No. 718,985. PATENTED JAN. 27, 1903.

L. K. DAVIS.

FUEL FEEDING APPARATUS.

APPLICATION FILED MAR. 12, 1902.

NO MODEL. 3 SHEETS—SHEET 1.

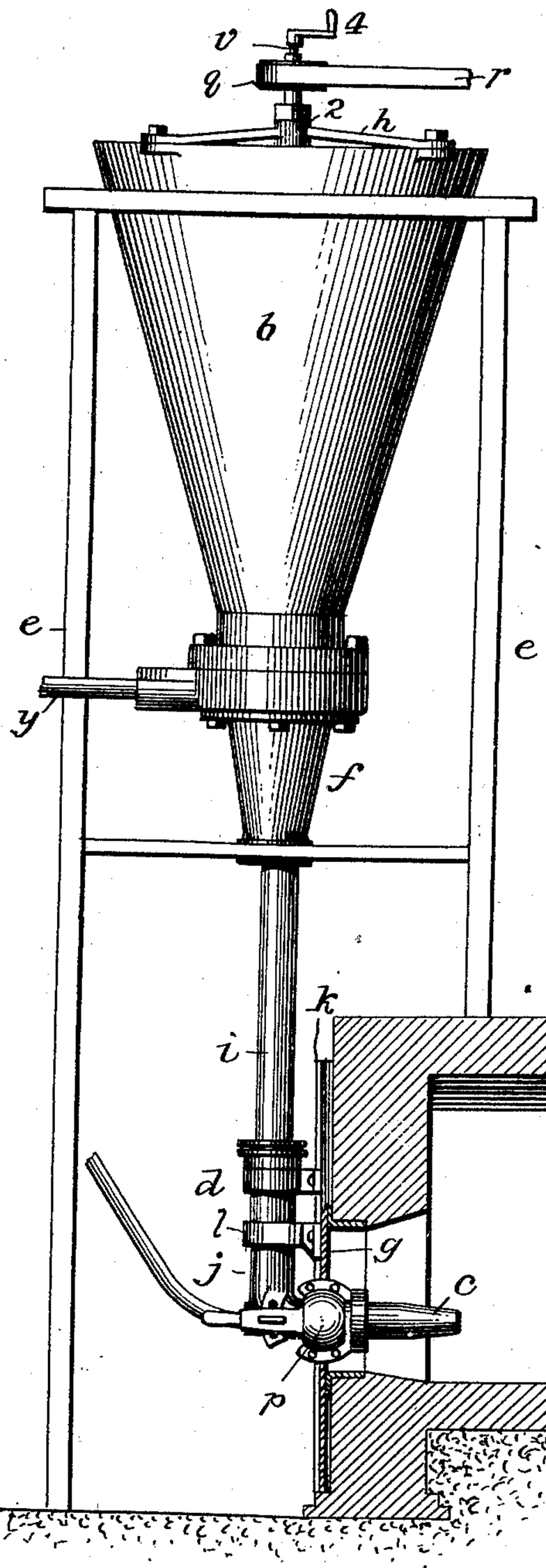

Fig. 1.

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NO MODEL. 3 SHEETS—SHEET 2.

Fig. 5.

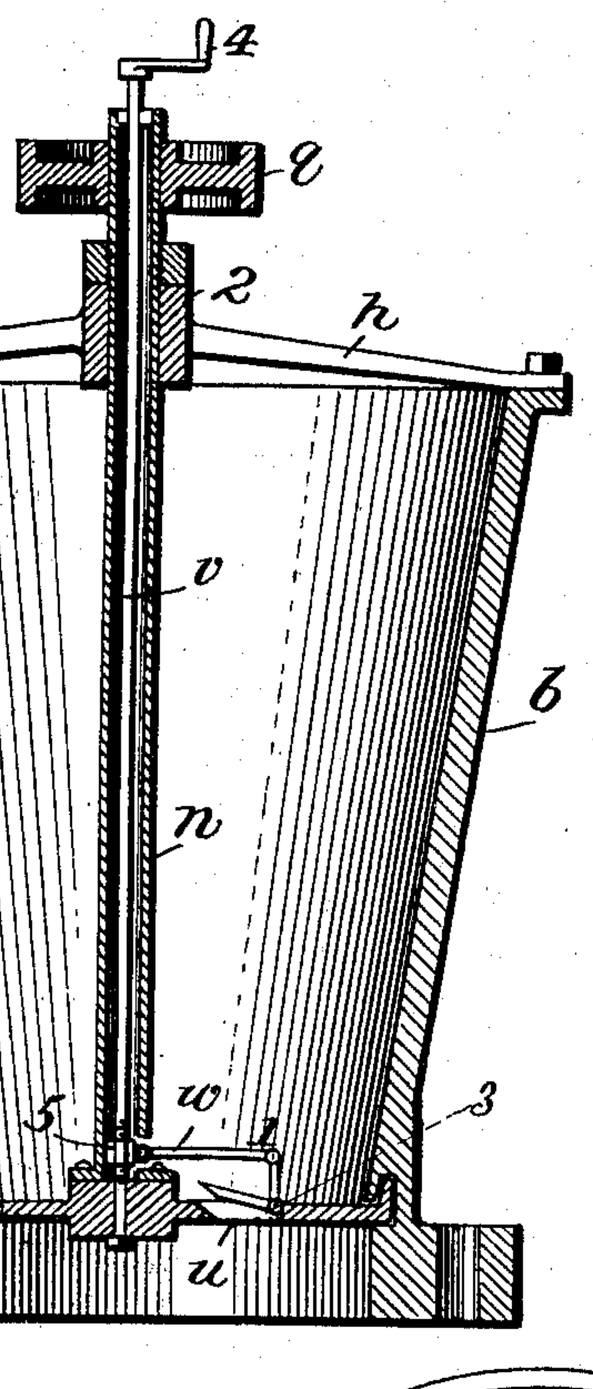


Fig. 1

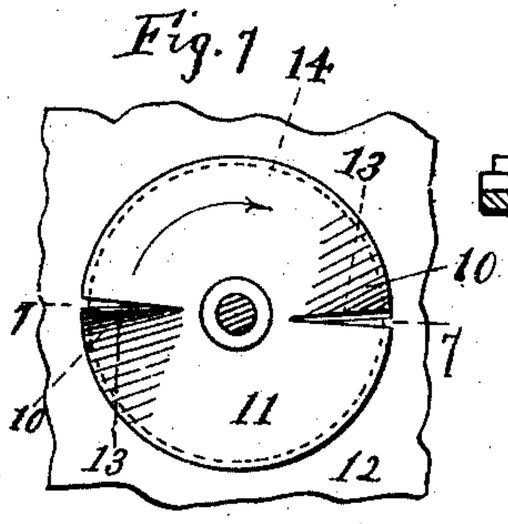


Fig. 8

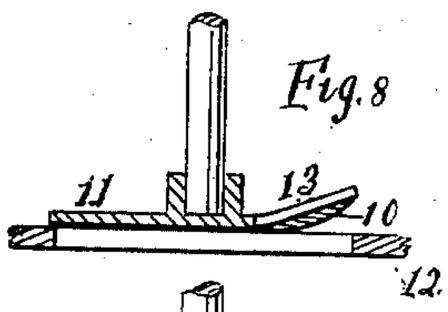


Fig. 9

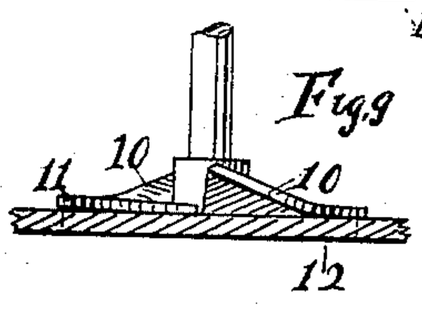


Fig. 6.

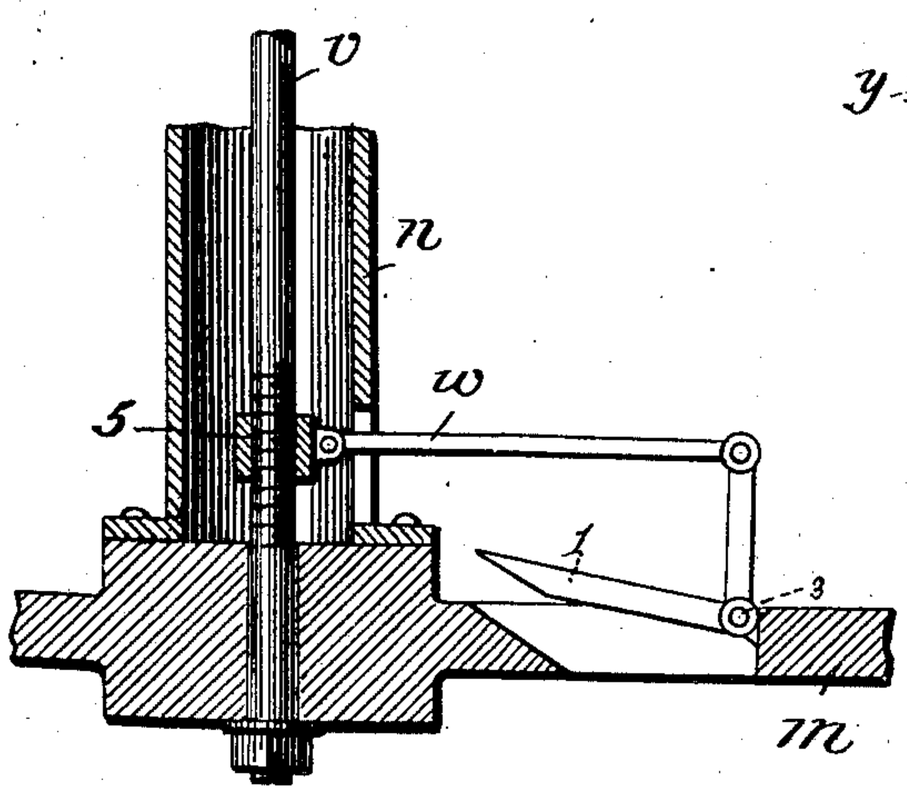
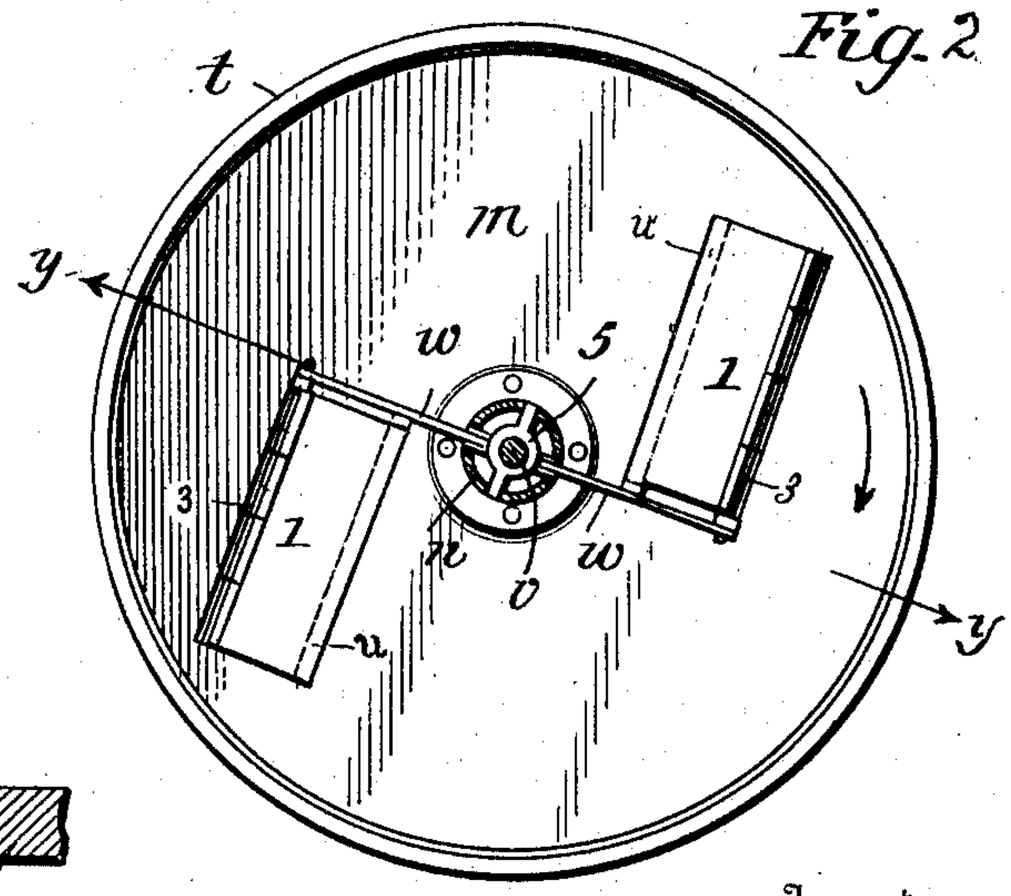


Fig. 2



Witnesses
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Inventor
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NO MODEL. 3 SHEETS—SHEET 3.

Fig. 3.

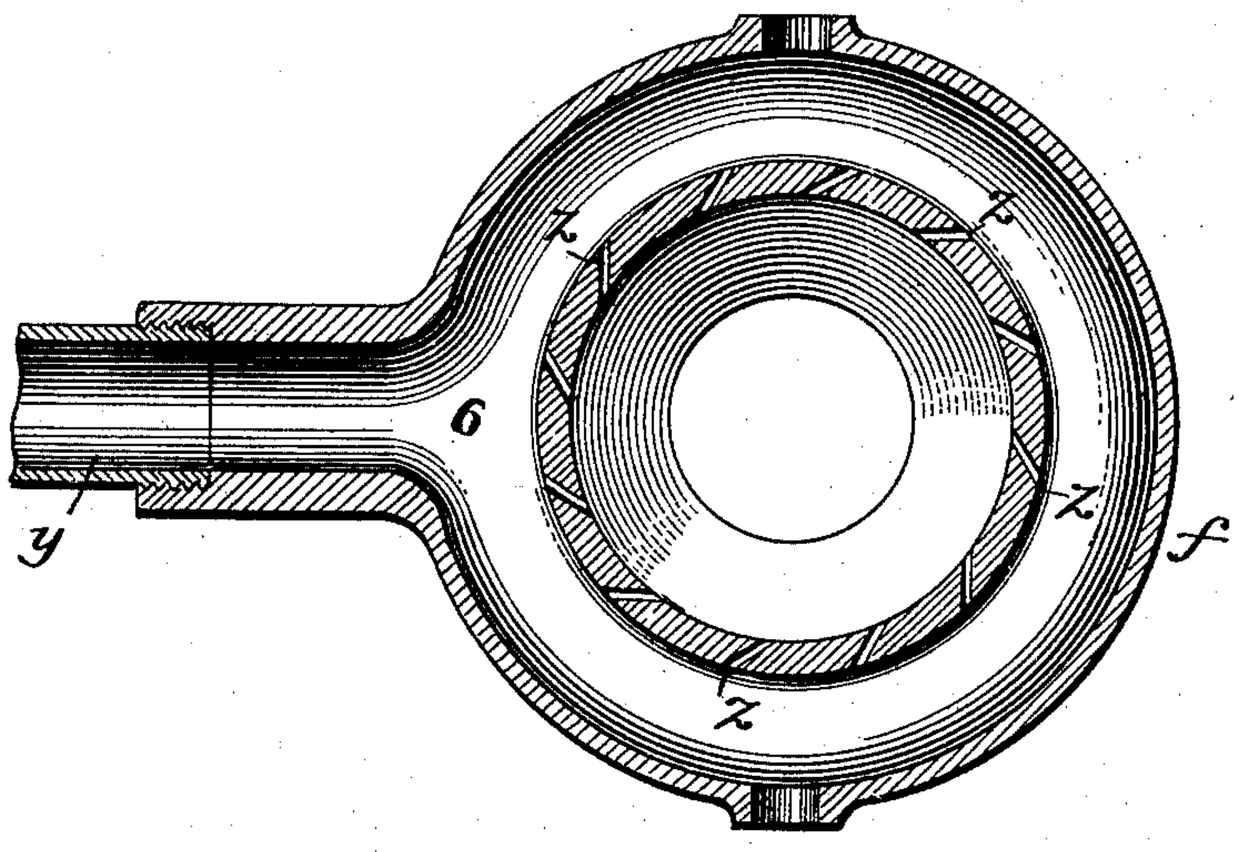

Fig. 4.

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UNITED STATES PATENT OFFICE.

LEWIS K. DAVIS, OF INDIANAPOLIS, INDIANA, ASSIGNOR TO GRACE P. DAVIS, OF INDIANAPOLIS, INDIANA.

FUEL-FEEDING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 718,985, dated January 27, 1903.

Application filed March 12, 1902. Serial No. 97,879. (No model.)

To all whom it may concern:

Be it known that I, LEWIS K. DAVIS, of Indianapolis, Indiana, have invented new and useful Improvements in Fuel-Feeding Devices, of which the following is a specification.

My invention relates to fuel-feeding apparatus for furnaces, but more particularly to apparatus for feeding fine fuel, as coal or coke, coal-dust, and the like.

The object of my invention is, primarily, to improve upon apparatus hitherto devised for evenly distributing fine fuel in furnaces through the agency of fluid under pressure, as air or steam.

A further object of my invention is to provide an apparatus which will not clog when the fuel contains moisture, which tends to form lumps.

My invention consists in apparatus and devices for carrying out the above objects; and it further consists in means hereinafter more fully described and shown in their many details of construction and operation in the accompanying specification and drawings, in which—

Figure 1 is a side view, partly in section, of my improved fuel-feeding apparatus, shown in connection with a furnace; and Fig. 2 is a plan view, partly in section, of details showing the hopper-disk and knives arranged thereon; and Fig. 3 is a sectional view of my apparatus, taken on the line x x of Fig. 4. Fig. 4 is a longitudinal sectional view of a portion of the fuel-feeding passage. Fig. 5 is a longitudinal sectional view of the hopper on line y y of Fig. 2, and Fig. 6 is an enlarged detail sectional view showing the operation of the hopper-knives. Fig. 7 is a plan view of a modification of the revolving disk. Fig. 8 is a sectional side view on line 7 7 of Fig. 7. Fig. 9 is a side view of the modified form of disk.

Referring to the drawings, a represents a suitable furnace in connection with which my improved fuel-feeding apparatus is shown, in this instance arranged in front of the furnace; but it may be arranged in any desired position relative thereto.

A suitable hopper b is shown supported upon a frame e, and a suitable passage formed of piping d connects the hopper with the apparatus for discharging the fuel into the furnace, this apparatus being shown in this instance as a nozzle c of substantially the same construction as that shown and described in my pending application, Serial No. 97,877, filed March 12, 1902. As this particular apparatus is claimed in that application and is no part of the present invention, it will not be described in detail herein, it being sufficient to state that the nozzle c is connected with the piping d by a universal joint p, so that it may be turned in any desired direction to discharge the fuel therefrom, and means are provided for raising and lowering the nozzle bodily at the entrance of the furnace, this operation being provided for by forming the piping d in telescopic sections i and j and supporting the nozzle and the portion j of the piping in such manner relative to the furnace that they may be moved vertically. As shown, the portion i of the piping d is connected to a sliding plate g by means of the struts l, and the nozzle projects through this plate. The plate itself is then slidably supported in guides k, connected to the furnace. The portion i of the piping d is suitably connected, as shown, by portion of piping f to the hopper b.

Means have hitherto been devised for causing an even feeding and distribution of the fuel to the furnace; but according to my invention I provide rotatable knives 1, so arranged that they break up the lumps which the fuel may form, as when it is moist, and they further regulate the feeding of the fuel. While these knives may be arranged in various positions, I prefer to place them within the hopper b, and as shown they are connected to a disk m, supported upon a shaft n, which may be hollow, as shown. The shaft n is supported in a bearing 2, connected by struts h to the hopper b, while means are provided for rotating the shaft, as a pulley q and belting r. It is preferred to provide a bearing, as shown, in the framing b for the disk m, the disk being provided with a flange t, bearing in a groove s in the framing. The disk is provided with an aperture or apertures u,

preferably arranged therein substantially as shown in Fig. 2, while the knives 1 are connected to the disk in such manner that their angles relative to the disk may be varied and suitable means for connecting the knives to the disk being provided, as hinges 3. The knives 1 are of such size and shape that when they are lying flat upon the disk the apertures will be entirely covered and fuel may not pass therethrough; but by raising the knives on their hinges slightly the fuel is fed through the apertures in the disk.

Suitable means are provided for raising and lowering the knives and varying their angles with the disk. A nut 5 on a rod *v*, in this instance shown in the hollow shaft *n*, is connected by bell-crank levers *w* to the knives, so that by rotating the rod *v*, as by a handle 4, the knives may be adjusted relative to the disk and apertures.

Assuming rotation of the disk in the direction of the arrow in Fig. 2, the cutting edges on the knives are so arranged that they will force their way into the fuel and break up the lumps and cause an even feeding of fuel which contains considerable moisture. According to the desired rate of feeding, the granulation of the fuel, the degree of moisture and the lumpiness of the fuel, the angle of the knives with the disk is varied, and this device has been found to operate efficiently and well.

Further means are provided in the passage connecting the hopper with the feeding-nozzle *c* for evenly feeding the fuel and separating moisture therefrom, as shown, this additional means operating through the agency of fluid under pressure, so acting upon the fuel as to cause a whirling motion of the same in its passage to the furnace. In the portion of piping *f*, preferably adjacent to the hopper *b*, is arranged a series of openings or twyers *z*, and means are provided (shown as a pipe *y*) for leading fluid under pressure as compressed air to the twyers *z*. These apertures or twyers *z* are arranged in the wall of the pipe-section *f*, which is of substantially circular cross-section, and the apertures, as shown, form angles with tangents to the circumference of the section *f* and at the same time are arranged at an angle to the longitudinal axis of said section, or, in other words, they are at an angle to the vertical axis of the passage connecting the hopper *b* with the nozzle *c*. The compressed air is led by the pipe *y* to that portion of the pipe-section *f* containing the twyers *z*, and, as shown, communication is made between the twyers *z* and the compressed-air pipe *y* by means of a passage-way 6, connecting with the pipe *y*. Preferably the section containing the twyers *z* is removably attached to the pipe-section *f*, as shown, by bolts 7. The fuel passing downward from hopper *b* to the apertures *u* in the revolving disk *m* is acted upon by the air-blast entering through the twyers *z*, and from the arrangement of said twyers it will be seen that a whirling motion is given to the fuel, or, in other words, a vortex motion is created therein, tending to separate the fuel into fine particles.

Endeavors have heretofore been made to regulate the feeding of fine fuel and obtain the even distribution thereof to the furnace by the sole agency of fluid under pressure; but I have found that apparatus so devised is inadequate for the purpose when the fuel contains more than a certain degree of moisture or is very lumpy.

My apparatus entirely overcomes the defects which have been found to exist in the operation of devices which rely solely upon fluid under pressure, for it will be seen that the revolving knives which I provide, preferably within the hopper, thoroughly break up any lumps which may form in the fuel and they also aid in getting rid of the moisture, while the adjustability of the knives serves as a means for regulating the feeding of the fuel. It will also be seen that by imparting a whirling or vortex motion to the fuel in its passage to the furnace I further mix and commingle the fluid with the fuel under pressure and obtain an even distribution.

Referring to Figs. 7, 8, and 9, a modification of the revolving disk is shown, wherein blades 10 are formed integral with the disk or plate 11 and project therefrom. The plate and its blades may be formed in any suitable manner, and, as shown, the blades slope upward from the disk 11 at reverse angles. When the disk is rotated, the edges 13 form the cutting edges, and the edge 14 of the disk bears upon the frame 12.

Without limiting myself to the details of construction herein shown and described, I claim and desire to obtain by Letters Patent—

1. In an apparatus for feeding fuel the combination with the hopper, a bottom for the same provided with apertures, means for rotating said bottom, cutting-knives extending over said apertures and means for adjusting said knives, substantially as described.

2. In a fuel-feeding device the combination with a rotatable disk provided with apertures for the passage of fuel, of adjustable knives arranged on the disk and extending over said apertures, substantially as described.

3. In a fuel-feeding device the combination with a rotatable disk provided with apertures for the passage of fuel, of adjustable knives extending over said apertures, substantially as described.

4. In a fuel-feeding device the combination with a rotatable disk provided with apertures for the passage of fuel, of knives arranged over the said apertures and means for adjusting the angle of the knives with the disk, substantially as described.

5. In an apparatus for feeding fuel the combination of a hopper, a rotating shaft with a disk thereon, forming a partition in the hopper, cutting-knives extending over and covering openings in the disk and means for

raising and lowering the cutting edges of said knives, substantially as described.

6. In an apparatus for feeding fuel the combination of a hopper, a rotating shaft with a disk thereon within the hopper, an aperture in the disk, a knife arranged above and extending over the same and means for raising and lowering the cutting edge of said knife, substantially as described.

7. In an apparatus for feeding fuel the combination of a shaft and means for rotating the same, a disk carried by said shaft and provided with openings for the passage of fuel, covers for the same and means for adjusting said covers to and from the apertures, substantially as described.

8. In an apparatus for feeding fuel the combination of a rotatable disk provided with apertures for the passage of fuel, knives connected to the disk and arranged opposite said apertures and means for varying the angle of the knives with the disk, substantially as described.

9. In an apparatus for feeding fuel the combination of a rotatable disk provided with apertures for the passage of fuel, knives hinged to said disk over the apertures and means for varying the angle of the knives with the disk, substantially as described.

10. In an apparatus for feeding fuel the combination of a rotatable disk provided with apertures for the passage of fuel, knives hinged to said disk over the apertures and means for simultaneously varying the angle of the knives with the disk, substantially as described.

11. In an apparatus for feeding fuel the combination with a hopper of a rotatable shaft and disk thereon, provided with apertures for the passage of fuel, said disk forming the bottom of the hopper, knives hinged to said disk over the apertures and means for varying the angle of the knives with the disk, substantially as described.

12. In an apparatus for feeding fuel the combination with a furnace, of a hopper, a rotatable disk in said hopper provided with apertures for the passage of fuel, adjustable knives arranged on the disk and extending over said apertures, a fuel-passage connecting the hopper with the furnace and means for producing a whirling motion in said fuel as it enters the passage, substantially as described.

13. In an apparatus for feeding fuel, the combination with the furnace, of a hopper, a fuel-feeding passage of substantially circular cross-sections arranged between the furnace-entrance and the hopper and provided with a series of openings in its sides adjacent the hopper, said openings being arranged at angles to tangents to the circumference of the passage and also at an angle to the vertical axis of the passage, substantially as described.

14. In a fuel-feeding device, the combination with a rotatable disk provided with apertures for the passage of fuel, of knives supported above and extending over said apertures, and means for moving said knives to and from the disk, substantially as described.

Signed this 27th day of February, 1902, at Indianapolis.

LEWIS K. DAVIS.

Witnesses:
EDWARD C. LEIBLE,
CLEMENS BLANK.