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BALANCING MEANS FOR HOISTING APPARATUS.
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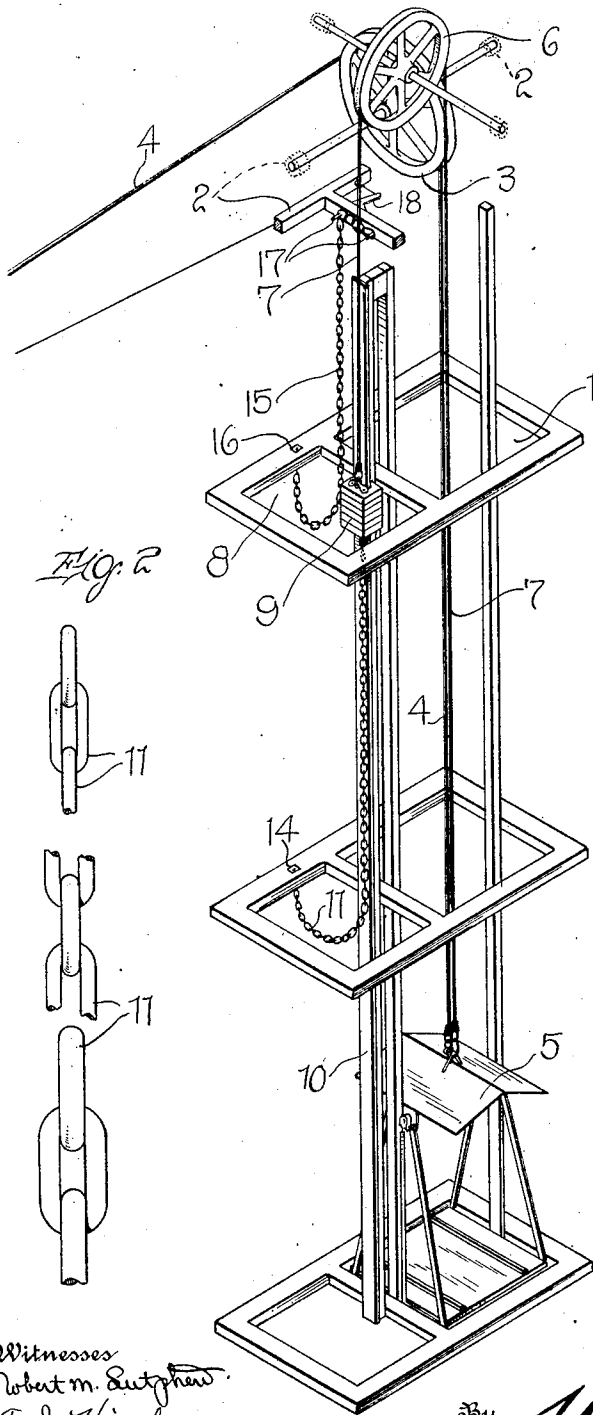


Fig. 1

Fig. 2

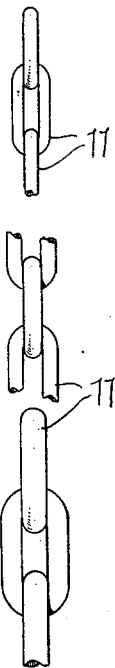
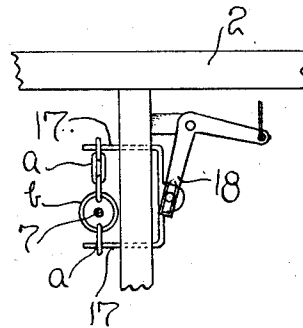


Fig. 3



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BALANCING MEANS FOR HOISTING APPARATUS.

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To all whom it may concern:

Be it known that I, LETSON BALLIET, a citizen of the United States, residing at Tonopah, in the county of Nye and State of Nevada, have invented certain new and useful Improvements in Balancing Means for Hoisting Apparatus, of which the following is a specification, reference being had to the accompanying drawings.

This invention relates to certain improvements in balancing means for hoisting apparatus; and the object of the invention is to provide a device of this general character having novel and improved means whereby the counter balance for the skip or cage is automatically varied in order to compensate for or equalize the dead weight of the skip or cage and its cable weight whereby the hoist power required to lift the skip or cage, when loaded, is substantially only for the net weight plus some friction.

The invention also has for its object to provide a device of this general character having novel and improved means whereby increasing capacities are permitted with a substantial reduction in engine horse power in comparison with hoisting devices now generally in use.

Furthermore, the invention has for its object to provide a balancing means of novel and improved character whereby a continually increasing load on the counter-weight side of the hoisting apparatus serves to retard the acceleration and whereby, if desired, the skip or cage may be caused to stop at a predetermined point.

The invention, furthermore, has for its object to provide a device of this general character having novel and improved means whereby, should the skip or cage run wild, the skip or cage may be brought to a stop with the possibility of injury or damage reduced to a minimum.

The invention also consists in the details of construction and in the combination and arrangement of the several parts of my improved balancing means for hoisting apparatus, whereby certain important advantages are attained and the device is rendered simpler, less expensive and otherwise more convenient and advantageous for use, all as will be hereinafter more fully set forth.

The novel features of the invention will be carefully defined in the appended claims.

In order that my invention may be the better understood, I will now proceed to de-

scribe the same with reference to the accompanying drawings, wherein—

Figure 1 is a diagrammatic isometric view of a hoisting mechanism constructed in accordance with an embodiment of my invention; Fig. 2 is an enlarged fragmentary view, detached, of an auxiliary balancing means as herein disclosed; and Fig. 3 is an enlarged fragmentary view illustrating a releasing means for certain of the balancing means as herein disclosed.

As set forth in the accompanying drawings, 1 denotes a conventional shaft of predetermined depth and 2 the head frame thereof of a predetermined height; the head frame, as herein set forth, is provided with a sheave wheel 3 over which passes the hoisting cable 4 suitably connected with the skip or cage 5 and with a suitable winding drum (not shown) of conventional form and driven in a general manner. Also suitably mounted in the head frame 2 but at a predetermined point above the wheel 3 is a second sheave wheel 6 over which is directed a cable 7 of a length sufficient to reach from the bottom of the shaft over the upper sheave 6 and down on the counter-weight side 8 of the shaft 1 to the surface, plus the required lengths for fastening, as is believed to be obvious. One extremity of the cable 7 is suitably secured to the skip or cage 5, while the opposite extremity thereof is secured to the counter-weight 9, herein disclosed as operatively engaged with the guide 10 in a manner which is believed to be self-evident. It is thought to be self-evident that as the cage or skip 5 is hoisted up, the counter-weight 9 descends until the positions thereof are reversed and vice versa.

The counter-weight 9, hereinbefore referred to, is a fixed weight and I have found that by employing in connection with such weight 9 a variable weight that the acceleration may be controlled, thereby resulting in economy in wear on the various cables and their concomitant parts and whereby motors of reduced engine horse power may be employed to hoist loads of increased capacities, the comparison being made with a hoisting apparatus wherein a variable balancing member operating in connection with the counter-weight is not employed.

As herein set forth, the variable counter balance comprises a plurality of hingedly connected weights 11, such weights being herein set forth as in the nature of links.

whereby a chain structure is afforded, one end weight or link 11 being suitably anchored, as at 14, at a predetermined point within the shaft 1 and preferably midway the depth thereof. In referring to the shaft 1, I wish to be understood as including in such term the timbers and other structures.

In view of the foregoing, it will be readily observed that as the counter-weight 9 descends the weights 11 each turn in a free loop, a link at a time, until sufficient of such links are hanging from the wall of the shaft, while the counter-weight 9 rests upon the bottom of the shaft, such counter-weight being comparatively light. This arrangement leaves the empty skip or cage 5, when ready to be returned to the bottom for a new load, at the top of the shaft with only the weight of the counter balance rope or cable upon it. When it descends, the counter balance 9 ascends and with the counter balance 9 are lifted in succession the members 11, the individual weights of such members 11 being such that when the counter-weight 9 reaches its uppermost position, the skip or cage 5 rests lightly upon the bottom of the shaft. By this arrangement, it will be seen that the dead weight of the cage or skip 5 plus its cable weight is compensated for or equalized so that when the skip or cage 5 is loaded to be hoisted, the hoist power required is lessened by the counter balance weight serving to take up the dead weight whereby the hoist power required is practically only for the net weight plus a certain amount of friction.

While I have hereinbefore referred to the counter-weight 9 and the skip or cage 5 as resting upon the bottom of the shaft, I wish to state that the weights 11 may be so proportioned as to cause the cage or skip 5 to stop at any predetermined point in the shaft. For example, a shaft 1500 feet deep with the lower 300 feet abandoned and work in progress on the 1200 foot level, the weights 11 can be such as to overcome the cage or skip 5 entirely and balance it at the 1200 foot point, as is believed to be self-evident.

I have found in practice that it is particularly advantageous to have the members 11 of differing weights, with the lightest member being attached to the shaft. By this arrangement, an exact balance may be effected. In order that the operation of my improved balancing means may be more fully understood, I will refer to a hoisting apparatus now in use with my invention employed in connection therewith. In this instance, the skip or cage on one side weighs 1600 lbs. and the counter-weight weighs 500 lbs. The counter-weight rope, which is 1300 feet in length, has 1200 feet more on one side than the other when the weight is up

and it weighs 744 lbs. in 1200 feet. It will be noted that with the skip resting on the bottom, the counter-weight cable alone would be 244 lbs. heavier than the counter-weight. However, the linked weight members are of a size as to weigh 590 lbs. per hundred feet, the first 110 feet so decrease or vary in weight as to result in its full length of 615 feet giving a weight of 1768 lbs. which, with the counter-weight of 500 lbs., gives an aggregate of 2268 lbs. While the skip or cage (1600 lbs.) plus 744 lbs. of cable weights 2344 lbs., thus the dead weight to be lifted is only 76 lbs., as that is all the weight of the skip or cage resting on the bottom. This gives a light starting or peak load. When the hoist starts to lift the skip or cage, the counter-weight starts down and the weight gets less as the counter balance weight members drop off and hang up on the wall of the shaft before the counter-weight cable gets over the shaft and adds its weight to the counter balance weight, as the weight of the hinged members becomes less until at the bottom the counter-weight weighs 500 lbs. plus 744 lbs. of chain or 1244 lbs. against the empty skip or cage weight without the rope or 1600 lbs. This gives the skip or cage about 350 lbs. when it starts down to accelerate and gradually removes the difference in weight to 76 lbs. at the bottom, preventing acceleration beyond certain limitations. By this it will be seen that a fall of the skip or cage would do little damage.

It is also a purpose of my invention to provide additional weight members normally inoperative but which are adapted to be brought into use in case the hoisting cable 4 should break or, if from any other cause, it should be necessary to automatically stop the descent of the skip or cage 5. As herein set forth, the additional weight members 15 are also hingedly united in a manner as has been set forth relative to the members 11, the lowermost of such members being connected, as at 16, to a wall of the shaft 1, while certain of such uppermost members *a-a* are detachably engaged by suitable supporting members 17, suitably carried by the head frame 2 in proper position relative to the counter-weight cable 7, while a member *b* intermediate the members *a-a* has directed therethrough the cable 7 so that when the additional weight is required the members *a-a* are detached from the supporting members 17, whereupon the members 11, through the medium of the member *b*, will co-act with the counter-weight 9 to give thereto the additional weight to overcome the descent of the cage or skip 5. While, for convenience of illustration, I have shown but one series of additional weight members 15, it is thought to be

self-evident that a plurality of such series may be employed as the necessities of practice may dictate. In order that the members *a-a* may be detached from the supporting members 17 I have found in practice that various methods may be employed, although for the purpose of disclosure I herein indicate an operating mechanism 18 adapted to impart such endwise movement to the supporting members 17 as to free the same from the members *b* and, as herein disclosed, such means includes a lever 19 which may be operated by the hoisting engineer or other person at such times when it is desired to cause the weight members 15 to become operative. If desired, the release of the members 17 may be effected automatically, especially in the case of an overwind. I have also found it of advantage to employ my improved balancing means in connection with a double-drum hoist and in which instance the counter-weight cable and the hoisting cable are one element and being overwound over one drum and underwound on the other in such a manner that the counter-weight ascends while the cage or skip descends and vice versa. This arrangement is particularly advantageous in that the counter-weight and chain weight serves to help start and hoist the load after the skip or cage is loaded at the bottom of the shaft.

From the foregoing it is thought to be obvious that a balancing means for hoisting apparatus constructed in accordance with my invention is of an extremely simple and comparatively inexpensive nature and is particularly well adapted for use by reason of the convenience and facility with which it may be applied in operative position and by reason of the resultant economies and it will also be obvious that my invention is susceptible of some change and modification without material departure from the principles and spirit thereof and for this reason I do not wish to be understood as limiting myself to the precise arrangement and formation of the several parts herein shown in carrying out my invention in practice.

Having thus fully described my invention what I desire to claim and secure by Letters Patent, is:

1. In a device of the character described, the combination with a cage and means for hoisting the same; of a counter-weight operatively connected with the cage and adapted to travel in directions reverse to the direc-

tions of travel of the cage, a plurality of hingedly connected members, one end member being connected with the counter-weight, while the opposite end member is secured at a point intermediate the path of travel of the counter-weight, and means for holding such members normally inactive relative to the counter-weight.

2. In a device of the character described, the combination with a cage and means for hoisting the same; of a counter-weight operatively connected with the cage and adapted to travel in directions reverse to the directions of travel of the cage, a plurality of hingedly connected members, one end member being connected with the counter-weight, while the opposite end member is secured at a point intermediate the path of travel of the counter-weight, auxiliary weight members hingedly connected one with the other, one end member of such auxiliary members being secured at a point intermediate the extent of travel of the counter-weight, a member adjacent the opposite end being adapted to be operatively engaged with the counter-weight, and means for holding such auxiliary members normally inoperative relative to the counter-weight.

3. In a device of the character described, the combination with a cage and means for hoisting the same; of a counter-weight operatively connected with the cage and adapted to travel in directions reverse to the directions of travel of the cage, a plurality of hingedly connected members, one end member being connected with the counter-weight, while the opposite end member is secured at a point intermediate the path of travel of the counter-weight, auxiliary weight members hingedly connected one with the other, one end member of such auxiliary members being secured at a point intermediate the extent of travel of the counter-weight, a member adjacent the opposite end being adapted to be operatively engaged with the counter-weight, and means coacting with certain of the auxiliary members for holding such auxiliary members normally inoperative relative to the counter-weight.

In testimony whereof I hereunto affix my signature in the presence of two witnesses.

LETSON BALLIET.

Witnesses:

RENE JENKINS,
HARRY O'BRIEN.