

(No Model.)

A. B. BOWERS.
DREDGING APPARATUS.

No. 411,183.

Patented Sept. 17, 1889.

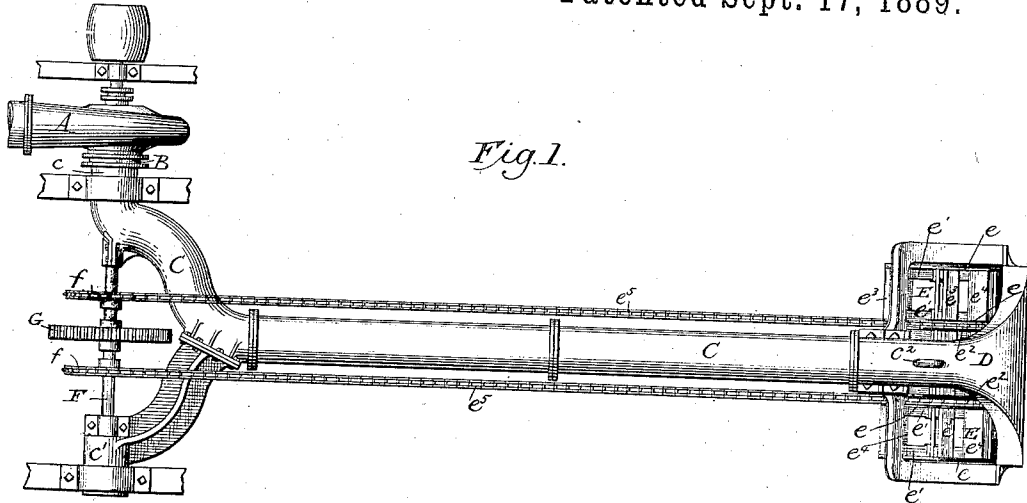


Fig. 1.

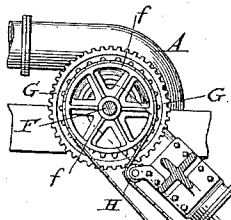


Fig. 2.

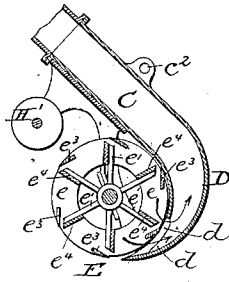


Fig. 3.

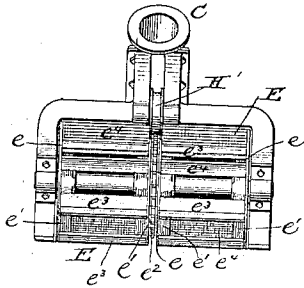


Fig. 4.

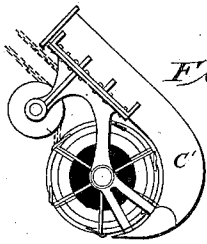


Fig. 6.

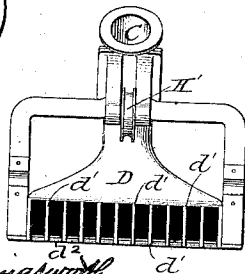


Fig. 5.

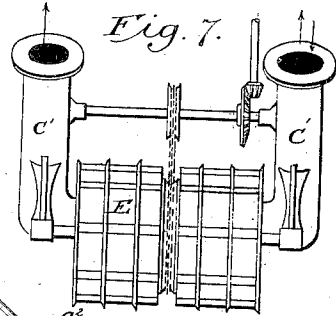


Fig. 7.

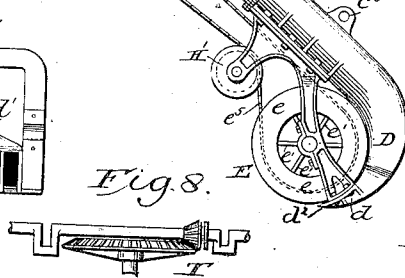


Fig. 8.

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ALPHONZO B. BOWERS, OF SAN FRANCISCO, CALIFORNIA.

DREDGING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 411,183, dated September 17, 1889.

Original application filed December 9, 1876. Divided and another application filed April 27, 1885. Again divided and this application filed May 17, 1887. Serial No. 238,513. (No model.)

To all whom it may concern:

Be it known that I, ALPHONZO B. BOWERS, of San Francisco, California, civil engineer, have invented certain Improvements in Dredging Apparatus, of which this, with the accompanying drawings, is a description.

It is a fifth division of the third division filed April 27, 1885, or the eighth division of an application filed by me December 9, 1876, and renewed April 16, 1879, being for portions thereof shown in original figures 7, 10, 18, 19, 20, and 21.

It consists, mainly, of a non-rotating excavating implement attached to a suction-pipe, in combination with a suitable fender projecting below said implement to enable it to ride over obstructions.

It also consists, in part, of the combination, with said implement and pipe, of a rotary fender; also, in the combination, with said implement, pipe, and rotary fender, of an auxiliary rotary excavator secured to and revolving with said fender.

Figure 1 is a plan of this apparatus, showing how two endless chains may be used to actuate the excavator. Fig. 2 is a side view showing how said excavator may be driven with a single chain. Fig. 3 is a vertical section through the lower end of the suction-pipe and excavator. Said Figs. 2 and 3 show the suction-pipe at an inclination nearer the vertical than will normally be the case, the proper inclination being such as will bring the peripheral fenders on E below the level of the cutting-edge d^2 . Fig. 4 shows the cutting-edges, chain-wheel, and bearings of the excavator. Fig. 5 shows the mouth of the suction-pipe with its screening-bars, scraper, and the brackets and bearings that support the excavator. Fig. 6 is a reproduction of original Fig. 18, Fig. 7 of original Fig. 22, and Fig. 8 of a portion of the driving-shaft of original Fig. 7 corresponding to shaft F in Fig. 1.

A is a pump for raising and discharging spoil.

B is a gland through which an air-tight connection is made between the swinging and stationary sections of suction-pipe.

C is an outboard section of suction-pipe. It swings in a vertical plane on trunnions c c' , the former being an elbow of said pipe, and the latter either an elbow or otherwise, in accordance with the number of pumps used. e^2 is an eye, to which the hoisting and lowering device may be attached.

D is the outer end, and d the mouth, of the suction-pipe. As here shown, this outer end is enlarged, flattened, curved around the excavator, and provided with a screening device, preferably consisting of the bars d' , to admit spoil but exclude material too coarse to pass through the raising and discharging apparatus. It is also provided with a scraper d^2 on the lower side of the suction-pipe.

E is a rotary excavator with outward delivery to the mouth of the suction-pipe. As here shown, in Fig. 1 it is provided with six and in Fig. 2 with four open-centered disks e . These disks are secured to arms e' radiating from central hubs keyed to the excavator-shaft. Between the central open-centered disks, Figs. 2 and 4, is a chain-wheel e^2 . Between the central and end disks, and secured thereto, are cutting-edges e^3 , which may be identical with the detachable knives described and claimed in the first divisional patent, No. 318,859; and back of these edges, and secured to the arms e' , are scrapers e^4 , that carry to the mouth of the suction-pipe the spoil cut by the knives e^3 . These knives are for cutting clay and similarly tenacious material, and should be removed with the driving-chain, also, when the excavation is in sand or gravel, the radial devices e^4 and scraper d^2 being sufficient and preferable for such easily-disintegrated material. This excavator may be actuated by an endless chain e^5 or in any other suitable manner, and as here shown is placed transversely to the pipe and in front of the mouth thereof. This excavator also serves as a fender for the protection of the scraper d^2 .

F is a short shaft between and in line with the axes of the trunnions c c' , on which may be placed chain-wheels f for actuating the endless chains and excavator shown in origi-

nal Fig. 18, reproduced in Fig. 6; or it may carry a pinion, as in original Fig. 7, present Fig. 8, to drive the excavator by suitable shafting and gearing, as indicated in original Fig. 22, present Fig. 7.

G is a gear or other suitable device for actuating the shaft F.

H H' are guide-sheaves for the endless chain.

As here shown, the dredge works with a forward feed in line with the longitudinal axis of the hull. By suitably changing its form and placing the suction-pipe in front instead of in the rear of the excavator the feed would be in the opposite direction.

I confine myself to neither form of construction, but in this eighth division claim—

1. In combination, a suction-pipe provided with a screening device that admits spoil to said pipe, but excludes substances too coarse to pass through the raising and discharging apparatus, and a rotary excavator having its axis outside of said device, said excavator being provided with cutting edges or blades whose spoil is delivered to and through said device to said pipe.
2. In combination, a suction-pipe provided with a screening device that admits spoil to said pipe, but excludes substances too coarse to pass through the raising and discharging apparatus, and a rotary excavator provided with scraping-blades that deliver their spoil to and through said device to said pipe.
3. In combination, a suction-pipe provided with bars that admit spoil to said pipe, but exclude substances too coarse to pass through the raising and discharging apparatus, and a rotary excavator having its axis outside of said bars, said excavator being provided with cutting edges or blades whose spoil is delivered between said bars to said pipe.
4. In combination, a suction-pipe provided with a screening device that admits spoil to said pipe, but excludes substances too coarse to pass through the raising and discharging apparatus, and a rotary excavator provided with scrapers and cutting edges or blades that deliver the spoil through said device to said pipe.
5. A suction-pipe having its lower end flattened, in combination with a rotary excavator outside of and its axis transverse to said pipe, said excavator being provided with cutting edges or blades that deliver their spoil outward to said pipe.
- 55 6. A suction-pipe having its lower end flattened, in combination with a rotary excavator outside of and its axis transverse to said pipe, said excavator being provided with scraping-blades that deliver their spoil outward to said pipe.
- 60 7. A suction-pipe having its lower end flattened, in combination with a rotary excavator outside of and its axis transverse to said pipe, said excavator being provided with scrapers and cutting-edges that deliver their spoil outward to said pipe.
8. A suction-pipe having its lower end flattened and curved, in combination with a rotary excavator outside of and its axis transverse to said pipe, said excavator being provided with cutting edges or blades that deliver their spoil outward to said pipe.
9. A suction-pipe having its lower end flattened and curved, in combination with a rotary excavator outside of and its axis transverse to said pipe, said excavator being provided with scraping-blades that deliver their spoil outward to said pipe.
10. A suction-pipe having its lower end enlarged, flattened, and curved, in combination with a rotary excavator outside of and its axis transverse to said pipe, said excavator being provided with scrapers and cutting-edges that deliver their spoil outward to said pipe.
11. In combination, a suction-pipe, rotary excavator, endless actuating - chain, and sheaves H H', for holding and guiding said chain.
12. The rotary excavator E, provided with the scrapers e', substantially as and for the purpose described.
13. A suction-pipe provided with a non-rotating excavating implement and a rotary fender secured to and in combination with an auxiliary rotary excavator.
14. In combination, a suction-pipe and a rotary excavator secured to the mouth thereof, said excavator being provided with cutting edges or blades and having its axis outside of and transverse to said pipe.
15. A suction-pipe provided at or near its mouth with a fixed or non-rotating excavating device, and a fender projecting down beyond said device to prevent this device from catching against obstructions.
16. A suction-pipe provided with a scraper, in combination with a device projecting down beyond said scraper to prevent this scraper from catching against obstructions.
17. A suction-pipe provided with a fixed or non-rotating excavating implement, and a rotary fender projecting down beyond this implement to prevent said implement from catching against obstructions.
18. A suction-pipe provided with a screen, a scraper, and a fender projecting down beyond this scraper to carry said scraper over obstructions.
19. A suction-pipe provided with a screen, scraper, and a rotary fender projecting down beyond the scraper.
20. In combination, a dredge-boat, a non-rotating suction-pipe constructed and arranged to swing in a vertical plane in line with or parallel with the line of the longitudinal axis of said boat, and a rotary excavator secured to the pipe and provided with peripheral longitudinal excavating-edges that deliver their spoil outward to said pipe.
21. In combination, a dredge-boat, a non-rotating suction-pipe constructed to vary the

depth of excavation by the raising or lowering of its outer end in a vertical arc, and a rotary excavator secured to said outer end and provided with longitudinal peripheral excavating-edges that deliver their spoil outward to said pipe.

22. A rotary excavator having excavating devices with outward delivery, and fenders

at the sides of the cutting-face and intermediate between said sides along said cutting-face to prevent said devices from catching against obstructions.

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Witnesses:

SCHUYLER DURYEE,
FINIS D. MORRIS.