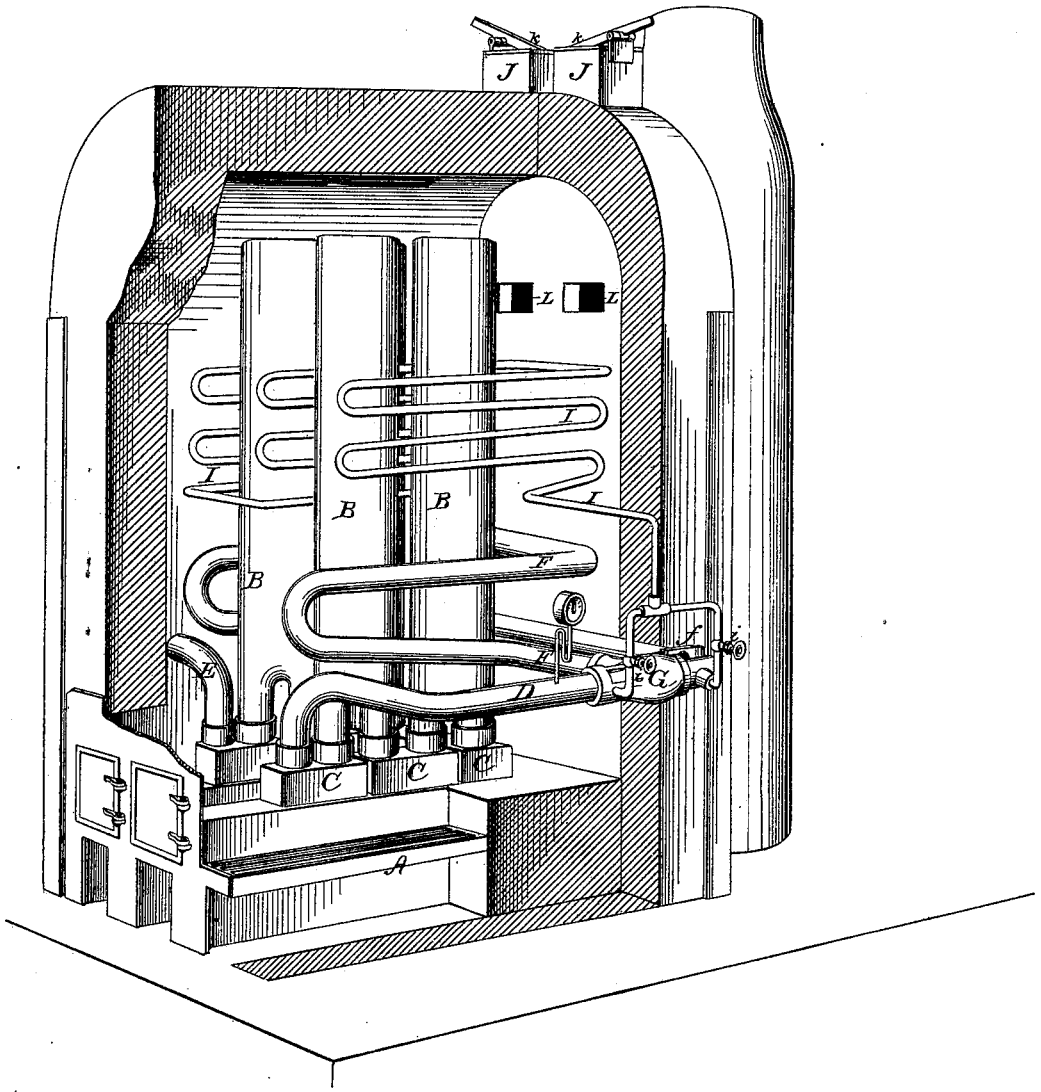
3 Sheets—Sheet 1.

S. C. SALISBURY.

PRODUCING A HOT-BLAST FOR METALLURGIC FURNACES.

No. 195,659. Patented Sept. 25, 1877

Fig. 1.



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C. Clarence Poole
N. B. Smith

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S. C. SALISBURY.

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Fig. 2.

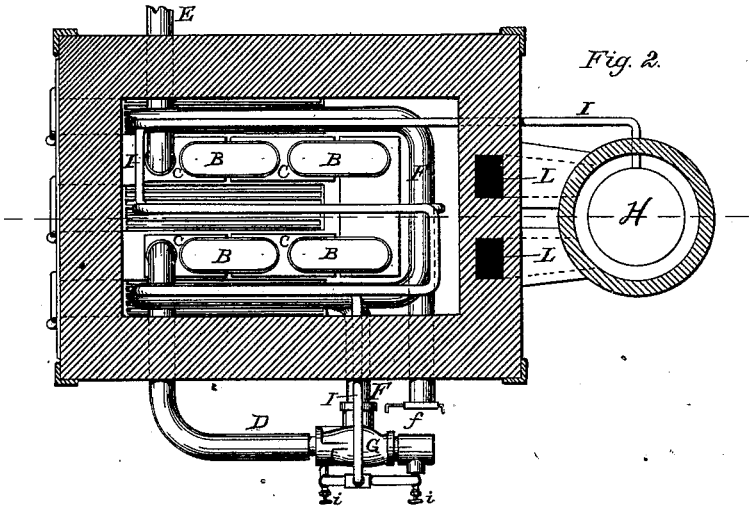
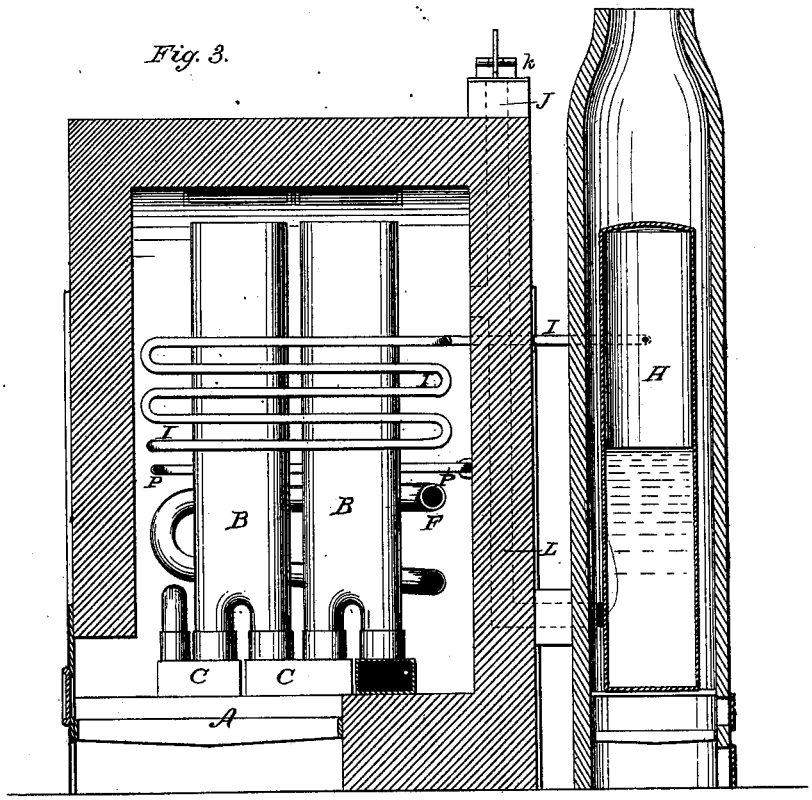


Fig. 3.



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3 Sheets—Sheet 3.

S. C. SALISBURY.

PRODUCING A HOT-BLAST FOR METALLURGIC FURNACES.

No. 195,659. Patented Sept. 25, 1877.

Fig. 4.

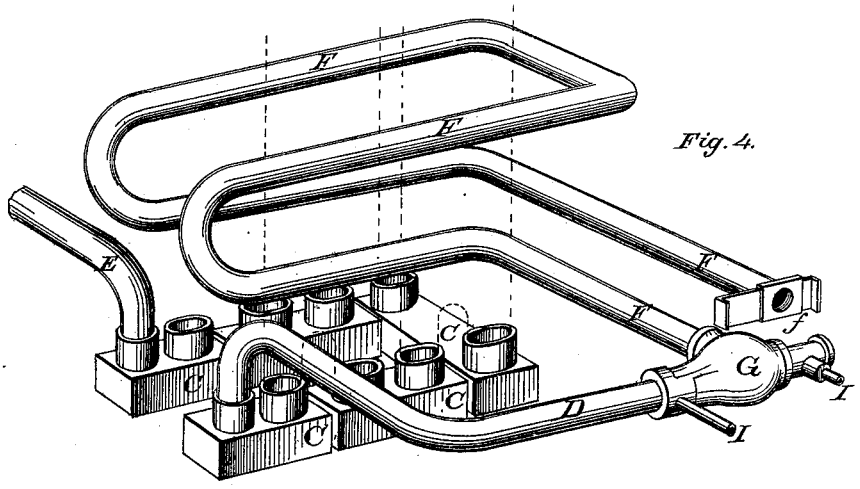


Fig. 7.

Fig. 5.

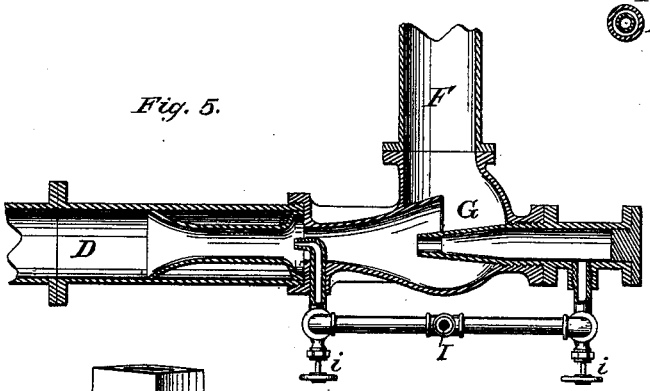


Fig. 6.

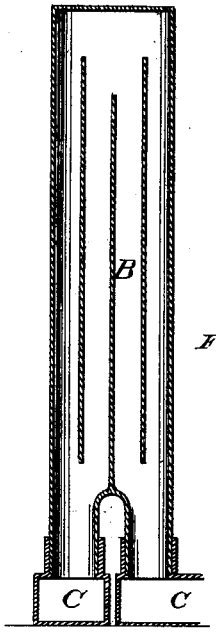
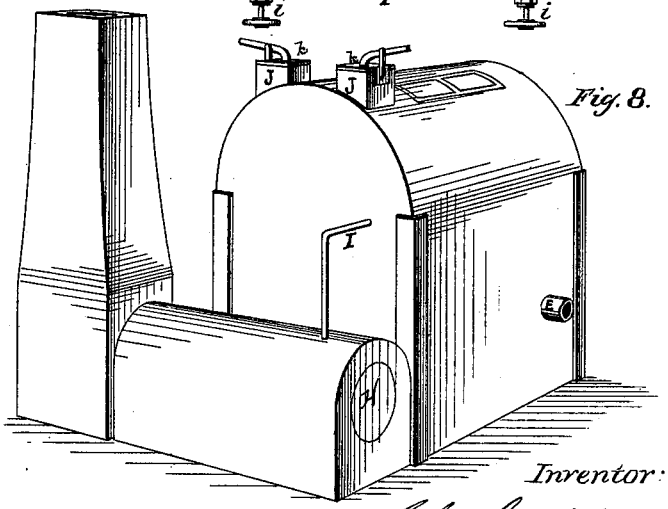


Fig. 8.



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R. D. O. Smith

UNITED STATES PATENT OFFICE.

SILAS C. SALISBURY, OF NEW YORK, N. Y.

IMPROVEMENT IN PRODUCING A HOT-BLAST FOR METALLURGIC FURNACES.

Specification forming part of Letters Patent No. **195,659**, dated September 25, 1877; application filed May 7, 1877.

To all whom it may concern:

Be it known that I, SILAS C. SALISBURY, of the city, county, and State of New York, have invented a new and Improved Method of Producing a Hot-Blast for Metallurgic and other Furnaces; and that the following is a full and particular description of the same.

My invention is applicable to all furnace purposes wherein a hot-blast is desirable, and for many purposes wherein the ordinary hot-blast is not now applicable; and therefore I do not design to limit myself to any particular method of using my improvement, though, for convenience of description, I shall only describe and refer to its use in connection with that class of furnaces commonly known as blast-furnaces.

The requirements of a blast-furnace are, first, blowing-engine; second, steam-motor; third, competent steam-generator; fourth, hot-blast oven; fifth, sufficient and proper engine-houses; sixth, engineers and assistants.

For large plants, items one, two, three, four, and five cost from fifty thousand dollars and upward, and competent engineers command a salary, say, of two thousand dollars per annum, and the wages of assistants exceed that sum.

With the best appliances it is impracticable to procure pressure exceeding four or five pounds per inch, and it is impossible to procure a uniform and steady pressure. The pressure is not under immediate control of the furnace-men.

The objects of my invention are, first, to dispense entirely with the blowing-engine; second, to dispense with the steam engine or motor; third, to materially reduce the size of the steam-generator, say, to one-twentieth; fourth, to materially reduce the cost of attendance; fifth, to procure at will any pressure desired up to, say, fifteen or twenty pounds, and possibly greater; sixth, to produce a blast with perfectly steady and uniform pressure; seventh, to place the whole apparatus under the immediate and direct management and control of the furnace-men.

These objects I accomplish by the joint action of superheated steam, hot air, a heating-furnace, and an injector, which therefore form the essential elements of my invention.

That others may more fully understand the details of my invention, I will particularly describe them, having reference to the accompanying drawings, wherein—

Figure 1 is a perspective view of my apparatus, portions of the wall being broken away to exhibit the interior structure. Fig. 2 is a plan of the same. Fig. 3 is a sectional elevation of the same. Fig. 4 is a perspective skeleton of the blast feed-pipe. Fig. 5 is a longitudinal section of the injector and attachments. Fig. 6 is a longitudinal section of one of the retorts. Fig. 7 is a cross-section of the superheater-pipe. Fig. 8 is a perspective view of my apparatus with a horizontal boiler.

A A are the furnace-grates of the hot-blast oven, and B B are the vertical retorts, which I prefer to construct after Benjamin Ford's Patent No. 124,803, March 19, 1873. These retorts I set in parallel rows in equal numbers, their tubular feet resting in shoes on the boxes C C, which receive and transmit the blast from one retort to the next. By this arrangement I economize space and fuel, because there is less floor-space by about one-sixth, and of waste heat about one-fourth less, when the retorts are ranged in two rows within the same oven, than if arranged in one row, as constructed by said Ford.

D is the inlet-pipe, and E is the outlet-main extending to the furnace. The practice heretofore has been to take in cold air at the inlet; but I propose to utilize a portion of the waste heat in the oven to heat the feed-air, and for that purpose I place the feed-pipe F in the oven around the retorts, taking cold air at the gated end *f*, passing it through the hot-pipe F, and delivering it to injector G at the inlet end of the pipe D, heated to, say, 500° Fahrenheit, whereby it is injected, and fed to the retorts with any desired velocity or pressure.

The boiler H may be heated by the waste heat from the oven, substantially in the manner shown, or may have its own fire, if preferable, and delivers common steam at ninety to one hundred pounds' pressure to the superheating-pipe I, which consists of a wrought-iron pipe inclosed in and protected by a cast-iron jacket, and laid in the oven in coils or folds back and forth between the retorts until its exposed surface is sufficient to raise the temperature of all the steam that passes

through it to 800° or 1,000° temperature, this superheated steam being then discharged into the steam-nozzle of the injector G.

The effect is to blow into the pipe D and through the retorts a current of air already so heated in the pipe F that there can be no condensation of the steam; and this current, in passing into and through the retorts, becomes heated to a still higher degree, and the steam probably decomposed, so that when it passes from the tuyeres it not only urges the fire, but adds fuel as well.

The velocity and consequent pressure of the blast may be controlled with the utmost delicacy and ease by the gate *f* and the throttle *i* in the steam-pipe.

The steam-pipe I is divided and enters the injector at two points—in rear and in front of the main cone; and I hereby produce a double blast, more effective than when the single blast only is employed. The waste heat and products of combustion are permitted to escape at the chimneys J J, or, by closing the dampers K K, they may be turned through the diving-flues L to the boiler H.

By the means and appliances above described an air-blast of any desired velocity and pressure is produced by a jet of superheated steam generated by the waste heat from the hot-blast oven, and the entire cost of establishing and maintaining the steam-motors and blowing-engines, with the immense and costly foundation and coverings, as well as the maintenance of costly superintendence, is saved; and, in addition to this great economy, the results attained are superior, because any desirable pressure can be produced and maintained with perfect uniformity, and with complete control, directly by the furnace-men.

Having described my invention, what I claim as new is—

1. An apparatus to produce a hot-blast, consisting, essentially, of a hot-blast oven, a steam-generator, and a blast-injector, taking steam from said generator at a high pressure, in combination, substantially as set forth.

2. A hot-blast oven and a blast-injector taking steam from a steam-generator, substantially as described, combined with a hot-feed pipe, F, laid in the waste-heat space of said oven, for the purpose set forth.

3. In combination, a hot-blast oven and a blast-injector taking steam from a steam-generator through a superheater-pipe, I, laid in the waste-heat space of said oven, substantially as described

4. A hot-feed pipe, F, and retorts B B, combined with a blast-injector, G, and a steam-pipe, I, to convey a jet of high-pressure superheated steam, as set forth.

5. The injector G, combined with the feed-pipe F, provided with a gate, *f*, for the purpose of regulating and controlling the flow of air to the blast-pipe.

SILAS C. SALISBURY.

Witnesses:

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C. CLARENCE POOLE.