No. 882,011.

H. W. METCALFE. PATENTED MAR. 17, 1908.

CRANE MECHANISM.

APPLICATION FILED JULY 8, 1907.

6 SHEETS—SHEET 1.

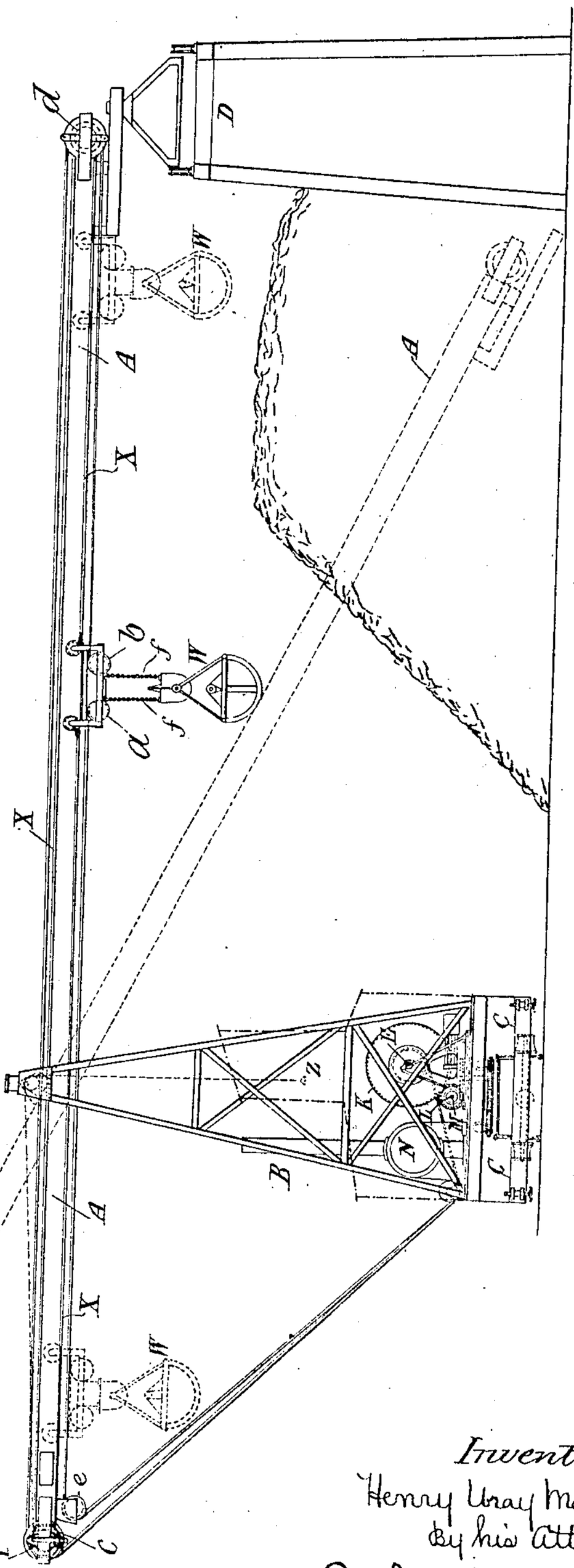

Fig. 1.

Witnesses.
M. L. Adams.
C. F. Early.

Inventor.
Henry Gray Metcalfe
By his Attorneys,
Baldwin & Wright.

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6 SHEETS—SHEET 2.

Fig. 2.

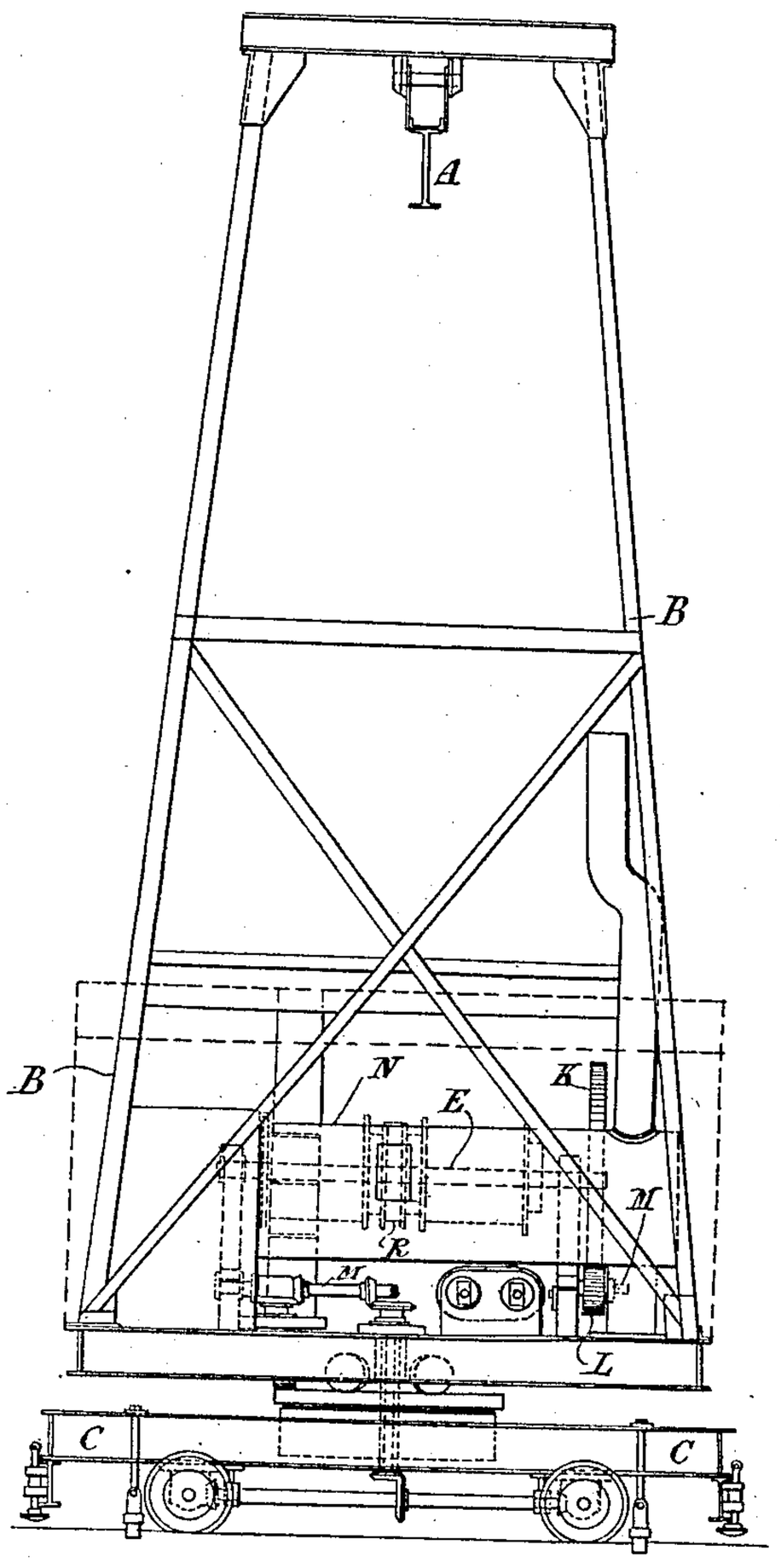

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Fig. 3.

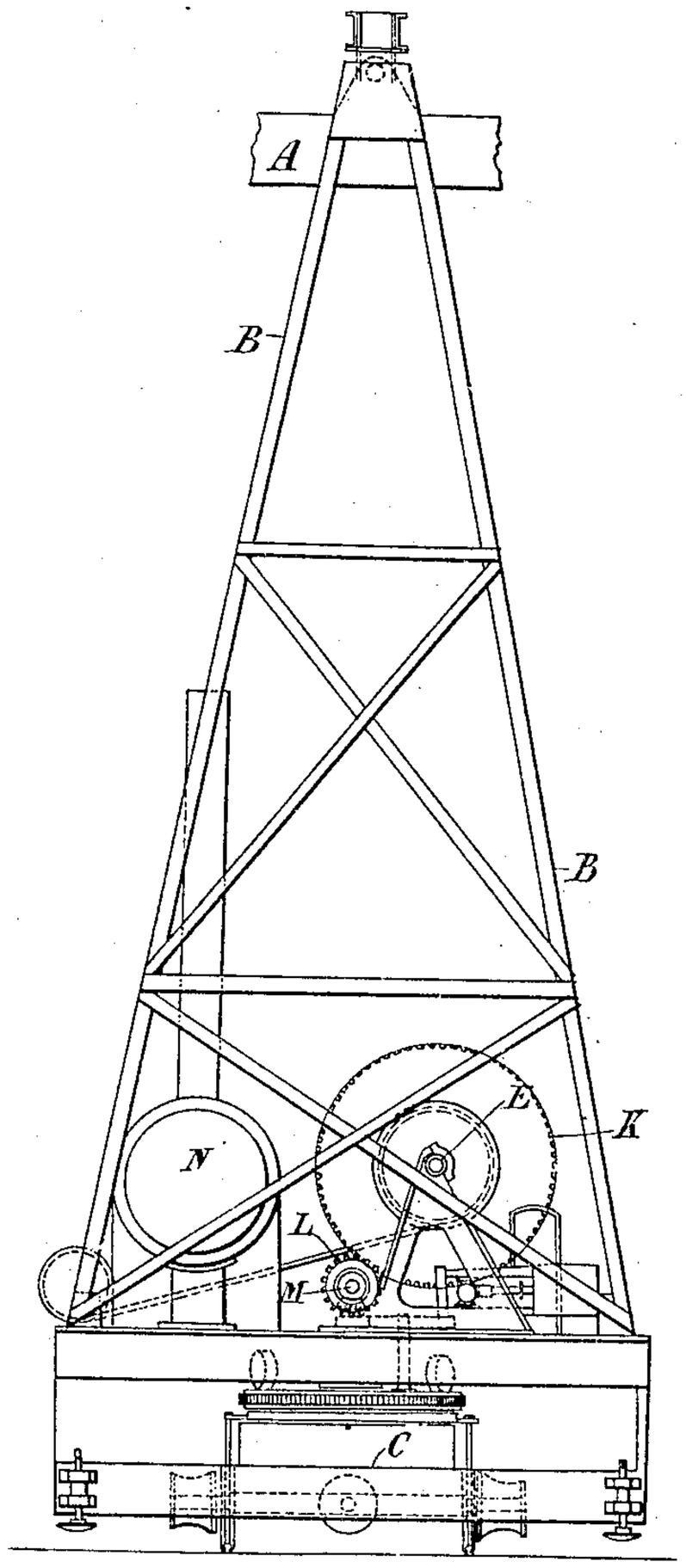

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Fig. 4.

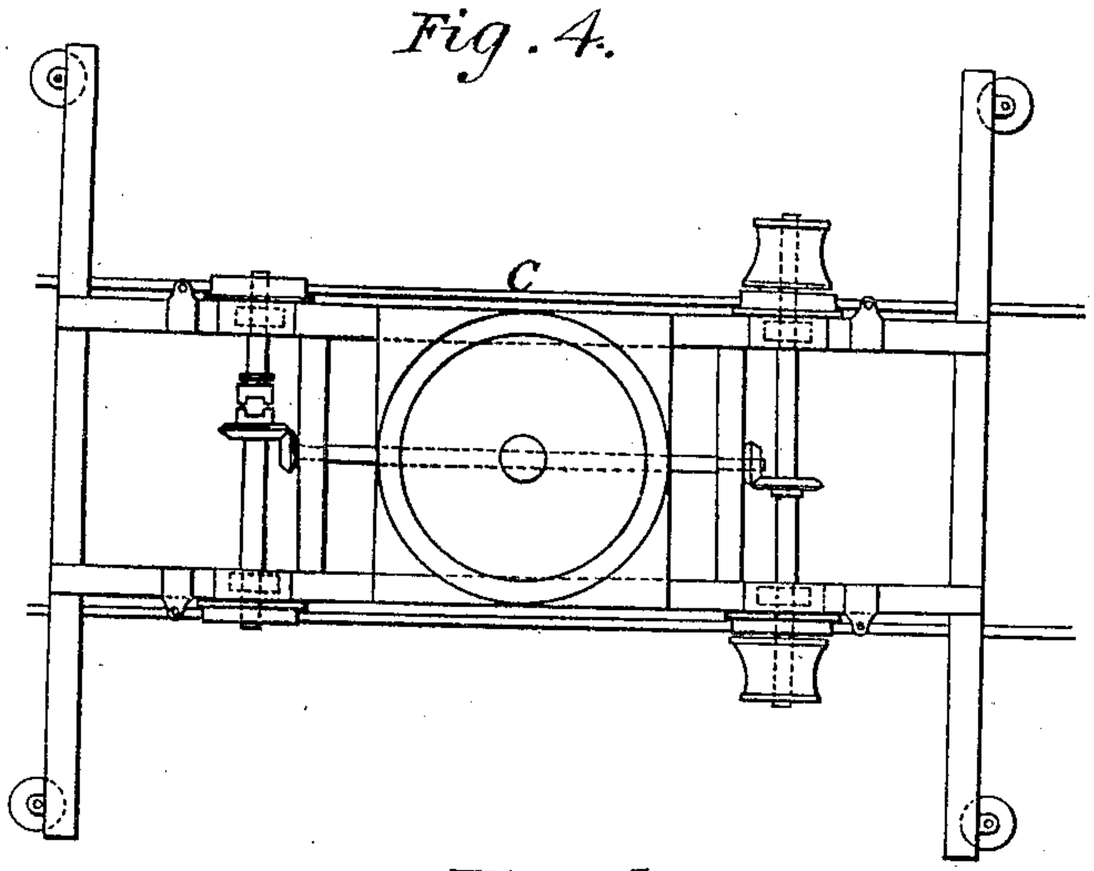
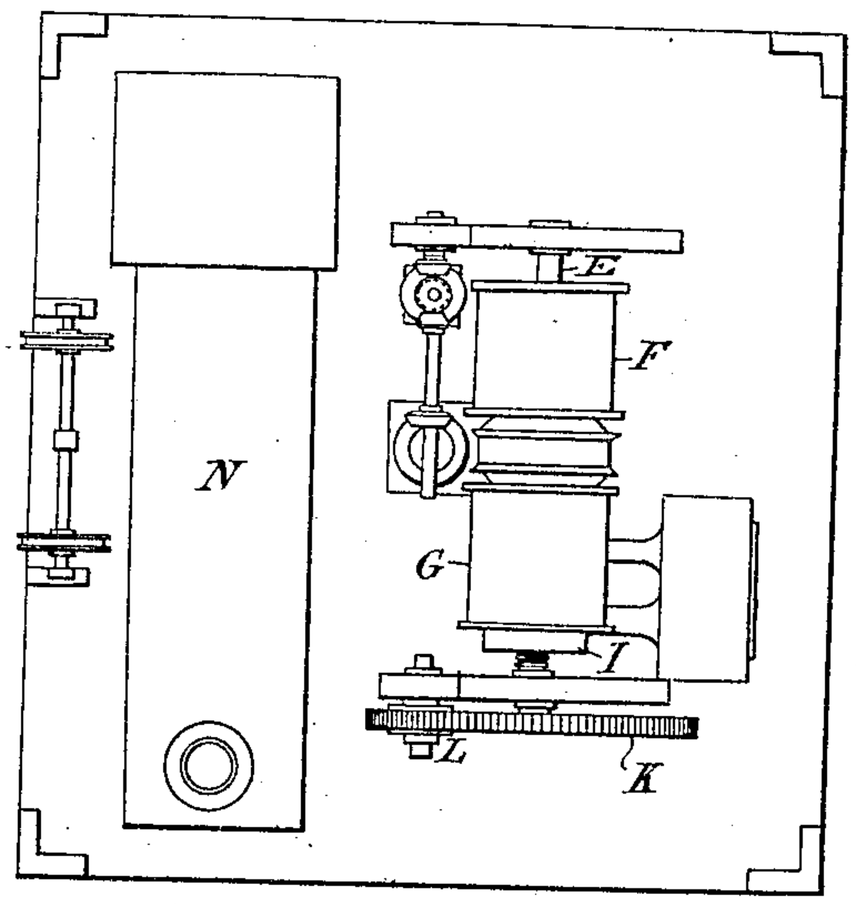


Fig. 5.



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6 SHEETS—SHEET 5.

Fig. 12.

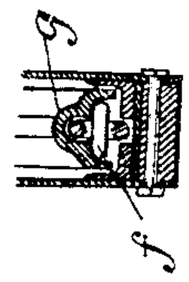


Fig. 6.

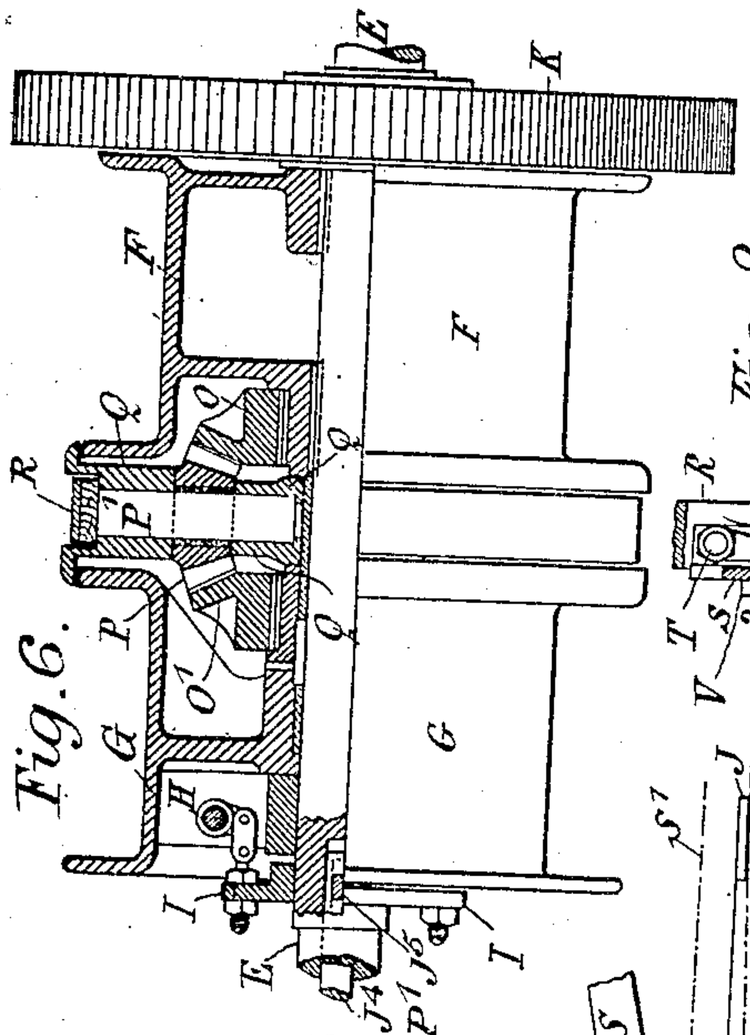


Fig. 8.

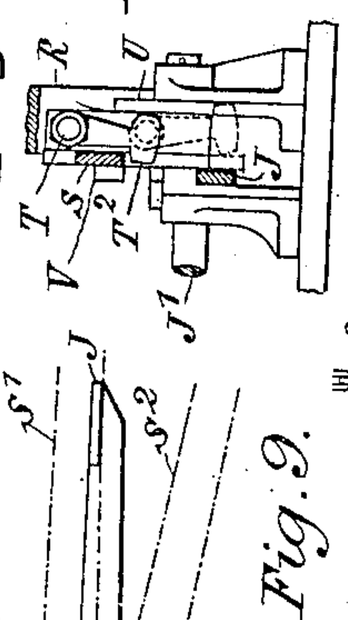


Fig. 11.

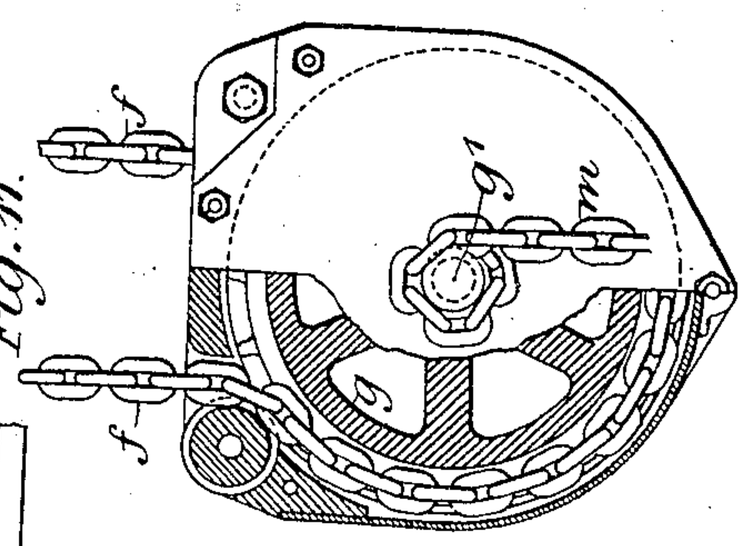


Fig. 9.

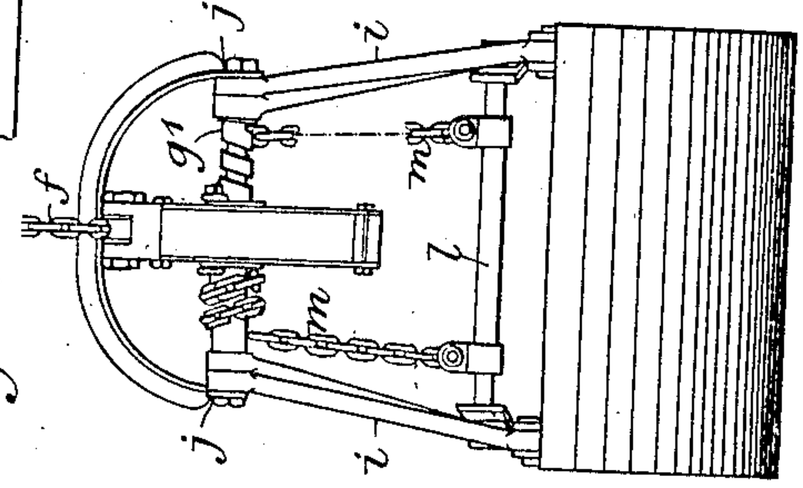


Fig. 7.

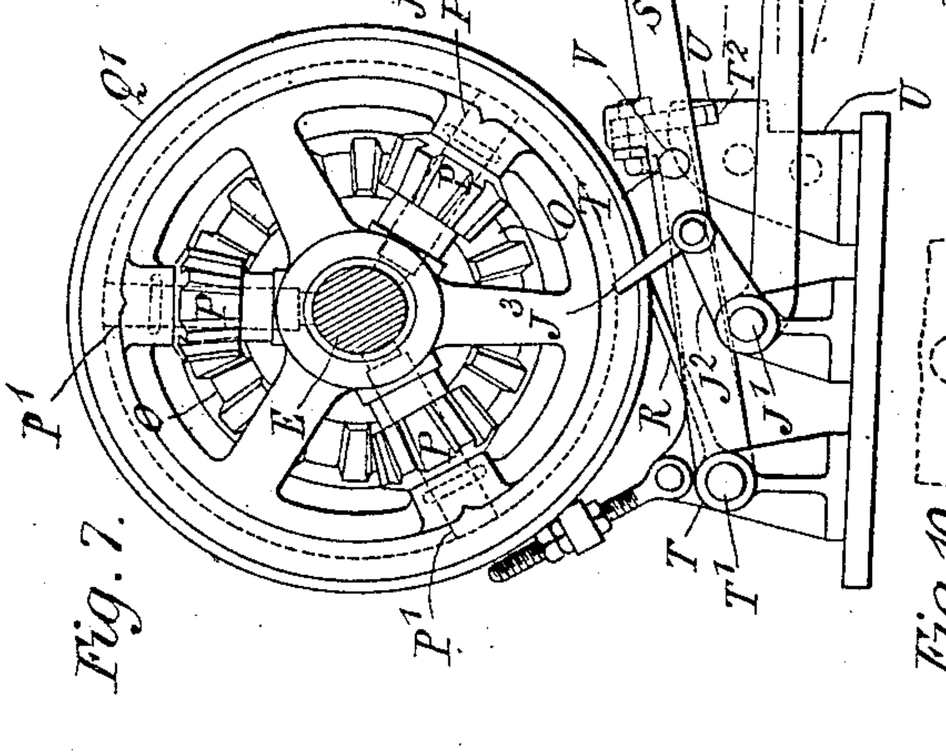
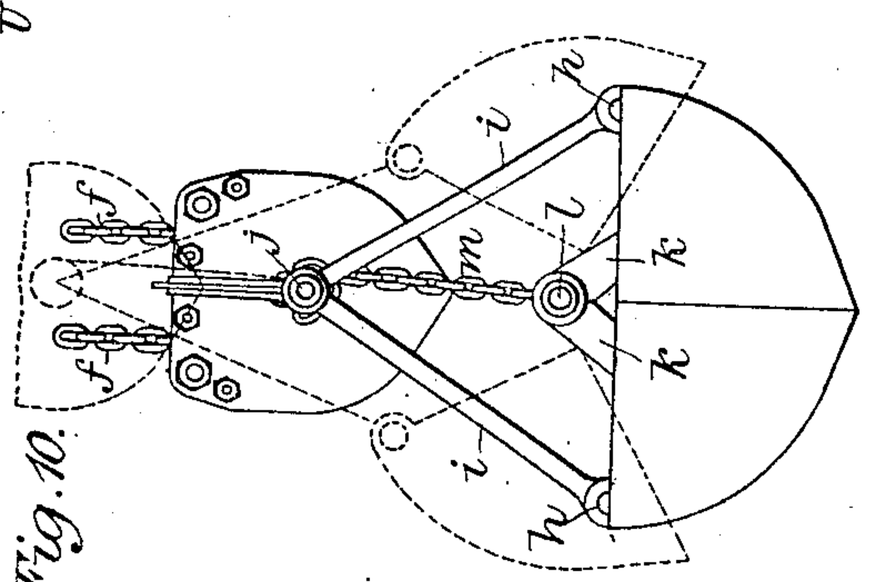


Fig. 10.



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CRANE MECHANISM.

APPLICATION FILED JULY 8, 1907.

6 SHEETS—SHEET 6.

Fig. 13.

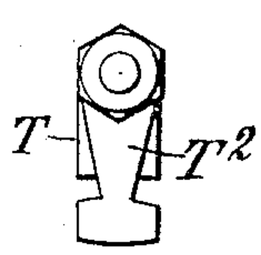


Fig. 14.

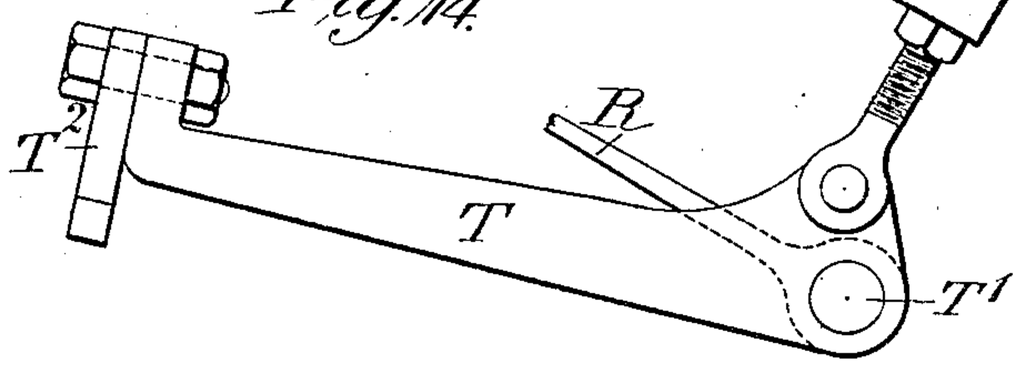


Fig. 15.

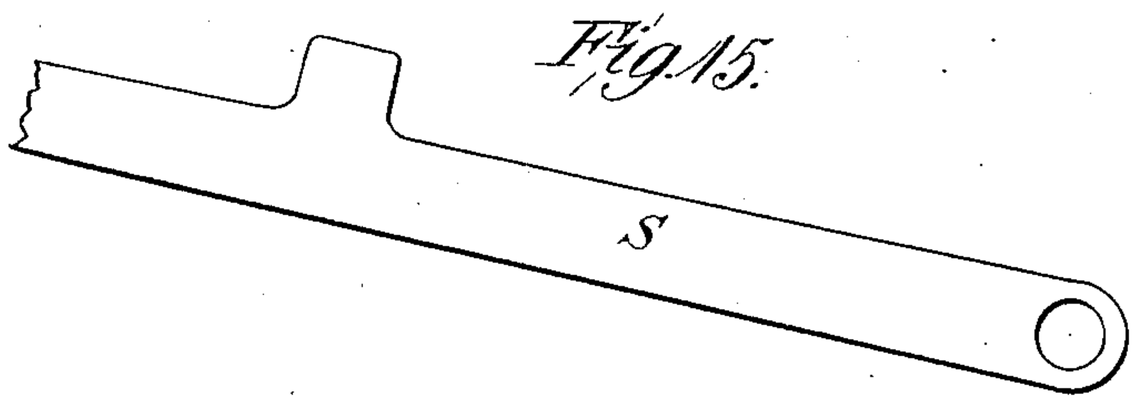


Fig. 16.

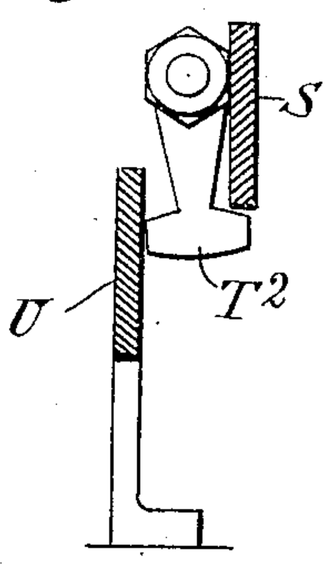
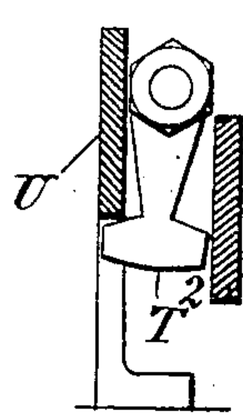


Fig. 17.



Witnesses.

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C. B. Franzoni.

Inventor:

Henry Uray Metcalfe,

By his Attorneys,

Baldwin & Wight.

UNITED STATES PATENT OFFICE.

HENRY WRAY METCALFE, OF EALING, ENGLAND.

CRANE MECHANISM.

No. 882,011. Specification of Letters Patent. Patented March 17, 1908.

Application filed July 8, 1907. Serial No. 382,692.

To all whom it may concern:

Be it known that I, HENRY WRAY METCALFE, engineer commander R. N., a subject of the King of Great Britain, residing at 45 Grange road, Ealing, in the county of Middlesex, England, have invented new and useful Improvements in Connection with Crane Mechanism, of which the following is a specification.

My improvements relate to that class of crane mechanism in which a grab or weight to be lifted or lowered is supported on a loop of lifting rope or chain hanging down from a carriage capable of being traversed along an approximately horizontal support and in which the two ends of the rope are led over guide pulleys to the two barrels of a two barrel winch so constructed that both barrels can be driven in the same and in either direction to raise or lower the grab or weight or one in one direction and the other in the opposite direction to cause the carriage to travel along the horizontal support.

My improvements are shown in the drawings annexed.

Figure 1 is a side elevation of the crane mechanism. Fig. 2 is an end elevation of the same. Fig. 3 is a similar view on a larger scale of the upright frame and a portion of the arm. Fig. 4 is a plan of the under carriage. Fig. 5 a plan of the machinery house. Fig. 6 is a side elevation with the upper half in section of the winch barrels. Fig. 7 a cross section of a modified form of the same. Fig. 8 a section of part of Fig. 7. Fig. 9 is a side elevation and Fig. 10 an end elevation of grab mechanism adapted to be used in conjunction with my crane mechanism if a grab is to be used. Fig. 11 is an elevation, one half in section, of the chain wheel and chains employed in connection with it. Fig. 12 is a section through a portion of the rim of the chain wheel. Figs. 13 to 17 inclusive are detail views of the brake mechanism.

The crane mechanism is constructed of a long arm A suspended at an intermediate point of its length from a pivot at the top of a vertical frame B, so that it may extend out horizontally or approximately so at each of its ends from the frame. Preferably one end of the arm is made longer than the other as shown in Fig. 1. When the crane is in use the outer end of the arm is as shown in Fig. 1 made to rest on a support D which may be either a temporary or permanent support, or wherever it is more convenient it may be upheld by suitable supporting ties.

As shown in the drawings the vertical frame is pivoted on a truck C which may be held fast by means of clips holding it down to the rails upon which the truck rests and by legs or supports thrust downwards from it on to the ground.

On the base of the upright frame B is mounted a winch having two barrels which can be driven in the same and either direction or one in one direction and the other in the other. A winch of this kind of any known construction may be used. The one that I prefer to use but to which I lay no claim is shown in plan view in Fig. 5 and on a larger scale in the detail views Figs. 6, 7 and 8. This winch is formed with a central shaft E upon which two barrels F, G are mounted. The barrel F is fast with the shaft and the barrel G capable of being set loose upon it but normally locked to it by a friction clutch H which is fast with the shaft. Any suitable form of clutch may be used the one shown is a friction clutch which is kept expanded and made to engage with the inner circumference of the barrel by a spring, it may be a coiled spring which surrounds the shaft E and bears at one end against a collar on the shaft and at the opposite end against a collar I which is free to slide on the shaft and which by its movement turns right and left handed screws which when turned thrust apart friction blocks. The spring is not shown in Fig. 6. A treadle-operated lever J keyed to the shaft J′ is provided for releasing the clutch. Preferably I effect this by a short arm J^2 on the shaft J′ being connected by a connecting rod J^3 to lever mechanism, not shown, by which a rod J^4 lying within the shaft can be drawn back and by a key J^5 projecting outwards from it and through a slot on the shaft and into the sliding collar I be made to draw back the collar with it. The central shaft E has also fast upon it a toothed wheel K into which a pinion L on the crank shaft M of any suitable engine may be geared. Or a direct drive from the crank shaft might in many cases be employed. A steam boiler for supplying steam to the engine is shown at N (Figs. 1 and 4). From the crank shaft of the engine a turning movement may as shown also be given to the upright frame B

and to the supporting wheels of the under carriage to cause the carriage to travel along rails on which the wheels run.

The ends of the two barrels which face one another have each fast upon them a toothed wheel O and O′ and these toothed wheels gear with opposite sides of pinions P on spindles P′ P′ which project radially from a ring Q capable of turning freely around the axis E. The outer ends of the spindles P′ pass into an outer ring Q′ which serves as a brake wheel. Or as shown in Fig. 7 the outer and inner rings may be formed as one wheel.

The brake may be a friction band R operated in the ordinary way by a treadle lever S. In this way when both barrels are fast with their shaft both may be turned together in either direction according to the direction in which the shaft is revolved. Or when the brake wheel is stopped from turning and the loose barrel unclutched from the shaft the fast barrel may be revolved in either direction while the loose barrel will be revolved in the other direction.

In order to simplify the working of the brake and clutch in this reversing of the loose barrel both may be operated by the one lever S in Fig. 7 yet allowing of either being operated independently of the other. In this case the treadle lever S is not actually connected to the brake band, being free to turn on the spindle T′ on which the brake lever T is mounted. On the end of this lever T is an anchor T^2 free to swing about its pivot. In the position shown in Figs. 7 and 8 the left hand fluke of the anchor engages under the treadle lever S, the anchor being prevented from swinging away by the guard plate U. Thus on the treadle being depressed the brake lever T will be carried with it and the brake applied. When the lever T has been so far depressed that the right hand anchor fluke reaches the lower extremity of the guard plate U the anchor will swing over, the right hand anchor fluke engaging under the guard plate and the left hand fluke disengaging from the treadle lever.

The brake will now be fully applied and further depression of the lever will have no more effect on it, though it will remain fully applied, as the anchor will be prevented from swinging back again by the side of the treadle lever, suitably widened at this point.

In Figs. 13 to 17, inclusive, part of the brake mechanism is shown more in detail. Figs. 13 and 14 show separately an end view and a side elevation of the brake lever T with the anchor shaped piece, T^2, jointed to its end. Fig. 15 shows separately the treadle lever S. The two levers S and T are mounted side by side on the same spindle T′. When the lever S is in its highest position, as shown in Fig. 16, it is above the right hand fluke of the anchor T^2, and the left hand fluke rests against the face of the fixed plate U. If the lever S is depressed, the anchor T^2 and consequently the brake lever T, to which it is jointed, will be carried down with it. When the lever S has been so far depressed that the anchor has been lowered to such an extent that its left hand fluke has been brought below the level of the bottom of the fixed plate U, the anchor is no longer restrained from turning and it therefore turns into the position shown in Fig. 17. The lever S can then be depressed still further without carrying the brake lever downwards along with it and the side of the lever S, bearing against the end of the right hand fluke insures that the left hand fluke shall be kept holding on below the fixed plate U, and the brake applied until the lever S has been again allowed to rise sufficiently to bring it above the right hand fluke. The anchor can then swing into position to bring its right hand fluke below the lever S and then as the lever S is allowed to rise still further the brake lever will move upwards with it and the brake will be taken off.

On the lever S disengaging from the brake lever T the stop V will come in contact with the clutch lever J and further depression of the treadle will release the clutch.

On releasing the treadle the clutch will first engage, and afterwards the brake is released as the anchor cannot hold it on by itself after the lever S has so far risen as to be out of position for compelling it to do so. Thus with the treadle lever in the position S the brake will be free and the clutch engaged, when it is in the position S′ the brake will be applied, and the clutch still in engagement, while when it is in the position S^2 the brake will be on, and the clutch free, and the barrels in condition to revolve in opposite directions. The two operations of locking the band brake and freeing the clutch may if desired be made to overlap to a certain extent to avoid undue strains on the gear. This can be effected by altering the relative position of the stop V.

When both barrels are locked to the shaft the band brake may be used in the ordinary manner as a brake.

On the arm A of the crane mechanism is mounted what may be called a traveler carriage W, which can be caused to travel to and fro along it. On the carriage are two pulleys *a b*. The ropes by which the materials are to be raised or lowered, and by which the carriage is to be traversed to and fro pass over these pulleys, and hang down between them. They may both be secured to a hook to which the material to be lifted may be attached.

The second end of one rope is passed over a guide pulley *c* at the end of the shorter arm and then downwards in any convenient way and made fast to one of the winch barrels.

The second end of the other rope is first passed around a pulley *d*, at the outer end of the arm, then over a guide pulley *e* at the inner end of the arm and thence downward in any convenient manner to the other barrel.

When the material is to be raised or lowered, both ropes are hauled in or eased out, both barrels being locked to the shaft, which is caused to rotate as necessary.

By supporting the crane arm at an intermediate point of its length and mounting the two barrel winch below it and by leading the ropes passing from the two barrels directly over pulleys at the shorter end of the arm, the longer end of the arm can be raised or lowered by turning both winch barrels in the same direction when the lifting hook or grab has been raised up against the underside of the arm. In this way the end of the longer arm can readily be lifted onto or off any support provided for it.

If it be desired to use a grab in conjunction with this crane mechanism, instead of attaching the ends of the two ropes pendent between the pulleys of the traveler carriage to a lifting hook I attach the ends to a length of chain *f* as shown in Fig. 1 and pass the chain as shown in Figs. 9, 10, 11 and 12 under a chain wheel *g* at the top of the grab as in some forms of grabs heretofore proposed wherein the opening and closing of the grab has been effected by allowing the ropes to for a time run around and thereby turn the pulley. The chain wheel itself may as shown be inclosed within a casing formed with apertures through which the chain enters and leaves. The grab bucket I form as heretofore of an open approximately semi-cylindrical bucket divided radially into two parts or jaws. Each jaw is swiveled about the "haunches," that is the upper outer extremity of each jaw is suspended at its ends by pivots *h* around which the jaw can turn downwards. The pivots *h* are connected by rods *i* to rings *j* surrounding the ends of the axis *g'* of the chain wheel. The upper inner end of each part of the bucket has an arm *k* extending slightly upwards from it.

A rod *l* passed through holes in these arms is upheld by chains or ropes *m* which at their other ends are wound around and secured to the axis *g'* of the chain wheel. This rod forms the axis pin or rod around which the jaws turn as they open or close. The dotted lines in Fig. 10 show the position of the parts when the grab is open.

When the loop of chain *f* is made to travel around the chain wheel *g* and the traveler carriage is prevented from shifting its position along the arm A the chain gearing with the wheel causes it to revolve and thereby either winds up or unwinds the chains or ropes *m* by which the rod *l* is supported and so either closes the grab bucket or allows it to open. An important point in this grab is the mechanical advantage obtained when closing it owing to the fact that the chain wheel can be made of much larger diameter than its axle.

When the bucket is fully open a stop on the chain prevents further travel of the chain around the chain wheel.

When closing the grab the pull on the "closing" side of the rope is heavy while that on the other side is practically *nil*, consequently the carriage would at once move along the arm and the grab would not close if the carriage were not prevented from shifting its position.

In order to be able to hold the traveler carriage stationary while closing the grab the carriage is attached to an endless rope X which is led around pulleys at the ends of the arm A. A brake Y acting on a brake drum on the axis of one of these pulleys can be applied by pulling downwards a cord Z as shown in Fig. 1. The brake I prefer to employ consists of two brake blocks which by the movement of a lever operated by the cord Z can be drawn one against the rope where it passes around the pulley to nip it against the pulley and the other against the opposite side of the pulley itself.

When the traveler carriage is to be shifted along the arm in either direction, the brake R is applied to the brake ring Q', and the clutch H locking the loose barrel to its axis is disengaged by fully depressing the treadle S.

The shaft is caused to rotate in the desired direction, and rope is wound up onto the one barrel while it is unwound from the other, thus causing the traveler carriage to move along the arm in one direction or the other. In this way the material can be raised or lowered, and the traveler carriage can be brought to any desired position along the arm before either raising or lowering.

In the manner hereinbefore described the traveler carriage can be brought to any desired position along the arm, the grab can then be lowered when open and brought down onto whatever material has to be raised. The grab can then be closed and again raised and carried by the traveler carriage to above any spot at which it is to be emptied and may then if desired be lowered to any desired distance before opening to discharge it.

It is obvious that the above described crane mechanism may if desired be mounted on a pontoon for use afloat. In this case the wheels and parts of the under carriage would be dispensed with. The support of the outer end of the arm would be arranged for as previously described.

What I claim is:—

1. Crane mechanism comprising a movable platform, an upright frame pivoted thereon, a crane arm suspended at an intermediate point of its length from a pivot at

the top of the frame, a carriage capable of being traversed along the arm, a two barrel winch and engine for driving it carried on the base of the frame, the barrels of the winch being capable of being driven either in opposite directions or both in the same direction, a rope led from one winch barrel around a guide pulley at the end of one arm then over a pulley on the carriage and downwards and then again upwards and over another pulley on the carriage (leaving a downwardly hanging loop on which the grab or weight to be lifted is supported) and around a guide pulley at the end of the other arm and from thence over a pulley at the end of the first arm back to the second winch barrel, substantially as described.

2. The combination of a crane arm, a carriage capable of being traversed along the arm, a rope led from a winch barrel around a guide pulley at one end of the arm, then over a pulley on the carriage and downwards and then again upwards and over another pulley on the carriage (leaving a downwardly hanging loop on which a grab is supported) and around a guide pulley at the other end of the arm and from thence over a pulley at the end of the first arm back to a second winch barrel, an endless rope rigidly attached to the carriage and passing around pulleys at the two ends of the crane arm and clamping mechanism for gripping this rope and thereby holding it fast whenever the carriage is to be restrained from moving along the arm.

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Witnesses:
J. MAIN,
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