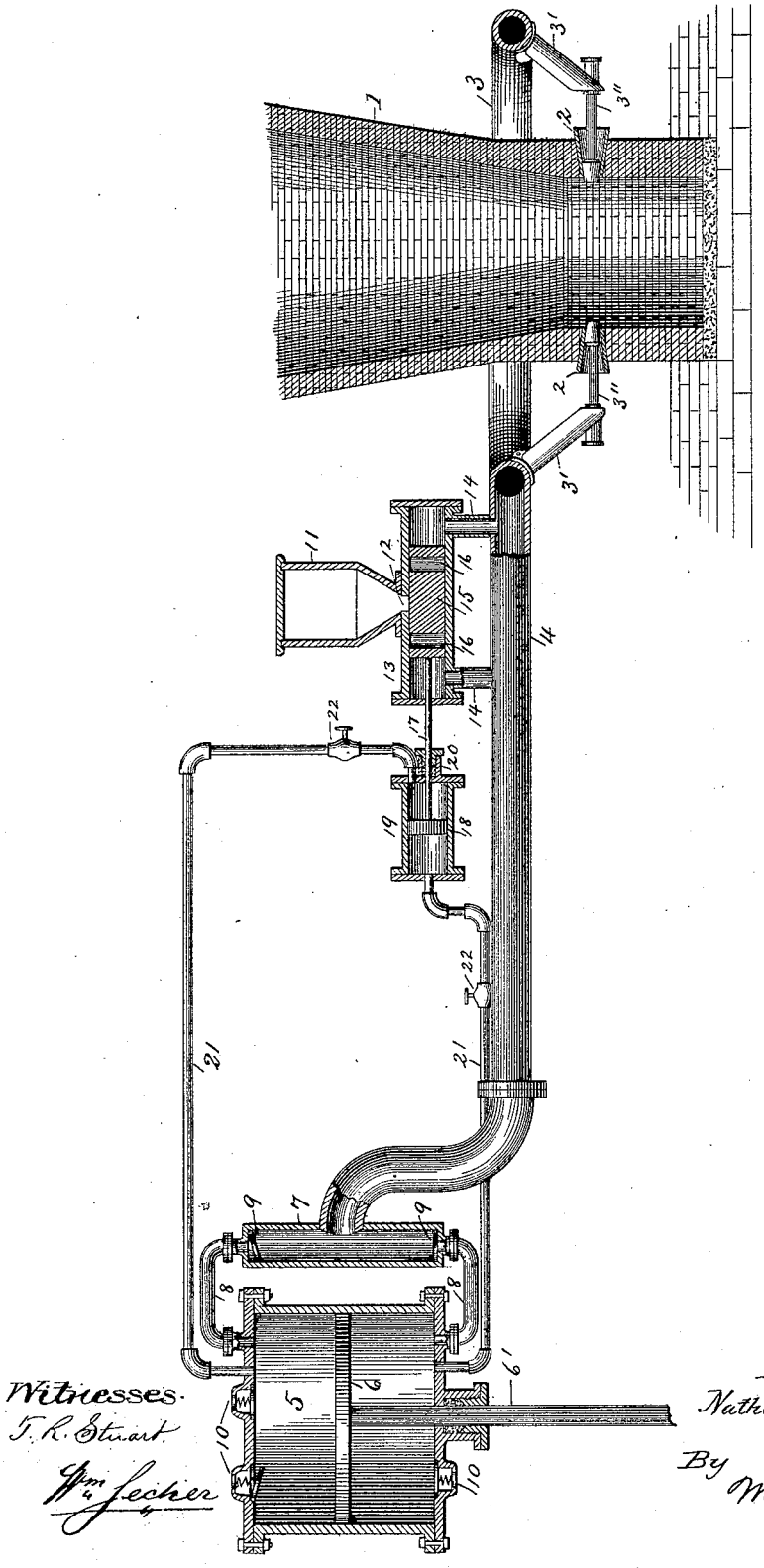
(No Model.)

N. A. PRATT.

FLUX FEEDING APPARATUS FOR BLAST FURNACES.

No. 401,063. Patented Apr. 9, 1889.



Witnesses.
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UNITED STATES PATENT OFFICE.

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FLUX-FEEDING APPARATUS FOR BLAST-FURNACES.

SPECIFICATION forming part of Letters Patent No. 401,063, dated April 9, 1889.

Application filed June 2, 1888. Serial No. 275,940. (No model.)

To all whom it may concern:

Be it known that I, NATHANIEL A. PRATT, a citizen of the United States, residing at Atlanta, in the county of Fulton and State of Georgia, have invented certain new and useful Improvements in Flux-Feeding Apparatus for Blast-Furnaces; 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.

My invention relates to apparatus for feeding flux into blast-furnaces during the process of smelting ores; and it consists in the improved construction and arrangement or combination of parts hereinafter fully disclosed in the description, drawing, and claims.

The objects of my invention are, first, to connect a flux-receptacle with the blast-pipe or bustle of a smelting-furnace in a novel and improved manner, whereby the delivery of the flux into the furnace by the air-blast will be facilitated; second, to provide, in connection with said flux-receptacle, improved means for feeding the supply of flux into said blast or bustle pipe; third, to connect the flux-feeding mechanism with the blower-cylinder by improved means, and, fourth, to provide an air-engine or cylinder and piston for operating said flux-feeding mechanism and means for connecting the ends of said cylinder with the ends of said blower-cylinder. I accomplish these objects by the apparatus shown in the accompanying drawing, forming a part of this specification, in which the same reference-numerals indicate the same parts, and in which the figure represents a vertical section of a portion of a smelting-furnace, the blower-cylinder, the air-engine or cylinder, and my improved flux-feeding apparatus.

In the drawing the numeral 1 indicates the furnace, which is provided with the usual tuyeres, 2. A blast or bustle pipe, 3, encircles the boshes of said furnace, and is provided with the drop-pipes 3′, having nozzles 3″, and is connected with the blast-main 4. This blast-main extends from the blower-cylinder 5 to the annular blast or bustle pipe 2, and said cylinder is provided with a reciprocating piston, 6, which is operated by the rod 6′ from any suitable engine or other power source. The end of the blast-main near the blower-cylinder is formed with a vertical chamber, 7, to the ends of which are secured two short curved branch pipes, 8, which open into the heads of said blower-cylinder. Outlet-valves 9 are arranged at the ends of said vertical chamber, opening into the same and out from the blower-cylinder, and have their seats over the ends of said curved branch pipes 8. The heads of the blower-cylinder are provided with air-inlet valves 10, which open into said cylinder and are provided with suitable springs or other means for closing them.

The flux hopper or receptacle 11 is supported over the blast-main 4 near the furnace, and is formed with an outlet-port, 12, opening into a casing or valve-chest, 13, which is connected with two feed-channels, 14, communicating with the blast-main. A valve, 15, reciprocates within said valve casing or chest, fitting snugly within the same, and is formed with two vertical ports or recesses, 16, which are adapted to alternately register with the outlet-port 12 of the hopper and with the feed-channels 14.

One end of a piston-rod, 17, is connected to the valve 15 and its other end is secured to a piston, 18, which reciprocates in an air engine or cylinder, 19, and slides through a stuffing-box, 20, on one head of said cylinder. To this cylinder or air-engine are connected two pipes, 21, which enter it at its ends, which extend from the heads of the blower-cylinder, and which are provided with stop-cocks 22.

The operation of the apparatus is as follows: When the furnace is in full operation or "blown in," the blower-cylinder 5 in action, the stop-cocks 22 in the small air-pipes 21 open, and the flux-hopper 11 filled with pulverized flux suitable for the ore to be smelted, the piston 6 in said blower-cylinder will alternately draw air into its upper and lower chambers through the valves 10 in its heads and force it out through the pipes 8, the valves 9, and the vertical chamber into the blast-main 4; also, when said stop-cocks 22 in the small air-pipes 21 are open, the air will be alternately forced into and drawn out of the ends of the air-engine or cylinder 19,

causing the piston 18 therein to be reciprocated. This will reciprocate the flux-valve 15 in the valve-casing 13 and cause the ports or recesses 16 in said valve to alternately register with the outlet-port 12 in the hopper and with the feed-channels 14, so that as said ports or recesses become filled with the pulverized flux they will drop it into the blast-main 4 through said feed-channels. The air passing through the blast-main will carry the pulverized flux along with it, force it through the bustle-pipe, drop-pipes, nozzles, and tuyeres into the boshes of the furnace, diffuse it through the molten metal, and cause it to take up and unite with the phosphorus, sulphur, and other impurities in the ore and fuel and bear them away in the cinder or slag.

In the operation of this apparatus the flux will be fed into the blast in regular quantities, which are regulated by the size of the ports or recesses in the flux-valve; also, the quantity of flux fed will be accurately proportioned to the speed of the piston of the blower-cylinder, and also by the force of the blast said flux will be perfectly diffused through the material in the lower boshes of the furnace at or near the zone of fusion.

Only a small quantity of the air-blast from the blower-cylinder will be consumed by the operate the flux-valve, as the pipes for supair-engine or cylinder and its piston, which plying the air to said engine or cylinder are small compared with the blast-main, and because the air-pressure required in said air-engine is not required to be great, as the compressed air at one side of the piston therein operates against a partial or nearly complete vacuum at the other side of said piston, which is caused by the action of the piston in the blower-cylinder drawing the air out of the air-engine at one end while it is being compressed at the other end.

Having thus fully described the construction and arrangement or combination of parts of my improved flux-feeder, its operation and advantages, what I claim as new is—

1. The combination, with a furnace having tuyeres, of a blower-cylinder, a blast-main, a bustle-pipe provided with nozzles, a flux-feeding apparatus for discharging pulverized flux into said blast-main, and an air-engine connected to and operated by compressed air from said blower-cylinder and operating to drive said flux-feeding apparatus, substantially as described.

2. The combination, with a furnace having tuyeres, of a blower-cylinder, a blast-main, a bustle-pipe provided with nozzles, a flux-hopper, a discharge-valve and its casing beneath said hopper and communicating with said blast-main, and an air-engine operated by compressed air from said blower-cylinder and operating said valve, substantially as described.

3. The combination, with a furnace having tuyeres, of a blower-cylinder, a blast-main, a bustle-pipe provided with nozzles, a flux-hopper, a discharge-valve beneath said hopper and communicating with said blast-main, an air-engine, a piston within the same connected to said valve, and pipes which connect said engine with said blower-cylinder, substantially as described.

4. The combination, with a furnace having tuyeres, of a blower-cylinder, a blast-main, a bustle-pipe provided with nozzles, a flux-hopper formed with an outlet-port, a valve-casing below said outlet-port, feed-channels which open into said blast-main, a reciprocating valve within said casing having ports or recesses which alternately register with said outlet-port and with said feed-channels, an air-engine, a piston within the same having its rod connected to said reciprocating valve, and pipes which connect said engine and blower-cylinder, substantially as described.

5. The combination, with the furnace 1, having tuyeres 2, of the blower-cylinder 5, provided with the air-inlet valves 10 and the piston 6, the vertical chamber 7, having inlet-valves 9, the curved pipes 8, the blast-main 4, the annular blast or bustle pipe 3, provided with nozzles 3″, the flux-hopper 11, provided with the outlet-port 12, the valve-casing 13, the feed-channels 14, the valve 15, formed with ports or recesses 16, the air-engine 19, the piston 18, connected to said valve 15 by the rod 17, and the pipes 21, provided with stop-cocks 22 and connected with said engine 19 and blower-cylinder 5, substantially as described.

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

NATHANIEL A. PRATT.

Witnesses:
T. R. STUART,
WM. SECHER.