A. B. Lipsey,

Hoisting Apps.

No. 111,356. Patented Jan. 31. 1871.

Fig. 4.

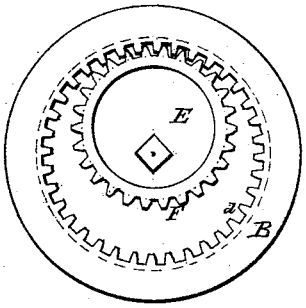


Fig. 2.

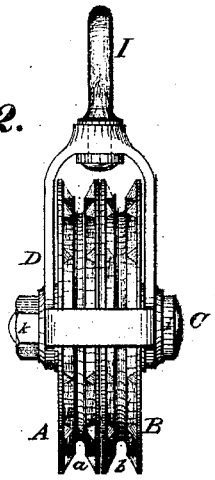


Fig. 5.

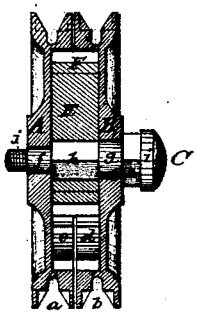


Fig. 1.

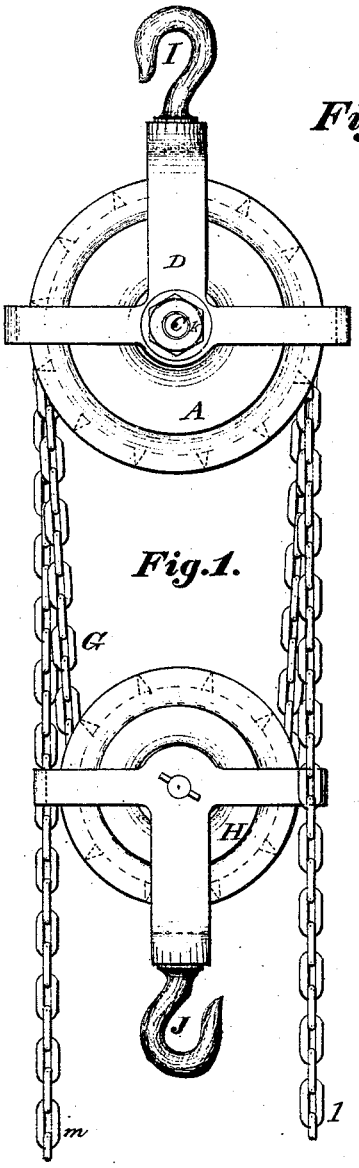
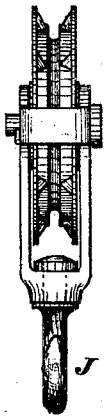


Fig. 3.



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ANDREW B. LIPSEY, OF NEW YORK, N. Y.

Letters Patent No. 111,356, dated January 31, 1871.

IMPROVEMENT IN HOISTING APPARATUS.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, ANDREW B. LIPSEY, of the city, county, and State of New York, have invented certain new and useful Improvements in Hoisting Apparatus; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawing and to the letters of reference marked thereon.

My invention relates to that class or kind of hoisting apparatus in which the force necessary to raise or otherwise move heavy weights, or to overcome the resistance to motion of heavy bodies, is obtained by applying the moving power through or by means of a chain or chains working over or upon wheels or pulleys of different diameters.

Heretfore apparatus of this character has consisted of two differential chain-wheels cast in one piece or secured together, with which one endless chain is used; or various combinations of spur-gearing with such chain-wheels, requiring either one or two chains; or a combination of one fixed and one revolving internal gear, a revolving pinion, two chain-pulleys, and two chains, such as is described in the patent issued to Jonathan Pickering, dated December 1, 1868, and in various English patents. The constructions named, except the first, are objectionable, because the line of draft does not pass through the center of weight of the double pulley or block, and, consequently, when in operation, the block is drawn over to one side, which materially increases the friction and resistance. The use of two chains unnecessarily complicates the apparatus and renders it cumbersome and unwieldy, as does also the various combinations of gearing heretofore employed.

The form first mentioned requires that one of the chain-grooves should be smaller than the other by at least the length of a space and a tooth, or about one and a half times the length of one link of the chain.

This feature limits its usefulness, as a less gain or rise of the load than is thus produced would enable a less force (applied for a longer time) to lift the load or weight.

The object of my invention is to obviate these difficulties, and to produce a hoisting apparatus in which the greatest practicable leverage or gain in lifting force may be obtained, or a less degree, if desired. I also make a simple, compact, and symmetrical hoisting apparatus by the use of my invention, and one not liable to get out of repair. For this purpose I use two separate chain-wheels, which may differ as to their diameters in the chain-grooves by at least one link, and each having an internal toothed gear (one of which has one or more teeth more than the other) fixed upon or cast with it. These two internal gears both mesh with a pinion which turns on an eccentric stud, bushing, or bearing formed upon or fixed to the spindle on which the chain-wheels are hung. A single chain joined at the ends, and a loose or movable single-grooved pulley is employed in the same manner as in the common differential pulley-block first above mentioned.

In this present form of construction the large chain groove and the internal gear having either the larger or the smaller number of teeth may be cast together, and the comparative size or proportion of these parts may be varied by any skilled machinist so as to obtain any desirable gain or leverage.

In the accompanying drawing—

Figure 1 is a side elevation of a hoisting apparatus which embodies my invention.

Figure 2 is an edge view of the same, the chain being removed.

Figure 3 is an edge view of the lower or single block.

Figure 4 is a side elevation of one of the internal gears, the pinion and eccentric stud being also shown in their proper positions.

Figure 5 is a vertical central cross-section of the upper or double block.

A and B are the two pulleys or chain-wheels in which the chain-grooves *a b* and the internal gears *c d* are formed. Teeth or stops are formed on the sides of the grooves *a b* to hold the chain and prevent it from slipping.

C is the pin or spindle on which the pulleys revolve. This pin is made square at *e*, where it passes through the strap D, so that it may not turn around.

f and *g* are journals formed on the said pin C, on which the pulleys A and B revolve.

h is a square portion of the pin, made small enough to pass through the pulley B.

A head, *i*, and a screw portion, *j*, on which the nut *k* is screwed, complete the pin.

On the square portion *h* of the pin C an eccentric bushing, stud, or bearing E is fixed, and a spur-pinion, F, hung to rotate thereon.

The chain-pulleys A and B (as shown) are of the same size, and the internal gear *d* has one more tooth in it than the internal gear *c*. The pinion F meshes or gears with both of the internal gears *c d*, and, therefore, at each revolution of the two pulleys, the pulley B gains on the pulley A a distance equal to the pitch of the teeth in the internal gears, measured on the pitch-line. It is evident that, by varying the relative diameters of the chain-grooves *a* and *b* and the relative number of teeth in the internal gears *c* and *d*, any desirable degree of leverage or gain may be obtained.

G is the chain by which the weight is sustained and raised and the hoist operated. It is passed from the

point *l* up over the pulley A to the left, then down and under the loose or friction-pulley H, and up again and over the pulley B. The lower ends *l* and *m* are joined, thus forming an endless chain. The lower or hand-loop is broken off at *l* and *m* to save space in the drawing.

The hook I serves to secure the double or differential pulley A B to the fulcrum or point of resistance, and the load or weight to be moved is attached to the piece J. The pulley H may be placed in either of the loops or bights of the chain with the same effect, the load in either case being raised by pulling upon one side of the other loop, and lowered by pulling upon the other side.

By securing the eccentric E to the pin C, as described, the parts may be brought very compactly together and the whole block be made quite symmetrical, the weight of metal being nearly or quite the same on either side of the point of suspension and equidistant from the center. From this it results that the load always keeps the center line of the upper and lower blocks exactly in line with the line of draft, instead of drawing it over to one side, as is the case with nearly all other geared differential pulleys.

The load having a tendency to turn the pulley A in one direction and the pulley B in the opposite diree tion, the strains (by aid of the friction when the chain-grooves differ in size) balance each other and hold the load suspended without the use of a break or other stop at any and every point.

The pin C is made of the form shown, in order that it may be inserted through all the parts through which it is to pass when the said parts are in position. By this means I am enabled to forge the frame or strap D in one piece and of the proper shape, before putting the block together, and, also, to readily remove the various parts for repairs. The eccentric E is made separate for the same reason only, it being to all intents and purposes a part of the pin C, and may be made in one piece with said pin, it being necessary in such case to make the strap D in two parts and bolt them together. By making the bearing *g* or the bearing *f* more or less eccentric to the pin C, the gears *c* and *d* may be made to differ in the number of teeth in each by more than one tooth, though when the difference is only one tooth this will not be necessary.

I am aware that various combinations and arrangements of spur and internal gearing have been applied to the common differential pulley-block, a number of which have been patented in this country and in Europe previous to the date of the above-named patent of Jonathan Pickering; but I claim none of these. Nor do I confine myself to the application of my invention above described and illustrated in the accompanying drawing, for, by aid of the description herein contained, any skilled mechanic may readily apply my invention to cranes, windlasses, stationary hoists, &c., as well as to lathes and other machinery.

Having thus fully described my invention,

I claim—

1. The chain-pulleys A B, constructed with internal differential gears *c d*, a common axis, in combination with the pinion F rotating around the eccentric hub E fast on the axis of said pulleys, the said pinion F meshing with the gears *c d* in their rotation around their axes, all arranged substantially as herein shown and described.

2. The arrangement of the gears *c d*, pinion F, eccentric E, and spindle C, with relation to the chain-pulleys A B, substantially as and for the purpose specified.

3. The pin or spindle C, having each of the parts *e*, *g*, *h*, and *f* of smaller size than the part preceding in the order named, substantially as described, for the purpose hereinabove specified.

ANDREW B. LIPSEY.

Witnesses:

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