

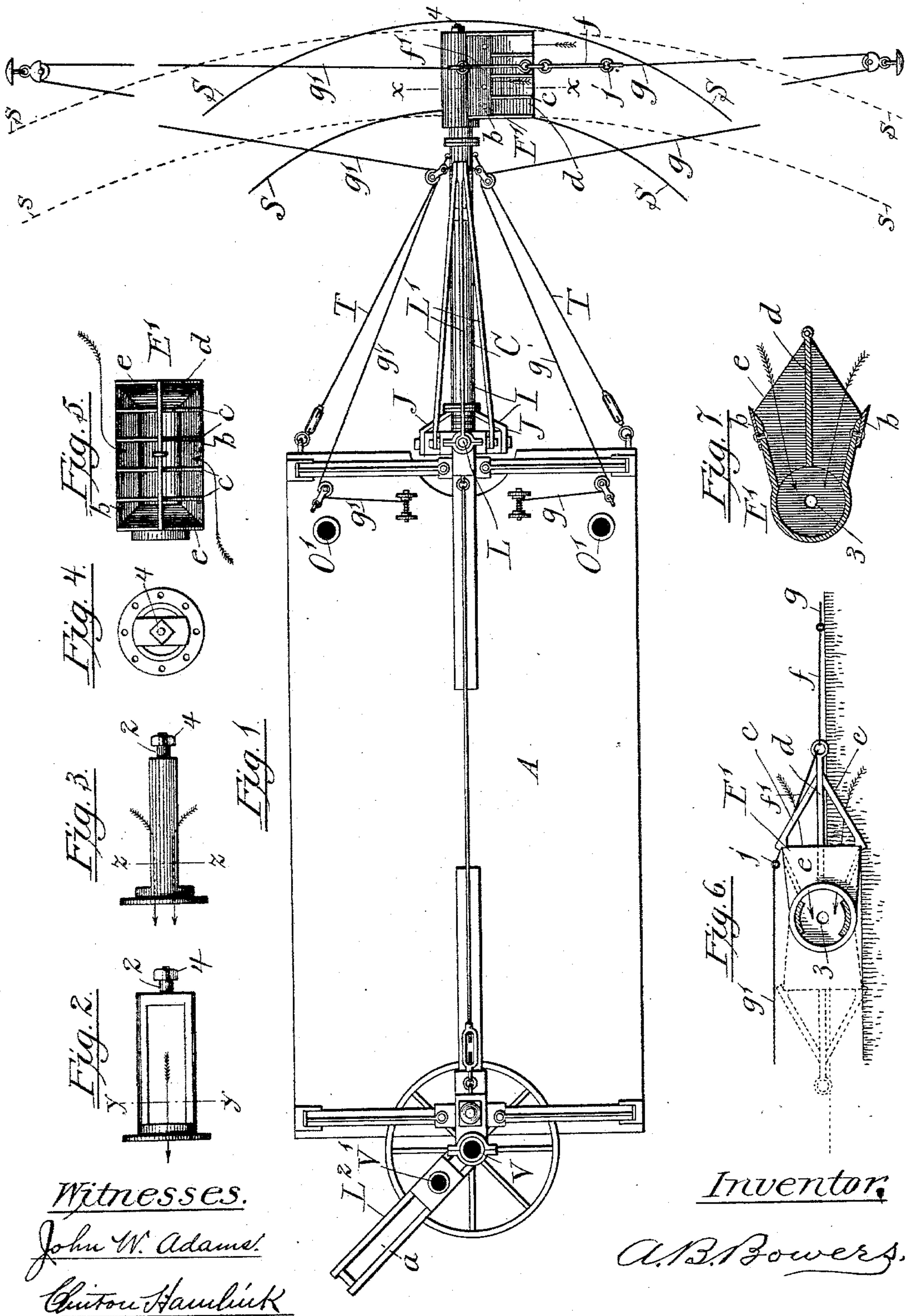
(No Model.)

2 Sheets—Sheet 1.

A. B. BOWERS.  
EXCAVATOR FOR HYDRAULIC DREDGERS.

No. 565,132.

Patented Aug. 4, 1896.



Witnesses.

John W. Adams.

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Inventor.

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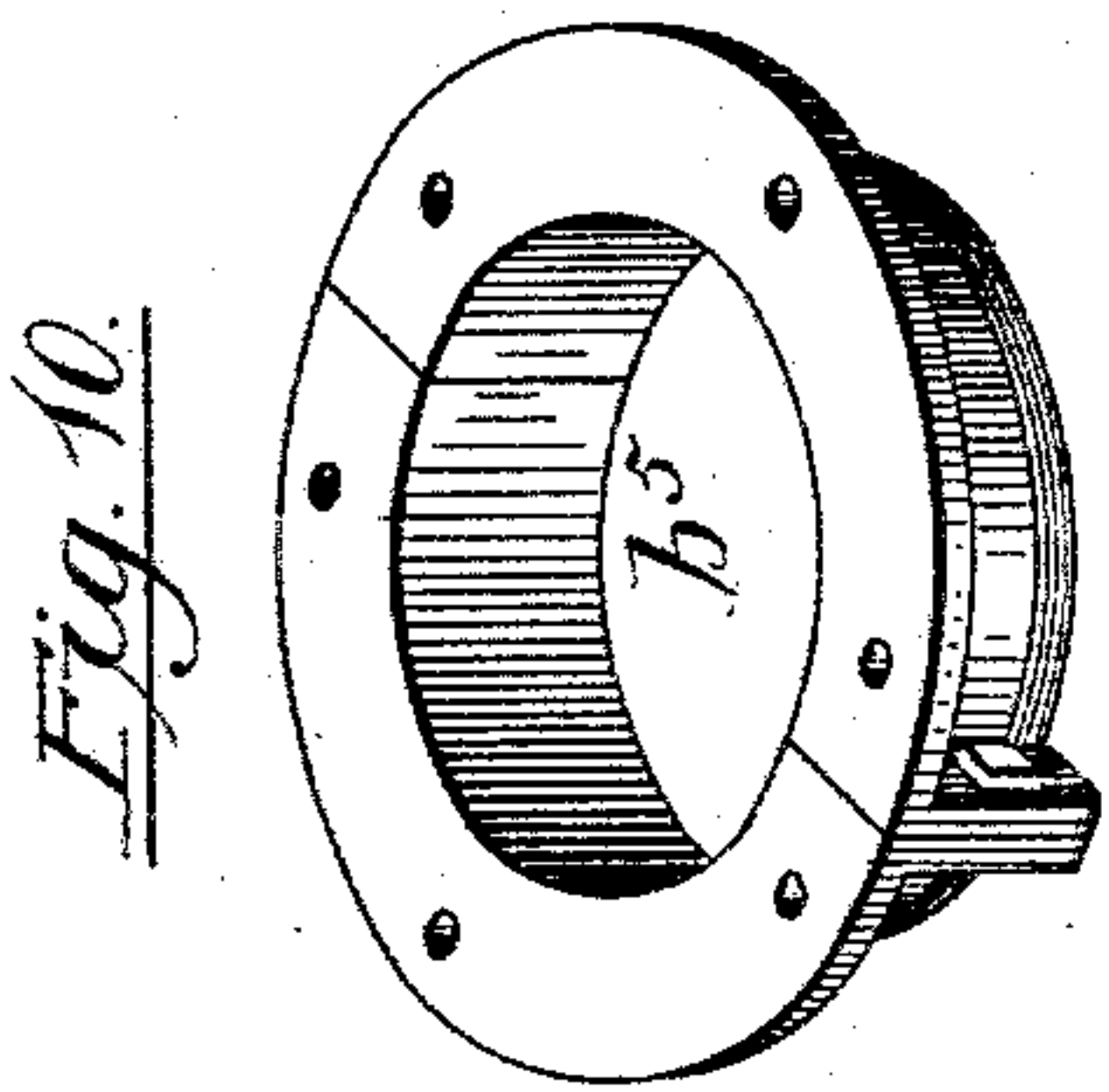
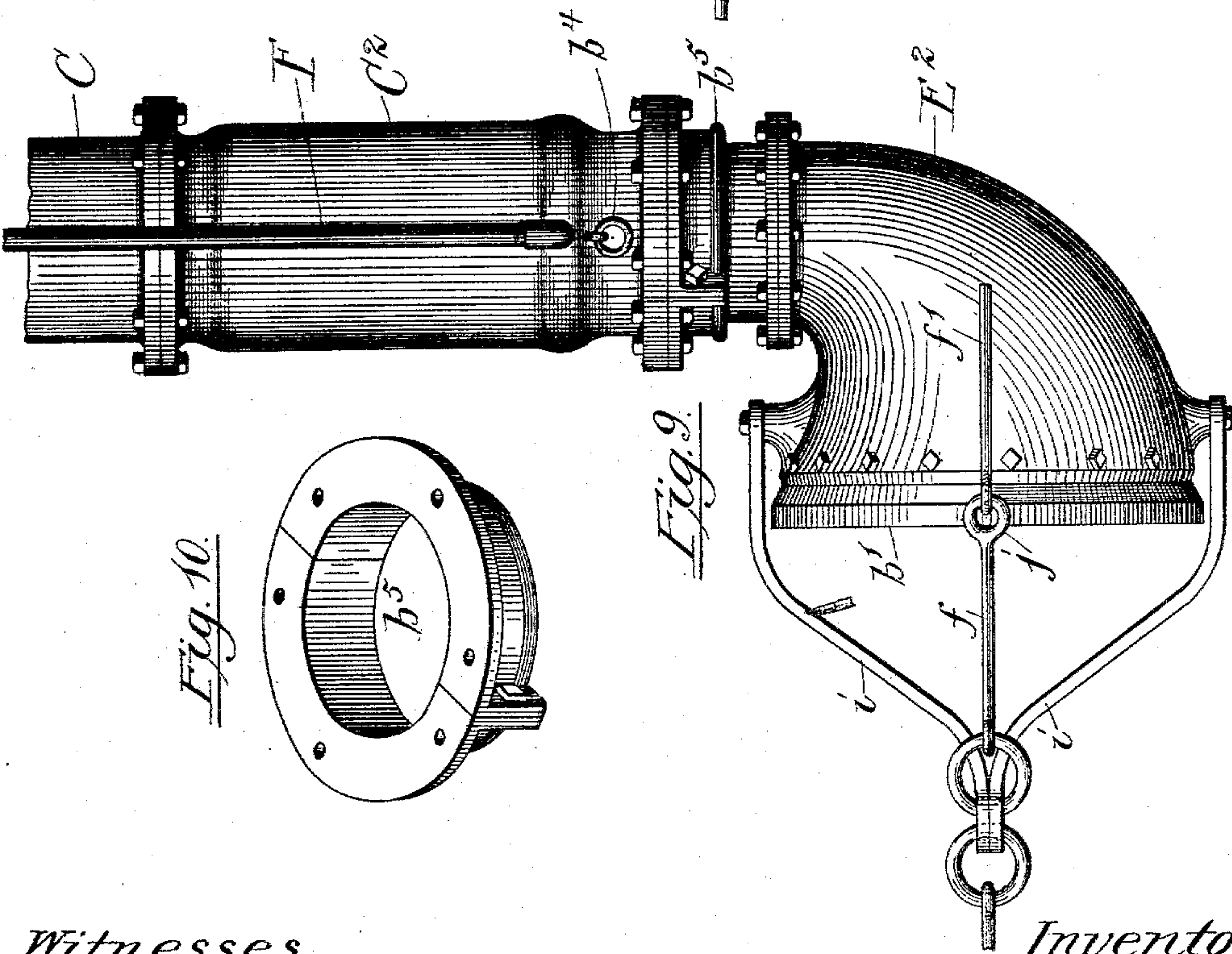
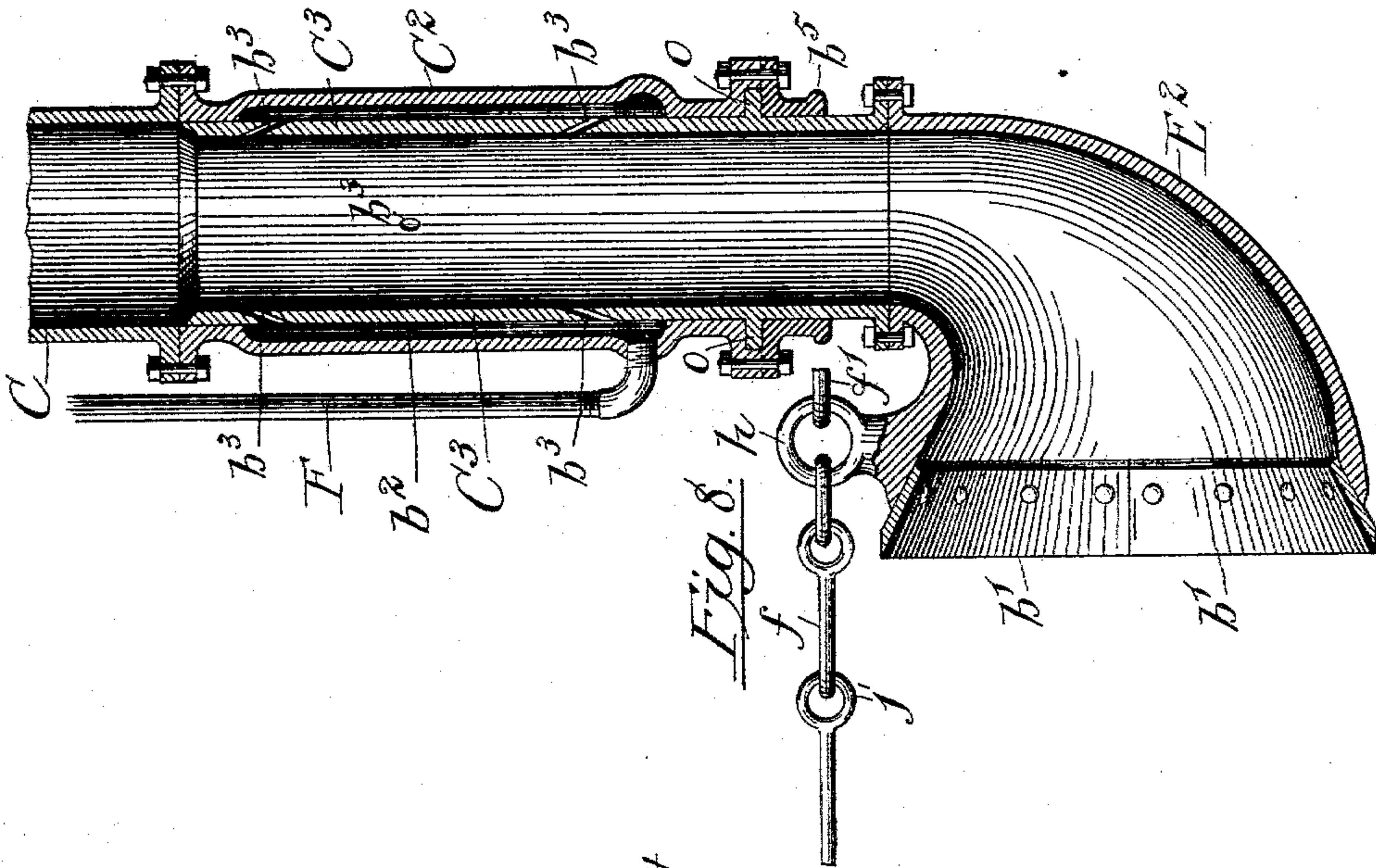
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# UNITED STATES PATENT OFFICE.

ALPHONZO B. BOWERS, OF SAN FRANCISCO, CALIFORNIA.

## EXCAVATOR FOR HYDRAULIC DREDGERS.

SPECIFICATION forming part of Letters Patent No. 565,132, dated August 4, 1896.

Application filed February 6, 1895. Serial No. 537,506. (No model.)

*To all whom it may concern:*

Be it known that I, ALPHONZO B. BOWERS, engineer, of San Francisco, California, have invented an Improved Excavator for Hydraulic Dredges, of which this, with the accompanying drawings, is a description.

It consists in part of a portion of an invention embodied in an application filed June 30, 1883, Serial No. 99,678, and in part of devices shown in a later application filed May 7, 1889, Serial No. 237,891, Figures 1 to 7 being copies of Figs. 3, 4, 5, 6, 7, and 18 of the application of June 30, 1883, and Figs. 8 and 9 being copies of parts of Figs. 1 and 2 of the later application.

The object of this invention is, in part, to provide a cheap and simple device to be used in practicing the invention secured to me by Letters Patent of the United States No. 318,860, under date of May 26, 1885, for "the improvement in the art of dredging, which consists in oscillating the boat on a contained center, thereby making an arc-shaped cut during the side movement of the boat."

It is obvious that this improvement in the art of dredging may be practiced with a great variety of devices, and numerous Letters Patent for special devices for this purpose have been taken out by me and others, and several applications by me for other devices for practicing the same are now pending in the Patent Office of the United States, all of which are subordinate and subject to said Letters Patent No. 318,860. This application is for still other subordinate devices that, under certain conditions, can be used with advantage in practicing this improvement in the art, and for other dredging purposes; but the invention herein claimed is not limited to a dredge-boat that oscillates "on a contained center." The boat may swing on a chain and anchor either in front or rear, on the discharge-pipe and flexible joint connecting the oscillating and non-oscillating sections described and claimed in United States Letters Patent No. 318,859, issued to me May 26, 1885, or it may swing on any other suitable pivot or radius and pivot. Nor is the invention limited to its application to dredge-boats that swing at all. The hull may be made stationary by vertical anchors in front and rear or by any other suitable

means. The tie-rods T T may then be removed, leaving the suction-pipe and excavator free to swing independently of the dredge-boat on a pivot L and boom L', or any other suitable device. The excavator may be mounted on a vertical telescoping or other suction-pipe and be constructed and arranged to move either in the arc of a horizontal circle or in straight horizontal lines or planes. Nor is the invention limited to the special devices illustrated, nor to those that reverse by a partial rotation, except when the word "rotatory" is used before "reversible," though substantially such devices are believed to be the best for the particular purposes for which they are more especially designed, to wit: to be used instead of a continuously-rotating excavator in combination with a suction-pipe.

For practicing the improvement in the art hereinbefore specified, it consists, broadly, of a dredge-boat having a suction-pipe and self-contained pivot or center of oscillation, with means for swinging said boat on said pivot, in combination with any suitable excavating or disintegrating device (other than a continuously-rotating implement) secured to the outer or lower end of said suction-pipe and constructed and arranged to continuously sever spoil from the mud bottom during the side swing of said dredge-boat on said pivot, and, preferably, so that on reaching the end of a cut or swing the excavating or disintegrating implement or device may be capable of cutting back again.

It also consists in part of the specific devices herein illustrated and described, which are rotatory reversible scrapers, each provided with cutting or scraping edge or edges and constructed and arranged so that each scraper is itself the open mouth of the suction-pipe or the side swing of said pipe independently of the boat.

Fig. 1 is a plan of a dredge-boat, showing several of the devices illustrated and claimed in Letters Patent of the United States No. 484,763, issued to me October 18, 1892, and the parts common to both are lettered as in Fig. 3 of said patent except the drag-lines g g', but in place of the rotary excavator of said figure there are here shown two forms of scraper-excavators in illustration of the com-



binations herein claimed. Fig. 2 may be regarded as a side view of one form of the outer end of the suction-pipe on which the scraper shown in Figs. 1, 5, 6, and 7 may be mounted. It is cut away on opposite sides, leaving only enough of the pipe to support the scraper, but as this outer end has to bear the strain of swinging the suction-pipe, and in most cases the dredge-boat also, it should be a separate casting, thicker and stronger than the suction-pipe proper, to the outer end of which it is bolted. It is provided with a journal 2, that fits into the bearing 3 in the outer end of the scraper E', and with a nut 4 to hold said scraper in position. Fig. 3 is a plan of Fig. 2. Fig. 4 is an end view of Figs. 2 and 3. Fig. 5 is a side view looking into the open flared mouth of one form of a reversible screening-scraper, a plan of which is shown in Fig. 1. Fig. 6 is an inner end view of the reversible scraper illustrated in Figs. 1 and 5, showing it in the ground in working position. It also shows a vertical cross-section of the casting on which the scraper is mounted in the line *xx*, Fig. 1, *yy*, Fig. 2, and *zz*, Fig. 3. Fig. 7 is a vertical cross-section through the line *xx* of the scraper only. Fig. 8 is a longitudinal section through another form of reversible scraper, the hollow shank on which the scraper is mounted, the outer end of the suction-pipe within which the hollow shank of the scraper turns as the scraper reverses, an annular space around the shank into which water may be forced to provide injection-jets for disintegrating the spoil, and a side view of a pipe through which water may be forced into this annular space for this purpose. Fig. 9 is a plan or top view of the scraper and lower end of the pipes, of which a horizontal section is shown in Fig. 8, showing also a different point of attachment of the drag-rods. Fig. 10 is a perspective of the split ring that may be used to hold the shank of the scraper within the end of the suction-pipe.

In all the figures like letters indicate like parts.

A, Fig. 1, is any suitable hull for carrying the boilers, engines, exhausting apparatus, and other machinery.

C, Figs. 1, 8, and 9, is a suction-pipe communicating with any suitable exhausting apparatus (not shown) on the dredge-boat. It may be connected with the boat by a universal joint to allow both vertical and lateral swings independent of the boat. As shown and mounted in Fig. 1 it illustrates one form of the "rigid connection I" claimed in Letters Patent No. 484,763, hereinbefore referred to.

E', Figs. 1, 5, 6, and 7, is one form of a reversible excavator or scraper. In these figures it is shown as rotatorily reversible and is provided with detachable cutting-blades *b b*, constructed and arranged to sever the material from the mud bottom while swinging

sidewise with the suction-pipe, or with the suction-pipe and dredge, as indicated in Figs. 1 and 6. It may be also provided with thin sharp-edged screening-blades *c c*, that can be used when necessary for excluding substances too coarse to pass through the pipes or the exhausting device. They also serve as fenders to enable the excavator to ride over obstructions. These blades may be detachable or otherwise, as preferred by the builder, and in most cases are unnecessary. It may also be provided with a dividing or other plate *d* or any suitable construction to run on the surface of the mud bottom, the mud entering below and the water above, as indicated by the arrows in Fig. 6. The end plates *e e* are also sharp and preferably armed with detachable cutting edges, so that they may be replaced by others when worn out. In Fig. 5 this scraper is shown with the end plates dished, which is usually the better form. This scraper is also provided with drag-rods *f f'*, Fig. 1, arranged in any convenient manner suitable for giving a side swing. In Figs. 1, 6, 8, and 9 the scraper is shown in position to be drawn sidewise by the line *g* in the arc *SS*, Fig. 1, if swinging independent of the hull on a universal joint at *L*, or in the dotted arc *ss*, Fig. 1, when swinging on the vertical anchor or self-contained pivot *V*. When the scraper in the form here shown has reached the end of the swing, it is rotatorily reversed for cutting back again, as shown in dotted outline at the left of Fig. 6, by disengaging the winding-drum of the line *g* and taking in the line *g'*, the mode of operation being precisely the same as when a rotary excavator is employed in lieu of the scraper.

E<sup>2</sup>, Figs. 8 and 9, is another form of reversible excavator. It consists, as here shown, of an open bell-mouthed rotatorily-reversible elbow-section of suction-pipe mounted so as to bring the mouth in proper position for cutting and receiving the spoil, while the main suction-pipe swings sidewise, substantially as shown. It forms a hollow mud gatherer or scraper communicating through an easy hollow curve and shank with the main suction-pipe, of which it is only a reversible excavating-mouth. It is preferably made of cast-steel with a sharp cutting edge *b'* all around the mouth. This cutting edge may be made separate and detachable, of cast-steel, in a single casting, and be turned in a lathe to fit the mouth of the suction-pipe, which may also be turned to receive it, as shown in Fig. 9, or it may be made in several pieces *b b'*, Fig. 8, and when detachable, whether in one or two pieces, be fitted and secured in any other suitable manner. This scraper may also be provided with screening-blades and dividing-plate, if desired. The drag-rods *f f'* may be attached to the dividing-plate *d*, Fig. 1, to eye *h*, Fig. 8, to the bail *i*, Fig. 9, or secured in any manner or place suitable for dragging and reversing the scraper. These drag-rods



are used in preference to chains or ropes to prevent slack from being drawn into the mouth of the scraper by suction. They should be provided with a sufficient number of joints *j* to bend over the knife *b* or *b'*, Figs. 1, 6, and 9, or over the suction-pipe, as shown in Fig. 8, which is perhaps the better construction. To these drag-rods, which are only a few feet in length, drag lines or chains *g g'* are secured for swinging the scraper, suction-pipe, and dredge, as indicated in Fig. 1.

*C*<sup>2</sup>, Figs. 8 and 9, is a lower section or extension of the suction-pipe. It is here shown with an annular water-space *b*<sup>2</sup>, communicating with the injection orifices or nozzles *b*<sup>3</sup> of the excavator-shank. It is also provided with an injection pipe or hose *F*, opening into the annular water-space *b*<sup>2</sup>. It is also provided with a ring *b*<sup>4</sup> or other device by which it is suspended from any suitable raising, lowering, and suspending mechanism. It is further provided with a collar *o*<sup>0</sup> and a device for holding the shank of the excavator in its proper position. This device, in the present instance, consists of the split flanged ring *b*<sup>5</sup>, bolted to the lower end of the section *C*<sup>2</sup> and loosely fitted to the collar *o* of the excavator-shank.

*C*<sup>3</sup> is the hollow shank of the excavator and forms an interior section of suction-pipe, of which the excavator itself is only a bell-mouthed elbow with a cutting-rim. It is provided with a flange at its lower or outer end, by which it is bolted to a similar flange on the bell-mouthed elbow constituting the reversible scraper. It may be further provided with one or more injection orifices or nozzles *b*<sup>3</sup>, and also with bearings loosely fitting the bearings in its socket *C*<sup>2</sup>. This is a convenient way of mounting the excavator when no ladder is used in connection with the suction-pipe; but it can obviously be mounted in many different ways, the only requisite being that it be mounted and connected with section *C* of the suction-pipe in such manner as to preserve its proper connection and be reversible.

*F* is an injection pipe or hose for purposes already specified.

*T T* are detachable tie-rods that may be used with a suction-pipe mounted on a universal joint to swing laterally independent of the hull when it is desired to swing hull and suction-pipe together.

I claim—

1. A dredge-boat having a self-contained pivot or center of oscillation and an excavating or disintegrating device (other than a continuously-rotating implement) provided with cutting edges, blades, teeth, or other disintegrating devices, in combination with and secured to the outer end of a suction-pipe, the whole being constructed and arranged to have said dredge-boat, suction-pipe, and excavating implement swing in a horizontal arc on said self-contained pivot (or center of oscillation carried by said dredge-boat), and con-

tinuously sever spoil from its bed during said swing with means for making the swing.

2. An excavating or disintegrating device (other than a continuously-rotating implement), provided with cutting edges, blades, teeth, or other disintegrating devices, in combination with and secured to the outer end of a suction-pipe mounted on a ladder and constructed and arranged to have said outer end and said excavating device swing substantially in the arc of a horizontal circle from side to side of the cut, and continuously sever spoil from its bed during said swing.

3. A rotatorily-reversible excavating or disintegrating device (other than a continuously-rotating implement) provided with cutting edges, blades, or other disintegrating devices, in combination with and secured to the outer end of a suction-pipe constructed and arranged to have said outer end and said excavating device swing substantially in the arc of a horizontal circle from side to side of the cut and continuously sever spoil from its bed during said swing and drag-lines for swinging the same and reversing the excavating or disintegrating implement.

4. A hollow reversible flared-mouthed excavator, constructed and arranged to swing and cut in lateral planes, in combination with a device for removing the spoil.

5. A hollow, reversible, flared-mouthed excavator, constructed and arranged to swing and cut in lateral planes in combination with, detachable cutting edge or edges.

6. A hollow, reversible, flared-mouthed excavator provided with screening-blades arranged to exclude substances too coarse to pass through the discharging apparatus.

7. A hollow, reversible, flared-mouthed excavator provided with a plate to run on the surface of the material to be dredged and means for moving and reversing the excavator.

8. A hollow, reversible, flared-mouthed excavator provided with fenders to enable it to ride over obstructions.

9. A hollow, reversible, flared-mouthed excavator provided with drag-lines and mechanism to reverse said excavator and swing it from side to side of the cut.

10. A hollow rotatorily-reversible scraper provided with cutting edge or edges and a hollow shank fitting and turning within suitable bearings in combination with a device for removing the spoil severed by said excavator.

11. A hollow, reversible, screening-scraper in combination with a device for removing the spoil.

12. A hollow, reversible, screening-scraper in combination with a suction-pipe.

13. A hollow, reversible, bell-mouthed elbow-shaped excavator constructed and arranged to swing and cut in lateral planes in combination with a device for removing the spoil.

14. A hollow, reversible, bell-mouthed, el-



bow-shaped excavator provided with detachable edge or edges.

15. A reversible, elbow-shaped open-mouthed pipe, provided with cutting edge or edges, means for swinging the open end of said pipe in lateral planes and means for removing the spoil.

16. A reversible, elbow-shaped, bell-mouthed, suction-pipe provided with cutting edge or edges, means for moving said bell-mouth in lateral planes and means for reversing the same.

17. A rotatorily-reversible, elbow-shaped, bell-mouthed scraper provided with cutting edge or edges, a hollow shank for receiving and a device for removing spoil, said shank being also provided with means for supporting, swinging and turning the same.

18. An injection-pipe opening into a water-space communicating with the injection-orifices of a reversible excavator-shank substantially as described.

19. A reversible, bell-mouthed scraper having a hollow shank provided with injection-orifices.

20. A reversible, bell-mouthed scraper having a hollow shank in combination with a device for removing the spoil through said shank.

21. A reversible scraper mounted on a hollow shank through which the spoil may be withdrawn.

22. A reversible flared-mouthed excavator, provided with a hollow shank by which it is

supported and through which the spoil may be withdrawn.

23. A reversible scraper-excavator constructed and arranged to swing, and cut while swinging, in a horizontal plane, and provided with a suitable shank for supporting said excavator, bearings to support said shank, means for reversing the excavator and means for removing the spoil.

24. A suction-pipe provided with an excavating device other than a continuously-rotating implement, said device having a flared mouth with cutting or scraping edge or edges or other excavating or disintegrating device or devices, the whole being constructed and arranged to sever spoil from the bottom or bank during the side swing of the pipe or of the outer end of said pipe, and means for making said swing.

25. A suction-pipe provided with a flared mouth arranged to scoop up material as it swings from side to side, with means for making said side swing.

26. A suction-pipe provided with an excavating or disintegrating device having a downward inclination or lead, constructed and arranged to draw into, take hold of and sever the spoil from the bottom as said pipe swings from side to side, with means for making said side swing.

A. B. BOWERS.

In presence of—

ALEXANDER WATT,

J. H. MILLER.