

E. B. GOODWIN.
 APPARATUS FOR TREATING ORES.
 APPLICATION FILED OCT. 14, 1908.

988,458.

Patented Apr. 4, 1911.

3 SHEETS—SHEET 1.

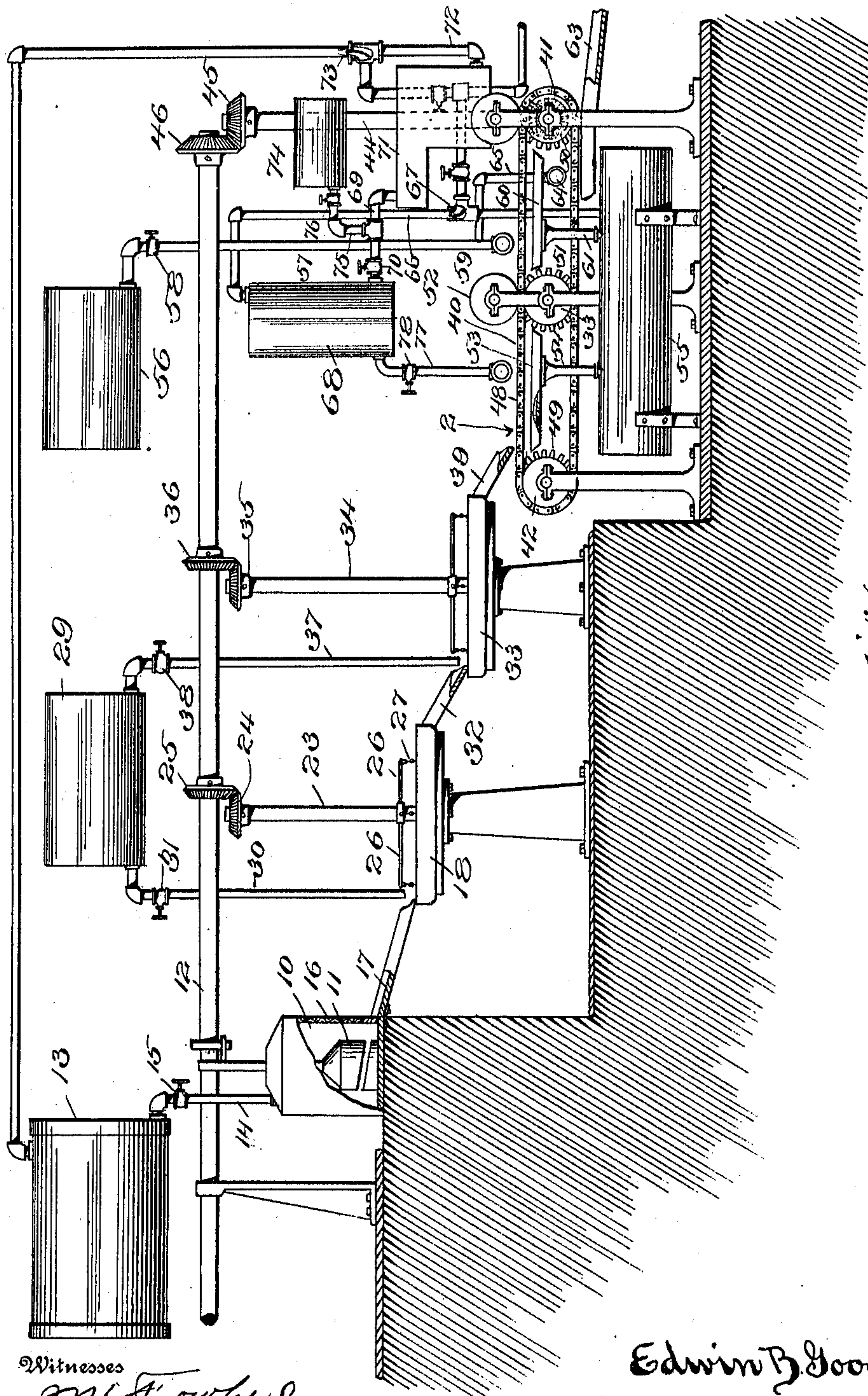


Fig. 1.

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Fig. 3.

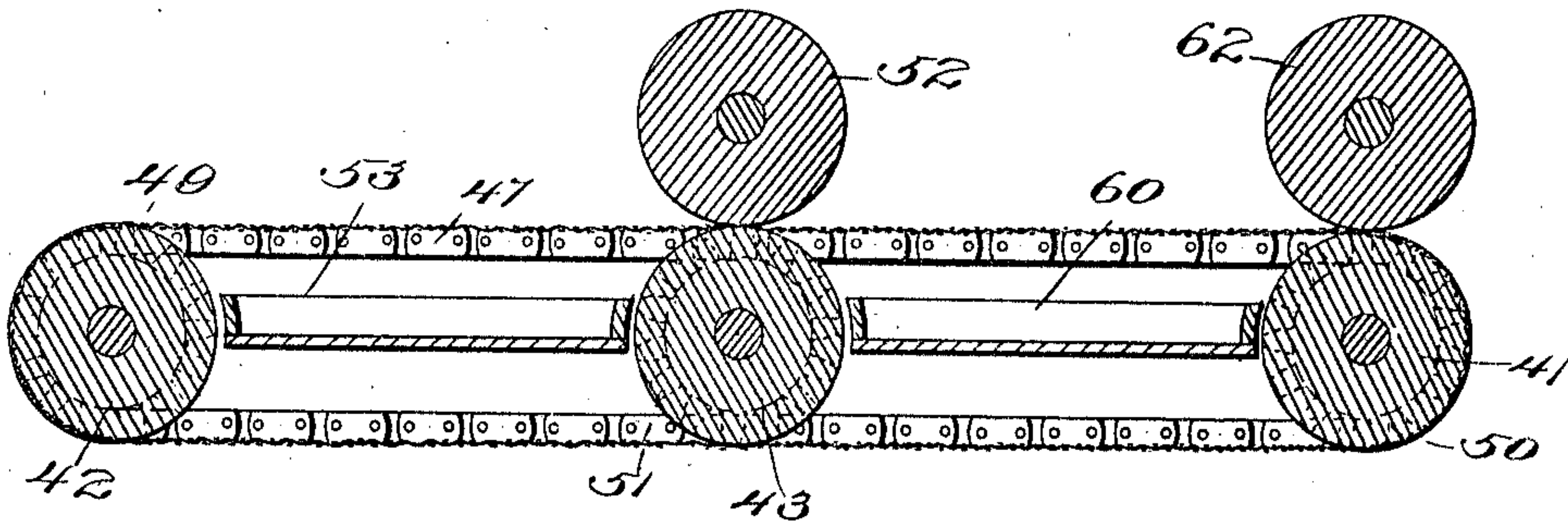


Fig. 2.

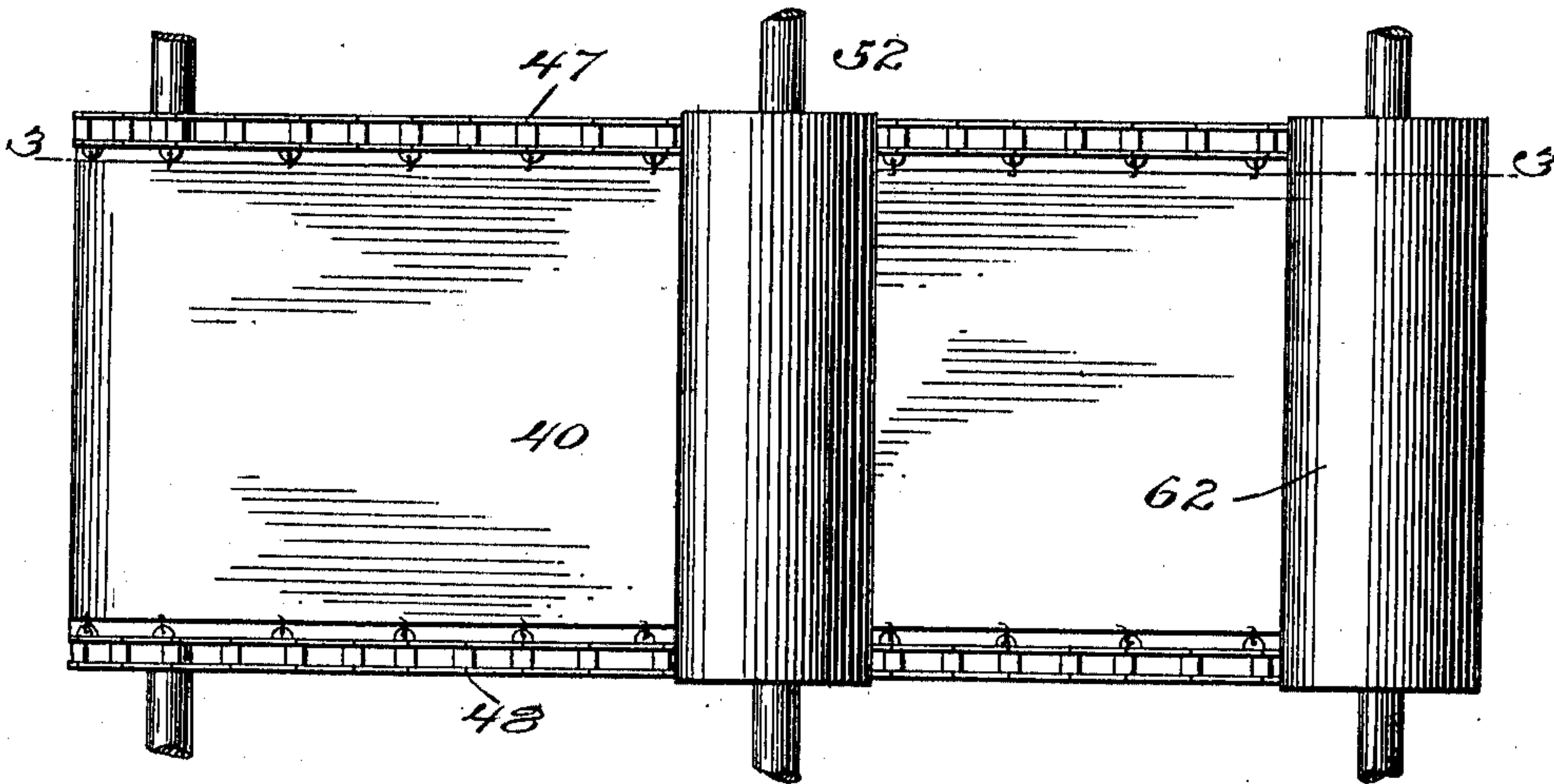
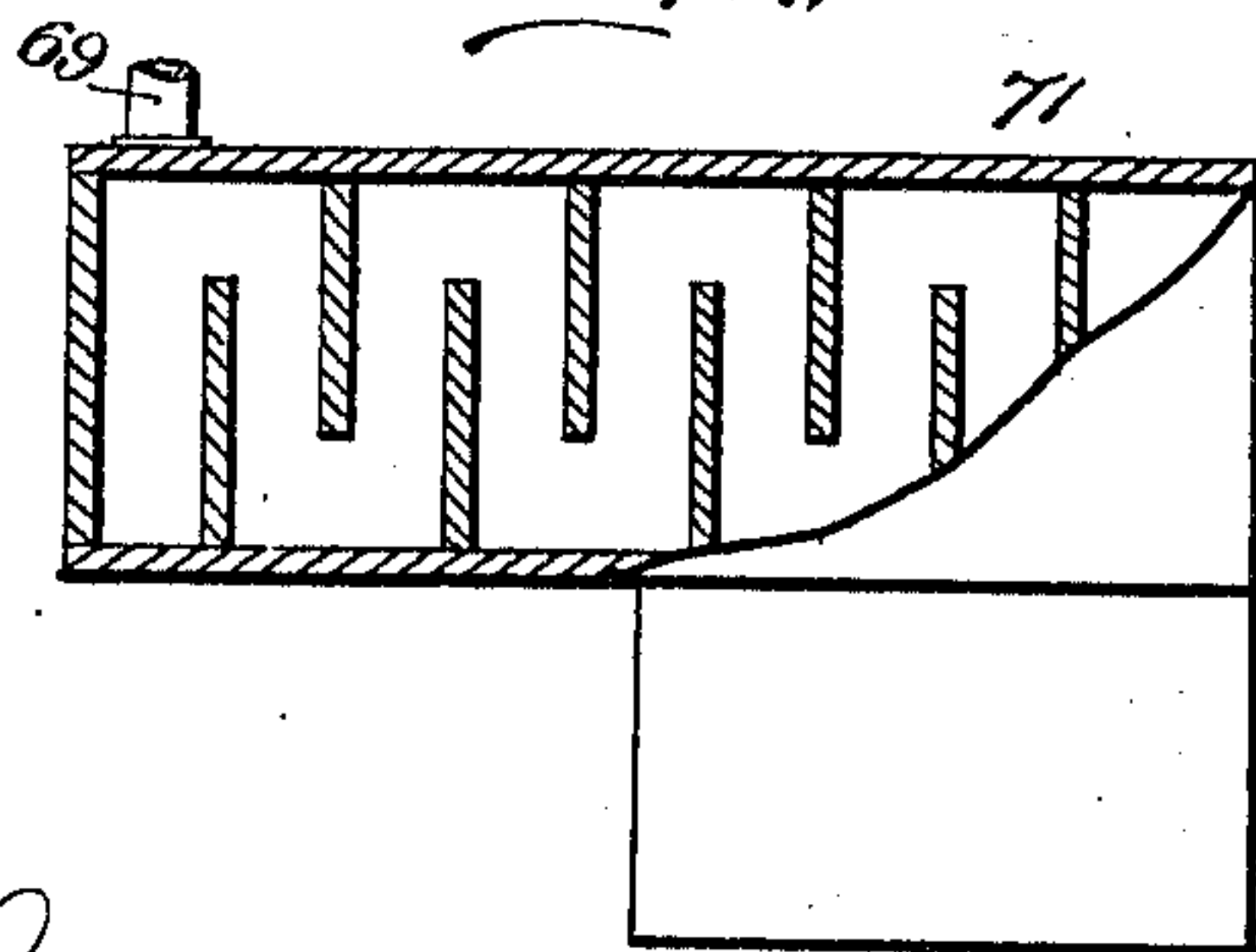


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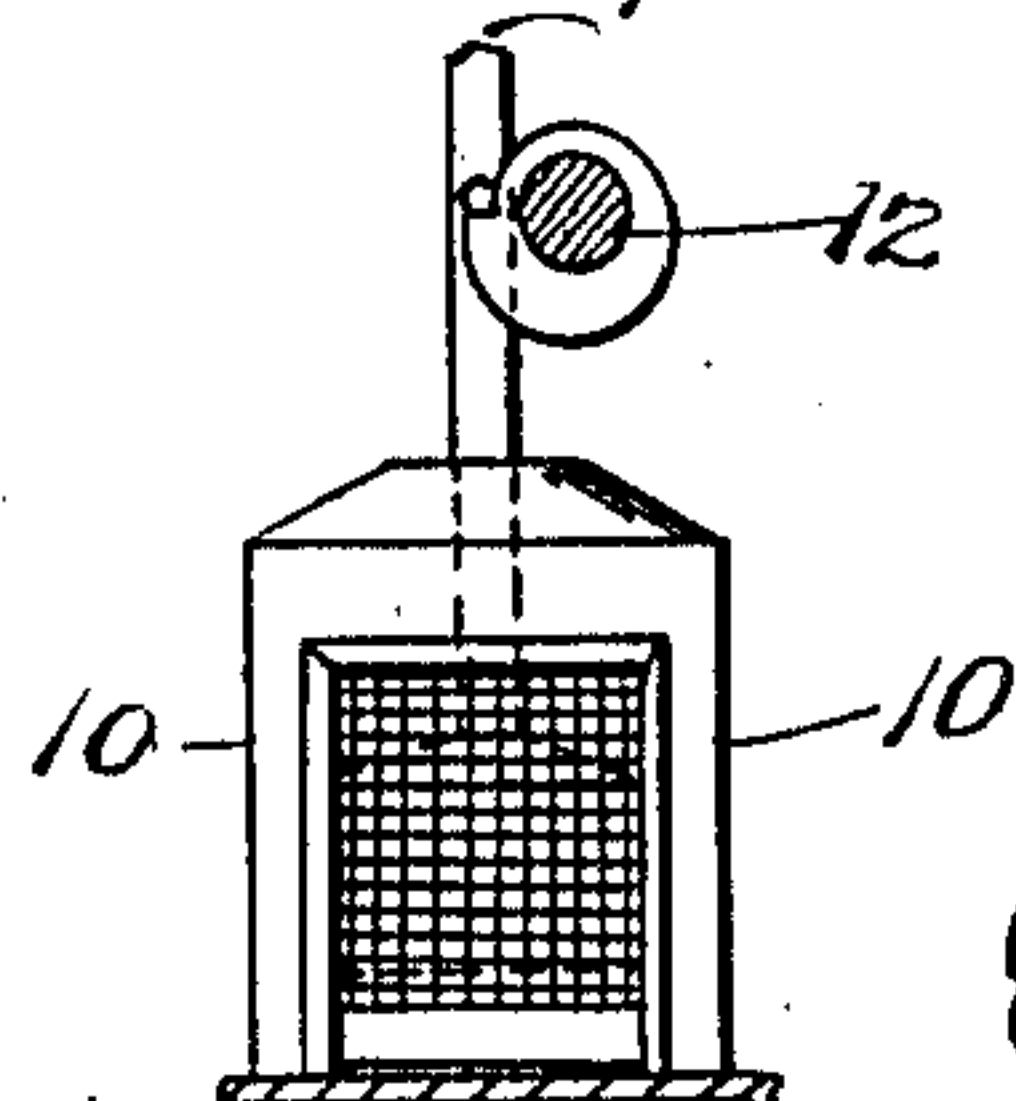
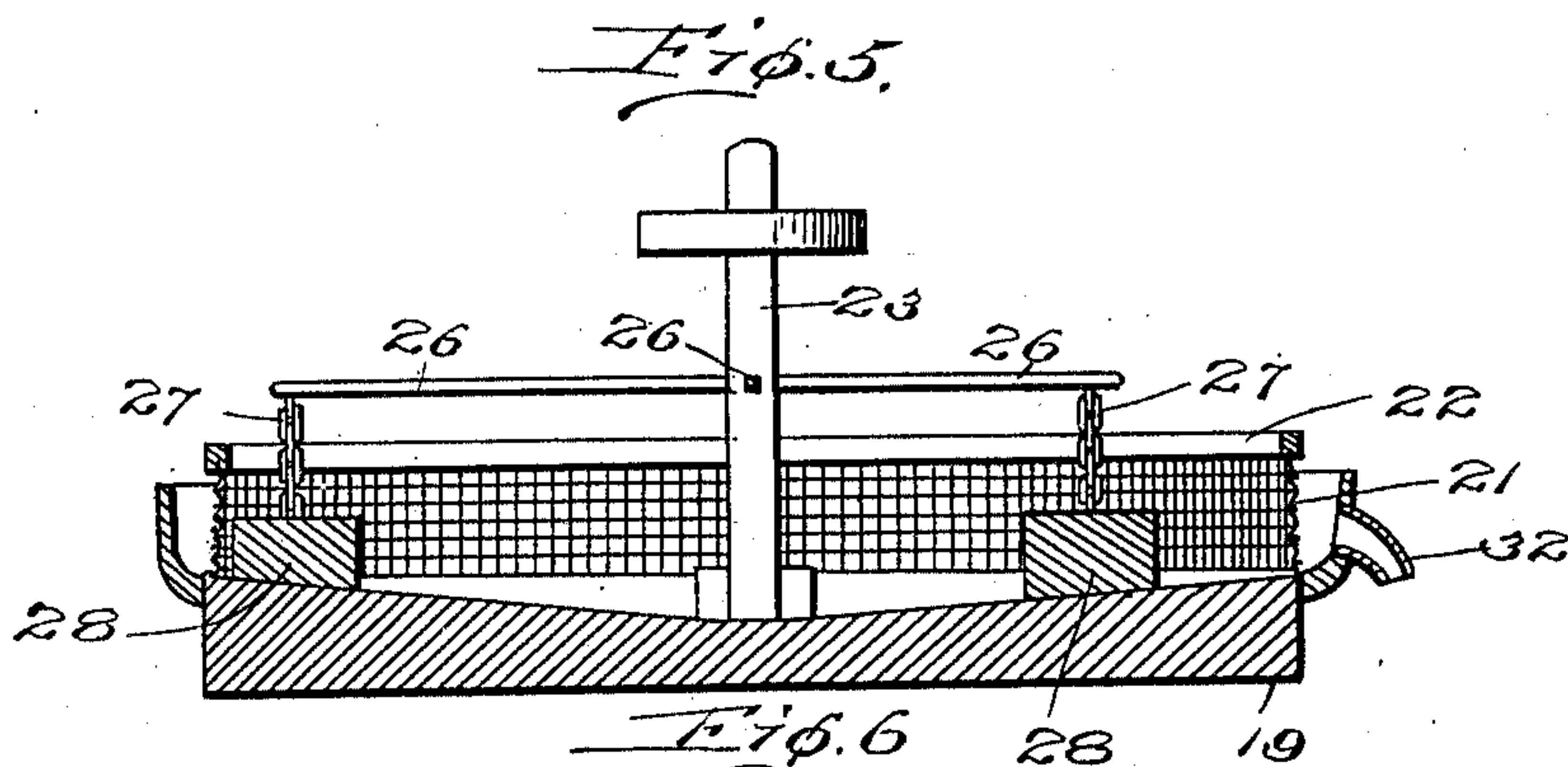
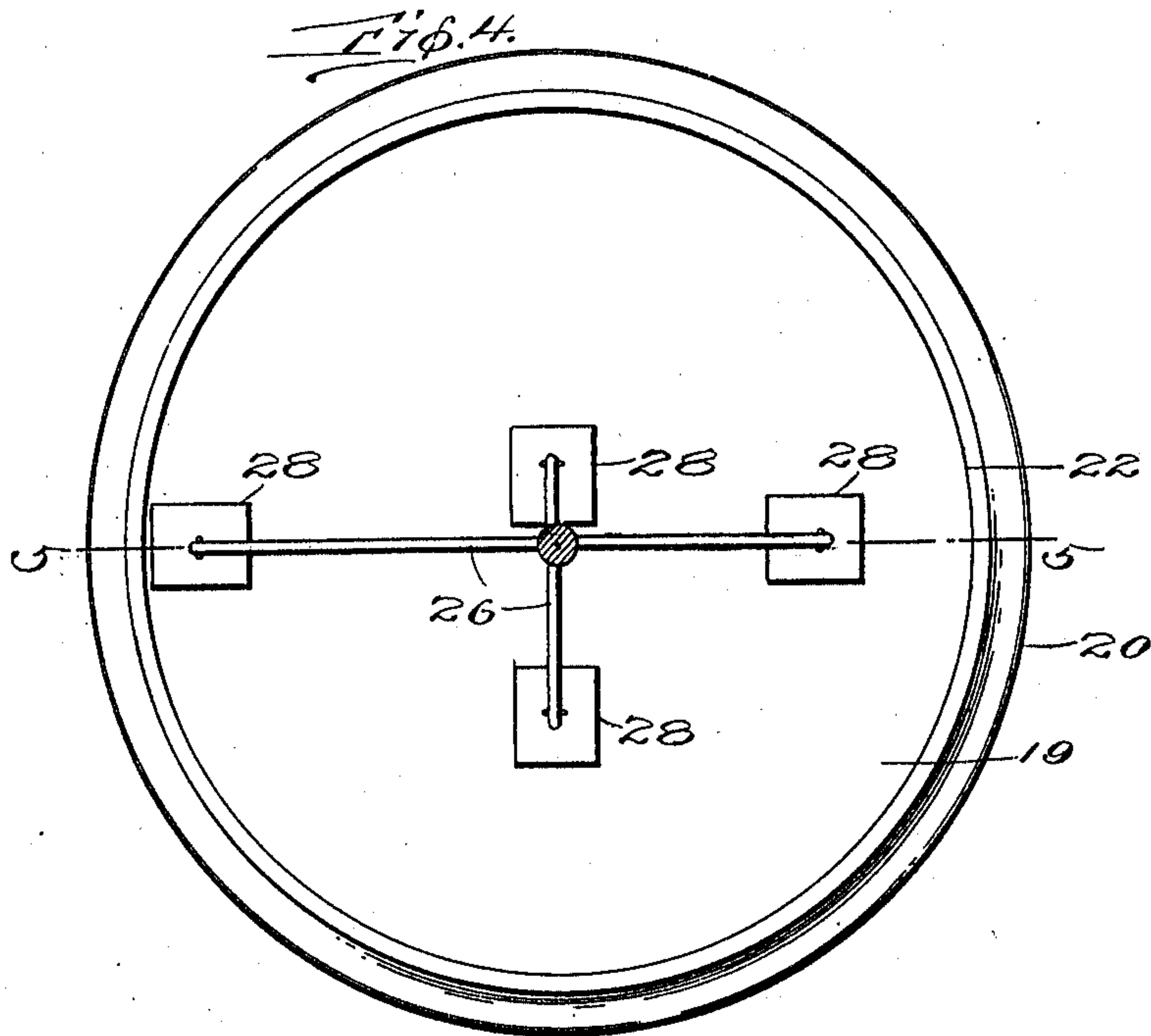
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UNITED STATES PATENT OFFICE.

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APPARATUS FOR TREATING ORES.

988,458.

Specification of Letters Patent.

Patented Apr. 4, 1911.

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To all whom it may concern:

Be it known that I, EDWIN B. GOODWIN, a citizen of the United States, residing at Ward, in the county of Boulder and State of Colorado, have invented certain new and useful Improvements in Apparatus for Treating Ores; 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.

This invention relates to apparatus for ore reduction, and has for an object to provide an organized mechanism adapted to physically and chemically reduce the ore.

A further object of the invention is to provide an organized mechanism wherein the solvent employed is heated to a high temperature and is successively supplied to the ore at successive steps of its physical reduction.

A further object of the invention is to provide in an organized mechanism means for physically reducing the ore and chemically associating it with a solvent and with improved means for extracting the dissolved ore from the reduced ore.

In the best known processes at present in practical operation a time is required of about one hundred and twenty hours to treat ores and even in that length of time all of the metallic values are not recovered. Furthermore the ordinary process cannot be employed with sulfid ores for the reason that the sulfid uses up such great quantities of the solvent that the cost of the solvent becomes prohibitive.

In the present invention the solution is employed very weak, so weak in fact that it has no action upon the sulfid but will still dissolve the values of the metals and reduce the time of treatment from one hundred and twenty hours to about thirty minutes completing the extraction of the values while passing through the successive stages of grinding, making the process continuous.

In Figure 1 the organization of the improved mechanism is illustrated somewhat diagrammatically in side elevation, certain parts being broken away to illustrate the construction and operation. Fig. 2 is a top plan view of the traveling belt upon which the physically reduced ores chemically treated are deposited. Fig. 3 is a view in longitudinal section of the traveling belt as on line 3—3 of Fig. 2. Fig. 4 is a top plan view

of one of the arastras. Fig. 5 is a diametrical sectional view of the arastra as taken on line 5—5 of Fig. 4. Fig. 6 is a diagrammatic view of the stamp. Fig. 7 is a view in side elevation with one of the sides broken away of the zinc box.

Like characters of reference designate corresponding parts throughout the several views.

The ores which are to be treated by the present apparatus are first inserted in the chamber 10 within which a stamp 11 of any usual and ordinary construction is operated from any approved source as from the line shaft 12. Into the chamber 10 commingling with the ore being operated upon by the stamp 11 a solvent is introduced from the tank 13 through the pipe 14 controlled by the valve 15. At a little distance from the bottom of the chamber 10 a screen 16 is employed screening an opening in the side of the chamber through which the solution of ore passes when it has been sufficiently pulverized by the action of the stamp. From the screen 16 the ore passes onto the amalgamation table 17 which recovers from the mass a portion of the values and also serves as a spout to conduct the materials into the first arastra 18. The arastras, of which 18 is one, are constructed in the usual and ordinary manner or as shown in Figs. 4 and 5 of the stone or cement flooring 19 having an upstanding rim 20 preferably of metal about the periphery of the floor and with a screen 21 disposed concentrically within the metal rim 20. The screen 21 has preferably about its upper edge a hoop 22 to protect such screen which hoop is supported by the screen or in any approved manner. The stone floor is somewhat hopper shaped or conical with the center lower than the edges and journaled concentrically of such floor is a vertical shaft 23 rotated in any approved manner as by the bevel gear 24 intergeared with the gear 25 from the line shaft 12. The shaft 23 carries a plurality of radial arms 26 of any approved number here shown as four and of different lengths carrying at or near their extremities short depending chains 27 to which are secured stones 28 at unequal distances from the center so that the entire floor of the arastra is engaged by the stone rotated by the shaft 23.

The action of the stamp in the mill constantly agitates the pulp and exposes it to the atmosphere, this action resulting in the

combination of the gold with the solvent so that when the pulp flows from the amalgamating floor into the first arastra a considerable portion of the solvent has been used up
 5 so that it becomes desirable to supply added solvent. For this purpose a tank 29 is provided containing a solvent solution with a pipe 30 leading therefrom to the arastra 18 controlled by the valve 31 by means of
 10 which the solvent may be conducted into the first arastra to bring the percentage of the solvent in the pulp up to approximately the original per cent. In the first arastra the ore in the pulp is ground even finer
 15 than in the stamp mill and at the same time is given a much more complete exposure to the atmosphere. The first arastra is provided with an outlet 32 by which the commingled pulp and solvent from the first
 20 arastra are conducted to the second arastra and such outlet is arranged at such height that a small quantity of pulp is always retained within the arastra.

The pulp conducted through the pipe 32
 25 is carried to the second arastra 33 similar in all respects to the arastra 18 having its shaft 34 intergeared with the line shaft 12 through the medium of the bevel gears 35 and 36. While beveled gears have been here shown
 30 as operating the shafts 23 and 34 of the arastras, it is to be understood that any means for rotating the shafts are within the scope of the present invention. As the pulp is exposed to the atmosphere in the first
 35 arastra and the strength of the solvent deteriorated by such exposure and by the commingling with the pulp, it is desirable to add some of the solvent to the pulp in the second arastra for which purpose a pipe 37
 40 communicates with the tank 29 controlled by a valve 38 which permits the flow of solvent into the second arastra.

After being acted upon in the second
 45 arastra the pulp and contained solution are discharged through the spout 39 upon a traveling endless apron 40. The apron 40 is constructed of fabric of any approved make, and runs over end rollers 41 and 42 being
 50 maintained substantially in a horizontal plane. A center roller 33 is also preferably employed to support the center of the traveling apron and power is applied to operate the apron in any approved manner as by the shaft 44 intergeared with the line shaft
 55 12 as by the bevel gears 45 and 46, although it is to be understood that any other means for operating the apron 40 is comprehended in the present invention. The apron 40 is also preferably attached at its longitudinal
 60 edges to sprocket chains 47 and 48 as shown particularly in Fig. 2 which sprocket chains run over end sprockets 49 and 50 and also over the center sprocket 51.

Above the center roller 43 a roller 52 is
 65 journaled and as the pulp carried by the

apron 40 passes between the rollers 43 and 52, it is subjected to pressure whereby the moisture is expressed from the pulp. From the apron 40 the solution drains through to the pan 53 and is discharged by means of a
 70 spout 54 into the sump tank 55. After the pulp upon the apron 40 has passed under the roller 52 it is subjected to washing by means of water from the tank 56 passing through the pipe 57 controlled by the valve
 75 58 and discharged through the spraying nozzle 59 upon the apron 40. The water supplied to the pulp washes through the solution which is caught by the pan 60 and drained through the pipe 61 into the sump
 80 tank 55. Upon the end roller 41 another wringing roller 62 is mounted again subjecting the pulp to compression by which the solution and the values are expressed from the pulp and drained through the apron onto
 85 the pan 60. The slime upon the apron 40 is carried by such apron around the roller 41 and drops upon the discharge chute 63 and such of the slime as adheres to the apron is washed by means of the spraying nozzle
 90 64 in communication with the water tank 56 through the pipe 65.

From sump tank 55 the solution is drawn and forced through the pipe 66 by means of the steam nozzle 67 into the settling tank 68.
 95 The steam from the steam nozzle 67 operates not only to raise the solution from the sump tank 55 into the settling tank 68 but incidentally heats the solution thus passing. From the settling tank 68 the solution is
 100 drawn through the pipe 69 controlled by the valve 70 into the zinc box 71 wherein the zinc precipitates the metals from solution and the solvent is drawn off and forced through the pipe 72 by a steam jet from the
 105 nozzle 73 back into the tank 13 from which it started. The steam jet from the nozzle 73, like the jet from the nozzle 67, also serves to again raise the temperature of the solvent so that when it has returned to the tank 13
 110 it is at a high temperature to be discharged again into the stamp chamber 10.

For action in the zinc chamber 71 it is found desirable to employ additional solvent so that a tank 74 is provided having a pipe
 115 75 controlled by the valve 76 discharging into the pipe 69 so that the solution passing from the tank 68 into the zinc chamber 71 is commingled with added solvent from the tank 74. The settlings from the settling
 120 tank 68 are discharged through the pipe 77 controlled by the valve 78 upon the apron 40 and are again subjected to the action upon the apron.

It is to be understood that the specific arrangement of the various parts here shown is strictly unnecessary and that other arrangements would be satisfactory in the operation of the device, and that the various
 125 tanks and their locations shown are wholly

diagrammatic and that tanks located in any convenient place would serve the purpose, and that the means shown for imparting motion to the several parts is also wholly diagrammatic.

The important features of the invention are believed at the present time to be the physical reduction of the ores in the stamp mill subjected at the same time to heated solvents from which the ore passes over the amalgamating table into a series of arastras of any approved number, here shown as two, but it is to be understood that the invention is not limited to two arastras as a greater or less number may be employed as the exigencies of the plant and the condition of the ores may make desirable and satisfactory, and the present invention comprehends an apparatus including any number of arastras used singly or in series of any approved number.

What I claim is:—

1. In an apparatus of the class described, a stamp mill, means to supply a solvent to the stamp mill, an arastra, means to conduct material from the stamp mill to the arastra, means to supply a solvent to the arastra, a traveling filtering fabric, means to discharge material from the arastra to the fabric, and means engaging the fabric adapted to extract values from the material upon the fabric.

2. In an apparatus of the class described, a stamp mill, means to supply a solvent to the stamp mill, an arastra, means to conduct material from the stamp mill to the arastra, a traveling filtering apron, means to conduct material from the arastra to the apron,

and means to subject material upon the apron to mechanical compression.

3. In an apparatus of the class described, a stamp mill, means to supply a solvent to the stamp mill, an arastra, means to conduct material from the stamp mill to the arastra, means to supply solvent to the arastra, a traveling filtering fabric, means to conduct material from the arastra to the fabric, means to subject material upon the fabric to mechanical compression, and means to wash material upon the apron after being subjected to mechanical compression.

4. In an apparatus of the class described, means for pulverizing ore, means to supply a solvent to the ore in said pulverizing means, an arastra, means to conduct material from the pulverizing means to the arastra, means to supply solvent to the arastra, a filtering fabric, means to convey material from the arastra to the fabric, and means for washing the material upon the fabric.

5. In an apparatus of the class described, means for pulverizing ore, means to supply a solvent to the pulverizing means, an arastra, means to conduct material from the pulverizing means to the arastra, means to supply solvent to the arastra, and means positioned to receive discharge from the arastra and to separate the solution from the tailings.

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

EDWIN B. GOODWIN.

Witnesses:

ISABEL M. STRONG,
CARLE WHITEHEAD.