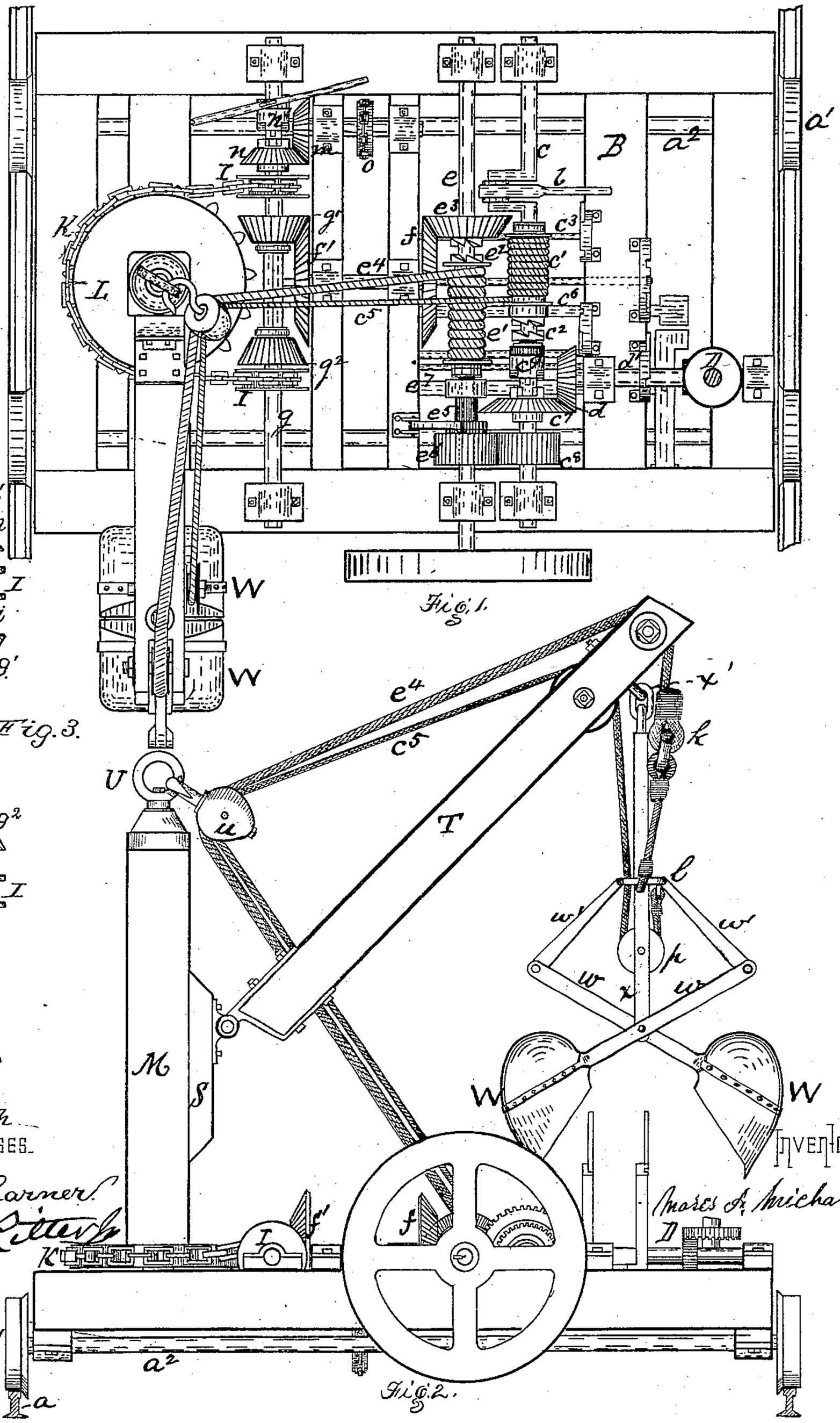
(No Model.)

M. A. MICHALES.

CRANE.

No. 265,270. Patented Oct. 3, 1882.



UNITED STATES PATENT OFFICE.

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CRANE.

SPECIFICATION forming part of Letters Patent No. 265,270, dated October 3, 1882.

Application filed August 12, 1882. (No model.)

To all whom it may concern:

Be it known that I, MOSES A. MICHALES, a citizen of the United States, residing at Allegheny city, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Cranes; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, wherein—

Figure 1 is a plan view, showing the mechanism for operating the crane and its adjuncts. Fig. 2 is a side elevation of the same. Fig. 3 is a longitudinal section of the shaft, chain, wheels, &c., for rotating the crane-post, on the line *x x*, Fig. 1.

Like letters refer to like parts wherever they occur.

My invention relates to the construction of cranes or derricks, and, while containing certain novel features applicable to all cranes or derricks, has others more especially applicable to the unloading and loading of coal, grain, and other merchandise transported in bulk on barges, vessels, cars, &c.

The first and main feature of the invention consists in combining with the scoops, grapples, or equivalent lifting devices a suspension and fulcrum bar, whereby the scoops or grapples may be manipulated from the crane to seize, hold, and convey the load.

The second feature consists in centering the hoisting-ropes on the crane-post by means of a swivel and snatch-block, whereby the power is applied to better advantage, the post and jib may be rotated without crossing or twisting the hoisting-gear, while the power remains in a fixed position.

There are other points of invention which relate to the arrangement and construction of the operating or power mechanism, which will hereinafter more fully appear.

I will now proceed to describe my invention, so that others skilled in the art to which it appertains may apply the same.

In the drawings, *a* indicates a track, which, in case the devices are used for loading and unloading barges, will be placed upon a suitable float. For railroad purposes it may be the usual track. A indicates a platform car or bed adapted to carry the operative mechanism, said track provided with suitable wheels, *a'*, connected by axles a^2. Where it is not desirable to move the devices the above-mentioned parts may be dispensed with.

Upon the car or bed A, at any suitable point—say, for instance, B—the boiler and engine or source of power may be placed and connected by a pitman, *b*, (belt or equivalent means,) with the main power-shaft *c*.

Upon the main power-shaft *c* slides loosely a trip-rope drum, *c'*, provided with one section of a clutch, c^2, the other section of said clutch being made fast to the power-shaft *c*. This drum *c'* is moved into and out of gear by sliding it along the power-shaft *c* by means of a lever, c^3, and has wound upon it the trip-rope c^5 of the lifting mechanism.

Below the drum *c'*, and adapted to be forced against the hub thereof by a treadle, is the brake c^6, which is used to retard the motion of the drum when the same is freed from the power-shaft and is turning under the pull of the trip cord c^5.

c^7 indicates a bevel-gear loose upon the power-shaft *c*, but adapted to be connected therewith by the sliding feathered clutch c^9, which is operated by a suitable lever. The bevel-gear c^7 transmits power from shaft *c*, through bevel-gear *d* and shaft *d'*, to the capstan D. The capstan will be found of great value in handling the float and barges, and will save much time and manual labor now demanded.

c^8 indicates a gear-wheel or pinion fast upon the power-shaft *c*, which meshes with a like pinion, e^6, on the shaft *e*, so as to transmit power to said shaft *e*, which carries the hoisting-rope drum *e'*. This hoisting-rope drum is also arranged loosely upon the shaft *e*, so as to slide thereon, and is provided with one section of a clutch, e^2, which engages with its mate sections attached to a bevel-gear, e^3, which gear is fast on the shaft *e*. The drum *e'* is moved into and out of connection by means of a suitable lever, and has wound upon it the hoisting-rope e^4. As this shaft *e* of the hoisting-drum has to be prevented from rotation during the time the derrick or crane is swinging round with its load and when it is detached from the power, I provide a ratchet fast upon the shaft, and a pawl or dog, as shown at e^5, and as the reverse rotation of the shaft has to be controlled when

the load is being deposited, and the power is cut off, I further provide a brake-pulley fast upon the shaft, and a brake, as shown at e^7.

f and f' indicate twin bevel-gears connected by a common shaft. One of these, f, meshes with bevel-gear e^3 on the shaft of the hoisting-drum, and receives power therefrom, while the other, f', meshes with one of two twin bevel-gears, g' g^2, on the shaft g.

g indicates a shaft which has for its object the rotation of the crane and the driving of the truck A. As these two functions are independently performed, it is necessary that the gear-wheels be arranged loosely upon the shaft and capable of connection with and disconnection therefrom. I will now describe one means by which this may be accomplished, referring for that purpose to Fig. 3.

The shaft g is cast or otherwise formed hollow, and within it is arranged a central sliding rod or bar, h, which carries two dogs, i i, which are adapted to be projected through slots in the shaft g. On the shaft g are placed loosely two chain-pulleys having recesses in their hubs. These chain-pulleys I will rotate freely on the shaft, except when locked thereto, by projecting the dogs i. From said chain-pulleys I a chain, K, passes around a sprocket-wheel, L, secured to the foot of the crane-post M. Intermediate of the chain-pulleys I are twin bevel-gearing g' g^2, secured to a sleeve which slides endwise on the shaft, but is compelled to rotate with the shaft by means of a spline or feather or equivalent well-known devices. These twin bevel-gears are controlled by a lever, so as to cause at will either one, g', or the other, g^2, of said bevel-gears to mesh with the bevel-gear f', and thus rotate the shaft g in one or the other direction; or both bevel-gears g' and g^2 may be thrown out of mesh with gear-wheel f' and the shaft g be left at rest.

From the foregoing it will be apparent that if the bevel-gears g' or g^2 be thrown into mesh with bevel-gear f' and the dogs i i projected to engage chain-pulleys I the crane-post must be rotated in one or the other direction, according to which bevel-gear g' or g^2 is in contact with bevel-gear f'.

N indicates a bevel-gear loose on the shaft g, but capable of connection thereto by a sliding clutch, n'. This bevel-gear n meshes with a like gear, m, secured to a short shaft which carries a chain-pulley, o, from which a chain-belt conveys power to the axle a^2 of the car A. It will thus be seen that by causing the sliding clutch n' to engage with bevel-gear n power is transmitted from the main power-shaft, c, through the several gear-wheels and shafts to the axle of the car, so that the car may at will be moved along its track.

Having thus described the mechanism for operating the crane, its adjuncts, and the platform or car on which it rests, I will next proceed to describe the crane and grapples or scoops.

M indicates the crane-post, which is stepped on the car A or other suitable platform, so as to rotate freely, and is provided at its base with a sprocket-wheel, L, or equivalent means for applying power to rotate it.

S indicates a slide, to which is pivoted the jib T. This slide S moves in ways on the crane-post m, and can be fixed at any desired point. The object of this adjustment is to raise or lower the jib to adjust it to the height best adapted to the work it has to do, and is especially useful in loading and unloading coal-barges, where the height of the sides of the barge and their relation to the float have to be provided for.

At the top of the crane-post I provide a swivel, U, or equivalent device which will rotate freely, and thereto I secure a snatch-block, u, for the passage of the hoisting-rope and trip-rope. At or near the extremity of the jib T, I provide two pulleys—one for the passage of the hoisting-rope and the other for the passage of the trip-rope. The hoisting-rope e^4 and trip-rope e^5 are led directly from their drums to the snatch-block u, secured to the swivel on the crane-post, and thence to the extremity of the jib. By thus leading the hoisting-rope directly to the center of rotation and thence to the extremity of the jib I am enabled to apply my power to the best advantage, avoid loss by friction, and to prevent the crossing or twisting of the rope when the crane swings around.

W W indicate the grapples or scoops, provided with the arms or levers w w, by which they may be pivoted together, and with the links or levers w' w', by which they may be operated. The arrangement of the levers w w and w' w' forms a compound lever, which insures great power and enables the scoops or grapples to hold their load securely.

The grapples or scoops are supported or suspended from the crane by a fulcrum-bar, x, to which they may be pivoted; and said bar may be rigidly secured to the crane, but is preferably connected thereto by a link, x', which increases its range of motion and enables a greater area to be worked over without moving the platform A. The links or levers w' w' are connected by a link, l, which preferably slides on the fulcrum-bar x, and to this link l the hoisting-rope e^4 is attached after it has passed over the pulley on the end of the jib, the hoisting-rope being so knotted, as at k, that its length below the knot shall be sufficient to close the scoops or grapples before or by the time the knot strikes the end of the jib. By adopting this plan a single hoisting-rope serves to control the scoops or grapples and the jib, thus dispensing with independent jib-ropes.

The scoops will ordinarily open automatically when the hoisting-rope e^4 is released; but in order to insure a positive control of the scoops I provide a trip-rope, e^5, which, having been passed through the snatch-block u and over its pulley on the end of the jib, is carried under a pulley, p, on the fulcrum-bar x and se-

cured to the link *l*, by which means a down-pull can be exerted to open the scoops or grapples, if necessary.

The devices being those described, or their equivalents, will operate as follows: Power having been applied to shaft *c*, if it is desired to use the capstan D for any purpose, clutch c^9 is thrown into gear with bevel-gear c^7, and power is communicated to bevel-gear *d* and through shaft *d'* to the capstan. If the car or platform is to be moved, bevel-gear *g'* or g^2 (according to direction) is thrown into gear with bevel-pinions *f'*, and power is transmitted from shaft *c*, by pinion c^8 e^9, shaft *e*, bevel-gear *f f'*, bevel-gear *g'* or g^2, to bevel-gear *n*. Then if the clutch *n'* is made to engage with bevel-gear *n* the power will pass to bevel-gear *m* and chain-wheel *o*, which rotates the axle a^2; or, if the crane-post is to be rotated, instead of throwing bevel-gear *n* into action by means of clutch *n'*, I project the dogs *i* (see Fig. 3) by means of rod *h* and cause them to clutch the chain-pulleys I, which through chain K rotate the crane. This latter operation is the most frequently performed, as it is the one which is made use of to swing the load from one place to another, and it will be observed that accordingly as the bevel-pinion *g'* or g^2 engages with the bevel-pinion *f'* will the post rotate in one direction or the other. The platform or car A having been moved into the desired position, as before specified, and the slide *s* raised or lowered to obtain the proper adjustment of the jib, the hoisting-rope e^4 is then released to allow the descent of the jib and scoops or grapples until they rest in the coal or other matter to be raised. The hoisting-rope drum *c'* on the shaft *e* is then caused to engage with clutch e^2, and the hoisting-rope e^4, being wound upon its drum, first closes the scoops or grapples by extending the compound levers *w w w' w'*, the position of the scoops or grapples being preserved by the fulcrum-bar *x*. By the time the scoops are fairly closed the knot *k* reaches the jib, and the hoisting-rope then exerts its force on the jib, raising it the desired height, after which the crane-post is swung round (in manner as before specified) until the load is over the desired place. The hoisting-drum is then released from its clutch and the brake e^7 applied to retard the reverse motion of the drum as the load descends and unwinds the hoisting-rope from the drum.

The scoops or grapples will usually open automatically; but, if such should not be the case, drum *c'* of the trip-rope c^5 is thrown into gear with clutch c^2, and the trip-rope, being wound upon its drum, makes a downward draw on link *l* and forces the scoops open. The crane can then be returned to its first position in the manner and by the means before specified, and the several operations repeated.

It will be seen by the foregoing that I at all times have perfect control over the movement of barges and the float where the devices are used for unloading coal, over the platform or car where the devices are mounted on a movable platform or car, over the crane, and over the grapples or scoops, whereby rapidity and certainty of operation are insured.

To illustrate one value of the present invention it will suffice to cite the present cost of handling the coal shipped down the Ohio and Mississippi rivers. From the Pittsburg section alone an average of eighty million bushels is shipped yearly. This coal is transported in barges which average one hundred and thirty feet long by twenty-four feet wide and seven feet deep, carrying twelve thousand bushels. The barges are unloaded by hand, the coal being shoveled across the barge some twenty-five feet, thence upon a platform within the barge, and finally to cars upon suitable floats, and to unload a barge of twelve thousand bushels will take from forty to fifty men one day. The loss from breakage of coal and formation of fine dust or slack, owing to the number of handlings required to unload a barge by the present methods, will amount to from five to ten per cent., and the cost of handling will range from one-half to one cent per bushel.

By my devices I am enabled to lift from twenty-five to fifty bushels at a time, can revolve my crane and its load three times in a minute, and can thus unload a barge in from two to three hours, or from three to four barges a day, at a cost of from one-fourth to one-third of a cent per bushel, and with little or no loss from breakage of coal and formation of slack.

Another great advantage of my devices is that they can be employed for unloading sunken or grounded barges, and thus not only save the coal, but the barges.

Having thus described the nature, object, and advantages of my invention, what I claim, and desire to secure by Letters Patent, is—

1. A grapple or scoop having a suspension or fulcrum bar, substantially as and for the purpose specified.

2. The combination, with a crane, of a grapple or scoops connected by compound levers, and a fulcrum or suspension bar having a link or movable connection with the crane, substantially as and for the purpose specified.

3. The combination, with the jib, of a grapple or scoops connected by compound levers, a fulcrum or suspension bar, and a single hoisting-rope, adapted to operate both the grapple or scoops and the jib, substantially as and for the purpose specified.

4. The combination of a grapple or scoops connected by compound levers, a fulcrum or suspension bar, a hoisting-rope which closes the grapple or scoops, and a trip-rope, substantially as and for the purpose specified.

5. The combination, with a crane and its jib, the crane-post having a swivel arranged thereon, of a hoisting-rope which extends from the power to the swivel on the crane-post and thence to the jib, substantially as and for the purpose specified.

6. The combination, with the crane-post having a swivel top, of the snatch-block and the hoisting and trip ropes which pass through the snatch-block, substantially as and for the purpose specified.

7. The combination, with the crane-post, of a sliding block having the jib pivoted thereon, grapples or scoops suspended from the jib by a suspension or fulcrum bar, and a hoisting-rope for operating the grapples or scoops and jib, substantially as and for the purpose specified.

8. The combination, with the crane-post having a sprocket-wheel, of a chain, a hollow shaft having loose chain-pulleys arranged thereon, and clutches or dogs arranged to seize and release the loose chain-pulleys, substantially as and for the purpose specified.

9. The combination of the hollow shaft having sliding twin bevel-gear arranged thereon, with chain-pulleys arranged loosely on the shaft, and clutches or dogs for seizing and releasing the chain-pulleys, and with a bevel-gear arranged loosely on said shaft, and a clutch for securing said bevel-gear, whereby the power may be applied at will to the crane or the carriage, substantially as and for the purpose specified.

10. The combination, with the crane, of a hoisting and a trip rope, drums for receiving the said ropes, said drums being arranged loosely upon their power-shafts and provided with clutch mechanism for connecting the drums to their respective shafts, substantially as and for the purpose specified.

11. The combination, with a crane, of its hoisting-rope, a drum therefor, mounted loosely on the power-shaft and provided with a clutch mechanism, a bevel-pinion, mounted on the same power-shaft and provided with a second clutch mechanism, and a capstan operated from the bevel-pinion on the power-shaft, substantially as and for the purpose specified.

In testimony whereof I affix my signature, in presence of two witnesses, this 12th day of August, 1882.

MOSES A. MICHALES.

Witnesses:

F. W. RITTER,

F. O. MCCLEARY.