

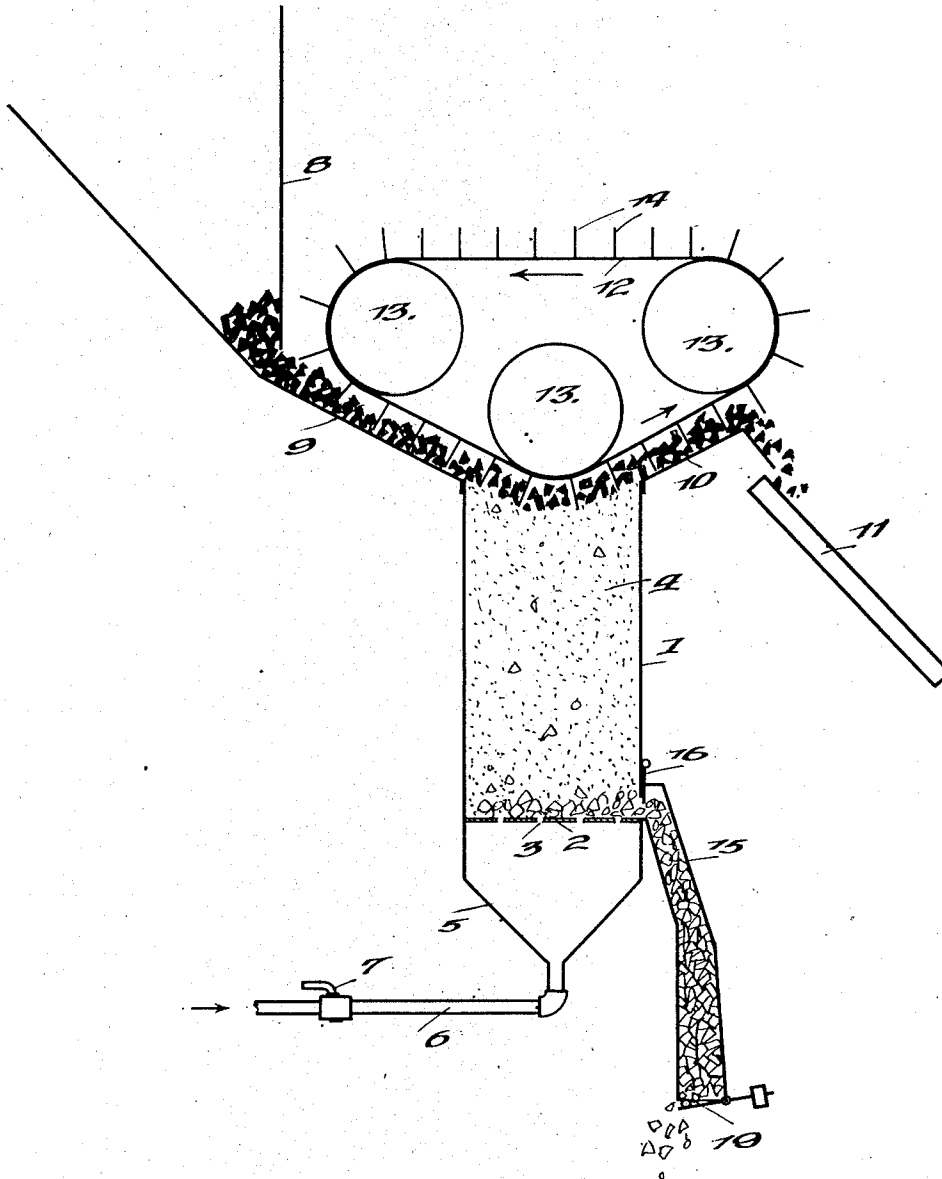
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PROCESS OF SEPARATING LOOSELY MIXED MATERIALS

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PROCESS OF SEPARATING LOOSELY-MIXED MATERIALS.

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To all whom it may concern:

Be it known that we, THOMAS FRASER and HARRY F. YANCEY, citizens of the United States, residing at Urbana, in the county of Champaign and State of Illinois, have invented certain new and useful Improvements in Processes of Separating Loosely-Mixed Materials, of which the following is a specification.

The present invention relates more particularly to processes whereby mixed materials having different specific gravities may be separated without the necessity of a preliminary classification or treatment.

The accompanying drawing is a diagrammatic view of an apparatus in which the process can be conveniently carried out, and illustrating the various steps or stages of said process.

While the invention has been found practically effective for removing slate, shale, pyrite and other material of an analogous character from coal, it is not necessarily limited to such use. Taking this, however,

as a concrete example, and referring to the accompanying drawing, a container 1 is employed, having a bottom 2 provided with perforations 3, and also having an open top.

In this container is located a body 4 of loose, dry, finely subdivided material, preferably of granular character, such as sand. The lower end of the container 1 below the bottom 2, is of tapered formation, as shown at 5, and connected to the apex thereof, is a pipe 6 for the delivery of air or other gaseous fluid under pressure. The supply of such fluid is controlled by a suitable valve 7.

A bin for holding the mixed material is indicated at 8, and leading from the outlet thereof is an inclined chute 9 extending to one side of the top of the container, while an upwardly inclined delivery table 10 extends from the opposite side and discharges on to a runway 11, which may be a screen.

An endless conveyer 12, operating around suitable rollers or drums 13, is provided with rakes 14 which operate downwardly over the chute 9 across the top of the granular body 4 and up the delivery table 10.

The process is as follows: Assuming a mixture of coal, which has a specific gravity of 1.30 and slate which has a specific gravity of 2.70 is in the bin 8, air under any suitable pressure is introduced through the pipe 6, and passing up through the body of sand or

finely comminuted material 4, will cause said body to boil. The said body, though dry and maintained in dry condition, will be caused to assume a fluidic condition and the specific gravity thereof can be altered, as desired by admitting more or less air. If therefore in the present example sufficient air is admitted to maintain the specific gravity of the body 4 at 1.40, it will be evident that it is heavier than the coal, and lighter than the slate. Consequently if the conveyer 12-14 is caused to operate in the direction indicated by the arrow the mixture of coal and slate is conveyed from the bin 8 on to the agitated sand body 4. As this mixture is dragged or moved across the said body the lighter material, namely, the coal will float at or near the surface just as wood floats in water, and will therefore be directed across on to the table 10 and discharged on to the chute 11, while the heavier materials, such as slate, shale, stone and the like will gravitate down through the body 4 and may be discharged therefrom through a spout, as 15. This spout may have a control gate 16 and a weighted valve closure 19, the spout being of sufficient length so that it will not act as a material by-pass for the air. In other words, the resistance afforded to the passage of air through the spout will be greater than that required to cause it to ascend through the body of sand.

Emphasis is laid upon the fact that this is a "sink-and-float" process in which the separating medium is a dry material and is maintained in substantially dry condition, while in operation. As a consequence the coal is not moistened and as water is difficult to remove and is detrimental in the utilization of coal, and indeed other materials, this serious objection is eliminated. Moreover it avoids the expense and inconvenience due to freezing, experienced in winter where wet washing is utilized, and it may be used where water is not available. Furthermore no preliminary sizing of the raw material before treatment is necessary and a plant for carrying out this process may be of a very simple character. It is to be understood that by the term "dry", it is not intended to restrict this process to the use of sand or other buoying material which is absolutely moisture free. But it should not be a mixture of the same with

a material amount of water, nor wet enough to be so sticky as to prevent a free flow of the material in which the particles will separate and move with substantially individual freedom.

Having thus fully described our invention, what we claim as new, and desire to secure by Letters Patent, is:—

1. The method of separating mixed materials having different specific gravities, which consists in creating in a body of loose dry granular material, a fluidic condition with an effective specific gravity between the specific gravity of the materials to be separated and less than said granular material has in its natural state, supplying the mixed materials to the surface of said body, and positively removing the lighter material from the upper portion of the body.

2. The method of separating mixed materials having different specific gravities, which consists in creating a fluidic, agitated body of loose dry granular material having an effective specific gravity between the specific gravity of the materials to be separated and less than said granular material has in its natural state, supplying the mixed materials to the surface of said body, and effecting the positive removal of the lighter material carried by the upper portion of said body.

3. The method of separating mixed materials having different specific gravities, which consists in creating a body of loose dry pulverulent material, passing a gaseous fluid upwardly through the material and thereby creating a fluidic condition thereof and causing its agitation and thereby reducing its effective specific gravity to a point between the specific gravities of the materials to be separated, supplying the mixed materials to the surface of said body while so agitated, and effecting the positive removal of the lighter material carried by the upper portion of said body.

4. The method of separating mixed materials having different specific gravities, which consists in creating a body of loose dry pulverulent material, passing a gaseous fluid upwardly through the material in sufficient quantities to create a fluidic condition and to cause its agitation and thereby reduce its effective specific gravity to a point between the specific gravities of the materials to be separated, supplying the mixed materials to the surface of said body while so agitated, positively removing the lighter materials from the upper portion of the body, and collecting and discharging the heavier material from the said body.

5. The method of separating mixed materials having different specific gravities, which consists in creating a body of loose dry pulverulent material, passing a gaseous fluid upwardly through the material in suffi-

cient quantities to create a fluidic condition of said body and to cause its agitation and thereby reduce its effective specific gravity to a point between the specific gravities of the materials to be separated, supplying the mixed materials in loose and substantially dry condition to the surface of said body while so agitated, and effecting the positive removal of the lighter materials in substantially dry condition from the upper portion of the body.

6. The method of separating mixed materials having different specific gravities, which consists in creating an agitated fluidic body of dry granular material having an effective specific gravity heavier than that of the lighter material and lighter than the heavier material and less than said granular material has in its natural state, directing a stream of the mixed materials to be segregated transversely of the upper portion of the body, whereby the heavier material will sink therein and the lighter material will float thereacross, and effecting the positive removal of the lighter materials in substantially dry condition from the upper portion of the body.

7. In apparatus for separating loosely mixed materials, the combination with a reservoir, of a body of loose finely subdivided material therein, means for causing the said body to have a dry fluidic condition, means for supplying the mixed material to the body, and means for effecting the positive discharge of the material of lighter gravity from the upper portion of said body.

8. In apparatus for separating loosely mixed materials, the combination with a reservoir, of a body of loose finely subdivided material therein, means for supplying the mixed material to the body, means for causing said body to have a specific gravity greater than one of the materials to be separated and less than the other, and means for effecting the positive discharge of the materials of lesser specific gravity from the upper portion of the body.

9. In apparatus for separating loosely mixed materials, the combination with a reservoir, of a body of loose finely subdivided material therein, means for supplying the mixed material to the body, means for causing said body to have a specific gravity greater than one of the materials to be separated and less than the other, means for permitting the separate discharge of the separated material, and mechanism for engaging and positively removing the lighter material that is carried by the upper portion of the body.

10. In apparatus for separating loosely mixed materials, the combination with a reservoir, of a body of loose finely subdivided material therein, means for supplying the mixed material to the body, means for de-

livering gaseous fluid under pressure upwardly through said body to cause it to have a dry fluidic condition with a specific gravity greater than one of the materials to
5 be separated and less than the other, and means for effecting the positive removal of the material of less specific gravity that is carried by the upper portion of the body.

In testimony whereof, we affix our signatures in the presence of two witnesses.

THOMAS FRASER.
HARRY F. YANCEY.

Witnesses:

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