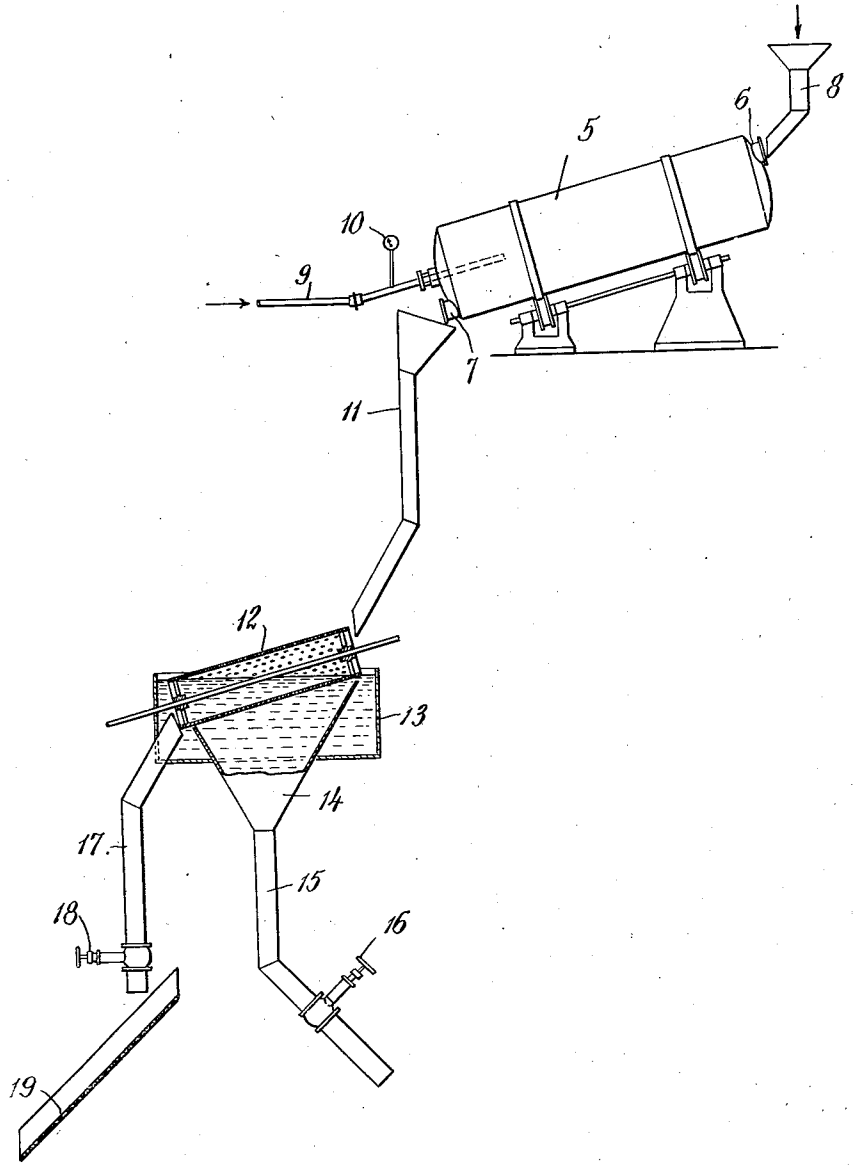
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RECOVERY OF SULFUR FROM ITS ORES.

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1,374,422. Patented Apr. 12, 1921.



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UNITED STATES PATENT OFFICE.

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1,374,422. Specification of Letters Patent. Patented Apr. 12, 1921.

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To all whom it may concern:

Be it known that I, GILBERT A. BRAGG, a citizen of the United States, residing at Thompson, in the county of Lyon, State of Nevada, have invented certain new and useful Improvements in the Recovery of Sulfur from Its Ores; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The present invention relates to the recovery of sulfur from its ores, wherein the sulfur, in a native or elemental state, is associated with silica and other gangue material.

The main characteristic feature of the invention consists in heating the ore, in a suitable state of subdivision, to the melting point of sulfur, in an appropriate liquid medium, thereby melting the individual sulfur particles contained in the ore pulp, and then causing a coalescence of the individual melted particles of sulfur, followed by solidification into grains or granules of a larger size than the particles of gangue; whereby the subsequent separation of the sulfur from the gangue is readily effected.

In the preferred practice of the invention, the sulfur ore is first crushed, ground, or otherwise comminuted to a suitable condition of subdivision, say 40 mesh. The finely ground ore is then mixed with a suitable liquid medium of such a character that it may be raised to a temperature above the melting point of the sulfur contained in the ore. For this purpose, water may be employed, mixed with the finely-divided sulfur ore to form an ore pulp. It will be found suitable, in most cases, to employ equal weights of water and ore in making up the pulp, although it will be understood that the ratio of the one to the other may be varied, as circumstances may require.

The ore pulp mixture is then admitted into a suitable container and its temperature is raised, preferably by the injection of live steam. The container is closed so that the steam, admitted at an appropriate temperature and pressure will raise the pressure and temperature of water in the container to such a degree that the individual particles of sulfur will melt. The injection of the steam into the ore pulp tends to agitate the mass but, in addition to such agitation, the container itself is preferably rotated. The molten sulfur, under the influence of the agitation, tends to agglomerate in lumps or granules much larger than the particles of gangue. After the mixture of ore and water has been agitated until a fairly complete agglomeration of the sulfur has taken place, the container and its contents are allowed to cool, if so desired, or the steam pressure may be released and the pulp discharged at once. In either case, the sulfur lumps or granules solidify and the pulp is discharged upon a screen of the same mesh as that originally employed in screening the ore, *i. e.*, in the assumed instance, a 40 mesh screen.

The sulfur, now in much larger particles than the gangue, is retained in a commercially pure state by the screen, while the gangue material passes through the screen and is run to waste or treated for such other values as it may contain. The sulfur retained by the screen may be dried, melted, and cast into any desirable shape.

A cylindrical steel container is preferably employed in the practice of the invention, and, as hereinbefore indicated, the mixture of ore, crushed to pass a screen of 40 mesh, is mixed with an equal weight of water, and is heated to the melting point of the sulfur contained in the ore, 40 pounds of steam pressure being usually ample for the purpose. The container is arranged for rotation around its own axis, which is inclined at an angle of say 15° to the horizontal, and is suitably equipped for charging and discharging the ore, and for the admission of the steam,—preferably at the lower end of the container. The container is revolved slowly (say at 5 or 6 revolutions per minute) which tends to bring the particles of sulfur together and to effect their agglomeration into the larger lumps or granules desired. In most cases, it will be found advantageous to fill the container to within a short distance from the top.

It is desirable to rotate the container slowly, as indicated, so that the lumps of sulfur in passing down the incline may not be subjected to any material grinding action by the gangue, which would otherwise tend to disintegrate them.

At the termination of the operation, the mixture of gangue and sulfur is discharged

into an inclined trommel, partially submerged in water, and carrying a 40 mesh screen. The gangue passes through the openings of the screen, and the resolidified sulfur is discharged from the end of the trommel, whence it is conveyed by any suitable means to the drying and melting apparatus. Any other suitable screening device may be substituted for the inclined trommel.

The accompanying drawing diagrammatically illustrates an arrangement of apparatus suitable for the practice of the invention. In the drawing, the rotatable cylindrical steel container 5 for heating the mixture of finely divided ore and water is represented as having a charging man-hole 6 at its higher end and a discharge man-hole 7 at its lower end. A feed chute 8 may be provided for conducting the finely divided ore, or a mixture of ore and water, to the charging man-hole 6. Steam is admitted to the container 5 by means of a steam pipe 9 having a pressure gage 10. The mixture of gangue and agglomerated lumps or granules of solid sulfur are discharged from the man-hole 7, through a chute 11, into the upper end of an inclined rotating trommel 12. The trommel is partially submerged by the water contained in a tank 13. The gangue passes through the interstices of the cylindrical screen of the trommel into a hopper 14 and is discharged through a pipe 15 having a valve 16. The resolidified lumps or granules of sulfur are too large to pass through the interstices of the screen and are accordingly discharged from the lower end of the rotating trommel, through a pipe 17 having a valve 18, on to an inclined screen 19, where the recovered sulfur is separated from the water.

Having thus described my invention what I claim is:

1. The method of recovering sulfur from its ores, which comprises heating an ore pulp, made up of a mixture of the finely divided ore in a suitable liquid medium, to the melting point of the sulfur contained in the ore pulp, agitating the mass so as to cause coalescence of individual melted sulfur particles into aggregates larger than the gangue particles, solidifying the sulfur aggregates thus formed, and ultimately separating the solidified sulfur aggregates from the gangue; substantially as described.

2. The method of recovering sulfur from its ores, which comprises charging an ore pulp made up of a mixture of the finely divided ore in a suitable liquid medium into an inclined container, heating the charge so as to melt the sulfur contained in the ore, and rotating the container, so as to cause coalescence of individual melted sulfur particles into aggregates larger than the gangue particles, solidifying the sulfur aggregates thus formed and ultimately separating the solidified sulfur aggregates from the gangue; substantially as described.

3. The method of recovering sulfur from its ores, which comprises heating an ore pulp, made up of a mixture of the finely-divided ore in water, at a temperature sufficient to melt the sulfur contained in the ore pulp, agitating the mass so as to cause coalescence of individual melted sulfur particles into aggregates larger than the gangue particles, solidifying the sulfur aggregates thus formed and ultimately separating the solidified sulfur aggregates from the gangue; substantially as described.

4. The method of recovering sulfur from its ores, which comprises charging an ore pulp, made up of a mixture of the finely-divided ore in water, into an inclined container, heating the pulp at a temperature sufficient to melt the sulfur contained therein, rotating the inclined container at a rate sufficient to cause individual melted sulfur particles to coalesce into aggregates larger than the gangue particles, solidifying the sulfur aggregates thus formed and ultimately separating the solidified sulfur aggregates from the gangue; substantially as described.

5. The method of recovering sulfur from its ores, which comprises heating a sulfur-containing ore to the melting point of sulfur in the presence of a liquid medium and thereby melting the sulfur therein, causing the thus melted sulfur to solidify into aggregates of a larger size than the particles of gangue associated with the solidified aggregates of sulfur, and separating the solidified sulfur aggregates from the particles of gangue associated therewith; substantially as described.

6. The method of recovering sulfur from its ores, which comprises heating a sulfur-containing ore to the melting point of sulfur and thereby melting the sulfur therein under such conditions that the gangue particles are wetted and coalescence of the melted sulfur thereby promoted, causing the thus melted sulfur to solidify into aggregates of a larger size than the particles of gangue associated with the solidified aggregates of sulfur, and separating the solidified sulfur aggregates from the particles of gangue associated therewith; substantially as described.

In testimony whereof I affix my signature.

GILBERT A. BRAGG.