Feb. 20, 1934. R. C. NEWHOUSE 1,947,487

MIXING APPARATUS

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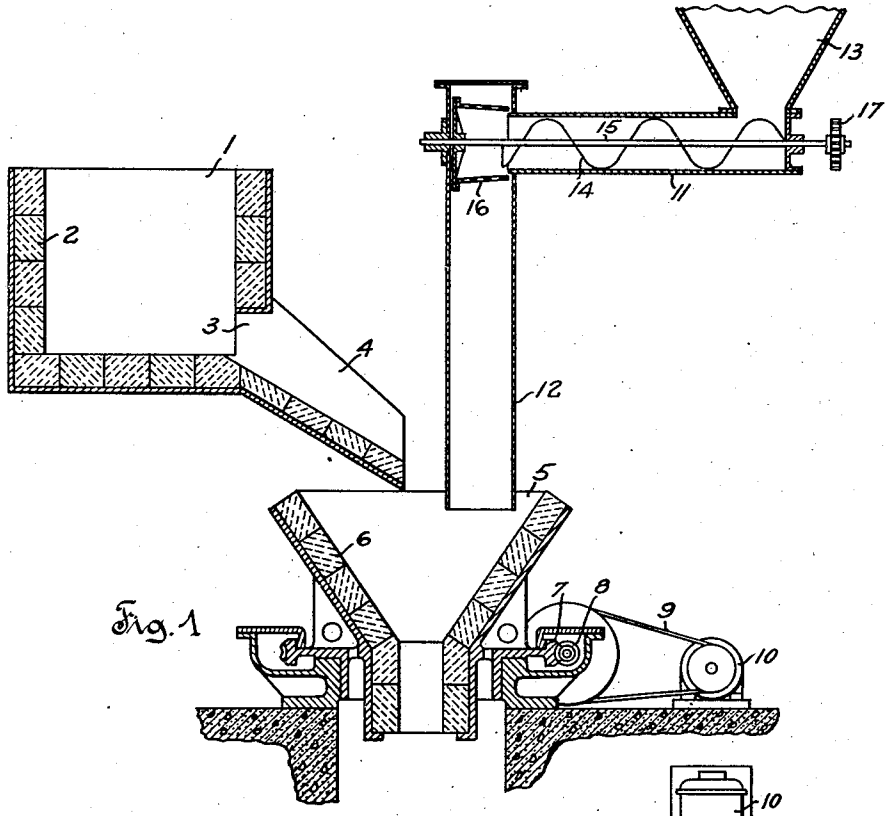


Fig. 1

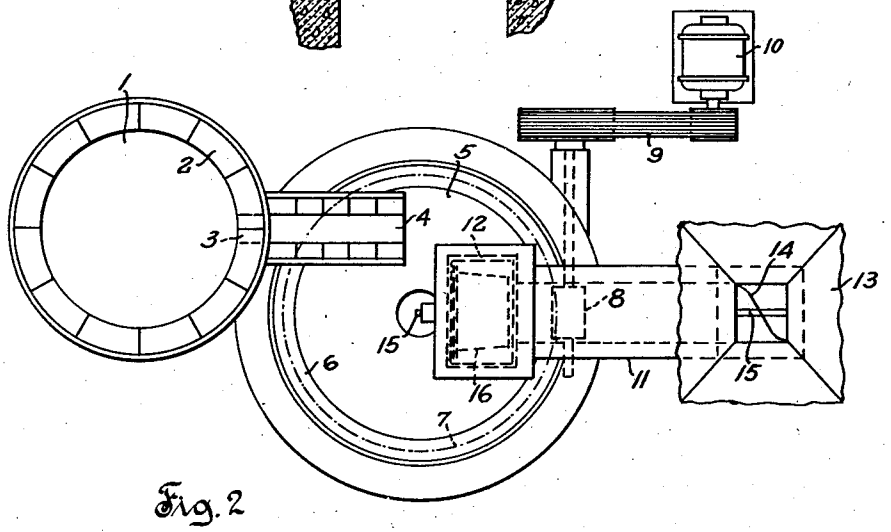


Fig. 2

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MIXING APPARATUS

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5 Claims. (Cl. 259—3)

This invention relates to an improvement in mixing apparatus.

An object of the invention is to provide means for mixing a pulverized material with a fluid or with a fluid containing solids in suspension.

A more specific object of the invention is to provide means for mixing pulverized limestone, pulverized gypsum and the like with molten blast furnace slag.

In my co-pending application, Serial No. 612,765 filed May 21, 1932, I have described and claimed a method of producing a light construction material from a mixture of molten slag and pulverized limestone, and the like. In said application I have shown and described one form of apparatus suitable for exploiting the method. The molten slag is introduced tangentially from an inclined spout near the top of a funnel shaped receptacle. The velocity of the stream of slag in flowing circumferentially and downwardly through the funnel causes a vortex into which the pulverized limestone or other powder is introduced.

Any finely divided dry material such as ground limestone or ground gypsum tends to float on top of a fluid such as molten slag, but the introduction of the powder to the vortex causes it to be carried under the surface as the material is deposited from the funnel and produces a proper mixing.

I have found that slag at the temperature at which it is drawn from the blast furnace has sufficient fluidity to flow from an orifice at a speed which will produce the desired vortex, but that after partial cooling, while still fluid, the viscosity is so great that a proper vortex may not be formed.

It is an object of the present invention to provide means to produce a vortex in a fluid where its initial tangential velocity is not sufficient to produce a proper vortex in a stationary funnel.

In attaining the objects of my present invention I use a funnel shaped receptacle, and provide means to rotate the funnel in order to produce a whirling motion in the molten slag or other fluid.

A clear conception of an embodiment of the invention may be had by referring to the drawing accompanying and forming a part of this specification, in which like reference characters designate the same parts in the various views.

Figure 1 is a transverse vertical section through the mixing apparatus. Figure 2 is a plan view of the apparatus.

1 is a receptacle, having a refractory lining 2, for the fluid material. The receptacle 1 has a discharge orifice 3 and an inclined spout 4.

Mounted in a suitable bearing below the spout 4 is the funnel shaped mixing receptacle 5, having a refractory lining 6. Mounted upon the funnel shaped receptacle 5 is a worm wheel 7, driven by the worm 8. The worm 8 may be driven by any suitable means, and is shown as driven by a multiple V belt drive 9 and a motor 10.

Mounted above the receptacle 5 is a feeder 11, having a discharge pipe 12 through which the pulverized material is delivered to the receptacle 5. The feed 11 is mounted below a bin which holds the pulverized material. 13 shows a fragmentary view of this bin.

The feeder 11, as shown, consists of a screw conveyor 14 mounted on a shaft 15. Mounted on the shaft 15 at the discharge end of the screw 14 is a frusto-conical revolving screen 16, having suitable holes to distribute the powdered material into the pipe 12. The shaft 15 may be driven by any suitable means, such as through the gear 17. The gear 17 is preferably driven by speed changing means, such as a variable speed motor.

During the operation of the apparatus, molten slag or other fluid is introduced to the receptacle 1. As it flows through the orifice 3 and the inclined spout 4, it is introduced tangentially into the funnel shaped receptacle 5. If the fluid is very viscous it does not attain sufficient initial velocity to produce a vortex in a stationary cone, but will flow slowly downward in a heavy stream toward the discharge of the funnel. This is prevented in the present invention by revolving the receptacle 5 at a suitable speed by means of the worm wheel 7. The revolution of the receptacle 5 produces a whirling motion of the fluid and spreads it in a layer on the lining 6.

The powdered material in the bin 13 is delivered in suitable quantities by means of the screw 14 to the revolving screen 16 which separates it and distributes it in the pipe 12. The powdered material falls through the pipe 12 into the vortex in the receptacle 5, and spreads over the surface of the fluid. As the layer of fluid converges at the lower part of the funnel, the powdered material is carried downward in the center of the stream of fluid.

The fluid, as it falls from the funnel shaped receptacle 5 onto the ground or into a suitable receptacle, flows outwardly, carrying the powdered material under the surface and producing a proper mixture of the two materials.

While my mixing apparatus is especially suitable for mixing a dry powder such as pulverized

limestone with molten blast furnace slag, it is evident that pulverized limestone or gypsum or other solid in the form of a slurry may be delivered by means of a suitable feeder to the vortex formed by revolving the funnel shaped receptacle 5. My apparatus may be used not only with other viscous fluids but may be advantageously used in some cases with a freely flowing liquid like water. It is well known that some dry powders are not easily wetted on account of their tendency to float on water. By means of my apparatus a dry powder may be delivered to the vortex formed by water flowing into the revolving funnel shaped receptacle 5. As the water flows from the receptacle 5 into any other suitable receptacle, the dry powder will be carried downward through the center of the falling stream of water and carried under the surface.

It should be understood that it is not desired to limit the invention to the exact details of construction shown and described, for obvious modifications will occur to a person skilled in the art, and I aim to cover all such modifications which do not depart from the spirit and scope of my invention as set forth in the following claims.

It is claimed and desired to secure by Letters Patent:

1. In mixing apparatus, a funnel shaped receptacle, means to rotate said receptacle on an approximately vertical axis, means to deliver a fluid tangentially to the upper portion of said receptacle, means to deliver a divided solid to the surface of the fluid delivered to said receptacle, and means to discharge said materials through the apex of said funnel shaped receptacle.

2. In mixing apparatus, a receptacle having imperforate walls extending downwardly toward a common center, means to deliver a fluid to a portion of said walls at a distance from said center, means to produce a vortex in said fluid by relative rotation between said receptacle and said fluid delivery means, means to deliver a second material to the surface of the said vortex, and means to discharge said materials at said common center.

3. In mixing apparatus, a receptacle having imperforate walls extending downwardly toward a common center, means to deliver a fluid to a portion of said walls at a distance from said common center, means to produce a vortex in said fluid by rotating said receptacle, means to deliver a second material to the surface of the said vortex, and means to discharge said materials at said common center.

4. In mixing apparatus, a funnel shaped receptacle having an axis sufficiently near the vertical to cause material to flow to the apex at the lower part of said receptacle, means to deliver a fluid to the upper portion of said receptacle, means to produce a vortex in said fluid by relative rotation between said receptacle and said fluid delivery means, means to deliver a second material to the surface of the said vortex, and means to discharge said materials at the apex of said receptacle.

5. In mixing apparatus, a funnel shaped receptacle having an axis sufficiently near the vertical to cause material to flow to the apex at the lower part of said receptacle, means to deliver a fluid to the upper portion of said receptacle, means to produce a vortex in said fluid by the rotation of said receptacle, means to deliver a second material to the surface of the said vortex, and means to discharge said materials at the apex of said receptacle.

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