951,712.

C. W. WILLEY.

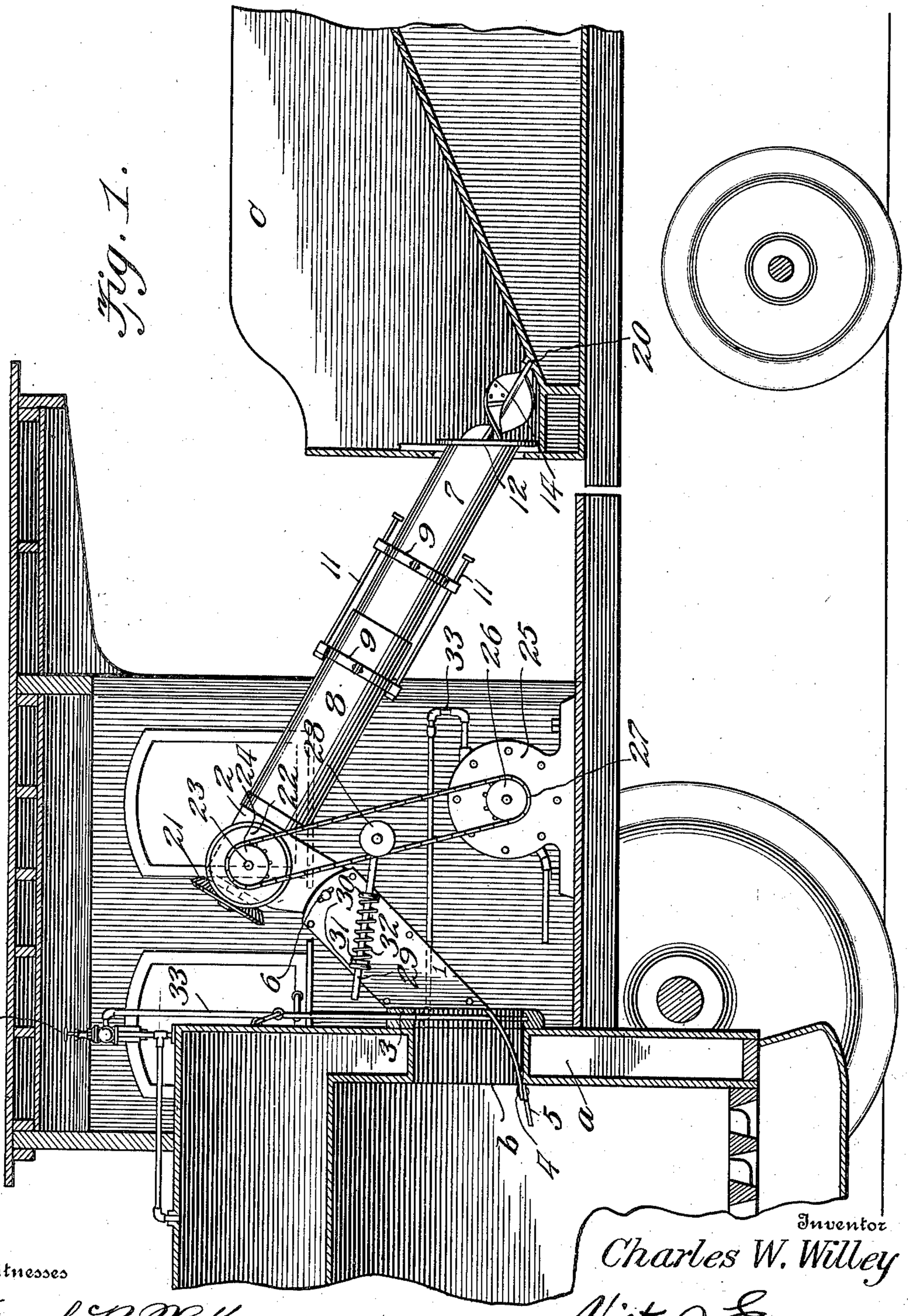
MECHANICAL STOKER.

APPLICATION FILED NOV. 29, 1907.

Patented Mar. 8, 1910.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses

Frank B. Hoffman.

J. W. Garner

By

Inventor

Charles W. Willey

Victor J. Evans

Attorney

C. W. WILLEY.

MECHANICAL STOKER.

APPLICATION FILED NOV. 29, 1907.

951,712.

Patented Mar. 8, 1910.

2 SHEETS—SHEET 2.

Fig. 5.

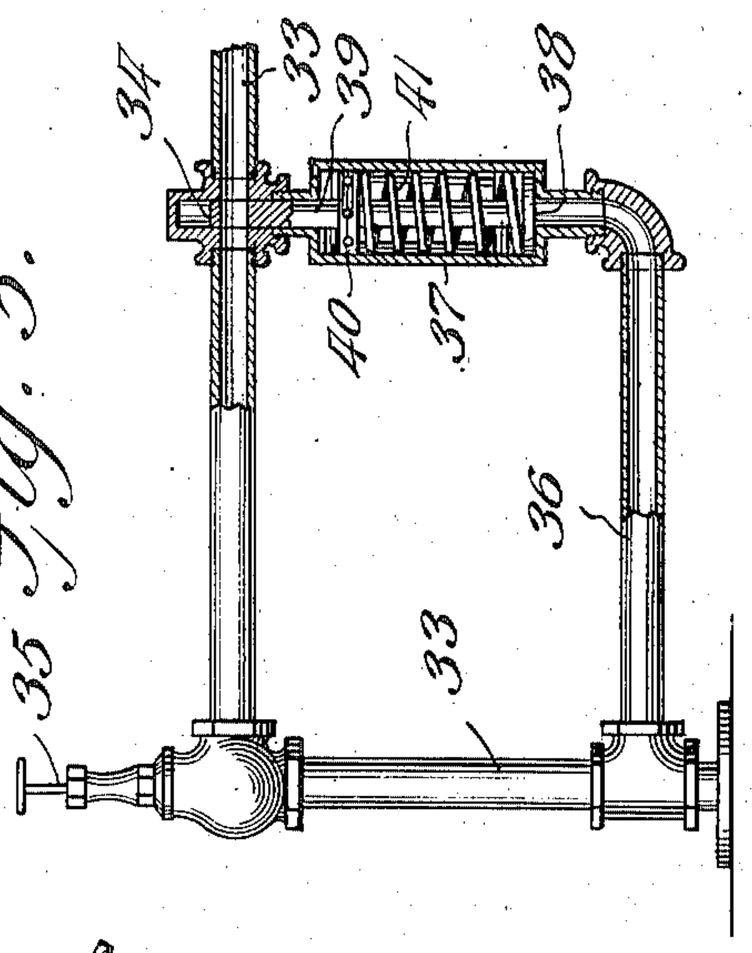


Fig. 3.

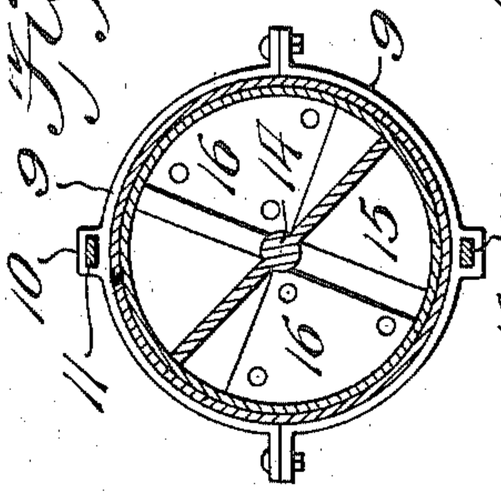


Fig. 4.

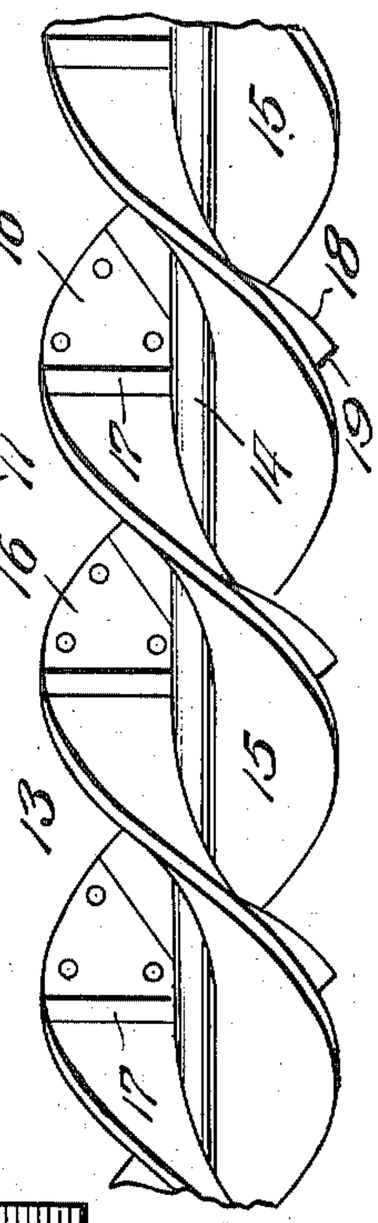
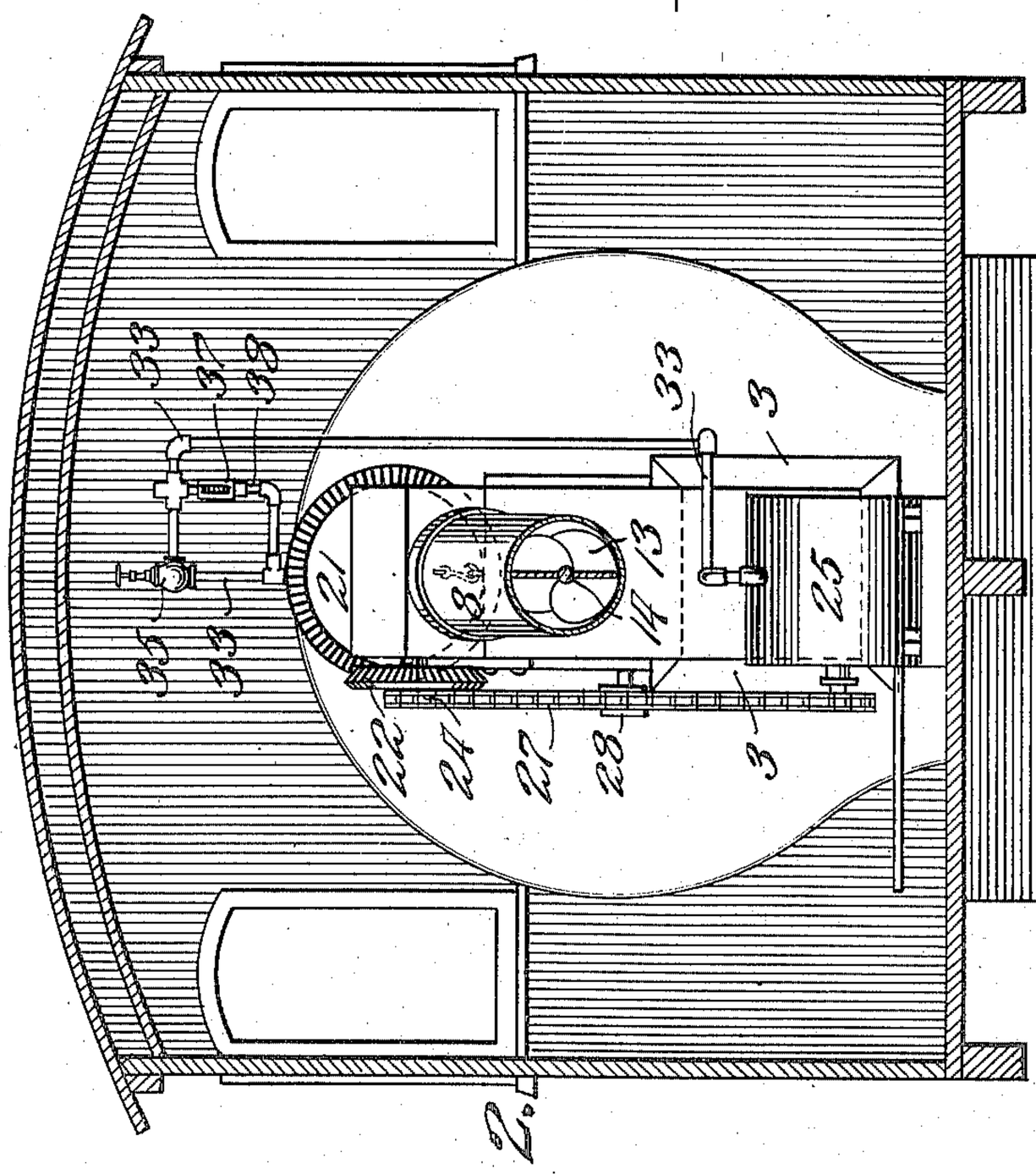


Fig. 2.



Witnesses

Frank B. Hoffman.

J. W. Garner

Inventor

Charles W. Willey

By Victor J. Evans

Attorney

UNITED STATES PATENT OFFICE.

CHARLES W. WILLEY, OF BIRNIE, MANITOBA, CANADA.

MECHANICAL STOKER.

951,712. Specification of Letters Patent. Patented Mar. 8, 1910.

Application filed November 29, 1907. Serial No. 404,453.

To all whom it may concern:

Be it known that I, CHARLES W. WILLEY, a subject of the King of Great Britain, residing at Birnie, in the Province of Manitoba, in the Dominion of Canada, have invented new and useful Improvements in Mechanical Stokers, of which the following is a specification.

This invention is an improved mechanical stoker for use in feeding fuel to the furnace of a locomotive or other steam engine and the said invention consists in the construction, combination and arrangement of devices hereinafter described and claimed.

The object of my invention is to provide a machine of this character which operates automatically to supply fuel to a furnace as the same is needed so as to maintain practically continuous steam pressure in the boiler.

In the accompanying drawings:—Figure 1 is a vertical longitudinal sectional view of a portion of a locomotive and tender provided with a mechanical stoker constructed in accordance with my invention. Fig. 2 is a transverse sectional view of the same. Fig. 3 is a detail transverse sectional view of the fuel conveyer. Fig. 4 is a detail elevation of the fuel conveying screw. Fig. 5 is a detail view, partly in elevation and partly in section of the means for automatically supplying steam to the engine which operates the fuel conveyer.

In accordance with my invention I provide a chute which comprises a lower section 1 and an upper section 2. Said lower section, which is inclined as shown, is provided with flanges 3 at its sides, at its lower end, to bear against the end of the boiler indicated at *a* and the said flanges are secured to the boiler head to dispose the lower end of the said lower section of the chute opposite the fire box *b* of the furnace. The said lower section of the chute is provided with an extended bottom plate 4 which enters and extends through the lower side of the fuel door opening and is provided at its lower end with V-shaped plates 5 which are secured thereto and form teeth which effect a separation of the pieces of coal as the same extend in the chute and serve to evenly distribute coal over the fire. The upper section 2 of the chute is pivotally connected to the lower section as at 6 so that said upper section of the chute is mounted for angular movement in a vertical plane.

A fuel conveying tube comprises a lower section 7 and an upper section 8 coupled together, the upper section of slightly greater diameter than the lower section and having its upper end secured to the outer side of the pivoted upper section 2 of the chute and discharging into said upper chute section. The said sections 7 and 8 of the conveyer tube are telescopically related so that the lower section is slidable longitudinally in the upper section and each of the said conveyer sections is provided with a band 9 having a plurality of outwardly extending lugs 10. Rods 11 pass through openings in the said lugs and are slidable in the lugs of the lower band and co-act with such band to keep the lower tubular section 7 in alinement with the upper section 8 under all conditions, so that while the fuel conveying tube is longitudinally extensible by reason of the telescopic movement of the section 7 of the section 8 said sections are prevented from moving angularly with reference to each other.

In the embodiment of my invention here shown the lower section 7 of the conveyer tube passes through an opening in the front side of the coal compartment *c* of the tender and is provided with a flange 12 which is secured on the inner side of the front wall of the tender. The conveyer screw 13 extends longitudinally through and is revoluble in the fuel conveying tube. Said screw comprises a central shaft 14 and spirally disposed blades 15 which extend thereon nearly from end to end thereof. The said spiral blades are provided with stop shoulders 16 at suitable distances apart, which in practice are preferably wedge-shaped plates 17, which are secured to the blades as by means of rivets or other suitable devices and present longitudinal outer surfaces 18 which are oblique to the proximate localized surfaces of the blades to which they are attached, and shoulders 19 at their upper ends. Hence, during the rotation of the conveyer screw the oblique surfaces 18 of the said stops offer minimum resistance to the passage of the coal or other fuel upwardly between the spiral blades of the conveyer screw or shoulders 19 which are substantially at right angles to the said spiral blades offer effectual resistance to the downward passage, by gravity of the coal and thus the conveyer screw is enabled to neutralize any tendency of the coal to pass

downwardly thereon by gravity and the capacity of the conveyer screw is correspondingly increased since the coal is prevented from slipping. The lower end of the conveyer screw shaft is stepped as at 20 in a bearing in the inclined bottom of the coal compartment of the tender near the front end of the tender so that the rear end of the screw is disposed in the forward end of the tender and immediately in front of the inclined bottom of the said coal compartment. The upper end of the conveyer screw shaft has a bearing in the upper section 2 of the chute and is provided with a gear wheel 21 which engages a similar gear 22 mounted on a shaft 23 which extends from one side of said upper chute section. A sprocket wheel 24 is also secured on said shaft and, hence, in effect is secured to the gear 22 so that said sprocket wheel and said gear 22 can only revolve together.

A suitable motor, which is here indicated as a turbine steam engine 25 is secured in the floor of the engine cab or on any other suitable support and its shaft is provided with a sprocket wheel 26, connected by an endless sprocket chain 27 to the sprocket wheel 24. The said sprocket chain is initially slack and the same is kept at the requisite tension by means of a tightener pulley 28 which engages one lead thereof and is mounted at one end of a longitudinal movable arm 29 which arm is here shown as slidably mounted in keepers 30 on one side of the lower section of the chute. Said arm has a stop 31. A coiled extensile spring 32 bears between said stop and one of the keepers 20 so as to tend to move the arm 29 and, hence, also the tightening pulley 28 in one direction so that said tightening pulley is caused to take up the slack in the sprocket chain occasioned by the angular movement of the upper chute section that is caused by motion of the locomotive and the cab.

It will be understood from the foregoing description that when the motor or engine 25 is in operation the conveyer screw is revolved and is caused to convey coal from the tender to the upper end of the conveyer tube and discharge it therefrom into the upper section of the chute, so that the coal is caused to descend the chute by gravity and to be discharged into the furnace.

Within the scope of my invention any suitable means may be employed to control the operation of the motor or to drive the conveyer screw of the mechanical stoker. It is, however, an object of the invention to provide automatically operating means controlled by variations of steam pressure in the boiler to control the operation of the stoker driving motor. For the purpose of this specification I show at Fig. 5 such pressure controlled apparatus for controlling the operation of the stoker driving motor. A steam pipe 33 which leads from the boiler to the motor 25 is provided with an automatically acting valve 34 and with a manually operated valve 35. A branch pipe 36 which leads from the steam pipe 33 at a point near the boiler discharges into a cylinder 37 in which operates a piston 38. The rod 39 of this piston is connected to the valve 34, which in the present instance is a slide valve, and on the said piston rod and within the cylinder is a stop 40 in the upper end of the cylinder through which the piston rod slides. A spring 41 which in the present instance is shown as a coiled extensile spring is disposed in the cylinder on the piston rod and between the stop 40 and the piston and acts to force the piston downwardly and normally open the valve 34 to the fullest extent. The tension of the spring is such that it normally maintains automatically the acting valve 34 in open position at the normal working pressure of steam in the boiler so that the motor 25 is kept constantly at work when the valve 35 is open so that the automatic stoker is driven continuously and feeds coal in the required quantities continuously to the furnace. In the event that the steam pressure in the boiler becomes excessive its action on the piston 38 will be such as to move the piston against the tension of the spring 41 and cause the automatically acting valve 34 to be entirely or partially closed according to the steam pressure, and, hence, diminish or entirely cut off the supply of steam to the motor 25 with the result that the speed of the mechanical stoker will be controlled automatically by the pressure of steam in the boiler thereby enabling steam of uniform pressure to be maintained in the boiler and also effecting economy of coal.

The conveyer screw shaft is loosely and slidably mounted in the tender of the locomotive. The opening formed in the tender is enlarged so as to provide for the lateral movement of the conveyer tube, the flange 12 being adapted to close said opening.

Having thus described my invention, I claim:—

1. In apparatus of the class described, a locomotive and tender therefor, a chute adapted for attachment to the locomotive furnace, said chute having an angularly movable upper section, a conveyer tube comprising slidable sections, said tube being connected at its forward end to the angularly movable section of the chute and at its rear end to the tender, and a conveyer screw disposed in the tube and having its upper end journaled in a portion of the angularly movable section and its lower end loosely and slidably mounted in the tender.

2. In apparatus of the class described, a locomotive and tender therefor, a chute carried by the locomotive and having an

angularly movable section, a tube connecting the angularly movable section with the tender and comprising telescopic sections adapted for longitudinal movement with respect to each other, and a conveyer extending throughout the length of the said tube.

3. In an apparatus of the class described, a locomotive and tender therefor, a chute adapted for attachment to the furnace of the locomotive and having an upper section movable angularly in a vertical plane and adapted for slight sliding movement, a tube connecting the angularly movable section with the tender and comprising telescopically connected sections adapted for movement with respect to each other, and a spiral screw extending through the said tube and having its rear extremity extended beyond the tube and disposed in said tender.

4. In an apparatus of the class described, a locomotive and tender therefor, a chute adapted for attachment to the furnace of the locomotive and having an upper section movable angularly, a conveyer tube attached to the upper section, means at the opposite end of the tube for securing the same to the tender, said conveyer tube comprising a plurality of sections slidably connected to each other, bands carried by the sections of the said conveyer tube, apertured lugs upon the bands, rods having portions disposed in the apertures in said lugs, and a spiral screw extending throughout the entire length of the tube and having its extreme rear end mounted in the tender.

5. In an apparatus of the class described, a locomotive and tender therefor, a chute mounted upon the furnace of the locomotive and having a section adapted for angular and sliding movement, a bearing located within the tender, a telescopic conveyer tube having one end opening directly into the tender and slidably mounted in the said bearing and having its other end secured to the said pivoted section of the chute, and a spiral conveying screw operatively mounted within the said conveyer tube.

In testimony whereof I affix my signature in presence of two witnesses.

CHARLES W. WILLEY.

Witnesses:

JOHN T. WILLEY,

JOHN HANCOCK.