(No Model.) 2 Sheets—Sheet 1.

T. F. FLINN.

DIFFERENTIAL HOISTING MACHINE.

No. 348,200. Patented Aug. 31, 1886.

Fig. 1.

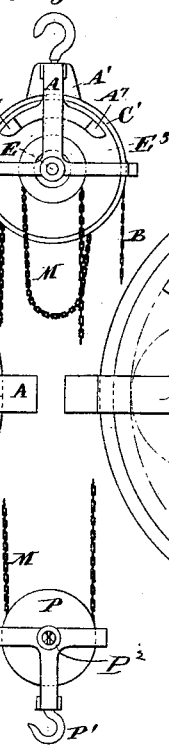


Fig. 2.

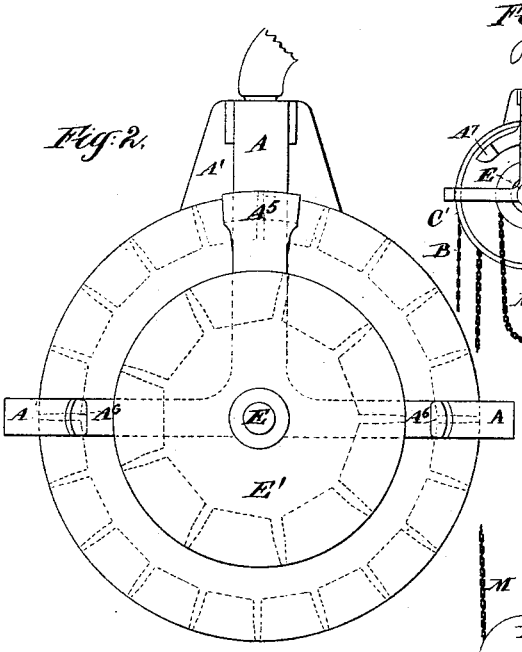


Fig. 3.

Fig. 4.

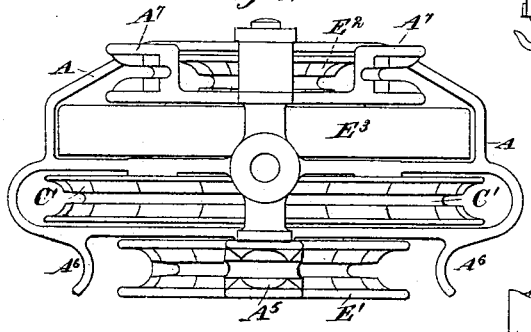


Fig. 5.

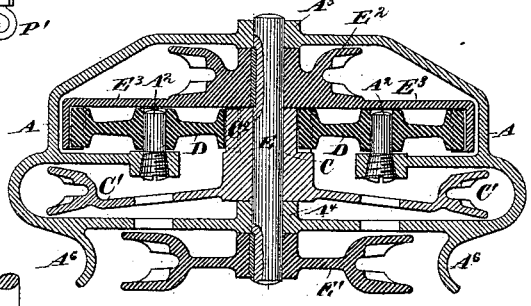


Fig. 7.

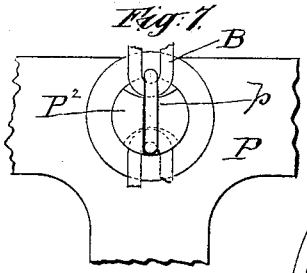


Fig. 6.

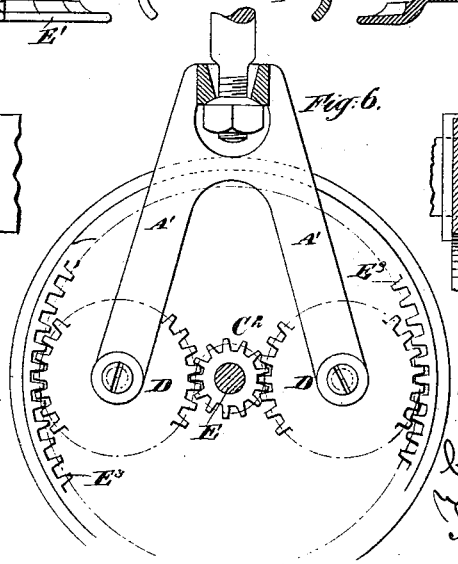
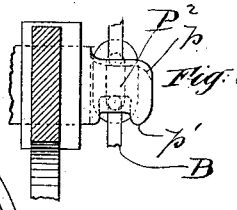


Fig. 8.



Witnesses:
Charles R. Searle,
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Inventor:
T. F. Flinn
by his attorney
T. D. Watson

(No Model.) 2 Sheets—Sheet 2.

T. F. FLINN.

DIFFERENTIAL HOISTING MACHINE.

No. 348,200. Patented Aug. 31, 1886.

Fig. 9.

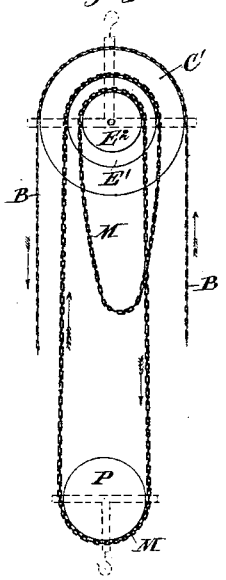


Fig. 10.

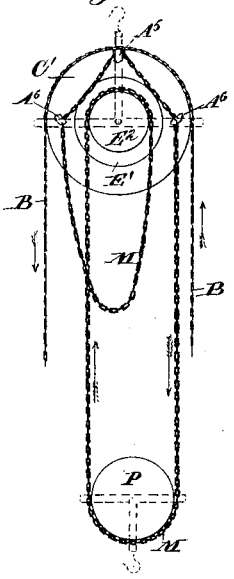


Fig. 11.

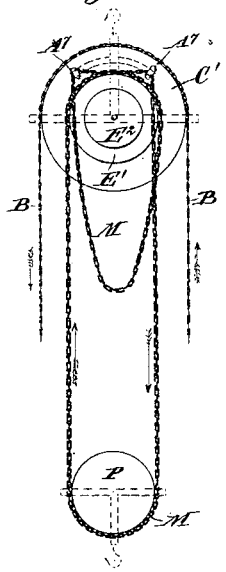
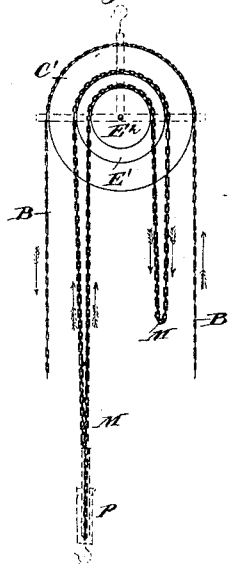


Fig. 12.



Witnesses:
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Inventor:
Thomas F. Flinn
by his attorney
Thomas Drew Stetson

N. PETERS, Photo-Lithographer, Washington, D. C.

UNITED STATES PATENT OFFICE.

THOMAS F. FLINN, OF BROOKLYN, NEW YORK.

DIFFERENTIAL HOISTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 348,200, dated August 31, 1886.

Application filed January 27, 1886. Serial No. 189,945. (No model.)

To all whom it may concern:

Be it known that I, THOMAS F. FLINN, of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Differential Hoisting-Machines, of which the following is a specification.

I employ two sprocket-wheels turning simultaneously, with suitable means for operating them, and a chain by which the hoisting is effected, which chain in one condition of the apparatus is taken up by one and let out by the other sprocket-wheel, the hoisting being due to a difference in the rate, one wheel taking up the chain faster than the other pays it out. Machines of this class have been long known, one of the names by which they are recognized being "differential pulleys." The chain is preferably endless, so that it may be run over the pulleys for an indefinite period to hoist or letting out slowly to lower. Such machines will hoist great weights by the power of one man or a small number of men, but the weight is lifted with extreme slowness. Doing miscellaneous work there are many occasions where the weight to be lifted is so small that a less degree of mechanical advantage or "purchase" will suffice, and if proper arrangements can be devised for obtaining such the weight will be lifted proportionately faster.

I have devised convenient means for giving the machine several degrees of mechanical advantage or purchase.

The simplest arrangement of the sprocket-wheels to give the desired differential motion is to have one larger than the other, and key both firmly on the same shaft. I will describe the machine as thus constructed.

My machine allows the chain to be worked in the ordinary way with the ordinary great purchase. It also allows it to be worked with one point of the chain held stationary, and another part wound up by the small sprocket-wheel. It also allows the chain to be worked with one point stationary and the other wound up by the larger sprocket-wheel. It also allows it to be worked with the chain wound up by both wheels. These variations give a successive diminution in the purchase and a corresponding successive increase in the rapidity in the rate of hoisting. With the proportions I have adopted in my experimental machine, one revolution of the hoisting-shaft will in the first condition take up nine (9) links and let out six (6) links, making a final or effective shortening of the double chain to the extent of one and a half (1½) link of the chain; in the second condition will take up three (3) links; in the third will take up four and a half (4½) links, and in the fourth condition, the two sprocket-wheels both pulling together, will take up seven and a half (7½) links. The construction holds the chain reliably and allows the changes of condition to be made rapidly and easily.

I will describe the invention as applied to a portable machine; but it may be understood that the same may be applied to a fixed construction.

The accompanying drawings form a part of this specification, and represent what I consider the best means of carrying out the invention.

Figure 1 is a general side elevation. Figs. 2 to 6, inclusive, are on a larger scale, and represent the upper portion of the apparatus with the chains removed. Fig. 2 is an elevation of the side the reverse of Fig. 1. The sprocketed condition of the wheels is indicated in dotted lines. Fig. 3 is an elevation of a portion corresponding to Fig. 1. Fig. 4 is a top view corresponding to Fig. 2. Fig. 5 is a central horizontal section. Fig. 6 is a central vertical section. Figs. 7 and 8 show certain portions on a still larger scale. Fig. 7 is an elevation, and Fig. 8 a vertical section. Figs. 9 to 12, inclusive, are diagrams showing the apparatus with the chains adjusted for use in different conditions. Fig. 9 shows the arrangement for the greatest purchase. Fig. 10 shows the arrangement for the next less purchase. Fig. 11 shows the arrangement for the third condition, that in which the purchase is still less than in Fig. 2. Fig. 12 shows the arrangement for the fourth condition, in which the purchase is still less, and the hoisting is effected the quickest.

Similar letters of reference indicate corresponding parts in all the figures where they occur.

A is the case or framing, certain parts being designated, when necessary, by additional marks, as A′ A^2, &c.

E is the main hoisting-shaft.

E^3 is a large internally-geared wheel fixed on the shaft E, through which motion is received from two "idle" gear-wheels, D D, each of which latter receives motion from a gear, C^2, on a sleeve, C. A large wheel, C', on this sleeve receives motion from a small chain, B, operated by hand. The sleeve C turns loosely on the shaft E. All these parts, as also the studs A^2, on which the idle-wheels D turn, and the portion A' of the framing, which supports these studs, may be of an ordinary and well-approved construction.

The main shaft E has two bearings in the framing, one formed in a sufficiently-thick portion, A^3, and another in a sufficiently-thick portion of the framing A^4.

E' is the large sprocket-wheel. It is fixed on the projecting or "overhung" end of the shaft E. There is a clear space outside of this wheel, which will allow the chain to be taken off and suspended on hooks or crossed at will.

A^5 is a stout vertical hook of the proper form to engage the chain M and hold it firmly. It is mounted over the large sprocket-wheel E'.

A^6 A^6 are horizontal hooks set in the positions represented, one each side of the large sprocket-wheel.

E^2 is the small sprocket-wheel fixed on the shaft E within the bearing A^3. It may be cast in one with the wheel E^3. The framing is so formed as to allow a considerable space over this wheel in which the chain may be lifted, as will presently appear.

A^7 A^7 are two stout hooks, mounted in the position shown, so that they can, when required, hold the chain M firmly over and without touching the small sprocket-wheel.

The pulley P, riding in the bight of the pendent portion of the chain M, being attached by its hook P' to the weight, (not represented,) will, by the operating of the chain B, and consequent quick turning of the sleeve C and slow turning of the shaft E, be hoisted at different rates, according as the chain M is adjusted in one condition or another.

For the most powerful, and consequently the slowest, hoisting, the chain M is placed on both the sprocket-wheels in the condition indicated in Fig. 9. For the next power (see Fig. 10) the chain is lifted from the large sprocket-wheel E', and engaged in the hooks A^5 A^6 A^6. In this condition the chain is taken up by the small wheel E^2, six (6) links at each turn, and as the other suspending-point of the chain is simply immovably fixed, the pulley P rises half the number of links—three (3) links. For the next power the chain must be restored to its place on the large sprocket-wheel E', and lifted off the small sprocket-wheel E^2, and engaged on the two hooks A^7. (See Fig. 11.) In this condition, the wheels being turned in the same direction as at first, each revolution takes up by the wheel E' nine (9) links of the chain M, and as the other suspending-point of the chain is simply fixed, the pulley P rises half as fast—four and a half ($4\frac{1}{2}$) links. For the fastest hoisting the chain M is taken off of the large sprocket-wheel and reversed in position, as indicated in Fig. 12. Thus conditioned, the wheels being turned the reverse of the first direction, each revolution of the shaft E takes up nine (9) links with one wheel, E', and six (6) links with the other, E^2—total, fifteen (15) links, which, being divided between the two parts of the chain, the pulley P rises half as fast—seven and a half ($7\frac{1}{2}$) links.

It will be observed that the part A^8 of the framing connects to the other parts thereof at a sufficient height to allow an open space between the hooks A^7 A^7. This allows the chain to extend directly across between these hooks when it is mounted therein.

The top of the framing A is equipped with a swivel-hook, which allows the whole device to be turned in any position required, turning freely around on the swivel, by which the suspending-hook is connected.

I provide a less amount of friction opposing the motion of hoisting than is found in any other form of hoisting-gear known to me. The friction is ordinarily sufficient to prevent the machine from running backward, while in my machine it is necessary to provide means for controlling the movement of the chain B. I provide means both novel and convenient for this purpose. Upon the pulley-frame P, preferably a continuation of the pivot or shaft of the pulley itself, I form a horn, P^2, having a vertical slot, *p*. (Seen in Figs. 1, 7, and 8.) The lower face of this duplex projection or horn P^2 is hook-shaped, as seen at *p'*. To prevent the weight from forcing the gear to run backward, it is only necessary to engage one of the alternate series of links of the chain B in the slot *p*, when the next lower link will engage the under faces of the horn P^2 and the hooks *p'* will prevent accidental displacement. The horn P^4 may be formed upon any part of the pulley or frame, both of which I designate by the letter P^4.

Modifications may be made in the forms and proportions within wide limits without departing from the principle, or sacrificing the advantages of the invention. The form of the framing and of the several hooks may be varied. The proportions of the sprocket-wheels may be varied.

I can employ other means than the small chain B for imparting the motion by hand or by machinery to the sleeve C.

I can employ other means than the sleeve C and idle-wheels D for turning the main shaft E. It is sufficient that there be means for conveniently and strongly turning this shaft. I prefer spur-gearing in about the proportions shown.

I claim as my invention—

1. The slotted horn P^2 on the weight-pulley P, in combination with hand-chain B and with hoisting mechanism, as set forth.

2. The combination with differential hoisting mechanism having hand-wheel attach-

ment, of the weight-pulley P, having a slotted horn, P^2, and hand-chain B, as set forth.

3. The horn P^2, having slot p, and hook-faces p', combined with hoisting mechanism and with chain B, as and for the purposes set forth.

4. The wheels E' E^2 and means for operating them simultaneously, in combination with the chain M, the framing A, and the hook A^5, the latter arranged above the wheel E', and adapted to engage a portion of the chain and hold it idly over said wheel, as set forth.

5. In a differential hoisting-machine, the sprocket-wheels E' E^2 and means for operating them differentially, in combination with the chain M and pulley P, and with the framing A, having a hook, A^5, for adjusting for one rate of motion, and a hook, A^7, for adjusting for another rate of motion, as herein specified.

6. In a differential hoisting-machine, the shaft E, sprocket-wheels E' E^2, pulley P, and chain M, in combination with a supporting-frame having bearings A^3 A^4 and hooks A^5 A^6 A^6 on one side and the hooks A^7 A^7 on the opposite side, arranged for joint operation, as herein specified.

In testimony whereof I have hereunto set my hand, at New York city, this 22d day of January, 1886, in the presence of two subscribing witnesses.

T. F. FLINN.

Witnesses:
H. A. JOHNSTONE,
MANIENE ELLISON.