May 24, 1960 R. V. PIERCE ET AL 2,937,773

SKIP HOIST FOR SHAFT-SINKING

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FIG. 1.

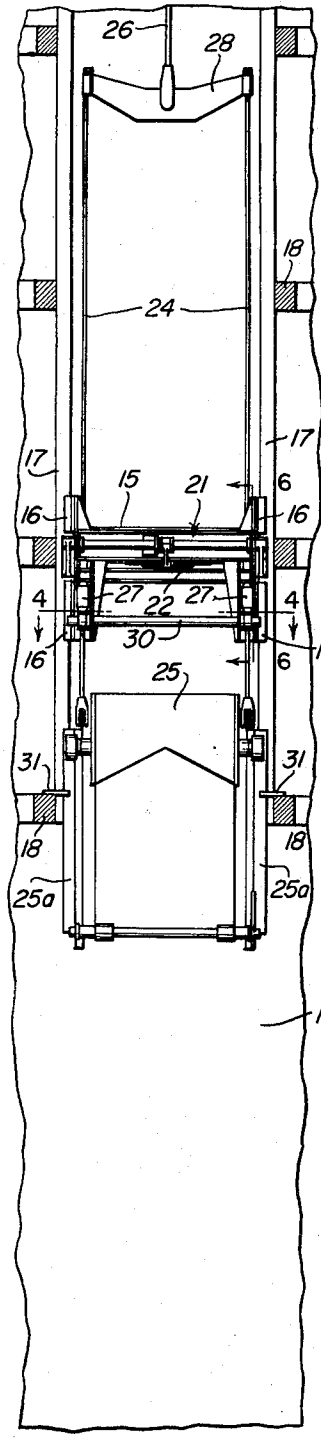


FIG. 2.

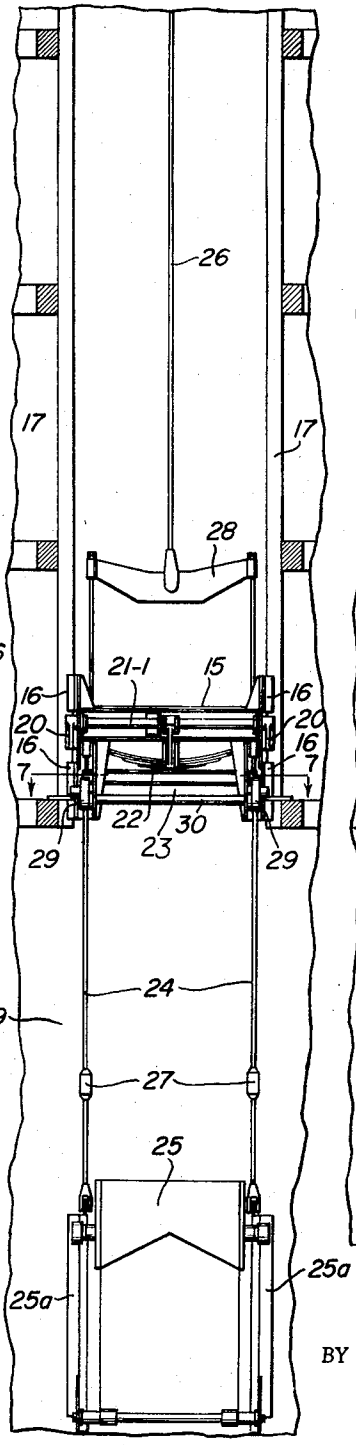
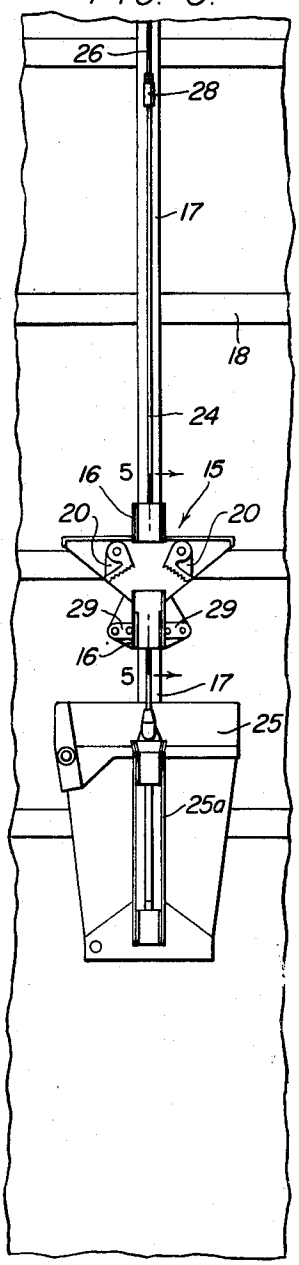


FIG. 3.



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FIG. 4.

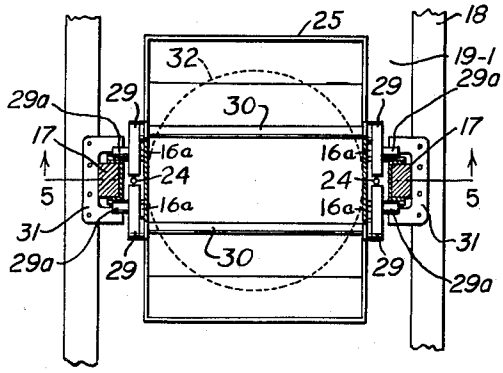


FIG. 7.

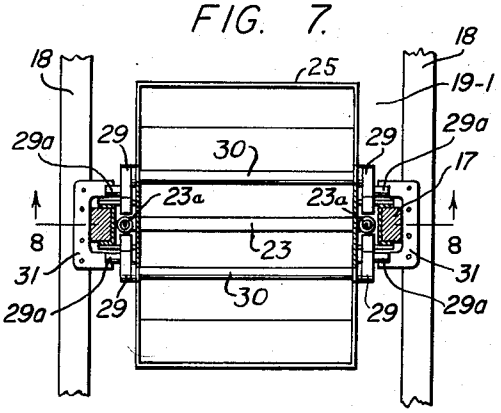


FIG. 5.

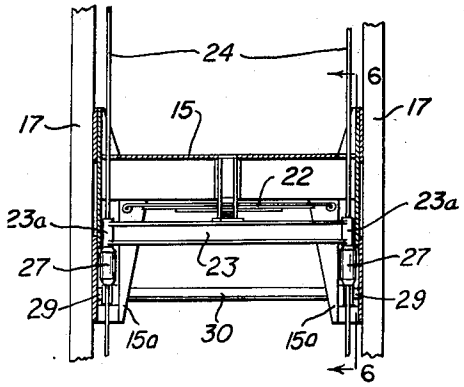


FIG. 8.

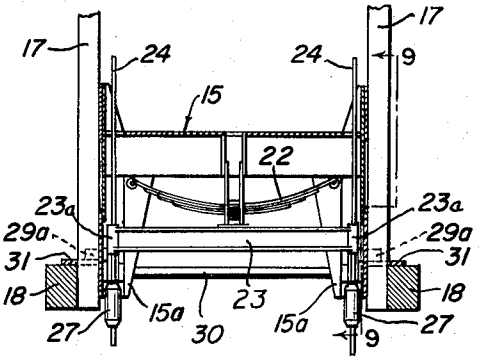


FIG. 6.

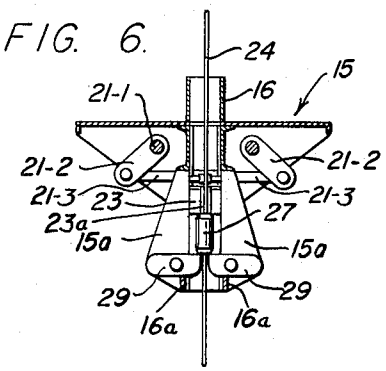
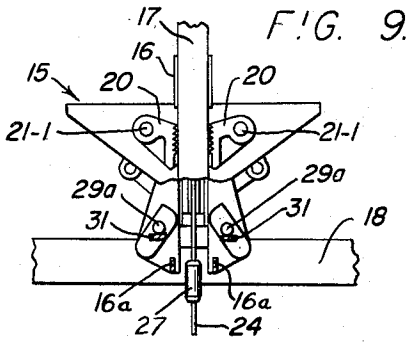


FIG. 9.



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SKIP HOIST FOR SHAFT-SINKING

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7 Claims. (Cl. 214—95)

This invention relates to hoisting apparatus of skip type, and particularly to skip hoists adapted primarily for shaft-sinking purposes, as, for example, in connection with mining operations.

In sinking mine shafts, it is customary to employ buckets or skips for hoisting and dumping earth materials mucked from the bottom of the shaft. Their use involves serious safety problems, for it is necessary to drop the bucket or skip below the usual guides which terminate at the lowest timber set near the bottom of the shaft. In such lowered position, the bucket or skip rests on the shaft bottom and can be easily loaded; but it is necessary that the guide rails be re-engaged by the guide shoes of the loaded bucket or skip as it is hoisted into the timbered portion of the shaft to rejoin the usual crosshead which remains in such timbered portion. This requires manual steadying and guiding of the freely suspended bucket or skip as its shoes re-engage the guide rails, and is a dangerous and often a time-consuming task.

It is customary to employ for shaft-sinking purposes so-called "round," i.e. substantially cylindrical, dump buckets equipped with heavy balls and chains and dump doors and lowered by a single hoisting cable. These are not only wasteful of space in the usual rectangular shafts, but require the provision of special dumping mechanism at the head frame. After sinking of the shaft is completed, such mechanism must be replaced at considerable expense by mechanism for dumping an ore-hoisting skip.

Buckets or skips of rectangular cross-section are much to be preferred, but are not generally used because of the likelihood of catching against the sides of the shaft from the rotating movement common as the freely suspended bucket or skip is being lowered or raised between the bottom of the shaft and the lower ends of the guide rails. In a known instance of use, hoisting chains are employed at opposite sides of a rectanguflar skip. Yet, the usual difficulty of re-engaging the guide rails is not avoided, nor is the necessity of a special dump arrangement.

While long guide shoes are sometimes utilized to avoid disengagement of guide rails when the bucket or skip is lowered, these are inconvenient and impractical in most instances.

Principal objects of the present invention are to provide a skiphoist for shaft-sinking purposes that employs the usual crosshead, with its safety rail-gripping dogs, and yet has its skip mechanically guided into shoe re-engagement with the guide rails when raised into the timbered portion of the shaft from lowered loading position; to provide such a system wherein protection is afforded against dropping of the skip should a hoisting cable break during descent or raising of the crosshead and skip; to make practical the use of a rectangular skip in most instances; to make it possible to employ standard skip-dumping mechanism during shaft-sinking, so as to eliminate the expense of top-out men and of conversion following completion of the shaft; to effect substantial economies in both the time and expense normally required for shaft sinking and to bring increased safety to the task.

Principal features in the achievement of the above

objects are the provision of cable guides at opposite lateral sides of the crosshead, and hoisting cables passing through the respective guides and attached to opposite sides of the skip, whereby the skip is prevented from rotating during its free suspension travel between bottom of shaft and crosshead and is positively guided back into engagement with the guide rails.

Ordinarily, the aforesaid hoisting cables will be little more in length than the distance between the bottom of the shaft and the lower ends of the guide rails, and a bridle will be employed as a connection between their upper ends and the lower end of a single main hoisting cable to which they are auxiliary.

Another outstanding feature is the use of the customary "torpedo" stops on the respective skip cables for the usual purpose of maintaining the crosshead safety dogs open, as well as the provision of cooperating dogs on the lower portion of the crosshead and dog-tripping members at the lower ends of the guide rails, as safety release mechanism for the skip as the crosshead reaches the lower ends of the guide rails.

Further objects and features of the invention will become apparent from the following detailed description of the presently preferred specific form thereof illustrated in the accompanying drawings.

In the drawings:

Fig. 1 represents a front elevation of the skip hoist in use, the shaft and shaft timbering being illustrated only fragmentarily and the crosshead and skip being shown as they descend together toward the lower ends of the timber guide rails;

Fig. 2, a similar view, but showing the crosshead locked in place at the lower ends of the guide rails by means of its safety dogs, and the skip lowered to the bottom of the shaft for loading;

Fig. 3, a side elevation of the skip hoist as shown in Fig. 1;

Fig. 4, a horizontal section taken on the line 4—4 of Fig. 1 and drawn to a somewhat enlarged scale;

Fig. 5, a fragmentary vertical section taken on the line 5—5 of Fig. 4;

Fig. 6, a fragmentary vertical section taken on the line 6—6 of Fig. 5;

Fig. 7, a horizontal section taken on the line 7—7 of Fig. 2;

Fig. 8, a fragmentary vertical section taken on the line 8—8 of Fig. 7; and

Fig. 9, a fragmentary view, partly in elevation and partly in vertical section, taken on the line 9—9 of Fig. 8.

Referring to the drawings:

In the illustrated form of the invention, a crosshead **15** of largely standard construction has the usual guide shoes **16** at opposite lateral sides thereof arranged to slideably engage timber guide rails **17** secured in customary manner to the usual timbering **18** of the shaft **19**.

The shaft **19** is sunk and timbered as deeply as practical prior to installation of the skip hoist. As illustrated, rectangular timber sets provide a plurality of rectangular shaft compartments, the skip hoist being installed in an intermediate compartment **19–1**, Figs. 4 and 7.

The usual rail-gripping, crosshead safety dogs **20** and actuating linkage mechanism **21** therefor, including leaf spring **22**, are provided on crosshead **15**, so that, when load is no longer exerted on such crosshead because of hoisting cable breakage or for some other reason, such as intentional release of load at the lower termination of shaft timbering, such crosshead dogs are made to grip the rails and so anchor the crosshead against further descent. As shown in Figs. 1 and 5, leaf spring **22** is compressed and flattened under load conditions, but as shown in Figs. 2 and 8, springs out to normal shape when the load is released, and, through customary linkage, in-

cluding rock shafts 21–1, Fig. 6, and links 21–2 and 21–3, causes the respective sets of crosshead dogs 20, Figs. 3 and 9, to grip guide rails 17, all as is well known to those skilled in the art.

Not heretofore provided in such a crosshead, however, are cable guideways 23*a*, Figs. 5, 6, and 8, formed at opposite lateral sides of crosshead 15, inwardly from the rail-engaging guide shoes 16 thereof, preferably, as here illustrated, as part of a floating, spring-supporting, cross-member 23. Through these guideways 23*a* pass respective cables 24 of a pair of hoisting cables, which have their lower ends fastened to a skip 25, Figs. 1–3, and are provided with torpedo stops 27, Figs. 5, 6, 8 and 9, normally bearing against cross-member 23, as shown in Figs. 5 and 6, to keep spring 22 compressed and safety dogs 20 open, see Figs. 5 and 3.

The skip cables 24 are connected to a main hoisting cable 26, Figs. 1–3, preferably by means of a bridle 28, as illustrated, the latter being attached to the winding drum of a suitable hoisting engine (not shown) installed in the head frame.

Skip 25 is advantageously of rectangular formation, and is provided with guide shoes 25*a* which normally engage the guide rails 17. Non-rotation of skip 25, when dropped below the guide rails and freely suspended in travel between shaft timbering and the bottom of the shaft, is insured by the pair of cables 24 restrained by the guideways 23*a*. Such cables and guideways, it should also be noted, insure automatic re-engagement of the skip guide shoes 25*a* with guide rails 17 and eliminate the dangerous task of manually guiding such re-engagement.

For releasing skip 25 from close association with crosshead 15 at the lower termination of the timbering 18 and for guarding against accidental descent of skip 25 should a hoisting cable break on the combined descent of crosshead and skip, latching mechanism is provided between skip cables 24 and crosshead 15. As illustrated, such mechanism makes effective use of the torpedo stops 27, and includes respective sets of trippable keeper dogs 29 arranged for latching action with respect to the torpedo stops.

The stops 27 are positioned adjacent to the skip 25, so as to keep such skip reasonably close to crosshead 15 when latched but to afford leeway for dumping. The keeper dogs are fixed to the opposite ends, respectively, of rock shafts 30, Figs. 4 and 7, and have trip pins 29*a* projecting therefrom toward and at opposite sides of the respective guide rails 17. Rock shafts 30 are journaled in respective crosshead frame members 15*a*, Figs. 5 and 8. Keeper dogs 29 are normally supported in their closed positions of Figs. 1, 3, and 4–6 by means of brackets 16*a* to which guide shoes 16 are attached, thereby normally serving to engage stops 27 and thereby support skip 25.

For tripping the pins 29*a* and throwing the keeper dogs into open position, thereby unlatching the skip from the crosshead, U-shaped tripper plates 31, Figs. 4 and 7, are fastened to the timbering 18 near the lower ends of the respective guide rails 17, so as to project inwardly of the hoisting compartment 19–1 into the paths of trip pins 29*a*.

In operation, crosshead 15 and skip 25 are lowered until unlatching of the skip occurs when trip pins 29*a* are tripped by tripper plates 31 and keeper dogs 29 are thrown open, see Fig. 9, thereby permitting torpedo stops 27 to pass through, whereby the skip is freely suspended from main hoisting cable 26 and the load on crosshead 15 is relieved. This means that, by the action of spring 22 or linkage 21, the crosshead dogs 20 are thrown closed to anchor the crosshead to guide rails 17, and that skip 25 descends to the bottom of the shaft, with its cables 24 descending through their respective guideways 23*a* in the crosshead.

When the skip is loaded, it is hoisted upwardly, its guide shoes 25*a* being automatically drawn into registry and re-engagement with rails 17 by reason of cables 24 and guideways 23*a*. When torpedo stops 27 again come into abutting engagement with floating cross-member 21–3 and such cross-member is raised and spring 22 compressed to release safety dogs 20 from their rail-gripping anchoring position, further winding of the main hoisting cable 26 lifts the crosshead and loaded skip in the usual manner. Keeper dogs 29 fall by gravity from their open and unlatched positions of Fig. 9 to their closed and latched positions of Figs. 3 and 4 as the crosshead is lifted beyond tripper plates 31.

While rails and rail-engaging shoes are customarily employed as vertical guides for a bucket or skip in a mine shaft, other guide instrumentalities may be utilized in the skip hoist of this invention.

The advantage of a rectangular skip, so far as carrying capacity is concerned, is indicated in Fig. 4 by the dotted circle 32 which represents the size of a conventional circular skip or bucket.

Whereas this invention is here illustrated and described with respect to a presently preferred specific embodiment thereof, it should be understood that various changes may be made without departing from the essential inventive concepts.

We claim:

1. In a skip hoist for use in sinking a shaft, the combination of guide rails terminating short of the bottom of the shaft; a crosshead having guide-rail-engaging means adapted to anchor such crosshead adjacent the lower ends of said guide rails; cable guideways secured at opposite lateral sides of said crosshead; a skip having guide shoes normally engaging said guide rails but adapted to disengage them when the skip is lowered to the bottom of the shaft; hoisting cables attached to opposite lateral sides of said skip and passing upwardly through said cable guideways; and hoisting means for said cables.

2. The combination of claim 1, wherein the hoisting means includes a single main hoisting cable; and a bridle interconnecting said main hoisting cable with the upper ends of the skip-hoisting cables.

3. The combination of claim 1, wherein the skip is of rectangular configuration.

4. The combination of claim 1, wherein there are additionally provided latching means for normally preventing separation of skip and crosshead; and tripping means at a predetermined location on the guide rails for opening said latching means during descent of the skip.

5. In a skip hoist for use in sinking a shaft, the combination of guide rails; a crosshead having guide-rail-engaging means adapted to anchor such crosshead at the lower ends of said guide rails; cable guideways secured at opposite lateral sides of said crosshead; a skip having guide-shoes normally engaging said guide rails; hoisting cables attached to opposite lateral sides of said skip and passing upwardly through said cable guideways; hoisting means for said cables; stops secured to the skip-hoisting cables between the skip and the crosshead; latching mechanism at opposite lateral sides of the crosshead for engagement by said stops to normally prevent separation of skip and crosshead; and tripping means for said latching mechanism, said tripping means being associated with the guide rails near the lower terminations thereof for tripping said latching mechanism as the skip descends so that said stops are free to pass therethrough and the skip may be lowered independently of the crosshead.

6. The combination of claim 5, wherein the latching mechanism comprises sets of normally closed keeper dogs at respectively opposite lateral sides of the crosshead.

7. The combination of claim 4, wherein the latching means comprises sets of normally closed keeper dogs at respectively opposite lateral sides of the crosshead.

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