July 21, 1936. A. NEVELING 2,048,561

DIPPER HANDLE FOR DREDGES

Filed Aug. 6, 1934 4 Sheets-Sheet 1

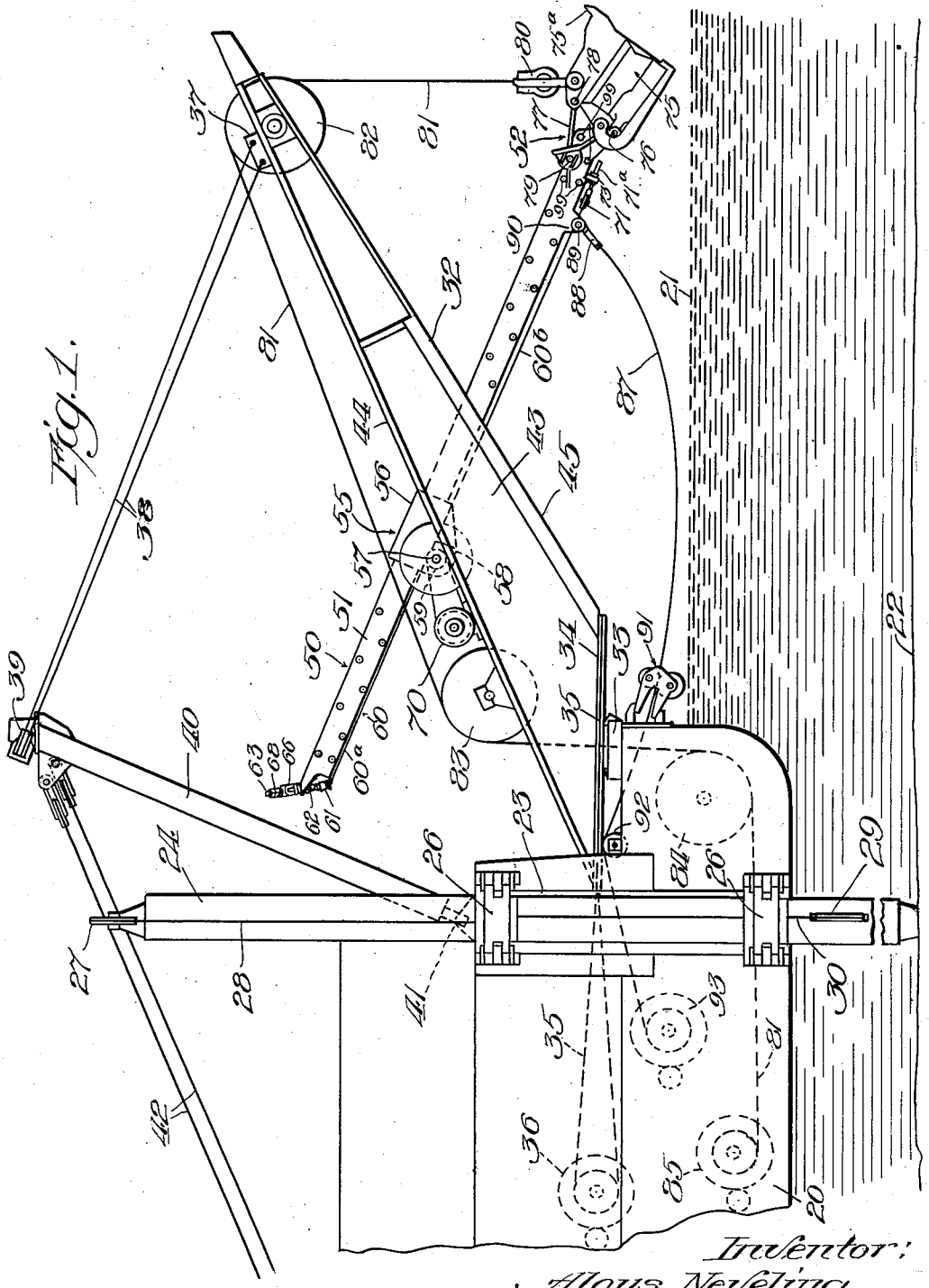


Fig. 1.

Inventor:
Aloys Neveling
By Rector, Hibbey, Davis & Macauley, Attys.

July 21, 1936. A. NEVELING 2,048,561

DIPPER HANDLE FOR DREDGES

Filed Aug. 6, 1934 4 Sheets-Sheet 2

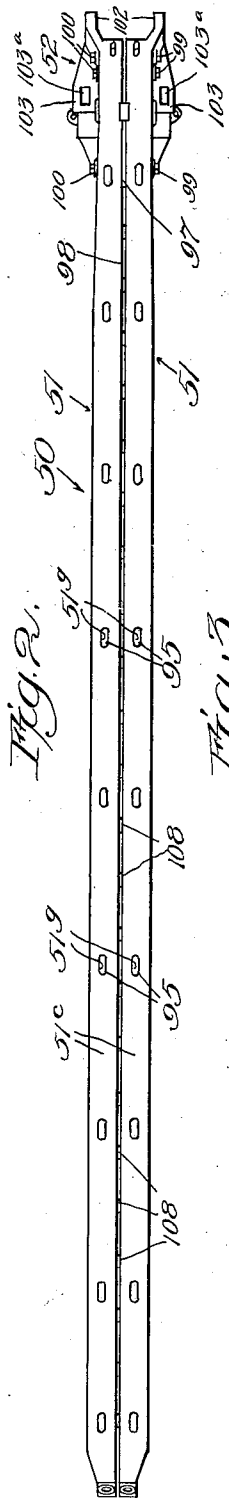


Fig. 2.

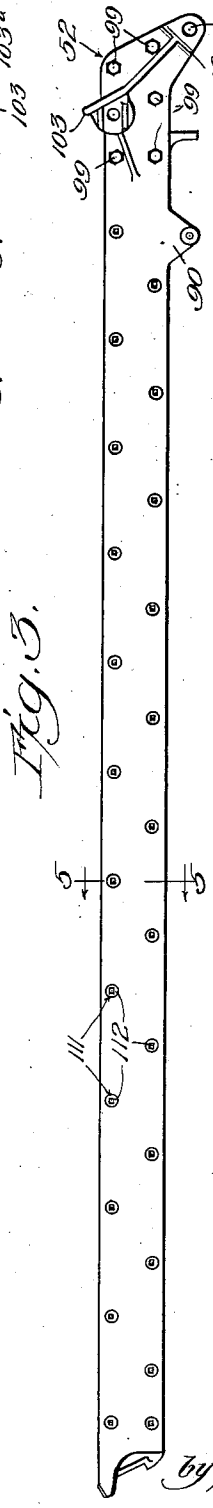


Fig. 3.

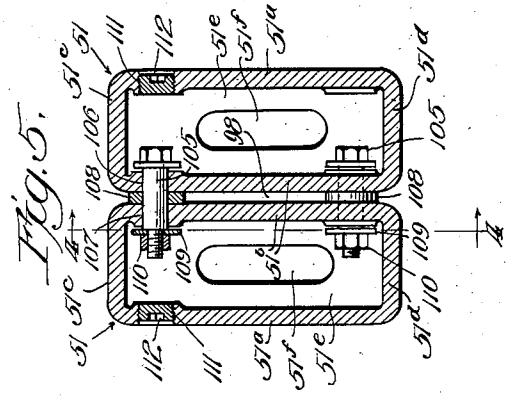


Fig. 5.

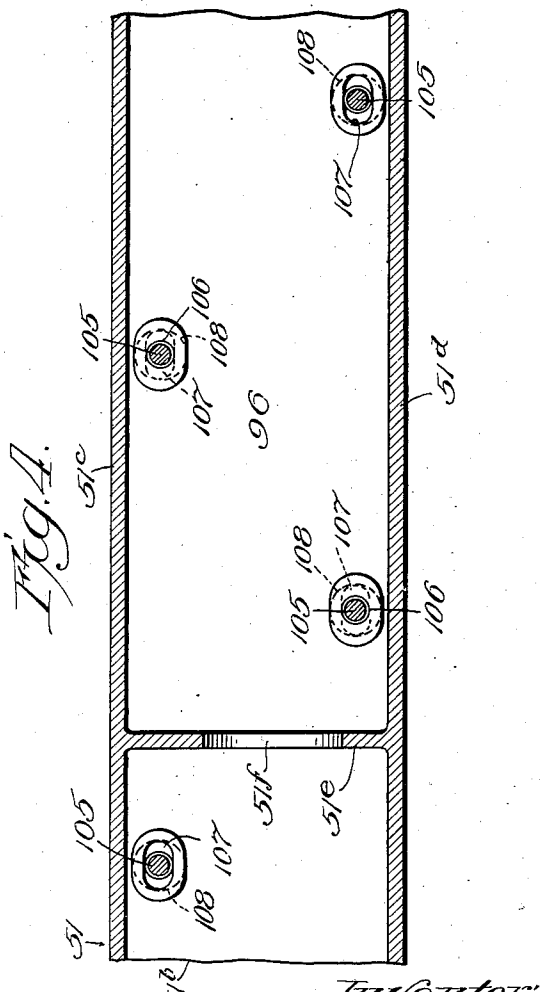


Fig. 4.

Inventor:
Aloys Neveling
by Rector, Hibbey, Davis & Macauley, Attys

July 21, 1936. A. NEVELING 2,048,561

DIPPER HANDLE FOR DREDGES

Filed Aug. 6, 1934 4 Sheets-Sheet 3

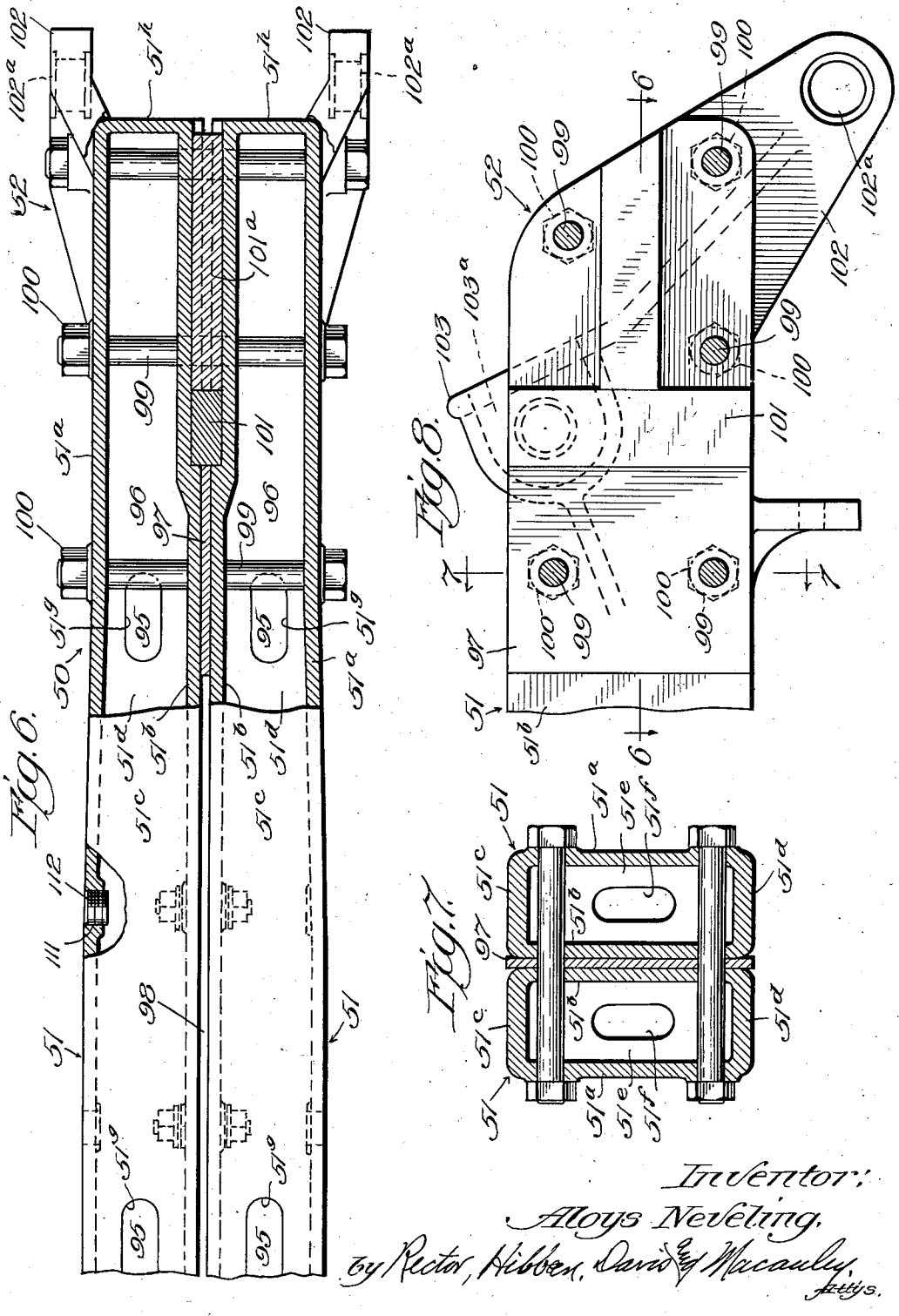


Fig. 6.

Fig. 8.

Fig. 7.

Inventor:
Aloys Neveling,
by Rector, Hibben, Davis & Macauley,
Attys.

July 21, 1936. A. NEVELING 2,048,561

DIPPER HANDLE FOR DREDGES

Filed Aug. 6, 1934 4 Sheets-Sheet 4

Fig. 9.

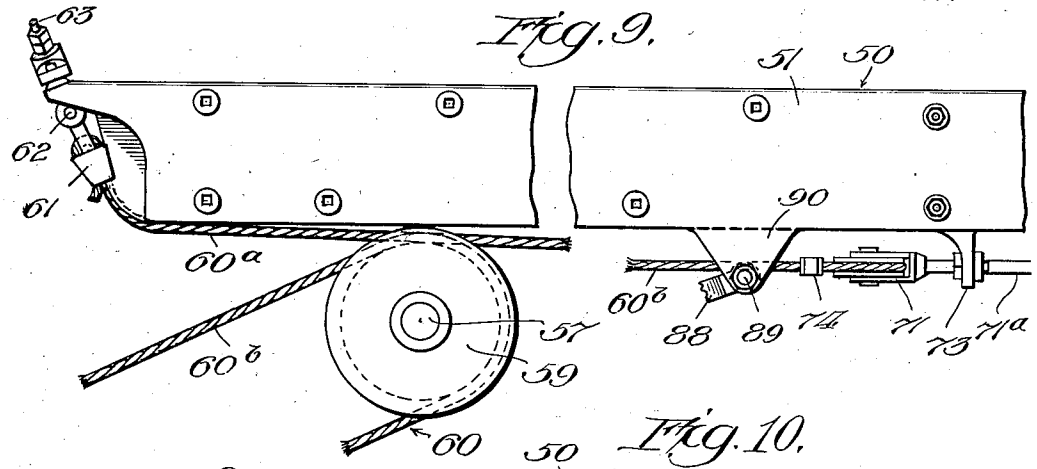
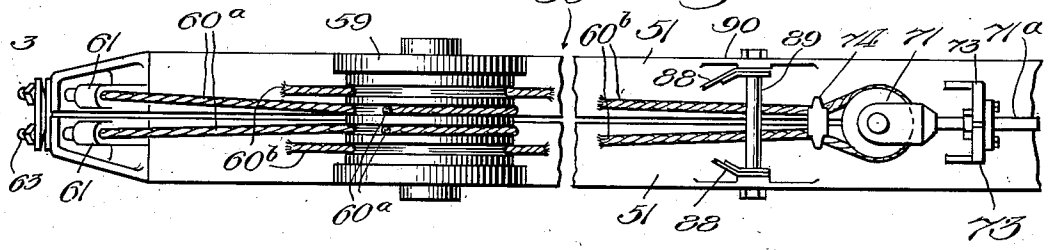


Fig. 10.



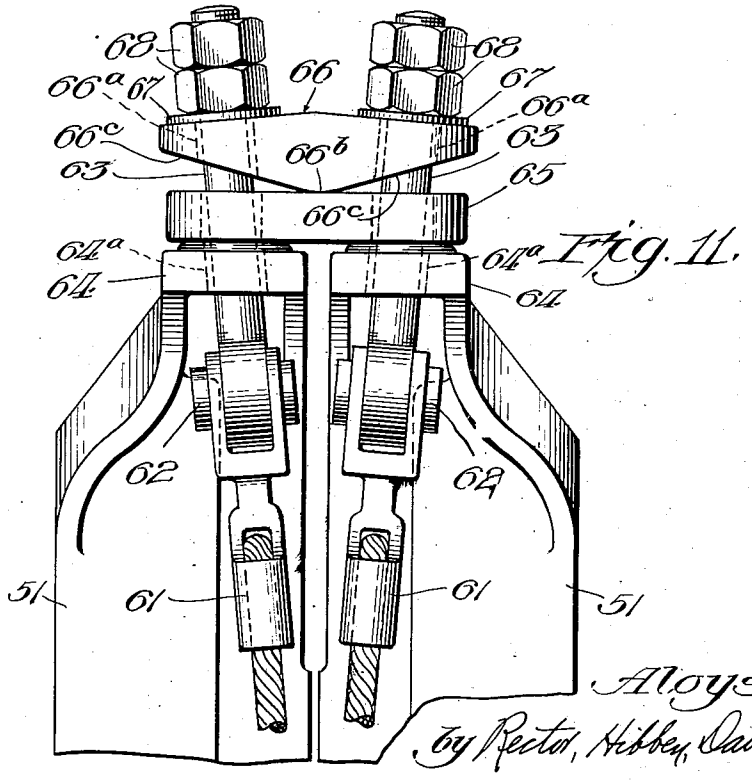


Fig. 11.

Inventor:
Aloys Neveling
by Rector, Hibben, Davis & Macauley
Attys.

Patented July 21, 1936 2,048,561

UNITED STATES PATENT OFFICE

2,048,561

DIPPER HANDLE FOR DREDGES

Aloys Neveling, Chicago, Ill.

Application August 6, 1934, Serial No. 738,596

9 Claims. (Cl. 214—145)

This invention relates to improvements in dipper handles for dredges and its purpose is to provide an improved handle which will effectually withstand the various heavy strains to which this member is subjected in the operation of a dredge. The dipper handle of a dredge is commonly mounted on a boom which projects outwardly from the dredge and with respect to which the handle has relative longitudinal and pivotal movements, during the actuation thereof by the operating mechanism, for the purpose of effecting the desired movements of the dipper or bucket as this dipper is caused to perform its digging, elevating and dumping functions. The dipper handle is subjected to tremendous strains which vary in character depending upon the position of the handle and these strains have heretofore caused a frequent rupture of dipper handles so that they have to be replaced, often at great expense. When the dipper handle is directed downwardly and pressed against the bottom of a river or harbor in which excavations are being made, the handle acts as a column and must withstand great compressive stresses. When the dipper handle is being swung upwardly in digging and hoisting, and when it is being swung laterally with a loaded dipper or bucket, it acts as a cantilever beam and is subjected to great bending strains, either vertically or laterally, or in combinations of these directions which produce a twisting action. Great bending strains are also set up in the dipper handle when the dipper is thrust against the bottom and its pressure made use of in turning the dredge about one of its vertical supporting members, called spuds, which are adapted to support the hull of the dredge upon the bottom when the dredge is in use. Another operation which produces severe bending or twisting strains in the dipper handle is that which occurs in digging operations when the handle is being swung for moving the dipper along the bottom. In this operation, each bite of the dipper, after the first one, during the operation of excavating a layer or zone of material, by successive forward and upward movements of the dipper along paths which are laterally displaced from each other, causes a twisting of the dipper and the handle because one side of the dipper overlaps and moves unobstructedly along the path of its next preceding digging movement while the other side engages and bites off another load of material, thereby setting up severe torsional strains in the dipper handle. Heavy torsional strains may also be set up when the dipper, during its digging movement, encounters a rock or other obstruction which is displaced from the center of the dipper.

In order to withstand these heavy strains, a dipper handle must have some flexibility so that it may bend at various points while at the same time having some relative movement of its different parts without breaking. One effort to obtain this result has resulted in the construction of dipper handles from steel beams and plates which are riveted together with blocks or beams of wood between them but it has been found in practice that the severe strains which are set up result in the shearing off of the bolts and rivets and, in addition, the structure has had insufficient strength to withstand the heavy strains to which the dipper handle is subjected. Efforts have also been made to overcome the difficulties of the prior constructions particularly those caused by bending and torsional strains, by constructing the dipper handle in parallel longitudinal sections, but these sections have always heretofore been rigidly connected at both ends of the dipper handle, if not at intervening points, so that no beneficial result has been obtained by forming the intervening parts in separate sections, since no relative movement of these sections could take place under bending strains without causing breakage of the dipper handle at one or more points where the sections are rigidly connected. These and other difficulties are overcome by the present invention, which may be embodied in a dipper handle operated entirely by cables as herein illustrated, or in a dipper handle operated in part by a rack bar and pinion, as disclosed in the co-pending application of John F. Cushing, Serial No. 738,588, filed August 6, 1934.

The principal object of the present invention is to provide an improved dipper handle which will effectually overcome the difficulties mentioned above and be capable of withstanding the various heavy strains to which the handle is subjected when in use. A further object of the invention is to provide a dipper handle comprising relatively movable longitudinal sections which are connected in an improved manner so that their relative movement to accommodate bending strains is not interfered with. A further object of the invention is to provide a dipper handle comprising a plurality of parallel integral sections which are rigidly connected only at the head of the handle where the bucket or dipper is attached, leaving the remaining portions free to partake of such relative movements as are required to permit the handle to adjust itself to the bending or torsional strains which

are set up therein. Another important object of the invention is to provide a dipper handle having an improved operating mechanism connected thereto and capable of operating efficiently when the dipper handle is bent to a substantial degree. A further object of the invention is to provide an improved dipper handle made up of a plurality of relatively movable longitudinal sections in combination with improved cable mechanism attached thereto and capable of accommodating itself to the relative movement of the sections brought about by the bending of the dipper handle. Another object of the invention is to provide a rack bar comprising relatively movable longitudinal sections in combination with means for attaching said sections to each other without interfering with the relative longitudinal movement of said sections. Still another object of the invention is to provide a dipper handle comprising relatively movable parallel longitudinal sections spaced apart by a narrow slot and rigidly connected only at the head of the handle. Other objects relate to various features of construction and arrangement which will appear more fully hereinafter.

The nature of the invention will be understood from the following specification taken with the accompanying drawings, in which one embodiment is illustrated. In the drawings,

Fig. 1 shows a side elevation of the forward end of a dredge equipped with a dipper handle embodying the features of the present invention;

Fig. 2 shows a top plan view of the dipper handle illustrated in Fig. 1;

Fig. 3 shows a side plan view of the dipper handle illustrated in Fig. 2;

Fig. 4 shows an enlarged longitudinal section through one of the parallel complementary sections of the dipper handle illustrated in Figs. 2 and 3, the section being taken on the line 4—4 of Fig. 5;

Fig. 5 shows an enlarged transverse section through the dipper handle, the section being taken on the line 5—5 of Fig. 3;

Fig. 6 shows an enlarged top plan view of the head end portion of the dipper handle illustrated in Figs. 2 and 3, a portion thereof being shown in horizontal section taken on the line 6—6 of Fig. 8;

Fig. 7 shows an enlarged vertical section through the dipper handle taken on the line 7—7 of Fig. 8;

Fig. 8 shows a side elevation of the head of the dipper handle illustrated in Fig. 6;

Fig. 9 shows an enlarged side elevation of a portion of the dipper handle, with parts thereof broken away, illustrating the connections of the cable mechanism by which the dipper handle is moved longitudinally with respect to the supporting boom;

Fig. 10 shows a bottom plan view of the dipper handle and mechanism illustrated in Fig. 9; and

Fig. 11 shows an enlarged bottom plan view of the equalizer which is embodied in the construction of Figs. 9 and 10 and which is adapted to equalize the tension in the operating cables, when there is a lateral flexure of the dipper handle.

The invention is illustrated in the drawings as being embodied in a dredge comprising a hull 20 adapted to float upon the water 21 beneath which is the bottom 22 of the river or harbor in which excavations are to be performed by the dredge. The hull 20 is provided on opposite sides adjacent its forward end with rectangular vertical recesses 23 in which are mounted the spuds 24. These spuds are in the form of vertically extending columns capable of vertical movement with respect to the hull 20 and adapted to be pressed against the bottom 22 during the operation of dredging so that the hull is supported by these members independently of its buoyancy upon the water. The spuds are guided in their channels or recesses by suitable rollers and are detachably retained in place by the bars 26. Each spud has a pulley 27 adjacent its upper end about which passes a cable 28 and each spud is further provided with a pulley 29 located in a slot adjacent its lower end, above which passes another cable 30. Each cable has one end secured to a fixed point on the dredge and the other ends of these cables are operated by winches located on the hull 20 so that the spuds may be raised or lowered and pressed against the bottom 22.

At its forward end, the hull 20 carries a dipper supporting frame or boom 32 which projects outwardly and upwardly and is arranged to turn about a vertical axis upon the supporting member 33 carried by the hull of the dredge. A large pulley 34 is carried by the lower end of the boom and a cable 35 is passed around this pulley and extends to a winch 36 which may be operated for the purpose of turning the boom in a lateral direction about its vertical axis for the purpose of locating the dipper handle and dipper in the desired position. The outer end of the boom carries a fixed block 37 to which are attached supporting cables 38 inclined upwardly and extending around tackle blocks 39 carried by a supporting strut 40 which is pivoted at 41 on the hull 20. The strut 40 is supported against forward movement by other cables 42 which are arranged to extend downwardly and rearwardly to a suitable support on the rear portion of the dredge. The body portion of the boom tapers outwardly and upwardly from its lower end and is preferably built up from a series of steel plates and angle iron members, including a pair of longitudinal vertically extending side plates 43 and top and bottom plates 44 and 45, respectively.

The intermediate portion of the boom 32 is provided with a longitudinal vertically extending slot in which is mounted a dipper handle 50 constructed according to the principles of the present invention and comprising, in this embodiment, a pair of substantially similar longitudinal sections 51 which are united with each other at the outer or lower end of the dipper handle to form an enlarged head 52, as shown particularly in Figs. 2 and 3. This dipper handle is adapted to reciprocate through a carriage 55 which comprises a channel-shaped housing 56 embracing three sides of the dipper handle and adapted to swing about a shaft 57 which is journaled in bearing blocks 58 secured to the upper side of the boom. The shaft 57 is adapted to be actuated to effect the reciprocation of the dipper handle through the slot of the boom by means of mechanism which is illustrated particularly in Figs. 1, 9, 10 and 11. This mechanism comprises a drum 59 secured on the shaft 57 and having passed thereover cables 60, including two cables 60^a for thrusting the dipper handle outwardly and two cables 60^b for moving the handle inwardly. The cables of each pair are adapted to act separately upon the complementary dipper handle sections 51 and to exert equal forces upon these dipper handle sections even when they are directed laterally, as when

elevating a loaded bucket at the lower or outer end thereof. The cables 60a are attached to clamps 61 having pivotal connections at 62 with the rods or bolts 63 by which the cables are connected with the inner or upper end of the dipper handle. Each dipper handle section 51 is provided at its upper end with an integral plate or bracket 64 having formed therein an aperture 64a through which one of the cable bolts 63 extends. These bolts are then passed through a separate end plate 65 which is apertured for engagement by the bolts with considerable clearance around the bolts so that some relative movement of the bolts and their connected parts laterally is permitted. The bolts 63 then pass through apertures 66a formed in an equalizer bar 66 which bears at its middle point 66b upon the end plate 65 and which has surfaces 66c diverging therefrom so that the part 66b is capable of rocking on the end plate to permit the bolts 63 to have relative longitudinal movement through the end plate and the bracket 64 which may be desirable to equalize the tension in the cables 60a when the dipper handle 50 is bent laterally with a resulting relative longitudinal movement of the end portions of the dipper handle sections 51. The ends of the cable bolts 63 are engaged by washers 67 and nuts 68 which permit any necessary adjustment to be made. The cables 60a extend around the drum 59 and then downwardly and rearwardly along the boom where they are passed around and secured to the drum of a driving motor or engine 70 which is mounted on the boom and which provides the motive power for effecting movement of the dipper handle with respect to the boom.

The other cables 60b for retracting the dipper handle are the ends of a single cable having its end portions secured to and passed around the drum of the engine or motor 70 in a direction which is the reverse of the arrangement of the cables 60a. After passing over the drum 59, the cables 60b extend forwardly and their common connecting portion is passed through a pulley 71 which has a bolt or stem 71a adjustably secured in a bracket 73 carried by and extending downwardly from the dipper handle, as shown in Figs. 9 and 10. Portions of the cable adjacent the pulley 71 are secured together by a clamp 74 so that the ends of the cable portions 60b adjacent the pulley 70 are relatively fixed, the pulley being merely employed as a convenient means for attaching the cable to a fixed point on the dipper handle. By means of the construction just described, it will be apparent that upon rotation of the drum of the driving motor 70, the drum 59 is rotated with the result that the cable sections passing over this drum are wound up in one direction and unwound upon the other, causing the dipper handle 50 to move longitudinally through the housing 56 of the carriage in either an upward or a downward direction, depending upon the direction of rotation of the drum. In the event that the complementary sections 51 of the dipper handle are distorted due to the lateral bending of the dipper handle with the result that the upper or inner ends of the sections 51 do not lie in the same plane, the tendency for unequal stresses set up in the cables 60a and 60b will result in the rocking of the equalizer bar 66 upon the end plate 65 until there is a complete compensation for the unequal tension by the adjustment of the effective length of the two cable portions 60a.

At the lower end of the dipper handle, there is mounted the bucket or dipper 75 which is connected to the head 52 of the dipper handle by a bolt 76 and also by links 77 which are attached to the dipper by a bolt 78 and to the dipper handle by a bolt 79. The dipper 75 has forwardly projecting teeth 75a forming a cutting edge which is adapted to engage the rock or earth forming the bottom 22 when the dipper is being moved along the bottom for excavating purposes. For the purpose of moving the dipper and the outer or lower portion of the handle in an outward direction with respect to the hull 20 or in an upward direction with respect to the bottom 22, the dipper is provided with a pivotally connected yoke 80 attached to a hoisting cable 81. This cable extends upwardly and around a pulley 82 which is rotatably mounted in the outer, upper end of the boom 32. The cable 81 then extends downwardly and rearwardly above the boom and is passed around another pulley 83 which is rotatably mounted on the lower part of the boom. After passing over the pulley 83, the cable 81 extends downwardly and partially around another pulley 84 which is rotatably mounted within the hull 20. From the pulley 84, the cable 81 extends rearwardly and around the drum of a winch 85 which may be operated for the purpose of winding up the cable 81 to elevate the bucket 75 or to release the cable and permit the bucket to lower.

The movement of the lower end of the dipper handle and the bucket inwardly toward the hull 20 is effected by means of a cable 87 which is attached to a yoke 88 having its arms pivotally mounted on a bolt 89 secured in the brackets 90 which are formed integrally with the sections 51 of the dipper handle, as shown in Figs. 9 and 10. This cable 87 extends rearwardly through a four-way sheave 91 mounted on the end wall of the hull 20, after which the cable is carried over a pulley 92 and thence around the drum of a winch 93 which may be operated for the purpose of pulling the lower end of the dipper handle downwardly and inwardly toward the hull, for the purpose of releasing this cable when the bucket and the lower end of the dipper handle are being pulled outwardly or upwardly by the mechanism heretofore described.

As shown particularly in Figs. 6 and 7, the complementary dipper handle sections are formed as substantially similar hollow members each of which is formed as one integral metal piece of cast steel or the like. Each section comprises an outer side wall 51a, a parallel inner wall 51b, a top wall 51c and a lower wall 51d. These walls are integrally united in the process of casting and are also united integrally with transverse webs or diaphragms 51e which are spaced apart at intervals along the dipper handle sections and which are provided with elongated core holes 51f. The top wall 51c is initially provided with similar elongated core holes 51g for the purpose of permitting the material of the core to be removed after the dipper handle sections have been cast but, inasmuch as these core holes tend to weaken the upper wall of the dipper handle, they are preferably closed, after the casting operation, by cover plates 95 which are welded in place so that they are adapted to transmit compressive forces which may be set up in the dipper handle when it is in use. The upper and lower ends of the dipper handle sections are closed by end walls 51h so that each section 51 has an inner chamber 96 extending throughout the length thereof.

At the outer or lower end of the dipper handle, the sections 51 are somewhat enlarged, as

shown in Figs. 6 and 8, and these portions are secured together to form the head 52 to which the bucket 75 is attached. As shown in Fig. 6, the complementary dipper handle sections are spaced apart throughout the length of the head 52 by means of a filler plate 97, leaving a comparatively narrow slot 98 extending throughout the remainder of the length of the dipper handle. The portions of the dipper handle sections which engage opposite sides of the filler plate 97 are secured together by bolts 99 and nuts 100, thus uniting the dipper handle sections rigidly at their outer or lower ends while leaving them free for relative movement throughout the remaining portions of their length. In order that stresses may be transmitted longitudinally through the head of the dipper handle independently of the bolts 99, the inner walls 51b of the dipper handle are enlarged within the head and are provided with registering key-ways engaged by a vertical key 101 and a horizontal key 101a which are welded in place. The side walls 51a of the dipper handle sections are provided at their extreme lower or outer ends with integrally formed brackets 102 having apertures 102a therein which are adapted to be engaged by the previously described bolt 76 by which the bucket 75 is attached to the dipper handle. The lower ends of the dipper handle sections are also provided with inwardly directed socket members 103 having apertures 103a therein which are engaged by the previously described bolts 79 by which the links 77 are attached to the dipper handle.

In order to permit those portions of the dipper handle sections 51 which are located inwardly from or above the head 52 to have relative movement, to compensate for the distortion of the dipper handle, while at the same time maintaining some connection between these separately formed sections, the adjacent parallel inner walls 51b of the dipper handle sections are connected at intervals by bolts 105 which engage complementary circular apertures 106 and elongated slots 107 formed in these walls. The bolts also pass through washers 108 which are positioned in the slot 98 between the sections 51 and which are of the same width as this slot. The threaded ends of the bolts are engaged by washers 109 and nuts 110. The circular holes 106, which are somewhat closely fitted by the bolts 105, and the elongated slots 107, which extend lengthwise of the dipper handle, are arranged opposite each other in pairs, that is, a hole in one inner wall 51b is arranged to register with an elongated slot 107 in the opposite wall 51b and these holes and slots are staggered in their arrangement in two rows extending longitudinally of the dipper handle adjacent its upper and lower edges. The holes and slots are also arranged so that the alternate holes 106 engaged by the bolts are located in the inner wall of one dipper handle section 51 while the intermediate holes 106 are located in the inner wall of the upper dipper handle section, with a corresponding alternating arrangement of the elongated slots 107. In order to permit these bolts to be inserted and the nuts 110 to be applied thereto, the outer vertical walls 51a of the dipper handle sections are provided with threaded apertures 111 which, after the bolts and nuts have been inserted and adjusted, are adapted to be closed by threaded plugs 112, thus closing the inner chambers 96 of the dipper handle sections. The nuts 110 are so adjusted on the bolts 105 that, while they prevent any substantial separation of the dipper handle sections, they permit relative longitudinal movement of these sections to the extent allowed by the longitudinal slots 107 which may be made ample in size to compensate for any degree of lateral bending of the dipper handle which is encountered in use. In this way, by forming the sections 51 of the dipper handle as separate complementary members and attaching them rigidly to each other only at the lower or outer end of the dipper handle which forms the head, the remaining portions of the dipper handle are permitted to partake of such relative movement as may be necessary to permit the lateral bending of the dipper handle without breaking. Although this improvement has been illustrated in connection with cable mechanism for moving the dipper handle longitudinally with respect to the boom, it will be understood that the improvements herein described may be employed with various forms of operating mechanism such as that disclosed in the co-pending application of John F. Cushing heretofore referred to.

Although one embodiment of the invention has been shown and described by way of illustration, it will be understood that it may be constructed in various other embodiments coming within the scope of the appended claims.

I claim:

1. The combination in a dipper handle, of a plurality of separate longitudinal sections, said sections being provided with registering bolt holes and slots, and a series of bolts each engaging a hole in one of said sections and a slot in the other of said sections for connecting said sections and permitting relative movement thereof.

2. The combination in a dipper handle, of a plurality of separate longitudinal sections, means for connecting said sections rigidly together at one end of said handle, said sections having registering holes and elongated slots in other portions of said sections, and a series of fastening members engaging said holes and slots for connecting said sections and permitting relative movement thereof.

3. The combination in a dipper handle, of a pair of hollow longitudinal sections having inner walls lying in proximity to each other, said inner walls having registering holes and elongated slots extending longitudinally of the dipper handle, and a series of bolts each fitting one of said holes and engaging one of said slots for connecting said sections and permitting relative movement thereof longitudinally of the dipper handle.

4. The combination in a dipper handle, of a pair of hollow longitudinal sections having inner walls lying in proximity to each other, said inner walls having registering holes and elongated slots extending longitudinally of the dipper handle, a series of bolts each fitting one of said holes and engaging one of said slots for connecting said sections and permitting relative movement thereof longitudinally of the dipper handle, said sections having outer walls provided with holes in registry with said bolts, and removable plugs normally closing said last named holes.

5. The combination in a dipper handle, of a pair of hollow complementary sections extending parallel to each other longitudinally of the dipper handle, each of said sections having integral transverse webs located therein at intervals, said sections being further provided with inner walls having registering bolt holes and elongated slots, and a series of bolts each engaging one of said holes in one of said slots, said

holes and said slots being arranged alternately in opposite sections.

6. The combination in a dipper handle, of a pair of complementary sections extending parallel to each other longitudinally of the handle, means for rigidly securing said sections together at one end of the handle while leaving the remaining portions of said sections free for relative longitudinal movement, said sections adjacent said securing means being provided with registering key-ways, and a key engaging said key-ways for transmitting stresses from one of said sections to the other.

7. The combination in a dredge, of a dipper handle comprising a pair of separate longitudinal sections secured together at one end of the handle and having the remaining portions thereof free for relative longitudinal movement, means for supporting said dipper handle, and operating mechanism connected to said dipper handle for effecting movement thereof with respect to said supporting means, said mechanism comprising parts separately connected to said dipper handle sections and including an equalizing connection for causing equal stresses to be exerted upon said dipper handle sections by said mechanism when said handle is bent laterally.

8. The combination in a dredge, of a dipper handle comprising relatively movable longitudinal sections, means for supporting said dipper handle, and operating mechanism for moving said dipper handle with respect to said supporting means, said operating mechanism including separate cables and an equalizer to which said cables are separately connected for causing substantially equal stresses to be exerted upon said dipper handle sections by said cable portions when relative longitudinal movement of said dipper handle sections occurs.

9. The combination in a dredge, of a boom, a dipper handle mounted for relative movement with respect to said boom, a dipper carried by said dipper handle, said dipper handle comprising complementary longitudinal sections which are rigidly connected adjacent said dipper and which have the remaining portions thereof free for relative longitudinal movement, and operating mechanism comprising a drum having cables wound thereon and connected to said dipper handle for effecting longitudinal movement thereof with respect to said boom, said cables having separate portions connected to the separate complementary sections of said dipper handle and an equalizer bar extending between said cable portions for causing the tension in said portions to be equalized upon relative movement of said dipper handle sections.

ALOYS NEVELING.