E. B. GOODWIN.

PROCESS OF TREATING ORES.

APPLICATION FILED OCT. 14, 1908.

970,325. Patented Sept. 13, 1910.

3 SHEETS—SHEET 1.

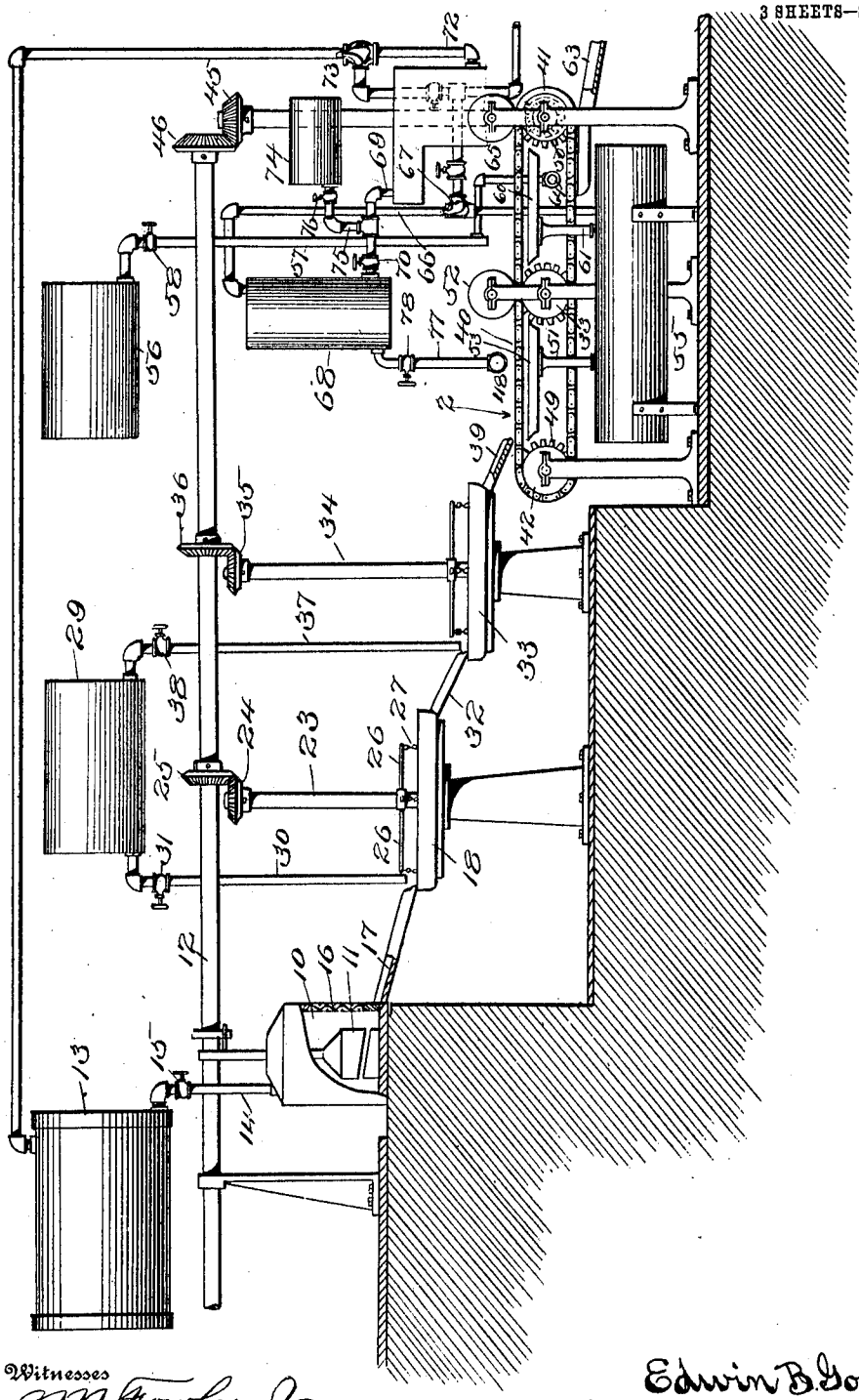

Fig. 1.

Witnesses

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3 SHEETS—SHEET 2.

Fig. 3

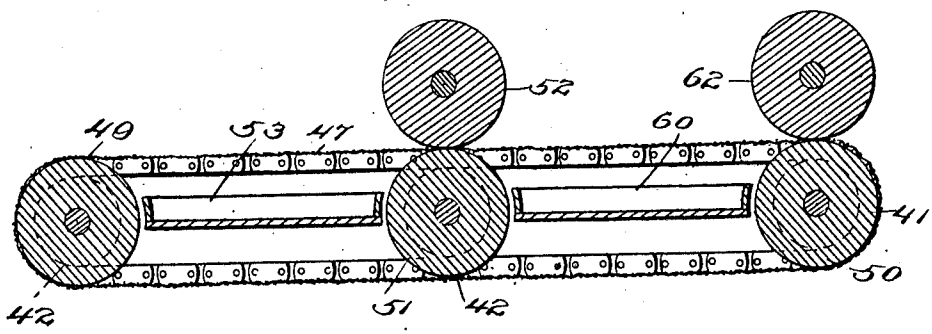


Fig. 2

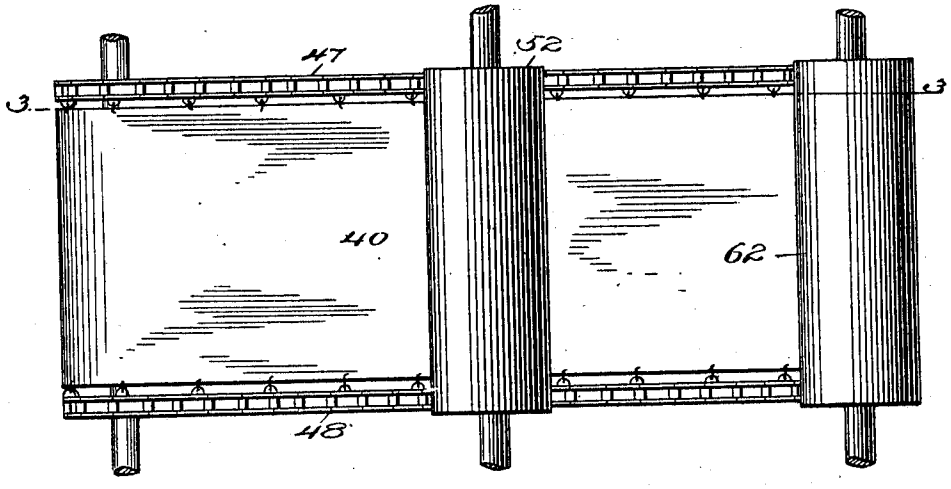
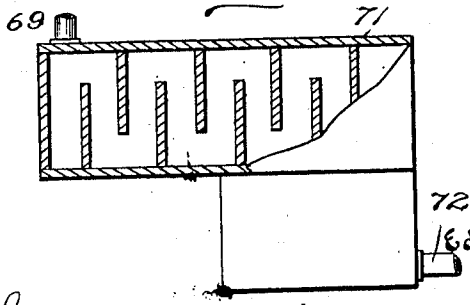


Fig. 7.



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3 SHEETS—SHEET 3.

Fig. 4

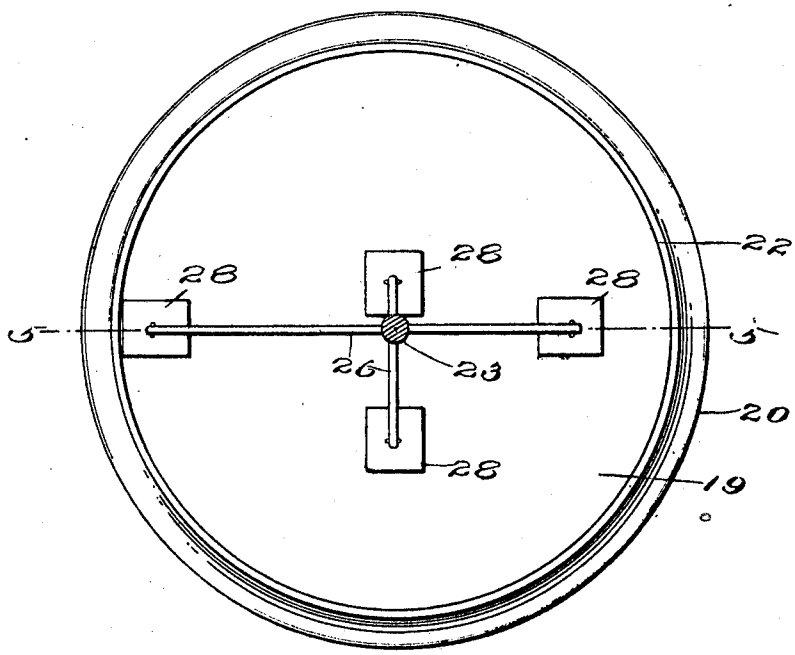


Fig. 5.

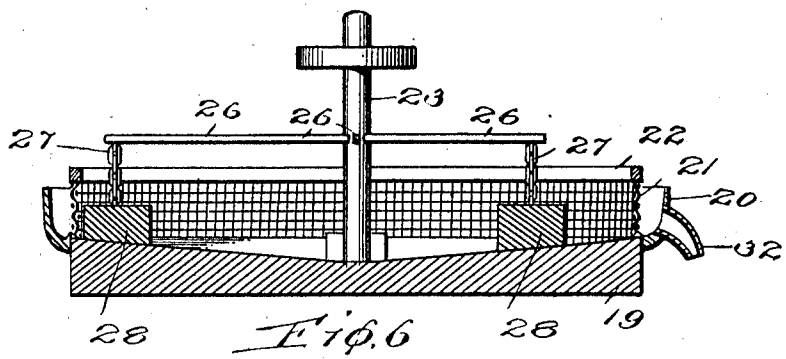
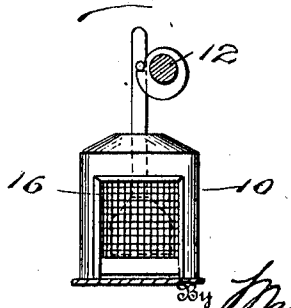


Fig. 6



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UNITED STATES PATENT OFFICE.

EDWIN B. GOODWIN, OF WARD, COLORADO.

PROCESS OF TREATING ORES.

970,325. Specification of Letters Patent. Patented Sept. 13, 1910.

Application filed October 14, 1908. Serial No. 457,667.

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 Processes 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 a process for physically and chemically reducing ores, and has for an object to provide a sequence of steps wherein the time employed in the reduction of ores is greatly reduced.

It is well known that in the processes at present employed the time required is approximately one hundred and twenty hours and that even that length of time does not suffice to reduce sulfid ores as the sulfid properties of the ores use up large quantities of the solvent so that the cost of the solvent becomes prohibitive.

In the present process a solvent of very weak strength is employed ranging from one one hundredth of one per cent. to twenty one hundredths of one per cent. of cyanid of potassium.

By the employment of the process of this invention the time for the reduction of ores and the extraction of practically the entire value up to as high as ninety eight per cent. is accomplished approximately in thirty minutes as compared to one hundred and twenty hours previously employed.

An object of the present invention is to so treat the ores mechanically and chemically at various stages of the process that the complete physical and chemical reduction of the ores is accomplished in the minimum time and with the maximum efficiency.

In the drawings a mechanism is illustrated by which the present process may be carried out, it being understood, however, that any other approved apparatus may be employed for such purpose and the apparatus illustrated only shown as illustrating one means for putting into effect the present process.

In the drawings:—Figure 1 is a diagrammatic elevation of an apparatus as above described. Fig. 2 is a top plan view of the apron which forms a part of the apparatus. Fig. 3 is a longitudinal sectional view of the apron and its associate parts as taken on line 3—3 of Fig. 2. Fig. 4 is a top plan view of one of the several arastras employed in the apparatus. Fig. 5 is a diametrical sectional view of one of the arastras as taken on line 5—5 of Fig. 4. Fig. 6 is a view in side elevation of a conventional stamp. Fig. 7 is a view in side elevation partly broken away of the zinc box employed as a part of the apparatus.

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

In carrying into effect the present process it is desirable to pulverize the ores and for this purpose a stamp is employed wherein a chamber 10 is used to contain the ores and the stamp 11 operated within such chamber in any approved manner as from the line shaft 12. It is desirable to supply some of the cyanid to the ores being operated upon within the stamp chamber and a tank 13 is disposed in any approved position having a pipe 14 forming communication between such tank and the stamp chamber and controlled by the valve 15. While the ore is being operated upon by the stamp within the chamber the cyanid solution is admitted and is agitated on association with the ore by the stamp. When the ore has been sufficiently pulverized by the stamp and commingled with the solvent it passes through the screen 16 onto an amalgamating table 17, which also serves to conduct the material to the first arastra 18. In the arastras illustrated a stone floor is employed having a metal rim or flange 20 surrounding the periphery thereof and with a screen 21 supported by a hoop 22 disposed concentrically within the flange 20. The stone floor 19 is hopper shaped and a shaft 23 is vertically journaled axially of such floor operated in any approved manner as by the beveled gears 24 and 25 from the line shaft 12. The shaft 23 is also supplied with radial arms 26 of various lengths carrying at or adjacent their extremities chains 27 attached to which are stones 28 dragging upon the bottom of the floor 19 as the shaft 23 is rotated. At any convenient point a tank 29 is employed containing a stronger solution of the cyanid, some of which is conducted by the pipe 30 controlled by the valve 31 into the first arastra and there, by reason of the mechanical action meets and commingles with the pulverized ore materials being acted upon therein. From the first arastra the spout or con-

veying member 32 is provided taking material therefrom to the second arastra 33, such spout being so arranged relative to the first arastra that a quantity of pulp and material is always present upon the floor before it overflows through such pipe into the second arastra. The second arastra is similar to the first and is operated by the vertical shaft 34 receiving power from the line shaft 12 through the medium of the gears 35 and 36. While two arastras are illustrated in the accompanying drawings, it is to be understood that such number may be decreased or increased at pleasure or as the exigencies of the plant or the condition of the ores may make necessary or desirable. The second arastra is also provided with means as the pipe 37 controlled by the valves 38 and communicating with the tank 29 for supplying added solvent thereto, similar to the action in the first arastra. A spout 39 similar in all respects and positioning to the pipe 32 conducts material from the arastra 33 onto an apron 40 carried upon end rollers 41 and 42 and a center roller 43. The apron is an endless one and receives motion in any approved manner as a shaft 44 intergeared with the line shaft 12 as by the bevel gears 45 and 46. The apron is also secured at its opposite longitudinal edges to sprocket chains 47 and 48 passing over end sprockets 49 and 50 and center sprockets 51 whereby the apron is always held taut. Above the center roller 43 a roller 52 is journaled bearing upon the center roller 43 with a considerable pressure whereby the slime and pulp upon the apron 40 is subjected to a compression between such rollers and the solvent and the contained values expressed from the pulp.

Beneath the apron 40 a pan 53 is disposed adapted to receive the solvent and contained materials passing through the apron either by gravity or compression, and a pipe 54 leads from such pan 53 to a sump tank 55. Above the apron 40 a tank 56 is located communicating by means of a pipe 57 controlled by a valve 58 with a spraying nozzle 59 disposed immediately above the apron 40 and positioned to spray water upon the apron 40 after such apron has passed between the rollers 52 and 43. Beneath the apron 40 is also a pan 60 communicating by means of a pipe 61 with the sump tank 55 and positioned to receive the washings from the pulp upon the apron 40 by reason of the water sprayed from the nozzle 59 or compressed by a roller 62 journaled above the roller 41 and adapted to again submit materials upon the apron to compression. The materials upon the apron are carried about the roller 41 and fall into the discharge sluice 63 and any material clinging to the apron is further discharged by means of the nozzle 64 receiving water through the pipe 65 from the tank 56. The sump tank 55 is supplied with a pipe 66 and a steam nozzle 67 is disposed to lift material from the sump tank 55 through such pipe 66 and discharge it into a settling tank 68. From the settling tank 68 a pipe 69 controlled by a valve 70 leads to the zinc tank 71 wherein the zinc of the tank precipitates the valuable metals from the solution and the solvent freed from the valuable metals is discharged through the pipe 72 by means of the steam nozzle 73 back into the primary tank 13. The steam nozzles 67 and 73 not only serve to raise the material within their respective pipes and discharge it into the tanks as above described but simultaneously heat the liquid so that it is contained in the tanks in a heated condition whereby chemical action is greatly accelerated. Within the zinc tank 71 it is found desirable to supply additional solvent and a tank 74 is, therefore, provided communicating by a pipe 75 with the pipe 69 and controlled by the valve 76 so that as the material flows from the settling tank 68 to the zinc tank 71 solvent is added thereto within the pipe 69 to commingle therewith.

As above explained the apparatus illustrated and just described is only one of the many means by which the present process may be carried into effect, the process comprehending the addition of a solvent heated to a high temperature to the stamp mill conducting the solution and pulp from such stamp mill over an amalgamating table to a series of arastras in each of which solution is added of the required strength to maintain the initial strength of the solvent which is used up in the stamp mill and the arastras by contact with the ores and also the exposure to the atmosphere. The traveling fabric table is also employed to drain out the solvent and valuable ore, both by gravity and compression and to subject the pulp to washing whereby still some of the value is secured. The steam jets for conveying the solvent, while not necessary for such purpose, are found to combine the functions of physically moving the material and at the same time imparting the necessary heat thereto for the greater acceleration of the process. By heating the mixture to near the boiling point, say for instance 180 or 200° Fahrenheit, the extraction is nearly instantaneous. That is as fast as the metals are released by the grinding process, thus making the process of extraction complete during the time it is passing through the successive stages of grinding and exposure to the solvent and atmospheric action.

What I claim is:—

1. The process of extracting metals from ores consisting in grinding the ores in suc-

cessive grinders to increased degrees of fineness, and at once subjecting the exposed metal particles to the combined action of the atmosphere and a solvent.

2. The process of extracting metals from ores, consisting in grinding the ores in successive grinders to increased degrees of fineness, and at once subjecting the exposed metal particles to the combined action of the atmosphere and a heated solvent.

3. The process of extracting metals from ores consisting in grinding ores and at once subjecting the metallic particles exposed by such grinding to the combined action of the atmosphere and a solvent.

4. The process of extracting metals from ores consisting in grinding ores and at once subjecting the metallic particles exposed by such grinding to the combined action of the atmosphere and a heated solvent.

5. The process of extracting metals from ores consisting in grinding the ores upon a floor and exposing particles of the freshly ground ores to the atmosphere immediately after engagement by the grinding mechanism.

6. The process of extracting metals from ores consisting in spreading and maintaining the ores in a solvent upon the floor, moving over the floor a grinding means and exposing the freshly ground particles of ore in a thin layer upon the floor in the immediate wake of the grinding mechanism.

7. The process of extracting metals from ores consisting in maintaining the ores in a solvent upon a floor, moving over the floor grinding bodies whereby a thin layer of suspended ore particles is exposed upon the floor in the atmosphere in the wake of the grinding bodies.

8. The process of extracting metals from ores consisting in grinding ores and at once subjecting the ore surfaces exposed by such grinding to the combined action of the atmosphere and a solvent.

9. The process of extracting metals from ores consisting in grinding ores and at once subjecting the ore surfaces exposed by such grinding to the combined action of the atmosphere and a heated solvent.

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

EDWIN B. GOODWIN.

Witnesses:

ISABEL M. STRONG,

CARLE WHITEHEAD.