No. 627,660. Patented June 27, 1899.

A. K. STONE.

DREDGING APPARATUS.

(Application filed Mar. 19, 1898.)

(No Model.)

Fig. 1.

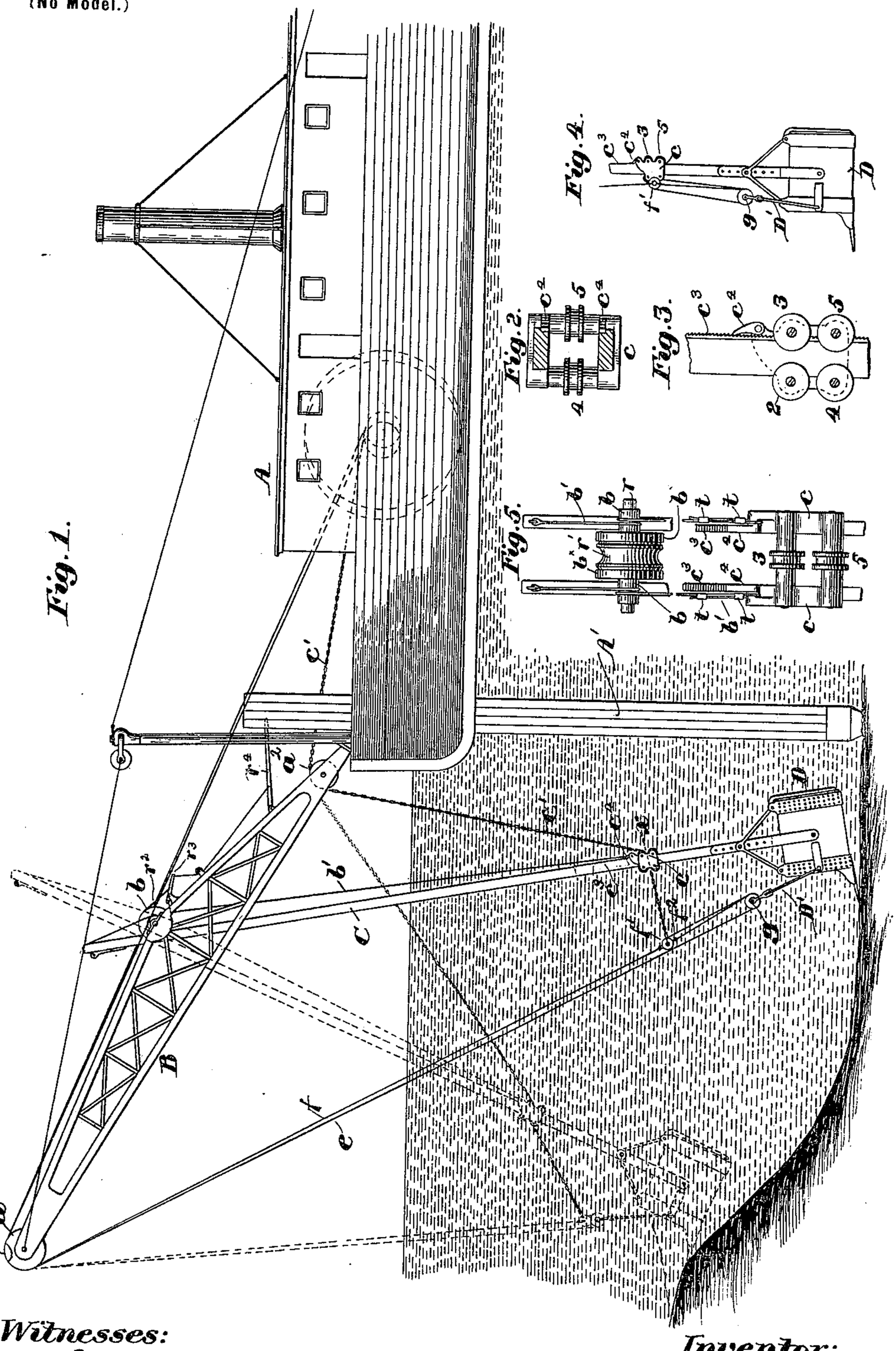

Fig. 4.

Fig. 2.

Fig. 3.

Fig. 5.

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UNITED STATES PATENT OFFICE.

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DREDGING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 627,660, dated June 27, 1899.

Application filed March 19, 1898. Serial No. 674,439. (No model.)

To all whom it may concern.

Be it known that I, ANDREW K. STONE, of Boston, county of Suffolk, State of Massachusetts, have invented an Improvement in Dredging Apparatus, of which the following description, in connection with the accompanying drawings, is a specification, like letters and figures on the drawings representing like parts.

In dredges employing a bucket at the end of a bucket-beam it is customary to provide the bail of the bucket with a pulley-block and the end of the boom in which the bucket-beam slides with another pulley-block, and the chain or cable for hoisting the bucket is connected at one end with the block carried by the boom, and said chain or cable is then carried down under a sheave of the block connected with the bail of the bucket, and then up and over a sheave of the block connected with said boom, and then down again under a sheave of the block connected with the bail, and then over a sheave mounted in the end of the boom, the opposite end of the said chain or cable being then taken to the usual hoisting-drum, thus leaving suspended between the end of the boom and the load what is called "three parts outboard" or a triplicate length of cable to be cared for. With such form of apparatus the bucket is lifted very slowly. I have devised means whereby the bucket may be lifted slowly, as usual, while it is being filled, but when filled the bucket may be lifted rapidly. To do this, the block which has heretofore been carried by the boom is attached to the end of an auxiliary chain or cable under the control of a separate drum, the block attached to the end of said auxiliary chain or cable standing, it may be, in the water when the bucket is being filled. During the filling of the bucket the power to be expended by the dredger is greatest, for the bucket is at such times subjected to its greatest or extreme strain, and at that time the movement of the bucket will be at its slowest speed; but substantially by the time that the bucket is filled it is very desirable to lift the loaded bucket more rapidly. In accordance with my invention while the bucket is being filled the cable, where it presents three lines outboard or three triplicate windings about the two sheaves of the two blocks, is drawn upon and taken up or shortened slowly to draw the block connected to the bucket close to the block attached to the end of the auxiliary chain or cable, that happening about as the bucket is filled or as the lip of the bucket arrives at the top of the surface in which the excavation or cut is being made, the said auxiliary chain or cable and the main cable being thereafter together at a more rapid rate of speed, but, however, at a uniform speed each with relation to the other, the said auxiliary chain or cable and the main chain or cable at such times acting conjointly and together to lift the load, both chains or cables being kept uniformly taut. The bucket having discharged its load is permitted to descend, and at such time both the main and auxiliary cables are slack, and the bucket-beam and bucket are pulled back toward the scow by a back-off chain or cable attached to the block connected with the auxiliary chain or cable, said block being pulled substantially over to the beam or to the carriage, to be described, mounted on the beam, whatever be the position of said carriage, the loosening of the backing-off chain or cable enabling the lip of the bucket to drop and properly engage the bottom. As soon as the lip of the bucket engages the bottom or material to be cut the main chain or cable is started and wound on a suitable drum, which causes the bucket to travel over the bottom or face to be dredged until the bucket is loaded, but during this time the auxiliary chain or cable remains substantially stationary; but when the bucket has been loaded the auxiliary chain or cable and the main chain or cable are started at a faster speed, as will be described.

Figure 1 shows part of a scow with my improved dredging apparatus in place, the full lines showing the bucket in position to be started and filled, the dotted lines showing it in position where it will be loaded. Fig. 2 is a section across the bucket-beam in the line *x*, Fig. 1. Fig. 3 is a somewhat-enlarged side elevation of said bucket-beam and the movable pawl-carriage containing rollers over

which the backing-off chain or cable runs. Fig. 4 shows the position of the parts as the bucket reaches its lowest position and while the pulley-block connected with the auxiliary chain or cable is yet held by the backing-off chain or cable. Fig. 5 is a detail showing part of one side of the bucket-beam with its attached friction, the carriage, and the ratchet-plates engaged by the pawls of the carriage, the beam being broken out to save space upon the drawings.

The scow A, shown as anchored or held in position by a spud A′, has pivoted upon it at one end a boom B, provided at its outer end with two suitable pulleys or sheaves a a' of substantially the same diameter. The boom B has at its end next the scow a third pulley or shaft a^2. The boom has boxes to receive a shaft r, having fast on it at its center (see Fig. 5) a hub r', having its ends convexed or cone-shaped, and loose on this shaft at each side of said hub and in contact therewith are two drums b, each drum having a connected friction-disk $b^\times$, having its face concaved to fit the conical ends of the hub.

Each disk $b^\times$ has coöperating with it a suitable friction device, only one of said devices being herein illustrated, said friction device being herein shown as a band r^2, (see Fig. 1,) surrounding the disk and operated to hug the disk more or less tightly by or through a suitable lever r^3, shown as connected by a cord with a second lever r^4, controlled as to its movements by a man on the scow, so that by or through these levers the friction on the disk $b^\times$ may be regulated or made more or less, as desired, to thus control the speed of descent of the bucket-beam and bucket. This invention is not, however, limited to the precise form of frictions represented, and instead I may use any other well-known or suitable form of friction capable of checking the rotation of the drum, when desired.

Each drum b receives about it a chain or cable b', one end of said chain or cable being attached to the beam, the other end being adjustably connected with a pawl-carriage c, shown as a very heavy casting, weighing in practice about a ton and fitted to slide on the bucket-beam C, carrying the bucket D, which latter may be of any usual or suitable form. This carriage is shown as containing four sheaves 2 3 4 5 each standing in the space between the two parts of the beam. These sheaves receive between them a backing-off chain or cable c', to be described. The beam has attached to it two ratchet-toothed plates c^3, which are engaged each by a suitable like pawl, as c^4, pivotally mounted on said carriage. The pawls in engagement with the said toothed plates prevent the carriage from rising while the backing-off chain is acting to pull the beam and bucket into operative position at the end of the scow. As the bucket is being lifted and filled, the beam rises in the ways formed for it in the boom, the cable b' acting on the friction-drums b, and they at such time being substantially free from friction turn freely; but when the bucket has discharged its load the friction is increased on said drums, so that the speed of the descent of the bucket-beam is duly controlled.

The weight of the carriage c on the chains or cables b', attached to the bucket-beam and extended over the friction-drums, as stated, effects such a close and tight clamping of said chains or cables and said friction-drums b as to preclude any chance or possibility of the said chains or cables slipping on said drums, and consequently by controlling the friction on the drums the speed of descent of the bucket-beam and bucket may be exactly determined.

To provide for adjusting the carriage c vertically on the bucket-beam, the ends of the chains or cables b' may be passed through suitable eyes of the said carriage, and the ends of said cables may then be suitably connected to the chains or cables above said carriage, any usual form of clamp being employed, as at t, and in this way the chains or cables may at desired times be loosened or opened, permitting the carriage to be lowered to the desired point on the beam, and then the said chains or cables may be again secured to other parts of the chain, so that said carriage will be anchored in its proper position, the pawls of the carriage engaging the ratchet-teeth of the plates opposite them.

It will be understood that when the backing-off chain is acting to draw the block f' toward the carriage c the main or auxiliary chains or cables will be slack, thus leaving them under the control of the backing-off chain, and consequently the pulley-block f' at the end of the auxiliary chain or cable is free to be drawn to the carriage in whatever adjustable position it may be put, and it will be understood that the distance between the carriage and the block g controls the length of the outboard or triplicate winding of the main chain or cable. It will consequently be understood that the length of the outboard or triplicate winding will be varied by the depth of the excavation to be made by the bucket, so that the bucket may while it is being filled be moved with its greatest power, and in order to vary the length of this outboard or triplicate winding it is necessary that the casting be adjustable on the beam, and the lower down said casting on said beam the shorter will be the outboard or triplicate winding and the less the depth of the cutting, and vice versa.

The scow has suitable drums, (shown by dotted lines,) each under the control of a suitable steam-engine, the said drums being actuated by friction devices engaging them, the said drums being capable of being driven at any desired or suitable speed, according to the degree of friction, and the drums may be rotated separately or all together at any desired speed. The main chain or cable e is ex-

tended from one of these usual drums over the sheave a', and the auxiliary cable f is extended from another of these drums over the sheave a, and the said auxiliary cable has attached to its outer or free end a block f', having a hook f^2.

The bucket D, connected with the beam b', is and may be of any usual or suitable construction, it being represented as provided with a bail D', having a block g.

The outer or free end of the main chain or cable is led over the pulley a' about the sheave of the block g, then up over and around a sheave of the block f', down again under a sheave of the block g, and the end of said chain or cable is then attached to the hook f^2 of the block f'. The end of the backing-off chain c' is also connected to a suitable hook or projection of the block f', and said chain is then led through between the rollers or sheaves of the carriage c and is then passed over the sheave a^2 and connected to its own actuating-drum. These drums may be and commonly are arranged side by side on the scow and in substantially the same line; but for the sake of better illustration I have shown the centers of these drums slightly out of line.

In operation let it be supposed that the lip of the bucket has just descended onto the bottom to be dredged or cut, as shown by full lines in Fig. 1. In this condition of the parts, as represented by full lines, it will be supposed that the chain c' is slack and that the auxiliary chain or cable is fixed and that one of the drums has been started to wind the main cable e. The winding of this cable causes the bucket (it being held down against the bottom being dredged by friction acting on the beam b') to be drawn to the left, its lip entering the material, the bucket rising from the cut filled. During the time that this bucket is being filled the outboard or triplicate winding is shortened, the bucket at such time moving at its slowest speed, the power exerted by the dredger being at its extreme. During the filling of the bucket the block g is drawn substantially up to the block f', the latter block preferably remaining stationary. About, however, as the block g meets the block f' the bucket will be filled, and then the bucket should be raised at a much more rapid speed until it is brought into the position where it is to be discharged. To effect this, the drum containing the auxiliary chain or cable is started at a high speed, and the drum containing the main chain or cable, partially wound, is started at a higher speed, a speed substantially equal to that of the drum receiving upon it the auxiliary chain or cable, and thereafter these two chains or cables are wound simultaneously and equally at a high speed, so that said chains or cables coöperate conjointly to carry the load, the blocks g and f' remaining during this operation substantially in contact. During this rapid raising of the bucket the chain or cable c' is loose; but after the bucket has been discharged the chain or cable c' is immediately tightened and wound on its own drum, and friction is applied to the drums b, and said chain is wound and through its connection with the block f' draws said block over against the carriage c on the beam and draws said beam and bucket toward the end of the scow, the block f' meeting the said carriage at its lowest point when the beam and bucket are in their most depressed position, and the outboard or triplicate winding extends always only from the block f' to the block g. Now to again load the bucket the chain c' is again made slack and the operation before described is repeated.

I believe that I am the first to employ a carriage upon the bucket-beam and control its position thereon according to the depth of the cut to be made in the bottom or bank to be dredged. So this invention is not limited to the particular shape shown for said carriage, nor is it limited to the use of the particular bucket shown, as I may employ any other usual or suitable bucket.

Having fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a dredging apparatus, the following instrumentalities, viz: a boom; a main and an auxiliary chain or cable; a block carried at the end of said auxiliary chain or cable; a bucket having an attached block over and about which the said main chain or cable is passed, said chain or cable being attached to the block carried by said auxiliary chain or cable; means to wind said main chain or cable at a slow speed and to thereafter wind both said chains or cables at a faster speed, and a bucket-beam, and a bucket, substantially as described.

2. In a dredging apparatus, the following instrumentalities, viz: a boom; a main and an auxiliary chain or cable; a block carried at the end of said auxiliary chain or cable; a bucket having an attached block over and about which the said main chain or cable is passed, said chain or cable being attached to the block carried by said auxiliary chain or cable; means to wind said main chain or cable at a slow speed and to thereafter wind both said chains or cables at a faster speed; a bucket-beam, a bucket, and a backing-off chain or cable connected with the block of said auxiliary chain or cable, to operate substantially as described.

3. In a dredging apparatus, the following instrumentalities, viz: a main and an auxiliary chain or cable; a block carried at the end of said auxiliary chain or cable; a bucket having an attached block over and about which the said main chain or cable is passed, said chain or cable being attached to the block carried by said auxiliary chain or cable, means to wind said main chain or cable at a slow speed, and to thereafter wind both said chains or cables simultaneously at a faster speed; a bucket-beam; a pawl-carriage mounted there-

on, a backing-off chain connected with the block attached to said auxiliary chain or cable, and passed through said carriage, and means to draw upon said backing-off chain to pull the block attached to said auxiliary chain or cable up to the block carried by the said bucket, substantially as described.

4. In a dredging apparatus, a boom, friction-drums mounted thereon, a bucket-beam having an attached bucket, a pawl-carriage mounted on said beam, and chains or cables connected each at one end with said bucket-beam, and adjustably connected at their ends with said pawl-carriage, the said chains or cables between their ends encircling the said drum, substantially as described.

5. In a dredging apparatus, the following instrumentalities, viz: a boom; a main and an auxiliary chain or cable; a block carried at the end of said auxiliary chain or cable; a bucket having an attached block over and about which the said main chain or cable is passed, said chain or cable being attached to the block carried by said auxiliary chain or cable; means to wind said main chain or cable at a slow speed and to thereafter wind both said main and auxiliary chain or cable simultaneously at a faster speed; a bucket-beam, a pawl-carriage, a carriage mounted thereon, pawls to hold said carriage in adjusted position, friction-drums mounted on said boom, chains or cables connected with said bucket-beam extended about the friction-drums mounted on said boom, and attached adjustably with said carriage, whereby said carriage may be raised or lowered on said beam according to the depth of cut to be made by said bucket; a backing-off chain connected with the block carried by said auxiliary chain or cable, and extended through said carriage, and a drum to wind at proper times said backing-off chain, as when the block connected with the auxiliary chain or cable is to be pulled to the block connected with the said bucket, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ANDREW K. STONE.

Witnesses:

GEO. W. GREGORY,

J. NELSON LEWIS.