Feb. 17, 1925.

1,526,618

A. A. WICKLAND

CENTRIFUGAL SAND MIXING MACHINE

Filed July 14, 1921 • 3 Sheets-Sheet 1

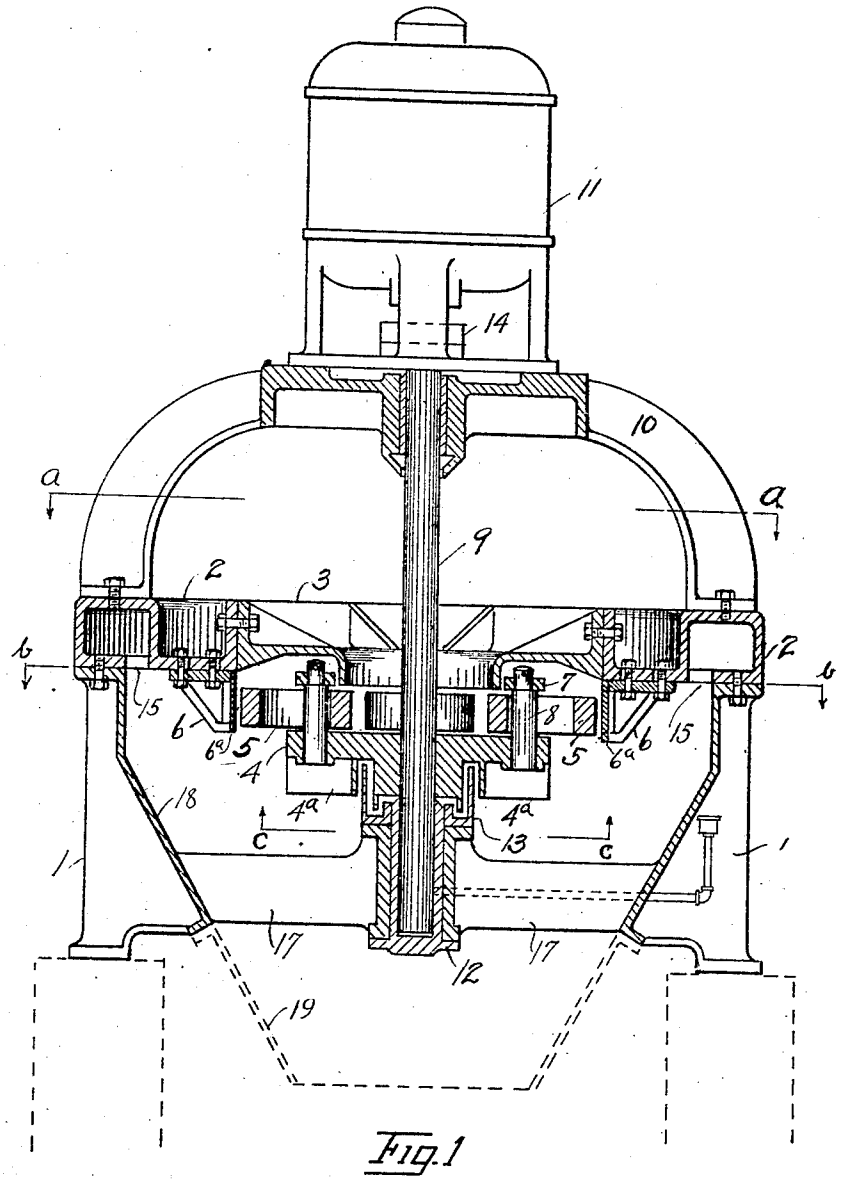



Fig. 1

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3 Sheets-Sheet 2

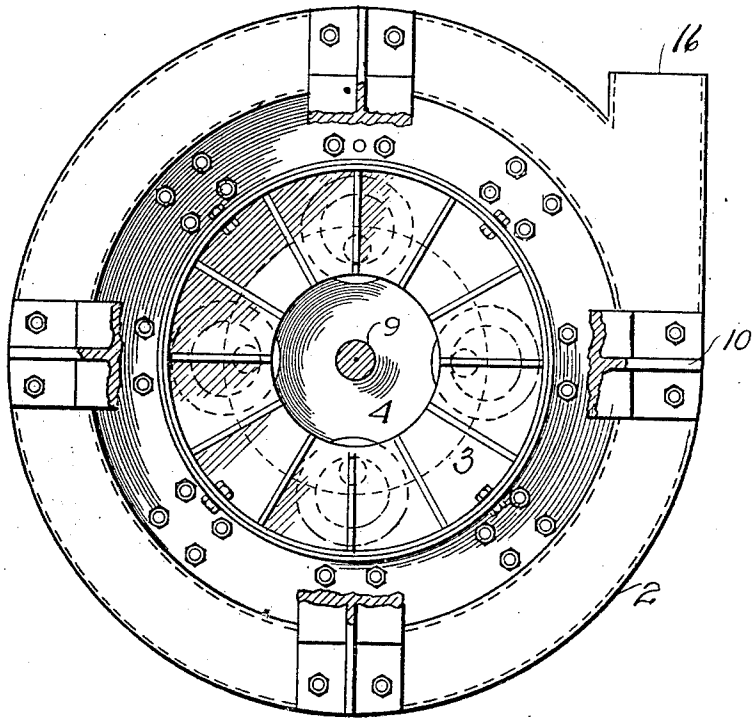



Fig. 2

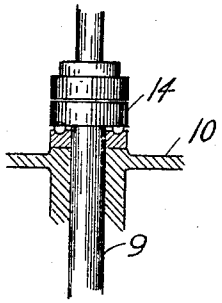



Fig. 6

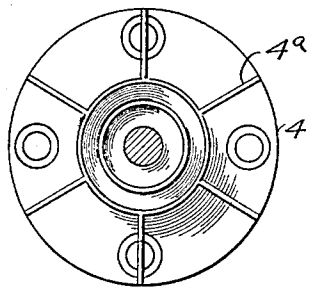



Fig. 3

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3 Sheets-Sheet 3

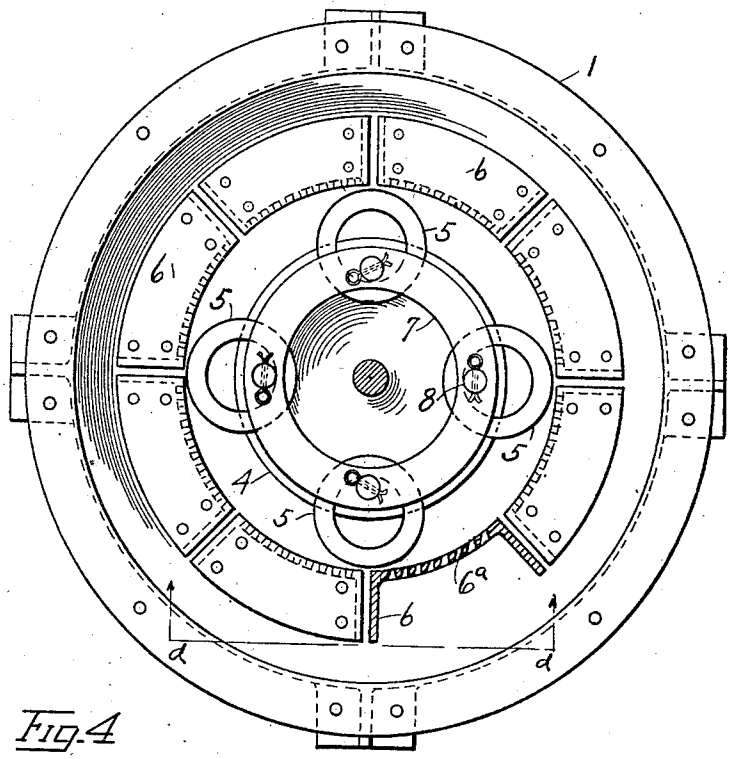



FIG. 4

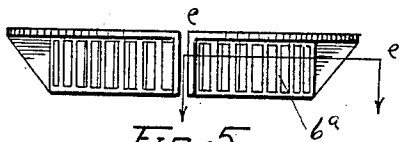



FIG. 5

WITNESSES:

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Patented Feb. 17, 1925. 1,526,618

# UNITED STATES PATENT OFFICE.

ALGOT A. WICKLAND, OF CHICAGO, ILLINOIS.

## CENTRIFUGAL SAND-MIXING MACHINE.

Application filed July 14, 1921. Serial No. 484,544.

*To all whom it may concern:*

Be it known that I, ALGOT A. WICKLAND, a citizen of the United States, and resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Centrifugal Sand-Mixing Machines; 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, reference being had to the accompanying drawings, which form a part of this specification.

My invention pertains to a new and useful centrifugal sand mixing machine and it has for its object, to provide a mechanical means for efficient mixing, kneading and conditioning of foundry sands.

A further object of my invention is to provide a device of simple mechanical construction in which all parts subjected to wear and abrasion are accessible and may be readily inspected, adjusted or replaced.

A further object of my invention is to provide effective means for the removal of the fine dust particles contained in used molding sand and also to cool and aerate the sand, leaving it in perfect condition for re-use.

The invention comprises further objects and novel features which will be hereinafter fully described and illustrated in the accompanying drawings wherein is shown the preferred embodiment of the invention, but it is understood that modifications can be made which come within the claims hereunto appended.

To obtain a full and correct understanding of the details of construction, combination of features, elements and advantages, reference is to be had to the accompanying drawings.

Figure 1 is a cross sectional view showing the stationary framing and revolving elements. Figure 2 is a plan view on line *a—a*, showing the cylindrical frame and cover plate also brackets for supporting driving mechanism. Figure 3 is a bottom view of disc 4. Figure 4 is a plan view of the revolving elements, perforated segments, and also the stationary shell or main frame on line *b—b*. Figure 5 is a front view of segments on line *d—d*. Figure 6 is a sectional view of the motor support and thrust bearing. Similar characters indicate corresponding parts in the several views.

By referring to Figure 1, it will be seen that the main frame 1 of the machine consists of a circular shell having three or more vertical legs and a center spider for supporting the lower shaft bearing 12. Mounted on this frame 1 is a circular head 2 which is hollow said head provided with openings 15 communicating with the interior of the shell and overlapping the inner wall of frame 1. This head is also provided with a flange and integral web to support the sectional cover plate 3 and the segments 6. The interior hollow section of the circular head 2 terminates in a tangential opening 16 which may be connected to an exhaust stack or exhauster, not shown on the drawing.

The removable, sectional disc 3 serves to cover a revolving disc 4, and guides or confines the flow of material fed into the machine to the center or rotational axis of the disc, as shown in Fig. 2. Disc 4 is keyed to the driving shaft 9. A plurality of loosely fitting Muller rings 5 are arranged to operate in conjunction with disc 4. These rings are losely mounted on axially arranged pins 8, carried by disc 4, and are held in place by a retainer ring 7, arranged thereabove, and which in turn is keyed to the pins 8 to prevent an axial movement of the rings. The Muller rings 5 are free to slidably move radially of the disc 4, but they are limited in their outward radial movement by engagement with the driving pins 8. It will be noted that the rings 5 can never directly engage with the adjacent face of the segmental ring 6, and in practice the nearest they reach this ring is about $\frac{5}{16}$".

A plurality of radially adjustable, perforated segments 6 form a complete circle or enclosure around the periphery of the revolving elements. This enclosure forms a track, spaced from and presenting a grating or perforated surface to the Muller ring 5, the track surface being shown most clearly in Fig. 5. This track consists of the several segments 6, which are securely bolted to the under face of the head casting 2, and pro-

vision is made so that these segments may be moved readily inwardly to compensate for wear between the track or working surfaces of the segments 6 and the Muller rings 5. In Fig. 4, one of the segments is shown in section on the line *e*—*e* Figure 5. It will be seen that the working faces of these segments are constructed with a number of vertical ribs 6ª alternately with corresponding openings or perforations which form a continuous track or enclosure as previously mentioned. The construction of these segments may be modified in several ways as long as the object is attained of providing a circular track consisting of alternate ribs and openings opposite to the path of the Muller rings 5. For the purpose of illustration, these segments are shown constructed with a horizontal body flange having diagonal braces or ribs to support the perforated face of the segment.

The recessed portion of the head 2 permits access to the bolts provided for holding the segments 6 in place. This head is also provided with a suitable flange for supporting the removable cover plate 3.

The circular shell 18 which is preferably an integral part of the main frame 1, serves the purpose of confining the material passing through the machine and an extension 19 may be provided thereon to guide the material into a suitable receptacle below the shell, as for instance a wheelbarrow or a conveyor belt, for final disposal.

An axial bearing with a removable bushing 12 is provided at the lower end of the driving shaft, this bearing being protected from dust by a circular wall and groove in parts 13 and 4.

The disc 4ª has a number of vanes on the under face, and the purpose of these vanes is to cause a sufficiently rapid circulation and radial flow of air within the machine while in operation to aerate the sand, but not sufficiently rapid to produce a blast.

The opposite end of the driving shaft 9 is run in a bearing supported by bracket 10 and a thrust bearing 14 carries the axial load of the revolving elements. This shaft 9 may be driven either by a belt and pulley or directly by an electric motor 11, as shown on Figure 1.

The nature of molding sand is such that it will readily clog up mixing machinery, rollers, paddles, or other agitating devices. The clay content apparently separates from the sand, and will adhere to, dry and bake on any surface with which it comes in contact, which will quickly lead to clogging of the machine parts unless this material is frequently scraped off.

In its natural state molding sand, as commonly used in foundries, consists of a fine grade of silica sand with a mixture of organic matter and clay. The clay content is not uniform, and frequently appears as small globules. To secure the required bonding and refractory properties of molding sand, it is necessary to mix various grades of sands, and best results are obtained when this mixing is performed in a manner resembling a kneading process. The clay particles must be squeezed in order to be thoroughly mixed with the sharp sand. Machines performing the mixing operation by passing the sand over rolls are not suitable for the reason that the action of the crushing rolls will pulverize the sand, producing very fine, minute particles, which is very objectionable.

In operating this machine, the shaft 9 revolves at a speed sufficient to cause the Muller ring 5 to move readily outwardly, due to centrifugal force. In operating, these rings do not touch the enclosure or track formed by the segments, as before mentioned, as any metallic contact between the moving elements and the stationary segments 6 would prove detrimental to the material being treated. The device is particularly intended for molding sand in a rather moist state, and in this state it consists of clay and sand crystals as its principal ingredients. This sand is fed continuously through the central circular opening in the cover, plate 3, and is deposited on the exposed face of the disc 4, adjacent its rotational axis. Owing to the loading of this disc 4 the sand is thrown outwardly toward the periphery, and is arrested when it comes in contact with the track 6 to which it has a tendency to adhere slightly because the sand is moist. The Muller rings 5 travel at a much greater speed than the radial flow of the material, and therefore the material becomes embedded between the exposed surfaces of the segmental track and the Muller ring 5, causing a thorough blending, mixing, or kneading of the ingredients of the sand, and which will squeeze the material through the perforations in the segments 6. Should large pieces of hard substances pass through the machine, these Muller rings will yield and permit such substances to drop through the annular opening between the rings and track without damage to the wear surfaces of the machine.

The action of the Muller rings 5 preclude the possibility of the sand material becoming crushed because these rings roll or knead the sand, and hence do not crush it to produce fine particles of dust in the sand treated, for to do so would make such sand inferior for foundry purposes. Due to the action of the Muller rings 5 the sand will be kneaded or squeezed through the openings in the track, and from thence it will fall by gravity into the shell or hopper 19.

As before stated, ordinarily all foundry sands for molding, coremaking and facing

purposes is used fairly moist, and owing to the large percentage of clay, loam or oil contained, it has a tendency to adhere to and clog the moving parts of mechanical sand mixers. The machine here described is designed to overcome this objection and permit a continuous flow of material through the machine. For certain classes of work it becomes desirable to run the sand through the machine in a dry state to remove the accumulation of fine dust particles present and for this reason means are provided for collecting and exhausting the dust. The vanes 4ª on the underside of the disc 4 tend to agitate and aerate the sand as it passes through the perforations in the segments 6 and falls into the hopper 19.

The segemental track 6 and Muller rings 5 may be readily removed when worn by simply removing the split cover plate 3 which will give access to the retainer ring 7. After this is removed the Muller rings 5 and segments 6 may be adjusted or replaced without difficulty. This construction also allows a convenient means for frequent inspection.

Having thus fully described my invention, I claim:

1. In a sand mixing machine, a cylindrical shell, a vertical driving shaft therein, a disc mounted on said shaft, means for feeding the sand into said shell directly onto said disc, a plurality of radially movable rings, drivably connected to said disc, and independently rotatable thereon, and movable beyond the periphery thereof, and a stationary perforated track spaced from the inner surface of the shell and radially spaced from the periphery of said disc in the plane of said rings.

2. In a sand mixing machine, a shell, a vertical driving shaft therein, a disc mounted on said shaft, means for feeding sand onto said disc, a plurality of radially movable rings drivably connected to said disc, and independently rotatable thereon, and movable beyond the periphery thereof, and a stationary perforated track, substantially in the plane of said rings, and spaced beyond the disc so as to be out of engagement with said rings to form a large annular opening between the track and disc, said opening communicating directly with the hollow interior of said shell therebelow, and said rings being freely movable across said opening to adjacent, but not into engagement with said track.

3. In a sand mixing machine, a shell, a vertical drive shaft therein, a disc carried by said shaft, a perforated track spaced annularly about said disc so as to form an annular opening therebetween, means for feeding sand onto said disc, axially arranged pins on said disc adjacent its periphery, Muller rings loosely mounted on said pins so as to be freely movable radially of the disc to co-operate with said track and squeeze the sand through the perforations thereof, and a ring connected to said pins above said Muller rings and preventing their upward movement.

4. In a device of the kind described and in combination, a shell, a revoluble disc arranged therein, having a vertical rotational axis, an annulus spaced from the inner wall of said shell and from said disc and having a series of circumferentially spaced openings therethrough entirely about its periphery, axially extending pins on said disc, Muller rings loosely mounted on said pins so as to be driven therethrough, and movable radially on said disc to adjacent but not into contact with said annulus, and means for feeding the material onto said disc adjacent its rotational axis.

5. In a device of the kind described, and in combination, a shell adapted to have sand fed thereinto, sand-kneading means therein and to which said sand is fed and from whence it is discharged into said shell, and means in said shell below the point of discharge of said sand from said kneading means and operated thereby for positively circulating air upwardly through said sand as it is discharged from said kneading means.

6. In a device of the kind described, and in combination, a shell, sand-kneading means therein and to which the sand is fed through the shell, a fan in said shell below said kneading means and driven thereby for positively forcing air upwardly through said sand as it discharges downwardly from said kneading means, and means operated independent of said air-circulating means for withdrawing the dust from said material simultaneously with the aerating thereof.

7. In a centrifugal sand mixing machine comprising a shell, a driving shaft vertically arranged within said shell, movable sand-kneading means arranged in said shell and operated by said driving shaft, an exhaust duct communicating with the interior of said shell above the point of discharge of said sand from said first-named means, and means in said shell and operated by said kneading means for circulating air through said sand after said kneading.

8. In a sand mixing machine, a shell, a vertical driving shaft therein, a disc operatively connected to said shaft and adapted to have the sand directed thereon, radially movable rings drivingly connected to said disc and independently rotatable thereon and movable beyond the periphery thereof, and a track spaced from the periphery of said disc and from said rings when the latter are in their outermost position, so that the sand will normally be kneaded between

said rings and track and so that the large pieces of material will engage said rings to actuate the latter radially inwardly relative to said disc to permit said large pieces to escape between said disc and track into the shell.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ALGOT A. WICKLAND.

Witnesses:
C. B. TEETER.
A. J. HARDER.