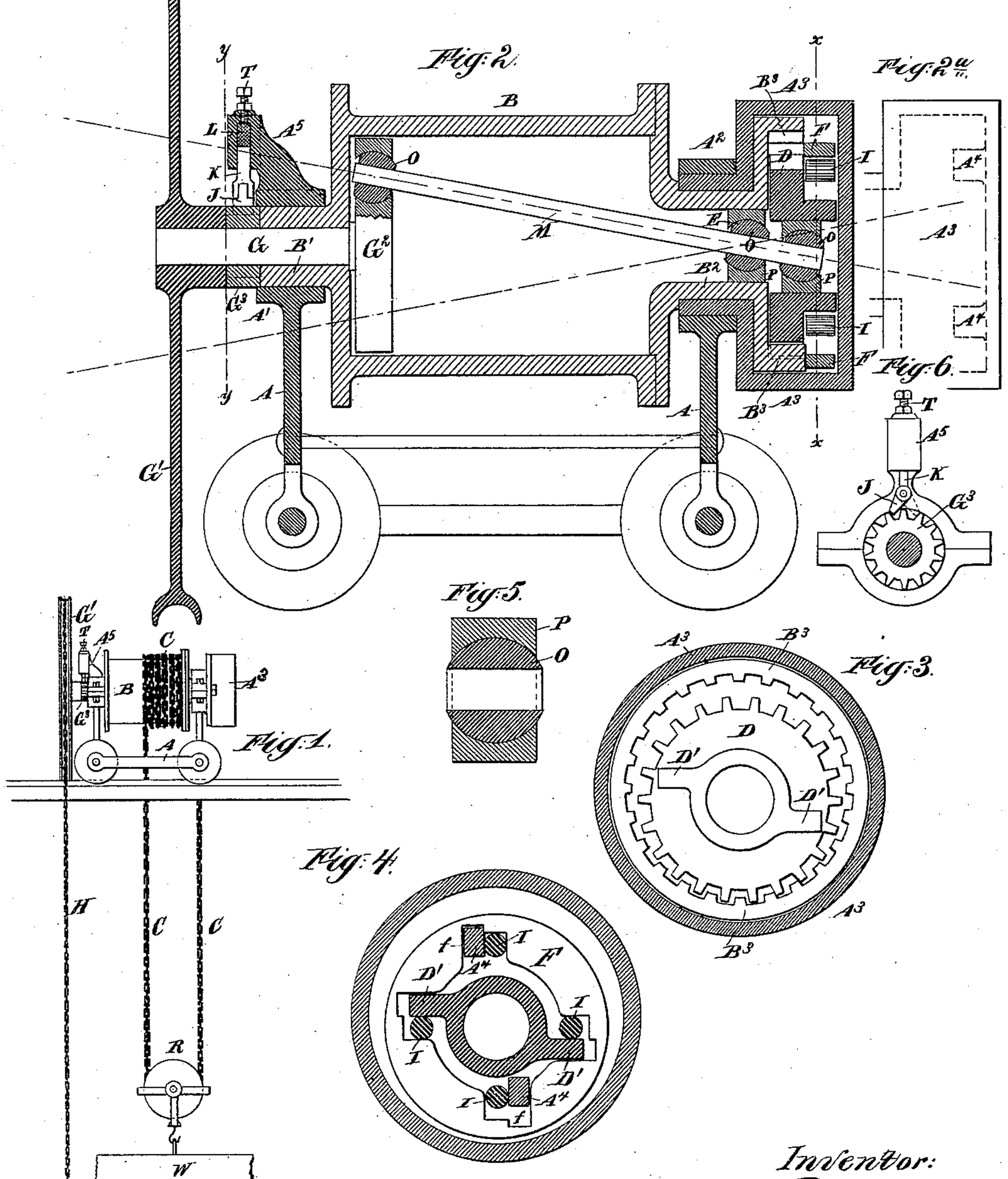
(No Model.)

W. ROTH.

HOISTING MACHINE.

No. 349,123. Patented Sept. 14, 1886.



Witnesses:
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UNITED STATES PATENT OFFICE.

WILLIAM ROTH, OF NEW YORK, N. Y.

HOISTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 349,123, dated September 14, 1886.

Application filed March 29, 1886. Serial No. 197,026. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM ROTH, of the city and county of New York, in the State of New York, have invented a new and useful Improvement in Hoisting-Machines, of which the following is a specification.

My improvement applies to that class of machines in which the strength of one man or other small force applied on a quick-moving part winds up a chain or rope slowly with greater force. Such are usually termed "hoisting-machines;" but they may be obviously applied for operating presses or for various other purposes where a great force is to be exerted at slow speed. One of the standard modes of operating such machines is by providing a spur-gear wheel mounted loosely on a crank, which gyrates it within an internally-geared windlass, providing means for holding the spur-wheel against revolving. The effect is by the different number of teeth to give a slow rotary motion to the windlass. My improvement applies to this general construction. I have devised means for greatly reducing the friction.

In hoisting large weights the gyratory motion of the internal wheel must be imparted with great force. The ordinary mode of attaining this end is by a crank or eccentric fixed on a shaft subject to the full strain. I operate by a crank of larger throw fixed on a separate shaft subject to a much less strain. I communicate from that crank of large throw the necessary small motion to the gear-wheel through a lever provided with universal joints. I have devised an improved construction of universal joint especially adapted for this use, and also a means reversible, when desired, for locking the parts against running backward. I have in my experiments made the leverage between the crank and the gyrating wheel about one to six. The machine is peculiarly free from frictional resistance. My experiments indicate that one man by my machine can easily, by reason of its little friction, lift more load than two men with the ordinary form in which a crank or eccentric is applied directly to the gyrating wheel. I provide a locking-dog in the form of a pawl, mounted on an adjustable spring device, which allows it to be conveniently reversed when desired. In hoisting the pawl stands in the position to prevent the mechanism from running backward. It may be left for any length of time, and the load will be held reliably. When it is desired to lower the weight, the operator simply pulls the operating-chain strongly in the direction to promote its descent. The great strain thus brought to bear on the pawl overcomes the force of the spring device by which its center is held in place. Under the influence of this strain the center retreats or moves radially away from the wheel to a sufficient extent to allow the pawl to reverse its position. Thenceforward it becomes ineffective, allowing the parts to be freely operated in the direction to lower the weight. When it is again desired to hoist either the same weight or another one, a strong force applied to the operating-chain effects another reversion of the position of the dog, and it is now ready to serve as at first. The device I employ to attain the purchase—a spur-geared wheel traverses around within a slightly-larger internally-geared wheel—is sometimes known as a "hunting-wheel."

The following is a description of what I consider the best means of carrying out the invention.

The accompanying drawings form a part of this specification.

Figure 1 is a general side elevation showing the entire mechanism with the weight which is being raised or lowered thereby. The remaining figures are on a larger scale. Fig. 2 is a central vertical section. Fig. 2ª is a side elevation of a portion, indicating in dotted lines the position of certain internal projections which perform important functions. Figs. 3 and 4 represent certain portions of the mechanism as they would appear viewed from the right-hand side of Fig. 2. Fig. 3 represents the spur-geared gyrating wheel and its inclosing internal gear, which attain the great purchase required. Fig. 4 is a section partly in elevation, the section being on the line *x x* in Fig. 2. Fig. 5 is a vertical section through one of the balls and inclosing-boxes. Fig. 6 is a section on the line *y y* in Fig. 2, as seen from the left.

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

I will designate the frame-work by the let-

ter A, using additional marks, as A′ A², &c., when necessary to designate special parts thereof.

A³ is a strong casing forming a part of the frame-work, and inclosing the gearing, to be presently described.

B is a strong windlass having hollow trunnions B′ B², supported in bearings A′ A² in the frame-work. The weight is raised and lowered by rotating this windlass and correspondingly taking up or paying out the chain H wound thereon. A stout internally-geared wheel, B³, is cast in one with the trunnion B².

D is a spur-gear wheel having one less tooth. This is mounted loosely on a center, which is to be gyrated in a small circle by means to be presently described. This motion causes the internally-geared wheel B³, and consequently the windlass B, to turn on its axis to the extent of one tooth at each gyration. One face of the wheel D carries two nearly radial projections, D′, which engage in rectangular recesses in the interior of a peculiarly-connected yoke, F, which receives in two rectangular recesses, *f*, corresponding internal projections, A⁴, from the strong fixed casing A³, which incloses it. Anti-friction rollers I are introduced to receive the strain, and to reduce the friction, which would otherwise be developed as these parts slide radially on each other. The slow rotation of B winds up the chain C and hoists the weight. I impart the required gyratory motion without necessitating a revolving motion of the parts which are subject to the strain. I employ a stout lever, M, mounted on a universal joint at E. It is unequal armed. Its short arm engages by a universal joint in the center of the wheel D. Its long arm engages crankwise in a cavity near the periphery of a wheel, G², carried on a shaft, G, which is supported in fixed bearings in the frame-work A, and receives motion through a large wheel, G′, from an endless chain, H, operated by hand. The strain to which the bearings of the shaft G and the engagement of the lever M with the wheel G² is subjected is slight by reason of the great leverage afforded by the unequal-armed lever M.

I attach importance to the construction of the universal joint at the fulcrum, where the lever M is supported on the frame-work and at the point where the short end of the lever M engages with the gyratory wheel. A similar joint is shown at the junction of M with G², and I consider such a good connection, but it is not so important at that point. Each is a ball-joint. At each of these points the lever M is cylindrical and extends through a cylindrical hole in a ball, O. This latter is received each in a correspondingly-spherical socket in a box, P, mounted, one in the frame-work A, another in the gyratory wheel B, and, as shown, a third in the wheel G². The slight movement involved is obtained by a partially-rolling and slowly-revolving motion. The friction induced by these slight and slow motions is far less than that involved in the ordinary complete revolutions of a crank or eccentric. The bearings of the shaft G are much less heavily loaded, the difference in load being due to the leverage or "purchase" of the unequal-armed lever M. The weight to be lifted is marked W. It is dependent on a pulley, R, which is carried in the bight of the chain C, one end of which is secured to the framing A, and the other end is wound up by the windlass B. The lever M may be of Bessemer steel or other strong material, nicely finished. It may be cylindrical throughout, as shown, or may be of any other form at other points; but it is important that it be cylindrical at the bearings. The balls O are produced in chills, or otherwise, of the required form, and, either with or without smoking or claying, are placed in the correct positions in the molds. The melted metal for the inclosing-boxes P is poured so that it flows around and tightly embraces them, while still leaving the parts sufficiently separated to allow the required turning motion. A little working with proper lubrication produces a very perfect ball-joint. My experiments indicate that this joint will keep in order under usual conditions for an indefinite period, as long as the other parts of the mechanism last.

G³ is a small toothed wheel keyed on the shaft G. It forms, with a pawl, J, slide K, and spring L, a reversible ratchet, which in one condition holds the weight suspended for any length of time and in another allows it to be lowered. The tension of the spring L may be adjusted by the screw T. All these parts are supported on a portion, A⁵, of the framing A.

In Fig. 6 the strong lines show the pawl in one condition and the dotted lines show it in the other. The tension of the spring L should be such that the slide K will be held down with sufficient force to withstand the tendency of the mechanism to turn of itself under the influence of any load which is likely to be applied through the chain C. In the act of hoisting, this pawl performs its ordinary functions, dropping into the recesses between the several teeth, and standing always ready to resist a backward motion when the parts are released; but when it is desired to lower, this pawl is reversed without labor by simply pulling strongly on the chain H, impelling the shaft G in the direction to lower. The tension of the spring L must be so moderate that it cannot be overcome by the force thus applied. When this occurs, the slide K rises momentarily in opposition to the force of the spring L, and allows the pawl to change its position, so that, instead of standing inclined in one direction it stands inclined in the opposite direction. After this change is made it will offer no resistance to the lowering of the weight, which must thenceforward be controlled by the chain H in the obvious manner. When it is again desired to hoist, a strong force ap-

plied through the chain H in the proper direction again reverses the position of the pawl, and the parts are ready to work as before.

Modifications may be made in the forms and proportions within wide limits. I can mount the frame-work A stationary, or make it traverse on an overhead railway, as shown, or can swing it from a chain or other efficient suspending means. I can vary the sizes of the internally-geared wheel B^3 and of the gyrating wheel D, yoke F, and inclosing-casing A^3. Each increase of size of these numbers increases the purchase of the machine. I can turn the wheel G′ by other means than the hand-chain H.

I claim as my invention—

1. The unequal-armed lever M and means, as the operating-shaft G and wheel G^2, for gyrating the longer end, in combination with the wheel D, operated by the shorter end and with the internally-geared wheel B^3, and the windlass B, and chain C, arranged for joint operation, substantially as herein specified.

2. The gyrating spur-wheel D, having the projections D′ and means for operating it, in combination with the casing A^3, internal projections, A^4, yoke F, rollers I, and the internal gear, B^3, and mechanism, as B C, operated thereby, arranged for joint operation, as herein specified.

3. The unequal-armed lever M, shaft G, and wheel G^2, for gyrating the longer end and the cylindrical bearings of said shaft, balls O, and inclosing-boxes P, in combination with the wheel D, operated by the shorter end, and with the internally-geared wheel B^3, windlass B, and chain C, all arranged for joint operation, as herein specified.

4. The lever M and universal joints therefor, the gyrating wheel D, internal gear, B^3, and connected mechanism, as B C, in combination with the shifting-pawl J, slide K, spring L, and housing or supporting-frame A^5, and with the wheel G^3 on the operating-shaft G, and wheels G′ G^2, all arranged for joint operation, substantially as herein specified.

In testimony whereof I have hereunto set my hand, at New York city, this 25th day of March, 1886, in the presence of two subscribing witnesses.

WILLIAM ROTH.

Witnesses:
JOHN ULRICH,
JOHN C. LAUG.