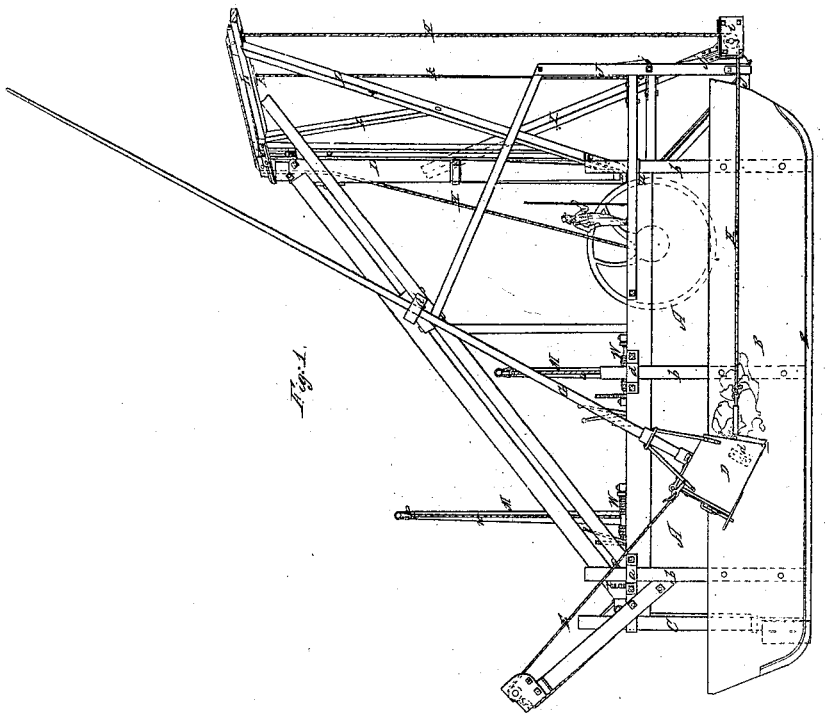
2 Sheets—Sheet 1.

A. HAWLEY.

EXCAVATING MACHINE.

No. 5,743. Patented Aug. 29, 1848.



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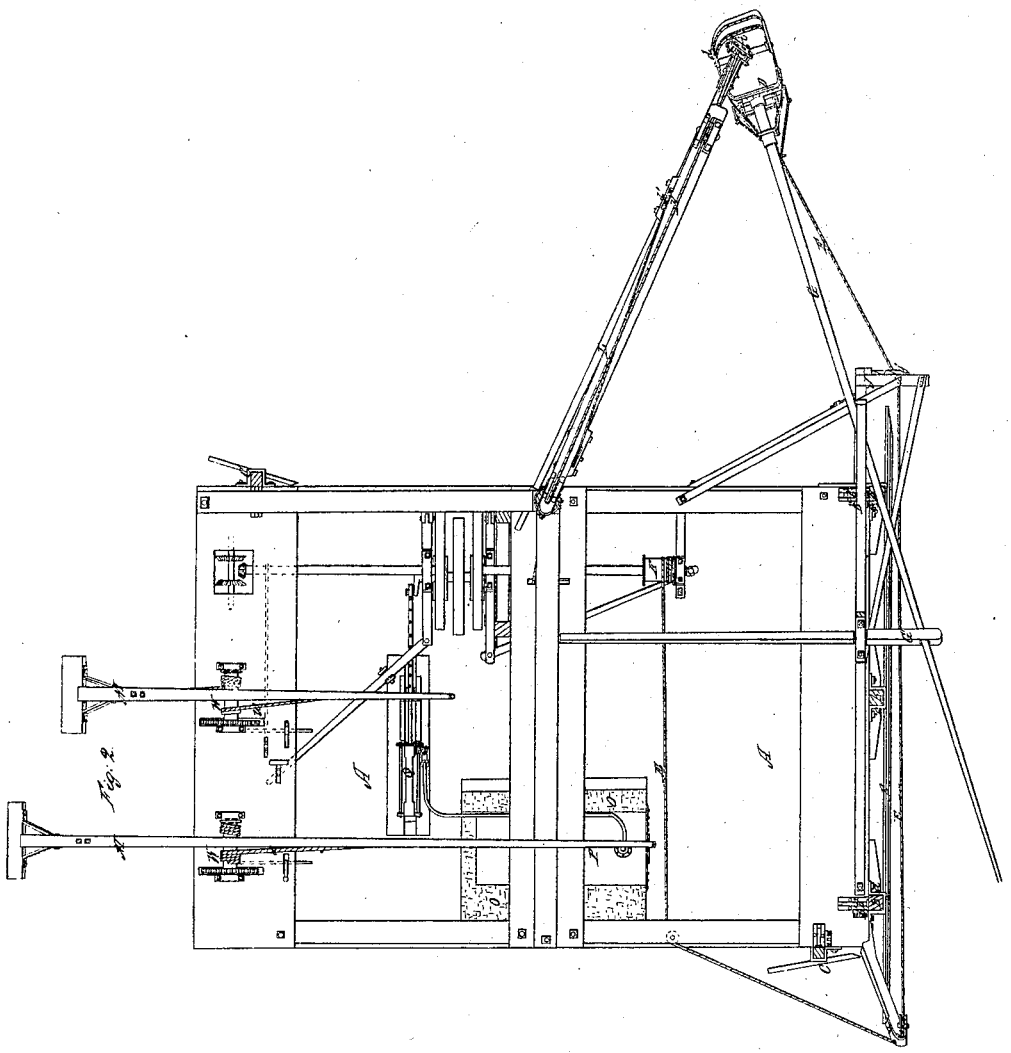

UNITED STATES PATENT OFFICE.

ABEL HAWLEY, OF MILWAUKEE, TERRITORY OF WISCONSIN.

FLOATING EXCAVATOR.

Specification of Letters Patent No. 5,743, dated August 29, 1848.

To all whom it may concern:

Be it known that I, ABEL HAWLEY, of the city and county of Milwaukee and Territory of Wisconsin, have invented a new and useful Machine for Excavating Canals, Deepening the Channels of Rivers and Harbors. Removing Bars, and for other Purposes. of which the following is a full, clear, and exact description, reference being had to the annexed drawings of the same, making part of this specification, in which—

Figure 1 is an end elevation, showing the scoop in the act of being loaded. Fig. 2 is a top view, showing the scoop in the act of being discharged of its load, upon the spoil bank.

When the same parts occur in the several figures they are designated by the same letters of reference.

This machine consists of a flat bottomed rectangular or other formed vessel, provided with a gage apron secured across its front end, which apron when the machine is ready for operation should correspond in form. magnitude, and position, with a transverse section of the cut to be made—with a combined perforator and scoop to penetrate or plough up and remove the earth—a crane with suitable chains and pulleys for hoisting up the scoop with its contained load of earth and conveying it to the spoil-bank. where it is unloaded or dumped—an extending boom with its pulley blocks, to govern the direction of the draft of the chain upon the scoop—setting poles to rest with their flat feet upon the bottom, behind the vessel. to push it up to the work, and hold it there—anchor guides on its sides to govern the direction in which it is moved—balance-wheels—cog-wheels—shafts—cranks—pulleys—couplings—friction brakes—levers—and other machinery to connect and give the proper motion to the several moving parts; with a steam engine and its boilers, furnace, and other appendages, which is the moving power that operates the whole. This machine is capable of excavating an ordinary canal of the largest dimensions, to its full size and of the proper form at one operation, completing it as it progresses, and with greater expedition, and less cost, than the same has heretofore been done by other means. It requires but few attendants, floats on the water of the canal being made, which must be filled for that purpose as soon as a space large enough to contain the machine has been excavated. It is therefore well adapted to making canals through swamps, morasses and other pestilential and unhealthy places, where it would be difficult, if not impossible, to procure a sufficient number of laborers to perform the work in the ordinary way, on account of the deleterious influences which such situations exert upon the health; and where, even if laborers could be obtained, the usual methods and appliances, are, with few exceptions, inadequate to the accomplishment of the work, because of difficulties existing in the nature and circumstances of the case, to describe which, would occupy too much space here, and would perhaps, be out of place, but these difficulties are well known and understood by engineers, who esteem them to be of such a formidable character that they are warranted for the sake of avoiding them in taking canals by circuitous routes at great expense. Many instances of this kind might be named, but I will only mention one by way of example, and that is generally known; I mean that portion of the Erie Canal in the State of New York which bends around the Rome swamp, thereby greatly increasing its length; and cost to make it at least twice as much as it would have done to make it directly through the swamp, by means of my machine. These statements are not conjectural, but a fair inference from the actual performance of the machines on the Illinois and Michigan Canal, where they are now in full and successful operation, making a cut through twelve miles of the morass known as the "Sag" which is one of the most difficult cuts to make, that has ever been undertaken in this or any other country. This machine is also well adapted for the excavation of canals through any of the ordinary formations that can be broken up and removed, without quarrying or blasting, including aggregations of tumble rock and boulders. It is also especially adapted to the removal of obstructions and the deepening of channels at the entrance of harbors. and in rivers, which it does with a degree of expedition and effect, heretofore unequalled.

To enable others skilled in the art to make and use my invention I will proceed to describe its construction and operation.

The float or vessel A is made, in preference, of an oblong rectangular form having

a flat bottom and vertical sides and ends, and is of such capacity that when loaded it will not draw more water than the depth to which the canal or cut to be made is limited. To the front end of the vessel a transverse apron B is secured by the iron loops or guides *a a a* in which the arms *b b b* slide, racks are placed on the backs of these arms into which pinions take which are secured to shafts mounted in suitable bearings fastened to the bulwark or deck of the vessel. These racks and pinions are for the purpose of raising and lowering the apron which when adjusted at the required elevation is held by the pawls b^2 b^2 b^2, Fig. 2 which take into the racks; on the pinion shafts clutches *b'* are fixed for the purpose of inserting handspikes to turn them. The apron is made of plank bolted to the arms *b b b*, the plank on the lower edge is twice as thick as the rest, its excess of thickness projecting forward, on the upper edge of this projecting plank a bar of iron R is secured to form a guide and stop to regulate the depth of the excavation, this rib is turned up in a curved form at each end as represented in Fig. 1. The apron is of the exact form and size of the transverse section of the cut to be made with the bottom of which its lower edge should coincide when the machine is in operation.

It is obvious that since the vessel floats on the surface of the water which is constant in its attitude, if any means could be devised whereby the bottom of the cut could be made to correspond with the lower edge of the apron that it would be on a water level, this object is accomplished by forming a projection on the side of the scoop which catches upon the rib R which arrests its further depression. The rib R of the apron and the projection *d* of the scoop are respectively so placed as to allow the cutting edge of the scoop to extend down far enough below the lower edge of the apron to excavate deep enough to permit it to pass along without resting upon the bottom of the cut.

On the sides of the boat the two combined anchors and steering apparatus C C are secured in any firm and substantial manner which will admit of their sliding freely up and down; they are raised and lowered in the same manner in which the apron is raised and lowered. These anchors or steering apparatus are severally composed of a piece of vertical timber with an oblique foot firmly secured in a transverse position to their lower end as seen in Fig. 2, and are for the purpose of holding the vessel steady, and counteracting by the obliquity of their course in the mud at the bottom of the cut, the tendency which the resistance offered to the scoop by the earth has to turn the vessel around; they are placed near the diagonally opposite corners of the vessel in such relative positions as tend to turn the ends of the vessel at which they are respectively placed in the same direction around the center, and if either end requires to be turned or guided around more or less it is simply necessary to lower or raise the anchor at that end as the case may be, in order that by sinking into the mud its lateral action may be increased, or by rising out of it may be diminished.

The scoop D is made of bar and boiler iron, its mouth or cutter being armed with steel to enable it the better to retain a sharp edge and so penetrate the earth more easily; it must be made of great strength to resist the immense strain to which it is at times subjected; it is firmly secured to the lower end of the guide boom G by bars collars and straps of iron. This boom the upper end of which passes through an eye in the end of the rock shaft G' is for the purpose of holding the scoop in the right position to plow up and load itself with the earth of the cutting and then afterward to change it into a suitable position to be discharged of its load which is done by opening the back or hinged end of the scoop and allowing the contents to drop out; these two positions of the scoop are respectively seen in Figs. 1 and 2. The capacity of the scoop should vary with the size and strength of the rest of the machine, about two cubic yards is however a good size for a machine suitable for ordinary canal or channel excavation.

The excavation is effected as follows: The scoop D is first drawn to the right end of the apron B by the back chain E which is fastened by one end to the rear end of the scoop, and by the other end to the drum F, being reeved through intermediate pulley blocks to give it the proper direction. The main chain H is next put in motion to draw the scoop forward, the back chain E being at the same time slackened, as the scoop is drawn along it plows up and loads itself with the earth and when it has arrived at the left end of the apron it is hoisted up and swung around to the spoil bank by the crane, and then discharged of its load. The back chain E is now again wound up to draw the scoop around again to the right end of the apron, the main chain H being at the same time slackened and the outer end of the extending boom I lowered, to again place the main chain in the best position to load the bucket; and the former operation is repeated until the earth is removed to a sufficient depth to allow the catch *d* on the side of the scoop to rest upon the rib R throughout its entire length, as it passes over it, when it will be found that the excavation of a section of the canal is completed the length of which equals the width of the scoop. The vessel and apron are now set up or forced up again to the breast of the excavation and another section is removed in the same man-

ner, thus the work advances by sections which suceed each other until the canal is completed.

On the side of the front end of the vessel a well braced and strongly built frame of timber J must be erected on the outside of which projecting stops *j j j* like the teeth of a ratchet are placed and are for the purpose of holding down the outer end of the extending boom I in order that the draft of the main chain H which is reeved through the block *i* on its outer end, may be in the proper direction to load the scoop which, when loaded and drawn up against the boom, presses against the same and disengages it from the stop *j* (the pressure being in proportion to the inclination of the crane to the spoil bank). There are several of these stops arranged upon the frame at suitable distances below each other, so that the end of the boom with its block may be held higher or lower to change the direction of the draft of the cable upon the scoop from time to time, as the nature and depth of the digging may require.

The extending boom I is a beam of timber secured to the middle of the mast of the crane by a truss of iron which is placed in a groove and is free to turn. This boom is longer than the arm of the crane and on its outer end the transverse block *i* is secured through which the main chain H is reeved. This boom is for the purpose of governing the direction of the draft of the main chain upon the scoop by means of the block on its end which is held in various positions against the stops *j j* for that purpose; it also aids in swinging the scoop back and forth, and in otherwise governing the motions of the same. The outer end of the boom is counterpoised by a weight K with which it is connected by the chain *k* which is reeved over the sheaves *k' k'*. This counterpoising greatly facilitates the raising, lowering, and management of the boom.

The crane L for raising the scoop and swinging it around to the spoil bank is composed of a mast, arm, braces, pulleys, and other necessary appendages arranged in any suitable way and is placed on one side of the vessel. It leans slightly outward so that the arm will swing out promptly with the scoop after the same is hoisted up whenever the back chain E is slackened.

For the purpose of moving the vessel from place to place, advancing it along as the work progresses, and holding it up to the work, two long setting poles M M having large flat feet placed transversely across their lower ends are projected over the stern of the vessel the feet resting on and abutting against the bottom of the river, canal, harbor, channel, or cut, as the case may be. These setting poles are alternately thrust out and drawn in by means of windlass W, W, and chains *w*, *w*. One end of each chain is secured to the upper end of one of the poles its middle being wound two or three times around the windlass adjacent to the pole to which it is attached. The other ends of these chains are secured to the lower part of the poles. This arrangement of the chains, windlasses, and poles resembles that of a drill bow when attached to the drill ready for operation. The motion of the windlasses is alternately in opposite directions to move the poles alternately in and out so as to thrust the vessel along as may be required.

The furnace O, boiler P, and engine Q are placed on the side of the vessel opposite to the crane to counterbalance the latter and keep the vessel in a horizontal position.

The steam engine is connected with suitable balance and cog wheels, drums, shafts, couplings, and chains to give motion to all the parts, which may be severally arranged as represented in the drawings, or in various ways which would answer nearly if not quite as well, but these things being common devices and well understood by engineers and mechanics generally a particular description of them is not here deemed necessary.

The frame work of both the machinery and the vessel should be of massive timber framed together in the strongest manner and the joining of those parts which sustain the heaviest strains should be strengthened by screw bolts and by straps of heavy bar iron.

Having thus described my improved excavator, what I claim therein as new, and desire to secure by Letters Patent, is—

1. The gage apron (B) substantially as described in combination with floating excavators, to determine the depth and form of the cut.

2. I also claim, the combination of the guides C C, with the vessel, the feet or paddles on the lower ends of the same, being oblique to its course, and inclined in such a direction, that when sunk into the mud while the vessel is being pushed forward, they will tend to turn it one way, while the action of the scoop tends to turn it the other, the resultant course being a mean between these opposing forces.

3. Likewise the combination of the setting poles with floating excavating apparatus for the purpose of holding the same up to its work and for moving it about from place to place.

In testimony whereof I have hereunto signed my name in presence of two subscribing witnesses this sixth day of March, 1848.

ABEL HAWLEY.

Witnesses:

B. H. WATSON,

STEPHEN W. WOOD.