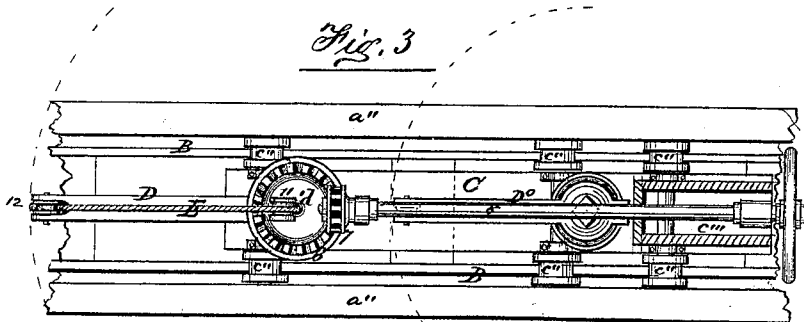
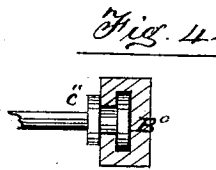
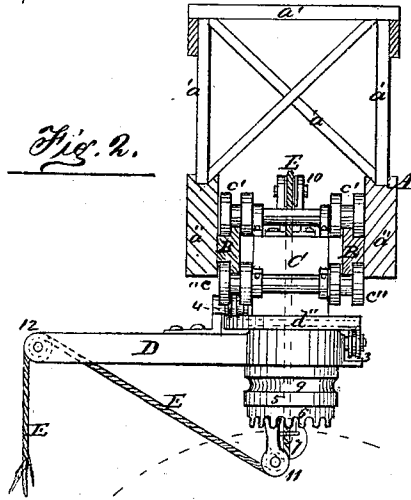
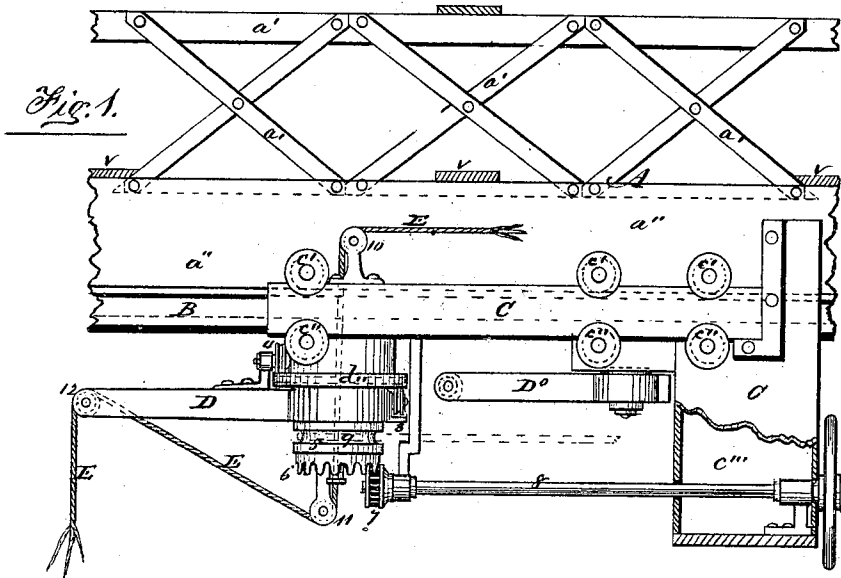


J. W. MIDDLETON.  
CRANE.

No. 112,829.

Patented Mar. 21, 1871.



Witnesses: *Ben Morrison*  
*Chas. H. Morrison*

Inventor: *J. W. Middleton*

# United States Patent Office.

JOHN W. MIDDLETON, OF PHILADELPHIA, PENNSYLVANIA.

Letters Patent No. 112,829, dated March 21, 1871.

## IMPROVEMENT IN CRANES.

The Schedule referred to in these Letters Patent and making part of the same.

I, JOHN W. MIDDLETON, of the city of Philadelphia, in the State of Pennsylvania, have invented certain Improvements in Traveling Cranes, of which the following is a specification.

### *Nature and Objects of the Invention.*

My improvements have a general relation to those traveling cranes operated by steam or other power upon the supporting-carriage, for the lifting and conveyance of heavy or bulky articles from one place to another; and

The first part of my invention relates to a horizontally-swinging crane-bar, supported and operated exclusively by over-head attachments, the object of this part of my invention being to allow clear and unobstructed thereby the whole area of that portion of the ground or floor beneath the same which may be within the extreme limits of the said crane-bar in its swinging movements.

The second part of my invention relates to the combination of the said over-head swinging crane-bar with a traveling carriage, supported and retained in position upon suitable track-rails suspended from a truss-frame or bridge above, or supported upon end walls or adjustable columns, in such a manner as to leave clear and unobstructed thereby the whole area of the ground or floor which may be within the extreme limits of the crane-bar and carriage upon any part of the track-rails, the object of this part of my invention being to afford facility for hoisting, carrying, and depositing heavy or bulky articles from one place to another, as in unloading ships and conveying the articles to the adjacent store-houses without obstruction from incumbrances of any kind on the wharf; in the elevation, conveyance, and deposit of large or heavy masses of either melted or solid bodies of iron, steel, or other metals in furnaces and foundries; and in the elevation and conveyance of marl from the pits, mineral ores from the mines, &c.

The third part of my invention relates to the combination of deeply-grooved rim-wheels on each side of the car, in combination, respectively, with a rail or rails so constructed as to afford an upper and a lower track for said wheels, the object of this part of my invention being to afford ample strength and protection against any separation of the respective track-rails or displacement of the carriage on the said track-rails by the consequent canting tendency of the carriage from the weight lifted or carried along thereby beside the said track.

The fourth part of my invention relates to an upper and a lower circular track-rail on the bottom of the carriage, in combination with a corresponding supporting and a friction-wheel on opposite sides of a central

hollow bolt, around which the said crane-bar swings horizontally, the object of this part of my invention being to support the crane-bar securely in the required horizontally-swinging position beneath the carriage when the said bar is heavily loaded.

The fifth part of my invention relates to the combination of a downward-projecting toothed cylinder with the under side of the crane-bar concentrically in relation to its turning-bolt, and with a correspondingly-toothed pinion on a shaft extending horizontally backward on the carriage, so that it may be operated by any suitable power on the said carriage, the object of this part of my invention being to enable the attendant, by hand or steam-power on the carriage, to give rotary motion to the said pinion, and, consequently, the required horizontal swinging motion to the loaded crane-bar.

The sixth part of my invention relates to the combination, with the toothed cylinder on the under side of the crane-bar, of a grooved friction-pulley and bearing, projecting from near the central bolt downward below the said toothed cylinder, and a suitable friction-pulley near the open upper end of the said bolt, the object of this part of my invention being to allow the crane-bar to swing around nearly in a complete circle by causing the burden-chain or rope of the crane-bar to pass up through the long, hollow turning-bolt, and thence to the operator on the carriage, without interfering with the required swinging motion of the crane-bar.

The seventh part of my invention relates to a traveling crane-carriage, provided with any suitable steam-generator and operating engine, in combination with a bridge or truss-frame provided with track-rails, and supported upon end walls, and, when necessary, by adjustable columns below, or both together, the object of this part of my invention being to afford powerful facilities for the lifting, carrying, and depositing of bulky or heavy articles from one place to another, as at marl-pits, ore-mines, and especially in the lifting and movement of large vessels containing melted iron, steel, or other metals from the furnace of iron, steel, or other metal works, to any distant part of the ground or floor of the building connected with the same.

### *Description of the Accompanying Drawing.*

Figure 1 is a side elevation, having the near side of the supporting-bridge or truss-frame and its track-rail removed, the far side being a section of the length of the same.

Figure 2 is an end elevation, with the supporting truss-frame or bridge and track-rails in transverse section.

Figure 3 is a plan view of the under side of the apparatus.

Figure 4 is a modification of the track-rails of the bridge.

#### General Description.

The truss-frame or bridge A, with the track-rails B B firmly secured thereto, are intended to be supported at their ends in an elevated position upon the end walls of the furnace, foundry, or other building, and, consequently, to reach from one end of the building to the other, the intervening parts of the sills *a'' a''* and track-rails B B being supported by the truss-work *a'* and the usual cross-ties *v v* of the roof of the building, in such a manner as to afford a sufficiently elevated and substantial rail-track bridge from one end to the other, along near the middle of the building. In very long buildings suitable adjustable or readily-removable columns are intended to be used, also, as supports, when necessary.

The carriage C is supported and secured to roll upon the track-rails B B by means of a sufficient number of deeply-grooved wheels, *c' c'*, the grooves in the said wheels and the form of the track-rails B B being respectively constructed and arranged to operate in such a manner that, while the tread of the grooves in the lower series of wheels *c' c'* roll upon the lower faces of the track-rails B B, the tread of the grooves in the upper series of wheels *c' c'* will just clear the upper faces of the same rails, and *vice versa*, the flanges of both series of the said wheels at the same time preventing the possibility of the latter running off the track, of any approach toward or separation from each other of the track-rails B B, and of any undue canting or tilting of the car C during the movements or operation of the same and its attachments.

The distance apart of the sills *a'' a''*, and, consequently, of the rails B B, is intended to be from three to ten feet, more or less, or in accordance with the burden intended to be suspended from the crane-bar.

The crane-bar D swings around a hollow bolt, *d'*, which passes upward through it from the center of the lower end of a cylinder provided with a surrounding double or a combined upper and lower track-rail, *d''*, and firmly secured to the under side of the carriage C.

Secured to the shorter end of the crane-bar D is a grooved pulley, 3, which bears upward against the lower part of the circular rail *d''*, while another grooved pulley, 4, which is secured to the upper side of the crane-bar D, bears downward upon the upper part of the same circular rail *d''*, and thus the two said pulleys or track-wheels, being made adequate in strength, support the bar D securely in a horizontally-moving position beneath the car C, the pulley 3 acting as a friction-wheel, and the pulley 4 acting as the supporting-wheel of the longer arm of the crane-bar D and its burden, while the hollow bolt *d'* serves as its turning or swinging point and keeps the said bar diametrically across the circular track-rail *d''*.

To the under side of the crane-bar D, at a part directly beneath the circular track-rail *d''*, there is fixed a vertical cylinder, 5, having fixed around its lower end a toothed wheel, into which gears a pinion, 7, on a shaft, 8, which shaft extends backward into any suitable car-box or station, *c''* on the carriage C, where it is intended to be operated to give the required swinging motions to the crane-bar D by hand or steam-power located on the said carriage.

If preferred, the swinging motions of the bar D may be given by means of a chain or rope passing around in the groove 9 of the cylinder 5, and thence around any suitable cylinder (not shown) operated in the car-box or station *c''* by the same power.

The burden-chain or rope E passes from any suitable winding-cylinder (not shown) operated by the power in the box or station *c''* to a grooved pulley, 10,

located just above the upper end of the hollow bolt *d'*, thence down through the latter and under a grooved pulley, 11, which is located at the lower end of the said hollow bolt *d'*, thence over the pulley 12 in the crane-bar D downward to the burden which is to be lifted or moved, or (for very heavy burdens) to any tackle between.

The carriage C is intended to be moved along backward or forward on the rail-tracks B B by means of a belt-rope or chain around a cylinder (not shown) on the carriage, and operated by a cylinder (not shown) in the car-box or station *c''*, or in the same manner as a steam-locomotive on an ordinary track.

As a modification of the track-rails B B, each may be made in the form shown in fig. 4, in which case only a single series of the grooved wheels *c''* will be required for each side of the car C, because the said wheels are placed between the upper and lower projecting parts of the track of the respective rails B B, fig. 4.

The ends of the truss-frame or bridge A may rest directly upon rollers (not shown) on the end walls of the inclosing building, so that the whole apparatus may be moved together laterally, if desirable, at any time.

It will now be understood without further description that this apparatus will afford great facility for lifting and moving from place to place on the ground or floor within its compass bulky or heavy burdens of any kind, as in the elevating of marl, ores, &c., from the pits, or merchandise from ships or store-houses, and moving the same over obstacles between the pit, ship, or store-house and the place of deposit, and especially in the lifting and carrying large masses of solid metal, or large vessels containing, say, from five to ten tons, more or less, of melted iron, steel, or other metals from the hearth, pool, or refining-vessels of a furnace to any part of the ground or floor of the building for casting the metal in flasks or molds, and all without the exposure of the workmen, as heretofore, to the intense heat of such large bodies of hot metal.

The operator, standing in the box or station on the car C, it is intended shall have full control of the movements of the same on the track-rails B B, and of the crane-bar D, and burden-rope or chain E, so that the operations to be accomplished may be effected by him with facility and at a safe and secure distance from the said burden, its source, and its depository, results of the highest importance in any iron and steel works embodying the processes and apparatus for manufacturing iron and steel, in all their different stages, direct from the ore by one continuous heat, as described and set forth in my previous patents in relation thereto.

D<sup>o</sup> is a secondary crane-bar, intended to be operated by hand when required.

#### Claims.

I claim as my invention—

1. The attachment of a horizontally-swinging crane-bar, D, to the under side of an elevated bridge or truss-frame, A, by any suitable intermediate connecting device, in such manner as to leave the whole area of the ground or floor beneath its circuit clear and unobstructed by its supports, substantially as and for the purposes hereinbefore set forth.

2. The combination of a horizontally-swinging crane-bar, D, with the under side of a traveling carriage supported upon suitable track-rails B B, secured along the inner sides of the bottom sills *a'' a''* of an elevated bridge or truss-frame, A, substantially as and for the purposes hereinbefore set forth.

3. The combination of a series of deeply-grooved rim-wheels on each side of the carriage C with a corresponding track-rail or rails fixed on the inner sides of the sills of the bridge or truss-frame A; the said

parts being arranged to operate together substantially as and for the purposes hereinbefore set forth and described.

4. The circular double-track rail *a*" on the bottom of the carriage C, in combination with the wheels 3 and 4 on the crane-bar D, and the central bolt *a*', the said parts being arranged to operate together substantially as and for the purposes hereinbefore set forth.

5. The combination of the circle of teeth 6 with the under side of the crane-bar D, supported as described, and with the operating-pinion 7 on the shaft 8, the said parts being arranged to operate together substantially as and for the purpose hereinbefore set forth and described.

6. The pulley-wheels 10 and 11 in combination with the hollow bolt *a*', the toothed cylinder 5, and the burden-rope or chain E, the said parts being arranged

to operate together substantially as and for the purpose hereinbefore set forth and described.

7. The combination, with an elevated bridge or truss-frame, A, of a carriage, C, provided with a swinging crane-bar, D, beneath, without any under-supports, and the said carriage being provided with any sufficient steam-power generator and operative engine, whereby the movements of the carriage forward and backward on the track-rails of the said elevated bridge or truss-frame, and the operation of the crane, may be effected substantially as and for the purposes hereinbefore set forth.

JOHN W. MIDDLETON.

Witnesses:

BENJ. MORISON,  
WM. H. MORISON.