No. 662,210. Patented Nov. 20, 1900.

H. R. WHEELER.

DREDGING APPARATUS.

(Application filed Mar. 10, 1900.)

(No Model.) 3 Sheets—Sheet 1.

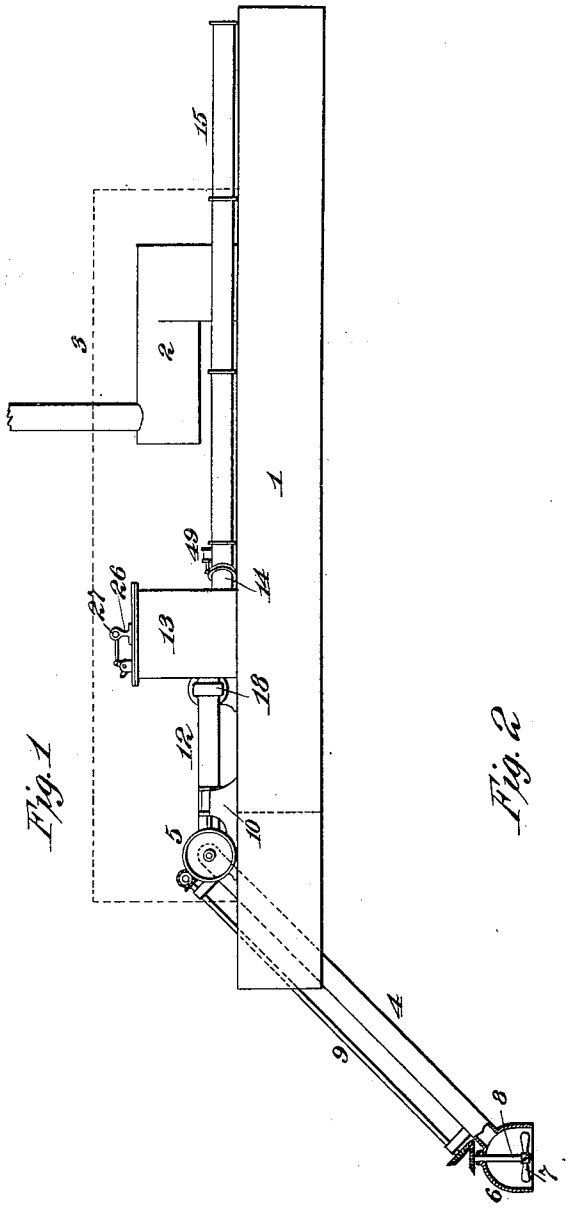


Fig. 1

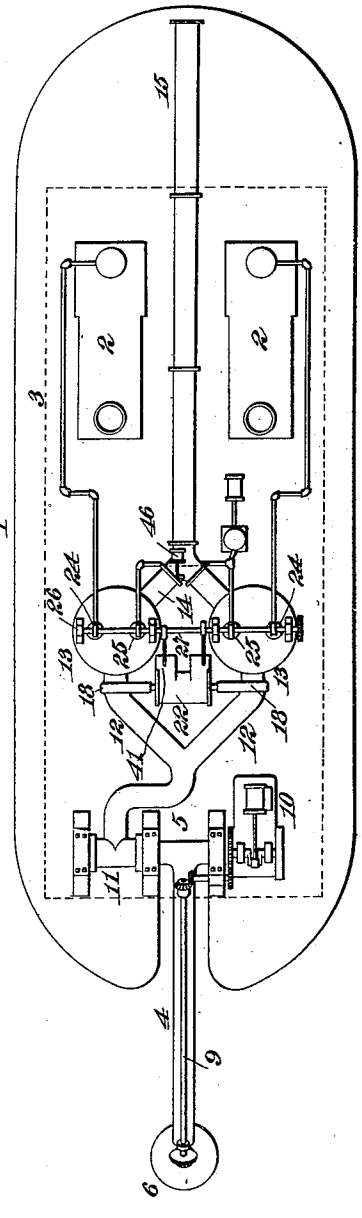


Fig. 2

Witnesses:

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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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Fig. 3

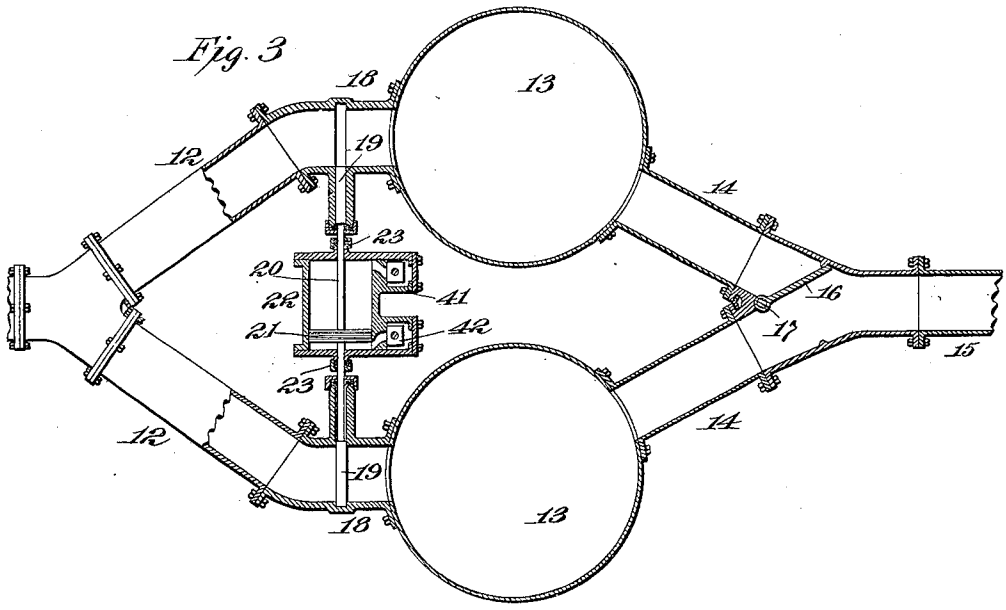
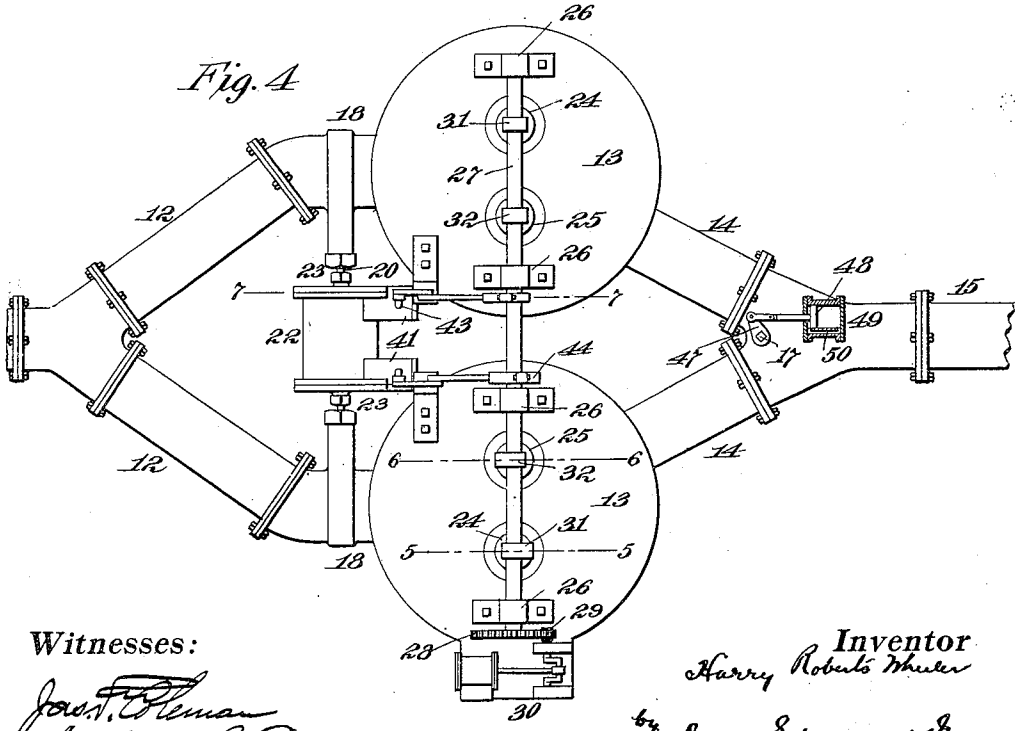


Fig. 4



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(No Model.) 3 Sheets—Sheet 3.

Fig. 5

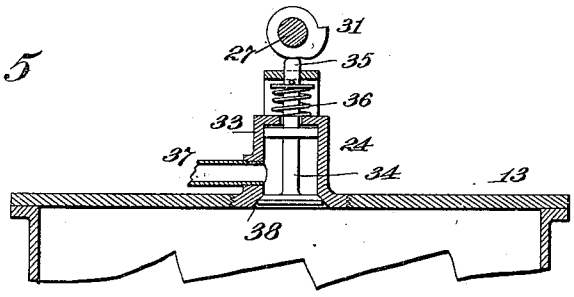


Fig. 6

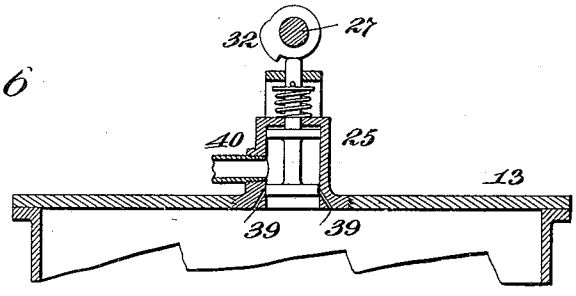
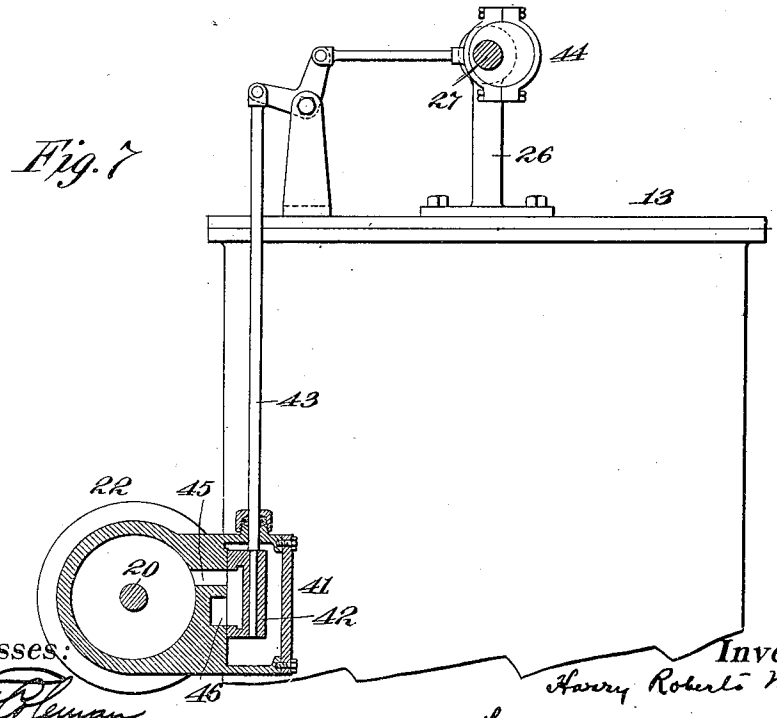


Fig. 7



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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

HARRY R. WHEELER, OF NEW YORK, N. Y.

DREDGING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 662,210, dated November 20, 1900.

Application filed March 10, 1900. Serial No. 8,161. (No model.)

To all whom it may concern:

Be it known that I, HARRY ROBERTS WHEELER, a citizen of the United States, residing in the borough of Brooklyn, in the city and State of New York, have invented a certain new and useful Improvement in Dredging Apparatus, of which the following is a description.

My invention relates to improvements in dredging apparatus; and the object of the invention is to simplify the construction of such apparatus, improve its efficiency, and enlarge its capacity.

The dredges now most extensively used in this country comprise a scow or float carrying a centrifugal pump of great capacity and operated by a separate motor, generally a steam-engine. The suction-pipe of the pump extends obliquely downward from the scow or float, so as to engage with the bottom, and the suction end thereof is provided with a suitable agitating or cutting device to disintegrate and loosen the bottom surface to be removed, said device being generally operated by a separate engine. Ordinarily the suction-pipe of the pump is pivoted with respect to the scow or float so as to be capable of being swung back and forth in the desired arc, so that it is now the practice to connect the suction-pipe with the centrifugal pump by a flexible connection. In some instances, however, the suction-pipe is held stationary with regard to the scow or float, and the latter, carrying the suction-pipe at its end, is then swung pivotally as a whole with respect to a spud forced down into the bottom, this swinging movement being effected by means of cables passing over blocks secured to anchors or to suitable abutments on the shore. The material from the centrifugal pump is discharged through discharge-pipes leading to a suitable place of deposit, which may be so far removed from the scow as to necessitate the carrying of the discharge-pipe on separate auxiliary floats. The objections to the apparatus as heretofore used have been the complications attendant upon the operation of the centrifugal pump by a separate engine and also to the relatively-small capacity of the pump. At the present time it is difficult to operate with a centrifugal pump with more than six per cent. of solid matter in the stream, while as the resistance to the discharge of the pump increases the lifting capacity is necessarily reduced. My present invention not only effects a great simplification in the apparatus employed, but also enables me to operate at the maximum depth and to force the material with heavier percentages of solid matter to any desired place of discharge, irrespective of the resistance in the discharge-pipe, either due to the length thereof or to the height of the final deposit above the water-line.

In order that the invention may be better understood, attention is directed to the accompanying drawings, forming part of this specification, and in which—

Figure 1 is a side view of a scow, dredge, or float equipped with my present improvements; Fig. 2, a plan view thereof; Fig. 3, an enlarged horizontal sectional view through the vacuum-pumps; Fig. 4, a plan of Fig. 3; Fig. 5, a section on the line 5 5 of Fig. 4; Fig. 6, a section on the line 6 6 of Fig. 4, and Fig. 7 a section on the line 7 7 of Fig. 4.

In all of the above views corresponding parts are represented by the same numerals of reference.

1 represents a scow or float which may be either provided with its own propelling mechanism or be moved from place to place by auxiliary means, generally provided with boilers 2 2 thereon inclosed in the usual housing 3.

4 is a metallic suction-pipe of large diameter, generally pivoted to the forward end of the scow at 5 so as to rest with its lower end in engagement with the bottom. The head 6, at the bottom of the suction-pipe 4, is provided with a rotary disintegrating device 7, carried on a shaft 8, which device is driven by a shaft 9, extending parallel to the suction-pipe from a small engine 10, carried by the scow or float.

11 is a flexible connection between the upper end of the suction-pipe and the pipe leading to the two branch pipes 12 12, which connect with two vacuum cylinders or receptacles 13 13. At least two of such receptacles are used, so that a practically continuous operation may be carried out, as will be explained.

14 14 are discharge-pipes from the vacuum-receptacles, leading to a single discharge-pipe

15, which extends from the scow to the place of discharge. Where the place of discharge is removed from the scow a considerable distance, it is the practice to carry the discharge-pipe on suitable auxiliary floats.

16 is a flap-valve mounted on a vertical pivot 17 and arranged to cover the discharge end of either of the pipes 14 14, as shown.

18 18 are casings carried by the auxiliary suction-pipes 12 12, and working in each of said casings is a gate-valve 19. Any other desired form of valve may be employed for alternately closing the auxiliary suction-pipes 12 12; but experience has shown that gate-valves are most effective for the purpose. It will also be understood that instead of a single flap-valve 16 in the discharge-pipes any other valve suitable for the purpose may be employed, and that, if desired, alternately-operated gate-valves or the equivalent thereof may be arranged in the discharge-pipes as well as in the suction-pipes of the pumping apparatus. The valves 19 are connected together by a piston-rod 20, on which is mounted a piston 21, which travels in a steam-cylinder 22. The cylinder 22 may be provided with stuffing-boxes 23 to prevent leakage of steam through the gate-valves. Each of the vacuum cylinders or receptacles 13 is provided with a steam-entrance valve 24 (see Fig. 5) and generally also with a water-valve 25, (see Fig. 6,) by which water may be admitted into the vacuum-cylinder to condense steam therein. Although this is the most effective way for condensing the steam and creating a vacuum in the cylinders or receptacles 13, it will be understood that such steam may be condensed by other means, such as by cooling-jackets or by cooling-pipes within the receptacles. The steam and water valves for the two vacuum receptacles or cylinders and the valves for the steam-cylinder 22 may be operated in any suitable way in the desired sequence. I prefer, however, to mount for this purpose in bearings 26 a cam-shaft 27, extending horizontally above the two cylinders or receptacles and carrying a spur-gear 28 at one end driven from a pinion 29 from a small auxiliary engine 30. The cam-shaft is provided with two cams 31 for operating the steam-inlet valves 24 and with other cams 32 for operating the water-inlet valves 25. These valves may be of any suitable character.

In Fig. 5 I show a convenient construction for the steam-inlet valves, wherein 33 represents a cylindrical casing screwed into the top of each of the cylinders and carrying a balanced valve 34, the stem 35 of which is operated by the cam 31, said valve being normally elevated by a spring 36. By depressing the valve steam may flow from the steam-pipe 37 through the passage 38, around the lower end of the valve, as will be understood. Ordinarily the valve will be balanced by the steam-pressure within the two pistons thereof, and the tension of the spring 36 will be sufficient to resist the vacuum when created. The construction of the water-valve is also preferably similar to that used for the steam-valve, (see Fig. 6,) except that a series of discharge-ports 39 are employed, by which water will be discharged from a water-pipe 40 in a series of fine jets or sprays when the valve is depressed. The cams 31 and 32 on the cam-shaft 27 will be so disposed as to operate the water-valve for one cylinder or receptacle simultaneously, or substantially simultaneously, with the steam-valve of the other, whereby the admission of water in a fine spray in one of the receptacles will result in the creation of a vacuum, which will draw the material therein through the suction-pipe, while the admission of steam in the other will force out the material already drawn by the suction previously created within it.

The cylinder 22 may be operated by any desired arrangement of valves, but preferably from the cam-shaft 27. To effect this result, the cylinder is provided at each end with a valve-chest 41, in which is mounted a slide-valve 42. seated by the pressure within the valve-chest and operated by a rod 43 from an eccentric 44 on the cam-shaft 27. A port 45 is adapted to be connected with the space within the valve-chest by the movement of the valve to one side by the eccentric 44, and upon the return movement of the valve the said port is connected with an exhaust-port 46 through a passage formed in the bottom face of the valve, as will be understood. The eccentrics 44 when used are so placed on the cam-shaft 27 as to permit steam to enter one end of the cylinder 22 to move the piston 21 thereof in a direction to close one of the valves 19 immediately before the opening of the steam-valve for the corresponding vacuum-cylinder or receptacle to allow the steam entering the latter to force the material out through the auxiliary discharge-pipe 14 thereof.

In order to prevent shock in the operation of the flap-valve 16 from one side to the other, I preferably provide the pivot 17 thereof with an arm 47, which connects with a piston 48 in a cylinder 49, containing a fluid, preferably glycerin, so as not to be affected by low temperatures. The ends of the cylinder 49 are connected by a run-around pipe 50 of reduced cross-section to allow the liquid to circulate through the same, thereby providing a dash-pot of a common construction.

The operation of the improved apparatus is as follows: The engine 10 is first started to actuate the cutting or disintegrating device 7, so as to loosen up the material to be removed. The auxiliary engine 30 is started to turn the cam-shaft 27 at the desired speed. This movement first operates one of the valves 42 of the cylinder 22 to allow steam to move the piston 21 thereof to close the valve in one of the auxiliary suction-pipes 12, and immediately thereafter the steam-valve 24 of that

cylinder or receptacle will be opened to allow steam to enter the same to expel air therefrom, this steam blowing out through the auxiliary discharge-pipe 14 thereof. The rotation of the shaft 27 then permits the steam-valve for the cylinder or receptacle under consideration to close and opens the water-valve thereof, resulting in the injection into the cylinder of water in the form of a fine spray to condense the steam and form a vacuum therein, closing by suction the flap-valve on the discharge-pipe 14. Immediately after this takes place the shaft 27 will have operated the valve 42 for the other end of the cylinder 22 to permit the gate-valve closing the suction-pipe 12 to open for the cylinder in which a vacuum has been created, and such vacuum will draw by suction the material up through the suction-pipe 4 into said receptacle. At the time the vacuum is being formed in one receptacle by the injection of cold water therein the steam-valve for the other receptacle is opened to permit steam to enter the same, the gate-valve 19 thereof being closed. When the steam-valve again opens for the cylinder or receptacle which has been filled with material by suction, the water-valve for the other receptacle will be opened to condense the steam and form the vacuum, closing the flap-valve 16 of its discharge-pipe 14 and the valve 19 thereof being opened to permit the suction to draw up the material into said receptacle. The admission of steam at this time into the other receptacle forces the material therefrom out through the discharge-pipe 14, this being permitted, since the valve 19 in its suction-pipe 12 will be closed. By thus employing at least two vacuum-pumps, operating in alternation and preferably automatically, as explained, one to draw the material by suction up through the suction-pipe and the other to simultaneously force the material by steam-pressure out through the discharge-pipe, a continuous flow of the material will take place from the point of removal to the place of discharge, so that the apparatus can operate at all times to the maximum capacity. Since the material is drawn up from the bottom by a practically perfect vacuum, the maximum lift can always be secured, while since the material is forced out through the discharge-pipe by the steam-pressure it can be removed to any place of discharge, however remote or elevated, by using a sufficiently high steam-pressure.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is as follows:

1. An improved dredging apparatus, comprising in combination a scow or float, a suction pipe carried by the same with its lower end in contact with the bottom to be dredged, two vacuum-cylinders on the scow or float, branch pipes connecting the suction-pipe with said vacuum-cylinders, mechanically-operated valves in said branch pipes, a common discharge-pipe leading from the scow or float, auxiliary discharge-pipes connecting the vacuum-cylinders with the common discharge-pipe, a flap-valve for automatically closing in alternation the discharge ends of the auxiliary discharge-pipes, and means for retarding the movement of said flap-valve, substantially as set forth.

2. An improved dredging apparatus, comprising in combination a scow or float, a suction-pipe carried by the same with its lower end in contact with the bottom to be dredged, two vacuum-cylinders on the scow or float, branch pipes connecting the suction-pipe with said vacuum-cylinders, mechanically-operated valves in said branch pipes, a common discharge-pipe leading from the scow or float, auxiliary discharge-pipes connecting the vacuum-cylinders with the common discharge-pipe, a flap-valve for automatically closing in alternation the discharge ends of the auxiliary discharge-pipes, and a dash-pot for retarding the movement of said flap-valve, substantially as set forth.

3. An improved dredging apparatus, comprising in combination a scow or float, a suction-pipe carried therefrom with its lower end in contact with the bottom to be dredged, a pair of vacuum-cylinders carried by the scow or float, auxiliary suction-pipes connecting the suction-pipe with said vacuum-cylinders, a common discharge-pipe, auxiliary discharge-pipes connecting the vacuum-cylinders with said common discharge-pipe, a gate-valve for each of the auxiliary suction-pipes, and means for simultaneously actuating said gate-valves, substantially as set forth.

4. An improved dredging apparatus, comprising in combination a scow or float, a suction-pipe carried therefrom with its lower end in contact with the bottom to be dredged, a pair of vacuum-cylinders carried by the scow or float, auxiliary suction-pipes connecting the suction-pipe with said vacuum-cylinders, a common discharge-pipe, auxiliary discharge-pipes connecting the vacuum-cylinders with said common discharge-pipe, a gate-valve for each of the auxiliary suction-pipes, and a steam-cylinder carrying a piston connected to both of said gate-valves, substantially as set forth.

5. An improved dredging apparatus, comprising in combination a scow or float, a suction-pipe carried thereby with its lower end in engagement with the bottom to be dredged, a pair of vacuum-cylinders carried by the scow or float, auxiliary suction-pipes connecting the suction-pipe with said cylinders, a common discharge-pipe, auxiliary discharge-pipes connecting the cylinders with said common discharge-pipe, valves in the auxiliary suction-pipes, steam-valves for admitting steam into the cylinders, and a cam-shaft having cams thereon for actuating said steam-valves in alternation, substantially as set forth.

6. An improved dredging apparatus, comprising in combination a scow or float, a suc-

tion-pipe carried thereby with its lower end in engagement with the bottom to be dredged, a pair of vacuum-cylinders carried by the scow or float, auxiliary suction-pipes connecting the suction-pipe with said cylinders, a common discharge-pipe, auxiliary discharge-pipes connecting the cylinders with said common discharge-pipe, valves in the auxiliary suction-pipes, steam-valves for admitting steam into the cylinders, a water-valve for each of said cylinders, and a cam-shaft carrying cams for operating said steam and water valves, whereby the steam-valve of one cylinder will be operated substantially simultaneously with the water-valve of the other, substantially as set forth.

7. An improved dredging apparatus, comprising in combination a scow or float, a suction-pipe carried thereby with its lower end in contact with the bottom to be dredged, a pair of vacuum-cylinders mounted on the scow or float, auxiliary suction-pipes connecting the cylinders with the suction-pipe, a common discharge-pipe, auxiliary discharge-pipes connecting the cylinders with said common discharge-pipe, valves in the auxiliary suction-pipes, a steam-cylinder for simultaneously actuating said valves, controlling-valves for said steam-cylinder, steam-valves for admitting steam into the vacuum-cylinders, and a cam-shaft carrying cams for operating the valves of the steam-cylinder and the valves of the vacuum-cylinders, substantially as set forth.

8. An improved dredging apparatus, comprising in combination a scow or float, a suction-pipe carried thereby with its lower end in contact with the bottom to be dredged, a pair of vacuum-cylinders mounted on the scow or float, auxiliary suction-pipes connecting the cylinders with the suction-pipe, a common discharge-pipe, auxiliary discharge-pipes connecting the cylinders with said common discharge-pipe, valves in the auxiliary suction-pipes, a steam-cylinder for simultaneously actuating said valves, controlling-valves for said steam-cylinder, steam-valves for admitting steam into the vacuum-cylinders, a cam-shaft carrying cams for operating the valves of the steam-cylinder and the valves of the vacuum-cylinders, and water-valves for said cylinders controlled by said cam-shaft, substantially as set forth.

This specification signed and witnessed this 7th day of March, 1900.

HARRY R. WHEELER.

Witnesses:
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JNO. R. TAYLOR.