

J. THOMAS.
Metallurgic Gas-Furnaces.

No. 139,834.

Patented June 10, 1873.

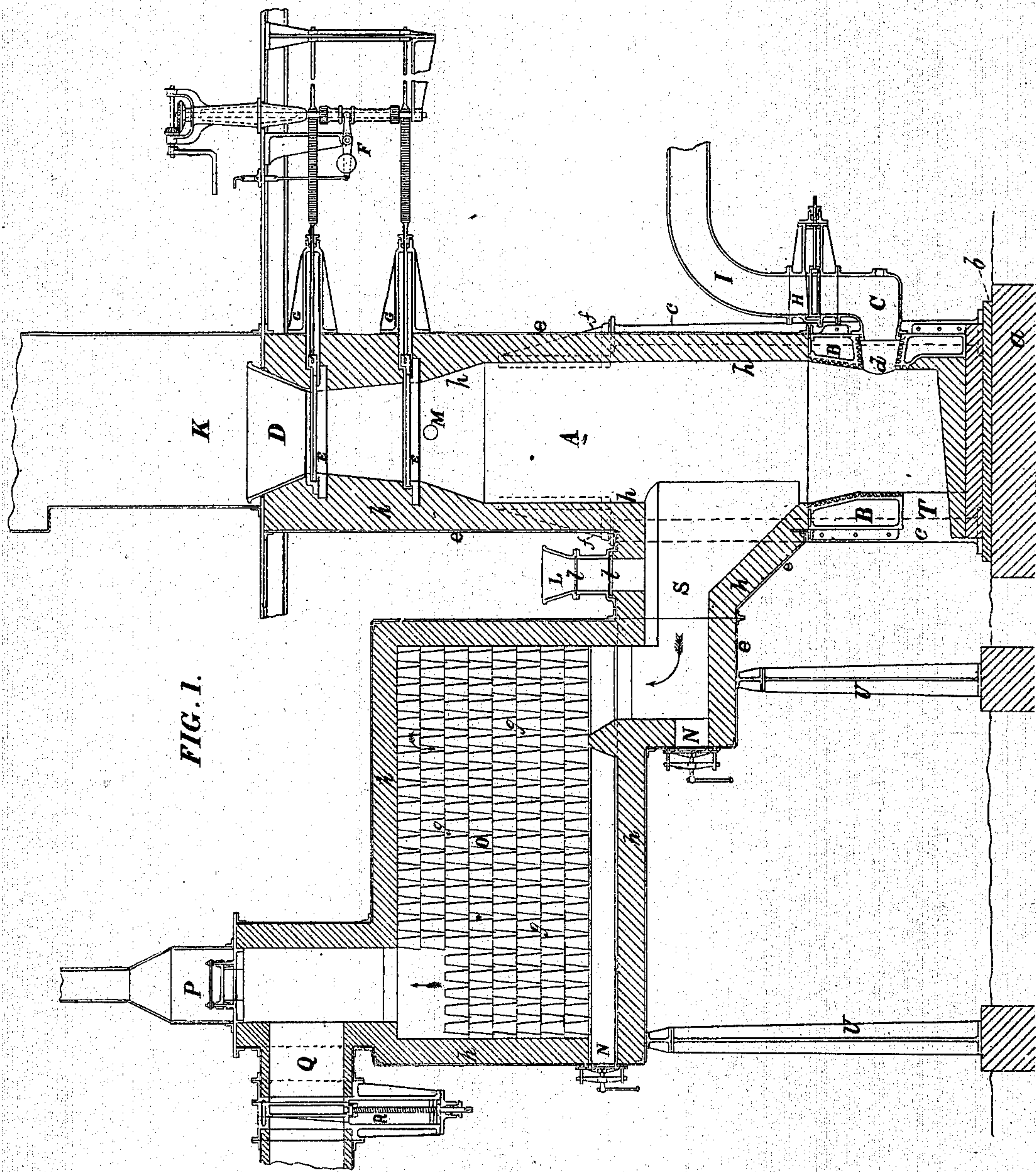


FIG. 1.

Witnesses:

Chas M Higgins
Arthur C. Fraser.

Inventor:

John Thomas,
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FIG. 2.

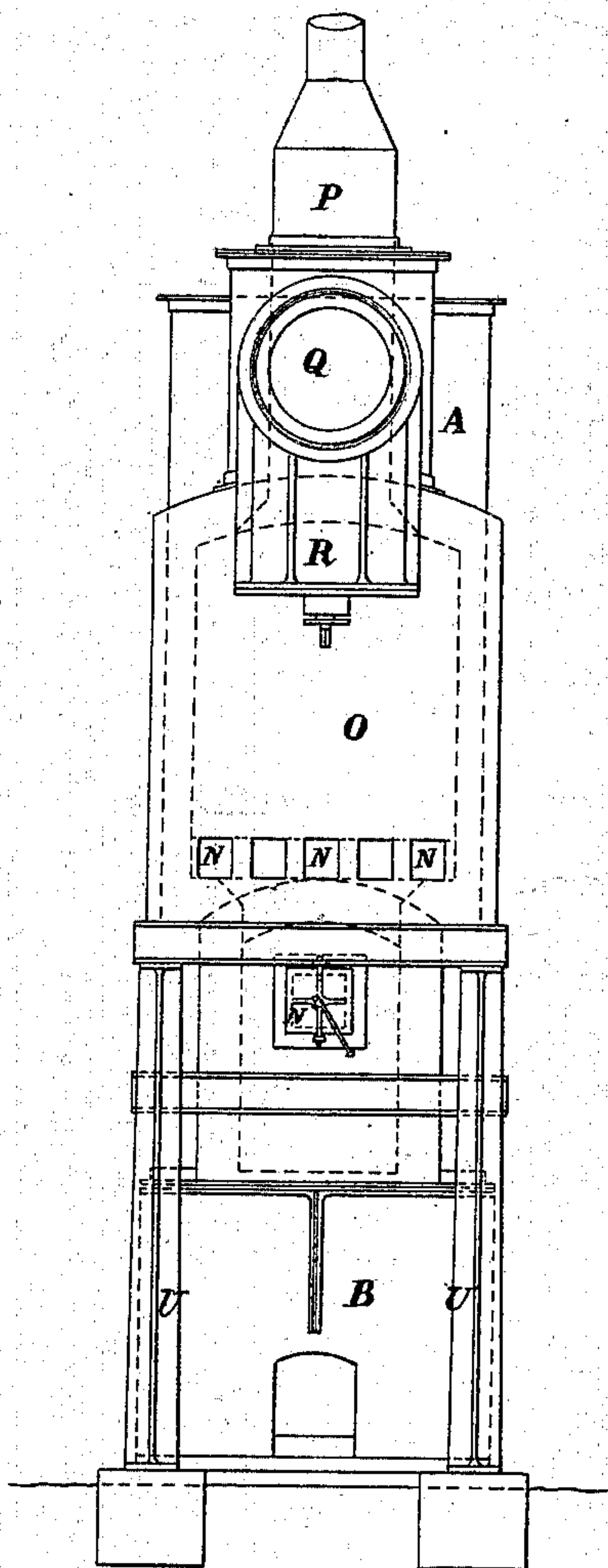
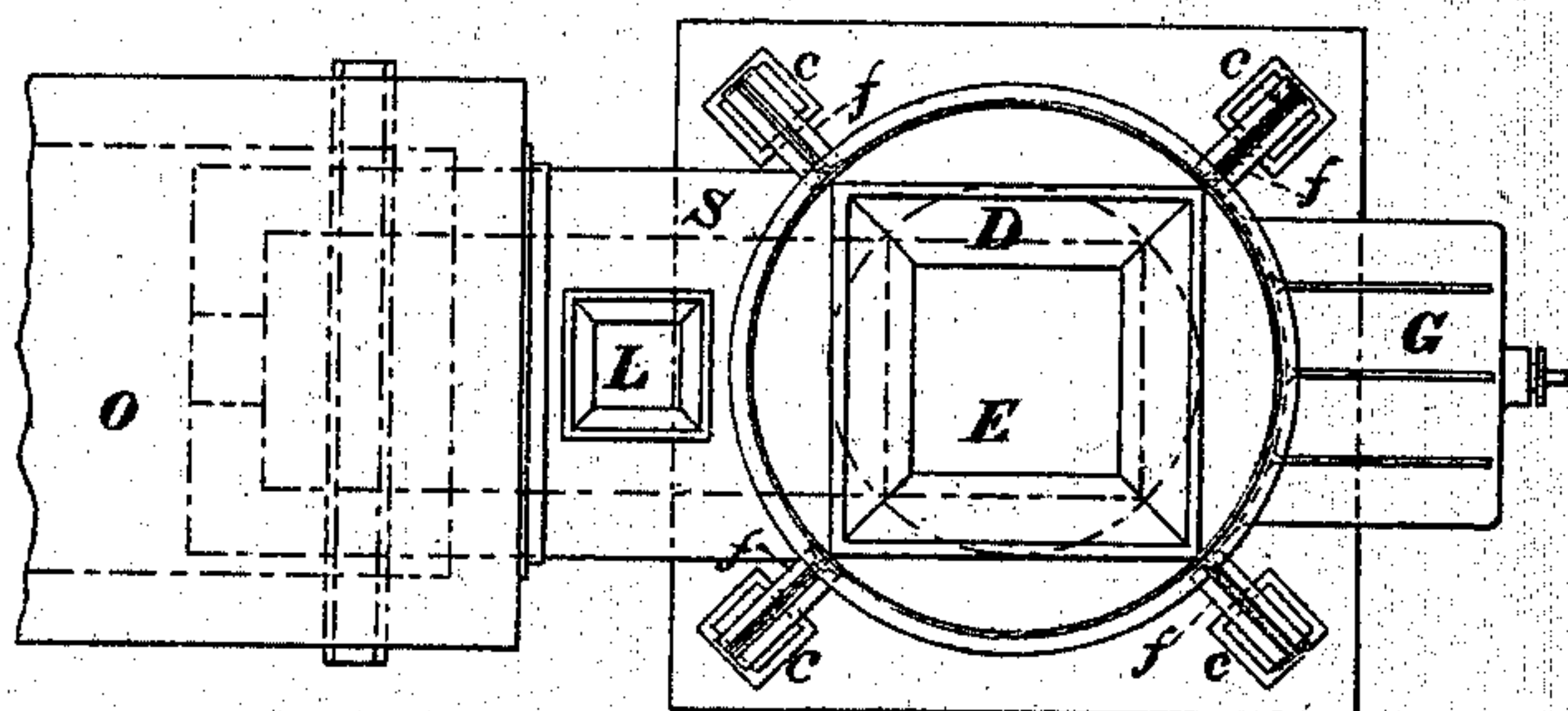


FIG. 3.



Witnesses:

Chas M Higgins
Arthur C. Fraser

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UNITED STATES PATENT OFFICE.

JOHN THOMAS, OF MIDDLESBROUGH, ENGLAND.

IMPROVEMENT IN METALLURGIC GAS-FURNACES.

Specification forming part of Letters Patent No. **139,834**, dated June 10, 1873; application filed April 25, 1873.

To all whom it may concern:

Be it known that I, JOHN THOMAS, of Middlesbrough, England, have invented or discovered certain new and useful Improvements in Furnaces for Generating Gas and Melting Metals; and I 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 and figures marked thereon—that is to say:

My invention has reference to furnaces for generating gas and melting metals; and it consists in the employment of bricks with alternating spaces in the gas-main chamber for separating the dust or other foreign matter from the gas in its passage through it, and in providing said gas-main with door-ways and doors for the removal of dust, and in a hopper arranged over the throat of the gas-main for introducing coals into the same.

Figure 1 of the annexed drawings is a longitudinal section of my improved furnace. Fig. 2 is an end elevation, and Fig. 3 is a plan, of the same.

As shown in the drawing, A, Fig. 1, is the body of the furnace, cased with iron *e*, lined with fire-brick and clay *h*, and supported on four columns, *c*. B B are water-boshes with spikes or ribs cast on them to hold up the lining of fire-resisting material. C are tuyeres for blast. D is a hopper for charging the furnace with material. E E are slides for admitting the fuel, metal, and fluxes into the furnace-generator A, which, being opened alternately by the gear F, will prevent the escape of gas. G G are casings around the slides to prevent the gas escaping. I is the blast-pipe from the blowing-machine, and H the stop-valve. K is a chimney over the top of the generator-furnace to carry off any gas that might escape while charging. L is a hopper with double slides *l l* for introducing coals or other carbonaceous materials into the throat *s* for improving the quality of the gas and increasing the quantity. M is a flue for taking off any light gases that may collect on the top of the fuel. O is the gas-main chamber or dust-trap filled with bricks *g*, with passages between

them for the circulation of the gas, and provided with door-ways N N for removing the dust. P is a safety-valve with chimney and casing. Q, gas-main service-pipes to puddling-machines or other furnaces with shut-off valve R. S is a throat-way or passage for the gas from the generator A to the dust-trap O. T is the tap-hole for running off the metal and slag, and U U are the columns which support the gas-main.

In constructing my improved furnace I make a sound foundation of brick or stone, *a*, Fig. 1, and on this I place a foundation-plate, *b*. On the plate I lay one or two courses of bricks, and on the bricks I fix one or more water-boshes, B, similar to those described in the specification of my invention for which Letters Patent of the United States were granted, dated March 8, 1870, No. 100,566. These water-boshes may be made in as many parts as is most convenient, and through them, in suitable places, I form one or more blast-holes, *d*, for air, and also tapping-holes T to run out the metal and cinder. The inside of these boshes, or side next the fire, is spiked or ribbed, as seen in Fig. 1, for the purpose of holding the lining. I then fix four columns, *c*, Figs. 1 and 3, one on each corner of the foundation-plate. I next make the upper casing *e* with a projecting gas-main branch, *s*, attached, which casing may be of wrought or cast iron, and I fix the same on the water-boshes and bolt them fast. I also firmly fasten four brackets, *f*, Fig. 3, to the outside of the casing, which brackets bear on and are bolted to the columns. These columns support the upper casing, and enable the boshes to be repaired or replaced with new ones when necessary. I also fix four other columns, U, under the projecting gas-main O S, to support the same. On the gas-main and near the throat S, which connects it with the upright generator, I fix a hopper, L, with two sliding shutters, *l l*. I also fix on the gas-main the service-pipes, and in each service-pipe I fit a valve or sluice, R. On the top of the gas-main I apply a safety-valve, P, for relieving any excess of pressure. At the end of the gas-main, and near the bot-

tom part, I make one or more door-ways and doors, N N, which doors are secured with a cross-bar and screw, as in ordinary gas-retorts. On the top of the upright casing *e* I place a hopper, D, Fig. 1, having two sliding shutters, E E, with levers or gears F, Fig. 1, to work them; and on the hopper I fix a chimney, K, with a door-way for charging, which chimney is to carry off any gas that may escape through the hopper. I also form an outlet, M, under the lower sliding shutter, and fix a pipe with a valve on the top, so as to let off, when necessary, the light gas that will accumulate in the upper part of the generator; risk of explosion is thus prevented. When I have erected the furnace-casing *e*, I line the water-boshes inside on the spikes or ribs with clay or other fire-resisting material, which lining should be about two inches thick; and from the top of the water-boshes I build fire-brick *h* up to and through to the hopper on the top of the gas-generator. I also build fire-brick all over the inside of the gas-main, and line inside the service-pipes with brick or clay. On the bottom of the gas-main I lay iron bars, (girder-shaped,) from nine inches to twelve inches high, and separate from each other so as to allow a clear space through the length of the bottom opposite the end door-ways. On the iron bars I lay or build up dry bricks *g*, Fig. 1, with spaces between the bricks for the passage of the gas, and I fill the gas-main up to or near the top with these bricks, excepting a clear space under the gas-main hopper L or in the throat S, connecting the gas-main with the upright generator, and also a clear space under the service-pipes to allow the gas to go off freely. I convey a blast of air to the furnace from any ordinary blowing-machine, and if gas of very high temperature is required I heat the air in its passage from the blower to the generator in any suitable stove or furnace. In the air-blast pipe I, and near the orifice or inlet to the generator or furnace I fit a sluice or valve, H, so as to regulate the quantity of the air, or to shut it off entirely. Having lined the generator melting-furnace, A, I dry the same, and I then let into the boshes B, through a pipe, sufficient water to keep them comparatively cool, which water will flow off through the outlet or waste-water pipe. I then raise the fire in the upright generator A, and when I have charged the same with sufficient fuel, which fuel should be good sound coke, or coke and coal mixed, I charge metal and fluxes with the fuel until the furnace or generator is full up to the under shutter of the hopper. I then close the hopper D on the top of the generator with the slide-shutters E, and I open the valves in the service-pipes. I then set on the air-blast through the tuyeres C, and the gas produced by the union of the oxygen of the air, uniting with the carbon and hydrogen of

the fuel, will pass through the throat, and through and between the spaces of the loose bricks *g* in the gas-main O, to the service-pipes Q, and the gas will be conveyed by the service-pipes to the different furnaces required to be heated. I convey to each heating-furnace, by a proper-sized pipe, a blast of air, and I so arrange the gas-pipe and the air-pipe that the gas and air shall come into contact on their entering the furnace to be heated; and if a high temperature is required I heat the air before it enters the heating-furnace. If it is necessary to enrich the gas with carbon I charge the hopper L on the gas-main with coal or other carbonaceous materials; I draw the upper slide *l* and let the charge fall onto the lower one, and I then close the upper slide and open the lower one, when the charge will fall on the hot coke in or near the throat S, which connects the gas-generator A with the gas-main O, the heat of which will cause the gas to evolve from the carbonaceous material supplied, which will improve the quality of the gas issuing from the gas-generator and increase the quantity. As the materials sink down in the gas-generator I continue to charge more materials through the hopper D, and this I perform by withdrawing the upper slide-shutter and letting the charge of materials fall onto the lower one, and by then closing the upper one and opening the lower one so as to allow the charge to fall into the gas-generator. This I perform regularly, so as to keep the generator nearly full. When there is sufficient metal I tap and run it out into a converting-furnace, which metal may be converted into iron or steel, as may be required. The water-boshes protect the lining on the lower part of the generator from being burnt or melted away, and will keep the inside in proper form for a considerable time. The loose bricks in the gas-main, which are set apart from each other for the passage of the gas, are so placed that the current of gas may strike against them, and that the dust and ashes blown from the generator, by striking against the bricks, will fall to the bottom of the gas-main between the girder-shaped iron bars, from which they may, from time to time, be cleaned out through the door-ways N N. The bricks also keep the gas hot. The melting of the metal and fluxes in the gas-generator dissolves the cinder deposit from the fuel, which cinder will combine with the fluxes in a liquid state, and can be run off as may be required, thus keeping the bottom clear from obstructions, (accumulation of solid cinder having hitherto been a hindrance to the successful working of this description of furnace,) and also, at the same time, melting the metal for the converting-furnaces, which will save the time and cost of melting in other furnaces.

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

1. The bricks *g*, in combination with the gas main or chamber O, substantially as and for the purpose herein set forth.

2. In combination with the gas-main O, provided with the bricks *g g*, the door-ways N and doors, arranged substantially as and for the purpose herein set forth.

3. The hopper L or equivalent, arranged over the throat of the gas-main for introducing coals or other carbonaceous material thereto, substantially as set forth.

In witness whereof I, the said JOHN THOMAS, have hereunto set my hand this twenty-ninth day of November, one thousand eight hundred and seventy-two.

JOHN THOMAS.

Witnesses:

I. C. MEWBURN,

GEO. BACON,

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