

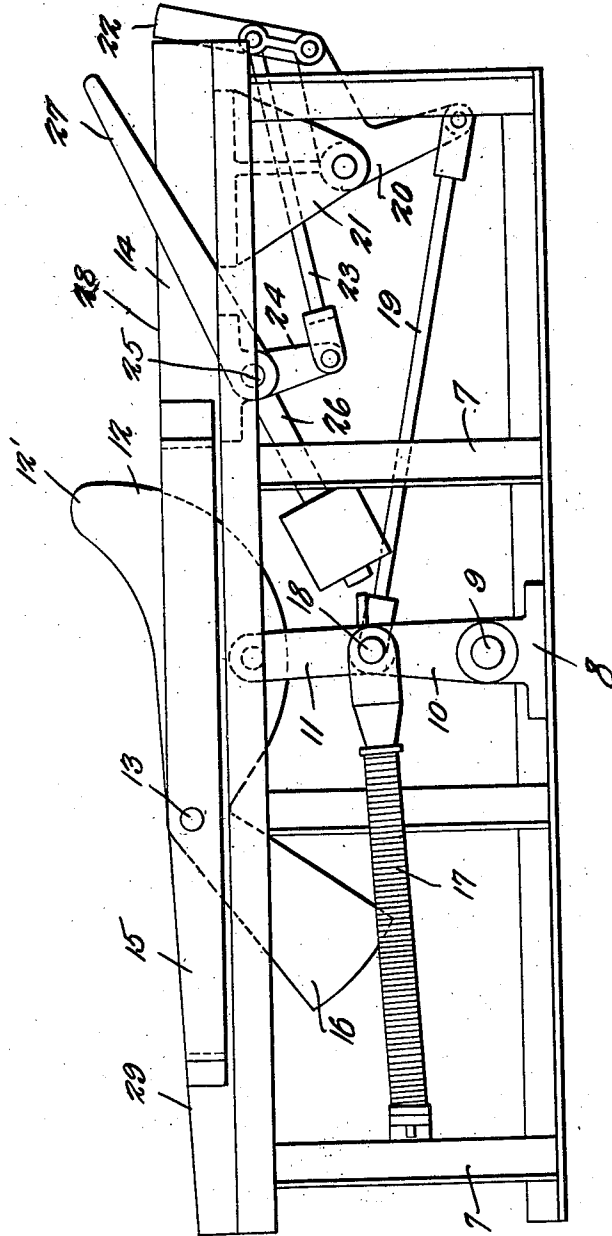
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GRAVITY CAR CONTROL FOR MINE HOISTS.
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Patented May 31, 1921.

2 SHEETS—SHEET 2.

1,379,870.

Fig. 3.



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GRAVITY-CAR CONTROL FOR MINE-HOISTS.

1,379,870.

Specification of Letters Patent.

Patented May 31, 1921.

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To all whom it may concern:

Be it known that I, DANIEL F. LEPLEY, a citizen of the United States, residing at Connellsville, in the county of Fayette and State of Pennsylvania, have invented a new and useful Gravity-Car Control for Mine-Hoists, of which the following is a specification.

This invention relates to apparatus for supplying mine cars to the cages of a mine hoist and constitutes a continuation in part of an application filed by me on January 29, 1920, Serial No. 354,847.

One of the objects of the invention is to combine with a caging apparatus of the general type shown, for example, in Patent No. 1,233,070 issued to me on July 10, 1917, an arrangement of tracks and crossovers so constructed that as cars are successively uncoupled from a trip standing on one of the tracks, they can be directed successively to either of two caging mechanisms, the grades of the tracks being designed to give the cars the proper momentum at different points during their approach to the caging mechanism and during their travel from said mechanism to the waiting cage.

A further object is to provide a gravity car controlled system which will hold the cars under absolute control without the use of brake mechanism other than the ordinary stop doors of the cager.

A still further object is to provide a cager in which a car is stopped on a rising grade but is started on a descending grade thereby to insure a quick getaway from the cager to the waiting cage.

With the foregoing and other objects in view which will appear as the description proceeds, the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed, it being understood that, within the scope of what is claimed, changes in the precise embodiment of the invention shown can be made without departing from the spirit of the invention.

In the accompanying drawings the preferred form of the invention has been shown.

In said drawings—

Figure 1 is a plan view showing in diagram the gravity controlled system com-

bined with a pair of cages and a vertical mine hoist.

Fig. 2 is a diagram showing the control in side elevation.

Fig. 3 is an enlarged side elevation of one of the cages forming a part of the apparatus.

Referring to the figures by characters of reference 1 and 2 designate a pair of cages adapted to work in opposite directions respectively within the shaft of a mine.

Arranged on the floor of the mine next to each hoist compartment and at the receiving or loaded car side is a cager through each of which extends one of a pair of tracks indicated at 3 and 4. The cagers are of like construction and are indicated generally at 5 and 6. As shown in Fig. 3 each cager comprises a supporting structure 7 provided, adjacent its center, and at the bottom thereof, with bearings 8 in which is journaled the main shaft 9 of the cager. Mounted on the end portions of this shaft are the lower links 10 of toggles the upper links 11 of which are pivotally connected to horns 12 pivoted, as at 13, between angle rails 14 mounted on the structure 7 and longitudinal yokes 15 secured to the outer sides of the rails. Each of the horns has a counterbalancing weight 16 extending from the pivot end thereof and normally inclined downwardly as shown in Fig. 3.

A compression spring 17 is interposed between the intermediate pivot 18 of the toggle and one end of the structure 7 and pivotally connected to the pivot 18 is a rod 19 attached to the depending arm of the bell crank 20 fulcrumed in a bearing 21. The other arm of this bell crank extends forwardly beyond the structure 7 and has an operating dog 22 pivoted thereon. A rod 23 connects this dog to an arm 24 depending from a transverse shaft 25 carried by the upper portion of the structure 7. A weighted arm 26 is extended in one direction from said shaft and a tripping treadle 27 extends in the opposite direction from the shaft and close to the outer side of one of the rails 14 so as to be held by the weighted arm 26 normally in the path of the wheels of a car mounted on the rails 14.

The dogs 22 on the two cagers normally project into the path of the hoist cages 1 and

2, respectively, so that when either of the cages is brought to its loading stage, it will come against the upper end of the dog 22 thereunder and thrust it downwardly, thereby causing the dog to operate the bell crank 20 and thrust through the rod 19 against the toggles. Thus the springs 17 will be placed under compression and the horns 12 lowered to release the car restrained thereby. As soon as the cage leaves the loading stage the springs 17 will return all their parts to their initial positions, restoring the horns 12 to their holding positions as shown in Fig. 3 where they will be securely held by the toggles, it being obvious, by referring to Fig. 3, that when the toggles are in supporting positions, their middle pivots 18 are past the dead centers and the toggles thus form rigid supports for the horns.

It will be noted that the rails 14 are not straight from end to end. Instead they are inclined from above the pivots 13 and downwardly toward the delivery end of the cager at approximately a five per cent. grade while those portions of the rails extending from above the pivots 13 to the other end of the cager are approximately level. The upper faces of the horns are so shaped that when the horns are in their raised or normal position, they will provide continuations of the level top faces of the rails and then curve upwardly to form top extensions 12'. The inclined portions of the rails 14 have been indicated at 28 while the level portions have been indicated at 29.

In practice it has been found desirable to have each cager extend about ten feet from the mine shaft. For a distance of about thirteen feet back from the caging apparatus each of the tracks 3 and 4 is preferably constructed at a one and one-half per cent. grade, as indicated at 30. For approximately six feet back of this grade each track is preferably constructed at about a three per cent. grade, as shown at 31. A short stretch of track, about four feet, is then provided at approximately a one per cent. grade, as shown at 32 and then for a distance of approximately twenty-five feet the tracks are constructed at about a one and one-half per cent. grade as shown at 33. It is at this point that crossovers 34 are provided, the same being constructed with switches 35 and 36 adapted to be operated by hand and whereby cars can be directed from either track onto the other track. For approximately ten feet beyond the one and one-half per cent. grade 33 the tracks are constructed with a three per cent. grade, as shown at 37, this grade merging into a two per cent. grade extending through approximately one hundred twenty-five feet as indicated at 38. From there back the tracks can be of any grade sufficient to allow the trips of cars properly to gravitate although it has

been found desirable to have this grade not to exceed one and one-half per cent.

When a trip of cars approaches the shaft on either of the tracks 3 or 4 it is stopped at the switch 35 or 36 and the first car is uncoupled and permitted to gravitate onto the cager 5 where it will be brought to a stop with its front wheels resting on the horns 12 and above and out of contact with the inclined portions 28 of the rails 14. The switch 35 is then thrown and the second car of the trip uncoupled and directed along the crossover 34 onto the other track where it is brought to position on the cager. The cars of the trip are thus distributed back and forth from one track to the other so as to stand uncoupled but in contact in two groups or series, the first car of each group or series standing on one of the cagers with its front wheels held elevated by the horns 12.

As soon as the weight of a descending cage has actuated one of the dogs 22 so as to shift the toggles and abruptly lower the horns 12 six operations take place in rapid succession as follows:

First, the two front wheels of car *a* and which are supported in elevated position by the horns 12, drop down to the five per cent. inclined portion 28 of the track.

Second, the weight of the car with its two front wheels resting on the horns, acts to force them down instantly and compress the spring 17 so as to relieve the other mechanism of this work.

Third, the sudden lowering of the front end of car *a* to the five per cent. grade gives it a forward impulse and a quick start before the cage has quite landed on the shaft bottom. This forward impulse will impart sufficient forward movement to the car *a* to cause it to bump the empty car *e* off of the cage so that the car *a* can take its place. Consequently the caging time can be reduced to three or four seconds in this way.

Fourth, after the car *a* has moved off of the cager far enough for the rear wheels to clear the limits of the horns 12, the front wheels pass over and bear down on treadle 27. This acts to release the spring 17, which was held under compression, to quickly return the toggle to its vertical or locking position so that the horns will thus be elevated and secured in position for engagement by the next car.

Fifth, immediately after car *a* has been released from the cager car *c* which is mounted on the three per cent. grade, will move along said grade and push the car *b* ahead of it over the one and one-half per cent. grade 30, onto and over the level portion of the cager track, indicated at 29, and onto the curved portions of the horns at which time the front wheels of the car *b* will be supported approximately one inch

above the five per cent. incline 28 thereunder. At this time car *c* will pass onto and over the one and one-half per cent. grade while both cars *b* and *c* will lose headway to such an extent that they will practically come to an easy stop without shock or jar when the front wheels of the first car *b* move upwardly onto the curved portions of the horns.

Sixth, immediately upon the landing of the cage and release of the car *a* from the cager, a loaded car which has been held at the front end of a trip on the three per cent. grade indicated at 37, is released by an attendant. This car starts quickly and drifts down over the crossover track section or else straight forward, along the approximate one and one-half per cent. grade indicated at 33 and comes against the car *c*, as indicated at *d* whereby the cars are held pressed forwardly with the front wheels of the front car pressed upwardly on the inclined portions of the horns 12 where they are held by the pressure of the cars.

Obviously both sides of the apparatus are operated in a similar manner, those cars distributed along the track 3 toward the cager 5 being arranged and operating similarly to the cars on the track 4 and cager 6.

It has been found in practice that with two cager equipments such as shown and the proper arrangement of grades, three or four cars can be caged and hoisted per minute with two men on the loading side of the track.

It is to be understood that the grades shown are only approximate and that the length of the various track sections and the percentages of their grades will depend on conditions such as length, weight, and running gear of the cars in use, etc.

This system will permit a man located at the grade section 37 to handle an entire trip of cars by gravity, stopping and uncoupling them at that point and directing the single cars down to the cages.

What is claimed is:—

1. The combination with separate oppositely movable hoist cages, of a caging section adjacent the path of each cage and including a track having one end portion level and the remaining portion which is nearest the path of the cage being inclined downwardly toward the delivery end thereof, stop dogs on said caging section for holding the front wheels of a car elevated above the horizontal and overhanging the inclined rails of the track, said dogs being movable to drop the front wheels of the car onto the inclined track and thereby impart an abrupt initial impulse to the forward movement of the car from the caging section and onto the cage platform.

2. The combination with separate oppo-

sitely movable hoist cages, of tracks leading to the shafts of the respective cages, means whereby uncoupled cars can be distributed from either track to both tracks, a caging section included in each track and close to each cage shaft, each caging section including a level track section and a section inclined downwardly toward the cage shaft, stop dogs forming a part of each caging section and constituting means for holding the front wheels of a car elevated above the horizontal and over the inclined portion of the caging section, the said tracks having variable grades for causing cars to gravitate to the respective caging sections, a car on one grade constituting means for holding another car in tilted position on the stop dogs.

3. The combination with hoist shafts and separate oppositely movable cages, of parallel tracks leading to the shafts, caging sections supplied by the tracks and each including a level portion, a portion inclined downwardly toward the shaft, and dogs extending above and beyond the level portion, crossovers connecting the two tracks, each track having a down grade of approximately three per cent. leading to the crossover section of the tracks which is approximately at a one and one-half per cent. grade and leads successively to approximately a one and one-half per cent. grade, a three per cent. grade, a one and one-half per cent. grade and thence to the level portions of the caging sections, said tracks constituting means for distributing loaded cars from either track to both tracks, thereby to line up the cars along the two tracks with one car on each track held with its forward end elevated above the five per cent. grade by the elevated dogs, said car being forced to elevated position by the pressure thereagainst of one of the following cars located on a three per cent. grade.

4. The combination with a caging section having a level track portion, a downwardly inclined track portion and stop dogs for holding the front wheels of a car elevated above the level portion of the track and over the inclined portion thereof, of a track leading to the caging section and having meeting portions of different percentages of grades whereby a loaded car will start by gravity, move at a moderate speed, come almost to a stop, move onto a grade of sufficient per cent. to start the car forward again by gravity, thence onto a reduced grade to move the car at a moderate speed to the level portion of the caging section.

5. In caging apparatus the combination with a track having one end portion inclined downwardly toward the delivery end thereof, stop dogs having their free end portions upturned and having straight wheel sup-

porting surfaces normally supported above the inclined end portion of the track, means for supporting the dogs in elevated position to hold the front wheels of a car above and
5 out of contact with the inclined end portion of the track, and means for releasing the dogs to drop the front wheels of the car onto the inclined portion of the track thereby to impart an abrupt initial impulse to the for-

ward movement of the car from the appa- 10
ratus.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

DANIEL F. LEPLEY.

Witnesses:

W. H. SOISSON,
BARNETTE BURKHARDT.