(No Model.)

N. W. PRATT.

APPORTIONING FURNACE DRAFT FOR BATTERIES OF STEAM BOILERS.

No. 382,489. Patented May 8, 1888.

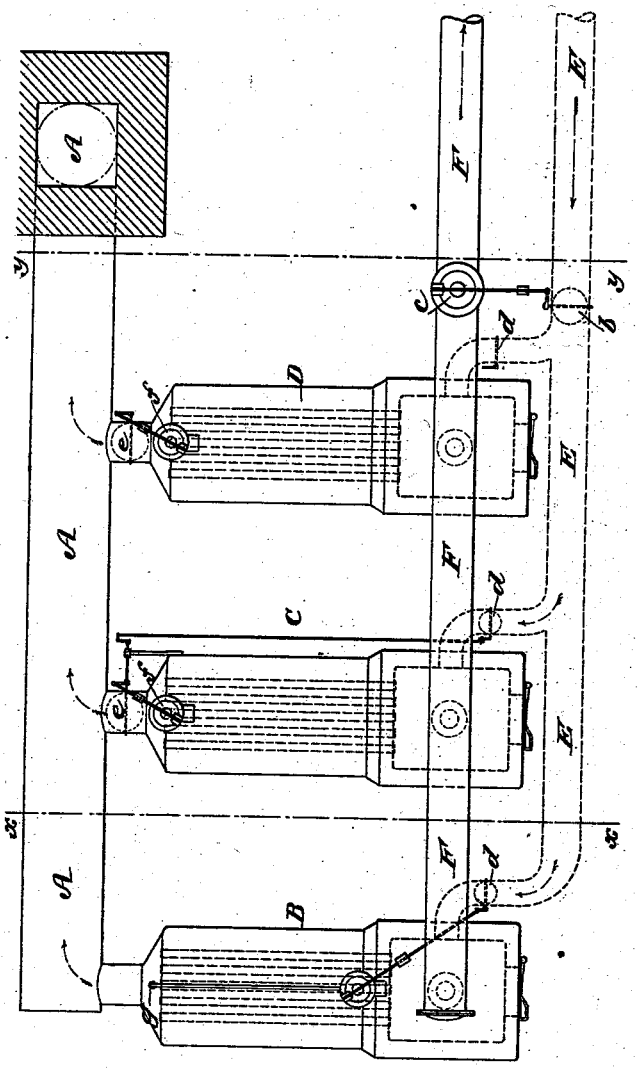

Fig. 1

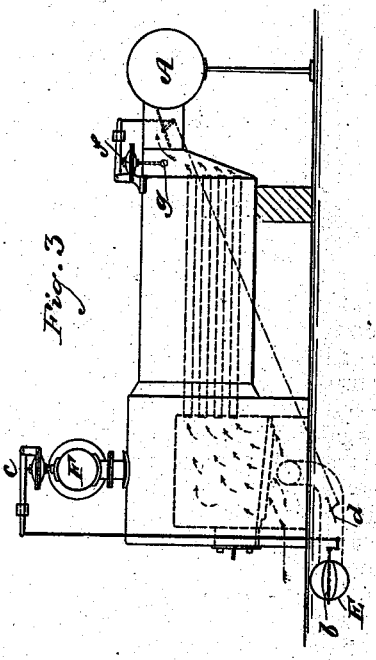

Fig. 3

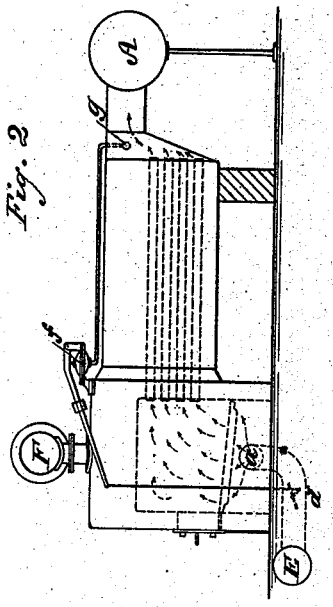

Fig. 2

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APPORTIONING FURNACE-DRAFT FOR BATTERIES OF STEAM-BOILERS.

SPECIFICATION forming part of Letters Patent No. 382,489, dated May 8, 1888.

Application filed June 23, 1887. Serial No. 242,209. (No model.)

To all whom it may concern:

Be it known that I, NAT. W. PRATT, a citizen of the United States, residing at Brooklyn, county of Kings, and State of New York, have invented certain new and useful Improvements in Apportioning Furnace-Drafts for Batteries of Steam-Boilers, of which the following is a specification.

This invention relates to apparatus for automatically controlling the amount of air supplied to steam-boiler furnaces according to the rate of combustion required in order to maintain a given pressure of steam; and the object of the invention is to so apportion the total amount of air supplied to the furnaces of the whole battery of boilers that the several fires shall be soonest equalized by delivering to each the different amounts of air which their different conditions may require, such equalization being intended for the purpose of increasing the efficiency of the steam regulation under violent fluctuations in the amount of power consumed.

In order to effect this equalization the invention consists in employing a double system of draft-regulation, the total air-supply being regulated by the steam-pressure, the apportioning of the total to each furnace being regulated by the temperature of the escaping gases of the same, respectively.

In the accompanying drawings a battery of three boilers is represented in diagram, the form chosen, for clearness of illustration, being of the locomotive type, although the invention is obviously applicable to all forms.

Figure 1 is a plan view; Fig. 2, a sectional elevation of the system taken on the line *x x;* and Fig. 3, a similar view taken on the line *y y.*

A is the common flue through which the draft is conveyed from the several boilers, B C D, composing the battery.

E is the air-pipe employed for conducting the air beneath the grates at *a*, Fig. 2.

The features of the invention are applicable to either a forced blast or a natural draft, and the draft-controlling apparatus shown is applicable to both methods.

F is the common drum or steam conductor, connecting and leading from the several boilers to the point of steam-eduction.

b is the main damper which governs the total amount of air supplied to the whole battery of boilers, the said damper being controlled by the action of the varying steam-pressure upon the flexible diaphragm of the pressure-regulator *c*, increasing or decreasing the total air-supply as more or less steam is consumed.

The auxiliary dampers *d*, provided in the draft-pipe at its several branches or points of entrance to the furnaces, or the auxiliary dampers *e*, placed at the points of exit of the furnace-draft to the flue A, or both sets of dampers, are connected to and regulated by the thermostat pressure-regulators *f*, the latter being actuated by the expansion or contraction of fluid within the bulbs *g* exposed to the temperature of the escaping gases from each furnace independently.

The pipe E may be employed for conducting either a forced or a natural draft. The dampers *d* and dampers *e* serve identical functions, whether the draft be forced or natural, and said double sets of dampers *d* and *e* may be used singly or together, the different arrangements being exemplified, as will be understood by an inspection of Figs. 2 and 3.

In the operation of the invention the steam-pressure actuates the main damper *b*, controlling the general air-supply, closing it partially when the pressure rises to the desired point and opening it when the pressure falls, the consequent amount of air passing through the grates bearing a definite relation to the amount of coal burned to develop the required horse-power. The amount of coal burned is thus decreased or increased, and the steam generated automatically holds the pressure approximately to the desired point under varying demands for steam; but the efficiency of a general draft-control system in which the regulation is extended only to the total air-supply as applied to a battery of boilers is limited, especially in cases where the amount of power required fluctuates very violently, inasmuch as the different conditions of the various fires may require specific amounts of air-supply to control them with quick response.

For illustration, given a battery of three boilers having their fires at different conditions or periods of activity, the fire which has

reached the best condition will, receiving the full supply of air, be rapidly forced and comparatively soon burned out while contributing the greatest amount of heat. The furnace which has been freshly charged with fuel will be developing the least share of heat, and, while supplied with the same amount of air as the one previously described, will take some time to reach an equal condition, whereas the third furnace, having its fire nearly burned out, would not receive a greater proportion of air than its condition required. To compensate for these varying conditions, the auxiliary dampers *d* and dampers *e*, or both in conjunction, are operated by the fluctuations in temperatures of the fires by means of the thermostats *g* and flexible diaphragms of the regulators *f*, so as to close said dampers if the temperature of the escaping gases is higher than the normal and open them when their temperature is low, thus decreasing the specific air-supply to the furnace delivering the highest temperature, and vice versa. The fires becoming equalized, the effectiveness of the total air-regulation as controlled by the damper *b* is materially extended, and therefore increased in its rapidity of action by reason of the uniformity of combustion promoted throughout the several fires.

The method of practicing my invention forms the subject-matter, and is claimed, in a separate application filed by me January 10, 1888, Serial No. 260,315.

Having thus fully described my invention, what I claim, and desire to secure by Letters Patent, is—

In an apparatus for controlling the air-supply to the furnaces of a battery of steam-boilers, the combination of a main draft-regulator, automatically governed by the fluctuation of steam-pressure within said boilers and arranged to control the total air-supply with auxiliary regulating-dampers operated by the variations of temperature of the escaping gases from the several furnaces, and arranged to intercept the passage of the air-supply apportioned by said auxiliary dampers to each furnace, respectively.

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Witnesses:
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