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HEAVY LIQUID OR SUSPENSION

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2 Claims. (Cl. 252—60)

This invention comprises improvements in or relating to processes of specific gravity separation and to heavy liquids or suspensions such as are used as differentiating media in sink-and-float or gravity processes of separating solid materials of different specific gravities.

Suspensions of finely ground solid constituents in aqueous liquids are of advantageous application in the concentration of ores and the cleaning of coal but for various reasons it has been found to be desirable to adjust or increase the density of the suspensions, for instance to control the viscosity and improve the stability or to suit them to a wider range of use.

In the specification belonging to my earlier patent application No. 310,411, filed December 21, 1939, I have made the disclosure that suspensions having specific gravities considerably heavier or greater than those previously obtained can be produced by the use of metals in a fine state of division, the metals, for example iron, ferro-alloys, metallic copper and copper alloys, therein contemplated being such as to be capable of recovery by magnetic separation or froth flotation.

According to this invention, it has now been established that in addition to the use of metals, very favourable results can be obtained by the employment, for the preparation of the finely-divided solid component of the suspensions, of metal mattes or speisses.

In the production of suspensions of the nature described, it is of importance to have the solid constituents in a very fine state of division and in further accordance with the present invention it has now been found that the subjection of appropriate metal products and metal mattes, or speisses, in heated condition (for instance, immediately after discharge from the furnace or after casting into pigs or the like), to the quenching or cooling action of water or other aqueous medium is a highly advantageous and economical method of treatment of these substances prior to grinding.

The effect of water and like media is to subject the heated substances to thermal shock which renders them crystalline and generally results in a breaking up, thus making them much easier to grind to the fine state of division desirable for heavy liquids or suspensions.

As examples of the metal mattes, mention may be made of copper-matte, nickel-matte and copper-nickel matte or mixtures thereof. The speisses are such as are obtained in the smelting of arsenical ores of nickel and cobalt (arsenides of nickel and cobalt).

The preparation (grinding) of these substances for use may be similar to that referred to in connection with cement copper in the specification aforesaid or it may be of any other appropriate nature.

It is preferable to resort to preliminary preparation of the products by quenching them with, or subjecting them to the cooling action of, water or other aqueous medium as aforesaid. The economical advantages of this procedure will be readily realised if, for example, reference is directed to the smelting of sulphide copper ores. A normal smelting operation comprises the treatment of the ores first in a reverberatory furnace from whence matte is tapped into a ladle and transported to a converter for further treatment. From such an operation products ranging from matte to blister are obtained which in the normal course of the process may be poured into sand moulds or channels and there sprayed with water or be dropped directly into water to granulate them. Thus, in the normal smelting process a divided product can be obtained and this is easily broken up further by grinding to produce the requisite suspension solid.

Similar considerations apply in the case of nickel and other metal mattes or the like. Moreover, other metal products or metallurgical-furnace products such as ferro-alloys, speisses and the like can be brought to a preliminarily broken up or crystalline state by quenching in a similar manner.

In thus providing a material which is easily or more readily ground to the desired fine state of division for heavy liquids or suspensions, the invention leads to important economical advantages, and the invention includes within its scope material produced in the manner described and subsequently ground.

As a further modification, the metal products and metal mattes and other furnace products referred to may be used in combination with other products and particularly metallic or non-metallic minerals in a suitably fine state of division, such, for example, as base metal concentrates, such as copper-, copper-nickel-, lead-, lead-zinc- or zinc-concentrates, or clay, barytes, bauxite, quartz, etc.

The finely-ground substances of the present invention are readily recoverable in a sink-and-float separation processes in which they are used for the heavy liquid. The mattes, for instance, may be recovered from the separated materials

by magnetic separation or by froth flotation and the speisses and by froth flotation or ordinary gravity methods.

The invention also includes within its scope processes of sink-and-float or gravity concentration comprising the employment, for the heavy liquid or suspension, of the substances described. It also includes the employment in gravity separation processes of suspensions in aqueous vehicles of mixtures of the finely divided metal products, metal mattes, speisses, and the like.

The suspensions may be used for the separation of ores or of other divided solid materials of different specific gravities. A very desirable feature of the use of metal mattes or speisses as the solid component of the medium for the separation of ores is that the ore is not contaminated, as is the case when galena is used as the solid component for the separation of ores other than lead.

In the production of suspensions of the different substances, the latter may be used in combinations of fine or colloidal particles and relatively coarse particles in the aqueous medium. For instance, the metal products or the mattes or other furnace products might be used as the coarse fraction and metallic or non-metallic minerals as the colloidal or fine fraction, or vice versa.

The substances and suspensions referred to are of advantageous application in carrying out the invention forming the subject of my application Serial No. 233,745 dated October 7, 1938, according to which a method of concentrating ores and other minerals by the sink-and-float process using stable heavy suspensions is provided, in which the tendency of the viscosity of the suspension to increase during the course of the concentration process is kept under control, by adjusting the relative proportions of fine and coarse particles in the dispersed phase whilst keeping the specific gravity of the suspension substantially constant, said adjustment being effected by removing a part of that portion of the dispersed phase the particle size of which is intermediate between that approaching colloidal size and that which settles rapidly and replacing same by a suitable amount of dispersed phase of larger particle size. In such a method, the substances and suspensions of the present invention are able to satisfy the required conditions of the dispersed phase with a high degree of efficiency and economy.

I claim:

1. A process for the production of a sink-and-float separating medium, which is substantially stable when in quiescent condition, which comprises, comminuting a solid material selected from the group consisting of metal mattes and speisses, to form a mass of small particles of sizes suitable for use as the dispersed phase in a substantially stable separating medium, and suspending the same in an aqueous liquid to form a medium of desired specific gravity.

2. A process for the production of a sink-and-float separating medum which is substantially stable when in quiescent condition, which comprises, quenching a hot metallurgical furnace product selected from the group consisting of metal mattes and speisses by a cold aqueous medium, comminuting the quenched material to form a mass of small particles of sizes suitable for use as the dispersed phase in a substantially stable separating medium, and suspending the same in an aqueous liquid to form a medium of desired specific gravity.

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