No. 737,921. PATENTED SEPT. 1, 1903.

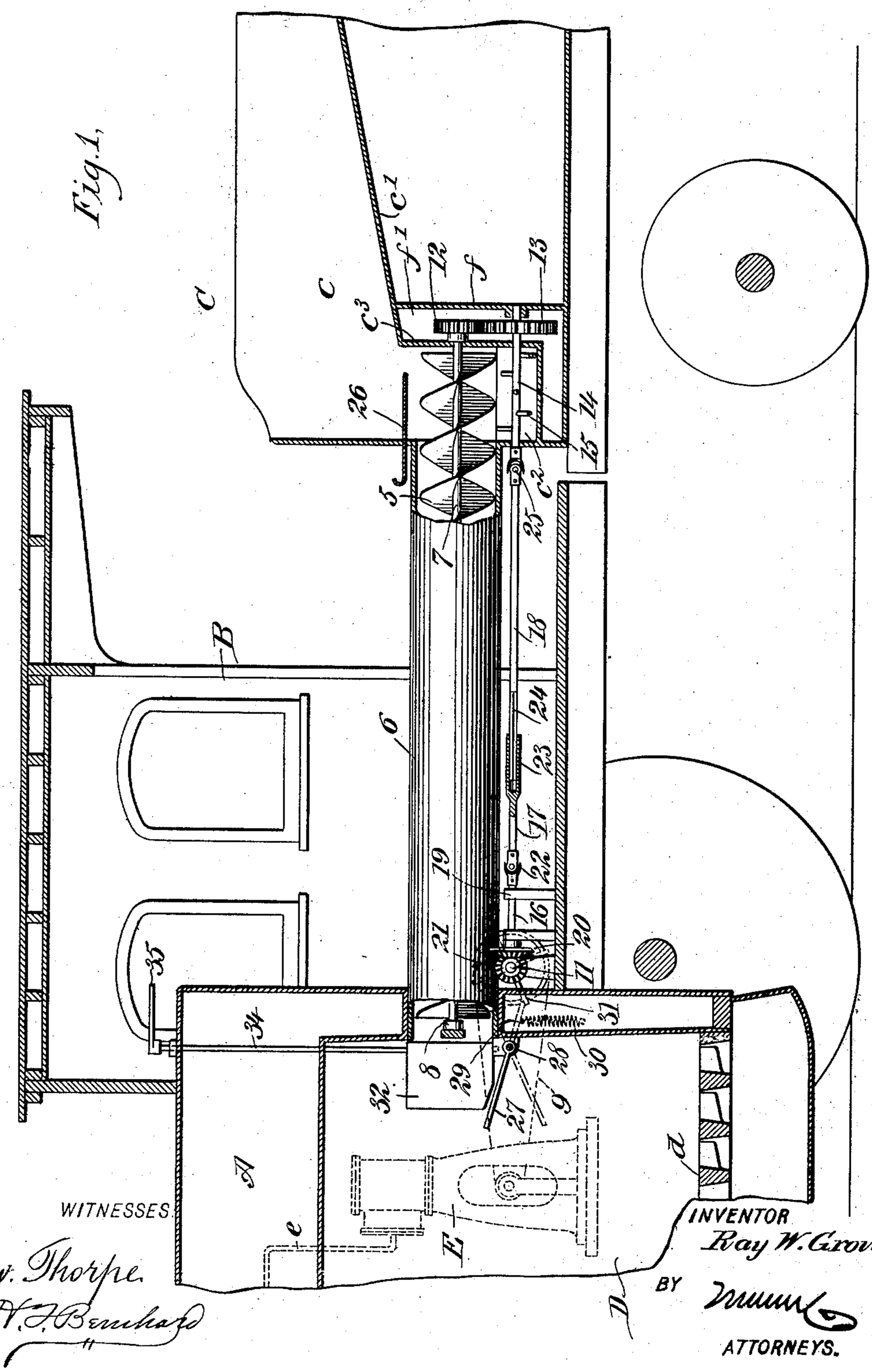
R. W. GROVE.

MEANS FOR FEEDING FUEL TO FURNACES.

APPLICATION FILED APR. 15, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.



WITNESSES.

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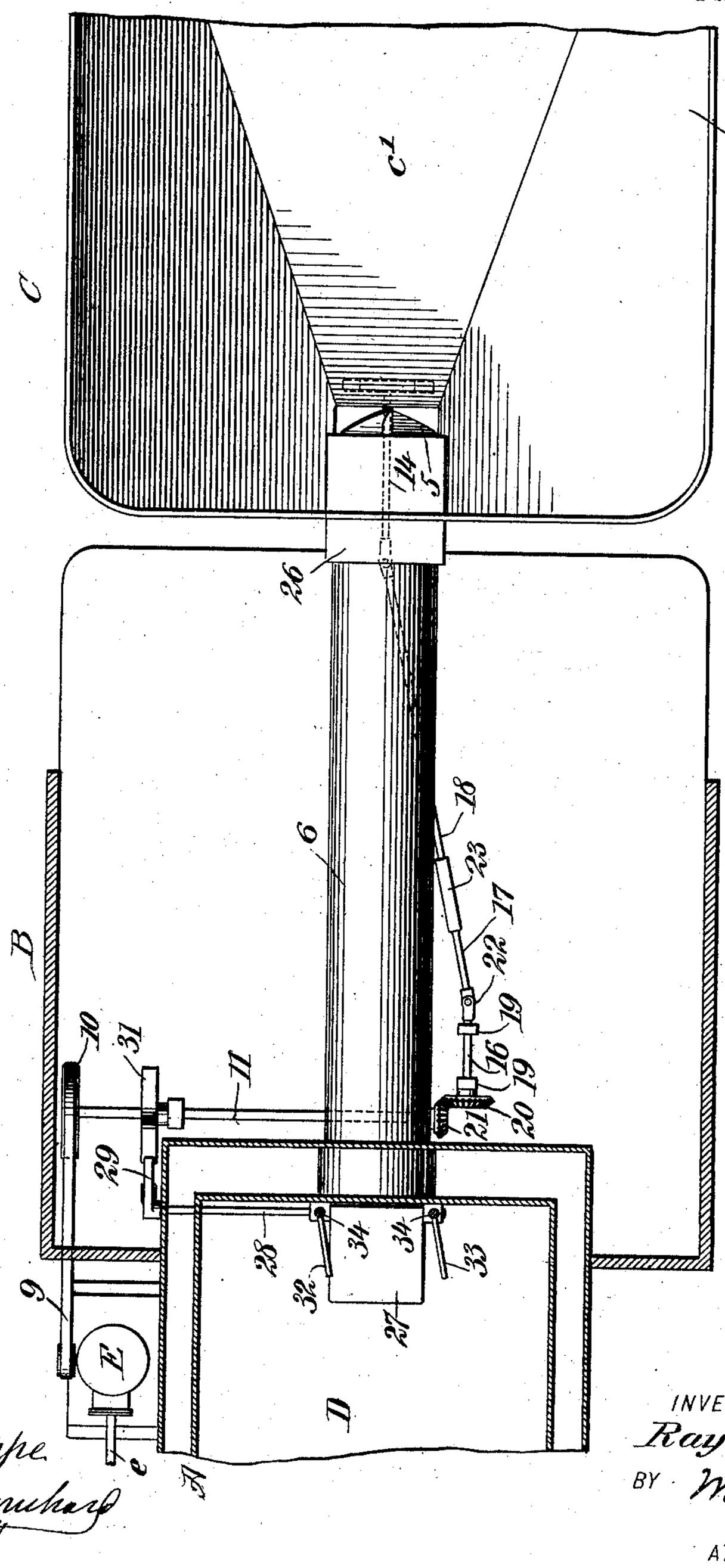
NO MODEL. 2 SHEETS—SHEET 2.

Fig. 2.



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UNITED STATES PATENT OFFICE.

RAY WILLARD GROVE, OF LEWISTOWN, MONTANA.

MEANS FOR FEEDING FUEL TO FURNACES.

SPECIFICATION forming part of Letters Patent No. 737,921, dated September 1, 1903.

Application filed April 15, 1903. Serial No. 152,729. (No model.)

To all whom it may concern:

Be it known that I, RAY WILLARD GROVE, a citizen of the United States, and a resident of Lewistown, in the county of Fergus and State of Montana, have invented new and useful Improvements in Means for Feeding Fuel to Furnaces, of which the following is a full, clear, and exact description.

My invention relates to means for feeding fuel to furnaces, the same being capable of use in connection with all kinds of furnaces, although it may be used to good advantage for feeding coal into the fire-boxes of locomotive-engines.

One object that I have in view is the provision of simple and efficient means for feeding solid fuel, such as coal, into the furnace in a way to minimize manual labor and the admission of cold air to the combustion or grate chamber.

A further object is to equip the fuel-feeding mechanism with means for distributing or spreading the incoming fuel over the fire-box and the bed of incandescent fuel therein, such distribution of the fuel being regulated to direct the same toward one side or the other of the grate-chamber or into the middle portion thereof.

Further objects and advantages of the invention will appear in the course of the subjoined description, and the novelty will be defined by the annexed claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in both the figures.

Figure 1 is a sectional elevation through a portion of a railway locomotive-engine and the fuel-tender associated therewith, illustrating the application of my improved fuel-feeding mechanism thereto; and Fig. 2 is a sectional plan view of the fuel-feeding mechanism applied to the parts shown by Fig. 1.

A designates the rear portion of the boiler forming a part of an ordinary railway locomotive-engine, B is the cab of said engine, and C is a portion of the engine-tender, all of which may be of any suitable or preferred construction. The boiler has the usual combustion or grate chamber D, provided with an ordinary grate *d*, and the tender C is furnished with a fuel-compartment *c*, having an inclined bottom *c'*, arranged to discharge coal or other fuel into a well c^2, which is located at the front part of the tender.

I employ a conveyer mechanism between the tender and the combustion-chamber, said conveyer mechanism being of any suitable or preferred type; but in the example shown said conveyer consists of a substantially horizontal screw conveyer 5, which is housed or contained within a suitable casing 6, the latter being preferably of cylindrical form. This conveyer and its casing extends through the locomotive-cab and from the tender to the furnace. The conveyer-casing 6 has its front end portion attached to or secured within the rear wall of the boiler A in any suitable way, while the rear end of said casing is connected with the tender in a proper way for communication with the fuel well or pit c^2. I do not limit myself to the manner of mounting or connecting the conveyer mechanism to the boiler-furnace and the tender, because in some instances it may be desirable to provide a slack or loose connection of the conveyer mechanism with these parts in order to compensate for the jolting and play of the tender with relation to the locomotive-engine.

The screw conveyer 5 is carried by a shaft 7, which extends longitudinally through the cylindrical casing 6, and, as shown by the drawings, the front end of this shaft may be mounted in a suitable bearing 8, which is supported by a part of the boiler-furnace, while the rear portion of said conveyer-shaft is adapted to be supported by a suitable bearing on the wall c^3, forming one side of the fuel pit or well c^2. The conveyer is designed to be positively driven by the power developed by an auxiliary or separate engine E, the latter being of any suitable or preferred type and supplied with steam from the boiler A by a suitable pipe *e*. This auxiliary engine may be mounted on a side portion of the locomotive-engine in any suitable way, and from the shaft of said engine extends a driving-belt 9, which is fitted to a pulley 10 on a horizontal transverse shaft 11, the latter being journaled in suitable bearings provided on a proper part of the locomotive-engine. This shaft 11 drives a train of connections adapted to transmit the motion to the rear portion of the conveyer-shaft 7, the latter being pro-

vided with a spur gear-wheel 12, adapted to have intermeshing engagement with a similar gear-wheel 13, which is attached to the rear extremity of an agitator-shaft 14. This agitator-shaft is disposed in a horizontal position across the well or pit c^2 and below the plane of the conveyor-shaft 7, said agitator-shaft having a series of fingers or blades 15 arranged to rotate in the fuel-pit c^2 for the purpose of stirring up the fuel which may lodge therein and bring said fuel within the field of action of the screw conveyer 5.

A wall or partition f may be provided within the tender C in parallel relation to the pit-wall c^3 in order to form a chamber or compartment f', in which the gearing 12 13 is adapted to be housed or contained, thus overcoming the accumulation of fuel within the tender in a way to interfere with the action of the transmission-gear. The agitator-shaft 14 and the driving-shaft 11 are connected operatively by an intermediate sectional shaft having its parts connected flexibly and telescopically together, thus making provision for the transmission of the motion of the shaft 11 to the shaft 15 and then to the screw-conveyer shaft independently of the jolting and swaying of the tender with respect to the locomotive, or vice versa. This intermediate shaft consists of sections 16 17 18, of which sections the member designated as 16 is journaled in stationary bearings 19 in position for a bevel-gear 20 to have intermeshing engagement with a bevel-pinion 21 carried on an end portion of the driving-shaft 11, said shaft-section 16 being shown as lying at right angles to said driving-shaft. (See Fig. 2.) The shaft member 17 is flexibly connected by a universal or knuckle joint 22 to the shaft member 16, and this shaft member 17 is provided with an elongated sleeve 23, having a square or polygonal socket adapted to telescopically receive the square or polygonal end 24 of the other shaft member 18, the latter having a flexible or knuckle-jointed connection 25 with the agitator-shaft 14. (See Fig. 1.) It will be seen that the engine E serves to drive the shaft 11 through the belt 9 and that the motion of this shaft is transmitted by the intermediate flexible shaft to the agitator-shaft 14, which in turn is geared to the extended rear end of the screw conveyer, whereby the latter is positively driven for the purpose of conveying the fuel from the hopper c through the casing 6 and delivering the same into the combustion-chamber D of the boiler-furnace. The engine E may operate at slow speed for the purpose of continuously driving the screw conveyer at a like speed, so as to feed the fuel constantly into the furnace; but it is evident that the engine may remain at rest and the fuel-feeding mechanism may be employed at intervals whenever it is desired to feed the coal into the furnace to meet the requirements of the service.

The walls of the hopper c may converge toward the pit or well c^2 in order to deliver the fuel upon the rear portion of the screw conveyer, which is prolonged or extended into and through the fuel-pit c^2. This hopper may be equipped with a valve or gate 26, adapted to be adjusted across the throat of the pit for the purpose of regulating the quantity of fuel adapted to pass by gravity from the hopper C into the pit.

In connection with the means for feeding fuel into the furnace without resorting to hand-labor I employ a spreading or distributing mechanism adapted to discharge the fuel in any required direction within the grate-chamber and upon the bed of incandescent fuel therein. One member of this distributing mechanism consists of a vibrating or rocking plate 27, which is attached to a horizontal shaft 28, the latter being journaled in appropriate bearings provided in or on the furnace adjacent to the rear wall thereof and below the exit end of the conveyer-casing 6. This shaft is shown as extending through one side of the boiler-furnace, and to the protruding end of said shaft is secured a tappet-finger 29. The distributing-plate 27 occupies an approximately horizontal position below the delivery end of the casing 6, so that the fuel advanced by the screw conveyer will load upon said distributing-plate, and this plate is normally moved to a raised position by any suitable form of retractor—such, for example, as the spring 30, which is located externally of the furnace and is connected with the tappet-finger 29. (See the dotted-line illustration in Fig. 1.)

The shaft 11 is provided with a rotary tappet 31, adapted to rotate therewith and having a series of arms which strike against the tappet-finger 29 successively. The rotation of this tappet operates the finger 29 against the energy of the spring 30 to impart a rocking motion to the shaft 28 and the distributing plate or member 27, whereby said plate or member is given a vibrating or jarring motion in a positive manner for the purpose of throwing the fuel to all parts of the furnace-chamber.

The direction in which the fuel may be distributed within the furnace-chamber is controlled by the employment of adjustable wings 32 33, which are disposed in vertical positions at opposite sides of the vibrating distributer 27 and above the field of motion thereof. These wings are fastened individually to adjusting-shafts 34, which extend vertically through the boiler A and are provided at their upper ends with suitable handles 35, which are within convenient reach of the engineer or fireman stationed in the cab B. It is evident that either shaft 34 may be adjusted to move the wing 32 or 33 away from the distributer member 27, thus allowing the fuel to be thrown in one direction or the other and toward one side or the other of the combustion-chamber; but the wings 32 33

may be operatively arranged above the vibrating distributer member in order to prevent the fuel from moving toward the sides of the furnace-chamber, and thus deliver said fuel into the middle part of said chamber.

The automatic feeding and distributing mechanism herein shown and described may be used in connection with any kind of furnace, and these mechanisms allow the furnace to be charged with fuel without exposing the fire or incandescent fuel to the action of cold air, which is an objection in ordinary furnaces, because the door must be opened when the fuel is shoveled therein. It is evident that the rear part of the boiler-furnace may be provided with one or more doors of small area adapted to permit the fireman to stoke the furnace.

It is evident that other kinds of gearing between the shaft 11 and the engine E may be employed—as, for example, chain-and-sprocket gearing.

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

1. The combination of a locomotive and a fuel-tender, a hopper carried by said fuel-tender, an inclosed conveyer extending from the fuel-hopper to the furnace of the locomotive, an agitator in the hopper, a driving connection between said agitator and the conveyer, an engine-shaft on the locomotive, and a self-adjusting shaft geared to the engine-driven shaft and operatively connected to the agitator.

2. The combination of a locomotive and a fuel-tender, a hopper carried by the fuel-tender, an inclosed conveyer extending from the fuel-hopper to the furnace of the locomotive, an agitator-shaft disposed parallel with and geared to said fuel-conveyer, an engine-driven shaft on the locomotive, and a freely telescopic shaft geared to the engine-driven shaft and to the agitator-shaft, for driving the latter and the conveyer.

3. The combination of a locomotive and a fuel-tender, a hopper carried by the fuel-tender, an inclosed conveyer extending from the fuel-hopper to the furnace of the locomotive, an engine-driven shaft on the locomotive, a shaft on the fuel-tender and geared to the conveyer-shaft, and a sectional shaft having its members flexibly and telescopically connected, said sectional shaft being geared to the engine-driven shaft and to the shaft which is geared to the conveyer, whereby the sectional and flexible shaft compensates for swaying movement of the fuel-tender relatively to the engine.

4. The combination with a conveyer arranged to discharge fuel to a furnace, of a horizontal rock-shaft mounted in a furnace-chamber and provided with an externally-located tappet-finger, a distributer member fast with said shaft and arranged to vibrate in a vertical plane, and a rotary tappet in coöperative relation to said finger.

5. The combination with a conveyer adapted to distribute fuel to a furnace, of a distributer member mounted to turn on a horizontal axis and disposed in active relation to said conveyer, and adjustable wings disposed at the sides of said distributer.

6. The combination with a conveyer, of a vibratory distributer, and individually-adjustable wings mounted independently of the distributer and disposed at the sides of said distributer.

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

RAY WILLARD GROVE.

Witnesses:
WILLIAM E. CORT,
EDGAR G. WORDEN.