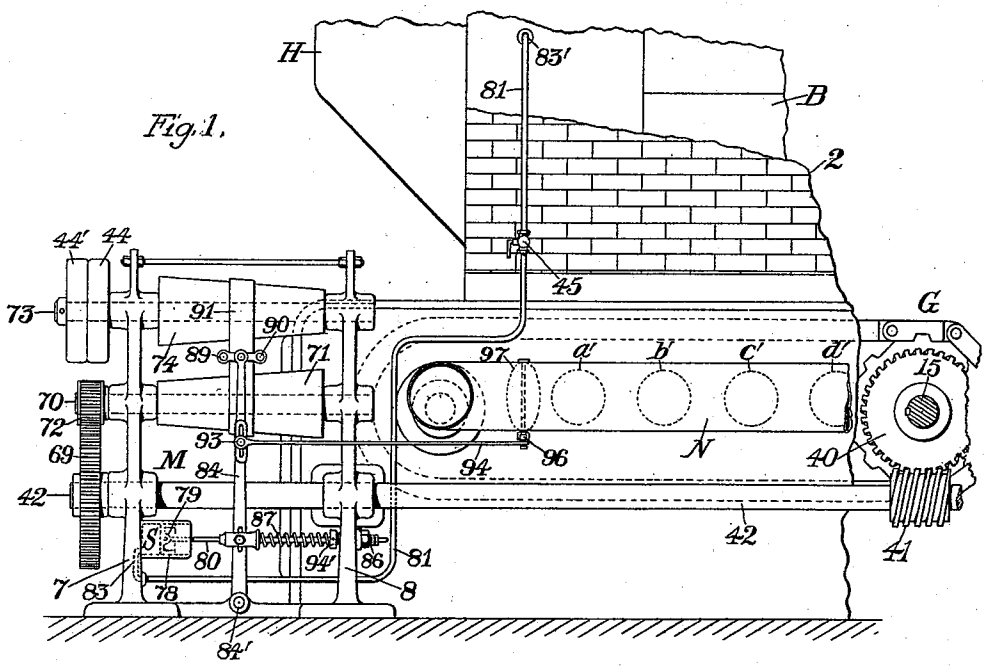


Fig. 1.



Witnesses:
John L. Edwards Jr.
Fred. J. Dole.

Inventor:
Eckley B. Coxe,
By his Attorney,
F. A. Richards

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

ECKLEY B. COXE, OF DRIFTON, PENNSYLVANIA.

STEAM PLANT.

SPECIFICATION forming part of Letters Patent No. 510,583, dated December 12, 1893.

Application filed October 16, 1893. Serial No. 488,273. (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, or are supplied with air through air-pipes communicating therewith, or both.

The object of the invention is to provide means for automatically regulating the pressure of the air-blast, and also, in some cases, the traveling-movement of the grate, 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 herein shown my present invention applied to a furnace of that kind, but only a small portion of the furnace structure is shown in this application.

In the drawings accompanying and forming a part of this specification, Figure 1 is a side elevation of a portion of a steam-plant of the class specified, furnished with my present improvement. Fig. 2 is a plan view of the parts shown in Fig. 1 with the exception that the steam-generator B (partially shown in Fig. 1) is omitted.

Similar characters designate like parts in both 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, a changeable-speed driving-apparatus for actuating the grate, and a pressure-controlled regulator for operating the regulator-valve and also (when the grate-speed is to be regulated) for controlling said driving-apparatus.

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 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.

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, as for instance, the series of pipes a', b', c', d', 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. For regulating the admission of air to the furnace through the pipe N, this is provided with an ordinary regulator-valve, 97, whose operating lever, 96, is connected with the aforesaid pressure controlled regulator.

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, combined with the pressure-controlled regulator which is designated in a general way by S. Said driving-mechanism comprises some suitable framework, 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 provided 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, in which is a piston, 79, that is connected by a rod, 80, with a lever, 84, intermediate to said cylinder and the aforesaid air-supply valve and also intermediate to said cylinder and the aforesaid driving-belt 91 of the driving apparatus. The lever 84 is pivoted at 84′, to the framework of the apparatus M and is connected by a rod, 94, pivoted thereto at 93, with the aforesaid lever-arm 96 of the regulator-valve 97. Said regulator-lever 84 has therein a slot, 92, in which the stud, 93, is adjustable for the purpose of varying the relative movements of the piston 79 and said air-valve 97. The regulator-lever 84 carries at its upper end, the belt-engaging fingers, 89 and 90, between and by which the belt 91 is controlled.

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 piston-rod 80 is shown continued beyond the lever 84 and is provided with a resistance-spring, 87, which bears against a collar, 94′, on said rod, and is adjusted to the required pressure by means of an adjusting-screw, 86, fixed in the upright 8 of the framework.

When the apparatus is in operation any increase in pressure in the cylinder 78 forces the same toward the right hand until the force thereof is counterbalanced by the increased resistance of the spring 87; at the same time the lever 84 being carried by its connection with the piston in the same direction operates through the connecting-rod 94 and the lever 96 to turn the air-valve 97 to reduce the air-supply admitted to the furnace. 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 the piston and the lever 84 toward the left-hand thereby turning the regulator-valve to admit a larger quantity of air to the furnace-chamber for increasing the combustion of the fuel therein. 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 air supply. 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 speed of the traveling-grate 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 with a furnace therefor having a traveling grate and having a regulator-valve in the air-supply conduit thereof, of a pressure-device and connections, substantially as described, having a steam-cylinder in communication with the generator, and having a piston for said cylinder operatively connected with said regulator-valve, substantially as set forth.

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 changeable-speed driving-mechanism operatively connected with the grate for actuating the same, and a pressure-device in communication with the generator and connected with and controlling said driving-apparatus, and also connected with said regulator-valve, whereby the admission of air to the furnace and the speed of the traveling grate thereof are simultaneously regulated, substantially as described.

ECKLEY B. COXE.

Witnesses:
E. B. ELY,
ED. V. LANSDALE.