

No. 610,048.

Patented Aug. 30, 1898.

S. H. & E. B. HAYCOCK.
APPARATUS FOR MINING IN FROZEN GROUND.

(Application filed Nov. 22, 1897.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1.

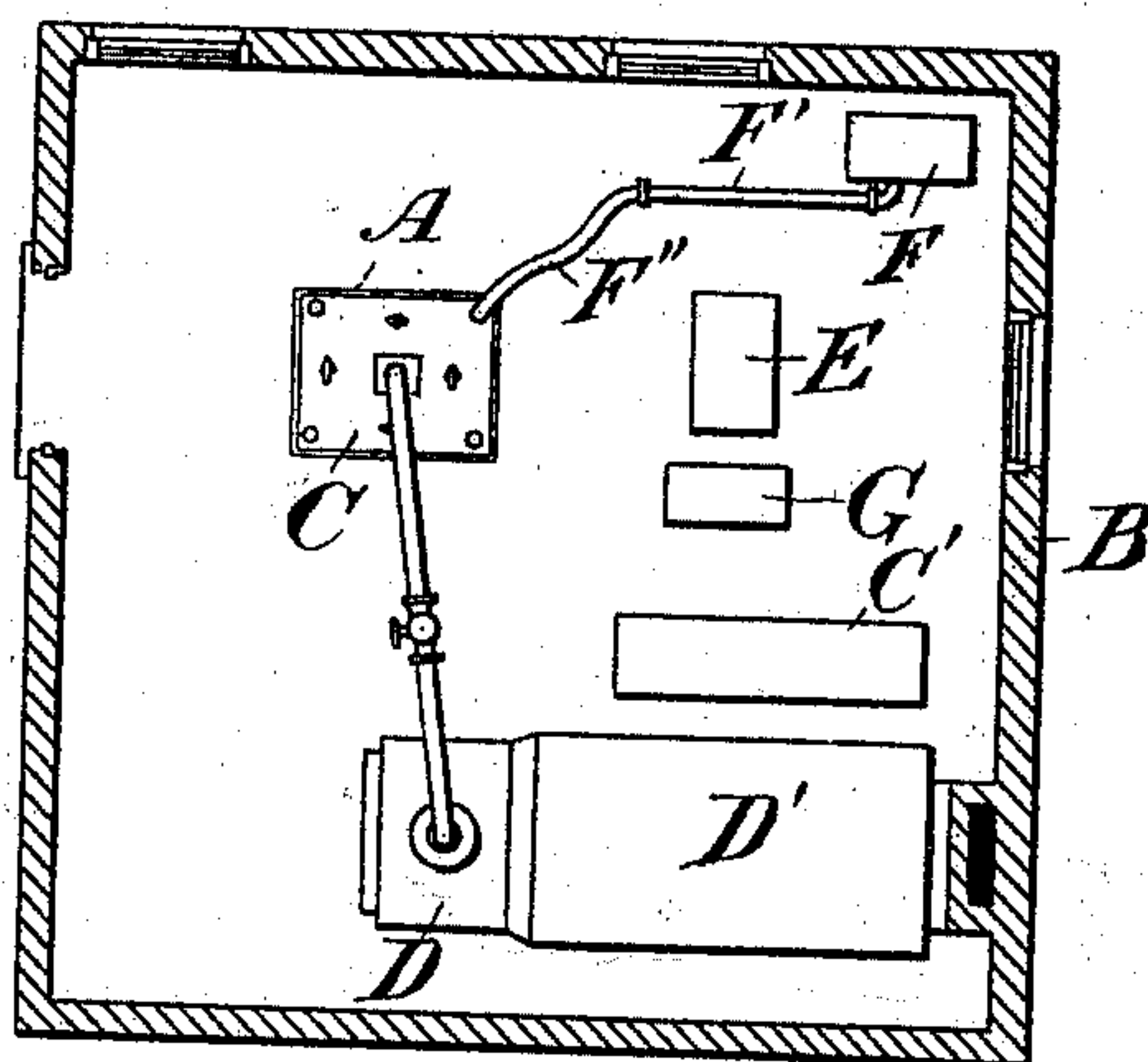


Fig. 2.

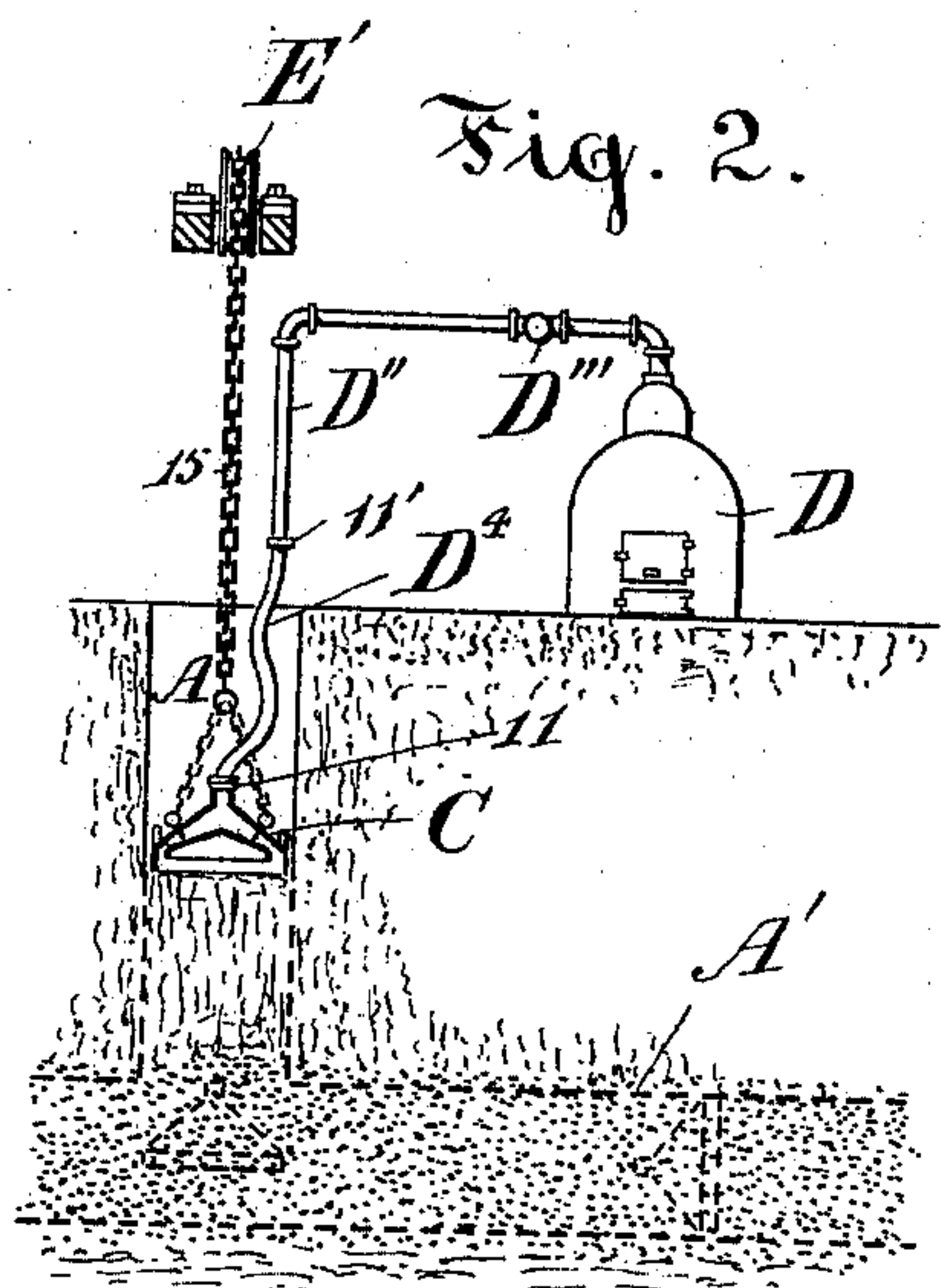


Fig. 6.

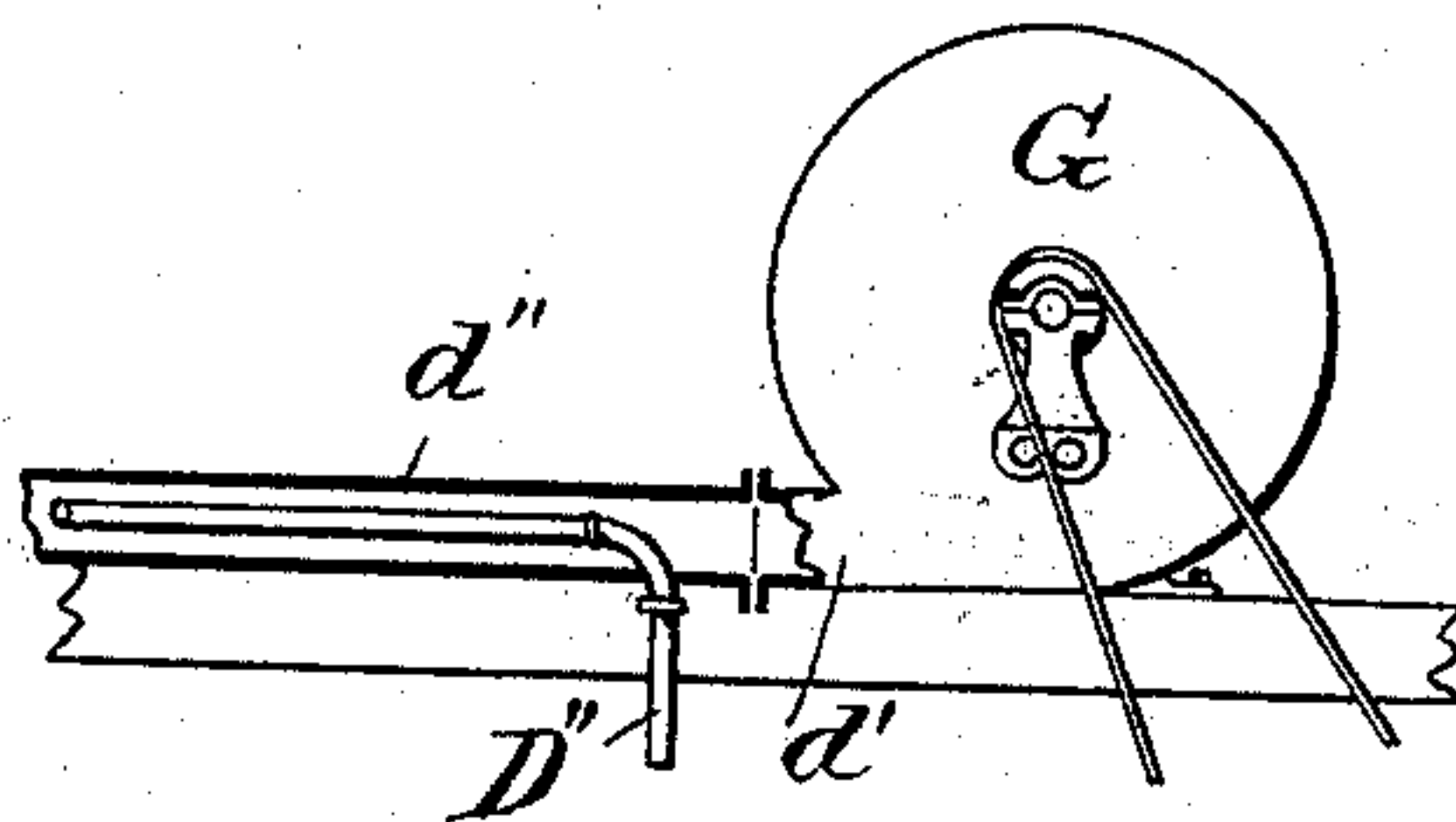
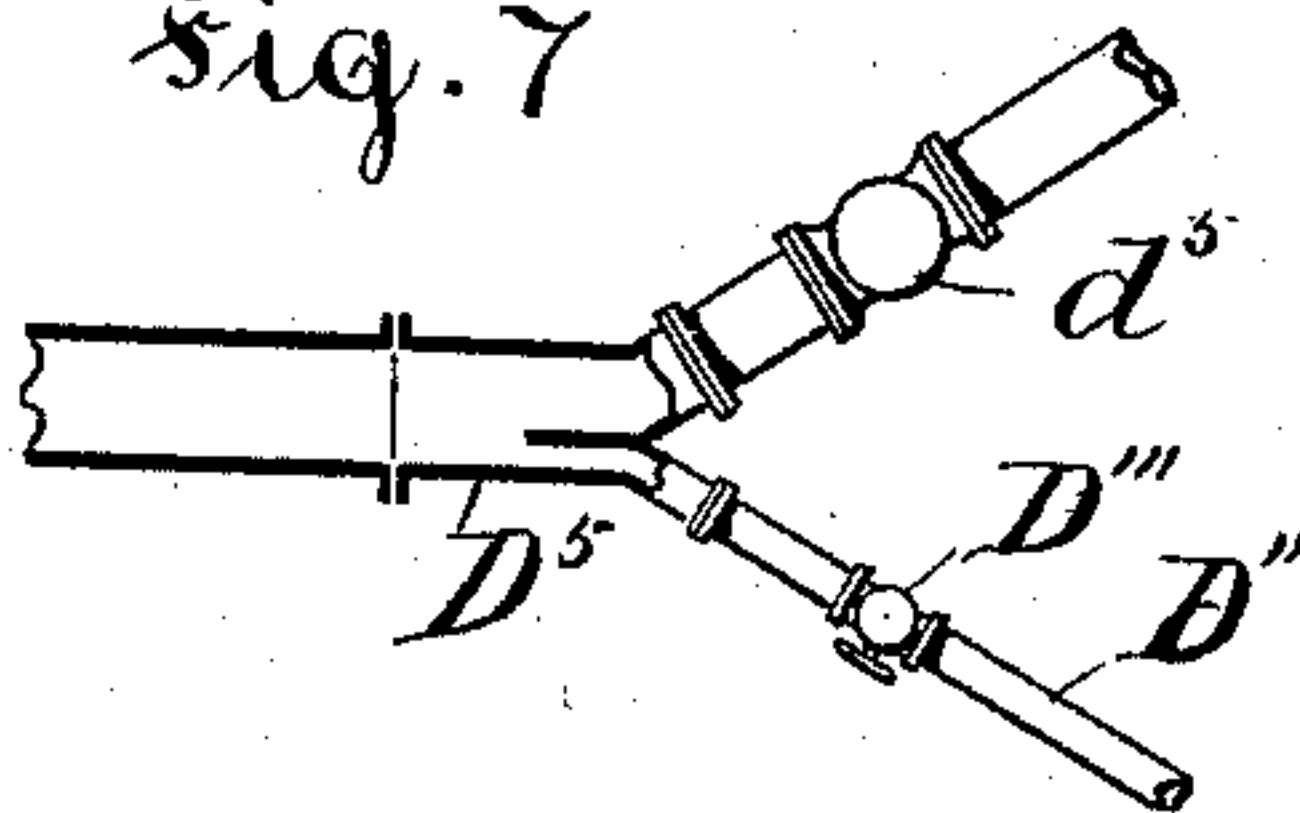


Fig. 7



Witnesses:

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Fig. 3.

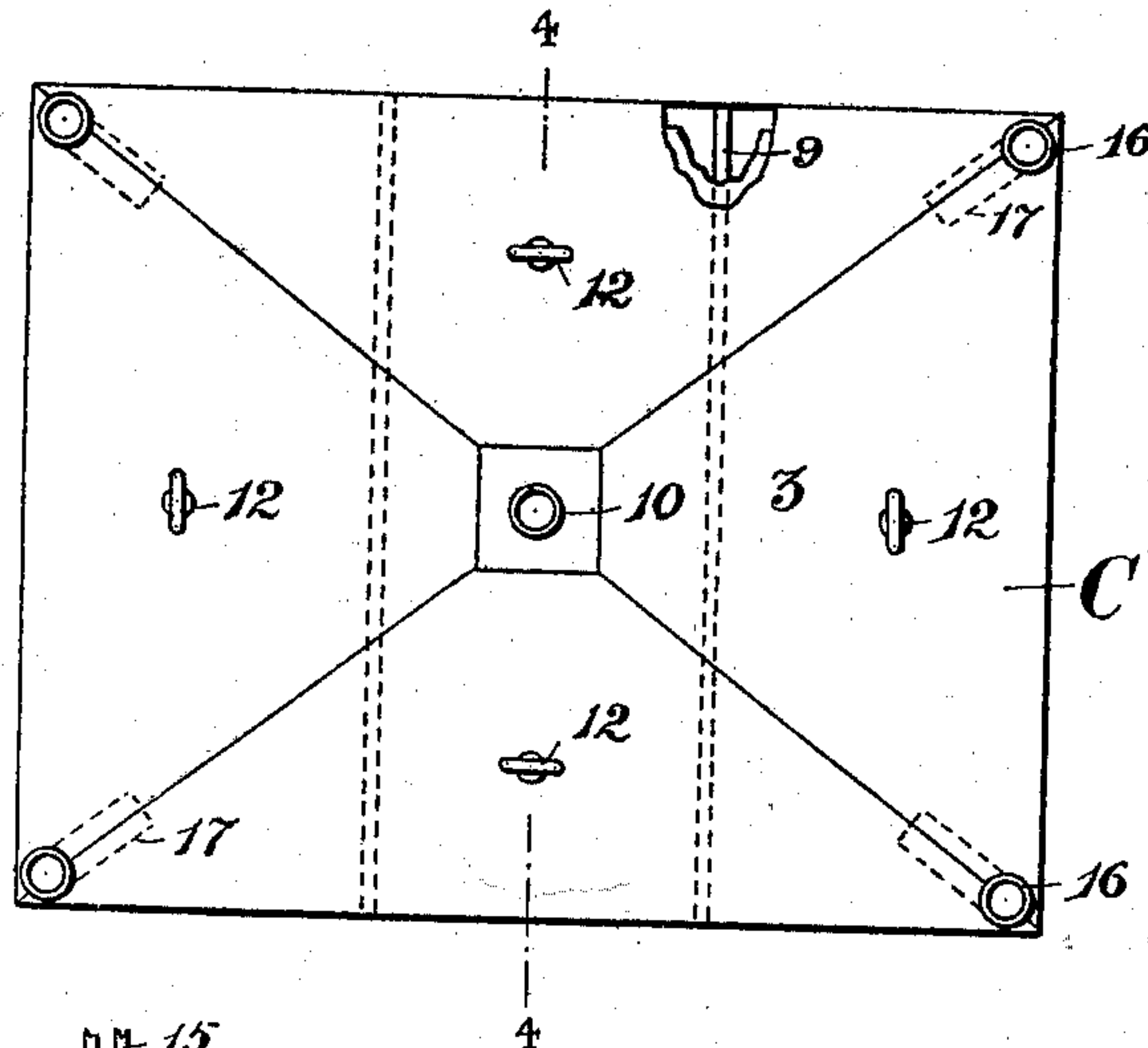


Fig. 4.

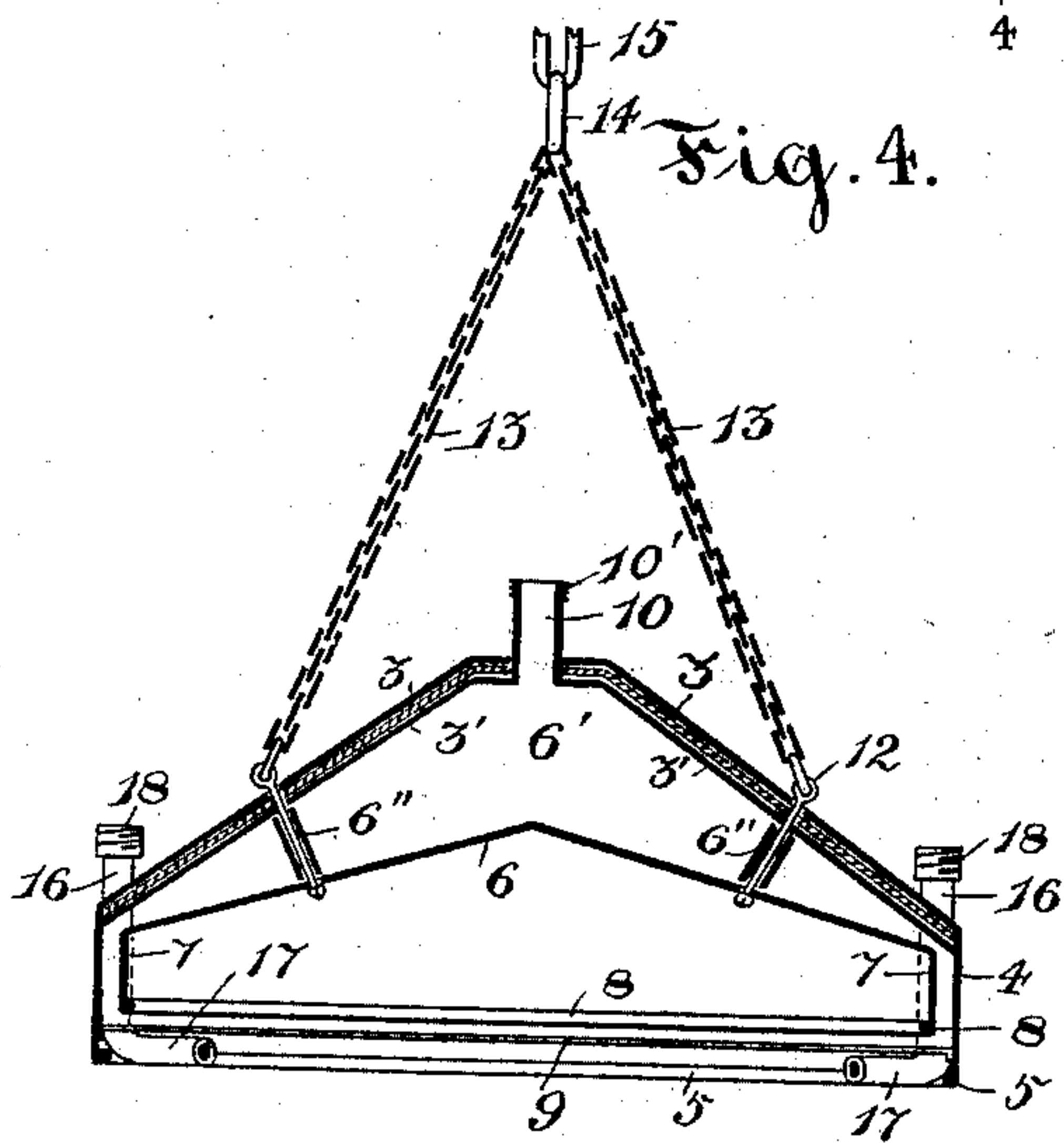
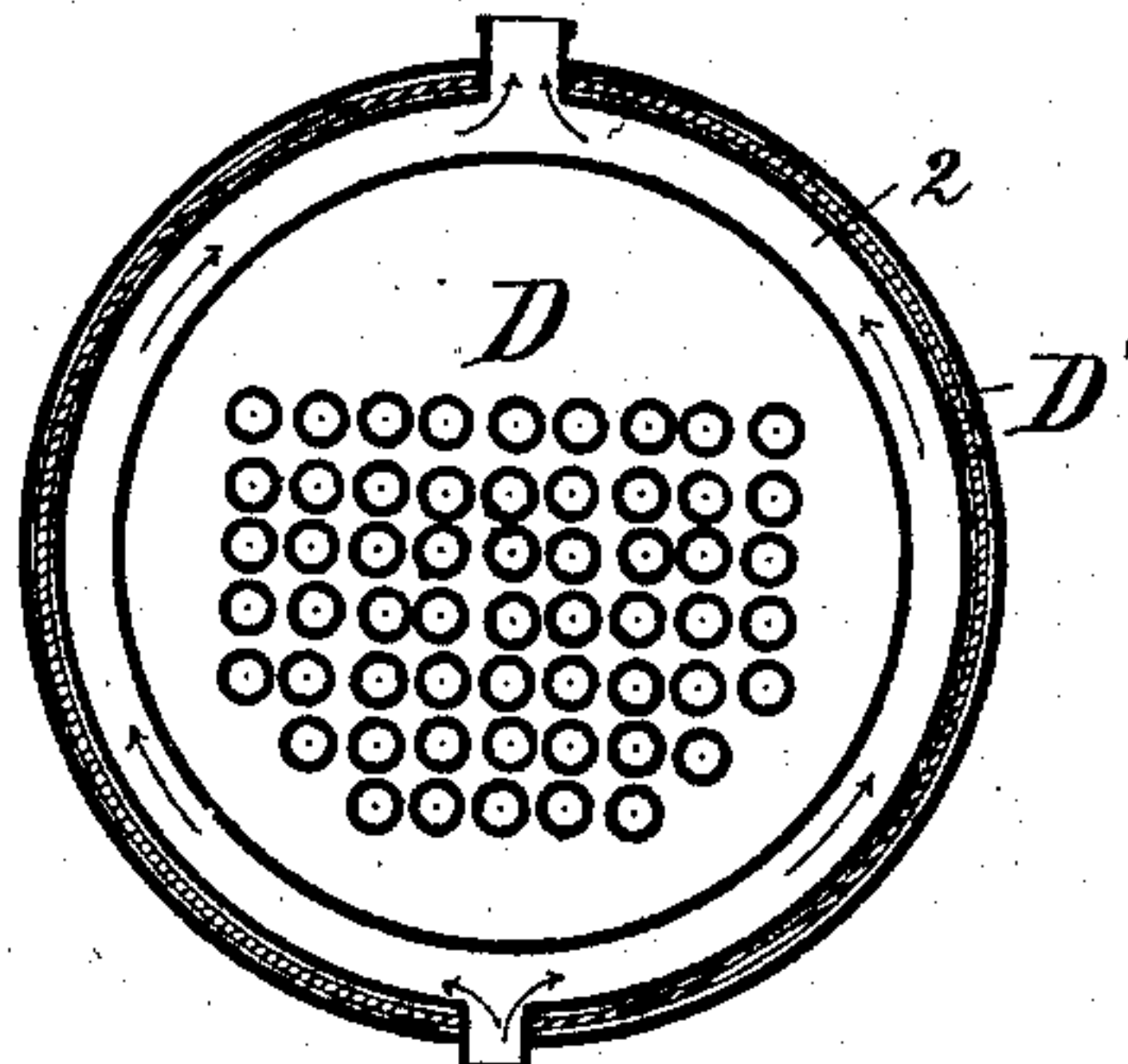


Fig. 5.



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UNITED STATES PATENT OFFICE.

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OTTAWA, CANADA.

APPARATUS FOR MINING IN FROZEN GROUND.

SPECIFICATION forming part of Letters Patent No. 610,048, dated August 30, 1898.

Application filed November 22, 1897. Serial No. 659,526. (No model.)

To all whom it may concern:

Be it known that we, SAMUEL H. HAYCOCK, of Iroquois, and EDWARD B. HAYCOCK, of Ottawa, in the Province of Ontario and Dominion of Canada, have invented certain new and useful Improvements in Apparatus for Mining in Frozen Ground; and we do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part thereof.

Our invention, which will be hereinafter fully set forth and claimed, relates to apparatus for sinking shafts and making drifts in sand, gravel, and similar formations, and especially when such formations are frozen.

The object of our invention is an apparatus for treating certain formations, such as may, in a limited sense, be described as soluble, as sand, gravel, and the like, and especially when frozen, for the purpose of sinking shafts and driving drifts in mining and similar operations.

Figure 1 is a plan of our improved mining plant. Fig. 2 is a section of a shaft and drift, with part of the machinery shown in elevation. Fig. 3 is a top view of the sinker. Fig. 4 is a vertical section of the same on line 4 4, Fig. 3. Fig 5 is a cross-section of a steam-boiler with hot-air jacket. Fig. 6 is a jacketed steam-pipe, the jacket being adapted to be filled with hot air by the fan. Fig. 7 shows a steam and hot-air junction, being a modification.

When a shaft is to be sunk in sand, gravel, or other formation of a similar description, and especially if there is more or less frost in the ground, a suitable building B is erected over the place where the shaft A is to be sunk, which is adapted to contain the necessary machinery. This latter consists of a movable sinker C, a steam-boiler D, a hoist E, and a pump F. If it is desired to utilize hot air or the waste heat of the boiler, a fan G is also employed to force the hot air through the heater and pipes, and it may also be used for ventilating the shaft A and drift A'. If hot air is to be generated by the waste heat of the boiler, a casing or jacket D' is placed around the boiler to form an air-space 2, as shown in

Fig. 5. In some cases, however, hot air may be used as the principal medium instead of steam and the latter only employed for motor purposes, such as hoisting, pumping, blowing, and the like.

The hoist, pump, and fan may each have its own engine, or one engine C' may drive a line of shafting, and from this power may be taken by belts to the said machines.

The sinker C is essentially a radiating apparatus somewhat resembling an inverted funnel. It is made the size of the pit or shaft intended to be sunk and may be of any desired shape, the rectangular form being shown in Figs. 1, 3, and 4. It may be constructed of galvanized-iron sheet and consists of a top 3, of depressed (or low) pyramidal (or conical) shape, with a central nozzle 10, which is provided with a thread 10' for a coupling 11 for a flexible hose. The top is made with a double wall 3' and the space between the two walls or sheets closed in and filled with non-conducting material to prevent upward radiation and waste of heat. Hooks or eyes 12 are secured to the upper sheet, to which short chains 13 are secured, all joined in a central ring 14, to which the lifting chain or rope 15 may be attached. To the outer edge of the top is secured a vertical downwardly-projecting rim or flange 4, having its lower edge strengthened by a bar 5. Within this structure and held apart therefrom to form a space 6' between them is an inner similar one consisting of a top or crown 6, similar to the top 3, but more depressed or flat, connected by stays 6'' with the upper one at suitable intervals and provided with a rim 7, not as deep and not reaching as far down as the outer one, and also provided with a strengthening-bar 8, cross-stays 9, connecting the outer rim, being secured some inches up from the lower edge. The crown 6 may be corrugated to increase its heating-surface. In each angle of the sinker (or at several points in the rim of a round one) may be inserted a short vertical pipe 16, projecting above the top 3 a little and provided with a hose-coupling 18 and kept low and near the lower edge 5. The sinker is connected with the boiler by means of a steam-pipe D'', provided with suitable

valve D''' and with hose-coupling 11' at the discharge end, which latter is brought into convenient proximity over the sinker C and connected therewith by a flexible hose D⁴.

5 The hoisting rope or chain 15, coming from the hoist E, is led over a pulley E', journaled vertically over the center of the shaft to a beam forming part of the building B or to sheer legs or other convenient or suitable support.

10 The process in frozen ground is as follows: The sinker C, which is preferably made in its rims about the size of the shaft to be sunk, is lowered by the hoist upon the place where the mouth of the shaft is to be. The flexible hose D⁴ having been duly connected with the coupling 11 of the sinker and the coupling 11' on the steam-pipe D'' and the steam-valve D''' being turned on, the steam passes in the space 6' of the sinker and comes in direct contact with the ground along the rim 5 and 8, while the crown 6 is heated and reflects the heat upon the ground below. The condensed water flows out at the rim and, with the water released from the ground by thawing, forms the latter into a slush. One of the pipes 16 in the sinker is now connected by its coupling 18 with a flexible hose F'', connected to the suction-pipe F' of the pump F. The pump will be of a character adapted to lift water holding debris in suspension, such as the centrifugal pumps usually are, and the pump, being set in motion, will draw off the water, and this will carry with it any sand and other debris which may be held in suspension and discharged into a sluice-box ready to be washed or discharged. The flexible hose F'' may be changed from one pipe 16 to the others in rotation, those not in use for the time being closed with a cap. Any accumulation of heavier debris which the pump F is not capable of lifting must be removed from time to time by the shovel or in any other convenient manner by first shutting off the steam and then lifting the sinker by means of the hoist. The hoist may also be used for lifting such coarser debris after the shaft has been sunk some depth.

When hot air is to be used as an auxiliary, it may be employed to heat a jacket d'' around the steam-pipe D'', into which the hot air from the boiler-jacket D' is forced by the fan G through a pipe d', as shown in Fig. 6, or the hot air may be allowed to mingle with the steam, a suitable junction D⁵ being inserted in the steam-pipe D'' and a back-pressure valve d⁵ inserted in the hot-air pipe to prevent the steam passing into it if the pressure becomes excessive. This modification is

shown in Fig. 7; but other means of mixing hot air and steam are well known.

Although steam is mentioned as the principal heat-conveying medium, hot air or other media might be used under certain given conditions with equal advantage.

We claim as our invention—

1. In a sinker, the combination of a low pyramidal top, a nozzle at the apex, a vertical rim or flange at the edge, a strengthening-bar along the lower edge of the rim or flange, a non-conducting lining to the top, an inner casing consisting of crown and rim a little distance from the outer one so as to form a space and the rim not extending as far down as the outer one and provided with a strengthening-bar, connections at intervals between the outer casing and the inner, and cross-stays connecting said outer rim, substantially as set forth.

2. In a sinker, the combination of a low pyramidal top, a nozzle at the apex, a vertical rim or flange at the edge strengthened at its lower edge, a non-conducting lining to the top, an inner casing consisting of crown and rim similar to the outer one but smaller and a little distance from it so as to form a space and its rim strengthened at the lower edge not extending as far down as the outer one, connections at intervals between the inner and outer casings, vertical pipes in the spaces between the flanges having lateral bends below and projecting above the top and provided with means of connecting them with hose or closing them, substantially as set forth.

3. A radiating apparatus or sinker approximating the shape of an inverted funnel and consisting of a flattened funnel-shaped top with central nozzle and hose-coupling and having a vertical flange or rim at the lower or outer edge, and an inner casing similar to the outer one but smaller and with crown more depressed and forming a radiating-surface with a space between it and the outer one that is open at the lower edges of the rims, substantially as set forth.

In testimony whereof we have signed in the presence of the undersigned witnesses.

SAML. H. HAYCOCK.

EDWARD B. HAYCOCK.

Witnesses to the signature of S. H. Haycock:

A. E. DUERELL,
MAY ADELAID HAYCOCK.

Witnesses to the signature of E. B. Haycock:

A. HARVEY,
B. HARVEY.