

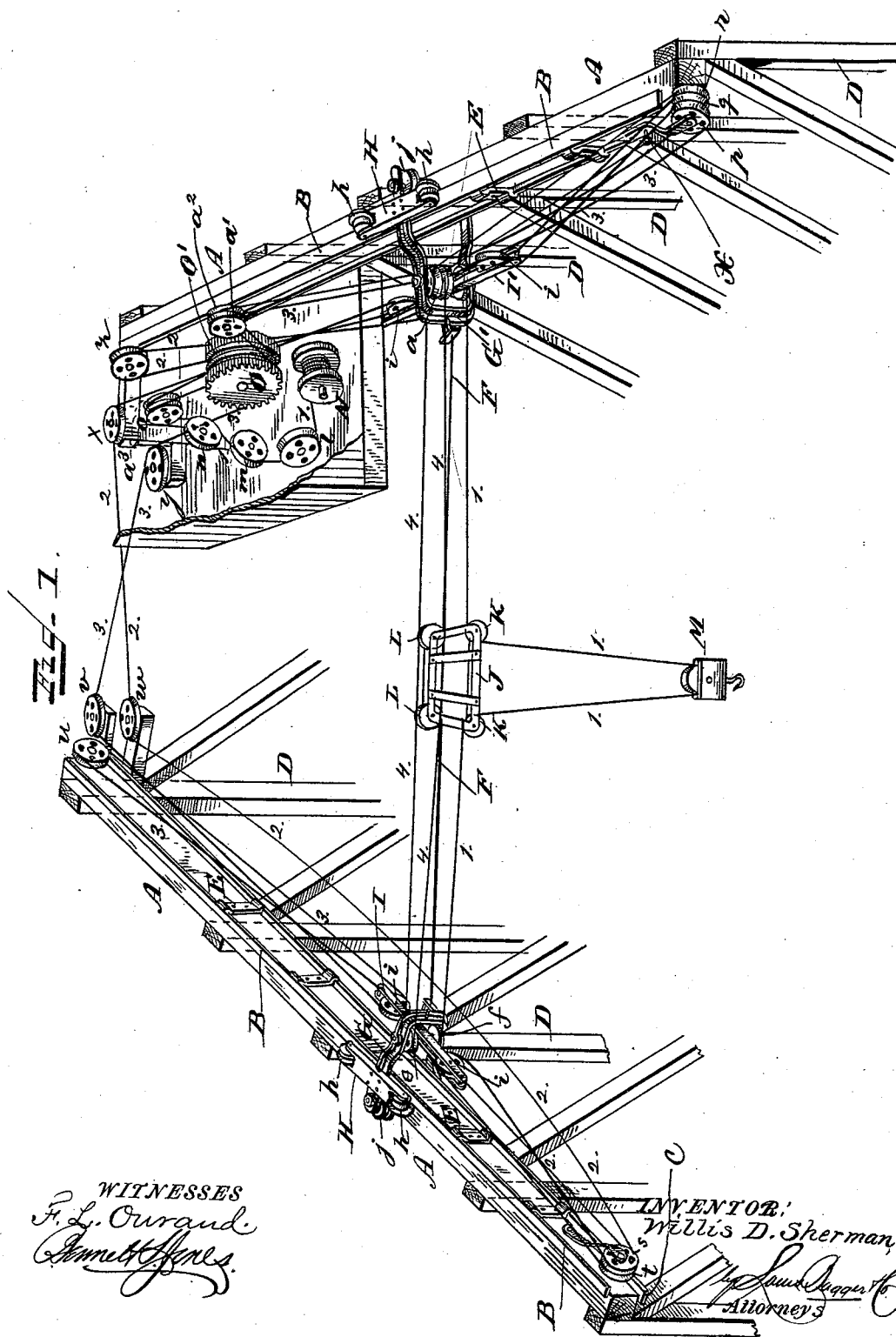
(No Model.)

7 Sheets—Sheet 1.

W. D. SHERMAN.
HOISTING AND TRANSFER APPARATUS.

No. 494,389.

Patented Mar. 28, 1893.



(No Model.)

7 Sheets—Sheet 2.

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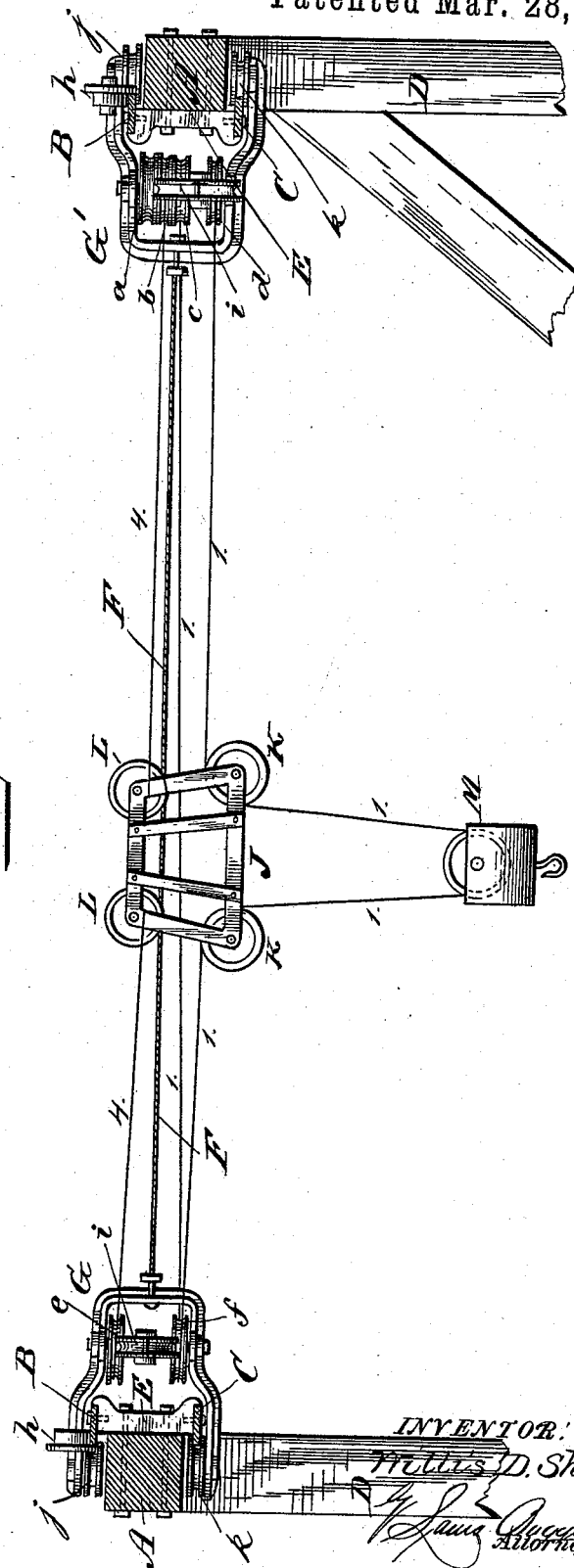


Fig. 2.

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James J. Jones
Attorneys

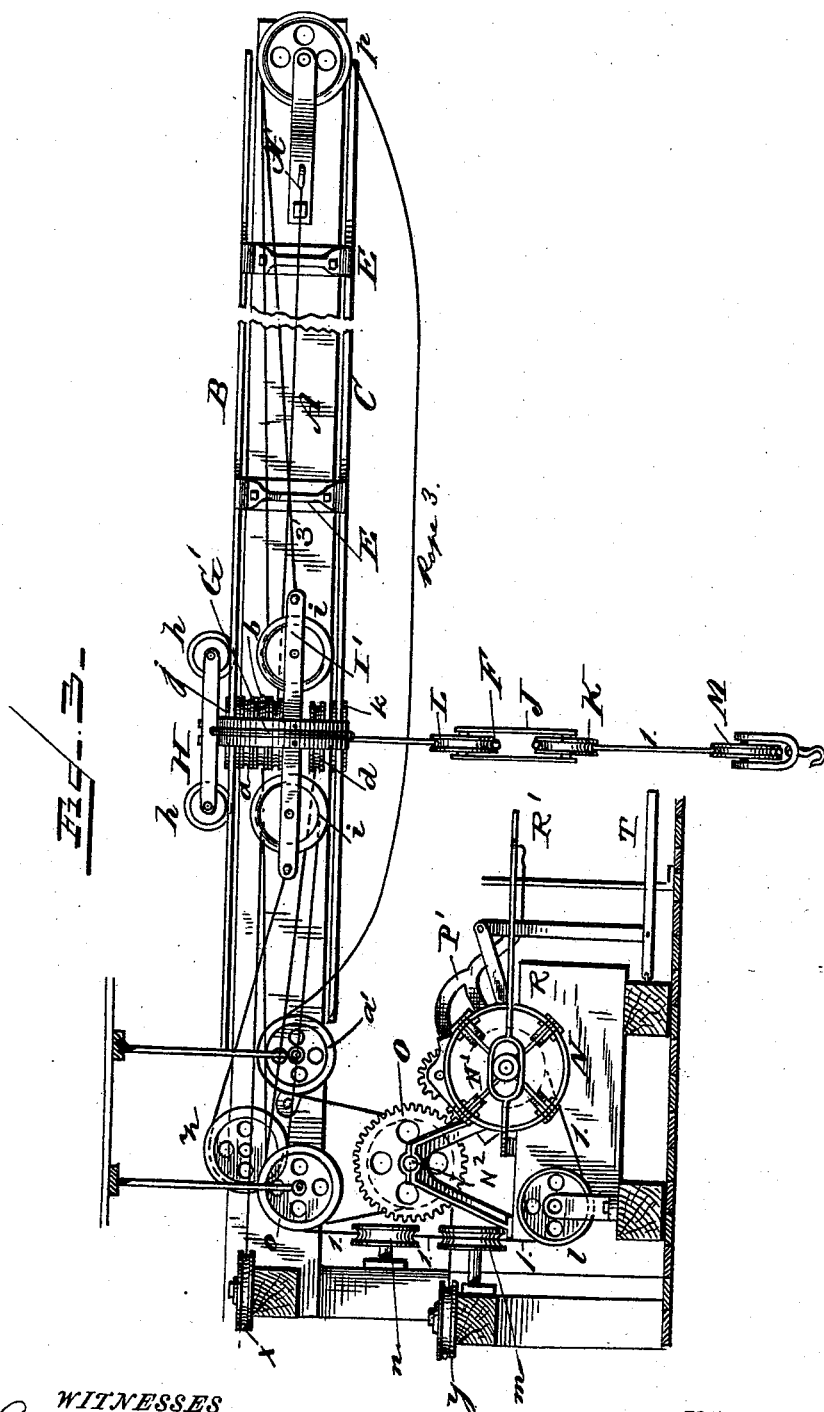
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7 Sheets—Sheet 3.

W. D. SHERMAN.
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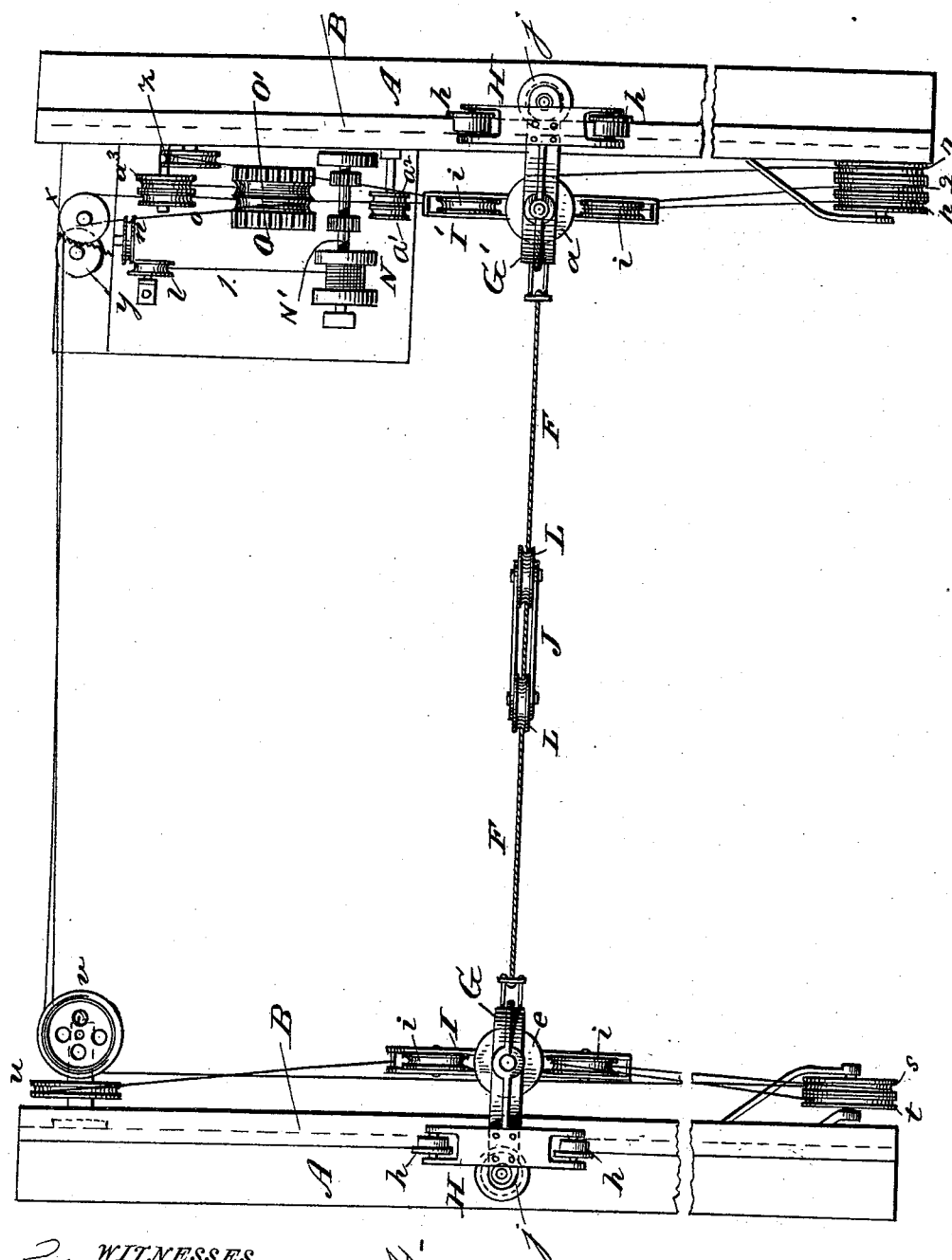
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FIG. 4.

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(No Model.)

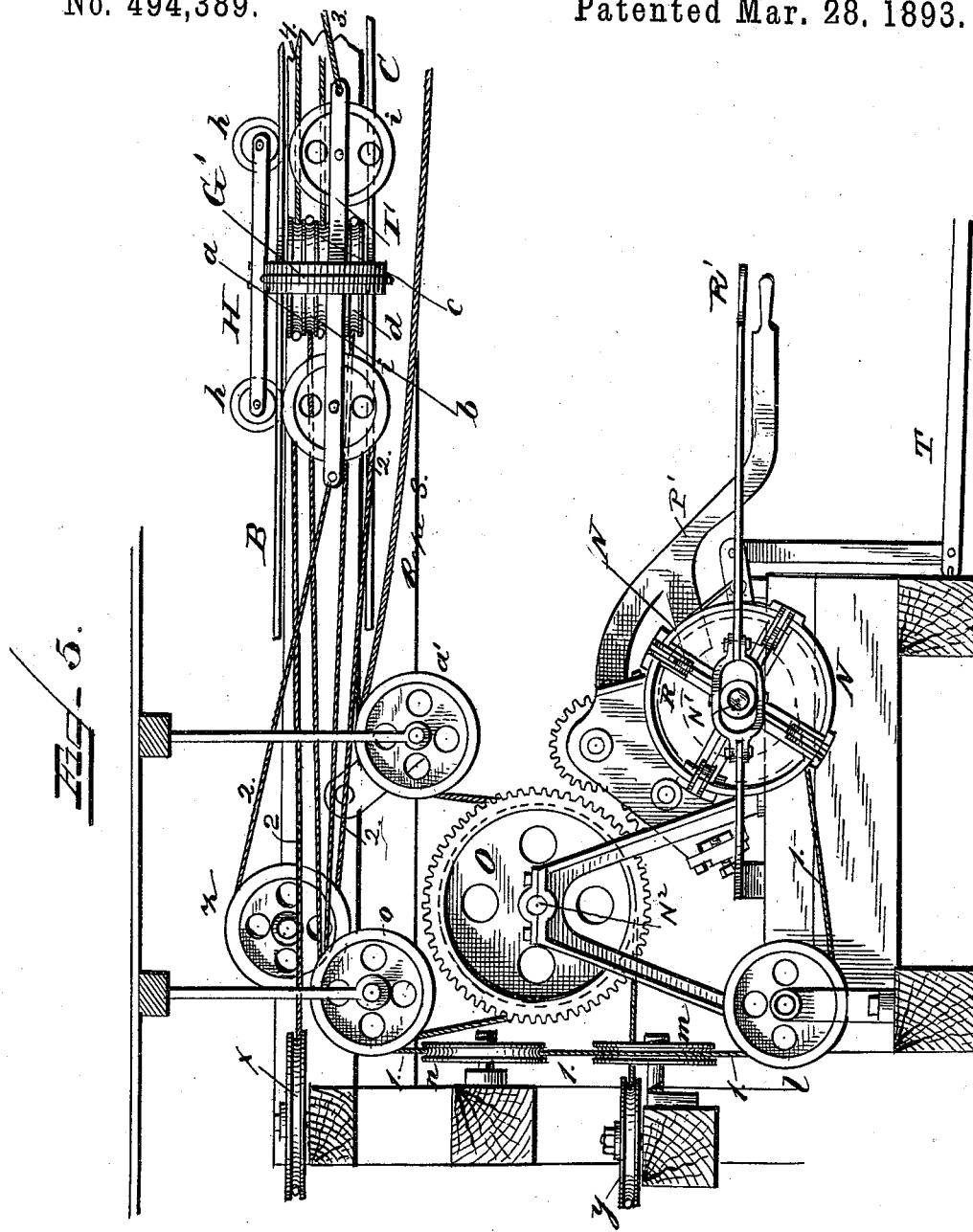
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W. D. SHERMAN.

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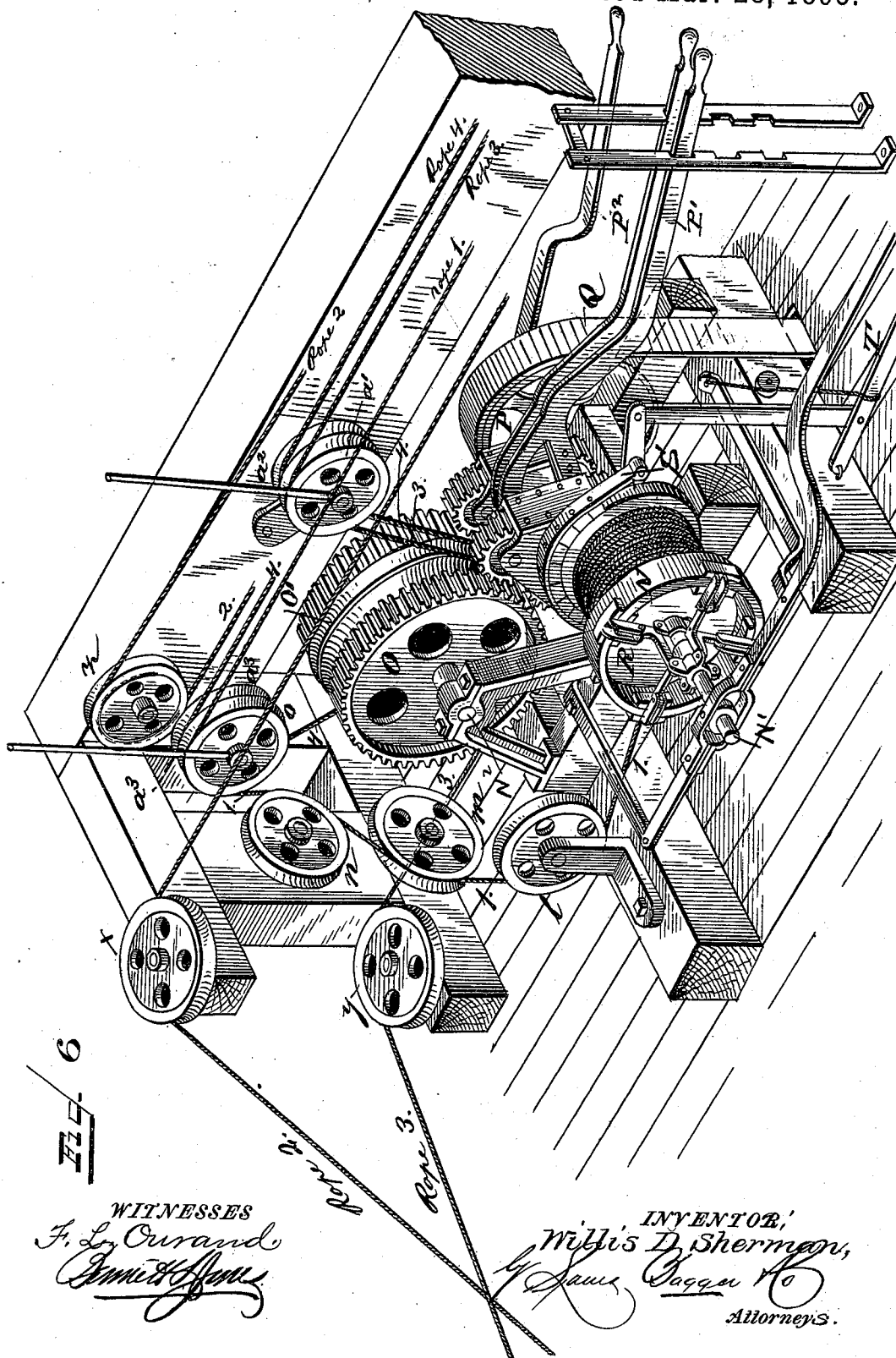
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W. D. SHERMAN.

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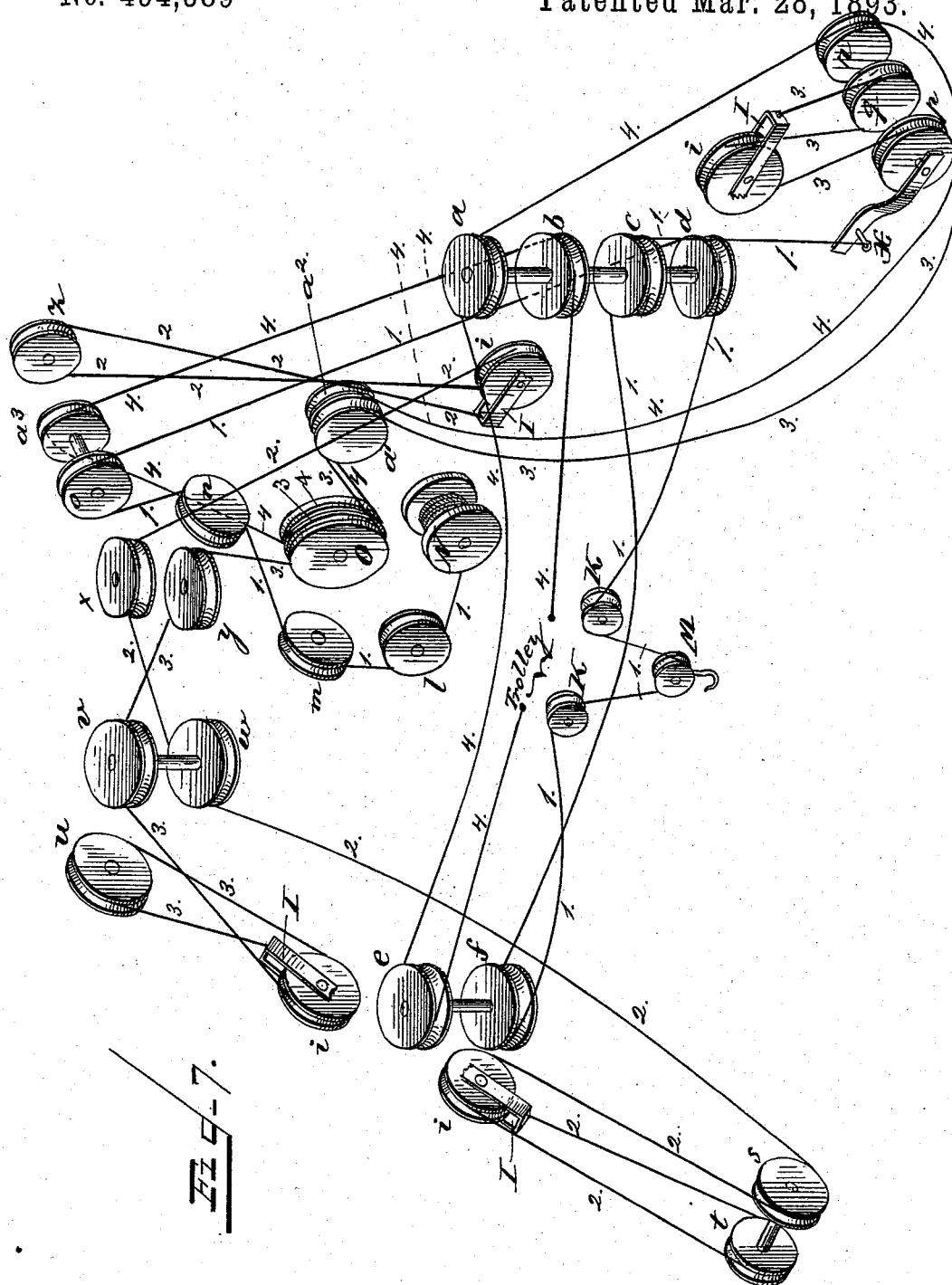
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7 Sheets—Sheet 7.

No. 494,389

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UNITED STATES PATENT OFFICE.

WILLIS D. SHERMAN, OF BROOKLYN, NEW YORK, ASSIGNOR OF FOUR-FIFTHS
TO CHARLES B. JOHNSON, FRANK B. JOHNSON, ELLIS H. BAILLIE, AND
JOHN J. WILSON, OF SAME PLACE.

HOISTING AND TRANSFER APPARATUS.

SPECIFICATION forming part of Letters Patent No. 494,389, dated March 28, 1893.

Application filed September 26, 1892. Serial No. 447,204. (No model.)

To all whom it may concern:

Be it known that I, WILLIS D. SHERMAN, a citizen of the United States, and a resident of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Hoisting and Transfer Apparatus; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

Figure 1 is a bird's-eye view of a hoisting and transfer system, made in accordance with my invention. This view is not intended to illustrate the details of construction, but simply to show the general appearance. Fig. 2 is a side elevation of the movable transverse wire-rope track with its trolley, showing the parallel stationary side tracks and their supports in cross section. Fig. 3 is a side elevation of one of the stationary elevated side tracks, with its appropriate carriage and the devices for operating the same. Fig. 4 is a plan of the two parallel elevated tracks with their movable transverse wire-rope track and the carriages, trolley and sheaves or pulleys appertaining thereto. Fig. 5 is a detail view of one end of one of the elevated side tracks, with its appropriate sheaves or pulleys, carriage, and mechanism for operating the same. Fig. 6 is a perspective view of the winch and drums for operating the apparatus; and Fig. 7 is a diagrammatic view, showing in perspective, the scheme of sheaves and ropes involved in the construction and operation of the apparatus.

Like letters and numerals of reference designate corresponding parts in all the figures.

This invention has relation to apparatus for hoisting and transferring from one point to another, within a yard or work-shop, heavy articles, such as sewer-pipe, blocks of cement or stone, castings of all kinds, or heavy pieces of machinery and ordnance in finished or unfinished condition. Heretofore it has been customary to effect such transfers by the device known as a "traveling crane," necessitating two movements, or lines of movement,

at right angles to each other and necessarily involving heavy and cumbersome apparatus; but by my invention the article to be lifted and carried may be transferred to the point where it is to be deposited, in any direction, by means of the system of sheaves, ropes, traveling carriages and a trolley, as will be hereinafter more fully described and claimed. In this manner, I dispense entirely with the heavy, expensive and cumbersome machinery of a traveling crane; my apparatus can be erected and put in complete working order at comparatively small expense; and I effect a great and important saving in both time and labor in operating it.

My apparatus involves six separate and distinct, but co-operating elements or features, as follows: first, a substantially built frame or scaffolding with parallel sides at even height, adapted to support two parallel elevated tracks; second, a system of stationary sheaves or pulleys affixed to said frame; third, a system of ropes operating in conjunction with the aforesaid pulleys; fourth, a system of sheaves and carriages operated by and in conjunction with the ropes and pulleys; fifth, a transverse movable wire-rope track, connecting the two parallel elevated and stationary tracks; and, sixth, a hoisting machine involving one hoisting winch and two revolving drums, which may be of any approved construction. It is the combination of these six elements, in the manner hereinafter set forth, which constitutes the essential feature of my invention and on which its merits as a practical time and labor saving device chiefly depend.

Referring to the drawings, the letter A designates the parallel stringers or supports of the elevated tracks, of which there are two, B and C, on each side. The stringers, A A, are carried by braced posts, D, at a suitable height above the ground, or the floor of the shop, and extend longitudinally and parallel to each other the entire length of the yard or shop on opposite sides thereof. On each side there is an upper track, B, and a parallel lower track, C, both of which consist of flat plates of metal bolted to heavy metal yokes, E, as illustrated more clearly in Figs. 2 and 3; said yokes be-

ing bolted to the inner sides of the stringers, A, by stout and strong bolts inserted transversely through the stringers. The rail carrying yokes, E, extend a little above and below the upper and under sides of the stringers (see Fig. 2), so as to leave a narrow space between the inwardly projecting flat rail and the top and bottom of the stringer which it overlaps. Upon these top and bottom rails, B and C, on each side, travel the two carriages between which is suspended the movable wire-rope track, F. Each of these carriages comprises a strong bail-shaped yoke or frame, G, forming a support and means of attachment for the appropriate end of the wire-rope track, F. The yoke appertaining to the carriage traveling on the left hand rail I have designated by reference letter G, while that appertaining to the rails on the opposite side, or right hand side, of the yard, is marked G'. Besides these yokes, G and G', each carriage consists of a top traveler marked, respectively, H and H', and a side traveler, marked, respectively, I and I'. In Fig. 2, one of these carriages is shown in side elevation; in Figs. 3 and 5 it is shown in front elevation, and in Fig. 4 we have a plan or top view, so that by reference to these several figures, the construction of the carriage will be readily understood. The object of the top traveler is to support the carriage upon the top rails, B, while the object of the side traveler is to form bearings for the sheaves whereby the trolley (as hereinafter described) is operated. The yoke, G and G', not only forms a bearing or connecting medium between the top traveler and the side traveler, but forms a bearing for a set of horizontal sheaves and pulleys, the arrangement and function of which will be hereinafter described.

On reference to the figures above referred to, it will be observed that the top traveler, H and H', of each carriage has two flanged wheels, *h h*, one at each end, which run upon the flat top rail, B, with the flange of the wheel bearing against the outer edge of the rail; the side traveler, I I', the ends of which project beyond those of the top traveler, has two sheaves or pulleys, the pair appertaining to the traveler, I, being marked *i* and *i'*, while the pair appertaining to traveler, I', of the opposite carriage is marked *i*² and *i*³. The yoke, G', appertaining to the carriage on the right hand track is provided with a set of four sheaves, marked, respectively, *a*, *b*, *c* and *d*; and the yoke, G, appertaining to the carriage on the left side track is provided with two horizontal sheaves, *e* and *f*. In addition to these sheaves, each of the carriage yokes, G and G', is provided with a horizontal top and bottom sheave or grooved pulley, shown at *j* and *k*, respectively, the location and function of which will be best understood by reference to Fig. 2 and 4. These horizontal grooved wheels, *j* and *k*, are journaled in the outer ends of the yokes, G and G', and run horizontally upon the inner ends or edges of the top and bottom rails, B

and C, respectively, thus operating to hold the carriage upon the rails endwise, or against tensile or lateral pull, in like manner as the "thrust" or downward push upon the carriage is sustained by the wheels, *h h*, of the top traveler, H.

We have seen that the transverse wire-rope track, F, is suspended between and supported by the inner ends of the carriage yokes, G and G', so as to move with the carriages as these are moved forward and back upon their elevated tracks. Upon this movable track, F, runs a two-wheeled trolley, the frame, J, of which carries at its lower corners the hoisting sheaves, K K; the trolley frame being supported upon its track, F, by the grooved track wheels, L L. Below the track trolley, J, is suspended, by the hoisting rope, the hoisting sheave or block, M, provided with a hook, as usual.

At any suitable point within the yard or workshop is located a hoisting machine by which the pulleys, carriages, and trolleys are operated through the medium of the peculiarly arranged scheme or system of wire-ropes illustrated in Fig. 7. For the sake of convenience, I prefer to locate the hoisting machinery in a shed or cage at one corner of the yard or shop, and on near the same elevation as the elevated side tracks, as represented in Fig. 1, because, when so located, the engineer manipulating the hoisting machinery will have a bird's eye view of the entire yard, free from obstruction, so that he can so manipulate the machinery as to effectually control the same with reference to the work to be done.

In Fig. 6, I have shown one form of hoisting machinery adapted to be used in my invention; but as the machinery, *per se*, forms no part of my invention and can be changed at will for different types of hoisting machinery which will answer the same purpose, so much only of said hoisting machinery will be referred to and explained as is necessary to arrive at a correct understanding of the peculiar arrangement and operation of the ropes, sheaves, carriages, &c., which derive motion from, and are guided by, this machinery.

The hoisting and guiding machinery, the construction of which will be understood more clearly by reference to Fig. 6, consists of a hoisting winch, N, which may be thrown into or out of operation by means of the clutch mechanism, R, operated by means of the lever, R'. This winch is also provided with a brake, S, operated by means of a lever or treadle shown at T. The main shaft, N', by means of which this winch is operated, receives a rotary motion by means of a pulley, P, and endless belt, Q; the other end of said belt passing around the main drive wheel of an engine located on the ground below. The pulley, P, has a continuously revolving motion, and by means of the clutch mechanism, R, the winch, N, may be revolved as desired through the

instrumentality of lever, R' , while, at the same time, when the winch is disengaged from the shaft, for the purpose of lowering the article attached to the block at the end of the hoisting rope, the speed of the winch may be controlled through the instrumentality of the brake, S , and lever, T . Upon a shaft, N^2 , journaled in suitable bearings, are journaled two drums, O and O' , each one of which is provided with a circumferential cog wheel adapted to engage a pinion which, through intermediate mechanism, receives a revolving motion from the main shaft, N' . By operating lever, P' , the drum, O , may be thrown into or out of operation, while by operating lever, P^2 , drum, O' , may be similarly thrown into or out of operation. Thus it will be seen that a hoisting machine adapted to be used in conjunction with my invention must contain three separate drums or winches, adapted to be operated independent of one another, or in combination with one another, as may be desired; viz., a hoisting drum or winch, N , the function of which is to hoist or elevate the article to be lifted and carried in the yard; a drum, O , adapted to operate the ropes which give motion and direction to the traveling carriages which run on the stationary side tracks; and an additional drum, O' , which operates and gives motion to the trolley which runs upon the wire track suspended between and supported by the two carriages running on the stationary elevated tracks. In other words, the function of the winch, N , is solely to raise and lower the block which is suspended from the trolley; the function of the drum, O , is to move the carriages forward and back upon their respective tracks; while the function of the drum, O' , is to move the trolley forward and back upon its movable wire-rope track, F . By suitable machinery, these three drums, N , O and O' , are so constructed and arranged that they may all be operated independent of one another, or in conjunction with one another, by the levers, R' , P' and P^2 , by the engineer standing in the elevated shed or cage which contains the hoisting machinery.

The hoisting rope, designated by the numeral 1, is attached firmly to and starts from the hoisting winch or drum, N , is then carried over fixed guide-sheaves, l , m , n and o , and then runs along-side the elevated track on that side of the yard till it reaches the horizontal sheave, d , which, as we have seen, is the lowermost in the series of four horizontal sheaves journaled on a common vertical axle, one above the other, within the yoke, G' , appertaining to the carriage on that (right hand) side of the yard. Passing around this horizontal bottom sheave, d , the hoisting rope, l , goes on over one of the trolley sheaves, K , down through the hoisting block, M , up again over the other trolley sheave, K , and across the yard (below the rope-track, F) to and around the horizontal bottom sheave, f , within the yoke, G , appertaining to the carriage on that (left hand) side of the yard. From this sheave, f ,

rope, l , again crosses the yard, underneath the track-rope, F , running across to sheave, c , within yoke, G' , opposite, around the same, and then along-side the elevated track on that (right hand) side of the yard to a bolt or staple, X , which is securely fastened near the end of the track and to which rope, l , is firmly fastened. Thus we have seen that one end of this rope (l) is fastened to the hoisting drum, N , while its other end is firmly fastened in the staple, X , at the end of the track; said rope involving, in the order named, the sheaves, l , m , n , o , d , the two trolley sheaves, K , and trolley block, M , sheaves, f and c , down to its point of attachment, X . When winch, N , is revolved, rope, l , will draw up the block, M , and any weight attached thereto, and will also take up all slack in the hoisting rope.

The guiding of block, M , with the weight attached to it, after it has been lifted a sufficient height to clear the ground and any obstructions thereon, is effected by means of the carriage drum, O , by means of which the carriage ropes, 2 and 3, are manipulated. These two ropes operate in conjunction with the sliding carriages and their sheaves, and certain stationary sheaves or pulleys, which latter are located and arranged as follows: At the outer end of the (let us say) right hand track, there are three sheaves, p , q and r , revolving in vertical planes on a common horizontal axle; and at the corresponding end of the opposite or left hand track, there are two sheaves, s and t , similarly arranged and journaled. At the opposite end of this same left hand track there is one sheave, u , revolving (like sheaves, s and t) in a vertical plane; two others, v and w , which revolve in horizontal planes, one (w) below the other (v). At or near the corresponding end of the opposite or right hand track, we find two horizontal pulleys, x and y , also arranged one below the other (corresponding to v and w on the opposite side), and a horizontal sheave or pulley, z . The remaining one or two sheaves which enter into this combination will be described in their proper place.

Now, starting from the inner or farthest end of the side carriage, I' , appertaining to the right hand track, is a pulley rope, 2, which runs along-side the track to its end, where it goes around sheave, z , and then comes back, or doubles on itself, around the carriage sheave, z^2 , from where it goes back to the horizontal sheave, x , after passing around which it crosses the yard over to sheave, w , at the opposite side, then forward along-side the track on the left hand side of the yard till it reaches the stationary sheave, s , at the end; passing around this sheave, rope, 2, doubles upon itself and goes back to and around the carriage sheave, i , appertaining to the carriage on the left side of the yard; then the rope again doubles upon itself and goes forward along-side of the track to and around the stationary sheave, t , from which, doubling upon itself for the third time on that side of

the yard it goes back to and is firmly fastened in the adjacent end of the side traveler, I. Thus it will be seen that one end of this carriage rope, 2, is fastened to the inner end of the right hand carriage traveler, I', and the other end to the outer end of the left hand carriage traveler, I; the sheaves involved being the following, in the order named, viz: *z*, *i*, *x*, *w*, *s*, *i* and *t*, as will appear more clearly on reference to Fig. 7. Another rope, marked by the numeral 3, is fastened to the inner end of the side traveler, I, which runs upon the left hand track, passes rearwardly to and over the stationary sheave, *u*, at the end of the track, then doubles upon itself and runs forward to and around the traveler sheave, *i'*, then up to and around the stationary horizontal sheave, *v*, from that point across the yard (crossing rope, 2,) to sheave, *y*, on the other side, and from this sheave to and once around the drum, O, and then up to and over a stationary horizontal guide sheave, *a'*; along the track on that side of the yard to the stationary sheave, *p*, which corresponds to and faces the sheave, *s*, at the corresponding end of the opposite track; then rope, 3, doubles upon itself and extends to the sheave, *v'*, appertaining to the side carriage, I', belonging to the right hand track, and from this point rope, 3, again doubles upon itself and runs to and around the stationary guide sheave, *q*, from which point said rope, again doubling upon itself, extends to the adjacent end of the side traveler, I', to which it is securely fastened, opposite to the point of attachment of the other rope, 2. Thus it will be seen that one of these carriage-operating ropes (2) is fastened at one end to one end of the side traveler, I, appertaining to the left hand track, while the other end of the same rope is fastened permanently in the opposite end of the opposite side traveler, I'; while, in like manner, the other carriage-operating rope, 3, is fastened permanently to one end of this right hand traveler, I', while the other end of the same rope, after passing over the carriage-operating drum, O, is similarly fastened to the inner end of the opposite traveler, I, opposite to that end of said traveler to which the rope, 2, is permanently attached. In other words, rope, 2, is fastened to the outer end of the left hand traveler, I, and the inner end of the right hand traveler, I', while its consort, 3, is fastened at the outer end of the traveler, I', but at the inner end of the left hand traveler, I; said rope, 3, being the only one which passes over and is operated by drum, O.

One rope more remains to be described, viz., rope 4, which is the one by means of which the trolley is operated. This rope is fastened to one end of the trolley frame, J, said frame running upon the transverse wire-rope track, F, by means of its grooved wheels, L L. Rope, 4, then passes to the left to and around the horizontal sheave, *e*, which is journaled within the yoke, G, appertaining to the left hand carriage; from this sheave said rope, 4, doubling

upon itself, runs back across the yard to the horizontal top pulley, *a*, which is journaled within the carriage yoke, G', appertaining to the right hand carriage; from this point rope, 4, extends along the right hand track to the stationary sheave, *r*, at the outer end of said track, around said sheave and, doubling upon itself, rope, 4, extends back to a stationary horizontal guide sheave, *a'*, back of and journaled upon the same shaft as sheave, *a'*, which has been described in connection with rope, 3. From this sheave, *a'*, rope, 4, extends down to and once around the operating drum, O', and then up to and around a guide sheave, *a''*, which is journaled upon the same shaft as the guide sheave, *o*, which has been described in connection with the hoisting rope, 1. From this sheave, *a''*, rope, 4, extends forwardly along-side of the right hand track to the horizontal sheave, *b*, which is the second one from the top of the set or series of four sheaves (*a*, *b*, *c* and *d*) journaled upon a vertical shaft within the yoke, G', appertaining to the right hand carriage; and from this sheave, *b*, rope, 4, extends approximately at right angles to the trolley frame, J, to which it is fastened opposite to the point of attachment of its other end. This completes the course of the fourth and last rope, involving the drum, O', the trolley which travels upon the movable wire-rope track, F, and the following sheaves and pulleys in the order named (starting from the left side of the trolley), viz: *e*, *a*, *r*, *a'*, drum, O', sheave, *a''*, sheave, *b*, and back to trolley, J.

Of these four separate ropes, the first, marked 1, is, as we have seen, the hoisting rope proper for raising or lowering the hoisting block, M, with its rope and taking up all slack; ropes Nos. 2 and 3, being fastened to opposite ends of opposite carriages, operate said carriages by running them forward or back upon their respective stationary elevated side tracks, so as to run the movable transverse rope track, F, forward and back; while the last rope, marked 4, operates to run the trolley, J, forward and back upon said rope-track, F. Rope, 1, is operated by the hoisting drum, N; rope, 3 (through which its consort, 2, is indirectly operated), is worked by the drum, O; and, lastly, the trolley rope, 4, is operated by the drum, O', and it follows that by working these three drums, N, O and O', all the ropes with their appropriate sheaves, carriages and trolleys, may be worked by a single operator standing within the cage at one corner of the yard simply by manipulating the levers and brakes appertaining to the three drums, N, O and O'. This is one of the great advantages of my invention, because it enables a single operator to move the hoisting block, M, to any point within the yard or workshop where its services are required, and after the hook has been fastened in the cradle or chains from which the article to be moved is suspended, the block may be lifted by throwing drum, N, into operation, to any re-

quired height so as to clear obstacles within the yard, and by then throwing either one, or both, of the drums, O and O', into operation, the carriages which travel on the elevated tracks, as well as the trolley which travels upon the flexible track suspended between these carriages, may be thrown into operation so as to carry the block, M, with the article suspended from it to any point within the yard.

It is obvious that the operating drums, N, O and O', may be operated simultaneously without waiting one for the other, so that the processes of hoisting and directing the course of the article suspended from block, M, may be simultaneous.

In the operation of a so-called traveling crane, as is well known, the operation of raising an article from the ground and then carrying it to the point where it is to be deposited involves at least two, and usually three, separate and successive operations, viz., first, the elevating of the article from the ground, and, second, the movement of the carriage in a longitudinal direction, to which motion is usually added a motion in a transverse direction. But by my system of ropes and sheaves, &c., these three compound motions or movements may be effected simultaneously by simultaneously operating the three drums, N, O and O', thus saving considerable time. Again, it will be observed that the arrangement of the stationary and movable sheaves, appertaining, respectively, to the stationary tracks and movable carriages, is such as to form compound blocks, so as to greatly reduce the power required to lift and move an article of given weight. In other words, instead of mounting the several sheaves appertaining to a compound block within a common shell, the sheaves are distributed over a wide area and sometimes at right angles to one another, yet effecting the same result as in an ordinary compound block, viz., reducing the power required to perform certain work to a minimum.

Another important advantage resulting from my invention as hereinbefore described is this, that the operator is enabled to manipulate the entire combination of movements from an elevated commanding point, which is stationary, and from which he can control and regulate all movements of the hoisting rope and trolley. By sufficiently elevating the cage which contains the operating machinery, as hereinafter described, the operator has a complete bird's-eye view of the entire field before him, which enables him to direct, with absolute accuracy, the delivery of the article to be carried by the trolley, as well as to direct the movement of the carrying trolley to the proper point where the article is to be grasped and lifted. It is needless to point out that, in this manner, great saving of time as well as labor may be effected, while,

at the same time, the whole operation, from beginning to end, can be supervised and managed by a single person having control of the operating mechanism.

Having thus described my invention, I claim and desire to secure by Letters Patent of the United States—

1. In a hoisting and transfer system, the combination with the elevated parallel frames and tracks, the sheaves, *u, v, w, p, q, r, s, t, a', a² and z, secured to said frames, the traveling yokes connected together by a rope or cable F, the sheaves *i, i', a, b, c, d, e* and *f* secured to said yokes, the trolley having sheaves *k, k*, and track wheels K, and the ropes passing over said sheaves, the hoisting block and rope and means for transmitting motion to said yokes, trolley and hoisting block, substantially as described.*

2. The carriage comprising the yoke, G, top traveler, H, having wheels, *h h*; side traveler, I, having sheaves or grooved wheels, *i* and *i'*; sheaves, *e* and *f*, journaled on a vertical shaft within the yoke, and top and bottom guide sheaves, *j* and *k*; substantially as and for the purpose herein shown and set forth.

3. The right hand carriage comprising the yoke, G', top traveler, H', having wheels, *h h*; side traveler, I', having sheaves or grooved pulleys, *i²* and *i³*; sheaves, *a, b, c* and *d*, journaled on a vertical axle within yoke, G'; and top and bottom guide sheaves, *j* and *k*; substantially as and for the purpose herein shown and set forth.

4. The combination of the drums, N, O and O'; ropes, 1, 2, 3 and 4; left hand carriage comprising the top traveler, H, side traveler, I, and yoke, G, with their appropriate sheaves as described; right hand carriage comprising the top traveler, H', side traveler, I', and yoke, G', with their appropriate sheaves as described; flexible track, F, connecting the yokes, G and G'; trolley, J, and block, M; substantially as and for the purpose herein shown and set forth.

5. The combination of the stationary elevated tracks arranged parallel to each other and in the same horizontal plane; the carriages running on said tracks and constructed as described; the flexible and movable track, F, connecting said side carriages; the trolley, J, running upon the flexible track; hoisting block, M; ropes, 1, 2, 3 and 4; and drums or winches adapted to operate said ropes either independent of or in combination with, one another; substantially as and for the purpose herein shown and set forth.

In testimony that I claim the foregoing as my own I have hereunto affixed my signature in presence of two witnesses.

WILLIS D. SHERMAN.

Witnesses:

H. B. HUBBARD,
S. M. HUBBARD.