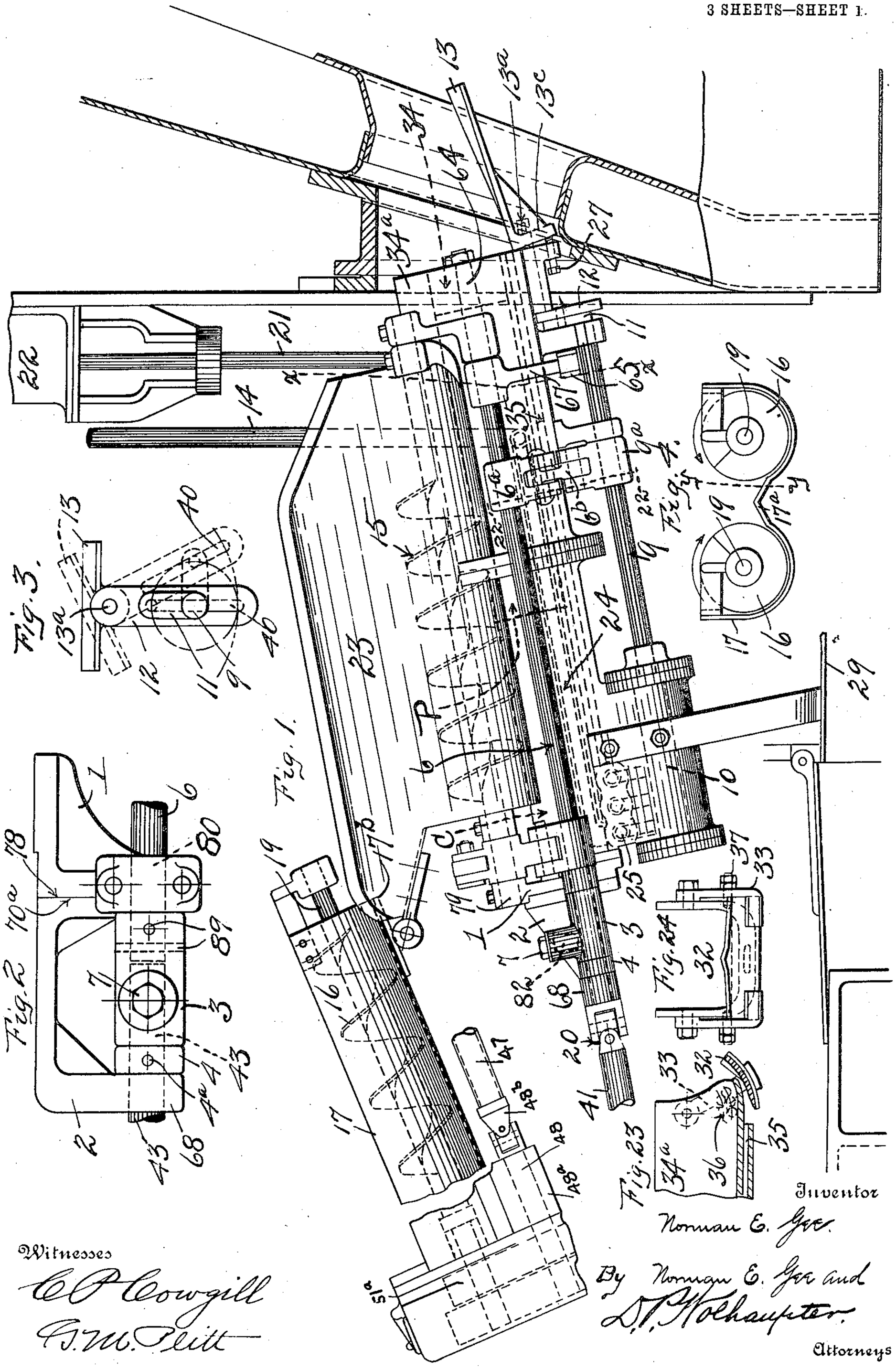
No. 847,061. PATENTED MAR. 12, 1907.

N. E. GEE.

MECHANICAL STOKER.

APPLICATION FILED MAY 7, 1906.

3 SHEETS—SHEET 1.



Witnesses

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Attorneys

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MECHANICAL STOKER.

APPLICATION FILED MAY 7, 1906.

3 SHEETS—SHEET 2.

Fig. 5

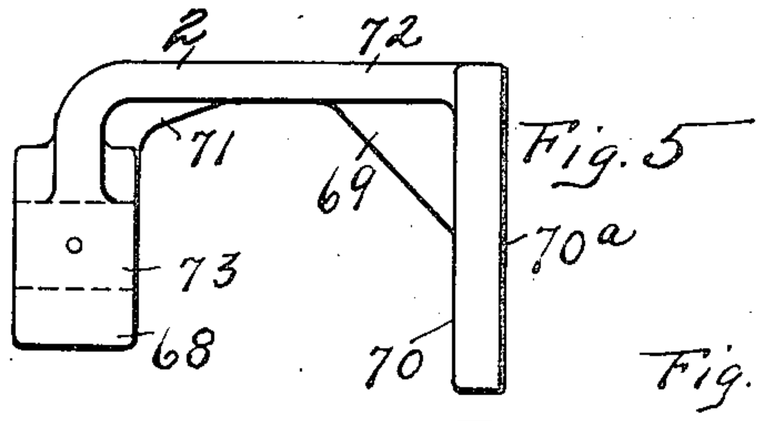


Fig. 6.

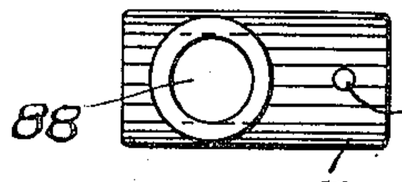


Fig. 6a

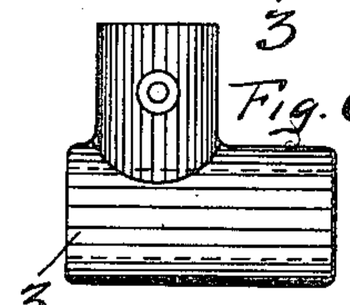


Fig 6b

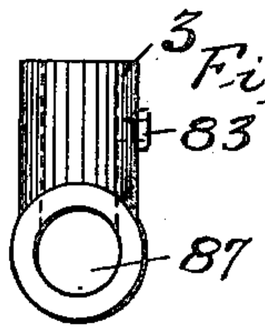


Fig. 5a

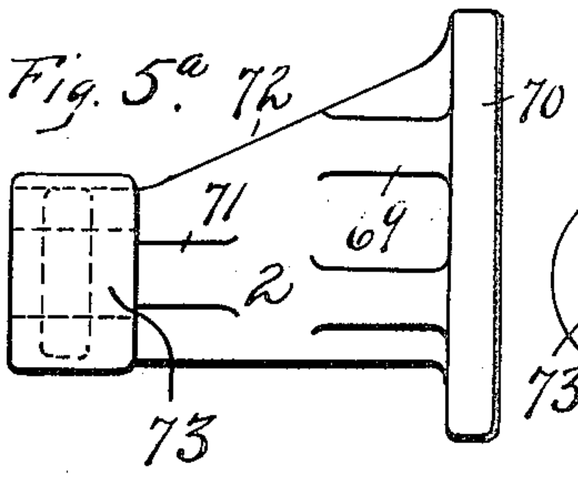


Fig. 5b

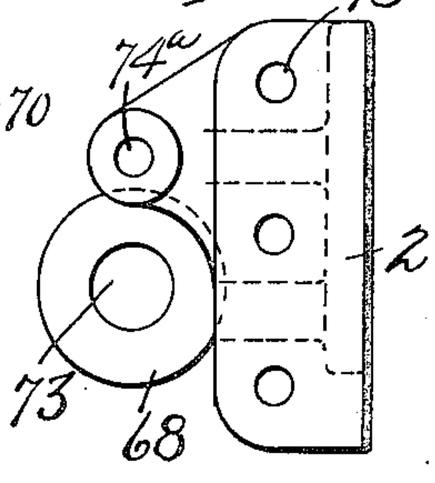


Fig. 7

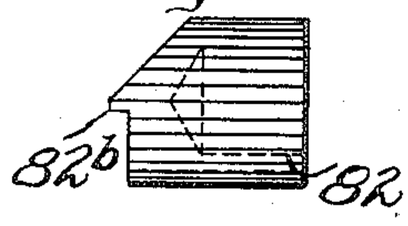


Fig. 7a

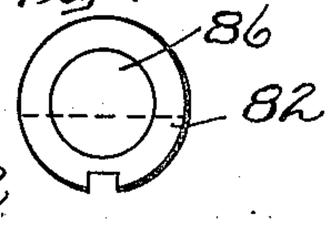


Fig. 8.

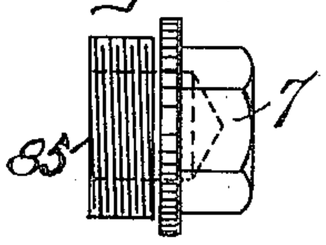


Fig. 8a

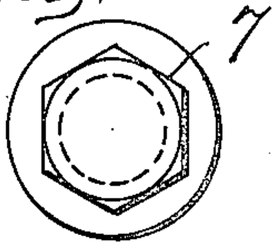


Fig. 9

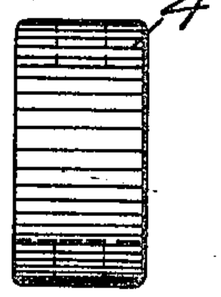


Fig. 9a

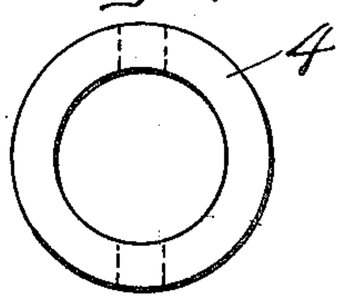


Fig. 17

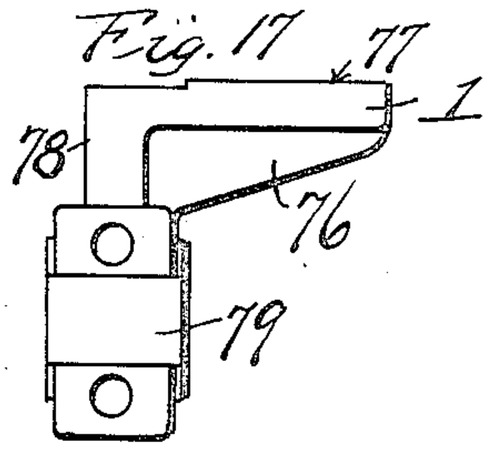


Fig. 10

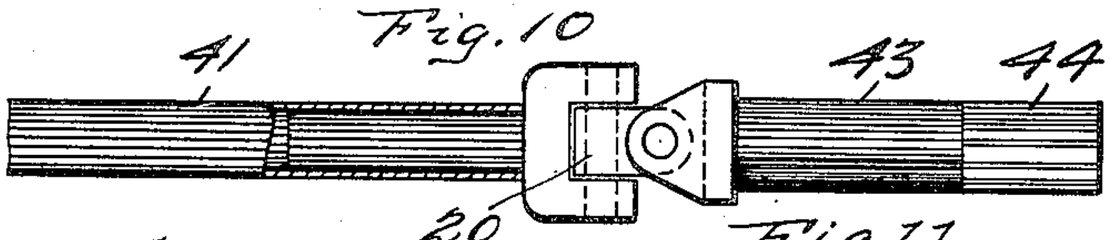


Fig. 12.

Fig. 11

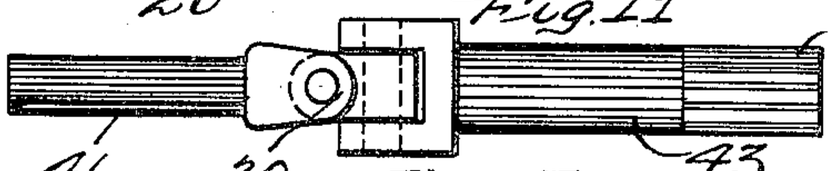


Fig. 17a

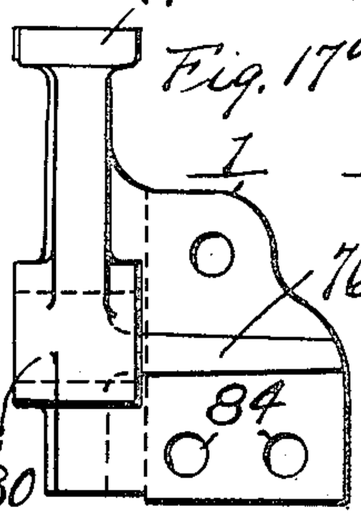


Fig. 17b

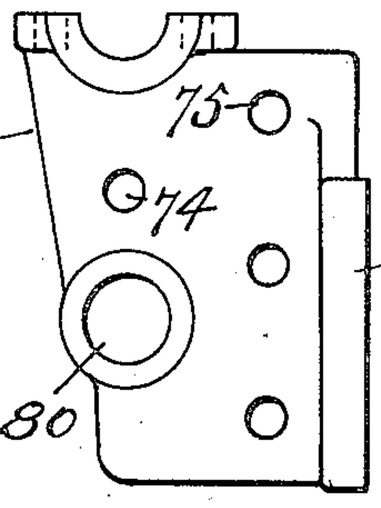


Fig. 15.

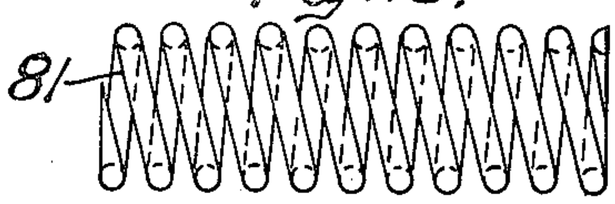


Fig. 16

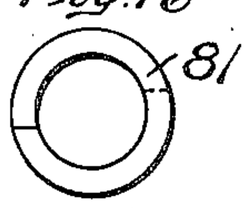


Fig. 13

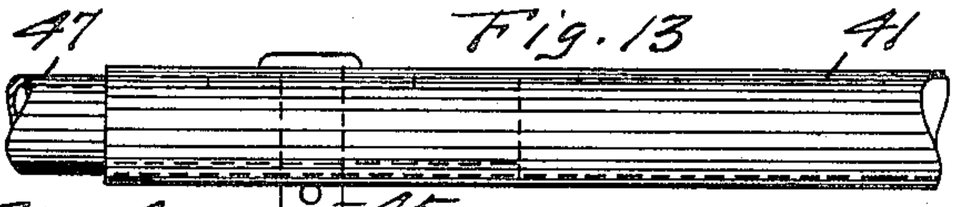
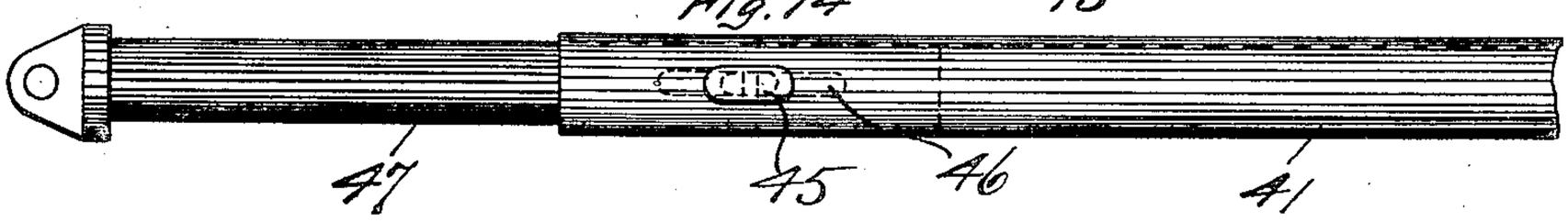


Fig. 14



Witnesses

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No. 847,061. PATENTED MAR. 12, 1907.

N. E. GEE.

MECHANICAL STOKER.

APPLICATION FILED MAY 7, 1906.

3 SHEETS—SHEET 3.

Fig. 22.

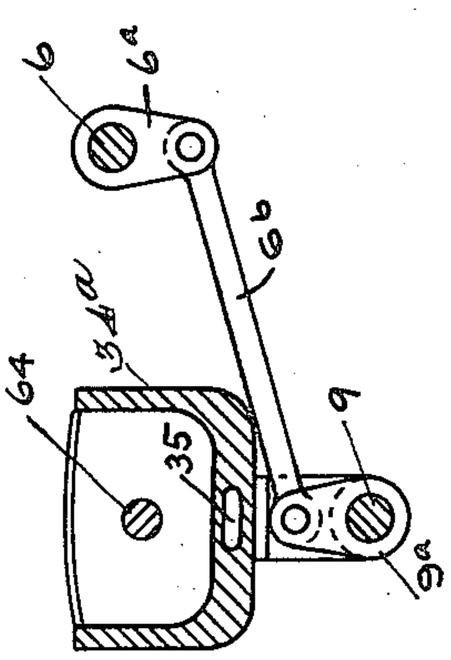


Fig. 18

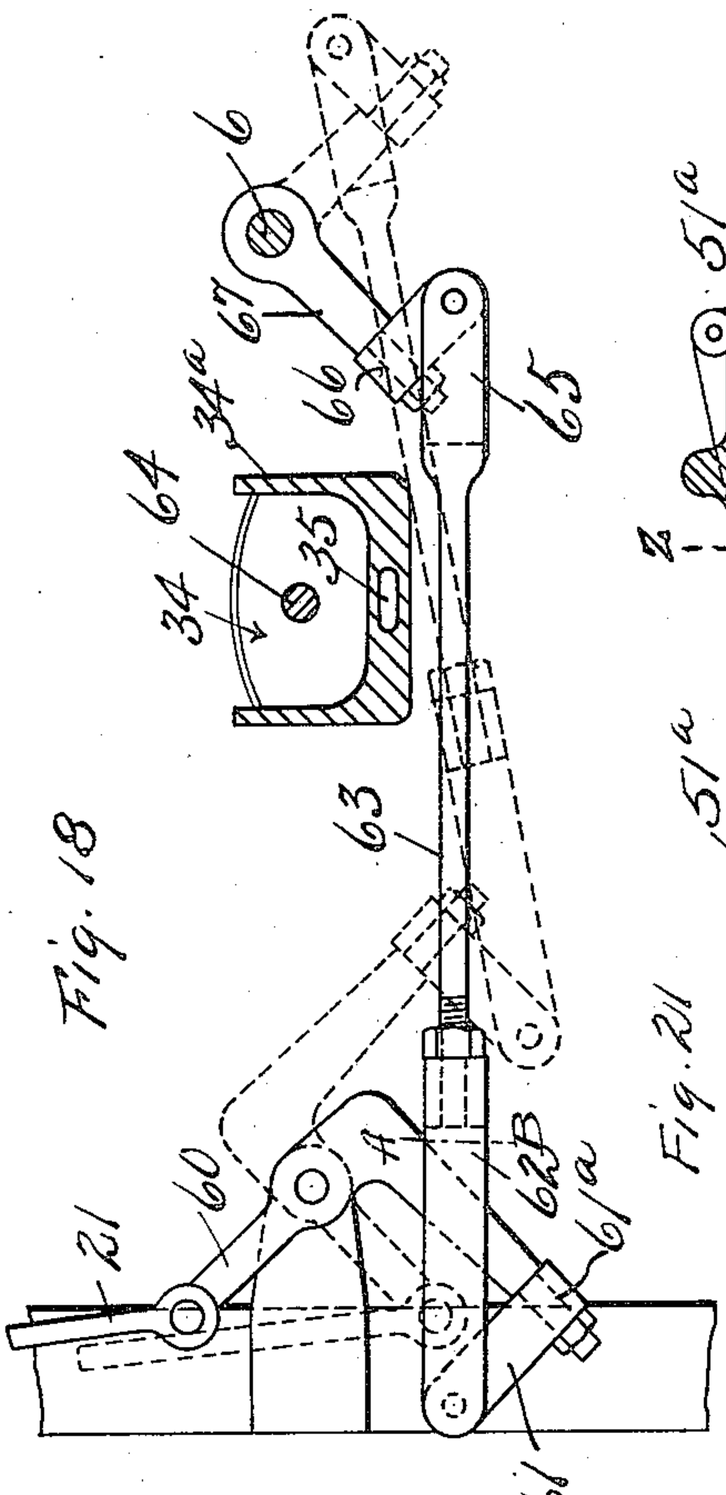


Fig. 19.

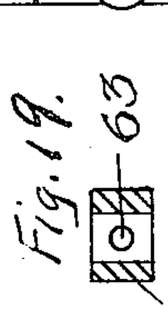


Fig. 20

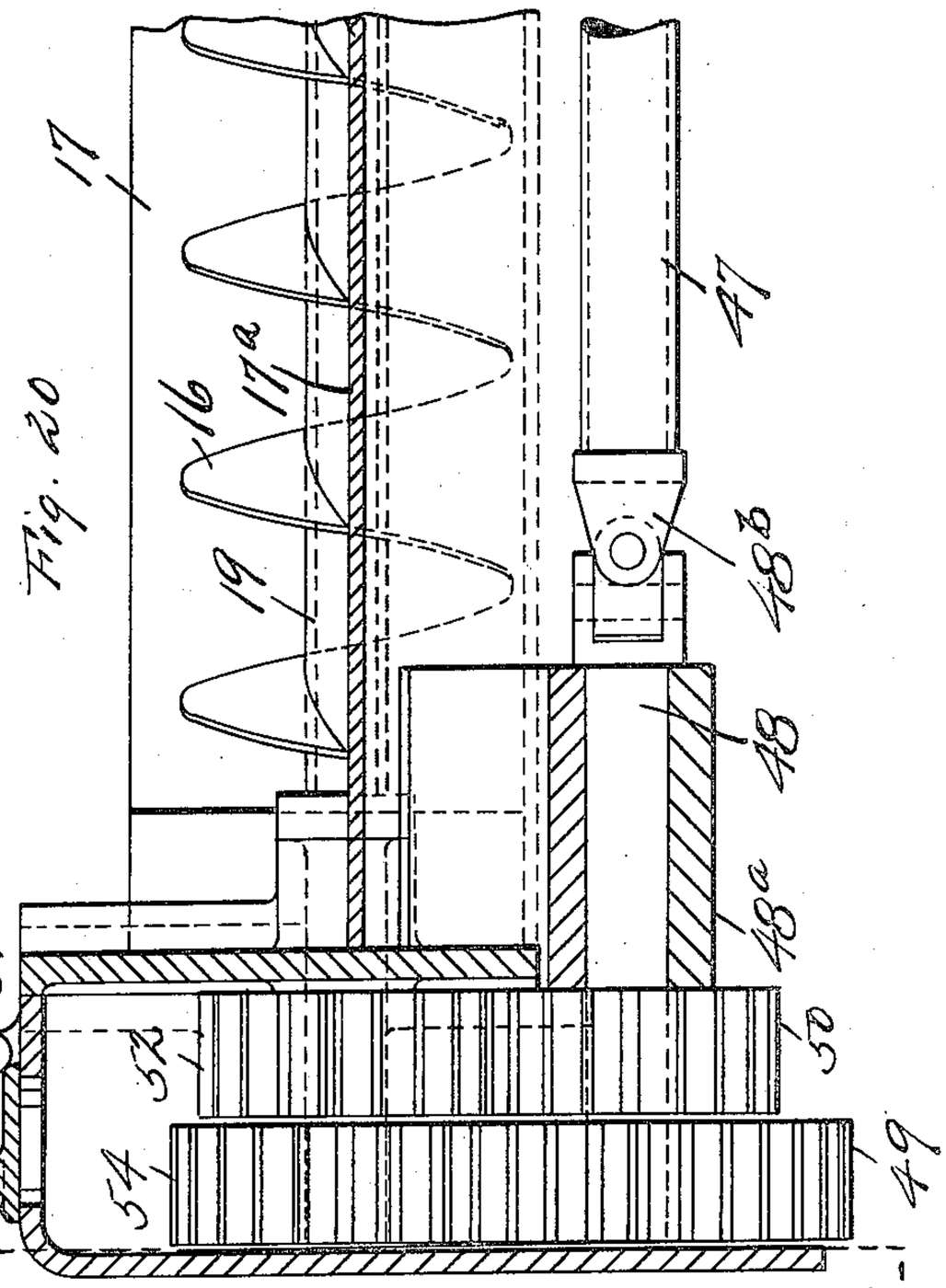
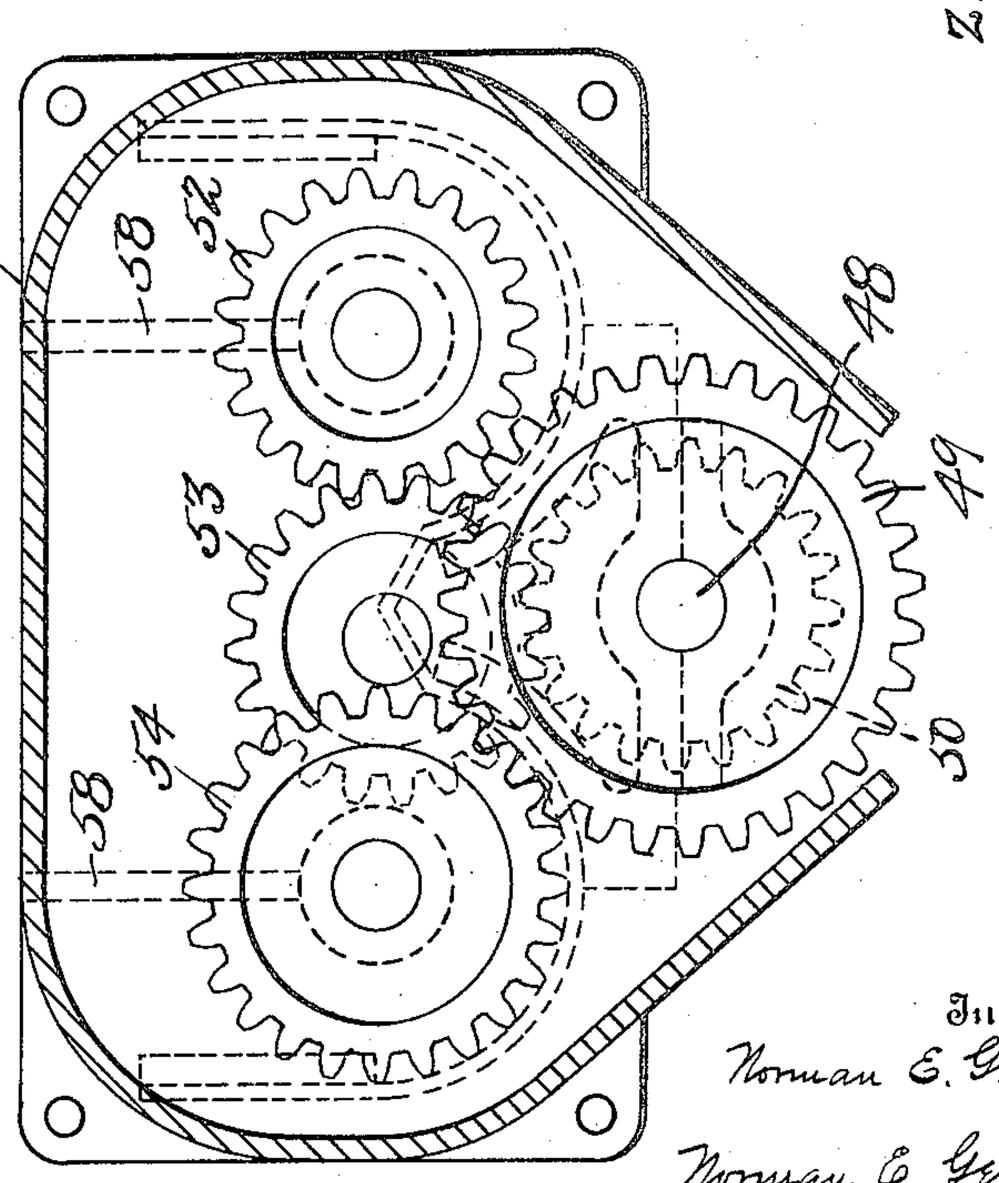


Fig. 21



Witnesses

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UNITED STATES PATENT OFFICE.

NORMAN E. GEE, OF ALTOONA, PENNSYLVANIA.

MECHANICAL STOKER.

No. 847,061. Specification of Letters Patent. Patented March 12, 1907.

Application filed May 7, 1906. Serial No. 315,543.

To all whom it may concern:

Be it known that I, NORMAN E. GEE, a citizen of the United States, residing at Altoona, in the county of Blair and State of Pennsylvania, have invented certain new and useful Improvements in a Mechanical Stoker, of which the following is a specification.

This invention relates to mechanical stokers of the type specially designed for stoking or firing locomotive-furnaces.

To this end the invention primarily has in view certain novel and practical improvements in that type of mechanical stokers embodying a stoking-engine wherein the fuel is projected into the fire-box under the impulse of a reciprocating stoking-head carried by the power-piston of the engine.

The present invention proposes to overcome the practical engineering difficulites which have been experienced in working some types of stokers by providing an improved coal-handling system whereby the fuel is taken from the tender coal-supply and carried to the hopper of the stoking-engine and then delivered through the fire-door opening of the locomotive-furnace and effectively distributed.

In the same connection a further object of the invention is to provide practical means by which a fuel-conveyer can be readily attached or adapted to the present type of Kincaid stoker, and, furthermore, this invention is intended to provide a simple means by which the power utilized to operate the conveyer is taken from the rocking shaft of the ordinary stoking-engine, thus not interfering in any way with the present design of said engine.

A further object of this invention is to provide improved deflecting means for the fuel delivered through the fire-door opening and at the same time permit of the use of bituminous coal.

A still further object of the invention is to provide improved means for operating the stoking-engine from the same source of power with the stoker set at any angle.

With these and many other objects in view, which will more readily appear as the nature of the invention is better understood, the same consists in the novel construction, combination, and arrangement of parts hereinafter more fully described, illustrated, and claimed.

The essential features of the invention involved in carrying out the objects above specified are necessarily susceptible to a wide range of structural modification without departing from the scope of the invention; but a preferred embodiment thereof is shown in the accompanying drawings, in which—

Figure 1 is a side elevation of a stoking-engine equipped with the special details and improvements contemplated by the present invention. Fig. 2 is a detail in plan of the bracket-casting fitted to the rear end of the stoking-engine shown in Fig. 1. Fig. 3 is a detail view of the deflector-operating mechanism. Fig. 4 is a detail end view of the upper discharging end of the fuel-conveyer. Figs. 5, 5^a, and 5^b are plan, side, and end elevations, respectively, of the bracket-casting. Figs. 6, 6^a, and 6^b are plan, side, and end elevations, respectively, of the ratchet-casing of the ratchet device shown in Figs. 1 and 2 of the drawings. Figs. 7 and 7^a are side and end views of the ratchet-plunger of said ratchet device. Figs. 8 and 8^a are side and end views of the plunger-cap of said device. Figs. 9 and 9^a are side and end views of the collar interposed between the ratchet-casing and the bracket-casting. Figs. 10 and 11 are detail views illustrative of the driving end portion of the sectional telescopic conveyer drive-shaft. Fig. 12 is a projected end view showing the ratchet formation of the driving-journal forming a part of the conveyer drive-shaft. Figs. 13 and 14 are detail views illustrative of the telescopic sections of the conveyer drive-shaft. Figs. 15 and 16 are a detail elevation and end view of the pressure-spring for the ratchet-plunger of the ratchet device. Figs. 17, 17^a, and 17^b are plan, side, and end elevations of the supporting member for the carrying-bracket or bracket-casting for the ratchet device, said supporting member being secured directly to the stoking-engine. Fig. 18 is a detail cross-sectional view on the line $x\,x$ of Fig. 1, showing the stoker-operating mechanism and omitting from the view the fuel-receiving-hopper of the stoking-engine. Fig. 19 is a detail view of one of the elements of the operating mechanism, the view being on the section-line A B of Fig. 18. Fig. 20 is an enlarged detail sectional view, on line $y\,y$ of Fig. 4, of the fuel-conveyer which lies in the tender and receives the fuel therefrom. Fig. 21 is a sectional view on the line $z\,z$ of Fig. 20. Fig. 22 is a detail sectional view on the line 22 22 of Fig. 1, illustrating the operating connection between shafts 6 and 9. Figs. 23 and 24 are detail sectional and end views, respectively, illustrating a modified arrange-

ment of rocking deflector-plate that may be utilized.

Like references designate corresponding parts in the several figures of the drawings.

The present invention does not contemplate any special improvement in the stoking-machine proper, and, in fact, has particularly in view an improvement of that type of mechanical stoker known as the "Victor" stoker and shown in the Kincaid patents, Nos. 668,130, No. 714,722, and No. 691,391. Hence for illustrative purposes there is shown in Fig. 1 of the drawings a Victor stoking-engine embodying in its organization an engine-cylinder C, a piston-head P working therein, a fuel-receiving chute 34ª, a stoking-head 34 working in said chute and connected with said piston, and a rotary controlling-valve 10, all of which parts are common and well known in the Victor stoker construction, and it will only be referred to herein in connection with those attachments which form a part of the present invention.

Referring particularly to the accompanying drawings, 1 designates a bracket-supporting member. This member or casting replaces the spiral conveyer journal-bearing on the right side of the Victor stoker, the bolt-holes 84 being used to secure the member to the rear end of the stoking-engine. A further purpose of this member is to form bearings for the right-hand helicoid spiral conveyer-journal 79, together with a bearing 80 for the rocking shaft 6 of the stoking-engine. In addition to these bearings it also forms a foot or base for the ratchet-carrying bracket or bracket-casting, (designated in its entirety by the numeral 2.) Openings 74 and 75 of the casting 1 coincide with similar openings 74ª and 75ª, located in casting 2, through which pass suitable fastening-bolts. Said casting 1 in addition to being generally designed to rigidly withstand the numerous shocks placed upon it is further provided with a web or rib 76, which forms a brace between the faces 77 and 78 and serves to materially strengthen the casting.

The carrying-bracket (designated by the numeral 2) is adapted to be secured to the face 78 of the support 1 to provide means for keeping the shafting in place, so as to enable the power to be delivered to the driving mechanism of the coal-conveyer. In addition to being strongly built said bracket is further provided with webs 69 and 71, which materially add to the strength thereof.

Referring to Figs. 1 and 2 of the drawings, it will be seen that the end 68 supports the conveyer-shaft driving-journal 43, upon which are milled the teeth 44, that engage the ratchet-plunger 82. Perfect alinement being necessary for the proper working of the ratchet, this casting is carefully dressed on face 70ª and fitted to face 78 of the supporting member 1. The ratchet-casing 3 is shown in detail in Figs. 6, 6ª, and 6ᵇ of the drawings and is shown assembled in Figs. 1 and 2, the latter figure showing where one end is secured to the rocking shaft 6 of the stoking-engine and the other end receiving the toothed conveyer driving-journal 43, from which power is transmitted to the coal-conveyer. To assemble these parts, the bracket-casting support 1 is placed in position by putting bearing 80, Figs. 17ª and 17ᵇ, over the protruding end of the rocking shaft 6 of the stoking-engine. The casting is then placed with face 77 against the stoker-frame and is secured in position by stud-bolts passing through holes 84, as shown in Fig. 17ª of the drawings. After this casting 1 is placed in position on the rear of the stoking-engine the ratchet-casing 3 is next positioned on the rear protruding end of the rocking shaft 6 and secured in place by pins 89 passing through both the ratchet-casing and the rocking-shaft end. (See Fig. 2.) The casting 2 is then placed in position, the face 70ª fitting against face 78 on the supporting-casting 1, after which bolts are passed through holes 74 74ª and 75 75ª, thus holding the two castings in place. The toothed member 43 of the universal-joint coupling 20, Figs. 10 and 11, is then placed in bearing 73 of the casting 2 and pushed through, and upon the protruding end the collar 4, Fig. 9, is placed, after which the part 43 is pushed through the bearing 73 until the toothed portion is in perfect alinement with the plunger-opening 88 of the ratchet-casing 3, Fig. 6 of the drawings. This being accomplished, the pin 4ª is passed through, as shown in Fig. 2, thus holding the parts in place. The plunger 82 is then introduced into opening 88 of the ratchet-casing 3, thus placing the tooth 82ᵇ in engagement with the teeth 44 on the journal 43. The helical spring 81 is then placed with one end engaging the opening 86 of the plunger, the other end of the spring engaging opening 85 in the cap 7, Fig. 8, after which the cap is screwed down in place, as shown in Figs. 1 and 2 of the drawings.

The universal joint 20 referred to accommodates the line of conveyer driving-shafting to the movement of the engine and tender when upon sharp curves or in case of broken springs on either engine or tender. This universal joint 20 provides a connection between the driving-journal 43 and the driving-shaft section 41, which telescopically receives the driving-section 47, which completes the line of shafting for driving the conveyer. The said shaft-sections 41 and 47 are permitted a relative longitudinal movement and are held against relative rotary movement through the medium of a pin-and-slot connection 45 and 46.

It will be observed that the buffing arrangement between the engine and tender

allows a horizontal movement which is accounted for in the telescope-shaft coupling. (Shown in Figs. 13 and 14.) It will be noted that with this arrangement the engine can readily pull away from the tender upon which the coal-conveyer is secured and not interfere in any particular with the operation of the coal-conveyer. In order that the coal may be delivered to the usual hopper 23 of the stoker, I have designed the coal-conveyer 17, in the trough of which revolve in opposite directions the helicoid conveyers 16. I attain the revolution of these conveyers by the train of gears shown in Figs. 20 and 21 of the drawings, gears 49 and 54 revolving in one plane and gears 50, 52, and 53 operating in another plane. In this connection it will be observed that the gears 49 and 50 are mounted on a driven gearing-spindle 48, journaled in a suitable bearing 48[a] at the rear lower end of the conveyer and having a gimbal-joint connection 48[b] with the rear end of the driving-shaft section 47. The gear 49 meshes directly with gear 54 on the rear end of the shaft 19 of one of the conveyers 16, while the other of said conveyers carries upon its rear end a gear 52, meshing with an idler-gear 53, which in turn meshes with the aforesaid gear 50. In order that the journals for these gears and spirals may be lubricated, oil-holes 58 are placed in forward part of the housing 51[a] for the gears. This housing protects the teeth of the gears from becoming injured with coal or coal-dust. In order that the conveyer-trough may clean itself of coal, the trough is shown cupped up at the center, as at 17[a], thus preventing any coal from becoming lodged between the screws.

As the stoker occupies any angle between the vertical back head of the boiler and the deck-plate 29 of the locomotive, it becomes necessary to resort to some constantly-operative means by which power can be transmitted from the driving-engine 22 to the rocking shaft 6 of the stoking-engine. To accomplish this and permit driving the whole mechanism at any desired angle, the means shown in Fig. 18 has been devised. The piston-rod 21 of the driving-engine 22 attaches to an arm of a bell-crank 60, the center of oscillation being offset with reference to the bifurcated reciprocal connecting-rod 63, that connects at 65 and 66 with the rock-arm 67, which is secured to the rocking shaft 6 of the stoker. Upon the offset end of the bell-crank 60 is loosely mounted the block 61, which fits between the cheeks 62 of the connecting-rod 63.

It will be readily seen that the combined movement of the bell-crank and the block 61 about 61[a] gives the movement that is required to drive the stoker when occupying any angle to the vertical back head of the locomotive-boiler. In said Fig. 18 the driving-engine is shown ready to make a stroke and also shows the operating mechanism in dotted lines with the stroke completed.

Referring to Fig. 1 of the drawings, the course of steam from the boiler until it has done its work in the stoker and been exhausted in the fire-box of the locomotive may be described as follows: Live steam from the locomotive-dome passes through pipe 14 to the body of the stoking-engine, thence through the usual cored feeding-passage 24 to the rotary valve. This rotary valve is simply indicated in the drawings by dotted lines and is designated by the reference-number 10. It is of the well-known Victor construction and forming no part of the present invention is not further described herein; but in connection with that valve the stoking-engine of the Victor stoker also includes a rocking valve-shaft 9, projecting outside of the valve casing or chamber. Reverting back to the course of the steam, it will be noted that the same passes from the said rotary valve through the valves 25 to the cylinder through cored portions. (Not shown.) The various passages and details of these valves are not shown and described in full for the purpose of avoiding confusion and also as the same form no part of the present invention. The exhaust-steam passes out through cored exhaust-passage 35 into the fire-box of the locomotive.

The coal from the tender being brought up by the spiral conveyers in the trough 17 is deposited in the hopper 23 of the stoker, and it will be further noticed that the lower edge 17[b] of the trough is above the place of deposit, this being essential to prevent the coal from choking the front of the conveyers. After the coal has been deposited in the hopper of the stoker it is carried forward by the helicoid spirals 15 therein to the stoking-head 34, which throws the coal with force against the deflector-plate 13. (Shown in Figs. 1 and 3 of the drawings.) The said stoking-head 34 is carried upon the front end of the piston-rod 64, the inner end of which connects with and is carried by the piston P within the engine-cylinder C of the stoking-engine, and in reference to the deflector-plate 13 it will be observed that the same is mounted at the front end of the stoking-engine and lies in a position beyond and below the lower edge of the fuel-chute 34[a], within which the stoking-head 34 reciprocates.

In order that the coal may be scattered uniformly over the surface of the grate in the fire-box, the attachment shown in Fig. 3 of the drawings has been devised and consists of said horizontally-rocking deflector-plate 13, attached, through the journal 13[a], to a slotted rocker-arm 12, which is operated by the crank-arm 11, rigidly attached to the rotary valve-rod 9 of the stoking-engine. The driving-engine operating this shaft through the mechanism described above and shown

in Fig. 18 of the drawings also operates the rotary valve-rod. Motion is transmitted from the rocking engine-shaft 6 to the valve-shaft 9 through the medium of a swinging ratchet-arm 9^a, having a ratchet engagement with the valve-shaft 9 and a link connection 6^b with a rock-arm 6^a, secured to the said engine-shaft 6. It will therefore be evident that any movement of the driving-engine 22 will necessarily affect the position of the deflector-plate 13 in the fire-door opening of the locomotive-boiler and cause the number of strokes of the driving-engine 22 to bear a fixed proportion to the amount of fuel placed on the plate 13. In connection with the mounting of the deflector 13 it is to be further observed that the vertical height of said plate may be determined or regulated through the adjustment of an adjusting-screw 27, mounted in a suitable bracket at the front end of the stoking-engine and engaging a pendent flange 13^c below the mounting of the deflector on the front end of the journal or pin 13^a. It follows that inasmuch as this plate occupies a number of different positions for each cycle of the rotary valve the coal forced against it will be distributed to the different parts of the fire-box. Fig. 3 shows the deflector-plate 13 in its horizontal plane and also in an inclined position.

A modified form of deflector-plate is shown in Figs. 23 and 24. In this form the deflector consists of a yoke having a main deflecting base or apron 32 and side arms 33, with means for adjusting the height of the outer edge by the use of bolts 37, engaging the recesses 36 on the sides of the chute 34, as shown in the drawing.

From the foregoing it is thought that the construction, action, and many advantages of the herein-described stoker improvement will be readily apparent without further elaboration or discussion.

What I claim is—

1. In a stoker, a stoking-engine having a rocking shaft, a fuel-conveyer, and a driving-shaft for the conveyer arranged in line with the rocking shaft and having a ratchet connection therewith.

2. In a stoker, the combination with the tender and a stoking-engine, of a rocking shaft carried upon the stoking-engine, a driving-engine having an operating connection with said rocking shaft, a fuel-conveyer extending from the tender to the stoking-engine, and a self-adjusting driving-shaft connection between the conveyer and said rocking shaft.

3. In a stoker, the combination with a stoking-engine, a fuel-conveyer, a shaft carried by the stoking-engine, a self-adjusting driving-shaft connection between said stoking-engine shaft and the conveyer, a driving-engine, and a self-adjusting operating mechanism between said driving-engine and said stoking-engine shaft.

4. In a stoker, the combination with the tender and a stoking-engine arranged to be set at an angle, a fuel-conveyer leading from the tender to the engine, a line of shafting for driving said conveyer, a driving-engine, and operating mechanism connecting the driving-engine with said line of shafting, said operating mechanism being self-adjusting to accommodate itself to any angularity of the stoking-engine.

5. In a stoker, the combination with the tender and a stoking-engine, a fuel-conveyer loosely arranged above the stoking-engine and leading from the tender, a line of shafting for driving the fuel-conveyer, said line of shafting including universally-jointed and telescopic sections, and a driving-engine having self-adjusting operating connections with said line of shafting.

6. In a stoker, the combination with the tender and a stoking-engine, of a fuel-conveyer leading from the tender, a rocking shaft carrying a ratchet device, a conveyer drive-shaft including a toothed member engaged by said ratchet device, and a driving-shaft having an operating connection with said shaft.

7. In a stoker, the combination with the tender and a stoking-engine, of a fuel-conveyer leading from the tender and loosely supported by the stoking-engine, a rocking shaft supported at one side of the stoking-engine and carrying a ratchet device, a telescopic drive-shaft having universal joints at its opposite end portions and also including a driving-journal provided with a toothed section received and engaged by said ratchet device, a driving-engine, and a self-adjusting connection between said driving-engine and said rocking shaft.

8. In a stoker, the combination with the tender and a stoking-engine, of a fuel-conveyer leading from the tender and loosely supported above the stoking-engine, a carrying-bracket mounted on one end of the stoking-engine, a rocking shaft arranged at one side of the engine and supported by said bracket, said rocking shaft carrying a ratchet device rigid therewith and arranged within said carrying-bracket, a driving-shaft for the conveyer having a ratchet member provided with a toothed section received in and engaged by said ratchet device, a driving-engine, and an operating connection between said driving-engine and said rocking shaft.

9. In a stoker, the combination with a stoking-engine, of a fuel-conveyer, a rocking shaft having a driving connection with said conveyer, a driving-engine, and self-adjusting operating mechanism comprising a rock-arm on said rocking shaft, a reciprocal rod having a loose-link connection with said rock-

arm, a bell-crank lever pivotally supported at one side of its angle and having a loose-link connection between one of its arms and said reciprocal rod, the other arm of said bell-crank having connection with the pitman of the driving-engine.

10. In a stoker, a stoking-engine having a fuel-chute and a stoking-head working therein, said engine also having a valve-shaft, a movable deflector carried upon the chute, and deflector-operating mechanism operated from said valve-shaft.

11. In a stoker, a stoking-engine, having a rotary valve-shaft, an adjustable deflector-plate mounted for movement at the discharge end of the engine, and an operating mechanism operated from said valve-shaft and comprising means for rocking the deflector-plate on a horizontal axis.

12. In a stoker, a stoking-engine having a rotary valve-shaft, a deflector-plate arranged beyond the discharging end of the engine, operating mechanism connected with said valve-shaft and comprising means for rocking said deflector-plate on a horizontal axis, a rocking engine-shaft, an operating connection between the engine-shaft and the valve-shaft, and a driving-engine having an operating connection with said rocking engine-shaft.

13. In a stoker, a stoking-engine, a horizontal rocking deflector-plate arranged beyond the engine, a supporting-journal for the plate provided with a slotted arm, and a suitably-operated crank member engaging said slotted arm to effect a rocking of the deflector upon a horizontal axis.

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

NORMAN E. GEE.

Witnesses:
J. W. WILLSON,
W. H. MCCURDY.