

No. 778,634.

PATENTED DEC. 27, 1904.

W. A. COLLINS.
DREDGE.

APPLICATION FILED SEPT. 14, 1904.

2 SHEETS—SHEET 1.

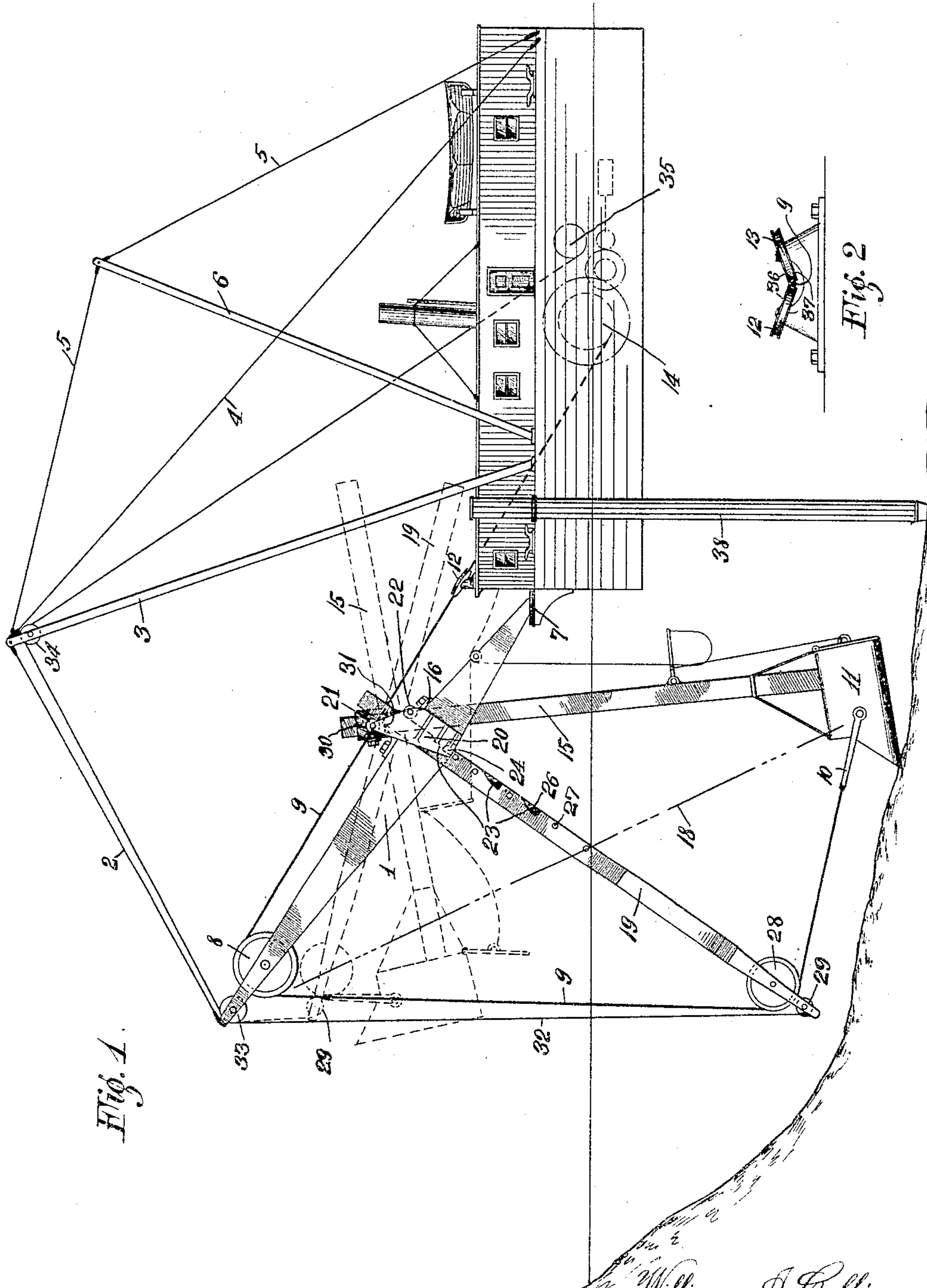


Fig. 1.

Fig. 2.

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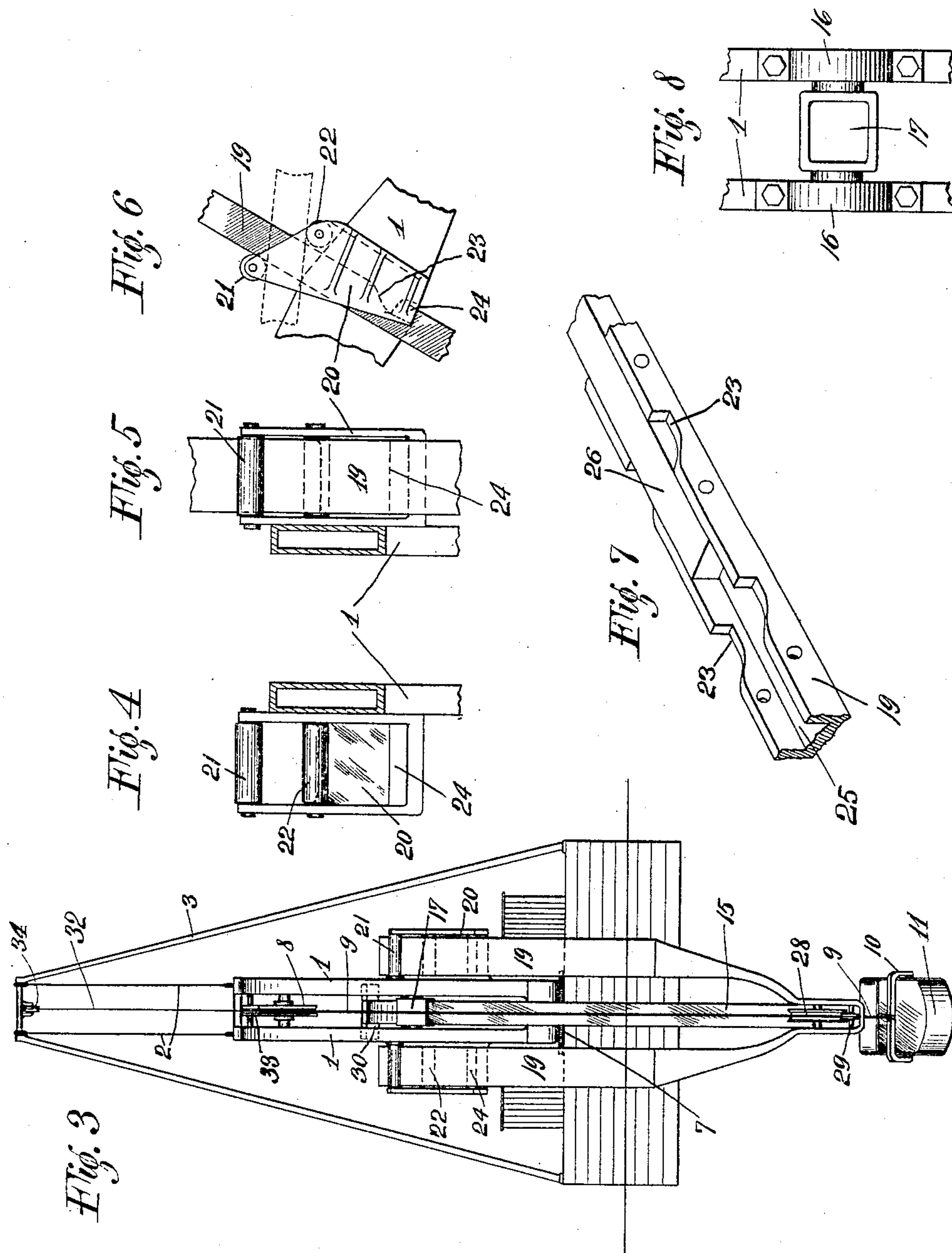
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2 SHEETS—SHEET 2.



Witnesses
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Annie Wiseman

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UNITED STATES PATENT OFFICE.

WILLIAM A. COLLINS, OF BLOOMFIELD, NEW JERSEY.

DREDGE.

SPECIFICATION forming part of Letters Patent No. 778,634, dated December 27, 1904.

Application filed September 14, 1904. Serial No. 224,386.

To all whom it may concern:

Be it known that I, WILLIAM A. COLLINS, a citizen of the United States of America, and a resident of Bloomfield, county of Essex, and State of New Jersey, have invented certain new and useful Improvements in Dredges, of which the following is a specification.

My invention refers generally to dredges, and its more particular reference will appear hereinafter.

My object has been to provide means whereby the power can be utilized to secure a more perfect and uniform penetration of the dipper into the material to be dredged. In carrying out this object I am enabled to do away with considerable labor necessary in operating dredges as at present constructed.

Further objects and utilities will appear as the specification proceeds.

I have illustrated my invention in the accompanying drawings, in the several figures of which I have designated like parts by like characters of reference. These drawings show my invention in a form which I prefer; but I do not wish to limit myself to the particular form or arrangement of parts there shown, since changes may of course be made without departing from the spirit of my invention.

In the drawings, Figure 1 is a diagrammatic view showing a dredge in which my invention is employed. Fig. 2 is a detail view of a pair of sheaves used to guide the operating-chain to its drum. Fig. 3 is a front elevation of said dredge. Figs. 4, 5, and 6 are detail views showing the manner of joining the radial arm to the boom. Fig. 7 is a detail perspective view of a portion of the radial arm. Fig. 8 is a detail view of the saddle and cannon.

In Fig. 1 I have shown a dredge of the usual type employing one operating chain or "whip." Extending from the bow of the dredge is a boom 1, suitably supported by the stays 2, which lead and are made fast to the truck of an A-frame 3. The latter is stepped so that it inclines forwardly, its uppermost point or truck being forward of the vertical plane of the pivot of the boom. The A-frame is secured in position by a backstay 4, made fast to the after-body of the dredge. In the

present instance I prefer to furnish additional support to the A-frame, and I have therefore provided an auxiliary backstay 5, made fast to the after-body of the dredge and leading over the A-frame 6, stepped near the foot of the A-frame and having a pronounced rake. The boom is usually mounted on a turn-table 7, so that it may swing in a horizontal plane. At its outboard end is a sheave 8, and rove through this sheave is an operating chain or cable 9, made fast to the bail 10 of the dipper 11 and leading through the guide-sheaves 12 and 13 to the drum 14, which is operated in the usual manner by gears and an engine. The dipper is carried by a dipper-handle 15, which swings in a vertical plane.

The dipper-handle operates in the boom in the following manner: A saddle 16 is secured at a suitable point on the upper side of the boom and bears a member commonly called a "cannon" 17, having bearings engaging in the saddle, and with its central portion substantially rectangular in shape. Through this cannon moves or slides the handle. The dipper-handle (shown in full lines in Fig. 1) is in a position where it is ready to be operated. As hitherto constructed power would be applied to the operating chain or cable along a line running from the point where the bail is attached to the dipper up to the sheave on the outboard end of the boom over which the chain passes. The power being applied, it is divided into its proper components, and the greater portion of it will result in a tendency to raise the dipper-handle upward through the cannon. This upward sliding of the dipper-handle, if unchecked, would render the filling of the dipper impossible. The tendency of the handle to rise has been counteracted hitherto by pinch or gib plates bearing against the handle where it passes through the cannon, and these plates have been operated by various devices commonly employed in friction-clutches. By regulating the friction of the pinch-plates on the handle the latter was held more or less rigidly at its lowermost position when power was applied to the operating-chain. This method of holding down the dipper-handle so that penetration of the dipper may be secured has proved very inef-

ficient and has involved the constant care and attention of a skilled workman at the mechanism used for operating the pinch-plates.

By employing my invention I do away with the necessity of the labor incident to operating the pinch-plates, and I provide a mechanism operating automatically and which insures a far greater and more uniform penetration of the dipper into the material to be dredged than has hitherto been possible. I accomplish this by interposing a member on the operating chain or cable at a suitable point between its connection with the dipper and the outboard end of the boom.

The angle which the operating-chain passing over the outboard end of the boom makes with the dipper-handle when the latter is at its lowermost position may be appropriately termed the "working" angle of the operating-chain. In dredges operating as at present this angle is sharply acute, as will be seen on reference to Fig. 1, where I have indicated such an angle by dotted line 18. To secure the proper penetration of the dipper, this working angle of the chain must be increased, and this is the function which the interposed member 19 performs. By its use I am enabled to secure a working angle of about eighty-five degrees. This member I shall term herein a "radial" arm, and I have shown it sliding through the box 20, secured to the outer side of the boom. I have mounted in this box the friction-rollers 21 and 22, which facilitate the movement of the radial arm through the box. The radial arm may be said to be in its operative position whenever it holds the operating-chain at a greater angle than that formed by the dipper-handle and a line drawn from the point where the operating-chain connects with the dipper to the sheave at the outboard end of the boom over which the chain passes. The arm is normally free to slide or roll through the box 20.

The radial arm, as shown in full lines in Fig. 1, is in its operative position, and when power is applied to the operating-chain the latter will exert a thrust upon the radial arm, tending to slide it back through the box. Means must therefore be provided to hold the arm in its operative position and to resist this thrust. Such means may take any suitable form. I have here shown such means in the form of a recess or notch 23 in the after side of the radial arm and a projection or lug 24 in the box adapted to engage in said recess or notch formed in the arm. The lug and notch when in engagement hold the radial arm against the thrust of the operating-chain.

It may be found desirable to adapt the working angle of the chain to suit various local conditions. Since the radial arm serves to increase this working angle, it is manifestly possible to vary such angle by adjusting the radial arm. That portion of the radial arm which lies between its point of contact with

the operating-chain and the point where it is held against the thrust of the latter may be termed its "operating radius." It is manifest that as this operating radius is varied the working angle of the chain will be varied in like degree. Hence the operating radius of the radial arm is preferably adjustable. Means to accomplish this end may take any form, and I have shown in the drawings means which I have found simple and effective. On the inboard face of the radial arm I form a groove 25, in which slides a block 26, which can be secured in any suitable position by means of pins 27. In the flanges formed by the groove I provide the recesses or notches 23, which are adapted to engage with the lug 24 of the box. The block 26 is of equal depth with the groove, so that when it abuts any particular recess or recesses the engagement of such recess with the lug is prevented. One recess is of course left free to engage with the lug at such a point as secures the desired operating radius of the arm.

While the outer end of the radial arm may bear in any suitable manner upon the operating-chain, I have preferred to have a sheave 28 at its outboard end bearing thereupon, such sheave acting as a bearing when the chain is operated.

When power is applied to the operating-cable, the dipper is drawn forward and upward from the position shown in full lines in Fig. 1 to the position shown in dotted lines. On its ascent it picks up the radial arm, carrying the latter with it upward to the position shown by the dotted lines. When the radial arm is picked up by the dipper-bail, the rollers act as a pivot about which both the handle and the arm revolve. Since the recess is an open one, the arm at a suitable point will slip its lug, and will then be free to slide inboard through the friction-rollers in the box. The dipper-handle passes freely through the cannon, and hence at the moment when the radial arm ceases to be held against the thrust of the operating-chain the handle is likewise free to pass inboard to the position shown in dotted lines in Fig. 1. When the dipper and radial arm are in their raised position, the outboard end of the arm will be in a higher plane than its inboard end, and it will therefore have a tendency to slide inboard. A stop must therefore be provided which shall effectually check this inboard motion. This stop may be formed variously. I have here shown it in the form of a sheave 29, placed between sheave 28 and the outboard end of the radial arm. This sheave bears against the operating-chain, and thereby prevents the radial arm from sliding inboard.

The descent of the dipper and the radial arm into the positions shown in full lines in Fig. 1 takes place by gravity in the usual manner. In order that the dipper-handle may not pass

entirely out of the boom, I have provided an adjustable stop 30 at the end of the handle opposite the dipper and the buffer 31 on the boom, which limits the downward motion of the dipper-handle. In like manner it is desirable to limit the descent of the radial arm in some positive manner. I accomplish this by means of the rope 32, made fast to the outboard end of the radial arm and rove through a sheave 33, placed between the sheave 8 and the outboard end of the boom and sheave 34, placed in the truck of the A-frame. When the radial arm is raised, this rope will be slackened. I therefore provide in the dredge suitable slack-take-up mechanism 35, operated in the usual manner.

The thrust exerted by the operating-chain on the radial arm produces a lateral vibration of the latter and tends to cause a corresponding buckling. To meet this strain, therefore, I prefer a radial arm substantially oblong in cross-section, and I position it in such a manner that its broader sides face inboard and outboard.

The sheaves 12 and 13, which serve to guide the operating-chain to its drum, are in the present instance placed on the deck-house and are inclined at an angle toward each other, so that the upper edges 36 are in close proximity, while the lower edges 37 are comparatively far apart. This prevents the operating-chain from losing its sheave. The scow may be anchored in any suitable manner, as by the spuds 38, driven from the port and starboard sides of the scow.

While I have shown my invention applied to a dredge employing only one operating chain or whip, it is apparent that the radial arm and its operating parts can be duplicated on both sides of the boom or other means found which render my invention applicable to dredges having two operating chains or whips.

From the foregoing description it will be seen that I have provided means whereby a more perfect and uniform penetration of the dipper is secured and its full capacity therefore utilized. I have thereby increased the efficiency of the dredge, and I have, furthermore, done away with the labor hitherto attendant upon manipulating the pinch-plates above described, and I have substituted in their place means which not only secure a more perfect and uniform penetration of the dipper, but whose parts are stronger, simpler, and automatically operable.

Having thus described my invention, what I claim is—

1. In a dredge or the like, the combination with a boom, a dipper and a dipper-handle, of an operating-chain secured to the dipper, means for operating said chain and a member bearing on the operating-chain and adapted to regulate the working angle thereof.

2. In a dredge or the like, the combination

with a boom, a dipper and a dipper-handle, of an operating-chain secured to the dipper and passing over the outboard end of the boom, means for operating said chain, and a radial arm interposed on the operating-chain between the dipper and the outboard end of the boom adapted to regulate the working angle of the operating-chain.

3. In a dredge or the like, the combination with a boom, a dipper and a dipper-handle, of an operating-chain, means for operating the chain, and means adapted to regulate the working angle of said chain.

4. In a dredge or the like, the combination with a boom, a dipper and a dipper-handle, of an operating-chain secured to the dipper and passing over the outboard end of the boom, means for operating said chain, and a radial arm mounted on the boom and interposed on the operating-chain between the dipper and the outboard end of the boom, said arm being adapted to regulate the working angle of the operating-chain.

5. In a dredge or the like, the combination with a boom, a dipper and a dipper-handle, of an operating-chain secured to the dipper and passing over the outboard end of the boom, means for operating said chain, and a radial arm slidably mounted on the boom and interposed on the operating-chain between the dipper and the outboard end of the boom, said arm being adapted to regulate the working angle of the operating-chain.

6. In a dredge or the like, the combination with a boom, a dipper and a dipper-handle, of an operating-chain secured to the dipper and passing over the outboard end of the boom, means for operating said chain, a radial arm slidably mounted on the boom and interposed on the operating-chain between the dipper and the outboard end of the boom, said arm being adapted to regulate the working angle of the operating-chain, and means adapted to hold the arm against the thrust of the operating-chain while the arm is in its operative position.

7. In a dredge or the like, the combination with a boom, a dipper and a dipper-handle, of an operating-chain secured to the dipper and passing over the outboard end of the boom, means for operating said chain, a radial arm mounted on the boom and interposed on the operating-chain between the dipper and the outboard end of the boom, said arm being adapted to regulate the working angle of the operating-chain, and means adapted to hold the arm against the thrust of the operating-chain while the arm is in its operative position.

8. In a dredge or the like, the combination with a boom, a dipper and a dipper-handle, of an operating-chain secured to the dipper and passing over the outboard end of the boom, means for operating said chain, a radial arm interposed on the operating-chain between the

dipper and the outboard end of the boom adapted to regulate the working angle of the operating-chain, and means adapted to hold the arm against the thrust of the operating-chain while the arm is in its operative position.

9. In a dredge or the like, the combination with a boom, a dipper and a dipper-handle, of an operating-chain secured to the dipper, means for operating said chain, a member bearing on the operating-chain and adapted to regulate the working angle thereof, and means adapted to hold the member against the thrust of the operating-chain when the member is in its operative position.

10. In a dredge or the like, the combination with a boom, a dipper and a dipper-handle, of an operating-chain secured to the dipper and passing over the outboard end of the boom, means for operating said chain, a box secured to the boom and provided with a lug, a radial arm carried by the said boom and sliding in the box, having its outer end bearing on the operating-chain between the dipper and the outboard end of the boom, and being adapted to regulate the working angle of the operating-chain, said arm having a recess adapted to receive the lug, said lug and recess being adapted, when in engagement, to resist the thrust of the operating-chain when the arm is in its operative position.

11. In a dredge or the like, the combination with a boom, a dipper and a dipper-handle, of an operating-chain secured to the dipper and passing over the outboard end of the boom, means for operating said chain, a radial arm mounted on the boom and interposed on the operating-chain between the dipper and the outboard end of the boom, said arm being adapted to regulate the working angle of the operating-chain, and adjustable means adapted to fix the operating radius of the arm.

12. In a dredge or the like, the combination with a boom, a dipper and a dipper-handle, of an operating-chain secured to the dipper and passing over the outboard end of the boom, means for operating said chain, a radial arm mounted on the boom and interposed on the operating-chain between the dipper and outboard end of the boom, said arm being adapted to regulate the working angle of the operating-chain, and adjustable means adapted to fix the operating radius of the arm and to hold the arm against the thrust of the operating-chain when the arm is in its operative position.

13. In a dredge or the like, the combination with a boom, a dipper and a dipper-handle, of an operating-chain secured to the dipper and passing over the outboard end of the boom, means for operating said chain, a box secured to the boom and provided with a lug, a radial arm carried by the said boom and sliding in the box, having its outer end bearing on the operating-chain between the dipper and the

outboard end of the boom, and being adapted to regulate the working angle of the operating-chain, said arm having a series of recesses adapted to receive the lug, said lug and recesses being adapted, when in engagement, to resist the thrust of the operating-chain when the arm is in its operative position, and means adapted to close all but one of the recesses against engagement with said lug.

14. In a dredge or the like, the combination with a boom, a dipper and a dipper-handle, of an operating-chain secured to the dipper and passing over the outboard end of the boom, means for operating said chain, a box secured to the boom and provided with a lug, a radial arm carried by the said boom and sliding in the box, having its outer end bearing on the operating-chain between the dipper and the outboard end of the boom, and being adapted to regulate the working angle of the operating-chain, said arm having a groove in the central portion of its after side, a series of notches in said arm adapted to relieve the lug, said lug and notches being adapted, when in engagement, to resist the thrust of the operating-chain when the arm is in its operative position, a block movable in said grooved portion of the arm, of a thickness equal to the depth of the groove, adapted to close the notches against engagement with the lug, and means for securing said block in position.

15. In a dredge or the like, a boom, a support therefor, means for swinging said boom in a horizontal plane, a dipper, a dipper-handle, carried by the boom and swingable in a vertical plane, an operating-chain secured to the dipper and rove through a sheave at the outboard end of the boom, means for operating said chain, and a member bearing on the operating-chain and adapted to regulate the working angle thereof.

16. In a dredge or the like, a boom, a support therefor, means for swinging said boom in a horizontal plane, a dipper, a dipper-handle, carried by the boom and swingable in a vertical plane, an operating-chain secured to the dipper and rove through a sheave at the outboard end of the boom, means for operating said chain, a radial arm swingable in a vertical plane and interposed on the operating-chain between the dipper and the outboard end of the boom adapted to regulate the working angle of the operating-chain.

17. In a dredge or the like, a boom, a support therefor, means for swinging said boom in a horizontal plane, a dipper, a dipper-handle, carried by the boom and swingable in a vertical plane, an operating-chain secured to the dipper and rove through a sheave at the outboard end of the boom, means for operating said chain, and means adapted to regulate the working angle of said chain.

18. In a dredge or the like, a boom, a support therefor, means for swinging said boom in a horizontal plane, a dipper, a dipper-handle,

dle carried by the boom and swingable in a vertical plane, an operating-chain secured to the dipper and rove through a sheave at the outboard end of the boom, means for operating said chain, a radial arm mounted on the boom, swingable in a vertical plane and interposed on the operating-chain between the dipper and the outboard end of the boom, said arm being adapted to regulate the working angle of the operating-chain.

19. In a dredge or the like, a boom, a support therefor, means for swinging said boom in a horizontal plane, a dipper, a dipper-handle carried by the boom and swingable in a vertical plane, an operating-chain secured to the dipper and rove through a sheave at the outboard end of the boom, means for operating said chain, a radial arm mounted on the boom, swingable in a vertical plane and interposed on the operating-chain between the dipper and the outboard end of the boom, said arm being adapted to regulate the working angle of the operating-chain, and means adapted to hold the arm against the thrust of the operating-chain when the arm is in its operative position.

20. In a dredge or the like, a boom, a support therefor, means for swinging said boom in a horizontal plane, a dipper, a dipper-handle carried by the boom and swingable in a vertical plane, an operating-chain secured to the dipper and rove through a sheave at the outboard end of the boom, means for operating said chain, a box secured to the boom and provided with a lug, a radial arm carried by said boom and sliding in the box, having its outer end bearing on the operating-chain between the dipper and the outboard end of the boom and adapted to regulate the working angle of the operating-chain, said arm having a recess adapted to receive the lug, said lug and recess being adapted, when in engagement, to resist the thrust of the operating-chain when the arm is in its operative position.

21. In a dredge or the like, a boom, a support therefor, means for swinging said boom in a horizontal plane, a dipper, a dipper-handle, carried by the boom and swingable in a vertical plane, an operating-chain secured to the dipper and rove through a sheave at the outboard end of the boom, means for operating said chain, a radial arm swingable in a vertical plane and interposed on the operating-chain between the dipper and the outboard end of the boom adapted to regulate the working angle of the operating-chain, and adjustable means adapted to fix the operating radius of the arm.

22. In a dredge or the like, a boom, a support therefor, means for swinging said boom in a horizontal plane, a dipper, a dipper-handle, carried by the boom and swingable in a vertical plane, an operating-chain secured to the dipper and rove through a sheave at the outboard end of the boom, means for oper-

ating said chain, a radial arm swingable in a vertical plane and interposed on the operating-chain between the dipper and the outboard end of the boom adapted to regulate the working angle of the operating-chain, and adjustable means adapted to fix the operating radius of the arm and to hold the arm against the thrust of the operating-chain when the arm is in its operative position.

23. In a dredge or the like, a boom, a support therefor, means for swinging said boom in a horizontal plane, a dipper, a dipper-handle carried by the boom and swingable in a vertical plane, an operating-chain secured to the dipper and rove through a sheave at the outboard end of the boom, means for operating said chain, a box secured to the boom and provided with a lug, a radial arm carried by said boom and sliding in the box, having its outer end bearing on the operating-chain between the dipper and the outboard end of the boom and adapted to regulate the working angle of the operating-chain, said arm having a series of recesses adapted to receive the lug, said lug and recesses being adapted, when in engagement, to resist the thrust of the operating-chain when the arm is in its operative position, and means adapted to close all but one of the recesses against engagement with the lug.

24. In a dredge or the like, a boom, a support therefor, means for swinging said boom in a horizontal plane, a dipper, a dipper-handle carried by the boom and swingable in a vertical plane, an operating-chain secured to the dipper and rove through a sheave at the outboard end of the boom, means for operating said chain, a box secured to the boom and provided with a lug, a radial arm carried by said boom and sliding in the box, having its outer end bearing on the operating-chain between the dipper and the outboard end of the boom and adapted to regulate the working angle of the operating-chain, said arm having a groove in the central portion of its after side, a series of notches in said arm adapted to receive the lug, said lug and notches being adapted, when in engagement, to resist the thrust of the operating-chain when the arm is in its operative position, a block movable in said grooved portion of the arm of a thickness equal to the depth of the groove adapted to close the notches against engagement with the lug, and means for securing the block in position.

25. In a dredge or the like, a boom, a support therefor, means for swinging said boom in a horizontal plane, a dipper, a dipper-handle, carried by the boom and swingable in a vertical plane, an operating-chain secured to the dipper and rove through a sheave at the outboard end of the boom, means for operating said chain, a radial arm swingable in a vertical plane and interposed on the operating-chain between the dipper and the outboard

end of the boom adapted to regulate the working angle of the operating-chain, and means adapted to limit the downward swing of said vertical arm.

5 26. In a dredge or the like, a boom, a support therefor, means for swinging said boom in a horizontal plane, a dipper, a dipper-handle carried by the boom and swingable in a vertical plane, an operating-chain secured to
10 the dipper and rove through a sheave at the outboard end of the boom, means for operating said chain, a radial arm mounted on the boom, swingable in a vertical plane and interposed on the operating-chain between the
15 dipper and the outboard end of the boom, said arm being adapted to regulate the working angle of the operating-chain, and means adapted to limit the downward swing of said radial arm.

20 27. In a dredge or the like, a boom, a support therefor, means for swinging said boom in a horizontal plane, a dipper, a dipper-handle carried by the boom and swingable in a vertical plane, an operating-chain secured to the
25 dipper and rove through a sheave at the outboard end of the boom, means for operating said chain, a radial arm mounted on the boom, swingable in a vertical plane and interposed on the operating-chain between the dipper
30 and the outboard end of the boom, said arm being adapted to regulate the working angle of the operating-chain, means adapted to hold the arm against the thrust of the operating-chain when the arm is in its operative position, and means adapted to limit the downward swing of said radial arm.

28. In a dredge or the like, a boom, a support therefor, means for swinging said boom in a horizontal plane, a dipper, a dipper-handle carried by the boom and swingable in a vertical plane, an operating-chain secured to the dipper and rove through a sheave at the outboard end of the boom, means for operating said chain, a box secured to the boom and
45 provided with a lug, a radial arm carried by said boom and sliding in the box, having its outer end bearing on the operating-chain between the dipper and the outboard end of the boom and adapted to regulate the working
50 angle of the operating-chain, said arm having a recess adapted to receive the lug, said lug and recess being adapted, when in engagement, to resist the thrust of the operating-chain when the arm is in its operative position, and means adapted to limit the downward swing of said radial arm.

29. In a dredge or the like, a boom, a support therefor, means for swinging said boom in a horizontal plane, a dipper, a dipper-handle, carried by the boom and swingable in a vertical plane, an operating-chain secured to the dipper and rove through a sheave at the outboard end of the boom, means for operating said chain, a radial arm swingable
60 in a vertical plane and interposed on the

operating-chain between the dipper and the outboard end of the boom adapted to regulate the working angle of the operating-chain, adjustable means adapted to fix the operating radius of the arm, and means adapted
70 to limit the downward swing of said radial arm.

30. In a dredge or the like, a boom, a support therefor, means for swinging said boom in a horizontal plane, a dipper, a dipper-handle, carried by the boom and swingable in a vertical plane, an operating-chain secured to the dipper and rove through a sheave at the outboard end of the boom, means for operating said chain, a radial arm swingable in a
80 vertical plane and interposed on the operating-chain between the dipper and the outboard end of the boom adapted to regulate the working angle of the operating-chain, adjustable means adapted to fix the operating
85 radius of the arm and to hold the arm against the thrust of the operating-chain when the arm is in its operative position, and means adapted to limit the downward swing of said radial arm.

31. In a dredge or the like, a boom, a support therefor, means for swinging said boom in a horizontal plane, a dipper, a dipper-handle carried by the boom and swingable in a vertical plane, an operating-chain secured to
95 the dipper and rove through a sheave at the outboard end of the boom, means for operating said chain, a box secured to the boom and provided with a lug, a radial arm carried by said boom and sliding in the box, having
100 its outer end bearing on the operating-chain between the dipper and the outboard end of the boom and adapted to regulate the working angle of the operating-chain, said arm having a series of recesses adapted to receive the
105 lug, said lug and recesses being adapted, when in engagement, to resist the thrust of the operating-chain when the arm is in its operative position, means adapted to close all but one of the recesses against engagement with the lug, and means adapted to limit the downward swing of said radial arm.

32. In a dredge or the like, a boom, a support therefor, means for swinging said boom in a horizontal plane, a dipper, a dipper-handle, carried by the boom and swingable in a vertical plane, an operating-chain secured to the dipper and rove through a sheave at the outboard end of the boom, means for operating said chain, a radial arm swingable in a
120 vertical plane and interposed on the operating-chain between the dipper and the outboard end of the boom adapted to regulate the working angle of the operating-chain, a rope secured to the outer end of the arm and
125 adapted to limit the descent of said arm, and a slack-take-up for said rope.

33. In a dredge or the like, a boom, a support therefor, means for swinging said boom in a horizontal plane, a dipper, a dipper-handle
130

carried by the boom and swingable in a vertical plane, an operating-chain secured to the dipper and rove through a sheave at the outboard end of the boom, means for operating said chain, a radial arm mounted on the boom, swingable in a vertical plane and interposed on the operating-chain between the dipper and the outboard end of the boom, said arm being adapted to regulate the working angle of the operating-chain, a rope secured to the outer end of the arm and adapted to limit the descent of said arm, and a slack-take-up for said rope.

34. In a dredge or the like, a boom, a support therefor, means for swinging said boom in a horizontal plane, a dipper, a dipper-handle carried by the boom and swingable in a vertical plane, an operating-chain secured to the dipper and rove through a sheave at the outboard end of the boom, means for operating said chain, a radial arm mounted on the boom, swingable in a vertical plane and interposed on the operating-chain between the dipper and the outboard end of the boom, said arm being adapted to regulate the working angle of the operating-chain, means adapted to hold the arm against the thrust of the operating-chain when the arm is in its operative position, a rope secured to the outer end of the arm and adapted to limit the descent of said arm, and a slack-take-up for said rope.

35. In a dredge or the like, a boom, a support therefor, means for swinging said boom in a horizontal plane, a dipper, a dipper-handle carried by the boom and swingable in a vertical plane, an operating-chain secured to the dipper and rove through a sheave at the outboard end of the boom, means for operating said chain, a box secured to the boom and provided with a lug, a radial arm carried by said boom and sliding in the box, having its outer end bearing on the operating-chain between the dipper and the outboard end of the boom and adapted to regulate the working angle of the operating-chain, said arm having a recess adapted to receive the lug, said lug and recess being adapted, when in engagement, to resist the thrust of the operating-chain when the arm is in its operative position, a rope secured to the outer end of the arm and adapted to limit the descent of said arm, and a slack-take-up for said rope.

36. In a dredge or the like, a boom, a support therefor, means for swinging said boom in a horizontal plane, a dipper, a dipper-handle, carried by the boom and swingable in a vertical plane, an operating-chain secured to the dipper and rove through a sheave at the outboard end of the boom, means for operating said chain, a radial arm swingable in a vertical plane and interposed on the operating-chain between the dipper and the outboard end of the boom adapted to regulate the working angle of the operating-chain, adjustable means adapted to fix the operating radius of the arm, a rope secured to the outer

end of the arm and adapted to limit the descent of said arm, and a slack-take-up for said rope.

37. In a dredge or the like, a boom, a support therefor, means for swinging said boom in a horizontal plane, a dipper, a dipper-handle, carried by the boom and swingable in a vertical plane, an operating-chain secured to the dipper and rove through a sheave at the outboard end of the boom, means for operating said chain, a radial arm swingable in a vertical plane and interposed on the operating-chain between the dipper and the outboard end of the boom adapted to regulate the working angle of the operating-chain, adjustable means adapted to fix the operating radius of the arm and to hold the arm against the thrust of the operating-chain when the arm is in its operative position, a rope secured to the outer end of the arm and adapted to limit the descent of said arm, and a slack-take-up for said rope.

38. In a dredge or the like, a boom, a support therefor, means for swinging said boom in a horizontal plane, a dipper, a dipper-handle carried by the boom and swingable in a vertical plane, an operating-chain secured to the dipper and rove through a sheave at the outboard end of the boom, means for operating said chain, a box secured to the boom and provided with a lug, a radial arm carried by said boom and sliding in the box, having its outer end bearing on the operating-chain between the dipper and the outboard end of the boom and adapted to regulate the working angle of the operating-chain, said arm having a series of recesses adapted to receive the lug, said lug and recesses being adapted, when in engagement, to resist the thrust of the operating-chain when the arm is in its operative position, means adapted to close all but one of the recesses against engagement with the lug, a rope secured to the outer end of the arm and adapted to limit the descent of said arm, and a slack-take-up for said rope.

39. In a dredge or the like, a boom, a support therefor, means for swinging said boom in a horizontal plane, a dipper, a dipper-handle, carried by the boom and swingable in a vertical plane, an operating-chain secured to the dipper and rove through a sheave at the outboard end of the boom, means for operating said chain, a radial arm swingable in a vertical plane and interposed on the operating-chain between the dipper and the outboard end of the boom adapted to regulate the working angle of the operating-chain, a rope secured to the outer end of the arm and adapted to limit the descent of said arm, a slack-take-up for said rope, and a stop adapted to limit the inboard movement of the radial arm.

40. In a dredge or the like, a boom, a support therefor, means for swinging said boom in a horizontal plane, a dipper, a dipper-handle carried by the boom and swingable in a

vertical plane, an operating-chain secured to the dipper and rove through a sheave at the outboard end of the boom, means for operating said chain, a radial arm mounted on the boom, swingable in a vertical plane and interposed on the operating-chain between the dipper and the outboard end of the boom, said arm being adapted to regulate the working angle of the operating-chain, a rope secured to the outer end of the arm and adapted to limit the descent of said arm, a slack-take-up for said rope, and a stop adapted to limit the inboard movement of the radial arm.

41. In a dredge or the like, a boom, a support therefor, means for swinging said boom in a horizontal plane, a dipper, a dipper-handle carried by the boom and swingable in a vertical plane, an operating-chain secured to the dipper and rove through a sheave at the outboard end of the boom, means for operating said chain, a radial arm mounted on the boom, swingable in a vertical plane and interposed on the operating-chain between the dipper and the outboard end of the boom, said arm being adapted to regulate the working angle of the operating-chain, means adapted to hold the arm against the thrust of the operating-chain when the arm is in its operative position, a rope secured to the outer end of the arm and adapted to limit the descent of said arm, a slack-take-up for said rope, and a stop adapted to limit the inboard movement of the radial arm.

42. In a dredge or the like, a boom, a support therefor, means for swinging said boom in a horizontal plane, a dipper, a dipper-handle carried by the boom and swingable in a vertical plane, an operating-chain secured to the dipper and rove through a sheave at the outboard end of the boom, means for operating said chain, a box secured to the boom and provided with a lug, a radial arm carried by said boom and sliding in the box, having its outer end bearing on the operating-chain between the dipper and the outboard end of the boom and adapted to regulate the working angle of the operating-chain, said arm having a recess adapted to receive the lug, said lug and recess being adapted, when in engagement, to resist the thrust of the operating-chain when the arm is in its operative position, a rope secured to the outer end of the arm and adapted to limit the descent of said arm, a slack-take-up for said rope, and a stop adapted to limit the inboard movement of the radial arm.

43. In a dredge or the like, a boom, a support therefor, means for swinging said boom in a horizontal plane, a dipper, a dipper-handle carried by the boom and swingable in a vertical plane, an operating-chain secured to the dipper and rove through a sheave at the outboard end of the boom, means for operating said chain, a radial arm swingable in a vertical plane and interposed on the operating-

chain between the dipper and the outboard end of the boom adapted to regulate the working angle of the operating-chain, adjustable means adapted to fix the operating radius of the arm, a rope secured to the outer end of the arm and adapted to limit the descent of said arm, a slack-take-up for said rope, and a stop adapted to limit the inboard movement of the radial arm.

44. In a dredge or the like, a boom, a support therefor, means for swinging said boom in a horizontal plane, a dipper, a dipper-handle, carried by the boom and swingable in a vertical plane, an operating-chain secured to the dipper and rove through a sheave at the outboard end of the boom, means for operating said chain, a radial arm swingable in a vertical plane and interposed on the operating-chain between the dipper and the outboard end of the boom adapted to regulate the working angle of the operating-chain, adjustable means adapted to fix the operating radius of the arm and to hold the arm against the thrust of the operating-chain when the arm is in its operative position, a rope secured to the outer end of the arm and adapted to limit the descent of said arm, a slack-take-up for said rope, and a stop adapted to limit the inboard movement of the radial arm.

45. In a dredge or the like, a boom, a support therefor, means for swinging said boom in a horizontal plane, a dipper, a dipper-handle carried by the boom and swingable in a vertical plane, an operating-chain secured to the dipper and rove through a sheave at the outboard end of the boom, means for operating said chain, a box secured to the boom and provided with a lug, a radial arm carried by said boom and sliding in the box, having its outer end bearing on the operating-chain between the dipper and the outboard end of the boom and adapted to regulate the working angle of the operating-chain, said arm having a series of recesses adapted to receive the lug, said lug and recesses being adapted, when in engagement, to resist the thrust of the operating-chain when the arm is in its operative position, means adapted to close all but one of the recesses against engagement with the lug, a rope secured to the outer end of the arm and adapted to limit the descent of said arm, a slack-take-up for said rope, and a stop adapted to limit the inboard movement of the radial arm.

46. In a dredge or the like, a boom, a support therefor, means for swinging said boom in a horizontal plane, a dipper, a dipper-handle carried by the boom and swingable in a vertical plane, a stop on said handle and a buffer therefor on said boom, an operating-chain secured to the dipper and rove through a sheave at the outboard end of the boom, means for operating said chain, a radial arm carried by said boom and swingable in a vertical plane, said arm being provided at its out-

board end with a sheave adapted to bear on the operating-chain, between the dipper and the outboard end of the boom to regulate the working angle of said chain, a rope secured to the end of the arm and rove through sheaves at the outer end of the boom and frame adapted to limit the downward swing of the said arm, a slack-take-up for said rope, a box secured to the boom and in which moves the radial arm, lugs on said box and corresponding recesses in the arm adapted to engage with each other to fix the operating radius of the arm and to hold the arm against the thrust of the operating-chains when the arm is in its operative position, friction-rolls mounted in said box and on which rolls the radial arm, a grooved portion in said arm, a block engaging therein and adapted to close one or more of said recesses against engagement with said lugs, a second sheave carried by the radial arm at its outboard end and adapted to limit the inboard movement of the arm and a pair of sheaves disposed at an angle adapted to guide the operating-chain to its operating means.

47. In a dredge or the like, a boom, a support therefor, means for swinging said boom in a horizontal plane, a dipper, a dipper-handle carried by the boom and swingable in a vertical plane, an operating-chain secured to the dipper and rove through a sheave at the outboard end of the boom, means for operating said chain, a radial arm carried by said boom and swingable in a vertical plane, said arm being provided at its outboard end with a sheave adapted to bear on the operating-chain, between the dipper and the outboard end of the boom to regulate the working angle of said chain, a rope secured to the end of the arm and rove through sheaves at the outer end of the boom and frame adapted to limit the downward swing of the said arm, a slack-take-up for said rope, a box secured to the boom and in which moves the radial arm, lugs on said box and corresponding recesses in the arm adapted to engage with each other to fix the operating radius of the arm and to hold the arm against the thrust of the operating-chains when the arm is in its operative position, friction-rolls mounted in said box and on which rolls the radial arm, a grooved portion in said arm, a block engaging therein and adapted to close one or more of said recesses against engagement with said lugs, a second sheave carried by the radial arm at its outboard end and adapted to limit the inboard movement of the arm and a pair of sheaves disposed at an angle adapted to guide the operating-chain to its operating means.

48. In a dredge or the like, a boom, a support therefor, means for swinging said boom in a horizontal plane, a dipper, a dipper-handle carried by the boom and swingable in a vertical plane, a stop on said handle and a buffer therefor on said boom, an operating-

chain secured to the dipper and rove through a sheave at the outboard end of the boom, means for operating said chain, a radial arm carried by said boom and swingable in a vertical plane, said arm being provided at its outboard end with a sheave adapted to bear on the operating-chain, between the dipper and the outboard end of the boom to regulate the working angle of said chain, a rope secured to the end of the arm and rove through sheaves at the outer end of the boom and frame adapted to limit the downward swing of the said arm, a slack-take-up for said rope, a box secured to the boom and in which moves the radial arm, lugs on said box and corresponding recesses in the arm adapted to engage with each other to fix the operating radius of the arm and to hold the arm against the thrust of the operating-chains when the arm is in its operative position, a grooved portion in said arm, a block engaging therein and adapted to close one or more of said recesses against engagement with said lugs, a second sheave carried by the radial arm at its outboard end and adapted to limit the inboard movement of the arm and a pair of sheaves disposed at an angle adapted to guide the operating-chain to its operating means.

49. In a dredge or the like, a boom, a support therefor, means for swinging said boom in a horizontal plane, a dipper, a dipper-handle carried by the boom and swingable in a vertical plane, a stop on said handle and a buffer therefor on said boom, an operating-chain secured to the dipper and rove through a sheave at the outboard end of the boom, means for operating said chain, a radial arm carried by said boom and swingable in a vertical plane, said arm being provided at its outboard end with a sheave adapted to bear on the operating-chain, between the dipper and the outboard end of the boom to regulate the working angle of said chain, a rope secured to the end of the arm and rove through sheaves at the outer end of the boom and frame adapted to limit the downward swing of the said arm, a slack-take-up for said rope, a box secured to the boom and in which moves the radial arm, lugs on said box and corresponding recesses in the arm adapted to engage with each other to fix the operating radius of the arm and to hold the arm against the thrust of the operating-chains when the arm is in its operative position, friction-rolls mounted in said box and on which rolls the radial arm, a grooved portion in said arm, a block engaging therein and adapted to close one or more of said recesses against engagement with said lugs, a second sheave carried by the radial arm at its outboard end and adapted to limit the inboard movement of the arm.

50. In a dredge of the character set forth, a radial arm substantially oblong in cross-section and having its broader sides facing inboard and outboard.

51. In a dredge, a boom, a dipper-handle, and means for operating the same and an adjustable stop on the upper end of the dipper-handle.

5 52. In a dredge of the character set forth, a boom, a dipper-handle, and a radius-arm, means for operating the same, and an adjustable stop secured to the upper end of the dipper-handle and adapted to gage its down-
10 ward movement.

53. In a dredge, the combination of a boom, and means for supporting the same, comprised of a guy, and two diverging members having their feet stepped in proximity to each other
15 adapted to support said guy and take up the strain thereon.

54. In a dredge, the combination of a boom, and means for supporting the same, comprising; a guy, and two diverging A-frames

having their feet stepped in proximity to each other, said A-frames being adapted to support the guy and to take up the strain thereon. 20

55. In a dredge, a pivoted boom, and means for supporting the same, comprising: an A-frame extending forwardly and having its
25 truck forward of the vertical plane of the pivot of the boom, an auxiliary A-frame stepped near the foot of the first-mentioned A-frame and having a pronounced rake, said A-frame being adapted to support the guy
30 and take up the strain thereon.

Signed at Bloomfield this 6th day of September, 1904.

WILLIAM A. COLLINS.

Witnesses:

HARRY N. REEVES,
A. V. DICKEY.