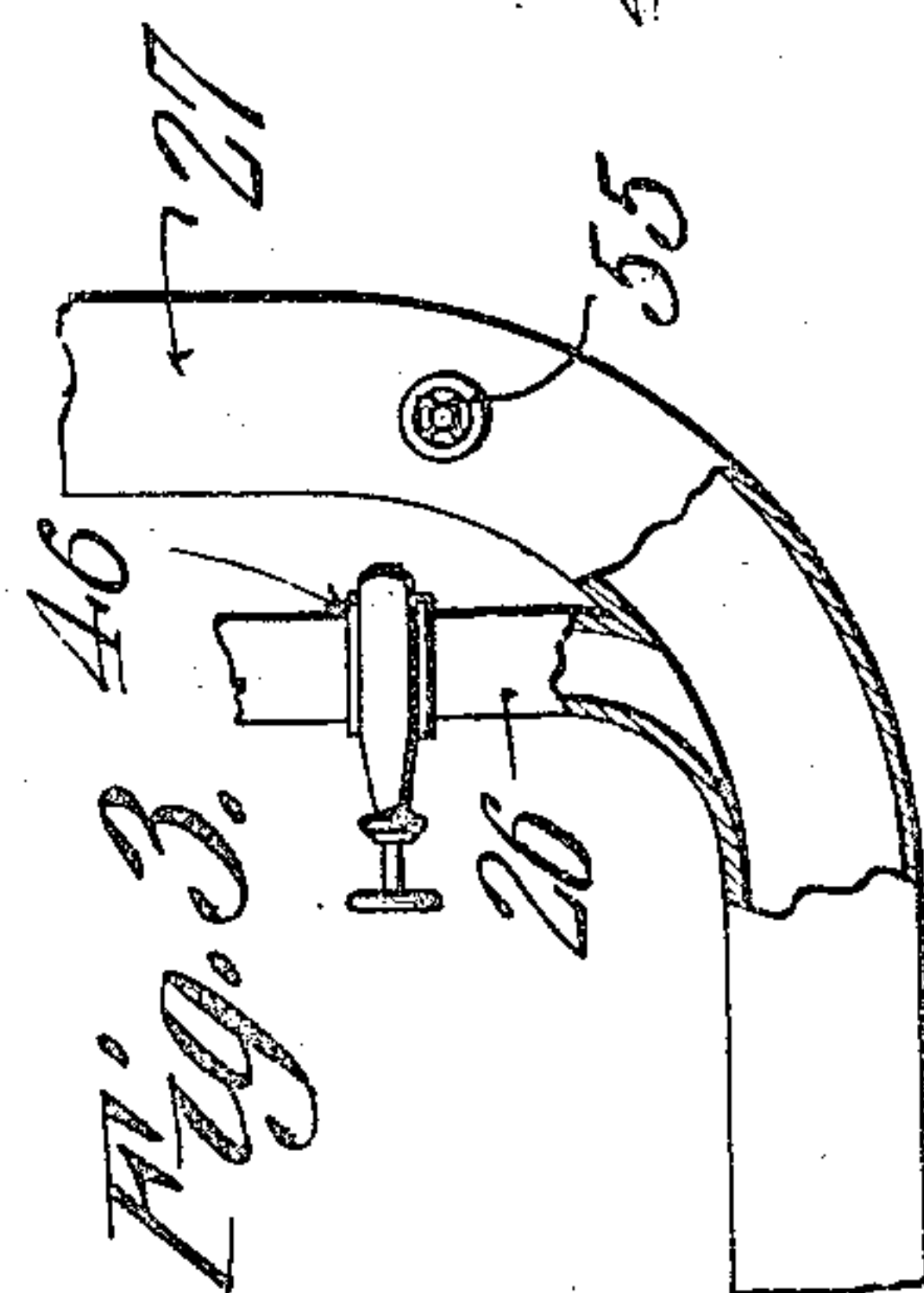
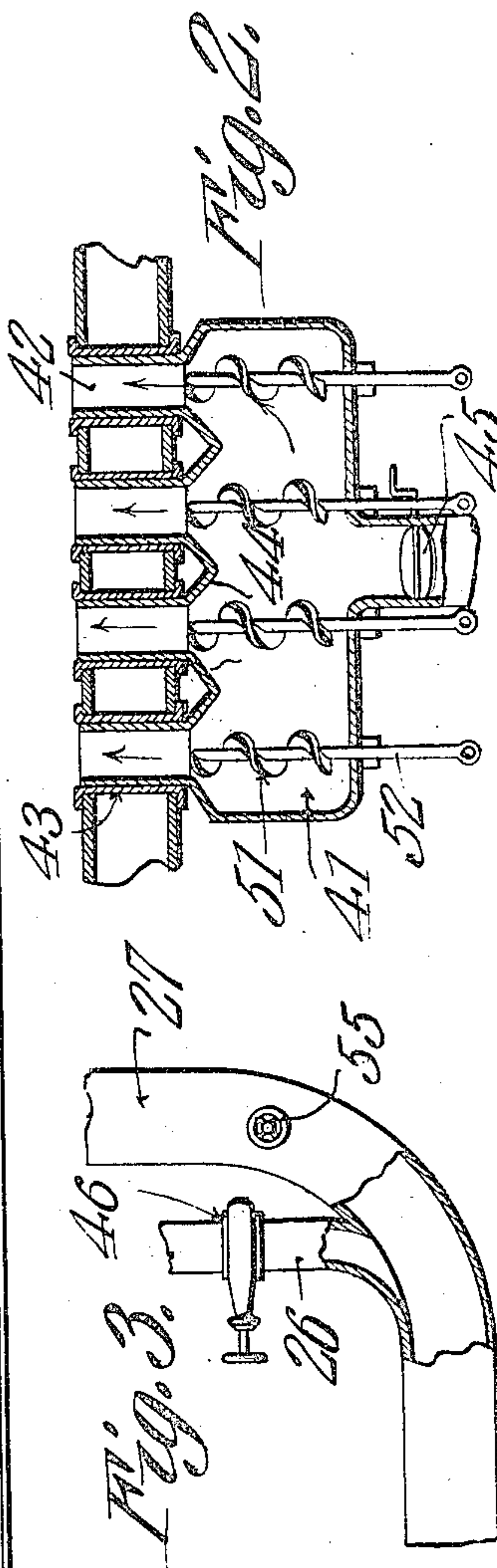
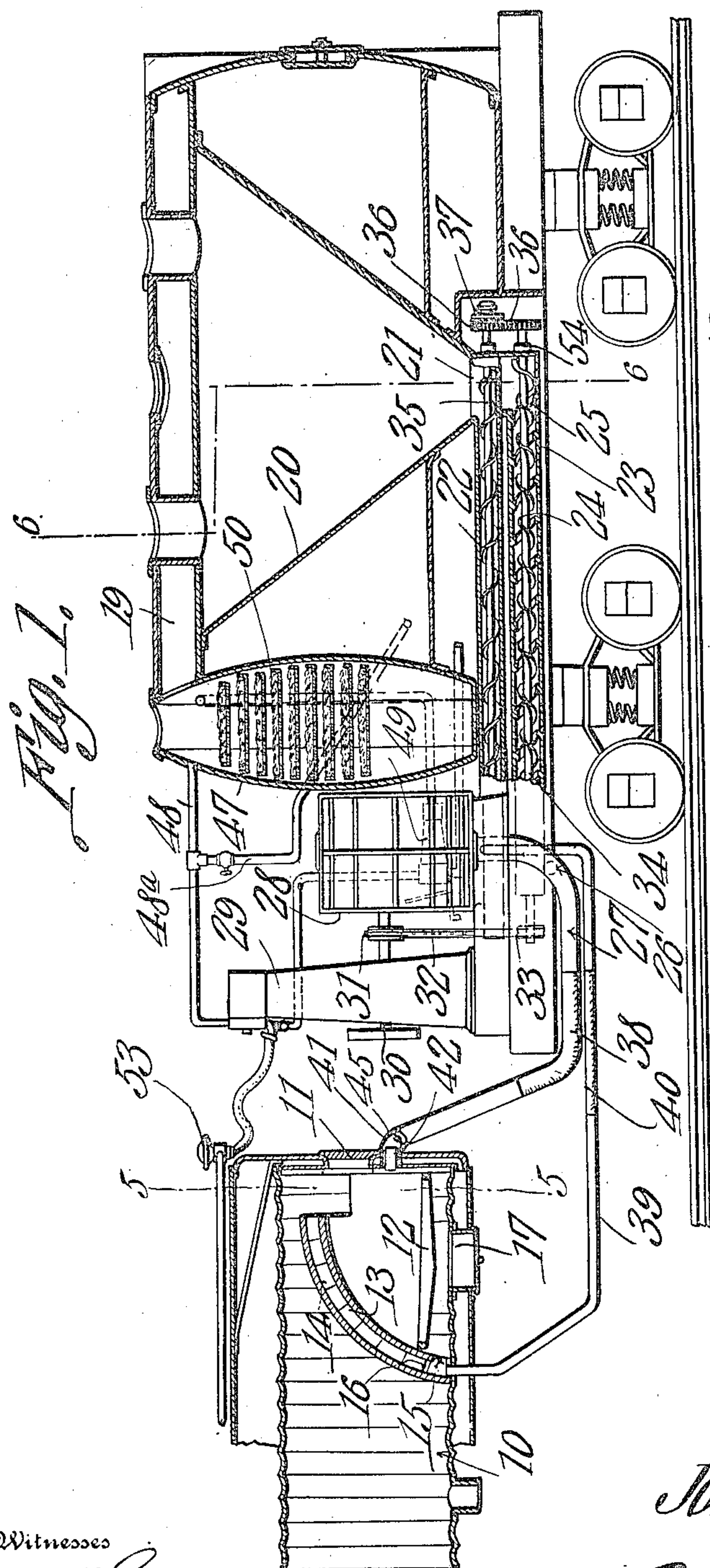


J. A. WELTON.
 APPARATUS FOR FEEDING PULVERIZED FUEL.
 APPLICATION FILED NOV. 5, 1909.

993,928.

Patented May 30, 1911.

2 SHEETS—SHEET 1.



Witnesses
E. J. Whitcomb
 Machineist

Inventor
John A. Welton.
 By *Cash & Co.*
 Attorneys

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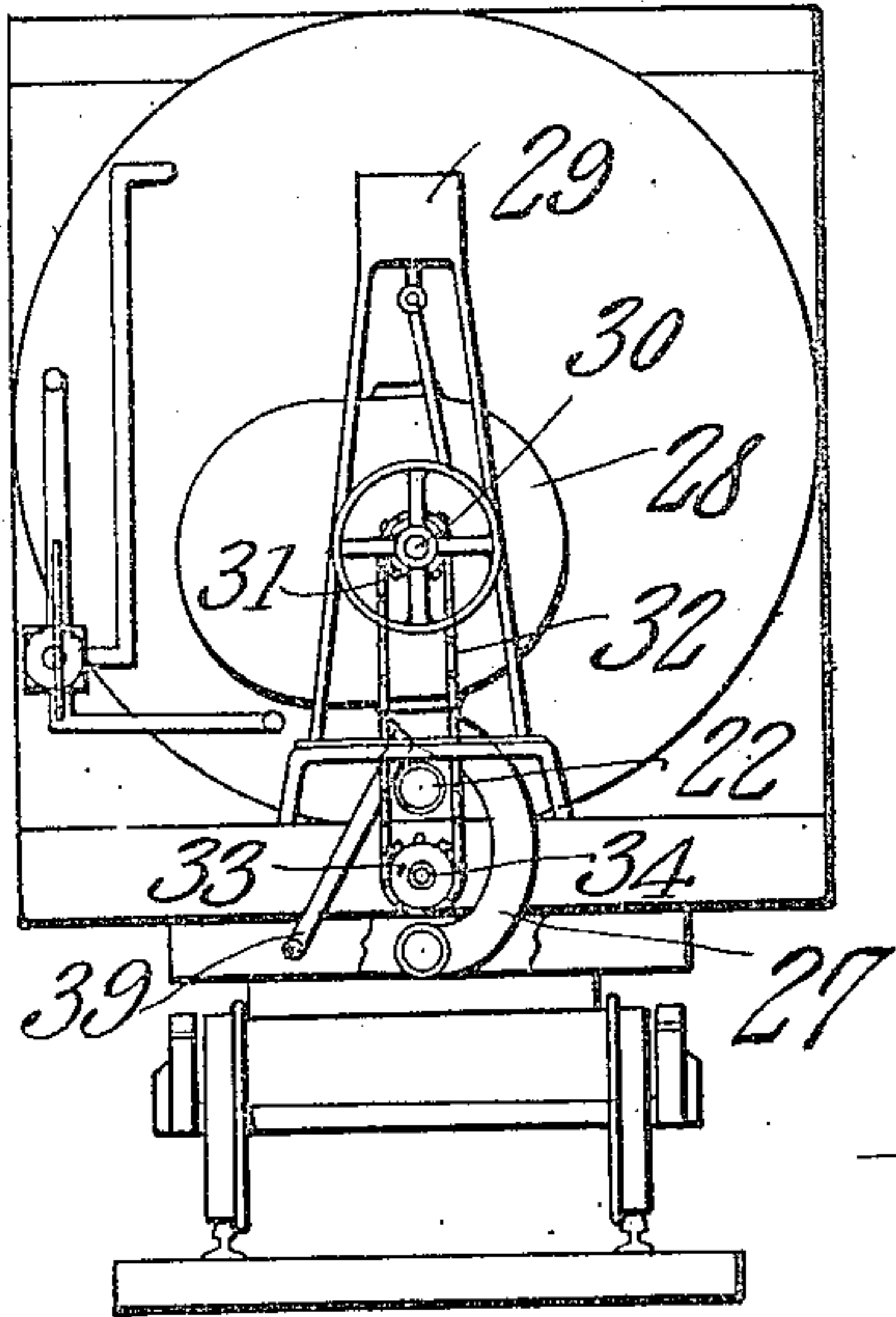


Fig. 4.

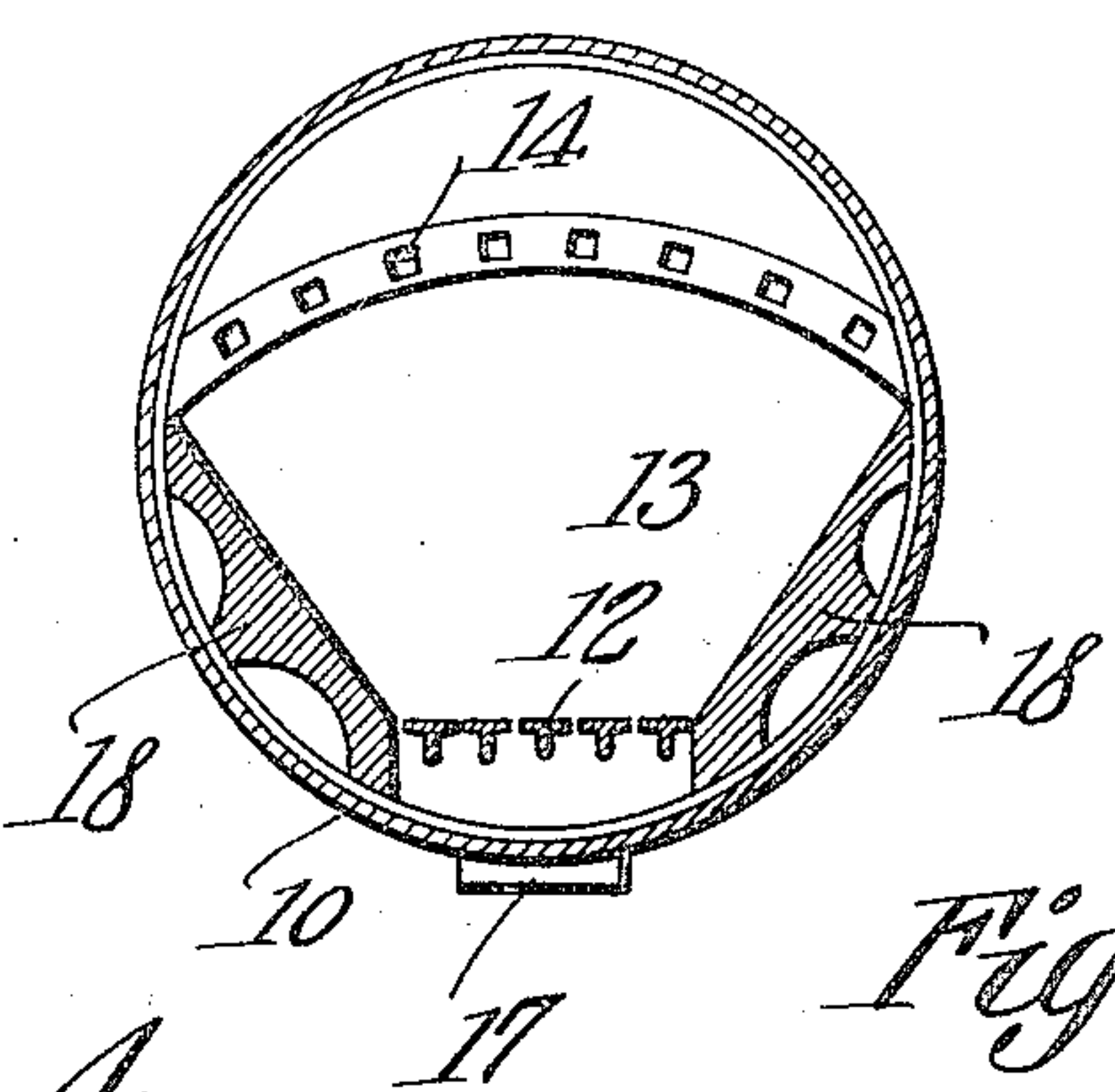


Fig. 5.

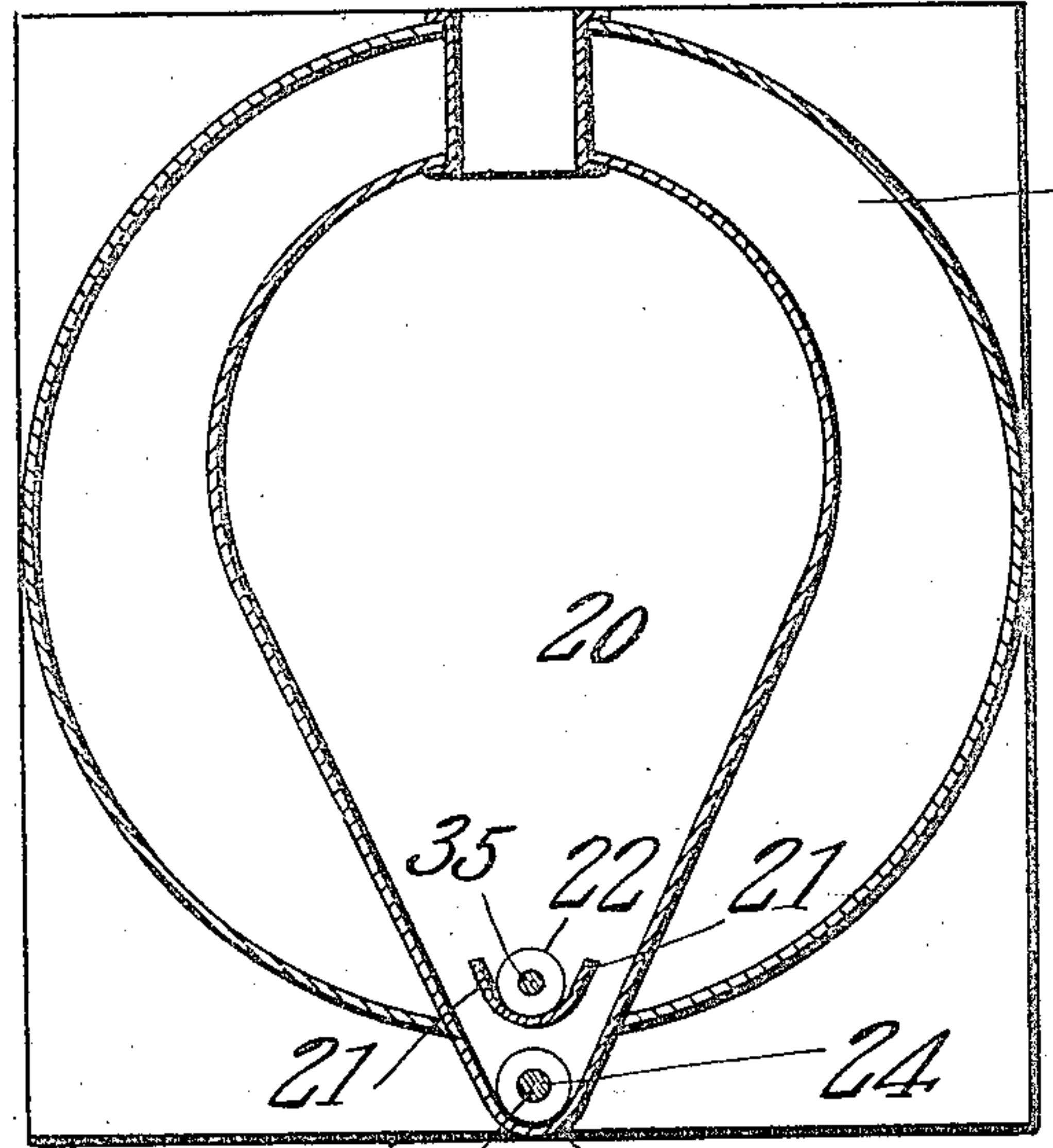


Fig. 6.

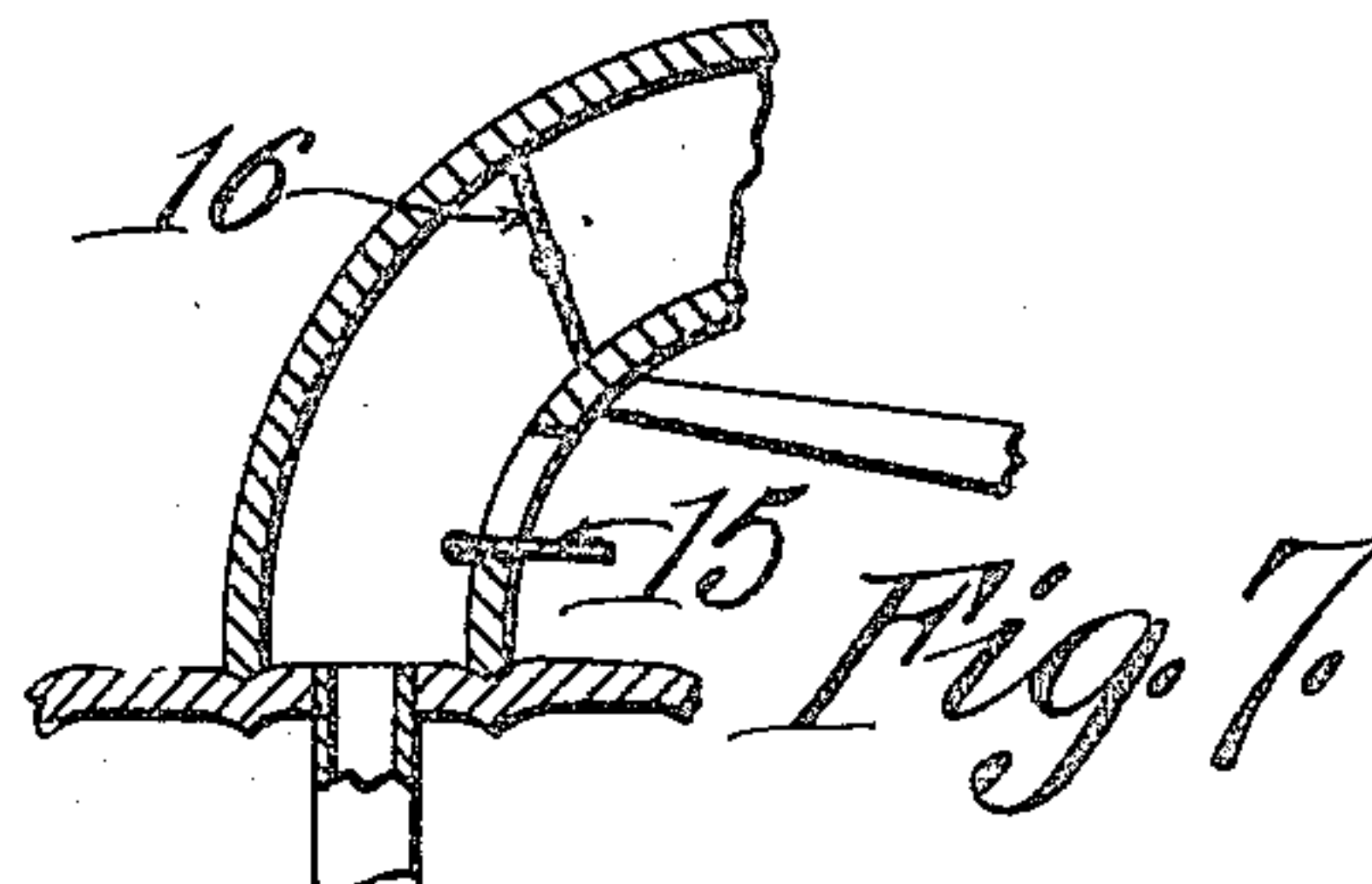


Fig. 7.

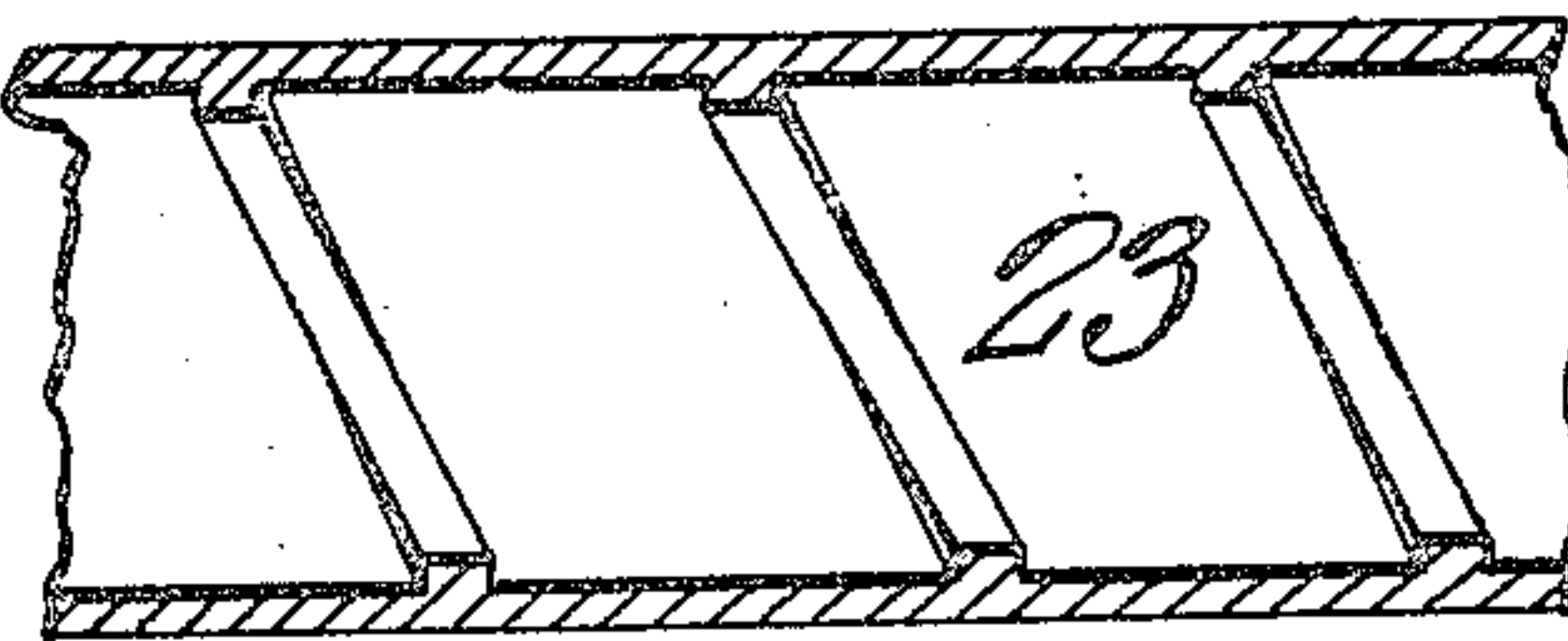


Fig. 8.

Witnesses
E. J. Stewart
M. Schmitt

Inventor
John A. Welton.
 By *Cash & Co.*
 Attorneys

UNITED STATES PATENT OFFICE.

JOHN A. WELTON, OF CANAL DOVER, OHIO.

APPARATUS FOR FEEDING PULVERIZED FUEL.

993,928.

Specification of Letters Patent. Patented May 30, 1911.

Application filed November 5, 1909. Serial No. 526,436.

To all whom it may concern:

Be it known that I, JOHN A. WELTON, a citizen of the United States, residing at Canal Dover, in the county of Tuscarawas and State of Ohio, have invented a new and useful Apparatus for Feeding Pulverized Fuel, of which the following is a specification.

This invention relates to apparatus for feeding and burning fuel in a pulverized form, the invention being specially applicable to steam boiler and other furnaces.

It is the object of the invention to provide improved means for grinding the fuel, and injecting it into the fire-box of the furnace.

Another object of the invention is to provide means for controlling the fire according to the pressure in the boiler, the fuel supply being reduced when the steam pressure rises above a predetermined point, and increased when the pressure drops below this point.

A further object is to provide improved means for feeding air into the fire-box, and mixing the same with the gases and fuel, in order to secure perfect combustion thereof.

The invention also contemplates the provision of an air pump for furnishing the injecting fluid, the pump being driven by a steam engine supplied with steam from the boiler of the furnace to which the fuel is fed, and the exhaust from said engine being utilized to heat the feed water.

With the herein stated objects in view, as well as others which will be apparent when the nature of the invention is better understood, the same consists in a novel construction and arrangement of parts to be hereinafter described and claimed, it being understood that various minor changes in the structural details may be resorted to, without a departure from the invention.

In the accompanying drawing forming a part of this specification, Figure 1 is a longitudinal section of the fire-box of a locomotive boiler, and an elevation, partly in section, of the tender. Fig. 2 is an enlarged horizontal section of the discharge end of the fuel delivery pipe. Fig. 3 is a plan view, partly in section, of the fuel and air pipes at their junction. Fig. 4 is a front elevation of the tender, partly broken away. Fig. 5 is a vertical section of the fire-box on the line 5-5 of Fig. 1. Fig. 6 is a vertical section of the tender on the line 6-6 of Fig. 1. Fig. 7 is a detail view of dampers used in

the apparatus. Fig. 8 is a detail view of ribs provided in a casing used in the apparatus.

The invention is shown in connection with a locomotive boiler furnace, but it is to be understood that it is not limited thereto, but that it may be applied with equal facility to a stationary boiler, and other furnaces.

Referring to the drawings, 10 denotes the fire-box of a locomotive boiler. The fire-box is cylindrical in form, and its shell is corrugated throughout its entire length, the structure being the same as the one disclosed in my former Patent No. 804,286 dated November 14, 1905. However, the invention may be applied to any other form of fire-box.

The front of the fire-box has a fire door 11, and in this end is mounted a grate 12, which does not extend throughout the entire length of the fire-box, but stops some distance from the rear end thereof. Between this end of the fire-box, and the rear end of the grate, is an arch 13 which rises from the bottom of the fire-box, and extends in a curve forwardly in the direction of the front thereof, so as to overhang the grate, the top of the arch being spaced from the top of the fire-box, so that the products of combustion may pass over the same to the rear end of the fire-box, and through the same to the flues. The arch extends throughout the entire width of the fire-box, and is constructed of fire brick or other refractory material, and it is formed with a checkered air passage 14 opening at one end through the bottom of the fire-box, and at the opposite end through the outer end of the arch. This passage is provided for the purpose of feeding air into the fire-box to support combustion. The air upon passing through the arch is heated, and the checker work serves to distribute the heated air through the fire-box, whereby it is thoroughly mixed with the gases and other products of combustion so that they are entirely consumed. Below the level of the grate 12, the arch 13 is provided with a damper 15 which opens into the space below the grate, and above this damper the air passage 14 contains a damper 16. Upon closing the damper 16 and opening the damper 15, air is fed through the grate bars to the fire thereon. The grate is provided for starting the fire, after which pulverized fuel is injected into the fire-box, and burned in suspension. Below the grate, the bottom of the fire-box is provided with the large

ground damper 17 through which the ashes may be discharged. The front end of the fire-box, up to the arch 13, is lined with fire brick or other refractory material 18 as shown in Fig. 5.

In Figs. 1, 4 and 6 is shown the tender carrying a supply of fuel and water. The water is carried in a cylindrical tank 19, in which is built a hopper 20 containing the supply of coal. Under the discharge end of the hopper is mounted a trough 21 in which works a screw conveyer 22 extending to the front end of the tender and discharging into a suitable receptacle. Below this trough is mounted a cylindrical casing 23 which also extends in the direction of the front end of the tender, and in which works a screw conveyer 24. The interior surface of the casing 23 is ribbed spirally, and these ribs in conjunction with the screw 24 form a grinder or crusher for the coal, the crushed coal being fed forwardly by the screw. The trough 21 does not extend entirely across the discharge end of the hopper as shown in Fig. 6, so that the coal may drop into the casing 23, and then be taken up by the screw 24. The trough therefore supports most of the weight of the coal, thereby causing the grinder to work with greater ease than would be the case if the entire weight of the coal were on the grinder. The front end of the casing 23 is entered by a pipe 26 into which the ground coal is discharged, and said pipe communicates with an air pipe 27 leading from a blower 28 mounted on the front end of the tender, and driven by an engine 29, also mounted on this end of the tender, the engine being supplied with steam from the boiler of the locomotive. On the crank shaft 30 of the engine is a sprocket wheel 31 which is connected by a chain 32 to a sprocket wheel 33 on the shaft 34 of the screw 24. On the shaft 35 of the screw 22 is a spur gear 36 which is in mesh with a similar gear on the shaft 34, whereby the motion of the latter is communicated to the screw 22. A suitable friction or other form of clutch 37 is provided for throwing the screw 22 into and out of operation. Between the tender and the locomotive, the pipe 27 is provided with a flexible section 38 and also a suitable coupling. The blower 28 is also connected by a pipe 39 to the passage 14 of the arch 13, this pipe being also provided with a suitable flexible portion 40, and a coupling. The pipe 27 terminates in a discharge head 41 having a series of nozzles 42 which pass through flues 43 mounted in the front wall of the fire-box, and discharging thereinto. The inner surface of the head 41, between the inlet ends of the nozzles 42, is brought to an edge as indicated at 44, to prevent the coal dust from lodging thereon. Adjacent to the head 41, the pipe 27 is provided with a valve 45, for

controlling the amount of fuel to be discharged into the fire-box. The ground coal is fed into the fire-box by an injector action, produced by the air passing across the mouth of the pipe 26, the latter pipe being provided, near its junction with the pipe 27, with a valve 46, to be closed only when oil is used for fuel, in which case the casing 21 will also be capped and the shaft ends packed with stuffing boxes 54. The air pipe 27 is provided with a relief valve 55 for the purpose of allowing excess air to escape if it should be found that too much air is being introduced into the fire-box to burn the fuel to the best advantage. It is therefore not necessary to provide a gearing to change the speed of the grinder, and it is proposed to make the blower amply large to furnish all the air required, and if it is found that too much air is supplied, the relief valve may be slightly opened, so that the excess air can escape, thus delivering to the fire-box, coal and air mixed in just the right proportion to produce perfect combustion. The front end of the tender carries a feed water heater 47 into which the exhaust from the engine 29 discharges, the exhaust pipe being indicated at 48. The feed water is discharged into the top of the heater from the tank 19 by an injector 49. The heater contains the usual pans 50 for catching scale and other impurities. A branch pipe 48^a leads from the exhaust pipe 48 to the space around the hopper 20 for conducting exhaust steam into said space to heat the walls of the hopper, and thereby dry the coal if it is wet, and prevent freezing of the coal in cold weather should the tank 19 leak. The discharge head 41 also contains means for imparting a whirling motion to the fuel, said means comprising screws 51 mounted on stems 52 extending through the wall of the head. One of these devices is mounted in front of each nozzle 42 and is dimensioned so that it may pass thereinto and serve as a scraper for removing deposits, the stems 52 being slidably mounted in the wall of the head for this purpose.

In operation, a fire is made on the grate 12 in the ordinary manner, coal being obtained from the hopper 20 upon throwing the conveyer 22 into gear. The damper 16 may be closed, and the damper 15 opened more or less to obtain a proper supply of air. When a sufficient fire to ignite the ground fuel is obtained, the same is turned into the fire-box in which it is burned in suspension. The heated air issuing from the arch 13 is thoroughly mixed with the fuel and gases, thus insuring a perfect combustion. The proportion of air and coal may be varied by operating the valve 45, and the amount of fuel discharged into the fire-box is controlled by the valve 45, and damper 16. The fire door need not be opened except

when starting the fire, thus preventing the entrance of cold air into the fire-box, and by constructing the discharge end of the fuel supply pipe, and mounting the nozzles 5 42 thereof, as described and shown in Fig. 2, cold air is prevented from coming in contact with the heated surface of the fire-box walls. The coal is ground at the time of using it, thereby avoiding a surplus that might possibly cause an explosion. The speed of the 10 pump is automatically controlled according to the pressure in the boiler. This may be effected by a pressure regulating valve shown diagrammatically at 53, said valve 15 reducing or shutting off the steam to the engine 29 when the boiler pressure rises above a predetermined point, and opening to increase the steam supply when the boiler pressure again drops.

20 The method of and the apparatus for obtaining and utilizing the comminuted fuel may also be applied to stationary boilers, in which case the air pressure for operating the injector may be obtained from a storage 25 tank, and the coal may be ground at any convenient place around the plant.

What is claimed is:

1. The combination with a fire box, of

means for feeding comminuted fuel thereinto, comprising a fuel receptacle, a trough 30 mounted in the discharge end thereof, and spaced at its opposite edges from the walls thereof, a screw conveyer working in the trough, a cylindrical casing mounted beneath the trough and the discharge end of 35 the receptacle, a grinder and conveyer mounted in said casing, a pipe into which the casing discharges, and a fluid pressure pipe leading to and discharging into the fire box, the said pipe being entered by the 40 fuel pipe.

2. The combination with a fire box, of a fuel injector discharging thereinto, a screw mounted at the inlet end of the discharge nozzle of the injector, for imparting a 45 whirling motion to the fuel, said screw being movable into the nozzle to serve as a scraper therefor.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature 50 in the presence of two witnesses.

JOHN A. WELTON.

Witnesses:

GEO. W. MYERS,
F. H. SHAW.