

June 10, 1924.

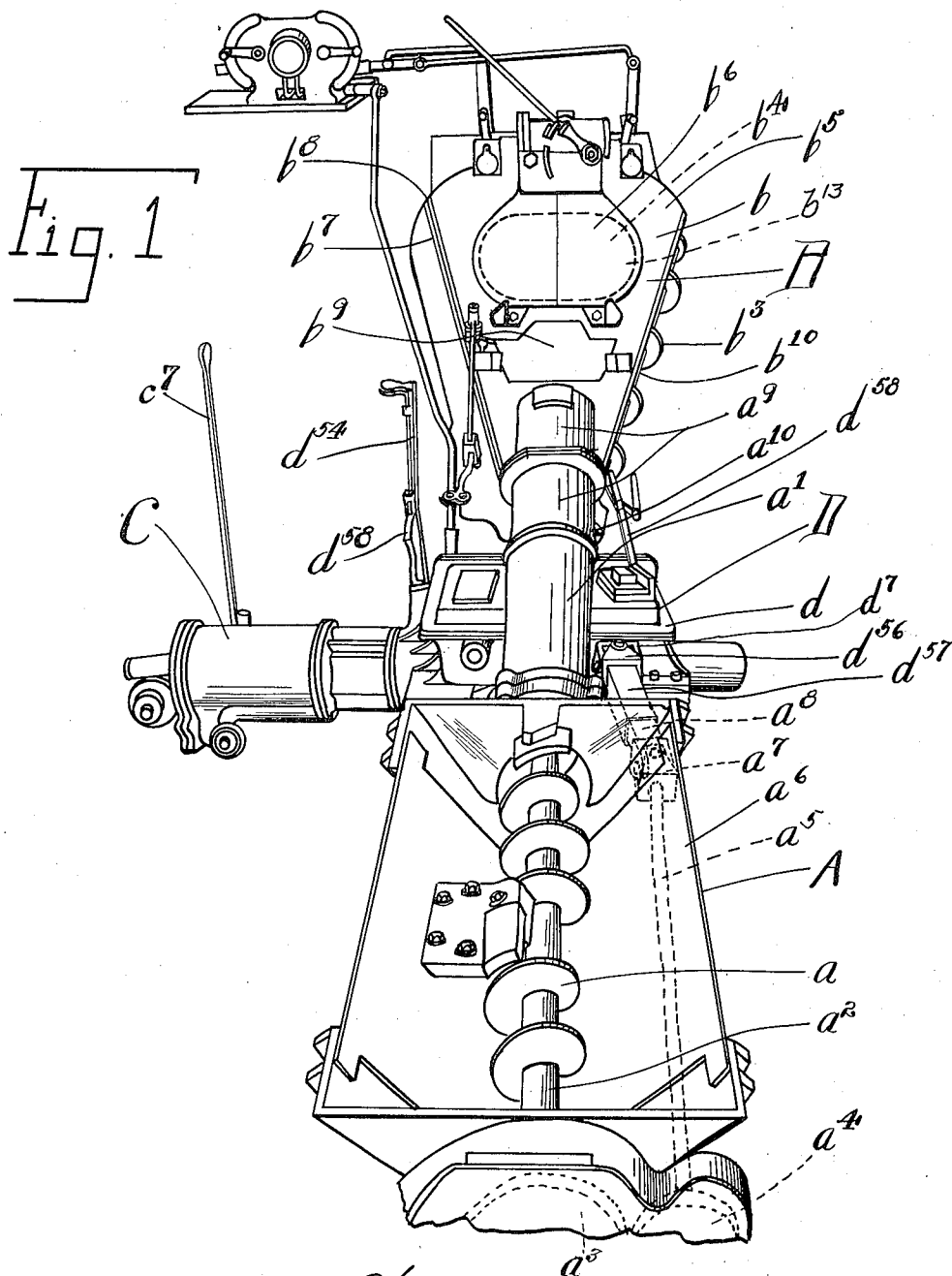
1,497,015

W. T. HANNA

MECHANICAL STOKER

Filed July 6, 1921

5 Sheets-Sheet 1



William T. Hanna

INVENTOR.

BY

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June 10 , 1924.

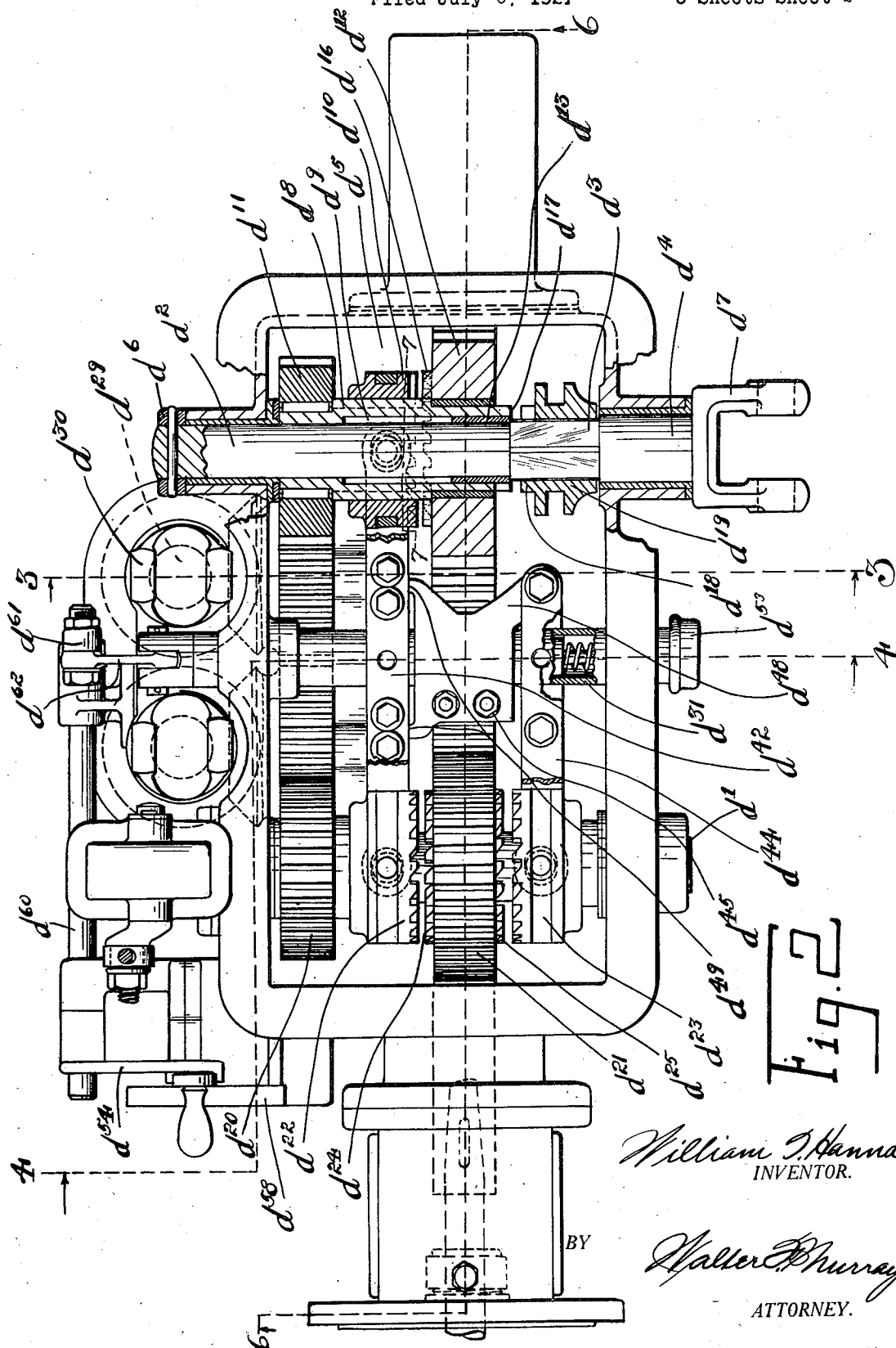
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W. T. HANNA

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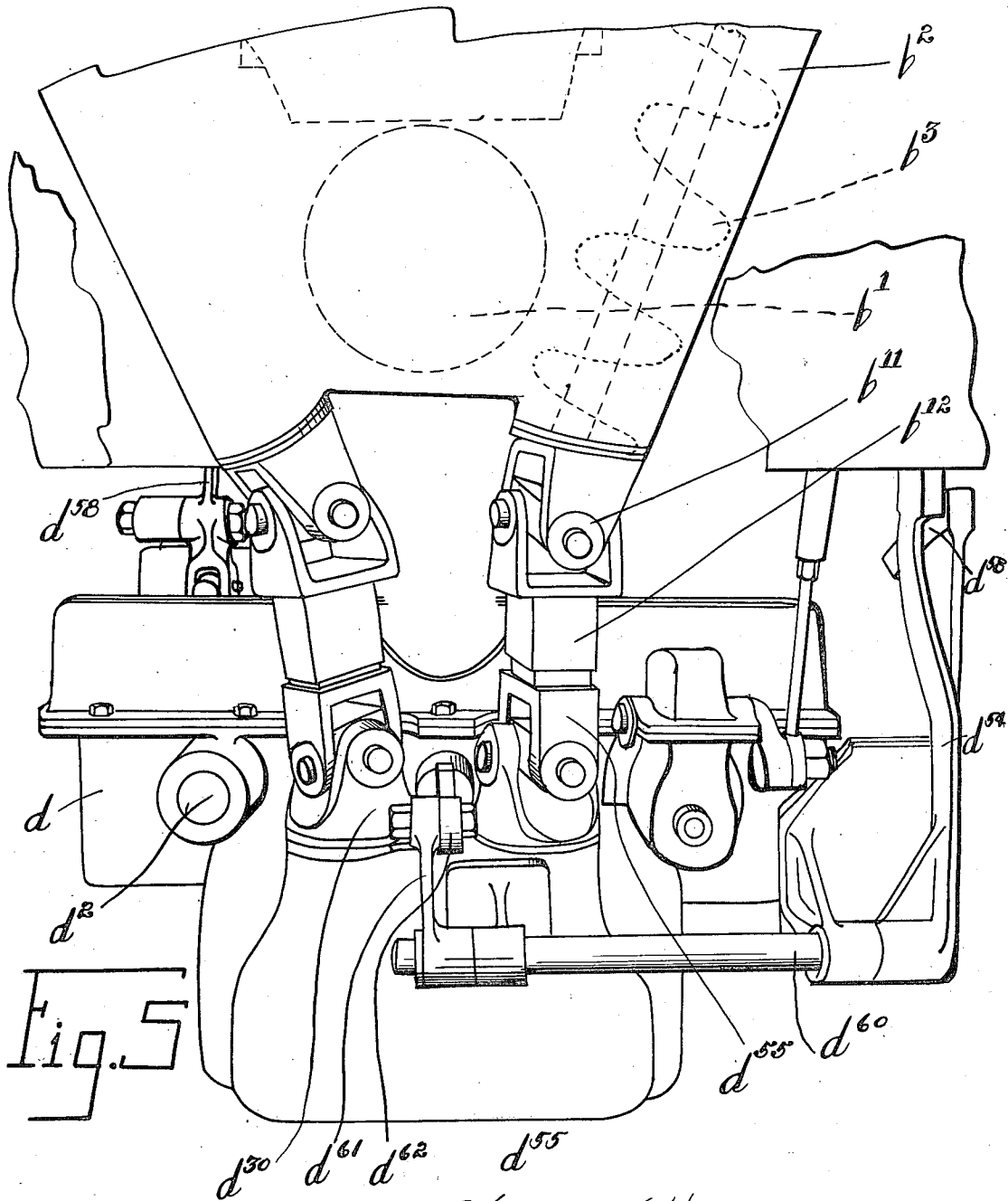
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5 Sheets-Sheet 4



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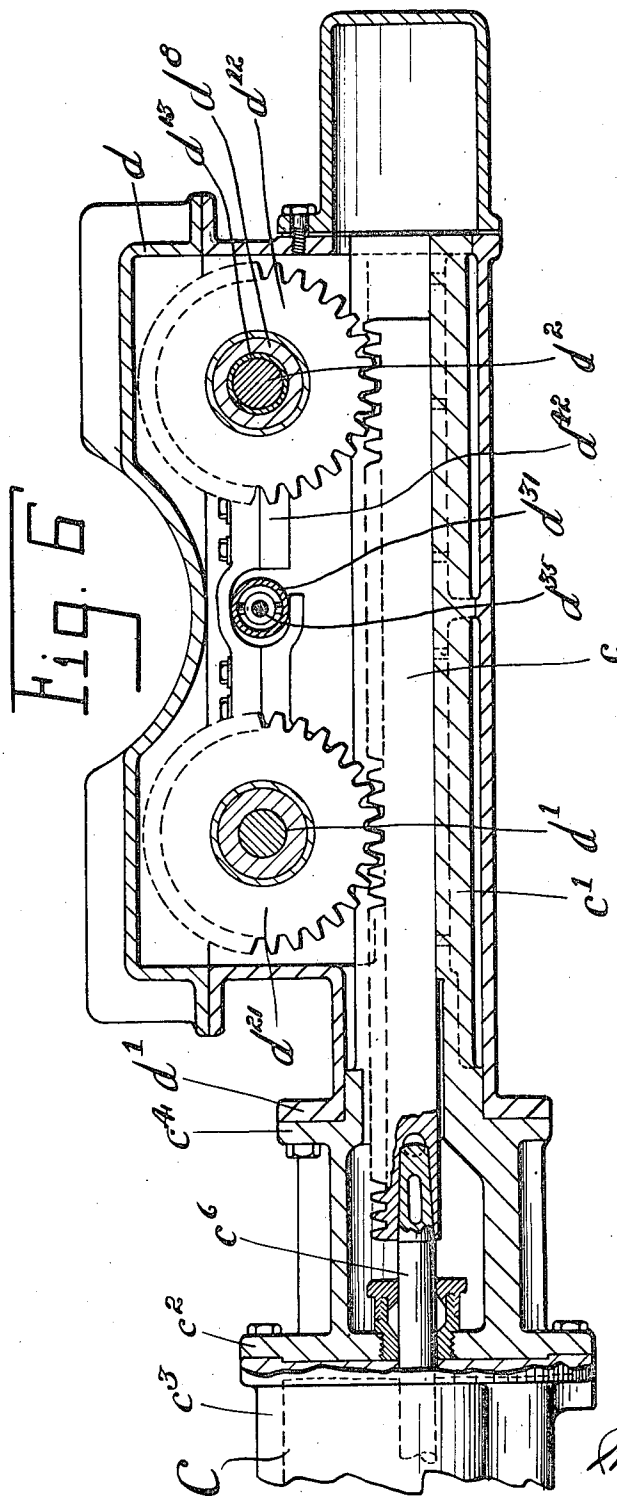
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W. T. HANNA
MECHANICAL STOKER

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5 Sheets-Sheet 5



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UNITED STATES PATENT OFFICE.

WILLIAM T. HANNA, OF CINCINNATI, OHIO.

MECHANICAL STOKER.

Application filed July 6, 1921. Serial No. 482,790.

To all whom it may concern:

Be it known that I, WILLIAM T. HANNA, a citizen of the United States of America, and a resident of Cincinnati, in the county of Hamilton and State of Ohio, have invented a new and useful Improvement in a Mechanical Stoker, of which the following is a specification.

My invention relates to the class of mechanical stokers which are especially adapted for use in stoking locomotive engines.

An object of my invention is to provide a device of the type referred to wherein it is possible to readily disassociate different parts of the device in order that defective and broken parts of the device may be readily removed and new parts installed in their place in a minimum of time, whereby it will be unnecessary to hold a locomotive out of service for any considerable periods of time because of stoker troubles.

Another object of my invention is to provide a device wherein continuous motion is imparted to the feed of the fuel.

Another object of my invention is to provide means whereby the feed of the fuel may be readily reversed or totally stopped.

These and other objects are attained by the means described herein and disclosed in the accompanying drawings, in which—

Fig. 1 is a perspective view of a stoker mechanism embodying my invention, the observer standing at the rear end of the device and looking forwardly.

Fig. 2 is a plan view of the power transmission mechanism forming a detail of my invention.

Fig. 3 is a sectional view on line 3—3 of Fig. 2.

Fig. 4 is a sectional view on line 4—4 of Fig. 2.

Fig. 5 is an enlarged view on line 5—5 of Fig. 3 showing parts seen by the observer when standing at the fore part of the stoker and looking rearwardly.

Fig. 6 is a sectional view on line 6—6 of Fig. 2.

Fig. 7 is an enlarged sectional view on line 7—7 of Fig. 2.

The feed trough A is disposed upon the locomotive tender and communicates, by means of a suitable feed tube, with the mechanism B located on the engine. The driving mechanism C is disposed substantially intermediate the feed trough A and the mechanism B, and is adapted to actuate the

transmission mechanism D from which power is transmitted to the various moving parts of the device. The transmission mechanism D comprises various cooperating elements adapted to transmit power from the mechanism C to the fuel moving parts of the device in a forward or a reverse direction.

The feed trough A is mounted upon a tender in a manner that is well known in the art and is adapted to have fuel fall thereinto by gravity or be thrown thereinto by the operator of the device in a well known manner. A spiral screw *a* is revolubly mounted within the lower portion of the trough A and is adapted to move fuel forwardly in the trough. The forward end of the trough communicates with a feed tube *a'* into which the spiral screw *a* extends and through which the screw is adapted to move the aforesaid fuel. The spiral screw *a* extends into the feed tube *a'* terminating adjacent the forward end thereof. The shaft *a*², forming a part of the spiral screw *a*, extends through the rear end of the trough A and has mounted upon it a gear *a*³ intermeshing with a gear *a*⁴ mounted upon the shaft *a*⁵ extending substantially parallel with the shaft *a*² and revolubly mounted upon the exterior of the trough A by any suitable means such as brackets *a*⁶. The forward end of the shaft *a*⁵ has mounted upon it a universal joint *a*⁷. An angular bar *a*⁸ extends forwardly from the forward member of the universal joint *a*⁷. The angular bar *a*⁸ is driven from the transmission mechanism D in a manner which will be explained hereafter. The forward end of the feed tube *a'* communicates with an upwardly extending feed conduit *a*⁹ by means of a swivel or ball and socket joint *a*¹⁰. The feed conduit *a*⁹ communicates at its upper end with the interior of the casing *b* of the mechanism B.

The chamber *b'* is formed at the lower end or bottom of the casing *b* and communicates with the conduit *a*⁹ and with the upwardly and outwardly inclined tubes *b*² formed within the casing *b*, and in which tubes the spiral screws *b*³ are adapted to be revolubly actuated. The tubes *b*² and the spiral screws *b*³ comprise the elevating conveyers adapted to carry the fuel from the chamber *b'* to a point near the upper end of the casing *b*, from which place the fuel is then discharged into the furnace door

opening b^4 shown in dotted lines in Fig. 1. The casing b is preferably pear shaped and has an aperture b^{13} formed on its rear wall b^5 adapted to be positioned in substantially horizontal alignment with the firing door opening of a locomotive, and which firing door opening is embraced by the forward wall of the casing b . The doors b^6 mounted upon the casing b are adapted to close the aperture b^{13} in the rear wall of the casing b which aperture is in substantial horizontal alignment with the firing door opening b^4 . The sides b^7 of the casing are removably mounted upon the center portion thereof by bolting the same to one another, the bolts being passed through the contacting flanges b^8 formed upon the central portion of the casing and upon the sides thereof. The sides b^7 form substantially one-half of each of the conduits b^2 , longitudinally within which the spiral screws b^3 revolvably extend. An observation door b^9 is mounted upon the rear wall of the casing b and when removed permits access to the chamber b' within the casing b . The spiral screws b^3 are driven from the power transmission mechanism D in a manner which will be explained hereafter. The shafts b^{10} , on which the spiral plates of the screws b^3 are mounted, extend through the lower end of the casing b and each has mounted upon it a member of a universal joint b^{11} . An angular socket b^{12} is formed upon the lower member of the universal joint b^{11} for a purpose which will be explained hereafter.

The driving mechanism C may be an engine of any type adapted to impart reciprocating motion to a rack c extending into the casing d of the transmission mechanism D. The rack c is slidably mounted upon a rack housing c' , which extends removably into the casing d transversely thereto. The rack housing c' has a flange c^2 formed at its outer end whereby the rack housing is removably mounted upon the cylinder c^3 of the engine C. A second flange c^4 is formed on the rack housing, said second flange being removably mounted upon a flange d' formed on the casing d . Suitable bolts are used to secure the several flanges upon one another. The rack housing has a longitudinal way c^5 formed therein, within which way the rack may be longitudinally reciprocated by means of the piston rod c^6 of the engine. The engine is of the reversible type, wherefore the cylinder on each side of the piston may be exhausted at will. This is of importance in the removing of foreign matter that may be admixed with the fuel and which may lodge between the parts so as to jam the parts and stop the mechanism.

The transmission mechanism comprises a casing d , transversely to which casing and through the lower portion of which extends

the rack housing c' . The parallel shafts d' and d^2 are revolvably mounted upon the housing and extend transversely to the line of movement of the rack c . The ends of the shaft d^2 are cylindrical and have formed between them a section d^3 substantially square in cross section. The one cylindrical end d^4 is of a diameter greater than the section d^3 and the other cylindrical portion of the shaft. The enlarged portion d^4 is mounted upon a suitable bearing mounted upon the casing, and with the reduced portion of such shaft, which reduced portion is in like manner mounted upon a bearing mounted upon the casing, serves to revolvably mount the shaft upon the casing d . The central portion of the shaft is disposed within the chamber d^5 formed within the casing d , and the ends of the shaft extend beyond the casing walls. The reduced portion of the shaft has a collar d^6 mounted upon it and the enlarged portion has a coupling d^7 mounted upon it, the collar and coupling comprising means limiting the lateral movement of the shaft. Interiorly to the chamber d^5 , and mounted upon the shaft d^2 , is a sleeve d^8 having a square central portion d^9 upon which is mounted a toothed clutch member d^{10} . If desired the square portion of shaft d^2 may be dispensed with and the clutch member d^{10} be splined thereupon. A cylindrical portion is formed on the sleeve on each side of the square portion d^9 , and upon the cylindrical portions are mounted the clutch gears d^{11} and d^{12} . The gear d^{11} is keyed to the sleeve. A bushing d^{13} is pressed into the sleeve and provides a bearing for the sleeve upon the shaft d^2 . The gear d^{12} is loosely mounted upon the sleeve and engages the rack c . The gear d^2 has formed upon its one side a series of teeth d^{16} adapted to intermesh with the teeth formed on the clutch member d^{10} when gear d^2 moves in a given direction, and to disengage themselves from the teeth in the clutch member when gear d^2 moves in an opposite direction. The sleeve has formed upon its end, into which the bushing d^{13} is pressed, a series of clutch teeth d^{17} which are adapted to engage complementary clutch teeth d^{18} formed on the yoke d^{19} slidably mounted on the square portion d^3 of the shaft d^2 .

The shaft d' has mounted upon it a gear d^{20} corresponding to the gear d^{11} and a gear d^{21} corresponding to the gear d^{12} . A sleeve is revolvably mounted upon the shaft d' in the same manner as is the sleeve d^8 mounted upon the shaft d^2 . The gear d^{20} is keyed to the sleeve on the shaft d' and the gear d^{21} is revolvably mounted on said sleeve. The sleeve mounted upon the shaft d' differs from the sleeve d^8 in that it has two square portions, one of each of which is adapted to lie upon each side of the gear 21. A clutch member d^{22} is disposed upon the square por-

tion of the sleeve intermediate the ends thereof, and a reverse clutch member d^{23} is mounted upon the square end of the sleeve adapted to extend beyond the gear d^{21} . The gear d^{21} has formed on its opposite side a series of teeth d^{24} and d^{25} constructed as are the teeth on the gear d^{12} . The teeth d^{24} are adapted to mesh with the teeth on the clutch member d^{22} during the time when the teeth d^{16} on the gear d^{12} are out of engagement with the teeth on the clutch member d^{10} .

Each clutch member is revolubly mounted within a band bearing d^{14} having the stud bearings d^{15} extending therefrom. Means are provided to retain the clutch members in such positions that the teeth thereof will not engage the teeth on the gears d^{12} and d^{21} . This arrangement will be explained hereafter.

The shaft d' is mounted upon suitable bearings which in turn are mounted upon the casing d in substantially the same manner as are mounted the bearings supporting the shaft d^2 upon the casing. The stud shafts d^{26} are mounted in the lower part of the casing below and parallel with the shafts d' and d^2 , and have mounted upon them the combined spur and bevel gears d^{27} . The spur teeth of these gears intermesh with one another and also engage one with the teeth of gear d^{11} and the other with the teeth of gear d^{20} . The bevel gear portions of the gears d^{27} engage the bevel gears d^{28} mounted upon the vertical shafts d^{29} mounted upon suitable bearings mounted upon the casing. The upper ends of the shafts d^{29} extend from the casing and have mounted upon them a coupling d^{30} of a universal joint. From the foregoing it will be apparent that motion from both of the gears d^{12} and d^{21} may be transmitted jointly to both the bevel gears d^{28} .

A tube shaft d^{31} , parallel with shafts d' , d^2 and d^{26} , is mounted upon the casing and extends through the chamber d^5 , and has formed in it the vertical slots d^{32} , d^{33} and d^{34} . Interiorly to the shaft, and extending longitudinally thereof, is a rod d^{35} having a bifurcated end d^{36} and a threaded end d^{37} . A pin d^{38} extends through the slots d^{32} in the tube shafts and extends between the branches of the bifurcated end of the rod. A shoulder d^{39} is formed at the junction of the bifurcated end of the rod with the center portion of the rod. A block d^{40} is slidably mounted upon the rod d^{35} and has extending from it the pins d^{41} which extend through the elongated slots d^{33} in the tube shaft. A fork or yoke d^{42} is slidably mounted upon the exterior of the tube shaft and is secured to the block d^{40} by means of the pins d^{41} . The stud bearing d^{15} on the band bearings mounting the clutch members engage the fork. A second block d^{43} is mount-

ed upon a rod d^{35} and is in like manner connected with a yoke or fork d^{44} mounted upon the exterior of the tube shaft. The yoke or fork d^{42} has pivotally mounted upon its opposite ends the clutch members d^{10} and d^{22} . The fork d^{44} has pivotally mounted upon its one end the clutch member d^{23} , the other end of the fork d^{44} being pivotally mounted upon the arm d^{45} extending from the plate d^{45} mounted upon the tube shaft d^{31} . The plate d^{45} has formed upon it, opposite to the arm d^{45} , the lugs d^{49} adapted to engage the fork d^{42} on opposite sides of the pivotal mounting of said fork upon the tube shaft, whereby the parts may be positioned as shown in Fig. 2. The rod d^{35} , contained within the tube shaft, has mounted adjacent its threaded end an abutment block d^{50} between which abutment block and the block d^{43} is mounted a spring d^{51} . Lock nuts d^{52} mounted upon the threaded end of the rod d^{35} are employed to adjust the tension of the spring d^{51} upon the blocks d^{50} and d^{43} . The block d^{40} engages the shoulder d^{39} on the rod and therefore is acted upon by spring d^{51} . In order to provide ready access to the lock nuts d^{52} , the end of the tube shaft extending from the casing has mounted upon it a cap d^{53} which may be removed in order to adjust the lock nuts d^{52} . The uncapped end of the tube shaft extends from the other end of the casing and is operatively connected with a lever d^{54} , whereby the tube shaft may be reciprocated in the direction of its length. The reciprocation of the tube shaft is employed to move the clutch members into engagement with the gears d^{12} and d^{21} .

The couplings d^{30} mounted upon the upper ends of the vertical shafts d^{29} have each mounted upon them a complementary coupling d^{55} , the two couplings forming part of a universal joint. Each coupling d^{55} has an angular shank formed upon it which telescopes into the angular socket b^{12} formed on the lower end of one of the universal joints b^{11} .

The coupling d^7 mounted upon the enlarged end of the shaft d^2 has mounted upon it the complementary coupling d^{56} , thereby providing a universal joint, and the said complementary coupling has formed upon it an angular socket d^{57} into which the angular bar a^8 extends telescopically. A suitable lever d^{58} is connected with the fork d^{19} in order to control the transmission of motion from the sleeve d^8 through the shaft d^2 to the shaft a^5 .

A lever c^7 , operative upon the engine C, is adapted to control the operation of this engine.

Suitable means such as the notched plate d^{58} , shown adjacent the lever d^{54} , may be employed with the respective levers to lock the different levers in their various posi-

tions. The notched plate d^{53} , with which the lever d^{54} controlling the movement of the tube shaft d^{31} cooperates, has disposed within it three notches whereby the tube shaft may be retained in such positions that the clutch members may be retained in any one of three positions, firstly, wherein all the clutch members are out of engagement with the gears d^{11} and d^{12} , secondly, wherein the clutch members d^{10} and d^{22} may engage the gears d^{12} and d^{21} , and thirdly wherein the clutch member d^{23} may engage the gear d^{21} . The lever d^{54} is pivotally mounted upon a transverse shaft d^{60} , pivotally mounted upon the exterior of the casing. An arm d^{61} is connected with the tube shaft d^{31} by means of a link d^{62} pivotally connected with the arm d^{61} and with the tube shaft d^{31} .

The operation of my device is as follows:

When the parts are in the positions as shown in the accompanying drawings, the rack c is free to be reciprocated and to thereby revolvably actuate the clutch gears d^{12} and d^{21} , without imparting any motion to the conveyers. Assuming now that the rack c is being reciprocated and that the lever d^{54} is actuated so as to move the tube shaft d^{31} in such direction that the cap d^{53} is moved further from the casing d than is shown in Figs. 2 and 4, wherefore the clutch members d^{10} and d^{22} assume such positions that their respective teeth may engage the teeth upon the gears d^{12} and d^{21} respectively. The yoke d^{42} , because of its pivotal mounting upon the pins d^{41} , and because of the action of spring d^{51} upon said pivotal mounting, causes the clutch members d^{10} and d^{22} , to alternately be moved into and out of engagement with the gears d^{12} and d^{21} respectively. In this way motion is transmitted first from the gear d^{12} to the sleeve d^8 , to the gear d^{11} , and then to the combined bevel and spur gears d^{27} , from which the elevating conveyers are actuated, and then after the rack has completed its stroke in one direction and the clutch member d^{10} is disengaged from the gear d^{12} , the gear d^{12} is free to be revolvably actuated in an opposite direction without effecting the movement of the sleeve d^8 , while the gear d^{21} is imparting motion through its complementary clutch member d^{22} to the sleeve mounting the gear d^{21} , and from this sleeve to the gear d^{20} , and to the combined bevel and spur gears d^{27} . It should be observed that there is a continuous movement of the sleeves upon which the clutch gears d^{12} and d^{21} are mounted, although these gears alternately are the driving forces actuating these sleeves. Therefore, when the clutch d^{10} is moved into engagement with the sleeve d^8 , a continuous motion is imparted from the sleeve d^8 to the shaft a^5 extending parallel with the conveyer disposed below the

tender. If, for any reason it is desired to reverse the feed of the fuel, the lever d^{54} is actuated so as to move the tube shaft d^{31} to its opposite limit, wherefore the clutch members d^{10} and d^{22} are disengaged from the gears d^{12} and d^{21} and the clutch member d^{23} is moved into engagement with the gear d^{21} . The yoke d^{44} , together with the spring d^{51} , actuates the clutch member d^{23} in the same manner in which the clutch members d^{10} and d^{22} are actuated. It should be observed that during the reverse operation there is an intermittent motion transmitted to the conveyers. This intermittent action of the conveyers is sufficient to provide the necessary movement of the fuel which might be necessary in order to permit the removal of obstructions from the conveyers, etc., and which removal of obstructions would be one of the reasons why the reverse would be used. It should be observed that with this arrangement it is possible to discontinue the feed of fuel from the tender to the elevating mechanism while the elevating mechanism is operative either in a forward or a reverse action.

Fuel from the tender is fed into the conveyer trough A and this passes through the feed tube a' by means of the spiral screw a and the extension thereof. After the fuel is discharged into the chamber b' in the casing b , it is elevated by the elevating conveyers disposed within the casing b , and discharged in the firing door of the engine.

What I claim is:

1. In a stoker mechanism the combination of an elevating mechanism comprising a pear shaped casing adapted to embrace a firing door of a furnace, upwardly and outwardly inclined feed tubes in the casing communicating at their tops with the firing door opening and at their bottoms communicating with a common chamber formed in the casing, spiral screws in the inclined feed tubes and extending through the lower wall of the casing, a feed trough, a conduit communicating with the feed trough and the common chamber through the rear wall of the casing, a spiral screw mounted in the feed trough extending through the wall thereof and into the conduit, a shaft mounted on the feed trough, intermeshing gears on said shaft and on the end of the last mentioned spiral screw, an engine, and a power transmission mechanism actuated by the engine for actuating the shaft mounted on the feed trough and the spiral screws in the pear shaped casing.

2. In a stoker mechanism the combination of an elevating mechanism comprising a pear shaped casing adapted to embrace a firing door of a furnace, upwardly and outwardly inclined feed tubes in the casing communicating at their tops with the firing door opening and at their bottoms commu-

5 communicating with a common chamber formed in
 the casing, an observation door in the rear
 wall of the casing, spiral screws in the in-
 clined feed tubes and extending through
 10 the lower wall of the casing, a feed trough,
 a conduit communicating with the feed
 trough, and the common chamber in the
 casing, a spiral screw mounted in the feed
 trough extending through the wall thereof
 15 and into the conduit, a shaft mounted on
 the feed trough, intermeshing gears on said
 shaft and on the end of the last mentioned
 spiral screw, an engine, a power transmis-
 sion mechanism actuated by the engine
 20 adapted to continuously and revolubly ac-
 tuate the shaft on the feed trough and the
 spiral screws in the pear shaped casing, and
 means to selectively and collectively drive
 the last mentioned spiral screws and the
 shaft.

25 3. In a stoker mechanism the combination
 of an elevating mechanism comprising a
 pear shaped casing adapted to embrace a
 firing door of a furnace, upwardly and out-
 wardly inclined feed tubes in the casing
 30 communicating at their tops with the firing
 door opening and at their bottoms commu-
 nicating with a common chamber formed in
 the casing, spiral screws in the inclined feed
 tubes and extending through the lower wall
 of the casing, a feed trough, a conduit com-
 35 municating with the feed trough and the
 common chamber in the casing through the
 rear wall thereof, a spiral screw mounted
 in the feed trough extending through the
 wall thereof and into the conduit, a shaft
 40 mounted on the feed trough, intermeshing
 gears on said shaft and on the end of the
 last mentioned spiral screw, an engine, a
 power transmission mechanism actuated by
 the engine adapted to continuously and rev-
 45 olubly actuate the shaft on the feed trough
 and the spiral screws in the pear shaped
 casing, means to selectively and collectively
 drive the last mentioned spiral screws and
 the shaft, and lever actuated means to re-

verse the movement of the spiral screws and the shaft.

4. In a stoker mechanism the combination
 of an elevating conveyer, a feed trough, a
 feeding conveyer adapted to move fuel from
 the feed trough to the elevating conveyer, a
 reversible engine, a transmission mechanism
 55 operatively connected with the engine, with
 the elevating mechanism and with the feed-
 ing conveyer mechanism, adapted to con-
 vert the motion imparted thereto by the en-
 gine into a continuous forward motion of
 the conveyer mechanisms, and lever actuated
 means to reverse the action of the conveyer
 mechanisms.

5. In a stoker mechanism the combination
 of an elevating conveyer, a feed trough, a
 feeding conveyer adapted to move fuel from
 the feed trough to the elevating conveyer, a
 reversible engine, power transmission means
 65 operatively connected with the engine
 adapted to impart continuous motion to the
 elevating conveyer and to the feeding con-
 veyer, and means to render the feeding con-
 veyer inoperative during the movement of
 the elevating mechanism.

6. In a stoker mechanism the combination
 of an elevating conveyer, a feed trough, a
 feeding conveyer adapted to move fuel from
 the feed trough to the elevating conveyer, a
 reversible engine, a transmission mechanism
 75 operatively connected with the engine, with
 the elevating mechanism and with the feed-
 ing conveyer mechanism, adapted to con-
 vert the motion imparted thereto by the
 engine into a continuous forward motion of
 the conveyer mechanism, means to reverse
 the action of the conveyer mechanisms, and
 80 means to render the feeding mechanism in-
 operative during the movement of the ele-
 vating mechanism.

In testimony whereof, I have hereunto
 subscribed my name this 30th day of June,
 1921.

WILLIAM T. HANNA.