(No Model.)

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## HYDRAULIC EXCAVATOR.

No. 495,791. Patented Apr. 18, 1893.

Fig. 1

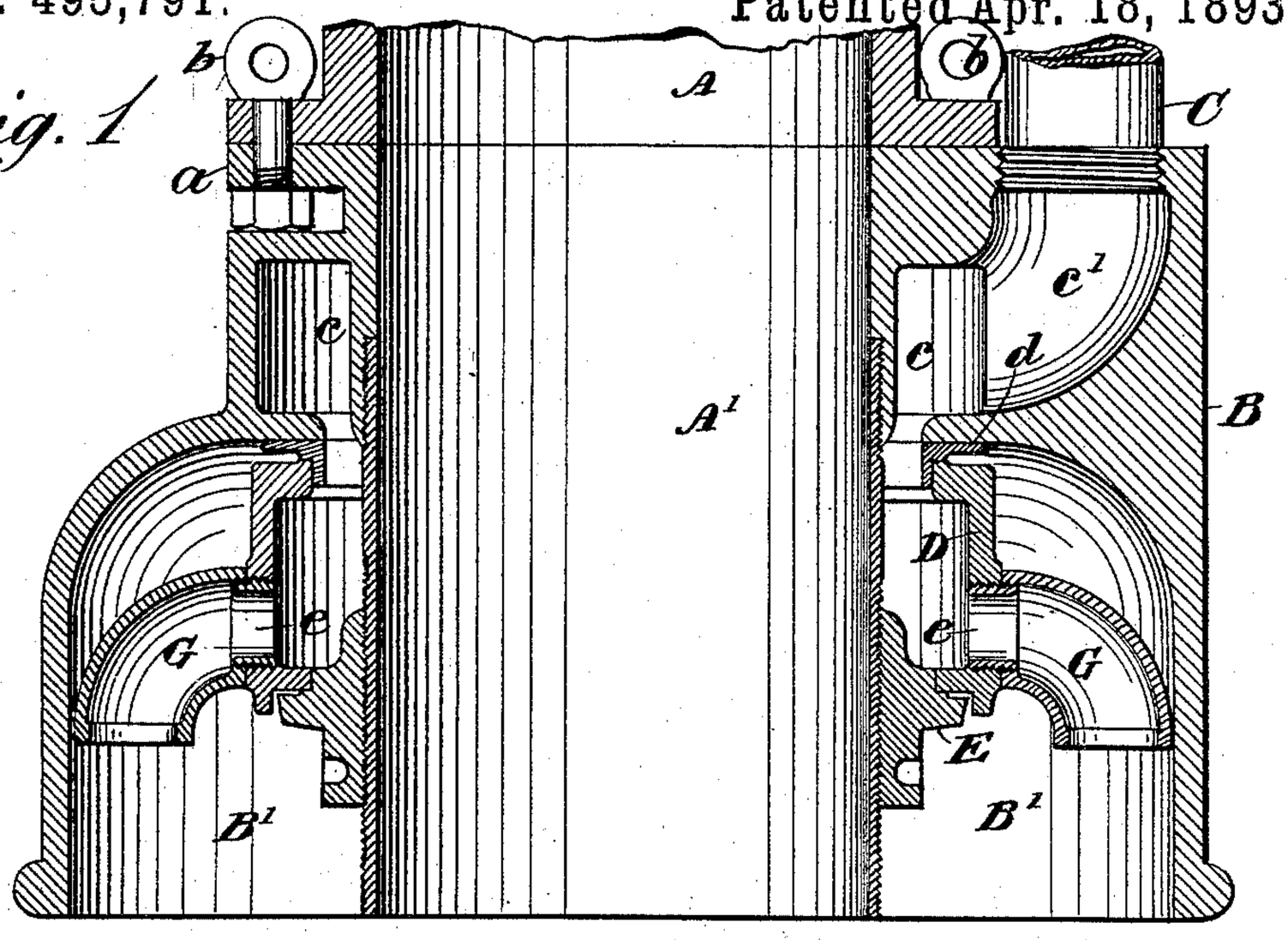
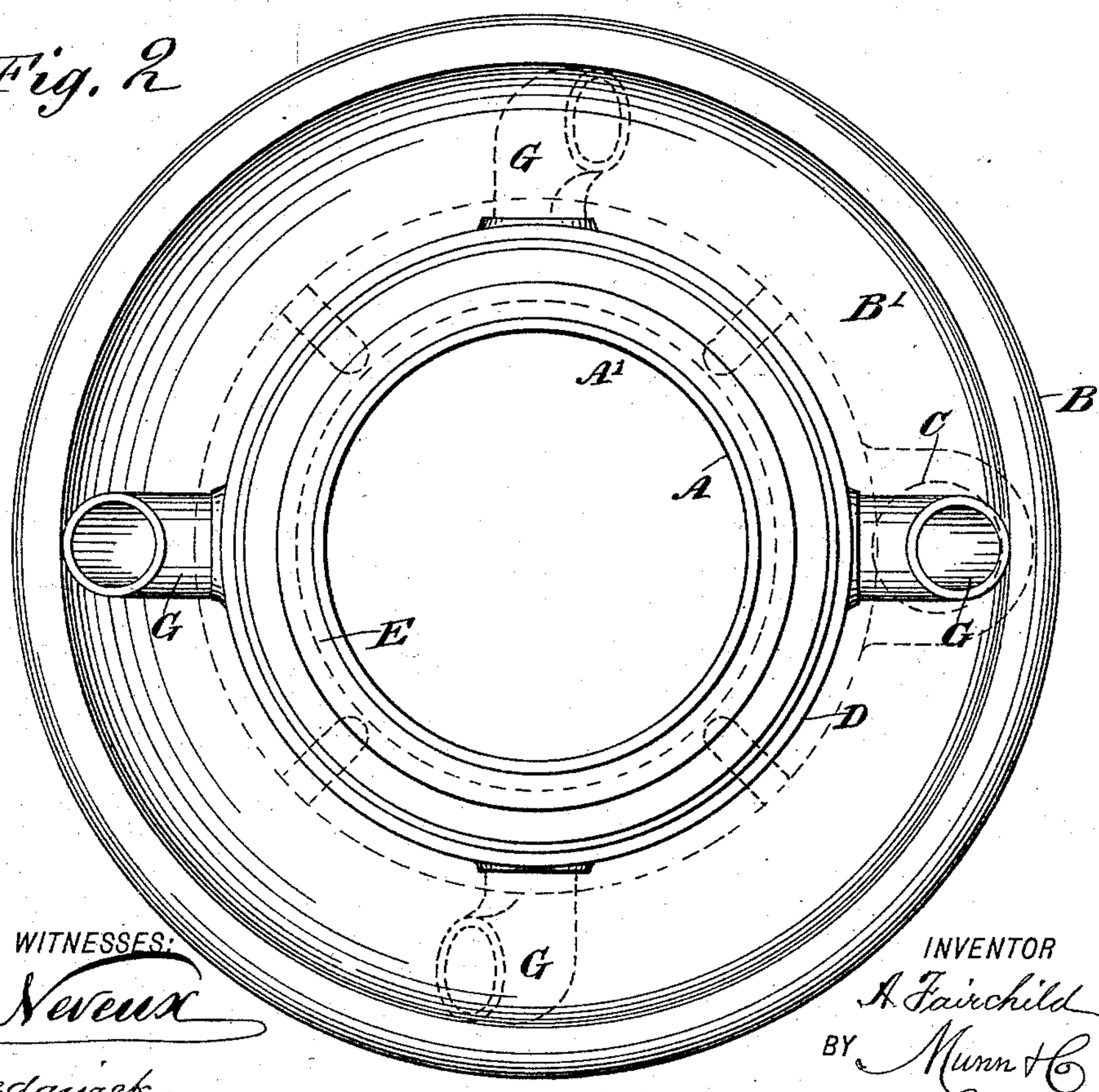



Fig. 2




WITNESSES:

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ADONIRAM FAIRCHILD, OF NEW YORK, N. Y.; BENJAMIN D. FAIRCHILD ADMINISTRATOR OF SAID ADONIRAM FAIRCHILD, DECEASED.

## HYDRAULIC EXCAVATOR.

SPECIFICATION forming part of Letters Patent No. 495,791, dated April 18, 1893.

Application filed July 22, 1892. Serial No. 440,860. (No model.)

*To all whom it may concern:*

Be it known that I, ADONIRAM FAIRCHILD, of New York city, in the county and State of New York, have invented a new and useful Hydraulic Excavator, of which the following is a full, clear, and exact description.

This invention relates to an improved excavator for the removal of sand, mud and gravel from the bottom of a water bed, and has for its object to improve the construction and operation of the device patented by me July 29, 1890, No. 432,279.

In the patented excavator mentioned, a vertical lift pipe is provided, through which the loosened material is elevated by a sand pump to the surface of the water in channels or other bodies of water where greater depth is desired. On said lift pipe, a hemispherical shell is loosely secured near its lower end, so as to rotate around the pipe end. Near the periphery and on the lower side of the shell, a series of spaced jet nozzles project which receive water under pressure from a force pump or other suitable source, the water jets from said nozzles having forcible contact with the ground near the lift pipe; a cup like attachment on the lower end of the lift pipe forming a wall between the lift pipe and shell that encircles both a certain distance above the lower extremity of the pipe. It has been found that increased efficiency is afforded if a different construction of parts is provided which will permit the outer shell of the excavator to be extended downwardly, so that an annular chamber will be formed between the shell and lift pipe, forcing water from the exterior of the shell to enter this space below the lower edge of the shell, and in its passage into the lower end of the lift pipe, carry with it the excavated material that has been loosened by the action of water jets within the annular chamber mentioned.

To effect the improvement indicated, my invention consists in the peculiar construction of parts and their combination, as is hereinafter described and claimed.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in both of the figures.

Figure 1 is a side view broken and in section, of the lower end portion of a lift pipe, and the improvement connected with it; and Fig. 2 is a reverse plan view of parts completed, partly in dotted lines, showing the improvement in place on a lift pipe.

The lift pipe A, shown broken away above in Fig. 1, is made of metal in cylindrical form, proportioned in diameter and length to the depth of the water operated in and the capacity of the pump used to lift the excavated material.

Upon the lower flanged end of the lift pipe A, there is a preferably cast metal dome like shell B, secured by bolts or other means, two eye bolts *b* oppositely located, forming parts of the connection between the flange *a*, of the lift pipe and the top of the shell, which latter is circularly apertured near its center, so as to align the wall of the aperture with the inner surface of the cylindrical lift pipe.

In the body of the shell B, near its upper surface, an annular channel or water duct *c* is formed, which is intersected by an inlet passage *c'*, that cuts through the top wall of the shell outside of the lift pipe A, said passage having its wall at the upper end threaded for engagement of a water supply pipe C, shown broken, but that in service is extended upwardly and receives water from a force pump or other adequate water supply under pressure. There is a lift pipe extension A', provided, which is screwed into the shell B, and aligns with the pipe A, becoming a part of the same, as indicated in Fig. 1.

Upon the true exterior surface of the piece A', an annular case D, is mounted. Said case is flanged radially on the inner side, which flanges extend toward the pipe extension A' a proper distance, and from the top and bottom walls of the case, which in use is an annular water conduit, that is supported in position, by its engagement at the inner edge of the upper flange thereon, with a joint plate *d* formed of any suitable metal and interposed between the case D, and a wall of the shell B, and also with a ring nut E, that has a threaded engagement with the pipe extension A' and bears upwardly against the lower flange on the case. At proper intervals, the cylindrical wall of the case D, is perforated and threaded therein, to receive short threaded

nipples *e*, which project sufficiently to engage the curved nozzles G, that may be set at any desired degree of inclination. The case D is in continuous communication on its upper side with the annular water chamber or duct *c*, and therefore will receive water under pressure from the pipe C, whether the case be stationary or rotating.

It will be seen that the shell B is cylindrically extended below the wall whereon the joint plate *d*, is seated; the concentric wall of the shell projecting sufficiently to align its lower edge with the lower edge of the pipe extension A′, or a short distance below the latter if preferred. The formation of the shell B, as described, will produce an intervening space B′ between its inner lower surface and the lift pipe extension, wherein the nozzles G, will discharge water upon the ground surface bounded by the shell. The nozzles may be set to project a jet from each directly in a vertical plane upon the ground to be excavated, or given an inclination to cause a routing action of the jets.

The entire device is swung from a laterally movable support, above the water surface, by chains or ropes not shown, that are fastened to the eye bolts *b*, so that the excavator may be manipulated to engage a range of surface by lateral vibration of the same.

In service, the water forced from the nozzles G, will cut away material below them, and as the lower edge of the shell B, is in contact with the ground, or near it, the draft of the sand pump that is attached to the top of the lift pipe A, will cause water to forcibly rush in under the edge of the shell and mix with the mud, sand or like excavated material, that is drawn upwardly in the lift pipe by the produced vacuum, which measurably extends within the space between the pipe and shell, thus facilitating the complete removal of excavated material.

Should it be found expedient to rotate the case D, this can be effected by a proper adjustment of the nut ring E, and an inclination of the nozzles G, in the same direction; a tightening of said nut fixing the case so as to render the nozzles stationary.

Having thus fully described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination with a lift pipe and an extension of the same, and a water supply pipe, of a cylindrical shell depending from the lift pipe concentric with its depending extension, and a rotatable case within the shell having jet nozzles located between the shell and lift pipe extension, substantially as described.

2. The combination with a lift pipe, a shell having an annular water duct in the upper end of the shell, and a depending cylindrical wall below the duct, of a water supply pipe leading to the duct, an annular case below the duct, jet nozzles in the wall of the case, and a ring nut on the lift pipe, supporting said case, substantially as described.

3. The combination with a lift pipe, a dome-like shell on the lower end of the lift pipe, a water supply pipe, and an annular duct within the shell connected to the water pipe by a passage, of an extension piece depending from the lift pipe, an annular case on said extension, radial nipples in said case, nozzles on the nipples, and a ring nut support for the case and engaging the extension piece, substantially as described.

4. The combination with a lift pipe, a cylindrical shell on the lower end of the lift pipe, an annular water duct in the upper end of the shell, and a water supply pipe connected by a passage with the annular duct, of an extension piece on the lift pipe centrally within the depending wall of the shell and forming an intervening inclosed space, an annular case on the lift pipe extension, a joint plate between the case and shell, an annular passage between the water duct and case, nipples in the side wall of the case, nozzles on said nipples, and a ring nut support for the case, substantially as described.

5. The combination with a lift pipe, a water supply pipe, a depending cylindrical shell of nearly equal length with an extension of the lift pipe centrally within it, a rotatable shell adapted to receive water from the supply pipe, and nozzles on the shell adapted to discharge water between the lift pipe extension and concentric shell, substantially as described.

ADONIRAM FAIRCHILD.

Witnesses:
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