

Oct. 20, 1925.

1,557,773

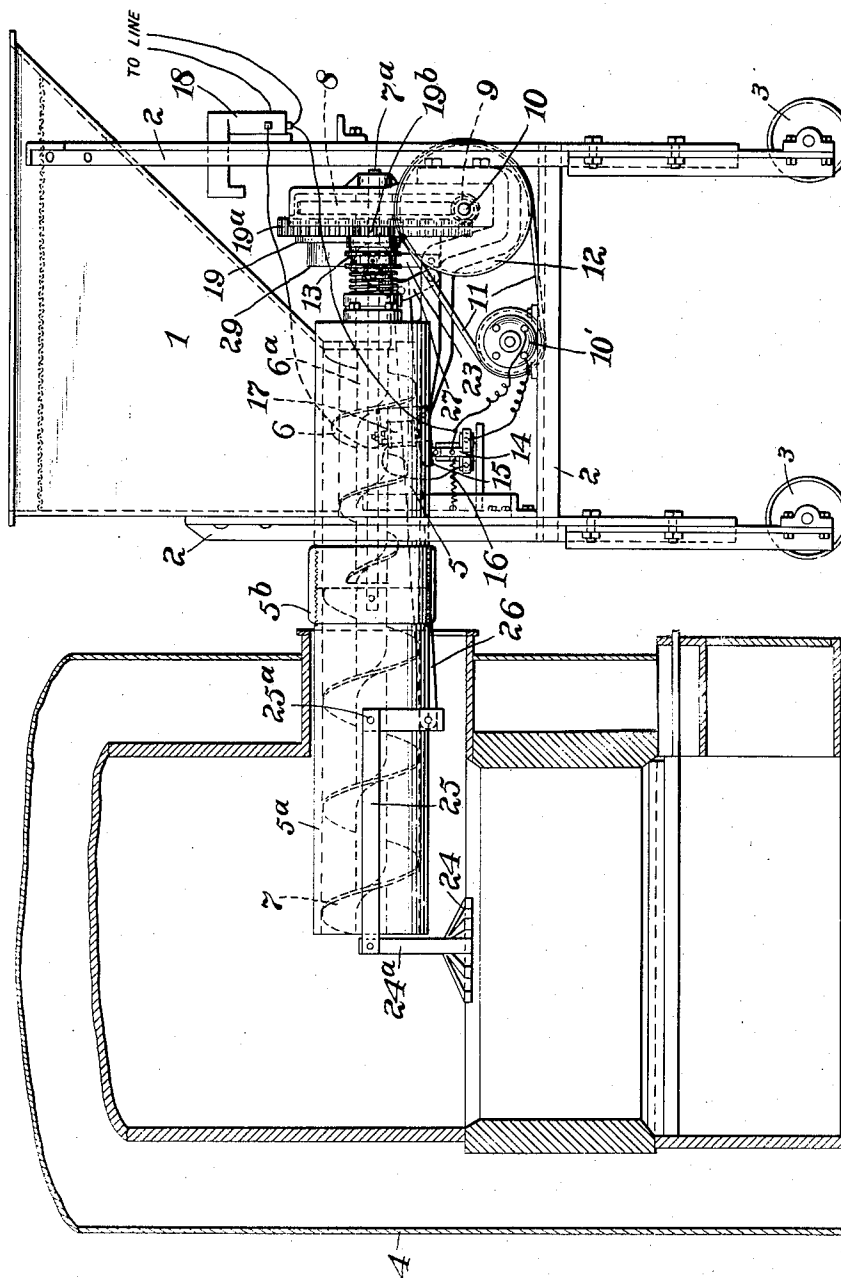
A. C. PILCHER ET AL

FUEL FEEDING APPARATUS

Filed April 3, 1922

4 Sheets-Sheet 1

Fig. 1.



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Fig. 2.

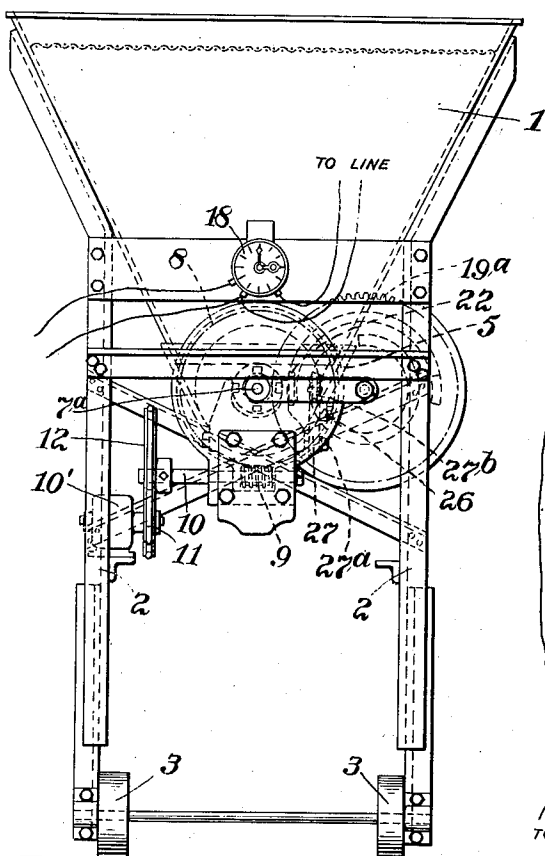


Fig. 6.

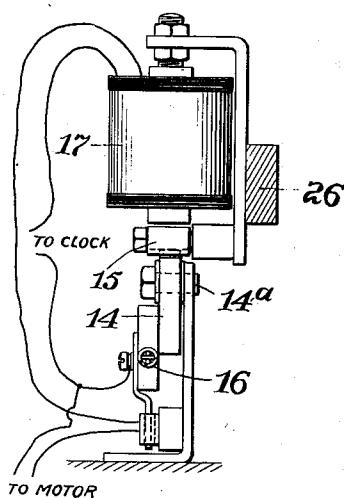
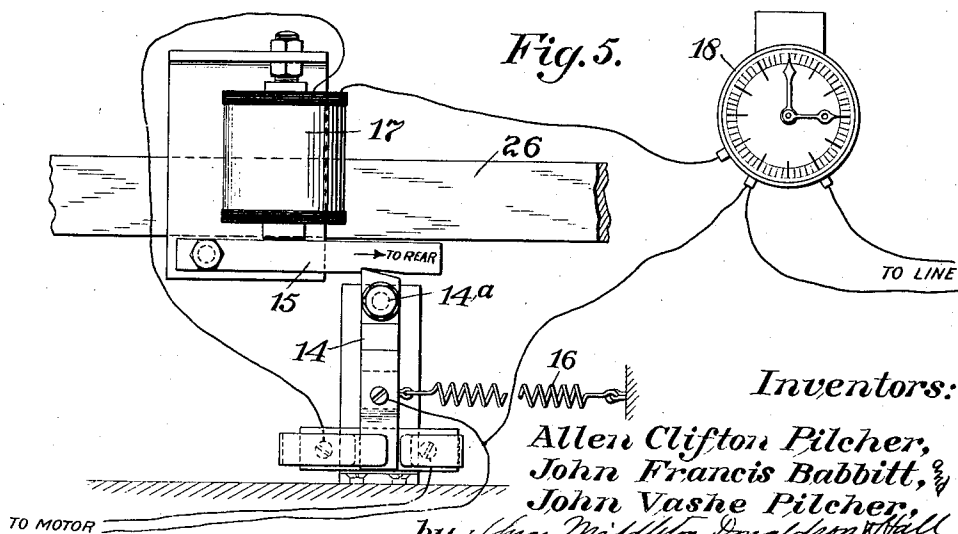


Fig. 5.



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Fig. 4.

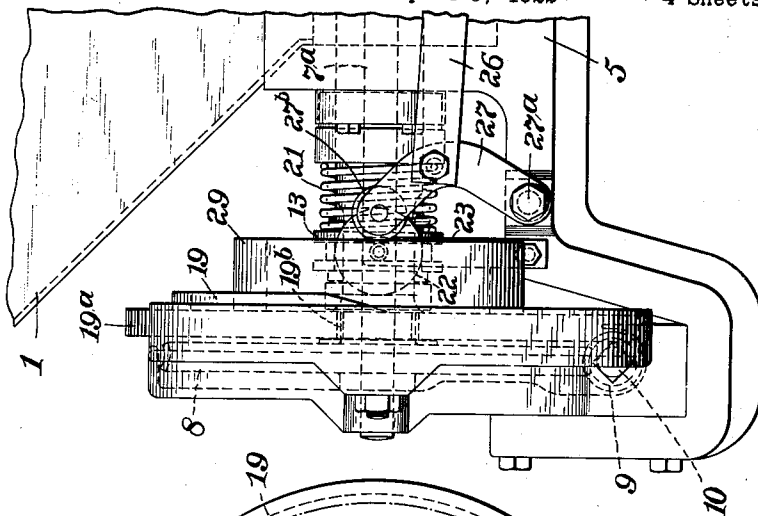
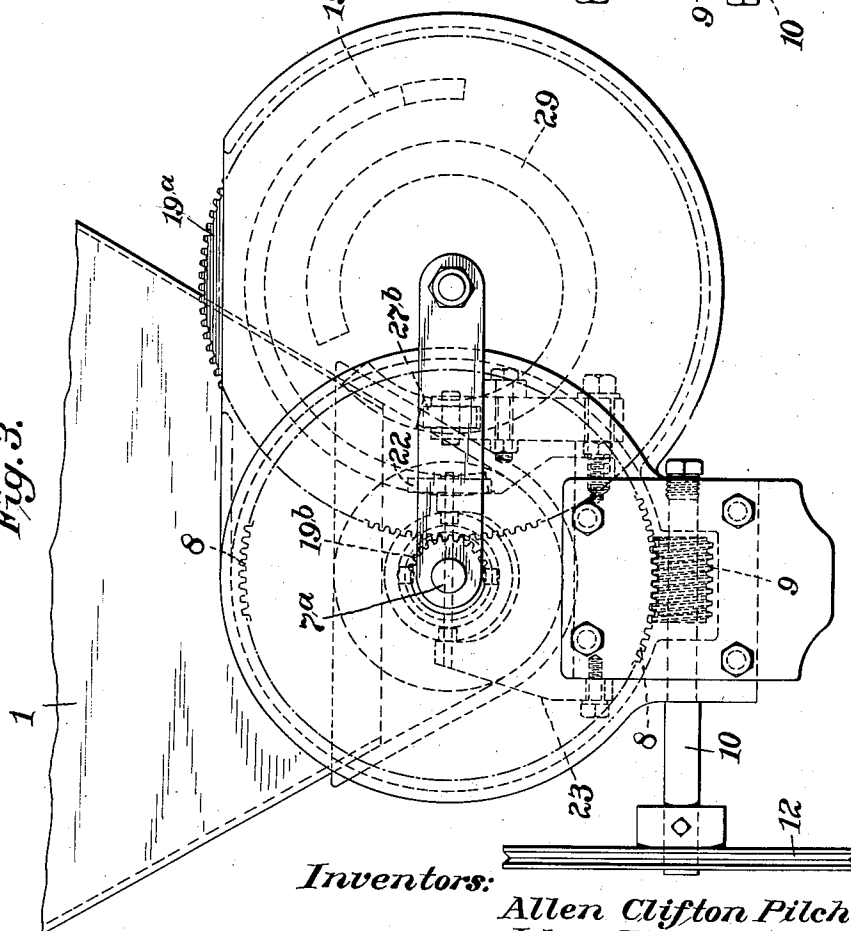


Fig. 3.



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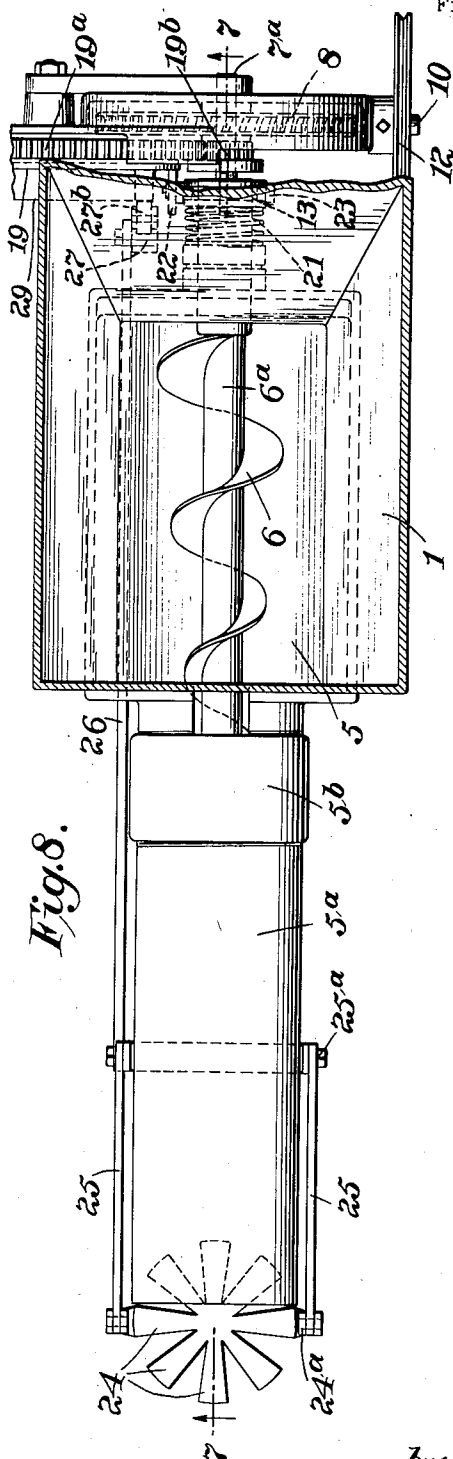


Fig. 8.

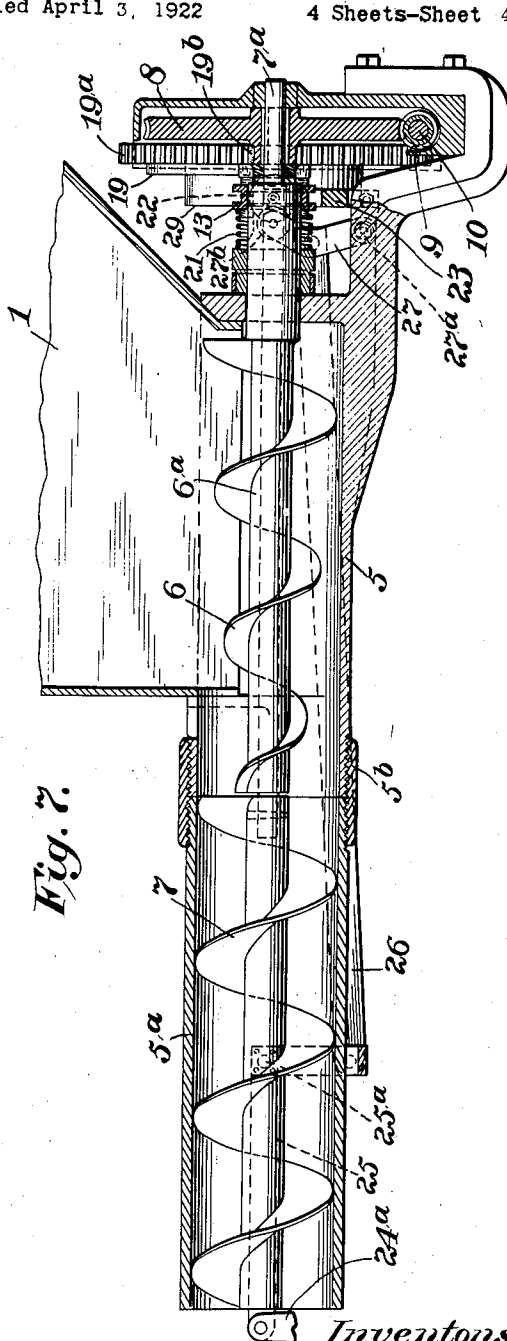


Fig. 7.

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UNITED STATES PATENT OFFICE.

ALLEN CLIFTON PILCHER, JOHN FRANCIS BABBITT, AND JOHN VASHE PILCHER, OF LOUISVILLE, KENTUCKY, ASSIGNORS TO EFFICIENCY MFG. CO., OF LOUISVILLE, KENTUCKY, A CORPORATION OF KENTUCKY.

FUEL-FEEDING APPARATUS.

Application filed April 3, 1922. Serial No. 549,125.

To all whom it may concern:

Be it known that we, ALLEN CLIFTON PILCHER, JOHN FRANCIS BABBITT, and JOHN VASHE PILCHER, citizens of the United States, and residents of Louisville, in the county of Jefferson and State of Kentucky, have invented certain new and useful Improvements in Fuel-Feeding Apparatus, of which the following is a specification.

Our present invention relates to improvements in fuel feeding devices for furnaces.

One object of the invention is to provide a feeding device of a portable nature which can be readily moved into position to supply the fire pot and removed therefrom.

Another object is to provide a feeding device which may be applied to a furnace or juxtaposed thereto and which will be arranged to automatically feed fuel into the furnace after determined periods.

Still another object is to provide a single feeding device which may be used to successively supply fuel to a plurality or bank of furnaces.

The invention further aims to provide apparatus which will automatically supply a definite or uniform amount of fuel.

Still another object is to provide such apparatus equipped with automatic spreading and tamping means.

With these and other objects in view, the invention includes the novel features of construction and arrangement and combination of parts hereinafter described and particularly defined by the appended claims.

The preferred embodiment of our invention is illustrated in the accompanying drawings, in which:—

Figure 1 is a sectional elevation showing our improved apparatus in feeding position relative to a furnace, which latter, as it is intended to be representative of any ordinary or desired form, is shown in a conventional manner only.

Fig. 2 is a front elevation of the feeding apparatus.

Figs. 3 and 4 are enlarged detail views, taken at right angles to each other, illustrating the driving mechanism or gearing.

Figs. 5 and 6 are detail views of the clock operated controlling mechanism.

Figs. 7 and 8 are enlarged detail views illustrating the feed screw arrangement, Fig. 7 being a section on line 7—7 of Fig. 8.

Referring by reference characters to these drawings, the numeral 1 designates a hopper of a size to contain sufficient fuel to supply a furnace fire pot with a plurality of charges, or to supply all the furnaces of a bank or series, which hopper is carried by a suitable frame 2 mounted upon casters or wheels 3 which enable it to be readily moved into and out of operative position relative to the furnace, which latter is indicated at 4.

The hopper delivers at its lower end into the trough shaped front end of a tubular conduit 5 which is of a size to have its delivery end readily enter the feed opening to the fire pot, and this delivery portion may be in the shape of a separate tube 5^a connected to the front portion by a screw coupling, as indicated at 5^b.

Within the tube is located screw means for conveying the fuel from the hopper through the delivery tube into the fire pot, and we prefer to make this screw means of duplex form, including a primary screw 6 and a secondary screw 7 which are designed to be operated in unison for a definite period of time, whereupon the primary screw is stopped and the secondary screw continues to operate until the portion 5^a of the tube or conduit is completely emptied.

The primary screw or conveyor 6 is preferably tapered as shown in detail in Figs. 7 and 8, or in other words, its helical blade decreases in height towards the delivery end so that the distance of the edge of the blade from the wall of the conduit increases so that all liability of jamming or clogging of the fuel is removed.

To effect the stopping of the primary screw and the continued operation of the secondary screw, the former is carried by a rotary sleeve 6^a suitably journaled within the tube, through which passes a shaft 7^a which has one end rigidly connected to the screw 7 and carries at its other or front end outside of the hopper a worm wheel 8 which is driven by a worm 9 fast on drive shaft 10. This shaft may be rotated from any suitable source of power, preferably from an electric motor 10' through belt 11 passing around belt pulley 12 on shaft 10 and a similar pulley on the motor shaft.

The conveyor screw 7 is thus driven directly from worm wheel 8 through shaft 7^a while the screw 6 is driven from the same

worm wheel 8 through the intermediary of a clutch 13 designed to be operated in the manner hereinafter described.

To enable the apparatus to be set to feed fuel after a given period, we provide a spring controlled switch 14, (Fig. 5) fulcrumed on a fixed pivot 14^a and normally held in position to cut off current from the motor by a locking bar or lever 15 having a shoulder engaging the heel of the switch lever, a spring 16 tending to swing the lever immediately it is released into motor circuit closing position.

The lock lever 15 is constructed as the armature of an electromagnet 17 which is designed to be energized at a determined time by a circuit closing clock 18, which, as it may be of any ordinary and well known construction, is only illustrated conventionally.

The circuit having been closed and the motor started, both screws are revolved and fuel fed to the furnace fire pot. After the screw conveyors have made the requisite number of revolutions a cam 19 carried by a gear 19^a driven from a small gear 19^b fast on gear 8 operates the clutch 13 against pressure of spring 21 to unclutch the primary conveyor screw, whereby said primary screw is stopped and the secondary conveyor screw continues to rotate until the delivery tube is completely emptied, whereupon cam 29, carried by gear 19^a, operates against roller 27^b on lever 27 fulcrumed at 27^a swinging said lever and forcing connecting rod or bar 26 in the direction of the arrow, Fig. 5, and as lever 15 and magnet 17 are carried by bar or rod 26, this moves switch lever 14 and breaks the circuit.

When the clock again makes contact and current is passed through the magnet, lock lever 15 is raised, releasing switch lever 14, which is immediately moved by spring 16 to close the motor circuit and repeat the cycle.

The cam 19 acts on a roller 22 fast on a clutch fork 23, which fork operates the clutch 13, hereinbefore referred to.

In connection with apparatus such as above described, it is essential to proper operation that means should be provided for spreading and tamping the fuel.

To this end we provide a spreader 24 which may be of shape corresponding to the character of fire pot, and which has its stem 24^a pivotally connected with the horizontally extending arms 25 of a duplex bell crank lever fulcrumed at 25^a on the sides of the conveyor tube, and having its other arm or arms connected to the end of link or bar 26 hereinbefore described.

Cam 29 is so shaped that during the feeding of the fuel the flaring or cone shaped spreader 24 is in raised position and serves as a spreader or distributor for the fuel.

Near the end of the firing period cam 29 allows the spreader 24 to drop, tamping the fire, and is immediately raised, breaking motor circuit.

The spreader and tamper, being pivotally supported from the bell crank, is easily removed through the fire door when the feeding device is removed from the furnace.

It will be understood that in practice the motor would be connected with a source of electric current by the customary flexible supply cables permitting the necessary range of movement of the apparatus.

Having thus described our invention, what we claim is:

1. Apparatus for feeding fuel to furnaces, comprising a supply hopper and delivery conduit, a support therefor, means for feeding fuel therefrom, a tamping device beneath the end of the conduit, and means for imparting vertical movement to said device.

2. Fuel feeding apparatus, comprising a hopper having a delivery conduit, primary and secondary feed devices in said conduit, means for operating both said devices in unison for a determined length of time and for stopping the primary device and continuing the feed of the secondary device for a further determined length of time.

3. Fuel feeding apparatus, comprising a hopper having a delivery conduit, primary and secondary feed screws in said conduit, a motor connected to directly operate said secondary feed screw, automatic means for controlling the action of the motor, and a clutch for disconnecting the primary feed screw from said motor with means for automatically operating said clutch.

4. Fuel feeding apparatus, comprising a hopper, a conduit for delivering fuel therefrom, fuel feeding means in said conduit, a bell crank pivotally supported at the side of the conduit and having a horizontal arm terminating adjacent the end of the conduit, a fuel spreading and tamping device suspended from said horizontal arm, and means for operating said bell crank.

5. Fuel feeding apparatus, comprising a hopper having a delivery conduit, a feed screw therein, a drive wheel for said feed screw, automatic means for operating said drive wheel, a movably supported fuel spreader adjacent the end of the conduit, and means for moving said fuel spreader, including a cam device operated from said drive wheel.

6. Fuel feeding apparatus, comprising a hopper having a delivery conduit, a primary feed screw therein having a hollow operating shaft, a secondary feed screw having an operating shaft extending through said hollow shaft and carrying a drive wheel, means for operating said drive wheel, and an automatically operated clutch for effecting the drive of said hollow shaft.

7. Fuel feeding apparatus, comprising a hopper having a delivery conduit, a primary feed screw therein having a hollow operating shaft, a secondary feed screw having an operating shaft extending through said hollow shaft and carrying a drive wheel, means for operating said drive wheel, a clutch for connecting said hollow shaft with said drive wheel, a clutch shifting device, and a cam operated from said drive wheel for operating said clutch shifting device.

8. Fuel feeding apparatus, comprising a hopper having a delivery conduit, a primary feed screw therein having a hollow operating shaft, a secondary feed screw having an operating shaft extending through said hollow shaft and carrying a drive wheel, means for operating said drive wheel, a clutch for connecting said hollow shaft with said drive wheel, a clutch shifting device, a cam operated from said drive wheel for operating said clutch shifting device, a fuel spreader supported to have vertical movement adjacent the end of the conduit, and means for imparting movement to said fuel spreader, including a rotary cam, and means for driving said cam from said drive wheel.

9. Fuel feeding apparatus, comprising a hopper having a delivery conduit, means for feeding fuel through said conduit, a bell crank pivoted at the side of the conduit and having a horizontal arm terminating adjacent the end of the conduit, a fuel spreader supported from said arm, a lever fulcrumed on a fixed axis, a bar connecting said lever with the other arm of the bell crank, a cam for operating said lever, and means for operating said cam in unison with the fuel feeding means.

10. Fuel feeding apparatus, comprising a hopper having a delivery conduit, means for feeding fuel through said conduit, a bell crank pivoted at the side of the conduit and having a horizontal arm terminating adjacent the end of the conduit, a fuel spreader

supported from said arm, a lever fulcrumed on a fixed axis, a bar connecting said lever with the other arm of the bell crank, a cam for operating said lever, and means for operating said cam in unison with the fuel feeding means, comprising an electric motor, time controlled means for energizing said motor, and means controlled by the movement of said bar for stopping the motor.

11. Fuel feeding apparatus, comprising a hopper having a delivery conduit, means for feeding fuel through said conduit, a bell crank pivoted at the side of the conduit and having a horizontal arm terminating adjacent the end of the conduit, a fuel spreader supported from said arm, a lever fulcrumed on a fixed axis, a bar connecting said lever with the other arm of the bell crank, a cam for operating said lever, and means for operating said cam in unison with the fuel feeding means, comprising an electric motor, a switch arm fulcrumed on a fixed axis and controlling the flow of current to the motor, a lock lever for said switch arm carried by said link or bar, a magnet also carried by said bar for operating said lock lever, and time controlled means for energizing said magnet.

12. Apparatus for feeding fuel to furnace, comprising a supply hopper and delivery conduit, means for feeding fuel therefrom, a tamping device and means for imparting movement to said device.

13. Fuel feeding apparatus, comprising a hopper having a delivery conduit, primary and secondary feed devices in said conduit, means for operating both said devices in unison for a determined length of time and for stopping the primary device and continuing the feed of the secondary device for a further determined length of time.

In testimony whereof, we affix our signatures.

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JOHN VASHE PILCHER.