S. WILKES.

Blast Furnace.

No. 18,167. Patented Sept. 8, 1857.

Fig. 3.

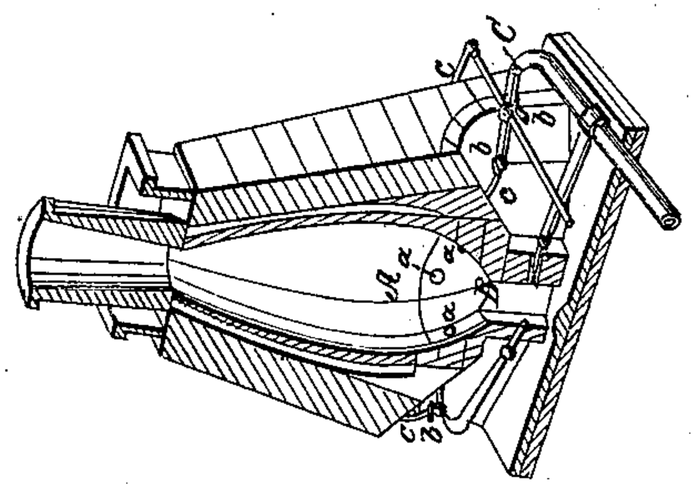


Fig. 2.

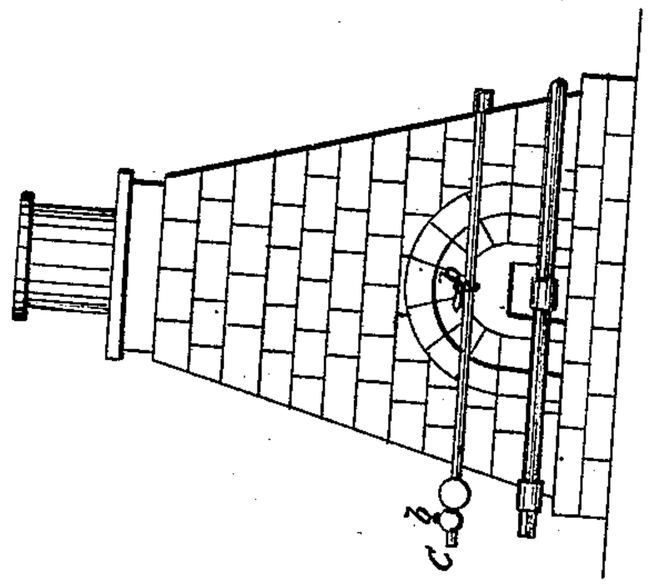
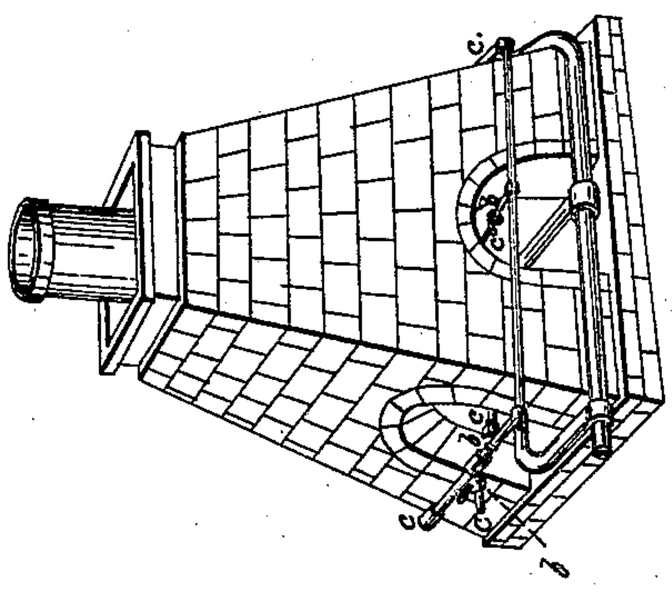


Fig. 1.



UNITED STATES PATENT OFFICE.

SAMUEL WILKES, OF HAMMONDSVILLE, OHIO.

IMPROVEMENT IN BLAST-FURNACES.

Specification forming part of Letters Patent No. 18,167, dated September 8, 1857.

To all whom it may concern:

Be it known that I, SAMUEL WILKES, of Hammondsville, in the county of Jefferson and State of Ohio, have invented a new and useful Improvement in the Application of Steam in the Smelting of Iron Ore, Mine, or Stone, and Making of Iron; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

Figures 1 and 2 represent an elevation of a blast-furnace with the application of my invention, and Fig. 3 is a sectional view of the same furnace through the center from side to side.

A is the top, and B the bottom, of the boshes. C is the main pipe leading from the steam-boiler; *c c c c*, branch pipes leading off into the furnace; *a a a a*, points at which the pipes enter the furnace; *b b b b b*, valves in the several pipes.

The nature of my invention consists in the introduction of the steam, whether with or without being previously passed through a heating apparatus, into blast-furnaces at the boshes instead of, as heretofore, at the tuyeres or with the blast.

To enable others skilled in the art to make use of my invention, I will proceed to describe its application and operation.

The means and apparatus by which the steam is generated are immaterial to the effect and may be adapted to local circumstances or situation. The generation of steam in sufficient quantity at a convenient location near the furnace so that a supply of steam as wanted may be readily procured to be introduced into the furnace is the essential thing, and for this purpose any of the ordinary means may be employed where a steam-engine is used upon the premises for other purposes. The same boiler may supply the steam to be introduced into the furnace, or a boiler may be erected for the express purpose. The steam is introduced into the furnace at different points in its circumference and at various heights, (within the limit of the boshes, however,) as at *a a a a*, in order that it may have the more full and free access to every portion of the contents within the boshes at the same time. It is desirable, however, that the number of points at which steam is introduced should not be too greatly multiplied, as the consequent increase of apertures in the masonry of the furnace will have a tendency to weaken its solidity. From four to six points is the most convenient number.

In furnaces already built the apertures through which it is designed to insert the pipes for the introduction of the steam will have to be drilled through the surrounding brick or stone work and the masonry of the boshes. In building furnaces these apertures may be conveniently channeled or cut in the upper or lower faces of the stones or fire-brick forming the inside of the boshes before they are laid, and openings left to correspond in building up the surrounding brick or stone work or stack. Through these apertures and openings the pipes conveying the steam from the boiler are to be laid or inserted. These pipes may be of cast or wrought iron, or any suitable material. They need not be larger in diameter than half an inch, and should be contracted at the opening into the furnace to a diameter of from one-eighth to one-quarter of an inch. The greater the number of points at which the steam is introduced into the furnace the smaller should be the diameters of the several pipes at their openings into the furnace. The pipes may all be supplied from a single pipe leading from the boiler, and from which they can branch off in any convenient arrangement. The apertures through the stones or fire-brick forming the boshes should not be of greater size than just to admit of the insertion of the pipes. The openings in the stack may more conveniently be made larger. The pipes should be provided with valves, in order that the flow of steam may be regulated and controlled. There may be either a single valve in the main pipe or one in each of the branch pipes, or both. The latter is the best arrangement.

The object of the introduction or application of the steam to the charge of the furnace at the boshes is to secure a thorough oxidization of the iron ore, mine, or stone by bringing in contact with it in the process of its reduction at the point at which the chemical action of the furnace is in most active progress the gaseous elements of water, thus effecting that change in the ore which presents it to the action of the fire during the melting in the state most favorable for a perfect and rapid production of iron therefrom.

In regard to the quantity of steam to be introduced and the time of its introduction, no

certain and uniform rule can be laid down. The size and kind of furnace, the nature and quality of the materials used, the character of the draft, and the state or condition of the furnace at any particular time will all require attention. By means of the valves in the several pipes the supply of steam can be regulated with due regard to the varying circumstances. Care must be taken in the introduction of the steam, as should a large quantity be introduced at once its sudden and great expansion under the intense heat of the furnace would produce too violent a disturbance of the charge and might result in an explosion. Until the furnace is fully fired and under way but little if any steam need be introduced, as until the melting of the iron ore, mine, or stone has commenced the material is not in condition for the proper and most beneficial action of the steam.

If it is desired to heat the steam before it is introduced into the furnace, it may be passed through a heating apparatus of any of the forms used for heating air for a hot-blast. By having a distinct series of pipes passing through the same apparatus and exposed to the same heat as the pipes for heating the air for the blast, the same fires may be made to answer for both the blast and the steam. The additional expense and trouble, however, necessary to be incurred to heat the steam will more than counterbalance, as a general thing, the advantage to be gained, especially where the steam-boiler from which the supply of steam is brought is so near to the furnace that no material cooling or condensation can take place in the passage of the steam from the boiler to the furnace. It may in some cases, however, be found, owing to local and special circumstances, that the expense and trouble will be justified by the additional advantage gained in heating the steam. After the steam has passed through the heating apparatus, it is introduced into the furnace in the same manner as when it is not heated.

I have described a particular manner in which the steam may be applied at the boshes; but I do not mean to limit myself to this particular manner, as the essence of my invention is not in the particular mechanical means and appliances used for the purpose, but in the discovery of the most advantageous point at which steam should be introduced into the furnace in the smelting and making of iron; and as I have invented and described a means by which my discovery may be practically employed and used, I desire to secure the benefit of my discovery and invention by Letters Patent.

I do not claim the use of steam in the smelting and making of iron.

What I claim as my invention, and desire to secure by Letters Patent, is—

The introduction and application of steam in blast-furnaces at the boshes, whether at one or more points, substantially in the manner as herein described.

SAM. WILKES.

Witnesses:

DENNIS MEAD,

WILLIAMS OGLE.