

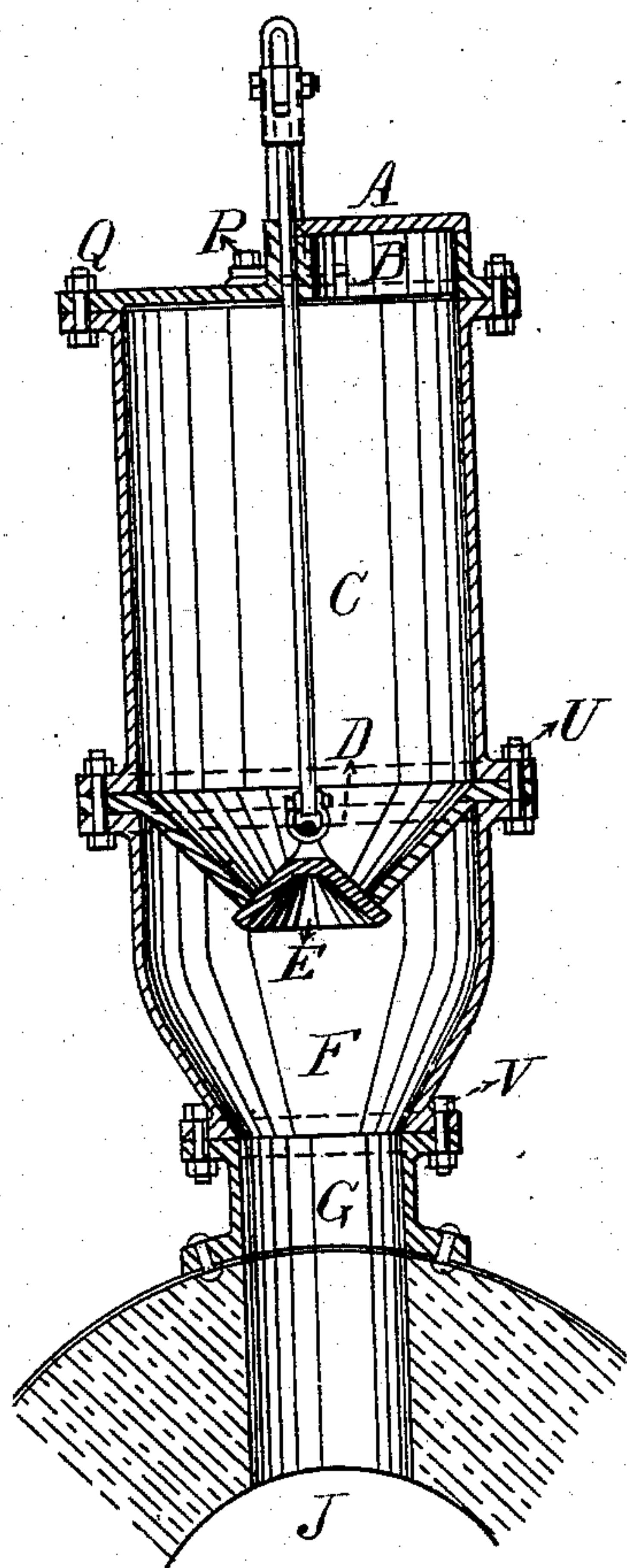
(No Model.)

J. J. FRONHEISER.

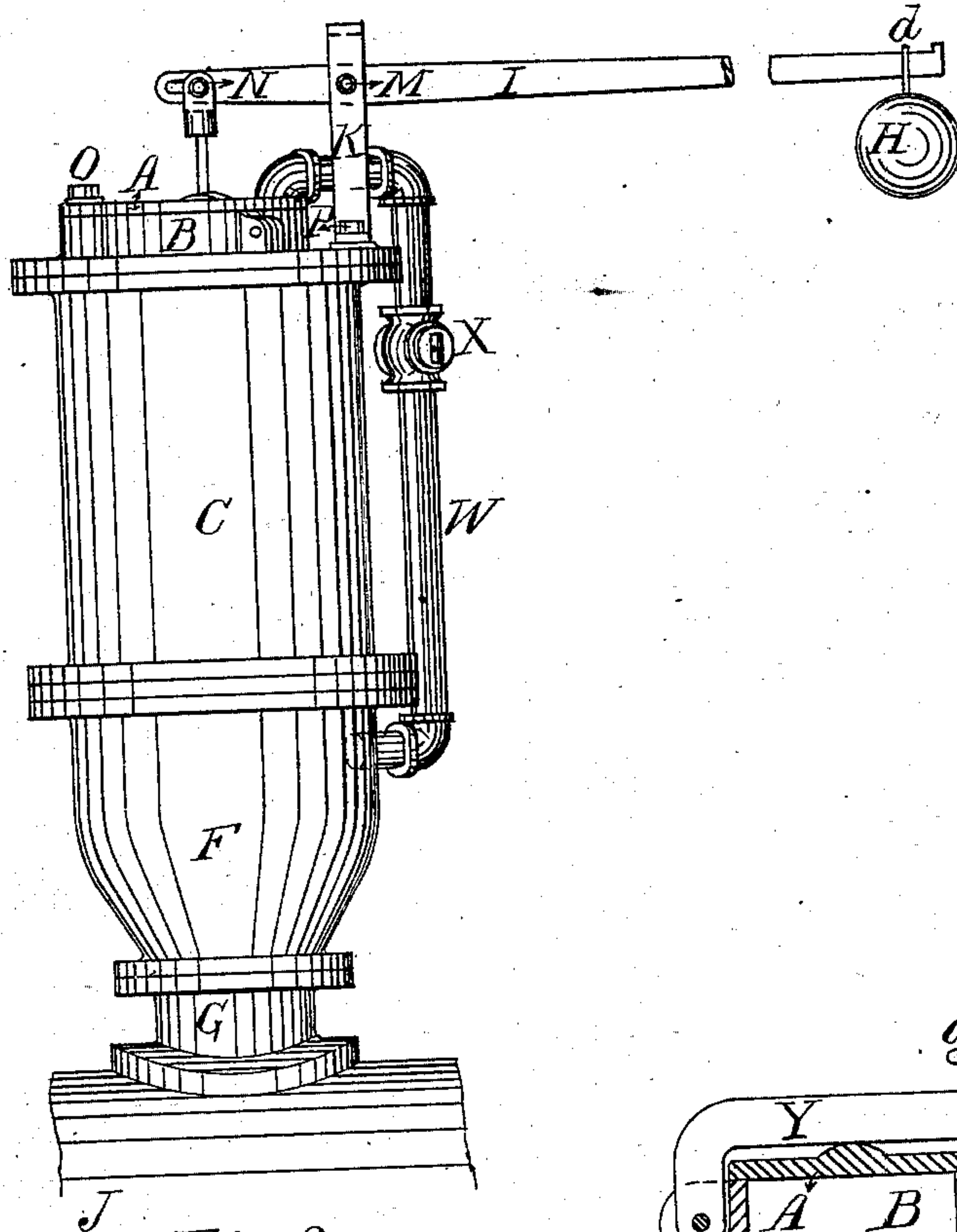
BLAST FURNACE.

No. 282,512.

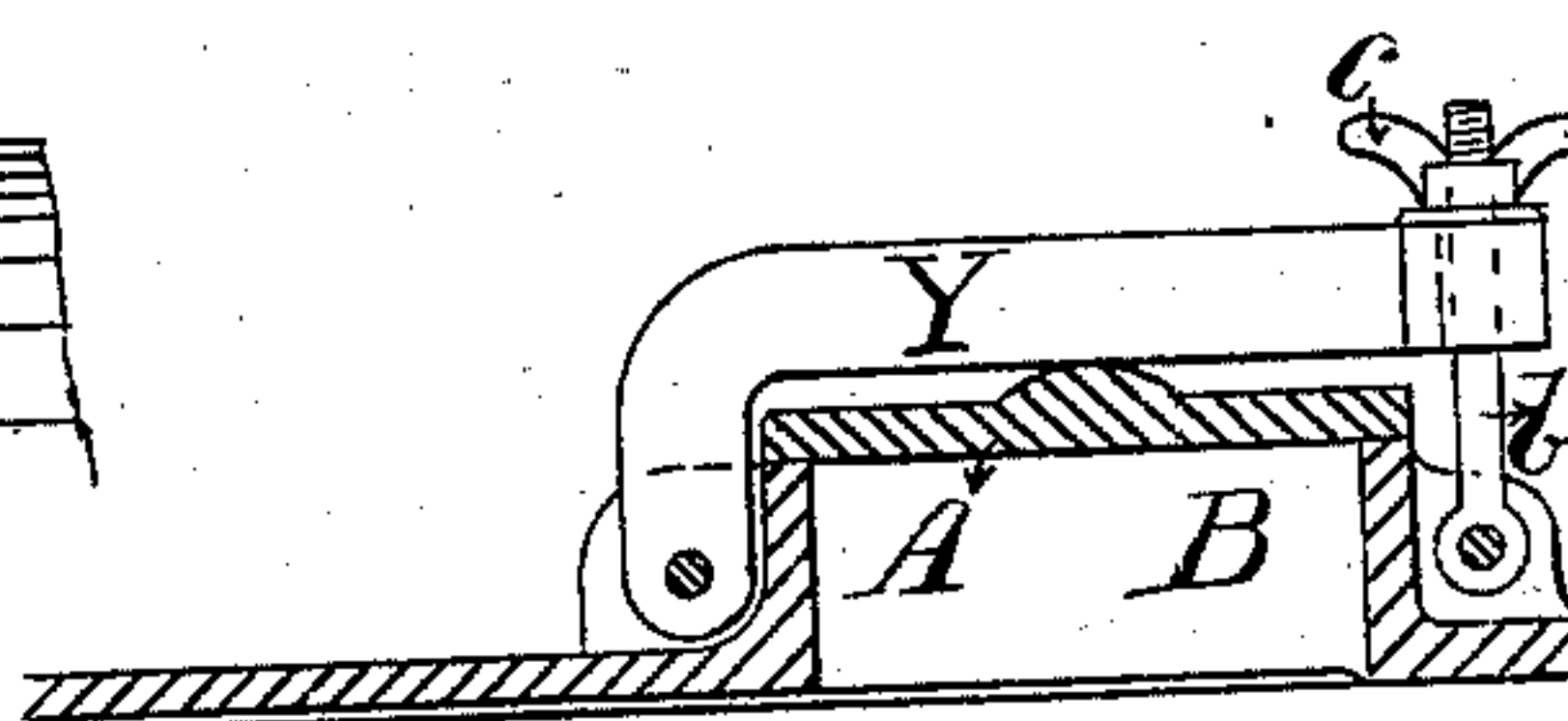
Patented Aug. 7, 1883.



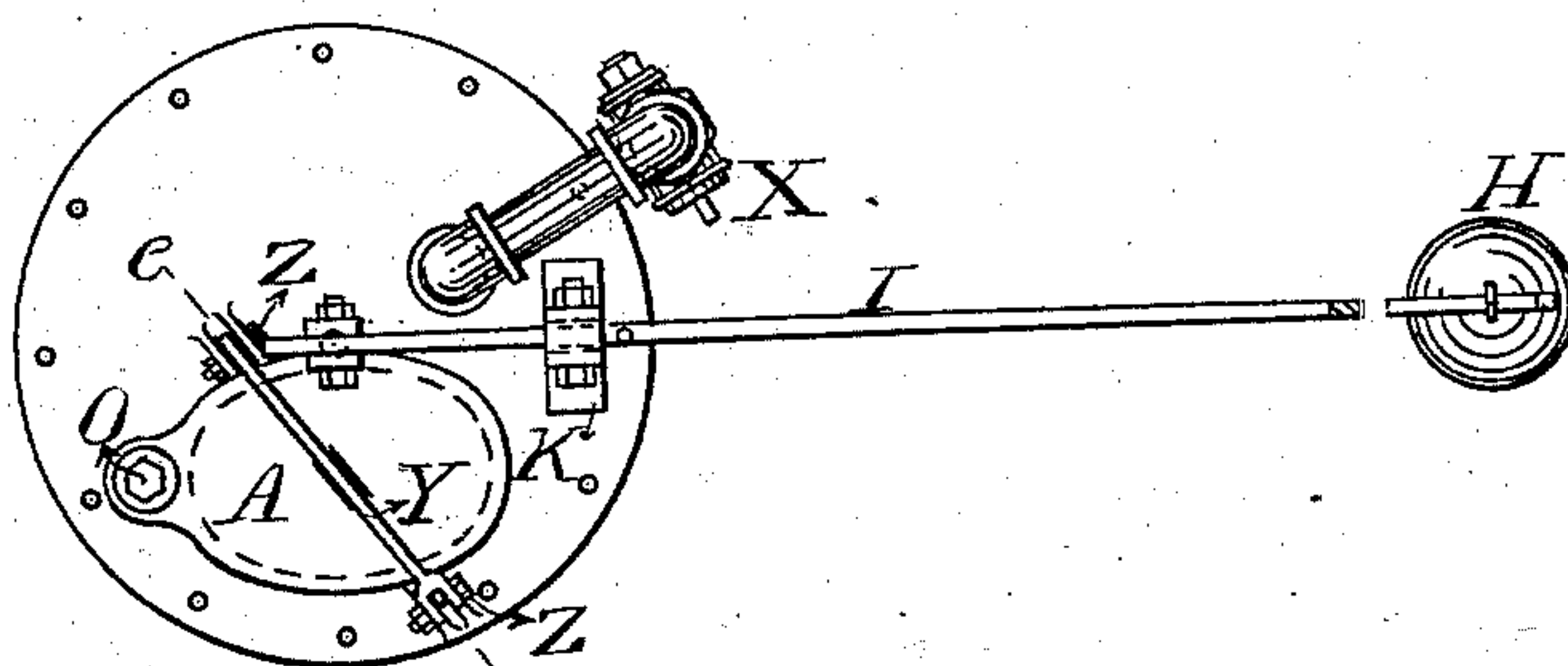
*Fig. 1.*



*Fig. 2.*



*Fig. 4.*



*Fig. 3.*

Witnesses.

Cyrus Eldon  
James M. Swank, Jr.

*Inventor.*

James J. Frankeiser



# UNITED STATES PATENT OFFICE.

JAMES J. FRONHEISER, OF JOHNSTOWN, PENNSYLVANIA.

## BLAST-FURNACE.

SPECIFICATION forming part of Letters Patent No. 282,512, dated August 7, 1883.

Application filed March 1, 1883. (No model.)

*To all whom it may concern:*

Be it known that I, JAMES J. FRONHEISER, of Johnstown, in the county of Cambria and State of Pennsylvania, have invented certain  
5 Improvements in Blast-Furnaces, of which the following is a specification.

My invention consists in a method of introducing materials into a blast-furnace through the tuyeres without taking off the blast, which  
10 I accomplish by means of the apparatus hereinafter described.

It very often happens that when a blast-furnace is scaffolded too cold, or when the cinder and metal from some other cause are too thick  
15 to run from the furnace, it becomes necessary to put sand, chloride of sodium, fluor-spar, or other chemicals or fuels of different kinds into the hearth of the furnace. Under the present  
20 customary arrangements the blow-pipes are either taken down entirely and the material is introduced through the tuyeres, or a cap on the end of the blow-pipe is removed and the pipe is filled with the material, so that it will be carried into the furnace after the blast is  
25 turned on. All of these manipulations, however, necessitate throwing the blast off of the furnace before the material can be introduced, and this has the disadvantage that just as soon as the blast pressure is removed cinder or metal  
30 is apt in some parts of the furnace to run back into the tuyeres, causing great loss. By my arrangement material can be fed into the furnace continuously without stopping the blast.

In the drawings accompanying this application, Figure 1 is a vertical section of the improved apparatus embodying my invention. Fig. 2 is an outside elevation of the same. Fig. 3 is a transverse view of the top. Fig. 4 shows the openings through which the materials are  
40 fed into the upper or hopper part of the apparatus.

In these figures the parts of the apparatus are indicated by letters as follows:

C represents the hopper or receptacle for  
45 the material.

B is the opening through which the material is introduced.

A is a valve closing the opening B, which valve A is held in place by the clamp Y, furnished with bolt *b* and nut *c* at one end and bolt Z at the other end. The valve A is allowed to open by swinging to one side on the  
50 bolt O.

E is a bell on the bottom of the cylinder or hopper C, and is manipulated by the rod *k* and  
55 lever I, which are connected by the bolt N, the lever I being fastened on the stand or fulcrum K by the bolt M, and is counterpoised by the weight H.

F is a funnel-like extension of the hopper  
60 C, fastened to it by the flange V at the top, and fastened to the neck G by the flange and bolt V.

J is the bustle-pipe, encircling the furnace above the tuyeres, the neck G entering it, as  
65 shown in Fig. 1.

W is a pipe connected with the funnel F below the valve E, and also connected with the hopper C at its top or above the valve E; this pipe W being furnished with the cock or  
70 valve X.

The method of operating this charging apparatus is as follows: The nut *c* is taken off of the bolt *b*, the clamp Y is removed, and the valve A is opened by swinging it to one side,  
75 when the material is charged through the valve A into the cylinder or hopper C. The valve A being then closed, and the valve E opened, the material by its own weight, if the pressure is not too great, will drop through the  
80 neck G into the bustle-pipe J, and will be carried directly into the furnace with the blast-air. In case the blast-pressure is too great against the valve E, and the weight of the material to be charged into the furnace is not sufficient to overcome it, then the valve X in the  
85 pipe W is opened, by which means the pressure above and below the valve E will be restored to equilibrium, and the material will drop through the valve E from its own weight.  
90

The cylinder or hopper C can be made large enough to hold several hundred pounds of material, and by adjusting the weight H on the lever I the size of the opening in the valve E may be regulated, and the rapidity with which  
95 the material is introduced into the furnace will be entirely under control.

I use as many of these devices or apparatus for charging as there are tuyeres in the furnace, placing one of them above each tuyere,  
100 so that the material will drop directly into the blow-pipe and be carried with the blast-air directly into the furnace.

I am aware that apparatus has been devised for blowing fuels and other solid matter into  
105 a blast-furnace, and I do not claim such appa-



ratus, broadly; and I do not use gas or a mixture of gas and other fuel, as my apparatus is designed for the use of solid fuel only.

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

In combination with the bustle-pipe of a blast-furnace, the hopper C, funnel F, counter-

poised bell E, and valve A, and the equilibrium pipe W, constructed substantially as described, 10 and for the purpose set forth.

JAMES J. FRONHEISER.

Witnesses:

CYRUS ELDER,  
JAMES M. SWANK, Jr.