

No. 841,006.

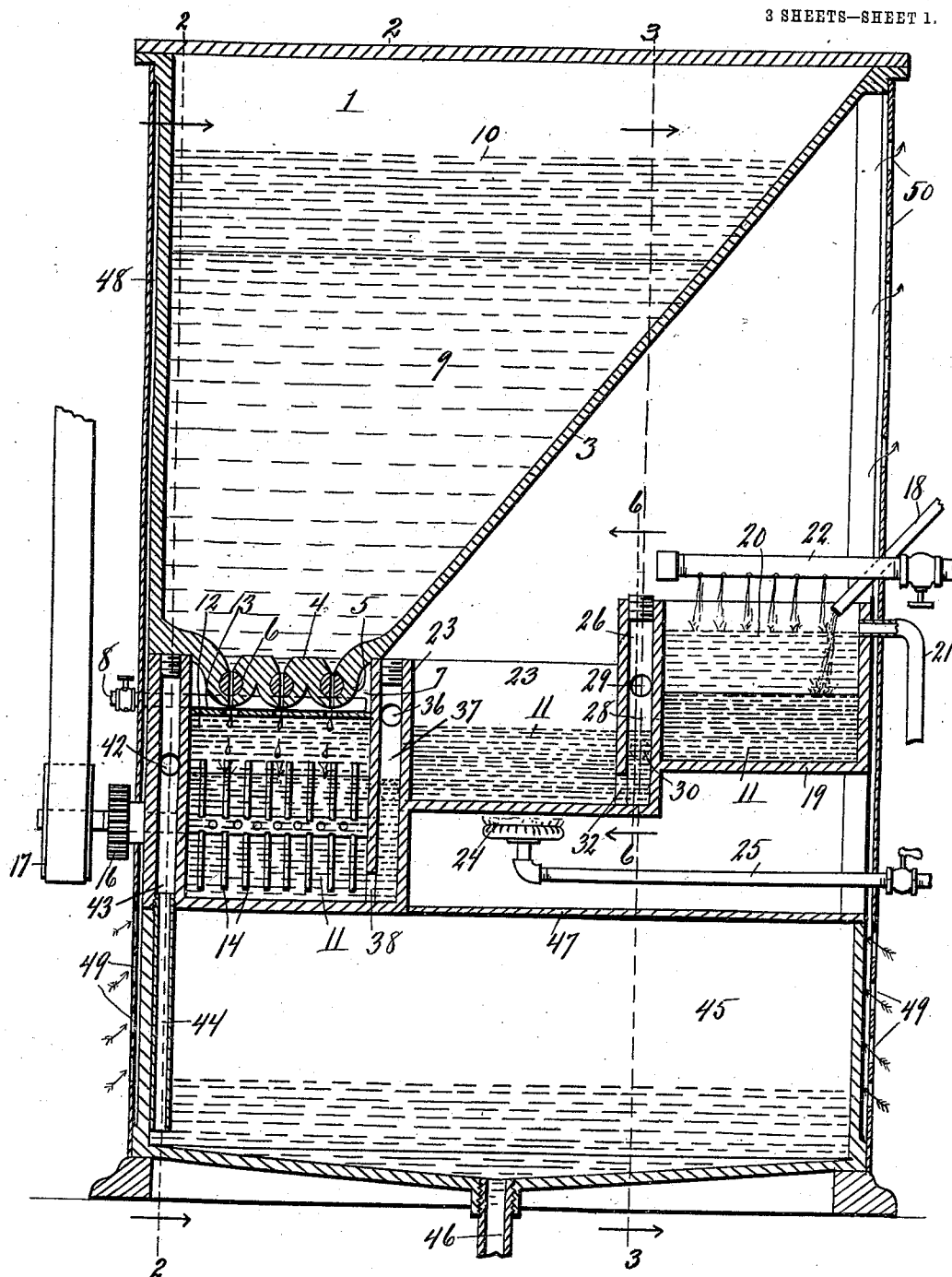
PATENTED JAN. 8, 1907.

H. P. EWELL.

APPARATUS FOR THE MANUFACTURE OF REDUCING AMALGAM.

APPLICATION FILED JAN. 8, 1906.

3 SHEETS—SHEET 1.



—Witnesses.
O. B. Baenziger.
J. B. Hewlett.

Fig. 1.

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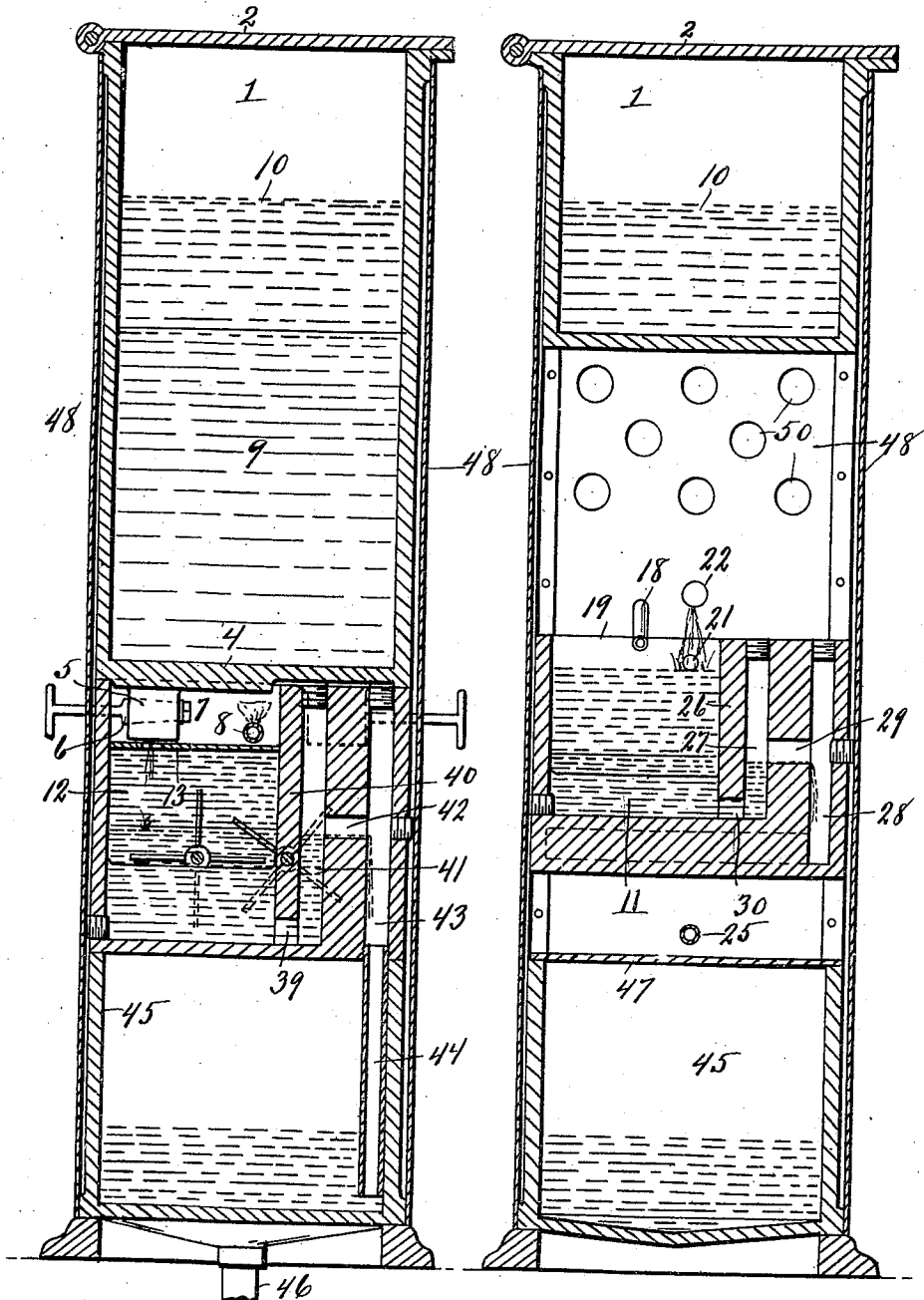


Fig. 2.

Fig. 3.

Witnesses.

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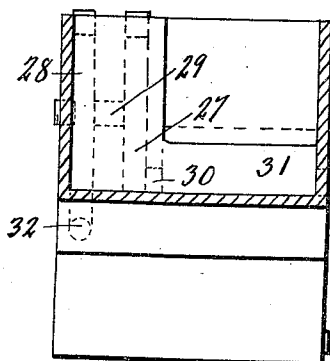
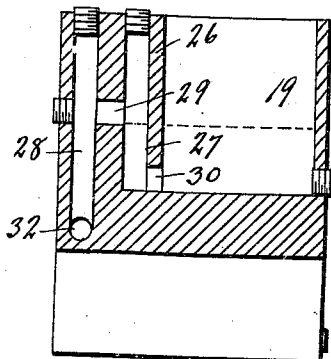
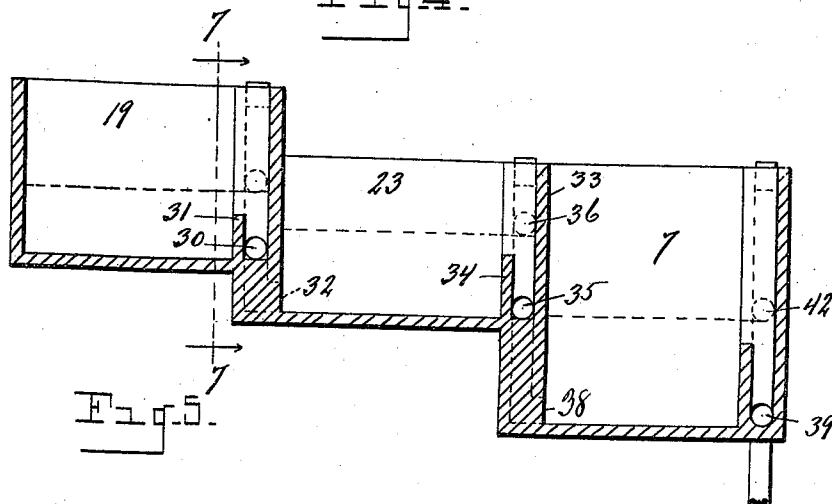
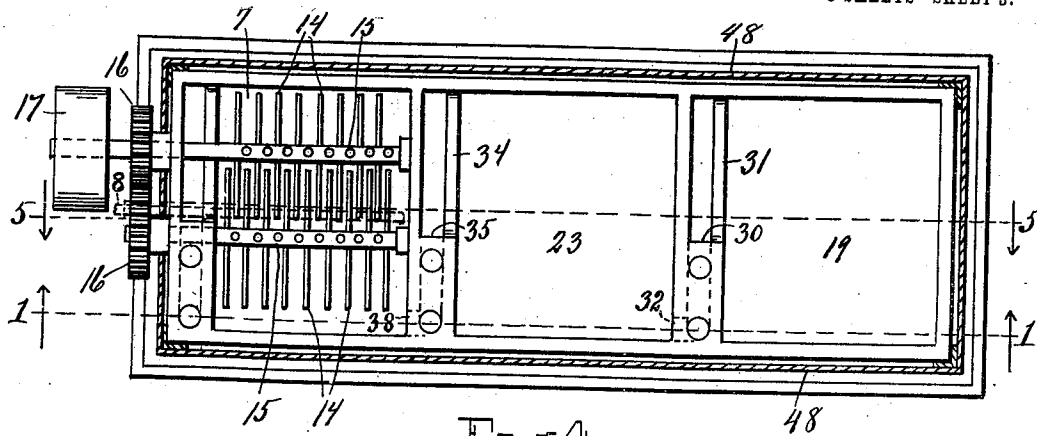
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—Witnesses.
O. B. Baenziger,
J. G. Howlett.

Inventor. —
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UNITED STATES PATENT OFFICE.

HERBERT P. EWELL, OF ROCHESTER, MICHIGAN.

APPARATUS FOR THE MANUFACTURE OF REDUCING-AMALGAM.

Patented Jan. 8, 1907.

No. 841,006.

Specification of Letters Patent.

Application filed January 8, 1906. Serial No. 295,025.

To all whom it may concern:

Be it known that I, HERBERT P. EWELL, a citizen of the United States, residing at Rochester, in the county of Oakland, State of Michigan, have invented certain new and useful Improvements in Apparatus for the Manufacture of Reducing-Amalgam; and I do 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, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

This invention relates to apparatus for the manufacture of reducing-amalgam for amalgamating purposes; and it consists in the construction and arrangement of parts herein-
after fully set forth, and pointed out particularly in the claims.

The objects of the invention are to provide simple and efficient means for introducing the reducing agent, preferably sodium, into the amalgamating material, preferably mercury, in a manner to prevent the formation of a solid block of sodium amalgam, the reducing-amalgam formed by the sodium and mercury being maintained in a fluid state because of the presence of an excess of mercury over the sodium.

A further object is to provide for returning the mercury from an amalgamating-machine and introducing it into the apparatus where-
in the reducing-amalgam is formed, provision being made for washing the mercury, so as to cleanse it of all impurities and foreign matter and for heating it, so as to drive the moisture therefrom before introduction into the chamber wherein it is amalgamated with sodium, the cleansing and drying of the mercury obviating exhausting the sodium by contact with oxids and sulfids and with the moisture which the mercury would otherwise contain after washing were it not dried.

A further object is to provide for a continuous flow of the mercury into the apparatus from an amalgamator and the discharge from the apparatus of a reducing-amalgam into an amalgamating-machine.

A further object is to provide for excluding air from the reducing agent in the apparatus, so as to prevent it attacking the oxygen in the air and for excluding air from the reducing-amalgam while being formed for the same reason, thereby maintaining the reduc-

ing agent unimpaired until it is brought into service in the amalgamating-machine.

A further object is to provide means for agitating the amalgamating material at the time of the introduction of the reducing agent thereinto to facilitate amalgamation and obviate the formation of hard sodium amalgam in excess of mercury.

A further object is to provide for the passage of the mercury or amalgamating material through the apparatus by gravity in a manner to obviate a possible backward flow thereof.

A further object is to provide for the introduction of heat to the apparatus, so as to reduce the sodium to a fluid and maintain it in a fluid state when introduced into the mercury or amalgamating material.

The above objects are attained by the apparatus illustrated in the accompanying drawings, in which—

Figure 1 is a vertical section through the apparatus, as on line 1 1 of Fig. 4. Fig. 2 is a like section, as on line 2 2 of Fig. 1. Fig. 3 is a similar section, as on line 3 3 of Fig. 1. Fig. 4 is a plan view of the apparatus with the casing appearing in horizontal section and the top section removed. Fig. 5 is a central longitudinal section through the receptacles forming the middle section, the agitator being omitted and the section being taken on line 5 5 of Fig. 4. Fig. 6 is a transverse section, as on line 6 6 of Fig. 1. Fig. 7 is a transverse section, as on line 7 7 of Fig. 5.

The apparatus in which the reducing-amalgam is formed consists of a rectangular body, comprising an upper section, a central or middle section, and a lower section, which may be made separately or integral, as desired. The upper section comprises a receptacle 1, having a hinged top 2 and upon one side an inclined wall 3, whereby the bottom 4 of the receptacle 1 is materially reduced in length, but in width remains equal to the width of said receptacle. Located in bosses 5, depending from the bottom 4 of said receptacle, are a number of plug-cock valves 6, through which the contents of the receptacle 1 may be discharged into the amalgamating-chamber 7 of the middle division of the apparatus, which is immediately below the bottom of the receptacle. Projecting into the amalgamating-chamber 7 is a gas-pipe 8, having suitable apertures therein, by means of which a number of jets of flame may be directed against the under side of the bottom

4 for the purpose of heating the contents of said receptacle. Within the receptacle 1 is placed a reducing agent 9, preferably sodium, which is rendered fluid by the application of heat, so as to enable it to be fed as desired through the plug-cock valves into the amalgamating-chamber. Within the receptacle 1 and upon the surface of the sodium is a stratum of paraffin 10 or analogous material. The presence of the paraffin excludes air from the surface of the sodium and prevents the chemical action which would be incident to the contact of air therewith.

Occupying the lower portion of the amalgamating-chamber is a suitable amalgam material 11, preferably mercury, and upon the top of said mercury is a stratum of paraffin 12. Crossing the top of the amalgamating-chamber is a covering-plate 13, having apertures therethrough in line with the discharge-openings from the valves 6, so as to permit the sodium from receptacle 1 to flow into the amalgamating-chamber, said sodium passing through the paraffin because of its greater specific gravity and reaching the surface of the mercury 11. The presence of the paraffin upon the surface of the mercury in the amalgamating-chamber excludes air from the mercury, thereby preventing an explosion which would otherwise occur upon contact of the sodium with the surface of the mercury.

To prevent the formation of hard sodium amalgam where the sodium comes in contact with the surface of the mercury, owing to the excess of sodium at that point, agitators are placed in the amalgamating-chamber for the purpose of carrying the sodium into the body of mercury, so as to always maintain an excess of mercury, thereby suspending the sodium therein and maintaining the sodium amalgam in the desired state of fluidity, said agitators consisting of radial arms 14, projecting from the parallel rotary shafts 15, which are suitably journaled in the amalgamating-chamber and whose outer ends are connected by the meshing gears 16, one of said shafts carrying a pulley 17 by means of which the desired rotary motion is imparted thereto. The arms of the opposed shafts overlap and are arranged staggeringly, so as to allow them to pass as the shafts rotate. The function of the agitators is to carry the sodium into the mercury and distribute it throughout the mercurial body, so as to render the amalgam uniform.

It is designed to employ this machine in connection with an ore-amalgamator wherein wells of the amalgamating material are employed, over which the ore-pulp is caused to pass, said wells of amalgamating material being supplied with reducing-amalgam from this apparatus, which is suitably connected thereto, the reducing-amalgam being so fed to the machine as to cause it to flow from well to

well down the inclined table in which the wells are located to a receptacle at the tail of the machine, from which receptacle the mercury or amalgamating material is returned to this apparatus by a suitable pump (not shown) to be washed and dried and again impregnated with sodium, thereby maintaining practically a constant flow of the reducing-amalgam from this apparatus through the amalgamating-machine, the amalgamating material being brought back to this apparatus after the passage through said machine for recharging with the reducing agent.

It is well understood in the art that mercury or analogous material in passing through an amalgamating-machine becomes more or less impregnated with foreign matter—such as oxids, &c.—which if they were not removed will be attacked and reduced by the sodium in the amalgamating-chamber, thereby exhausting the sodium and creating annoying gases. To rid the return mercury of its impurities, it is discharged through a suitable pipe 18 into a washing-tank 19, in which indicates the mercury or amalgamating material, and 20 the water, which is maintained at the proper level by means of an overflow-pipe 21, the water being supplied through a suitable spray-pipe 22, which projects over the tank 19. From the washing-tank the mercury is discharged by gravity into a drying-tank 23, in which the moisture is evaporated therefrom, the heat being furnished by a suitable burner 24, located under the bottom of said tank and supplied with hydrocarbon gas through a pipe 25.

It will be noted that the drying-tank 23 is below the level of the washing-tank 19. In order to trap the mercury between said tanks and maintain it at the desired level in the washing-tank and prevent the possibility of a backward flow of mercury from the drying-tank and at the same time insure the drawing of the mercury from the bottom of the washing-tank, so as to avoid the dirt which may be upon the surface thereof, said tanks are separated by a dividing-wall 26, through which are formed vertical passages 27 and 28, connected by a horizontal passage 29 at the level it is desired to maintain the mercury in the washing-tank. Connecting the washing-tank at the level of the bottom thereof with the vertical passage-way 27 is an opening 30. (More clearly shown in Fig. 3.) Separating the opening 30 from the body of the washing-tank is a short vertical apron 31, over which the mercury must flow in order to reach the horizontal opening 30. By this arrangement it will be noted that the mercury flowing through the opening 30 fills the vertical passage 27 to the level of the horizontal passage 29. After reaching the level of the horizontal passage 29 the addition of mercury to the washing-tank will cause an overflow of mercury from passage 29 into the vertical pas-

sage 28 and through the horizontal opening 32 at the bottom of passage 28 into the drying-tank 23.

It will therefore be seen that by this arrangement the mercury in the washing-tank is always maintained at the level of the horizontal passage 29 and that in order to enter said passage 29 the mercury must first enter the vertical passage 27 through the horizontal opening 30, thereby causing the mercury to draw from the bottom or lower portion of the washing-tank. The same arrangement is used in providing for the passage of the mercury from the drying-chamber 23 into the amalgamating-chamber 7, the communicating passages being formed in the dividing-wall 33, which separates said tanks, the mercury flowing over the apron 34 to the horizontal passage 35, thence to a vertical passage leading to the upper horizontal passage 36, the height of which determines the level of mercury in the drying-tank, thence into the vertical passage 37, which communicates at its lower end with an aperture 38, leading into the bottom of the amalgamating-chamber. After the mercury and sodium shall have been thoroughly amalgamated, as before described, the reducing-amalgam is discharged from the amalgamating-chamber through a port 39 at the level of the bottom of the amalgamating-chamber formed through the partition 40 and communicating with the vertical passage 41, with which the horizontal passage 42 communicates, said horizontal passage determining the level of the amalgam in the amalgamating-chamber. A vertical passage 43 receives the amalgam from the horizontal passage 42 and directs it into a vertical tube 44, whose lower end terminates adjacent to the bottom of the storage tank or receptacle 45, in which the reducing-amalgam is contained and from which said amalgam is conveyed to an amalgamating-machine (not shown) by a suitable pipe 46, communicating with the bottom thereof. The storage-tank is provided with a closed top 47, which excludes air therefrom and prevents foreign substances falling into the reducing-amalgam after it is prepared.

The apparatus is inclosed in a sheet-iron casing 48, which is spaced from the walls thereof to afford a circulation of air, said casing at the bottom being provided with ventilating-openings 49 and at the top with ventilating-openings 50. The lower openings permit of the entrance of sufficient air to supply the burners, while the upper openings permit of the escape of the moisture which is evaporated from the mercury in the drying-tank.

It will now be understood that by means of this apparatus the mercury used in an amalgamating-machine may be washed, dried, and amalgamated with a suitable reducing agent and in the form of a reducing agent

passed through the amalgamating-machine, and the mercury after the exhaustion of the reducing agent again returned for reamalgamation, making it possible to maintain a continuous operation.

It is essential to amalgamation that the mercury at the time of the introduction of the sodium be heated. The heat necessary for the purpose of amalgamation is supplied to the mercury in the drying-tank and is retained by the mercury in its passage to the amalgamating-chamber.

Having thus fully set forth my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an apparatus for the manufacture of reducing-amalgam, the combination of a receptacle for the reducing agent, an amalgamating-chamber, means for discharging the reducing agent into the amalgamating material in said chamber, and means for excluding air from the amalgamating material at the point of introduction of the reducing agent thereto.

2. In an apparatus for the manufacture of reducing-amalgam, the combination of a receptacle for the reducing agent, an amalgamating-chamber, means for discharging the reducing agent into the amalgamating material in said chamber, means for excluding air from the amalgamating material at the point of introduction of the reducing agent thereto, and an agitator within the amalgamating-chamber to facilitate amalgamation.

3. In an apparatus for the manufacture of reducing-amalgam, the combination of a receptacle for the reducing agent, an amalgamating-chamber, means for introducing the reducing agent into the amalgamating material in said chamber, means for applying heat to the reducing agent to maintain it in a fluid state, means for excluding air from the amalgamating material at the point of introduction of the reducing agent thereto, and an agitator to facilitate amalgamation.

4. In an apparatus for the manufacture of reducing-amalgam, the combination of a receptacle for the reducing agent, means for heating the reducing agent in said receptacle to maintain it in a fluid state, means for excluding air from the surface of said reducing agent, an amalgamating-chamber, means for discharging the reducing agent onto the surface of the amalgamating material in said chamber, means for excluding air from the surface of the amalgamating material, and an agitator to facilitate amalgamation.

5. In an apparatus for the manufacture of reducing-amalgam, the combination of a receptacle for the reducing agent, means for applying heat to hold said reducing agent in a fluid state, a fatty substance in a fluid state upon the surface of the reducing agent to exclude air therefrom, an amalgamating-chamber, means for discharging the reducing agent

into the amalgamating material in said chamber, a fatty substance upon the surface of the amalgamating material through which the reducing agent passes, and means
5 for facilitating amalgamation.

6. In an apparatus for the manufacture of reducing-amalgam, the combination of an amalgamating-chamber, means for introducing amalgamating material into said
10 chamber, means for washing and drying said amalgamating material before entrance into said chamber, a receptacle for the reducing agent, and means for discharging the reducing agent into the amalgamating material in
15 said chamber to form the reducing-amalgam.

7. In an apparatus for the manufacture of reducing-amalgam, the combination of an amalgamating-chamber adapted to contain
20 amalgamating material, a receptacle to contain the reducing agent, means for discharging the reducing agent in small quantities into the amalgamating material in said chamber, and means for excluding air from the amalgamating material at the point of entrance
25 of the reducing agent thereinto.

8. In an apparatus for the manufacture of reducing-amalgam, the combination of an amalgamating-chamber, a drying-tank, a
30 washing-tank, means for regulating and directing the flow of the amalgamating material through said tanks into said chamber, a receptacle for the reducing agent, means for directing the reducing agent from said receptacle into the amalgamating material,
35 and an agitator to facilitate amalgamation.

9. In an apparatus for the manufacture of reducing-amalgam, the combination of a washing-tank, a drying-tank, an amalgamating-chamber arranged in successively-declining planes in the order mentioned, means
40 for maintaining the amalgamating material at a proper level in said tanks and chamber and directing the flow of said material by gravity into said chamber through said tanks.

10. In an apparatus for the manufacture
45 of reducing-amalgam, the combination of an amalgamating-chamber, means for introducing amalgamating material into said chamber, means for washing and drying said amalgamating material before entrance into
50 said chamber, and means for discharging the reducing agent into the amalgamating material in said chamber to form the reducing-amalgam.

11. In an apparatus for the manufacture
55 of reducing-amalgam, the combination of an amalgamating-chamber adapted to contain amalgamating material, means for discharging the reducing agent into the amalgamating material in said chamber, and means for
60 maintaining the amalgamating material in excess of the reducing agent at the point of introduction of said reducing agent into said amalgamating material.

In testimony whereof I sign this specification
65 in the presence of two witnesses.

HERBERT P. EWELL.

Witnesses:

E. S. WHEELER,
I. G. HOWLETT.