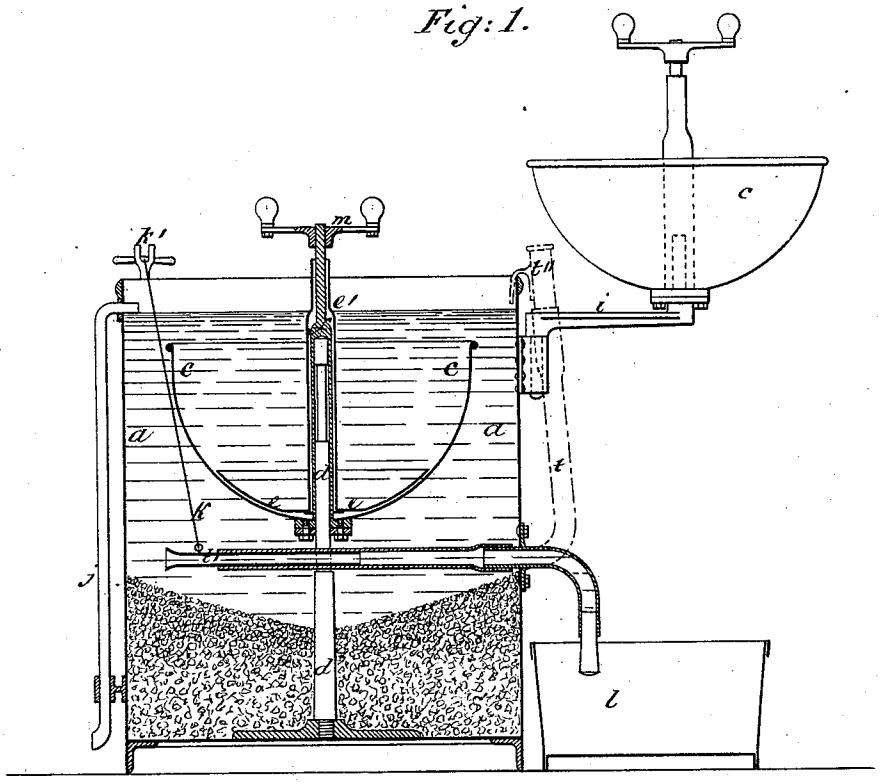
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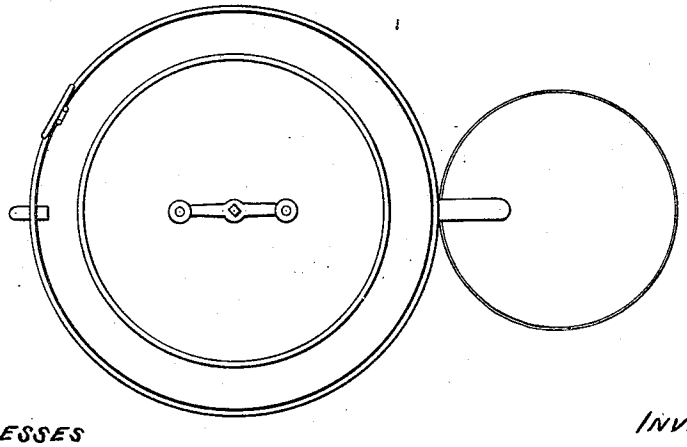
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Ore-Washer.

No. 217,722. **Patented July 22, 1879.**

Fig: 1.





WITNESSES

Wm A Skinkle

Geo W Breck

INVENTOR:

Ernest Bazin

By his Attorneys

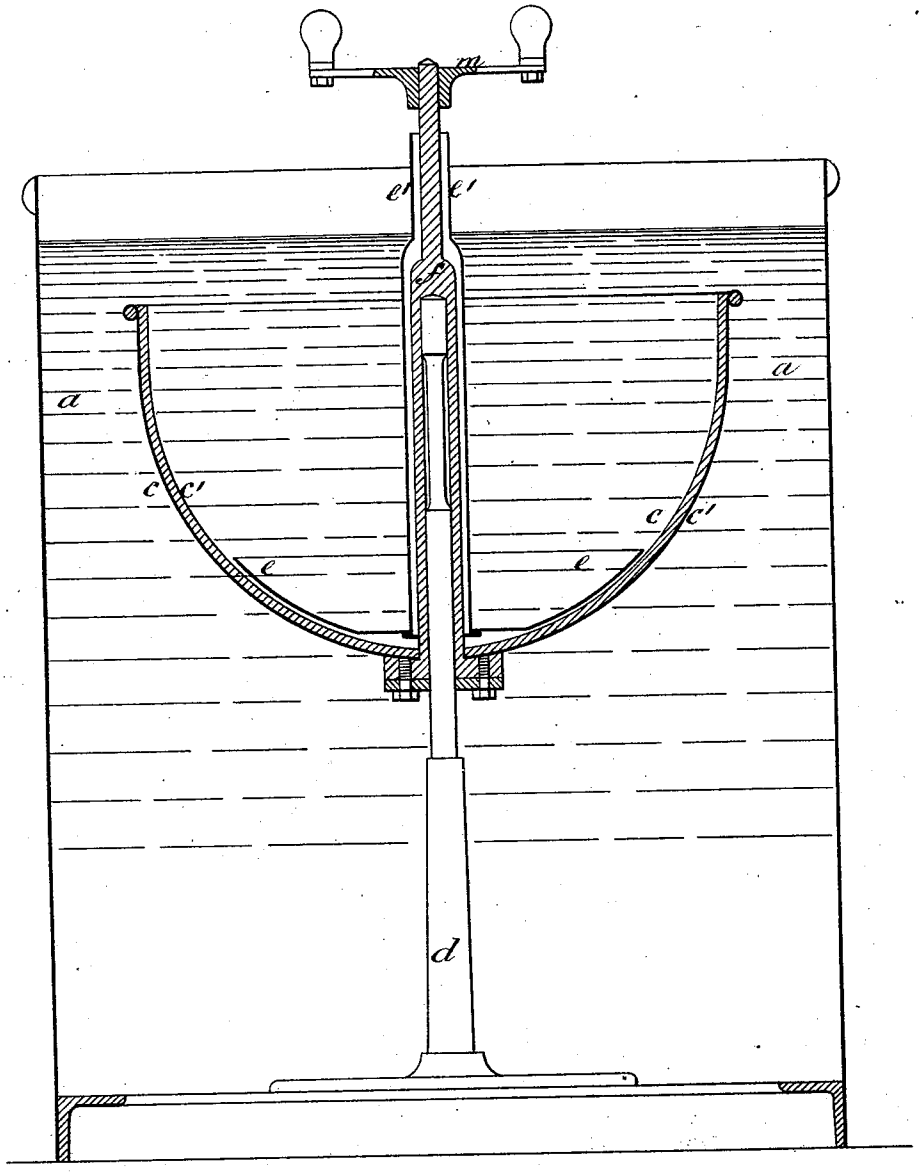
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Fig. 2.



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Fig: 3.

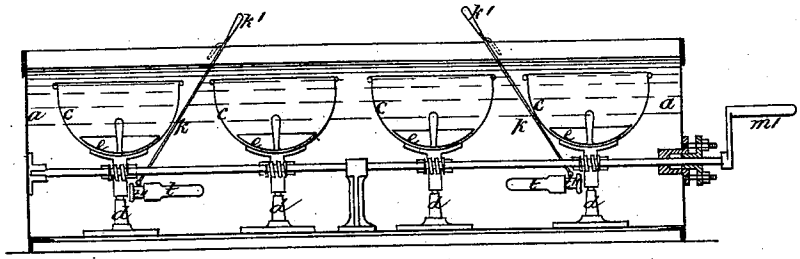


Fig: 3a.

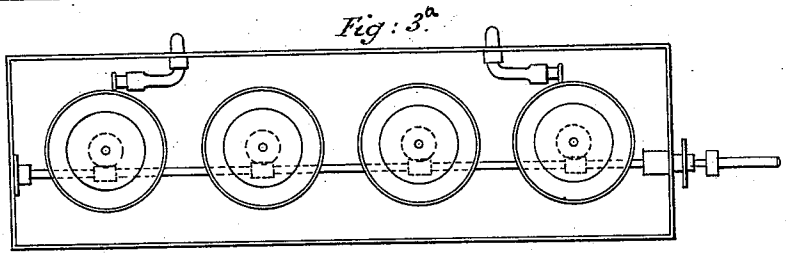


Fig: 11.

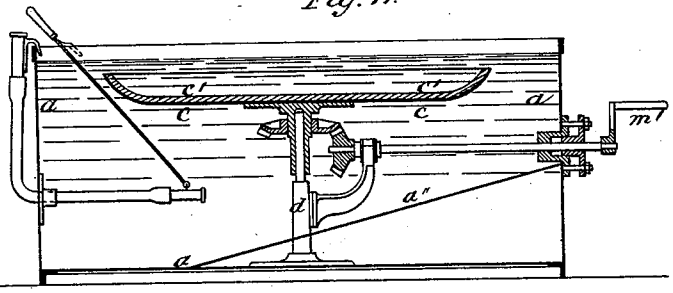
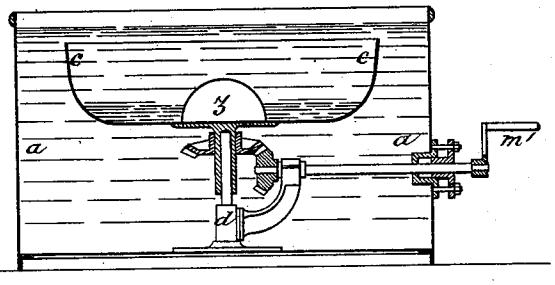


Fig: 12.



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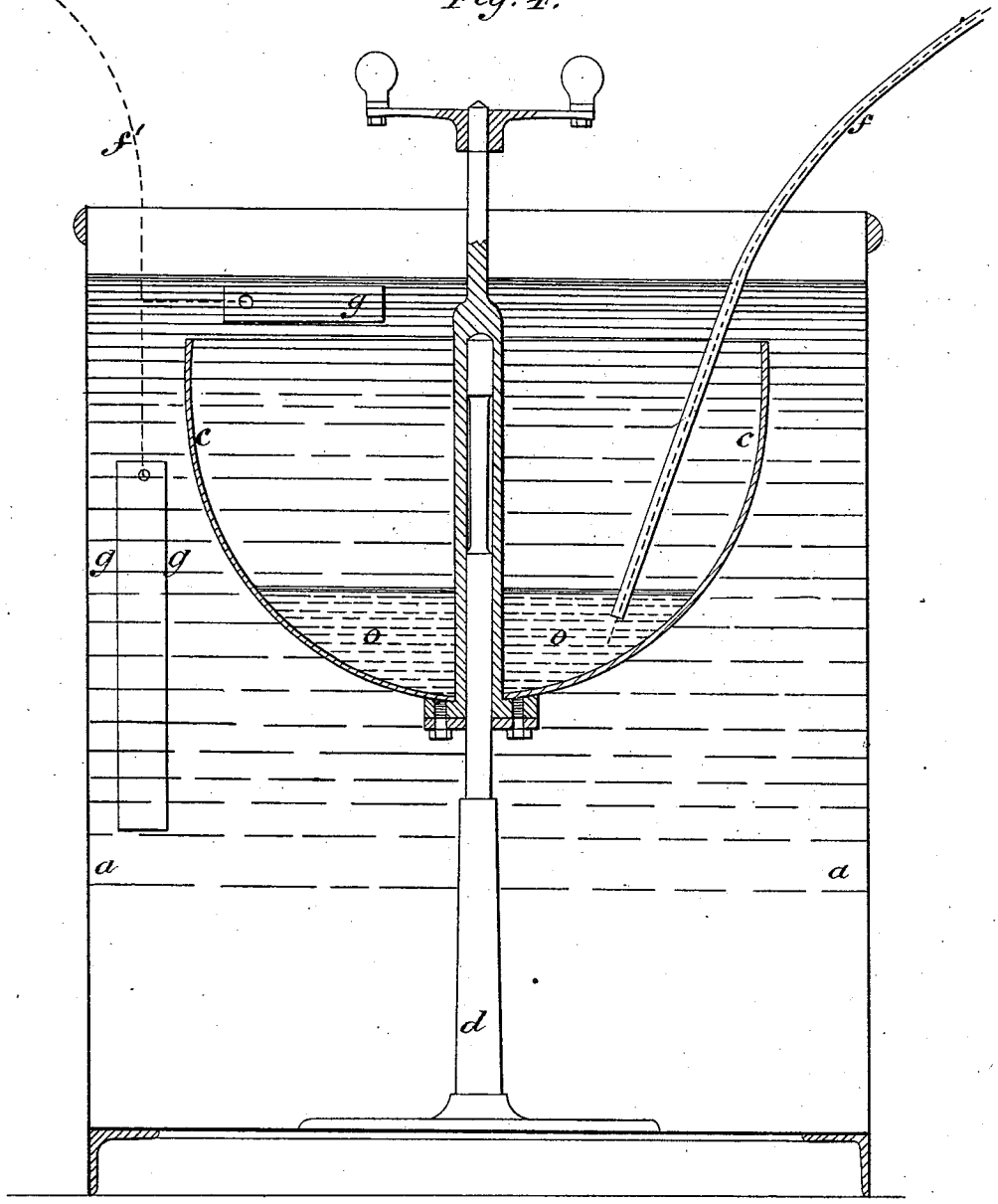
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Fig: 4.



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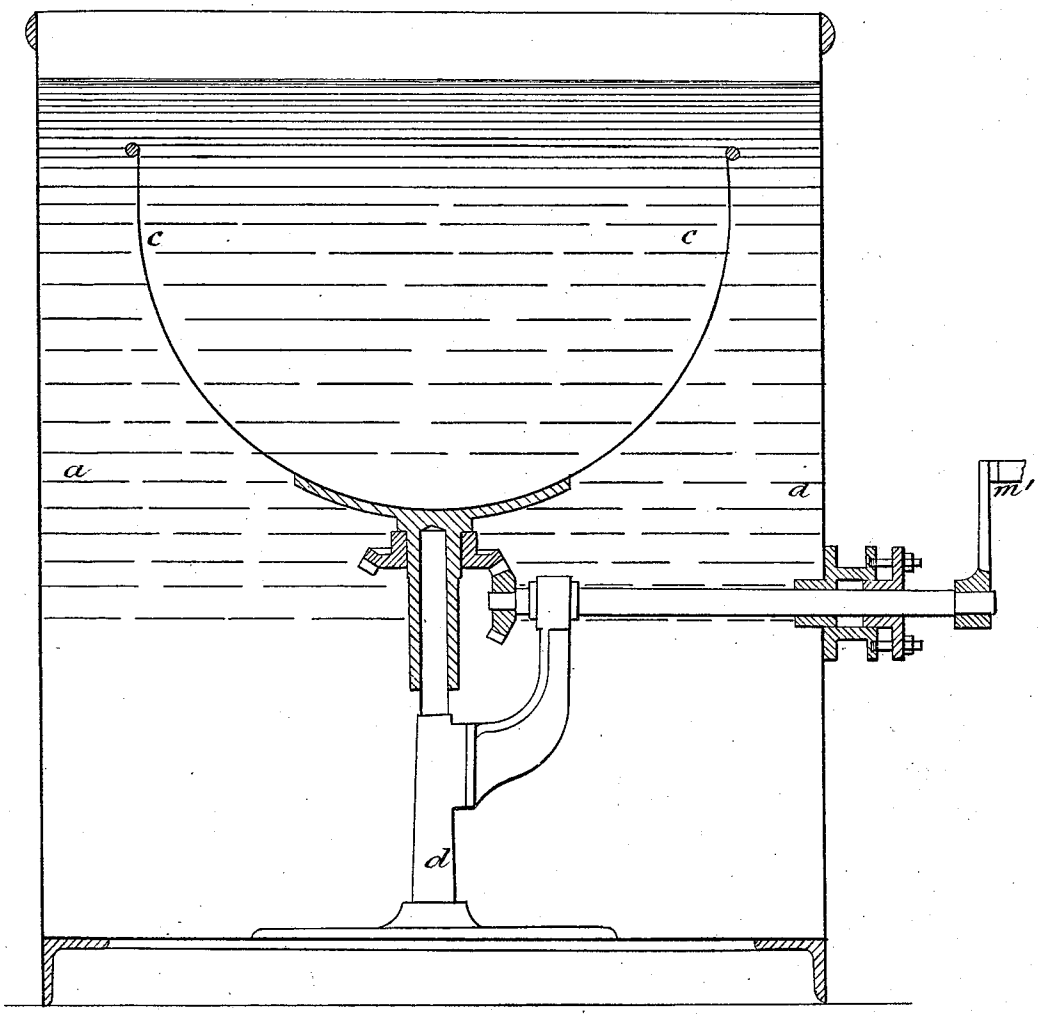
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Fig: 5.



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Fig: 6.

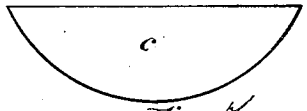


Fig: 7.

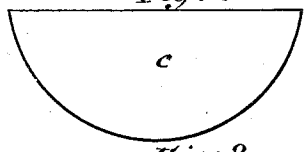


Fig: 8.

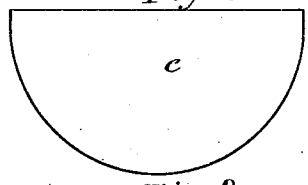


Fig: 9.

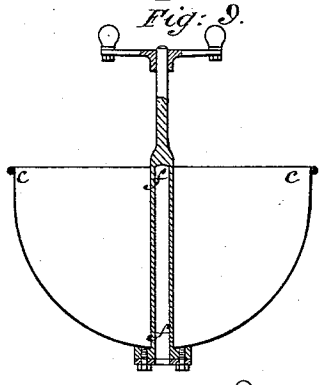


Fig: 10.

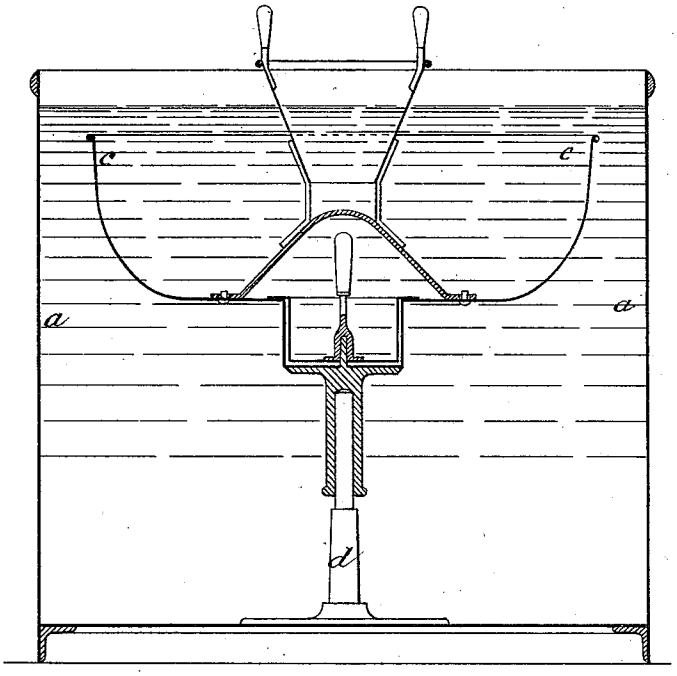


Fig: 13.

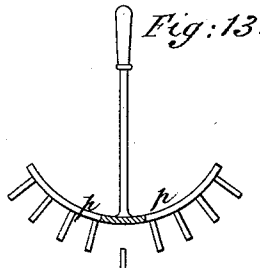


Fig: 14.

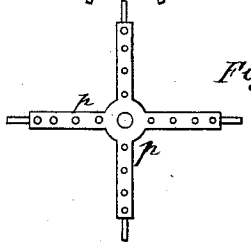


Fig: 16.

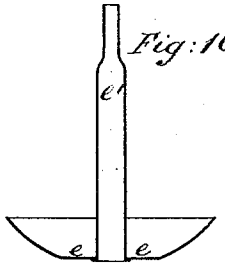
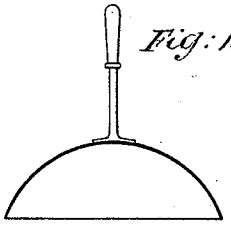


Fig: 15.



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UNITED STATES PATENT OFFICE.

ERNEST BAZIN, OF PARIS, FRANCE.

IMPROVEMENT IN ORE-WASHERS.

Specification forming part of Letters Patent No. **217,722**, dated July 22, 1879; application filed May 7, 1878; patented in England, April 16, 1877.

To all whom it may concern:

Be it known that I, ERNEST BAZIN, of Paris, in the Republic of France, civil engineer, have invented new and useful Improvements in Apparatus for Washing Auriferous and Argentiferous Sand and other matters separable by the operation of washing, which improvements are fully set forth in the following specification, reference being had to the accompanying drawings.

This invention in some essential features is similar to that for which British Letters Patent were granted me April 16, 1877, No. 1,488, and has for its object improvements in apparatus for the separation of matters of different densities under water or liquid by means of centrifugal force with the aid of a rotating pan, which is more or less hollow, and of which the curvatures, more or less marked, offer a certain resistance to the expulsion of the matters projected from the center to the circumference of the said pan by the propelling action due to the centrifugal force. In a word, this invention relates to improvements in apparatus of the class involving the employment of centrifugal force under water or liquid to obtain the separation of matters of different densities.

The subject-matter deemed novel is hereinafter fully described, and then specifically designated by the claims; and consists, essentially, first, in the combination of a washing-pan adapted to be supported and rotated about a vertical axis under water, and a centrally-supported gatherer occupying the center of the pan inside and at its bottom, and removable therefrom, so that the washed material which is collected in the gatherer may be lifted out of the pan; second, a peculiar gatherer having a sheath or sleeve bearing for centrally mounting it on its support in a washing-pan; third, the combination of a tank having a support or standard projecting upward from its bottom, a washing-pan supported by said standard and rotating about it beneath the surface of the liquid contents of the tank when in operation, and a removable gatherer supported within the washing-pan for collecting and removing the washed material; fourth, a peculiar washing-pan having a central supporting socket or sleeve bearing and a handle for rotating it; fifth, the combination of a tank, a support or upright therein, a washing-pan revolving about said support and above the bottom of the tank, an adjustable flexible pipe for removing the sands, and an incline for conducting the sands to the pipe.

The centrifugal hydraulic washer is composed, as will be seen on reference to Figure 1 of the annexed drawings, of a tank, *a*, made of sheet-iron, filled with water, and furnished in the center with an upright support or standard, *d*, intended to carry the washing-pan *c*, which should be caused to rotate around this axis at the velocity necessary for the expulsion of the sterile matters.

In the center of the washing-pan there is solidly fixed to it a socket, (see Fig. 9,) which, resting upon the standard *d*, allows the desired rotary motion to be imparted by the aid of the handles *m* placed on its upper end. A gatherer, *e*, furnished with a sheath, *e'*, (see Fig. 16,) covering the socket, occupies the center of the pan. It is intended to collect the residues of the washing operation, so that they may be removed without its being necessary to take the pan itself out of the water.

One or more brackets, *i*, supported in sockets riveted to the side of the tank *a*, support other washing-pans, forming a series suitable for treating different descriptions of materials. A small pipe, *j*, serves as an overflow for the water from the tank and allows the overflowing water to be collected.

By the aid of an india-rubber tube, *t*, traversing the interior of the tank and furnished at its extremities with metal ends *t' t''*, and of a rod, *k*, with a handle, *k'*, for directing the end *t'* of the interior suction-tube, *t*, the sands deposited at the bottom of the tank are emptied into the cistern *l* by the action of the hydraulic pressure, it being understood that the outer end, *t''*, of the pipe is dropped into the cistern *l*, and consequently to a much lower level than that of the water contained in the tank *a*. At the end of the operation the outer end, *t''*, of the tube is hooked up to the side of the tank—an arrangement which avoids the employment of a stopper or cock.

In some cases a small rake, *r*, (see Figs. 13 and 14,) will be useful to triturate, work up, and separate earths which are somewhat compact.

A small spherical cap pierced in the upper part with capillary air-holes and furnished with a handle (see Fig. 15) will be useful when the matters to be washed are pulverulent—that is to say, impalpable. It serves as a cover and prevents the matters rising too rapidly from the bottom of the washing-pan.

The washing-pans are generally of the form of spherical cups. (See Figs. 1, 2, 3, 4, 5, 6, 7, 8, and 9.) When at work they stand upon their pivots, and are submerged to the extent of five or six centimeters.

Figs. 6, 7, and 8 represent three washing-pans of equal diameters, but of different depths, so that they will offer different resistances to the escape of the matter proportioned to their curvatures. The pans 6, 7, and 8 are 0.45 of a meter in diameter. The pan 6 has a depth of 0.15, and is intended for washing coarse sand. The pan 7 is 0.20 in depth, and is intended for washing sand of medium size, and the pan 8 is 0.25 in depth, and is intended for fine sand or earth, or for finely-crushed quartz. This last form of pan represents a hemisphere with the addition of a cylindrical rim two centimeters and a half deep.

It is evident that the diameter and the form and the material of the washing-pan may be varied, and they may be of large dimensions where large quantities of material have to be dealt with; but the principle of the system remains without modification.

Figs. 10, 11, and 12 represent three different types of centrifugal hydraulic washers.

Figs. 3, 5, 11, and 12 represent a washer driven by means of a horizontal axis provided with a crank-handle, *m'*.

Fig. 5 represents a washer with a hemispherical pan and without a gatherer.

Fig. 1 represents a washer having a pan of red copper.

Figs. 2 and 11 represent the washing-pan of different form and dimensions, and covered on the interior with india-rubber to increase the sliding friction of the matters it is desired to collect. The tank in Fig. 11 is furnished with an inclined plane to facilitate the removal of the sands.

Fig. 3 represents a series of four washing-pans made of red copper and hemispherical. They are contained in a rectangular tank, and are driven from a horizontal axis by the aid of endless screws and gearing. The washing-pans are furnished with gatherers having sockets fitting onto studs fixed in the bottoms of the pans. Fig. 3ª shows a plan of the arrangement.

Fig. 10 represents a pan of somewhat large capacity, in the center of which there is formed a hollow to accommodate the gatherer. A cone surmounted by a funnel, through which falls the material to be washed, covers the gatherer, and is sustained in its place in the center of the pan by four legs riveted to its bottom.

Fig. 12 represents a washing-pan made of iron, and which, at its center, carries a convexity, *z*, also of iron, and intended to keep the material off from the center (where the centrifugal velocity is but small) and throw it toward the circumference of the pan. A bath of mercury rests upon the bottom of the pan to amalgamate the dust or flakes of gold in their passage from the center to the circumference.

Fig. 4 represents a special arrangement of the centrifugal hydraulic washer. This washer is intended for the treatment of argentiferous sulphurous quartz. The tank, in place of containing ordinary water, contains salt-water slightly acidulated. The pan is of iron, and at its bottom a certain quantity of mercury is placed at *o*. An insulated electric wire, *f*, terminates in the mass of mercury, and another wire, not insulated, *f'*, but connected with the opposite pole, and furnished with two plates of red copper, *g*, is plunged into the salt and acidulated water, as the drawing shows. In consequence of the electric current in this salt and acidulated medium decomposition of the mineral results, and consequently separation of the gangue of magnetic oxide of iron, of sulphur, and of silver. The sterile matters will be thrown out of the pan by the action of the washer, and the silver will amalgamate itself with the mercury or will be deposited upon the copper plates.

Operation of the apparatus: When the operator deposits upon the bottom of the submerged pan auriferous sand of a density of 2, the sand immediately, from its position, loses fifty per cent. of its weight in consequence of the volume of water which it displaces, while the gold, which weighs 19.8, only loses one-nineteenth. The operator then has to deal with matters requiring to be separated, of which one, the sterile matter to be expelled, weighs 1, while that which is rich and has to be preserved weighs 18. The material is generally placed in the pan at the outset in an irregular manner; if so, it is evenly distributed by giving three or four small alternate movements with the handle of a quarter-circle in either direction. This precaution having been taken, the apparatus is set to work, and a rotary motion, which should be gradually accelerated, is given to the pan. A few revolutions of the pan are sufficient to effect the division and classification of the matters which are carried round with the pan and encounter a resistance from the mass of relatively inert water. At this time the centrifugal force operates and projects the matters from the center to the circumference of the pan. The liquid mass, which has already determined the division and the classification of the matters, becomes, in some sort, a regulator or regulating agent of the centrifugal propulsion, and moderates its energy by tempering or proportioning the expelling power. The sands, which now weigh 1, traverse through the midst of the liquid, mount the side of the pan, and, as they experience the rotary and centrifugal action, they escape tangentially by reason of the resultant

of the two forces combined, and fall into the tank. As to the gold, which now weighs 18, the rotary action having less effect upon it, it is thrown by the centrifugal force along the side of the pan, and mounts up until it is in equilibrium, and without any special attention on the part of the operator it ascends the curved wall of the pan, always according to its volume and its density, and proportionally to the action of the centrifugal propulsion—that is to say, it will ascend until its volume and its density have become proportional and are in equilibrium with the curvature of the pan and the force of centrifugal projection.

When the operator finds that the water, at first inert, is now carried in a continuous current by the action of the rotary motion of the pan, he should reverse the motion. This operation, renewed from time to time, causes a sudden fall of the suspended matters to the bottom of the pan, classifies them again, and facilitates the division under water of the rich and the sterile matters.

When the operator judges that the washing is terminated—that is to say, when he thinks that he has sufficiently condensed or concentrated the matter remaining in the pan—he stops the rotary motion, the matters then fall onto the bottom of the gatherer, and the operator, having removed the handle, can easily lift the gatherer containing the residue of washing out of the water. Generally this residue, with sand of a uniform nature, is about one-half per cent. of the matter originally put in.

The ordinary charge of a pan of 0.45 meter in diameter is eight liters. The removal of the gatherer takes place every quarter of an hour, and at the same time the sand accumulated at the bottom of the tank is removed. The operation of emptying is of extreme simplicity. It is only required to unhook the outer end of the emptying-pipe, placing it upon the ground, or into a cistern if it be desired to retain the water, and to direct the inner end of the tube to the sand by means of a rod attached to it. The hydraulic pressure then sets up an energetic current, which carries off the sand with it.

A washer with a pan of 0.45 meter should work over about six tons of auriferous sand in ten hours of effective work. It will return in practical working about ninety-nine per cent.—that is to say, the loss of gold may be reckoned at about one per cent.

Washers of large dimensions can be worked by a steam-engine or any other motor more powerful than the hand of man.

It is also understood that the washing process may be operated in any tanks, receptacles, or even in any piece of water.

I employ in some cases simple flat circular plates, offering, as resistance to the expulsion of the heavy matters, it may be, grooves more or less hollow and of various forms, or else a simple bed of fabric or of india-rubber grooved circularly.

Having thus described the nature of my said invention and the manner of performing the same, I would have it understood that I claim—

1. The combination, with the washing-pan, of the removable centrally-supported gatherer therein, occupying the center of the pan at its bottom, by means of which gatherer the washed material is collected and retained and may be lifted out of the pan, substantially as hereinbefore set forth.

2. The gatherer *e*, having the sheath *e'*, substantially as and for the purpose hereinbefore set forth.

3. The combination of the tank, the support or standard, the washing-pan rotating about said standard, and the removable gatherer within the washing-pan, substantially as and for the purpose hereinbefore set forth.

4. The washing-pan *c*, having the central socket and the handles *m*, substantially as and for the purpose hereinbefore set forth.

5. The combination of the tank, the support *d*, the washing-pan revolving about said support and above the bottom of the tank, the adjustable flexible pipe for removing the sands, and the incline for conducting the sands to the pipe, these members being and operating substantially as hereinbefore set forth.

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Witnesses:
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