

(No Model.)

G. A. MILLER.
APPARATUS FOR EXCAVATING WELLS, &c.

No. 494,877.

Patented Apr. 4, 1893.

Fig. 1.

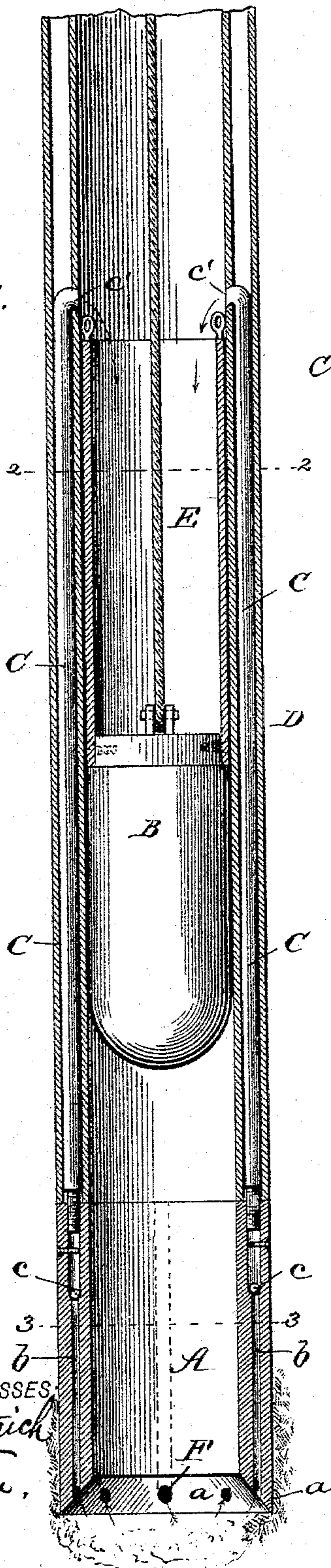


Fig. 2.

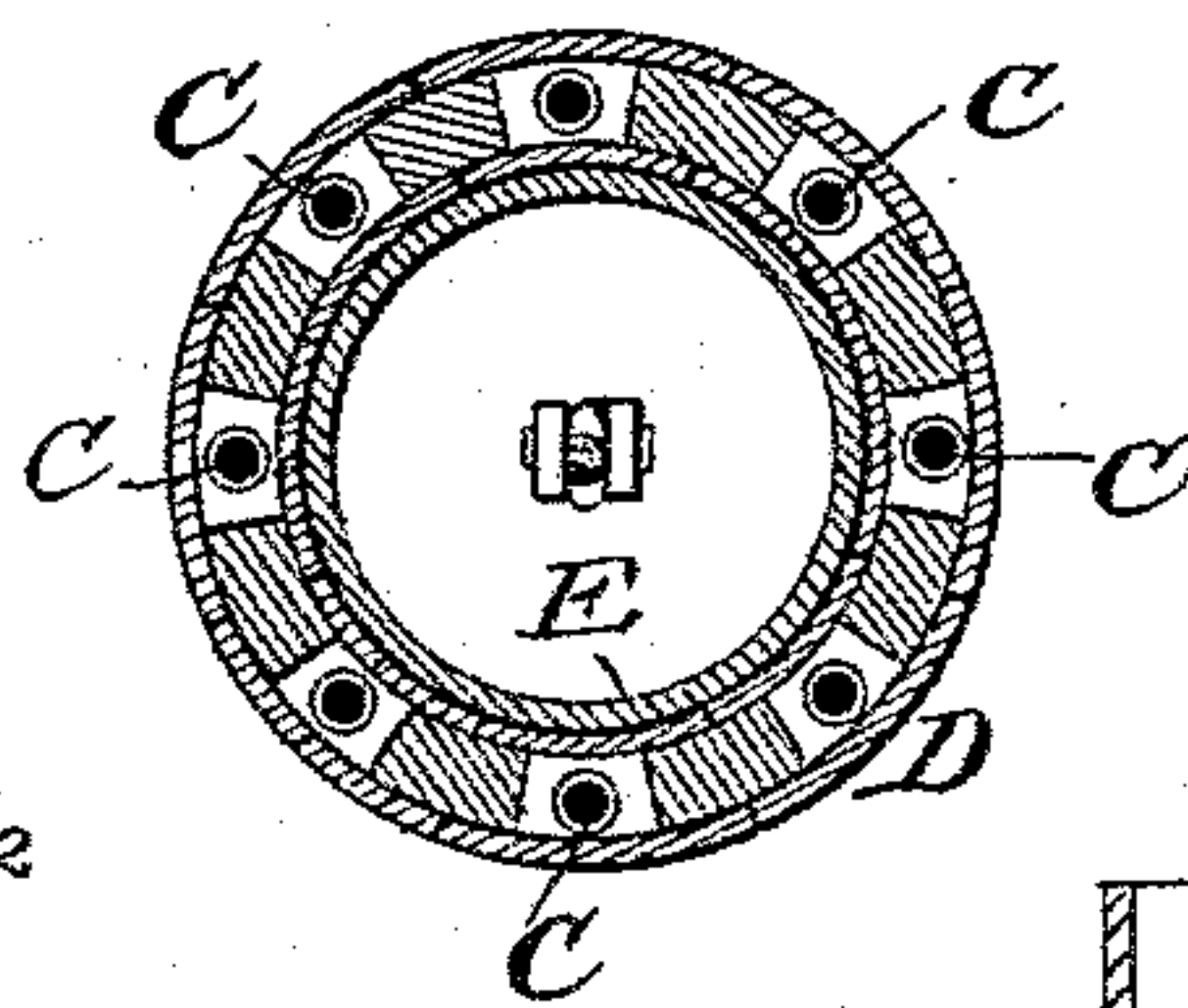


Fig. 4.

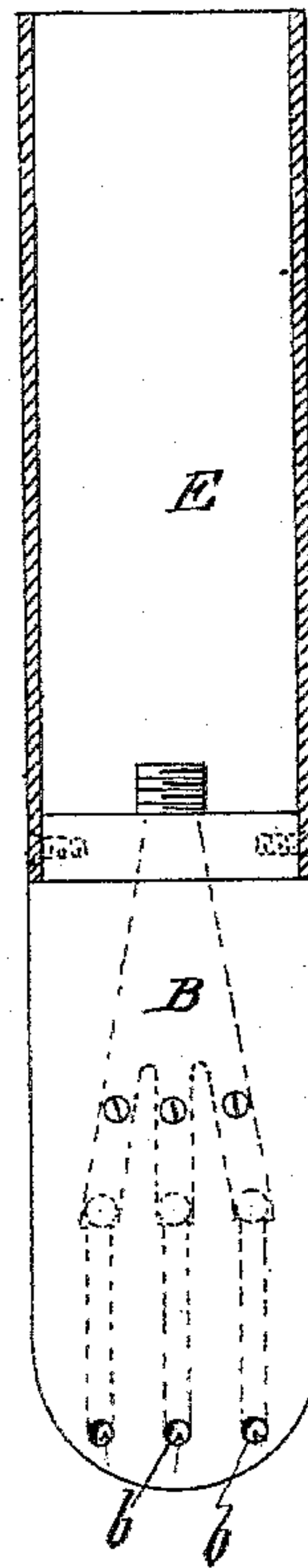
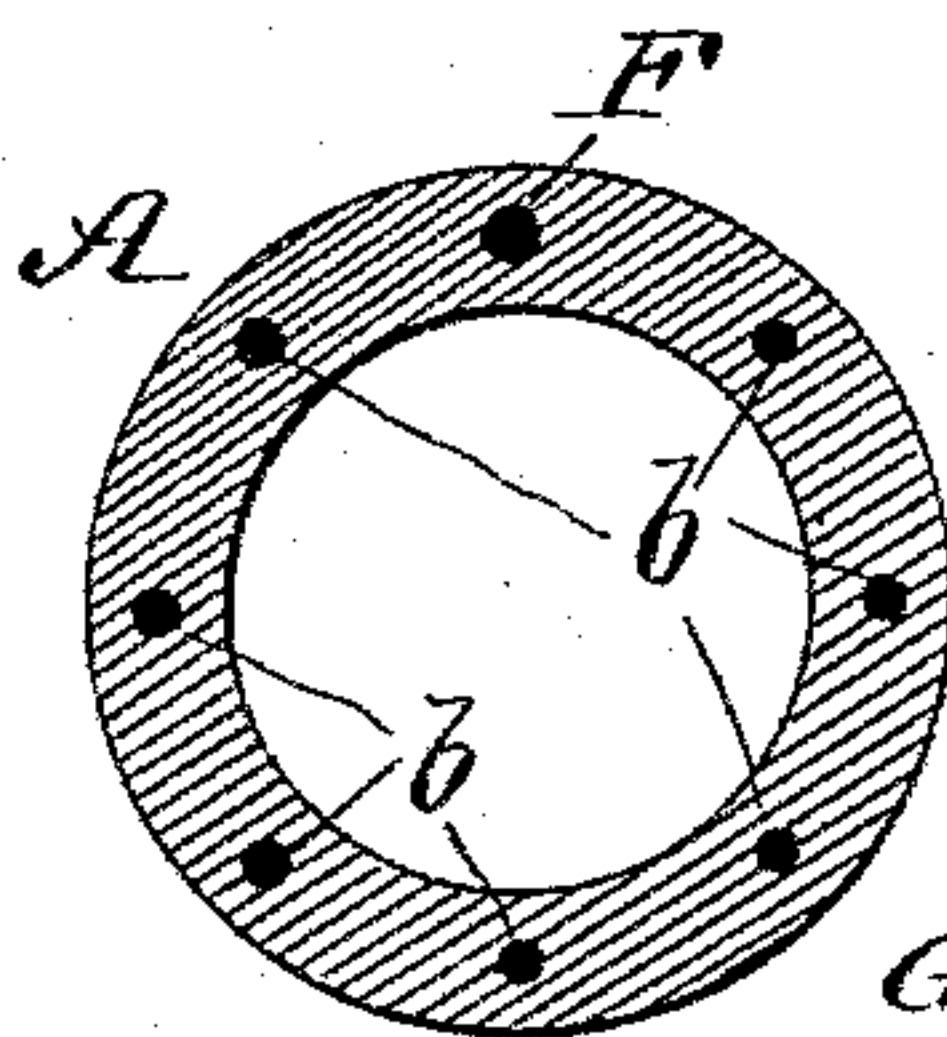


Fig. 3.



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APPARATUS FOR EXCAVATING WELLS, &c.

SPECIFICATION forming part of Letters Patent No. 494,877, dated April 4, 1893.

Application filed September 1, 1892. Serial No. 444,833. (No model.)

To all whom it may concern:

Be it known that I, GEORGE A. MILLER, residing at Colfax, Whitman county, in the State of Washington, have invented a new and useful Improved Apparatus for Excavating Wells, Shafts, &c., of which the following is a specification.

In a patent granted to me June 7, 1892, I have described a method of excavating by use of an explosive substance or torpedo, and a drop or hammer, which is allowed to fall upon the torpedo, thus causing it to explode and by the sudden and violent impact of the gas thus developed, loosening, disrupting, disintegrating and pulverizing the surrounding earth, stone or rock. My present invention is an improvement in this line and involves an improved apparatus, whereby the loosened earthy material is elevated and removed from the well or cavity.

In the accompanying drawings—Figure 1 is a sectional elevation of my improvements. Figs. 2 and 3 are respectively cross sections on lines 2, 2 and 3, 3 of Fig. 1, and Fig. 4 shows a somewhat different construction of excavator.

A indicates a circular steel head, or "shoe" having straight sides and a conical cavity *a*, in the under side. This shoe A, has a central vertical opening in which the elongated cylindrical device B, which I term the excavator proper works. The shoe is also provided with vertical passages *b*, which are preferably arranged as shown in Fig. 1, there being three or more on one side of the central opening and three or more on the other. From these openings *b* as many tubes C, extend upward and are curved inward at the top. Ball check valves *c* are located in the passages *b*, and seated in hemispherical cavities in the shoe A.

A large casing or cylinder D, which may be made of steel or iron or of scantling or other cheap and light lumber—is attached to the upper side of the shoe A and extends upward to an indefinite length. Upon the excavator B and directly beneath the inbent ends *c'* of the tubes C, is placed a tank or reservoir E for receiving the material forced up through and discharged from the tubes C. This reservoir is also of indefinite length, but its ca-

capacity should be such as to enable it to hold all the material, or slush which may be taken up by and discharged from the tubes C, in the progress of a day's work, so that the reservoir will require to be removed and its contents discharged but once a day.

The practical operation of this before described apparatus is as follows: Suppose a shallow cavity to have been excavated in the earth and the apparatus to be arranged over and partly within the same, and suspended by means adapted to raise and lower it, and also to raise and drop the excavator B, independently of the other parts. (In practice I employ for these functions an apparatus which I have constructed for the purpose and which I propose to make the subject of an application for patent.) The first step in the operation is to deposit a torpedo in the cavity. This is effected by lifting the excavator B, a few feet and dropping it through the central opening in the shoe A, but it may be delivered through a separate unvalved tube or passage F, passing through the shoe. The excavator B is then dropped upon the torpedo, whose ensuing explosion disrupts, shatters, disintegrates and pulverizes or loosens and dislodges the surrounding stone, rock or earth. The material thus acted upon together with inflowing water forms a plastic mass or slush, which is forced up through the tubes C, and caused to discharge into the reservoir E, by the reciprocative action of the excavator B. That is to say, the latter is rapidly raised and dropped, and thus acts like the piston of a force pump, driving the slush up the tubes C, by the force of mechanical impact and atmospheric pressure. The ball valves *c*, will obviously permit the slush to readily pass them but prevent its return. When all or most of the slush has been forced up, another torpedo is deposited in the now deepened cavity and the former operation continued as before, at rate of five to ten feet per hour.

It will be noted that the shoe serves as a barrier or medium which resists the explosive action of the torpedo in the upward direction. The torpedo employed is composed of some modern high power explosive, such, for example, as fulminate of mercury which gives

a pressure of forty-eight thousand atmospheres for detoning and gun cotton which gives an atmospheric pressure of say twenty-four thousand for disrupting.

5 The excavator, or hammer and piston B may weigh several hundred and even a thousand pounds, and with the reservoir filled may weigh twenty thousand pounds.

10 Instead of the tubes running up within the casing they may run up outside the same.

It will also be understood that instead of running all the pipes C up full length they may be merged in two or more pipes and the latter extended up to discharge into the reservoir.

15 It will also be understood that where desired the passages *b* may be formed in the excavator as shown in Fig. 4 instead of in the shoe.

20 Having thus described my invention, what I claim is—

1. The improved apparatus for use in ex-

cavating wells, shafts &c., the same consisting of a head or shoe having a central opening and other passages which are provided 25 with check valves; tubes connected with such passages, a reservoir for receiving the material delivered from the tubes, and a device which is adapted to reciprocate through the shoe and thus alternately perform the func- 30 tions of a drop hammer and piston of a force pump, as shown and described.

2. In an excavator of the character described, the combination with the shoe having a conical cavity in its under side, a cen- 35 tral opening and one or more slush passages opening within said cavity of one or more slush-conveying tubes, and check valves arranged within them, as specified.

GEORGE A. MILLER.

Witnesses:

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