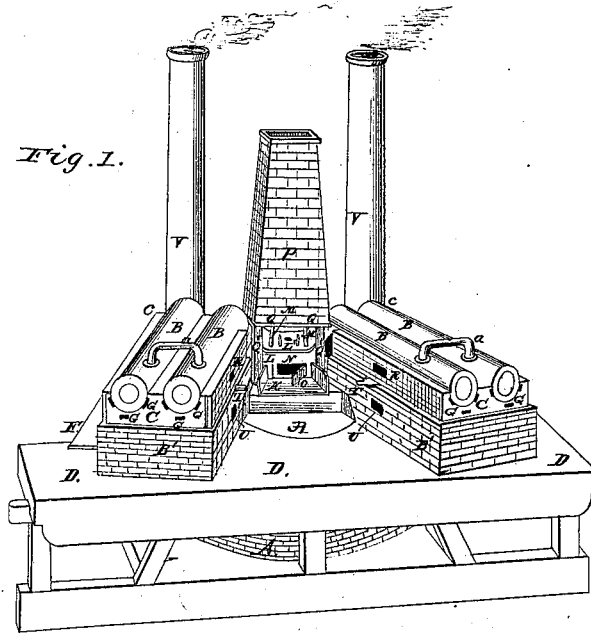


*M. Bell,*  
*Steam-Boiler Furnace,*

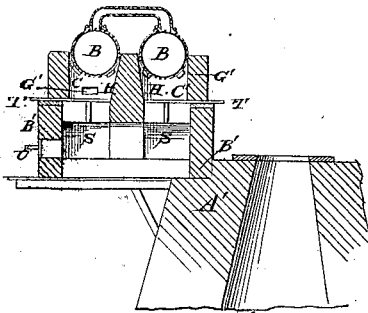
*No 1630,*

*Patented June 10, 1840.*

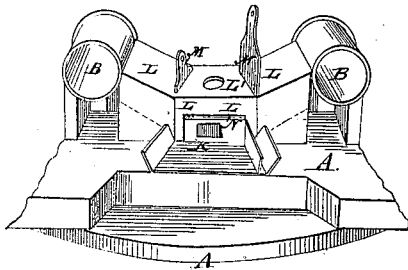
*Fig. 1.*



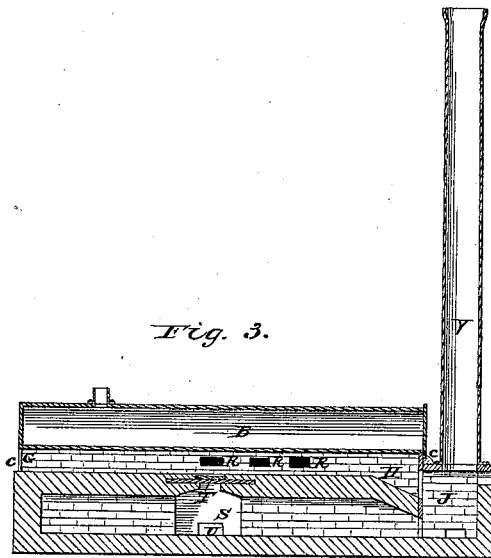
*Fig. 2.*



*Fig. 4.*



*Fig. 3.*



# UNITED STATES PATENT OFFICE.

MARTIN BELL, OF ANTIS TOWNSHIP, HUNTINGDON COUNTY, PENNSYLVANIA.

## MODE OF APPLYING THE WASTE HEAT OF BLAST-FURNACES TO STEAM-BOILERS.

Specification of Letters Patent No. 1,630, dated June 10, 1840.

*To all whom it may concern:*

Be it known that I, MARTIN BELL, of the township of Antis, in the county of Huntingdon and State of Pennsylvania, have invented an Improvement in the Management of the Heat of Blast-Furnaces, said improvement consisting in the manner of applying the waste heat of such furnaces to the generating of steam in steam-boilers, which steam may be applied to the working of any of the ordinary blowing apparatus for supplying the blast of air to the furnace or to other purposes; and I do hereby declare that the following is a full and exact description thereof.

The only useful application of the large quantity of heat which escapes from the ordinary blast furnace, has been the employing it for the heating of air to create what is known under the name of the hot-blast. I am aware that it has been suggested also that this waste heat might be employed for the generating of steam, and the working of steam engines; but I do not know or believe that the same has been practically and successfully applied to this purpose until the same was done by me. The manner in which I have effected this is represented in the accompanying drawings.

Figure 1, shows the general arrangement of my stack, or furnace, and of the steam boilers to be heated thereby, with some of their appendages. Fig. 2 is a cross section of two of the boilers, and of the arches or masonry in which they are set. Fig. 3, is a longitudinal section of one of the boilers, its flue, chimney, &c.; and Fig. 4, represents the arrangement at the tunnel-head of the stack for the supply of fuel and the management of the heat which is to be conducted therefrom under the boilers.

In the respective figures like parts are designated by the same letters of reference.

A, A', is the furnace, or stack, built in any of the ordinary modes.

D, D, is a platform on a level or nearly so, with the top of the stack, and from which the furnace is supplied with fuel and the other materials used. This platform in the drawing, is shown as though built of timber, but its construction will be governed by its location, in a manner well understood by iron-masters.

B', B', are the arches or masonry, in which is set the horizontal boilers B, B—B, B.

These boilers are best made of the ordinary cylindrical form, but may be made otherwise, and are supported at their ends by cast-iron plates C, C, in which G, G, represents openings for the purpose of introducing scrapers to remove the ashes and other matter which will accumulate in the flues under the boilers. These boilers are placed in pairs, parallel to each other, and the heated gaseous products of combustion issuing from the tunnel-head is conducted along a flue under the boiler nearest to it, and extending to the front *c*, whence it returns under the second boiler, and escapes through the chimney V. These flues are shown at H, H. In addition to the openings G, G, in the plates C, C, for the purpose of clearing the flues, &c., I intend also to make openings through the brick work at the sides, as R, R, with the same intention. In the middle of the arch forming the setting of the boilers, I construct a pit or receptacle S, S, into which the ashes and other matter collected in the flues under the boilers is made to fall by means of the scrapers, and into these pits I make an opening, as at U, for their removal, adapting to these openings close fitting doors or stoppers; and I also adapt to them at their upper sides, sliding covers T, T. Under the chimneys V, V, there are also receptacles J, Fig. 3, for the deposition of ashes, &c., with the requisite provision for clearing the same when necessary. The chimney or chimneys V, V, must be of such height as to cause sufficient draft in the flues. Upon the top of the tunnel there is a plate K of cast-iron, placed horizontally, and having a perforation in the center for the passage of the heated air or flame, this plate having ledges cast upon it to receive the edges of the plates which it is to sustain, and which form the flues which lead on either side to the boiler arches. Portions of these plates are shown at L, L. The upper plate L', Fig. 1, is perforated in the middle, to allow the draft to pass through it when not directed through the lateral flues and under the boilers. This opening is to be provided with suitable covers. This part may be surmounted by a chimney P, which is shown as resting on a rectangular base plate Q, Q, supported by iron columns Q', Q', the lower ends of which rest upon the stack.

N, is a feed hole for admitting the fuel, &c., and this is closed by a door O.

There is not any thing special in the part

of the structure last described, the plates L, merely forming a portion of the flues at the top of the stack, which extends laterally, so as to communicate with those passing under the boilers nearest to the stack, by which to conduct the heated air under them when required. When so conducted the opening in the plate L', Figs. 1 and 4, is to be closed and the dampers which are used to open or cut off the communication through the flues to the boilers are to be raised. M, M, Figs. 1 and 4, are the stems of these dampers, which cross the flues in the ordinary manner, and which may be raised by chains and levers or other known devices.

The boilers are, of course, furnished with steam pipes and all the other appendages requisite to their connection with a steam engine, which may be of any of the known kinds adapted to the intended purpose.

a, a, represent the steam tubes to connect two of the boilers, and from which also a steam pipe may pass to connect the boilers with the engine.

It will be manifest that the two pair of boilers, on either side of my stack, are perfectly similar in their arrangement, and that one or both pairs may be used, as may be preferred. It is not necessary, in fact, to construct both, but it will be advantageous so to do, as in case of repairing becoming necessary, when one set is out of order, the other may be used.

Having thus fully described the manner in which I construct my flues and boilers for the purpose of employing the waste heat from a blast-furnace for the generating of steam, to be applied to the working of a blowing apparatus, by which the furnace itself may and can be blown and the necessary blast furnished therefor, and for other purposes, what I claim therein as constituting my invention and discovery, and which I desire to secure by Letters Patent, is—

The arrangement of flues and their necessary appendages as hereinbefore described, by which I connect a pair or pairs of boilers with a blast furnace, substantially in the manner set forth and described, thereby applying the flame and heat escaping out of the top of the furnace to create a steam power which may be used to blow the furnace and which may also be applied to other purposes; and it is hereby declared that I do not intend or purpose to limit myself to the number of boilers, or to the precise form of the respective parts, as described and delineated, but to vary these as I may think proper, while I attain the same end by means substantially the same.

Antis township, Huntingdon county, Penna., 14th March, 1840.

MARTIN BELL.

Witnesses:

WM. P. ELLIOTT,  
EDMUND MAHER.