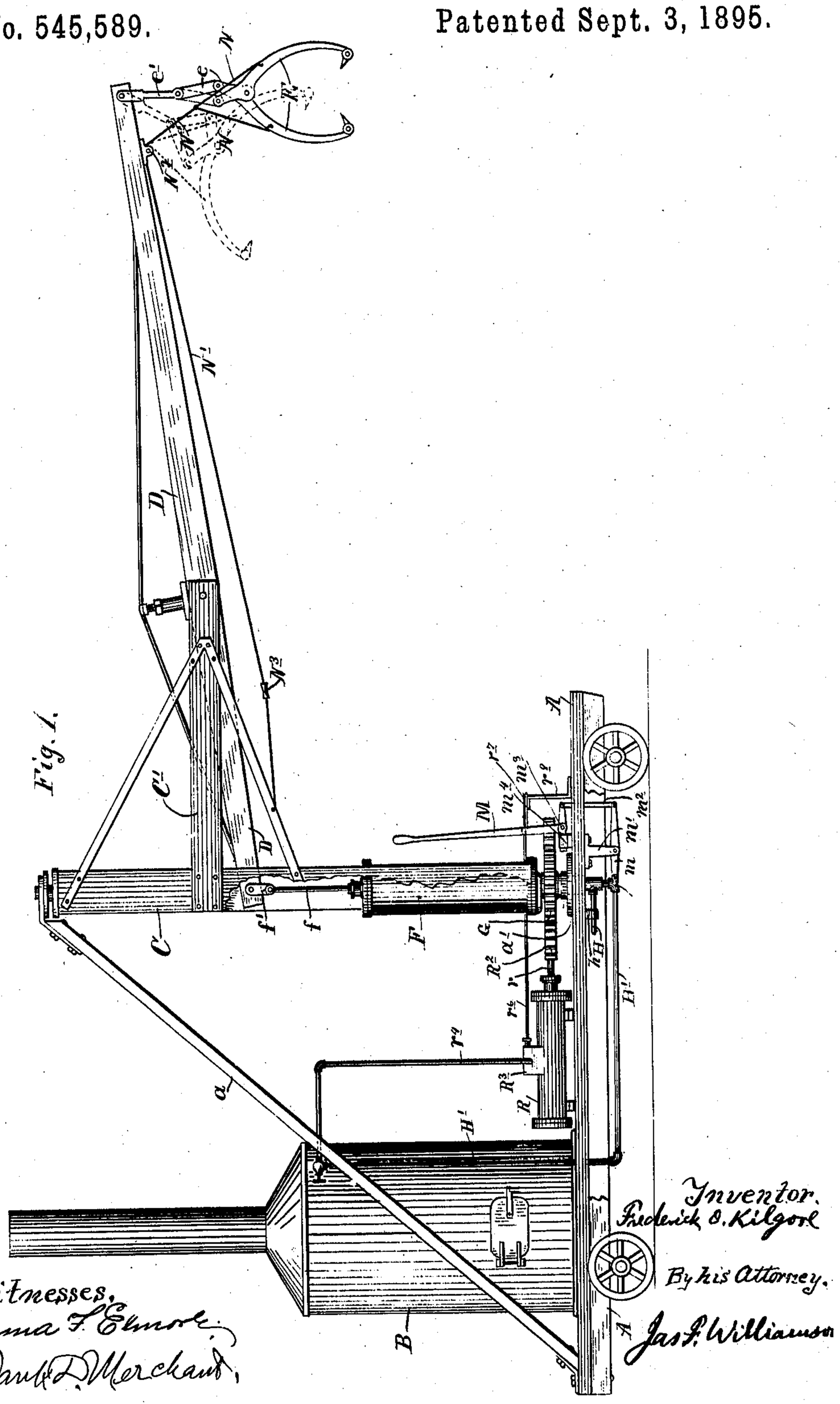
(No Model.) 2 Sheets—Sheet 1.

F. O. KILGORE.

POWER CRANE.

No. 545,589. Patented Sept. 3, 1895.

Fig. 1.



Witnesses,
Emma F. Elmore.
Frank D. Merchant.

Inventor.
Frederick O. Kilgore
By his Attorney.
Jas F. Williamson

(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

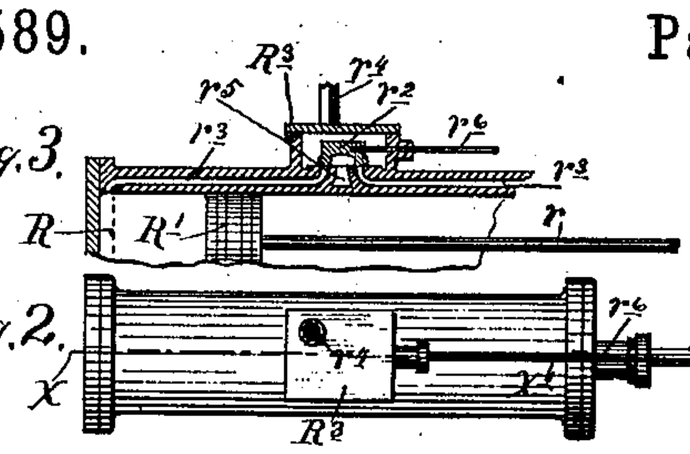


Fig. 2.

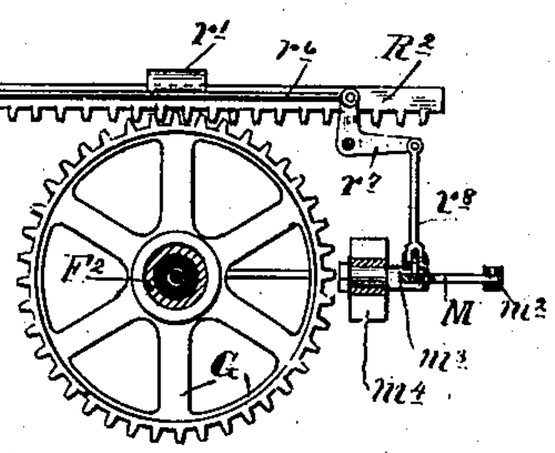


Fig. 4.

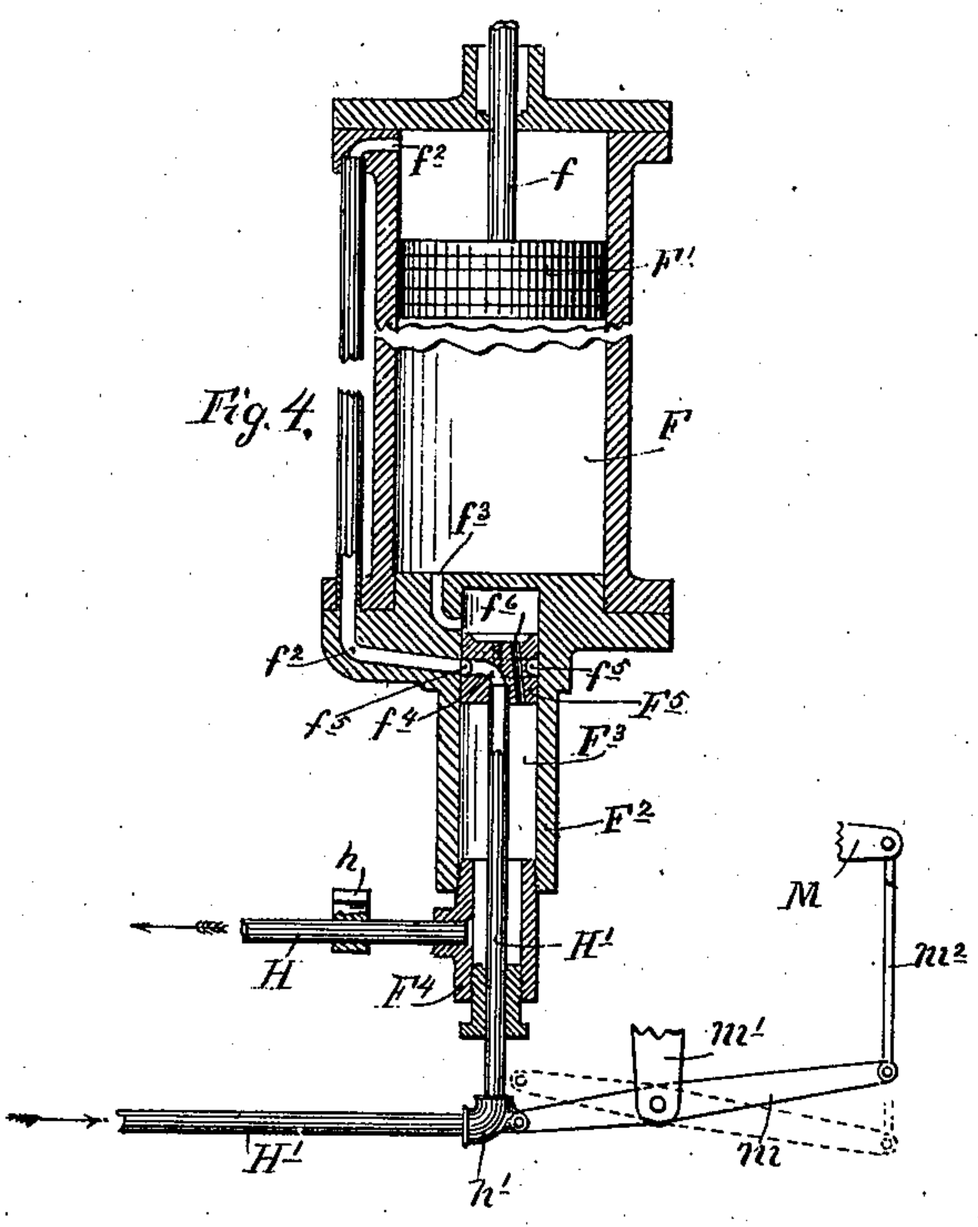


Fig. 5.

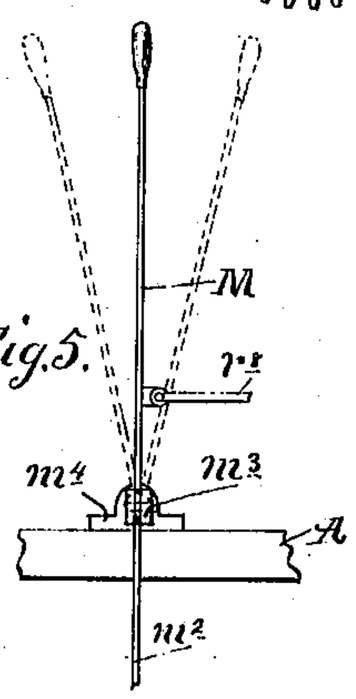


Fig. 6.

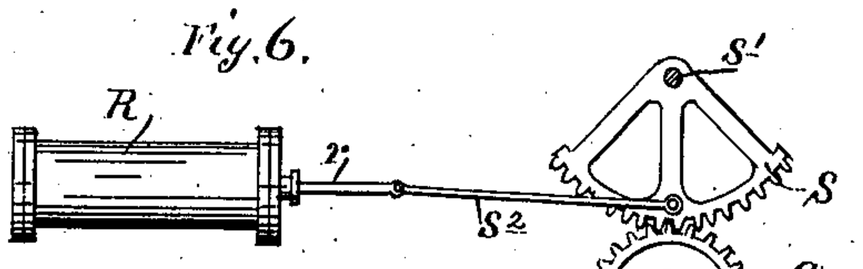
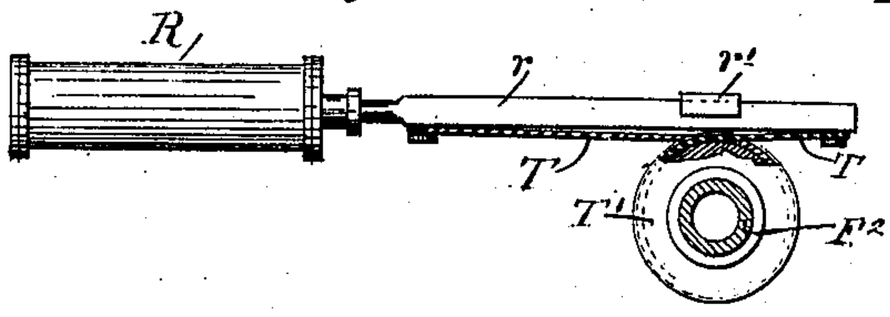


Fig. 7.



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Inventor
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By his. Attorney.
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UNITED STATES PATENT OFFICE.

FREDERICK O. KILGORE, OF MINNEAPOLIS, MINNESOTA.

POWER-CRANE.

SPECIFICATION forming part of Letters Patent No. 545,589, dated September 3, 1895.

Application filed February 16, 1893. Serial No. 462,577. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK O. KILGORE, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Power-Cranes; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to cranes.

While capable of general use, my present invention was particularly designed for use in handling logs in sawmills, and has for its special object to provide a crane for such purpose, which will be more nimble and rapid in operation, and which may be more easily controlled than the cranes hitherto employed for the purpose.

To these ends I employ the several novel devices and novel combinations and arrangements of devices, the salient features of which may be briefly set forth as follows: First, I employ in connection with the pair of engines, applied as just described, a single controller for the valves of both of the said engines, the said controller being capable of independent action on the valves of the two engines, either coincidently or at different times. Second, I so construct and arrange the controller for the engine-valves and the connection for controlling the grapple-opening device that a single operator may manipulate both and thereby control all the movements of the crane and the grapple from a single position.

The valve mechanism of the hoisting-engine is also of novel construction and will be fully set forth in the following detailed description.

The preferred form of my invention is illustrated in the accompanying drawings, as applied on a movable truck; but it will, of course, be understood that a fixed platform or other support might be used instead of the truck.

Referring to said drawings, wherein like letters refer to like parts throughout the several views, Figure 1 is a right side elevation of the truck and my crane, some parts being broken away. Fig. 2 is a detail in plan view showing my preferred connections from the engine for imparting the rotary or oscillatory motion to the crane and also showing a portion of the valve-controlling mechanism. Fig. 3 is a longitudinal vertical section on the line X X′ of Fig. 2, some parts being broken away. Fig. 4 is a vertical central section, some parts being broken away and others being removed, showing the hoisting-engine, its valve mechanism, and immediate connections. Fig. 5 is a detail view in front elevation showing the single and common valve-controlling device or controller and the support for the same. Fig. 6 is a detail plan view illustrating a modification of the mechanism shown in Fig. 2 for oscillating the crane. Fig. 7 is a similar view of another modification.

A represents the supporting-trucks, and B a steam-boiler thereon.

C is the crane-mast, which is held at its top by the stay brace or braces *a*, rising from the truck, and at its bottom by a bearing-plate *a′*, fixed to the top of the truck-platform. The mast C is free to rotate or oscillate in its bearings *a a′*, and is cut away or formed of double uprights spaced apart at their central and lower portions to form a seat for the hoisting-engine and give clearance for the inner end of the jib operated thereby.

C′ is an outwardly-extended mast-arm or jib-support rigid with the mast and suitably braced therefrom.

D is the pivoted jib pivotally connected to the outer end of the mast-arm C′. The jib D carries at its outer end a grapple, which is preferably in the form of a lazy-tongs E *e*, the toggle-section *e* of which is hung to the jib by means of an unyielding or stiff link *e′*. In virtue of this construction of the grapple, when the weight of the jib is thrown upon the grapple, the toggle-section *e* will be spread and the grapple-jaws E will be forced open, and when the grapple is lifted by the jib the grapple-jaws will tend to close by gravity, and their closing action will be further increased by the load caught by the grapple. The inner end of the jib D terminates at or near the mast C and works between the two upright parts of the same.

F is the cylinder, and F′ is the piston of the reciprocating engine applied for lifting the load. The cylinder F is rigidly secured between the two parts of the mast C in an upright position with its axis on the pivotal cen-

ter of the mast. The piston F′ has its piston-rod *f* extended upward through the upper head of the cylinder and connected by means of a link *f′* to the inner end of the jib D. The lower head of the cylinder F is provided with a depending cylindrical pivot or pintle portion F^2, which projects downward through and works pivotally in the bearing-plate *a′* of the truck.

G is a spur-gear rigidly secured to the pintle portion F^2 of the cylinder F at a point immediately above the bearing *a′* and resting with its hub on the said bearing. The purpose of this gear G will appear later on. The pintle portion F^2 is formed with an axial chamber and valve-seat F^3, provided with steam-passages f^2 and f^3, extending from the vertical wall thereof, respectively, one to the upper and the other to the lower end of the cylinder F. The lower end of this valve-seat F^3 is closed by a stationary thimble F^4, the upper end of which extends into the seat F^3 and permits the pivotal motion of the pintle portion F^2 around the same.

H is an exhaust-pipe from the thimble F^4. Both the pipe H and the thimble F^4 are supported in position by means of a keeper *h*, secured to the bottom of the truck A and embracing said exhaust-pipe H.

H′ is a steam-supply pipe extending from the boiler B first downward below the platform of the truck A, then forward to a point immediately under the pivotal center of the mast, and then upward on the line of the mast's pivotal center through the thimble F^4 and terminating in and secured to a valve F^5 for controlling the steam-passages f^2 and f^3. This valve F^5 is in the form of a piston-head working with a tight joint in the seat F^3, and has a port-opening f^4, forming a continuation of the steam-supply passage from the pipe H′, and terminating in an annular peripheral groove f^5. This valve F^5 has also a series of exhaust-perforations or outlet steam-passages f^6, extending vertically through the same. To the elbow-union *h′* of the pipe H′ is pivotally attached the free end of a lever *m*, pivotally fulcrumed to the bracket *m′*, depending from the truck-frame. The outer end of the lever *m* is connected by means of a link m^2 to the forwardly-projecting end of a bell-crank hand-lever M. This hand-lever M constitutes the common and single controlling device or controller for the valves of both engines, as will presently appear. The lever M is mounted for universal pivotal movement by means of its pivotal connection with a swivel head or block m^3, working in a fixed bearing-block m^4, secured on top of the truck-platform.

The operation of the crane in raising and lowering the load is as follows: By rocking the lever M toward the front the forward end of the steam-delivery pipe H′ will be raised, carrying with it the valve F^5 and bringing the annular steam-port f^5 opposite the steam-port f^3, thus admitting steam to the lower end of the cylinder F. In this position the valve will be carried above the steam-port f^2, thereby opening the upper end of the cylinder to the lower portion of the valve-seat F^3, from whence the steam is free to exhaust through the exhaust-pipe H. As is evident under this action of the valve mechanism, the piston F′ *f* will be raised and the load or grapple will be lowered. Again, when the hand-lever M is rocked to the rear the valve F^5 will be drawn downward into the position shown in Fig. 4, in which position the annular valve-groove f^5 will be opposite the steam-port f^2, thus admitting steam to the upper end of the cylinder F. In this position the upper edge of the valve F^5 will be drawn below the port f^3, thus opening the lower end of the cylinder to exhaust through said port f^3, through the upper chamber of the valve-seat F^3, from thence through the perforations f^6 in the valve F^5 into the lower chamber of said seat F^3, and from thence into the exhaust-pipe H. As is obvious in this action of the valve mechanism, the piston F′ *f* will be forced downward and the load caught by the grapple E *e* or the grapple itself will be raised. The horizontal section of the steam-supply pipe H′ will yield or spring sufficiently to permit the movements of the valve F^5. N is a grapple-opening device shown as in the form of a pair of strands connected one to each of the grapple-tongs on opposite sides of the tongs-pivot and provided with a common connection N′, extending over a suitable guide-sheave N^2 on the outer end of the jib, and thence to within reach of the operator standing on the truck-platform. The inner end of the cord N′ or other flexible connection is secured to the jib-support or elsewhere, and the said cord may be provided with a handle-piece N^3. The operator can handle the grapple-opening device N from the connection N′ with one hand while handling the valve-controller M with the other.

Referring now to the means for imparting to and controlling the rotary motions of the crane, R is the cylinder and R′ *r* is the piston of the reciprocating engine. The cylinder R is rigidly secured to the platform-truck A longitudinally thereof, and the piston-rod *r* of the piston carries at its outer portion a rack R^2, which works through a keeper *r′* and is thereby held in engagement with the spur-gear G, which is rigid with the mast C. R^3 is the steam-chest of the engine, r^2 is the slide-valve working in said chest, and r^3 are the stem ports opening from the steam-chest into the front and rear ends of the cylinder. This valve mechanism is of the ordinary well-known construction, and it is only deemed necessary to note that the forward movement of the slide-valve r^2 causes an outstroke of the piston, while the rearward movement of the said valve r^3 will cause the inward movement of the said piston. Steam is supplied to the steam-chest R^3 from the boiler B through a steam-supply pipe r^4 and is exhausted

through the exhaust-port r^5. The stem r^6 of the valve r^2 extends forward through the steam-chest R^3 and is connected to one end of a pivoted bell-crank r^7, the other end of which bell-crank is connected by means of a link r^8 to the side of the hand-lever M. The bell-crank r^7 is pivoted at its angle to a bracket r^9 rising from the truck-platform.

The operation of the mechanism just described to give the rotary or oscillatory motion to the crane is a follows: By throwing the lever M laterally toward the right side of the machine the valve r^2 will be drawn forward, admitting steam to the rear end of the cylinder R, thus forcing the piston R′ r and the rack R^2 forward and rotating the crane so as to turn the grapple end of the jib to the right. By moving the hand-lever M in the opposite direction—toward the left side of the machine—the valve r^2 will be thrown backward, the piston R′ r will make an inward stroke, and the grapple end of the jib will be thrown to the left. Thus, by this construction and arrangement of the valve-operating mechanism the movement of the hand-lever M laterally will give the movement of the grapple end of the jib the same direction as the movement of the lever. The forward motion of the lever M causes an upstroke of the piston of the hoisting-engine F F′, thus lowering the grapple, and the rearward movement of the lever M causes a downstroke of the said piston, thus raising the grapple, as hitherto stated. It is therefore obvious, from the foregoing description, that in virtue of the universal movement of the lever M both engines may be independently controlled, either at different times or at the same time, by one hand of the operator. This is accomplished by moving the said hand-lever or controller M at an angle to the direct lines of its operative movements; or, otherwise stated, the lines of the operative movement on the respective valves extend at right angles to each other, the forward and backward motion controlling the engine which raises or lowers the jib and the lateral motion from right to left controlling the engine which oscillates or swings the crane. The lever M will therefore move on one or the other of these direct lines if either engine is to be operated alone, leaving the other idle; but ordinarily it is desirable to operate both engines at one time, thereby raising or lowering the grapple while swinging the crane. To do this it is only necessary for the operator to move the lever M on the angular line, which would be the resultant of two forces simultaneously applied in the operative lines for the independent actions of the two engines. In other words, it takes the diagonal of the two operative lines. This arrangement of the two engines for simultaneously operating the jib and swinging the crane under the control of a single lever greatly increases the efficiency of the machine. The operator with one hand on the lever M controls the engine, leaving his other hand free to operate the grapple-opening device through the connection N′. Hence there need be no lost time whatever in manipulating the crane.

In the modification shown in Fig. 6 the spur-gear G on the crane-mast C is engaged by a segmental gear S, pivoted to the truck-frame at S′ and connected at a point eccentric to its center by means of a link S^2 to the end of the piston-rod r of the engine R R′. The segmental gear S is of relatively large radius, as compared with the gear G, for the purpose of giving an increased angular movement to the said gear G, and hence to the crane.

Another modification is shown in Fig. 7, wherein a flexible connection T—such as a band, rope, or cable—is given a turn around a sheave T′ on the mast and its opposite ends attached to the opposite ends of the piston-rod r. It is obvious that this arrangement may be made to swing the mast through any or the whole of the circle, as may be desired. If it should be only necessary to swing the mast through a small arc the piston-rod r might be directly connected to a crank-arm on the mast. This is so obvious that illustration of the same is not deemed necessary.

It will be understood that many of the details of the constructions herein shown and described might be changed without departing from my invention.

When using the crane on a stationary platform instead of the truck—as, for example, on the floor or framing of a sawmill—it is preferable to mount the hoisting-engine below the mast in line with the same and pass the piston-rod up through the bearing-plate to the jib or to a cross-head connected with the jib.

It should be noted that the construction of the hoisting-engine crane-mast is an important improvement, enabling the valve mechanism to be readily applied and controlled while permitting the free rotary or oscillatory movement of the crane.

The pivotal connection of the grapple with the jib by the link e', the flexible grapple-opening device N with its operating extension N′, and the location of the guide-sheave N^2 a short distance back of the link e', which should be about ten inches, enable the operator by the proper manipulation of the jib D and the cord N′ to swing the grapple with respect to the jib through an arc of about forty-five degrees to each side of the vertical line. It will be understood, of course, that the grapple is given its movement on one side of a vertical line by drawing on the cord N′ and is swung to the other side of the vertical line by letting go of the cord and allowing gravity and momentum to become effective. This gives the grapple a range forward and backward of about ninety degrees, enabling the logs or other materials to be picked up from any point in a comparatively large field. In other words, the connection N N′ serves a double function, one of which is to co-operate

with the pivoted jib D to swing the grapple forward and backward. Of course it would be possible to add another connection for the express purpose of swinging the grapple; but this would be much less desirable, for the reason operator could not well manipulate two different connections with one hand, which he must do with this crane to leave the other hand free for the lever M, to control the engines.

Actual usage has demonstrated that this crane will load eight logs per minute, picking the same from the ground, swinging the same through a half circle, and delivering the same to a car or other elevated support.

What I claim, and desire to secure by Letters Patent of the United States, is as follows:

1. The combination with a crane, of a pair of engines applied one to raise or lower the load and the other to swing the crane and a common controller for the valves of both engines, substantially as described.

2. The combination with a crane having a pivoted jib, of a pair of reciprocating engines, the reciprocating members of which act respectively one to oscillate the mast and the other to oscillate the jib and a common hand controller for the valves of both engines mounted for simultaneous or independent action on the said valves, whereby both engines may be independently or simultaneously operated under control from a common source, substantially as described.

3. The combination with a crane having a pivoted jib, of a pair of reciprocating engines applied one to swing the crane and the other to raise or lower the jib, and a common controller for the valves of both engines in the form of a hand-lever having a universal movement, substantially as and for the purposes set forth.

4. The combination with the crane having a pivoted jib of the engines F F′ and R R′ operating as described, the bell crank hand-lever M pivoted to the swivel m^3, and provided with the connections m^2 m H′ to the valve F^5 and with the connections r^8 r^7 r^6 to the valve r^2, arranged and operating, substantially as described.

5. The combination with a crane having a pivoted jib, of the pair of reciprocating engines having their reciprocating members applied respectively one to swing the crane and the other to raise or lower the jib, a common controller for the valves of both engines capable of independent or simultaneous action thereon, a lazy tongs grapple having its head toggle connected to the jib by an unyielding link, and a grapple opening device provided with an operating connection extended to within reach of the operator, whereby both of the engines and the grapple are under the control of a single operator from one position.

6. The combination with a crane having a pivoted jib of the engine on the mast having its piston applied to operate the jib and provided on one of its cylinder heads with a recessed extension forming a pintle or pivot for the mast and a seat for the engine valve, a sliding valve in said seat and a combined supply pipe and valve stem movable axially in said seat for supplying the fluid and controlling the valve, substantially as described.

7. In a crane having the pivoted jib D, the combination with the lazy tongs grapple E e having its head toggle pivotally connected with the jib by the rigid link e', of the guide sheave N^2 located on the jib, a short distance back of the grapple, and the combined opening and swinging device N applied to the grapple and provided with the common connection N′ passing over said sheave N^2, substantially as and for the purpose set forth.

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

FREDERICK O. KILGORE.

Witnesses:
JAS. F. WILLIAMSON,
EMMA F. ELMORE.