(No Model.) 3 Sheets—Sheet 1.

C. F. PIKE.

ORE WASHER OR CONCENTRATOR.

No. 528,975. Patented Nov. 13, 1894.

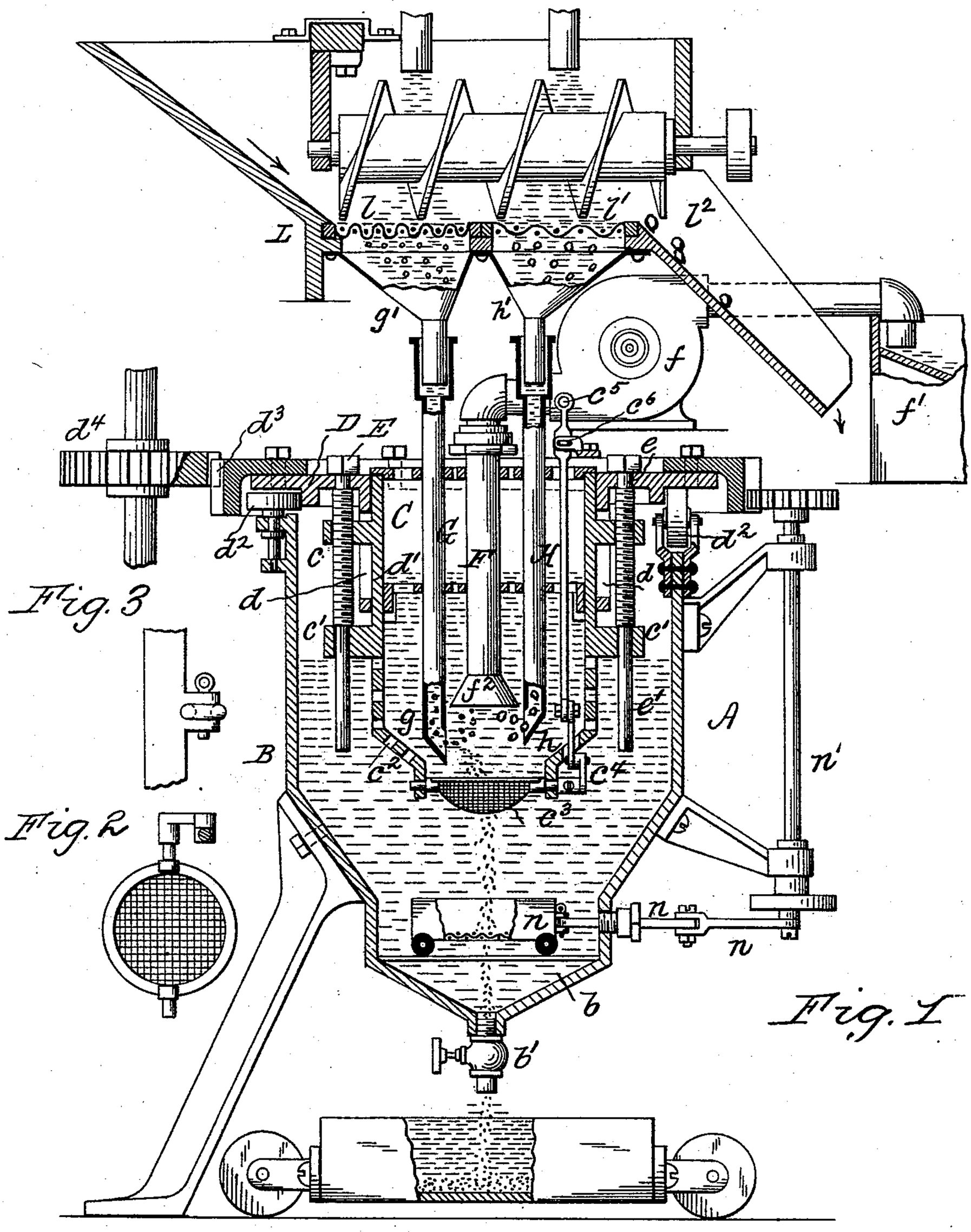

Fig. 3

Fig. 2

Fig. 1

WITNESSES:
K. Van Stavoren.
L. Van Stavoren.

INVENTOR
Charles F. Pike
By A. J. Vanstavoren
attorney

(No Model.) 3 Sheets—Sheet 2.

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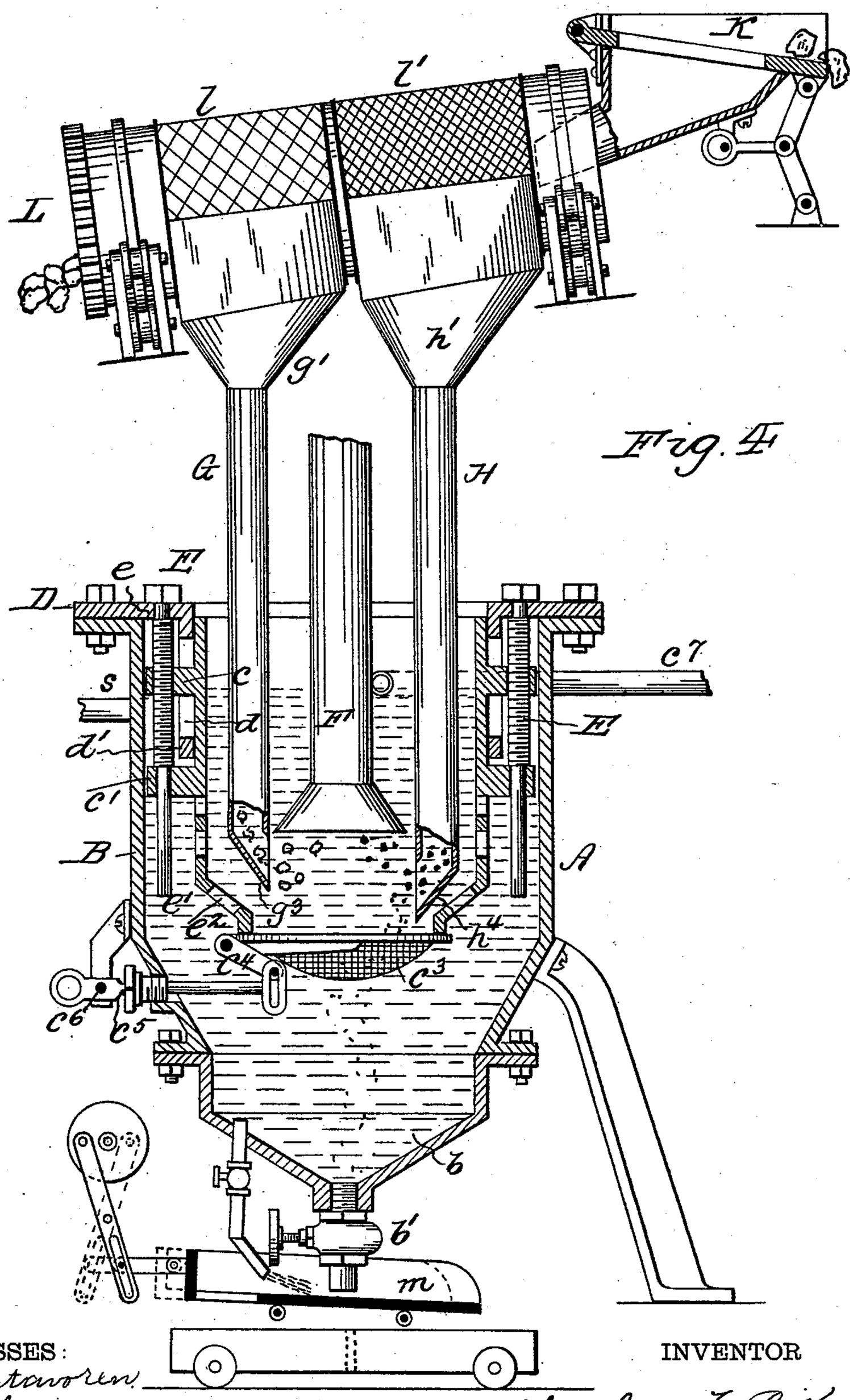

Fig. 4

WITNESSES:
K. Van Stavoren.
L Van Stavoren.

INVENTOR
Charles F. Pike
By C. J. Vanstavoren
attorney

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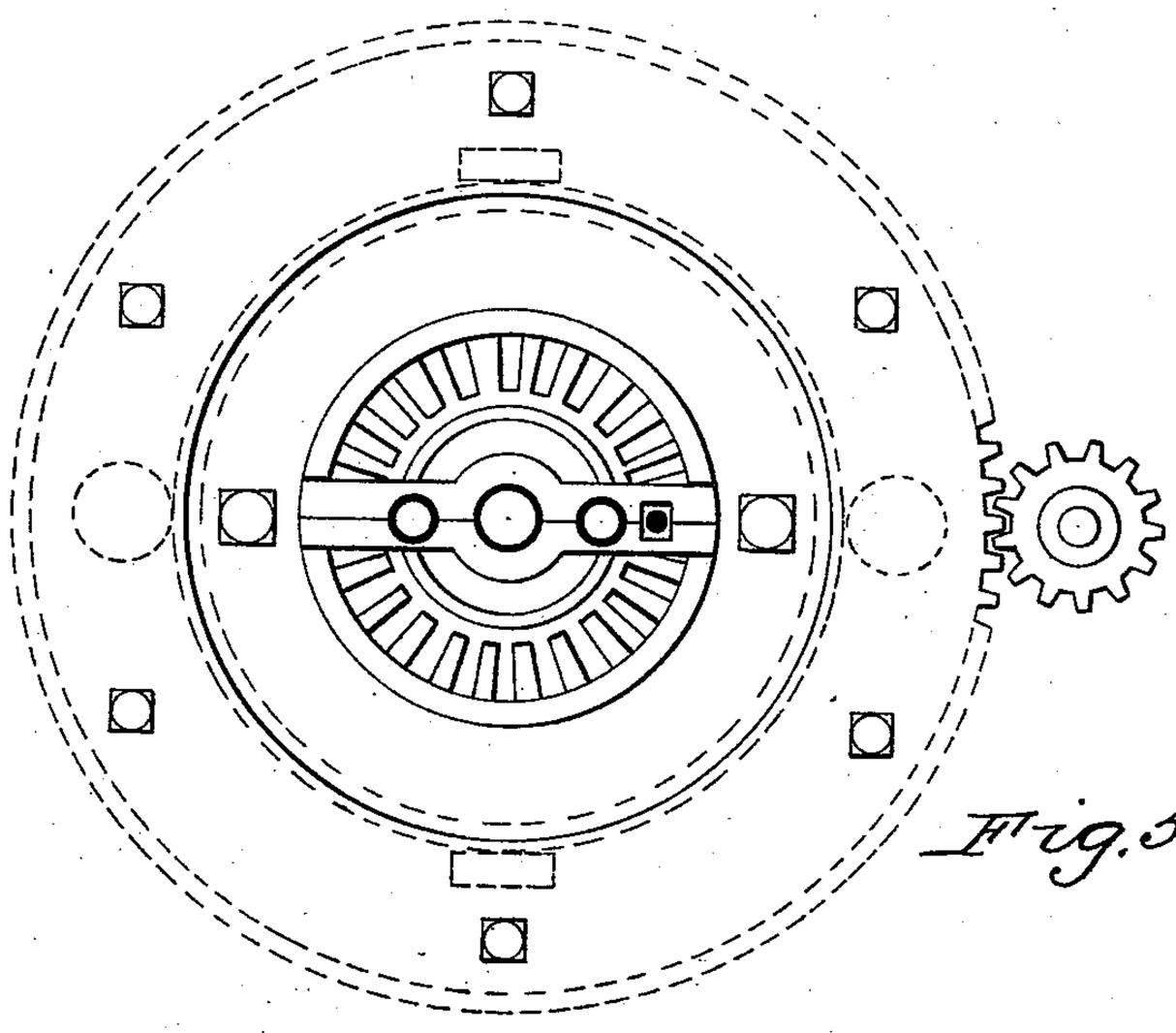


Fig. 5

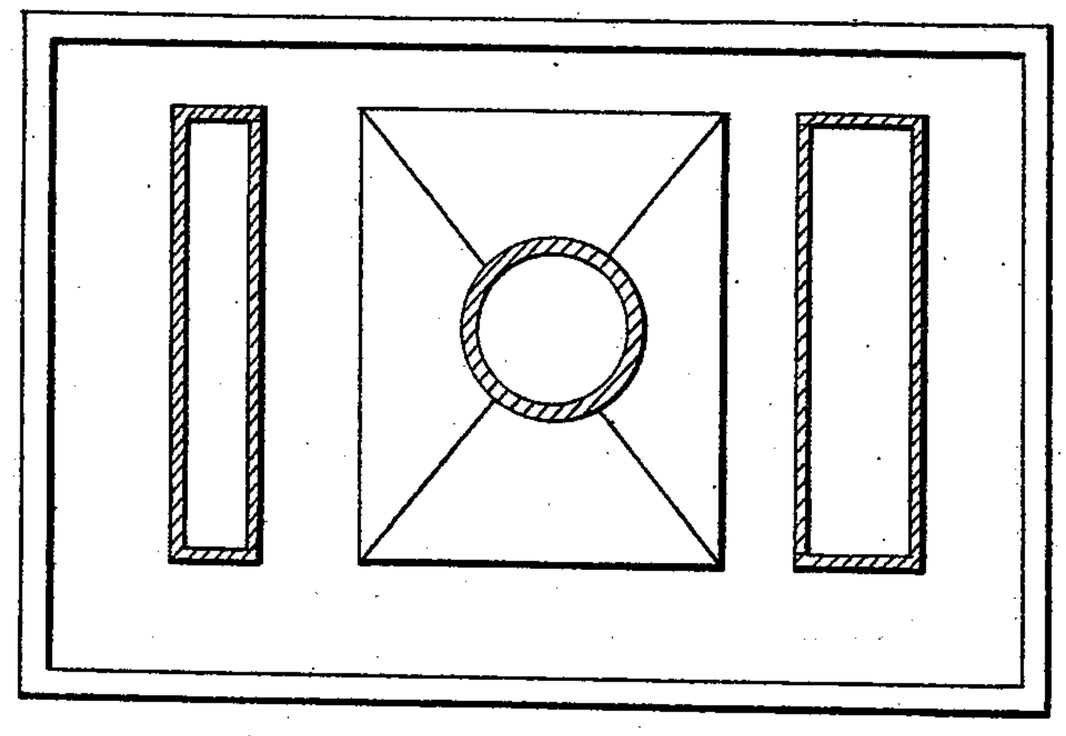
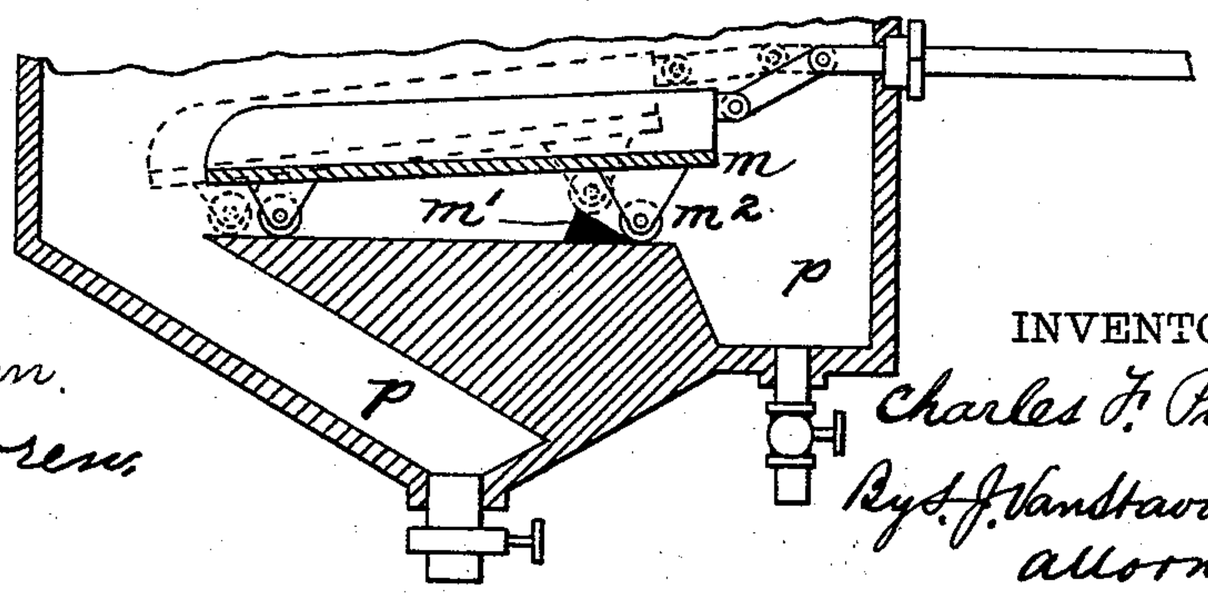


Fig. 6

Fig. 7



WITNESSES.
K. Van Stavoren.
L. Van Stavoren.

INVENTOR
Charles F. Pike
By J. Vanstavoren
attorney

UNITED STATES PATENT OFFICE.

CHARLES F. PIKE, OF PHILADELPHIA, PENNSYLVANIA.

ORE WASHER OR CONCENTRATOR.

SPECIFICATION forming part of Letters Patent No. 528,975, dated November 13, 1894.

Application filed June 10, 1893. Renewed April 17, 1894. Serial No. 507,940. (No model.)

To all whom it may concern:

Be it known that I, CHARLES F. PIKE, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Ore Washers or Concentrators; 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 has relation to ore washers and concentrators of that form wherein the ore or gangue is deposited in a vessel at one side, subjected to the agitating influence of water in motion and is discharged by suction; and it has for its object to increase the efficiency of such machines; and to this end the gangue or ore is divided or separated into different grades of fineness and each grade is separately fed into the washer at varying distances from the suction pipe inlet in order that each grade may be subjected to a different strength or velocity of suction force previously to being discharged. This admits of a primary separation of the different sizes of metal in the ore or gangue and secondly of a more thorough individual separation of the metal from the lighter or waste material of each grade, and finally it avoids the discharge of metal by segregation or that action wherein particles of metal especially small particles are carried along by and discharged with large or bulky lighter material by adhesion thereto, as is the case when all of the ore or gangue is fed into the same strength or velocity of suction force as has heretofore been done.

My invention has for its further object to separate from the ore or gangue, and from the concentrated metal, any sand or other materials, whether containing metal, or devoid of metal, which are too heavy for discharge through the suction pipe and which therefore form an objectionable part of the concentrations when mixed with the pure free metal.

My invention has for its still further object to so vary or regulate the suction force of the discharge that economy is attained in the amount of power required for operating the discharge pump.

Another object of my invention is to provide an efficient, durable and economically operated washer or concentrator for working large bulks of ore or gangue thoroughly and rapidly.

My invention accordingly consists of the combinations, constructions and arrangements of parts as hereinafter more fully described in the specification and pointed out in the claims.

Reference is had to the accompanying drawings, wherein—

Figure 1, is a vertical section, partly in elevation, of a form of washer and concentrator embodying my improvements. Fig. 2 is a plan, partly sectional, of the perforated swinging or hinged bottom and part of its controlling mechanism, for the main chamber of the washer. Fig. 3 is an elevation, showing the connecting rod coupling connection with the reciprocating car located in the outlet chamber of the washer, drawn to an enlarged scale. Fig. 4 is a sectional elevation similar to Fig. 1 of another form of my improvements. Fig. 5 is a plan of washer shown in Fig. 1. Fig. 6 is a plan, partly sectional, of an oblong form of washer, and Fig. 7 is a section of the lower outlet end of washer with a separator attachment located and operating therein.

A represents the washer which as shown in Figs. 1 and 4 consists of an outer chamber B having a lower outlet chamber *b* with drain cock *b'*, and of an inner chamber C. This latter chamber as shown has laterally projecting lower and upper lugs *c* and *c'* respectively on opposite sides; or a number of them radially arranged may be used. The upper lugs *c c* pass through elongated openings *d d* in a flange *d'* which surrounds the upper part of chamber C exteriorly, and depends from a top plate D. The lugs *c c* have threaded openings for engagement with supporting and adjusting screws E E for chamber C; the upper ends of said screws being swiveled at *e* to plate D and their lower unthreaded ends *e'* sliding in openings in lugs *c' c'* which form guides for said screw ends. By adjusting the screws E E the chamber C may be raised or lowered

as desired for a purpose hereinafter described.

The plate D, supporting the chamber C, may be secured to the casing of chamber B as shown in Fig. 4, in which case the chamber is non-rotatable. If it is desired to rotate chamber C, said plate D has roller bearings d^2 d^2, see more plainly Fig. 1, mounted on the casing of chamber B as desired or shown and the top plate D is provided with a gear d^3 which meshes with a driving pinion d^4; or any other suitable power transmitting devices may be used.

The chamber C as shown is open at both ends, and it has perforations c^2 in its sides, and a reticulated or perforated hinged bottom c^3 which may have a crank or other suitable connection c^4 with a handle or actuating bar c^5 for dropping and raising said bottom from the outside of the machine whenever required. Said bar c^5 may pass up through chamber C as shown in Fig. 1 and have a locking bolt c^6 for holding the bottom in its raised position; or said bar may pass laterally through the casing of chamber B, as indicated in Fig. 4. Chamber C may have an overflow pipe c^7 if desired. See more plainly Fig. 4.

F represents the suction discharge pipe leading from chamber C to a pump f which may discharge onto a screen f' or otherwise as desired.

G and H are the feed supply pipes for different grades or fineness of ore or gangue; G being the feed pipe for the lightest and least bulky material and H for the heavier and bulkier material of the ore or gangue. The exit ends g and h of these pipes are arranged relatively to the inlet end f^2 of the suction pipe so that the lighter and less bulky grade of ore or gangue is fed into the chamber C at a greater distance away from the inlet end f^2 than are the heavier and bulkier materials, so that the former will be subject to less suction influence than the latter and more time is afforded for the metal of each grade to be completely separated or comminuted from the lighter or waste material thereof before the latter comes within the full influence of the suction force for discharging the same. Hence the metal contained in each grade has ample opportunity to separate from its individual grade and descend to the perforated bottom c^3 before the waste material thereof acquires its maximum discharging velocity. The heavier or more bulky grades being nearer to the suction force are correspondingly acted on for completely separating their contained metal from the waste material. This separation of the ore or gangue into different grades and feeding each grade separately into chamber C not only results in a complete primary separation of the different sizes of the metal in the ore or gangue from one another and a more thorough agitation of and individual separation of the metal by gravity in each grade from the waste products thereof before the latter acquire their maximum discharging velocity, but also reduces to a minimum the tendency of the finer particles of metal of any grade being carried by segregation with the waste materials of the same or another grade to the discharge tube.

The feed pipes G and H are so supported that they move vertically with chamber C when it is adjusted in order to vary the distance of the exit ends of feed-tubes G H to and from the inlet end of suction pipe F. The adjustment of chamber C and tubes G and H instead of the suction tube F as heretofore results in greater variation or regulation of suction force for the discharge without increasing the height of the column of water to be lifted by the pump. Hence less power is required for running the latter and the work it has to do is constant or never varies when an adjustment is made, which is done whenever the grade of the gravel, ore or gangue supplied to the machine varies.

The tubes G and H are supplied from hoppers g' and h' respectively which in turn are fed by a revolving, stationary or other suitably constructed screen L having meshes of different grades l and l' respectively and an outlet end l^2 for bowlders or other like useless bulky material.

If desired the screen L may be supplied from an initial shaking screen K which separates all the largest and useless material from the gangue or ore before it passes into the screen L.

The operation is obvious. The grades of ore or gangue fed into chamber C are first brought to a comparative state of rest by the inclined or arresting plates or ends g^3 and h^4 respectively, so as to drop or slide into the water in said chamber without undue force. Their particles are separated, allowing the free metal and its compounds too heavy for the suction force in pipe F to discharge, to drop to the screen or perforated bottom, the mesh of which may be fine enough to admit only of fine particles, like black-sand or other foreign substance, passing therethrough. If desired, such falling metal may be still further screened by a reciprocating screen or box of fine mesh n, having suitably mounted and operating mechanism n n', as shown in Fig. 1; or such mechanism may be otherwise provided for and actuated as desired. As the falling metal passes out of the drain cock b' when opened, it, with the accompanying flow of water, may be permitted to fall apon a reciprocating separator-table m, having a quick return motion which will separate the pure metal from the impure or other foreign substances as shown in Fig. 4. If desired such separator may be located in chamber b, as shown in Fig. 7, in which case the angle of the separator table is varied as it is reciprocated, it being of less or minimum inclination on its quick return and of a maximum inclination on its forward

slow motion; such variation in the incline of the table being provided to subserve the function of a flow of water upon such table when its inclination is constant. Any suitable means may be provided for varying such inclination, a form of which is shown in Fig. 7, consisting of a fixed incline m' for the roller m^2 on the rear end of the table to ride up and down on as it is reciprocated.

From the foregoing it will be noted that the ore or gangue is divided into different grades; that each grade is separately fed into the washer at a different distance from the inlet end of the suction pipe to expose the different grades to varying degrees of suction and afford each grade ample time for complete separation of all its particles and prevent the same coming into close contact with other particles of varying size to mechanically or by segregation carry with them any pure metal when discharged; that impure metal or foreign metal or other heavy substances are separated from the gangue and are not carried to the amalgamating chamber; that such impure metal or foreign substances are further separated from the pure metal, either before emerging from the machine, or after. If the former, suitable pockets or outlets are provided for the separated metals or substances as indicated at p, Fig. 7.

The washer may have an inlet water pipe or supply as shown at s, Fig. 4, to provide for an upward flow of water in chambers B and C to assist in agitation and separation of the ore or gangue fed to chamber C. If desired, however, such water supply may be fed to the washer with the ore or gangue, as shown in Fig. 1.

From the foregoing it is obvious that the constructions and arrangements of parts herein described may be variously changed without departing from the spirit of my invention.

What I claim is—

1. In an ore washer or concentrator, the combination of a receiving vessel, a number of feed devices for feeding ores of different grades into said vessel, and a suction discharge device, the field of force of which is differently located for the different grades of ore fed into said vessel, substantially as set forth.

2. In an ore washer or concentrator, the combination of a receiving vessel, different feed devices for feeding different grades of ores into said vessel, and a suction discharge device located at varying distances from said feed devices, substantially as set forth.

3. The combination in a washer or concentrator, of a feed, a discharge device for the waste-matters, a chamber for the concentrations, and a separator below said chamber, and mechanism for actuating said separator for separating the collective concentrations into different grades, substantially as set forth.

4. In an ore washer and concentrating device, the method of separating from the pure metal the impure metal or other heavy substances desired to be saved, which consists in successively and continuously feeding all the ore or gangue into the washer, then separating all the pure and impure metals and said heavy substances from the ore or gangue, and discharging the waste-matters, and then separating the concentrations into their different desired grades, substantially as set forth.

5. In an ore washer and concentrator, the combination of a lengthwise adjustable ore or gangue receiving and discharging chamber, a suction discharge tube and adjustable feed tubes depending into said chamber, substantially as set forth.

6. The combination of a screen supply having different meshes, separate feed tube for each such grade, a suction discharge tube, and means for varying the distance of the outlet ends of said feed tubes to and from the inlet end of the suction pipe, substantially as set forth.

7. In an ore washer and concentrator, the combination of a lengthwise adjustable ore or gangue receiving and discharging chamber, means for rotating said chamber, a suction discharge and adjustable feed-tubes depending into said chamber, substantially as set forth.

8. In an ore washer and concentrator the combination of a chamber, a series of feed pipes, a discharge appliance, and the outlet ends of said feed pipes having a varying location distantly from the inlet end of said discharge appliance, substantially as set forth.

9. The combination with an ore washer and concentrator, of a chamber C* having a perforated bottom, means for opening and closing said bottom, a reciprocating screen below said bottom and actuating devices for said screen, substantially as set forth.

10. The combination with an ore-washer and concentrator, of a receiving chamber for the ore or gangue having an outlet chamber for the concentrations, a separator in said outlet chamber for the concentrator, consisting of reciprocating inclined table with a quick return motion and which alters its inclination as it reciprocates, and actuating mechanism for said table, substantially as set forth.

11. In an ore washer or concentrator, the combination of a receiving vessel, a suction discharge device, a number of feed devices for simultaneously feeding different grades of ore into said vessel, the outlet ends of said feed devices located at different distances from the inlet end of said discharge device, and a water supply for said vessel, substantially as set forth.

12. In an ore washer or concentrator, the combination of a receiving vessel, a feed-device for simultaneously feeding separate dif-

ferent grades of ore into said vessel, and a discharge device varyingly located relatively to the feed of the different grades of ore, substantially as set forth.

13. In an ore washer or concentrator, the combination of a feed device for feeding different grades of ore into the vessel, and a discharge device for removing the waste matters of all the different grades fed into said vessel, substantially as set forth.

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

CHARLES F. PIKE.

Witnesses:
THOS. S. RODGERS,
JAMES T. DAILY.