

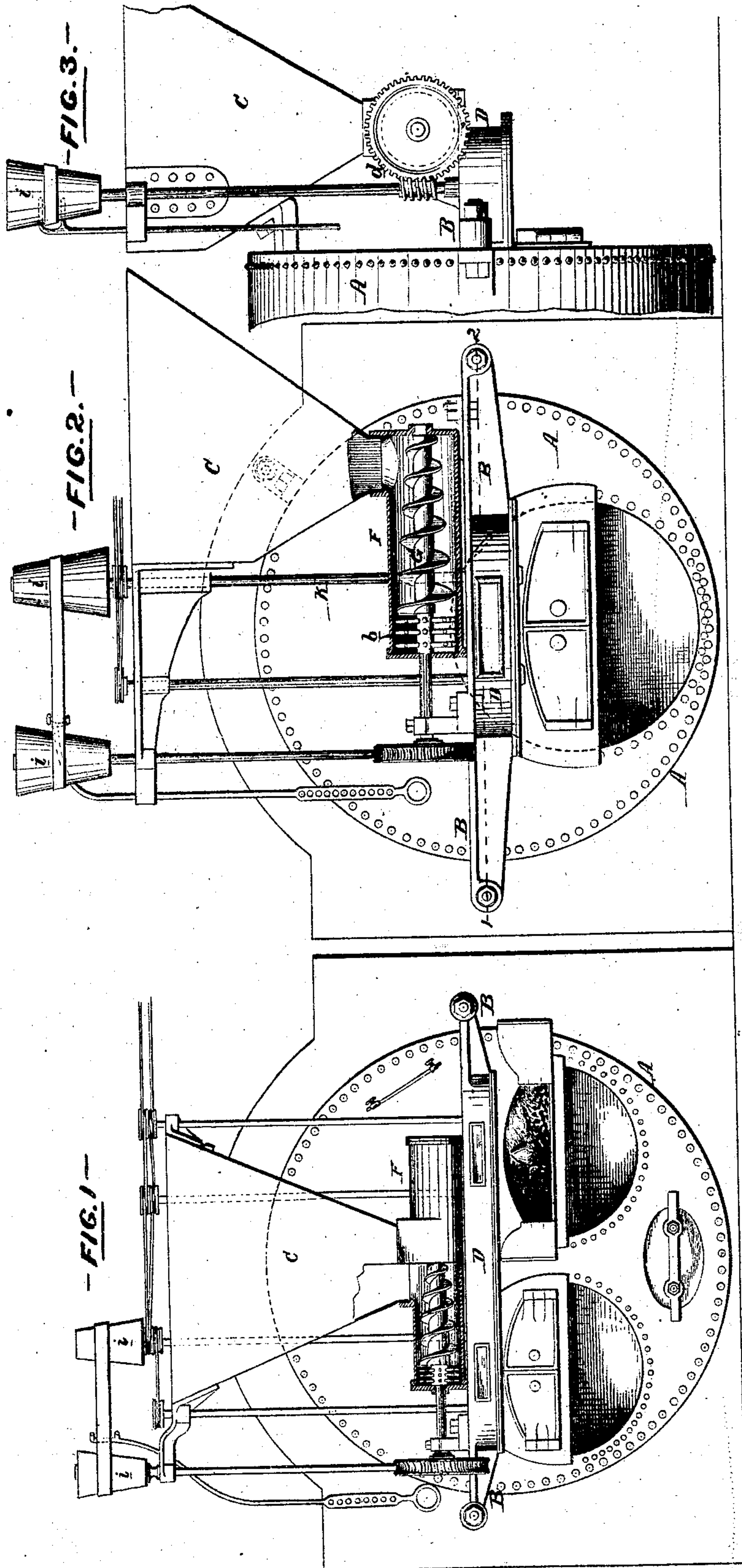
GEORGE F. DEACON.

2 Sheets--Sheet 1.

Improvement in Apparatus for Feeding Furnaces with Fuel.

No. 116,165.

Patented June 20, 1871.



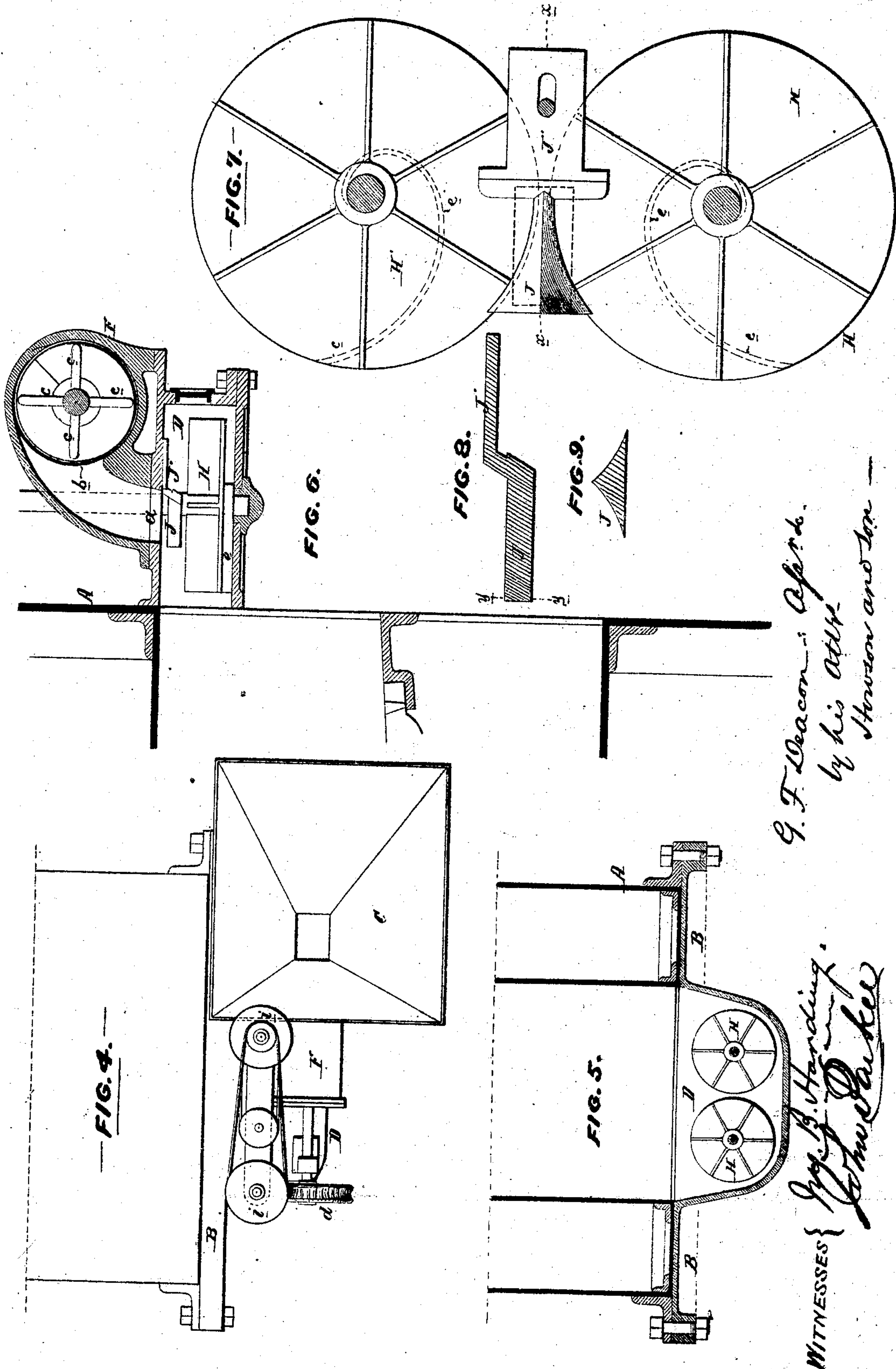
*G. F. Deacon - Applicant  
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*Witnesses  
Jno. B. Handing  
John C. Baker*

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G. F. Deacon: Agent.  
by his Att'y  
Horton and Son

WITNESSES { J. B. Harding.  
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# UNITED STATES PATENT OFFICE.

GEORGE FREDERICK DEACON, OF LIVERPOOL, ENGLAND, ASSIGNOR TO  
DILLWYN SMITH, OF BURLINGTON COUNTY, NEW JERSEY.

## IMPROVEMENT IN APPARATUS FOR FEEDING FURNACES WITH FUEL.

Specification forming part of Letters Patent No. 116,165, dated June 20, 1871.

*To all whom it may concern:*

Be it known that I, GEORGE FREDERICK DEACON, of Liverpool, in the county of Lancaster, in England, civil engineer, have invented certain Improvements in Apparatus for Feeding Furnaces with Fuel, of which the following is a specification:

### *Nature and Object of the Invention.*

My invention consists of certain improvements, freely described hereafter, in apparatus for automatically feeding furnaces with fuel, the mechanism employed being of such simple and effective character that it is not liable to get out of order, while it can be so regulated as to project the fuel onto any portion of the grate-surface, and thus enable a perfectly level fire to be constantly maintained.

### *Description of the Accompanying Drawing.*

Figure 1, Sheet 1, is a front view of a double-flue boiler with my invention applied to the same; Fig. 2, a front view of a single-flue boiler with the apparatus attached; Fig. 3, a side view of Fig. 2; Fig. 4, Sheet 2, a plan view of Fig. 2; Fig. 5, a sectional plan on the line 1 2, Fig. 2; Fig. 6, an enlarged sectional view of part of the apparatus and of the furnace and boiler to which it is attached; Fig. 7, a plan view of the propelling-fans detached from the apparatus; Fig. 8, a section on the line *x x*, Fig. 7; and Fig. 9, a section on the line *y y*, Fig. 8.

### *General Description.*

In order that my improvements may be fully understood, I will first describe briefly the machine or apparatus upon which my said improvements are founded.

This machine was constructed with a hopper or receptacle for holding the fuel placed immediately over the front portion of the furnace or fire-place. Below this hopper were placed, in a funnel, two or more rollers, having on their surfaces pins or projections for crushing or breaking the coals and metering or regulating the supply of the same to the furnace. Each set of these crushing-rollers was driven by means of eight or ten toothed and worm-wheels. Below these rollers were two fans, revolving in a horizontal plane, and contained in a box opening to the furnace, which fans received

the fuel among their vanes and projected or threw it into the furnaces. These fans were fixed on the lower ends of vertical shafts, extending to some height above the boiler-front, in order to be clear of the hopper, and were driven by means of pulleys on the upper ends of these shafts.

I retain the use of the hoppers and fans, but instead of the crushing-rollers, with the numerous toothed wheels and worms, which were required to drive them, and which constituted the most objectionable and troublesome feature of the original machine, I prefer to use a screw or worm of any form, placed either vertically, horizontally, or obliquely, one end of such screw or worm being in communication with the hopper, the other end with the box containing the fans. Sometimes I use a screw with several threads of long pitch revolving horizontally in the bottom of the hopper, which, in this case, is placed directly over the fans. This screw has a shearing and crushing effect on the coal, reducing it to a small size, and metering it and delivering it to the fans. But by preference I place the hopper a little to one side of that portion of the fan-box into which the coal is delivered, as shown in the drawing, where A represents an ordinary single-flue boiler; B, a frame for supporting the feeding apparatus, secured at its opposite ends to the shell of the boiler; C, the hopper; and D, the fan-box. I connect the bottom of the hopper with an aperture, *a*, in the fan-box, for admission of the coal to the fans, by a horizontal funnel or cylinder, F, in which is arranged to turn a deeply-cut screw or worm, G, nearly equal in diameter at the fan-box end to the internal diameter of the cylinder, but tapering uniformly to a smaller diameter at the hopper end, that portion of the screw directly beneath the hopper being merely a shaft with a very shallow thread. This form of screw is preferable for two reasons: First, the smaller portion of the screw, working in the bottom of the hopper, or in a chamber communicating therewith, produces a slight but constant motion of the fuel from the hopper in a sloping heap along the cylinder, extending further from the hopper than the natural angle of repose of the fuel, and rendering the quantity of fuel carried on during a given number of revolutions constant



for different qualities of fuel. Secondly, the increasing size of the helix insures in its revolving motion the crushing of any lumps of coal or other fuel larger than the pitch of the screw. To facilitate the production of this result the bottom of the cylinder, in which the tapered portion of the screw works, may be corrugated longitudinally. Toward the end of the screw-cylinder there is an opening, *b*, communicating with the case or box *D*, in which the fans *H* and *H'* revolve. This opening *b* may be placed at the bottom, end, or side of the cylinder; but I prefer to place it at the side, and to lift the coal to it by projections or pins *c* on the screw-shaft. This causes the coal to fall over the edge parallel to a line joining the fan-centers, and renders the feed to the two fans equal. (See Figs. 1 and 6.) The screw may be driven by a single worm and wheel, *d*, which constitutes the only toothed gearing in the apparatus. When two fires are sufficiently close together, as in the double-flue boiler shown in Fig. 1, I generally place the hopper between and use a right-and-left-handed screw to carry the fuel from the hopper to the said fires. In this case a single worm and wheel is all the gearing required for the furnaces.

In the original machine a considerable quantity of coal fell between the horizontal fans and onto the bottom of the fan-box. This coal, continually increasing, was pushed over the edge of the box onto the front of the furnace and heaped upon the dead-plate. I remedy this defect by the use of a plate, bar, or deflector, *J*, Fig. 7, having curved and inclined sides, and corresponding in form with the space between the two fans, which plate being fixed across the under part of the opening *a*, from which the coal falls, and above the fans, prevents the coal from falling elsewhere than on the two fans; and with this I combine a plate or slide, *J'*, for increasing or diminishing the opening *a* so as to alter the position of the falling coal from one part of the fans to another, and thus adjust the uniformity of its distribution over the grate-surface.

In the original machine a difficulty was experienced by the accumulation of coal-dust in the space between the fan-box bottom and the bottom plates of the revolving fans. I obviate this by casting onto the fan-bottom a spiral rib or vane, *e'*, Fig. 7, which, working in this space, prevents any substance from entering or accumulating.

In the old machine the crushing or metering-rollers were geared from one of the fan-shafts, so that to change the speed of these rollers it was requisite to change the speed of the fans also.

In my improved apparatus the worm-shaft receives its motion from one of the fan-shafts *K*; but I use conical pulleys *i i*, or other suitable means, for the purpose of varying the relative velocities of the shafts, so that the speed of the mitering-screw may be altered without changing the speed of the fans.

Instead of arranging the driving-pulleys above the hopper, as shown in the drawing, I frequently render the whole apparatus more compact by shortening the fan-shafts and placing the said pulleys as low down as possible, the fan-shafts in such case having both their top and bottom bearings in one bracket, which is bolted to the fan-box or frame *B*.

It will be evident that my invention can be applied to furnaces generally, whether intended for generating steam or for other purposes, as well as to furnaces of the character illustrated in the drawing.

#### Claims.

1. The combination, with the hopper and fuel-distributing fan, of a screw or worm, revolving within a cylinder or trough and conveying the fuel substantially as herein described.

2. The combination, substantially as herein described, of the hopper or other receptacle for the fuel, fans, or vanes, by which the said fuel is projected into the furnace, and a screw, tapered, as and for the purpose specified.

3. The opening *b*, close to one end of the screw-cylinder and above the level of the bottom of the same, in combination with pins or projections *c* on the screw-shaft, for the purpose of lifting the fuel and pushing it into the said opening.

4. The adjustable deflector *J J'*, arranged and operating in combination with the fans and with the discharge-opening *a*, substantially in the manner described.

5. The spiral vanes *e*, cast on or secured to the bottom of the propelling-fans, for the purpose specified.

6. The combination of the feed-screw, the feeding-fan or fans, the conical pulleys *i i* on the driving-shafts of the fan and feed-screw, and their adjustable strap, the whole being arranged as described, so that the speed of the feed-screw may be increased or diminished without altering that of the fan, as set forth.

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

GEORGE FREDERICK DEACON.

Witnesses:

CHAS. E. STEVENS,  
JNO. PHILLIPS.