

J. Y. Smith.

Metallurgic Furnace.

2 Sheets--Sheet 1.

No. 120,005.

Fig. 1.

Patented Oct. 17, 1871.

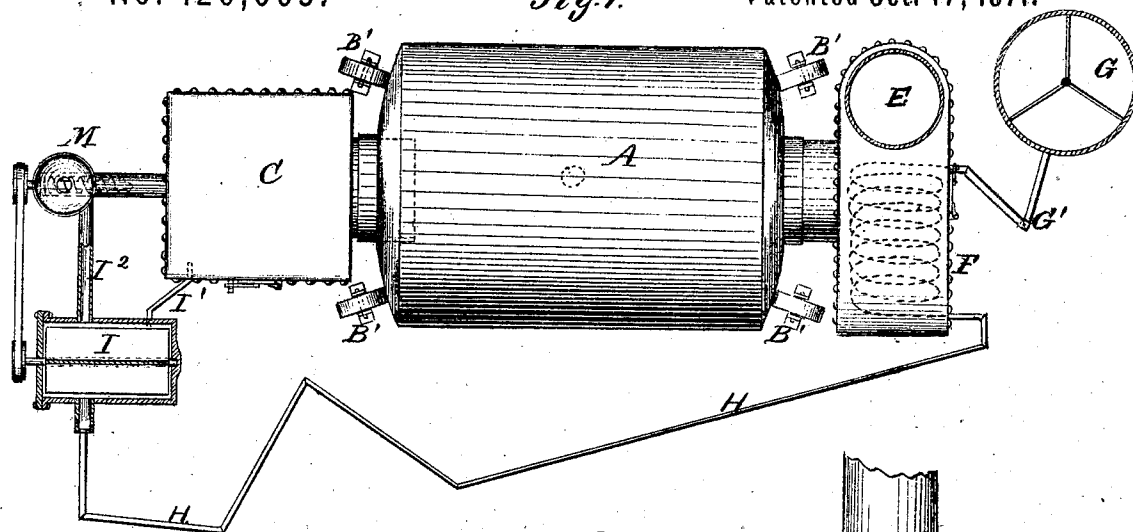


Fig. 2.

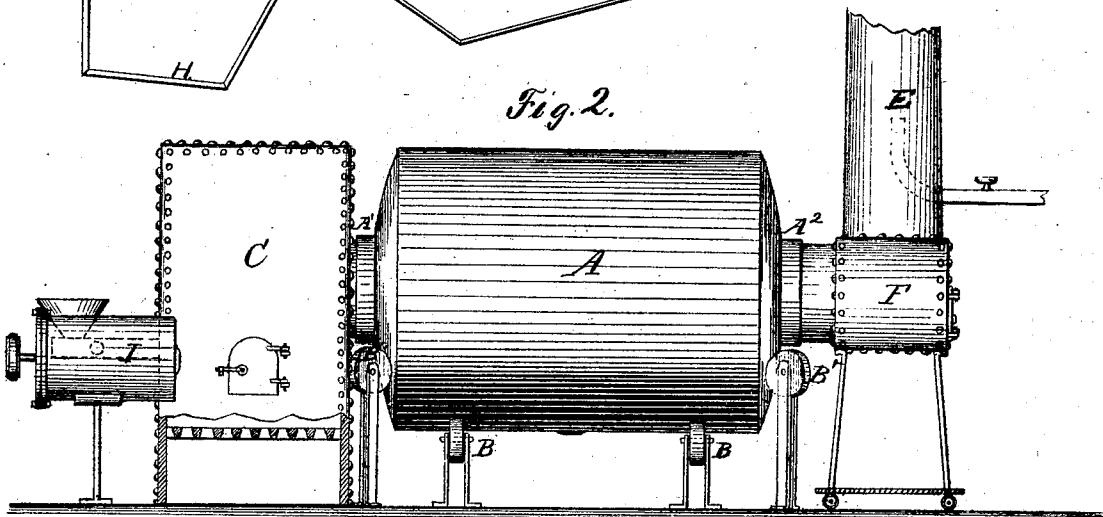


Fig. 5

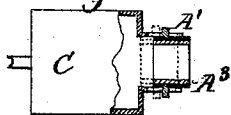


Fig. 4

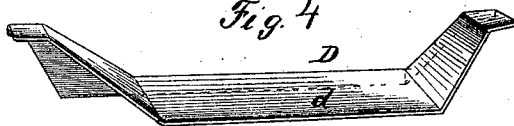
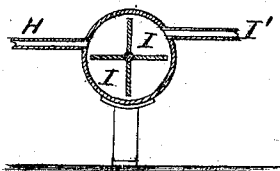


Fig. 3



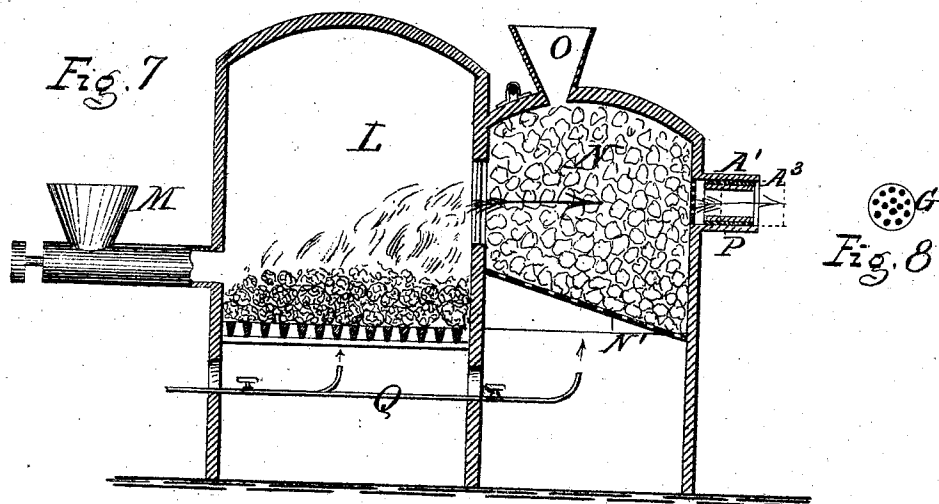
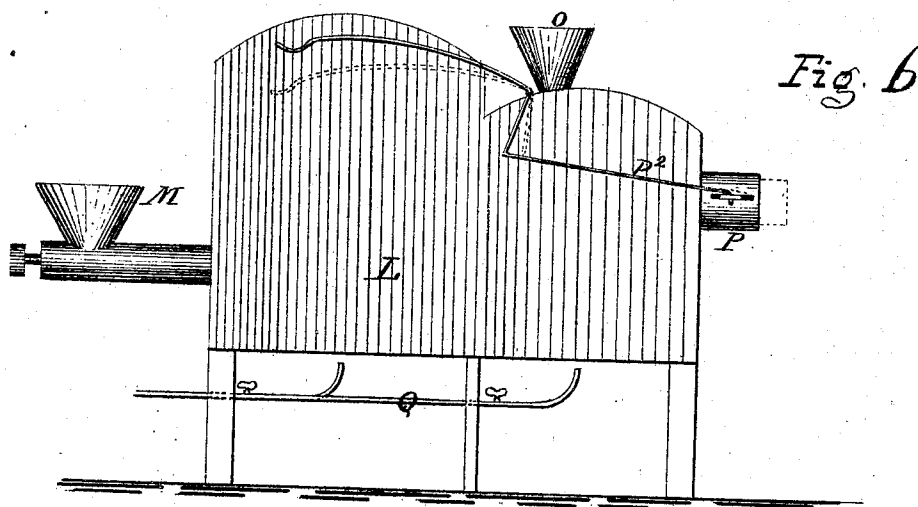
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John Y Smith. 2 Sheets--Sheet 2.
Metallurgic Furnace.

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UNITED STATES PATENT OFFICE.

JOHN Y. SMITH, OF PITTSBURG, PENNSYLVANIA.

IMPROVEMENT IN METALLURGIC FURNACES.

Specification forming part of Letters Patent No. 120,005, dated October 17, 1871; antedated October 3, 1871.

To all whom it may concern:

Be it known that I, JOHN Y. SMITH, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Revolving Puddling-Furnaces; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the annexed drawing making part of this specification, in which—

Figure 1 is a plan view. Fig. 2 is a side elevation; Fig. 3, a section of the fan; Fig. 4, a perspective view of a part. Fig. 5 is a plan and section of the furnace and adjustable throat.

In all the figures the same letters are employed in the designation of identical parts.

My improvements relate to a puddling-furnace of that class in which the furnace is made to revolve; and my invention consists in a new mode of putting a lining into such furnaces and in certain details of construction to be hereinafter set forth.

I have also shown in Figs. 6, 7, and 8 a furnace primarily adapted to this class of puddling-furnace, but also susceptible to application in connection with other kinds of furnaces. In this part of my case my invention consists in placing between the combustion-chamber and the puddling-furnace a chamber filled with incandescent coke or anthracite coal or other similar pure carbonaceous substance, through the interstices between which gases evolved in the combustion-chamber are caused to pass, and a perfect combustion thereof is thereby effected.

In the annexed drawing, I have shown at A a revolving puddling-furnace, made in the ordinary manner of staves of iron and lined internally with a refractory lining, to be hereinafter more fully described. This furnace revolves upon the friction-wheels B, being driven in the usual manner. The heads of the furnace are made slightly conical, and other wheels, B', are so placed and supported that they shall hold the furnace against that tendency to longitudinal movement which I have found, in practice, to be one of the difficulties attending the use of furnaces of this class. The combustion-chamber is indicated at C. It may be made so that it may be wheeled to one side to give access to the interior of the puddling-furnace. I prefer to use as a lining for my furnace pulverized silex, obtained readily by grinding quartz-rock. This

is mixed with a small quantity of salt or lead, or both, and slightly moistened with water. This I put into the furnace in the following manner: Flanged formers D, Fig. 4, are formed to fit the inside of the furnace, extending from end to end, the narrow flange indicated by dotted lines bearing against the case of the furnace and leaving a space between such shell and the inner plate *d*. One of these formers being placed in the furnace, the space between the shell and the plate *d* is packed with the prepared silex, so as to form a lining between the shell and said plate, extending into the throats A¹ A² of the furnace. Another former, D, is then introduced, and in like manner packed with the silex, and so on until the entire surface of the furnace is lined. A slow fire is then built and the furnace revolved, and as the silex is dried the intensity of the fire is increased until the silex is fused into a homogeneous mass, forming a perfect lining in one homogeneous tubular mass for the entire furnace. The formers may be removed during this operation as soon as the lining is capable of sustaining itself; or, being made of cast-iron, may be allowed to remain in the furnace until the intensity of the heat melts them. The lining, in hardening, will expand so as to fill the spaces left on the removal of the formers, and a perfect and entire lining of silex be left within the shell of the furnace capable of resisting any heat afterward required in the furnace. The uptake E opens out of a chamber, F, containing a coil for heating the air-blast. The chamber F may be mounted on wheels so that the end of the puddling-furnace may be opened to permit the contents of the furnace to be taken out. In this case the fan-case G must be connected with the hot-air coils by a jointed pipe, G', and the blast-pipe H must also be in like manner jointed so as to permit the chamber F to be moved without disconnecting the pipes. One difficulty in operating this class of furnaces has been to maintain the connection between the movable parts of the furnace and the revolving furnace. This I obviate in the following manner: Inside the throats I place rings made of silex in the manner set forth. These rings are placed inside the throats, so as to fit neatly, but to allow the longitudinal adjustment of the rings. The rings may be operated by means of the weighted lever shown in Fig. 6, attached to the ring A³. The

rings will be pressed together, but as they wear the lever will keep the ends in contact; and when a ring is worn out it may be readily replaced by a new one.

I propose to use in connection with the furnace finely-pulverized fuel; and to feed this to the combustion-chamber I desire to employ the force of the blast. To this end I use a case, I, containing a fan which is driven by the blast passing through the case. The blast is then partly conducted directly into the combustion-chamber through the pipe P¹, and partly through the pipe P² into the fuel-feeder, to carry with it the finely-pulverized fuel into the combustion-chamber. On the end of the fan-shaft which passes through the end of the case I is a pulley connected with the pulley on the end of the spiral feeder placed in the fuel-injector K, so that the revolution of the fan-wheel gives motion to the spiral feeder.

Instead of the ordinary furnace, I prefer to use one made on the principle of that shown in Figs. 6 and 7. The combustion-chamber L may be constructed with the ordinary grate-bars for burning solid fuel, or with the fine-fuel injector M, or both. Between the combustion-chamber and the revolving or other furnace I place another chamber, N, to be filled with lumps of a pure carbonaceous fuel, such as coke or anthracite coal, the lumps being of such size as to permit the draught to be forced through their interstices. This may be effected by means of the pressure-blast or by the aid of an exhaust-pipe in the up-take, through which a jet of steam is forced into the up-take, or by both combined. These lumps may be fed into the chamber N through the hopper O. This chamber should also be constructed with grate-bars N', to permit the ashes and clinkers or other solid product of combustion to be drawn off. The pipe Q is intended to discharge a blast of air under the grates, as shown. The gases of combustion, or the carbonized air, in passing through the chamber N and between the incandescent lumps therein, will be heated to the highest possible degree and a perfect combustion effected. By this means I am able to produce a pure reducing flame in the furnace.

I am aware that a furnace is shown in Tooth's English patent No. 277 of 1860, having a chamber placed between the fire-box and the puddling-furnace to be filled with gas-yielding coal, to be distilled by the action of the heat passed through the mass; but it is no part of my purpose to make gas in this chamber; on the contrary, it is indispensable that the coal used should be as nearly as possible pure carbon, the best material being a pure anthracite or coke or charcoal, for, if the material used will yield a gas under the action of the heat other than a pure carbonic acid or oxide, it will not answer the purpose in view in this invention, which is the purification and heating of the gases evolved in the fire-box.

It is obvious that this form of heating-furnaces may be used with other kinds of furnaces, and also that other furnaces for generating heat may be used in combination with a furnace such as that shown. I do not, therefore, limit my claim to the use of the two in combination.

I am aware that revolving puddling-furnaces are in common use; and also that the use of pulverulent fuel is common; and also that such fuel has been injected over the surface of fires of solid fuel or mingled with the gaseous products thereof; and also that it has been proposed to drive jets of pulverulent fuel against the surface of lumps of refractory substances piled in the combustion-chamber and maintained in an incandescent state to assist in burning the particles of fuel. None of these things are, therefore, claimed unless such lumps of refractory substances are used in a chamber such as N.

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

1. A revolving furnace, A, the inclined heads of which are supported against friction-wheels B', substantially as and for the purpose set forth.

2. A revolving furnace, A, when lined on the interior by a solid tube of homogeneous material formed by the action of heat, substantially as set forth.

3. In combination with a revolving furnace, adjustable rings of refractory material for forming the joints between the necks of the furnace and the parts connected therewith.

4. The formers D, when used in combination with the shell of the furnace to form the lining thereof, substantially in the manner set forth.

5. In combination with the blast-pipe and spiral fuel-feeder M, a fan and case, I, when respectively so constructed and connected that the blast shall operate the feeder, substantially in the manner set forth.

6. In combination with the combustion-chamber L, a chamber, N, filled with incandescent lumps of a pure carbonaceous substance, such as coke, or anthracite coal, through which chamber the gaseous products of combustion are forced, substantially as set forth.

7. In combination with an apparatus for feeding finely-pulverized fuel to be burned while floating in the air, a chamber, N, filled with incandescent lumps of such carbonaceous substances as aforesaid, through which the carbonized air is forced, substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN Y. SMITH.

Witnesses:

B. EDW. J. EILS,
A. RUPPERT.

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