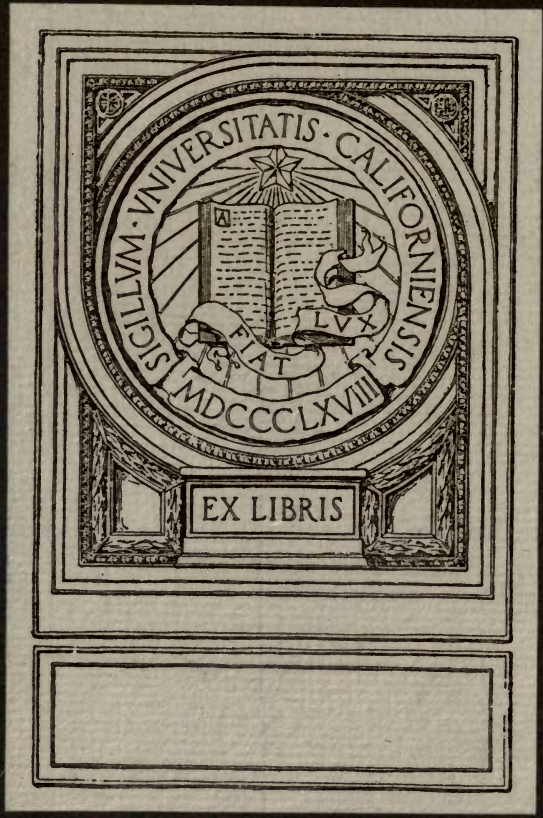
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Volume Eight Number One

SCHOOL OF MINES AND METALLURGY

UNIVERSITY OF MISSOURI

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JANUARY 1916

BIBLIOGRAPHY CONCENTRATING ORES BY FLOTATION

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SCHOOL OF MINES AND METALLURGY

UNIVERSITY OF MISSOURI

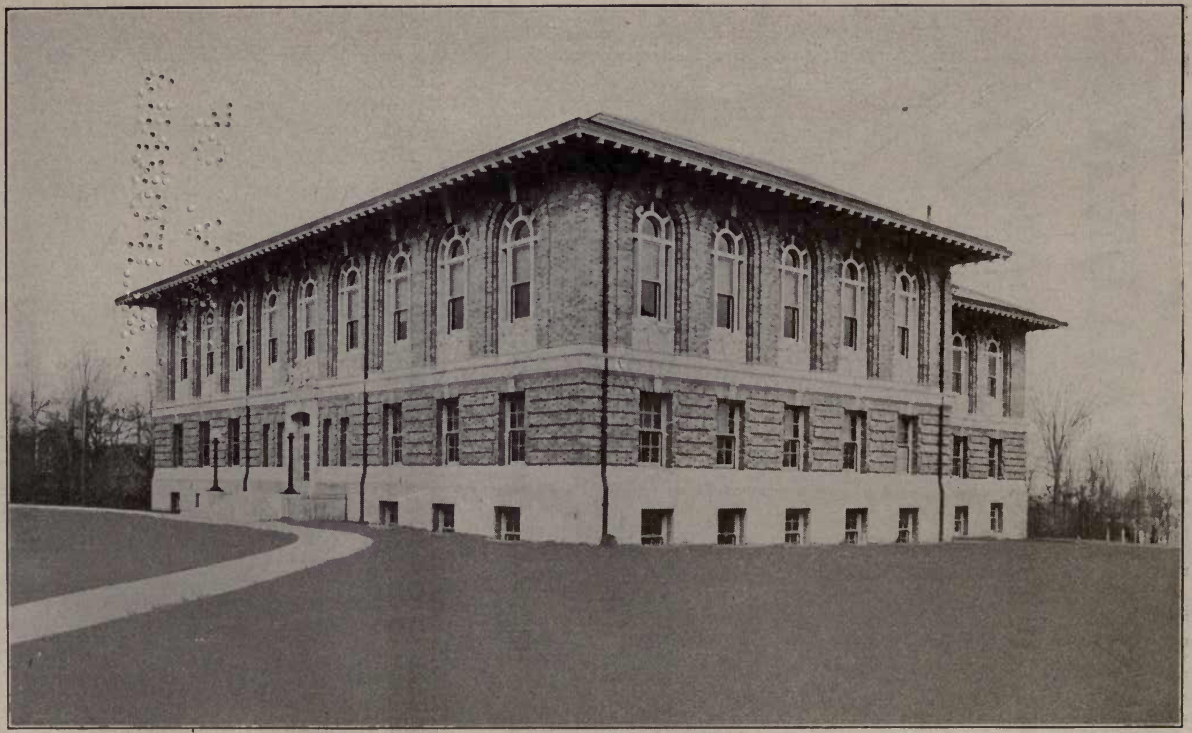
LIST OF REFERENCES ON CONCENTRATING ORES BY FLOTATION

Compiled by Jesse Cunningham, Librarian

THE MISSOURI SCHOOL OF MINES AND METALLURGY, THE MISSOURI BUREAU OF GEOLOGY AND MINES AND THE UNITED STATES BUREAU OF MINES are making cooperative investigations on the Milling and Concentration of Missouri Ores.

ROLLA, MISSOURI

1916



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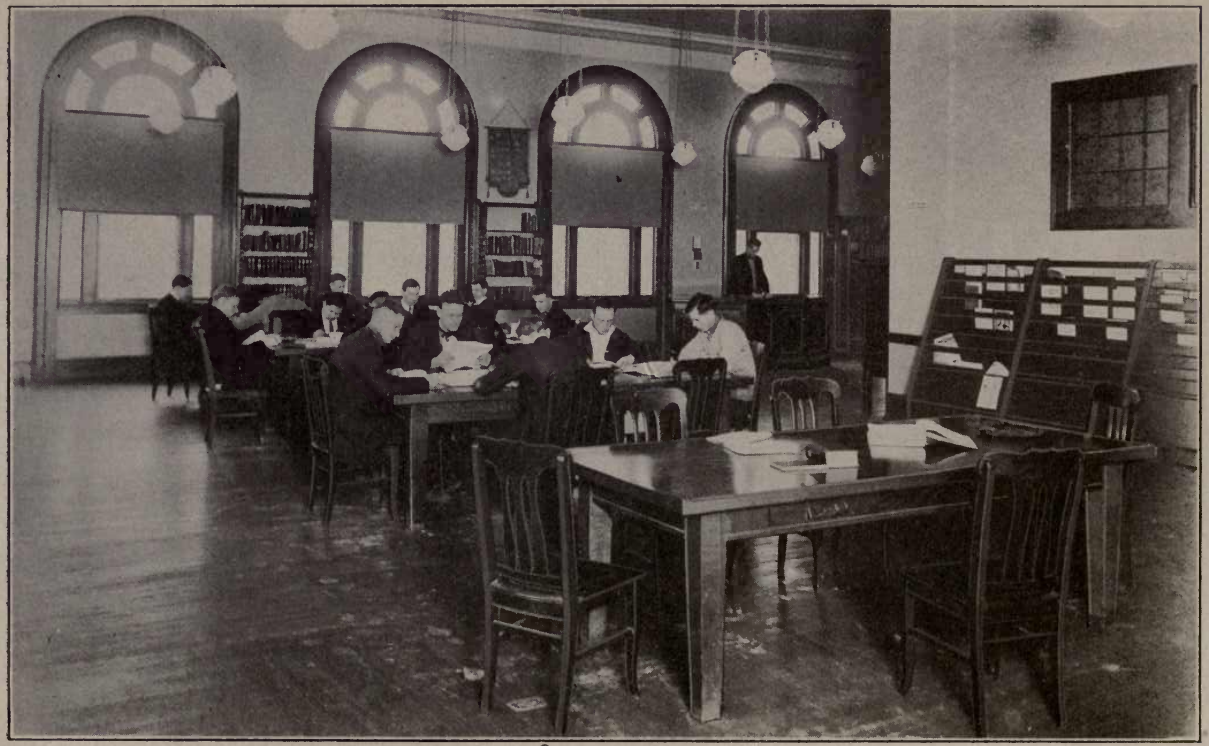

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TABLE OF CONTENTS

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PREFATORY NOTE.

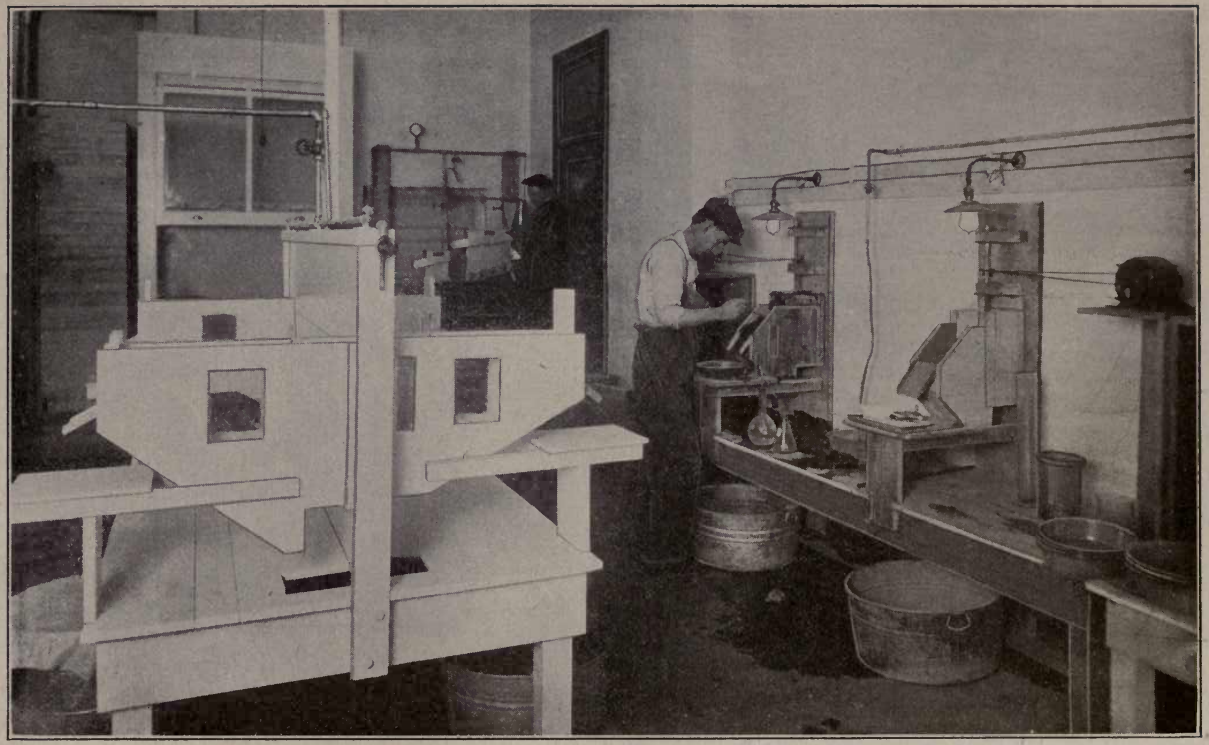
This list has been prepared primarily for the use of the Mining Experiment Station and students of the School of Mines and Metallurgy engaged in experimentation at the flotation laboratory of this institution, and is based on the collection of material now in the library of the school. It is hoped, however, that the list will serve as a guide, at least in America, to the study of the subject. Emphasis has been placed on no particular feature of the process, the intent being to include all important material coming under the observation of the compiler. Articles containing mere mention of the name of a process or the name of a company using a process are not included.

The great interest in the subject of colloids and surface tension in its connection with the theory of oil flotation processes warrants the inclusion of a section devoted to references on this phase. No claim for completeness is made, as the plan adapted was to choose from the mass of material on colloids and surface tension the better known standard books and articles, and to include enough of these to serve as a basis for further study and experimentation.

Acknowledgment is due Theodore Jesse Hoover for a liberal use of his bibliography in the second edition of "Concentrating Ores by Flotation"; to the libraries of St. Louis, especially the St. Louis Public and the Academy of Science, for courtesies extended, and to Carl Stifel for the use of his collection of United States patents. The list has profited from many valuable suggestions made by Professor V. H. Gottschalk of the Department of Chemistry. Professor Gottschalk is deeply interested in the theory of flotation, especially as it is connected with colloidal chemistry and surface tension. His expert knowledge was placed at our disposal without reservation.

The table of contents shows the arrangement of the references. A name index to patents follows that section. An author-subject index appears also at the end, pointing out the literature on special and more minute phases of the subject. The numbers in these indexes refer to items and not to pages.

JESSE CUNNINGHAM.



FLOTATION LABORATORY

ABBREVIATIONS USED.

Aust. Min. Stand.—Australian Mining Standard.

Austral. Min. & Eng. Rev.—Australian Mining and Engineering Review.

B. C. Min. Exch.—British Columbia Mining Exchange.

Bull. Am. Inst. Min. Engrs.—Bulletin of the American Institute of Mining Engineers.

Bull. Instn. Min. & Metl.—Bulletin of the Institution of Mining and Metallurgy.

Can. Min. Jour.—Canadian Mining Journal.

Can. Min. Rev.—Canadian Mining Review.

Chem. Metl. & Min. Soc. of S. Africa.—Journal of the Chemical, Metallurgical and Mining Society of South Africa.

Chem. News.—Chemical News.

Electrochem. & Metl. Indust.—Electrochemical and Metallurgical Industry.

Eng. & Min. Jour.—Engineering and Mining Journal.

Eng. Mag.—Engineering Magazine.

Jour. Amer. Chem. Soc.—Journal of the American Chemical Society.

Jour. Fr. Inst.—Journal of the Franklin Institute.

Jour. Phys. Chem.—Journal of Physical Chemistry.

Jour. Soc. Chem. Indust.—Journal of the Society of Chemical Industry.

Journ. Can. Min. Inst.—Journal of the Canadian Mining Institute.

Metl. & Chm. Engng.—Metallurgical and Chemical Engineering.

Mex. Min. Jour.—Mexican Mining Journal

Min. & Eng. Rev.—Mining and Engineering Review.

Min. & Engng. Wld.—Mining and Engineering World.

Min. & Metl. Soc. Amer.—Mining and Metallurgical Society of America.

Min. & Sci. Pr.—Mining and Scientific Press.

Min. Jour.—The Mining Journal (London)

Min. Mag.—The Mining Magazine.

Min. Mag. (N. Y.)—Mining Magazine (New York).

Min. Rept.—Mining Reporter.

Min. Sci.—Mining Science.

Min. Wld. Index.—Mining World Index of Current Literature.

Mines & Meth.—Mines and Methods.

Mines & Min.—Mines and Minerals.

Minr. Ind.—Mineral Industry.

Minr. Res. U. S.—Mineral Resources of the U. S.

N. S. W. Mines Dept.—Annual Report of the Department of Mines of New South Wales.

Oesterreischische Zeit. f. B. u. H.—Oesterreischische Zeitschrift fur Berg- und Huttenwesen, Vienna.

Pac. Coast Miner—Pacific Coast Miner.

Phil. Mag.—Philosophical Magazine.

Pop. Sci. M.—Popular Science Monthly.

Roy. Soc. Vict. Proc.—Proceedings of the Royal Society of Victoria.

Sch. Mines Quar.—School of Mines Quarterly.

Sci. Amer. Supp.—Scientific American Supplement.

Techn. Blatter—Technische Blatter.

Trans. Am. Electroch. Soc.—Transactions of the American Electrochemical Society.

Trans. Am. Inst. Min. Engrs.—Transactions of the American Institute of Mining Engineers.

Trans. Aust. Inst. Min. Eng.—Transactions of the Australasian Institute of Mining Engineers.

Trans. Instn. Min. & Metl.—Transactions of the Institution of Mining and Metallurgy.

West. Chem. & Metl.—Western Chemist and Metallurgist.

Zeit. Anorg. Chem.—Zeitschrift fur Anorganische Chemie.

Zeit. Phys. Chem.—Zeitschrift fur Physikalische Chemie.

Zts. Oberschles Berg-und Huttenmannisch—Zeitschrift Oberschles Berg- und Huttenmannisch.

The following abbreviations are used for the months of the year: Ja., F., Mr., Ap., My., Je., Jl., Ag., S., O., N,, D.,

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contemporaneous treatises, is reduced to such simple, commonsense terms as to be within range of any serious minded student.

The style is unhappily difficult, so that the following suggestions may not be amiss. After several readings of the short paper on "The Theory of Colloid Chemistry," read first the excellent summaries at the ends of the "Theory of Emulsification" papers before undertaking a rapid survey of the whole set; follow this by a more careful consideration of the summaries with re-reading of portions of the text when necessary; continue this process until the drift of the argument begins to reveal itself.

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617 Washburne, C. W. The capillary concentration of gas and oil.
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619 *British Ore Concentration Syndicate Ltd. vs. Minerals Separation Ltd.
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620 Croasdale, Stuart. Why is the patent mania?
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621 Decision in Elmore flotation patents.
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622 Decisions in flotation litigation.
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623 Decision in the flotation litigation.
Eng. & Min. Jour. v. 96, p. 229. Ag. 2, '13.

624 The Elmore flotation process. The specifications showing the original claims for the patents on which the process is based.
Mines & Min. v. 32, p. 124-125. S. '11.

625 Elmore oil process patent decision.
Eng. & Min. Jour. v. 86, p. 321. Ag. 15, '08.

626 Flotation.
Min. Mag. v. 9, p. 426-427. D. '13.

627 Flotation again.
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628 Flotation and the patent law.
Min. & Sci. Pr. v. 109, p. 586. O. 17, '14.

629 Flotation companies unite. Broken Hill concentration.
Min. & Sci. Pr. v. 104, p. 637. My. 4, '12.

630 Flotation litigation.
Min. Mag. v. 10, p. 168-170. Mr. '14; p. 406-407. Je. 14.
Eng. & Min. Jour. v. 97, p. 579. Mr. 14, '14; p. 673. Mr. 28, '14; p. 973-974. My. 9, '14.

631 Flotation litigation and possible results.
Min. & Sci. Pr. v. 107, p. 903. D. 6, '13.

632 Flotation litigation, Elmore vs. The Sulphide Corporation decision.
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633 The flotation patent litigation.
Eng. & Min. Jour. v. 97, p. 679. Mr. 28, '14.

634 Flotation patents.
Min. Mag. v. 1, p. 261-268; p. 289-290. D. '09. v. 2, p. 301. Ap. '10.
Eng. & Min. Jour. v. 97, p. 1067-1068. My. 23, '14.

635 The flotation process.
Eng. & Min. Jour. v. 91, p. 745-746. Ap. 15, '11, v. 97, p. 969. My. 9, '14; v. 99, p. 253. Ja. 30, '15.

636 Flotation process litigation.
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Eng. & Min. Jour. v. 83, p. 865. My. 4, '07; v. 86, p. 778. O. 17, '08; v. 87, p. 216. Ja. 23, '09; v. 96, p. 277. Ag. 9, '13; v. 98, p. 710, O. 17, '14.

637 Flotation process litigation. Ore Concentration Co. Ltd. v. Sulphide Corporation. Full text of judgment.
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638 Flotation processes.
Minr. Ind. v. 22, p. 838-843. 1913.

639 Flotation suit.
Metl. & Chem. Engng. v. 13, p. 409-411. Jl. '15.

640 Hyde, James M. Flotation and the patent law.
Min. & Sci. Pr. v. 109, p. 728. N. 7, '14.

641 Litigation.
Min. & Sci. Pr. v. 99, p. 766. D. 4, '09.

642 Minerals Separation Ltd.
Aust. Min. Stand. v. 51, p. 125. F. 12, '14.

643 Minerals Separation Co. sues.
Eng. & Min. Jour. v. 92, p. 1172. D. 16, '11.

644 The Minerals Separation decision.
Can. Min. Jour. v. 35, p. 340. My. 15, '14.

645 Minerals Separation suit at Butte, Mont.
Metl. & Chem. Engng. v. 11, p. 309. Je. '13.

646 Minerals Separation vs. Elmore.
Eng. & Min. Jour. v. 87, p. 38, Ja. 2, '09.

647 Minerals Separation, Ltd. vs. James M. Hyde.
Min. & Sci. Pr. v. 107, p. 270-272. Ag. 16, '13.
Min. Jour. v. 102, p. 738. Ag. 2, '13; p. 800. Ag. 23, '13.
Min. Mag. v. 10, p. 188-189. Mr. '14.
Eng. & Min. Jour. v. 96, p. 317-318. Ag. 16, '13.

648 *Minerals Separation Ltd. vs. Potter.
Aust. Min. Stand. v. 42, p. 38. 1909.

649 Minerals Separation vs. Ore Concentration (1905).
Min. Jour. v. 85, p. 649. My. 22, '09.

650 More flotation litigation.
Eng. & Min. Jour. v. 98, p. 222. Ag. 1, '14.

651 More flotation-process litigation.
Eng. & Min. Jour. v. 83, p. 675. Ap. 6, '07.

652 More "Process" litigation. Ore Concentration Co. (1905) Ltd. vs. Sulphide Corporation Ltd.
Aust. Min. Stand. v. 45, p. 539-540. Je. 1, '11.

653 Norris, Dudley H. Flotation—A paradox.
Min. & Sci. Pr. v. 111, p. 955-958. D. 25, '15.

654 Oil flotation.
Min. Jour. v. 106, p. 624-625. Jl. 4, '14.

655 Oil process litigation.
Min. & Sci. Pr. v. 97, p. 660-661. N. 14, '08.

656 The Ore Concentration Co. (1905).
Eng. & Min. Jour. v. 88, p. 130. Jl. 17, '09.

657 Ore Concentration Co. (1905) Ltd. The Elmore patents litigation.
Aust. Min. Stand. v. 47, p. 78. Ja. 25, '12.

658 Patent rights in oil separation processes. The Minerals Separation, Ltd. (Appellants) vs. The British Ore Concentration Syndicate and A. S. Elmore (Respondents).
Min. Jour. v. 87, p. 314-316. N. 20, '09.

659 Patent rights in oil separation processes. The British Ore Concentration Syndicate, Ltd. vs. Minerals Separation Ltd.
Min. Jour. v. 84, p. 220. Ag. 15, '08.

660 Potter and Delprat processes.
Eng. & Min. Jour. v. 83, p. 389. F. 23, '07.

661 *Potter Sulphide Ore Treatment Co. vs. Minerals Separation Ltd.
Aust. Min. Stand. v. 41, p. 678. 1909.

662 Potter's sulphide treatment.
Min. & Sci. Pr. v. 96, p. 42. Ja. 4, '08.

663 Process litigation.
Min. Jour. v. 100, p. 136. F. 8, '13; p. 962. O. 11, '13.

664 Process litigation. Minerals Separation case.
Aust. Min. Stand. v. 51, p. 208. Mr. 12, '14.

665 Progress of flotation litigation.
Min. & Sci. Pr. v. 108, p. 642-643. Ap. 18, '14.

666 Rival flotation processes.
Min. & Sci. Pr. v. 97, p. 344. S. 12, '08.

667 Scott, Walter A. Air-froth flotation. A legal version of the technology of the process.
Min. & Sci. Pr. v. 111, p. 583-589. O. 16, '15. Illus.

668 Shellshear, Wilton. Minerals Separation vs. Debavay process.
Min. & Sci. Pr. v. 107, p. 21. Jl. 5, '13.

669 The slime-filtering decision.
Eng. & Min. Jour. v. 94, p. 917-918. N. 16, '12.

670 The status of flotation litigation.
Min. & Sci. Pr. v. 111, p. 917-918. D. 18, '15.

671 Sweeping decision in flotation litigation.
Metl. & Chem. Engng. v. 12, p. 362-363. Je. '14.

672 Walker, Edward. Flotation process litigation.
Min. & Sci. Pr. v. 98, p. 62. Ja. 9, '09.

673 ——— Flotation processes during 1913.
Min. & Sci. Pr. v. 108, p. 79-80. Ja. 3, '14.

674 Wolf, J. D. Flotation patents.
Min. & Sci. Pr. v. 105, p. 832. D. 28, '12.

675 Zinc Corporation.—Battle of the processes.—The Elmore oil process.
Min. & Sci. Pr. v. 94, p. 651-652. My. 25, '07.

676 Zinc Corporation and the flotation processes.
Eng. & Min. Jour. v. 91, p. 1198. Je. 17, '11.

677 Zinc process litigation.
Min. Jour. v. 95, p. 1256. D. 23, '11.

PATENTS

In the comparatively short space of twelve years (June, 1912) about 500 patents for flotation processes, or apparatus in connection with them, have been applied for. All of them without exception are based upon the difference in the relations between ores and gangues to the surface tension of water. From the theoretical point of view, the only distinction between the various processes consists in the means adapted to raise the ore particles to the surface, but in the particular working of the various apparatus and plans there are some substantial differences. The important British and United States patents are chronologically arranged below.

GREAT BRITAIN.

678 G. Robson, Dolgelley, and S. Crowder, London, Eng. Separating ores from finely divided gangue by adding soapy water and a hydrocarbon. No. 2,538 of 1895.

679 Ore Treatment. F. E. Elmore, Leeds. Using a heavy oil for catching the metallic constituents of ore, while the gangue is washed away by the water. No. 21,948 of 1898.

680 Concentrator.—A. S. Elmore, London. Modifications in the plans used in the inventor's system of concentrating ores with oil. No. 15,526 of 1901.

681 Sulphide Ore Treatment.—C. V. Potter, Victoria, Australia. Treating fine ground sulphide ores with a weak solution of sulphuric acid and heat, so causing metallic compounds to float on the surface and separate from the gangue. No. 1,146 of 1902.

682 Concentrator.—H. E. T. Haultain and H. R. Stovel, Nelson, B. C. A plant for concentrating ores by the addition of oil to the pulp. No. 9,521 of 1902.

683 Concentration by Oil.—A. Froment, Traversella, Italy. In separation of ores by oil concentration, the addition of substances to generate gas which makes the separation more rapid. No. 12,778 of 1902.

684 Oil Concentration.—J. B. Schammell, London. Using oil, containing a small quantity of chloride of sulphur, for catching metallic particles out of ore. No. 15,280 of 1902.

685 Treating Sulphide Ores.—G. D. Delprat, Broken Hill, N. S. W. Separating sulphides from gangue by immersing the finely ground ore in a hot solution of bisulphate of soda, the sulphides thereon rising to the surface and the gangue falling to the bottom. No. 26,279 of 1902.

686 Treating Zinc-Bearing Tailings.—G. D. Delprat, Broken Hill, N. S. W. Throwing zinc tailings into an acid solution of nitrate of soda, the sulphides being carried to the top by the gas generated and the gangue falling to the bottom. No. 26,280 of 1902.

687 Separating Ores.—A. E. Cattermole, London. Separating ores from gangue by first immersing in an emulsion of oil, soap and water, the proportion of oil being very small, so that the metallic particles do not float but sink with the gangue, and afterwards separating the metallic particles by mechanical classifiers. No. 26,295; 26,296 of 1902.

688 Oil Concentration.—A. S. Elmore, London. In the oil concentration process, arrangements for working without access of air so as to adapt the process to the treatment of tellurides and other easily oxidizing ores. No. 184 of 1903.

689 Separating Zinc Sulphides.—G. A. Goyder and E. Laughton, Adelaide, South Australia. Separating zinc sulphide from tailings by passing into water slightly acidulated with sulphuric acid, which generates gas around the sulphide and so causes it to rise to the surface while the gangue falls to the bottom. No. 16,839 of 1903.

690 Separating Sulphides.—A. E. Cattermole, H. L. Sulman and H. K. Picard, London. The use of fatty acids or resin acids for separating sulphides from gangue suspended in water. No. 17,109 of 1903.

691 Oil Concentration.—A. E. Cattermole, London. A method of oil concentration, using a small amount of saponified oil and separating the mineral from the gangue by jigging. No. 18,589 of 1903.

692 Sulphide Recovery from Tailings.—G. D. Delprat, Broken Hill, N. S. W., Australia. Improvements in the inventor's process for recovering sulphides from tailings, by passing them into a bath of bisulphate of soda. No. 19,783 of 1903.

693 Oil Concentration.—Sulman & Picard, London. In separating minerals from gangue by oil concentration, introducing the oil in the form of a vapor mixed with jets of air. No. 20,419 of 1903.

694 Ore Treatment.—G. D. Delprat, Broken Hill, New South Wales. Method of making sulphides rise to the surface in a solution of common salt containing 2 per cent sulphuric acid. No. 27,132 of 1903.

695 Oil Concentration.—J. D. Wolf, London. Passing ores through petroleum mixed with other oils and chloride of sulphide, and afterwards removing any gangue taken up by passing through warm water. No. 4,793 of 1904.

696 Slime Deposition.—H. L. Sulman and H. F. K. Picard, London. Collecting up slimes and depositing them by adding small amounts of soapy matter to the solutions. No. 13,481 of 1904.

697 Concentration.—J. D. Wolf, London. A concentrator of the traveling belt type, in which the mineral particles are separated from the gangue by means of a greasy surface on the belt, and not by concussion or gravity. No. 17,407 of 1904.

698 Ore Separation.—F. E. Elmore, London. The use of a vacuum for increasing the efficiency of the process for floating metallic sulphides by means of bubbles of air or gas, and thus separating them from gangue. No. 17,816 of 1904.

699 Ore Separation.—A Debavay, Melbourne, Australia. Separating blende from gangue in zinc tailings and concentrate, by making use of surface tension of water; the tailing is passed gently upon the surface of water, the surface tension being sufficient to support the blende but not the gangue. No. 18,660 of 1904.

700 Separating Sulphides from Gangue.—J. H. Gillies, Melbourne, Victoria. In separating sulphides from gangue by the "saline process," improved apparatus for introducing the material into the vats. No. 20,159 of 1904.

701 Oil Concentration.—A. Schwarz, New York, U. S. A. Adding fatty substances to petroleum, and also sulphur compounds, in order to increase the efficiency of the process for concentrating ores by means of oil. No. 23,906 of 1904.

702 Sulphide Separation.—A. P. S. Macquisten, Glasgow. This invention relates to the separation of metallic sulphides from gangue by flotation. The inventor uses a traveling belt which continuously passes into and out of water. As the belt goes into and out of the water, the particles of sulphide are floated off, leaving nothing but gangue on the belt. No. 25,204 and 25,204A of 1904.

703 Ore Separation.—A. J. F. Debavay, Melbourne, Victoria. Apparatus to be used in bringing thin films of ores on the surface of water, by means of which the metallic particles are floated and the gangue sinks. No. 25,858 of 1904.

704 Concentrating Machine.—F. E. Elmore, London. Apparatus in which to conduct the inventors process for conducting flotation-concentration under a vacuum. No. 29,282 of 1904.

705 Ore Separation.—H. L. Sulman, H. F. K. Picard, and J. Ballot, London. The application of surface tension of water for supporting mineral particles with oily surfaces. No. 29,374 of 1904.

706 Concentrating Ore.—Sulman, Picard and Ballot, London. The inventors add a small proportion of alkali, soapy matter, or other substances that diminish the surface tension of water, to the water used in grading, vanning or buddling ores, the addition being for the purpose of increasing the efficiency of the separation. No. 1821 of 1905.

707 Flotation Process.—Sulman, Picard and Ballot, London. A modification of the flotation process for separating sulphides from gangue, consisting in bringing dry powdered ore on to the surface of acidified water, the metallic particles floating and the gangue falling. No. 5260 of 1905.

708 Separation of Sulphides.—A. S. Elmore, London. In flotation processes for separating sulphides from gangue, adding to the liquid a soluble chloride as calcium chloride, together with a small portion of free hydrochloric acid. No. 5,953 of 1905.

709 Flotation Process.—A. P. S. Macquisten, Glasgow. Improvements in the inventor's flotation process for separating minerals, consisting of the addition of minute quantities of fatty acids to the water. No. 15,119 of 1905.

710 H. L. Sulman, London. Conducting the process of flotation of sulphides by means of oil at the boiling point of the floating solution. No. 19,709 of 1905.

711 Concentrator—R. E. Saunders, London. A pneumatic apparatus for separating gangue from mineral, consisting of a series of baffle plates, against which the ore is drawn by suction. No. 21,398 of 1905.

712 Flotation Process.—H. L. Sulman, H. F. K. Picard and J. Ballot, London. Improvements in the inventor's flotation process for separating certain metallic compounds from gangue, with the object of more equally wetting the various constituents of the ore. No. 26,711 of 1905.

713 Concentration Process.—H. L. Sulman, H. F. K. Picard and J. Ballot, London. In the inventor's process for floating minerals from gangue in a saponified oily medium, subjecting the mixture to atmospheric pressure and subsequently relieving it, thereby releasing gaseous bubbles, which carry up the mineral. No. 26,712 of 1905.

714 Ore Dressing.—Concentrating table. H. L. and E. A. Sulman, London, England. A form of bubble or concentrating table on which the material to be treated is periodically rolled over by a squegee so that the action of the water running down the surface may be more effective in floating off the lighter particles. No. 9,981 of 1906.

715 Flotation Process.—G. A. Chapman, Broken Hill, N. S. W. Improvements in tne Sulman-Picard-Ballot process for flotation of sulphides by adding fatty acids and agitating in water, consisting in adding to the ore acidified water in one vat and adding the fatty matter subsequently in another vat. No. 17,328 of 1906.

716 Flotation Processes.—H. L. Sulman, London, Eng. In flotation processes for separating ores from gangue in which the ore is exposed alternately to the action of air and water, slightly warming the liquid in which the flotation takes place. No. 19,944 of 1906.

717 Separation Process.—Improvements in apparatus for more or less completely separating subdivided solid matter from a liquid. Particularly applicable for thickening ore pulp and for feeding or measuring the pulp or solid. Francis E. Elmore and Alexander F. Elmore, London. No. 26,821 of 1907.

718 Ore Treatment.—Improvements relating to the treatment of ores or the like. A. A. Lockwood and M. R. A. Samuel, London, E. C. No. 12,962 of 1908.

719 Concentration.—Improvements in or relating to the concentration of ores. Arthur H. Higgins, Broken Hill, N. S. W. No. 26,352 of 1908.

720 Concentration.—Improvements in or relating to the concentration of ores. H. L. Sulman and H. F. K. Picard, London, England. No. 28,173 of 1908.

721 Flotation Process.—Improvements in and relating to the separation of zinc blende and other metalliferous constituents from ore concentrates and slimes by flotation or granulation. Edward J. Horwood, Broken Hill, N. S. W., Aust. No. 1,789 of 1909.

722 Ore Treatment.—Improvements relating to the treatment of ores or the like. A. A. Lockwood and M. R. Anthony Samuel, London. No. 16,229 of 1909.

723 Concentration.—Improvements in the concentration of oxidized ores. H. L. Sulman and H. F. K. Picard, London, Eng. No. 26,019 of 1909.

724 Concentration.—Improvements in or relating to the concentration of ores. H. L. Sulman, A. H. Higgins and J. Ballot, London, Eng. No. 28,933 of 1909.

725 Concentration.—Improvements in or relating to apparatus for ore concentration. T. J. Hoover, London, Eng. No. 6,896 of 1910.

726 Separation.—Improvements in the selective separation of metals from complex ores or products. Henry L. Sulman and Hugh K. Picard, London, Eng. No. 8650 of 1910.

727 Concentration.—Improvements in or relating to ore concentration. T. J. Hoover, London, England. No. 10,929 of 1910.

728 Separation.—Improvements in or relating to the separation of ores or the like. Murex Magnetic Co., Ltd., and Alfred A. Lockwood, London, Eng. No. 13,009 of 1910.

729 Zinc.—Improved treatment of siliceous zinc ores. F. B. Dick, Hampton, Middlesex. No. 17,735 of 1910.

730 Concentration.—Improvements in or relating to the concentration of copper ores. Henry H. Greenway, Melbourne, Australia. No. 18,943 of 1910.

731 Concentration.—Improvements in or relating to the concentration of ores. H. H. Greenway, Melbourne, Australia. No. 21,856 and 12,857 (?) of 1910.

732 Concentration.—Improvements in or relating to the concentration of ores. H. H. Greenway, Melbourne, Aust., and Henry Lavers, Broken Hill, N. S. W. No. 22,973 of 1910.

733 Concentration.—Improvements in or relating to ore concentration. Henry Lavers, Broken Hill, N. S. W., Minerals Separation, Ltd., and E. H. Nutter, Lond, Eng. No. 23,870 of 1910.

734 Concentration.—Improvements in or relating to method and apparatus for ore concentration. E. H. Nutter and Minerals Separation, Ltd., London, Eng. No. 23,949 of 1910.

735 Concentration.—Improvements in or relating to ore concentration. E. H. Nutter, London, Eng. No. 2,383 of 1911.

736 Ore Treatment.—Improvements in the Treatment of Ores. Murex Magnetic Co. and A. A. Lockwood, London, Eng. No. 13,208 of 1911.

737 Magnetic Separation.—Improvements in or relating to the separation of ores or the like. Murex Magnetic Co., Ltd., and A. A. Lockwood, London, Eng. No. 18,189 of 1911.

738 Magnetic Separation.—Improved process for the magnetic preparation or oiling of ores or the like and apparatus therefor. Murex Magnetic Co., Ltd., and A. A. Lockwood, London, Eng. No. 25,469 of 1911.

739 Concentration.—Improvements in or relating to ore concentration. G. A. Chapman and S. Tucker, London, Eng. No. 28,929 of 1911.

740 Concentration.—Improvements in or relating to ore concentration. G. A. Chapman and S. Tucker and Minerals Separation, Ltd., London, England. No. 14,273 of 1912.

741 Concentration.—Improvements in or relating to apparatus for ore concentration. J. Hebbard, Broken Hill, N, S. W. and Minerals Separation, Ltd., London, Eng. No. 15,546 of 1912.

742 Ore Concentration.—Improvements in or relating to apparatus for concentration. W. Broadbridge, A. C. Howard and Minerals Separation, Ltd., London, Eng. No. 25,490 of 1912.

743 Flotation Process.—Process for treating sulphide or carbonate-sulphide ore slimes and ores by flotation. K. Schick, Siegen, Germany. No. 25,689 of 1912.

744 Concentration.—Method of and apparatus for concentrating ore and the like. G. S. A. Appelqvist and O. E. Tyden, Stockholm, Sweden. No. 402 of 1913.

745 Selective Separation of Ores.—A. H. Higgins and Minerals Separation Limited. A process for the selective separation of different constituents of an ore by flotation consists in the separate treatment of products containing particles of substantially uniform size or containing particles having substantially the same rate of fall in liquid. The factors of differential gaseous attachment and of differential falling power in liquid are thereby utilized, and concentrates relatively high in certain constituents and residues relatively high in others are obtained. The sized or classified products

may be treated by the process described in 16,141 of 1913, or in the apparatus described in 21,650 of 1913 (C. A. 9,782). The frothing-agent used is preferably partly soluble in H_2O, such as eucalyptus oil, and is present in very small quantity, more being added during the treatment if required. Acids, alkalies, or soluble salts may be present. Cf. C. A. 8, 1562. No. 1,368 of 1914.

UNITED STATES

746 Process of Collecting the Floating Precious Metal from Quartz or Cement-Rock Tailings.—Alfred E. Jones, of Newark, New Jersey, assignor to himself, John T. Rowland, and Robert Gray, Jr., of same place. Process for collecting and obtaining float-gold from quartz or cement-rock tailings, which consists in, first, passing into such tailings a fibrous pulp; secondly, withdrawing the fibrous material and the matter commingled therewith; next, pressing the water from the same; and, finally, destroying the fibrous material. No. 267,351.

747 Method of Saving Floating Materials in Ore-Separation.—Hezekiah Bradford, of Philadelphia, Pennsylvania. Method of saving floating materials in ore-separation, consisting in passing the water and floating materials along in an open unobstructed sheet from the table or separating-machine with but little agitation of the water, thus preventing such materials from being carried beneath the surface and subsiding, then causing the water and floating materials to plunge or fall into a water-receptacle, and then retaining said floating materials in said receptacle until they lose their floating power and sink. No. 345,951.

748 Ore-Slimer.—Edgar A. Hockley, of Ouray, Colorado. An ore separator or slimer consisting of a receiving-tank provided with an inclined screw conveyor, a separating-tank provided with perforated pipes located at or near its bottom, and a standpipe connected therewith, said tank being provided with a top and bottom discharge, a vertically-movable gate provided with valves and floats, whereby the discharge of material from the tank is automatically regulated, and a suitable filtering-tank, the three tanks being arranged and connected substantially as and for the purpose set forth. No. 466,753.

749 Method of and Apparatus for Separating Slime or Fines from Water Used in Milling Ores.—Albion M. Rouse, of Boulder, Colorado, assignor to George R. Williamson, of same place. An improved method consisting in depositing the mill-tailings into a receptacle through which there is an upward flow of water, then carrying the water and tailings through a chamber, and causing an upward flow of air through the body of water and tailings, forming a scum. No. 469,599.

750 Process of Concentrating Ores.—Charles B. Hebron and Carrie J. Everson, of Denver, Colorado. A process for concentrating ores, which consists in first joining the metallic and mineral particles in the pulverized ore with a quantity of buoyant material and then sifting or blowing the prepared ore while in a dry state upon the

surface of liquid, whereby the buoyed metallic and mineral particles are made to float and thus separate from the gangue, which settles. No. 471,174.

751 Process of Concentrating Ores.—Charles B. Hebron, of Denver, Colorado, assignor of five-sevenths to Carrie J. Everson, of same place, Mamie W. Hutchinson, of Topeka, Kansas, and Charles T. Brown, of Chicago, Illinois. Process for concentrating ore, consisting of producing by heat a vacuumed and expanded condition in the mineral and metallic particles of the ore, of presenting to such ore while in a heated, vacuumed, and expanded condition, and by movement and pressure mechanically joining with the mineral and metallic particles thereof particles of buoyant material, of cooling and aerating such buoyed mineral and metallic particles, and of presenting such prepared ore stock to the surface of liquid, so that the buoyed mineral and metallic particles of the ore stock are maintained upon the surface of such liquid for a greater length of time than the rock matrix of the ore stock and thereby for such time separated therefrom. No. 474,829.

752 Method of and Apparatus for Separating Graphite or Like Substances from Crushed Rock.—Axel. W. Nibelius, of Hackettstown, New Jersey. The process of separating graphite and like substances from the crushed rocks, which consists in causing a falling body of dry and crushed rock to meet a vertically and upwardly moving body or stream of water at the surface of and within a surrounding body of comparatively still water, on which surface the flakes of graphite or other substance not absorbing water are separated and are floated off on the overflowing water, while the water-absorbing particles are precipitated in the water. No. 486,495.

753 Separation of Metals and Metallic Compounds from Ores or Other Substances.—George Robson, of Dolgelly, England, assignor to himself, and Samuel Crowder, of London, England. The method of recovering metals and metallic compounds from finely-divided substances, which consists in thoroughly and mechanically agitating and mixing a fatty oil with said substances while the same are in a moist or plastic state due to admixture of water therewith, then drawing off the fatty oil, carry the metal particles, and metallic compounds from said substances, and then separating the metals and metallic compounds from the oil. No. 575,669.

754 Apparatus for Separating Metallic from Rocky Constituents of Ores.—Francis E. Elmore, Leeds, England. The combination in an apparatus for separating metallic from rocky constituents of ore; of a rotary drum having internal helical ribs, pipes for delivering oil and ore and water into one end of said drum, a water-subsiding vessel arranged below the drum and receiving the oil, ore and water therefrom, a centrifugal drum arranged below said water-subsiding vessel, and a pipe for conducting the metallic portions and the oil from the top of the water-subsiding vessel into said centrifugal drum. No. 653,340.

755 Apparatus for Separating Solid Bodies from Liquids.—Denis Gale, of Denver, Colorado. In a separating apparatus, the combination with a vessel, consisting of two chambers, means for causing water in one chamber to flow in a thin sheet over the surface of water in the second chamber, a conduit with a flat bottom communicating with the surface of the water in the second chamber, and a slide adjustable over the surface of the water in the second chamber. No. 655,338.

756 Process of Separating Metallic from Rocky Constituents of Ores.—Francis E. Elmore, Leeds, England. The process of separating the metallic from other constituents of ore, which consists in mixing with crushed ore to which sufficient water has been added to make a flowing mixture, a substance other than mercury, to which the metallic particles only will adhere, and then recovering the metallic particles from such substance. No. 676,679.

757 Apparatus for Separating or Concentrating Minerals or Ores.—Henry Peareth Hawdon Brumell, of Buckingham, Canada. In an apparatus for separating or concentrating minerals or ores, a vessel adapted to contain a body of still water, a water-supply pipe projecting into said tank below the water-level, said pipe being provided with a nozzle having a discharge directed toward a point of the end wall of the vessel intermediate the water-level and the level of the nozzle, whereby a thin stream of water will be projected against said wall and deflected thereby across the surface of the body of wate in the vessel to a discharge at the opposite end of the vessel, and a hopper adapted to deliver the material to be separated to said stream. No. 678,860.

758 Graphite-Separator.—John H. Davis, of Glens Falls, New York, assignor to United States Graphite Company, of same place. A water graphite-separator of trough-like construction, provided with means near the bottom of the trough for distributing the inflowing water to the machine; in combination with means for conveying the water and the graphite on the surface thereof in one direction and additional means for conveying the tailings in a different direction by the action of gravity and a part of the water; together with a horizontally-disposed perforated partition located above the tailings-conveying means. No. 679,473.

759 Ore-Separator.—Alexander A. Allen, of Birmingham, Alabama. The combination with a vessel arranged to discharge by overflow a broad, unbroken sheet of liquid, a receptacle arranged at a lower level to contain a body of approximately still water and to discharge by overflow at one side, a broad inclined chute extending from said vessel to a point in said receptacle below the plane of discharge of the latter and arranged to receive the sheet discharged by said vessel and deliver it substantially unbroken in said receptacle, and means for placing upon the moving sheet discharged from said vessel a thin layer of material to be separated. No. 688,279.

760 Separating Mineral Substances by the Selective Action of Oil.—Alexander Stanley Elmore, of London, England. The process for separating metallic and rocky constituents of ore, which consists in

mixing pulverized ore with water and mixing the ore and water with oil in the presence of an acid, allowing the mixture to rest, whereby the oil having the metallic substances entrapped in it floats at the top of the mixture, and separating the metallic constituents from the oil. No. 689,070.

761 Apparatus for Separating Minerals by Selective Action of Oils.—Alexander S. Elmore, London, England. The combination in an apparatus for separating metallic from rocky constituents of ore, of a trough, a shaft adapted to revolve within said trough and provided with inclined blades, pipes for delivering oil and water to said trough, a subsidence-tank arranged at one end of said trough, extending below the same and communicating therewith, said tank adapted to receive the liquid mineral pulp and oil from said trough, a vertically-extending partition arranged in said tank at the top thereof for the purpose set forth, a centrifugal drum arranged at one side of said tank, a pipe connected to said tank and communicating with said drum for discharging therein the metallic ingredients and the oil, and a pipe connected to the tank for discharging therefrom the earthy and rocky ingredients. No. 692,643.

762 Apparatus for the Separation of Minerals by the Selective Action of Oils, etc.—Alexander S. Elmore, London, England. In apparatus for affecting separation of minerals by the selective action of oils and like substances, the combination of a stepped incline for downflow of the mixed pulp and oil, with a traveling apron arranged over and in suitable proximity to the said stepped incline for downflow of the mixed pulp and oil with a traveling No. 703,905.

763 Ore-Separator.—John W. Wolf, Randolph, Iowa. In a separator, the combination with tank adapted to contain liquid, of a submerged hopper therein, and vibrating collecting-pan in the tank under the hopper, covered by a convex separating-sieve which is close to the lower edge of the hopper, forming a narrow escape-opening therebetween. No. 725,609.

764 Ore-Separator.—Charles F. Wheelock, Birmingham, Alabama. The combination of a vessel adapted to be filled with water and provided with means for precisely determining the level of the water, a chute declining toward and adapted to reach said level; a transverse water-pipe slightly below the water-level, approximately parallel with and in proximity to the discharge edge of the chute and discharging laterally in the same general direction as the chute; means for delivering water under pressure to said pipe; means for regulating said pressure; and means for causing a thin, uniform stream of dry graphite to descend the chute. No. 734,641.

765 Extraction of Zinc, Lead and Silver Sulphides from Their Ores.—Guillaume D. Delprat, Broken Hill, New South Wales, Australia. The method of separating ores from gangue, which consists in forming a bath containing nitric acid, feeding finely ground ore thereto, whereby gas bubbles will be formed on the ore particles to raise

them to the surface of the solution, and removing the particles of ore so lifted to the surface. No. 735,071.

766 Process of Purifying Graphite.—Moritz Friedrich Reinhold Glogner, Freiburg, Germany. A process for purifying graphite in a wet and cold manner by the use of water and petroleum, consisting in the following operations: purifying the graphite mineral from its heavy admixtures (as for instance quartz, iron and the like) by a washing with cold water; mixing said purified graphite mineral with about three or four times its weight of cold water; very strongly agitating said paste within a closed vessel after the addition of a quantity of petroleum of about half the weight of the pure graphite contained in the mixture; and then sprinkling water over the surface of the liquid, after the mixture has been allowed to stand, in order to obtain a quicker and more complete separation of the graphite particles from the earthy substances. No. 736,381.

767 Apparatus for Extracting Gold and Other Metals from Ores.—Edmund L. Vander Naillen, San Francisco, Cal. An apparatus comprising a concentrating tank provided with an inlet and an outlet, and a valve disposed transversely within the tank and operating when closed to separate the lower portion of the tank from the upper portion thereof. No. 737,533.

768 Process of Preparing Concentrating-surfaces.—Arthur De Wint Foote, Grass Valley, California. The process of preparing a concentrating-surface, consisting in commingling petroleum and lime and spreading the same evenly over the surface of a concentrator. No. 744,322.

769 Apparatus for Separating Graphite or other Materials from Associated Impurities.—Israel F. Good, Allentown, Pennsylvania, assignor of one-half to George Francis Pettinos, Bethlehem, Pennsylvania, and John Herbert Harris, Allentown, Pennsylvania. An apparatus comprising a rotary receiving-table, and pneumatic means for holding the finer particles of graphite thereon while the coarser portions escape. No. 745,960.

770 Process of Separating Zinc Blende from Ores.—William Jamieson and Francis J. Odling, Melbourne, Victoria, Australia. In the separation of zinc-blende from ore with which it is associated, treating the ore in a pulverized state and sufficiently wet condition with chlorine, for the purpose of attacking the surface of the zinc-blende and submitting the ore so treated to a vanning motion. No. 750,034.

771 Mineral-Separator.—Homer L. Orr, Greeley, Colorado. In a mineral-separator the combination of a receiving-tank, a separating-tank, a filtering-tank, a pipe or vessel connecting the filtering-tank and the receiving tank having therein a shaft provided with spiral blades, and means located in the receiving-tank and driven by the inflowing water for operating said shaft to return the filtered liquid to the receiving tank, substantially as described, and a feed-pipe from the receiving tank to the separating-tank. No. 758,464.

772 Apparatus for the Concentration of Minerals by Means of Oil.—James W. Van Meter and Martin P. Ross, San Francisco, California. An apparatus for concentrating minerals by means of oil, comprising a channel through which the oil flows, means for supplying pulp and water to the oil at the head of said channel, means in said channel at intervals for drawing off the settled gangue and water, means at the foot of said channel for separating the relatively upper and lower portions of the oil, and means for returning said separated upper portion of oil to head of the channel. No. 762,774.

773 Separation of the Metallic Constituents of Ores from Gangue.—Arthur E. Cattermole, Highgate, London, England. A process of separating metalliferous matter from gangue, which consists in agitating a mixture of powdered ore and water with oil in emulsion in water containing an alkaline emulsifying agent, so as to agglomerate the oil-coated particles into granules, and subjecting the mixture to classification to remove the small non-coated particles from the granules. Nos. 763,259 and 763,260.

774 Apparatus for Use in Certain Processes of Extracting Sulphides from Ores.—Guillaume D. Delprat, Broken Hill, New South Wales, Australia, assignor to Broken Hill Proprietary Company, Ltd., Melbourne, Victoria, Australia. In an ore concentrating apparatus in which the concentrates are floated to the top of a body of liquid, a pan having an inclined perforate bottom down which the ore slides, means to feed liquid to the pan, a sump at the lower edge of the bottom for tailings, a discharge for concentrates at the liquid level of the pan, a baffle-plate between the sump and pan extending from the discharge to near the lower edge of the inclined bottom to maintain a quiescent body of liquid in the sump and at the same time maintain a flow of liquid from the pan through the discharge. No. 763,662.

775 Process of Effecting the Separation of Minerals.—George A. Goyder and Edward Laughton, Adelaide, South Australia, Australia. In a method of separating minerals and extracting some of them as concentrates, the steps of moving the ore in a finely-divided state in a solution which by the production of gas causes certain of the minerals contained in said ore to rise; and deflecting and guiding them as they rise. No. 763,749.

776 Process of Separating Carbon from Pulverized Carbonaceous Materials.—James D. Darling, Philadelphia, Pa. A process of separating carbon from pulverized carbonaceous material, which consists of mixing oil with said material; and flowing water through the mixture and through an obstruction impervious to the commingled oil and carbon, but previous to the water and gangue. No. 763,859.

777 Process of Separation.—Alfred Schwarz, New York, N. Y., assignor to Charles N. Lindley, individually and as trustee, New York, N. Y. A process of separating different materials by the selective action of two liquids of different specific gravities, which consists in introducing the materials in a granular or pulverulent condition,

quietly, without downward impetus, and without agitation, into a bath of oil floating upon water. No. 766,289.

778 Extracting Zinc or Other Sulphides from Their Ores.—Guillaume D. Delprat, Broken Hill, New South Wales, Australia. A method of separating ores from their gangue, which consists in forming an aqueous solution of an acid capable of reacting with the ore to form a gas and increasing the density of said solution by adding thereto a suitable substance, then feeding the mixture of ore and gangue to the solution, decreasing the density of the gas as it is formed on the ore particles, and removing the ore particles raised to the surface. No. 768,035.

779 Separation of Metals from Their Ores.—Joseph B. Scammell, London, England. The process consists in bringing finely-ground ore suspended in water into contact with chloride of sulphur diluted from 200 to 400 times with oil matter, whereby the metallic particles combine with the sulphochlorinated oil. No. 770,659.

780 Separation of Mineral Substances by Means of the Selective Action of Oil.—Cosmo Kendall, Upper Norwood, England. A process for the treatment of finely-divided material for the separation of graphic substance contained therein from associated rocky matter or gangue, consisting in mixing said material with water, bringing said material intimately into contact or thoroughly mixing it with suitable pure thin oil, as kerosene oil or paraffin oil, projecting at a considerable velocity the mixture so produced under the surface of a volume composed of said material, water and oil, allowing oil and graphitic substance adhering thereto to pass upward to said surface, and drawing off from said surface oil and graphitic substance immediately on arrival at said surface. No. 771,075.

781 Process of Concentrating Ores.—Alice H. Schwarz, New York, N. Y., assignor to Schwarz Ore Treating Company. A method of concentrating ores, which consists in mixing a melted fatty matter which is solid at normal temperatures with the ore, then solidifying the fatty matter and separating the gangue from the values entrained in the fatty matter while the latter is solidified. No 771,277.

782 Process of Separating Metals from Sulphide Ores.—Charles V. Potter, Balaclava, Victoria, Australia. A process of separating metals from pulverized sulphide ores which consists in adding to the same an acid solution which is a nonsolvent of the precious metals, then applying heat to the same, and removing the sulphides from the surface of the solution. No. 776,145.

783 Apparatus for Recovering Precious Metals.—Virginia Tunbridge, Newark, New Jersey, Administratrix of John Tunbridge, Deceased. An apparatus comprising a supply-channel, a screen at the end of said supply-channel, a separator connected with the outlet of said supply-channel, a screen located at the outlet of the separator and provided with means for holding soap, and a filter connected with the outlet of the separator. No. 777,159.

784 Separation of the Metallic Constituents of Ores from Gangue.—Arthur E. Cattermole, London, England. A process of separating metalliferous matter from gangue, which consists in mixing the pulp with an amount of oil equaling only a fraction of the metalliferous constituents, agitating the mass until the oil-coated metalliferous matter is agglomerated into granules, and subjecting the mixture to classification to remove the small noncoated particles from the granules. No. 777,273.

785 Concentration of Minerals from Ores.—Arthur E. Cattermole, Henry L. Sulman, and Hugh F. Kirkpatrick-Picard, London, England. A process of concentrating ores which consists in mixing the ore pulp with soap solution and a mineral acid so as to liberate from the soap the organic acid which coats the desired mineral particles, but not the gangue, agitating the mixture so as to agglomerate the coated mineral particles into granules and separating the granules from the non-coated gangue. No. 777,274.

786 Apparatus for Separating Sulphides from Their Ores.—James H. Gillies, Melbourne, Victoria, Australia. An apparatus for separating sulphides from ores, comprising a treatment pan or vessel, means for heating the same, means for conveying a supply of cool or cold liquid to the bottom of said pan, and means for permitting said liquid to escape from the bottom of the pan to carry away the drossy matter without lowering the temperature or the level of the heated liquid in the upper part of said treatment pan or vessel. No. 778,747.

787 Apparatus for Recovering Zinc or Other Sulphides from Their Ores.—James H. Gillies, Melbourne, Victoria, Australia. In an apparatus for recovering zinc and other sulphides from their ores by the wet or chemical process, and in combination, a receptacle, a series of radial over-lapping inclined V-shaped catchment-chutes so placed as to guide the rising metallic gaseously-supported particles and on their falling receive and automatically discharge the same, said catchment-chutes being so arranged that each slightly overlaps its neighbor on one side, a central escapement-channel into which said particles fall, and means for removing said particles from said channel. No. 780,281.

788 Apparatus for Separating and Concentrating Minerals.—George A. Goyder and Edward Laughton, Adelaide, South Australia, Australia. Apparatus for separating minerals and extracting some of them as concentrates, consisting of a vessel adapted to contain a solution, the floor of such vessel being partly horizontal and partly inclined and provided with means for heating the solution, a feeding-hopper extending across one end of said vessel adapted to feed ore or minerals in a finely divided state, a series of transverse rod-rakes, and means for moving them at a regulated speed along the bottom of the vessel from the feed to the discharge end, inclined deflectors along and above the bottom of the separating portion of the vessel, trough-receptacles arranged parallel with the said deflectors and at such distance from the bottom of the vessel as to enable the gas-raised particles of mineral to be deflected, guided,

deposited and collected therein, sloping extensions of said troughs and angular rakes for discharging the concentrates from the troughs through the sloping extension of the vessel. No. 784,999.

789 Separation of Metals from Their Ores.—Jacob D. Wolf, London, England. A process of separating metals from their ores which consists in agitating pulps with oil until the oil has taken up all the metallic-mineral contents with some gangue, separating the mineral-bearing oil from the pulps, removing suspended particles of gangue from the oil by passing it through warm water and separating metallic minerals from the oil. No. 787,814.

790 Ore Concentration.—Arthur E. Cattermole, Henry L. Sulman, and Hugh F. Kirkpatrick-Picard, London, England. A process of concentrating ores which consists in mixing a freely flowing ore pulp with a soap solution and a mineral acid so as to liberate the organic-acid from the soap throughout the suspended ore mass in intimate contact therewith, whereby the organic acid coats the desired mineral particles and not the gangue, and thereafter separating the coated mineral matter from the non-coated gangue. No. 788,247.

791 Mineral Reclaimer and Saver.—Homer L. Orr and Fred B. Finley, Fort Collins, Colorado. In a tank divided into a plurality of compartments of different sizes, a screen arranged in the larger compartment, a trough arranged below the screen, a plurality of compartments, each containing a filtering medium and means for supplying oil and water to the compartments, and means for causing the liquids to traverse a tortuous path therethrough. No. 790,913.

792 Apparatus for Saving Precious Values in Soils.—Benjamin Wm. Rice, Caldwell, Idaho. An apparatus for saving metallic values from sand, gravel, etc., comprising a shaking-screen, a trough supported by arms secured to said screen, a screen-box, bars supported by said screen and positioned underneath the exit end of said trough, a tank adapted to contain water and oil and positioned underneath said screen box, sprocket-wheels mounted within and upon the upper edge of said tank, a sprocket-chain traveling about said wheels, cross pieces secured at intervals to the links of said chain and projecting laterally from the sides of the chain and adapted to travel adjacent to the bottom of the tank substantially its entire length, and a gate positioned within said tank and underneath which said cross-piece upon the chain are adapted to travel. No. 792,617.

793 Ore Concentration.—Henry Livingstone Sulman and Hugh Fitzalis Kirkpatrick-Picard, London, England. A process of concentrating ores which consist in bringing the pulp into intimate contact with "oil" in the form of spray and with a gas and thereafter separating the metalliferous constituents from the gangue. No. 793,808.

794 Means for Effecting Aqueous Separation.—James D. Darling, Philadelphia, Pennsylvania. An apparatus for effecting aqueous

separation which consists of a receptacle; a water inlet and outlet to the same with means for regulating the flow of both; a foraminate partition interposed within the receptacle on the side toward which the water flows; an agitating apparatus within the receptacle on the side of the partition toward which the water enters; and propeller-blades in proximity to the partition by the rotation of which the material in the receptacle may be constantly driven away from the partition in opposition to the flow of the current. No. 795,823.

795 Treatment of Sulfids and Complex Ores.—Charles H. Ward, Sydney, New South Wales, Australia. A process of roasting ores in the presence of heated gases, which consists in first passing the ore through a current of such gases in a direction opposite to the flow thereof, and subsequently causing the ore and the current of gases to move together in the same direction, and reducing the temperature of the heated gases as they and the ore are moved together in the same direction. No. 799,696.

796 Process for Concentrating Ores.—Walter Murray Sanders, Iola, Kansas. The methods of concentrating ore, which consists in subjecting it to a non-acid solution capable of reacting with evolution of gas, and collecting such particles as are sustained by the evolved gas. No. 805,382.

797 Process of Concentrating Ores.—Alfred Schwarz, New York, N. Y., Assignor to Schwarz Ore Treating Company, Phoenix, Arizona Territory, a corporation of Arizona Territory. The method of treating ores which consists in subjecting a non-sulfid ore to the action of a soluble sulfid to convert the mineral into a sulfid, then treating the mass with a hydrocarbon and finally separating the hydrocarbon with the entrapped metallic constituents of the ore from the tailings. No. 807,501.

798 Process of Concentrating Ores.—Alfred Schwarz, New York, N. Y. Assignor to the Schwarz Ore Treating Company, Phoenix, Arizona Territory, a corporation of Arizona Territory. The method of concentrating ores which consists in mixing with the pulverized ore an agent to which the metallic constituents will adhere, consisting of a mixture of a normally non-liquid resinous hydrocarbon and a non-resinous hydrocarbon, then separating said adhesive agent with the entrapped values from the tailings, and finally separating the values from said agent. No. 807,502.

799 Process of Concentrating Ores.—Alfred Schwarz, New York, N. Y., assignor to the Schwarz Ore Treating Company, Phoenix, Arizona Territory, a corporation of Arizona Territory. The process of concentrating ores consisting of mixing with the pulverized ore a selective agent consisting of a mixture of a liquid hydrocarbon and a normally solid fatty matter, which mixture is solid at normal temperatures, separating said agent with its entrapped values from the tailings, and finally recovering the values from the selective agent. No. 807,503.

800 Process of Concentrating Ores.—Alfred Schwarz, New York, N. Y., Assignor to Schwarz Ore Treating Company, Phoenix, Arizona Territory, a corporation of Arizona Territory. The process of concentrating ores consisting in melting a normally solid hydrocarbon, mixing dry pulverized ore therewith, separating said hydrocarbon with its entrapped values from the tailings by subjecting the mixture to the action of a bath of heated water while maintaining said hydrocarbon in a melted condition, and finally recovering the values from the hydrocarbon. No. 807,504.

801 Process of Concentrating Ores.—Alfred Schwarz, of New York, N. Y., assignor to Schwarz Ore Treating Company of Phoenix, Arizona Territory, a corpoation of Arizona Territory. The process of concentrating ores consisting in mixing the ore out of contact with water with an adhesive agent composed of a hydrocarbon and sulfur, separating said agent with the entrapped values from the tailings, and recovering the values from the adhesive agent. No. 807,505.

802 Process of Concentrating Ores.—Alfred Schwarz, of New York, N. Y., assignor to Schwarz Ore Teating Company, of Phoenix, Arizona Territory, a corporation of Arizona Territory. The process of concentrating ores consisting in melting a normally solid resinous hydrocarbon, mixing the pulverized ore therewith and separating said hydrocarbon with its entrapped values from the tailings, and finally recovering the values from the resinous hydocarbon. No. 807,506.

803 Process of Separating Minerals.—Edmund B. Kirby, of Rossland, Canada. The process of separating minerals, which consists in mixing together the pulverized mineral material, a considerable quantity of water, and a solution of bitumen and kerosene; in gently agitating this mixture, and in blowing a gas into the same to assist in the flotation of said solution and the mineral particles which have been coated thereby; and in separating said solution and mineral particles. No. 809,959.

804 Process of Recovering Values from Sulfid Ores.—Edwin C. Pohle, Reno, Nevada. The process of recovering values from sulfid ores which consists in mixing the ore with a chlorid, subjecting the mixture to heat in an oxidizing atmosphere, cooling the product, leaching the mass with water, to remove the contained bodies soluble therein, leaching the residue with a solution of a cyanid of an alkali metal, and finally, precipitating the gold and silver from the solution. No. 811,085.

805 Graphite-Separator.—John Henry Davis, of Glens Falls, New York. A graphite-separator, comprising a main trough, means for feeding graphite ore and water thereto, means for maintaining a water-level in the trough, and a series of partitions in the trough, each provided with a separating-plate having its front end located just below said water-level; each of said plates being provided with means for carrying away fine sand and mud from a point near the surface of the water. No. 816,303.

806 Ore-Separator.—Fred B. Finley, of Los Angeles, California. In an ore-separator, the combination of a tank provided with an outlet-

valve, a combined hopper and coil mixer arranged within the tank, a second tank into which the first tank discharges, a third tank into which the second tank discharges, a float-operated valve in the second tank for controlling passage of oil to the third tank, a valve in the first tank, a rock-beam, and a connection between the rock-beam and the float of the second tank and the valve of the first tank. No. 822,515.

807 Separator for Use in the Concentration of Ores.—Alfred Schwarz, of New York, N. Y., assignor to Schwarz Ore Treating Company, of Phoenix, Arizona Territory, a corporation of Arizona Territory. In a separator for use in the concentration of ores the combination of a kettle adapted to contain water, shelves supported within said kettle, scrapers cooperating with said shelves to impart a continuous movement to the contents of the kettle, an over-flow-discharge outlet at the top for the concentrates and adhesive agent, and a discharge-outlet at the bottom of the kettle for the tailings No. 825,080.

808 Process for Separating Finely-Divided Material.—Francis Edward Elmore, of London, England. A process of separating certain constituents of finely-divided material consisting in mixing the material with a liquid and a substance that has a selective affinity for some of the constituents, subjecting the mixture to a pressure below that of the atmosphere and collecting the particles floated. No. 826,411.

809 Ore Concentration.—Henry Livingstone Sulman, Hugh Fitzalis Kirkpatrick-Picard, and John Ballot, of London, England. The process of concentrating powdered ores which consists in separating the mineral from the gangue by coating the mineral with oil in water containing a small quantity of oil, warming the mixture, agitating the mixture to form a froth, and separating the froth. No. 835,120.

810 Ore Concentration.—Henry Livingstone Sulman, of London, England. A process for concentrating ores which consists in mixing the powdered ore with water, adding a small proportion of oily liquid having a preferential affinity for metalliferous matter, agitating the mixture, heating the mixture until gaseous bubbles are generated therein so that the oil-coated mineral matter forms into a froth and separating the froth from the remainder by flotation. No. 835,143.

811 Ore Concentration.—Henry Livingstone Sulman, Hugh Fitzalis Kirkpatrick-Picard, and John Ballot, of London, England, assignors to Minerals Separation, Limited, of London, England. The process of separating powdered minerals from one another which consists in suspending the powdered minerals in a liquid, subjecting the mixture to a gas-pressure and thereafter relieving the pressure whereby bubbles of gas are liberated in the pulp and carry certain minerals to the surface. No. 835,479.

812 Separating-Tank.—Edmund B. Kirby, of Rossland, British Columbia, Canada. The combination of a separating-tank containing

agitator mechanism, with means for discharging into the contained fluid charge a gas and a liquid lighter than water and immiscible therewith. No. 838,626.

813 Process of Concentrating Ores.—Alfred Schwarz, of New York, N. Y., assignor to Schwarz Ore Treating Co., of Phoenix, Arizona Territory, a corporation of Arizona Territory. The method of concentrating ores consisting in mixing with the pulverized ore rosin-oil, then separating said agent with its entrapped values from the tailings and finally recovering the values from said agent. No. 842,255.

814 Apparatus for Separating Minerals.—James Francis Latimer, of Toronto, Ontario, Canada. An apparatus comprising a vessel provided with a funnel-shaped bottom having a controlled discharge-opening at the apex thereof; an upwardly-sloping deflecting plate extending into said vessel; a screen of suitable mesh supported within said vessel at the top of the funnel-shaped bottom thereof; a rotatable pipe or conduit for introducing water into said vessel and having its discharge-end opening below said screen; horizontally-held paddles supported by said conduit at the required angle and designed to operate above said screen so as to create a centrifugal force so as to divide the graphite from the rocky matter or gangue and at the same time create an additional upward current in the water above said screen to that caused by the flow of water upward through said screen so as to cause the oil-provided graphite to rise to the top of the water so that it may be caught by said deflecting plate and so conducted out of said vessel. No. 851,599.

815 Process for Separating Minerals.—James Francis Latimer, of Toronto, Ontario, Canada. The process of separating graphite and similar substances from rocky matter and gangue, consisting in mingling the crushed ore with oil; delivering the oil-provided mass to; and maintaining it in an upflowing current of water; centrifugally agitating the mass to separate the components and so accelerate the current as to carry the oil-provided graphite to the top of the water; flowing the so separated graphite away; settling the gangue through an upflowing current of reduced speed below the zone in which the material is fed and agitated, and removing said gangue by a downwardly-flowing current. No. 851,600.

816 Process of Separating Zinc-Blende by Flotation.—Auguste Joseph Francois Debavay, of Kew, Victoria, Australia. A process of separating zinc blende particles from ores, tailings, and concentrates in a pulverized condition comprising the freeing of zinc blende particles from the carbonates and other impurities by first submitting the material to the action of a chemical re-agent, and then discharging the material in a film-like manner into a body of water by delivering the material in a thin pasty condition in the presence of a stream of water upon an inclined surface extending to said body of water, and then separating the zinc blende floating on the water from the remaining ores, tailings, or concentrates which precipitate in the body of water. No. 864,597.

817 Method of Separating the Metallic and Rocky Constituents of Ores.—Dudley H. Norris, of New York, N. Y. The method of separating the metallic and rocky particles of ore, which consists in

introducing a stream of water containing air in solution into a mixture composed of crushed ore, oil and water to cause bubbles of air to form in said mixture and rise to the surface thereof to carry off the metallic particles of the ore. No. 864,856.

818 Process for Separating Solids.—Arthur P. Stanley Macquisten, of Glasgow, Scotland. A process for separating solids having different surface affinities for liquids, consisting in forming a pulp of the mixture, bringing the commingled particles through the surface of a gently flowing stream of liquid and returning the same to the stream in a direction transverse to the flow of the stream, and collecting concentrates thereby caused to float upon the stream. No. 865,194.

819 Apparatus for Separating Solid Particles from Each Other.—Arthur P. Stanley Macquisten, of Glasgow, Scotland. Means for separating a mixture of finely divided particles of ore, comprising a cylinder arranged to rotate in contact with a body of liquid, said cylinder passing through the surface of the liquid in such direction as to carry the particles there through and to cause them to roll back to the surface of the liquid, said cylinder having a ribbed interior surface. No. 865,195.

820 Apparatus for Separating Solid Particles from Each Other.—Arthur Penrhyn Stanley Macquisten, of Glasgow, Scotland. Means for separating a mixture of finely-divided particles of ore, comprising a support for said particles arranged to move in contact with a body of liquid, said support passing through the surface of the liquid in such direction as to carry the particles there through and to cause them to roll back to the surface of the liquid. No. 865,260.

821 Apparatus for Concentrating Ores.—Alexander S. Elmore, London, England, Assignor to the Ore Separation Company (1905) Limited, London, England. Apparatus for the treatment of ores with oil, comprising a mixing tank, a mixing device for intimately mixing a pulp of the ore with oil in the mixing tank, and a floating sea of oil inclosed by a ring for excluding the air from the said tank during the mixing process. No. 865,334.

822 Apparatus for Separating the Metallic Particles of Ores from the Rocky Constituents Thereof.—Dudley Hiram Norris, of New York, N. Y. An apparatus comprising a receptacle having its upper end open to the atmosphere and adapted to receive a flowing mixture of pulverized ore and water, means for introducing a stream of water containing air in solution into the mixture in said receptacle to cause infinitesimally small nascent bubbles of air to form in said mixture and rise to the surface thereof to collect the metallic particles of the ore together, a member arranged at the upper end of said receptable to receive the metallic particles of the ore, and a discharge pipe at the lower end of the receptacle out of which the water and the rocky particles of the ore pass. No. 873,586.

823 Separation of Metalliferous Minerals from Gangue.—Henry Livingstone Sulman, Hugh Fitzalis Kirkpatrick-Picard, and John Ballot, of London, England. The process of treating ores to sepa-

rate metalliferous matter from gangue which consists in mixing the powdered mineral with water to form a freely flowing pulp, agitated by the mineral pulp with a small quantity of oil sufficient only to impart a thin coating of oil to the metalliferous particles, distributing the mixture in the form of a thin sheet of flowing liquid, causing the immersed particles to be exposed to the air and thereafter to meet the surface of the liquid, collecting the floating oiled metalliferous particles and collecting the gangue which sinks. No. 879,985.

824 Separation of Metals from Their Ores.—Jacob D. Wolf, of London, England. The combination with a traveling belt, of means for coating one face of same with a metal selective substance, means for roughening said coating, said roughened coating adapted to receive wet ore pulp, and means for relieving said belt of said selective substance and adhering metals. No. 899,149.

825 Process for Separating Metals from Their Ores.—Jacob David Wolf, of London, England. A method of separating metals from their ores which consists in forming a pulp; passing said pulp containing the metals over an oily adhesive substance; and in abrading the surface of said substance by drawing apart the body of the same, and thereby causing some of the mineral particles to adhere thereto. No. 899,478.

826 Ore-Concentrator.—Henry Livingstone Sulman and Evan Aspray Sulman, of London, England, assignors to Minerals Separation, Limited, of London, England. In an apparatus for concentrating ores the combination of a fixed surface, means for feeding powdered ore over the surface, means for continuously feeding a thin stream of liquid over the surface, a movable body having a flexible squeegee edge in contact with the surface sufficiently flexible to pass over the ore while exerting sufficient pressure on the surface to remove the film of water therefrom, means for sweeping the body over the surface in a direction at right angles to the direction of flow of the water to cause the ore to be alternately exposed to the air and to the edge of the liquid. No. 902,018.

827 Apparatus for Concentrating Ores.—Walter Murray Sanders, of Marion, Kentucky. Apparatus for concentrating ore by flotation, comprising a tank having means for introducing ore and solution below the normal liquid surface, a central discharge gate for tailings, a substantially central overflow for concentrate, and means for imparting a whirling motion to the liquid in the tank. No. 911,077.

828 Apparatus for Separating Ores by Flotation.—Auguste Joseph Francois De Bavay, of Kew, Victoria, Australia. A method with the combination of a feed pipe, a rotary worm therein, an ore supply connected to each terminal of said pipe, a water supply pipe arranged parallel and adjacent to said feed pipe, a plurality of inclined chutes, distributing means extending transversely of each chute, a liquid containing receptacle at the lower end of each chute, provided at one side with an adjustable overflow lip and inclined gutter for receiving and conveying the particles capable of flotation, an end-

less traveling belt in each of said receptacles having one end submerged therein and adapted to convey the heavier constituents from one trough to the succeeding inclined chute, spray pipes adapted to deliver water upon the belts after they have emerged from said receptacles, and operating means common to said distributing means and said endless traveling belts. No. 912,783.

829 Ore Separating Process.—Marcus Ruthenburg, of Lockport, New York. A process of separating ore or concentrate particles of different specific gravity, which cannot be wetted in water, which consists in surrounding the same with a non-metallic liquid capable of wetting the surfaces of said particles so that they are separated by gravity without flotation in said liquid. No. 933,491.

830 Process of Treating Ores.—Alfred A. Lockwood and Marcus R. A. Samuel, London, England. The process of treating ores, which consists in mixing an ore with a magnetic substance and an oily liquid adapted to cause the magnetic substance to adhere to some constituent part of the ore in preference to the others, and then magnetically separating the mixture. No. 933,717.

831 Roasting Separation Process.—Henry Azor Wentworth, of Newton, Massachusetts, assignor to Huff Electrostatic Separator Company, of Boston, Massachusetts, a corporation of Maine. The process of separating zinc sulfid from other sulfids associated therewith which consists in superficially changing sulfids other than zinc sulfids by subjecting the mass to heat, and thereafter separating by flotation, the heat-affected particles from those unaffected. No. 938,732.

832 Apparatus for Ore Concentration.—Theodore Jesse Hoover, of London, England, assignor to Minerals Separation Limited, of London, England. In an apparatus for concentrating ores by gaseous flotation of certain mineral particles in liquid, the combination of, an agitation vessel, a spitzkasten contiguous thereto, said vessel and spitzkasten adapted to contain circuit liquid, means for agitating the contents of the agitation vessel so as to beat air into the liquid, and a wall between the agitation vessel and the spitzkasten having a wide communication orifice below the level of the liquid in both vessels, said agitation vessel adapted to discharge substantially directly into the spitzkasten. No. 953,746.

833 Concentration of Ores.—Henry Livingstone Sulman, of London, England, assignor to Minerals Separation Limited, of London, England. A process of concentrating ores which consists in mixing the powdered ore with slightly acidified water containing in solution a minute quantity of an alcohol, agitating the mixture, bringing the ore particles into contact with air so as to cause the metallic sulfids to float and separating the floating particles. No. 955,012.

834 Process of Treating Ores.—Alfred A. Lockwood and Marcus R. A. Samuel, London, England, assignors to the Murex Syndicate Limited, London, England. A process of treating sulfid ores which consists in crushing ores composed of friable sulfids in which the commingled grains or particles are bound together by a sulfid, agitating such crushed ores with an alkaline silicate solution to

weaken the bonds between the grains of the commingled sulfids on cleavage lines so that they may be advantageously separated without excessive grinding and concomitant sliming and then subjecting said particles to separation and separate collection. No. 956,381.

835 Process of Treating Ores and Carboniferous Earths.—Alfred A. Lockwood, of London, England. In a process for treating ores, agitating the ore with a mixture comprising water, an insoluble metallic compound containing oxygen and an oily liquid which has been so treated that it contains a minute quantity of a metallic compound insoluble in water for the purpose of preventing the washing out of said insoluble metallic compound, and then separating the oiled particles from the unoiled particles by a flotation process. No. 956,773.

836 Process for Treating Metallic Slimes.—James Dunstone, of Dollar Bay, Michigan. The process consisting in agitating copper slimes in the presence of an emulsion of oil, an aqueous solution of sodium nitrate, and an acid adapted to decompose the sodium nitrate, and collecting the portion floated. No. 956,800.

837 Apparatus for Electrical Separation.—Henry Azor Wentworth, Newton, Mass., assignor to Huff Electrostatic Separator Company, Boston, Mass., a Corporation of Maine. In an electrical separator, a conveyor electrode, means to deliver comminuted material thereto, an adjacent spray discharging electrode, and an insulated electroconductive shield, so disposed in relation to the two electrodes as to intercept further lodgment of the spray upon material affected by the spray earlier in the conveyance of the material, and so as to produce, in opposition to the surface of the conveyor electrode, a material-repelling static field, and means to collect separately the separated material. No. 960,470.

838 Ore Concentration.—Henry Livingstone Sulman, Henry Howard Greenway, and Arthur Howard Higgins, of London, England. A process of concentrating ores which consists in mixing the powdered ore with water containing in solution a small quantity of a mineral-frothing agent, agitating the mixture to form a froth and separating the froth. No. 962,678.

839 Method of Separating Minerals.—Alexander S. Ramage, of Detroit, Michigan, assignor to Chemical Development Co., of Buffalo, New York, a corporation of Colorado. The method of treating ores containing a plurality of mineral components, which consists in immersing the ore in a suitable solution, separately floating said mineral components by progressively raising the temperature of the solution, and removing at each rise of temperature the product separated during such rise. No. 967,671.

840 Process of Separation.—Henry Azor Wentworth, of Lynn, Massachusetts, assignor to Huff Electrostatic Separator Company, of Boston, Massachusetts, a corporation of Maine. The process of separating ingredients of comminuted material, which consists in associating with the material a substance chemically reactive upon particles thereof, thereby producing upon the particles affected by

the reactive substance superficial coatings of a compound different from the original substance of the particles in respect to film-tension of a liquid, and thereupon separating the differentiated particles by film-tension of said liquid. No. 970,002.

841 Apparatus for Separating Minerals from Their Ores.—Samuel K. Behrend, of Denver, Colorado. The combination with a separating tank adapted to contain liquid, and a pipe which discharges radially at the center of the tank and at the surface of the liquid therein, of a barrier located between the water inlet and overflow, said barrier having members in the path of material floating thereon, and a screen located above the tank between said means and the water outlet, for sifting the material to be treated upon the surface of the liquid in the tank. No. 973,467.

842 Apparatus for Ore Concentration. Theodore Jesse Hoover, London, England, assignor to the Minerals Separation Limited, London, England. Apparatus for concentrating ores by gaseous flotation of certain mineral particles in liquid comprising in combination a mixing vessel, an agitator in the mixing vessel, a spitzkasten at the outlet of the mixing vessel, a secondary mixing vessel, a centrifugally acting agitator in said secondary mixing vessel and a connecting conduit between the tailings outlet of the spitzkasten and the zone of the suction influence of the centrifugally acting agitator of said secondary mixing vessel. No. 979,857.

843 Process of Concentrating Ores.—Walter Murray Sanders, Marion, Ky. The process of concentrating sulfid ores, which consists in first concentrating the ore to effect a substantially complete separation of calcite, and thereafter subjecting the purified ore to further concentration by flotation in a solution adapted to react upon the ore to produce bubbles and capable of reacting upon calcite. No. 988,737.

844 Magnetic Preparation of Ores.—Alfred Arthur Lockwood, London, England, assignor to Murex Magnetic Company, Limited, London, England. In the magnetic preparation of an ore, the process which consists in treating the ore with a magnetic substance, an oily liquid, and a solution of a sulfid of an alkali metal and magnetically separating the mixture. No. 996,491.

845 Liquid Ore Separation.—Francis I. du Pont, of Wilmington, Delaware. The process of separating solids of different specific gravities, consisting in liquefying anhydrous antimony bromid, passing the mixture to be separated therethrough and separately discharging the portions which float and those which sink. No. 1,014,624.

846 Apparatus for the Wet Dressing of Sulfid Ores.—Benjamin Sedgely Smith, of Manly, near Sydney, New South Wales, Australia. An apparatus for concentrating and classifying sulfid ores, the combination of conducting means for a film of water, means for distributing ores on the surface of the film of water, an inclined table provided with an aperture therein, a valve controlled receptacle open to and in water tight engagement with the said aperture in

said table, and a drowning box interposed between said conducting means and said table to conduct the ore carrying film of water from the former to the latter, to thoroughly submerge the ore therein whereby it sinks into said receptacle upon reaching the same. No. 1,014,977.

847 Process of Treating and Subsequently Separating Sulfid Ores, etc.—Edward James Horwood, of Broken Hill, New South Wales, Australia. The process of separating zinc sulfid from other sulfids associated therewith which consists in superficially changing sulfids other than zinc sulfids by subjecting the mass to heat, and thereafter separating by flotation, the heat-affected particles from those unaffected. No. 1,020,353.

848 Art of Concentration of Mineral Substances.—James M. Hyde, of Basin, Montana. A continuous process of concentrating the valuable constituents from ore pulps, comprising the addition to the pulp of an acid precipitant adapted to react upon the ore, allowing a time interval to elapse prior to subjecting it to the separation treatment, then subjecting the pulp to a separation treatment comprising the steps of adding a non-metallic material which will preferentially coat the valuable particles of the ore and separating said coated particles as a concentrate. No. 1,022,085.

849 Apparatus for Separating Particles of Rubber from Materials with which they are Commingled.—William Sullivan Blaine, of Torreon, Mexico, assignor to Intercontinental Rubber Company, of New York, N. Y., a corporation of New Jersey. Apparatus for separating particles of rubber from materials with which they are commingled, said apparatus comprising a flotation tank, a concentrating table communicating with said tank at one end thereof, and an overflow for the flotation tank, so arranged as to maintain a shallow covering of water upon the concentration table. No. 1,032,732.

850 Method of Separating Particles of Rubber from Materials with which they are Commingled.—William Sullivan Blaine, of Torreon, Mexico, assignor to Intercontinental Rubber Company, of New York, N. Y., a corporation of New Jersey. The method of separating particles of rubber from materials with which they are commingled, which consists in separating the rubber particles by flotation in a body of water, and withdrawing the heavier residues or sinkers into an auxiliary substantially quiescent body of water and under such back pressure as will substantially prevent re-entrance into the sinkers, of rubber particles that have been released. No. 1,032,733.

851 Process of Separating Ores.—Alfred Arthur Lockwood, of London, England, assignor to Murex Magnetic Company, Limited, of London, England. A process which consists in treating the ore with an oily liquid, water and with a silicate of an alkali metal to modify the behavior of the oil toward the constituents in the ore and separating the oiled constituents from the unoiled constituents. No. 1,043,850.

852 Process of Separating Ores, etc.—Alfred Arthur Lockwood, of London, England, assignor to Murex Magnetic Company, Limited, of London, England. A process which consists in treating an oxidized ore with an oily liquid and water; aiding the oiling of the metalliferous contents of the ore by treatment with a carbonate of an alkaline metal and separating the oiled constituents from the unoiled constituents. No. 1,043,851.

853 Separation of Metallic Sulfids from Sulfid Ores.—Thomas John Greenway, of Armadale, near Melbourne, Victoria, Australia, assignor to Potter's Sulphide Ore Treatment Limited, of Melbourne, Australia, a corporation of Victoria, Australia. A process for the separation of metallic sulfids from sulfid ores which consists of first intimately mixing finely divided particles of the ore with a small proportion of viscous oil; secondly, feeding the oiled ore into a heated acidulated solution; thirdly, skimming or floating off the coherent buoyant scum of gasified oiled sulfid particles, and separately withdrawing the unoiled sunken gangue particles. No. 1,045,970.

854 Ore Float-Separator.—Robert Henry Jeffrey, of Gabriel, Mexico. An ore-float separator containing a body of liquid, means giving the effective surface of the liquid conical form, a centrally disposed liquid supply delivering the liquid radially outward in all directions, an ore distributer above the liquid and adjustable to and from the liquid surface, and means for imparting rotary motion to the ore distributer. No. 1,052,061.

855 Process for Treating Ores.—Carl Schick, of Siegen, Germany. A process of treating ore slimes which consists in mixing the slimes with a chlorin derivative of benzol, agitating the mixture, subjecting the mixture to an acid bath, and permitting the settlement of the mixture. No. 1,055,495.

856 Apparatus for Separating Minerals.—Alexander Herbert Smith, of Glasgow, Scotland. The combination of a spitzkasten having an open top, a concentrate lip and a straight side wall having a slot lower than said lip and remote from the bottom of the spitzkasten; a pocket surrounding said slot and provided with a lip higher than said slot and lower than the concentrate lip; and means for conducting mineral feed into the spitzkasten. No. 1,056,952.

857 Ore Mixing and Separating Apparatus.—Alexander H. Smith, of Glasgow, Scotland. An ore mixing and separating apparatus, the combination of a mixer casing having a closed sloping top; a propeller fan mounted in said casing; feed means for a material to be separated and a frothing reagent; a decanting separator; and a sloping conduit of greater length than depth communicating with the upper part of the casing adjacent to the uppermost part of said sloping top and discharging beneath the water level of the decanting separator. No. 1,058,111.

858 Apparatus for Ore Concentration.—James Hebbard, of Broken Hill, New South Wales, Australia, assignor to Minerals Separation Limited, of London, England. Apparatus for concentrating ores by

gaseous flotation of certain mineral particles in liquid, comprising in combination two adjacent mixing vessels, each containing a rotary agitator and a spitzkasten placed contiguous thereto having a high level orifice leading from the first mixing vessel to the spitzkasten, and a low level orifice leading from the spitzkasten to the bottom of the second mixing vessel. No. 1,064,209.

859 Method of Gravity Liquid Separation of Solids.—Francis I. du Pont, of Wilmington, Delaware. A process of gravity liquid separation of solids, which consists in immersing the solids to be separated in a volatile gravity liquid, separately removing from the bath the separated constituents of different specific gravity, volatilizing the gravity liquid carried off by each constituent, condensing the same and returning the same to the separating bath and maintaining the circuit of the liquid carried off from the bath by the constituents from its departure from the bath until return to the bath out of connection with the air. No. 1,064,459.

860 Ore Concentration.—Henry Howard Greenway, of Melbourne, Victoria, and Henry Lavers, of Broken Hill, New South Wales, Australia, assignors to Minerals Separation Limited, of London, England. A process of concentrating ores, which consists in mixing finely divided ore with water containing a froth-producing essential oil, agitating the mixture to form a froth, and separating the froth. No. 1,064,723.

861 Apparatus for Gravity Liquid Separation of Solids.—Francis I. du Pont, of Wilmington, Dela. An apparatus for gravity liquid separation of solids, in combination, a revolving cylinder adapted to contain the separating liquid, conical ends projecting from said cylinder, an inner peripheral continuous spiral blade in said cylinder, a spiral blade formed of staggered sections in one conical section, and a spiral blade formed in part of perforated sections, and in part of staggered sections in the other conical section. No. 1,067,410.

862 Ore Concentration.—Edward Hoit Nutter, of Berkeley, California, and Henry Lavers, of Broken Hill, New South Wales, Australia, assignors to Minerals Separation Limited, of London, England. A process for concentrating ores which consists in treating the crushed ore by a flotation process two or more times under different conditions to obtain froths or scums having the constituents of each in certain ratios of size, and thereafter subjecting the powdered mixture contained in each froth to a classifying step to separate the constituents. No. 1,067,485.

863 Ore-Concentrator.—Henry Ellsworth Wood, Denver, Colo. The combination with an inclined vibrating ore concentrating table, of a water supply or feed box for maintaining a stream of water across the table, an ore feeding device adapted to deposit the ore in a finely divided state upon the surface of the stream near its source, and an outlet gate at the edge of the table opposite the feeding device, the table being constructed with an area devoid

of riffles adjacent the water supply box, and with the riffles in the direct path of the stream modified to reduce disturbance of the surface conditions of the water flowing over them. No. 1,071,850.

864 Process for the Treatment and Separation of Complex Sulfid Ores.—Tormod Reinert Forland, Broken Hill, New South Wales, Australia. A method for chloridizing sulfid ores, of zinc, lead, iron, copper, nickel, arsenic, silver and the like, which comprises treating said ore with chlorin gas, at a temperature at which said metals, with the exception of silver, are converted into chlorids, and certain of said chlorids are volatilized, and chlorid of sulphur is formed and volatilized; passing said volatilized chlorids, together with any remaining chlorin and chlorid of sulphur, and other gases into a contact with a further amount of said ore, at a temperature at which the chlorid of sulphur will attack said metal sulfids, and form chlorids of said metals except silver, and free sulphur, and at which temperature certainly only of said chlorids are volatile. No. 1,078,779.

865 Ore Concentration.—George Albert Chapman and Stanley Tucker, of London, England, assignors to Minerals Separation Limited, of London, England. A process for concentrating ores, which consists in subjecting to agitation and to the action of a selective agent a pulp of an ore containing a carbonate, in the presence of a bisulfate of an alkali metal, and separating the selected portion of the ore. No. 1,079,107.

866 Apparatus for Washing Ore.—Hermann Alexander Brackelsberg, of Hagen, Germany. In a float separator for minerals, a plurality of receptacles adapted to overflow into one another, the overflow walls being at progressively lower levels, and each overhanging the surface of liquid in the next receptacle at an angle adapted to cause a film of liquid to flow along the overhanging surface of said wall, and means for gently feeding the material and liquid across the series of receptacles. No. 1,080,886.

867 Ore-Separator.—Charles Henry Brown, Magdalena, New Mexico, assignor to the Sherwin-Williams Company, Cleveland, Ohio, a Corporation of Ohio. An apparatus consisting of a combination of a liquid tank; a plurality of spaced rolls in the tank disposed alternately above and below the designed level of the liquid, the rolls below such level having a plurality of spaced peripheral ribs; a movable conveyor extending over the rolls above such level and under the rolls below such level; a device adjacent an end roll for feeding material to the conveyer in the direction of its movement; a plurality of spreaders respectively disposed transversely of and above the conveyer adjacent the several rolls disposed above the liquid level; and means for transversely reciprocating the spreaders. No. 1,081,360.

868 Apparatus for Ore Concentration.—Walter Broadbridge and Allen Crawford Howard, London, England, assignors to Minerals Separation Limited, London, England. Apparatus for carrying out the agitation-froth process of ore concentration comprising in com-

bination a series of agitating and aerating vessels, a series of spitzkastens contiguous thereto and communicating with a plurality of the said vessels at various points, and partitions between the spitzkastens which do not extend up to the liquid level, so as to leave uninterrupted surface for the formation of the froth. No. 1,084,196.

869 Ore-Concentrator.—Henry Ellsworth Wood, Denver, Colorado. Apparatus consisting of the combination with a settling tank, of a rotating drum or roller submerged to near its top and having a longitudinally corrugated surface, the corrugations being of such form as to carry a continuous surface film and means for depositing in a finely comminuted state upon the exposed portion of the drum, the ore to be concentrated. No. 1,088,050.

870 Method and Apparatus for Ore Concentration.—Howard Hoyt Nutter, New York, N. Y., and Theodore Jesse Hoover, London, Eng., Assignors to Minerals Separation Limited, London, England. A method of concentrating ores by the formation of a mineral-bearing froth which consists in causing the froth as it is formed to pass over a lip below the level of the free air surface, causing the body of the pulp to pass onward to further treatment without passing over said lip, and causing the more permanent froth of the froth thus separated to pass over a second lip. No. 1,093,463.

871 Process for Recovering Metalliferous Constituents of Ores.—Joseph T. Terry, Jr., San Francisco, California. A process which consists in the subjection of metalliferous particles of ores existing as carbonates, oxides, chlorids and sulphates, to the action of a hydrogen-sulfid gas, then subjecting the resulting product to partial vacuum, then agitation in the presence of an oil-film-forming substance, and recovering the oil-film-forming substance, and recovering the oil-coated particles by flotation. No. 1,094,760.

872 Concentration of Ores.—Henry Howard Greenway, Melbourne, Victoria, Australia, Assignor to Minerals Separation Limited, London, England. A process of concentrating ores which consists in mixing a powdered ore with neutral water containing in solution a minute quantity of an aromatic hydroxy compound, agitating the mixture in the cold to form a froth and separating the froth. No. 1,099,699.

873 Process for the Separation of Metallic Sulfids from Gangue and Apparatus Therefor.—Leslie Bradford, Broken Hill, New South Wales, Australia, Assignor, by Mesne Assignments, to Minerals Separation Limited, London, England. A process of concentrating ores, which consists in mixing the ore with water to form a flowing pulp, adding to the pulp sufficient acid to bring about the evolution of gas by chemical action of the acid, subjecting the pulp and evolved gas therein to violent agitation, and then flowing the agitated pulp away from the place of agitation and separating the floating material. No. 1,101,506.

874 Ore Concentration.—Henry Howard Greenway, Clare, South Australia, and Alfred Henry Piper Lowry, Prahran, Victoria, Aus-

tralia. A process of concentrating metalliferous ores, which consists in subjecting the ore to the action of a chromium salt and to flotation separation whereby products are obtained relatively high in certain values, and other products are obtained relatively high in other values. No. 1,102,738.

875 Ore Concentration.—George Albert Chapman and Stanley Tucker, London, England, Assignors to Minerals Separation Limited, London. A process for concentrating ores, which consists in first agitating a quantity of water with a modifying agent out of contact with the ore so as to form an air emulsion, and thereafter adding to the water the ore to be treated and agitating the same therewith so as to form a froth and separating the froth. No. 1,102,873.

876 Ore Concentration.—George A. Chapman, London, England, Assignor to Minerals Separation Limited, London, England, a Corporation of England. A process for concentrating ores, which consists in grinding the ore with water, in the presence of an agent for modifying the water, so that the agent modifies the physical characteristics of the water, and separating the floating mineral. No. 1,102,874.

877 Ore-Concentrating Apparatus.—John M. Callow, Salt Lake City, Utah, Assignor to Metals Recovery Company, Augusta, Maine, a corporation of Maine. An ore concentrating apparatus having a solution containing tank and a porous body therein through which fine streams of air under pressure are admitted into the solution from below, a means operating in proximity to the upper surface of said body for maintaining the heavier constituents of the solution in suspension to thereby prevent the blanketing of the air outlets of said porous body. No. 1,104,755.

878 Apparatus for Liquid Separation of Solids.—Francis I. du Pont, Wilmington, Delaware, Assignor to International Haloid Company, a Corporation of Delaware. The combination with a tank adapted to hold the separating liquid having an outlet from which the separated constituent is discharged, of a conveyer, a conduit through which the conveyer travels, means to heat the conduit, a condenser, a pipe leading to the condenser from the conduit at a relatively hot part of the latter, a vapor discharge from the condenser and a pipe leading from the vapor discharge to the conduit at a relatively cool part of the latter, and means to deliver material from the tank outlet to the conveyer, said tank, conduit and condenser being closed against direct connection with the external atmosphere. No. 1,106,195.

879 Separation of Zinc-Blende and other Metalliferous Constituents from Ore Concentrates and Slimes by Flotation or Granulation.—Edward James Horwood, Broken Hill, New South Wales, Australia. A process of separating sulfids, the method which comprises extracting water soluble substances from a material comprising a plurality of such sulfids, thereafter submitting to a heating operation to deaden certain of such sulfids and finally separating the sulfids by a selective wetting operation. No. 1,108,440.

880 Method of Concentrating Ores.—William Sydney Stevens, Magdalena, New Mexico, Assignor, by Mesne Assignments, to The Ozark Smelting and Mining Company, Cleveland, Ohio, a Corporation of Ohio. The process of concentrating ore, which consists in mixing together at a temperature of not less than 60°C. crushed ore, sufficient water to form a flowing pulp, sulfuric acid, and a mineral oil in amount only sufficient to preferentially coat the desired sulfids particles of the ore; and thereafter presenting the pulp to the air and then to the surface of a liquid to cause a flotation of the oiled sulfid particles by surface tension. No. 1,116,642.

881 Ore-Concentrating Apparatus.—John M. Callow, Salt Lake City, Utah, Assignor to Metals Recovery Company, Augusta, Maine, a Corporation of Maine. An ore concentrating apparatus having a solution-containing tank and a porous medium therein through which fine streams of air under pressure are admitted into the solution from below, a means operating in proximity to the upper surface of said medium for maintaining the heavier constituents of the solution in suspension to thereby prevent the blanketing of the air outlets of said porous medium, said means including a rotary member adapted to beat into the solution the air diffused by the porous medium, and means for rotating said member at a high speed. No. 1,124,853.

882 Ore-Separatory Apparatus.—John M. Callow and David J. Kelly, Salt Lake City, Utah, Assignors to Metals Recovery Company, Augusta, Maine, a Corporation of Maine. An apparatus of the combination with a tank adapted to contain a mixture of powdered ores and water and a frothable agent, of a hollow rotary member operable in the tank and adapted to receive a gaseous fluid under pressure, said member being sufficiently porous to permit the passage of the gaseous fluid therethrough but not the water and pulp. No. 1,124,855.

883 Ore-Flotation Apparatus.—John M. Callow, Salt Lake City, Utah, Assignor to Metals Recovery Company, Augusta, Maine, a Corporation of Maine. An apparatus having a pulp-containing tank and a porous body therein through which streams of gaseous fluid under pressure are admitted into the solution from below, said porous body permitting the passage of the gaseous fluid but not pulp and water, and a reciprocable carrier mounted in the tank and having elements operating in the proximity to the upper surface of said body for maintaining the coarser constituents of the solution in suspension to thereby prevent the blanketing of the outlets of said porous body. No. 1,124,856.

884 Process of Concentrating Ores.—John M. Callow, Salt Lake City, Utah, Assignor to Metals Recovery Company, Augusta, Maine, a Corporation of Maine. Apparatus for separating the metalliferous from the non-metalliferous ingredients of an ore mass, the combination of a pulp receptacle, means for forcing substantially uniformly distributed bubbles to the surface of said mass, and independent means for exhausting said bubbles from the upper surface of the pulp. No. 1,125,897.

885 Process of Treating Ores.—Joseph W. Emerson, Salida, Colorado. The process of removing blende from blende-containing concentrates which comprises submerging a body of such concentrates in a relatively deep body of an acid solution, mechanically engaging said particles as soon as they rise above the general plane of such body of concentrates and immediately removing them from the acid solution. No. 1,126,965.

886 Apparatus for Separating Minerals By Flotation.—Bernard MacDonald, Los Angeles, California. An apparatus for separating minerals by flotation comprising a receptacle, a launder adjacent to the receptacle into which the material passes from the receptacle, a vertically disposed transfer-pipe within the receptacle having a lower open intake end and an upper discharge end, a pipe entering the lower open end of the transfer-pipe, means for supplying compressed air to said last mentioned pipe and means for supplying oil to said last mentioned pipe. No. 1,134,690.

887 Flotation-Machine.—Charles E. Rork, Douglas, Arizona. A flotation separator including a settling tank provided at its sides with overflow lips, an agitation chamber extending longitudinally and centrally of the tank being partially immersed therein and divided into a plurality of transverse compartments, each compartment being provided at one side with an inlet opening near its bottom and at its other side with an outlet opening near its top, such openings being reversely arranged in adjacent compartments, partitions in the settling tank forming chambers which communicate with one inlet and one outlet opening, and an agitator mounted in each compartment of the agitation chamber. No. 1,136,485.

888 Apparatus for the Wet Dressing of Sulfid Ores.—Benjamin Sedgely Smith, Sydney, New South Wales, Australia. In combination, a surface tension separating table provided with means for flowing liquid therethrough, a screen thereover adapted to deliver a predetermined size of material to the table, a distributing screen close to and parallel with the surface of the liquid on the table, interposed in the path of material dropping from the primary screen and adapted to break the momentum thereof. No. 1,136,622.

889 Flotation of Minerals.—Raymond F. Bacon, Pittsburgh, Pennsylvania, Assignor to Metals Research Company, New York, N. Y., a Corporation of Maine. The method of effecting the separation of oxidized ores from associated gangue, which consists in subjecting the mixture, in a finely divided condition, to the action of a soluble sulfid, thereby effecting a conversion of the oxidized ore into sulfids, and then converting the hydrogen sulfid present into constituents innocuous to flotation, and finally subjecting the mixture to flotation. No. 1,140,866.

890 Flotation of Minerals.—Raymond F. Bacon, Pittsburgh, Pennsylvania, Assignor to Metals Research Company, New York, N. Y., a Corporation of Maine. The method of effecting the separation of oxidized ores from associated gangue, which consists in subjecting the mixture, in a finely divided condition, to the action of a soluble sulfid, thereby effecting a conversion of the oxidized ore into sul-

fids, and then converting the hydrogen sulfid present into constituents innocous to flotation, and finally subjecting the mixture to flotation. No. 1,140,866.

891 Ore-Concentrating Apparatus.—John M. Callow, Salt Lake City, Utah, Assignor, by Mesne Assignments, to Metals Recovery Company, a Corporation of Maine. An apparatus consisting of the combination of a tank or receptacle adapted to receive ore pulp and a substance having the property of frothing in the presence of a gaseous medium and agitation, a casing within the lower portion of the tank and separated therefrom to form a surrounding space or chamber, a body of porous material within said inner casing and supported above the bottom thereof so as to form a chamber between said porous body and the bottom of the tank, a feed-pipe terminating in the lower portion of the tank above the porous body and adapted to deliver the pulp into the casing above said body, a pipe leading into the chamber below said porous body and adapted to admit a gaseous medium under pressure thereinto, said porous body subdividing the gaseous medium and distributing the same irregularly substantially throughout the entire surface of the pulp, and a discharge means connecting with the space or chamber between the inner casing and the tank and adapted to deliver therefrom the heavier material which has settled into said space. No. 1,141,377.

892 Separation of Mixed-Sulfid Ores.—Henry Lavers, Surrey Hills, Victoria, Australia, Assignor to Minerals Separation American Syndicate (1913) Limited, London, England. A process of concentrating metallic sulfid ores, which consists in subjecting the ore to the action of a chromium salt in a slightly alkaline solution and to a flotation separation in a heated circuit whereby a flotation product relatively high in certain sulfids and a residue relatively high in other sulfids are obtained. No. 1,142,821.

893 Process of Separating the Constituents of Rocks.—Gunnar Sigge Andreas Appelqvist and Einar Olof Eugen Tyden, Stockholm Sweden. The process of separating constituents of rocks by the aid of oils which consists in treating the material to be separated in the form of a powder in dry condition with oils gasified by the application of heat, repeating at will the said treating operation, immersing the material thus treated into a liquid, agitating the mass, and allowing the different particles to separate from one another. No. 1,143,797.

894 Concentration of Minerals by Flotation.—Archibald R. Livingston, Canon City, Colorado, Assignor to the New Jersey Zinc Company, New York, N. Y., a Corporation of New Jersey. The method of separating floatable minerals from material with which they are associated, which consists in feeding the mixture into the body of water, progressively raising it through the surface of the water at an angle greater than its natural angle of repose, meeting the emerging top layer by a downflowing film of water, and floating the top layer thereby into the main body of water at the surface thereof and collecting the material thereby separated separately from that which sinks. No. 1,147,633.

895 Ore Separating Process.—Arthur J. Moxham, Wilmington, Delaware. A process of separating solid constituents of different specific gravities in a heavy liquid, first treating the solids to reduce the specific gravity of each of the solid constituents to the extent required to cause the separating liquid to have the desired specific gravity relative to the specific gravity of each of the solid constituents, and then effecting the separation of the solid constituents in such separating liquid. No. 1,151,117.

896 Apparatus for Ore Concentration.—Arthur Howard Higgins and William Warwick Stenning, London, England, assignors to Minerals Separation, Limited, London, England. Apparatus for concentrating ores by gaseous flotation of certain mineral particles in liquid, comprising, in combination, a vessel, means for introducing a gas therein at the lower part of the vessel, means for producing a zone of violent agitation and gasification in the lower part of the vessel, a baffle above the agitator for producing a quiescent zone in the upper part of the vessel, the baffle being inclined downwardly from the inlet side to the outlet side of the vessel, an inlet for the pulp to the vessel below the baffle, means for removing the froth from the upper surface of the liquid, and an outlet for the residues above the baffle. No. 1,155,815.

897 Apparatus for the Concentration of Ores.—Thomas Mackellar Owen, Broken Hill, New South Wales, Australia, assignor to Minerals Separation American Syndicate (1913), Limited, London, England. An apparatus for concentrating ores by gaseous flotation of certain mineral particles in liquid, a single upright vessel open at the top comprising both an agitation and a separation vessel, an inlet conduit for ore pulp at the bottom of the vessel, an outlet conduit for tailings near the top of the vessel, a rotatable agitator in the lower part of the vessel, a conduit for air leading into the lower part of the vessel, vertically elongated baffles immediately above the agitator terminating at a substantial distance below the surface of the liquid in the vessel for producing a baffling zone above the atomizing zone, and a substantially quiescent topmost and separating zone above the baffling zone. No. 1,155,836.

898 Ore Concentration.—Louis Albert Wood, London, England, assignor to Minerals Separation American Syndicate (1913), Limited, London, England. A process of concentrating ores which consists in subjecting the powdered ore suspended in water free from frothing agents to the admission of gas, forcefully disseminating the gas through the pulp in such a way that the gaseous bubbles preferentially attach themselves to certain mineral particles, and rise toward the surface and discharge their mineral load with the pulp, and catching and removing such discarded mineral below the surface of the liquid. No. 1,155,861.

899 Slime-Thickener for Dewatering Mine-Tailings.—Wilton E. Darrow, Sutter Creek, California. A device comprising a receptable having a central inlet pipe extending to a point near the bottom thereof, a plurality of openings in the side of said receptacle, another receptacle disposed around said first named receptacle, said

openings communicating with said second named receptacle, and a plurality of deflectors arranged in said first named receptacle. No. 1,156,276.

900 Agitator for Ore Treatment.—Cyrus Robinson, Mount Vernon, New York, assignor to Metallurgical Engineering Process Corporation, a corporation of New York. In an agitator for ore treatment, the combination of a receptacle adapted to contain a mixture of solvent solution and finely divided ore, a vertical tube mounted in the receptacle and terminating at its lower end above the bottom of the receptacle, an air nozzle at the bottom of the receptacle below and closely adjacent the lower end of the tube, means for delivering air to the nozzle to agitate the mixture in the tube and force it upward therethrough, means supplemental to the receptacle for receiving the mixture from the upper end of the tube, and means for entering the nozzle to cut down the effective cross area thereof. No. 1,156,372.

901 Process of Extracting Metals from Ores.—Robert S. Towne, New York, and Cyrus Robinson, Mount Vernon, New York, assignors to Metallurgical Engineering & Process Corporation, a corporation of New York. A process for effecting the separation of soluble values from a mass, it consisting in subjecting the mass to the action of a solvent solution of comparatively high dissolving efficiency for a comparatively short period of time, positively and actively agitating the mass and the solution during the said period, subjecting the mass to a positive and active dehydration, thereby withdrawing from it a major portion of the solution together with the dissolved values contained therein, subjecting the remaining mass to the action of a similar solvent solution of comparatively low dissolving efficiency for a comparatively long period of time, positively and actively agitating the mass and the solution during the said period, subjecting the mass to a second positive and active dehydration, thereby withdrawing from it a major portion of the second solution together with the dissolved values contained therein, and extracting the dissolved values from each of the said withdrawn solutions independently of the other. No. 1,156,382.

902 Separation of Metallic Sulfids from Ores.—Thomas Mackellar Owen, Sydney, New South Wales, Australia, assignor to Edward William Culver, Sydney, New South Wales, Australia. In selective or preferential froth flotation separation of metallic sulfids from slimes, a process for augmenting the flotative quality of certain sulfids in relation to certain other sulfids, which consists in adding to and agitating with the pulp a limited proportion of alkaline permanganate. No. 1,157,176.

903 Separation of Minerals by Flotation.—Lewis G. Rowand, Brooklyn, N. Y., assignor to New Jersey Zinc Company, New York, N. Y., a corporation of New Jersey. The method of separating sulfid constituents from ores in which they are contained, which comprises feeding the solid particles of the ore in a finely

divided condition upon a moving layer of an oleaginous liquid having a selective action for the sulfids of a character to effect flotation, progressively feeding said layer with its charge of ore into a flotation liquid at the surface thereof, and floating off and recovering the floating sulfids. No. 1,159,713.

NAME INDEX TO PATENTS

(Numbers refer to items and not pages.)

AUTHOR-SUBJECT INDEX

(Numbers refer to items and not to pages.)

Differential flotation .....413, 496, 498.

PUBLICATIONS OF THE MISSOURI SCHOOL OF MINES

BULLETIN—GENERAL SERIES.

Vol. 1, No. 1, Dec. 1908. The human side of a mining engineer's life. Edmund B. Kirby. (Commencement address, June 10th, 1908.)

Vol. 1, No. 2, 38th Annual Catalogue, 1909-1910.

Vol. 1, No. 3, June, 1909. Education for utilty and culture. Calvin M. Woodward. (Tau Beta Pi address.)

Vol. 1, No. 4, Sept., 1909. The history and the development of the Cyanide Process. Horace Tharp Mann.

Vol. 2, No. 1, Dec., 1909. The Jackling Field. School of Mines and Metallurgy.

Vol. 2, No. 2, 39th Annual Catalogue, 1910-1911. (Out of print.)

Vol. 2, No. 3, June, 1910. Some of the essentials of success. Charles Sumner Howe. (Commencement address, June 1st, 1910.)

Vol. 2, No. 4, Sept., 1910. Friction in small air pipes. E. G. Harris, Albert Park, H. K. Peterson. (Continued by Technical Series. Vol. 1, No. 1 and 4.)

Vol. 3, No. 1, Dec., 1910. Some relations between the composition of a mineral and its physical properties. G. H. Cox, E. P. Murray.

Vol. 3, No. 2, March 1st, 1911. 40th Annual Catalogue, 1911-1912.

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