

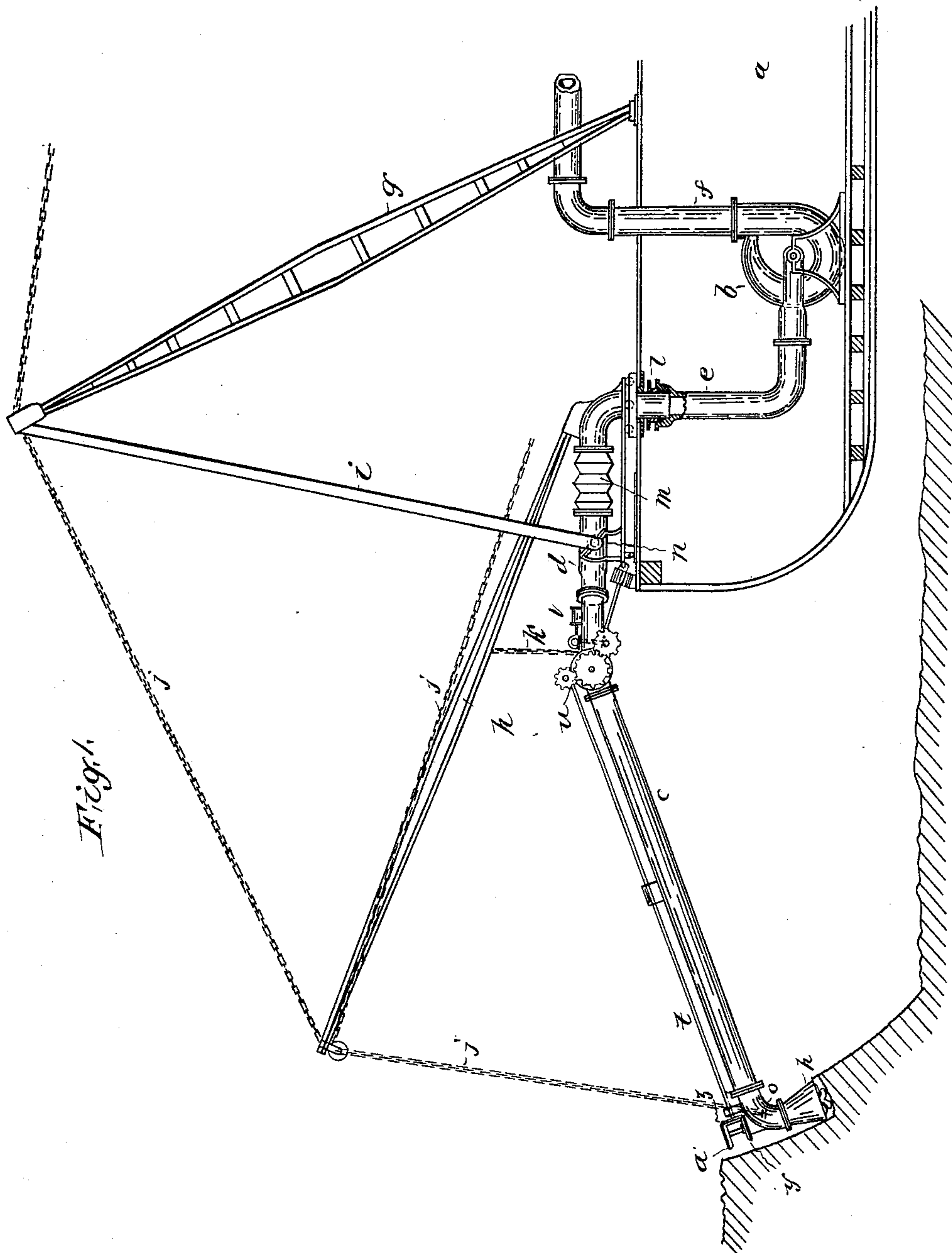
(No Model.)

3 Sheets—Sheet 1.

M. F. BRAINARD.
DREDGING MACHINE.

No. 386,866.

Patented July 31, 1888.



WITNESSES:

W. H. Morgan,
E. H. Morgan,

INVENTOR,

Morris F. Brainard,

BY

A. P. Thayer,

ATTORNEYS.

(No Model.)

3 Sheets—Sheet 2.

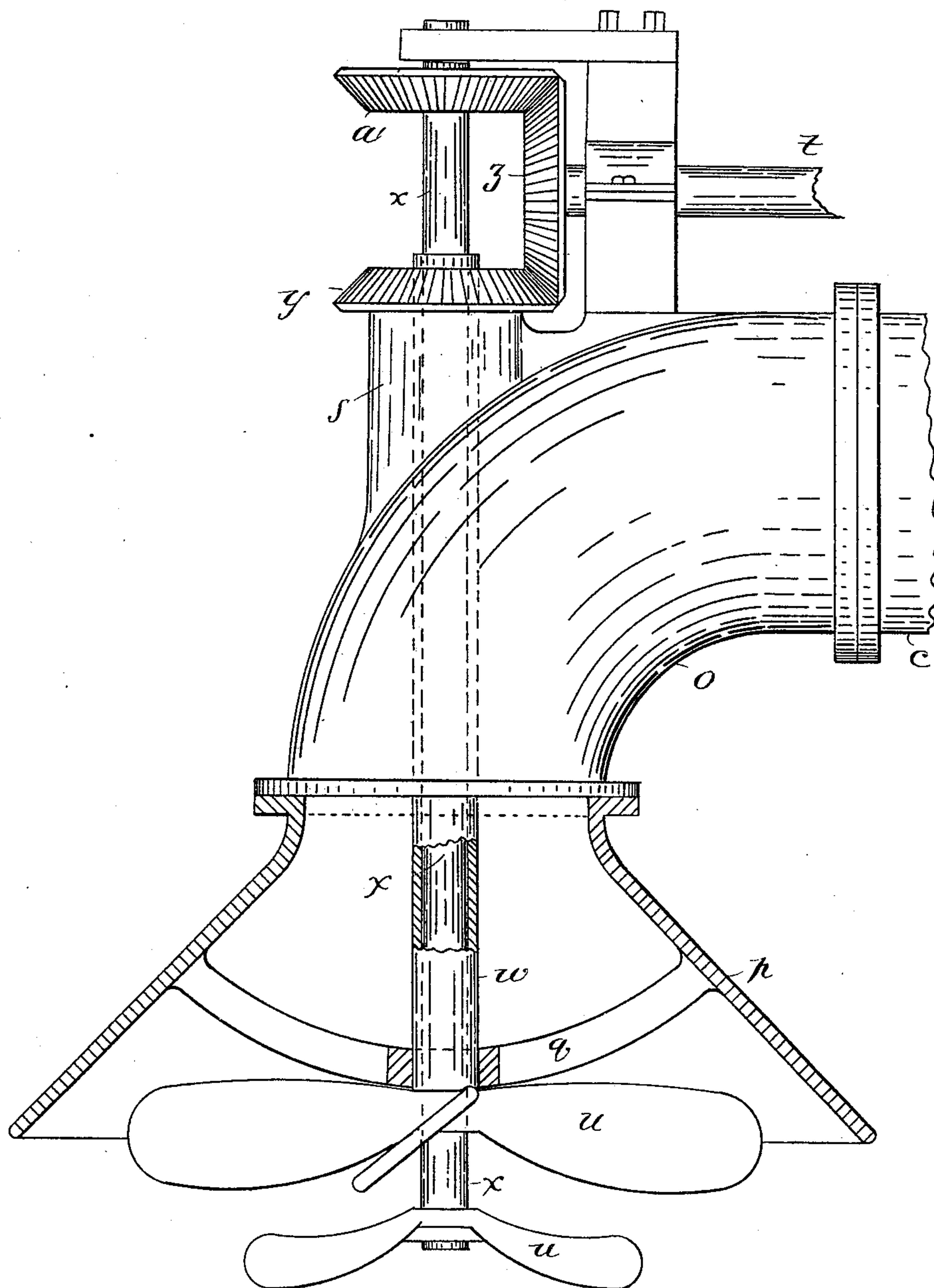
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Fig 2



WITNESSES:

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E. H. Morgan.

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Morris F. Brainard.

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A. P. Thayer.

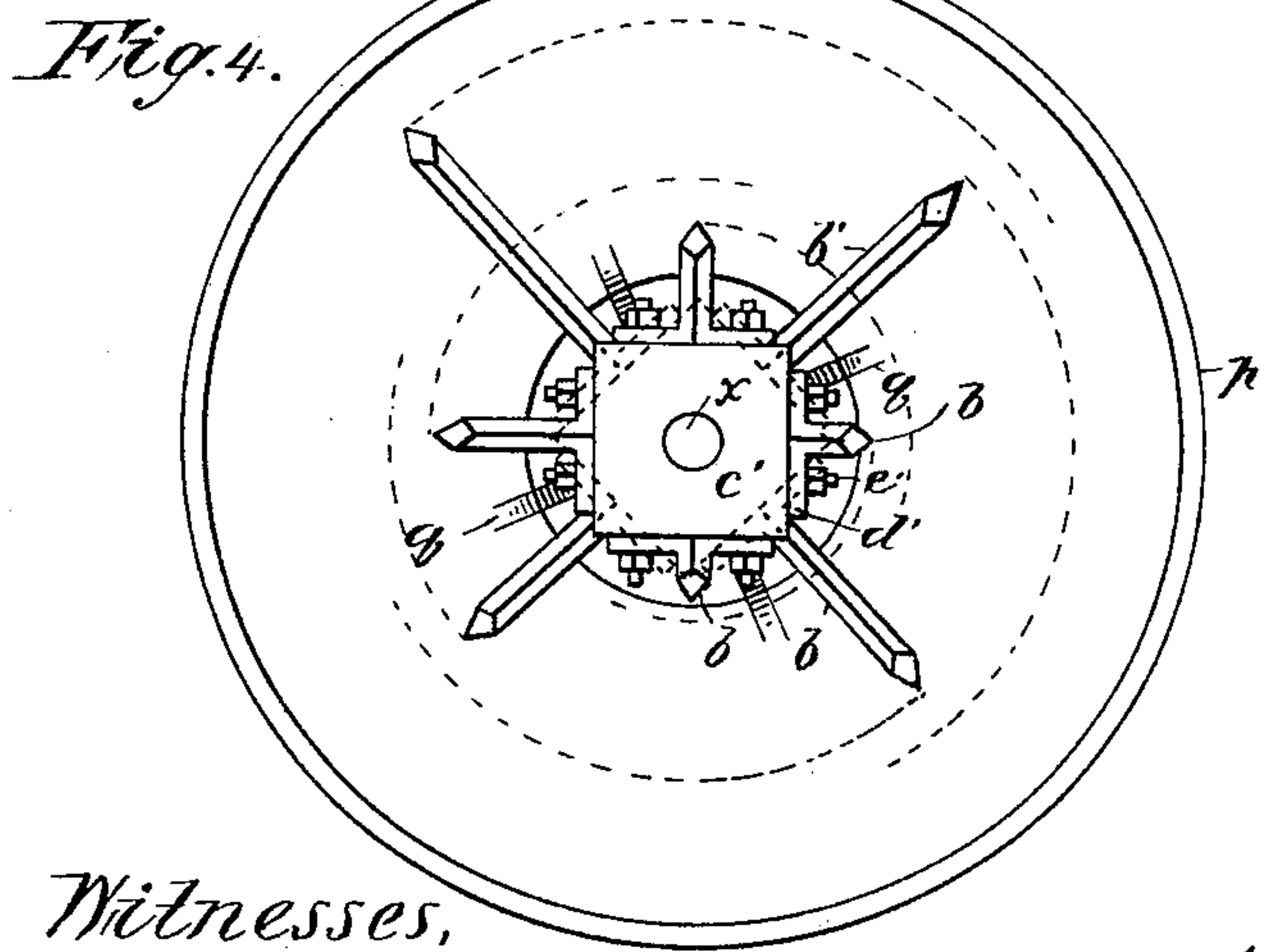
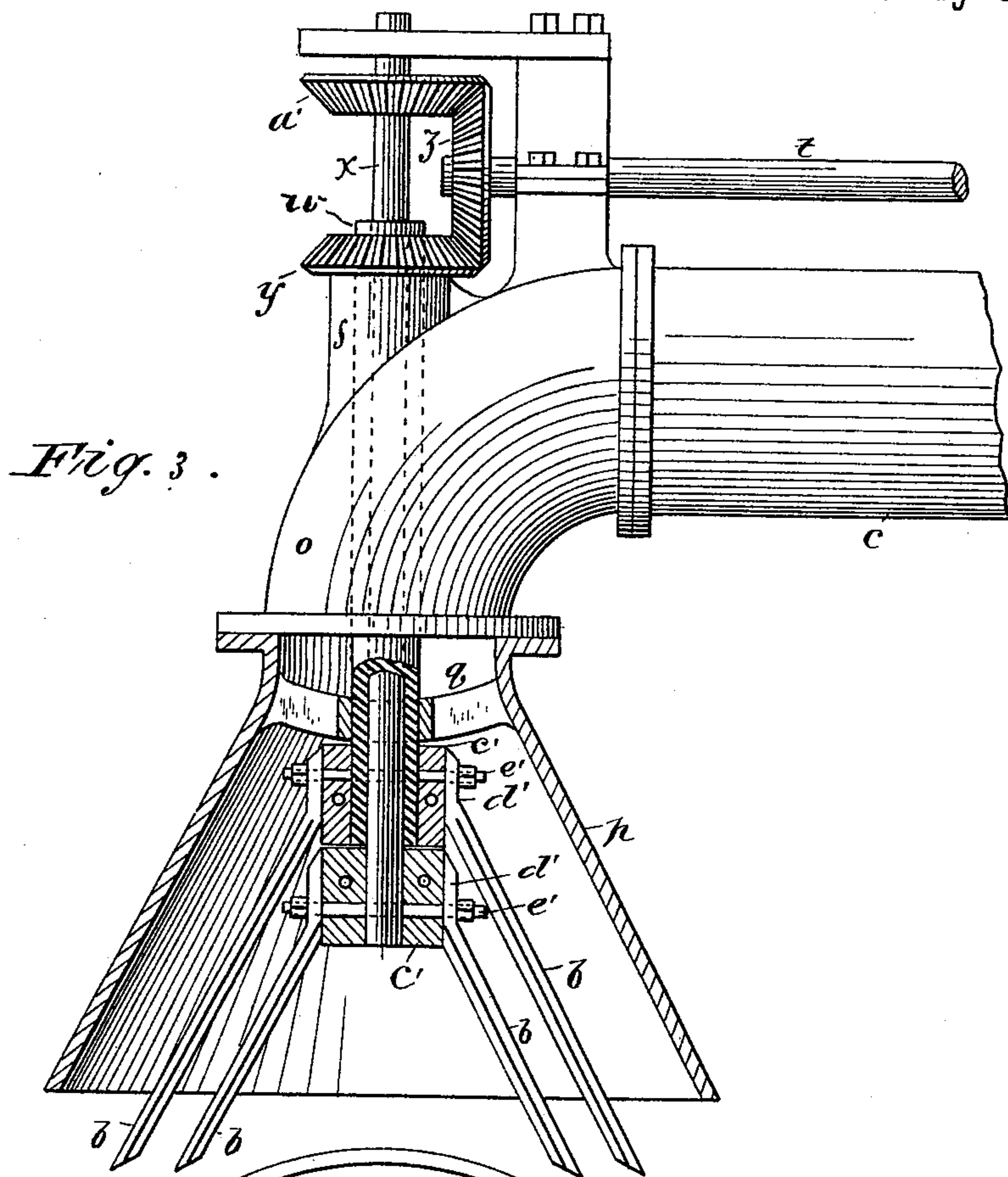
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W. Benjamin,
J. H. Morgan.

Inventor.
Morris F. Brainard.
By A. P. Thayer,
attor.

UNITED STATES PATENT OFFICE.

MORRIS F. BRAINARD, OF BROOKLYN, NEW YORK.

DREDGING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 386,866, dated July 31, 1888.

Application filed May 9, 1887. Serial No. 237,508. (No model.)

To all whom it may concern:

Be it known that I, MORRIS F. BRAINARD, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Dredging-Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to dredging-machines in which sand, mud, and the like material are raised slightly from the bottom by a rotary digger or excavator, and then drawn up with a current of water through a suction-tube and discharged through a delivery-pipe by the action of a powerful fan or centrifugal pump on the dredge-boat.

The invention consists, mainly, in the contrivances of the receiving end of the suction-pipe and the digger or excavator, the rest of the apparatus being similar to the apparatus claimed by me in a prior application for a patent now pending, and is not claimed herein.

In the accompanying drawings, Figure 1 is a sectional elevation of the dredge-boat and side elevation of the dredging apparatus, with a part in section. Fig. 2 is partly a side elevation and partly a section of the receiving end of the suction-pipe and side view of diggers applicable to the arrangement of the suction-pipe; also a side view of the driving-gear for operating the diggers. Fig. 3 is a similar view with diggers of novel contrivance, such as I prefer to use. Fig. 4 is a plan view of the diggers of Fig. 3, and of the funnel inverted.

The dredge-boat *a*, centrifugal pump *b*, suction-pipe *c d e*, discharge-pipe *f*, also the shears *g*, boom *h*, stays *i*, and the suspending-chains *j* and *k*, are all substantially the same as in my former application above referred to, and need not be described in detail herein, it being understood that the sections *c* and *d* are adapted for shifting laterally to the dredge-boat on the joint *l*, for the lateral range of the excavator, also that section *c* is jointed to section *d* suitably for vertical range, and also that section *d* has a flexible joint, *m*, for relief of the shocks to which it is subject by the operation of joint *c*, and is mounted on the

carriage *n*, on which it rides in the lateral movements.

In the apparatus of my former application a rotary digger is arranged under a hood, which is a prolongation of the upper side of the tube *c*, the axis of the digger being parallel with the axis of the tube, but somewhat lower. In another arrangement that has been used a hollow rotary digger on the end and in the axis of the tube receives the excavated material through openings in its sides and discharges the same through its upper end into the tube, in both of which arrangements the action of the digger on the earth is not so direct as is desirable, and the gearing for operating the digger causes some obstruction to the working of the digger into the ground. For a more effective application of the digger I now make the suction pipe *c* with a bend or elbow, *o*, and a funnel-terminal, *p*, at the lower end, projected directly in the line of approach of the digger to the work, with a digger in the axis thereof, adapted to approach the work endwise and unobstructedly by any of the other parts, and also so surrounded by the funnel as to make more effective action of the water raised by the pump in taking up the earthy matters stirred up by the digger. The lower end of the shaft of the digger is carried in a cross-bar, *q*, inside of the funnel. The upper end extends through a bearing-boss, *s*, of the elbow, and is geared with the lower end of a shaft, *t*, extending down along the upper side of suction-tube *c* from suitable driving-gears, *u*, at the joint of sections *c* and *d*, and suitably geared with a motor-engine, *v*, the digger being thus geared by apparatus located where it makes no obstruction whatever to the digger, and the digger being itself adapted for the most direct and effective action on the earth.

The digger may be constructed in the form of a screw-propeller, *u*, or other approved form; but whatever the form may be I propose to employ two diggers, one above another, using a tubular shaft, *w*, for the upper one, and a shaft, *x*, for the lower one, extending through shaft *w*, and to gear said diggers independently to the driving-shaft *t*, so that they may run independently and in opposite directions, for more effectually disintegrating hard lumpy matters and mixing them with

the water in fine particles best adapted for being carried along with the water.

The tubular shaft *w*, carrying the upper digger, is geared by the wheel *y* with the wheel *z* on the driving-shaft *t*, and shaft *x*, carrying the lower digger, is geared by wheel *a'* with said wheel *z*.

The digger which I prefer to use, especially for hard and clay bottoms, consists of iron or steel prongs *b'*, bolted on a hub, *c'*, attached to the shaft and projecting downward obliquely and divergent from the point of connection with the hub, so that they penetrate the earth endwise and cut side or edge wise. I prefer to make the bars square, or substantially so, in cross-section, and adjust them with one angle in the line of travel for a cutting-edge; but they may have cutting-edges of more or less acute development.

I prefer to use four prongs to each digger, making them with a T-head, *d'*, and bolting them onto the flat sides of the hub with bolts *e'*, extending through the hub and securing the prongs of opposite sides by the same bolts. The prongs may thus be taken off for repairs and renewal without disturbing the hubs. The diverging prongs of the upper digger extend outside of those of the lower digger, and all the prongs are so graduated in respect of their radial projection of the lower end that they cut in different planes and slices successively for the most effective action.

I am aware that a rotary digger has been connected through the elbow of the suction-pipe with a rotary piston working in a cylinder mounted on the back of the elbow for operating the digger by water or compressed air, and I do not claim such device, mine being a rotary digger connected with the driving-gear at the joint of the suction-pipe, as described.

What I claim, and desire to secure by Letters Patent, is—

1. The combination, in a dredging-machine, of a suction-pipe jointed to the suction apparatus on the dredge-boat, and having a bend or elbow and a funnel-terminal projected directly in the line of the approach of the digger to the work, and a rotary digger in the axis thereof geared through the elbow of the suction-pipe with a driving-shaft carried in bearings on the upper side of the pipe and

connected with the motor-gearing at the joint of said pipe with the suction apparatus, said digger adapted to approach the work unobstructedly by any other part of the apparatus, substantially as described.

2. The combination, in a dredging-machine, of a suction-pipe jointed to the suction apparatus on the dredge-boat, and having a bend or elbow and a funnel-terminal projected directly in the line of the approach of the digger to the work, and two reversely-revolving diggers in the axis thereof adapted to approach the work unobstructedly by any other part of the apparatus, substantially as described.

3. The combination, in a dredging-machine, of a suction-pipe jointed to the suction apparatus on the dredge-boat, and having a bend or elbow and a funnel-terminal projected directly in the line of the approach of the digger to the work, and two revolving diggers in the axis thereof mounted on shafts extending through the bearing-boss on the back of the elbow and independently geared with the driving-shaft for rotation reversely to each other, substantially as described.

4. The improved rotary digger for dredging machines, consisting of metallic prongs bolted on the sides of a hub attached to the driving-shaft and projecting in the direction of the approach of the digger to the work and divergently from the axis of the same, substantially as described.

5. The combination, with the funnel-mouth of the suction pipe in a dredging-machine, of two rotary diggers in the axis of the funnel-mouth, consisting of the prongs bolted on the hubs and arranged divergently from the axis of the cutter-head, substantially as described.

6. The combination, with the funnel-mouth of the suction-pipe in a dredging-machine, of a rotary digger in the axis of the funnel-mouth, consisting of prongs bolted on the hub and graduated in respect to their radial projection to cut in different planes and slices, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

MORRIS F. BRAINARD.

Witnesses:

W. J. MORGAN,
S. H. MORGAN.