W. BARRY.

CHAIN HOIST.

APPLICATION FILED APR. 5, 1913.

1,128,401.

Patented Feb. 16, 1915.

3 SHEETS—SHEET 1.

Fig. 1.

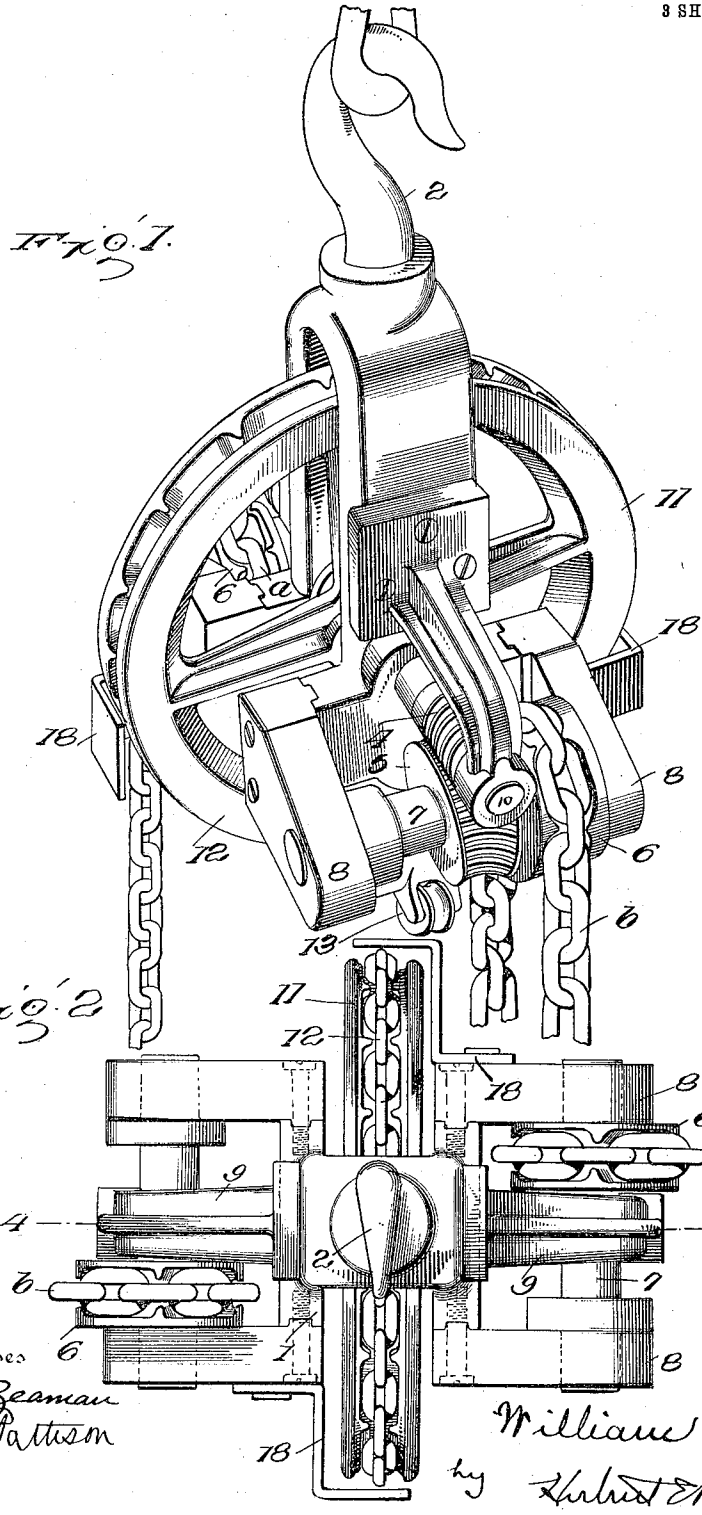

Fig. 2

Witnesses

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3 SHEETS—SHEET 2.

Fig. 3.

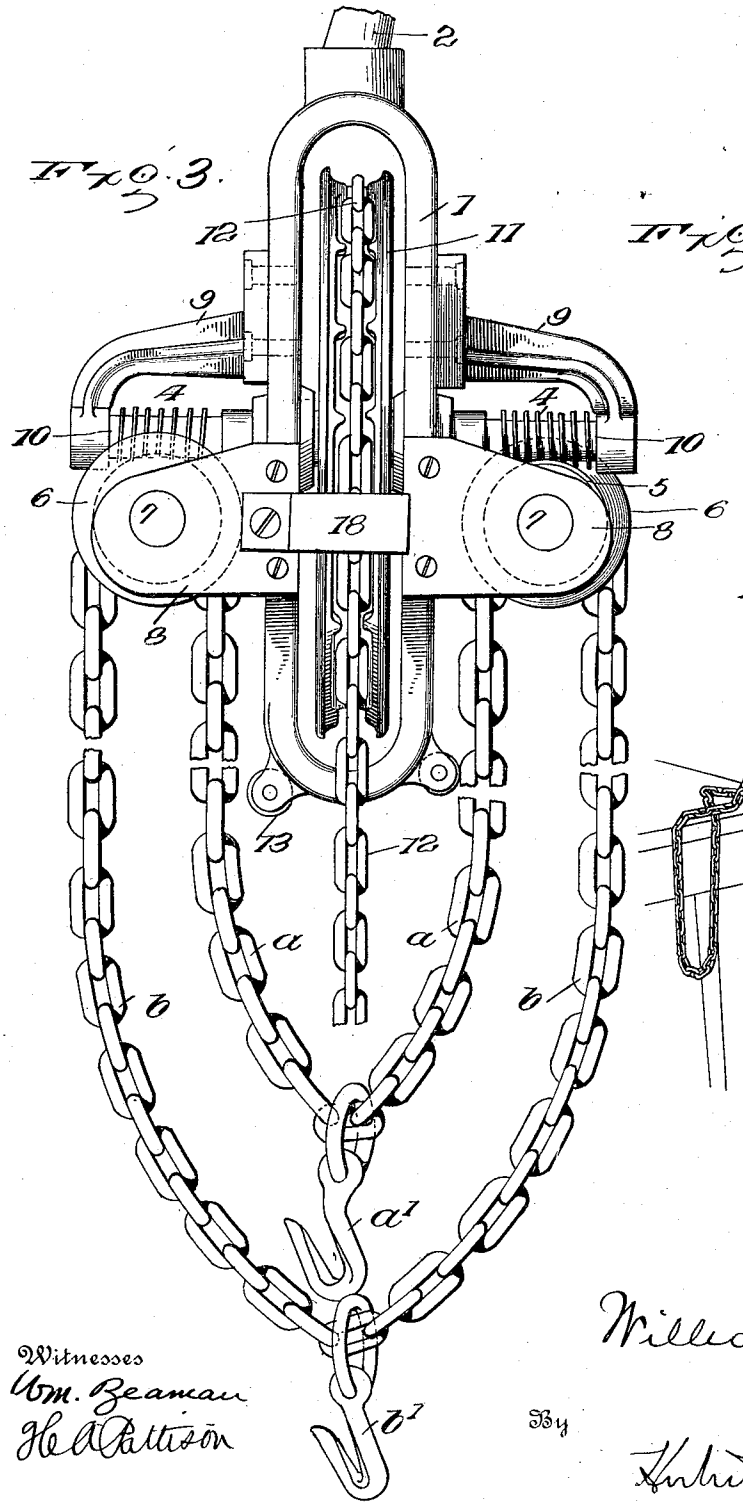
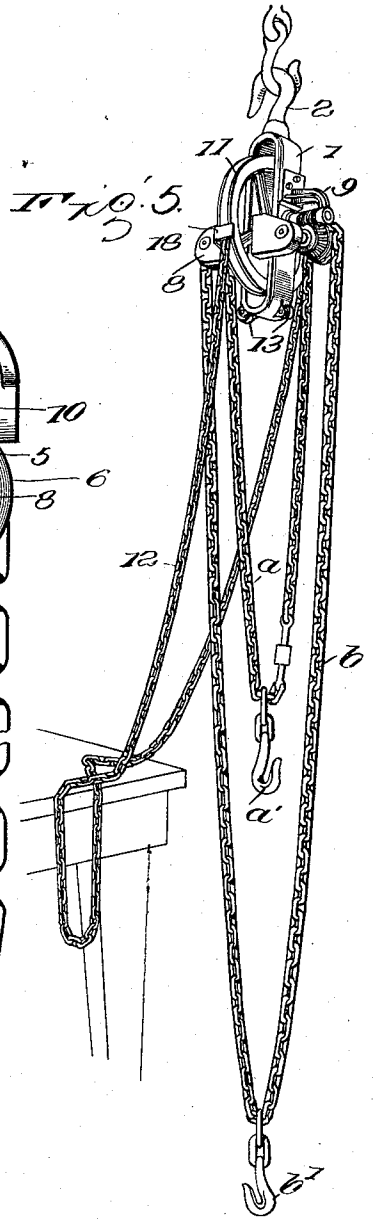


Fig. 5.



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3 SHEETS—SHEET 3.

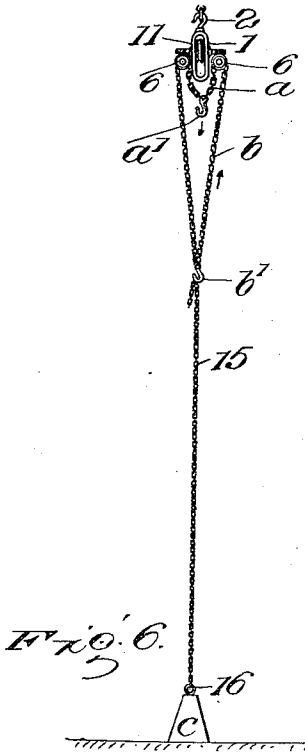

Fig. 6.

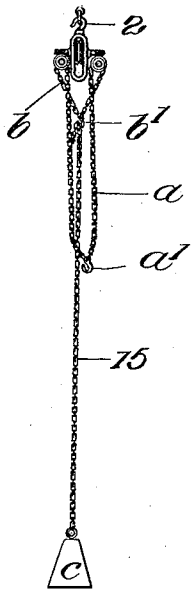

Fig. 7.

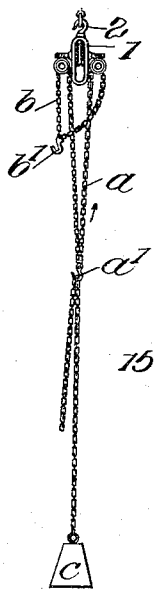

Fig. 8.

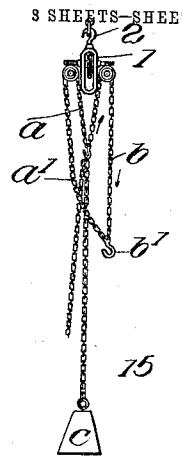

Fig. 9.

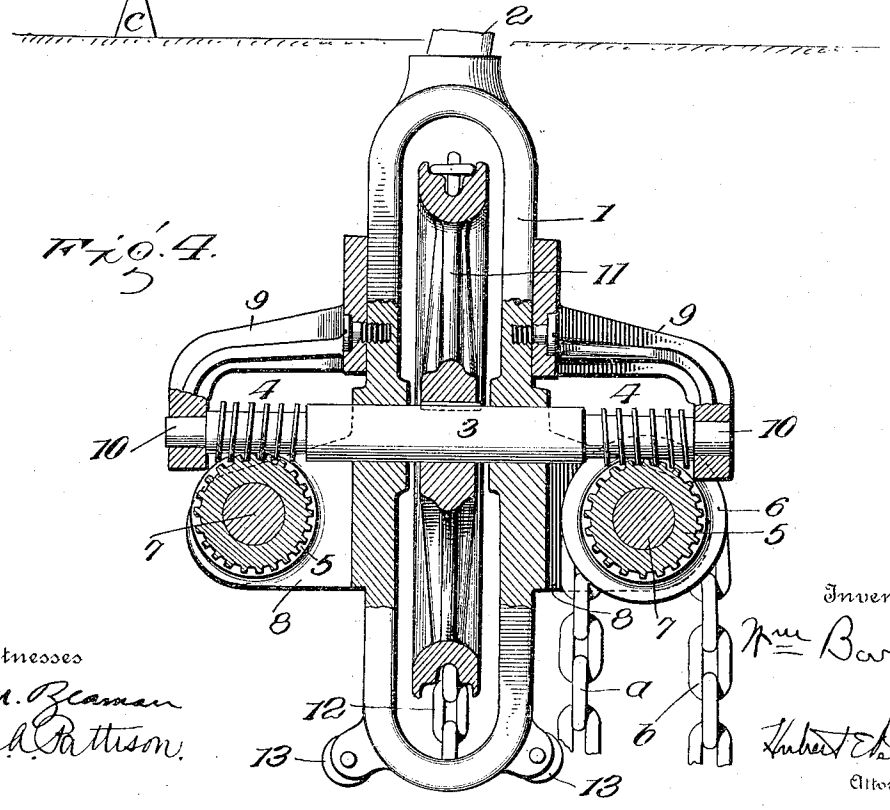

Fig. 4.

Witnesses

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UNITED STATES PATENT OFFICE.

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CHAIN HOIST.

1,128,401. Specification of Letters Patent. Patented Feb. 16, 1915.

Application filed April 5, 1913. Serial No. 759,256.

To all whom it may concern:

Be it known that I, WILLIAM BARRY, a citizen of the United States, residing at Oswego, in the county of Oswego and State of New York, have invented certain new and useful Improvements in Chain Hoists, of which the following is a specification.

This invention relates to certain improvements in hoisting apparatus; and the objects and nature of the invention will be readily understood by those skilled in the art in the light of the following explanation of the accompanying drawings illustrating what I now believe to be my preferred embodiment or mechanical expression from among other formations, constructions, and arrangements within the spirit and scope of the invention.

An object of the invention is to improve chain hoists, particularly those of the screw or worm type now commonly found on the market, to increase the field of usefulness thereof and in particular to increase the capacity of such hoists in the matter of range of lift or the vertical distance through which a load can be lifted by such devices.

A further object of the invention is to provide means whereby the distance that a chain hoist can lift a load can be greatly increased without increasing the length of the sprocket hoisting chain carried by such hoist and forming a part thereof.

A further object of the invention is to attain certain improvements in chain hoists of the type embodying hoist chains carried by worm-driven sprockets and each provided with oppositely-moving alternately applied load-carrying hooks, whereby each hook of a chain will move in the vertical line of the hoist support and thereby enable the hooks to alternately carry the load without lateral thrust or tilting of the hoist.

A further object of the invention is to provide certain improvements in arrangement and construction of parts and in cooperating elements whereby an improved and efficient chain hoist will be produced having a very extensive vertical lifting range of action.

A further and particular object of the invention is to improve chain hoists and the like to maintain the pull of the load in or along the center vertical line of the hoist.

A further object of the invention is to provide certain improvements in the construction and arrangement of parts and details whereby an improved and highly efficient chain hoist will be produced.

The invention consists in certain novel features in construction and in combination and arrangements as more fully and particularly set forth and pointed out hereinafter.

Referring to the accompanying drawings:—Figure 1, is a perspective view of the hoist, parts being broken away. Fig. 2, is a top plan view thereof. Fig. 3, is a side elevation. Fig. 4, is a vertical section on the line 4—4, Fig. 2. Fig. 5, is a perspective of the hoist in action. Figs. 6, 7, 8, and 9, are diagrammatical views illustrating how the hoisting combination that includes the load chain, is utilized.

In the particular example illustrated, I show a supporting frame or housing 1, in the form of a vertically elongated loop, at its upper end provided with the upright swiveled supported hook 2, from which the entire apparatus is supported, and which is arranged in the vertical center line of the hoist and constitutes the vertical axis about which the hoist can be turned or rotated.

A horizontal actuating or worm shaft 3, is arranged transversely of the frame 1, and is mounted in the sides thereof and projects in opposite directions therefrom and at its outer end portions, beyond said frame sides, is provided with the oppositely threaded worms 4, meshing with and actuating the worm wheels 5, in opposite directions.

Each worm wheel is rigid with a sprocket wheel 6. The horizontal shafts 7, or axes carrying the pairs of worm and sprocket wheels are mounted in suitable journal boxes carried by pairs of arms or brackets 8, rigidly secured to the opposite sides of the frame and projecting outwardly therefrom in opposite directions and so arranged that the vertically-disposed worm and sprocket wheels are spaced outwardly from the adjacent sides of the frame.

The worm shaft is mounted at opposite sides of its center in spaced boxes or bearings in the two vertical lengths of the supporting frame or housing 1, and in addition, I provide bracing and stiffening supports for the extremities of said shaft beyond the worms. For this purpose, I show stiff rigid arms or brackets 9, fixed to the opposite sides of the housing 1, and projecting laterally therefrom in opposite directions above

the worm shaft. These brackets 9, have outer depending ends providing journal or bearing boxes for the ends 10 of the worm shaft that extend outwardly beyond the worms. These brackets 9, aid in bracing the worm shaft against springing or yielding and in constantly maintaining the worms in operative mesh with the worm gears on the shafts 7.

The two worm gears 5, are both located in the same vertical plane as the worm shaft 3, and the two winding drums or sprocket wheels 6, are located at opposite sides of said vertical plane. In other words, the drums 6, are located in separate vertical planes, and the vertical plane of the worm shaft is arranged midway between said two planes. This result is accomplished by arranging one drum 6, at one end of its worm gear 5, and the other drum 6, at the corresponding opposite end of the other worm gear. The worm shaft is located approximately in the vertical plane of the longitudinal vertical center line of the hoist, and hence the two hoisting drums, sheaves or wheels 6, are correspondingly located at opposite sides of said vertical plane to approximately balance each other.

On the central portion of the worm shaft, between the sides of the frame, I fix a sprocket wheel 11, carrying a loosely hanging endless hand chain 12, of any suitable length. The worm shaft can be rapidly rotated in either direction by this hand chain as will be well understood by those skilled in the art. The depending plies of the hand operating chain 12, are preferably confined against accidental displacement from the sheave or wheel 11, by suitable guards. For instance, I show rigid fixed guard brackets 18, for this purpose, secured to diagonally opposite blocks or brackets 8, and extending outwardly beside the said wheel and at their free ends having fingers traversing the periphery of the wheel and confining the chain in the groove thereof.

In the example illustrated, I show an endless sprocket hoisting chain passing over the two sprocket wheels 6, and hanging therefrom in two bights, loops, plies or ends. The inner bight *a*, hangs from the inner or adjacent edges of the two sprocket wheels and passes down between the same and the adjacent sides of the frame and extends from wheel to wheel around or below the lower end of the frame, and at its lower or central portion this bight (or this inner end) of the chain carries a vertical grab hook *a'*, located and movable in the vertical center line of the hoist. The opposite sides of the lower portion of the frame are provided with idler rolls 13, to receive and guide the opposite sides or plies of said inner bight *a*, of the hoisting chain and hold them properly spaced from the frame particularly when the load is being carried by said bight. The outer or larger bight *b*, of the hoisting chain hangs from the outer edge portions of the two sprocket wheels 6, and at its central portion (or at the opposite end of the chain) is provided with grab hook *b'*, located in the center vertical line of the hoist. The arrangement of parts is such that when the worm shaft is rotated in one direction, one bight of the hoisting chain will shorten to elevate its grab hook while the other bight will lengthen, and when the shaft is rotated in the opposite direction, the direction of movement of said bights and their hooks will be reversed.

The chain hoists of the worm and like types generally found on the market, have but a comparatively short lifting range. These hoists are usually employed for purposes where but a short lift is required and hence for economical reasons are equipped with short hoisting chains. When it is necessary to elevate a load to a point above the range of lift of such a hoist, it is necessary to elevate the load to the limit of the range of lift of the hoist, then block up the load so as to support it independently of the hoist, and then elevate the hoist itself to a position where it can be again applied to the load to lift the same through its range of lift. If the load has not then reached the elevation desired, it must be again blocked up so that the hoist can be secured at a still higher elevation, to repeat the operations just described.

It is an object of my invention to provide a chain hoist combination whereby loads can be lifted to high points or throughout an extensive range of lift, without requiring the slow and expensive blocking up operation, and whereby a chain hoist equipped with the comparatively short economical hoist chain can be utilized for the common short lifts for which such hoists are particularly intended, as well as for the long lifts for which said hoists are not ordinarily adapted.

In carrying out my invention, I provide a comparatively long length of comparatively heavy or strong chain 15, preferably at one end having a strong load hook 16. This chain constitutes the load chain and the hook 16, thereof is adapted to be applied to the load, (*c*, for instance) to lift and carry the same, while the grab hooks *a'*, *b'*, are adapted to alternately engage between links of said load chain to support the same and the load and to elevate the chain and load with a step by step motion. The load chain is preferably composed of similar links so formed with respect to the two similar grab hoods *a'*, *b'*, that said chain can be locked to and supported by either of said hooks by slipping any link of said chain edgewise into the slot of either hook so that

the link above the one held in the hook will act as a stop in supporting the chain from the hook.

In using my invention, the swivel supporting hook or suspending device 2 is applied to any suitable support located a distance above the high elevation to which the load is to be raised. The distance from the hoist frame when thus supported in the elevated position, to the load to be lifted far exceeds the direct range of lift of the hoisting chain *per se*. The length of the load chain plus the length of the range of lift of the hoisting chain, however, exceeds the distance that the load is to be lifted. The load hook of the load chain is then secured or otherwise applied to the load to support and carry the same, and one end grab hook (b' for instance) of the hoisting chain is then lowered approximately to its limit and the load chain is held in a vertical position and a link thereof is engaged in said grab hook, see Fig. 6. The hoist is then operated by the hand chain to elevate the load by the load chain until said grab hook b' of the hoisting chain has approximately reached its limit of upward movement see Fig. 7. During this action the opposite end grab hook (a' for instance) of the hoisting chain has dropped to approximately its limit of downward movement. The operation of the hand chain is then stopped, and while the hoist supports the load against dropping by reason of the worm gear, or its equivalent, said lowered or opposite end grab hook (a') is fitted on a link of the load chain located as far as possible below the upper grab hook (b') that is then supporting the load. The hand chain is then operated in the opposite direction to operate the hoist chain in the opposite direction from that in which it moved in the first step just described, and hence the weight of the load is transferred to the grab hook a', so that the hook b', can be released from the load chain see Fig. 8. The continued operation of the hand chain will then elevate the load through hook a', until approximately the limit of upward movement of said hook is reached see Fig. 9. The operation of the hand chain can then be stopped and while the load is held elevated by hook a', the hook b', is again engaged in the load chain at a point as far as possible below hook a', and the operation is then repeated by again reversing the direction of rotation of the worm shaft. The load is thus elevated step by step by utilizing the two grab hooks a', b' alternately to pull up on the load chain I might say, hand over hand, through the reversal of the direction of movement of the hoist after each step or elevating operation.

It will be noted that the grab hooks when under load are approximately located in the center vertical line of the hoist, that is, in the vertical line from the suspending hook 2, to the load c and thereby avoid objectionable lateral tilting of or strain on the hoist. Each grab hook when under load is centrally arranged directly under the point 2, and the pull of the two plies of each hoisting chain bight is then equal on the two sprocket wheels to avoid such tilting of the hoist frame and parts. The strain of the hoisting chain bights under load is equally distributed throughout both side portions of the hoist frame to maintain said frame in normal vertical position, whether the load is being carried by grab hook a' or by grab hook b', and hence for short lifts within the range of lift of either of said hooks, the hoist can be employed without the load chain by applying either grab hook directly to the load.

Inasmuch as the two hoisting drums, sheaves or wheels 6, are diagonally arranged, *i. e.* are located at opposite sides of the vertical plane of the worm shaft and worm gears, the two hoisting chain bights a', b', hanging from said sheaves are arranged obliquely or diagonally with respect to said vertical plane and at their lowermost portions intersect said plane, whereby the grab hooks a', b', hang one over the other in the hereinbefore mentioned center vertical line of the hoist.

I do not wish to limit all features of my invention to the particular frame disclosed, nor to the particular gearing, nor to the particular hoisting chain arrangement, and it is evident that various changes, variations and modifications might be resorted to without departing from the spirit and scope of my invention and hence I do not wish to limit myself to the exact disclosure hereof.

What I claim is;—

1. In a hoist, the combination of an upright loop like frame at its upper end provided with a support, a worm shaft arranged transversely of and mounted in the opposite sides of said frame and provided with a driving wheel and hand operating connection arranged between the sides of said frame, worms on the end portions of said shaft, worm wheels meshing with said worms and provided with and driving hoisting sheaves, means supporting said wheels and sheaves at the opposite sides of said frame, said sheaves being arranged at corresponding opposite ends of said worm wheels, and an endless hoisting chain passing over and hanging from said two sheaves and forming inner and outer oppositely-moving diagonally-arranged bights.

2. A chain hoist comprising a depending frame at its upper end provided with supporting means, pairs of supports projecting laterally from opposite sides of said frame, a pair of parallel horizontal axes mounted

in and carried by said supports and spaced laterally from the frame sides, a pair of worm gears on said axes, a pair of hoisting sheaves on said axes and simultaneously rotated in opposite directions by said gears, a worm shaft mounted in and arranged transversely with respect to said frame and at its outer ends provided with worms arranged above and meshing with said gears, brackets fixed to and projecting laterally from said frame above said shaft and at their outer ends formed with bearings for the outer extremities of said shaft beyond said worms, and hand controlled means for rotating said shaft and applied to the central portion thereof.

3. A portable hoisting apparatus comprising supporting means, a pair of oppositely rotatable parallel winding sprockets provided with shafts in a common horizontal plane and spaced a distance apart, a worm shaft for simultaneously rotating said sprockets in either direction and provided with an actuating pulley arranged centrally between said sprockets, and an endless hoisting chain passing over said sprockets and having opposite movable inner and outer bights depending therefrom and each provided with load carrying means, the inner bight having legs of equal length hanging from the adjacent inner edges of the sprockets and the outer bight having legs of equal length hanging from the outer edges of the sprockets, said several load carrying means being maintained when under load approximately in the central vertical line of the apparatus.

4. A hoisting apparatus comprising a frame, an actuating shaft arranged transversely of and mounted in said frame and at its central portion provided with a driving wheel having a hand operating connection, worms on the end portions of said shaft, worm wheels driven by said worms and provided with hoisting sheaves, said sheaves being spaced apart and having parallel axes, and an endless hoisting chain passing over and driven by said sheaves and hanging from the adjacent sides of the sheaves to form an inner bight provided with load carrying means and also hanging from the outer sides of the sheaves to form an outer bight having load carrying means, said several load carrying means being maintained to move approximately in the center vertical line of the apparatus when under load.

5. In combination, in a portable hoisting apparatus, a frame, a worm shaft mounted therein, a pair of worm wheels simultaneously driven in opposite directions by said shaft, each worm wheel provided with a hoisting sheave, said sheaves being spaced apart and having parallel axes arranged in a common horizontal plane, said shaft and wheels being arranged in the same vertical plane as the central vertical line of the apparatus, said sheaves being arranged at correspondingly opposite ends of said worm wheels, and an endless hoist chain passing over and hanging from said two sheaves to form inner and outer oppositely movable diagonally arranged bights each provided with load carrying means, the inner bight having sides of equal length hanging from the inner edges of the sheaves and the outer bight having sides of equal length hanging from the outer edges of the sheaves.

6. A hoisting apparatus comprising a frame, an actuating worm shaft arranged transversely of and mounted in said frame and at its central portion provided with a driving wheel having a hand operating connection, worm wheels driven by said shaft and provided with hoisting sheaves, said sheaves being spaced apart and having parallel axes, and an endless hoisting chain passing over and driven by said sheaves and hanging therefrom.

7. A portable hoisting apparatus comprising supporting means, a pair of oppositely rotatable parallel winding sprockets mounted on axes arranged side by side in a common horizontal plane and spaced a distance apart, a worm shaft for simultaneously rotating said sprockets in either direction and provided with an actuating pulley arranged centrally between said sprockets, and an endless hoisting chain passing over said sprockets and hanging therefrom.

8. A portable hoisting apparatus comprising supporting means, a pair of oppositely rotatable parallel winding sprockets rotatable on axes arranged side by side in a common horizontal plane and spaced a distance apart, means for simultaneously rotating said sprockets in either direction, and an endless hoisting chain passing over said sprockets and having oppositely movable inner and outer bights depending therefrom and each provided with load carrying means, the inner bight having legs of equal length hanging from the adjacent inner edges of the sprockets and the outer bight having legs of equal length hanging from the outer edges of the sprockets, said several load carrying means being maintained when under load approximately in the central vertical line of the apparatus.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM BARRY.

Witnesses:
LENA STREEMAN,
TORREY A. BALL.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."