(No Model.)

J. F. BENNETT.

HOT BLAST APPARATUS FOR BLAST FURNACES.

No. 294,003. Patented Feb. 26, 1884.

Fig 1.

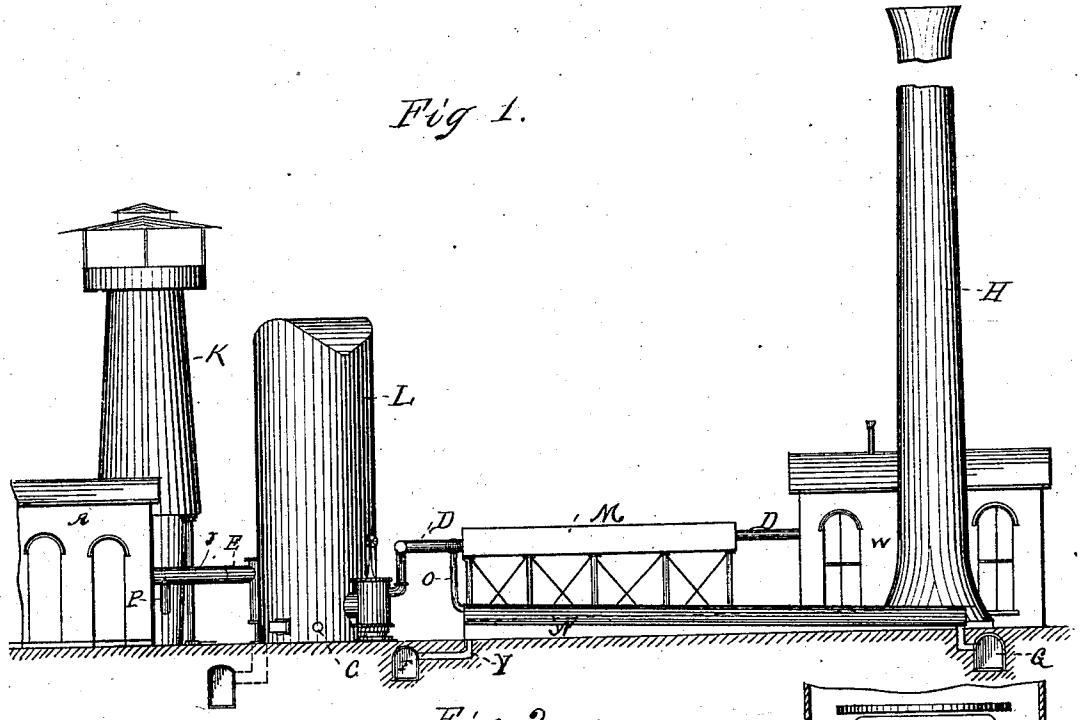
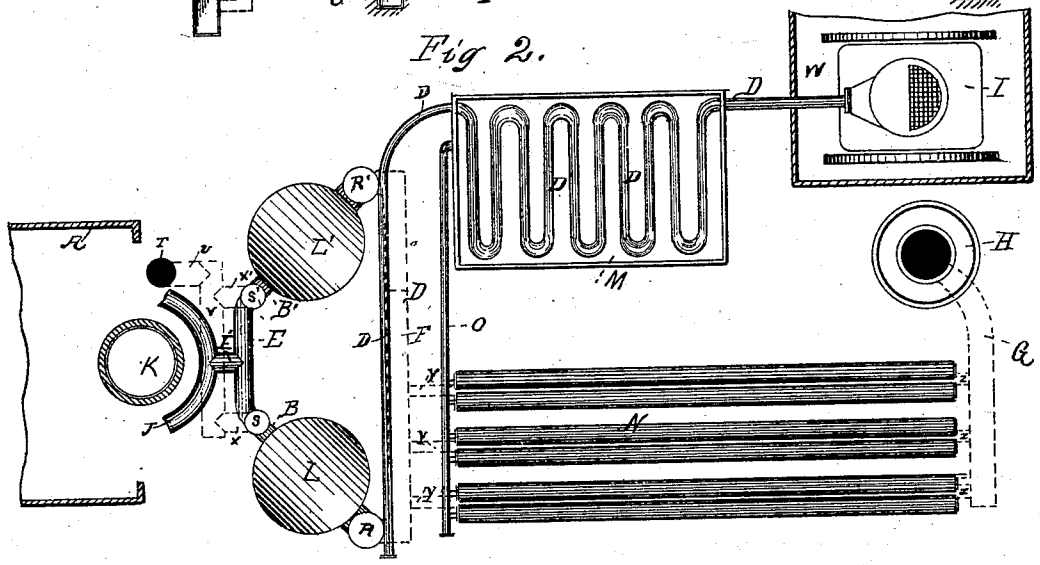


Fig 2.



Witnesses
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UNITED STATES PATENT OFFICE.

JOHN FRANCIS BENNETT, OF PITTSBURG, PENNSYLVANIA.

HOT-BLAST APPARATUS FOR BLAST-FURNACES.

SPECIFICATION forming part of Letters Patent No. 294,003, dated February 26, 1884.

Application filed February 7, 1883. (No model.)

To all whom it may concern:

Be it known that I, JOHN FRANCIS BENNETT, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Hot-Blast Apparatus for Blast-Furnaces, of which the following is a specification.

My invention relates to improvements in apparatus for charging blast-furnaces with a heated-air blast; and it consists of the means illustrated, whereby the atmospheric air forced into the furnace by a blower is heated, previously to its entrance to the furnace, by the waste gases evolved from the blast-furnace; and the object of my improvements is to heat an atmospheric blast in its passage to the furnace continuously by the waste gases evolved from the furnace, with a simple construction of plant. I attain this object by the methods hereinafter described, and the means illustrated in the accompanying drawings, in which—

Figure 1 represents an elevation of the plant essential to the successful operation of my invention; and Fig. 2 represents a plan view of the same, partially in section.

Similar letters refer to corresponding parts in both views.

A is a suitable building, in which the operations incident to the management of the furnace may be carried on.

B is a pipe conducting the waste gases from the blast-furnace, received through downcomer T, pipes U V X, and valve S, into the stove L.

B′ is a pipe conducting the waste gases from the blast-furnace, received through downcomer T, pipes U V X′, and valve S′, into the stove L′.

C represents suitable air-inlets in the bases of the stoves, to insure the combustion of the hot gases in the stoves.

D is a pipe conducting atmospheric air from the blower I into the stoves. It is so made to pass through the steam and hot-water tank M that the air shall pursue a sinuous passage, whereby it receives a greater increment of heat than if the pipe pursued a path parallel to the base of the rectangular tank. At the curves of the pipe the area is increased to such extent that no appreciable loss of velocity results. The pipe D is connected by the valves R and R′, respectively, with the stoves L and L′, and these valves are so controlled that only one is open to the pipe D at a time, so that the air traverses the stoves L and L′ alternately.

E is a pipe conducting heated air, received either from the stove L through pipe B and valve S or from stove L′ through pipe B′ and valve S′, to the pipe E′.

E′ is a pipe transmitting the heated air received from E to the pipe J.

F is a pipe conducting the hot gases from the blast-furnace, which have been relieved of a large amount of heat in traversing the stoves, and are permitted access, alternately, to one or the other end, according as the valve R or R′ is open, into the flues Y Y Y, which lead the gases under the boilers N N N, where any heating-power remaining in them is utilized in the generation of steam. Thence the gases are discharged into the shaft H by means of flues Z Z Z and G.

I is a blower suitably housed in a building, W, which forces atmospheric air into the pipe D.

J is a pipe receiving the heated air from pipe E′, which it conducts into the furnace by a drop-pipe, P, through suitable tuyeres.

K is the blast-furnace.

L and L′ represent the stoves heating the atmospheric air received from the blower.

M is a preheating-tank receiving steam from the boilers N N N by means of pipe O, which it utilizes in raising the temperature of the air forced by the blower through the pipe D. A suitable outlet for water of condensation is provided.

N N N are the boilers. They are preferably made very long—say ninety feet—and of comparatively small diameter, and are laid at an angle to the horizon, whereby the greatest possible surface is presented to the waste gases to relieve them of their heat.

T is the downcomer, conducting the waste gases from the furnace into the pipe U.

V is a pipe connecting the branch pipes X X′ with the branch pipe U.

Y Y Y are flues conducting the gases from pipe F under the boilers N N N, and Z Z Z are corresponding flues at the other end, conducting them into the main flue G, whence

they are drawn into the chimney H by its natural draft. Each of the boilers may be provided with two suitable safety-valves rising to different pressures, the one responding to the smaller pressure being connected with the pipe O.

It will be understood that all the furnace-gases are conducted alternately into the stoves L L′, where, combining with atmospheric air, the intense heat due to combustion is stored until the cold air from the blower takes it up in passage to the furnace; that the gases relieved of the greater portion of their heat are then conducted under the boilers, to generate the steam requisite to drive the blower and to heat the tank M, where a preliminary warming is imparted to the air. The condensed steam from the blower and the heated waste water from the tuyeres and other sources in the apparatus may be conducted into the tank for the same purpose.

I do not restrict myself to two stoves, as three may sometimes be more beneficial, and where two blast-furnaces are operated adjoining each other it may be found economical to employ five stoves for them.

I am aware that heretofore air has been gradually heated in its transit from the blower to the blast-furnace, and this I do not broadly claim; but

What I claim, and desire to secure by Letters Patent of the United States, is—

1. The combination, with a blast-furnace, of two hot-blast stoves, a steam-boiler, a preheating-reservoir, and connecting-pipes and valves, substantially as and for the purpose specified.

2. The combination, with a blast-furnace, K, of a downcomer, T, drop-pipe P, bustle-pipe J, connecting-pipe E′, heated-air-supply pipe E, hot-air-supply pipe U, connecting-pipes V X X′, valves S S′, stoves L L′, valves R R′, hot-air pipe F, air-pipe D, steam-pipe O, flues Y Z G, chimney H, blower I, and tank M, substantially as and for the purpose specified.

JOHN FRANCIS BENNETT.

Witnesses:
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