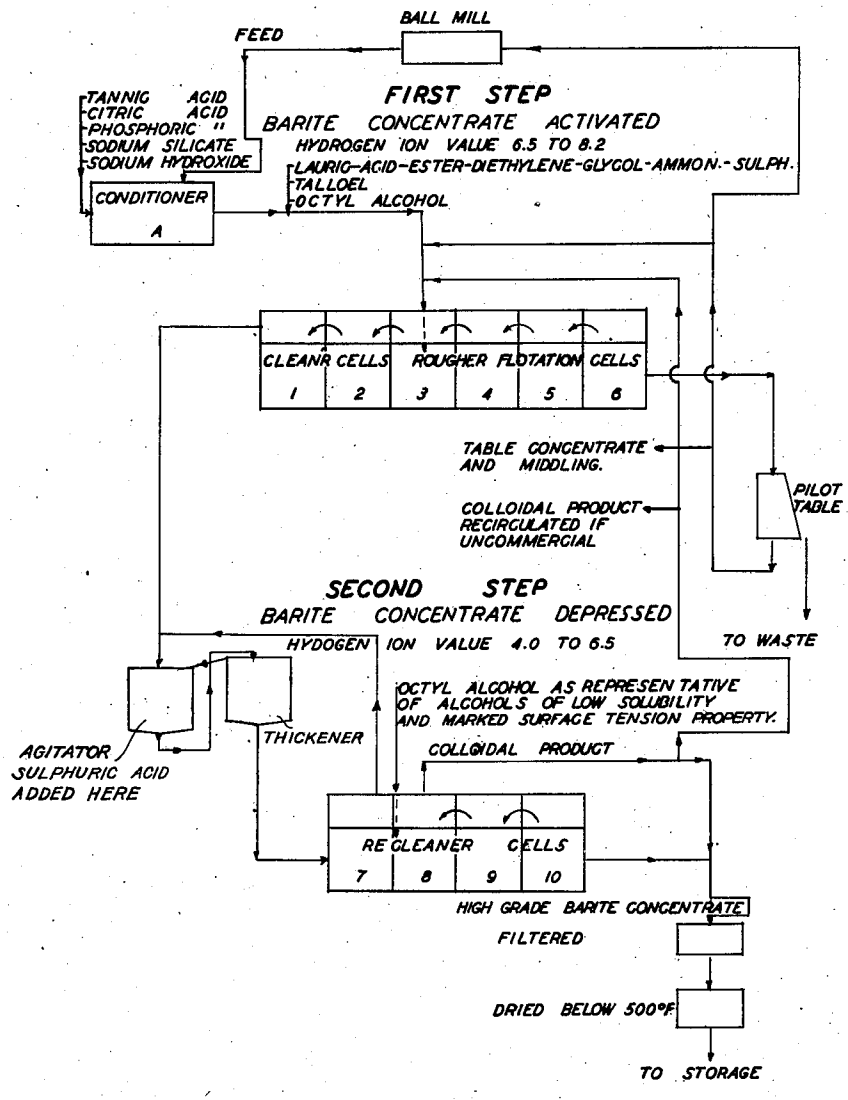
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FLOTATION PROCESS

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INVENTOR
E. H. Hoag

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FLOTATION PROCESS

Edward H. Hoag, Los Angeles, Calif.

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It is the object of this invention to improve or combine low cost chemicals into a flotation reagent which has powerful collecting properties for baryta ores with depressing properties for undesirable minerals, such as limestones, siliceous minerals, oxides of alumina and iron, titanium, manganese and impurities associated therewith in a flotation bath.

Another object is to use said process for a wide range of pH values for activating baryta ores while depressing the undesirable minerals at the same time.

Another object is to improve the process by combining chemicals in various proportions whereby they are partially or completely soluble in water, in order that they may be better qualified as collectors and frothers for baryta ores.

The combination of chemicals referred to above, for example, consists of a mixture of talloel (75%), lauric-acid-ester-diethylene-glycol-ammonium-sulphate (20%), and octyl alcohol (5%) or thereabouts. Also, it may consist of a combination of said chemicals in various proportions whereby an emulsion is formed which may be almost or completely soluble in water.

The minute quantities of said reagent that are utilized for collecting and frothing purposes for baryta as well as for depressing limestone, siliceous minerals, iron oxides and the cost of said chemicals gives it advantages over other reagents for like purposes. It is more efficient, the extraction of baryta concentrate is better and of a higher specific gravity and quality.

According to the present invention a new process with improved results are obtained by the use of the above reagent and method which are set forth for concentrating baryta ores and separating said barite from siliceous minerals, heavy iron and alumina oxides, manganese, titanium, limestone, alkalie earths, colloidal-iron and alumina hydroxides and impurities, according to the results indicated in Tables Nos. 1, 2, 3 and 4.

These tables give the analysis of the different products obtained such as concentrates, colloids, colloids middlings, middlings and tails, their assay values per ton of ore, weight percent and distribution percent for tests made on baryte ore. In Table No. 1 the midds include colloids and colloids midds.

Talloel when introduced into a flotation bath by itself is generally accepted as a poor collector for barite. Also, when it is alone it is a poor collector of iron and and alumina oxides, siliceous materials and clays. Also, it does not have collecting properties which are selective for barite from other minerals in a flotation bath. Alone it is an undesirable frother on account of its unwieldy nature in forming large inefficient bubbles for frothing purposes.

Lauric - acid - ester - diethylene - glycol - ammonium-sulphate when introduced into a flotation bath by itself is rated as a poor collector for barite.

Likewise, if any two of these chemicals hereinabove mentioned are combined and introduced into a flotation machine for flotation purposes, they do not give the improved collecting and frothing properties as when all three chemicals are combined for similar purposes.

The combination of the three chemicals functions cooperatively in producing new and better results; and they become a complete flotation reagent, that is, a reagent which collects, acts as a frother for desirable minerals, and depresses undesirable minerals. Each member of the group modifies each succeeding member to improve the final unitary result; that is, it improves the final activation and collection of barite in a selective manner in the form of a high grade concentrate collected in a flotation froth, while at the same time it partly depresses siliceous minerals, limestone, iron and alumina oxides. In this manner it causes an economical separation of barite in the form of a concentrate from the associated minerals contained therein.

The solution, an emulsion of the "oil-in-water" type serves particularly for the hydration of colloidal particles as well as for ion exchange of said particles, especially for cation exchange and for its property of being soluble in water; and also, for being more rapidly wetted by water than by oil.

It is possible to get very good results by mixing talloel lauric-acid-ester-diethylene-glycol-ammonium-sulphate with octanols, or hexanols, or heptanols, or primary alcohols of the general formula $C_nH_{2n+1}OH$, chosen from the groups having low solubility and marked surface tension property, for example, hexanols, heptanols, octanols, nonanols, decanols and dodecanols, or diethylene glycol-mono-ethyl-ether, or Dupont B-23, or members of the terpene series, or Cellosolve, or butyl ethers, which serve similarly to octyl alcohol. Therefore, it is understood also, that several synthetic products or alcohols can be utilized or substituted. Also, it is possible to obtain good flotation results without using octyl alcohol or substitutes according to the class of barite and the ingredients associated therewith.

The process consists of a series of steps. The

first step consists of introducing the hereinabove mentioned reagent into a flotation bath, and comprises subjecting the pulp of the ore to be separated to agitation and aeration in order to form a film on the surface of said barite so that it is activated and collected in a flotation froth. The introduction of tannic, citric or tribasic acid is for the purpose of depressing undesirable minerals, such as heavy iron oxides, siliceous minerals, limestone or calcareous minerals, alumina, manganese, and titanium oxides and impurities included therein, and of causing a desirable separation of the above minerals. Colloidal iron and alumina hydroxides are not depressed as easily as heavy iron oxides and are dealt with in the second step of the process together with suspended minerals, such as colloidal silica, lime, titanium and manganese oxides.

In its natural state barite is often found intimately associated with heavy iron and alumina oxides as well as with colloidal iron and alumina oxides the latter being strongly adsorbed thereto forming an adsorptive film on said mineral and very easily floated with it. Therefore, in the first step of the process, heavy oxides and undesirable minerals are depressed and separated from barite; at the same time said barite is activated and collected in a flotation froth. In the second step of the process, the reverse operation is undertaken, that is, the barite is depressed and the colloidal and suspended minerals are activated and collected in a flotation froth. This operation is accomplished by removing or modifying the film formed on said barite by any reagent or chemical which lowers the pH value of the flotation bath, such as tannic, citric, sulphuric acid, sodium sulphate. If octyl alcohol, heptonals, or diethylene-glycol-mono-ethyl-ether or aliphatic and aromatic alcohols of the general formulas $R.CH_2OH$ and $C_nH_{2n+1}OH$ respectively, chosen from the group having low solubility and marked surface tension, for example, hexanols, heptanols, octanols, nonanols, decanols and dodecanols are introduced into the flotation bath, colloidal iron and alumina hydroxides, suspensoids, or suspended minerals are activated and collected in a flotation froth, separating said products from depressed barite.

The process is illustrated further as follows: Grinding and thickening of the mill pulp according to regular mill practice. The pulp is passed to a flotation machine from a conditioner wherein conditioner reagents are added. The flotation reagent is added to the flotation machine activating barite minerals which are collected as rougher barite concentrates in a flotation froth, while the siliceous minerals, limestones, heavy iron and alumina oxides and impurities contained therein, are depressed. This is the first separation of undesirable minerals from said barite. The tailings from the first rougher machine go to a second flotation machine and so on, while the barite concentrate is returned to each preceding machine.

The first rougher concentrate is passed to a cleaner flotation machine in which the first step of the process is involved and the hereinabove mentioned reagent is again added in small quantities until a final product of barite concentrate is obtained.

The cleaner concentrate from step No. 1 is passed to a second conditioner to remove the film on the surface of said barite as described. The chemicals used are sodium sulphate, sulphuric acid, or tribasic acids, or tannic acids or citric acid.

The conditioned pulp from step No. 1 is passed to a cleaner flotation machine in which frothers and collectors of the type of octyl alcohol, carbitols, aliphatic and aromatic alcohols of the general formulas $R.CH_2OH$ and $C_nH_{2n+1}OH$ chosen from the group having low solubility and marked surface tension property, higher alcohols, Dupont B–23 or inert frothers are added to separate the colloids and suspensoids contained therein.

In step No. 1 barite is activated and collected in a flotation froth while heavy iron and alumina oxides limestones, siliceous minerals and impurities are depressed. The hereinabove reagent is the collector and frother and forms the film on said barite.

In step No. 2 the barite is depressed while colloidal iron and alumina hydroxides and suspended minerals are activated and collected in a flotation froth.

The combination of these two steps remove undesirable minerals from said barite during a repeated cycle until a high grade barite concentrate is obtained.

The Table No. 1 indicates that a barite concentrate was produced assaying as follows: $BaSO_4$, 96.20%; Fe_2O_3, 0.34%; SiO_2, 1.40%; Al_2O_3, 1.46% from an original ore assaying as follows: $BaSO_4$, 77.30%; Fe_2O_3, 9.66%; SiO_2, 8.73%; and Al_2O_3, 4.06%. The colloids and suspensoids associated with this ore interfered considerably with the complete separation of said minerals. Step No. 1 produced a barite concentrate which assayed $BaSO_4$, 92.0%; Fe_2O_3, 1.70% SiO_2, 3.5% and Al_2O_3, 2.5%. As this concentrate does not give a grade whereby the specific gravity is sufficient for commercial use it was necessary to remove colloids and suspensoids as per step No. 2, which raised the grade of barite concentrate to the assay content as indicated in the Table No. 1.

The pH value of the flotation bath in step No. 2 varied between 3.55 to 3.2. The film formed on the surface of the mineral in step No. 1 was removed by the procedure in the process known as step No. 2. Barite is activated in step No. 1 but depressed in No. 2. Heavy iron and alumina oxides siliceous minerals, titanium, manganese, limestone and impurities are depressed in step No. 1, while colloids, suspensoids and suspended minerals are activated in step No. 2.

Therefore, the novelty of the process consists of introducing a reagent which has specific properties or qualities for flotation purposes by selectively separating barite from associated minerals which could not be accomplished similarly by other flotation reagents. Said reagent acts by forming a film on barite to activate it and make it water repellent and in this manner separating said mineral from heavy iron and alumina oxides and siliceous minerals associated therewith. This film is removed by subsequent operation designated as step No. 2 for the specific purposes of separating colloids and suspensoids from the barite concentrate from step No. 1 and whereby the heavy oxides and undesirable minerals associated therewith were previously removed.

Both steps contribute to the continuous separation of barite from undesirable associated minerals such as heavy iron and alumina oxides, siliceous minerals, limestone, alkalie earths, manganese, titanium oxides and impurities, by repeating the cycle of steps No. 1 and No. 2 as many

times as it is necessary to obtain a high grade barite concentrate free from iron and alumina colloids and suspensoids.

The process is illustrated further and described as follows and whereby grinding, classification and thickening of pulp is undertaken according to regular milling practices for baryta ores.

The thickened pulp from the thickener is the feed for the first conditioner where depressors are introduced, such as sodium silicate to depress free silica and tannic or citric acid to depress heavy oxides of iron, alumina and lime. From the 1st conditioner the pulp goes to the rougher flotation cells of approximately six more or less or fed to cell 3 where the flotation reagent as described in application is introduced either to cell 3 or 4 or 5 or 6. The rougher baryta concentrate is activated and collected in a flotation froth while the heavy oxides of iron, titanium, manganese, free silica and lime are depressed as tailings. The rougher baryta concentrates from cell 3 goes to flotation cleaner cells of two or more or thereabout and fed to cell 2; the concentrates from cell 2 goes to cell 1; the cleaner concentrates from cell 1 goes to second conditioner which step is designated as the first step of the process. Acid, for example, sulphuric acid is introduced into the 2nd conditioner to lower the pH value of the bath sufficiently to remove chemical or adsorbed films formed on the surfaces of the mineral baryta which were acquired in step No. 1 or to make said minerals "water-avid" or for "wetting purposes"; also, to break up the flotation froth and prepare the baryta concentrates for depressing purposes, which is known as the beginning of the second step of the process.

The rougher concentrate from cell 6 goes to cell 5; from cell 5 to cell 4; and from cell 4 to cell 3.

In the second step of the process baryta concentrates go from the 2nd conditioner to flotation cells of four more or less or to cell 7; the said baryta concentrates being depressed goes to cell 8 from cell 7; from cell 8 to cell 9; and from cell 9 to cell 10. High grade baryta concentrate from cell 10 goes to dryer and to storage.

"Colloid" products, which consist of true colloids, suspensoids and lighter specific gravity minerals with impurities contained therein are activated and go from flotation cell 10 to cell 9; from cell 9 to cell 8.

The final "colloid" products if low grade are returned to sell 3 from cell 8 and again subjected to the first and second steps of the process. If the final "colloid" products are high grade they go directly to the dryer and to storage.

Flotation cell 7 is in closed circuit with the second conditioner in order to break up the flotation froth from the first step as well as to loosen or remove the chemical or adsorbed films formed on the baryta concentrate therein.

Octanols or hexanols or heptanols or diethylene-glycol-mono-ethyl-ether or aromatic and aliphatic alcohols of the general formulas $R.CH_2OH$ and $C_nH_{2n+1}OH$ respectively chosen from the group having low solubility and marked surface tension property or members of the terpene series are introduced into cell 8 as activators, frothers and collectors of "colloids" or "suspensoids" or lighter specific gravity minerals or products, such as, colloidal iron and alumina, silica and impurities. The pH value of the flotation bath is kept near to the isoelectric point or thereabout, in order that conditions will be favorable for the separation of iron, alumina and silica "colloids" from heavy baryta concentrates contained therein. The critical point at which iron and alumina colloids are activated and collected in a flotation froth is for a pH value of the flotation bath between 2 to 7.5 or thereabouts; and the critical point at which colloidal baryta is activated and collected is for a pH value of said bath between 6.5 to 8.2 or thereabout. Therefore, a separation of iron and alumina colloids from baryta colloids and concentrates is possible by control of the pH value of the flotation bath and by collecting each mineral in a flotation froth at its critical point of activation and separation.

If true iron and alumina colloids are adsorbed to baryta colloids and the adsorbed films are not completely removed or only partly removed or loosened then both minerals may be activated and collected in a flotation froth. If this product is low grade then it is returned to cell 3 from cell 8 repeating the cycle of steps No. 1 and No. 2 of the process for this returned produuct. If the product is high grade it joins the final baryta concentrate for drying, which is designated for storage.

The tails from cell 3 go to cell 4; from cell 4 to cell 5; from cell 5 to cell 6; from cell 6 to pilot table. The table concentrates and middlings go to cell 3 or back to the grinding department if too coarse for flotation purposes, and the final tails go to waste.

The final baryta concentrate after it has been filtered is dried in the usual manner at temperatures of 500° F. or thereabout.

The novelty of the process is illustrated by the separation of heavy oxides of iron and alumina, lime and silica and "colloids" of iron, alumina and silica with impurities, from heavy as well as colloidal baryta concentrates which have been very difficult tasks to perform economically heretofore by other known flotation methods. This separation is due to the differences in flotation properties of iron and alumina colloids from baryta colloids and concentrates at a critical point of activation and separation of said minerals and colloids for a definite pH value of the flotation bath. That is, the iron and alumina colloids are activated in a flotation bath before the baryta colloids, or before or near to changes in the flotation bath from an acid to an alkaline condition or near to its isoelectric point or thereabout.

The novelty of the combination of tallol, lauric-acid-ester-diethylene-glycol-ammonium-sulphate and octyl alcohol in addition to what has already been described is, that said combination as a reagent does not lose its frothing nor collecting qualities nor properties while going through the two steps of the process, if the pH value of the flotation bath is kept near to the critical point for separation and activation of the hereinabove mentioned minerals and colloids. For this reason said reagent can be used over again several times in transferring residual amounts of same from cell 8 to cell 3 without deterioration. The novelty of the process consists of step No. 1 whereby a chemical film is formed on the baryta minerals due to the flotation reagent. It is activated and collected in a flotation froth, while heavy oxides of iron, manganese, titanium, lime and silica are depressed and removed as tailings. Also, it consists of step No. 2, whereby the chemical film from step No. 1 and the adsorbed film due to positive colloidal iron and alumina hydroxides adsorbed to negative colloidal baryta or

silica are removed or loosened. This latter step causes baryta concentrates to be depressed while iron and alumina colloids, suspensoids, and lighter specific gravity minerals and impurities are activated and automatically separated from baryta minerals by collecting said "colloids" in a flotation froth as hereinabove described.

Both steps contribute to the efficient separation of baryta minerals and colloids from the heavy and lighter oxides and colloids of iron and alumina, silica, lime and the various metallic or mineral impurities.

The "colloid" middlings designated as such in Table III are returned from cell 8 to cell 3 going through steps No. 1 and No. 2 several times or until the baryta concentrates contain the grade of barium sulphate for storage. The only exit for silica, lime, heavy oxides of iron, alumina, titanium, manganese and other impurities is from cell 6 leaving the circuit as tails and going to the pilot table and then finally to waste.

Having described the process it is evident that many variations of the above are possible, such as reversing steps No. 1 and No. 2 or by repeating the cycles several times for activating and depressing baryta concentrates and "colloids" whereby a very high grade baryta concentrate can be produced from a very low grade baryta ore in its natural state.

Also, it may not be desirable to remove iron and alumina colloids or the core may not contain these colloids in which case step No. 2 serves as a recleaner for the pH value of the flotation bath is kept near to its isoelectric point or thereabout.

By reference to Table IV it is evident that the removal of "colloids" of iron and alumina helps to improve barite concentrate as a more efficient weighting material for mud-laden-fluids in rotary drilling for oil and gas wells. The Table V shows that the "water-loss" has improved 20.26% and the initial gel (viscosity) has improved 50% over the same original weighting material before the colloids were removed.

The tests show that the original high grade barite concentrate containing colloids of iron and alumina with suspensoids is considerably improved by removing said colloids and suspensoids by step No. 1 and step No. 2 of the process.

The tests show that by the lower filter rate, the weighting material is improved by removing the colloids of iron and alumina and suspensoids. It shows a lower "water-loss" and higher mud-yield which in turn means better suspending power, superior gel-strength, viscosity and wall-building properties.

TABLE No. 1

Step No. 1 and step No. 2 of process combined

Product	Weight, percent	Assay, percent				Distribution, percent			
		$BaSO_4$	Fe_2O_3	SiO_2	Al_2O_3	$BaSO_4$	Fe_2O_3	SiO_2	Al_2O_3
Calc. head	100.00	77.30	9.66	8.73	4.06	100.00	100.00	100.00	100.00
Conc	46.00	96.20	0.34	1.40	1.46	57.25	1.61	7.38	16.51
Midds	39.25	81.80	6.20	8.18	3.80	41.53	25.16	36.57	36.69
Tails	14.75	6.40	48.00	33.40	12.90	1.22	73.23	55.87	46.80

Step No. 1

Reagent	Reagent in pounds per ton of ore					
	First conditioner	First rougher	Second rougher	First cleaner	Second cleaner	Total
Tallcol (75%) Lauric-acid-ester-diethylene-glycol-ammonium-sulphate (20%) Octyl (5%)		0.10	0.10	0.08	0.08	0.36
Na_2SiO_3	0.20			0.10	0.20	0.50
Quebracho	0.10	0.10	0.05	0.05	0.05	0.35

pH value 4.0 to 7.5.

Step No. 2

	Second conditioner	Third cleaner	
Caustic soda	0.10		0.10
Sodium sulphate	0.10		0.10
Sulphuric acid	0.50	0.20	0.70
Octyl alcohol	0.08	0.16	0.24

pH value 6.5 to 8.2.

NOTE.—Barite concentrates include heavy barite concentrates and barite colloids and suspensoids. Midds. are returned to rougher machine to cell 3 in description repeating step 1 and step 2 of the process until high grade.

TABLE No. 2

Step No. 1 and step No. 2 combined

Product	Weight, percent	Assay, percent				Distribution, percent			
		$BaSO_4$	Fe_2O_3	SiO_2	Al_2O_3	$BaSO_4$	Fe_2O_3	SiO_2	Al_2O_3
Calc. head	100.00	65.94	3.67	15.51	3.76	100.00	100.00	100.00	100.00
Conc	50.95	96.20	0.32	2.00	1.08	74.35	4.45	5.57	14.61
Colloids	12.55	93.40	0.78	2.80	1.02	17.77	2.67	2.26	8.39
Midds	10.10	16.00	12.10	56.00	15.10	2.45	33.20	36.46	40.48
Tails	26.40	13.60	8.30	62.40	11.50	5.45	59.64	54.71	41.52

Step No. 1

Reagents in pounds per ton ore same as per Table No. 1. pH value of flotation bath 6.5 to 8.2.

Step No. 2

Reagents	Second conditioner
Sulphuric acid	0.40
Octyl	0.10
Aromatic and aliphatic alcohols of the general formula $R.CH_2OH$ and $C_nH_{2n+1}OH$ respectively, chosen from the group having low solubility and marked surface tension property	0.10

pH value of flotation bath 2.0 to 4.0.

NOTE.—The concentrates and barite colloids are combined into the final high grade products. The midds. and tails are discarded. The table shows the heavy oxides of $Fe_2O_3Al_2O_3$ and SiO_2 and the colloids of iron and alumina hydroxides are removed.

TABLE No. 3

Steps No. 1 and No. 2 combined

Product	Weight percent	Assay, percent				Distribution, percent			
		$BaSO_4$	SiO_2	Fe_2O_3	Al_2O_3	$BaSO_4$	SiO_2	Fe_2O_3	Al_2O_3
Calc. head	100.00	52.72	32.58	3.63	8.72	100.00	100.00	100.00	100.00
Conc.	17.00	91.00	4.80	0.87	2.03	29.34	2.53	4.08	3.96
Colloid conc.	19.28	94.00	3.30	0.72	1.68	34.39	1.95	3.83	3.71
Colloid midds.	25.48	51.20	30.00	4.92	11.48	24.75	23.45	31.80	33.55
Midds.	21.45	19.60	50.90	7.80	18.30	7.97	33.51	46.13	45.02
Tails	16.79	11.20	76.20	3.06	7.14	3.55	38.56	14.16	13.76

Step No. 1

Reagents in pounds per ton of ore same as per Table No. 1. pH value 6.5 to 8.2.

Step No. 2

Reagents	Second cond.
Sulphuric	0.40
Diethylene glycol-mono-ethyl-ether	0.10
Terpeneol	0.10

pH value 2.0 to 4.0.

NOTE.—Table shows barite conc. and barite colloids produced from a low grade barite ore. The colloid midds. are returned to circuit at cell 3 for step No. 1 and step No. 2 of the process until high grade conc. is obtained. The final midds. and tails are discarded.

TABLE No. 4

Step No. 1 and step No. 2 combined

Product	Weight, percent	Assay, percent				Distribution, percent			
		$BaSO_4$	SiO_2	Al_2O_3	Fe_2O_3	$BaSO_4$	SiO_2	Al_2O_3	Fe_2O_3
Calc. head		93.41	3.83	1.36	0.37	100.00	100.00	100.00	100.00
Conc.	78.99	95.60	2.30	0.94	0.26	80.84	47.41	54.54	54.93
Colloid conc.	12.18	94.00	3.80	1.57	0.43	12.26	12.09	14.04	14.02
Colloid midds.	6.50	87.80	8.80	4.09	1.11	6.10	6.44	19.56	19.33
Tails	2.33	32.00	56.00	6.93	1.87	0.80	34.03	11.86	11.67

pH value 4.0 to 7.5, step No. 1.
pH value 6.5 to 8.2, step No. 2.

Step No. 1

Reagent.—Reagent in pounds per ton of ore same as per Table No. 1.

Step No. 2

Sulphuric acid	Second conditioner
Sulphuric acid	0.40
Diethylene-glycol-mono-ethyl-ether	0.20
Octyl alcohol	0.10

NOTE.—The table shows the removal of colloids and suspensoids of Al_2O_3, Fe_2O_3 from a very high grade barite concentrate, which was used as an improved weighting material for mud-laden-fluids test as per Table V. The colloid midds are returned to cell 3 of the process and step No. 1 and step No. 2 are repeated until a high grade product is obtained.

TABLE No. 5

Showing improved weighting material ($BaSO_4$) for mud-laden fluids by removal of colloids and suspensoids by step No. 1 and No. 2 of the process from barite concentrate

	BaSO conc.	Table IV conc.	Table IV conc., 80%, Table IV coll. midds., 20%
Specific gravity	4.30	4.39	
Initial data:			
Weight material...grams	325	325	325
Mud.....do	202	202	202
Mud weight...lbs./cu. ft.	121.5	122.5	121.5
24-hour data:			
Stormer viscosity.....cpe.	20	20	30
Initial gel.....grams	4	6	35
30' cor. water-loss.....cc.	38.0	30.3	38.0

NOTE.—2.5% by weight solids in mud. Column No. 1 had a tendency to settle. Columns No. 2 and No. 3 were stable.

The table shows an improvement of barite concentrate as a constituent of mud-laden fluids by removing the colloids of iron and alumina and silica from a barite concentrate, by step 1 and step 2 of the process.

The Serial Number 517,469 relates to the flotation reagent employed in the described process for producing high grade barite concentrate.

I claim:

1. A froth flotation process, comprising agitating and aerating a pulp of barite ore associated with uneconomic minerals including hematite, limonite, magnetite, manganese, ferro-magnesium, calcitic and silicate minerals, colloidal and suspensoidal gangue minerals of Fe, Si and Al, in the presence of a reagent consisting of talloel, lauric-acid-ester-diethylene-glycol-ammonium-sulphate and an alcohol chosen from the group consisting of hexanols, heptanols and octanols, in the presence of a conditioner chosen from the group consisting of silicates of soda, floating the barite, colloidal and suspensoidal gangue minerals at a pH value above 6.5 as a flotation concentrate, thereby depressing the uneconomic minerals, then adding to the froth concentrate an acidic substance chosen from the group consisting of sulphuric acid to lower the pH value to below 6.5 thereabout, agitating and aerating said froth concentrate in the presence of an alcohol chosen from the group

consisting of hexanols, heptanols, and octanols to produce a froth containing colloidal and suspensoidal gangue minerals, and thereby depressing the economic mineral barite, separating the colloidal and suspensoidal products and said barite from each other at the critical point of separation, as described.

2. A flotation process for concentrating barite ores associated with colloids and suspensoids of Fe, Al, and Si, and uneconomic minerals including heavy oxides of iron, ferro-magnesium, titanium, manganese and silicate minerals, which comprises, subjecting a pulp of the ore to be concentrated to agitation and aeration, in the presence of talloel, lauric-acid-ester-di-ethylene-glycol-ammonium sulphate and an alcohol chosen from the group consisting of hexanols, heptanols, and octanols, in the presence of a conditioner selected from the group consisting of silicates of soda, floating the barite, colloids and suspensoids of Fe, Al, and Si at a pH value above 6.5, thereby depressing uneconomic minerals, then adding to the froth concentrate an acidic substance chosen from the group consisting of sulphuric acid, which lower the pH value to below 6.5 thereabout, agitating and aerating the flotation froth concentrate in the presence of an alcohol chosen from the group consisting of hexanols, heptanols and octanols, to produce a froth containing colloidal and suspensoidal minerals of Fe, Al, and Si, and thereby depressing barite, separating said minerals from each other, as described.

3. A flotation process for concentrating barite ore associated with colloidal and suspensoidal gangue minerals of iron, alumina, silica, ferro-magnesium, calcitic, manganese, titanium and silicate minerals, in the presence of lauric-acid-ester - di - ethylene-glycol ammonium-sulphate, talloel and an alcohol chosen from the group consisting of hexanols, heptanols, and octanols, in the presence of a conditioner and depressor chosen from the group consisting of citric, tannic and phosphoric acids and their alkali-metal salts, floating the barite minerals together with colloids and suspensoids of Fe, Al, and Si, at a pH value above 6.5, thereby depressing silicate minerals, calcitic, Mn, Ti, minerals, ferro-magnesium and heavy oxides of Fe minerals, then adding to the froth concentrate an acidic substance chosen from the group consisting of sulphuric acid, tannic, citric and phosphoric acids to lower the hydrogen ion concentration to below a pH value of 6.5 thereabout, agitating and aerating said froth concentrate in the presence of an alcohol chosen from the group consisting of hexanols, heptanols and octanols to produce a flotation froth containing colloids and suspensoids of Fe, Al, and Al, and thereby depressing the economic mineral barite, separating said minerals from each other.

4. A froth flotation process, comprising, agitating and aerating a pulp of barite ore associated with iron and aluminum oxides, impurities including heavy oxides of Fe, ferro-magnesium, calcitic silicates, manganese, titanium minerals in the presence of a reagent consisting of talloel, lauric-acid-ester-di - ethylene-glycol-ammonium-sulphate and an alcohol chosen from the group consisting of hexanols, heptanols and octanols, in the presence of a conditioner chosen from the group consisting of sodium silicate, floating the barite and colloidal and suspensoidal gangue minerals at a pH value between 6.5 and 8.2 thereabout, as a flotation concentrate, thereby depressing heavy oxides of iron and alumina, silicates, calcites, manganese and titanium minerals, alkali-earth-minerals and ferro-magnesium minerals, then adding an acidic substance chosen from the group consisting of sulphuric acid, citric, tannic and phosphoric acid to the froth concentrate until the hydrogen ion concentration is below 6.5 thereabout, agitating and aerating the froth concentrate in the presence of an alcohol chosen from the group consisting of hexanols, heptanols and octanols, to produce a froth containing the colloidal and suspensoidal gangue minerals and thereby depressing the economic mineral barite, separating said minerals from each other, as described.

5. A froth flotation process, comprising, agitating and aerating a pulp of barite ore associated with iron and aluminum oxides and colloidal gangue minerals and impurities including heavy oxides of Fe, ferro-magnesium, calcitic, silicate, manganese and titanium minerals, in the presence of a reagent consisting of talloel lauric-acid-ester - di-ethylene - glycol - ammonium-sulphate and an alcohol chosen from the group consisting of alcohols of the general formula $C_nH_{2n+1}OH$, with $n=6$ to 8 inclusive, in the presence of conditioners selected from the group consisting of citric, tannic phosphoric and their allied alkali-metal salts, floating the barite, colloidal and suspensoidal gangue minerals at a pH value above 6.5, thereby depressing minerals of iron, silicates, calcites, alkali-earth-metals, titanium and manganese minerals, ferro-magnesium and aluminum-silicate minerals and impurities associated therewith, then adding an acidic substance selected from the group consisting of sulphuric acid, until the pH value is below 6.5, agitating and aerating the froth concentrate in the presence of an alcohol chosen from the group consisting of hexanols, heptanols and octanols and thereby separating depressed barite from floated colloidal and suspensoidal minerals, as described.

E. H. HOAG.