March 30, 1926. 1,579,035

M. B. RYAN

LEVELING DEVICE FOR STEAM SHOVELS

Filed May 21, 1925 4 Sheets-Sheet 1

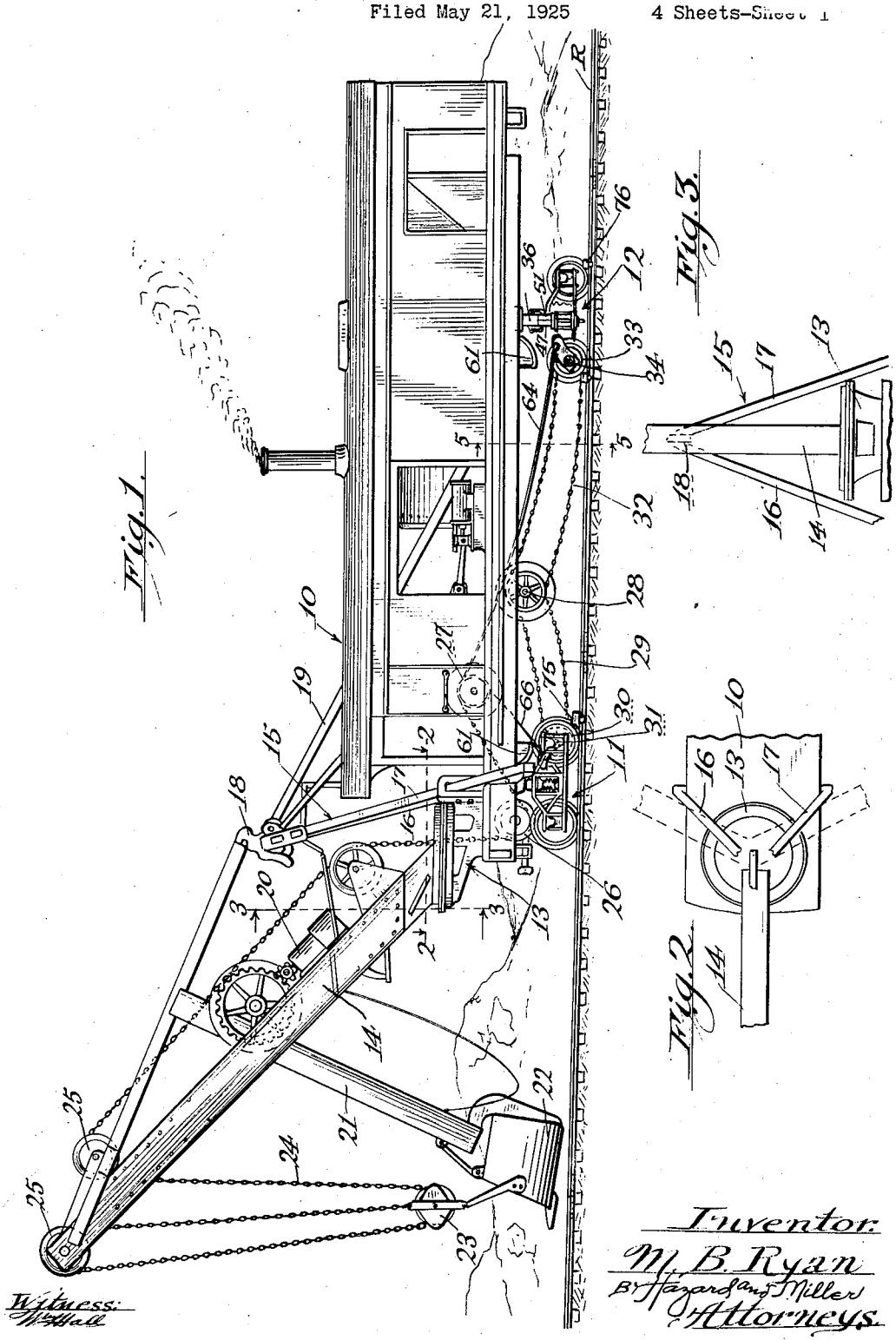


Fig. 1.

Fig. 3.

Fig. 2.

Witness:
W. Hall

Inventor:
M. B. Ryan
By Hazard and Miller
Attorneys.

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M. B. RYAN

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Filed May 21, 1925 4 Sheets-Sheet 2

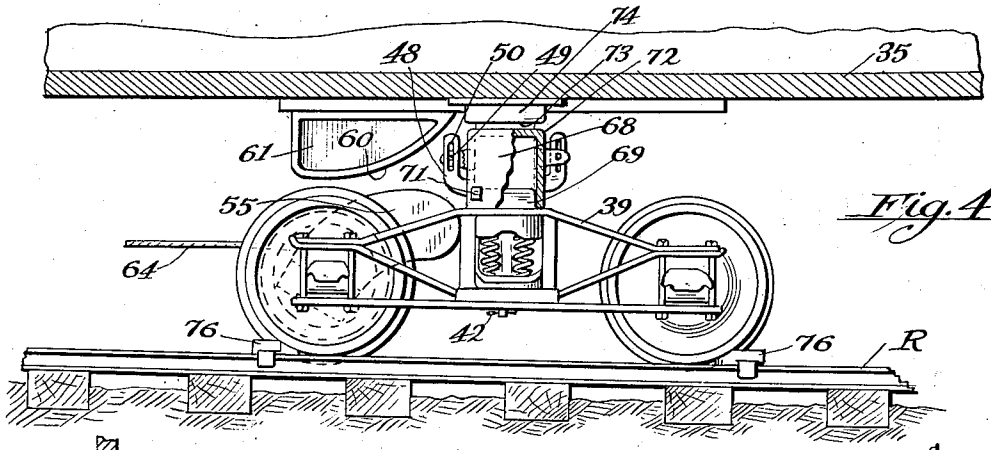


Fig. 4.

Fig. 5.

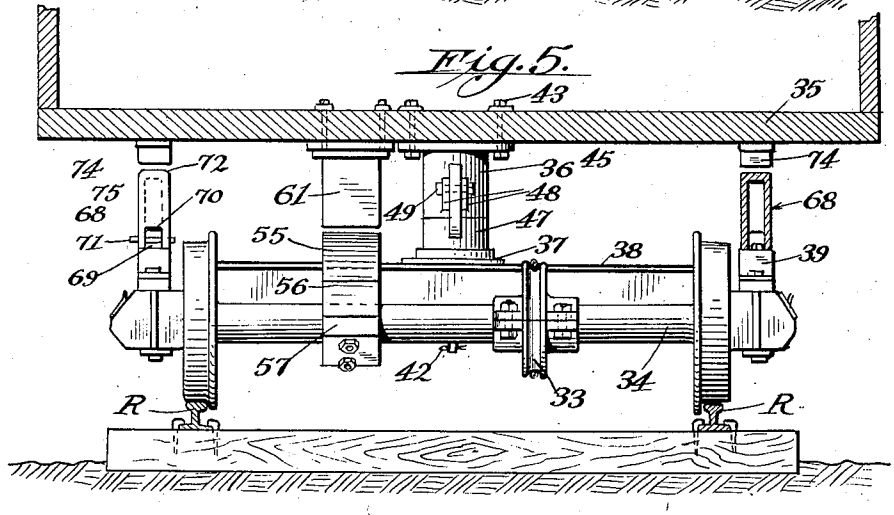


Fig. 9.

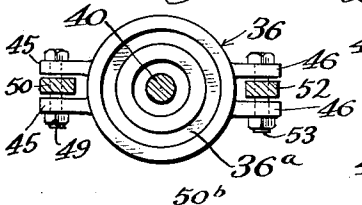


Fig. 10.

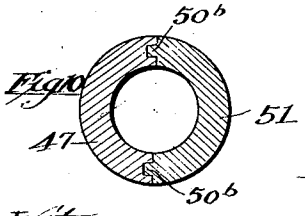


Fig. 11. Fig. 12.

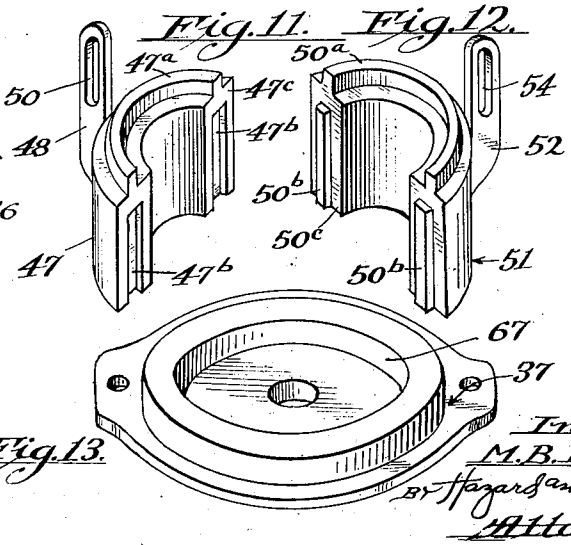


Fig. 13.

Witness:

Inventor:
M. B. Ryan
By Hazard and Miller
Attorneys

March 30, 1926. 1,579,035

M. B. RYAN

LEVELING DEVICE FOR STEAM SHOVELS

Filed May 21, 1925 4 Sheets-Sheet 3

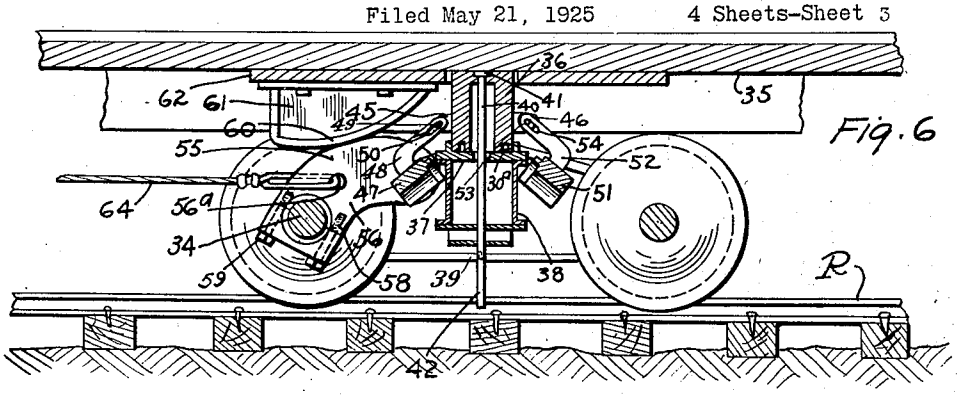


Fig. 6

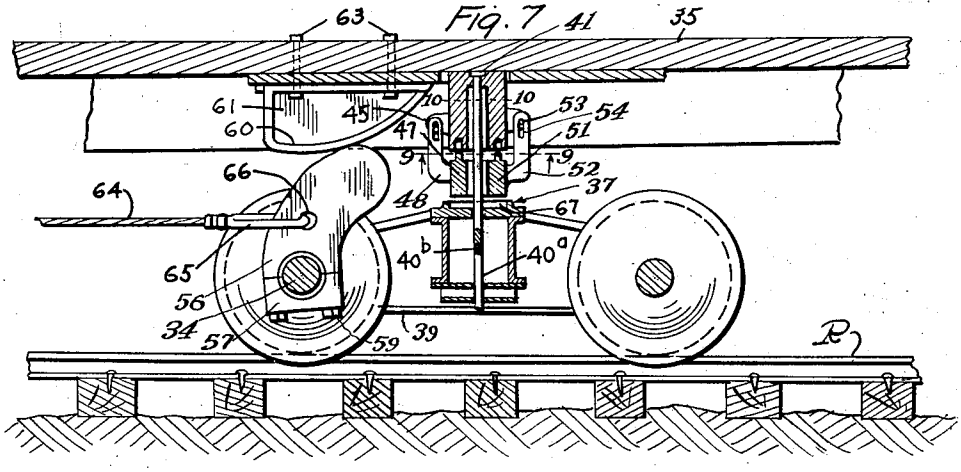
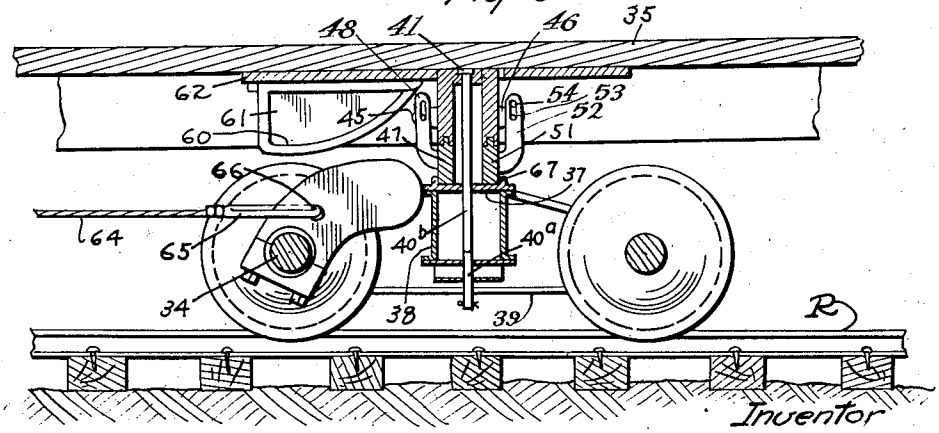


Fig. 7

Fig. 8



Inventor
M. B. Ryan.
by: Hazard and Miller
Attys.

March 30, 1926. 1,579,035

M. B. RYAN

LEVELING DEVICE FOR STEAM SHOVELS

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Fig. 15

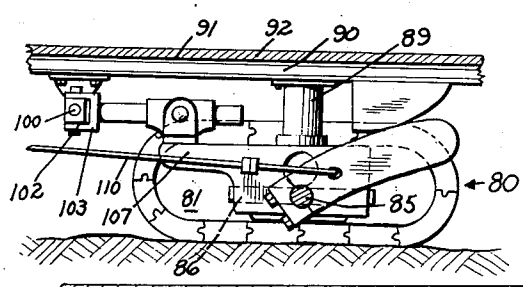
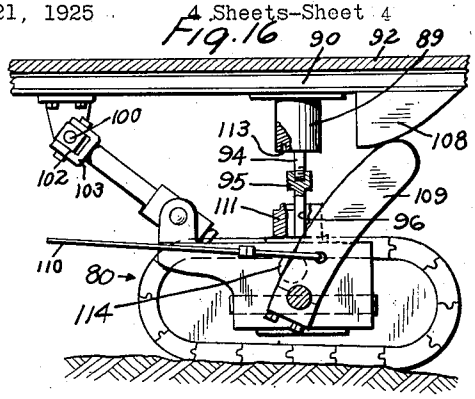


Fig. 16



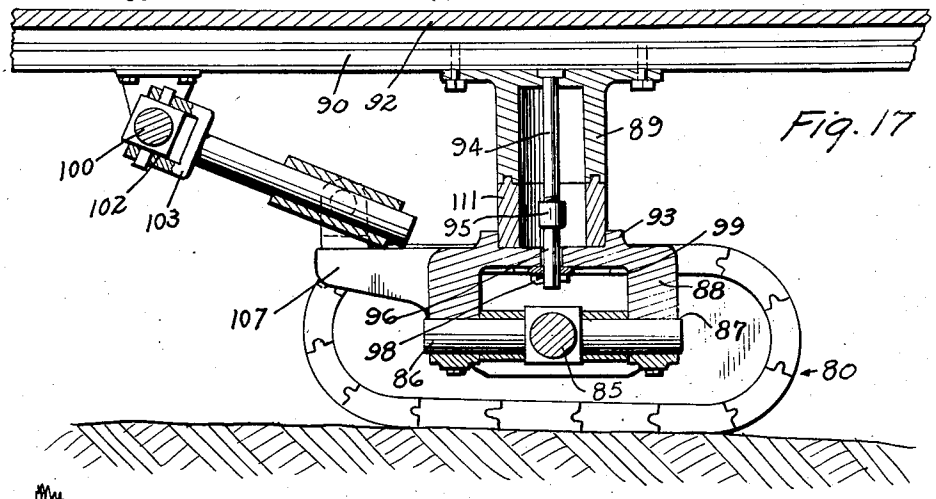
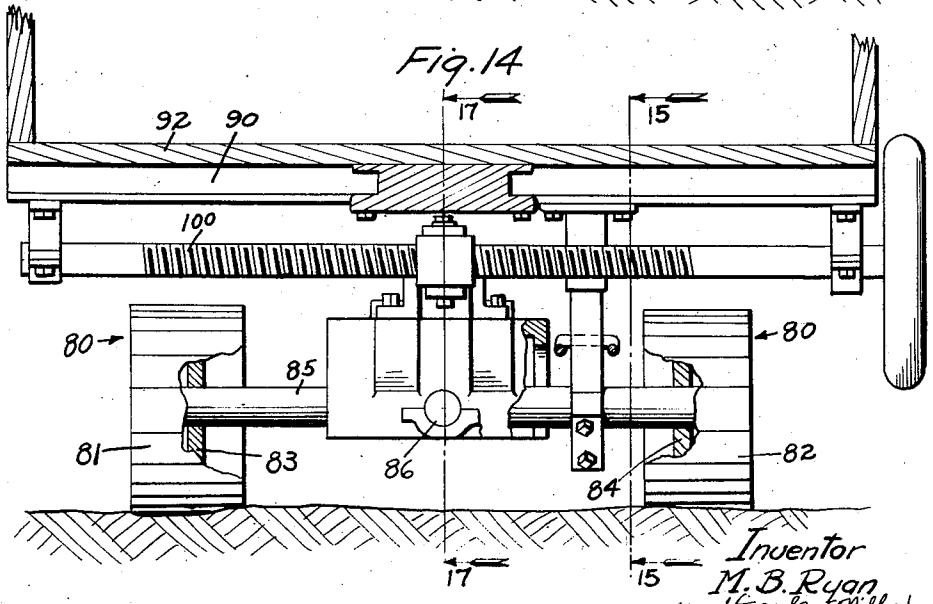


Fig. 17

Fig. 14



Inventor
M. B. Ryan
by: Hagan and Miller
Attys.

Patented Mar. 30, 1926. 1,579,035

UNITED STATES PATENT OFFICE.

MICHAEL B. RYAN, OF LOS ANGELES, CALIFORNIA.

LEVELING DEVICE FOR STEAM SHOVELS.

Application filed May 21, 1925. Serial No. 31,839.

To all whom it may concern:

Be it known that I, MICHAEL B. RYAN, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented new and useful Improvements in Leveling Devices for Steam Shovels, of which the following is a specification.

This invention relates to steam shovels, more particularly to the type of shovel known as the Standard steam shovel.

It is well understood by those familiar with the construction and operation of Standard steam shovels that the shovel will operate much more efficiently when in a level position, rather than on a slant, that is when the shovel is being operated on a grade.

The movement or radius of operation of the boom of a Standard steam shovel is limited by the standards or uprights of the A frame and when the steam shovel is working on an upgrade the boom tends to swing rearwardly due to gravitation. The movement of the boom may be checked and brought to a stop at any desired point by the engine provided for swinging the boom, however, the operator of the shovel must be constantly on the alert, more so than when the shovel is operated on a level, and if he inadvertently fails to quickly check the rearward swinging movement of the boom it will occasionally develop so much speed that it cannot be stopped, except by dropping the loaded dipper, and if this is not instantly done, the boom will strike one of the standards of the A frame and in some instances when the dipper is heavily loaded the A frame will be struck with such force as to partially demolish it, which will put the shovel out of commission until the A frame is repaired.

When the shovel is being operated on a downgrade, a reversal of the above conditions take place, hence no damage or accidents can occur due to the swinging of the boom rearwardly. Additional power, however, must be applied to swing the boom rearwardly and it must be held in a rearward position while the dipper is being unloaded.

While this is not so very objectionable, the total sum of the additional amount of power required in a day's run to swing the boom rearward will be a considerable amount, of course, depending upon how steep the grade is.

It will also be appreciated that when the shovel is working on a grade, the water level in the boiler is affected, i. e., the water tends to be at a higher level at one end of the boiler, which of course, is obviously very objectionable.

The object of this invention is to provide a mechanism for leveling a Standard steam shovel while operating on either an up or downgrade. The object is accomplished by the disclosure herein set forth, by the following description of the accompanying drawings, the novel features hereof being pointed out in the appended claims, in which:

Figure 1 is a side elevation of a Standard steam shovel as it appears while operating on an upgrade and showing the shovel on a level and held in this position by the leveling apparatus.

Fig. 2 is a fragmentary plan view taken on line 2—2 of Fig. 1.

Fig. 3 is a fragmentary elevation taken on lines 3—3 of Fig. 1.

Fig. 4 is a fragmentary side elevation of the rear truck, showing the shovel on a level and the tracks on an incline.

Fig. 5 is an enlarged fragmentary section taken on line 5—5 of Fig. 1.

Fig. 6 is a vertical section through the rear truck, showing the shovel and tracks on an incline with the shovel raising apparatus as it appears before being operated to raise the level of the shovel.

Fig. 7 is a view analogous to Fig. 6, showing the shovel after it has been raised to its highest position by the mechanism.

Fig. 8 is a view analogous to Figs. 6 and 7 and corresponding to Figs. 1, 4 and 5, showing the shovel as it appears after being brought to a level position.

Fig. 9 is a transverse section taken on the line 9—9 of Fig. 7.

Fig. 10 is a transverse section taken on line 10—10 of Fig. 7.

Figs. 11, 12 and 13 are views showing details of parts of the shovel leveling mechanism.

Fig. 14 is a vertical section taken through a steam shovel mounted on caterpillars looking rearward.

Fig. 15 is a section taken on line 15—15 of Fig. 14, looking in the direction indicated by the arrow.

Fig. 16 is a section taken substantially on the same plane as Fig. 15, showing the shovel as it appears when being raised to a level position by the leveling apparatus.

Fig. 17 is a transverse section showing the shovel in level position.

Referring by numerals to the accompanying drawings, particularly to Fig. 1, 10 generally designated a Standard steam shovel which is mounted on a pair of railroad trucks 11 and 12 respectively. A center casting, generally designated at 13 is mounted on the forward end of the shovel and a boom designated at 14 is rotatably mounted on the center casting in the usual manner. The boom is supported by the usual A frame 15, having standards 16 and 17 connected at their upper ends by an equalizer 18, which in turn is connected to a beam or brace 19 which extends rearwardly and is secured to the floor of the shovel in the usual manner.

The boom carries a crowding engine 20, which operates a bail 21, carrying a dipper 22, by means of the usual rack and pinion construction. The dipper is provided with a sheave 23 adapted to receive a chain 24 which passes over a plurality of pulleys 25 mounted on the boom, thence through the center casting under a pulley 26 and around the hoisting drum 27.

An intermediate shaft 28 is adapted to move the shovel backward or forward by means of a chain 29, which engages a split sheave 30 secured to the rear axle 31 of the forward truck 11, and a chain 32 engaging a sheave 33, secured to the front axle 34 of the rear truck 12.

The shovel 10 has a floor 35, to which is secured the center pivot casting 36 adapted to engage a member 37 secured to the cross-beam 38 of the truck, which is mounted between and at right angles to the side bars 39.

A king pin 40, having a head 41, extends through the casting 36, member 37 and cross-beam 38 and is provided with a split key 42. The casting 36 is substantially of the same form as is commonly used and answers the same purpose, that is, for allowing pivotal movement of the trucks. In the present instance, the casting 36 is of cylindrical shape and is secured to the floor of the shovel by bolts 43 engaging flanges 44 formed thereon.

A segmental block 47 is pivotally connected to the casting 36 by a pin 49 extending through openings in a pair of ears 36^a on the casting 36 and a slot 50 in an arm 48, formed on the segmental block 47. In a like manner a segmental block 51, having an arm 52 is pivoted to the center casting 36 by pin 53 extending through a pair of ears on the casting 36, and a slot 54 formed in the arm 52. The segmental block 47 has an annular lug 47^a and grooves 47^b are formed in the end faces 47^c. The segmental block 51 has an annular lug 50^a and tongues 50^b formed on the end faces 50^c.

The segmental blocks are used for retaining the steam shovel in level position, therefore, various lengths of these blocks are provided. For example, if it is necessary to raise one end of the shovel three inches, segmental blocks three inches long are used, and if it is necessary to raise the shovel ten inches, a corresponding pair of segmental blocks are used.

The shovel is raised by a cam 55, which is formed in two pieces 56 and 57, having curved faces adapted to engage a front axle 34 and is held in place thereon by studs 58 having nuts 59. The cam 55 is adapted to engaged a curved face 60 of an inverted arcuate member 61, which engages a reinforcing plate 62 secured to the underside floor 35 of the shovel, and is held in place by bolts 63 extending through the floor and reinforcing plate. The cam is raised by a chain or cable 64 which is carried to and wrapped around the hoisting drum 27. The cable 64 is fastened to a link 65 passing through an opening 56^a formed in the part 56 of the cam 55.

The forward truck 11 is provided with a similar mechanism as above described and is operated by chain or cable 66 which also may be carried to the hoisting drum 27, it being understood that the hoisting chain 24 need not be removed from the hoisting drum before the cables 64 and 66 are applied thereto.

The member 61 and casting 36 are permanently left in place on the shovel. The cam 55 and segmental blocks 47 and 51 and the cables 64 and 66 are not applied until it is necessary to level the shovel.

When it is desired to level the shovel, the distance necessary to raise the forward or rear end of the shovel is then determined by the grade. A pair of segmental blocks of sufficient length are then applied to the casting 36 and the cam 55 is secured with the axle 31 or 34, depending upon which end of the shovel must be raised. The cam 55 is then raised by the rotation of the hoisting drum 27, the movement of which may be very accurately adjusted by manipulating the throttle of the hoisting engine. In other words, the shovel will not be raised too suddenly.

The hoisting drum is rotated until the shovel is raised into position as shown in Fig. 7, at which time the segmental blocks will have their faces 47^c and 50^c abutting and the tongues 50^b will be fitting within the grooves 47^b. The hoisting drum is then

reversed which will allow the cam to move downward, which in turn will allow the segmental blocks to drop into the annular recess 67 of the member 37 and the annular lugs 47ª and 50ª will pass into the annular groove 36ª of the casting 36, as shown in Figs. 1 and 8.

By use of the cam 55 and the member 61, the shovel may be raised about thirty inches. Hence, extensions must be provided for the king pin 40. These are indicated at 40ª having threaded shanks 40ᵇ adapted to engage female threads formed in the end of the king pin, directly below the openings provided for the split key 42.

When the shovel is raised, means are provided to take care of the side tilting of the shovel and consists of side bearings 68 which are placed over the bumpers 69 carried by the trucks 11 and 12. The side bearings are made in various lengths corresponding to the segmental blocks 47 and 51. The side bearings are preferably formed of cast steel and have an opening 70 which will permit the bearings to be pushed over the bumper. The bearings are held in place by tapered keys 71, it being understood that the side bearings are placed in position when the shovel is raised to the position as shown in Fig. 7. Therefore, when the cam 55 is lowered, the shovel will be prevented from tilting sidewise, as the top surface 72 of the side bearings will be in a position to engage the underside 73 of the bumpers 74 secured to the floor 35 of the shovel.

The shovel 10 is prevented from traveling backward by rail clamps 75 as shown in Fig. 1. Rail clamps 76 may also be placed under the rear wheel of the rear truck 12 if desired.

In addition to raising and lowering the forward and rear ends of the shovel in order that it may be brought to a level position, the shovel leveling device may also be employed to temporarily lift either end of the shovel in use in place of a jack. This is very advantageous in the event that the shovel runs off the track, as either end may be quickly lifted and blocked, thereby permitting the trucks to be replaced on the track.

Referring to Figs. 14 and 17, the shovel is mounted on caterpillar trucks, generally designated at 80 and consists chiefly of treads or endless chains 81 and 82 which are movably mounted on frames 83 and 84 which are pivotally mounted on a shaft 85.

A shaft 86 is formed integral and at right angles to the shaft 85 and is mounted in bearings 87 of a casting 88. The casting 88 is pivotally mounted and is adapted to receive a center casting 89 secured to a center beam 90 of the frame 91 which supports the floor 92 of the steam shovel. The center casting 89 is cylindrical in shape and is adapted to rest within a recess 93 on the top of the casting 88.

The upper end of a king pin 94 is secured to the upper end of the center casting 89 and has a lower threaded portion 95, which is adapted to rest within a recess 93 on the top of the casting 88.

The upper end of a king pin 94 is secured to the upper end of the center casting 89 and has a lower threaded portion 95, which is adapted to receive an extension 96. The king pin normally extends through an opening 97 formed in the casting 88 and is held in place by a split key below a washer 99.

The caterpillar truck 80 is utilized for steering the steam shovel and is adapted to be swung about the pivoted center casting 89 by a screw 100 which is mounted in bearings 101 secured to the underside of the frame 91.

A nut 102 engages the screw 100 and is held against rotation thereon by a clevis 103 mounted on the end of a shaft 104 which is slidably mounted in a sleeve 105, pivotally mounted in brackets 106, which are secured to arms 107 formed integral with the casting 88.

An inverted arcuate member 108 of the same construction as the arcuate member 61 shown in Figs. 1 to 13, is secured to the frame 91 and is adapted to be engaged by cam 109 pivotally mounted on the shaft 85. The cam 109 is raised and lowered by a cable 110 which is carried to and wrapped around the hoisting drum of the steam shovel.

As shown in Fig. 16, the shovel is shown raised to its highest point during the operation of leveling and when in this position the extension 96 is applied to the king pin 94 and a pair of segmental blocks 111 are placed in the recess 93. The segmental blocks have annular lugs 112 adapted to interlock in recesses 113 formed in the underside of the center casting 89. After the extension 96 has been applied to the king pin 94 and the segmental blocks 111 placed in the recess 93, the cam is lowered by reversing rotation of the hoisting drum which will allow the center casting 93 to rest on top of the segmental blocks 111. The washer 98 is then placed over the end of the extension 96 and the split key is then applied, it being understood, that the split key and washer are removed before the shovel is raised.

An opening 114 is formed in the casting 88 in order that the split key 98 and washer 99 may be reached for removal and replacement as previously referred to.

It will be understood that the caterpillar truck is of standard construction together with the screw 100, the only alteration being necessary is to provide the pivoted sleeve 105, in order to accommodate

the raising and lowering movement. The motive power for caterpillar steam shovel is applied to the forward belts and the rear caterpillar trucks act as idlers.

From the construction shown it will be seen that the shovel leveling apparatus shown in Figs. 14 to 17, is of the same construction as that shown in Figs. 1 to 13, and may be readily applied to a steam shovel employing caterpillars.

From the construction it will be seen that the shovel leveling device is comparatively simple in construction and is very substantial and may be easily applied to a steam shovel without altering the construction of the shovel, and some parts of the apparatus may be permanently left on the shovel while the remaining parts may be easily removed when it is necessary to transport the shovel.

It will also be noted that no auxiliary engines are required and that the engine operating the hoisting drum which in turn operates the shovel raising device, has ample power to accomplish raising the shovel without difficulty.

Various changes may be made without departing from the spirit of the invention as claimed.

What is claimed is:

1. Means for raising the forward or rear end of a steam shovel to a level position when the steam shovel is operating on an up or downgrade, said means carried by the forward and rear trucks of the steam shovel and operated by the power plant of the steam shovel.

2. In a steam shovel, a cam rotatably mounted on an axle of a truck of the steam shovel, a member secured to the underside of the shovel directly above said cam, a cable connecting said cam with the hoisting drum of the steam shovel, said cam adapted to engage said members secured to the underside of the shovel and elevate one end of the steam shovel when the hoisting drum is rotated and means for retaining the end of the steam shovel in elevated position.

3. In combination with a steam shovel, its railroad truck, floor and hoisting drum of a cam adapted to be rotatably mounted on one of the axles of the truck, an arcuate member secured to the under side of said floor directly above said cam, a cable adapted to be connected to said cam and hoisting drum of said truck, a pair of segmental blocks carried by the center pivot casting, said cam adapted to elevate the floor of the steam shovel when said hoisting drum is rotated, said segmental blocks adapted to retain the steam shovel in position.

4. A device for leveling a steam shovel when operating on a grade, comprising a cam secured to the rear axle of the forward truck, a second cam rotatably mounted on the front axle of the rear truck, a segmental block secured to the underside of the floor of the steam shovel directly above said first and second cam, said cam adapted to be operated by a cable connecting said cams to the hoisting drum of the steam shovel, said cams adapted to be operated independently of each other and elevate the forward or rear end of the shovel from an inclined to a level position by rotation of said hoisting drum, and means carried by the center pivot casting of each of said trucks adapted to retain the steam shovel in a level position.

5. In combination with a steam shovel having a floor mounted upon trucks, means operable by the power plant of the steam shovel for varying the distance between the floor and either truck.

6. In combination with a steam shovel having a floor supported upon trucks, means operable by the power plant of the steam shovel mounted upon the trucks for varying the distance between the floor and the trucks so as to permit the floor to be leveled when operating upon an up or down grade.

7. In combination with a steam shovel having a floor mounted upon trucks, a cam pivoted upon each truck, engaging members mounted upon the floor adapted to be engaged by said cams, and means operable by the power plant of the steam shovel for swinging said cams so as to raise or lower the floor of the steam shovel relatively to said trucks.

8. In combination with a steam shovel having a floor mounted upon trucks, a cam pivoted upon each truck, engaging members mounted upon the floor adapted to be engaged by said cams, means operable by the power plant of the steam shovel for swinging said cams so as to raise or lower the floor of the steam shovel relatively to said trucks, and means for supporting the floor in its elevated position after it has been raised by the cams.

9. In combination with a steam shovel having a floor mounted upon trucks, a cam pivoted upon each truck, engaging members mounted upon the floor adapted to be engaged by said cams, means operable by the power plant of the steam shovel for swinging said cams so as to raise or lower the floor of the steam shovel relatively to said trucks, means for supporting the floor in its elevated position after it has been raised by the cams, and means for preventing sidewise tilting of the floor when in its elevated position.

In testimony whereof I have signed my name to this specification.

M. B. RYAN.