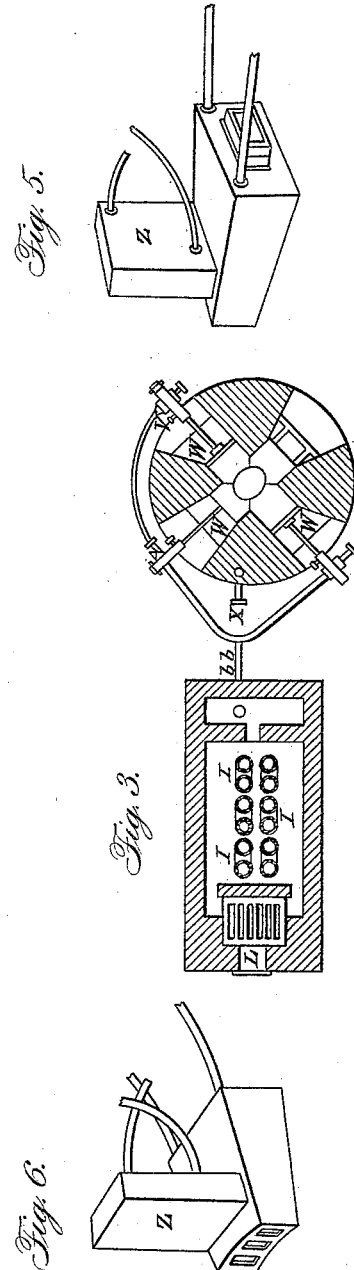
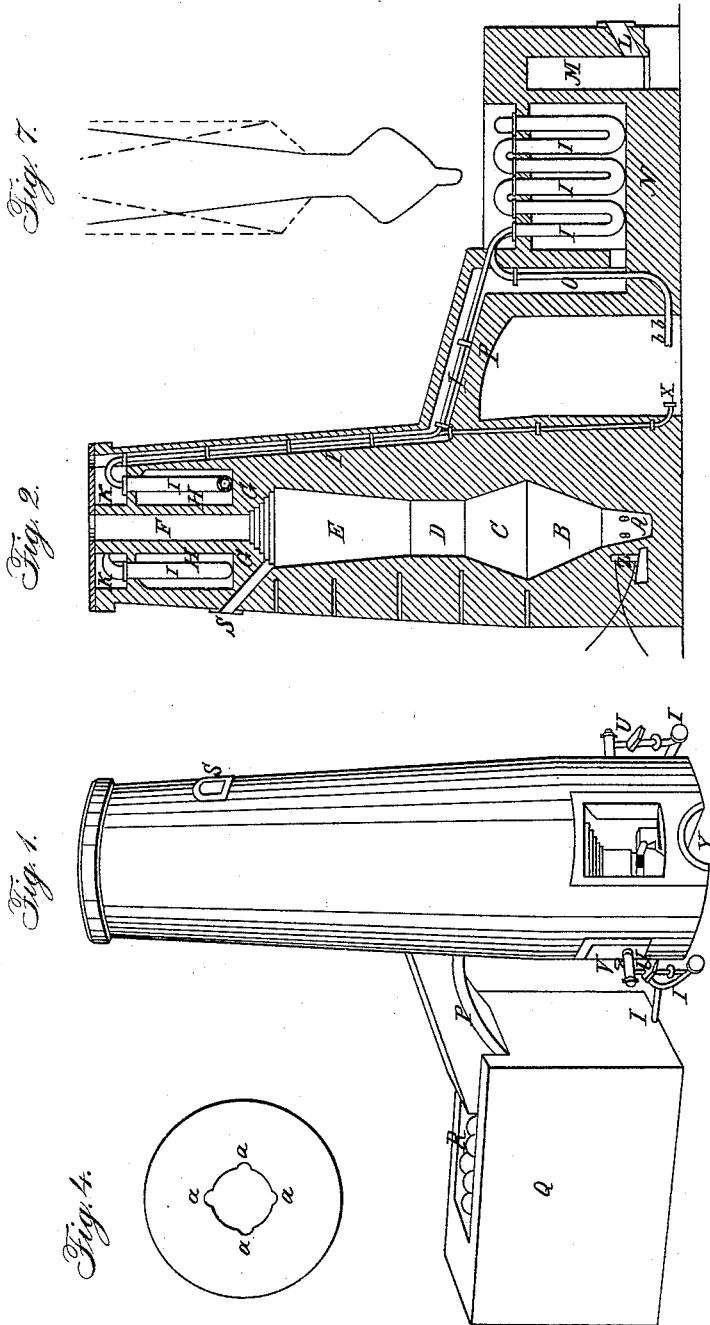


I. C. BRYANT.

Blast Furnace.

No. 1,057.

Patented Dec. 31, 1838.



UNITED STATES PATENT OFFICE.

ISAAC C. BRYANT, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN FURNACES FOR MANUFACTURING IRON.

Specification forming part of Letters Patent No. 1,057, dated December 31, 1838.

To all whom it may concern:

Be it known that I, ISAAC C. BRYANT, of the district of Northern Liberties, in the county of Philadelphia and State of Pennsylvania, have invented a new and useful improvement in the furnace for the manufacture of iron from the ore, called the combined hot-air blast-furnace; and I do hereby declare that the following is a full and exact description.

My invention consists in the application of four new features, parts, or modes of construction of four several portions or parts of the furnace and its apparatus, with a view to improve and economise the manufacture of iron from the ore by anthracite or other coal, using the hot blast.

First. I improve the furnace by contracting its inner walls above the customary bosh or spreading, B, Fig. 2, and making a second bosh or enlargement or the interior of the furnace, E, Fig. 2, above the first or customary bosh, B, and above the said contraction C, Fig. 2. A second or third contraction and a third or fourth bosh may be added, if found expedient, the object being to diminish the pressure of coal on the lower or customary bosh, and the liability to wedging or compression of the coal at the lower part of the furnace when anthracite is used.

Second. I improve the furnace by making recesses or grooves, Fig. 4, *a a a a*, on the inner surface of the furnace extending vertically upward from the crucible or from the tops of the tuyeres, or from the lower part of the furnace into or near the top of the first bosh or spreading, and farther, if deemed expedient, the object being to allow the ascent of air and heat through these grooves, and thus diminish the excess of heat at and near the crucible, and diffuse the heat and combustion more equally throughout the mass. The number of these grooves or recesses may vary as expediency may dictate.

Third. I improve the convenience and economy of the method of heating the air for a hot blast by contracting the upper part of the furnace to a large flue, F, Fig. 2, and constructing a chamber, H H, surrounding it between an outer and an inner cylinder, the outer cylinder consisting of the exterior wall of the furnace, and the inner cylinder consisting of the exterior wall of the said flue F. In this chamber I heat the air for blast by passing through

the chamber the blast-pipe in numerous undulations, convolutions, or windings, so as to expose a great surface to the heat of the chamber which escapes from the upper part of the furnace, and is conducted into the lower part of the chamber by several smaller flues or pipes passing from the furnace near the foot of the flue F underneath the brick-work G G.

Fourth. I improve the water-tuyeres or parts through which the blast enters the crucible of the furnace by making a narrow and oblong opening from each tuyere (see Fig. 6) for the passage of the blast, instead of a round opening, as usually practiced, thereby diffusing the application of the blast more extensively around the furnace and upon the fuel.

Fifth. I cool the crucible of the furnace and prevent its burning rapidly away by placing around it several metallic boxes or cases filled with water, the water entering at an aperture in the lower portion of each box and passing out at the upper portion, so as to keep up a constant current, and thus absorb a portion of the heat from the crucible.

These improvements are described in connection with the whole furnace and with reference to the annexed drawings, as follows:

Figure 1 exhibits a front view of the entire furnace. Q, Fig. 1, the smaller furnace, which may be attached to the main furnace for the purpose of further heating the blast after it has first been heated in the chamber H H, Fig. 2, before mentioned. R shows the upper curvatures of the pipe in which the air is heated. I I I, Fig. 1, are parts of the continuation of the same main pipe. U U are slide-valves for shutting off the blast from the furnace or for letting on such quantity as may be desired. V is one of three screws, more particularly described by reference to Fig. 3. S exhibits the feeding-door for admitting fuel, ore, and limestone, which may be also admitted at the top of the furnace through the large flue F, Fig. 2. Y is the arch forming the false bottom.

Fig. 2 exhibits a vertical section of the main and air-heating furnaces. A is the crucible. B is the first or customary bosh or spreading in diameter. C, D, and E are the contraction, continuation, and subsequent enlargement of the diameter of the interior surface of the furnace, which enlargement B constitutes the second bosh, the said contraction and enlargement

being a part of my improvement. F is the upper part of the interior of the furnace contracted to a large flue or cylinder to give space for the double cylindrical chamber H H, which surrounds the flue F. In this chamber H H the air for blast is first heated by being passed through it in the pipe or pipes with suitable convolutions to increase the surface exposed to the heat. This chamber and the arrangement for placing it constitute a portion of my improvement. Flues which cannot be seen in the drawings pass near G G from the furnace into the chamber H H for the purpose of heating it, and passing through it a portion or the whole of the escaping air of the furnace, which is thence conducted by suitable flues to the top of the furnace. S is the opening for fuel, &c., already described. G G is the projecting brick-work forming the bottom of the chamber, and J J is the projecting brick-work forming the top of the chamber and protecting the joints on the pipe from the action of the fire. K K are spaces left to afford access to the joints of the pipe. These spaces are usually filled with sand to prevent the escape of heat. L is the feeding-door of the extra furnace Q. M, Fig. 2, is the arch of the fire-grate bars, which bars are visible in Fig. 3. N is the stone or brick foundation, on which the convolutions of the pipe in the furnace Q rest. O and P are flues for the passage of the pipes and the escape of the air used to heat the extra furnace Q.

Fig. 3 exhibits a ground view or horizontal section of the main and air-heating furnaces taken at the level of the crucible. W W W are three tuyere blast-pipes leading from the main pipe I into the tuyere-arches, which arches are built in the customary manner. V V V are three screws fitted into enlargements of the tuyere-pipes for the purpose of slipping the tuyere-pipes out or retaining them in their position, as may be wished. The blast of cold air from the atmosphere enters the blast-pipe's eye at X, Figs. 2 and 3. It passes up to the heating-chamber H H; thence, after being heated, it passes down by the descent of the pipe and through the flue P into the extra or air-heating furnace, where it is further heated, the convolutions of pipe being seen at I I I in Figs. 2 and 3; thence it passes through the flue O and out of the heating-furnace at b b, Figs. 2 and 3; thence it passes into the main furnace, as seen in Fig. 3, through the tuyere-pipes W W W.

Fig. 4 is a horizontal section of the furnace taken at a higher point than Fig. 3. a a a a

are the grooves or recesses for the passage of air and heat, as already described, constituting a portion of my improvement.

Figs. 5 and 6 are different views of one of the water-tuyeres, showing in Fig. 5 where the blast enters the tuyere and in Fig. 6 the opening whence it escapes to the furnace. Z, Fig. 5, and Z, Fig. 6, are two of the cases or boxes containing water placed over the tuyeres and around the crucible to cool the latter by a current of water passing through them and absorbing a portion of heat.

In Fig. 7 the plain lines show the form of the first and second boshes, as also represented in Fig. 2. The dotted lines of Fig. 7 show different forms in which the extra bosh may be varied. The interior as well as exterior of the furnace may be made either round, oval, or square.

What I claim as my improvement is—

1. The application of the contraction C and the second bosh, E, with one or more additional contractions and boshes, if deemed expedient.
2. The application of the recesses or grooves, Fig. 4, for the purposes mentioned.
3. The application of the air-heating chamber H H, surrounding the upper portion of the furnace, and the arrangement by which it is effected, the object being convenience and economy of fuel, the said chamber being constructed and arranged in the manner set forth.
4. The use of an elongated opening in each of the water-tuyeres, for the purpose already stated.
5. The use of boxes or cases containing water constantly shifted by a current placed around the crucible, so as to absorb a portion of its heat and increase its durability. These boxes may be made in number and breadth only equal to the water-tuyeres, or they may be increased either in number or in breadth, so as to form an entire circle around the crucible. Their size and thickness may be varied as experience may prove to be expedient. They may be extended in height from the bottom of the crucible to the top of the square of the crucible.

6. The combination of the above improvements or new modes of construction, or of any one or more of them, with a furnace built in the ordinary manner in other respects, or in such manner as may be chosen by the founder.

I. C. BRYANT.

Witnesses:

THOS. P. JONES,
CHS. M. KELLER.