No 627,769. Patented June 27, 1899.

H. C. BEHR.

HOISTING MACHINERY.

(Application filed Feb. 7, 1899.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1.

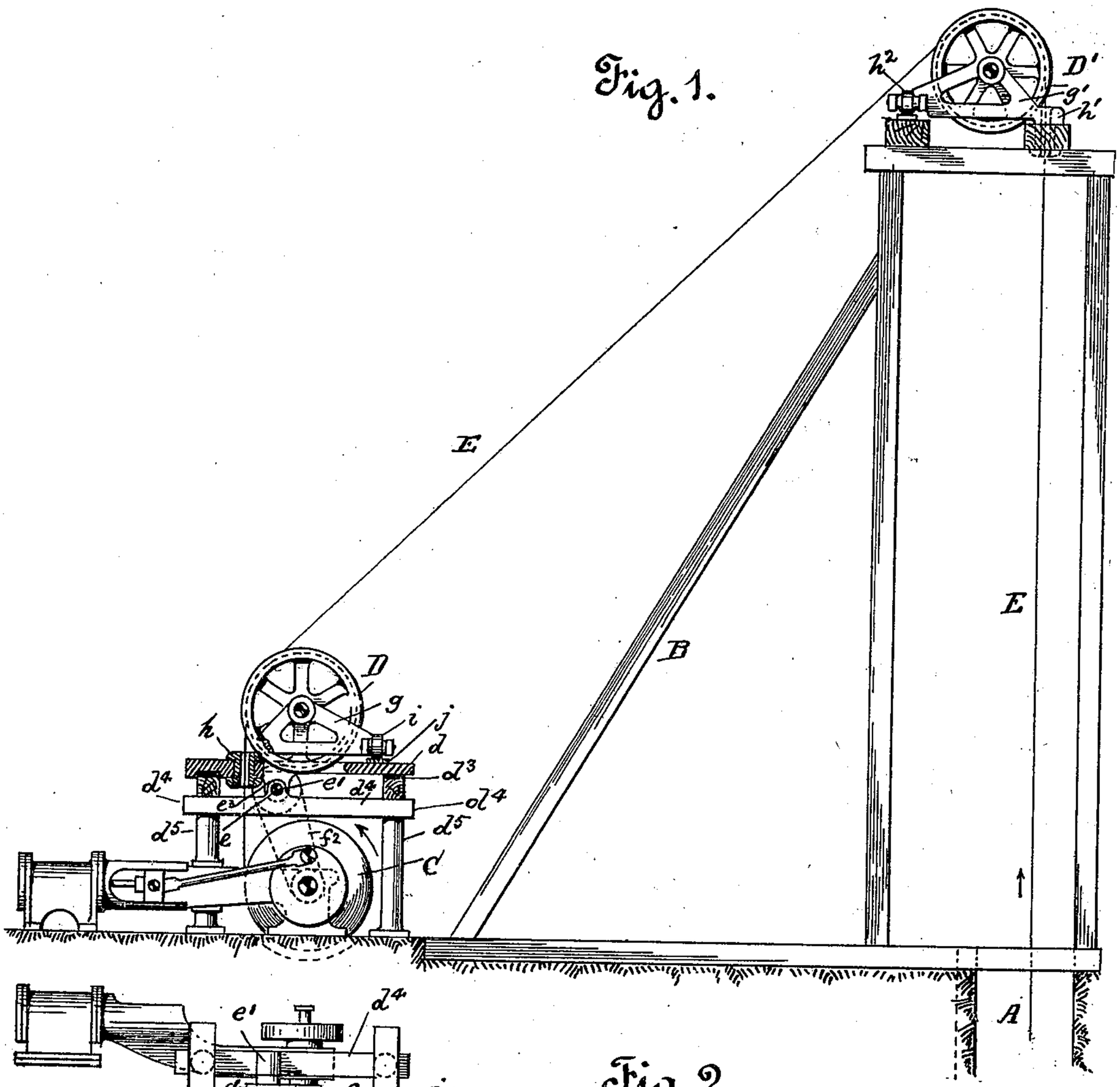

Fig. 2.

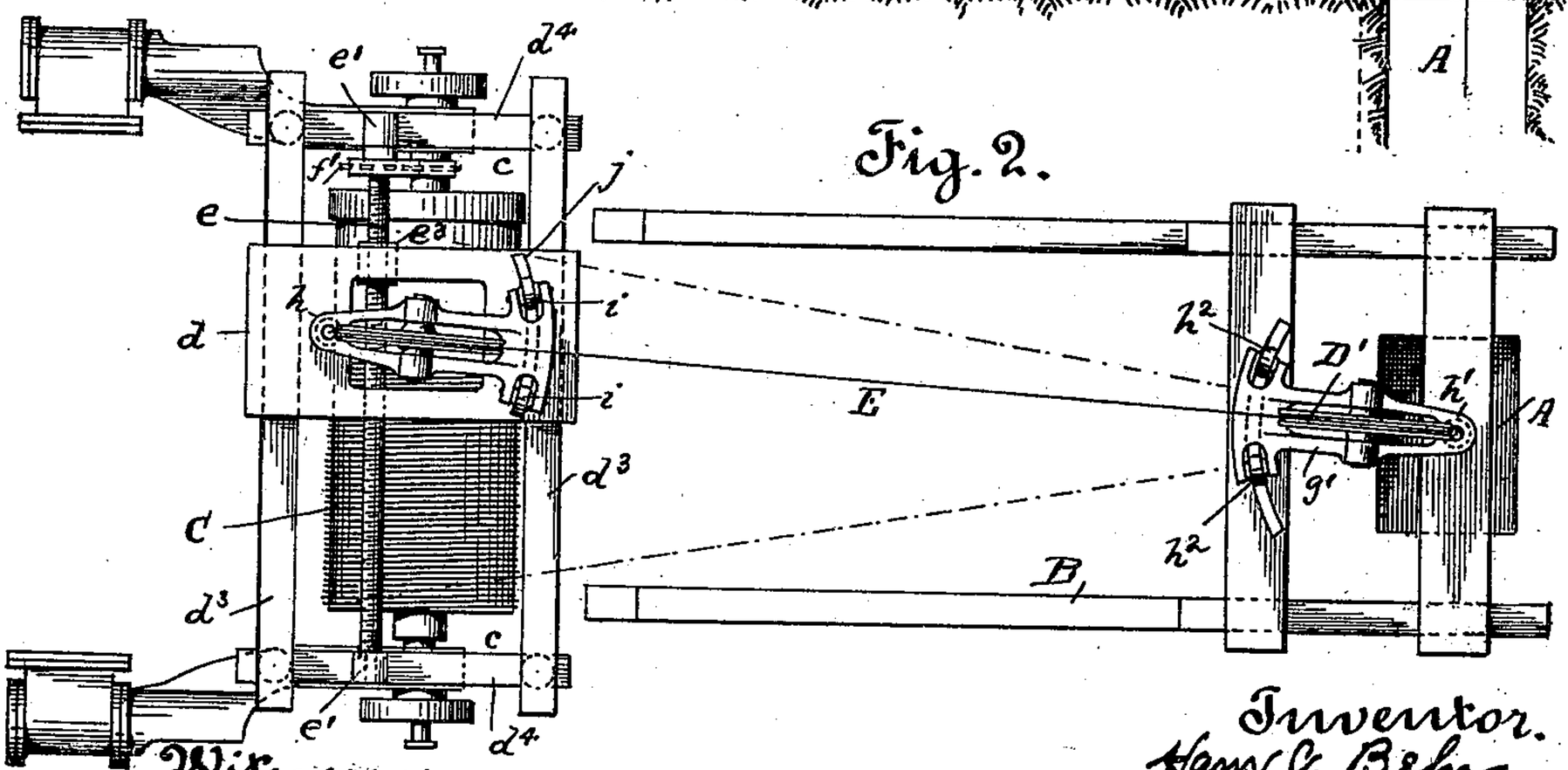

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Fig. 5.

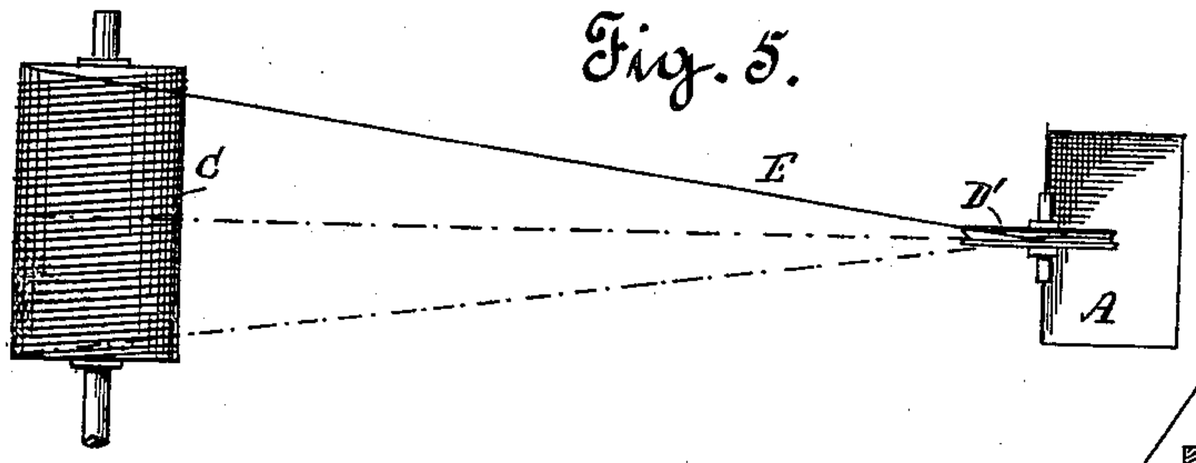

Fig. 3.

Fig. 4.

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UNITED STATES PATENT OFFICE.

HANS C. BEHR, OF SAN FRANCISCO, CALIFORNIA.

HOISTING MACHINERY.

SPECIFICATION forming part of Letters Patent No. 627,769, dated June 27, 1899.

Application filed February 7, 1899. Serial No. 704,815. (No model.)

To all whom it may concern:

Be it known that I, HANS C. BEHR, a citizen of the United States, residing at the city and in the county of San Francisco, in the State of California, have invented certain new and useful Improvements in Hoisting Machinery; and I do hereby declare that the following is a full, clear, and exact description thereof.

This invention has relation to certain new and useful improvements in hoisting machinery, and more especially to that class for use in connection with the working of mines or such where the hoisting rope or cable winds off and on one or more drums; and it consists in the arrangement of parts and details of construction, as will be hereinafter fully set forth in the drawings and described and pointed out in the specification.

The object of my invention is to relieve the sheave and the hoist-rope of the undue wear to which they may be subjected by reason of the side or lateral deviation of the winding-rope as the same is wound upon the hoisting-drum and over the sheave, which object is attained by so constructing the sheave and also a traveling sheave arranged close to the drum that they will give or swing in the arc of a circle in accordance with the lateral deviation of the winding-rope as it winds upon or plays off of the winding-drum, thus compensating for these lateral strains due to deviation of the hoist-rope and relieving the rope and sheaves thereof. By so arranging that the sheaves referred to may give to the deviation of the hoist-rope I am enabled to use or employ a winding drum or drums of much smaller diameter and greater width than can be made use of where the deviation of the hoist-rope is not provided for, thus enabling the winding to take place in single layers without the drawback usually attendant to this style of winding of the hoist rope or cable. By thus constructing the parts so as to compensate for the deviation under all circumstances of the rope which leads from the pit-head or guide sheave much saving in wear and tear of the hoisting-rope is created.

For a comprehensive understanding of my invention reference must be had to the accompanying sheets of drawings, forming a part of this application, wherein—

Figure 1 is a side view in elevation, showing the application to a single drum-hoist driven by a pair of engines and the arrangement of the traveling sheave in proximity to the winding-drum and the guide-sheave mounted upon the gallows-frame. Fig. 2 is a top plan view of the mechanism illustrated in Fig. 1. Fig. 3 is a similar view to Fig. 1, illustrating a double-drum hoist. Fig. 4 is a top plan view of the mechanism illustrated in Fig. 3, and Fig. 5 is a view showing the customary disposition of the drum relative to the shaft and the pit or guide.

Prior to entering upon the detailed description of my invention it is deemed best to call attention to Fig. 5, as illustrating the present arrangement of hoist and the difficulties attendant upon it and which it is sought to overcome. A is the shaft of a mine or deep well or such like bore of underground work. Above this is the usual pit-head or guide sheave D, over which the hoisting-rope E passes from the shaft and down to the hoisting or winding drum C. In this customary arrangement the axis of the drum C is at right angles to a plane passing from the side of the drum through or near the shaft A, and this results in a deviation of the rope-lead from the pit-head or guide sheave to the drum. The extremes of deviation of the rope from the direct course favorable for winding properly onto the drum are well illustrated in Fig. 5. Now if the drum be made of large diameter to correct this deviation and provide sufficient extent of surface to receive a long rope wound in a single layer it will require a larger engine or otherwise objectionable gearing to operate it, and if the drum be made of small diameter to avoid the use of such large engine or gearing it must be made long to furnish winding-surface to receive the rope, and in this case the deviation of the rope becomes excessive. With this illustrated repetition of the difficulties to be overcome I shall now proceed to an explanation of the drawings, in which—

A is the shaft, over the mouth of which is the gallows-frame B, having at its top the pit-head or guide sheave D.

C is the winding or hoisting drum, mounted upon a suitable support *c*. Above or in close proximity to this drum is arranged a travel-

ing sheave D, which directs the rope E to the drum, said rope being the hoisting-rope leading up from the shaft and over the pit-head or guide sheave D′ down to the traveling sheave D. The relative arrangement of the traveling sheave and the hoisting-drum is such that the former is above or in close proximity to the latter, as shown in Figs. 1 and 2, and the rope-lead face or edge of said guide-sheave remains in a fixed plane with the winding side of the drum, in which plane the rope E is led to said drum, as shown by Figs. 1 and 2.

The sheave D is capable of having a traveling movement imparted to it, so that it may traverse the drum and lay up or lay off the rope, as required. For this purpose I show the sheave with its bearing-frame supported on a carriage *d*, which carriage slides on tracks d^3, carried on the cross-beams d^4 of the frame-columns d^5. The direction of travel of the carriage *d* is parallel to the winding side of the drum, in this case illustrated perpendicularly beneath the edge or face of the sheave D. As the rope winds on or off the drum in a spiral, the sheave D is correspondingly advanced laterally or moved along with its carriage-frame by means of the screw *e* or any suitable mechanism in such a manner that the guiding edge of the sheave will always keep the winding-rope in the plane of rotation of the drum where the said rope winds on or off of the latter.

The screw *e* is supported in the bearings *e′* on the cross-beams d^4, and the same is driven by the chain-gearing $f' f^2$ from the axis of the drum or any portion driven thereby. This operating-screw engages the nut e^3 on the lower side of the carriage, and thereby traverses it. Instead of the screw *e* any other suitably-operated traversing mechanism may be used for the driving-carriage.

Since the hoist-rope leads to a point above or near the shaft, it must deviate laterally as it winds on or off the drum. It is therefore necessary to keep the plane of rotation of the traveling sheave above the drum always within the plane containing both the laterally-deviating part of the rope leading toward the shaft and also the portion of the rope leading from the drum to the sheave arranged thereabove. In order to accomplish this and at the same time have the rope-leading edge or face of the sheave in line with the winding side or face of the drum, it (the sheave) must be capable of swinging about an axis coincident with that of the rope leading from the sheave to the drum. For this purpose the traveling sheave is mounted in a frame *g*, which is pivoted at *h* to the carriage *d*, the pivot or trunnion *h* being coaxial with the rope leading to the drum and is made hollow to admit of the rope passing centrally through the same. The opposite end of the sheave-frame *g* is preferably carried by rollers *i* on a segmental track *j*, laid on the carriage *d*, so that the resistance to the swinging of the traveling sheave will be reduced to a minimum, the tension of the hoist or winding rope leading toward a fixed point above or near the shaft or pit being the directing force by which the traveling sheave D is swung around about the pivot or trunnion *h* and deviates its plane of rotation in correspondence with the deviation of the rope leading to the shaft, the limits of deviation being indicated by dotted lines in the drawings. It is also necessary to provide for swinging the guide-sheave D′ in the same manner at the point at which the rope radiates in its lateral deviation. In Figs. 1 and 2 of the drawings the guide-sheave D′ is illustrated as the pit-head sheave for leading the rope to the pit, while in Figs. 3 and 4 the guide-sheave is an intermediate sheave leading the rope upward to the fixed directing-sheave D^2. The sheave D′, either as a pit-head or intermediate guide sheave, is mounted similarly to the traveling sheave D in a frame *g′*, and in this case swings on the trunnion *h′* about a fixed axis, whereas the axis about which the sheave D swings is traversed parallel with the winding drum or drums. The arrangement of sheave D′ as an intermediate sheave may be advisable in cases where two drums are used to work two adjacent shaft-compartments, as illustrated in Fig. 4. In such cases one rope is usually made to wind over while the other winds under its drum, so that by coupling the drums a descending load will help to raise one to be lifted. For this arrangement it is required that one of the traveling sheaves D be placed forward of its drum in order that its downward rope leading edge and swinging point will be above the front face of its drum, Figs. 3 and 4. The trunnion or pivot *h′* of the guide-sheave is hollow, so that the rope may pass therethrough in the same manner as with the trunnion of the traveling sheave. As with the frame of said traveling sheave, the frame *g′* is provided with rollers h^2, which work on a suitable track in order to reduce friction of the swinging frame *g′* to a minimum. These rollers may be omitted, if so desired. By the disposition and arrangement of the sheaves as thus described the vertical swinging or sagging of the hoisting-rope does not cause rubbing against the flanges of the sheaves, for the reason that these sheaves rotate in the same plane as the sag of the rope.

Having thus described my invention, what I claim as new, and desire to secure protection in by Letters Patent, is—

1. In a hoisting apparatus, the combination with the winding-drum, of a sheave mounted so as to be free to swing with the deviation of the hoist or winding rope, a traveling carriage to which the sheave is pivoted, and of mechanism for imparting travel to the carriage as the rope is wound on and off the drum.

2. The combination with the winding-drum, of a sheave-frame pivoted in close proximity thereto, a sheave mounted therein, the sheave-frame being free to swing with the directing strain of the hoist-rope upon the sheave, and

of mechanism for imparting lateral movement to the sheave-frame as the hoist-rope is laid on and off the drum.

3. The combination with the winding-drum, of a sheave-frame pivoted so as to adjust its plane in the direction of the rope leading from a shaft, a sheave mounted in said frame and which leads the rope to the drum, mechanism by means of which the sheave-frame is caused to travel in correspondence with the laying on or off of the rope, and of a guide or pit-head sheave mounted to swing about a fixed axis.

In testimony whereof I hereunto affix my signature, in presence of two witnesses, this 27th day of January, 1899.

HANS C. BEHR.

Witnesses:
N. A. ACKER,
WALTER F. VANE.