Sept. 1, 1931.

L. R. CULVER

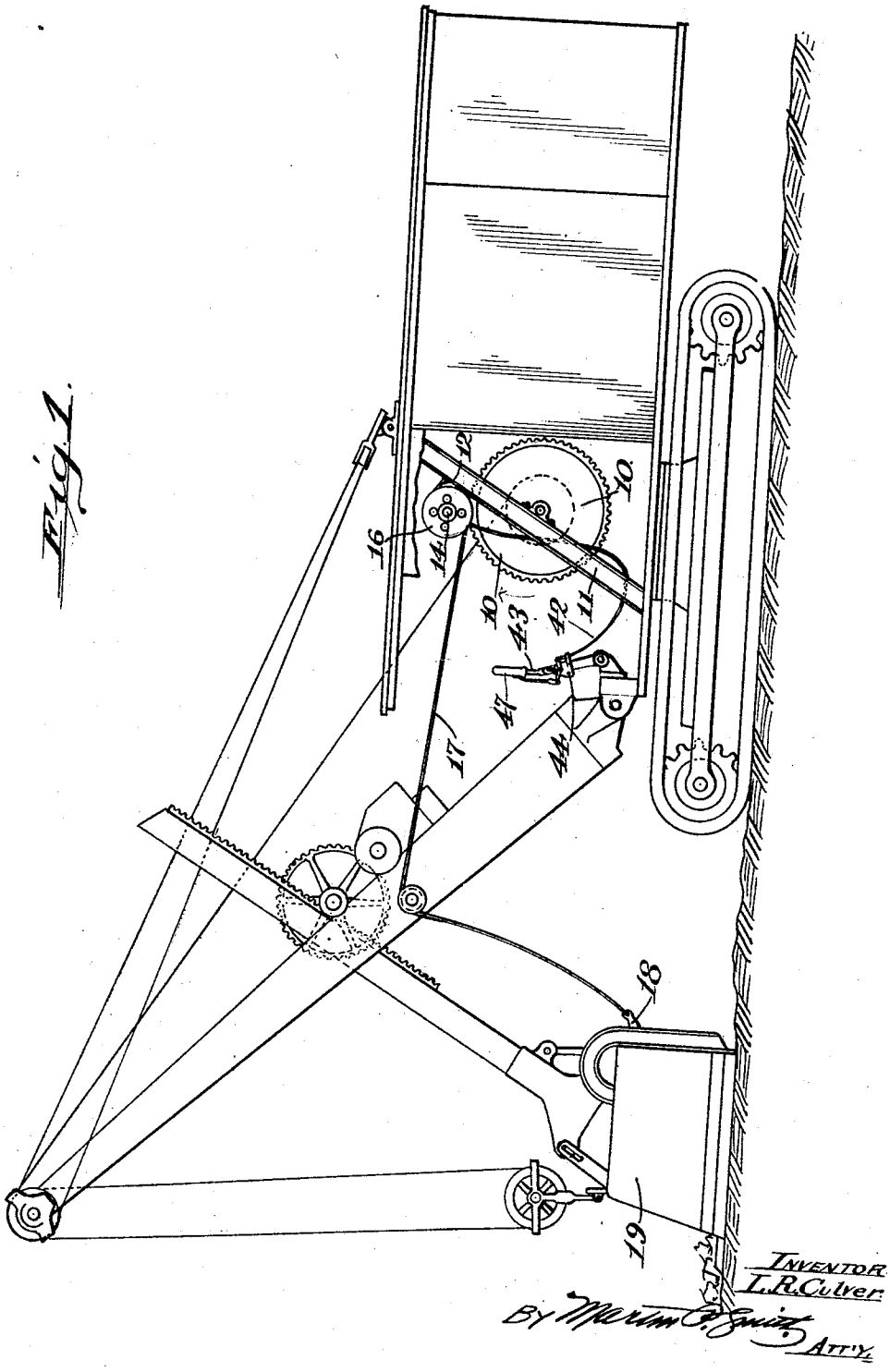
1,821,499

DIPPER DOOR LATCH RELEASE

Filed May 28, 1930

3 Sheets-Sheet 1

Fig. 1.



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3 Sheets-Sheet 2

Fig. 2.

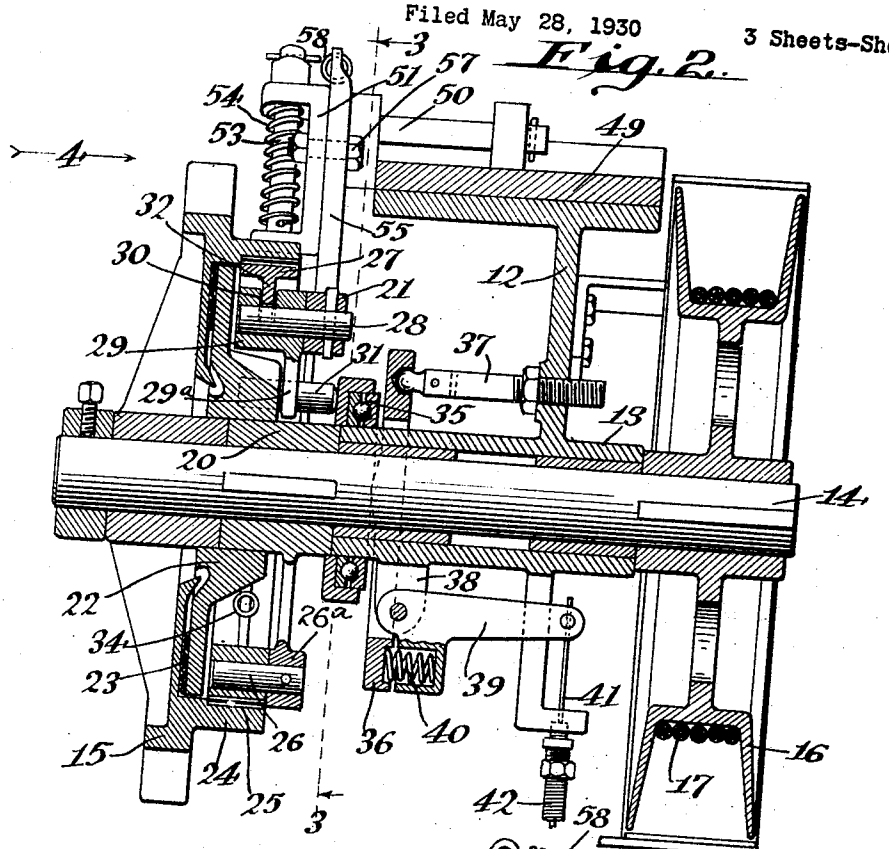
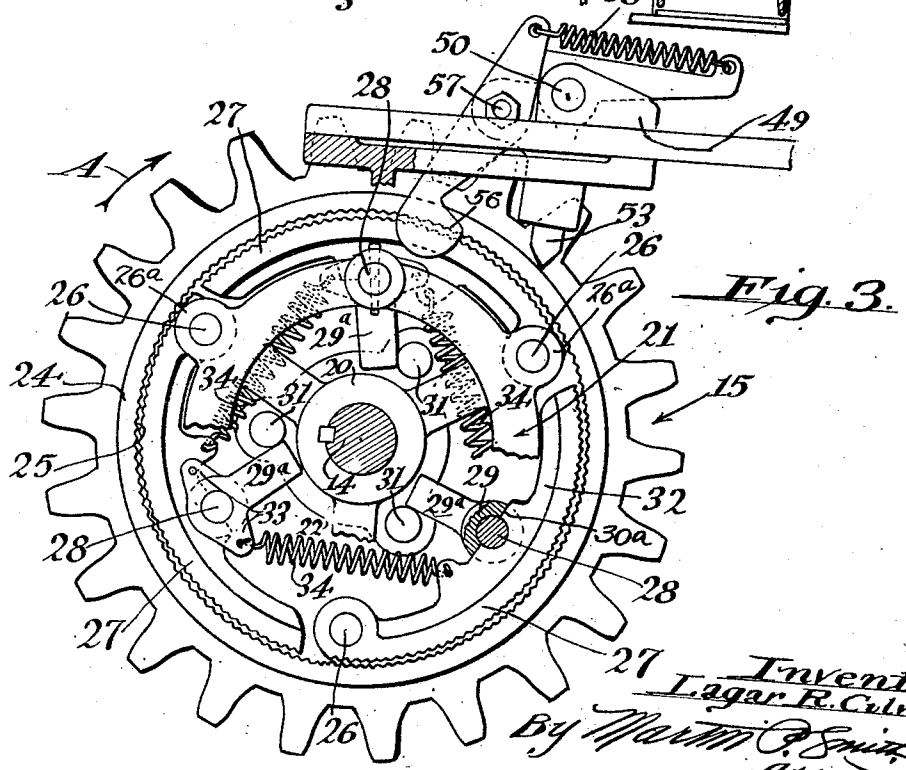


Fig. 3.



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Filed May 28, 1930

3 Sheets-Sheet 3

Fig. 4.

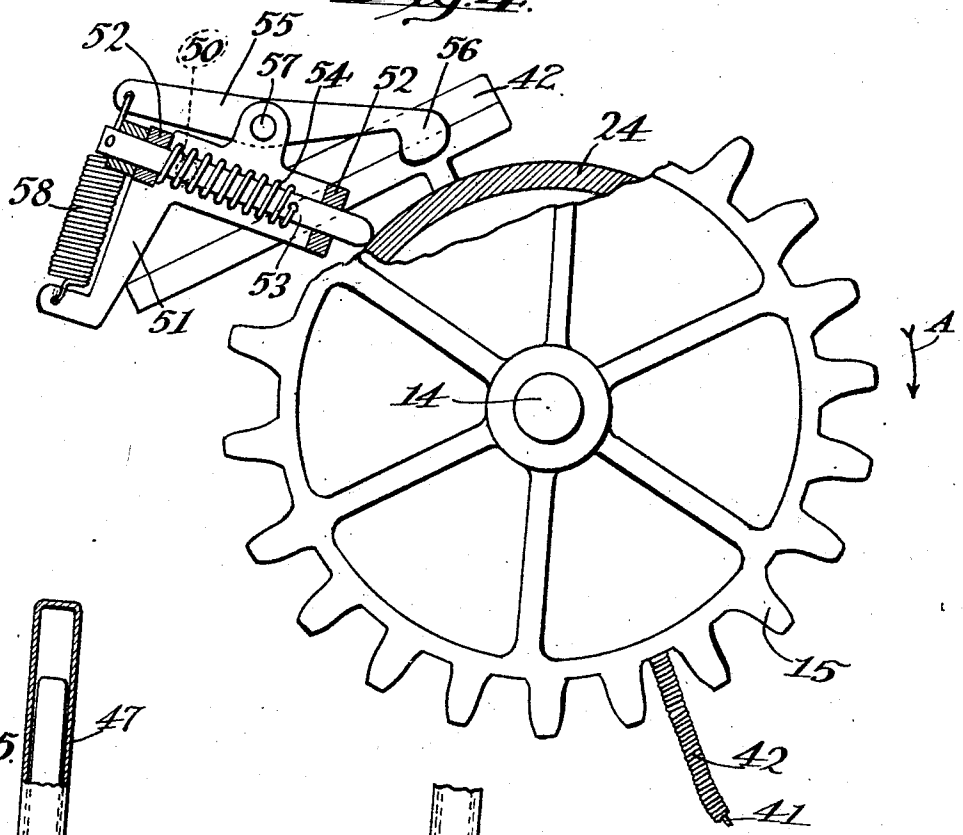


Fig. 5.

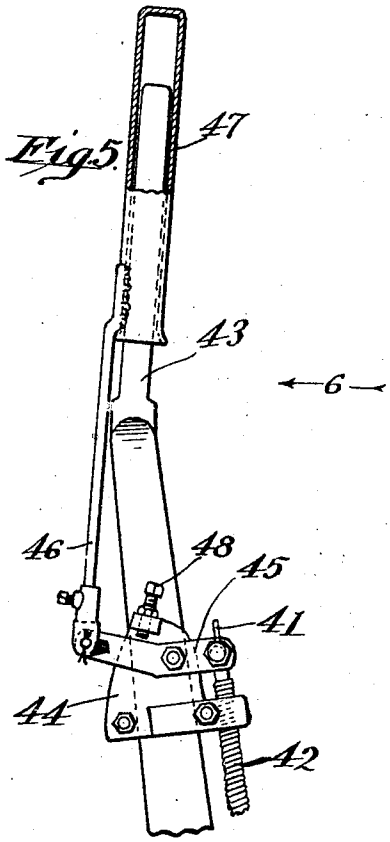
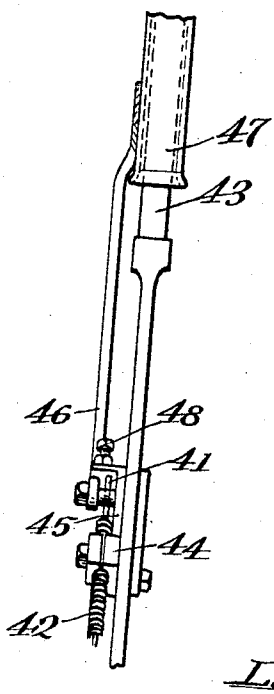


Fig. 6.



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UNITED STATES PATENT OFFICE

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DIPPER DOOR LATCH RELEASE

Application filed May 23, 1930. Serial No. 456,479½.

My invention relates generally to power operated shovels, and more specifically to a means for releasing the latch utilized for holding the dipper door in closed position. The invention herein disclosed is an improvement on a somewhat similar structure that forms the subject matter of my co-pending application for U. S. Letters Patent filed July 16, 1929, Serial No. 378,758.

In certain types of power shovels, the main driven gear rotates continuously in one direction except when the shovels are reversed or caused to travel in a rearward direction.

The dipper door latch release is operated by a pinion meshing with the main driven gear, the rotation of said pinion being transmitted through a friction clutch, to a drum upon which a cable is wound and the latter extending from said drum to the latch on the dipper door. Engagement of the clutch causes the cable to wind onto said drum, thereby effecting release of the latch.

Further objects of my invention are, to generally improve upon and simplify the construction of the existing forms of dipper door latch releasing devices, further, to provide relatively simple and efficient means for automatically stopping rotation of the cable release drum and preventing unwinding of the cable from said drum when the shovel is caused to travel in a rearward direction and further, to provide an improved form of clutch that effects a driving engagement between a pinion that is constantly rotated by the main drum gear of the shovel and the drum upon which the release cable is wound.

A further object of my invention is, to provide an improved form of handle and means for actuating the clutch so as to bring about a driving engagement between the constantly driven pinion and the release cable carrying drum.

With the foregoing and other objects in view, my invention consists in certain novel features of construction and arrangement of parts that will hereinafter be more fully described and claimed and illustrated in the accompanying drawings, in which:

Fig. 1 is a side elevational view of a power shovel and showing my improved dipper door latch release in operative position thereupon.

Fig. 2 is a section taken lengthwise through the center of the release cable actuating mechanism including the constantly driven pinion, the clutch actuating mechanism and the release cable carrying drum.

Fig. 3 is a cross sectional view taken approximately on the line 3—3 of Fig. 2.

Fig. 4 is an elevational view partly in section looking in the direction indicated by the arrow 4 in Fig. 2 and showing the means for automatically stopping the rotation of the release cable carrying drum when the shovel is reversed or driven in a rearward direction.

Fig. 5 is an enlarged side elevational view partly in section of the handle that is utilized for actuating the clutch.

Fig. 6 is an edge view of the handle and looking in the direction indicated by the arrow 6 in Fig. 5.

Referring by numerals to the accompanying drawings which illustrate a practical embodiment of my invention, 10 designates the main drum gear of a power shovel which main gear is suitably journaled in the gantry frame 11 of the shovel and secured to the gantry frame above the main drum gear is a bracket 12 provided with a bearing 13 for a horizontally disposed shaft 14.

Loosely mounted on one end of this shaft is a pinion 15 that meshes with the teeth of the main drum gear 10 and consequently said pinion is constantly driven by said main gear while the shovel is in operation.

Secured on the end of the shaft 14, opposite the end on which pinion 15 is mounted, is a drum 16, upon which is adapted to wind a cable 17 and which cable extends from the lower side of said drum over suitably located pulleys to the latch 18 of the door of dipper 19.

Secured in any suitable manner to shaft 14, adjacent to pinion 15, is the hub portion 20 of a spider 21 and loosely mounted on hub 20 and on the hub of pinion 15 is the hub portion of a disc 22 that functions as a clutch.

Positioned adjacent to the outer portion of

disc 22, is a clutch facing 23 that is adapted to frictionally engage the web of pinion 15 and effect a driving engagement therewith.

Formed integral with the inner face of pinion 15 is a ring flange 24, the inner face of which is transversely corrugated, as designated by 25.

Seated in bosses 26[a] on the outer portion of spider 21, are pins 26 that project toward disc 22 beneath flange 24 and pivotally mounted on the projecting portion of each pin 26 is an arcuate shoe 27, the outer face of which is corrugated and adapted to engage the corrugated face 25 of flange 24.

Seated in spider 21 at points between the pins 26 and projecting toward disc 22 are pins 28 that are secured to said spider in any suitable manner, preferably by means of pins or keys and journaled on the projecting ends of these pins, immediately beneath the intermediate portions of the brake shoes 27, are heads 29 with which are formed short arms or fingers 29[a] that project toward the shaft 14.

The outer portions of the heads 29 are provided with notches 30 for the accommodation of webs 32 that project from the rear faces of the shoes 27 and, at the ends of the notches 30, the heads 29 bear against the adjacent edges 30[a] of the flanges 32, or those edges that are immediately adjacent to the pins 28 (see Fig. 3).

Seated in and projecting outwardly from the hub portion of disc 22, between the arms of the spider 21, are pins 31 that are adapted to bear against the arms 29[a] that project inwardly from the heads 29.

Projecting laterally from each head 29 is a perforated ear 33 and secured thereto is one end of a retractile spring 34, the opposite end thereof being secured to the next adjacent one of the brake shoes 27 adjacent to the pin 28 that is associated therewith.

Arranged to slide freely on bearing 13, is an anti-friction thrust bearing 35 that bears directly against the outer ends of the pins 31 and bearing against the outer face of this thrust bearing to the sides of shaft 14 is the intermediate portion of a yoke 36, the upper end of which is fulcrumed on the outer ends of a pin or stud 37 that projects from bracket 12.

Depending from bearing 13 are lugs 38, to which is fulcrumed a bell crank 39 and interposed between the lower end of yoke 36 and the short arm of this bell crank is an expansive spring 40.

Secured to the end of long arm bell crank 39 is one end of a flexible member 41, preferably a wire that extends through a flexible tubular sheath 42, the ends of which are suitably supported.

Fulcrumed on the frame in the cab of the shovel directly in front of the position occupied by the operator is an upwardly projecting hand lever 43 that functions as one of the control levers for the shovel and secured on said lever is a bracket 44 to which is connected one end of the flexible sheath 42.

Fulcrumed on this bracket is a short lever 45, to one end of which is secured one end of the flexible member 41 and pivotally secured to the opposite end of lever 45 is the lower end of rod 46 that extends upwardly directly in front of lever 43 and the upper end of said rod is secured to a hollow member 47 that is mounted for vertical movement on the upper end of lever 43 (see Figs. 5 and 6).

A set screw 48 seated in bracket 44 limits the swinging movement of lever 45 in one direction.

The parts just described provide means for drawing the flexible member 41 through the sheath 42 so as to swing bell crank 39 on its fulcrum and thereby cause yoke 36 to bear against thrust bearing 35.

Secured on the upper portion of bracket 12 and projecting toward the pinion 15 is a bracket 49 and pivotally mounted on the outer end of this bracket by means of a pin 50, the axis of which is parallel with the axis of shaft 14 is a bracket 51 that occupies a position directly over the ring flange 24.

Formed on bracket 51 are spaced lugs 52 and arranged for sliding movement therethrough is a rod 53, the inner end of which rides directly on the outer face of ring flange 24. Associated with this rod is an expansive spring 54 that yieldingly resists outward movement of the rod relative to the ring flange.

A lever 55 that is provided on its inner end with a head 56 is fulcrumed on a pin 57 that projects laterally from bracket 51 and connected to the rear end of this lever is one end of a retractile spring 58, the opposite end of which is secured to the lower portion of bracket 51. This pivoted spring held lever 55 occupies a plane parallel with the pinion 15 and spider 21 and it is positioned so that when bracket 51 is swung to a certain position on its axis, the pin 50, the head 56 on said lever will be positioned directly on the path of travel of the lugs on spider 21 in which the pins 26 are seated.

In the operation of my improved dipper door latch release pinion 15, which is constantly in mesh with the main drum gear operates continuously as said main drum gear is rotated, but the frictional engagement between the pinion and disc 22 is normally insufficient to impart driving movement to said clutch and the parts actuated thereby including the shaft 14 and drum 16.

To actuate the device and cause the cable 17 to wind onto drum 16 and thereby disengage the dipper door latch, the operator of the machine moves the hollow handle 47 downward a short distance on lever 43, thereby swinging lever 45 on its fulcrum and

drawing flexible member 41 through the sheath 42.

Such action swings bell crank 39 upon its fulcrum, thereby swinging yoke 36 on its fulcrum and moving thrust bearing 35 against the pins 31. These pins are seated in disc 22 and the latter will be forced into engagement with pinion 15 through the clutch facing 23 and as a result disc 22 will be rotated a short distance until the pins 31 engage the fingers 29ª that project inwardly from the heads 29 and as said fingers are swung on their fulcrums, which are the pins 28, the shoe 27 will be swung outwardly against the resistance offered by springs 34 so that the corrugated outer faces of said shoes will engage the correspondingly corrugated inner face of the ring flange 24, thereby effecting an interlocking engagement between said ring flange and the spider 21 that carries the shoes and as said spider is fixed on shaft 14 the latter will be rotated.

As shaft 14 is thus rotated, the drum 16 carried by said shaft will be likewise rotated so as to wind cable 17 thereunto and consequently releasing the dipper door latch 18.

As soon as the release of latch has been effected the operator releases pressure on the hollow handle 47 and said handle and the parts associated therewith including flexible member 41 and bell crank 39 will be returned to their normal positions by expansive spring 40 which was slightly compressed as bell crank 39 was previously acuated. As soon as pressure on the thrust bearing 35 is relieved the arms 29ª will swing back to their normal positions under the influence of the retractile springs 34 and as these springs are connected to the shoes 27 the latter will be drawn out of engagement with the ring flange 24, thereby bringing about a disengagement of said shoes with the ring flange and consequently disconnecting spider 21 and the pinion 15.

As the arm that carries the dipper is again lowered into position to be filled, the dipper door will close by gravity, thereby unwinding a portion of the cable from drum 16.

During the operation of the shovel and while the same is being driven forwardly in its operation, the pinion 15 rotates clockwise or in the direction indicated in the arrow in Fig. 4 and under such conditions the free end of rod 53 rides with comparatively light friction on the surface of the ring flange 24, as seen in Fig. 4.

When the shovel is moved rearwardly in its operation, pinion 15 will be rotated anti-clockwise and in order to prevent the cable from being unwound from drum 16 during such operation I provide the automatic stop mechanism that includes the finger 53 and lever 55. As soon as the pinion 15 starts rotating in a reverse direction or anti-clockwise, the end of finger 53 will frictionally engage the surface of the ring gear 24 with sufficient bearing to be swung into a reverse position and which action necessarily swings bracket 51 upon its fulcrum 50.

As a result of this movement the lever 55 will be swung downwardly so that head 56 on the inner end thereof is positioned directly in the path of travel of the heads on spider 21 that carry the pins 26 and when one of the lugs on the spider engages head 56, the spider and parts carried thereby will be prevented from further rotating and consequently the shaft 14 and drum 16 will be held against reverse rotation which would othewise permit the cable 17 to unwind from the drum.

The spring 58 is put on for safety in the event that the operator causes the dipper to move outwardly to such an extent as to overhaul the trip cable, in which event the bosses 26ª on the spider will act through lever 55 to overcome the tension of spring 58 so as to permit the cable to pay out.

When the shovel is again driven forwardly and the pinion 15 rotates in its normal clockwise direction the inner end of rod 53 will frictionally engage the surface of the ring flange 24 and the bracket 51 and parts carried thereby will swing back to their normal positions as illustrated in Fig. 4.

When the parts just described have been swung so as to position the end of lever 55 in the path of travel of the lugs on the spider, said lever and bracket 51 occupy the positions as illustrated in Fig. 3 and at this time the pinion 15 is rotating reversely or in the direction indicated by the arrow A in Fig. 3.

At the time the pins 31 engage the fingers 29ª and move the same so as to bring about an engagement between the shoes 27 and the corrugated inner face of the ring flange 24, the heads 29 will bear on the flanges 32 of the shoes immediately to the sides of the pivot pins 28 and thus each arm and the shoe with which it is associated will move as one part when swung into engagement with the ring flange and when the pressure of the pins 31 against the arms 29ª is relieved the springs 34 will withdraw the shoes from engagement with the ring flange. Finger 53 rides lightly at all times on ring flange 24 of gear 15 and while said gear is revolved clockwise, as illustrated in Fig. 4, the head 56 of lever 55 will be held out of engagement with the bosses 26 on spider 21, thereby permitting spider 21 and drum 16 (both of which are keyed to shaft 14) to revolve freely in either direction, being controlled only by the clutch mechanism and the pull on trip cable 17.

When the shovel is reversed the direction of rotation of gear 15 is necessarily reversed and instead of running in a clockwise direction, as illustrated in Fig. 4 it will run counter clockwise and such action would unwind

the cable and permit the same to become tangled if there was no device to hold the drum 16 from turning in an anti-clockwise direction when gear 15 is turning in the same direction.

When gear 15 is turning in the direction indicated by the arrow A in Fig. 3 and which direction is counter clockwise as compared to the direction of movement of said gear when viewed as illustrated in Fig. 4, finger 53 has shifted from the position it occupies as illustrated in Fig. 4 (the spring 54 permitting said finger to slide outwardly in its bearing 52 while said finger is shifting its position) thereby allowing head 56 to drop into the path of travel of the bosses 26ª on spider 21. Such action will hold the spider and drum from turning to unwind cable 17.

Lever 55 and rocking member 51 could be made in one piece but for the fact that there must be some means provided for safety in case the shovel operator shoves out the dipper. In such event the successive tension on cable 17 will cause the spider 21 to overcome the tension on spring 58 and lever 55 will swing so as to permit bosses 26ª to pass and thereby allow the cable to unwind as long as there is excessive tension on said cable.

Thus it will be seen that I have provided relatively simple, practical and efficient means for imparting pull to the cable that is connected to the dipper door latch of a power shovel and said releasing means having associated therewith automatically acting means that will prevent the large actuating cable from unwinding from its drum when the shovel is moved rearwardly.

It will be understood that minor changes in the size, form and construction of the various parts of my improved dipper door latch for power shovels may be made and substituted for those herein shown and described without departing from the spirit of my invention, the scope of which is set forth in the appended claims.

I claim as my invention:

1. In a power shovel dipper door latch release, the combination with a shaft, of a pinion loosely mounted on said shaft, which pinion is in mesh with the main driving gear wheel of the power shovel, a dipper door latch releasing cable carrying drum secured to said shaft, a clutch member secured to the pinion, a cooperating clutch member secured to said shaft and automatically operating means controlled by the rotation of the clutch member that is secured to the pinion for restraining the clutch member that is mounted on the shaft against reverse rotary motion when the main driving gear wheel and pinion are reversely rotated.

2. In a power shovel dipper door latch release, the combination with a shaft, of a pinion loosely mounted on said shaft, which pinion is in mesh with the main driving gear wheel of the power shovel, a dipper door latch releasing cable carrying drum secured to said shaft, a clutch member secured to the pinion, a cooperating clutch member secured to said shaft, automatically operating means controlled by the rotation of the clutch member that is secured to the pinion for restraining the clutch member that is mounted on the shaft against reverse rotary motion when the main driving gear wheel and pinion are reversely rotated and manually operable means for effecting an engagement of the clutch member on the shaft with the clutch member that is secured to said pinion.

3. In a dipper door latch release for power shovels, a shaft, a drum mounted thereon, a cable carried by said drum and connected to the dipper door latch, a pinion loosely mounted on the shaft and in mesh with the main drum gear of the power shovel, a ring flange on said pinion, the inner face of which flange is corrugated, a spider secured to the shaft, spring held shoes pivotally mounted on said spider and adapted to engage the corrugated face of the ring flange, manually operable means for moving the shoes into engagement with said ring flange, a clutch adapted to provide a driving engagement between the spider and pinion and automatically acting means for holding the clutch against reverse rotation when said pinion is reversely rotated.

4. In a dipper door latch release for power shovels, a journaled shaft, a drum secured thereto, a cable secured to said drum and connected to the dipper door latch, a pinion loosely mounted on the shaft and meshing with the main drum gear of the power shovel, a clutch loosely mounted on the shaft and adapted to engage said pinion, manually operable means for effecting a driving engagement between said clutch and pinion, a spider secured to the shaft, means actuated by the rotation of the disc effecting a driving engagement between the spider and pinion and automatically acting means for effecting a disengagement of the driving connection between the spider and pinion when said pinion is reversely rotated.

5. In a dipper door latch release for power shovels, a journaled shaft, a drum secured thereto, a cable carried by said drum and connected to the dipper door latch, a pinion loosely mounted on the shaft and in engagement with the main drum gear of the power shovel, a ring flange on said pinion, the inner face of which flange is corrugated, a spider secured to the shaft, spring held shoes pivotally mounted on said spider and provided with corrugated faces that are adapted to engage the corrugated face on the ring flange, a manually operable clutch for effecting a driving engagement between the spider and pinion and means actuated by said pinion and the flange carried thereby for automat-

ically effecting a disengagement of the driving connection between said spider and pinion.

6. In a power dipper door latch trip, the combination with a shaft of a pinion mounted for rotation on said shaft, which pinion is in engagement with a gear of the power shovel with which the dipper door latch trip is associated, a dipper door latch releasing cable carrying drum secured to said shaft, a spider secured to said shaft, friction shoes fulcrumed on said spider, cams fulcrumed on said spider, a friction disc slidably mounted on the hub of said spider and the hub of said pinion, a clutch facing arranged between the face of the friction disc and the web of said pinion, thrust pins secured to said friction disc, a fulcrumed yoke, a thrust collar mounted between the ends of said thrust pins and said yoke, a bell-crank lever mounted adjacent to the free end of the yoke, an expansion spring interposed between said yoke and bell-crank lever, a flexible member pivotally connected to said bell-crank lever, a lever fulcrumed on one of the operating levers of the shovel with which the door latch trip is associated, said flexible member being connected to said last mentioned lever, a rod pivotally connected to said last mentioned lever and a thimble connected to said rod and mounted on the upper end of the operating lever upon which said fulcrumed lever is mounted.

7. In a power shovel, the combination with its dipper door latch and one of its constantly rotating gears, of means for maintaining the trip cable from unwinding when said constantly rotating gear is reversed, a drum on which said trip cable is secured, a shaft to which said drum is secured, a spider secured to said shaft, bosses on said spider, a pinion rotatably mounted on said shaft, a ring flange on said pinion, a rocking member, a spring tension finger carried by said rocking member and bearing on said ring flange, a centrally fulcrumed lever pivoted on said rocking member, a spring for maintaining said lever in position and which lever is arranged so that one end is adapted to move into the path of the bosses on said spider when said rocking member swings on its axis.

8. In a power shovel, the combination with the dipper door latch and one of the constantly rotating gears of the shovel, of means for taking up the slack of the dipper door latch tripping cable, comprising a drum on which the trip cable is wound, a shaft to which said drum is secured, a spider secured to said shaft, a pinion rotatably mounted on said shaft, a web between the spokes of the said pinion to provide a friction surface, a friction disc slidably mounted on the hubs of said spider and pinion, a clutch facing interposed between said friction disc and said web, thrust pins secured to said friction disc and extending between the spokes of said spider, an adjustably mounted pivoted yoke, a thrust bearing disposed between the ends of said thrust pins and yoke, a fulcrumed bell-crank lever having one arm in contact with said yoke, a spring interposed between said yoke and arm, a control wire pivotally connected to the other arm of said bell-crank, a lever to which the other end of said control wire is connected, a plate secured to one of the operating levers of the shovel with which the trip is associated, said last mentioned lever being fulcrumed on said plate and an adjusting screw seated in said plate and adapted to bear against said lever so as to regulate the pressure between said disc and pinion to maintain any desired tension on the cable.

In testimony whereof I affix my signature.

LAGAR R. CULVER.