No. 616,455. Patented Dec. 27, 1898.

C. M. DAY.

NOZZLE FOR BURNING PULVERIZED FUEL.

(Application filed Dec. 4, 1895. Renewed May 31, 1898.)

(No Model.) 2 Sheets—Sheet 1.

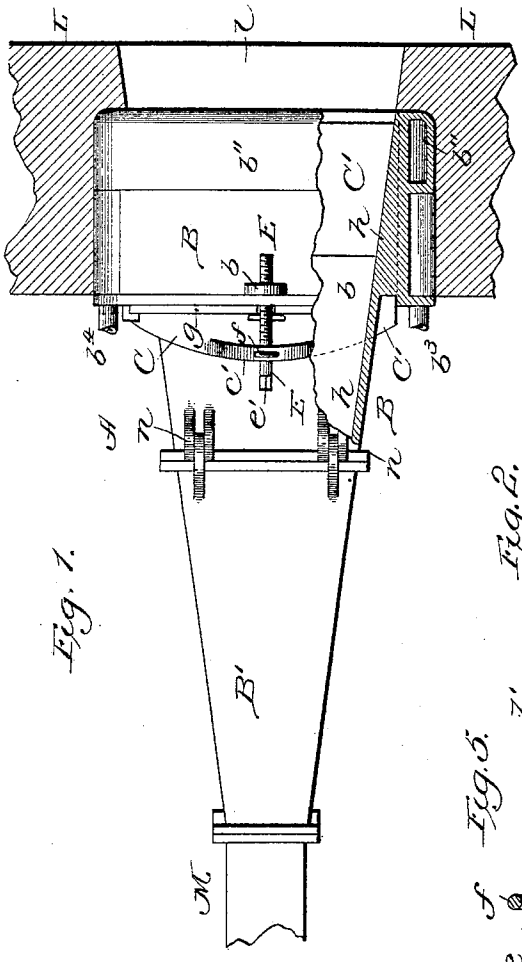


Fig. 1.

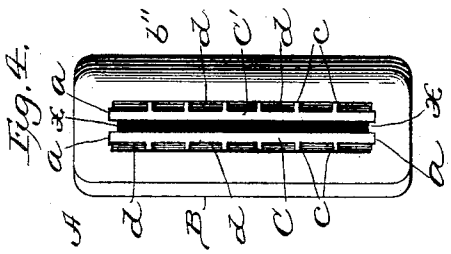


Fig. 4.

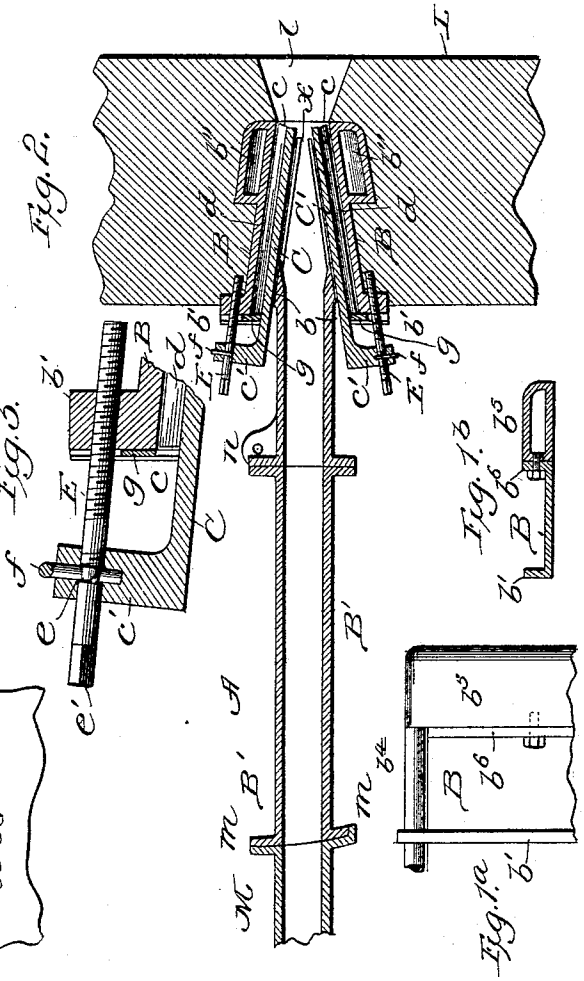


Fig. 2.

Fig. 5.

Fig. 7.

Fig. 7a.

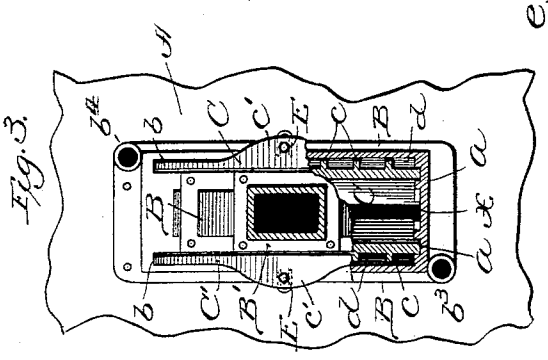


Fig. 3.

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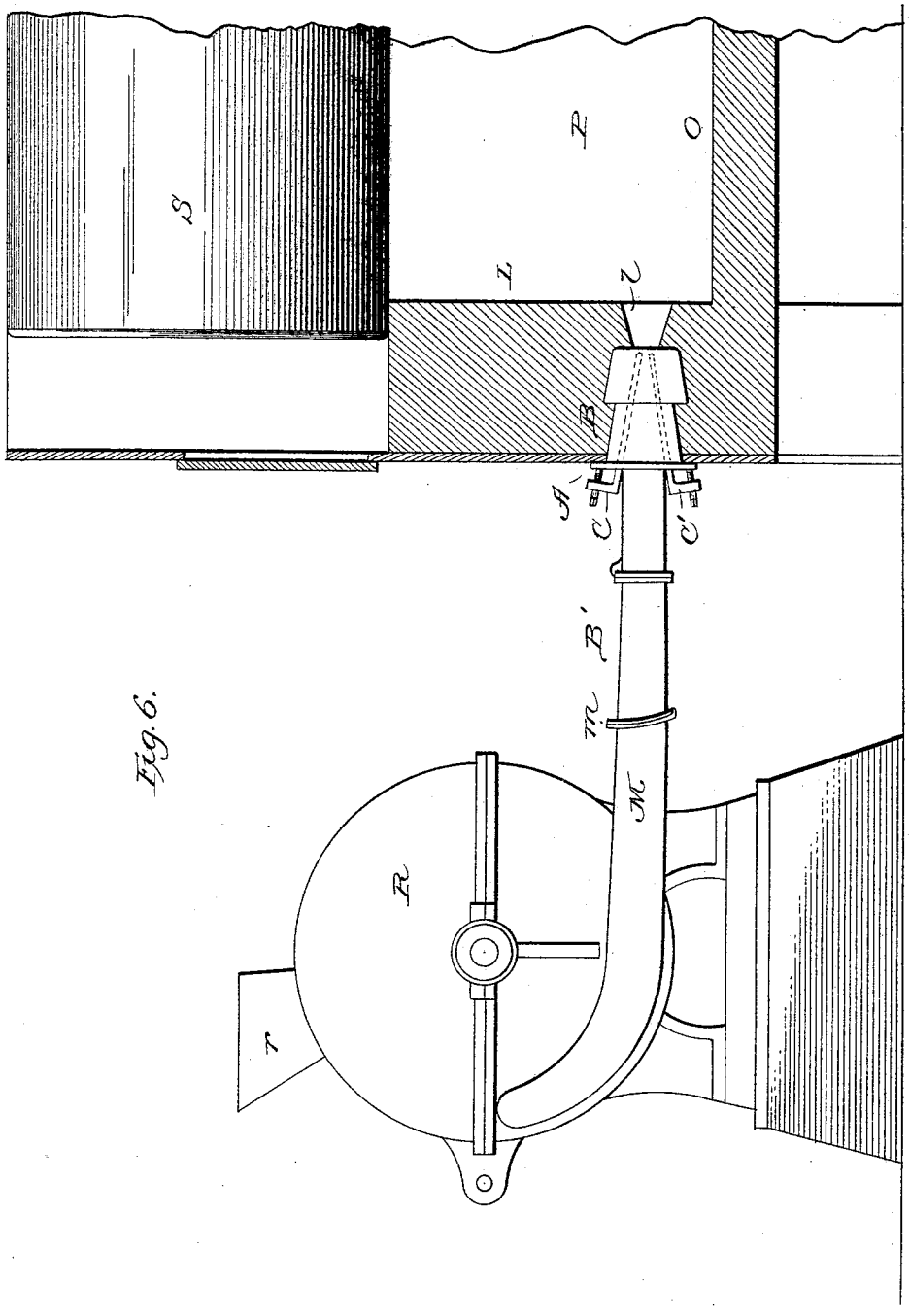


Fig. 6.

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UNITED STATES PATENT OFFICE.

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NOZZLE FOR BURNING PULVERIZED FUEL.

SPECIFICATION forming part of Letters Patent No. 616,455, dated December 27, 1898.

Application filed December 4, 1895. Renewed May 31, 1898. Serial No. 682,213. (No model.)

To all whom it may concern:

Be it known that I, CHARLES M. DAY, a citizen of the United States, residing at New York, (Brooklyn,) in the county of Kings and State of New York, have invented certain new and useful Improvements in Nozzles for Burning Pulverized Fuel; and I do hereby 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.

This invention relates to a nozzle for burning pulverized fuel.

The object of my invention is to provide adjustable devices for discharging a blast of mixed pulverized fuel and air in a thin expanding sheet of variable thickness into the combustion-chamber of a furnace, regulating the flow of said blast into the combustion-chamber, and also deflecting the current either upward or downward, as may be desired.

Another object of my invention is to provide for separately admitting currents of air for cooling and protecting the adjustable plates of the nozzle and for aiding combustion of the blast of carbon-dust.

Another object of my invention is to provide for preventing clogging of the adjustable plates by coking of fuel thereon through excessive heat, whereby a uniform blast of pulverized fuel may be forced through the nozzle to the combustion-chamber.

Another object of my invention is to provide means for conveniently and quickly cleaning the nozzle.

I will now describe the details of construction of my improved nozzle for burning pulverized fuel by reference to the accompanying drawings, in which—

Figure 1 represents a top plan view of the device with a part broken away. Fig. 1^a represents a top plan view of the nozzle having a detachable water-jacket tip. Fig. 1^b represents a vertical longitudinal section thereof. Fig. 2 represents a vertical longitudinal section of the nozzle with its delivery end located in the wall of the furnace. Fig. 3 represents a rear end view of the nozzle, partly in transverse section. Fig. 4 represents a front end view of the delivery end of the nozzle. Fig. 5 represents a sectional detail of a portion of the nozzle, showing the adjusting-screw. Fig. 6 represents an elevation, partly in section, showing the pulverizing-mill, the burner-nozzle, and a steam-boiler furnace.

The nozzle A is constructed of suitable cast metal and is set at its delivery end in the front wall L of a steam-boiler or other furnace. The nozzle is composed of the main casing B and the movable or swinging section B′. Both the sections B and B′ of the casing have flaring side walls, as shown in Fig. 1, and the top and bottom plates converge toward each other at the delivery end, as shown in Fig. 2. Thin rectangular slots or openings *b b* are formed in the top and bottom plates of the casing B for receiving the adjustable plates C C′. The casing is also provided with the circumferential flange *b′* for bolting it in place in the furnace-wall. A water-jacket b'' is cast with the casing, preferably at its front end, and such jacket is provided with the inlet-pipe b^3 and the outlet-pipe b^4 for circulation of water. A detachable water-jacket tip b^5 is preferably bolted or otherwise secured to casing B, as shown in Figs. 1^a and 1^b.

The adjustable sliding plates C C′ are inserted from the exterior through the wide thin openings or slots *b* in the upper and lower plates of the casing and are preferably inclined so as to converge toward their front ends, as shown. The side walls of the casing are provided with inclined grooves *a a*, forming guideways for said plates C C′, as shown in Figs. 3 and 4. The plates C C′ are preferably provided with longitudinal spacing-ribs *c* for forming air-passages *d* between the casing and said plates. Said ribs increase the radiating-surface of the plates and serve for conducting heat to the inflowing air, thereby cooling the plates. The outer ends of plates C C′ are provided with outwardly-turned lugs or ears *c′ c′* for receiving the adjusting-screws E. A sliding damper *g* is placed at the inlet-openings of the air-passages *d* for controlling the admission of air thereto.

The adjusting-screw E is held in ear *c′* and preferably made with an annular groove *e* for forming a swivel-joint with the pins or staples *f*. Either two pins or a staple *f* is inserted in vertical holes through the lug or ear *c′*, so as to engage with the grooves *e* and permit the screw E to turn in its opening. The opening in the flange *b′* is screw-threaded for the adjusting-screw E to work through, and

thereby slide the plate C forward or backward. The screw E is preferably made with a squared end e' for applying a wrench. By means of the construction shown the pins or staples f can be withdrawn from ears c' and then the plates C pulled out of the casing without disturbing the screws E. The plate C can thus be quickly removed for repairs or for cleaning and quickly replaced in the casing.

For the purpose of cleaning out any dust or other foreign matter which may be deposited in the nozzle I provide the movable section B′, which is preferably hinged at n to the stationary part B of the nozzle and is also connected by a joint m to the delivery end of the spout M, leading from the pulverizing-mill. The abutting ends of the section B′ and spout N are curved, as shown, so that the section B′ may be swung upward upon its hinge n. The nozzle being opened, any accumulation of dust or other material can be cleaned out from both sections.

The pulverizing-mill R, having a hopper r and a delivery-spout M, is mounted upon a suitable base and is preferably connected by its spout directly to the nozzle, as shown in Fig. 6.

The combustion-chamber P of the furnace is preferably provided with a solid hearth O. The steam-boiler S is set in the furnace in the usual manner. A flaring opening l is preferably formed in the wall L between the delivery end of the nozzle and the combustion-chamber, as shown, for preventing the flame from coming in contact with the nozzle. The adjustable plates C C′, being inclined longitudinally to a horizontal plane, are so set as to form at their inner ends a wide and thin opening. This opening can be varied by sliding the plates either inward or outward. If a larger delivery-opening is desired, both plates may be slid backward and held in place by the adjusting-screws, and if a smaller delivery-opening is desired both plates are slid forward by said screws or other suitable means. If it is desired to direct the blast upward from a horizontal plane, then the upper plate may be slid backward and the lower plate slid forward, or the upper plate alone may be slid backward or the lower plate alone slid forward. If it is desired to deflect the blast downward, the movements of the plates are reversed. In case there is a deposit of heavy particles of unconsumed coal or coke upon the hearth O a current of air will be admitted through the lower passages of the nozzle and thence between the flame and hearth of the combustion-chamber, so as to completely burn the coked material on the hearth. Air will be drawn in through the upper and lower passages d d of the nozzle both by the escaping blast at the end of the nozzle and by the chimney-draft. The admission of air will be controlled by the sliding dampers g. By means of said dampers the air may be wholly shut off, if desired.

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

1. In a nozzle for burning pulverized fuel, the combination with a casing, of an inclined sliding plate extending through the width of the nozzle and forming a continuous plane surface, and means for adjusting it longitudinally toward or from the delivery end of the nozzle for decreasing or increasing the opening at said delivery end and thereby regulating the flow of mixed fuel and air to a combustion-chamber.

2. In a nozzle for burning pulverized fuel, the combination with a casing, of a pair of inclined sliding adjustable plates extending through the width of the nozzle and forming continuous plane converging surfaces, substantially as described.

3. In a nozzle for burning pulverized fuel, the combination with the casing having side walls flaring toward the delivery end, of one or more inclined, sliding, adjustable plates extending through the width of the nozzle and forming one or more continuous plane surfaces, and means for independently moving each plate longitudinally, for varying the opening at the discharge end of the nozzle, substantially as described.

4. In a nozzle for burning pulverized fuel, the combination with a casing of inclined, sliding, adjustable plates arranged therein to form air spaces or passages between the casing at top and bottom and said plates, substantially as described.

5. In a nozzle for burning pulverized fuel, the combination with the outer casing, as B, having at or near its inlet end a horizontal transverse slot, of an inclined sliding plate in said slot and extending through the width of the nozzle, and a detachable water-jacket tip, as b^5, secured to the delivery end of said casing for protecting the outer end of said sliding plate, substantially as described.

6. In a nozzle for burning pulverized fuel, the combination with an outer casing, of inclined adjustable plates therein, air-passages between said casing and plates and a water-jacket exterior to said casing for preventing clogging, by coking of fuel thereon, through excessive heat, substantially as described.

7. In a nozzle for burning pulverized fuel, the combination with the outer casing, of an inclined plate converging from its rear to its front end toward a horizontal median plane, and means for sliding such plate inward or outward for varying the vertical height of the discharge-opening and directing the blast either upward or downward, as desired.

In testimony whereof I affix my signature in presence of two witnesses.

CHARLES M. DAY.

Witnesses:
E. B. CLARK,
H. M. STERLING.