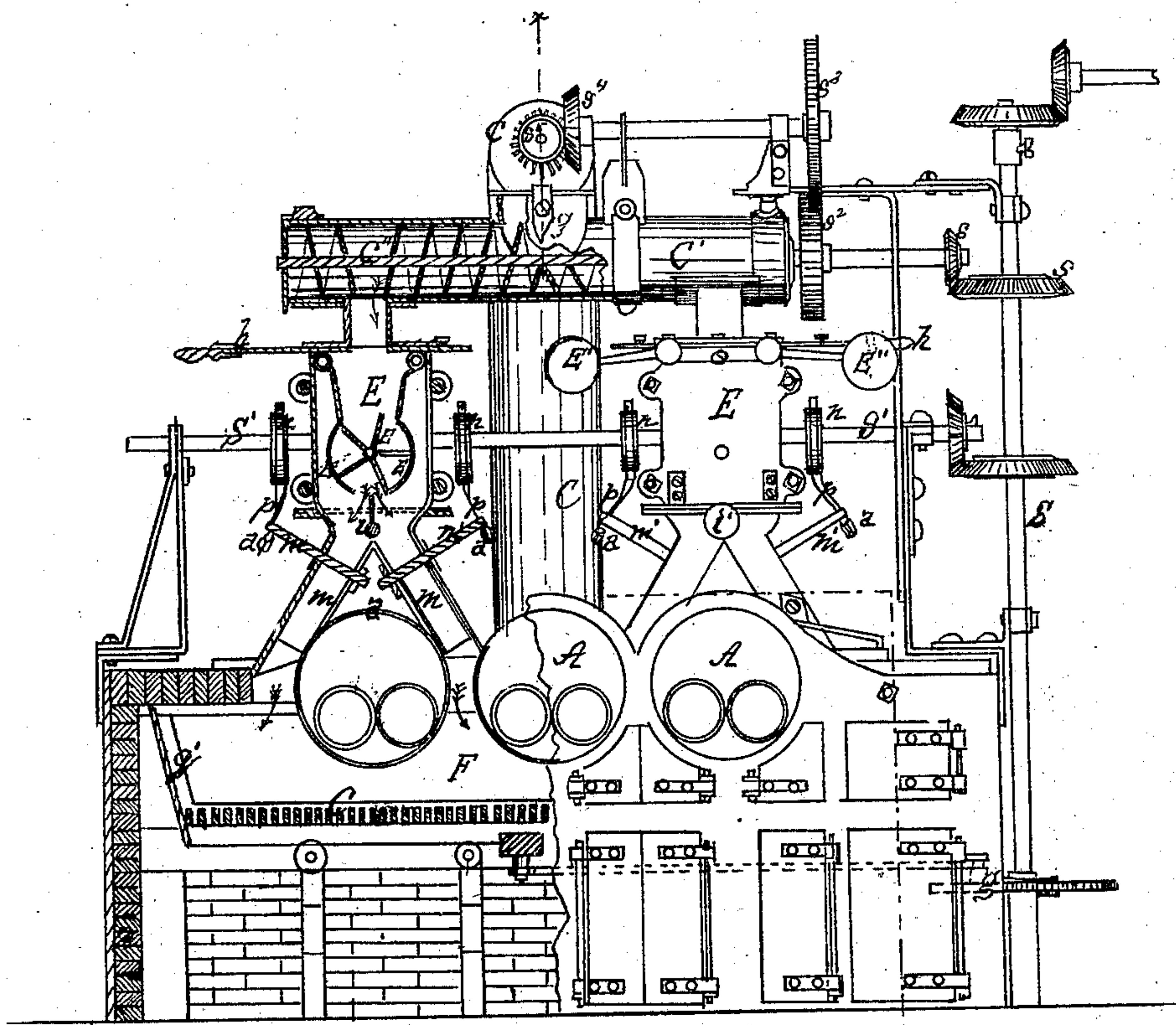


*J G. M<sup>c</sup> Cormick.*  
*Feeding Fuel to Furnace.*  
*N<sup>o</sup> 79914*      *Patented Jul. 14, 1868.*

Fig. 1.



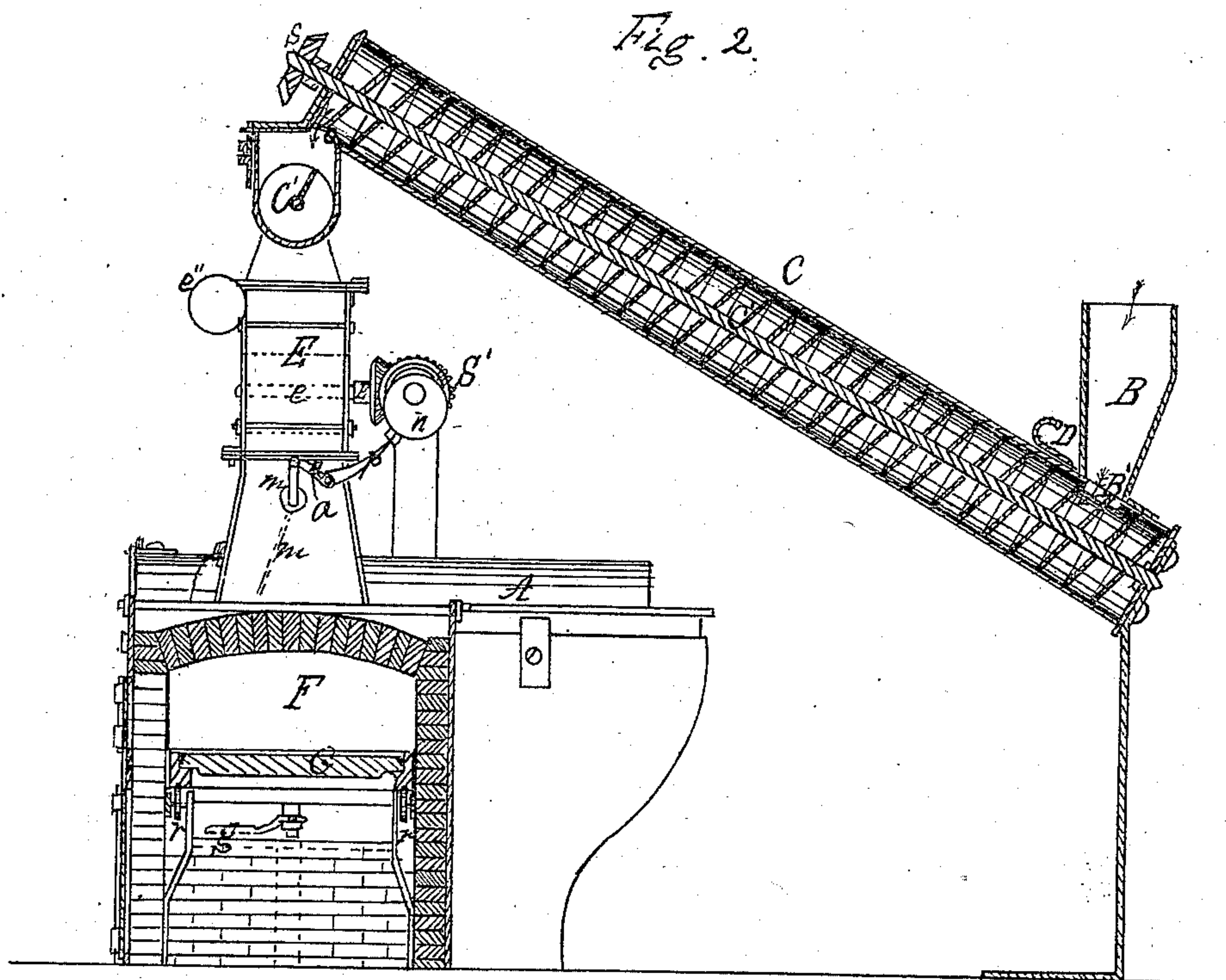
WITNESSES.

*Nathan S. Ellsworth*  
*J. H. Miller*

Inventor

*John B. McCormick*  
*Perkins & Co*  
*attys*

*J. G. McCormick.*  
*Feeding Fuel to Furnace.*  
*N<sup>o</sup> 79914* *Patented Jul. 14, 1868*



*Witnesses*  
*John B. Ellenark*  
*J. W. Mister*

*Inventor*  
*John G. McCormick*  
*For all the*  
*Attys.*



# United States Patent Office.

JOHN G. McCORMICK, OF LOUISVILLE, KENTUCKY, ASSIGNOR TO HIMSELF  
AND M. W. FERGUSON.

*Letters Patent No. 79,914, dated July 14, 1868; antedated July 3, 1868.*

## APPARATUS FOR FEEDING FUEL TO FURNACES.

*The Schedule referred to in these Letters Patent and making part of the same.*

### TO ALL WHOM IT MAY CONCERN:

Be it known that I, JOHN G. McCORMICK, of Louisville, in the county of Jefferson, and State of Kentucky, have invented a new and improved Apparatus for Feeding Fuel to Furnaces; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, and in which—

Figure 1 is a front elevation of my invention, showing a section of the left side, and

Figure 2 is a vertical cross-section of the same, through the dotted red line *x* of fig. 1.

This invention is an apparatus for carrying fuel, coal, saw-dust, &c., from a bunker to the furnace, and feeding it regularly, uniformly, and evenly, over the length and breadth of the fire-grate, under any number of steam-boilers, at the same time.

The machine is worked by the engine, and requires no care, except in keeping the bunkers supplied with fuel to be used.

Similar letters of reference indicate corresponding parts in the several figures.

In the drawings, *A A A* represent a set of boilers, used in connection with a steam-engine, whether stationary or upon steamships or other conveyances, and heated by the furnace *F*.

*B* is a funnel or bunker, containing a supply of fuel to be fed to the furnace *F*.

*C* is a cylindrical tube, extending from a gate or aperture, *B'*, at the bottom of the bunker, to a point nearly over the centre of the fire-grate.

*C'* is another similar tube, situated under the upper extremity of the tube *C*, so that the latter communicates with it through an opening *c*, as shown in fig. 2.

The cylinder *C* is situated in an inclined position, rising from the bunker to the cylinder *C'*. The latter extends horizontally across above all the boilers, as seen in fig. 1. The office of the cylinder *C* is to convey coal from the bunker to the horizontal cylinder *C'*, the office of the latter being to convey the fuel to the different boilers, and discharge it upon the grate *G* beneath them, by means of bifurcated spouts *E E*, of the form shown clearly in fig. 1. The spouts are situated vertically above the boilers, and divide so as to distribute the fuel on each side of them.

The fuel is elevated through the cylinder *C* by means of a worm or screw, *c'*, working within the cylinder. A similar worm or screw, *c''*, extends through the whole length of the cylinder *C'*, for the purpose of distributing the fuel, received from the inclined cylinder, along the whole length of the horizontal cylinder. This screw works right and left from the central line *x* to the outer boilers, in order to divide and distribute the fuel, and left and right from each extremity of the cylinder to the outer boilers, in order to prevent any of the fuel from lodging in the ends of the cylinders. The latter object, however, might be reached by enlarging the apertures above the end boilers, or making their feeding-spouts funnel-form, or by some equivalent device, so that the screw *c''* should simply be a screw working right and left from its centre. Both these screws are driven by power applied at the shaft *S*, and communicated through the gear *s s' s'' s''' s'''' s'''''*. I do not, however, limit myself to any particular arrangement of this gear. Any arrangement which will answer the purpose will come within the limits of my invention.

The fuel, having thus been carried to each discharge-spout *E*, falls into the spout upon a regulating-wheel, *e*, working tightly between two hinged concaves *e' e''*, which, operated by a weight, *e'''*, press against the ends of the arms of the wheels, and confine the fuel to the wheels, so that it cannot pass them faster than their revolution will allow. The wheels themselves consist of a shaft, provided with five or any other convenient number of arms, which extend across and fill up the passage between the concaves, and intercept all the fuel that falls from the horizontal cylinder. An opening between the lower ends of the concaves, directly under the wheel-shaft, allows the fuel that passes around the wheels with their revolution to escape and pass to the grate. In falling from the opening it is divided by the separator *i* into two equal portions, one portion entering one branch



of the divided spout and falling on one side of the boiler, and the other portion entering the other branch and falling under the other side.

The separator is an instrument resembling a stove-damper, composed of a plate or leaf attached to a rod at the point where the branches of the spout meet, and so constructed as to turn in either direction, and entirely close that branch of the spout, and direct all of the coal into the other branch, or to stand vertically between the two, as shown in fig. 1, splitting the stream of descending fuel into two parts, and directing it equally into each branch. Its inclination is regulated at any desired angle by means of a hand-wheel, *V*, outside of the spout.

It is evident that the concaves and wheel will require an enlargement of the spout for their accommodation. I accordingly place them in a chamber, sufficiently large to receive them and to allow the concaves to operate.

One object of the concaves is to confine the fuel to the wheel ordinarily, and yet to yield and allow large pieces of coal, sticks, &c., to pass, which would otherwise endanger the safety of the apparatus.

The wheels *e e* are worked by a shaft, *S'*, with which they gear, and which receives motion from the main shaft *S*.

In each branch of the spout *E* is a vibrating-leaf or plate, *m*, hanging from a rocker-shaft, *m'*, operated by a cam, *n*, on the shaft *S'*, through the medium of a pitman, *p*, and arm *a*.

The object of this vibrating-plate is to scatter the fuel the whole length of the boiler, so as to equalize it and increase its heating-power.

The branches of the spouts widen out lengthwise of the boilers as they approach them, in order to give room for the vibrating-plates to operate to advantage.

The fuel, having thus passed from the bunker to the furnace, and being scattered along equally the whole length of the boilers on each side of them, falls upon the grate *G*, which, in its turn, vibrates back and forth under the boilers, in a direction transverse to them, being operated by the shaft *S*, through the means of a cam, gear-wheel, crank, or other device, shown at *g*, for that purpose.

In the drawings, my grate is shown as running on the rollers *r r*, and operated by a pitman, crank, and gear-wheel. I do not, however, limit myself to these details of construction, but wish to leave myself free to use any arrangement of sliding, rocking, or swinging grate, which travels back and forth under the boilers in a direction across their longer axis.

This vibrating-grate is for the purpose of distributing the fuel equally under the boilers, as the swinging plates *m m* distribute it along their length. The action of the two arrangements together, therefore, secures a uniform and even distribution of the fuel over the whole surface of the fire-grate, and, when these parts are operated in connection with the feeding-apparatus, insures a uniform combustion of all the fuel, including, as is found in practice, even the smoke, generating the greatest possible amount of heat therefrom.

Any fuel may be used in connection with the apparatus, which can be fed through the cylinders.

In order that the fuel may not escape from the ends of the vibrating-grate, the latter is provided with raised ends *g'*, which confine it to the heating-surface of the grate. The ends of the furnace must be extended or chambered a little more than usual, to give room for the motion of the grate.

Dampers *h h* may be provided at any suitable point in the spouts *E E*, to prevent the smoke from going up through the cylinders when the apparatus is not in motion, though, if the parts are properly constructed, there will be no need of dampers. The great object of the concaves and wheels working within the spouts is to close the spouts air-tight, so that no smoke can ascend through them, and when constructed properly they will perfectly accomplish that purpose.

A damper or gate, *D*, may also be attached to the bottom of the bunkers, to regulate the supply of fuel feeding from them. This, however, may not be necessary, as the velocity with which the shaft *S* is run will perfectly govern and control the action of all the parts, and regulate the feeding of the fuel to the furnace. The shafts are to be geared up or down, to give the proper relative speed to the different parts of the apparatus.

The great object of this invention is to enable the public to use finely-pulverized fuel, such as coal-dust, the refuse or screenings of the mines, bagasse, saw-dust, &c. The use of fuel in a pulverized state economizes its heating-power to the highest extent. In that condition it burns rapidly and with an intense heat, scarcely a particle of it escaping in the form of smoke. Great difficulties have hitherto attended its use for such purpose, arising from the impossibility of properly feeding it to the furnace.

My machine completely obviates these difficulties, enabling, in some instances, two men to easily feed furnaces, which have hitherto required the constant efforts of six or eight men, and in all cases saving at least fifty per cent. of labor hitherto employed for such purposes.

My machine does its work more perfectly than it can possibly be done by hand, requiring no opening of the doors to let in great draughts of cold air, and heaping up no cold fuel under the boilers, but keeping up a constant supply of fuel in the required quantities, and at the required points.

The opening of the furnace-doors, and the sudden cooling of the under side of the boilers by the cold air and fresh fuel, have caused many boilers to break and burst from unequal expansion and contraction; this danger is entirely obviated by my invention. The fuel which my machine thus utilizes, at such immense advantages over the old system, has been hitherto considered as almost worthless, selling for less than one-fourth of the price of coal. With such material my machine saves one-half of the expense of fuel, utilizes a substance now considered worthless, prevents explosion, and increases the heating-power of the furnace.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The arrangement of the double-acting screw *c''* within cylinder *C'*, when constructed and used substantially as and for the purpose specified.



2. The arrangement of the concaves *e' e'* and wheels *e e* within the spout *E*, through which fuel is fed to a furnace, substantially as and for the purposes indicated.
3. The arrangement of the bifurcated spouts *E E* astride of the boilers *A A*, substantially as and for the purposes described.
4. The instrument *z*, when used in a feeding-spout for the purpose of directing the fuel to its proper destination, and constructed and operated as above described.
5. The vibrating-plates *m m*, substantially as and for the purpose specified.
6. The arrangement of the vibrating-grate *G* with the horizontal boilers *A A A*, in such a position that it vibrates back and forth transversely under them, for the purpose of levelling the fuel beneath them, substantially as described.

Witnesses:

JAMES H. GRIDLEY,

NATHAN K. ELLSWORTH.

JOHN G. McCORMICK.