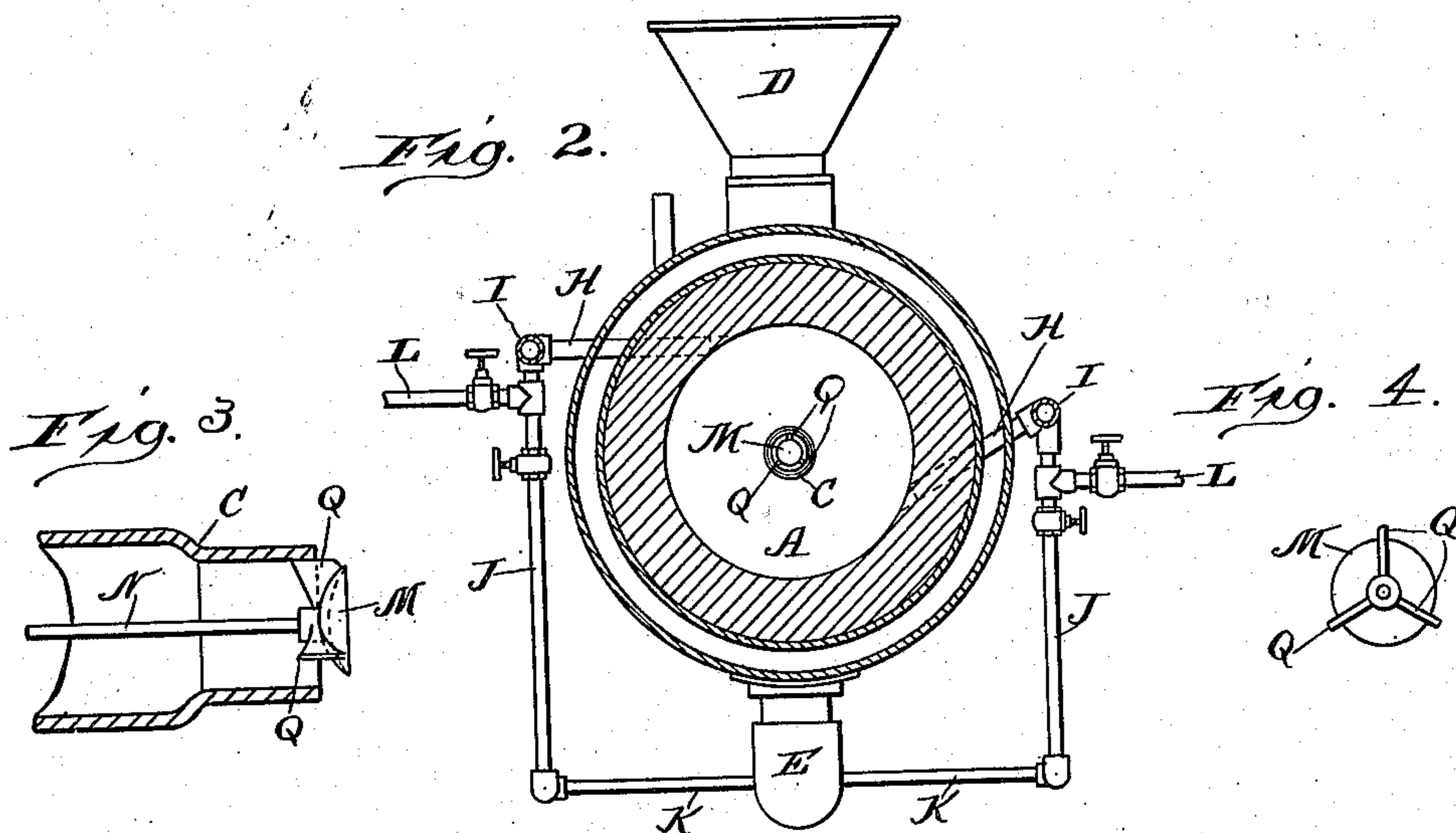
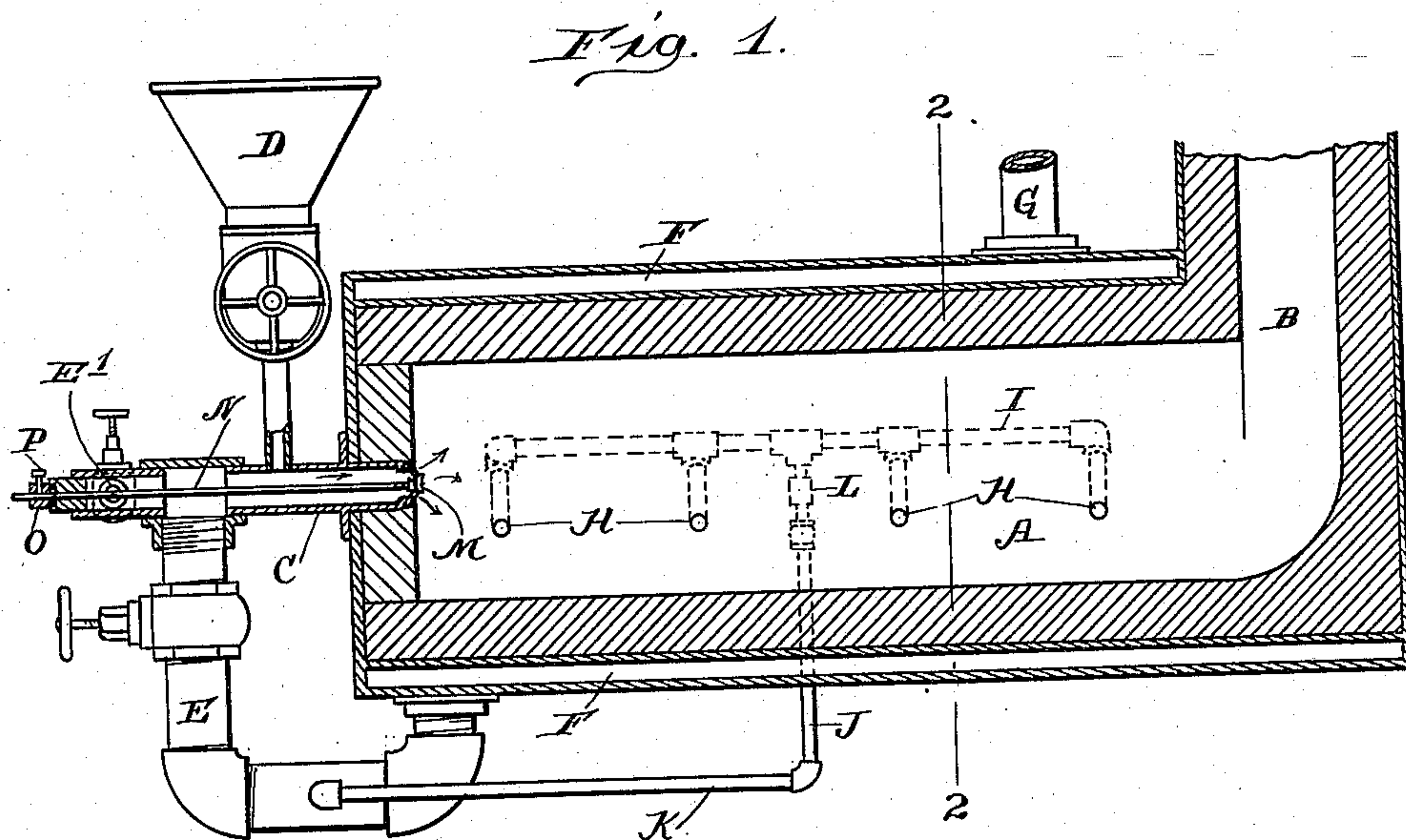


No. 858,640.

PATENTED JULY 2, 1907.

G. S. WELLES.
METHOD OF BURNING FINELY DIVIDED FUEL.
APPLICATION FILED APR. 30, 1906.



Witnesses:

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UNITED STATES PATENT OFFICE.

GEORGE S. WELLES, OF CHICAGO, ILLINOIS.

METHOD OF BURNING FINELY-DIVIDED FUEL.

No. 858,640.

Specification of Letters Patent.

Patented July 2, 1907.

Application filed April 30, 1906. Serial No. 314,450.

To all whom it may concern:

Be it known that I, GEORGE S. WELLES, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Methods of Burning Finely Divided Fuel; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

10 My invention relates to a novel method of burning pulverized coal or other finely divided fuel, the object being to provide a method whereby relatively perfect combustion is obtained and in which the fire may be controlled to suit all requirements.

15 My said method consists in the novel steps herein-after fully described and claimed.

In the accompanying drawings, I have illustrated apparatus suitable for carrying out my method and in which:

20 Figure 1 is a central vertical longitudinal section of the combustion chamber of a furnace provided with fluid vehicle and fuel feeding means. Fig. 2 is a vertical transverse section of the same on the line 2—2 of Fig. 1. Fig. 3 is a detail longitudinal section of a nozzle employed. Fig. 4 is a view in elevation of a deflecting plate disposed in said nozzle.

My present method is very similar or rather practically identical with the method forming subject of my application for Letters Patent of the United States filed, 30 April 16, 1906, Serial No. 311962 which consists briefly in introducing into one end of a combustion chamber a supply of pulverized fuel admixed with air under pressure, the latter constituting the vehicle for carrying said pulverized fuel. The combustion chamber is cylindrical or substantially so and into the same are introduced laterally and tangential to the inner wall thereof jets of air under pressure or air admixed with combustible gas as, for instance, carbureted air, such air jets or currents following the contour of the inner wall 40 and forming encircling currents which completely envelop the jet of admixed air and fuel introduced at the end of the chamber. The encircling air currents serve not only to protect the walls of the combustion chamber against too intense action of the heat but serve also 45 to deflect the admixed air and fuel and cause the same to pass spirally and slowly through the combustion chamber, adding continuously fresh supplies of oxygen to promote combustion. It is expressed in the said application that it is desirable to avoid direct impingement of the longitudinal and encircling currents against each other but to bring the same gradually into contact for the reason that it was thought the direct impingement of the stream of fuel against the encircling current would produce too intense heat for the walls to bear for 50 any considerable period. It has since been found that this is true when the fire is maintained at relatively full

blast but that when a relatively low fire is maintained for a considerable period, the walls of the combustion chamber gradually cool down until the temperature in the combustion chamber attains a point so low as to be 60 insufficient to cause ignition of the fuel introduced, consequently causing complete extinguishment of the fire. To overcome this difficulty it has been found necessary when the fire is maintained relatively low to direct the admixed air and fuel more or less directly toward 65 the annular wall of the combustion chamber so as to maintain said wall sufficiently hot to maintain the fire, the directness of the flow toward said annular wall being decreased as the supply of fuel is increased and vice versa. The encircling air currents prevent direct impingement of the flame against said wall and serve at the 70 same time to equalize the heat of the latter throughout so that the danger of overheating said wall at any point is minimized.

In a companion application filed of even date herewith I have fully described and claimed apparatus suitable for carrying out the methods forming subject of this and the aforesaid application of April 16th, such apparatus being here illustrated only sufficiently to 80 comply with requirements.

In the accompanying drawings A indicates a cylindrical combustion chamber communicating at one end with an outlet B for the hot products of combustion, the other end being provided in its end wall with a feed nozzle C communicating between its ends with a hopper D, 85 containing pulverized fuel and provided with suitable feed mechanism, and at its other end with a feed pipe E for compressed air. The latter communicates with a jacket F inclosing said combustion chamber, and which receives its supply through the pipe G. Entering said 90 combustion chamber in a direction tangential to the inner wall thereof and at a plurality of points in the periphery thereof are pipes H all of which are connected by means of pipes I, J and K with said pipe E, and are also connected with a source of supply of combustible gas or 95 carbureted air by means of the pipes L, said pipes E, J, K and L being controlled by valves. The compressed air is heated in the said jacket F before entering the chamber A through said nozzle C and pipes H and thus serves to maintain the annular fire brick wall of said 100 chamber A cool externally. The air or gas jets introduced through the said pipes H follow the contour of the wall of the chamber A and thus circle within the latter. Primarily the combustible fluid is introduced to heat said walls and so far heat said chamber as to 105 cause the subsequently admitted pulverized coal to ignite, said fluid being gradually shut off and the air admitted through said pipes H gradually increased as the heat of the chamber increases, until the pulverized fuel and air above are introduced. 110

In said nozzle C preferably in the delivery end thereof, I provide a deflecting plate M disposed upon the end

of a rod N passing through the outer end wall of said nozzle and maintained in any desired position therein by means of the collar O and set-screw P. The said deflecting plate M is dished so that the face thereof against which the fuel impinges will serve to deflect the same outwardly at an incline. By means of the three wings Q radially disposed on said plate M the latter is maintained centrally disposed in the cylindrical delivery end of said nozzle as will be obvious. The said plate M may be longitudinally shifted to project slightly beyond the mouth of said nozzle and when in this position the fuel impinging against the same will be deflected radially outwardly at almost a right angle to its normal direction of travel, while, if said plate is drawn farther into the nozzle the angle of deflection will be gradually reduced so that the fuel will impinge less directly against the annular wall of the combustion chamber. By maintaining the plate within the said nozzle it is not subjected to the intense heat of the chamber and consequently does not require frequent replacement.

The nozzle C is preferably also connected with a source of supply of combustible gas or carbureted air by means of the valve controlled pipe E', such combustible fluid being introduced in primarily heating the combustion chamber and being subsequently introduced together with compressed air and pulverized fuel if desired, but this is seldom necessary or advisable.

I contemplate the employment of any suitable means other than those illustrated and described to carry out

my said method, and the latter relates equally as well to the burning of pulverized or finely divided fuel other than coal.

I claim as my invention—

1. The hereindescribed method of burning finely divided fuel which consists in directing such fuel relatively radially into revolving air currents. 35
2. The hereindescribed method of burning finely divided fuel which consists in introducing into a combustion chamber lateral rotating air currents following the peripheral walls thereof, and introducing inwardly of said air currents and in a direction toward the same admixed finely divided fuel and a fluid vehicle therefor. 40
3. The hereindescribed method of burning finely divided fuel which consists in introducing into a combustion chamber lateral rotating previously heated air currents following the peripheral walls thereof, and introducing inwardly of said air currents and in a direction toward the same admixed finely divided fuel and a fluid vehicle therefor. 45
4. The hereindescribed method of burning finely divided fuel which consists in introducing into a combustion chamber lateral rotating previously heated air currents following the peripheral walls thereof, and introducing inwardly of said air currents and in a direction toward the same admixed finely divided fuel and a previously heated fluid vehicle therefor. 50 55

In testimony whereof I have signed my name in presence of two subscribing witnesses.

GEORGE S. WELLES.

Witnesses:

RUDOLPH WM. LOTZ,
E. F. WILSON.