

No. 668,842.

Patented Feb. 26, 1901.

A. M. ROUSE.

APPARATUS FOR ELECTROLYTICALLY EXTRACTING AND DEPOSITING GOLD AND SILVER FROM THEIR ORES.

(No Model.)

(Application filed May 28, 1900.)

2 Sheets—Sheet 1

Fig. I.

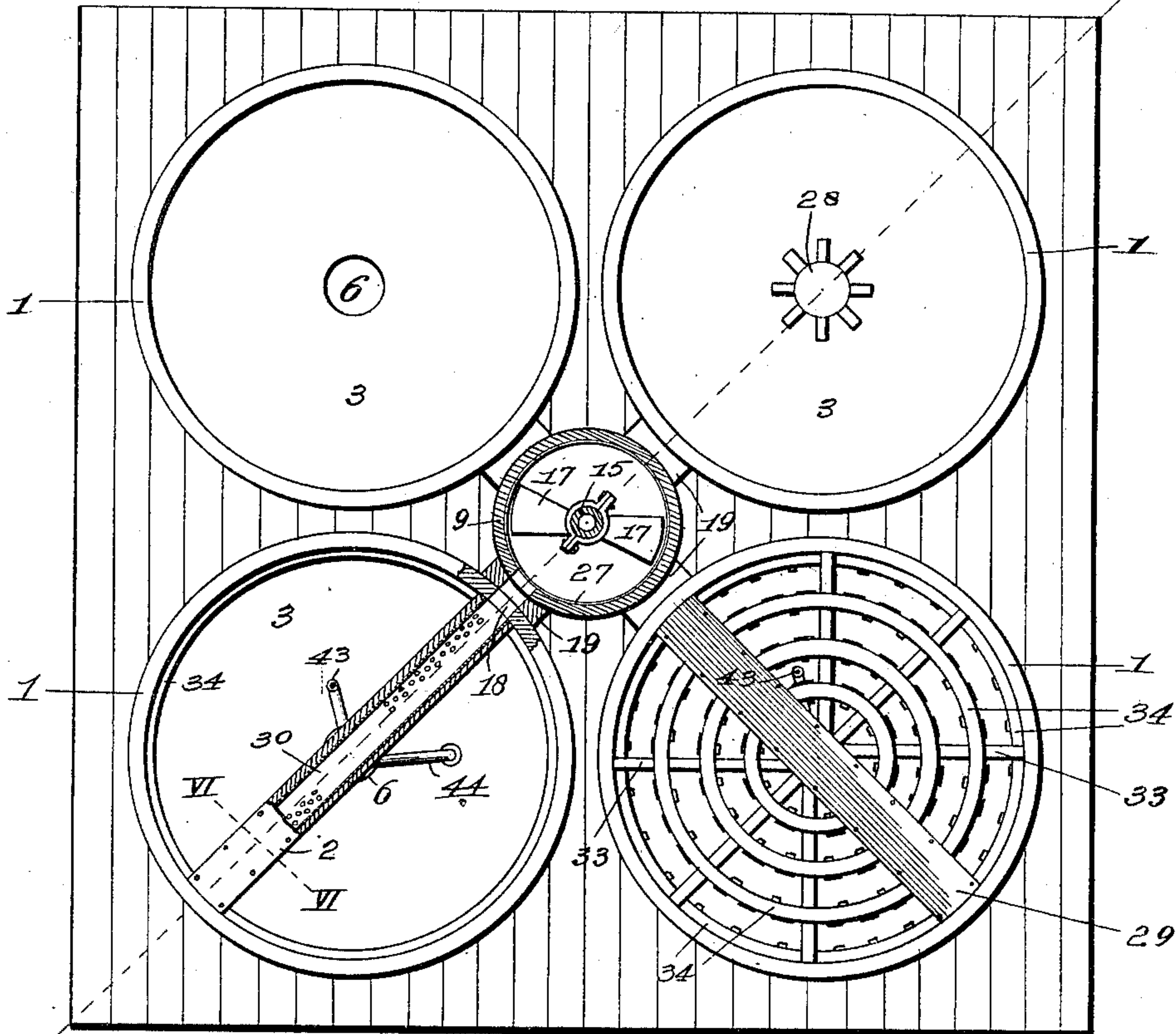


Fig. II.

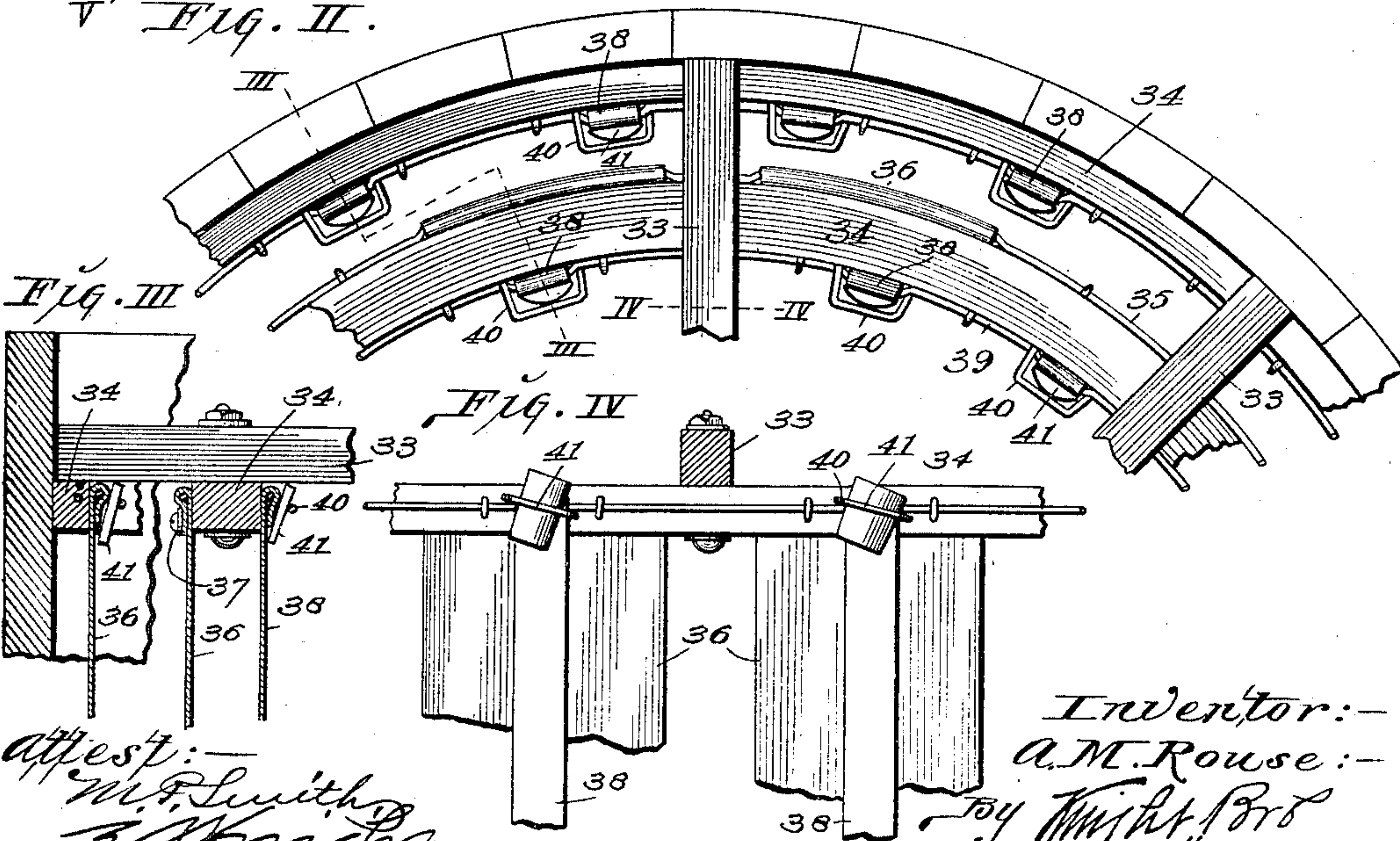


Fig. III.

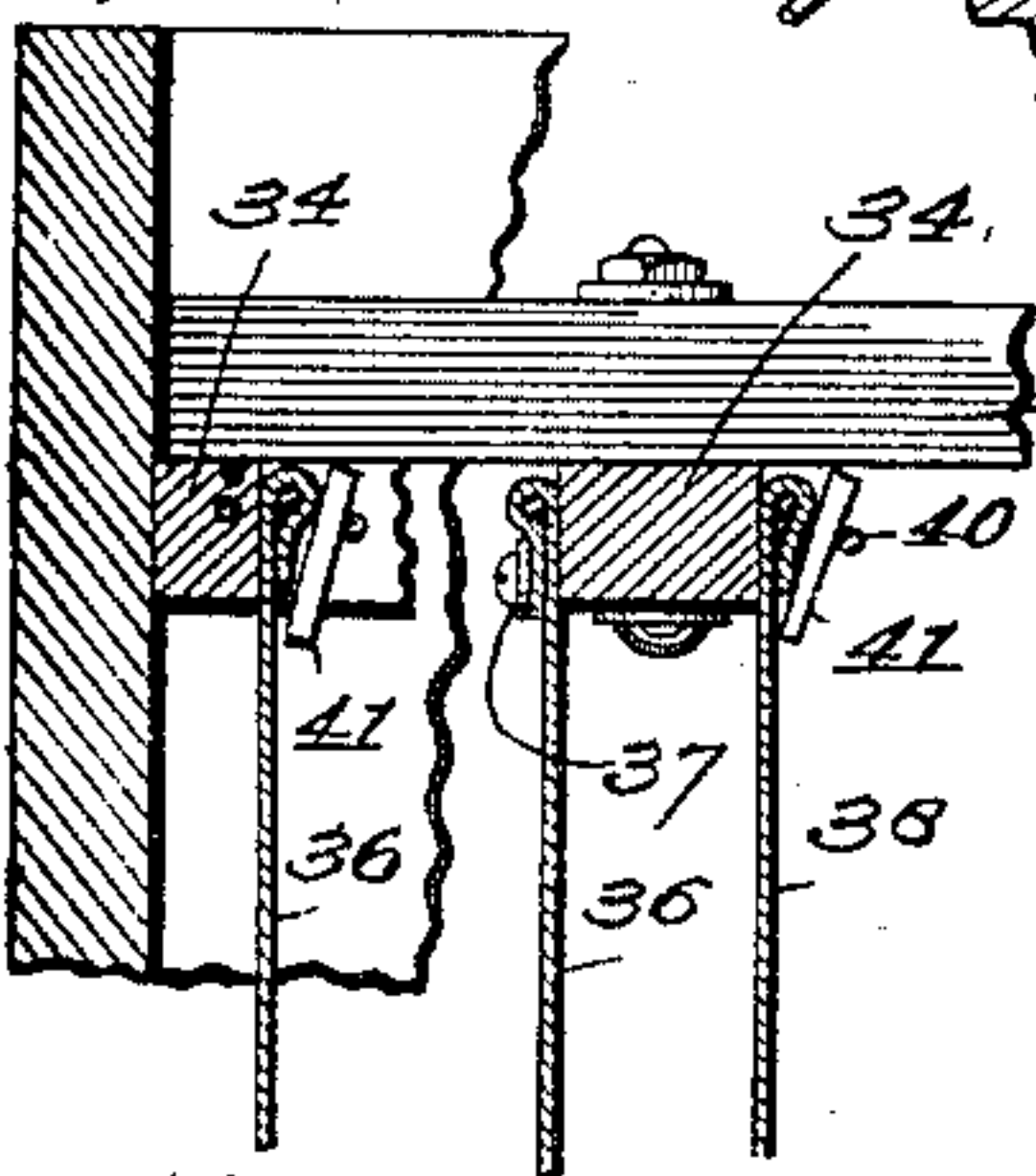
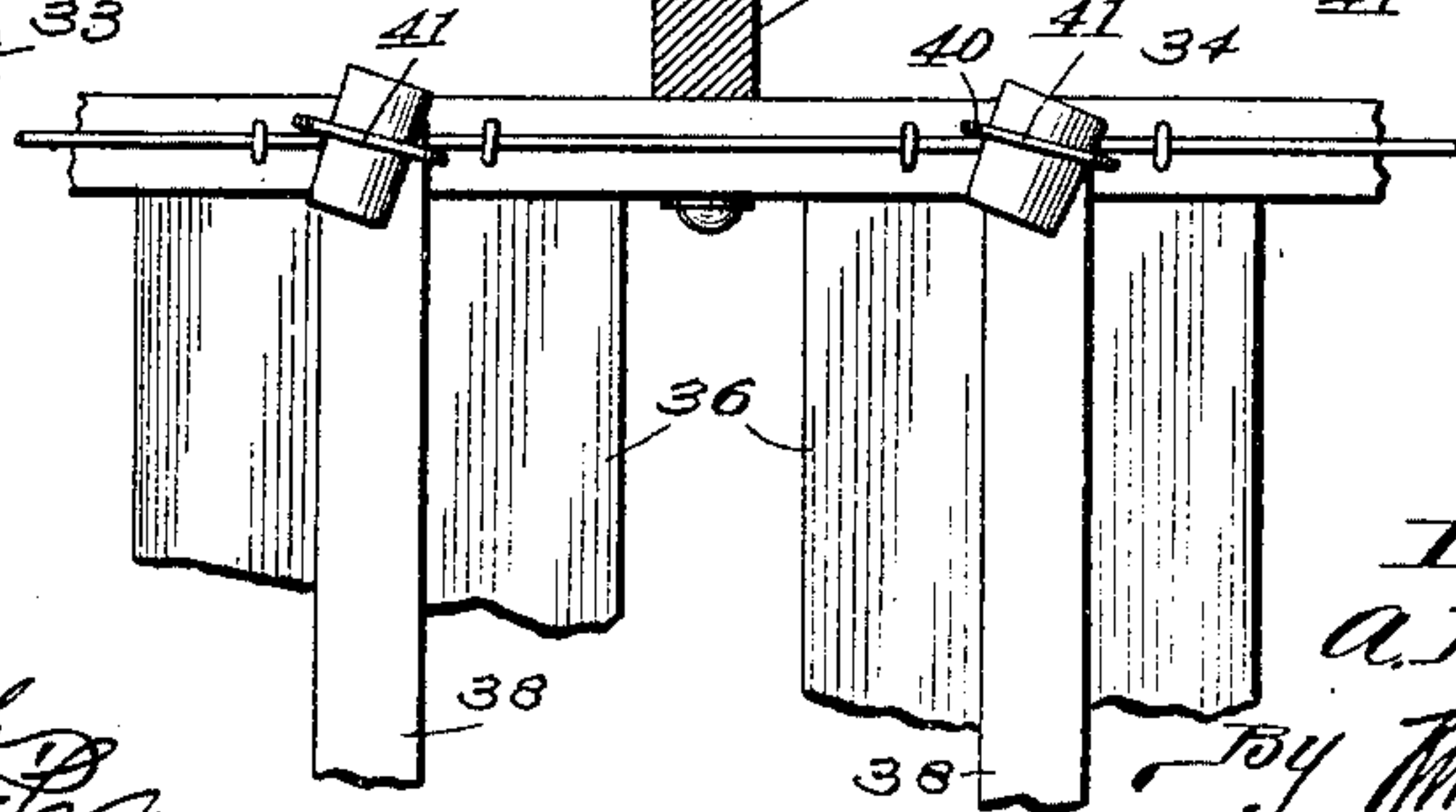


Fig. IV.



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Fig. V.

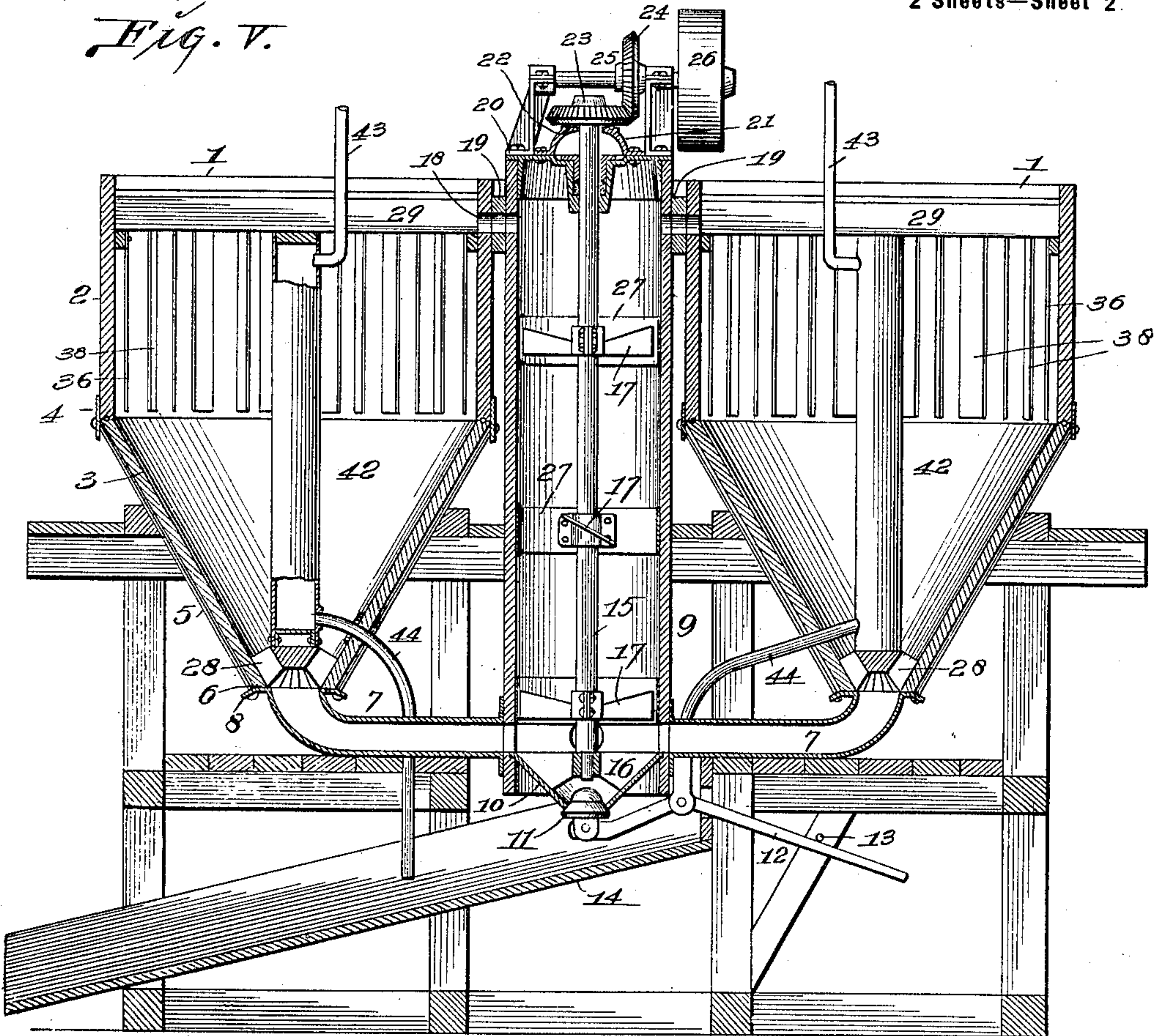
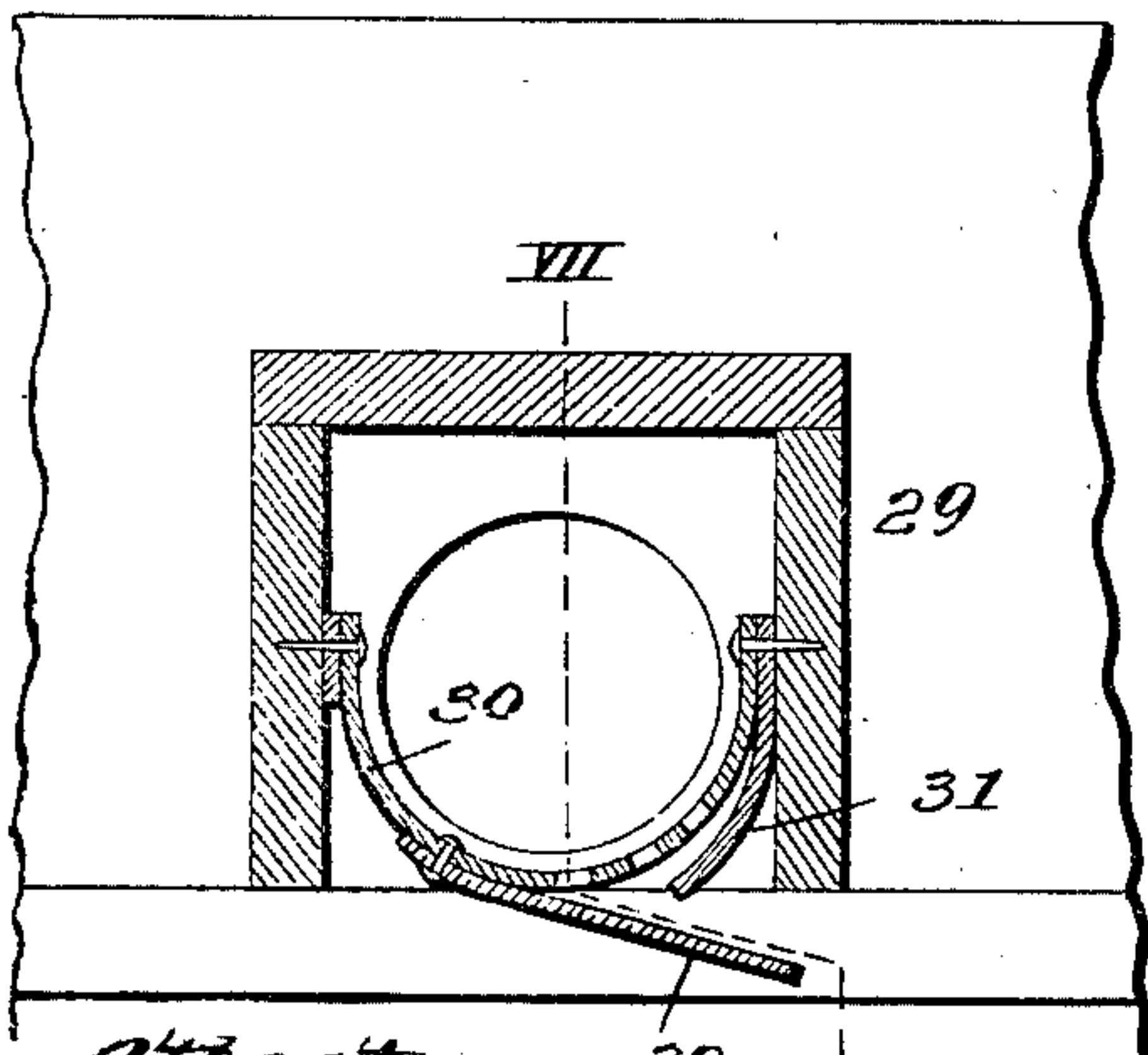
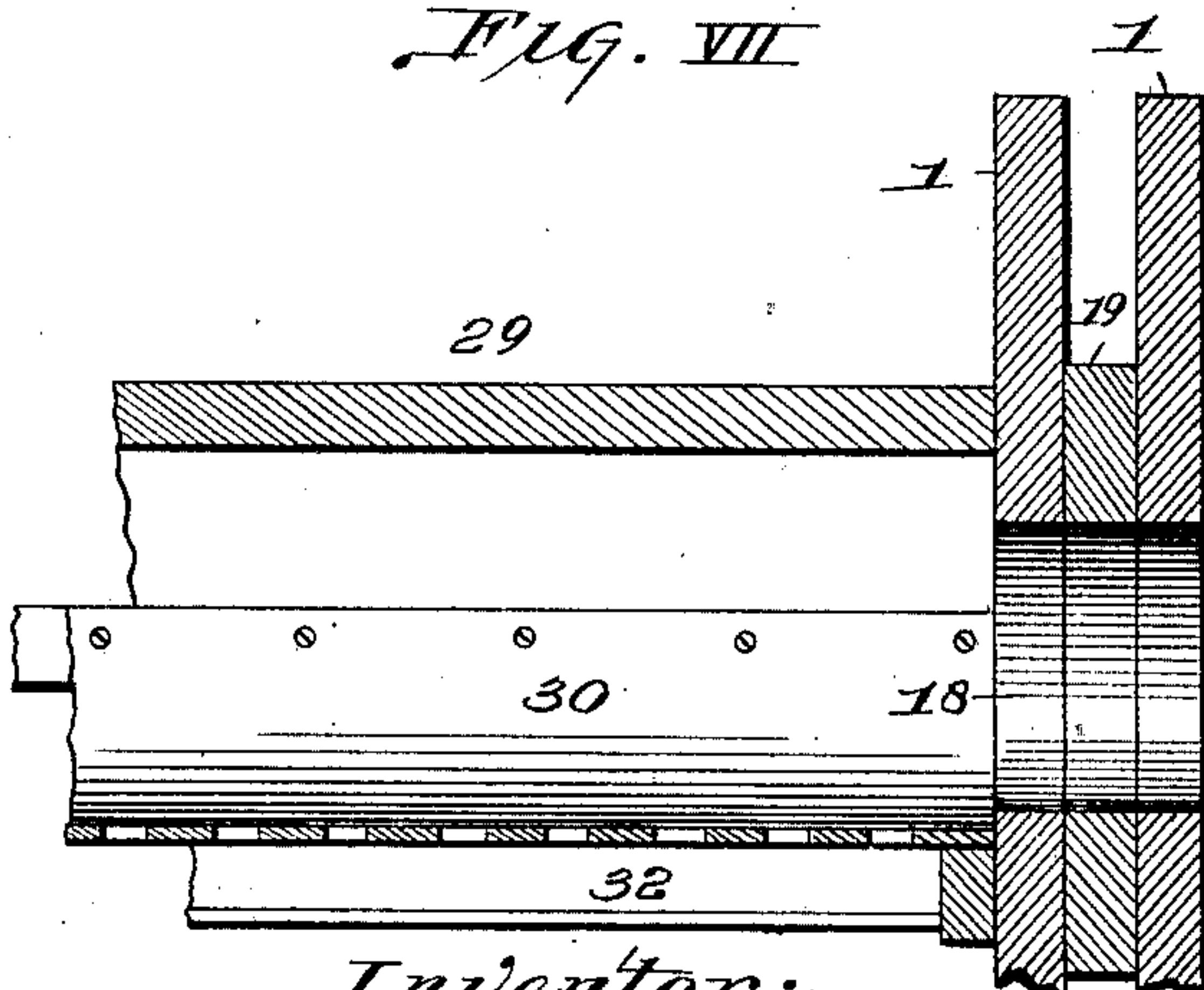


Fig. VI



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Fig. VII



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UNITED STATES PATENT OFFICE.

ALBION M. ROUSE, OF DENVER, COLORADO, ASSIGNOR OF ONE-HALF TO
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APPARATUS FOR ELECTROLYTICALLY EXTRACTING AND DEPOSITING GOLD AND SILVER FROM THEIR ORES.

SPECIFICATION forming part of Letters Patent No. 668,842, dated February 26, 1901.

Application filed May 28, 1900. Serial No. 18,252. (No model.)

To all whom it may concern:

Be it known that I, ALBION M. ROUSE, a citizen of the United States, residing at Denver, in the county of Arapahoe and State of Colorado, have invented certain new and useful Improvements in Apparatus for Electrolytically Extracting and Depositing Gold and Silver from their Ores, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to an apparatus for service in electrolytical extraction and deposition in removing gold and silver from ore-pulp containing them, the object of the invention being to provide better and more efficient means and conditions in and by which the metals are more efficiently precipitated onto the cathodes arranged in the apparatus. My invention consists in features of novelty hereinafter fully described, and pointed out in the claims.

Figure I is a top or plan view of my improved apparatus with parts omitted to better illustrate portions that would be obscured thereby. Fig. II is an enlarged detail top view of a fragment of one of the tubs of the apparatus and parts of the anode and cathode supporting ring-sections located therein. Fig. III is a cross-sectional view taken on line III III, Fig. II. Fig. IV is a detail side elevation of one of the anode and cathode supporting ring-sections and the parts carried thereby, one of the section-supporting cross-bars being shown sectional on line IV IV, Fig. II. Fig. V is a vertical sectional view taken through the apparatus on the line V V, Fig. I. Fig. VI is an enlarged cross-sectional view taken on line VI VI, Fig. I. Fig. VII is a longitudinal sectional view taken on line VII VII, Fig. VI.

As shown in the drawings, there are in the apparatus a series of tubs that are all arranged in communication at both top and bottom with a centrally-located agitation-tube through which the ore-pulp under treatment is constantly passed, said pulp being originally placed in the tubs of the series, from which, in the operation of the apparatus, it is withdrawn into the lower end of the centrally-located tube and raised by mechanical means

to the upper end of the tube to pass again into the tubs and among the anodes and cathodes arranged therein in a swirling manner occasioned by the agitation produced in the mass of ore-pulp in carrying it upwardly through the central tube and discharging it therefrom into the tubs. By this arrangement I provide for a large tonnage capacity in the tubs in which the deposit of the metals is electrolytically accomplished.

1 designates the tubs, which, as shown, are four in number; but two or any greater number of such tubs may be utilized in conjunction with each other without departing from my invention, the four shown being illustrated only for example. The tubs 1 are constructed of upper cylindrical sections 2 and lower conical sections 3, (see Fig. V,) the said sections being joined by a hoop 4 and tie-rods 5, connected to said hoop. The conical sections 3 are provided at their lower ends with discharge-mouths 6, (see Figs. I and V,) and they are seated upon the open ends of conducting-pipes 7, having flanges 8, that receive the lower ends of the tie-rods 5. The conducting-pipes 7 lead to and are connected to a centrally-located tube 9, having a conical apertured bottom 10, that is normally closed by a valve 11, carried by a lever 12, held by suitable means, such as the pin 13. (See Fig. V.) The bottom 10 is located above a trough 14, adapted to receive the discharge of refuse from the tube 9.

15 designates the shaft of an agitator having its lower end journaled in a slotted bearing-block 16 (see Fig. V) and provided with agitator-blades 17, designed to be rotated and to perform the service of elevating the ore-pulp from the lower end of the tube 9 as it is delivered thereinto from the conducting-pipes 7. Communication from the upper end of the tube 9 into the upper ends of the tubs 1 is provided by ducts 18, that pass through the walls of the tube and tubs and through interposed joint-blocks 19, these ducts permitting the conveyance of the ore-pulp from the tube 9 as it is raised therein to the upper ends of the tubs in the manner to be hereinafter explained.

The upper end of the tube 9 is closed by a cap 20, through which the agitator-shaft 15

passes, and the cap is surmounted by a bearing member 21, provided with a raceway for antifriction-balls 22, (see Fig. V,) that receive and support a pinion 23, carried by the agitator-shaft, the said antifriction-balls being designed to carry the weight and thrust of the agitator shaft, blades, and pinion to permit easy movement of said parts. The pinion 23 receives the mesh of a pinion 24 on a shaft 25, journaled in suitable supports and provided with a pulley 26, to which power is applied to drive the agitator.

Within the tube 9, at the location of the blades 17, are wear-receiving shield-rings 27, that serve as protection for the interior of the tube.

28 designates slotted blocks located at the bottoms of the tubs 1 and through which the ore-pulp passes to the conveying-pipes 7.

29 designates casings suitably supported in the upper ends of the tubs 1 and extending transversely thereacross. Within these casings are perforated conduits 30, (see Figs. I, VI, and VII,) that receive the ore-pulp as it passes from the tube 9 through the ducts 18 to the tubs 1. The ore-pulp passes from the conduits 30 into the tubs through the perforations therein. As it flows through the perforations it is deflected by deflectors 31 (see Fig. VI) onto chutes 32, arranged at angles to the rounded bottoms of the conduits, whereby the pulp is discharged into the tubs tangentially onto the mass of pulp contained by the tubs, which is maintained at a level immediately beneath said chutes. The force with which the ore-pulp is delivered into the tubs from the conduits depends entirely upon the rapidity of motion of the agitator within the tube 9, which constantly works the pulp upwardly through said tube and into said conduits, and as the pulp is conveyed through the conduits onto the chutes 32 its force is directed against the mass of ore-pulp contained by the tubs, which causes a swirling action of said mass to be effected for the purpose to be hereinafter explained.

33 designates cross-bars secured to the walls of the tubs 1 and the conduit-casings 29. These cross-bars form supports for ring-sections 34, arranged concentrically within the tubs.

35 designates positive-current wires secured to the ring-sections 34, and 36 designates anodes having their upper ends folded over said wires 35 and fixed to the ring-sections by binding-screws 37.

38 designates the cathodes, having hooked upper ends suspended from the negative-current wires 39, that are attached to the ring-sections 34, said cathodes being held in place by means of loops 40 and wedges 41, inserted through said loops to bind against the cathodes, whereby such cathodes may be readily removed and replaced by new ones each time that a clean-up of the apparatus is made.

It is of importance in an apparatus for electrolytically treating ore-pulp that the pulp be

kept at a temperature from 90° to 120°, and to obtain and maintain such temperature I provide means for heating the pulp, which comprises heater-tubes 42, centrally located in the tubs 1 and having their lower ends closed and seated upon the blocks 28 at the bottoms of the tubs and their closed upper ends secured to the cross-bars 33. Steam is introduced into these heater-tubes from a steam-pipe 43 to provide the necessary heat therein. 44 designates drip or drain pipes leading from said heater-tubes and arranged to discharge into the trough 14. By the use of these heating devices with the other parts of the apparatus I am enabled to fix and maintain the best degree of temperature and to save hours of time on every batch of ore-pulp treated in the apparatus.

The anodes used in my apparatus are preferably of sheet-lead. The cathodes are made from the precipitate resulting from the extraction and deposition thereon of metals from a previous batch of gold or silver ore pulp treated, such cathodes being produced by melting the cathodes previously used with the precipitate gathered thereon in the previous operation of the apparatus, such cathode being melted each time that a clean-up of the apparatus is effected and cast in molds to produce cathodes for subsequent use in the apparatus, and they may be in the form of plain or corrugated plates or any other desirable construction. The use of the precipitate bearing previously-used cathodes recast and made into new cathodes from an economical standpoint is obvious, for the reason that at every clean-up of the apparatus new cathodes may be formed in hot-metal molds direct from a crucible, and the operator may always maintain a supply of the cathodes in stock for use. Furthermore, silver and gold are excellent conductors of electricity, silver being rated at one hundred and gold at seventy-five and equal parts alloyed at eighty-seven per cent. A still more valuable feature, however, lies in the fact that when the cathodes are removed from the apparatus the metal is almost, if not quite, free from baser metals and is in condition for the crucible without the necessity of having to separate the gold and silver from the baser metals from which the cathodes now in general use are made.

In the practical use of my apparatus the valve 11, closing the bottom of the tube 9, is fixed in closed position, and the agitator, composed of the shaft 15 and blades 17, is set in motion, after which the ore-pulp to be treated is introduced into the tubs 1. The pulp should be of about equal weights of ore and water, forming a mass semifluid or pasty. At this stage the solvents to be used should be introduced into the tubs with the mass of ore-pulp, (such solvents being preferably cyanid of potassium, sodium chlorid, bromin, and oxygen, combined to suit prevailing conditions.) The electrical current is then switched into the current-wires 35 and 39 and

should be from five to ten volts and from fifty to one hundred amperes to suit conditions. The agitator in the tube 9 being in motion, the pulp will pass from the tubs to the conveying-pipes 7 and be drawn into the tube 9 and carried upwardly through said tube to be discharged therefrom through the ducts 18 into the conduits 30 and therefrom in steady streams into the mass of ore-pulp. The streams from the conduits discharging over the chutes 32 act with force against the mass of ore-pulp within the tubs and cause a swirling action of said mass, and the swirling of the mass, with the gravitation thereof, results in a spiral motion of the pulp as it flows around the anode and cathode electrodes, during which the cathodes gather the dissolved particles of metals in the pulp.

As the solvents used in the extraction and deposition of gold and silver are of very low percentage of strength, their action on such metals would be slow without the combined action of electricity and the swirling of the metals as the pulp passes through the tube 9, and, furthermore, the action of the weak solvent on the particles of gold and silver forms coatings on the surfaces of the particles that retards further action until such coating has been removed. The removal of the coatings I accomplish by the swirling action produced upon the metals contained by the pulp as they are agitated in passing upwardly through the tube 9.

I am aware that it is not now to use cathodes of gold and silver in an apparatus for electrolytically treating ore-pulp, and I disclaim cathodes of such metals, broadly considered; but so far as my knowledge goes it has never heretofore been proposed to make such cathodes from the cathodes previously used with the precipitate thereon, and this I maintain to be a most valuable feature, in view of the advantages hereinbefore named relative to cathodes so made.

I claim as my invention—

1. In an apparatus of the class described, the combination of a series of tubs adapted to contain the ore-pulp to be treated, anodes and cathodes arranged in said tubs, an agitation-tube having communication with said tubs at the upper and lower ends thereof, and an agitator located in said tube; substantially as described.

2. In an apparatus of the class described, the combination of a series of tubs, anodes and cathodes arranged in said tubs, an agitation-tube having communication with said tubs at both their upper and lower ends, an agitator located in said tube having means by which the ore-pulp to be treated may be

elevated therein, and perforated conduits located in the upper ends of said tubs adapted to receive the ore-pulp from said tube, and discharge it into said tubs; substantially as described.

3. In an apparatus of the class described, the combination of a series of pulp-receiving tubs, anodes and cathodes arranged in said tubs, an agitation-tube having communication with said tubs at their upper and lower ends, an agitator arranged in said tube, perforated conduits located in the upper ends of said tubs, and chutes located beneath said conduits onto which the ore-pulp is discharged; substantially as described.

4. In an apparatus of the class described, the combination of a series of pulp-receiving tubs, anodes and cathodes arranged in said tubs, an agitation-tube having communication with said tubs at their upper and lower ends, an agitator arranged in said tube, perforated conduits located in the upper ends of said tubs, chutes located beneath said conduits onto which the ore-pulp is discharged, and deflectors located beside said conduits adapted to direct the flow of pulp onto said chutes as it passes through said conduits; substantially as described.

5. In an apparatus of the class described, the combination of a series of tubs, anodes and cathodes arranged in said tubs, an agitation-tube having communication with said tubs at the upper and lower ends thereof, an agitator comprising a shaft and blades, and wear-receiving rings positioned in said tube at the location of the said blades; substantially as described.

6. In an apparatus of the class described, the combination of a series of tubs, anodes and cathodes arranged therein, an agitation-tube having communication with said tubs at the upper and lower ends thereof, an agitator mounted in said tube, a pinion on the shaft of said agitator and a ball-bearing support for said pinion, located between said support and pinion, and means for driving said pinion, substantially as described.

7. In an apparatus of the class described, the combination of a series of tubs, anodes and cathodes arranged therein, an agitation-tube having communication with said tubs at the upper and lower ends thereof, an agitator in said tube, a heater-tube at the center of each tub in the series, and means for conveying heat to said tubes; substantially as described.

ALBION M. ROUSE.

In presence of—

EDWARD P. LEECH,
A. S. WHITAKER.