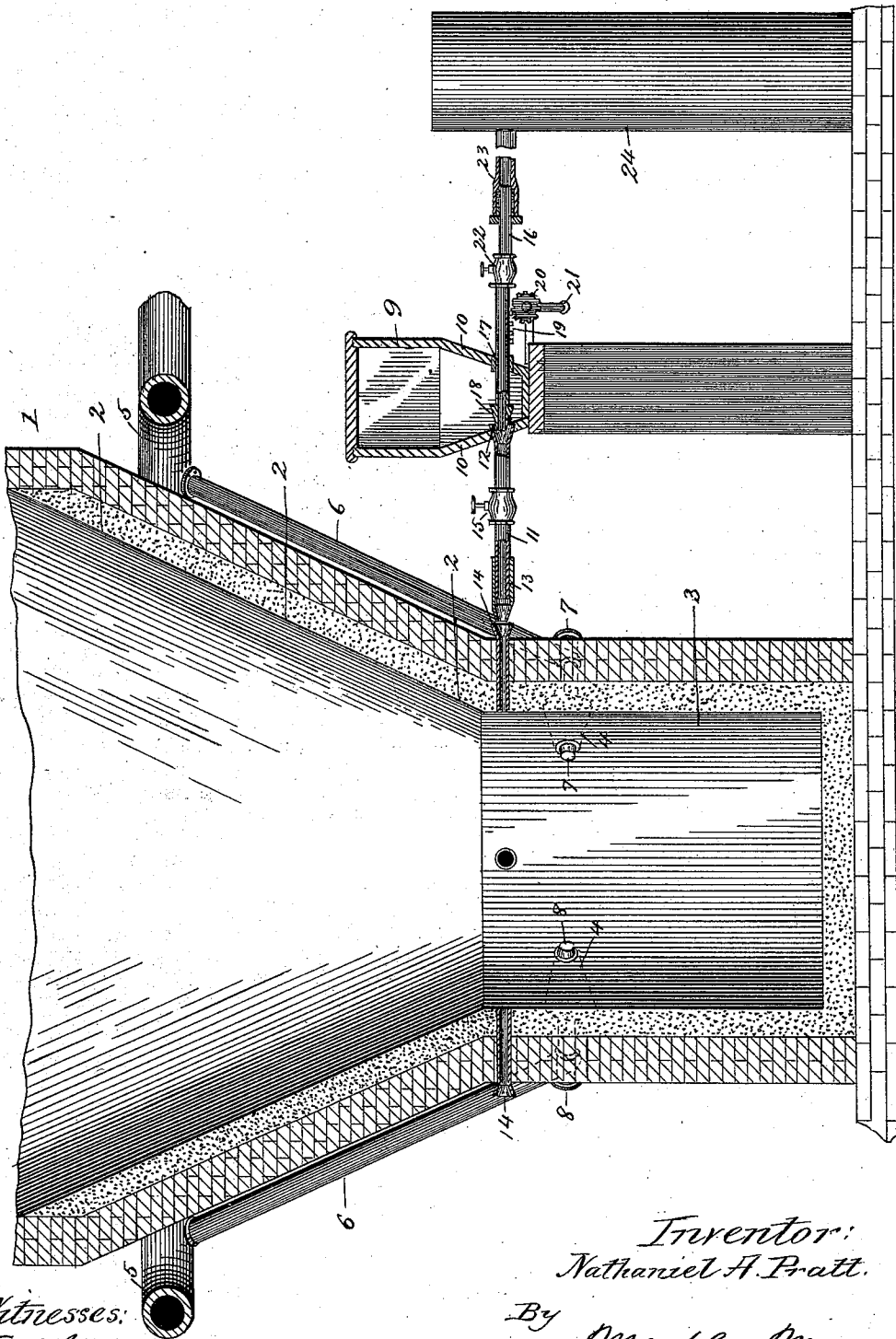


(No Model.)

N. A. PRATT.  
FLUX FEEDER FOR BLAST FURNACES.

No. 402,103.

Patented Apr. 23, 1889.



Witnesses:  
J. R. Stuart  
Wm. Lecher

Inventor:  
Nathaniel A. Pratt.  
By Marble & Mason,  
Attys.

# UNITED STATES PATENT OFFICE.

NATHANIEL A. PRATT, OF ATLANTA, GEORGIA, ASSIGNOR TO THE PRATT  
STEEL COMPANY, OF BIRMINGHAM, ALABAMA.

## FLUX-FEEDER FOR BLAST-FURNACES.

SPECIFICATION forming part of Letters Patent No. 402,103, dated April 23, 1889.

Application filed June 2, 1888. Serial No. 275,941. (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-Feeders 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 feeders or injectors for delivering finely-comminuted flux into the body of a blast-furnace for smelting iron; and it consists in the improved construction and arrangement or combination of parts, hereinafter fully disclosed in the description, drawings, and claims.

The objects of my invention are, first, to provide receptacles or hoppers for containing finely-comminuted flux with discharge-pipes having funnel-shaped inner ends within said hoppers, and with pipes which convey a blast of compressed air which enters said hoppers opposite the funnel-shaped ends of said discharge-pipes, and which are provided with conical mouth-pieces that project into said funnel-shaped ends; second, to provide means for adjusting the inner ends of said blast-conveying pipes with relation to said funnel-shaped inner ends of said discharge-pipes, and, third, to provide movable couplings between the outer ends of said discharge-pipes and the nozzles in the walls of the furnace through which the flux is forced into said furnace. I accomplish these objects by the apparatus shown in the accompanying drawing, forming 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 blast-furnace and of one of my improved flux feeders or injectors.

In the drawing, the numeral 1 indicates the furnace, which is constructed, generally, in the usual or any suitable or preferred manner, and which is provided with the boshes 2, the crucible 3, and the tuyeres 4. The blast or bustle pipe 5 surrounds the furnace, and is provided with the drop-pipes 6, having blast-

nozzles 7 8, &c., which enter the furnace through the tuyeres at the lower part of the boshes. These drop-pipes and their nozzles, and also the flux-hoppers, flux-nozzles, and other parts of the feeding apparatus, are not all shown in the drawing, those not shown being merely duplicates of those which are illustrated.

The hoppers 9, formed with downwardly-converging sides 10, are supported a short distance from the outside of the furnace, and are preferably arranged at equal distances around the same. Each of these hoppers is provided with a discharge-pipe, 11, the inner end, 12, of which is formed in the shape of a funnel or hollow cone and secured within said hopper, and its outer end is provided with a slidable coupling or tube-section, 13, which registers with and is adapted to enter with its outertapering end into a flux-nozzle, 14. This flux-nozzle passes through the wall of the furnace, preferably in the lower part of the boshes and a short distance above the tuyeres and blast-nozzles; but it may be arranged below the latter. A suitable stop cock or valve, 15, is placed in the discharge-pipe 11 between the sliding coupling 13 and the hopper 9.

A compressed-air or injector pipe, 16, slides in a stuffing-box, 17, in the side of the hopper, diametrically opposite the funnel-shaped inner end of the discharge-pipe, and is provided with a conical mouth-piece, 18, which finds a seat in said funnel-shaped end of the discharge-pipe. This injector-pipe 16 is also provided outside of the stuffing-box 17 with a rack, 19, which is engaged by a cog-wheel or pinion, 20, which is provided with a suitable handle, 21, or similar means for revolving it. A stop cock or valve, 22, is also provided in said injector-pipe 16 outside of said rack; also, the outer end of this pipe is adapted to slide in the packed end of a blast-conveying pipe, 23, which extends from a compressed-air receiver, 24, which is fed from a suitable air-compressor or blowing-engine; or said pipe may be fed directly from the air-compressor or blowing-engine.

The operation of my flux feeder or injector is as follows: After the hopper of the apparatus has been charged with finely-commin-

uted flux, and when the compressed-air reservoir has also been charged or the compressor or blowing-engine started, and when the furnace has been started in operation, the sliding coupling is drawn out to enter the flux-nozzle. Then the injector-pipe 16 is slid back by the pinion and rack, so as to open the funnel-shaped end 12 of the discharge-pipe 11. Then the stop-cock 15 in said discharge-pipe is opened, and then the stop-cock 22 in the injector-pipe is also opened. The blast of compressed air in the injector-pipe will then draw the finely-comminuted flux into the funnel-shaped end of the discharge-pipe and blow it through said pipe, the sliding coupling, the nozzle, and into the body of the furnace. The feed of the apparatus may be stopped by sliding the injector-pipe into its seat in the funnel-shaped end of the discharge-pipe, when the stop-cocks may be closed and the coupling 13 slid back from the flux-nozzle.

The supply of flux forced into the furnace and the quantity of the same in proportion to the strength of the forcing-blast may be regulated by adjusting the injector-pipe toward or from the funnel-shaped end of the discharge-pipe. For instance, by drawing said injector-pipe away from said funnel-shaped end a greater supply of flux will be fed into the furnace, but with comparatively less air force, and by pushing said injector-pipe farther toward said funnel-shaped end a less supply of flux will be fed, but with a comparatively greater air force. The force of the blast may also be regulated by the stop-cocks upon the discharge and injector pipes.

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

1. The combination, with a blast-furnace having a flux-nozzle, of a flux-hopper, a discharge-pipe having a sliding coupling thereon adapted to enter said nozzle, an injector-pipe which is movably inserted within said hopper and arranged with its inner end opposite the inner end of said discharge-pipe, and devices for longitudinally adjusting said injector-pipe, substantially as described.

2. The combination, with a blast-furnace having a flux-nozzle, of a flux-hopper, a discharge-pipe having a funnel-shaped inner end within said hopper and a sliding coupling on its outer end, and an injector-pipe having a conical mouth-piece arranged opposite the

funnel-shaped inner end of said discharge-pipe, substantially as described.

3. The combination, with a blast-furnace, of a flux-hopper, a discharge-pipe which is adapted to enter said furnace, and which is provided with a funnel-shaped inner end within said hopper, a movable injector-pipe having a conical mouth-piece which is adapted to project into said funnel-shaped end of the discharge-pipe, and provided with a cogged rack, a pinion meshing with said rack, and a handle for revolving said pinion, substantially as described.

4. The combination, with a blast-furnace, of a flux-hopper provided with a stuffing-box on one side, a discharge-pipe which is formed with a funnel-shaped inner end within said hopper diametrically opposite said stuffing-box, an injector-pipe which slides through said stuffing-box, and which is provided with a conical inner end or mouth-piece and with a rack and stop-cock outside of said hopper, a pinion meshing with said rack and provided with a handle for revolving it, and a blast-conveying pipe which has the end of said injector-pipe sliding inside of its packed end, substantially as described.

5. The combination, with a blast-furnace having a flux-nozzle in the wall thereof, of a flux-hopper, a discharge-pipe formed with a funnel-shaped inner end within said hopper, and having a slidable coupling upon its outer end which is adapted to enter said flux-nozzle, and an injector-pipe entering said hopper opposite the funnel-shaped end of said discharge-pipe and adapted to project into the same, substantially as described.

6. The combination, with a blast-furnace, having a flux-nozzle, 14, in the wall thereof, of a flux-hopper, 9, a discharge-pipe, 11, provided with a funnel-shaped inner end, 12, and with a stop-cock, 15, a sliding coupling, 13, upon said pipe, a sliding injector-pipe, 16, provided with a conical inner end, 18, a rack, 19, and stop-cock 22, a pinion, 20, provided with a handle, 21, and meshing with said rack, a blast-conveying pipe, 23, having the end of said injector-pipe sliding in its packed end, and a suitable compressed-air supply, substantially as described.

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

NATHANIEL A. PRATT.

Witnesses:

T. R. STUART,  
WM. SECHER.