(No Model.) 2 Sheets—Sheet 1.

F. STAHL & J. S. REW.

APPARATUS FOR GRINDING AND AMALGAMATING ORES.

No. 457,541. Patented Aug. 11, 1891.

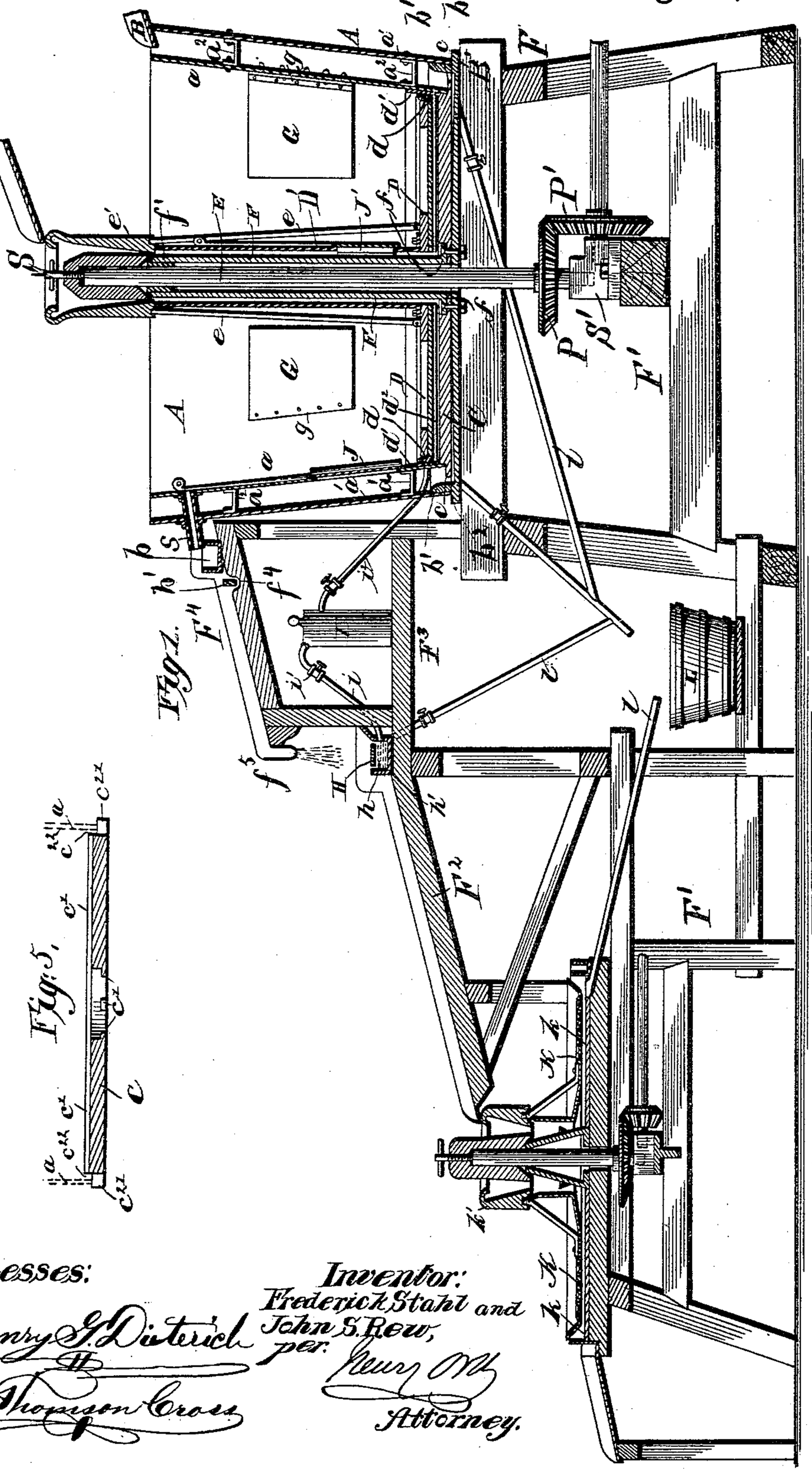

Fig. 1.

Fig. 5.

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(No Model.) 2 Sheets—Sheet 2.

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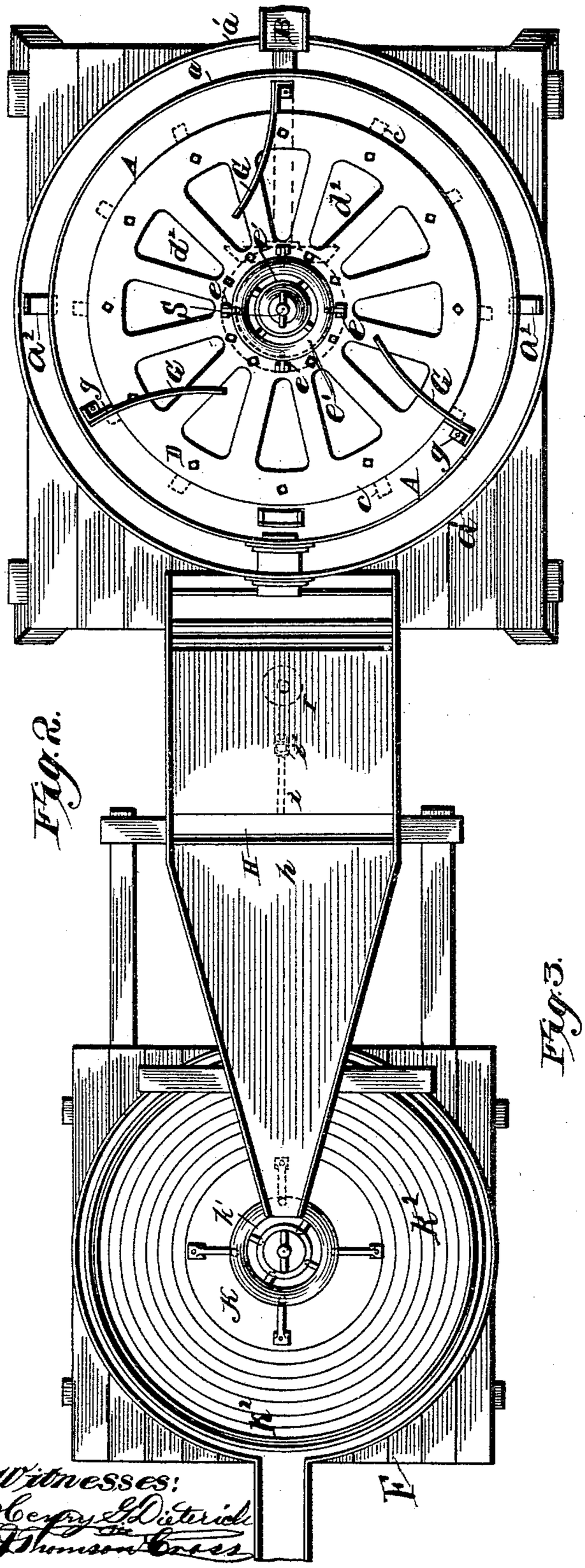

Fig. 2.

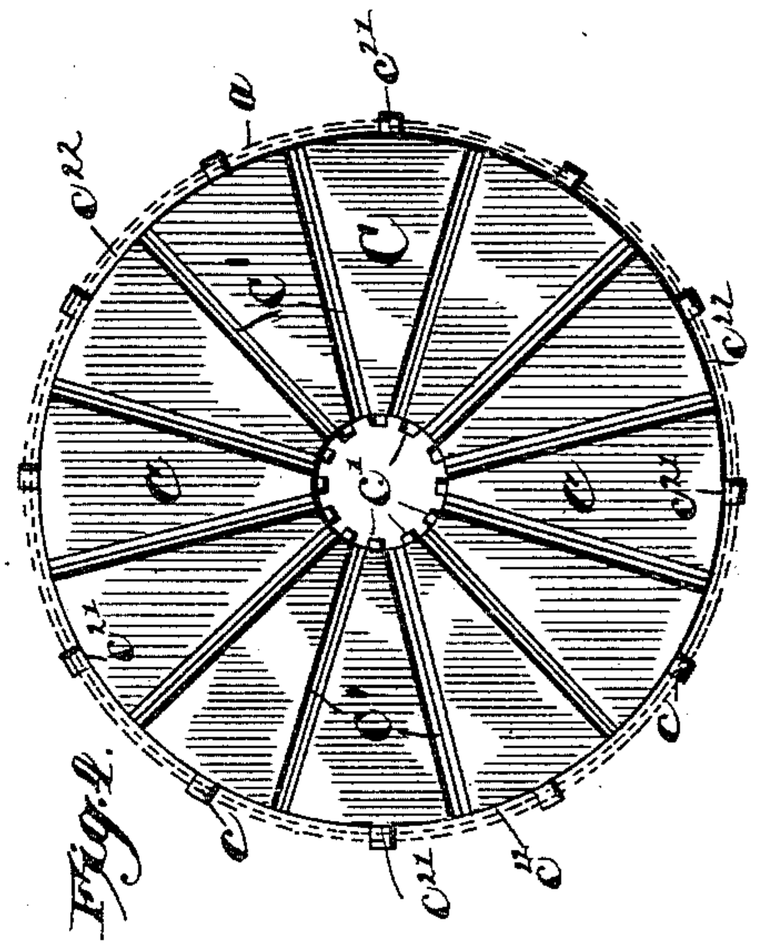

Fig. 4.

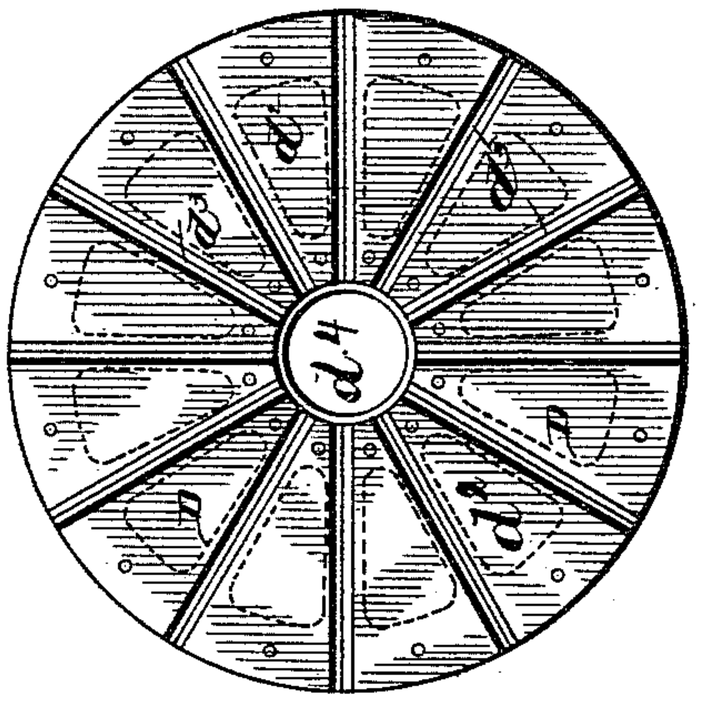

Fig. 3.

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UNITED STATES PATENT OFFICE.

FREDERICK STAHL AND JOHN SPRING REW, OF ST. ARNAUD, VICTORIA.

APPARATUS FOR GRINDING AND AMALGAMATING ORES.

SPECIFICATION forming part of Letters Patent No. 457,541, dated August 11, 1891.

Application filed March 27, 1890. Serial No. 345,545. (No model.)

To all whom it may concern:

Be it known that we, FREDERICK STAHL and JOHN SPRING REW, mining managers, both subjects of the Queen of Great Britain, residing at St. Arnaud, in the British colony of Victoria, have invented new and useful Improvements in Apparatus for Grinding and Amalgamating Auriferous and Argentiferous Material, of which the following is a specification.

This invention has been devised for the purpose of providing simple and more effective means for treating auriferous or argentiferous ores, whether as slime tailings or gangue, and whether passing directly from the battery or from a puddling-machine or from a settling-pit or from a heap of tailings; and its special object is to provide means for recovering the fine gold, which is to a large extent lost at present by being carried away in the waste water and sludge.

In order to provide an apparatus which will be readily transportable, we construct the whole apparatus in sections not exceeding, say, two hundred-weight each, thus providing facilities for reaching districts at a distance from a railway or other traffic route.

The invention consists in the construction of the apparatus, in the combination of cooperative parts or elements whereby the purposes or objects for which it has been devised are attained, and in the means employed for preventing the "sickening" of the mercury and for preventing the mercury from being driven out of the auxiliary amalgamating-vessel, as will now be fully described, reference being had to the accompanying drawings, in which—

Figure 1 is a central longitudinal section, and Fig. 2 is a plan of a complete apparatus for grinding and amalgamating auriferous and argentiferous material, said apparatus being constructed and arranged according to our invention, while Fig. 3 is a plan of the under side of the grinding and amalgamating muller, and Fig. 4 is a plan view illustrating the construction of the false bottom of our improved combined grinding and amalgamating apparatus. Fig. 5 is a section on line xx of Fig. 4, showing a portion of the inner pan in dotted lines.

Similar letters of reference indicate the same parts throughout the drawings.

In the above-mentioned drawings, F′ indicates a suitable framing of appropriate construction for the support of the several elements of the apparatus, and A is the main amalgamating-pan. This pan is constructed of two concentric sections a and a', secured together by U-shaped brackets a^2, so as to form an exterior annular space between the two sections.

B′ is the pan-bottom, that has a vertical annular flange b' concentric with and some distance inside of its periphery, forming a seat b^2 and bearing for the outer pan-section a'. The inner pan-section a has an opening adapted to be closed by a valve or gate J, said opening being some distance above the lower edge of said inner pan-section.

C is a false bottom, which, like bottom B′, has seats and bearings for the inner pan-section a, whereby the pan-sections are detachably connected with the bottom B′ and false bottom C, respectively. The seat and bearings for the inner pan-section are formed by radial lugs or projections c, formed on and projecting from the periphery of the false bottom C, which is constructed in sections having rabbeted meeting edges to form radial channels or passages c^2 in its upper face for the passage of the material, the segmental sections being so constructed as to form a central circular opening when assembled, into which project lugs c', formed on the inner ends of the sections, that serve as bearings, to which and the bottom B′ is bolted the foot-flange f of a hollow standard F, in whose upper end a vertical spindle or shaft E has one of its bearings, said shaft or spindle having bearing also in the framing F′ and in a step S′, in which latter one end of a horizontal shaft S^2 has bearing also, the shafts carrying a bevel-pinion, as P and P′, respectively, the shaft P being driven from any suitable prime motor.

As more clearly shown in Fig. 4, the lugs c, that form a bearing for the pan-section a, are of the same thickness as the false bottom C for some distance beyond the periphery of the latter, while the outer portion of the said lugs is thinner, forming shoulders c^{21}, that hold the lower edge of the pan-section some distance away from the periphery of the false bottom C. In this manner segmental pas-

sages c^{22}, Fig. 4, are provided for the passage of the pulp from the annular space between the pan-sections to the grinding device. The inner pan-section is further provided with a liner or packing-ring d' near its lower edge.

On the vertical spindle E is keyed an annular feed-hopper e', that is adjustable vertically by means of the screw S, having bearing on the upper end of the spindle and working in a screw-threaded axial bearing e^2 of the feed-hopper. The axial bearing e^2 of the feed-hopper has in its under side a conical recess, and is seated on the upper end of the hollow standard F or the bearing or stuffing-box sleeve f' therein and through which the spindle E passes, so as to form a tight joint and prevent pulp or water from passing to the inside of the said standard.

A grinding disk or muller D is suspended from the feed-hopper e' by means of hanger-rods e, and said muller has a peripheral packing-ring d, that co-operates with the like packing-ring d' of the inner pan-section to form a tight joint for purposes presently to be explained. The muller D consists of a disk, to the under side of which are secured segmental shoes d^2, so as to form between them radial channels that extend from the periphery to the central opening d^4, as more plainly shown in Fig. 3, around which opening is bolted a tubular hub or sleeve D', whose upper end has bearing on the under side of the central feed-hopper e', thus forming an annular feed-passage between said hub or sleeve and the standard F for feeding the material to the central opening of the muller and thence through the radial channels d^3 between the muller and false bottom C. In the sleeve D' is formed an opening adapted to be closed by a gate or valve J', for purposes presently to be explained.

G G are wing-plates projecting from the inner pan-section a, that serve to prevent any whirling or centrifugal motion of the material, said wings being preferably made of electro-copper plates secured by angle-pieces g to said inner pan-section.

Near its upper end the amalgamating-pan is provided with an overflow-spout s, that discharges into a box b, placed in a chute F^4, in which is formed a transverse well f^4, into which dips a baffle-board b', the box b and baffle-board b' serving to avoid splashing and to retard the flow of the material discharged from the pan. At the discharge end of the chute F^4 is a perforated spout f^5, that discharges the material into a receiver containing mercury, as at h, upon which floats a copper plate H. Our object in employing this floating copper plate, instead of allowing the material to fall directly into the mercury, is to prevent the latter from being driven out of the well by the falling material, and in order to prevent such mercury from sickening we provide a receptacle or bottle I, conveniently arranged on a shelf F^3 below chute F^4. This bottle or flask contains a mixture of one or more ounces of scrap zinc, six ounces of pure hydrochloric acid, and half an ounce of ammonium chloride, and we convey the gas resulting from such mixture through a flexible or other pipe i to beneath the surface of the mercury h, the said pipe being provided with a small stop-cock i', whereby the flow of gas may be regulated as may be found desirable. If desired, another pipe i^2 may be provided for conveying such gas to beneath the surface of the mercury in the pan A, as clearly illustrated in Fig. 1. After the material under treatment has been passed through the mercury h, on which, as hereinbefore mentioned, the copper plate H floats, it is led by a chute F^2 to an amalgamator whose essential feature consists of a disk K of metal, having concentric corrugations k^2, Fig. 2, and revolving upon the surface of a bed of mercury k, Fig. 1, between which and said disk the material is forced to pass from the center feed-hopper k' on said disk to the periphery thereof. The corrugations in this disk serve to retard the travel of the material toward the periphery thereof, and moreover tend to force such material below the surface of the mercury, rolling it over and over in its travel, and thereby effectually insuring that every particle of material will be brought into intimate connection with the mercury. Pipes $l\,l$ lead from the different mercury-wells to a tub or other suitable receptacle L, in order that the mercury may be readily drawn off when it is desired to "clean up" the apparatus.

From the description of the construction of the amalgamator A it will be seen that we provide both an outside and a central feed, and when either is used the material previously reduced to a suitable degree of fineness and mixed with water will pass between the false bottom C and muller D and through the mercury in the lower portion of the pan before it can reach the overflow.

If the material is fed, as, for instance, from feed-chute B to the exterior feed-duct, the gate J is closed while the gate J' is opened, the material passing from the exterior feed-duct through passage c^{22}, between the lower edge of the inner pan-section and the periphery of the false bottom C, thence through the radial channels c' d^3 in the proximate faces of the false bottom and muller, respectively, to the central opening in said muller, and thence upwardly through the annular passage formed between sleeve D' and standard F and out of opening in said sleeve. When, on the contrary, the material is fed to hopper e', the gate J' is closed and the gate J opened, the material flowing in an opposite direction to that above described and into the exterior annular feed-space, and thence into the pan. In either case all of the material is brought into intimate contact with the mercury, as it is obvious that when the muller is revolved the material between it and the false bottom is carried along, and, if necessary, further ground or rubbed up, and the

particles are rolled over and over in the mercury, thereby insuring the amalgamation of the greater portion of the precious metal. Such precious metal as is not amalgamated will be recovered in the auxiliary amalgamator *h'* K, so that ores poor in precious metal or tailings or sludge may be profitably worked.

Having thus described our invention, what we claim is—

1. In an amalgamator, the combination of an amalgamating-pan provided with an exterior annular feed-duct in communication with the pan near the bottom thereof, a muller revoluble in the pan and provided with an axial annular passage opening into the pan above the muller, and a packing between the muller and pan, whereby the material fed thereto is caused to pass under the muller, and thence through the axial passage into the pan, for the purpose set forth.

2. In an amalgamator, the combination of an amalgating-pan provided with an axial tubular and an exterior annular feed-duct, both provided with valved discharge-ports opening into the pan and both in perpetual communication with said pan near the bottom thereof, a muller provided with an axial passage leading to the axial feed-duct and adapted to revolve in the pan below the valved discharge-ports in the feed-ducts, and a packing between the muller and pan, for the purpose set forth.

3. In an amalgamator, the combination, with a primary amalgamator, of a secondary amalgamator, which latter consists of an amalgamating-pan for containing mercury and a disk provided with concentric corrugations and adapted to revolve in contact with the mercury in the pan, conduits leading from the primary to the secondary amalgamator, a feeding device adapted to feed the material centrally of the disk to the under side thereof, and an amalgamator interposed in the conduits and consisting of a pan containing mercury and a copper plate floating thereon, for the purpose set forth.

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