H. F. SHAW.

Hoisting Apparatus.

No. 54,419. Patented May 1, 1866.

Fig. 1.

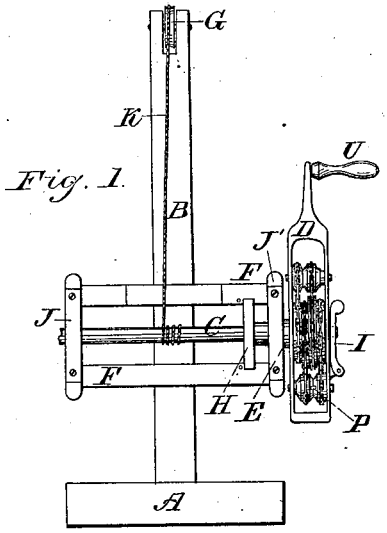


Fig. 2.

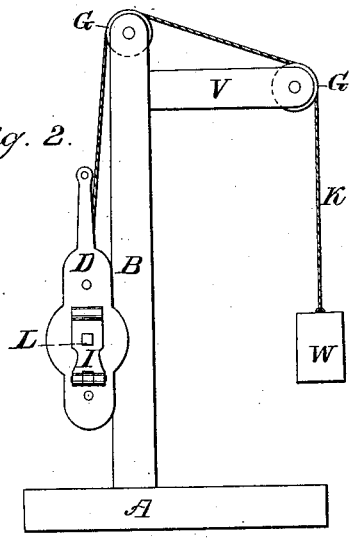
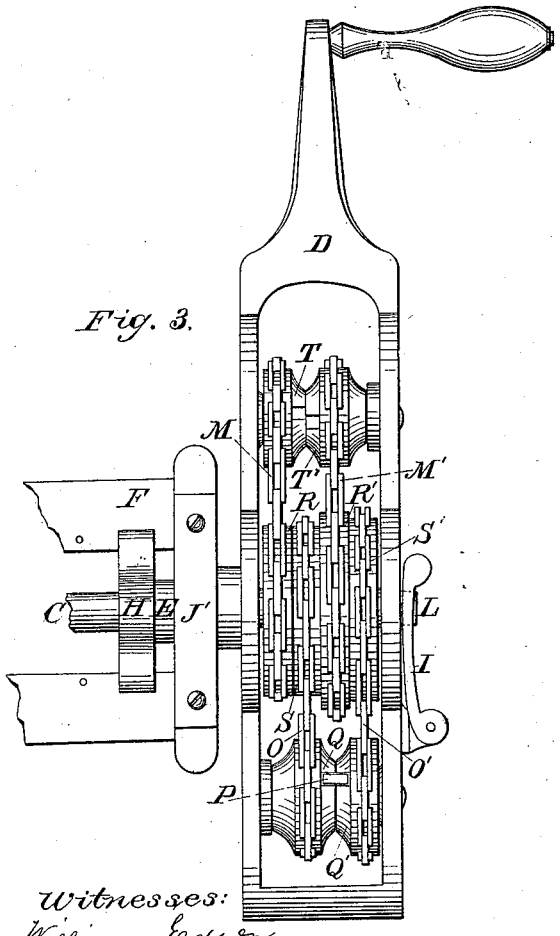


Fig. 3.



Witnesses:
William Edson
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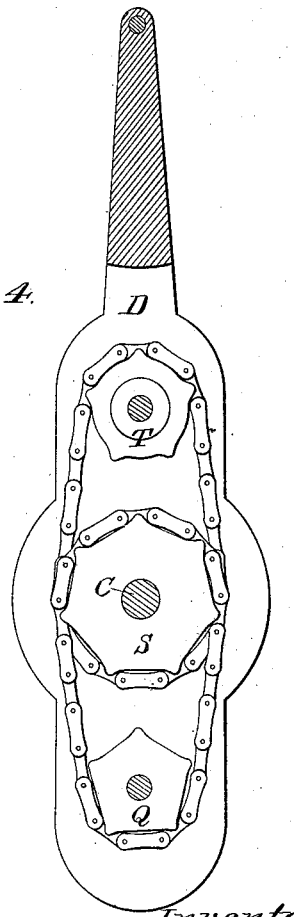
Fig. 4.



Inventor.
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UNITED STATES PATENT OFFICE.

HENRY F. SHAW, OF WEST ROXBURY, MASSACHUSETTS.

IMPROVEMENT IN HOISTING APPARATUS.

Specification forming part of Letters Patent No. **54,419**, dated May 1, 1866.

To all whom it may concern:

Be it known that I, HENRY F. SHAW, of West Roxbury, in the county of Norfolk, in the State of Massachusetts, have invented a new and useful Improvement in Hoisting Apparatus; and I do hereby declare that the following is a full and exact description thereof.

To enable others skilled in the art to make and use my invention, I will proceed to describe its nature, construction, and operation, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

The nature of my invention consists in a new and useful combination and arrangement of differential pulleys, sometimes called "English pulleys," for use in hoisting-machines.

In the drawings, Figure 1 is a rear elevation, showing one application of my hoisting apparatus to a derrick. Fig. 2 is a side elevation of the same. Fig. 3 is an enlarged view of my improved gear. Fig. 4 is a cross-section of the same.

Figs. 1 and 2 represent my hoisting apparatus as applied to an out-rigged derrick; but it may be applied to a derrick of any description, or it may be used in buildings, in which case the construction of the frame will vary to suit the character of the work to be performed.

C is a shaft or barrel, around which the hoisting rope or chain K is wound. The shaft C is hung in the wooden frame F F J J, Fig. 1, in the ordinary manner. It has a square end, L, by means of which and the catch I the gear-frame D may be locked to it, in which case the frame D and the shaft C revolve together with necessarily the same rapidity.

The wheels or pulleys T T′ R R′ S S′ Q Q′ are of the usual form and construction of chain-pulleys, as shown in the drawings, and are made with prominent cusp-points, so that the chain cannot slip upon them. The wheels R and S are solidly attached to each other and to the square metallic piece E, Fig. 3.

The bar H slides upon the piece F F, and having a square opening in its center over the part E of the pulleys R S, thus preventing them from revolving.

The pulleys R′ and S′ are fixed to each other and to the shaft C. The pulleys Q Q′ and T T′ serve to transmit the power from S to S′ and R to R′, and are alternately idlers and workers, as a greater or less weight is to be raised.

The duty of the pulleys Q Q′ T T′ is simply to transmit motion from the chains O and M to the chains O′ and M′, and through them, by means of the pulleys R′ and S′, to the hoisting shaft or barrel C. Whenever the pulleys R and S are locked, so as not to revolve, by means of the squared piece E and slide H, and the frame D is made to revolve, the chains M and O must begin to traverse, which action is communicated to the pulleys Q and T, causing them to revolve upon their own axes. Now, if we suppose, as shown in Fig. 3, that the pulley Q is keyed to the pulley Q′, Q′ will also revolve, carrying with it the chain O′, which, acting through the pulley S′, revolves the shaft C.

When the pulleys Q Q′ are keyed together by means of the key P, I call them "workers," when not thus keyed I call them "idlers." The same may be said of the pulleys T′ and T.

M M′ O O′ are chain-bolts connecting the different pulleys. U is a handle by which the machine is operated.

To operate the machine I proceed thus: The weight W is attached to the chain K. If the weight is not great the catch I is closed onto the square L of the shaft C, the lock H is slipped off from the square part E of the pulleys R and S, and the whole gear-frame D and the shaft C are all made to revolve together. The shaft C, being locked directly to the gear-frame D by the catch I, must necessarily revolve with the same velocity as that of the gear-frame, so that the power gained is only that due to the ratio between the length of the lever D (in this use of the machine the frame D is only useful as a lever) and semi-diameter of the shaft or winding-barrel C. If the weight W is very great I use one set of the differential pulleys in this manner: The pulleys R and S, which I call the "driving-pulleys," are made stationary by slipping the lock-piece H upon the square E, and the gear-frame is loosed from the shaft C by pulling back the catch I. I now pin one pair of the idlers, Q Q′, for instance, so that they shall revolve together, and the machine is ready for operation.

Upon inspection, it will be seen that if I re-

volve the gear-frame D the driving-pulleys R S remaining stationary, the chain-belts must traverse around their respective pulleys.

The chain O, traversing around the fixed pulley S, will cause the idler-pulley Q, and consequently its companion Q′, to revolve. This action sets in motion the chain O′, which, traversing upon the working-pulley S′, of a different diameter from its driving-pulley S, causes it to revolve. The principle of action here involved would be precisely the same if, instead of two chain-belts, O′ and O, as here shown, there should be but one belt, extending from S around some convenient pulley located in the place of Q Q′ and returning to the pulley S. Now, if we revolve the frame D our supposed pulley will be carried around the fixed pulley S, and thus the belt, link by link, will traverse around S, and also around S′; but if S has a different number of teeth from S′, it is evident that S′ cannot remain stationary in relation to S. Suppose, for instance, that the belt has one hundred links, and that the pulley S has ten points; now, the belt must be carried ten times around the pulley before all of its links shall have passed all of the points. But we will say that the pulley S′ has twenty points, and all of the links of the chain will have come in contact with all of the points when the chain has been carried around but five times; hence we may see that the revolution of the larger pulley must follow the revolution of the chain, so that while the chain traverses ten times around the small pulley, it had passed relatively but five times around the large pulley, or, in other words, the large pulley has made five revolutions upon its own axis. The same line of reasoning may be applied to any two pulleys, and it will be seen that if the two pulleys S and S′ are equal in diameter and are connected by a chain-belt no relative rotation will take place—that is, if one is stationary the other will be, or if one revolves the other will, with the same speed. If the pulleys are of different diameters they will not remain stationary in regard to each other, but will, of necessity, have a relative rotation. If S′ is smaller than S it will revolve in a contrary direction to that of the gear-frame; but if the working-pulley S′ is larger than the driving-pulley S, then it will revolve in the same direction as that of the gear-frame.

The leverage gained depends simply upon the difference of diameter of S and S′, and as far as the leverage is concerned it is of no matter which of the two is the largest; but there is less friction in the machine if the working-pulley S′ is larger than the driving-pulley S than there would be if it was smaller, for the reason that if the working-pulley S′ is larger than the driving-pulley S it will revolve in the same direction that the gear-frame revolves, while, if the working-pulley S′ is smaller than the driving-pulley S it will revolve in a direction contrary to that of the gear-frame, thus adding to the friction.

I use the pulleys T T′ and the chains M M′ when I wish to change the amount of leverage, in which case the pin or key P is taken from the pulleys Q Q′ and is used to connect the pulleys T T′.

If it is required to hold the weight suspended I put down the lock I upon the square end L of the shaft C. This prevents any motion of the machine.

The advantages of my arrangement are these: It may be made very compact, and at the same time giving almost unlimited purchase, and is not expensive, and runs almost noiseless, making it very desirable for storehouses, &c.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The general combination and arrangement of the differential pulleys and chains, substantially as described, and for the purpose set forth.

2. The latch I, or its mechanical equivalent, working as described, and for the purpose set forth.

3. The holding-pin or lock H, or its mechanical equivalent, in combination with the driving-pulleys R and S, substantially as described, and for the purpose set forth.

HENRY F. SHAW.

Witnesses:

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A. HUN BERRY.