

John Y Smith.
Imp^d Apparatus for feeding pulverized
fuel into furnaces.

No. 120,007.

Patented Oct. 17, 1871.

Fig. 1.

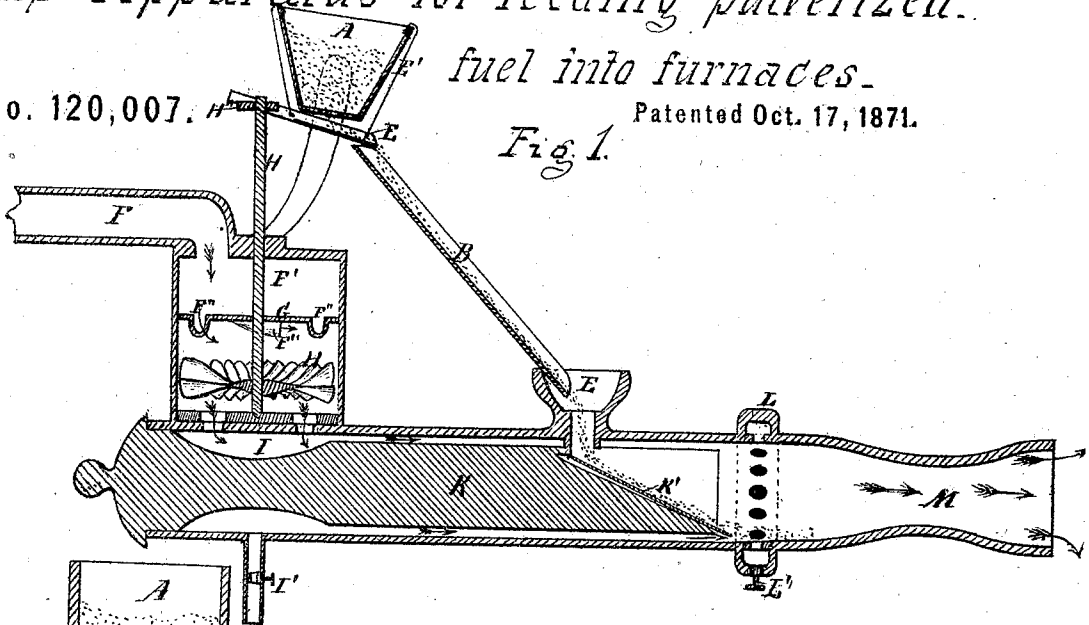


Fig. 2.

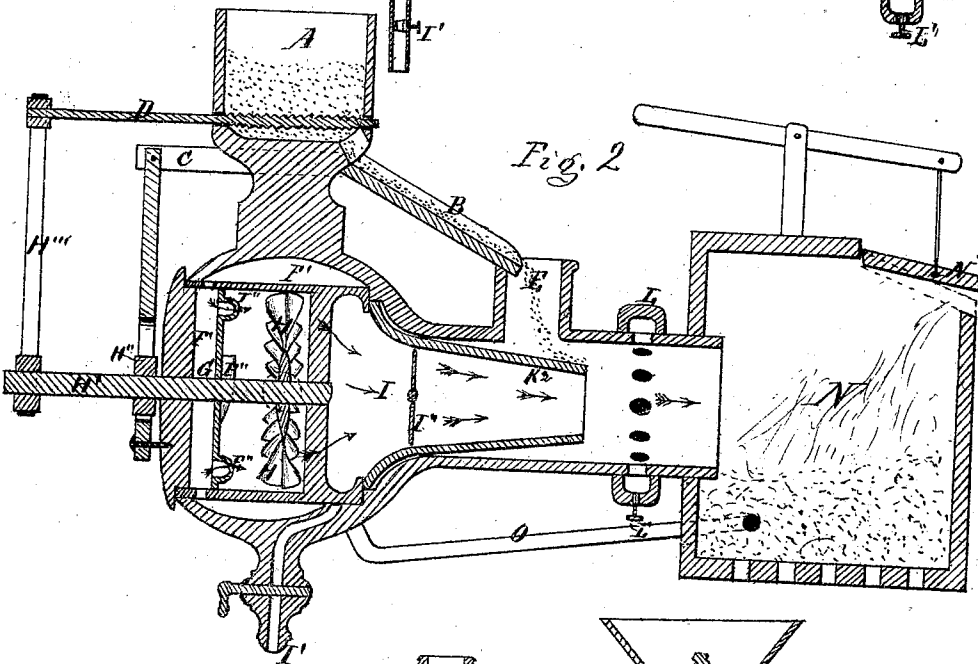
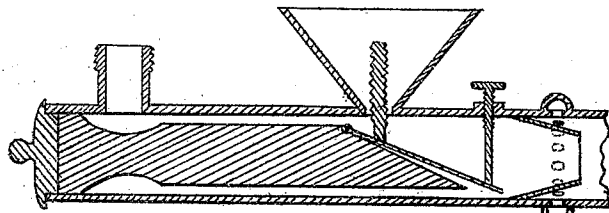


Fig. 4.



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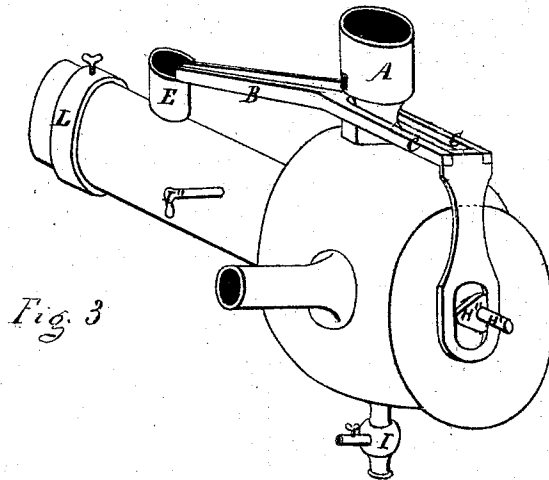


Fig. 3

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UNITED STATES PATENT OFFICE.

JOHN Y. SMITH, OF PITTSBURG, PENNSYLVANIA.

IMPROVEMENT IN APPARATUS FOR FEEDING FUEL INTO FURNACES.

Specification forming part of Letters Patent No. 120,007, dated October 17, 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 an Improved Apparatus for Feeding Pulverized Fuel into Furnaces for supporting combustion therein; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the annexed drawings making part of this specification, in which—

Figure 1 is a vertical longitudinal section. Fig. 2 is a similar section, showing a modified form of construction of the apparatus. Fig. 3 is a perspective view of the apparatus as shown in Fig. 2. Fig. 4 is a vertical longitudinal section of another modified form of construction of the apparatus.

The same letters are used in the designation of identical parts in all the figures.

My improvements relate to apparatus for feeding finely-pulverized fuel into furnaces, which may be employed for supplying furnaces of all kinds with any sort of fuel which can be reduced to a finely-powdered state, and passed into the furnace there to be ignited and consumed. Another improvement introduced into this apparatus is the application of the force of the current of steam, air, or gas passing through the injector to use in communicating motion to the shoe or shaker, which regulates the discharge of pulverulent combustible from the hopper. Other improvements in the details of construction and arrangement will be specifically pointed out in the following specification and claims.

Many different kinds of apparatus have been patented in the United States and in England for feeding pulverized fuel into furnaces through the blast-tuyeres mingled with the air for supporting the combustion; but all of which I have any knowledge have been subject to the disadvantage of having no convenient means of regulating the relative supply of air and combustible so as to adapt the quantities of each to the requirements of a given case. Although the economy of burning fine coal—of which so large an amount is annually wasted at the mines, in coal-yards, and at manufactories where coal is used as a fuel—has been recognized, the defects of all apparatus heretofore employed have been such as to prevent their general introduction into use. I do not, therefore, claim the use of pulverulent combus-

tibles introduced with the blast, for such use has been known for many years.

My claims for novelty of invention are confined to those modifications of construction in the apparatus to be hereinafter set forth.

In the annexed drawings I have shown, in Figures 1 and 2, two forms of apparatus differing in arrangement, but involving the application of the same principles of operation.

A is a hopper or pipe, through which the finely-pulverized and dried fuel is introduced, and from which it passes through a chute, B, into the injector, its discharge being regulated by a vibrating shoe, C, such as is in common use in connection with the hoppers of grinding-mills. The feed of the shoe is regulated in the ordinary manner by the strap C', which is used to raise or lower the shoe. In addition to or instead of the shoe a spiral conveyer, D, may be placed in the bottom of the hopper; or other common devices may be substituted for either. E is a hopper, into which the fuel is discharged from the chute B, it passing thence into the pipe, through which it is carried into the furnace or combustion-chamber. F is the induction-pipe, through which steam may be carried to the chamber F¹. It is obvious, however, that this pipe may be connected with the trunk of a pressure-blast or a gasometer, or other receptacle for combustible gases, should either be employed instead of steam. G is a diaphragm, extending across the chamber F¹. This diaphragm may be horizontal, as shown in Fig. 1, or vertical, as shown in Fig. 2. It has through it openings F², arranged to discharge the current of steam, air, or gas against the floats of the wheel H, which thereby will be caused to revolve on its shaft H¹, which may be vertical, as shown in Fig. 1, or horizontal, as shown in Fig. 2. This wheel may be of any approved form of wind-wheels or rotary engine, such as are in common use. On the shaft H¹ is placed a cam, H², which, acting against the shoe, will give a vibratory motion thereto, according to a common arrangement in use in analogous cases. In case a screw-feed is used, as in Fig. 2, it may be revolved by means of the connecting-shaft H³ and suitable bevel-wheels, or by means of pulleys and an endless belt. The steam, air, or gas passing through the wheel H is discharged into the exhaust-pipe I. In order that the motion of the wheel H may be maintained in cases where it is not desirable to

carry all of the current into the combustion-chamber or furnace a pipe, I¹, closed by a stop-cock, is carried out of the exhaust-pipe I, through which the current operating the wheel may be discharged into the open air. A butterfly-valve, I², may be inserted in this tube for the purpose of regulating the passage of the current through the exhaust-pipe when the pipe I¹ is open. In the case illustrated in Fig. 1 the blast is carried between the exhaust-pipe and a central tubular core, K, and the pulverulent combustible passing down upon the slide K¹ will be carried away by the current passing around it. In the case illustrated in Fig. 2 such current is carried through a pipe, K², onto which the pulverulent material is discharged, which is carried away by the centrally-placed blast or jet. In either case I prefer to hinge the slide or tube onto which the pulverulent material falls to the exhaust-tube in such manner that the action of the passing current shall cause it to vibrate and prevent the pulverulent material to lodge thereon. Around the exhaust-tube is placed an annular chamber, L, connected by openings with the interior tube. Other openings L' placed therein, and regulated by stop-cocks, will admit air in such quantities as may be desired. The openings from the annular chamber into the exhaust-tube must be directed forward or covered by a forward inclined flange projecting from the interior of the exhaust-tube, so that the current passing through the tube will tend to create a vacuum at the mouth of the openings, and thus draw the air from the chamber L into the exhaust-tube, where it will be mingled with the steam or gas and combustible particles in such proportions as may be determined by the stop-cocks, and thus the combustible be introduced into the combustion-chamber in combination with the quantity of air required to support its combustion without that excess of air which is found to be injurious in the action of other analogous apparatus not susceptible to such regulation. By means of this regulation of the escape-pipe I¹, and the air-supply openings L', the speed of the wheel H may be maintained so as to keep up the constant vibration or revolution of the feed, and the air or steam passing into the furnace increased or diminished as the requirements of maintaining the combustion of the pulverulent particles may demand. The exhaust-pipe may be straight, or formed as shown at M in Fig. 1, for the purpose of scattering the combustible particles as they enter the furnace. A fire-box, N, as shown in Fig. 2, may be employed, constructed with a door, N', by means of which the discharge of flame into the furnace may be regulated at will. In the latter figure I have shown at O a pipe, which should also be fitted with an annular air-chamber, like that shown at L, which may be used for throwing a blast below the grates or into the mass of incandescent fuel in the fire-box.

In Fig. 4 I have shown an arrangement which dispenses with the hopper A and adjuncts and chute B, a hopper of sufficient size being placed directly over the hole E, through which the pul-

verized fuel is introduced upon the vibrating slide K¹. In this case an agitator with a roughened surface is attached upon said slide, and extends up into the hopper so that the fuel therein is constantly agitated and a continuous discharge insured.

I propose to use one or more of the above-described apparatus in connection with the same furnace. Where more than one are used they should be so directed that the draughts from them, as they enter the combustion-chamber or furnace, should not encounter one another as they enter from opposite directions, but rather so as to form a vortex of flame to sweep around the interior of the furnace or combustion-chamber.

The application of the apparatus is not limited to any particular kind of furnace, but may be used for any purpose where heat is required. In applying the apparatus to locomotive-engines or other uses I would provide conveyers for conveying the pulverized material into the hopper, which may be operated by the rotary wheel H, or independently by power otherwise derived, as might be most convenient.

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

1. An apparatus for feeding pulverulent fuel into a furnace, combining in its construction the following elements, viz., an induction and an exhaust-pipe, an intermediate wheel arranged to be revolved by the action of the current of steam, air, or gas passing through said pipes, and a shoe or other feeding mechanism regulating the discharge of the pulverized material connected with said wheel so as to be moved by it, substantially as set forth.

2. In combination with a pipe or series of pipes for passing a current of steam or gas into the furnace or combustion-chamber, a hopper or pipe for delivering into such current of gas or steam the pulverized fuel, and an opening or series of openings for introducing air mingled with the steam or gas and pulverized fuel into the furnace or combustion-chamber, when, and only when, further combined with mechanism for regulating the quantities, respectively, of the steam or gas, pulverized fuel and air so admitted, substantially as set forth.

3. In such an apparatus, in combination with the induction and exhaust-pipes and wheel H, an opening, as at I¹, for regulating the flow of steam into the furnace while maintaining the uniform action of the wheel, substantially as set forth.

4. The slide K¹ or pipe K², when arranged to receive the stream of entering pulverulent fuel, and when so supported that the passing current shall impart to them a tremulous motion, substantially as and for the purpose set forth.

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

Witnesses:

JOHN Y. SMITH.

D. P. HOLLOWAY,

E. F. CLAUSEN.

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