No. 842,364.

PATENTED JAN. 29, 1907.

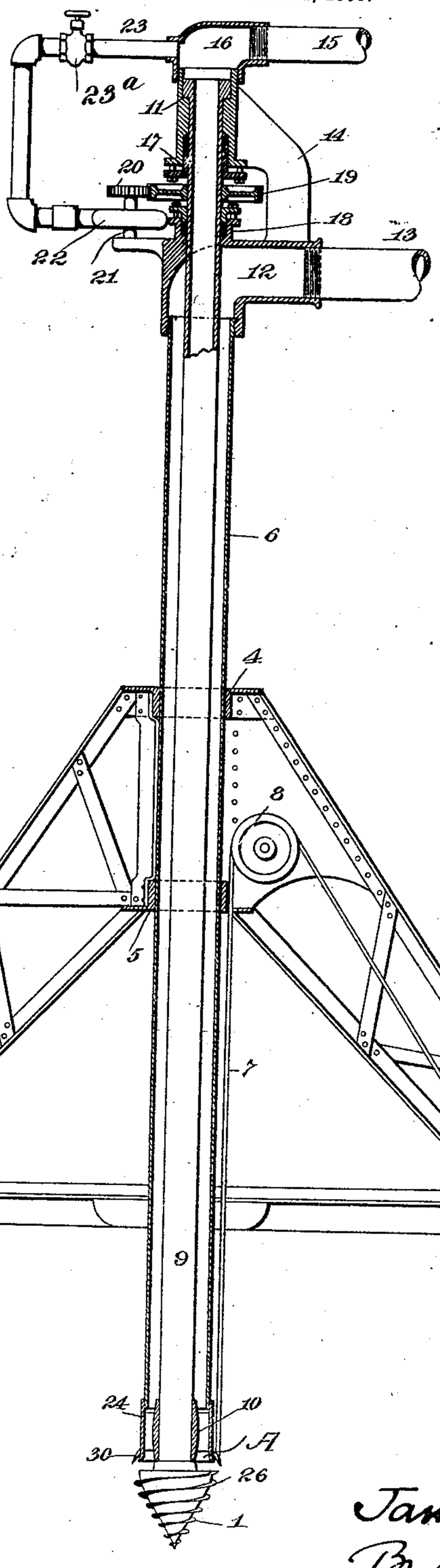
J. L. WHITE.

DREDGE.

APPLICATION FILED DEC. 4, 1905.

2 SHEETS—SHEET 1.

Fig. 1



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2 SHEETS—SHEET 2.

Fig. 2

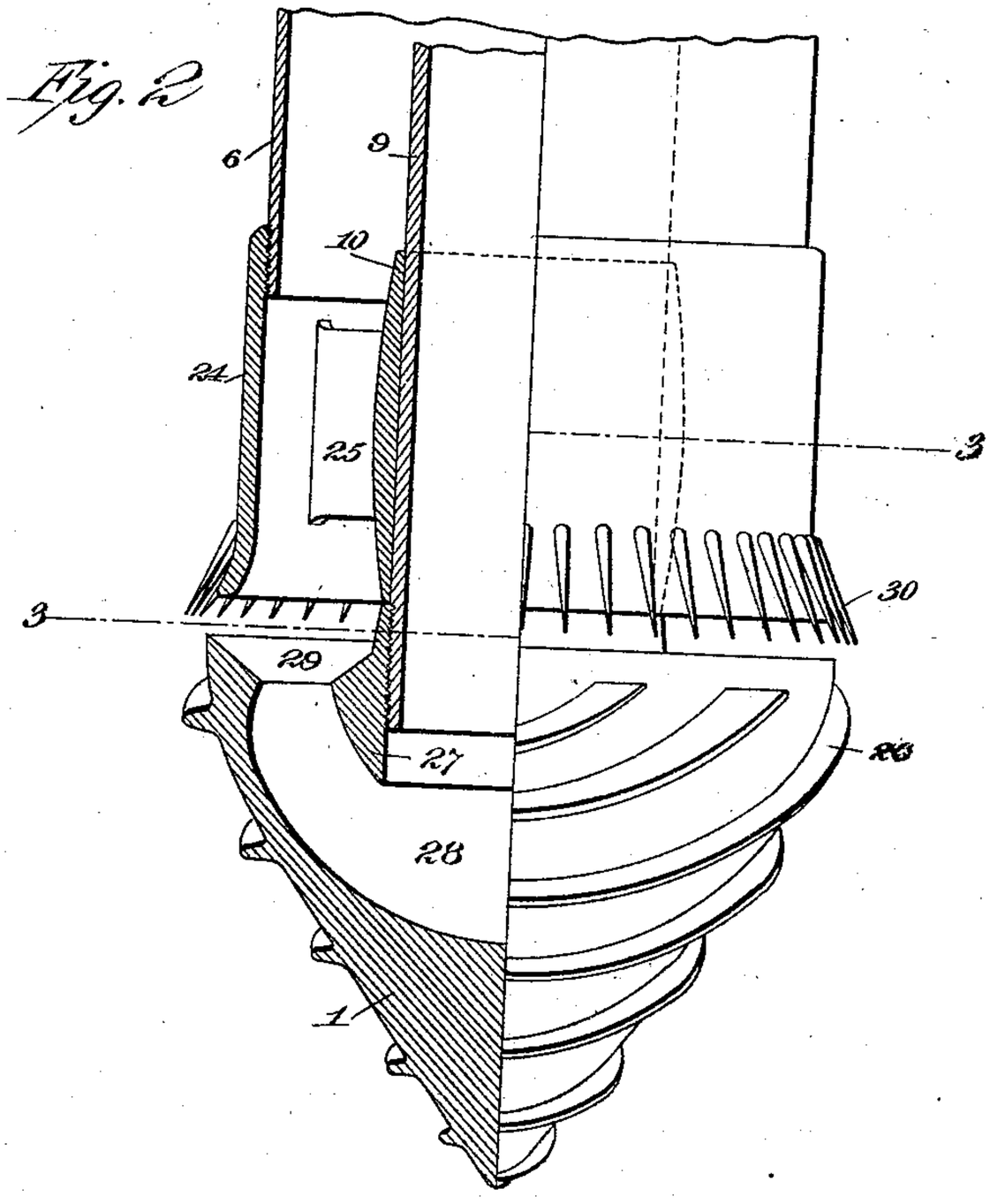
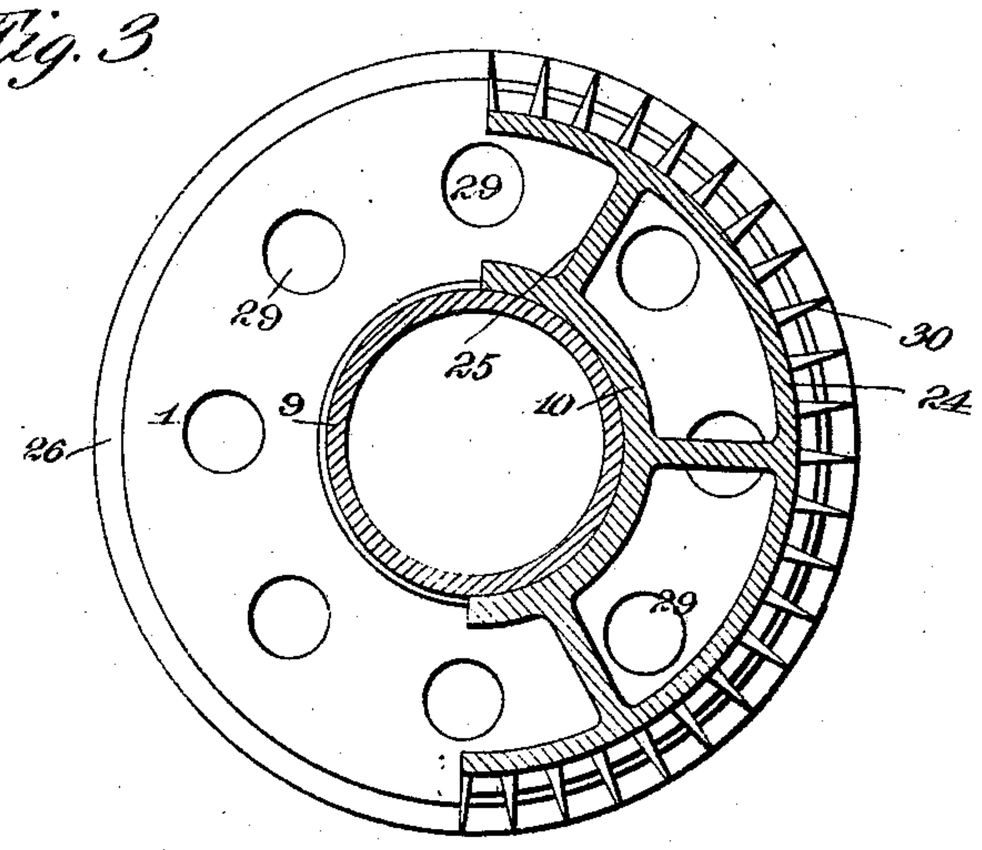


Fig. 3



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UNITED STATES PATENT OFFICE.

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DREDGE.

No. 842,364. Specification of Letters Patent. Patented Jan. 29, 1907.

Application filed December 4, 1905. Serial No. 290,082.

To all whom it may concern:

Be it known that I, JAMES L. WHITE, a citizen of the United States, and a resident of Milwaukee, county of Milwaukee, and State of Wisconsin, have invented a certain new and useful Improvement in Dredges, of which the following is a description.

The present invention relates to an improvement in dredges adapted to work upon the beds of bodies of water.

The objects of the present invention are to increase the efficiency of the dredge, simplify its construction, and prevent its choking.

Other objects will more fully appear from the following specification, drawings, and claims.

Figure 1 represents a view, partly in section, of the operative portions of a dredge embodying my invention. Fig. 2 is an enlarged view of the auger or cutter-head, shown partly in section; and Fig. 3 is a sectional view taken on the lines 3 3 of Fig. 2.

In all of the views like parts are designated by the same reference characters.

In carrying out my invention I provide an injector A, to which is attached a rotary auger or cutter-head 1, which is so supported that it may be rotated, elevated, depressed, and moved about. I show one means of supporting it which consists of a framework 2, having legs mounted upon skids 3, which in use rest upon the bed of a body of water. This framework 2 carries bearings 4 and 5, in which is supported the tubular portion 6 of the dredge, which constitutes the up-leg of the dredge. This tubular portion 6 freely slides within the bearings 4 and 5, so that the auger may be raised or lowered. It may be elevated by means of a cable 7, which passes over the sheaves 8 8 and leads inshore to a device for hauling it. (Not shown.) It will drop by its own weight. The auger or cutter-head 1 is mounted upon a shaft 9, which passes through a steady-bearing 10 at the bottom of the tube 6 and a hanging bearing 11 farther up, preferably above the top of the tube 6 and above the surface of the water. As shown in Fig. 1, the tube 6 is provided with an elbow 12 at the top and which extends off into a flexible pipe 13 to the place where the excavated material is to be received. This elbow carries a bracket 14, which supports the bearing 11.

One of the principal features of the invention consists in making the shaft 9 hollow, so that it serves the purpose of the inlet-pipe for supplying water under pressure to the injector A, this constituting the down-leg of the dredge. As shown in Fig. 1, the inlet-pipe 15, which is preferably flexible and is used for introducing water under pressure, enters a casing or head 16, secured to the bracket 14 and surrounding the bearing 11. This casing 16 communicates with the interior of the shaft-pipe 9 and permits entrance of water under pressure into this pipe. Leakage is prevented downwardly by means of a stuffing-box 17, arranged below the bearing 11. A second stuffing-box 18 will prevent leakage upward around the joint where the shaft-pipe 9 passes into the pipe 6. The shaft 9 is suitably rotated at the necessary speed. One way of securing this rotation is illustrated in Fig. 1. This mechanism comprises a spur-gear 19, secured to the shaft-pipe 9 between the two stuffing-boxes. Intermeshing with this gear is a pinion 20, carried upon a shaft 21. The shaft 21 is rotated by means of a motor 22. As illustrated, the motor is a water-motor; but any other form of motor may be employed. The motor is advantageously operated by water under pressure taken from the pipe 15. A by-pass pipe 23, connecting the motor to the chamber 10, permits water under pressure to enter the motor and operate it properly. If desired, the apparatus may be operated with the motor disconnected. This may occur where it is desired to excavate without rotating the cutter-head. To permit this to be done, a valve 23[a] may be placed in the by-pass pipe 23.

Figs. 2 and 3 illustrate the details of the injector A and the cutter-head 1 and details of the mechanism for supporting the cutter-head. The lower end of the pipe 6 is provided with a tubular extension 24, shown as attached to the pipe by screw-threads, or it may be attached in any other suitable way. This extension may be removed for the purpose of adjustment or repair. Its lower end is open and the walls slightly flare outward, as shown. Studs 25 support the steady-bearing 10 without seriously obstructing the passage through the pipe. The cutter-head 1 is conical in shape and provided with a number of cutting-ridges 26. These ridges

are preferably spirally arranged and have sharp edges, as shown, so that the head on rotating will act upon the principle of an auger. The cutter-head is preferably removably attached to the pipe-shaft 9. As shown, the parts are provided with screw-threads, the pipe-shaft entering a central opening 27 in the cutter-head and is there secured by the threads. Other means than that illustrated may be employed to secure the parts together. The injector A is formed as follows: Within the center of the cutter-head is a chamber 28, which communicates with the central opening 27. Around the upper face of the cutter-head and outside the central bearing are a number of nozzles 29, which communicate with the central chamber 28. The combined area of these nozzles 29 preferably should not exceed the cross-sectional area of the pipe 9, so that the velocity of the water through the nozzles 29 will be the same or at least as much as that through the pipe 9. The sides of the nozzles 29 flare outwardly, as shown in Fig. 2. These nozzles are located immediately below the open portion of the extension 24. The bottom of the chamber 28 curves gradually upward and outward toward the nozzles 29; but immediately below these nozzles the walls converge, so that the cross-sectional area is somewhat restricted. The amount of flare of the walls of the nozzles is such that the upper edges of contiguous nozzles communicate or almost communicate, so that these nozzles practically constitute a single annular opening. This annular opening is located immediately below the annular opening formed by the walls of the tubular extension 24 and the steady-bearing 10. The outer edge of the extension 24 and the cutter-head are arranged at the proper interval apart so that an opening sufficiently large will be formed to permit the entrance of the excavated material. The chamber 28, curving and flaring outward, as it does, will direct the stream of water which passes downward through the pipe 9 outward and upward in the form of jets caused by the nozzles 29. As these nozzles are almost contiguous, the water will pass upward in the form of an almost continuous annular stream, entering the extension 24 and passing up the pipe 6. The solid material which is to be excavated will drop through the opening between the cutter-head and the extension 24. The parts may be so proportioned, however, that water will be drawn in through this opening, which will assist in introducing the material to be excavated into such a position that it will be directly acted upon by water issuing out of the nozzles 29.

A series of spikes 30 are carried by the extension 24. These spikes extend downward adjacent to the opening between the extension and the cutter-head and serve as a petticoat or means to prevent the entrance of solid and objectionable obstructions to the pipe 6. These obstructions may be in the form of small bowlders, large rocks, driftwood, or other debris.

The operation of the device is as follows: A device for supplying water under pressure to the pipe 15 is provided, and the pipe 13 extends to a place where the excavated materials are to be received. The entire device is then hauled out upon the bed of the stream, lake, ocean, or other body of water, the pipe 6 being elevated, while this is being done, sufficiently high to keep the cutter 1 clear of the bottom. This may be done by keeping a strain upon the cable or rope 7 while the frame is being hauled out. This cable is then slackened when the cutter is located over the desired portion of the bottom, allowing the tube 6 and the cutter to drop and rest upon the bed of the stream. Water under pressure is now admitted to the pipe 15. Part of this water will descend down the pipe-shaft 9. A certain portion will be shunted through the pipe 23 and will rotate the motor 22 and with it the pipe-shaft 9. The auger will be rotated only at sufficient speed to cause it to bore into the materials to be excavated, but not so fast as to stir up such materials. The object of the auger is to cause the intake of the injector to descend into the material, so that this material will drop by gravity upon the top of the auger. The weight of the parts will cause the auger to bore into the bottom. The water under pressure passing through the pipe-shaft 9 will enter the chamber 28 and be discharged upward around the entire periphery of the auger. This discharging water will pass through the extension 24, around the studs 25, and up through the pipe 6, and so to the discharge. At the same time the material which is being loosened by the auger will drop by gravity into the annular opening between the top of the auger and the extension 24. This action will be assisted more or less by the injector-like action of the rising body of water upward through this annular opening. The restriction on the discharge portion of the chamber 28 immediately below the discharge-nozzles 29 will cause an increase of velocity at this point. The water discharged into the sleeve 24, which, as shown in the drawings, is much larger than the discharge-orifices 29, will cause an injector-like action and draw in a certain amount of water through the annular separating-opening. This will tend to assist the passage of solid material into the sphere of action of the rising column of liquid. This injector-like action is not essential to the successful operation of the device, as the solids may be introduced into the sphere of action of the rising stream solely by the action of gravity. Large obstructions will be

prevented from entering the annular opening by means of the petticoat 30. The operation of excavating is continued by allowing the auger to sink to the desired depth and then elevating it by means of the rope 7. As soon as the auger is raised clear of the bed of the body of water the entire device will move, sliding upon the skids 3, and will be pulled inshore by the rope 7. Whenever the rope is slackened, the weight of the parts will cause the auger to again rest upon the ground and the operation of excavating again repeated.

By the construction described the water does not act upon the suction principle by sucking up the solids, but acts directly to elevate the excavated material by pushing it up. The distance, therefore, which the material can be elevated and passed is much greater than in a device which acts upon the suction principle. By employing the tubular shaft 9 the effect of the tube for admitting water and the shaft for rotating the auger is secured by one device.

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

1. A device for excavating, having in combination, a pipe for admitting water under pressure, and a pipe for forcing off the excavated material, this latter being open at the bottom, an auger below the opening for drawing the pipes into the material to be excavated, and means for directing a stream of water upward into the draw-off pipe so that the material adjacent to the pipes will fall into the sphere of influence of the rising stream.

2. In a device for excavating material, the combination of a pipe for admitting water under pressure, a pipe for forcing off the excavated material, this latter being open at the bottom, means for placing the open-ended mouth of the draw-off pipe adjacent to the material to be excavated, such means being adjacent to the open-ended mouth, and means for passing the water upward below such material, and forcing it up in the draw-off pipe.

3. In a device for excavating, the combination with an injector, and a conical auger, the top of the auger being adjacent to the inlet of the injector.

4. In a device for excavating, the combination with an injector and a cone-shaped auger below and adjacent to the intake of the injector, and means for rotating the auger, whereby the material will drop by gravity upon the top of the auger within the sphere of influence of the injector.

5. In a device for excavating, the combination with an injector having an intake at the lower end thereof, of an auger for drawing the intake of the injector into the material which is to be elevated.

6. In a device for excavating, the combination with an injector, of an auger for drawing the intake of the injector into the material to be acted upon, and a pocket carried by the auger for holding such material in proximity to the intake of the injector.

7. In a device for excavating, the combination with an inlet-pipe, an outlet-pipe and openings between the inlet and outlet pipes, such openings forming an injector and an auger for drawing the intake of the injector into the material which is to be elevated.

8. In a device for excavating, the combination with an inlet-pipe, an outlet-pipe and means of communication between the inlet and outlet pipes, of an auger for drawing the outlet-pipe into the material to be acted on, and a pocket on the auger to hold the said material in proximity to the outlet-pipe.

9. In a device for excavating, the combination with an injector, having a down-leg and an up-leg, and an auger, the said auger being carried by the down-leg.

10. In a device for excavating, the combination with a pipe and an auger, a supporting-shaft for the auger, within the pipe, the said pipe having an extension, and a steady-bearing for the shaft, the said steady-bearing being carried by the extension.

11. In a device for excavating, the combination with a down-leg, and an auger connected thereto, the said auger including a central connection for the down-leg, a hollow central chamber, means connecting the chamber to the down-leg, and an annular opening on the top of the auger communicating with the central chamber.

12. In a device for excavating, the combination with an up-leg, an auger below it separated by an interval forming an annular space, and a petticoat covering this interval.

13. In a device for excavating, the combination with a pipe, an extension thereon, and an auger, the auger being separated by an interval forming an annular space, and a series of spikes carried by the extension, forming a petticoat covering this interval.

14. In an excavating device, the combination with an up-leg, a tubular shaft therein constituting a down-leg, an elbow on the down-leg, a bracket above the elbow, a shaft-bearing for the down-leg, a chamber on the bracket, and driving means intermediate the bearing and the elbow.

15. In a device for excavating, the combination of an up-leg, a chamber above the leg, a tubular shaft within the down-leg and extending into the chamber, a bearing therefor within the chamber, a stuffing-box on the chamber, and a stuffing-box on the down-leg, and a spur-gear between the two.

16. In a device for excavating, the combination with a pipe constituting an up-leg, a pipe constituting a down-leg, an auger on the down-leg, means for admitting water under

pressure to the down-leg, a water-motor, and a by-pass pipe for shunting a portion of the water under pressure to the water-motor.

17. In a device for excavating, the combination with a frame and sledge-like feet therefor, of an injector movable in the frame, means for vertically moving the injector, and means for moving the frame.

18. In a device for excavating, the combination with a movable frame and sledge-like feet on the frame, of an injector movable in the frame, means for lowering the injector, and means for raising the injector.

19. In an apparatus of the character described, the combination with a movable frame and sledge-like feet on the frame, of an injector movable in the frame, means for lowering the injector, means for raising the injector, and means for moving the frame, said moving means and raising means being the same.

This specification signed and witnessed this 27th day of November, 1905.

JAMES L. WHITE.

Witnesses:
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EDWIN HENES.