Jan. 4, 1966 L. A. JAMES 3,227,245

ALIGNMENT APPARATUS FOR A SKIP HOIST BUCKET

Filed Sept. 9, 1963 2 Sheets-Sheet 1

FIG. 2.

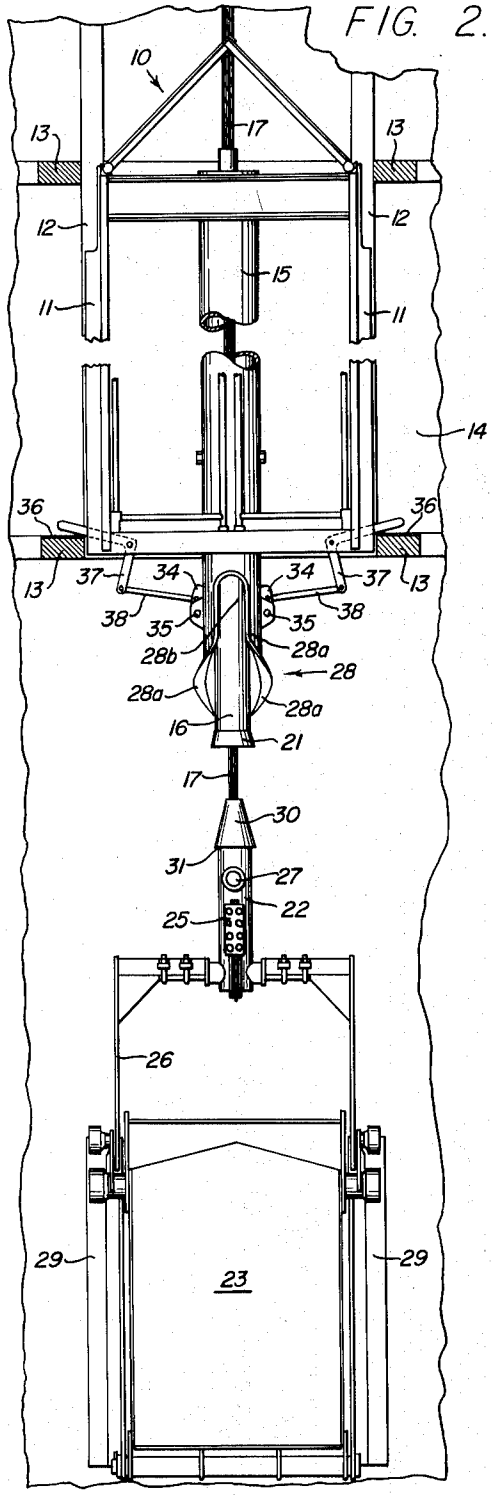
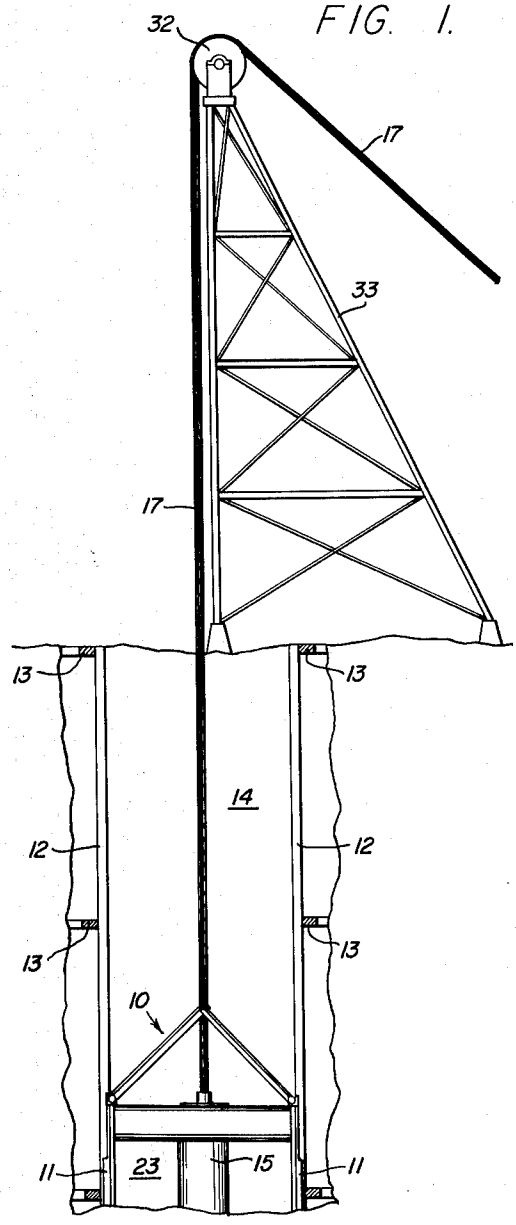


FIG. 1.



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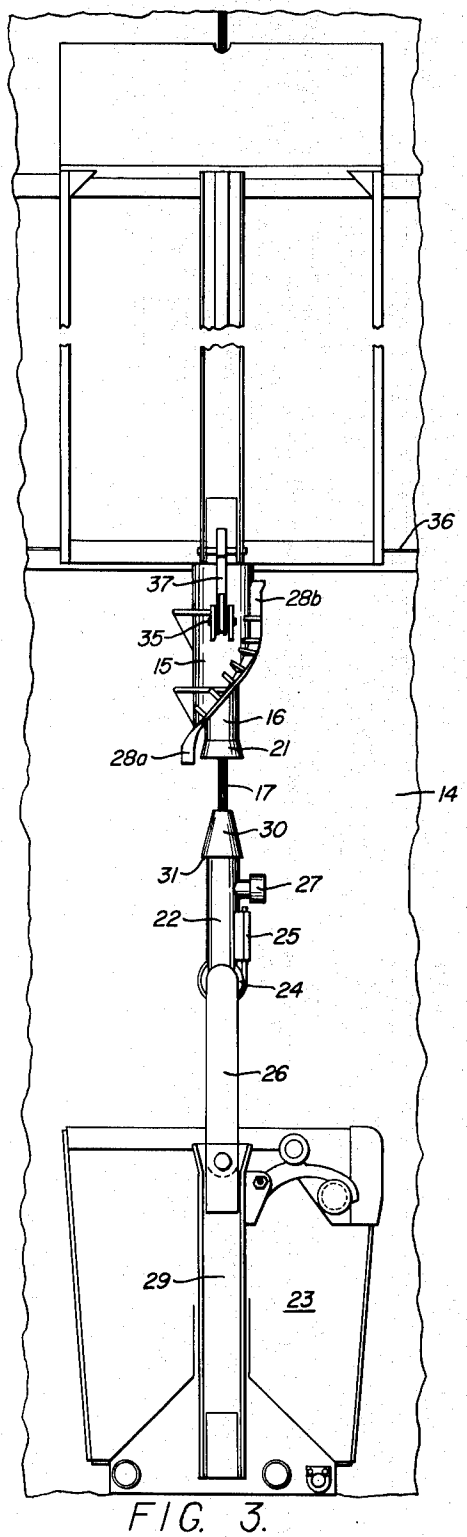
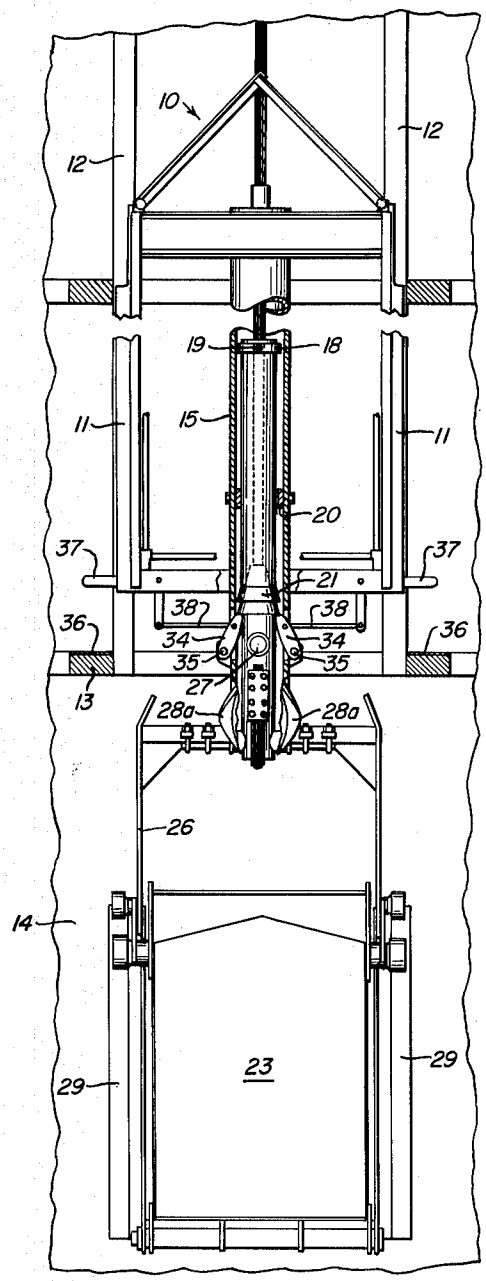


FIG. 3.

FIG. 4.



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ALIGNMENT APPARATUS FOR A SKIP HOIST BUCKET

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9 Claims. (Cl. 187—96)

This invention relates to hoisting apparatus used in sinking shafts for mines and the like. More particularly, it is concerned with improving skip hoists of the type previously disclosed in U.S. Patent No. 2,937,773, issued May 24, 1960, to Roger V. Perce et al.

In sinking mine shafts, it has long been customary to lower a skip (or bucket) to the bottom of the shaft, fill it with earth mucked from the bottom of the shaft, raise it out of the shaft, dump it, and repeat the cycle of operations. For reasons of economy, it has become common in such shaft-sinking operations to shore up the shaft with timber reinforcement sets and then to sink the shaft as far as possible below the lowermost set before stopping to place additional reinforcement. The depth that the shaft can be lowered before the additional reinforcement must be added is depedent on existing earth conditions, i.e. the capability of the natural earth formation to stand untimbered. This varies from shaft to shaft.

During lowering and raising of the skip used in the sinking operation, such skip is preferably connected to a crosshead and guided on guide rails, which extend from the mouth of the shaft to the lowermost reinforcement timber set, and is freely moved without guides through the remainder of the shaft depth. Prior to development of the skip hoist disclosed in Patent No. 2,937,773, it had long been necessary to manually engage skip guide shoes with guide rails of the timber set, a dangerous and time-consuming activity.

Patent No. 2,937,773 discloses apparatus for automatically engaging the guides with the guide rails, thereby eliminating many of the hazards encountered, and to this extent has proven satisfactory. However, in employing the skip hoist apparatus of the patent it has been found that individually designed headframes are required for suspending the skip. These headframes are necessarily constructed at a considerable height above ground level, inasmuch as they must provide for suspending the skip-hoisting cables and the skip itself well above ground level, so the skip can be conveniently dumped. Since the lengths of the hoisting cables vary according to the depth that the shaft can be safely mucked below the reinforcing sets, the height of the headframe varies accordingly. Furthermore, as the height of a headframe varies, the dimensions of its base structure also necessarily varies to provide appropriate support. The costs involved in providing the headframe structure are, therefore, considerable.

Principal objects of the present invention are to provide a skip hoist construction that will automatically engage the skip guide shoes with guide rails in a shaft; one that can be suspended from a standard, low-height headframe, regardless of the depth below a reinforcement set that the shaft is mucked; one that can be used with most any type of skip, e.g. an ordinary bucket; and one that provides increased safety for persons using the apparatus.

Principal structural features in the achievement of the above objects include the provision of a guide-rail-engaging cross head having a single cable guideway; a skip having an upwardly extending stem; a cable fixed to the upper end of the stem and passing through the cable guideway; an alignment cam surrounding the lower end of the guideway; and cam follower means on the stem for cooperating with the cam to position the stem and attached skip so that guide shoes on the skip will engage guide rails positioned in the shaft.

Another outstanding feature of the present invention is the provision of a positive, non-friction, latch means interconnecting the crosshead and the skip for guided movement together therewith. Such latch means advantageously includes a shoulder formed on the stem; dog members biased against the stem and mounted on the crosshead for pivotal movement in one direction to allow the stem shoulder to pass upwardly between them, while contacting the shoulder and preventing undesired separation and individual downward movement of the crosshead from the stem and attached skip; and a trip actuator to render the dog members ineffective to prevent separation.

There is shown in the accompanying drawing a specific embodiment of the invention representing what is presently regarded as the best mode of carrying out the generic concepts in actual practice. From the detailed description of this presently preferred form of the invention, other more specific objects and features will become apparent.

In the drawings:

FIG. 1 represents a fragmentary, side elevation of the skip, skip hoist, and headframe in use;

FIG. 2, a front elevation of the skip hoist and skip, with the skip shown in lowered position in the mine shaft;

FIG. 3, a view similar to FIG. 2, showing the skip hoist and skip in side elevation; and

FIG. 4, a view similar to FIG. 2 but showing the crosshead and skip engaged during movement above the lowermost reinforcement timber set and with the cam sleeve cut away for purposes of illustration.

Referring to the drawings:

In the illustrated form of the invention a crosshead **10** has elongate guide shoes **11** at opposite lateral sides thereof, arranged to slidably engage shaft guide rails **12** mounted on the usual reinforcement timbering **13** of shaft **14**.

As is usual in the sinking of mine shafts, the shaft **14** is sunk and timbered as far as practical before installation of the skip hoist. Rectangular timber sets are used to shore up the shaft and to form a plurality of rectangular compartments, the skip hoist assembly being positioned in an intermediate one of the compartments.

A cable guideway **15** extends through crosshead **10** and is preferably of larger diameter at the bottom of the crosshead than at the top, so that a cylindrical stem guide **16**, FIG. 2, can be positioned to reciprocate in the lower end of the guideway and the narrowed top will maintain alignment of the cable **17** as it passes through the guideway.

A collar **18**, FIG. 4, surrounds the upper end of stem guide **16** and is held in place by set screw **19**. This collar will contact abutment **20** bolted to the inside of cable guideway **15** to prevent the stem guide falling out of the guideway. The bottom end of the stem guide is flared slightly at **21**, to provide a guiding surface for a stem **22**, FIGS. 2 and 3, as will become apparent.

Cable **17** is attached to stem **22**, which is centrally fixed to the top of a skip **23**. The cable passes downwardly through the center of the stem, angularly out its bottom, and around the sheave of pulley **24** before being solidly gripped by cable clamp **25** at the side of the stem. The stem is conveniently connected to the skip by means of a bail **26**, as shown.

A cam follower **27** mounted on the side of stem **22** cooperates with oppositely branched cam surfaces **28***a* of cam means **28**, FIG. 2, formed at the bottom of cable guideway **15** to rotate the skip such that guide shoes **29** provided thereon will be positioned to engage guide rails **12**.

Whatever the position of the skip while in the bottom of the shaft, when it is raised cam follower **27** contacts

and rides up one or the other of the cam surface **28***a* and into straight grooved portion **28***b* of such cam means **28**. When the cam follower is in this groove, the guide-engaging shoes **29** are aligned with guide rails **12**.

Although the preferred cam follower is shown as a wheel, it should be apparent that followers of other configurations and type could be used, as, for example, immobile followers of circular, semi-circular, or triangular configuration.

The head **30** of stem **22** is cone-shaped and forms a shoulder **31** at its junction with the remainer of the stem body.

As the skip **23** is raised, cone-shaped head **30** engages the inner surface of flared end **21** of stem guide **16** and moves into position centering the skip. Continued raising of the skip results in cam follower **27** contacting one or the other of cam surfaces **28***a*, and, as the cam follower travels up the cam surface, in rotation of the skip until it is in the shaft guide rail engagement position previously described.

After the cam follower has been moved to the top of groove **28***b*, further hoisting raises the crosshead and the skip together out of the shaft, where the skip can be dumped in the usual manner.

In order to raise and lower the skip and crosshead, the cable **17** is passed over a pulley **32** of headframe **33**, FIG. 1, and is then wound on or unwound from a motor-driven take-up reel (not shown). The pulley of the headframe must be positioned high enough above the mouth of the shaft to allow the crosshead and skip to be lifted clear for dumping purposes. This height will depend upon the size crosshead and skip utilized, but will not be dependent upon the distance the skip is lowered below the shaft guides, as is true for the headframe used with the skip hoist assembly of the aforementioned Patent No. 2,937,-773.

Dog members **34**, FIGS. 2, 3, and 4, mounted on pivots **35** fixed to the outer surface of cable guideway **15** pivot away from each other to allow head **30** and the body of stem **22** to pass upwardly therebetween. The dog members are gravity biased towards each other and remain in constant contact with the stem, so that, should the skip start to move downwardly, they will be positioned under shoulder **31** to prevent separation of the skip from the crosshead. If found desirable, the dogs could as well be forced toward each other by a positive biasing means, such as a spring.

To release the dog members so that the skip can be lowered to the bottom of the shaft when the crosshead has reached the bottom of the guide rails, landing chairs **36**, L-shaped trip-release levers **37**, and connecting links **38** are provided. The trip-release levers are pivotally mounted on opposite outer edges of the crosshead such that one leg extends outwardly from the crosshead where it will come in contact with one of the landing chairs positioned on one of the lowermost cross timbers. The other leg depends from the pivot, and its end is pivotally connected by means of one of the links **38** to a dog member, as shown.

As the crosshead and skip are guided together down the shaft, the extending legs of levers **37** come to rest on landing chairs **36**. This pivots the levers to pull dog members **34** from beneath shoulder **31**. The stem and stem-head can then pass downwardly between the dog members and the skip can be lowered alone as far as desired.

After the skip has been filled, it is again raised. As soon as the crosshead is elevated from its lowermost position the dog members move, under the effect of their biasing force, into position beneath shoulder **31**, again preventing undesired separation of the crosshead and skip.

Although the crosshead illustrated herein is satisfactory for many purposes, it should be apparent that a safety crosshead of the type disclosed in Patent No. 2,937,773 could also be used if desired.

Use of the skip-hoist apparatus of the present invention not only results in cost savings, because of the smaller quantities of material required, but also in a savings on the costs of erecting the headframes. For any particular skip or bucket, a standard low headframe can be preformed and site assembled by unskilled workers. Moreover, the same headframe can be used on other shafts.

Whereas there is here illustrated and specifically described a certain preferred construction of apparatus which is presently regarded as the best mode of carrying out the invention, it should be understood that various changes may be made and other constructions adopted without departing from the inventive subject matter particularly pointed out and claimed hereinbelow.

I claim:

1. A skip hoist for use in sinking a shaft having guide rails terminating short of the bottom of the shaft, comprising a crosshead having guide-rail-engaging means adapted to anchor such crosshead adjacent the lower ends of the guide rails of the shaft; a cable guideway through said crosshead; a skip having guide shoes normally engaging said guide rails, but adapted to be disengaged therefrom when the crosshead is anchored adjacent the lower ends of the guide rails; a hoisting cable; means connecting said hoisting cable at the top and centrally of said skip, said hoisting cable extending upwardly through said guideway; and alignment means to align the guide shoes of the skip for engagement with the guide rails, said alignment means including cooperating cam members fixed to the crosshead and skip, respectively.

2. The skip hoist of claim **1**, wherein the means connecting the hoisting cable at the top and centrally of the skip includes a bail extending across the top of the skip, and an upwardly extending stem fixed centrally of said bail, said cable extending into the top of said stem and being rigidly fixed thereto.

3. The skip hoist of claim **2**, further including positive latch means interconnecting the skip and the crosshead for guided movement together.

4. The skip hoist of claim **3**, wherein the positive latch means includes at least one dog member pivotally mounted on the crosshead for movement into and out of the guideway, said at least one dog member being biased towards said guideway, and a shoulder formed on said stem, said shoulder being movable upwardly in said guideway past said at least one dog member, but prevented from reverse movement by abutment of said shoulder against said dog member.

5. The skip hoist of claim **4**, further including means for releasing the dog member from engagement with the shoulder when the crosshead is anchored adjacent the lower ends of the guide rails.

6. The skip hoist of claim **4**, wherein the shoulder is formed between the stem body and a conical head formed at the upper end of the stem; and wherein a cylindrical stem guide having a flared bottom portion is positioned in the guideway and movable therein, said flared portion and said conical head co-operating to center the stem and the skip with respect to the guideway.

7. 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 the crosshead adjacent the lower ends of said guide rails; a cable guideway through said crosshead; a skip having guide shoes normally engaging said guide rails but adapted to be disengaged therefrom when the crosshead is anchored adjacent the lower ends of said guide rails; a stem positioned above and fixed centrally of said skip; a cam follower on said stem; cam means fixed to the bottom of said crosshead and having cam surfaces in surrounding relationship with the bottom of the cable guideway and an elongate cam groove form-

ing an extension of said cam surfaces from the top thereof toward said crosshead; and a cable fixed to the free end of said stem and extending upwardly through said cable guideway.

8. A skip hoist for use in sinking a shaft having guide rails terminating short of the bottom of the shaft, comprising a crosshead having guide-rail-engaging means adapted to anchor said crosshead adjacent the lower ends of the guide rails of the shaft; a cable guideway through said crosshead; a skip having guide shoes normally engaging said guide rails, but adapted to be disengaged therefrom when the crosshead is anchored adjacent the lower ends of the guide rails; a hoisting cable; means connecting said hoisting cable at the top and centrally of the skip including a bail extending across the top of the skip, and an upwardly extending stem fixed centrally of said bail, said cable extending into the top of said stem and being fixed thereto; positive latch means for interconnecting the skip and the crosshead for guided movement together, including at least one dog member pivotally mounted on the crosshead for movement into and out of the guideway, said dog member being biased towards said guideway; a shoulder formed on said stem, said shoulder being movable upwardly in said guideway past said dog member, but normally being prevented from moving downwardly by its abutment against said dog member; a cam surface formed at the lower end of the guideway; and a cam follower formed on the side of the stem, whereby hoisting on the cable raises said cam follower into following contact with the cam surface, with a resultant positioning of the skip guide shoes for engagement with the guide rails.

9. A skip hoist for use in sinking a shaft having guide rails terminating short of the bottom of the shaft, comprising a crosshead having guide-rail-engaging means adapted to anchor said crosshead adjacent the lower ends of the guide rails of the shaft; a cable guideway through said crosshead; a skip having guide shoes normally engaging said guide rails, but adapted to be disengaged therefrom when the crosshead is anchored adjacent the

lower ends of the guide rails; a hoisting cable; means connecting said hoisting cable at the top and centrally of the skip including a bail extending across the top of the skip, and an upwardly extending stem fixed centrally of said bail, said cable extending into the top of said stem and being fixed thereto; positive latch means for interconnecting the skip and the crosshead for guided movement together, including at least one dog member pivotally mounted on the crosshead for movement into and out of the guideway, said dog member being biased towards said guideway; a shoulder formed on said stem, said shoulder being movable upwardly in said guideway past said dog member, but normally being prevented from moving downwardly by its abutment against said dog member; means for releasing the dog members from engagement with the shoulder only when the crosshead is anchored adjacent the lower ends of the guide rails; a cam surface formed at the lower end of the guideway; and a cam follower formed on the side of the stem, whereby hoisting on the cable raises the cam follower into following contact with the cam surface, with a resultant positioning of the skip guide shoes for engagement with the guide rails.

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