R. LUCKENBACH.

AMALGAMATING PROCESS.

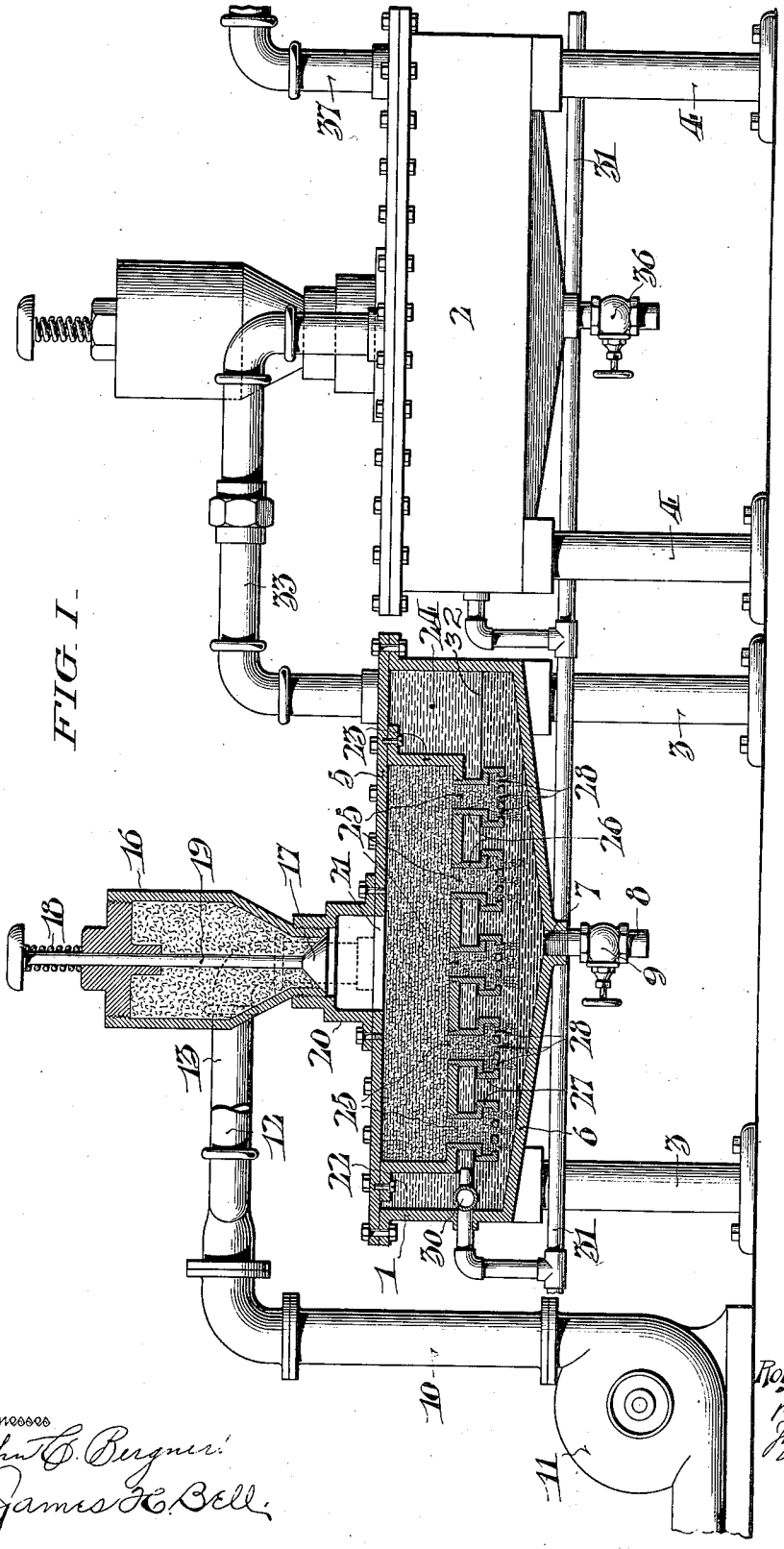
APPLICATION FILED OCT. 18, 1911.

1,124,482.

Patented Jan. 12, 1915.

2 SHEETS—SHEET 1.

FIG. 1.



Witnesses

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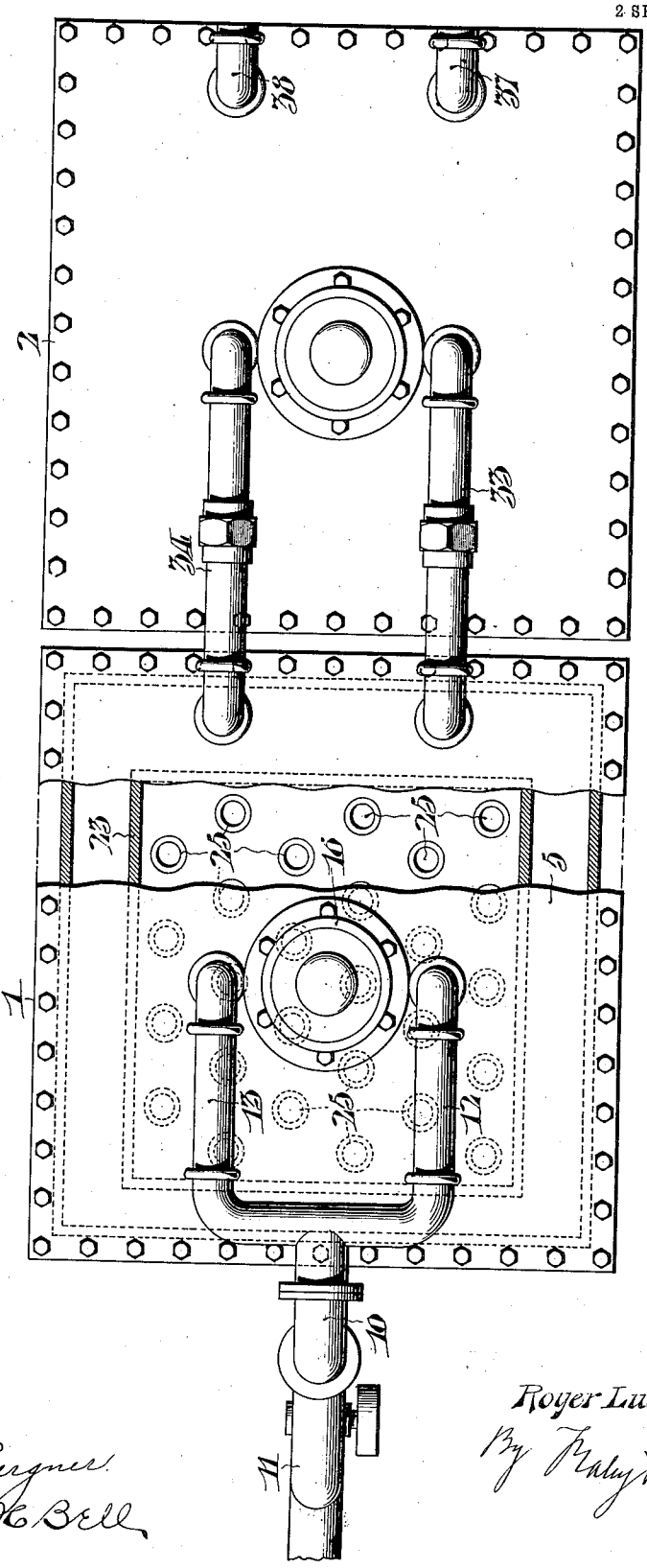
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2 SHEETS—SHEET 2.

FIG. II.



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UNITED STATES PATENT OFFICE.

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AMALGAMATING PROCESS.

1,124,482. Specification of Letters Patent. Patented Jan. 12, 1915.

Application filed October 18, 1911. Serial No. 655,394.

To all whom it may concern:

Be it known that I, ROYER LUCKENBACH, residing at Darby, in the county of Delaware and State of Pennsylvania, have invented certain new and useful Improvements in Amalgamating Processes, whereof the following is a specification, reference being had to the accompanying drawings, which illustrate a typical apparatus convenient for carrying out my improved process.

In said drawings, Figure I, represents, partly in vertical longitudinal section and partly in side elevation, the form of apparatus referred to. Fig. II, is a top or plan view, a portion of the top casing being broken away to show the interior construction.

My invention relates to the recovery of amalgamable metallic constituents from ore, or other admixture thereof, by means of mercury, or a mercurial compound. The improved process is addressed particularly to insuring thorough and substantially uniform diffusion of the material undergoing treatment, so as to afford complete access of the amalgamating agent thereto; also to presenting said material to the amalgamating agent at a region where the maximum avidity of the latter exists; and also to separating and positively removing the gangue, or other waste portions, with a minimum of interference to the amalgamating action.

I will first describe the apparatus selected as a typical one adapted to the conduct of the process, which apparatus is shown as comprising two similar units arranged in series, so that the ore can be subjected to successive treatments, but it must be understood that the invention is not restricted to the use of such apparatus. As the two units are similar in internal construction and arrangement, it will be only necessary for the purposes of the present specification, to describe in detail one thereof.

Referring to the drawings, the respective units comprise closed tanks or receptacles 1, and 2, in this instance rectangular in general outline, and mounted upon legs 3, and 4, respectively. The internal construction thereof is illustrated in the sectional view at the left hand portion of Fig. I, and the broken away portion of Fig. II, where it will be seen that the tank 1, is provided with a removable top or cover 5, and that the bottom portion 6, tapers from all four sides toward a central aperture 7, having a discharge pipe 8, and valve 9.

The inlet conduit 10, having a pumping device whose casing is conventionally indicated at 11, leads into the upper portion of the tank 1, by means of the bifurcated pipes 12, and 13. Between said pipes there may be conveniently located a receptacle 16, for the admission of any reagent which it may be deemed desirable to employ, in conjunction with the mercury or compound thereof. Said receptacle is cylindrical in form, having a conical bottom as shown, with an aperture controlled by means of a valve 17, automatically retained in a closed position by means of a spring 18, surrounding the stem 19, and manually operable by a downward pressure transmitted through said stem. The receptacle 16, may conveniently be mounted by providing a screw thread upon the exterior of its bottom portion, engaging with an internal thread in the neck of an approximately cylindrical chamber 20, removably secured to the top of the tank 1, and surrounding the opening 21, which registers with the aperture in the bottom of the chamber.

A downwardly depending casing 23, is mounted upon the under side of the top 5, of the tank and extends across the same from side to side, there being however an interspace between the exterior walls of said casing and the walls of the tank at the ends of the latter, as indicated at 22, and 24, respectively. The bottom of said casing 23, is provided with a number of symmetrically arranged apertures 25, from each of which depends a discharge tube 26, whose lower portion is enlarged, as shown at 27, and having a bottom provided with a plurality of orifices 28. These enlarged lower ends of the discharge tubes project laterally to some extent all around and above the actual regions of discharge, thus affording shields to protect the descending ore and the amalgamated material, as will be hereinafter described. A jet 30, extends into the end of the casing so as to communicate with the open space 22, said jet being connected with a pipe 31, for the admission of water or steam under pressure from any convenient source, (not shown in the drawings). Discharge pipes 33, and 34, lead from orifices in the top 5, of the casing, above the space 24, said discharge pipes

leading into the top of the next tank 2, where they enter in the same relation thereto, as was characteristic of the inlet pipes 12, and 13, of the tank 1.

As before stated, the internal construction of the tank 2, which constitutes the second unit of the series, is similar to that just described and the only points necessary to note are that said tank 2, is provided with top discharge pipes 37, and 38, respectively, which may lead either to the dump, or, if desired, may constitute the inlet pipes of a third unit arranged in the similar serial relation to the second one.

In order to conduct my improved process by means of the above apparatus, I proceed as follows:—The lower portion of the tanks 1, and 2, is filled with the liquid amalgamating reagent consisting of mercury, or a mercurial compound, to such a depth that the level of the reagent is well above the plane of the discharge openings 28, and preferably coincident with the plane of the peripheral flanges formed by the upper surfaces of the enlargements 28, as indicated at 32.

The material to be treated is supplied in the form of a pulp comprising finely ground ore commingled with water, or an aqueous solution, and is pumped into the tank 1, under considerable pressure, through the inlet pipes 12, and 13. The pulp is primarily discharged into the interior of the casing 23, where it tends to diffuse itself substantially throughout the whole thereof, and consequently is subdivided into a number of streams, which descend through the tubes 26, and are again definitely subdivided into an increased number of smaller streams issuing through the orifices 28, and discharging well beneath the surface of the amalgamating reagent. Thus the particles sought to be recovered are not only definitely diffused in a uniform manner throughout the body of the amalgamating agent, but are introduced thereto considerably below the upper level thereof, and consequently at a region where said agent is relatively free from oxids, or other substances, which float upon the surface and whose presence might tend to interfere with the amalgamating action. Furthermore, the descending streams of ore, as well as the amalgamated particles, are effectually protected against entrainment by the current of floating gangue, which is forced through the apparatus, across the top surface of the amalgamating agent, such protection being afforded by the lateral projection of the enlarged lower ends of the tubes 26.

When an adjunctive reagent is employed, such for instance, as a solvent of the metal sought to be recovered, or a material which may tend to enhance the avidity of the mercury itself, such substances may conveniently be fed by means of the receptacle 16, and its controlling valve 19, into the body of the pulp stream before its subdivision, and such solvent, or other substance, will thus be diffused through the pulp. As the action of the mercury proceeds, the amalgams of the precious metals, (which are usually the ones sought to be recovered), tend to descend toward the bottom of the tank, while the gangue and impurities rise to the top and float upon the surface of the mercury, and when the interspace between the casing 23, and the tank is filled to overflowing by the continued admission of pulp, the floating portions are discharged through the pipes 33, and 34, into the next tank of the series, where the process just described recurs, and finally the tailings or waste is discharged to the dump.

If desired, the discharge and removal of the floating portions can be expedited, by the admission of water or steam through the jet 30, as the forced current thereby created will tend to drive them through the apparatus, more rapidly than would be the case if the action depended solely upon the current of entering pulp, but in either case the particles which are heavy enough to remain in the body of the mercury are not disturbed by the passage of the superincumbent material.

I am of course aware that amalgamating processes of various kinds have long been in use, and that it is not new to cause a stream of pulp to pass along, or through, a body of mercury, and therefore I do not claim broadly such a method of treatment. So far as I am aware however, my invention is peculiar in the feature of extended and definite subdivision of the pulp streams, the positive submergence of said streams below the surface of the mercury, and the continuous removal of the floating portions in a definite and protected stratum and hence without disturbance to the amalgamating action, and also in the further feature of employing, in conjunction with the characteristics just mentioned, a positive vehicle for carrying off the floating portions, irrespective of the action of the main feed.

I use the term "ore," in my claims, as comprehending any admixture of amalgamable metallic particles with non-amalgamable foreign material, whether such admixture be in its initial native condition, or be a residuum of previous treatment, or otherwise.

Having thus described my invention, I claim:

1. The hereinbefore described improvement in amalgamating processes, which consists in positively feeding ore pulp in a plurality of definitely divided streams into a body of liquid amalgamating re-agent at points substantially below the surface there-

of; retaining the amalgamated portions within said liquid; permitting the unamalgamated portions to separate and float upon the surface of said liquid; introducing an independent current of a fluid vehicle along the surface of the amalgamating reagent; and driving said floating portions off by the combined effects of the feed and of said independent vehicle.

2. The hereinbefore described improvement in amalgamating processes, which consists in positively feeding ore pulp in a plurality of definitely divided streams into a body of liquid amalgamating reagent, at points substantially below the surface thereof; retaining the amalgamated portion within said liquid; permitting the unamalgamated portions to separate and float upon the surface of said liquid; introducing an independent current of a fluid- vehicle along the surface of the amalgamating reagent; and driving off said floating portions in a definite and protected stratum by the combined effects of the feed, and of said independent vehicle, whereby entrainment of the amalgamated portions or ore is prevented.

In testimony whereof, I have hereunto signed my name at Philadelphia, Pennsylvania, this sixteenth day of October 1911.

ROYER LUCKENBACH.

Witnesses:

JAMES H. BELL,

E. L. FULLERTON.