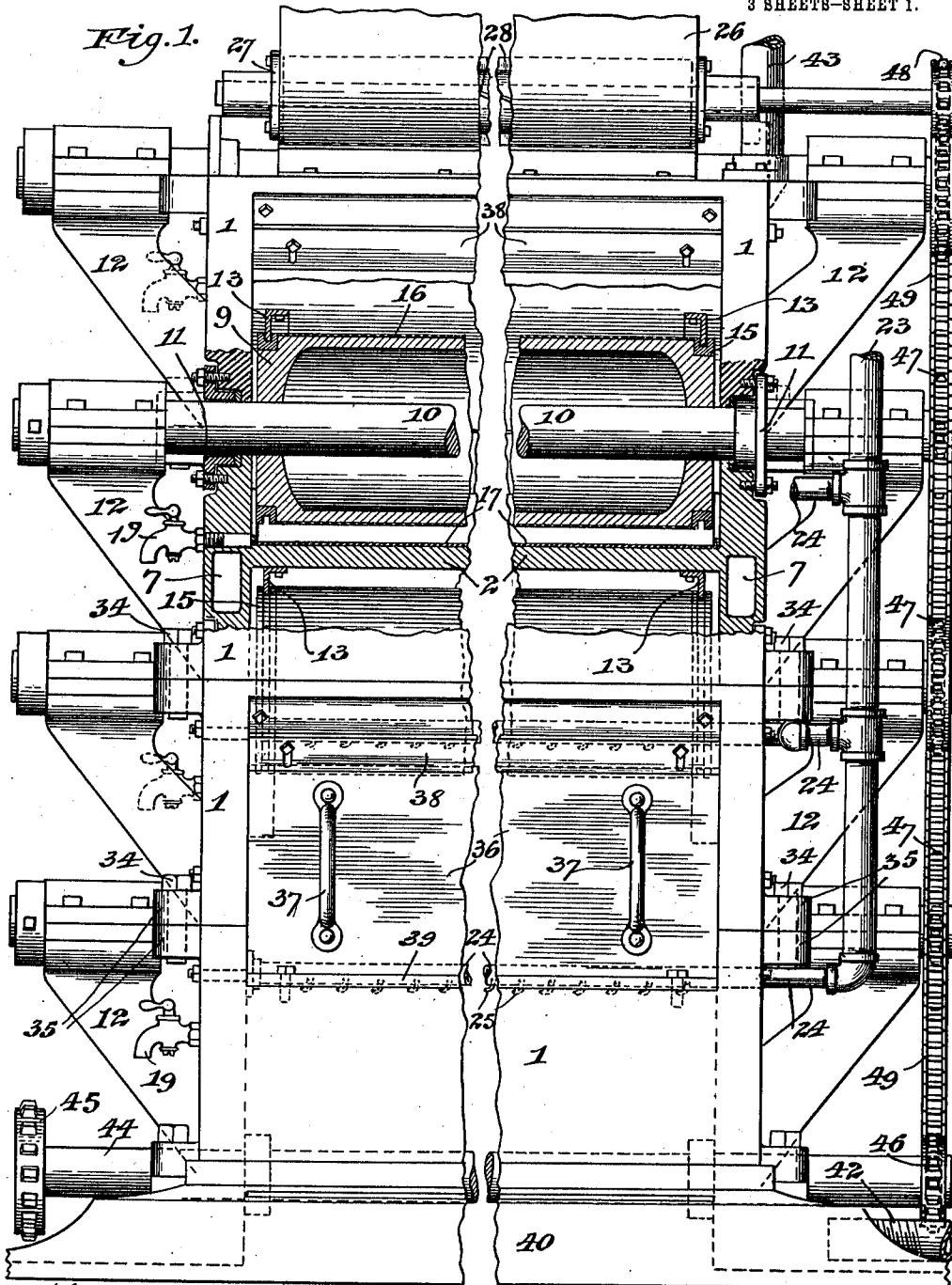


ORE SEPARATOR.

1,031,285.

3 SHEETS-SHEET 1.



Witnesses,
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FRANK C. O'BRIEN & FREDERICK C. O'BRIEN.

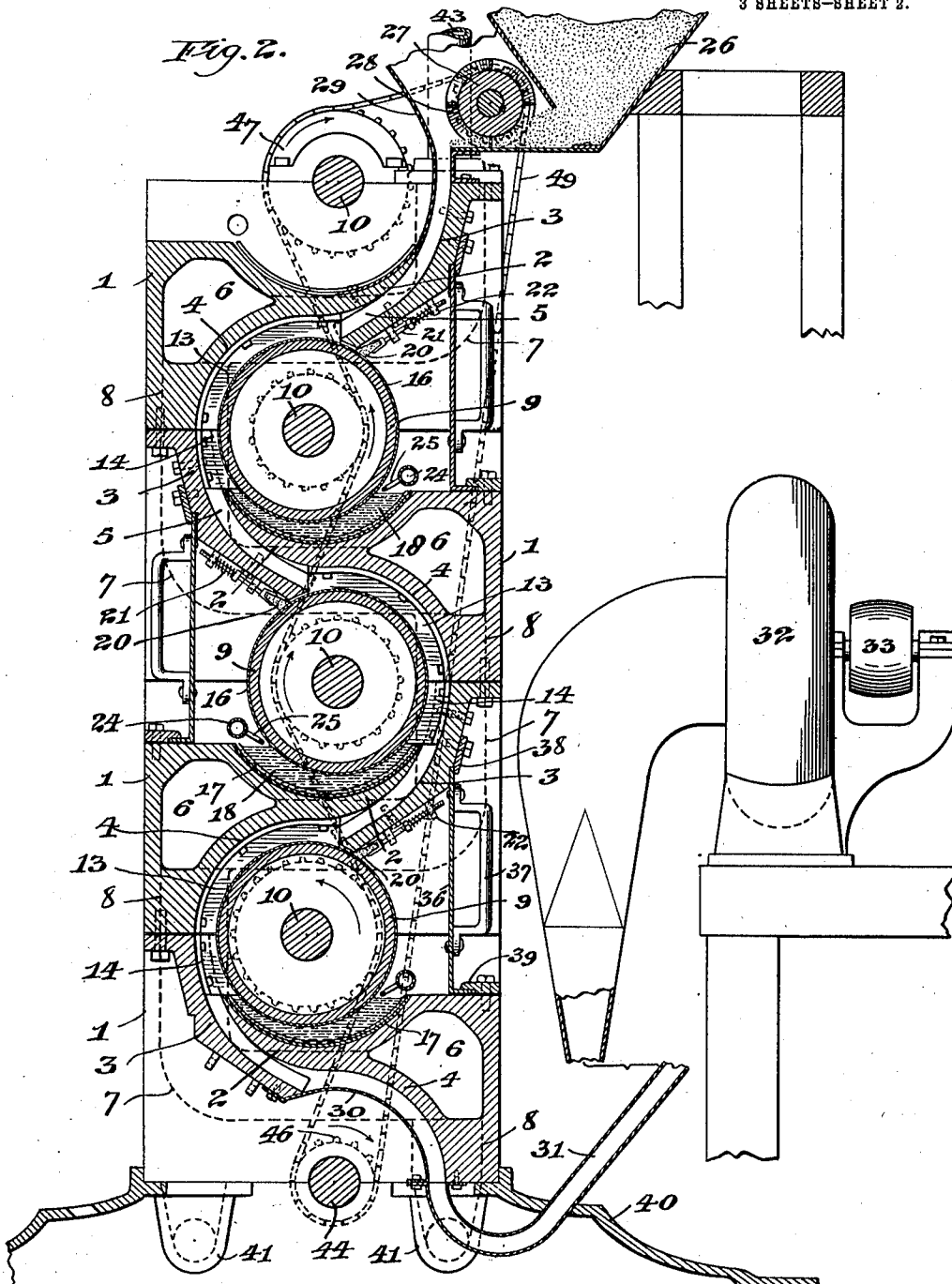
ORE SEPARATOR.

APPLICATION FILED SEPT. 28, 1910.

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Patented July 2, 1912.

3 SHEETS-SHEET 2.



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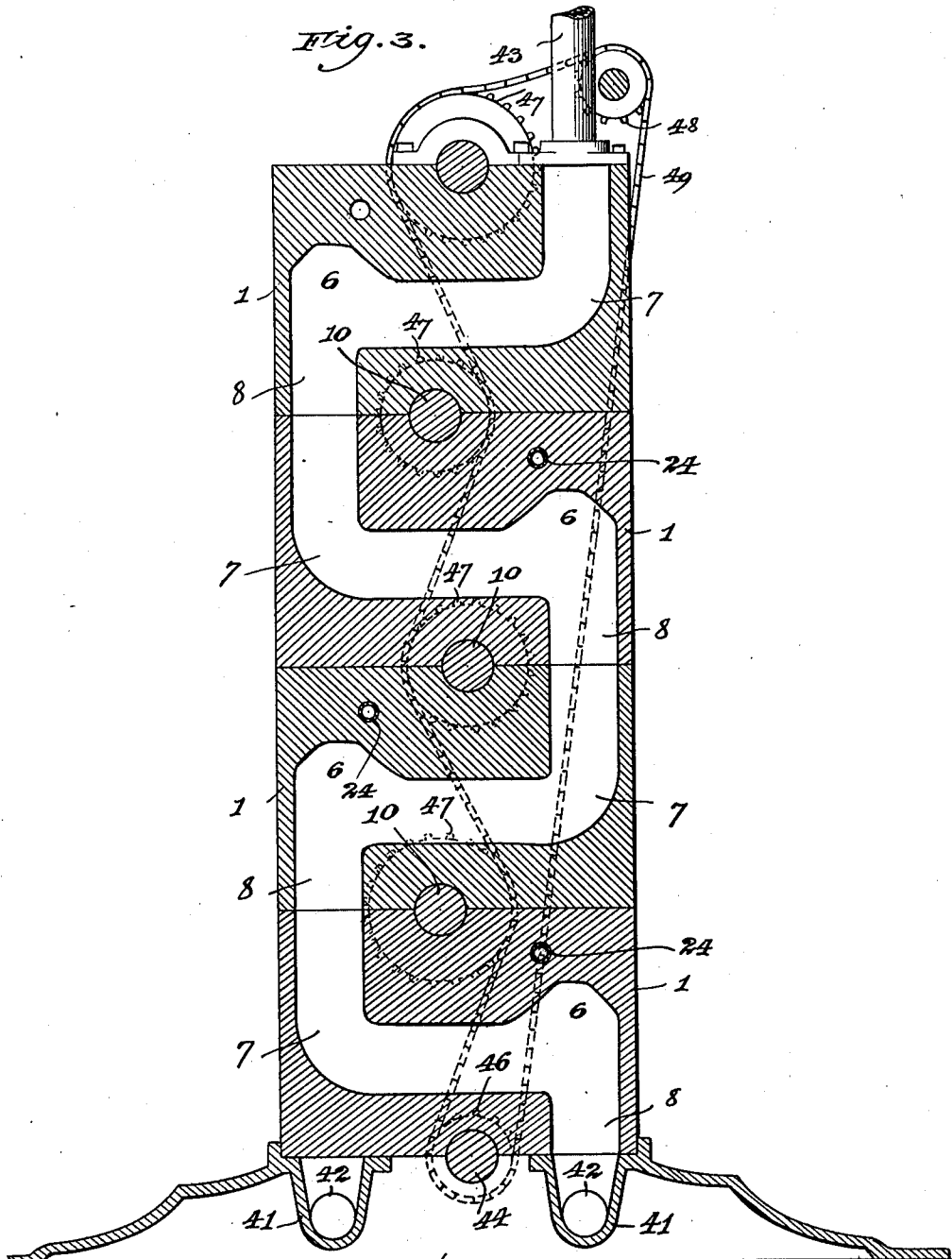
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3 SHEETS-SHEET 3.



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UNITED STATES PATENT OFFICE.

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ORE-SEPARATOR.

1,031,285.

Specification of Letters Patent.

Patented July 2, 1912.

Application filed September 28, 1910. Serial No. 584,236.

To all whom it may concern:

Be it known that we, FRANK C. O'BRIEN and FREDERICK C. O'BRIEN, both citizens of the United States, residing, respectively, at Denver, Colorado, and Prescott, Arizona, have invented certain new and useful Improvements in Ore-Separators, of which the following is a specification.

This invention relates to ore separators and more particularly to that class known as "dry" separators, in which the use of water is dispensed with.

The apparatus of the present invention is of the same general type or character as that set forth in Letters Patent to Frank C. O'Brien, No. 702,990, June 24, 1902; and it consists in several improvements in the amalgamator therein shown designed to simplify the construction, facilitate the manipulation, and increase the efficiency of such device.

An apparatus embodying our invention is illustrated in the accompanying drawings, in which—

Figure 1 is a side elevational view, partly in vertical axial section, of our improved ore separator; and Fig. 2 is a transverse vertical section through the same, with the air-forcing device shown in elevation. Fig. 3 is a vertical sectional view through one of the side walls of the structure, more particularly illustrating the continuous conduit for the heating agent of the mercury troughs.

Referring to the drawings, the frame work of the apparatus comprises chiefly a plurality of superposed sections consisting of identical hollow rectangular castings 1, of which adjacent superposed castings are inversely disposed widthwise relatively to each other. Each casting is formed substantially centrally thereof with a longitudinally disposed concave mercury trough 2 and with curved walls 3 and 4 which form in part the walls of a serpentine conduit designated as an entirety by 5 for the air-blast and the pulverized ore carried thereby. Within and extending lengthwise of each section below and to one side of the mercury trough 2 is a cored chamber 6 which communicates at its ends with cored passage-ways 7 and 8 in the end walls, the passage-way 7 of one section registering with the passage-way 8 of an adjacent section, whereby the chambers 6 of the several sections are in free communication with each other (see

Fig. 3). Each section below the conduit walls 3 and 4 and above the trough 2 and the top wall of the chamber 6 is open or hollow between the end walls; and within these registering upper and lower spaces of adjacent sections are journaled a series of drums 9, each drum being fast on a shaft 10 that extends through suitable stuffing boxes 11 in the end walls of the casting and is journaled in brackets 12 secured to said end walls, as clearly shown in Fig. 1. The several drums are located opposite and substantially co-axially with the curved stationary conduit walls 4 and the upper portions of the stationary conduit walls 3, and constitute moving portions of said conduit walls. The side of each trough 2 lying opposite the wall 3 also forms a stationary portion of the front and rear walls of the conduit; and the latter is sealed at its sides throughout those portions which are formed in part by the drums themselves by means of curved packing-strips each made in two registering sections 13 and 14 that are secured respectively to the walls 3 and 4 near the ends of each section (Fig. 1) and engage grooved annular packings 15 applied to the ends of the drums.

Each drum is provided with a surface covering or sheath 16 of copper; and similarly each mercury trough 2 has a removable copper lining 17.

The several drums 9 rotate in the directions indicated by arrows in Fig. 2, and each dips into a body of mercury 18 contained in the trough 2, which body of mercury may be drawn off from time to time, as required, through a valve-controlled discharge spout or faucet 19 extending through one end wall of the trough.

To seal the air conduit between the lower ends of the walls 3 and the surfaces of the respective drums adjacent thereto we employ felt strips 20 carried by spring-actuated holders 21 slidably mounted in lugs 22 on the undersides of the walls 3, said strips also serving to sweep off and return to the troughs surplus mercury which may adhere to the drums.

In the practical operation of the apparatus considerable of the non-metallic waste matter passing through the same tends to adhere to the surfaces of the drums as the latter emerge from the mercury baths, and this matter we largely remove through the

agency of jet-blasts of air introduced from a suitable source of compressed air through a vertical pipe 23 (Fig. 1), horizontal branch pipes 24 leading therefrom into and
 5 through the respective frame sections and jet-nozzles 25 communicating with said branch pipes and directing the jet-blasts substantially tangentially of the surfaces of the drums at the points where the latter
 10 emerge from the mercury baths.

The pulverized ore to be treated is delivered into a hopper 26 mounted on the upper end of the frame, and is fed in a uniform stream therefrom by a feed-roller 27
 15 suitably journaled across the discharge mouth of said hopper and provided with spiral blades 28 which positively advance the material from the hopper into the upper end of the serpentine conduit 5. A suitably
 20 formed sheet-metal casing 29 forms one wall of the conduit 5 at its upper end; while a similar sheet-metal casing 30 coöperates with the wall 4 of the lower frame section to form the lower end of the conduit.
 25 From the latter a pipe 31 connected to the bottom of the lower section and registering with the lower end of the conduit leads into the suction side of an air-blower indicated at 32; this latter being driven by a belt to
 30 pulley 33 from any suitable source of power.

The several frame sections are separably united as by means of screw-bolts 34 (Fig. 1) passing through mating lugs 35 on the ends of adjacent sections; and access is readily
 35 had to the several drums and troughs by removing sheet-metal cover-plates 36 that extend between the top wall of the heating chamber 6 of each section and suitable
 40 shoulders formed on the outer side of the conduit wall 3 of the immediately superposed section; said cover-plates being provided with handles 37 and being conveniently secured in place by clamps 38 and 39
 45 engaging the upper and lower edges of said cover-plates.

The structure rests upon a suitable hollow base 40 to the underside of which are secured at opposite ends thereof a pair of
 50 couplings 41 into one or the other of which is led a pipe 42, according to the position on the base of the lower frame section 1; the coupling to which the pipe 42 is attached being in free communication with the lowermost end wall passage 8 of the lower frame
 55 section 1. Secured to the top of the upper frame section 1 and communicating with the end wall passage 7 thereof is a pipe 43. The pipes 42 and 43 constitute parts of a suitable circulation system for a heating
 60 agent such as hot water or steam, best shown in Fig. 3, such heating agent flowing continuously through the several chambers 6 and the communicating passages 7 and 8 therebetween, and serving to heat the mer-
 65 cury in the several troughs 2.

For imparting rotation to the several drums and to the feed-roller 27 we have shown a driving shaft 44 journaled upon and across the base 40 and actuated through
 70 a sprocket-wheel 45 by a sprocket-chain (not shown) leading from any suitable source of power; the opposite end of shaft 44 carrying a sprocket-wheel 46 over which and over
 75 sprocket-wheels 47 on the several drum-shafts 10 and a sprocket 48 on the shaft of roller 27 is led an endless sprocket-chain 49.

The apparatus thus constructed operates in the following manner: The pulverized ore is supplied continuously to the hopper 26 by any suitable means, and the driving-
 80 shaft 44 and suction-fan 32 being started, the ore is discharged in a continuous uniform stream into the upper end of the serpentine conduit 5, being drawn through the latter by the air-blast induced by the fan. 85
 At the same time the heating agent is continuously circulated throughout the frame of the same, heating up the mercury in the several troughs. As the ore descends and passes over those portions of the peripheries
 90 of the drums that constitute moving walls of the conduit, the gold or other precious metal contained therein is attracted by the mercury on the surface of the drums and adheres thereto together with, of course, 95
 some of the non-metallic particles. As the surface thus coated passes into the mercury trough the heated mercury in the latter causes the metallic particles to drop away from the surface of the drum into the
 100 trough, said metallic particles gradually accumulating on the copper-lined bottom of the latter. As the coated surface emerges from the heated mercury the greater part of the residue of non-metallic dust that still
 105 adheres to the surface of the drum is blown off the latter by the action of the air-jets issuing through the nozzle 25; and such surplus mercury as may cling to the surface of the drum is brushed or wiped back by
 110 the action of the felt strips 20, so that by the time the surface of the drum again enters the field of the conduit 5 it is comparatively clean except for an amalgamating film or covering of mercury which again
 115 becomes active to attract the metallic ingredient of the ore. It will thus be seen that the recovery of the precious metal is mainly by deposit thereof, through the action of heat, in the copper-lined bottoms of the
 120 several troughs, rather than on the surfaces of the drums themselves as heretofore. The machine is capable of operation for a considerable period of time before requiring to be "cleaned up"; but when this is necessary
 125 it is very simply and easily performed by drawing off the mercury through the faucets 19, removing the cover-plates or doors 36, and pulling out the copper lining 17 of the
 130 several troughs, and removing the valuable

metal deposited thereon. The mercury withdrawn is also an amalgam containing some of the precious metal, which is also separated out in the usual way. By replacing the copper linings of the troughs, refilling them with fresh mercury, and replacing the cover-plates 36, the machine is primed for fresh operation.

It will be noted that those parts of the serpentine conduit which lie opposite and parallel with the surfaces of the drums are somewhat wider than the intermediate parts between the adjacent drums; the effect of which is to render the flow of the air and pulverized ore through such wider parts of the conduit slower than its flow through the narrower parts, which gives the metallic constituent of the ore a better opportunity to settle and collect on the surfaces of the drums.

We claim—

1. In a separator of the class described, the combination with a plurality of amalgamating cylinders, of a plurality of superposed frame sections in which said cylinders are rotatably mounted, said frame sections being open on one side toward said cylinders, mercury troughs carried by said frame sections into which said cylinders dip and provided with detachable copper linings removable through the open sides of said frame sections, a continuous conduit for the passage of a stream of pulverized

ore extending through said superposed frame sections and formed in part by the peripheral surfaces of said cylinders, and removable doors constituting closures for the open sides of said frame sections, substantially as described.

2. In a separator of the class described, the combination with a plurality of superposed frame sections consisting of identical cored rectangular castings whereof adjacent castings are inversely disposed widthwise relatively to each other, each of said castings being open on one side and containing a mercury trough and sections of serpentine conduits for the flow of ore and a mercury heating medium, of a plurality of amalgamating cylinders rotatably mounted in said frame sections, detachable copper linings in said mercury troughs removable through the open sides of said frame sections, and removable doors constituting closures for the open sides of said frame sections, substantially as described.

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FREDERICK C. O'BRIEN.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."