E. H. MURRAY.

BLAST-FURNACE.

No. 182,947. Patented Oct. 3, 1876.

Fig. 1.

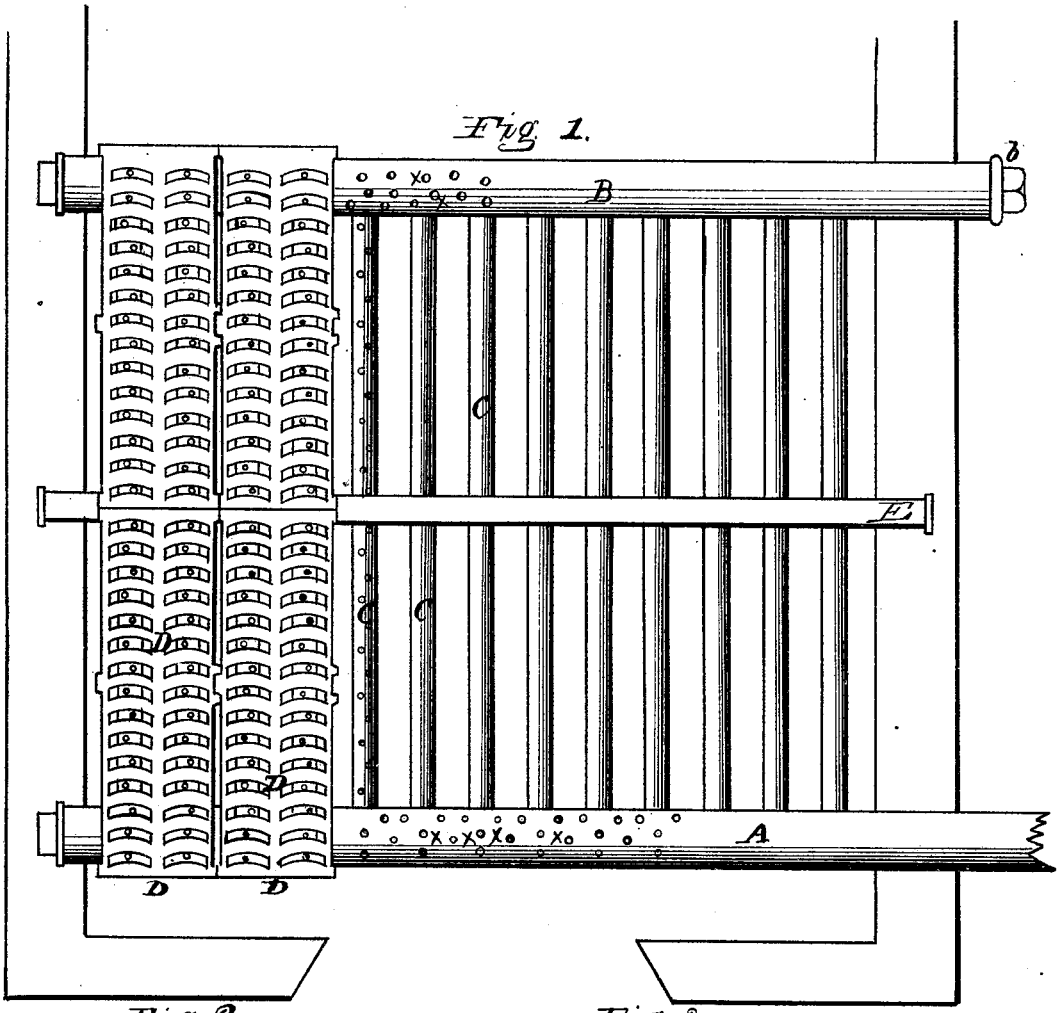


Fig 2

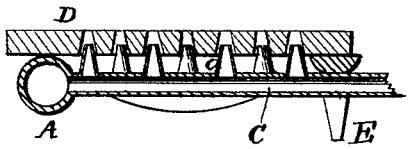


Fig 3.

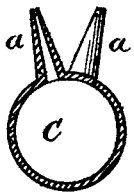
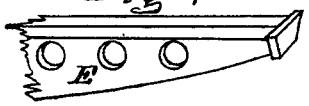


Fig 4



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UNITED STATES PATENT OFFICE.

ERASTUS H. MURRAY, OF ST. PAUL, MINNESOTA, ASSIGNOR TO SMITH BROTHERS & MURRAY, OF SAME PLACE.

IMPROVEMENT IN BLAST-FURNACES.

Specification forming part of Letters Patent No. **182,947**, dated October 3, 1876; application filed June 27, 1876.

To all whom it may concern:

Be it known that I, ERASTUS H. MURRAY, of St. Paul, in the county of Ramsey and in the State of Minnesota, have invented certain new and useful Improvements in Blast-Furnaces; and do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, making a part of this specification.

The nature of my invention consists in the construction and arrangement of a furnace for use under steam-boilers, having for its object the utilization of hard and soft coal screenings, slack or dust, peat, &c., for fuel, as will be hereinafter more fully set forth.

In order to enable others skilled in the art to which my invention appertains to make and use the same, I will now proceed to describe its construction and operation, referring to the annexed drawing, in which—

Figure 1 is a plan view of my furnace-grate and attachments. Fig. 2 is a longitudinal section of one of the grate-bars. Fig. 3 is a cross-section of one of the pipes under the grate-bars. Fig. 4 shows a part of a center bearing-bar used in the grate.

A and B represent two hollow iron pipes, each about four inches in diameter, perforated on top with holes *x x* about one-eighth of an inch in diameter. The pipe A is placed just back of the fire-front and close underneath the grate-bars, the front ends of the grate-bars resting on said pipe. One end of the pipe A is closed, and rests in the side wall of the arch, while the other end is open and passes through the opposite wall, to which latter end of said pipe a blast-fan is to be attached. The pipe B is placed in the same position as the pipe A, directly in front of, or into, the bridge wall, upon which pipe the rear ends of the grate-bars rest. The open end of the pipe B is covered by a cap, *b*, which is to be removed whenever it may become necessary to blow out ashes or dust that may accumulate in the pipes. These two pipes A and B are connected by other pipes C C, of about one inch in diameter, and having their ends screwed into the pipes A and B at right angles and at about four and a half inches apart, from center to center, passing directly underneath each section D of the grate-bars lengthwise. These pipes C are perforated on top with holes about three-eighths of an inch in diameter, at a proper distance apart to bring one hole directly underneath each opening in the grate-bar. In these holes in the pipes C are screwed hollow tubes *a a*, about one and one-half inch long, with top opening drawn down to about one-eighth of an inch in diameter, resembling and operating as a blow-pipe. These tubes are set in each connecting pipe C in two straight lines, one-fourth of an inch from the center, diverging alternately in different directions, as shown in Fig 3.

E represents the center bearing-bar, both ends of which rest in the side walls of the arch; and upon said bar rest the ends of the grate-bar sections that meet in the middle of the furnace. The connecting-pipes C pass through holes in the bar E, said pipes assisting in supporting the bar, and the bar keeping the pipes in proper place.

The grate-bar sections D are made each about eight inches wide with quarter-inch curved openings *d*. The castings between the openings are one and three-quarter inch deep, three-eighths of an inch top surface, and one-eighth of an inch bottom surface, leaving the openings at the bottom of the grate-bar about five-eighths of an inch wide.

In Fig. 1 I have shown four sections, D D, of grate-bars in place, with one-quarter inch space lengthwise between them, and also showing the relative position of the connecting pipes and tubes or blow-pipes conveying the blast of air to the furnace; also, perforations *x* in the pipes A and B.

By means of a pipe having one end attached to and covering the exhaust of the blast-fan, and the other end entering the smoke-stack or chimney just above the return-flues of the boiler, the hot air and all gases and smoke which would otherwise escape are returned to the furnace, where all combustible matter, gases, smoke, &c., are consumed, which, added to the advantage of the hot-air blast, secures great economy in fuel, and also prevents the

escape of all sparks through the smoke-stack or chimney. This blast, forced into the supply-pipe A, passes through all the connecting-pipes, and gives a uniform pressure through each, forcing through the openings in the grate-bars, by means of the tubes or blow-pipes *a*, about fifty separate and distinct blasts of compressed air to the square foot of grate-bar surface. The many currents of air emitted by these blow-pipes, each diverging from the centers of the connecting-pipes alternately, in different directions, crossing each other above the grate-bars, give to the whole fire-surface a uniform blast, producing a solid and even flame. The size of the pipes and the openings in the blow-pipes may be larger or smaller, according to the size of the furnace and the amount of blast required, and the pressure of air regulated by means of a gate in the supply-pipe.

It will be noticed that by my construction of furnace the natural draft is not obstructed or impaired. The fire is started in the same manner as in an ordinary furnace with ordinary grate, receiving the same benefit of the natural draft, adding the blast as soon as sufficient steam is generated to start the blast-fan, when all kinds of coal screenings, slack or dust, peat, tan-bark, &c., can be satisfactorily burned, making a hotter and more perfect fire than the best coal or wood with natural draft. By this method there is also a great saving in grate-bars, because of the constant blast passing up through them, preventing burning, and being less liable to spring or warp. These furnaces are equally adapted to all locomotion, steamboat and portable as well as stationary boilers, and are easily adjusted without change of arch or fire-front.

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

1. In a furnace, a system of pipes communicating with each other, provided with diverging tapering tubes or blow-pipes, and arranged immediately under the grate-bars, and adapted to be connected with a blast-fan having connection with the smoke-stack, substantially as and for the purposes herein set forth.

2. In combination with the grate-bars of a furnace, the parallel perforated front and rear pipes A B, center-bar E, and the connecting pipes C C, provided with diverging tapering tubes or blow-pipes *a a*, all constructed and arranged substantially as and for the purposes herein set forth.

3. The grate-bar sections D D, constructed as described, with curved tapering openings, as shown, in combination with the pipes A B and connecting-pipes C, having blow-pipes *a*, substantially as and for the purposes herein set forth.

In testimony that I claim the foregoing I have hereunto set my hand and seal this 18th day of May, 1876.

ERASTUS H. MURRAY. [L. S.]

Witnesses:
E. S. CHITTENDEN,
EDWARD P. LYON.