Dec. 28, 1926. 1,611,944

A. G. J. RAPP

SAND REVIVIFIER

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Fig. 1

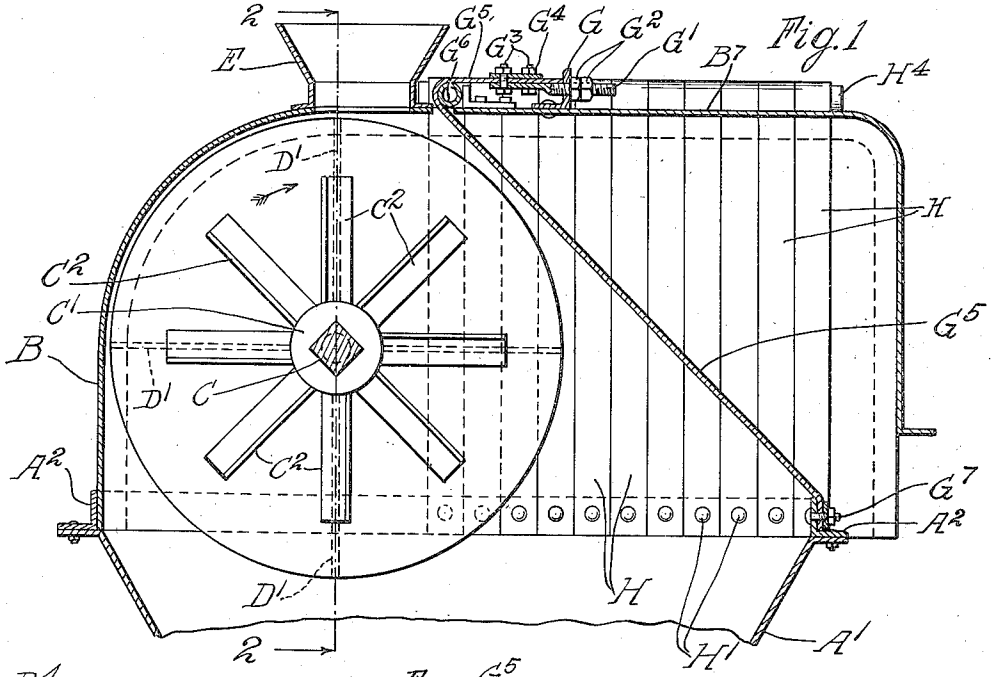
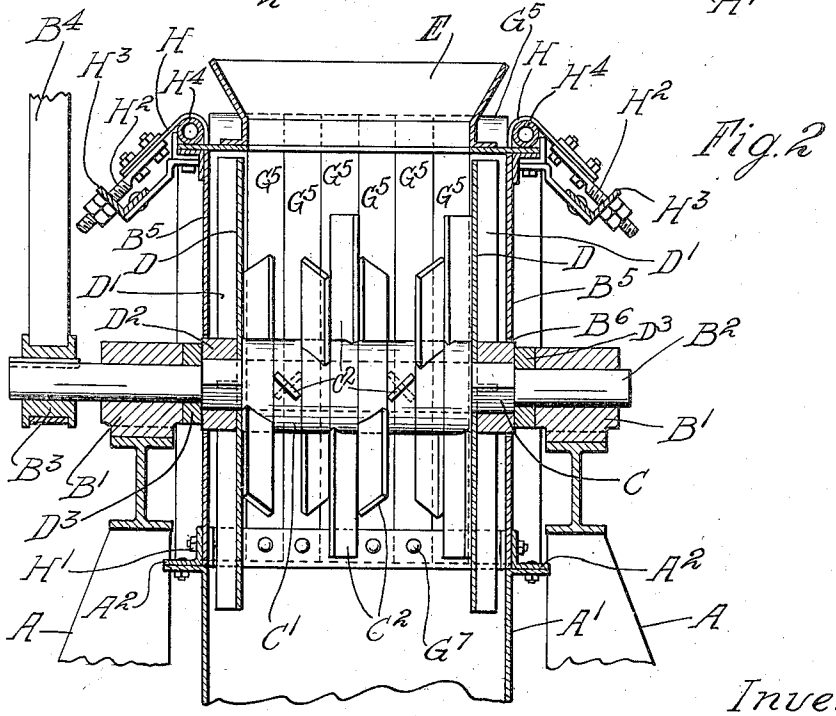


Fig. 2



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Fig. 3

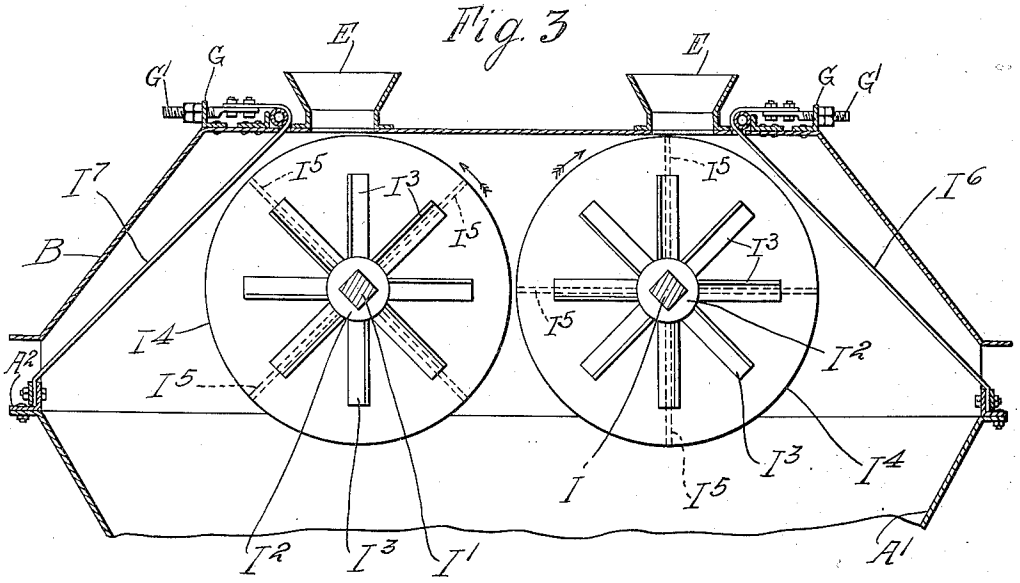
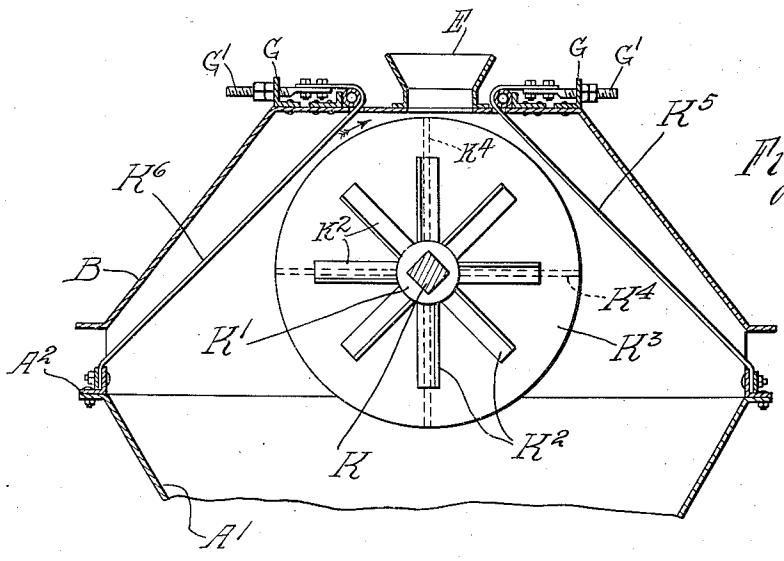


Fig. 4



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UNITED STATES PATENT OFFICE.

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SAND REVIVIFIER.

Application filed December 24, 1925. Serial No. 77,501.

My invention relates to improvements in a sand beater or sand mixer or in machines which may be used for beating or mixing sand, coal or any other granular or finely divided material.

My machine is expected to take the material in question, which may be finely divided or may be wet and adhesive. The material is beaten or broken and the particles separated by the violent blows of the beater.

One object of my invention is to break up or divide or separate the material in question, particularly where the fine particles have gathered in lumps, or are bonded or held together by moisture. Another object is the provision of means for preventing the adherence of particles to the sides of the beater housing or casing. Other objects will appear from time to time in the course of the specification and claims.

I illustrate my invention more or less diagrammatically in the accompanying drawings, wherein:

Figure 1 is a longitudinal, vertical section;

Figure 2 is a section on the line 2—2 of Figure 1; and

Figures 3 and 4 are longitudinal, vertical sections through variant forms of the device.

Like parts are indicated by like symbols throughout the description and drawings.

A is any suitable foundation wall or member containing or supporting a hopper A^1. A^2 is a circumferential centering or securing flange to which may be secured a casing or housing member B. Supported without the wall of such housing, for example in the bearing members B^1 is the beater shaft B^2 provided with a pulley B^3 about which passes the driving belt B^4 which may be driven from any suitable power source not herein shown. B^5 are the side walls of the housing B, apertured as at B^6 to permit the passage of the beater shaft and the members mounted thereon.

The shaft is squared as at C and secured to the squared portion is a beater hub C^1 from which project outwardly a series of beater arms C^2. These beater arms are relatively flat members having plane faces inclined to planes perpendicular to the axis of rotation of the beater shaft. At the extremities of the hub C^1 are mounted discs D provided with radially positioned outwardly projecting vanes D^1, having a slight clearance from the side walls B^5 of the housing. D^2 are any suitable spacing or securing members for such discs D, their outer faces being in contact with spacing washers D^3 about the rounded portions of the shaft B^2.

Positioned generally in the vertical plane of the beater shaft is a feed hopper E associated with the upper portion of the housing B and adapted to deliver the material to be beaten to the beating zone defined by the radial extension of the beater arms C^2.

Mounted upon the top B^7 of the casing B is an abutment member G apertured to permit the passage of a plurality of bolts G^1, to the outer extremities of which are screw threaded the securing nuts G^2. The inner end of each bolt is fastened, for example, by the bolts G^3 and nuts G^4, to the upper end of a belt member G^5. This belt passes downwardly about the small tube or cylinder G^6, its lower end being secured as at G^7 to the edge of the hopper A^1. It will be understood that I prefer to employ a relatively large number of parallel belts in order to close the entire end of the housing and to interrupt the travel of the material laterally ejected from the beating zone. Under some circumstances I may employ a single broad member. I have illustrated the belts as inclined at an angle to the horizontal. It will be realized that the angular relation of the belt may be indefinitely varied to suit the conditions desired. I may employ a variety of materials for such belts, but prefer the ordinary trade belting.

If found desirable, and as illustrated in Figures 1 and 2, the sides, or a portion of the sides of the housing may also be formed by a plurality of vertically positioned belt members H, secured at their lower ends as at H^1 along the edge of the hopper A^1 and held at their upper ends by belt tightening bolts H^2 similar to the already described bolts G^1 which pass through the abutment members H^3, and serve to draw the upper ends of the belts about the cylinders H^4.

Referring to Figure 3, in the place of the single beater illustrated in Figures 1 and 2, I employ a plurality of beater shafts I, I^1, rotating in opposite directions, each having

a beater hub I^2 with the outwardly projecting arms I^3 and discs I^4 with the outwardly projecting vanes I^5, as shown in detail in Figure 2. In such case I employ belt members at each end of the casing or housing instead of at one end as shown in Figure 1. It will be realized that the individual belt members I^6 I^7 at the opposite ends of the housing may be identical in detail with those shown in great detail in Figure 1. Either one or two delivery hoppers may be used, two being shown.

Referring to Figure 4, I illustrate a single beater shaft K with the hub K^1, the beater bars K^2, the discs K^3 and the vanes K^4. In this form of my device, also, as in Figure 3 I position belt members K^5 K^6 at each end of the housing.

It will be realized that whereas I have illustrated a pratical and operative device that nevertheless many changes may be made in the size, shape, number and disposition of parts without departing from the spirit of my invention and that I wish my drawings to be taken as in a broad sense diagrammatic and illustrative rather than as limiting me to the specific description and showing herein made.

The use and operation of my invention are as follows:

Material such as sand, dust, coal or the like, which is to be broken up or mixed, is fed into the hopper or hoppers at the top of the various forms of my device. One phase of my invention, most broadly stated, consists in the employment of a beating zone and of an arresting member which vibrates in response to the impact of the material projected from the beating zone.

Referring particularly to Figures 1 and 2. as the material is fed through the hopper E it passes into the beater zone formed by the rapidly rotating beating arms. All the material as it falls is struck by the beater arms or paddles and is projected suddenly against the belts G^5. It will be understood that the individual belt members are all tightly held by the belt tighteners G^1. Owing to their length and the flexible material of which they are made they vibrate or quiver under the impact of the finely divided material and the continuous projection of such material thereagainst keeps them in a relatively constant vibration of sufficient intensity to shake from them such material as might otherwise adhere. Any desired number of belts may be used, from a single belt or a pair of belts to a multiplicity of narrow belts. The belts, when more than one is used, abut against each other and are so closely spaced that the volume of material which passes through the interstices is negligible. In fact the result is a double separating action. The material is to a very large extent broken up by the impact of the beating arms. Some of it falls or is thrown into the hopper A^1 without actually reaching the end of the housing or the belts B^5. Such of it as reaches the belts is subjected to the vibratory action of the belts and not only is kept from adhering to the belts but is further broken up, if not already entirely reduced to its desirable fineness.

It will be understood that the material handled is already finely divided but that, by the addition of water or otherwise, it has formed in lumps or cakes or may be in a muddy, slimy condition. This is particularly the case with fine sand used in casting.

Under some circumstances I find it desirable to form the sides of the casing of a belt section or a plurality of belt sections H similarly supported and tightened. These have, although to a smaller extent, the same property of resisting the adherence of the material. Their vibration is, of course, less since they do not so directly receive the impact of the projected material.

Referring to the Figure 3 I illustrate a plurality of beaters and a plurality of hoppers, each beater directing the material which passes through its hopper against the tightened belt sections I^6 or I^7 respectively. The action is identical with the beater of Figure 1 but the capacity is of course increased. I may also, if I wish, reverse the direction of rotation of the two beater shafts and cause the beaters to throw the material against each other, thus passing the material through two beating zones and also promoting separation or breaking up of lumps by opposing the two streams of such material.

Referring to Figure 4 I illustrate a single beater and hopper but minimize the tendency of the material to adhere to the ends of the housing by employing belt members K^5 and K^6 at each end of the housing.

In each of the forms employed I use at each end of the beater shaft or hub a pair of discs spaced slightly from the inner face of the housing walls. These discs are provided with vanes having a slight clearance from such walls. In response to the rapid rotation of the beater shafts these discs and their vanes act as fans or blowers and effectively clear the inner face of the housing from any adhering material. This clearing action extends about the entire area of the disc and for a distance of a number of inches outwardly from the periphery of the disc. In the form of Figure 1 the disc is therefore able to scour the inner walls of the housing on each side through a very substantial portion of their area. Such areas of the walls as are beyond the range of this scouring effect are, as shown in Figure 1, formed of vertical belt lengths.

The same scouring effect takes place in the forms of Figures 3 and 4 and since the interior walls of the housing sides are air

scoured and since the ends of the housing are formed of vibrating belting lengths, it is obvious that the adherence of the material to the interior of the housing is reduced to a minimum.

I claim:

1. In a beater, a housing open at the bottom and closed at sides and top, a feed member at the top, a beater member within the housing, and means for rotating it, and material arresting means comprising a strip of flexible material extending across the path of the material propelled by the beater, and means for maintaining such strip under tension.

2. In a beater, a housing open at the bottom and closed at sides and top, a feed member at the top, a beater member within the housing, and means for rotating it, and material arresting means comprising a plurality of strips of flexible material positioned side by side and extending across the path of the material propelled by the beater.

3. In a beater, a housing open at the bottom and closed at sides and top, a feed member at the top, a beater member within the housing, and means for rotating it, and material arresting means comprising a strip of flexible material extending across the path of the material propelled by the beater, and adjustable means for exerting tension thereupon.

4. In a beater, a housing open at the bottom and closed at sides and top, a feed member at the top, a beater member within the housing, and means for rotating it, and material arresting means comprising a plurality of strips of flexible material positioned side by side and extending across the path of the material propelled by the beater, and adjustable means for exerting tension thereupon.

5. In a beater, a housing open at the bottom and closed at sides and top, a feed member at the top, a beater member within the housing, and means for rotating it, and material arresting means comprising a plurality of strips of flexible material positioned side by side and extending across the path of the material propelled by the beater, the strips extending from the housing top downwardly to the plane of the housing bottom, and being inclined downwardly and outwardly away from the beater zone.

6. In a beater, a housing open at the bottom and closed at sides and top, a feed member at the housing top, a beater member within the housing and means for rotating it, material arresting means positioned at an end of the housing, comprising a plurality of flexible belt lengths positioned side by side across the path of material propelled by the beater, the belt lengths being anchored at their bottoms and extending upwardly to and through the top of the housing, and belt tightening members, upon the housing top, in engagement with the ends of said belts.

7. In a beater, a housing, a feed member at the top of the housing, a receiving member positioned beneath the housing, a beater member within the housing and means for rotating it, and a flexible arresting means extending across the path of the material propelled by the beater, and means for maintaining it under tension.

8. In a beater, a housing, a feed member at the top of the housing, a receiving member positioned beneath the housing, a beater member within the housing and means for rotating it, and a flexible tensional arresting means extending across the path of the material propelled by the beater.

9. In a beater, a housing, a feed member at the top of the housing, a receiving member positioned beneath the housing, a beater member within the housing and means for rotating it, a flexible tensional arresting means extending across the path of the material propelled by the beater, and means for adjusting the tension thereof.

10. In a beater, a housing open at the bottom and closed at sides and top, a feed member at the top, a beater member within the housing, and means for rotating it, and material arresting means at each end of the housing, comprising a strip of flexible material extending across the path of the material propelled by the beater, and means for maintaining such strip under tension.

11. In a beater, a housing open at the bottom and closed at sides and top, a feed member at the top, a beater member within the housing, and means for rotating it, and material arresting means at each end of the housing, comprising a plurality of strips of flexible material positioned side by side and extending across the path of the material propelled by the beater.

12. In a beater, a housing, a plurality of feed members at the top of the housing, a receiving member positioned beneath the housing, a plurality of beater members within the housing and means for rotating them and separate flexible arresting means extending across the path of the material propelled by each beater.

13. In a beater, a housing, a plurality of feed members at the top of the housing, a receiving member positioned beneath the housing, a plurality of beater members within the housing and means for rotating them and flexible arresting means extending across the path of the material propelled by the beater, comprising a plurality of flexible belt lengths positioned side by side across each end of the housing.

14. In a beater, a housing, a feed member at the top of the housing, a receiving member positioned beneath the housing, a beater

within the housing and means for rotating it, and concentrically rotating means associated with said beater member for directing cleansing currents of air across the inner face of the housing about each end of the beater.

15. In a beater, a housing, a feed member at the top of the housing, a receiving member positioned beneath the housing, a beater within the housing and means for rotating it, and concentrically rotating means associated with said beater member for directing cleansing currents of air across the inner face of the housing about each end of the beater, comprising fan members positioned at each end of the beater member.

16. In a beater, a housing, a feed member at the top of the housing, a receiving member positioned beneath the housing, a beater within the housing and means for rotating it, and means associated with said beater member for directing cleansing currents of air across the inner face of the housing about each end of the beater, comprising discs positioned at each end of the beater member and vanes projecting therefrom toward the housing wall.

17. In a beater, a housing, a feed member at the top of the housing, a receiving member positioned beneath the housing, a beater member within the housing and means for rotating it, and a flexible arresting means extending across the path of the material propelled by the beater, said housing having flexible, lateral wall sections.

18. In a beater, a housing, a feed member at the top of the housing, a receiving member positioned beneath the housing, a beater member within the housing and means for rotating it, and a flexible arresting means extending across the path of the material propelled by the beater, said housing having flexible, lateral wall sections, the flexible arresting means and the flexible housing wall sections comprising a plurality of belt lengths positioned side by side, means for supporting them and means for exerting tension thereupon.

19. In a beater, a housing, a feed member at the top of the housing, a receiving member positioned beneath the housing, a beater member within the housing, and means for rotating it, such housing comprising in part flexible wall sections.

20. In a beater, a housing, a feed member at the top of the housing, a receiving member positioned beneath the housing, a beater member within the housing, and means for rotating it, such housing comprising in part flexible wall sections, such flexible sections consisting of a plurality of belt lengths positioned side by side.

21. In a beater, a housing, a beater member within the housing and means for rotating it, and a tensional vibratory arresting member adapted to vibrate in response to the impact of material delivered by the beater member.

22. In a beater, a housing, a beater member within the housing and means for actuating it, and a tensional vibratory arresting member adapted to vibrate in response to the impact of material delivered by the beater member.

23. In a beater, a housing, a beater member within the housing and means for rotating it, and a plane surfaced tensional vibratory arresting member adapted to vibrate in response to the impact of material delivered by the beater member.

24. In a beater, a housing, a beater member within the housing and means for rotating it, and a plane surfaced, tensional vibratory arresting member adapted to vibrate in response to the impact of material delivered by the beater member, and means for adjusting the tension thereof.

25. In a beater, a housing, a beater member within the housing and means for rotating it, and a vibratory arresting member adapted to vibrate in response to the impact of the material delivered by the beater member, a receiving member positioned beneath the beater member and the vibratory member, the vibratory member being upwardly and inwardly inclined from one edge of said receiving member toward and above said beating member.

26. In a beater, a housing, a horizontally axised beater member within the housing, and means for rotating it, a material receiving means positioned beneath said beater and a vibrating arresting member adapted to vibrate in response to the impact of the material delivered by the beater member, inclined upwardly and inwardly across said material receiving means in line with the path of the material delivered by said beater.

Signed at Chicago county of Cook and State of Illinois, this 15th day of December, 1925.

AXEL G. J. RAPP.