

H. DAVIES.

MECHANISM FOR WORKING SELF ACTING GRABS.

No. 460,362.

Patented Sept. 29, 1891.

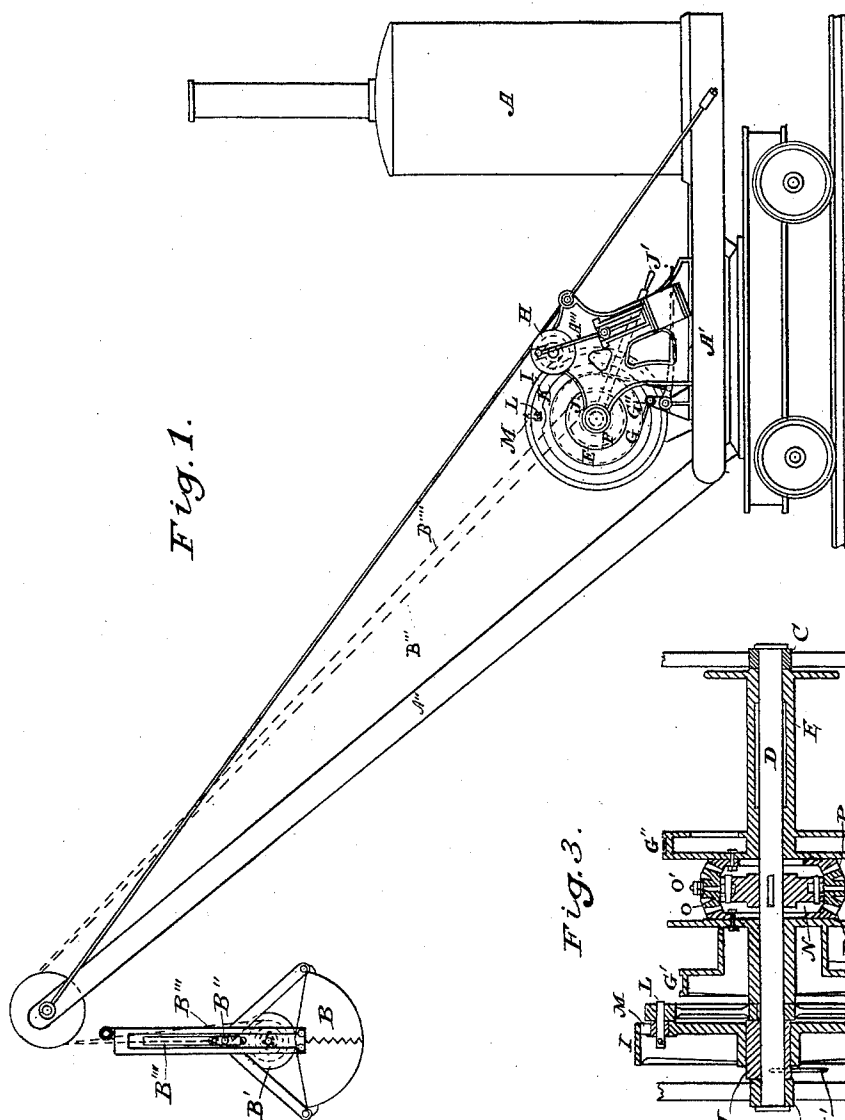
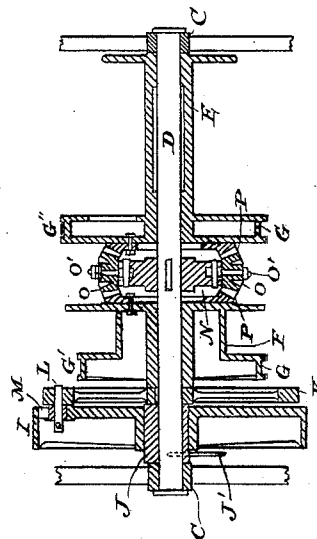


Fig. 1.

Fig. 3.



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(No Model.)

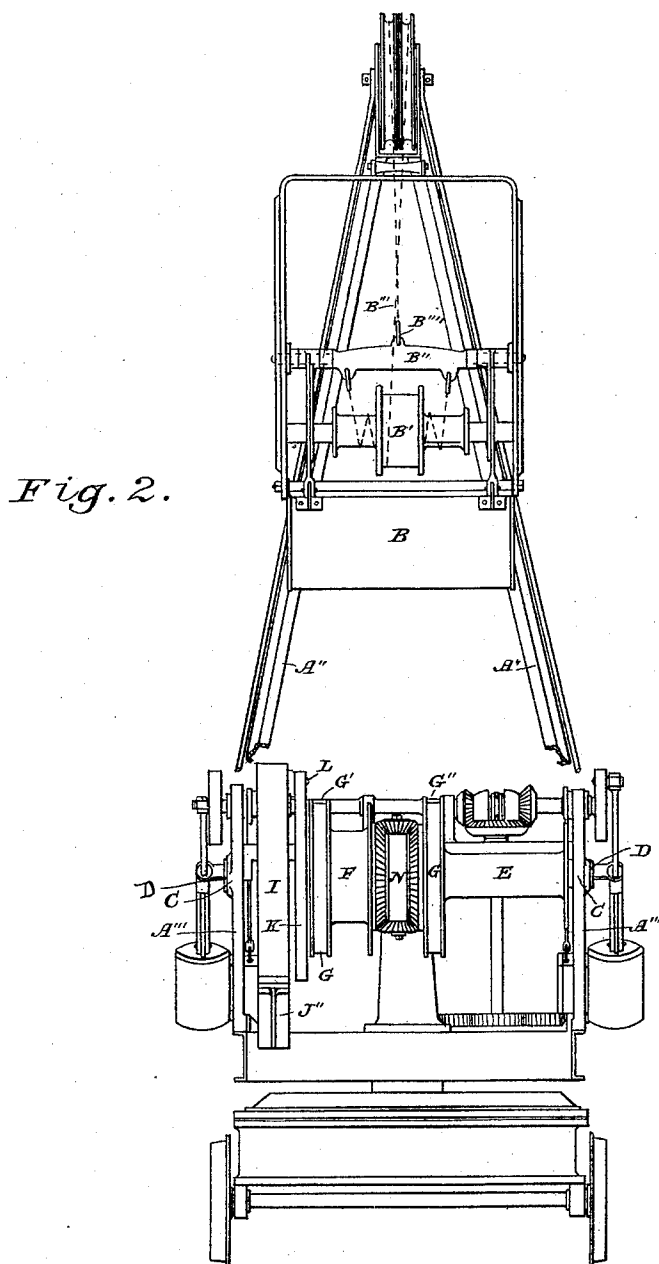
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Fig. 4.

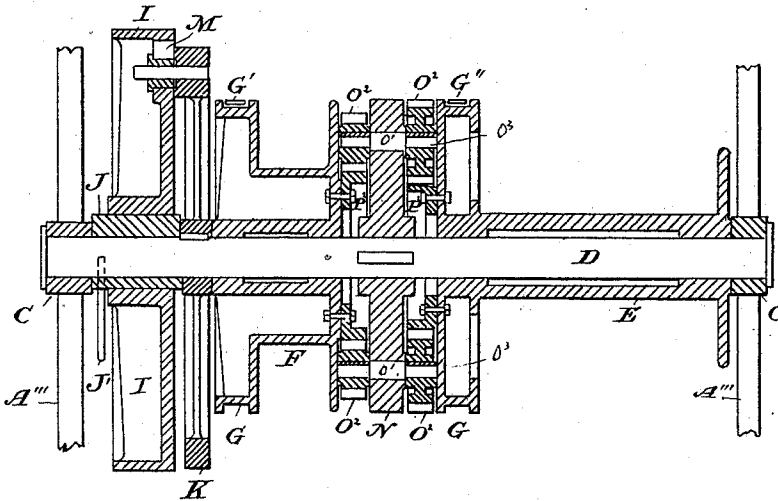
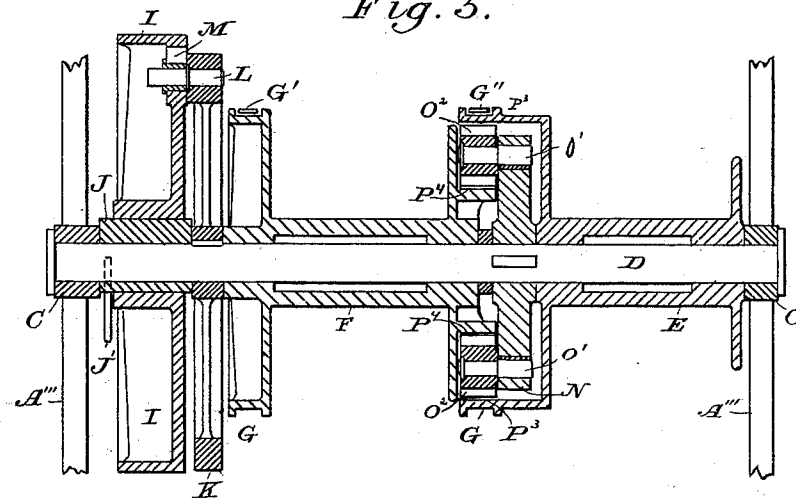


Fig. 5.



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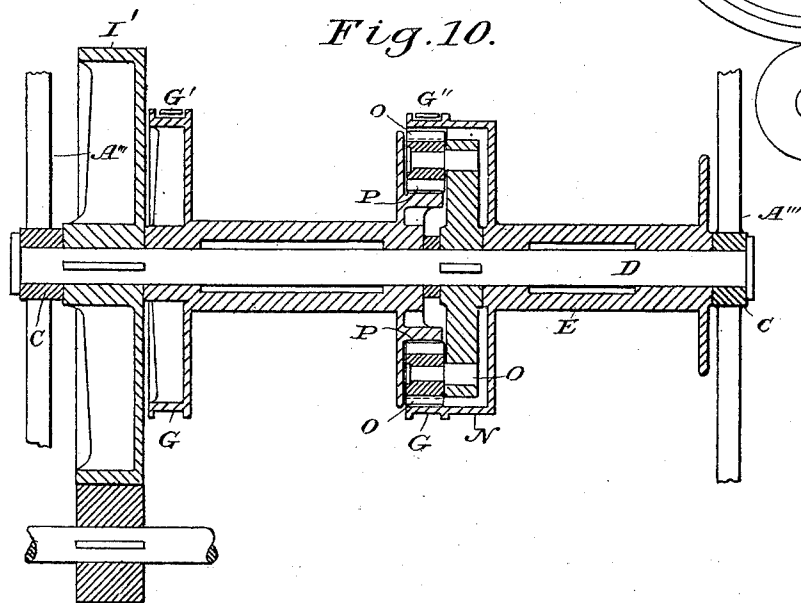
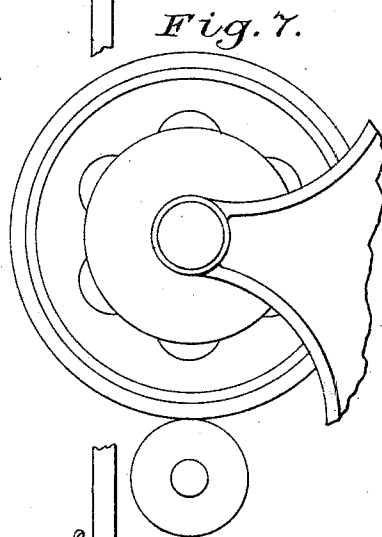
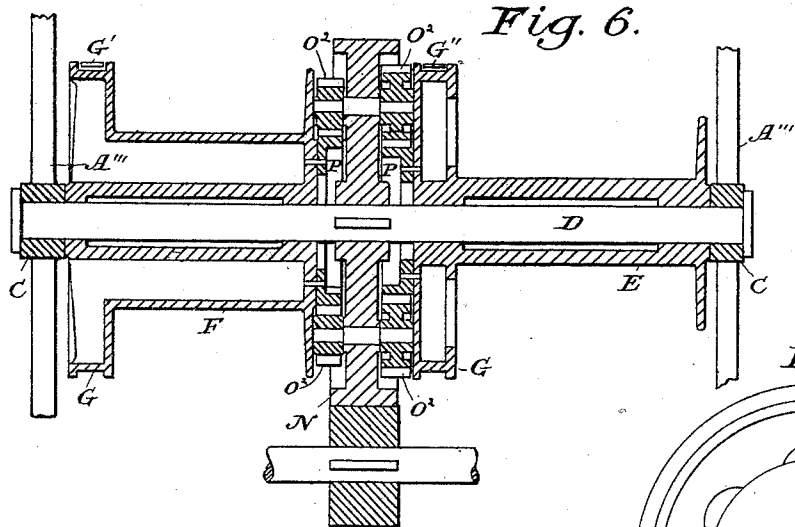
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Fig. 9.

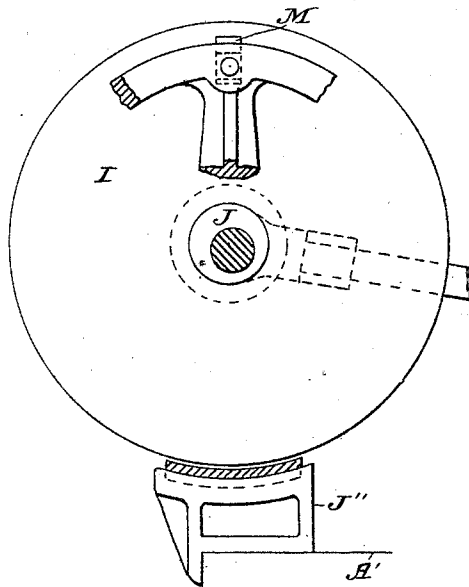


Fig. 8.

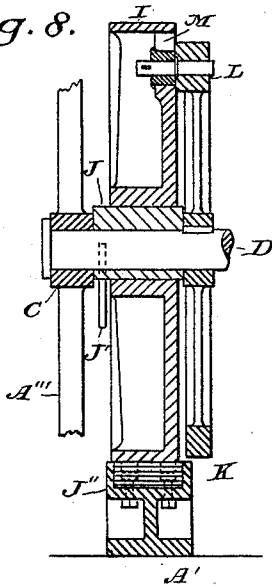


Fig. 11.

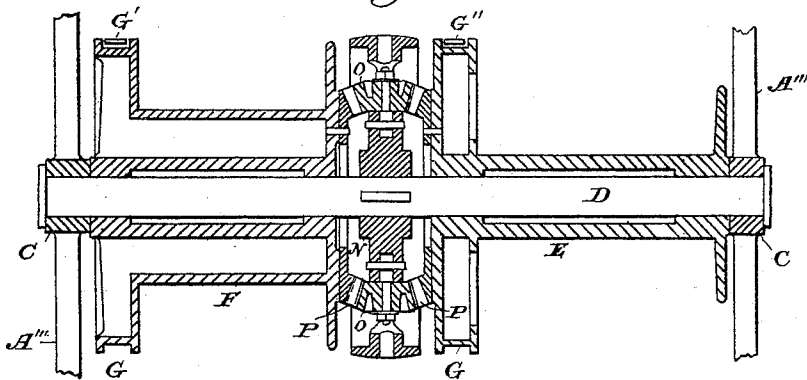
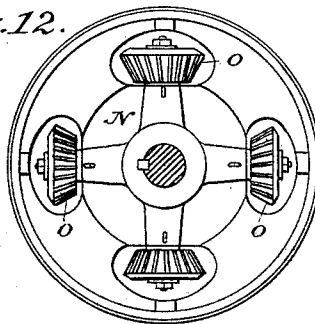


Fig. 12.



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UNITED STATES PATENT OFFICE.

HENRY DAVIES, OF PETERSHAM, NEW SOUTH WALES.

MECHANISM FOR WORKING SELF-ACTING GRABS.

SPECIFICATION forming part of Letters Patent No. 460,362, dated September 29, 1891.

Application filed August 6, 1889. Serial No. 319,954. (No model.)

To all whom it may concern:

Be it known that I, HENRY DAVIES, engineer, of Heathfield, Blairgowrie Street, Old Canterbury Road, Petersham, in the Colony of New South Wales, have invented new and useful Improvements in Mechanism for Working Self-Acting Grabs, Buckets, Claws, and the Like Apparatus, of which the following is a full, clear, and exact description.

My invention has for its object the improvement of mechanical contrivances used for working self-acting grabs, buckets, grabs with tines or claws, and other apparatus used for performing the operations of dredging, excavating, digging, raising, and discharging or depositing.

My improvements consist in the removal of the usual counterbalance-weight or counterbalance-barrel suspended in chains or running in racks at the back of the crane or other contrivances operating by means of a complicated system of messenger-chains, pitch-chains, and wheels and the substitution therefor of two chain or rope barrels mounted on one shaft, each having its own independent brake and both connected with a winding engine, winch, or hoist, from which variable and differential motions are imparted to them by means of wheels and pinions, which may be either bevel, miter, spur, or friction wheels and pinions.

My invention is illustrated by the accompanying drawings, in which the same letters are used throughout the various views to indicate similar parts.

Figure 1 is a side elevation of a grab-dredger and crane fitted with my improved mechanism. Fig. 2 is a front elevation of the same, omitting a portion of the jib. Fig. 3 is a sectional elevation in detail, showing a form of my differential gear, in which bevel or miter-wheels and pinions are used. Fig. 4 is a sectional elevation in detail, showing another form of my differential gear, in which spur wheels and pinions are used; and Fig. 5 is a sectional elevation of a form of my differential gear in which the mechanism consists of pinions gearing into a spur-wheel and an internally-toothed wheel. Fig. 6 is a similar view showing the use of friction-gearing for directly driving the pinion-disk. Fig. 7 is a side elevation of the devices shown in

Fig. 6. Fig. 8 is a sectional view illustrating the braking devices. Fig. 9 is a side view of the same. Fig. 10 is a sectional view illustrating the use of friction-gearing for driving the main shaft. Fig. 11 is a similar view, in which the pinion disk is shown in the form of a pulley adapted to be driven by a belt. Fig. 12 is an elevation of the same, the main shaft being shown in detail.

In Figs. 1 and 2 the boiler A, table A', jib A'', and winch-frame A''' are essential parts of a steam-crane such as is ordinarily used in conjunction with grabs for the purpose of excavating or dredging.

B is a bucket-grab. The barrel B', yoke B'', closing-chain B''', and opening-chain B'''' are the various parts and connections necessary to effect the operations of opening, closing, raising, and lowering the same when in use.

C is a bearing formed in the side frames or cheeks of the winch to receive the main shaft. D is the main shaft.

E is a loose barrel for receiving the closing-chain, and F is another loose barrel for receiving the opening-chain, which is connected to the yoke B'' of the grab.

G G are the brake-treads formed upon the barrels E and F.

G' and G'' are brakes.

H is a friction-pulley transmitting motion to the friction-wheel I.

J is an eccentric placed in the eye of the friction-wheel and operated by means of lever J' to produce contact between the friction-pulley H and wheel I.

K is a driver keyed to the main shaft and engaging the friction-wheel I by means of the crank-pin L, fitting in the slot M, formed in the said friction-wheel, and permitting the eccentric adjustment of the latter.

N is a disk keyed upon the main shaft carrying the bevel-pinions O O upon studs O' O'. P P are bevel gear-wheels secured to the barrels E and F and gearing with the pinions O O.

I make the barrels E and F of the same or different diameters, as may be most suitable for the particular work to be performed; but for working a bucket-grab such as is shown in Figs. 1 and 2 I prefer to make the barrels of different diameters, as shown on Figs. 2

and 3, and to arrange the gearing as shown on Figs. 1, 2, and 3, from which it will be seen that the two barrels E and F are loose on the main shaft D of the winch, from which they receive a differential motion by means of one or more bevel-pinions O O, mounted on a disk N, made fast on the main shaft D and turned by it. The pinions carried by the disk run loose on their bearings and engage with the bevel gear-wheels P P, fixed on the ends of the barrels, so as either to give motion to or receive motion from either barrel, according to requirements.

In the arrangement shown by Fig. 4 the disk N carries one or more pairs of spur wheels or pinions O², each pair of two sizes, running loosely on journals O³, placed parallel with the axis of the main shaft, the said spur wheels or pinions gearing with two spur-toothed wheels P², fixed one upon the end of each barrel.

In another form of my mechanism (shown by Fig. 5) I transmit motion to the barrels by means of one or more spur-pinions O², which are made to gear with an internally-toothed wheel P³, attached to one barrel, and an externally-toothed wheel P⁴, attached to the other barrel. The barrels are made of any suitable diameter, according to the system of wheel-gearing used and the work to be performed in each particular case, certain modifications being necessary to obtain a variable differential motion of the two barrels when used for the purposes set forth. To each barrel I attach the necessary brake treads, which are operated by independent brakes and levers, as in Fig. 3. The disk N is made to revolve in either direction and is under the control of the brake-pad J."

I may cause the disk N to become the driver by affixing to it a rim or face exterior to the pinions adapted to receive motion by some such old and well-known method as a belt, Figs. 11 and 12, spur, or friction gear, Figs. 6 and 7, which will be transmitted to the barrels by means of the differential gear already described and illustrated, in which case the disk N may revolve loose on the shaft D or be secured thereto by a key or feather, when the shaft will revolve with it in the journals C. With this arrangement the friction-wheel I, the eccentric J, the driver K, and the brake-pad J" may be dispensed with, giving greater length of barrels for the same width of winch; or I may drive the shaft D by means of a wheel I', Fig. 10, similar to the friction-wheel I, but secured to the shaft by key or feather, actuated by such old and well-known methods as a belt, spur, or friction gearing. The invention may thus be availed of, though receiving its motive power otherwise than by cylinders, &c., attached to itself—as, for instance, by a portable engine located at a distance.

My invention serves to operate many kinds of grabs, and the arrangements shown by Figs. 1, 2, and 3 is that which I use preferably for

working a bucket-grab, such as is shown on Figs. 1 and 2. In this method the closing chain or rope B''' is coiled around and secured to the barrel B' of the grab, and is led thence over one of the jib-head pulleys to the barrel E, to which its other extremity is secured. The opening chain or rope B''', secured to the cross-bar or yoke B'' of the grab, is led over the other jib-head pulley and thence to the barrel F, to which its other extremity is secured. The friction-wheel I is mounted loose on an eccentric J, placed upon the main shaft, the eccentric being operated by a lever J', which brings the friction-wheel into contact with the driving-pulley H or in contact with the brake-pad J'', Figs. 1 and 2. In the friction-wheel I construct a radial slot M to receive the crank-pin L, attached to the driver K, which is keyed upon the main shaft. When the eccentric J is turned in one direction, the friction-wheel is made to engage with the driving-pulley, thus giving the required motion to the main shaft, upon which the barrels are placed. By a reverse movement of the eccentric the main shaft is arrested, contact being produced between the wheel's face and the brake-pad.

The various motions required to operate the grab are effected as follows: If the grab is suspended as shown in the drawings, the wheel I being on the brake-pad J'', and it is desired to open it, the brake G' of the opening-barrel F is applied. The lever J' is then operated so as to gently release the wheel I, when the grab will open and the spoil will be discharged. The grab is then swung into the required position for descent. The grab may now be said to be ready for lowering for the purpose of excavating, to accomplish which, the wheel I being still kept free, the brake G' is to be judiciously eased, when the descent will be made, both chains being finally allowed to overrun a little in order that the grab may strike with its full weight on the material to be lifted and press with the greatest possible effect upon it. During the subsequent operation of closing, which is effected by again applying the opening-brake G', care should be taken that the opening-chain is well paid out and quite slack. By operating the lever J' contact is now made between the friction-wheel I and the driving-pulley H. The grab will then be made to close upon the material to be excavated. The opening-brake G' is then released, and the grab will at once be raised with its contents to any desired elevation and may be swung into the original position ready to again discharge the spoil.

An important feature in connection with the cut made by the grab actuated by my gear is that it rests with a maximum force upon the material to be excavated and is not deprived of the least part of its effectiveness by the operation of the opening-chain, which in most other appliances used for this purpose lifts the grab partly off its work at this

period, when it is desirable for it to press most forcibly upon the ground. In other mechanism for operating grabs it has also been observed that there is considerable difficulty in releasing and raising the grab when it has closed upon an immovable object, such as a snag; but with this invention it is merely requisite to pay out the closing-chain B''' quite slack and apply the closing-brake G'' and, placing the wheel I and pulley H in contact, haul on the opening-chain B''''', when the grab will open and release the snag.

It has hitherto been found that grabs have a difficulty in operating on refractory ground, such as hard clays and certain impacted and cemented sands. Much of this difficulty is removed by the property which my gear possesses of enabling the grab to gnaw or repeatedly bite at the ground before finally cutting it. This is effected as follows: The grab being open and resting on the ground, some slack chain is paid out, and, the brake G' being applied, the winch is made to haul on the closing-chain B''', but only to make a partial closing. Brake G' is released and slack chain is again paid out. Brake G'' is then applied and the winch is made to haul on the opening-chain B''''', when the grab will open, and so on, repeating the operation of gnawing the surface until a good hold is obtained, when the final cut is made, as before described.

An additional advantage associated with the use of my differential gear is that the depth at which it will work a grab effectively is not limited, and it does not require any adjustment of weights and pulleys to suit variations of depth. My gear also does away with the severe shocks, such as are incident to the use of other mechanism when the weight of the grab and excavated material contained therein is being transferred from one chain to the other. It is also to be noted that in lieu of the chains which are imperatively used with other arrangements I can substitute iron or steel wire ropes, and that whether chains or ropes be employed they may be much lighter than those required by other systems, because with my gear each chain does half the work.

My invention may be operated by means of either hand, steam, or any other motive power.

Having thus described the nature of my

invention and the manner in which the same is carried into effect, I desire to state that I do not confine myself to the precise form of the mechanism hereinbefore described and shown for working self-acting grabs, buckets, and claws, and the like apparatus, as the requisite differential motion of the barrels may be obtained by mechanical variations of my method.

I make no claim for the device of the grabs, buckets, or claws, nor yet for the principle of working such apparatus by means of winches or cranes, or for the use of a differential gear in a windlass or winch used for other purposes than for dredging, excavating, raising, and discharging or depositing, in combination with grabs, buckets, claws, &c.; but what I believe to be new is the particular arrangement and combination of mechanism for the purpose of operating grabs, buckets, claws, and the like apparatus hereinbefore described, and illustrated in the accompanying drawings; and

What I claim is—

1. The combination, with a grab or bucket, of opening and closing connections therefor and two barrels for operating said connections, connected by differential gearing, substantially as set forth.

2. The combination of the grab B, the connections B''' B'''' for closing and opening the same, the barrels E F, differential gearing connecting said barrels, brakes G'' G' for controlling the barrels, and means for actuating the differential gearing, substantially as set forth.

3. The combination, with a grab or bucket, of opening and closing connections therefor, two barrels for operating said connections, connected by differential gearing, and shaft D, eccentric J, wheel I, and brake-pad J² for operating and controlling said gearing, substantially as set forth.

The foregoing specification of my improvements in mechanism for working self-acting grabs, buckets, claws, and the like apparatus signed by me this 10th day of June, 1889.

HRY. DAVIES.

Witnesses:

ALFRED DE LÉON,
Solr., Sydney.

JOHN J. STONE,
Civil Engineer, Sydney.