Feb. 23, 1926. 1,574,492

W. LEHMAN ET AL

DIPPER TRIP

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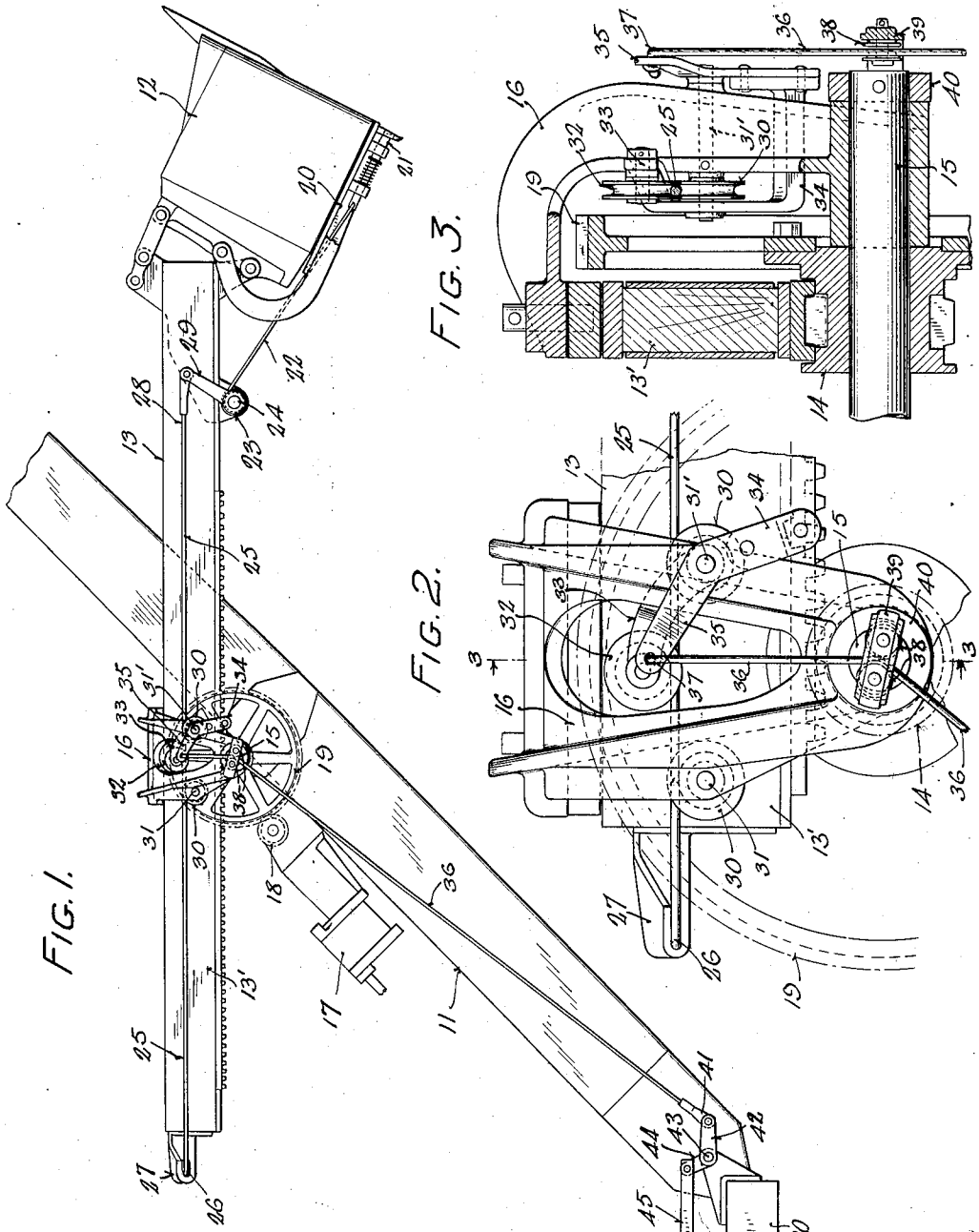

FIG. 1.

FIG. 2.

FIG. 3.

INVENTORS:
Werner Lehman
Fred J. Brewer
Roger Sherman Hoar
Benjamin F. Johnston
Mitchell L. Fykse

BY Ralph W. Brown ATTORNEY.

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FIG. 5.

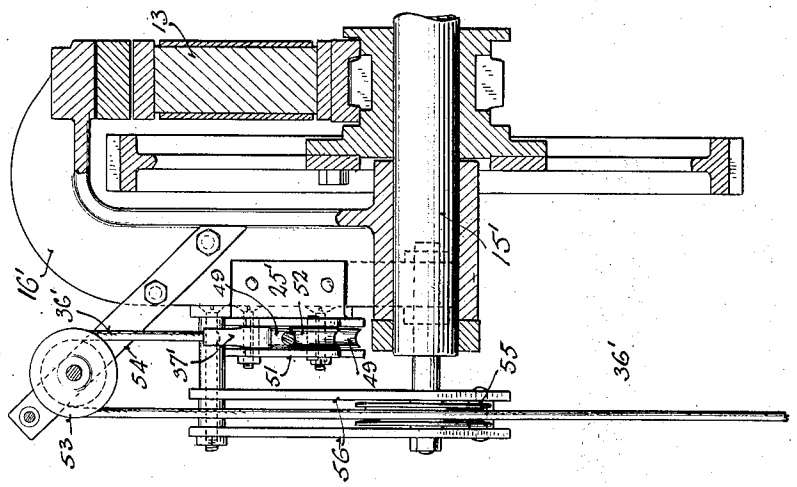
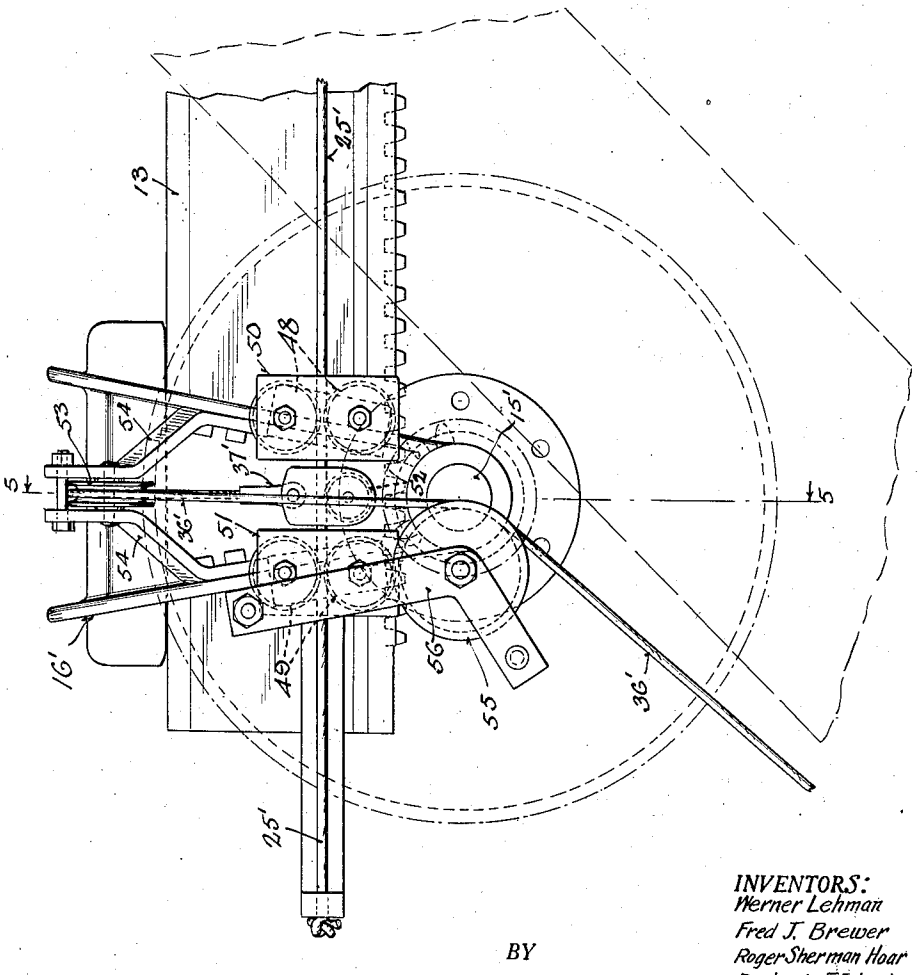


FIG. 4.



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BY Ralph L. Brown.

ATTORNEY.

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UNITED STATES PATENT OFFICE.

WERNER LEHMAN, FRED J. BREWER, AND ROGER SHERMAN HOAR, OF SOUTH MILWAUKEE, AND BENJAMIN F. JOHNSTON AND MITCHELL L. FYKSE, OF MILWAUKEE, WISCONSIN, ASSIGNORS TO BUCYRUS COMPANY, OF SOUTH MILWAUKEE, WISCONSIN, A CORPORATION OF WISCONSIN.

DIPPER TRIP.

Application filed September 4, 1923. Serial No. 660,903.

To all whom it may concern:

Be it known that we, WERNER LEHMAN, FRED J. BREWER, and ROGER SHERMAN HOAR, residing at South Milwaukee, and BENJAMIN F. JOHNSTON and MITCHELL L. FYKSE, residing at Milwaukee, all in the county of Milwaukee and State of Wisconsin, citizens of the United States, have invented a certain new and useful Improvement in Dipper Trips, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

This invention relates to dipper trip mechanisms for power shovels.

Considerable difficulty has been experienced in devising a dipper trip mechanism that will function satisfactorily and uniformly under all conditions of operation and in the various positions assumed by the dipper during normal working. This is due, at least in part, to the various degrees of slack ordinarily occurring in the latch line or other operating cable as the dipper is moved from point to point throughout its operating range. Attempts heretofore made to overcome this difficulty have met with partial success. Devices for automatically taking up the slack as it occurs have been introduced. These have their objections. Some are limited in their application to machines of a particular mechanical design. Others lead to mechanical complications.

One object of the present invention is the provision of a dipper trip mechanism which will so conform to various positions of the dipper as to avoid the occurrence of any slack therein.

Another object is the provision of a novel arrangement of latch line which will fully compensate for all lengthwise shifting of the dipper stick and thereby avoid the necessity for any slack take-up mechanism.

Another object is the provision of a novel arrangement of trip operating cable which will fully compensate for all swinging movements of the dipper stick.

Another object is the provision of a novel system of dipper trip cables which will fully compensate for both swinging and shifting movements of the dipper stick and so permit mechanical operation from the main platform of the machine without requiring slack take-up mechanism.

Other objects and advantages will appear from the following description of two embodiments of this invention.

In the drawings:

Figure 1 is a side elevation of a portion of a steam shovel equipped with a trip mechanism constructed in accordance with the present invention.

Figure 2 is a view on a larger scale of a portion of the trip mechanism of Figure 1.

Figure 3 is a sectional view taken substantially on the line 3—3 of Figure 2.

Figure 4 is a view similar to Figure 2 of a portion of a trip mechanism of somewhat different form.

Figure 5 is a sectional view taken on the line 5—5 of Figure 4.

The shovel selected for illustration includes a main platform 10, boom 11, dipper 12 and dipper stick 13 constructed and arranged in the usual manner. The dipper stick 13 in this instance is bifurcated and straddles the boom, each of the legs 13′ thereof resting upon and meshing with a pinion 14 mounted to rotate about a shaft 15 fixed in the boom. A saddle block structure 16 pivotally mounted on each end of the shaft 15 retains the legs 13′ in operative position and permits the dipper stick to swing about the axis of the shaft. Longitudinal shifting of the dipper stick is effected by the usual boom engine 17, through the pinions 18 and gears 19, in the usual manner. The dipper door 20 is releasably retained in closed position by the usual spring pressed latch 21 connected through a cable 22 with a drum 23 fixed to a shaft 24 carried by the dipper stick.

The present invention provides a new and improved trip mechanism by which the latch may be released in any position of the dipper to effect opening of the dipper door. The trip mechanism shown in Figures 1, 2 and 3 comprises a latch line 25 extending parallel to the dipper stick between one of

the legs 13′ thereof and the corresponding saddle block structure 16. This line is secured at one end 26 to a bracket 27 fixed to the rear end of the adjacent dipper stick leg and at its other end 28 is secured to an upright latch lever 29 fixed to the shaft 24. The arrangement is such that the condition of the line and its position relative to the dipper stick is undisturbed by swinging and lengthwise shifting of the dipper stick.

The latch lever 29 is actuated by crimping the latch line 25. Mechanism for this purpose is mounted on the saddle block structure, so as to rock therewith during swinging of the dipper stick, and in this instance comprises a pair of spaced sheaves 30 journaled upon stub shafts 31 and 31′ fixed in the saddle block structure. These sheaves are arranged beneath the latch line and constitute a supporting guide therefor. A third sheave 32 is disposed above the latch line and contacts therewith intermediate the sheaves 30. This sheave is carried by a lever 33 rockably mounted upon the inner end of shaft 31′ and rigidly connected through a yoke 34 with an actuating lever 35 rockably mounted upon the outer end of shaft 31′. The yoke 34 serves to partially counterbalance the weight of the levers 33 and 35 and the parts supported thereby so that the sheave 32 normally rests lightly upon the latch line. Since it is limited in its downward movement by the saddle block structure, this yoke also prevents undue movement of the sheave 32 away from the latch line during swinging of the dipper stick and consequent rocking of the saddle block structure.

Lever 35 is actuated preferably from the main platform of the machine through a cable 36 connected as at 37 therewith and arranged so as to remain substantially taut in all positions of the dipper stick. In this instance, this cable passes between a pair of guide sheaves 38 by which it is directed substantially across the pivotal axis of the saddle block structure. Sheaves 38 are journaled in a bracket 39 constituting an integral part of a collar 40 fixed to the end of shaft 15. The other end of cable 36 is connected with any appropriate actuating means. In Figure 1 it is shown connected, as at 41, with one arm 42 of a bell crank, mounted on a fixed pivot 43 carried by the main platform 10. The other arm 44 of this bell crank is connected through a link 45 with an appropriate foot lever 46 mounted upon the platform and yieldably retained in the normal inactive position shown by any appropriate means, such as a spring 47.

This it will be noted that a dipper trip mechanism is provided in which the operating cables are free from slack in all positions of the dipper. Since the latch line 25 is free to move lengthwise with the dipper stick it compensates completely for all longitudinal shifting thereof and since that portion of the cable 36 above the sheaves 38 is free to swing with the saddle block structure about the pivotal axis thereof, without appreciable foreshortening, full compensation is had for all swinging movements of the dipper stick. The dipper door may be released by the operator in any position of the dipper by merely depressing the foot lever 46. This action of the foot lever rocks the bell crank arms 42 and 44 in a clockwise direction (Fig. 1), thereby exerting an effective pull on the cable 36, by which the lever 35, and consequently lever 33, is swung downwardly and the sheave 32 pressed against the latch line 25 to crimp the same between the sheaves 30. This crimping of the latch line causes latch lever 29 to swing to the left so that the drum 23, through the cable 22, withdraws the latch 21 into released position.

The trip mechanism shown in Figures 4 and 5 is similar in many respects to that just described. The latch line 25′ is connected at its opposite ends with the rear end of the dipper stick and with an upright latch lever, respectively, as hereinabove described, and extends parallel with the dipper stick. In this instance, however, it passes outside of the saddle block structure 16′ between two pairs of guide sheaves 48 and 49 mounted within brackets 50 and 51 fixed to the saddle block structure outside thereof. A floating sheave 52 is arranged between these pairs of sheaves beneath the latch line and supported by the end 37′ of an operating cable 36′. This cable passes from the sheave 52 over a sheave 53, journaled between fixed brackets 54 carried by the saddle block structure, and thence downwardly beneath a compensating sheave 55 to an appropriate actuating means upon the main platform of the machine. Sheave 55 is journaled in a fixed bracket 56 fixed to the saddle block structure. Sheave 55 is so disposed with respect to the axis of shaft 15′ as to fully compensate for any foreshortening effect that might otherwise be produced on the cable 36′ by swinging of the saddle block structure.

It will thus be seen that this form of trip mechanism will also readily conform to all movements of the dipper stick, and that no slack occurs in either the operating cable 36′ or the latch line 25′ thereof during such movement. As in the mechanism first described, the dipper door latch mechanism may be released in any position of the dipper by pulling the cable 36′. A pull on the cable 36′ forces the sheave 52 upwardly against the latch line 25′ and effects a crimping thereof between the upper guide sheaves 48 and 49.

Various changes may be made in the embodiments of the invention hereinabove de-

scribed, without departing from or sacrificing any of the advantages of the invention as defined in the appended claims.

We claim:

1. In a power shovel having a dipper and dipper stick mounted for swinging and shifting movements the combination of dipper door latch mechanism, a latch operating line arranged to automatically compensate for all shifting movements of the dipper stick, and latch line operating mechanism arranged to compensate for all swinging movements of the dipper stick.

2. In a power shovel having a dipper and dipper stick mounted for swinging and shifting movements the combination of dipper door latch mechanism, a latch operating line connected with said dipper stick and extending parallel to the direction of shifting movement thereof, and means operable upon said line to release said latch mechanism in any position of said dipper stick.

3. In a power shovel having a dipper and dipper stick mounted for swinging and shifting movements the combination of dipper latch mechanism, line crimping mechanism, and a latch operating line extending parallel to said dipper stick and operatively associated with said crimping mechanism in the various positions assumed by said dipper stick.

4. In a power shovel the combination of a dipper and dipper stick, a pivoted guide in which said dipper stick may reciprocate longitudinally, dipper door latch mechanism, a latch operating line, means carried by said guide for operating said line, and a cable substantially intersecting the pivotal axis of said guide for actuating said line operating means.

5. In a power shovel the combination of a dipper and dipper stick, a pivoted guide in which said dipper stick may reciprocate longitudinally, dipper door latch mechanism, a latch operating line, means carried by said guide for operating said line, a cable for actuating said means, and a guide sheave for said cable adjacent the pivotal axis of said guide.

6. In a power shovel the combination of a dipper and dipper stick, dipper door latch mechanism, an upright latch operating lever, a latch operating line connected at one end with said lever and at the other end with said dipper stick, line crimping mechanism operatively associated with said line, and means for actuating said crimping mechanism.

7. In a power shovel having a dipper and dipper stick mounted for swinging and shifting movements, the combination of dipper door latch mechanism, a latch operating line extending substantially parallel to said dipper stick in all positions thereof, and means for operating said line to release said latch mechanism comprising cable operated sheaves and a cable having a substantially uniform degree of tautness in all positions of said dipper stick.

8. In a power shovel having a working platform and a dipper and dipper stick supported thereon for swinging and shifting movements, the combination of dipper door latch mechanism, a latch operating line extending substantially parallel to said dipper stick in all positions thereof, means including cable operated sheaves and a cable leading from said platform for operating said line to release said latch mechanism, means associated with said cable for maintaining the same in a taut condition during swinging movements of said dipper stick, and means on said platform for operating said cable.

9. In a power shovel having a dipper and dipper stick mounted for swinging and shifting movements, the combination of dipper door latch mechanism and a two part latch operating line so disposed that one part compensates fully for all shifting movements of the dipper stick and is free from disturbance by swinging movements thereof, and the other part compensates fully for all swinging movements of the dipper stick and is free from disturbance by shifting movements thereof.

10. In a power shovel, having a dipper and dipper stick mounted for swinging and shifting movements, the combination of dipper latch mechanism, line crimping mechanism, a latch lever pivoted on the handle, and a latch operating line extending from said lever, parallel to said dipper stick and operatively associated with said crimping mechanism in the various positions assumed by said dipper stick, said parallelism being attained by extending the latch lever upwardly, rather than downwardly from its fulcrum.

11. In a power shovel, having a dipper and dipper stick mounted for swinging and shifting movements, the combination of dipper latch mechanism, line crimping mechanism, a latch lever pivoted on the handle, and a latch operating line extending from said lever to attaching means adjacent the rear end of the handle, parallel to said dipper stick and operatively associated with said crimping mechanism in the various positions assumed by said dipper stick, said parallelism being attained by extending the latch lever upwardly, rather than downwardly from its fulcrum.

In witness whereof, we hereunto subscribe our names July, 1923.

WERNER LEHMAN.
FRED J. BREWER.
ROGER SHERMAN HOAR.
BENJAMIN F. JOHNSTON.
MITCHELL L. FYKSE.