

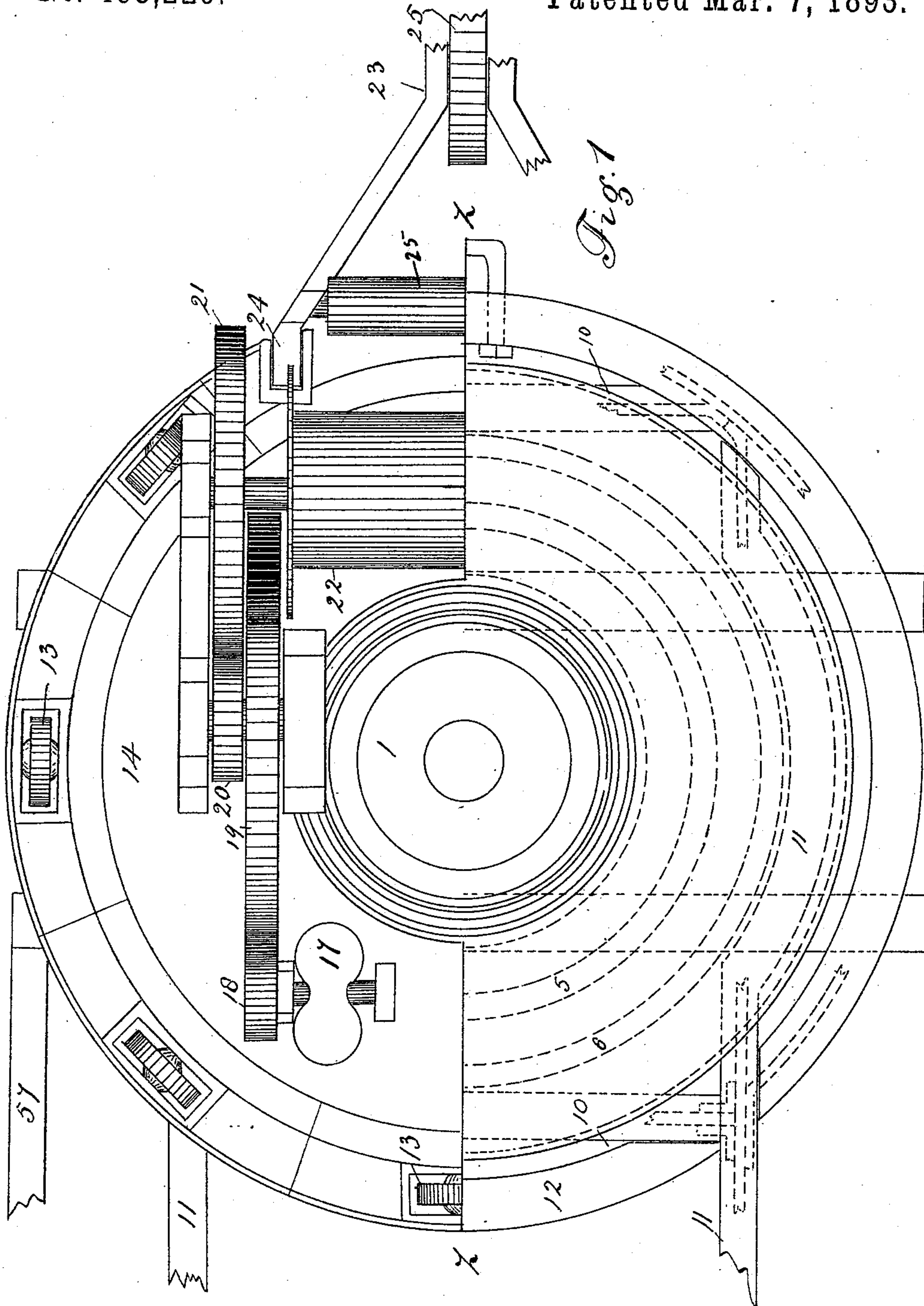
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7 Sheets—Sheet 1.

E. S. BENNETT.
DREDGE.

No. 493,226.

Patented Mar. 7, 1893.



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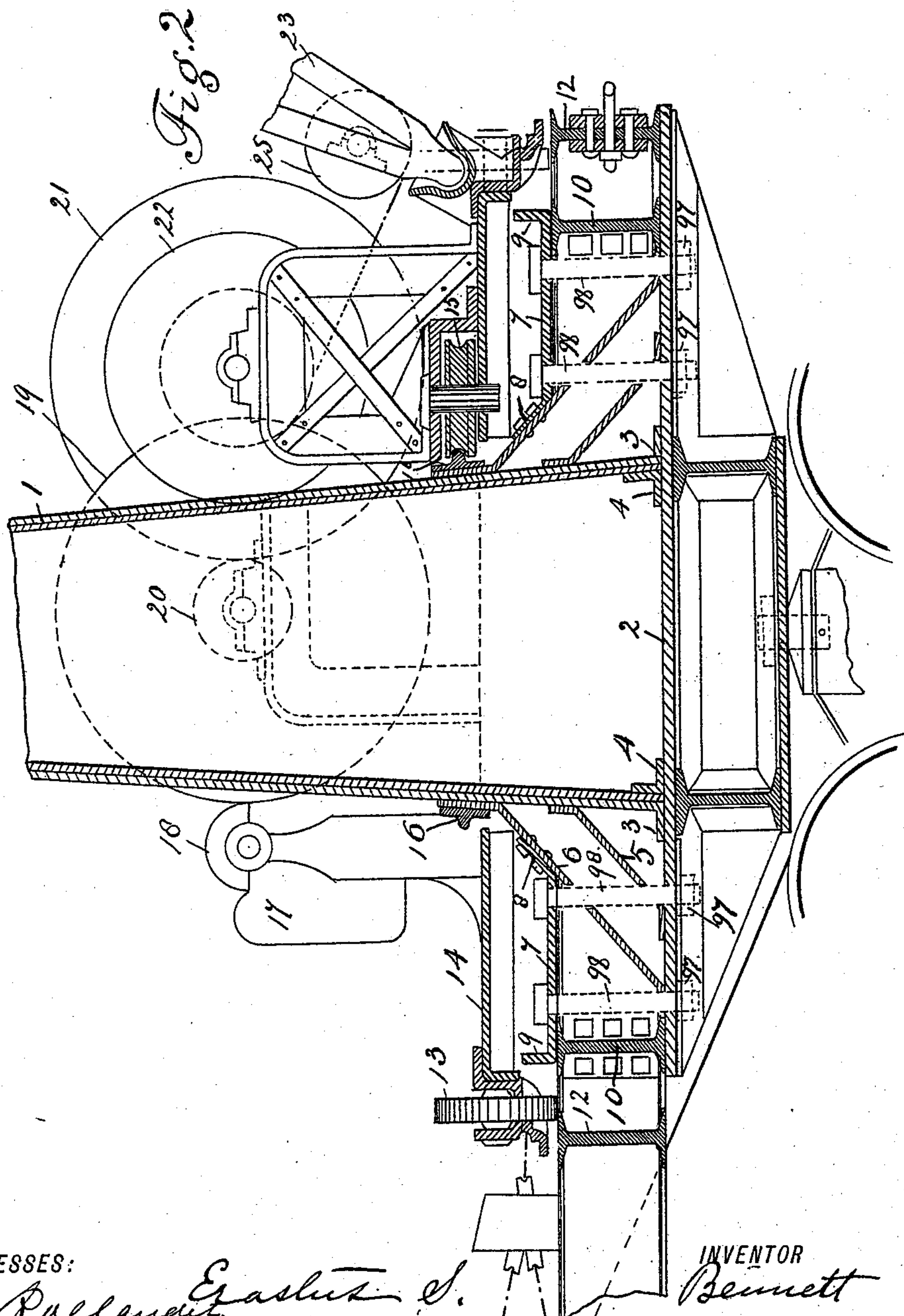
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7 Sheets—Sheet 2.

E. S. BENNETT.
DREDGE.

No. 493,226.

Patented Mar. 7, 1893.



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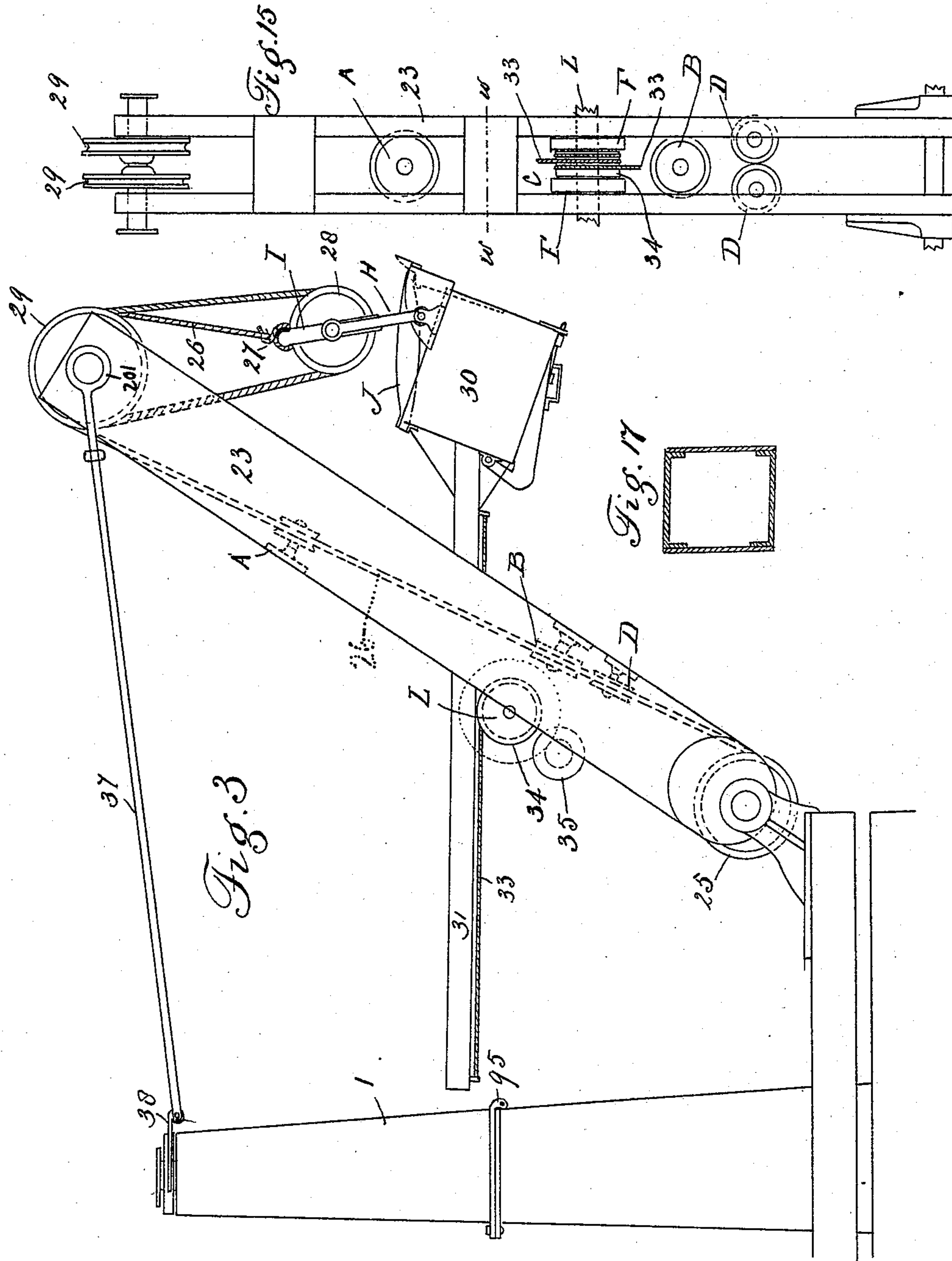
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E. S. BENNETT.
DREDGE.

No. 493,226.

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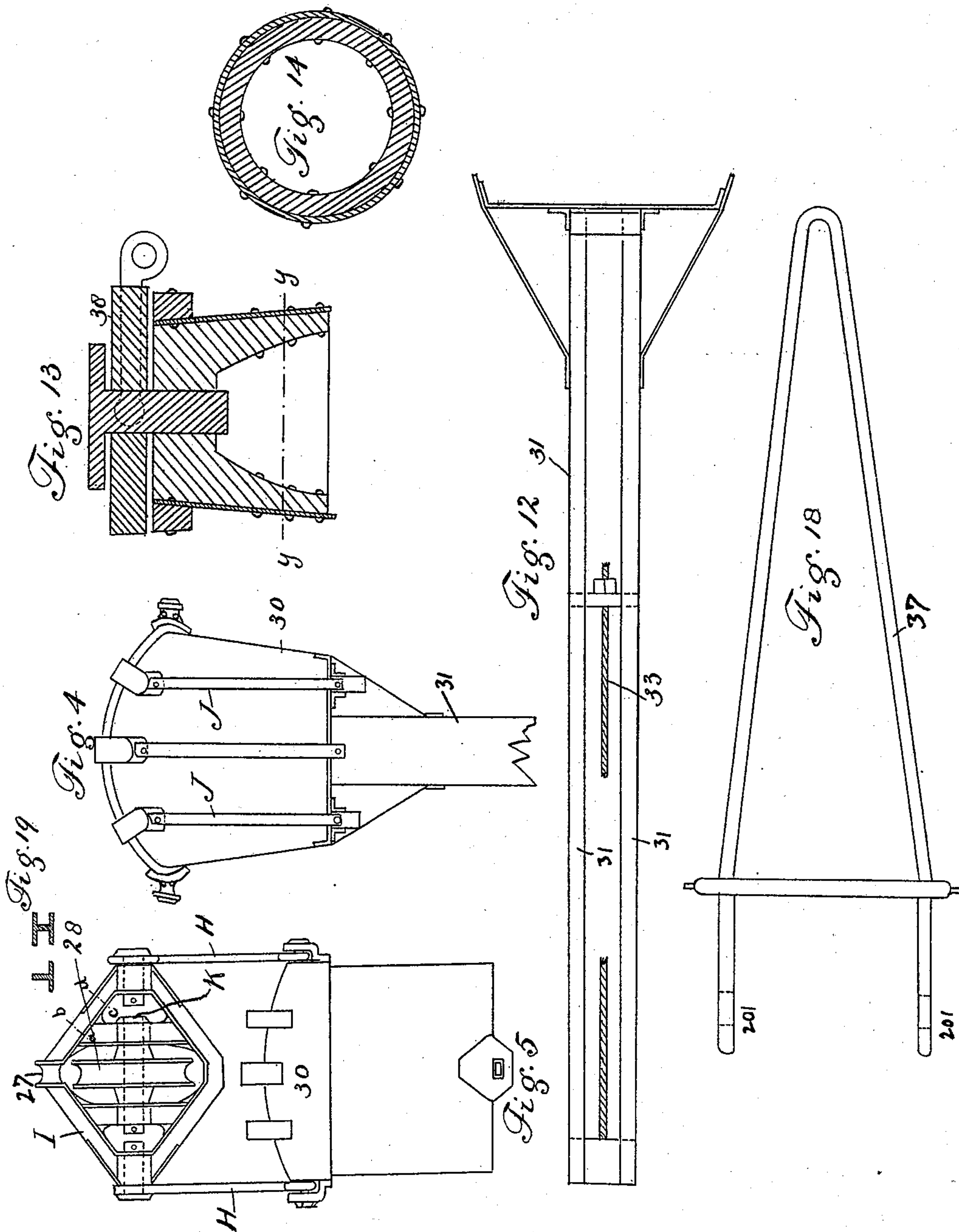
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E. S. BENNETT.
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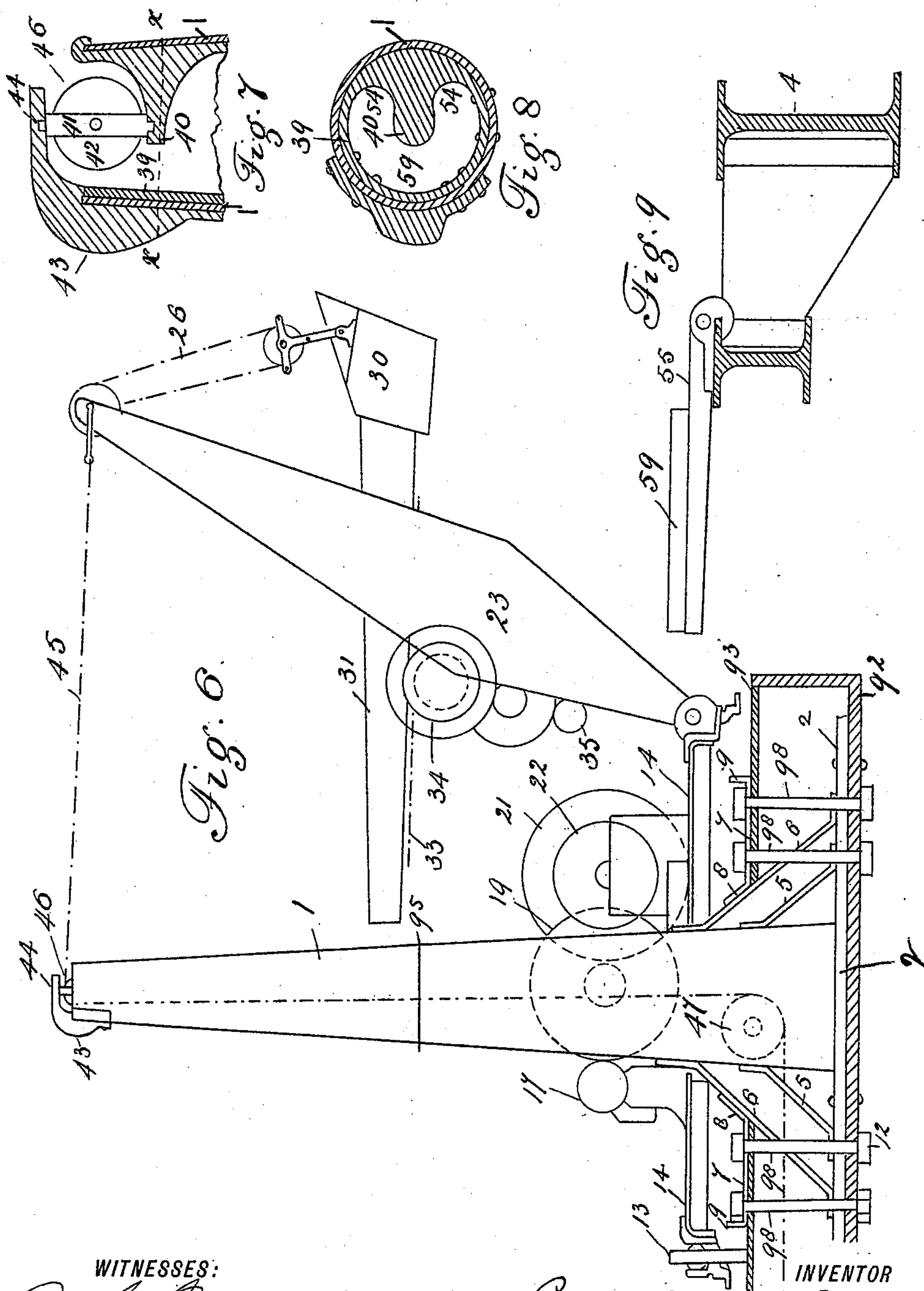
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E. S. BENNETT.
DREDGE.

7 Sheets—Sheet 5.

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Patented Mar. 7, 1893.



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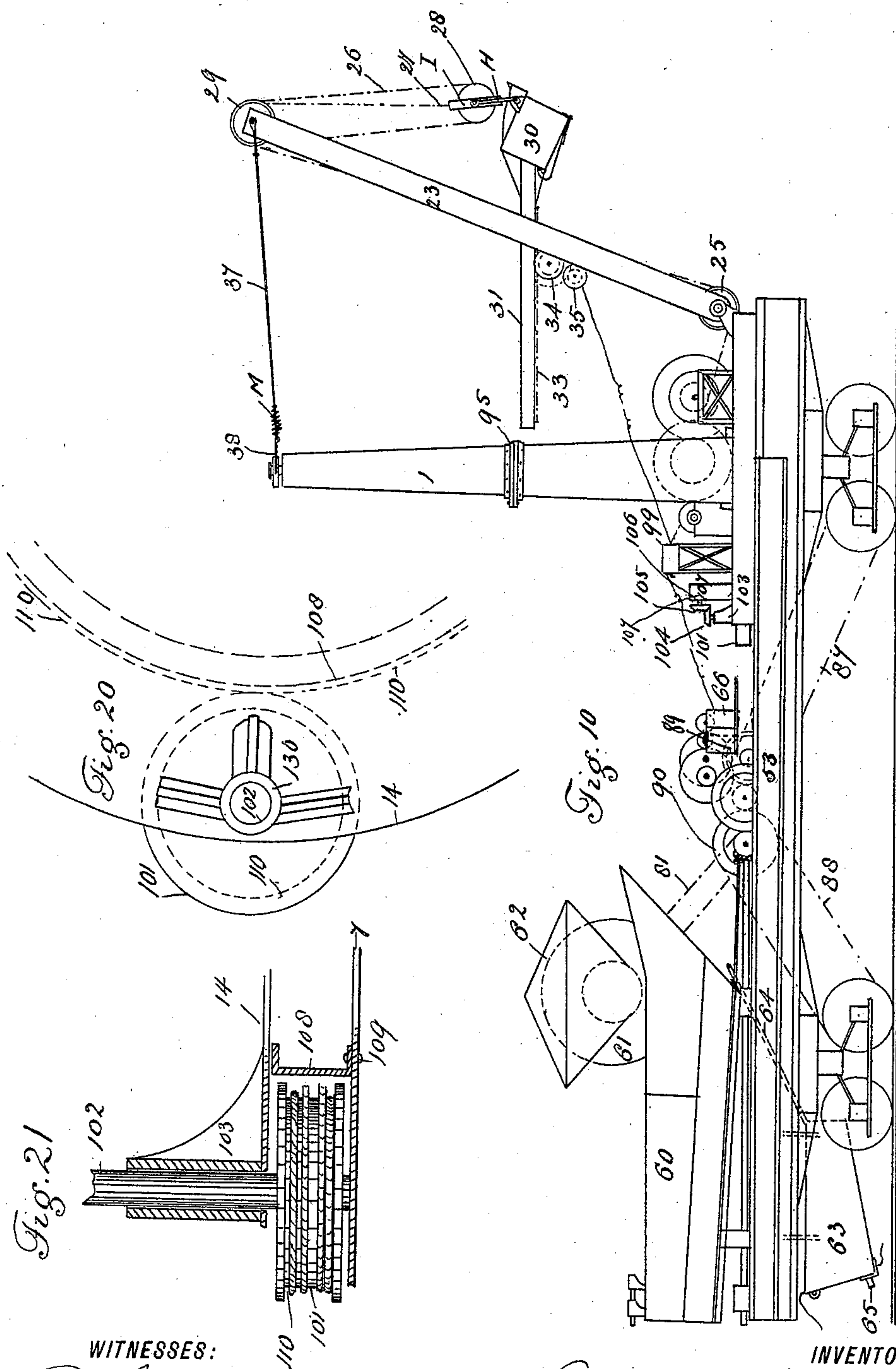
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E. S. BENNETT.
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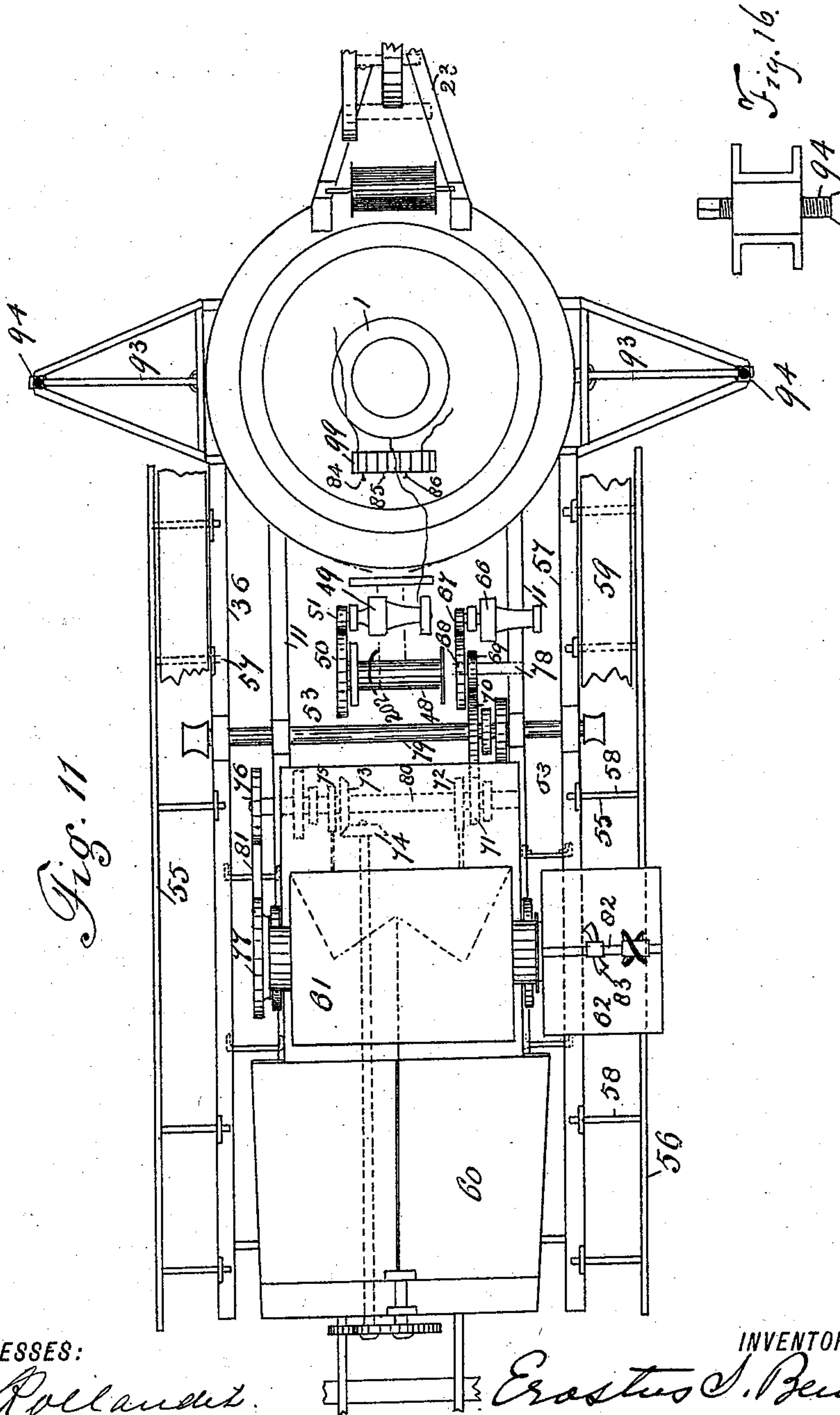
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7 Sheets—Sheet 7.

E. S. BENNETT.
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No. 493,226.

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UNITED STATES PATENT OFFICE.

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DREDGE.

SPECIFICATION forming part of Letters Patent No. 493,226, dated March 7, 1893.

Application filed January 28, 1890. Renewed September 29, 1891. Again renewed October 3, 1892. Serial No. 447,622. (No model.)

To all whom it may concern:

Be it known that I, ERASTUS S. BENNETT, a citizen of the United States, residing at Denver, in the county of Arapahoe and State of Colorado, have invented certain new and useful Improvements in Dredges; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to improvements in dredges; and the object of my improvement is to provide a dredge having a stationary mast securely anchored at the base and entirely unsupported above its base, said mast forming the chief element of the hoisting apparatus of the machine and bearing the strain over its top in raising the boom and the bucket with its load; the mast being surrounded by a rotating platform, to which the boom is hinged and on which is located a revolving drum and a motor connected therewith, and other features, all of which are illustrated in the drawings and hereinafter described and claimed.

In the drawings is illustrated an embodiment of my invention; in which drawings:—

Figure 1 is a plan view of the mast: in one half of this figure the revolving platform together with the mechanism supported thereon is shown, while in the other half the mechanism underneath the platform is shown in dotted lines. Fig. 2 is a vertical section taken through the center of Fig. 1 on the line $z-z$. Fig. 3 is a side elevation of the mast, the boom and the bucket in position for operation. Fig. 4 is a plan view of the bucket. Fig. 5 is an end view of the bucket. Fig. 6 is an outline elevation, showing the device secured to a scow. Fig. 7 is a vertical section taken through the top of the mast and the mechanism secured thereto for guiding and supporting the rope or cable connected with the upper extremity of the boom. Fig. 8 is a transverse section of the same taken on the line $x-x$ Fig. 7. Fig. 9 is a section taken through one of the main girders and one of the hinged

wings of the platform. Fig. 10 is a side elevation of my improved dredge illustrating its use in connection with an amalgamating tank, the dredge and the tank being both mounted on the same platform. Fig. 11 is a plan view of the same, except that the upper portion of the boom and its connections are broken away. Fig. 12 is a plan view of the bucket handle. Fig. 13 is a vertical section taken through the top of the mast and a device secured thereto for attaching one extremity of the rope or cable, the other extremity of which is secured to the top of the boom. Fig. 14 is a transverse section taken through the top of the mast on the line $y-y$ Fig. 13. Fig. 15 is a top view of the boom. Fig. 16 is an end view of the lower extremity of the braces secured to each side of the stationary platform. Fig. 17 is a section taken on the line $w-w$ Fig. 15. Fig. 18 is an enlarged view of the metal strap or loop pivoted to the top of the boom and forming a means of attaching the support for the boom. In Fig. 19 are shown two sections taken on the lines $a-b$ and $c-d$, Fig. 5. Fig. 20 is a plan view of part of the rotating platform and mechanism connected therewith for actuating the same. Fig. 21 is a view partly in elevation and partly in section of the same.

In these views, the reference numeral 1 indicates a stationary hollow mast constructed of any suitable material, preferably steel, and secured or anchored at the base to the platform 2 of the dredge. The exterior of the base of the mast is provided with a flange 3 in contact with and securely bolted to the platform 2. To the interior of the base of the mast is suitably secured the angle iron 4, the horizontal projection of the angle iron being made fast to the platform 2. The base of the mast is still further secured to the platform by the conical frustum shaped sheet metal plates 5 and 6, Fig. 6; both being provided with flange extensions at their upper and lower extremities, the upper flange of each being secured to the periphery of the mast and the lower flange to the top of the platform 2. The plates 5 and 6 are similarly shaped, plate 6 being, however, much larger than plate 5 which is secured to the mast below plate 6, and to the platform nearer the base of the

mast than plate 6; hence plate 6 is located above and completely surrounds plate 5, as shown in Fig. 2. The mast is further secured to the platform by the horizontal circumferential plate 7 having its inner extremity provided with the inclined flange 8, shaped to correspond with the inclination of plate 6 to which it is securely bolted as shown. The outer extremity of plate 7 is upturned and formed into a vertical flange 9; the outer portion of this plate is supported by the I-beams 10, one on each side of the mast and upon which the plate 7 rests. The I-beams 10 are secured to the platform just beyond or close to the outer edge of the conical frustum shaped plate 6. Plate 7 is secured to the platform by means of bolts 98, all of which pass through apertures in the plate 7 and in platform 2, their threaded extremities projecting beneath the platform where they are provided with nuts 97. Those bolts which are farthest from the mast also pass through apertures in the flanged base of frustum shaped plate 6, while the inner bolts or those nearer the mast pass through the inclined portions of both plates 5 and 6. It will thus be seen that the mast is anchored or secured to the platform beyond possibility of removal therefrom by the strain upon the mast during the operation of the dredge.

A circular rail 12, I-shaped in cross section is suitably secured to the platform outside of and surrounding the mechanism heretofore described.

Rail 12 forms the track for the rollers 13 of the rotating horizontal platform 14, which is adapted to turn freely around the mast and above the structure by means of which the mast is secured to the lower stationary base. The rollers 13 are suitably pivoted or journaled within the outer circumference or rim of the rotating platform.

To the inner portion of the platform 14 and near the mast, is pivoted a horizontal roller 15 having a grooved periphery adapted to engage a circumferential rib or track 16 suitably secured to the exterior of the mast.

Upon the rotating platform are suitably journaled and supported the electric motor 17 and the gear wheels 18, 19, 20 and 21, through the medium of which, motion is communicated from the motor to the revolving drum 22, to which is secured and upon which is wound and unwound the cable or rope in raising or lowering the bucket during the operation of the dredge. The lower extremity of the boom 23 is hinged to or socketed in the outer rim of the rotating platform. The upper extremity of the boom is provided with two pulleys 29, 29 pivoted between the side frames of the boom.

A and B are guide pulleys pivoted to the boom and adapted to guide the cable passing therethrough to one side of the bucket handle which passes through the space or opening C.

D, D are small pulleys which guide the cable to a central position after it leaves the

pulley B, and preparatory to its passing under the pulley or roller 25 at the lower extremity of the boom. By the use of these guide pulleys the cable is guided to one side of the bucket handle and does not pass therethrough as in the ordinary way. The friction necessarily resulting from the passing of the cable through the bucket handle is thereby obviated.

34 is a revolving drum, rigidly secured to a suitable shaft L pivoted within the sides of the frame.

F, F are two pulleys, loosely mounted upon the shaft L and adapted to turn thereon, the said pulleys being located one upon each side of the drum 34. The pulleys F are considerably larger than the drum, and are adapted to support the bucket handle above the drum and prevent any friction between the bucket handle and the cable wound around the drum.

To each side of the upper portion of the bucket scoop 30, is pivoted a short upwardly extending arm H. Within these arms H is pivoted the frame I; said frame supporting a pulley 28, adapted to rotate upon a pin K secured within the frame. The object of this mechanism is to support the pulley 28 nearer the bucket than can be done by the means heretofore employed, thereby permitting the bucket to be raised higher; since the farther the pulley is from the bucket, the sooner will said pulley be brought in contact with the top of the boom, when further elevation becomes impossible. Heretofore, the side arms H of the bucket bail have been connected at the top by a heavy bar and the pulley supported by tackle extending considerably above said bar. My frame I being pivoted directly to the arms H and supporting the pulley, possesses the advantage already mentioned, namely, of bringing the pulley close to the bucket. The shape of the frame I is that of an oblique-angled quadrilateral, the four sides being therefore so braced as to give the same strength as the heavy solid bar heretofore used, the material in my improvement being at the same time so shaped as to receive and support the pulley on a direct line drawn through the center of the apertures in the top of arms H.

26 is a chain or cable secured to the frame I of the dipper at 27; thence passing over one of the pulleys 29 pivoted to the top of the boom; thence, down over the pulley 28, pivoted or journaled within the frame I of the dipper; thence, over the other pulley 29, and down through the boom, engaging the pulley A; thence, past the dipper handle, engaging the pulley B on the opposite side of the handle; between the pulleys D, D and under the roller 25 to the drum 22 upon the rotating platform.

30 is the dipper, provided with the handle 31 which passes through the boom at C, as shown. The chain or cable 33 of the handle is suitably secured to the drum 34; the outer portion of the handle resting upon the pul-

leys F on each side of the drum. Motion is communicated to the drum by the electric motor 35.

The grate bars J are suitably secured to the top of the bucket; and are designed to prevent the entrance of large rocks thereinto.

37 is a supporting rod, made fast, as by loops 201, at one extremity, to the top of the boom and secured at the other extremity through the medium of a spring M, to a device 38 swiveled to the top of the mast. The device 38 is shown in detail in Figs. 13 and 14; and may be used when the inclination of the boom remains the same and the action of the dipper is controlled exclusively by the chain or cable 26 heretofore described. When, however, as is very often the case, it is desirable and advantageous to raise and lower the boom every time the bucket is filled and emptied, the device shown in Figs. 6, 7 and 8 is employed. This device consists of a ring or tube 39 fitted within and bolted to the top of the mast and provided on its interior with a lug 40 forming the pivotal support for the lower extremity of the vertical block 41 within which is pivoted or journaled the pulley 42 over which the chain or cable passes as shown in Fig. 6. The upper extremity of block 41 is pivoted to the projecting horizontal extremity 44 of the part 43, which is secured to the top of the mast by the use of bolts, the latter extending through the ring 39. The use of this device is illustrated in Fig. 6; in which the chain or cable 45, one extremity of which is secured to the top of the boom, passes through the opening 46, over the pulley 42, down through the hollow mast, under the pulley 47, suitably supported and journaled near the base of the mast, and thence, through suitable openings in the conical plates 5 and 6, back to a suitable drum on the stationary platform. It will thus be seen that by the use of the mechanism just described, the boom may be quickly and easily raised and lowered each time that the bucket is filled and emptied, the device at the top of the mast allowing the upper horizontally extended portion of the chain or cable 45 to move back and forth freely within the space 46 while the boom is turned with the rotating platform, the perpendicular portion of the chain or cable near the top of the mast entering the recesses 54 formed on the interior of ring 39 and on each side of the lug 40.

The rotating platform may be actuated by an electric motor 49, from which motion is communicated to a drum 48, through the medium of gear wheels 50, and 51, all located upon the stationary platform 53 as shown in Fig. 11. The chain or cable 202 wound around the said drum and extending to the said rotary platform is shown by dotted lines in the same figure. I prefer, however, to operate the rotating platform by the use of the mechanism shown on an enlarged scale in Figs. 20 and 21 and, on a smaller scale, in Fig. 10, in connection with the entire dredge mechan-

ism. In these views, the reference numeral 101 indicates a spool rigidly secured to a shaft 102 and suspended thereon between the rotating platform 14 and the stationary plate 7 beneath said platform. The shaft 102 extends upward through a suitable aperture in the platform 14 and through a journal box 103 secured to said platform. Rigidly secured to shaft 102 above the journal box 103, is a bevel gear wheel 104, meshing with another wheel 105 secured to a shaft 106; to which shaft motion is communicated by the electric motor 107, suitably supported upon the rotating platform. The gear wheel 104 is so located upon its shaft that it rests upon or engages the top of the box 103, thereby performing the office of a shoulder upon shaft 102, in supporting the spool 101 between the two platforms as before stated. To the top of the plate 7, beneath the rotating platform and surrounding the mast, is secured the track 108, formed preferably of angle iron as shown, and securely bolted to the plate 7 at 109. The chain or cable 110 is wound one or more times around the spool 101, its two extremities extending therefrom around the track 108 in opposite directions, these extremities being secured to the said track at suitable points.

In the operation of the rotating platform by the mechanism just described, motion is communicated to the shaft 102 from the motor 107, through the medium of gear wheels 104 and 105. As the spool 101 rotates with shaft 102, the spool must move around the track, which is stationary and connected with the spool by the cable 110, as heretofore described. As the spool moves around the track, the platform 14 must move therewith by virtue of the connection heretofore described.

The stationary platform 53 of the dredge is provided with the wings or side extension frames 55 composed of the bars 56 extending length-wise of the platform and parallel with the girders, and the cross bars 58 made fast to bars 56 at one extremity and hinged at the opposite extremity to the outside girders 57 of the main platform. These extension frames may be provided with a covering 59, which may be laid thereon temporarily or while the dredge is in operation and removed during transportation of the dredge as it is supposed that the side extensions or wings will be folded up or turned inwardly upon the main platform during the transportation of the dredge on railway tracks in order to suitably limit the width of the platform. The main girders 11, 11 of the platform, one on each side, partially encircle the base of the mast, to the foundation plates of which they are securely fastened. The forward extremities of girders 57 are suitably secured to the platform upon which the mast rests.

93, 93 are two braces, one on each side of the dredge, said braces being inclined downward, their lower extremities being provided with screw bolts 94 which may be screwed

through the extremities of the braces until their lower ends come in contact with the ground. These braces are needed during the swinging of the boom upon the rotating platform and give the necessary support to the side of the machine upon which the boom is moving.

In Figs. 10 and 11 an amalgamating tank 60 is shown mounted upon the stationary platform 53 of the dredge. Above this tank is mounted the cylindrical separator 61, provided with the hopper 62 into which the material to be treated is emptied from the dredge bucket whence it passes into the separator, which, after removing a large portion of the gangue or crude material, discharges the balance into the amalgamating tank below, where through the influence of the jarring, vibratory, shaking or trembling movement imparted to the tank by the action of the dredge, particularly while dipping and raising the bucket, the gravitation and amalgamation of the mineral within the tank is thorough and complete, the platform being mounted upon springs which permit and facilitate the shaking or vibratory movement mentioned.

63 is a tank secured to the platform underneath the amalgamating tank, into which tank 63 the surplus quick silver together with some amalgam escaping from the sides of the large tank 60 is conducted through pipe 64, which is connected at its upper or receiving extremity with the lowest part of the bottom of the tank 60, and at its lower or discharge extremity with the top of the quick silver tank. The jarring movement imparted to the platform by the action of the dredge is also beneficial in causing the amalgam to settle to the bottom of the tank 63 whence it is drawn off through cock 65.

The entire dredging and amalgamating machinery is operated by electric motors 17, 35, 49, 66 and 107. The operation of all these motors except 66, has been heretofore described in connection with the description of the mechanism whose action they control. Motor 66 is located upon the main platform 53 and operates the amalgamating machinery through the medium of the gear wheels 67, 68, 69, 70, 71, 72, 73, 74 and 75, said gear wheels being suitably supported upon the shafts 78, 79, and 80 journaled upon the platform 53.

76 is a pulley from which motion is communicated from the shaft 80 by the belt or chain 81 to the pulley 77, thus communicating motion to the cylindrical tank 61.

The operation of the motors 17, 35, and 49 or 107 is controlled by one man who stands at the switch block 99 and by the movement of a switch 84, 85 or 86 in a given direction, gives a certain movement to the motor with which the switch moved is electrically connected, and by moving the switch in an opposite direction, the action of the corresponding motor is reversed. It is thus that the rotating platform and drums 22, 34 and 48 are made to revolve alternately in opposite directions

according as it is necessary to move the bucket backward or forward, to raise or lower the boom or, to raise or lower the bucket or to move the rotating platform in one direction or the other during the operation of the mechanism heretofore described.

When the platform supporting mechanism is mounted upon trucks as shown in Fig. 10, the same may be propelled by the motor 66 through the medium of belts or chains 87 and 88 connecting the pulleys 89 and 90 with the trucks 91.

In Fig. 6 the dredge mechanism is shown mounted upon a scow, 92 representing the bottom and 93 the deck of the same. In this case the mast is secured to the bottom of the scow as shown.

In the operation of the dredge the boom together with the bucket is swung around the mast upon the rotating platform and the contents of the bucket discharged directly into the hopper 62 of the separator. The movement of the boom around the mast is permitted by reason of there being no stays, braces or guys connected with and supporting the mast above its base, leaving the entire space surrounding the mast unobstructed. The mast is centrally hinged at 95, thereby permitting its upper portion to be dropped down until the top is in contact with the platform of the dredge. This hinging of the mast allows the machine to pass under railroad bridges during transportation.

Having thus described my invention, what I claim is—

1. In a dredge, a hollow mast so securely anchored at the base as to require no other support, a pulley 42 revolving in a block 41, supported and pivoted at the top of the mast in a vertical position, a suitable boom, a chain or cable having one extremity secured to the top of the boom, passing thence over the pulley 42, down through the mast, under a suitable guide pulley at its base and thence back to a suitable revolving drum located upon the platform, substantially as described.

2. In a dredge the combination with a stationary mast so securely anchored at the base as to require no other support, a boom having its upper extremity secured to the top of the mast by a chain or cable, its lower extremity being hinged to the rotating platform, a main stationary platform 53 having its main girders connected with the mechanism for securing the base of the mast, and an amalgamating tank mounted upon the platform 53, thus securing from the action of the dredge a jarring vibratory movement aiding and facilitating the gravitation and amalgamation of the mineral within the tank, substantially as described.

3. The combination with a stationary mast so securely anchored at the base as to require no other support, of a rotating platform surrounding the mast, a main stationary platform 53 having its main girders connected with the foundation of the mast, a boom and

a bucket, the boom being suitably connected at one extremity to the rotating platform, an amalgamating tank mounted upon the platform 53, and a suitable hopper into which the material to be treated is discharged from the bucket and whence it passes through a suitable separator to the amalgamating tank where by means of the jarring, vibratory movement imparted by the action of the dredge, the settling and amalgamation of the mineral is aided and facilitated, substantially as described.

4. The combination of a stationary mast so securely anchored at the base as to require no other support, a rotating platform surrounding the mast, a main stationary platform 53 having its main girders connected with the foundation of the mast, a boom suitably connected with the mast and the rotating platform, a bucket suitably connected with the boom, an amalgamating tank mounted upon the platform 53, into which the material to be treated is discharged through the medium of a hopper 62 located above the tank, and a quick silver tank located beneath the amalgamating tank and connected therewith by a suitable discharge pipe, the entire machinery being operated and controlled by suitable electric motors, substantially as described.

5. In a dredge a boom provided with pulleys A and B pivoted within its frame, located intermediately between its extremities and adapted to engage the cable and guide the same to one side of the bucket handle, substantially as described.

6. In a dredge the combination with the rotating platform of a spool underneath said platform, a shaft to which said spool is secured, said shaft extending through the platform, a track 108 secured beneath the rotating platform, a cable wound around the spool and secured to said track and suitable means of communicating motion to the shaft and thence to the platform, substantially as described.

7. In a dredge the combination with the rotating platform of a motor mounted thereon, a shaft extending through and journaled within said platform, a spool rigidly secured to the shaft and suspended beneath the platform, a stationary track 108, a cable wound around the spool and secured to the track and means of communicating motion from the motor to the shaft, substantially as described.

8. The combination with a hollow stationary mast, having a lug projecting into the interior thereof, and a horizontal extension above its top, of a vertical block pivoted between the said lug and extension, a pulley carried in the said block, a pivoted swinging boom, and a cable connected to the said boom and passing over the said pulley, as described.

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

ERASTUS S. BENNETT.

Witnesses:

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