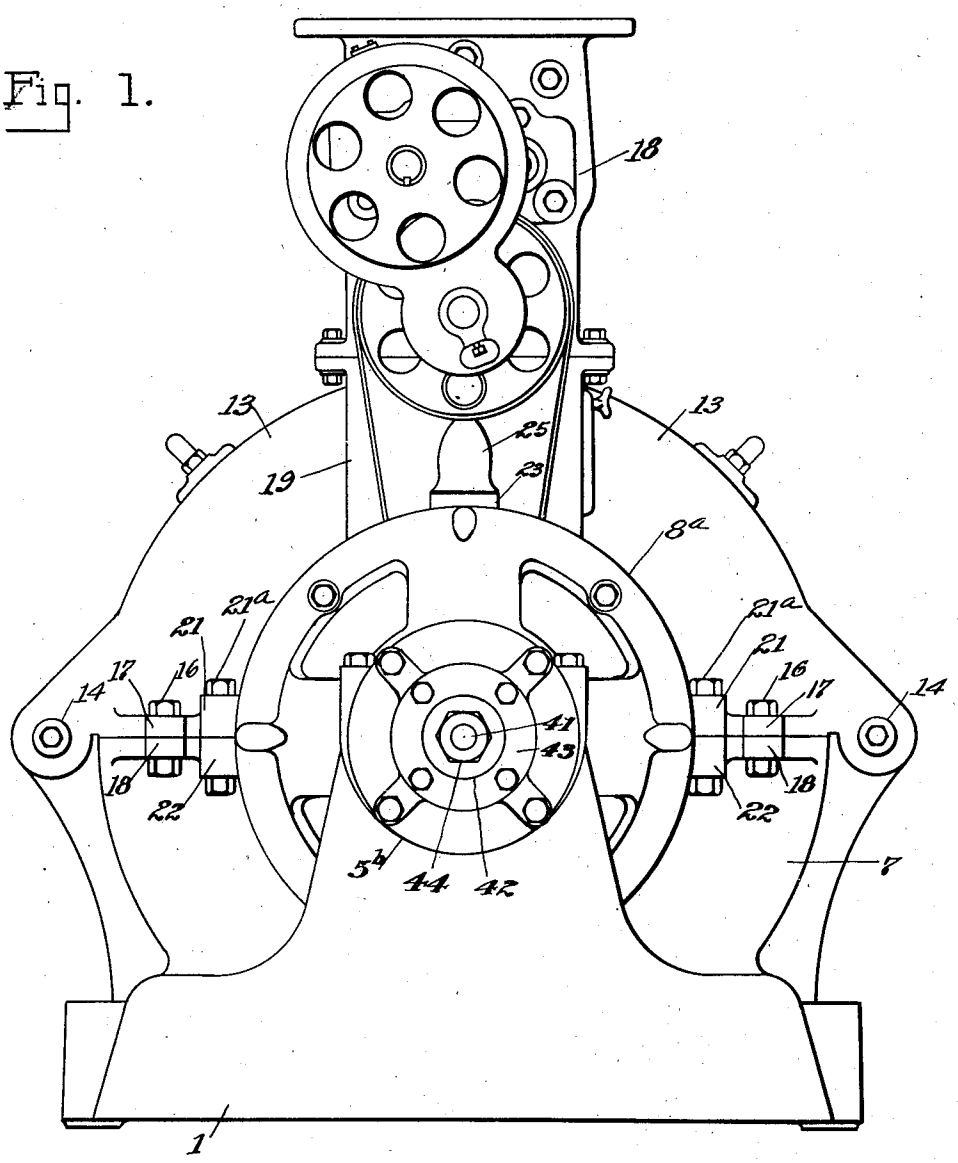
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A. P. DANIEL

ATTRITION MILL

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Fig. 1.



Inventor

Allan P. Daniel

By Staley & Bowman

Attorneys

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A. P. DANIEL

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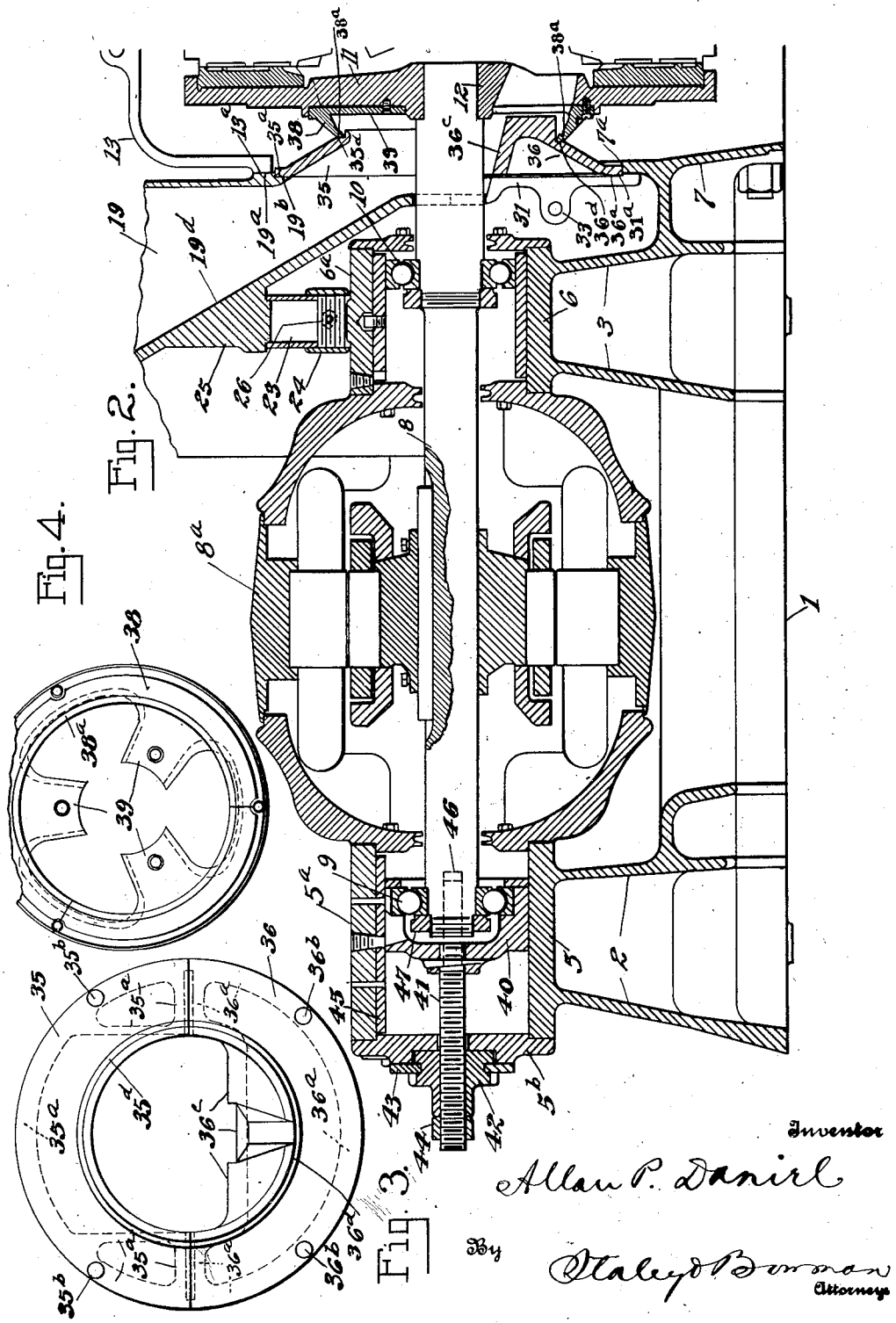


Fig. 2.

Fig. 4.

Fig. 3.

Inventor
Allan P. Daniel
By Staley & Bowman
Attorneys

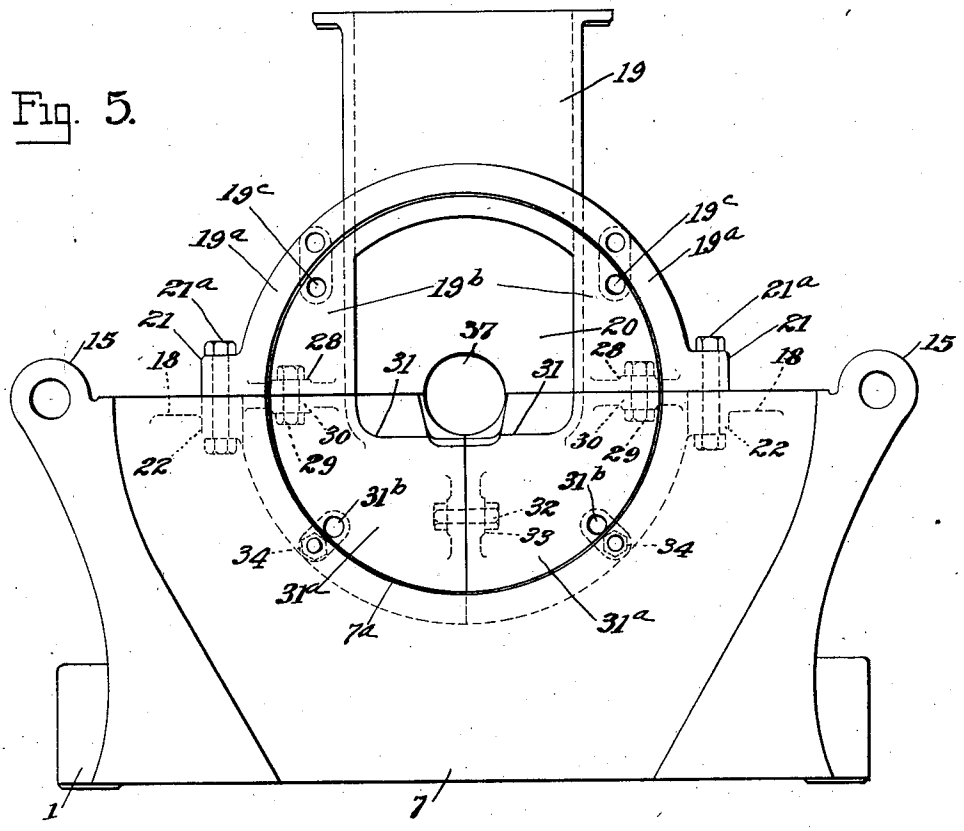
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A. P. DANIEL

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Fig. 5.



Inventor

Allan P. Daniel

By Staley & Berman

Attorneys

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UNITED STATES PATENT OFFICE.

ALLAN P. DANIEL, OF SPRINGFIELD, OHIO, ASSIGNOR TO THE BAUER BROTHERS COMPANY, OF SPRINGFIELD, OHIO, A CORPORATION OF OHIO.

ATTRITION MILL.

Application filed April 4, 1922. Serial No. 549,479.

To all whom it may concern:

Be it known that I, ALLAN P. DANIEL, a citizen of the United States, residing at Springfield, in the county of Clark and State of Ohio, have invented certain new and useful Improvements in Attrition Mills, of which the following is a specification.

This invention relates to improvements in attrition mills, a type in which the material to be ground is fed through a feed spout which communicates with a central opening in one of the rotating grinding members enclosed by a casing, and it particularly relates to that part of the structure wherein a tight seal is provided between the spout and rotating grinding member and between the spout and casing.

In mills of this kind it is customary to provide the discharge end of the feed spout with a seal ring with which co-operates a wear ring on the rotating grinding member through which the material is fed, and one of the objects of this invention is to provide means for so automatically positioning the rings in assembling the structure that they will occupy correct relative axial and facial positions with respect to each other to enable a tight seal between the rings to be secured.

A further object of the invention is to so construct the feed spout and the wear and seal rings as to permit either one or both of the rings to be removed without disturbing the feed spout proper or other operating parts, such as the operating shaft for the open-center grinding member.

A further object of the invention is to provide means for supporting the feed spout and casing for the grinding members of a character to cause them to properly align themselves with each other at the point where the spout enters the casing to effect a tight seal between the parts.

A further object of the invention is to provide improved means for adjusting the relation of the seal and wear rings.

In the accompanying drawings:

Fig. 1 is an end view of a mill embodying the improvements.

Fig. 2 is a longitudinal section of a portion of the same.

Fig. 3 is an elevation of that face of the seal ring which co-operates with the wear ring.

Fig. 4 is an elevation of that face of the wear ring which co-operates with the seal ring.

Fig. 5 is an end view of the feed spout and supporting base of the structure looking at the discharge side of the spout with the seal ring and other parts removed.

Referring to the drawings: 1 represents a supporting base having integrally formed upright standards 2 and 3 provided at their upper ends with integrally formed bearing housings 5 and 6, the caps 5^a and 6^a of which are cast with the housings and afterwards split therefrom, this being readily accomplished by casting the housings with cored holes and employing a splitting wedge. The base also has cast integrally therewith a vertical wall 7, the upper edge of which is finished to lie in a horizontal plane passing through the axial center of the bearing housings, and is also formed with a circular depression 7^a hereinafter referred to; the wall of this depression being formed on the arc of a circle whose center is the axial center of the finished bearing housings. This is apparent from Fig. 5 which shows the relation of the upper surface of the wall 7 and the wall of the depression to the center of the opening 37 for the shaft 8. The shaft 8 driven in the present case by an electric motor 8^a is mounted in ball bearings 9 and 10 in the respective housings which are finished to receive the retainer for same, and carries at its inner end an axially aligned grinding head 11 of any suitable construction, which has the usual central feed openings 12 and which cooperates with a second grinding head (not shown) to reduce the material. By thus casting the base and housings en bloc and accurately finishing the housings for reception of the shaft bearings, an accurate axis of rotation of the shaft and grinding head carried thereby will be automatically established as well as an accurate point of support on the wall 7 for the purpose to be explained. The upper portion of the grinding heads are enclosed by two casing members 13 more or less loosely hinged at 14 to lugs 15 on the bed structure. These lugs are arranged in pairs, but one lug of each pair being shown in the drawings. The casing parts are secured to the bed by bolts 16 (Fig. 1) which clamp together finished lugs 17 and 18 located re-

spectively on the casing parts and the wall 7 of the bed structure.

The feed spout is indicated at 19, a feeding mechanism for the material, indicated in a general way at 18, being mounted on the upper end of the spout, the details of this mechanism forming no part of the present invention. This spout is formed with a discharge opening 20 and has two oppositely arranged finished feet 21 which are secured to finished lugs 22 on the wall 7 of the bed structure by bolts 21^a; the upper surface of these lugs forming part of the upper surface of the wall 7 which, as before explained, is in a horizontal plane which passes through the center of the finished bearing housings and consequently through the center of the shaft 8 after it is assembled. The spout is further supported by an adjustable member 23 (Figs. 1 and 2) threaded in a sleeve 24, interposed between the cap 6^a of the bearing 6 and a lug 25 on the spout, cap screws 26 serving to hold the parts in adjusted position. By reason of this arrangement, in which the lugs 21 and 22, which form the support for the spout, and the lugs 17 and 18, which form the attachment for the casing members 13, may be finished at the same setting to cause them to accurately align themselves with each other, it will be seen that when the parts are assembled the finished faces 13^a and 19^a of the casing members and spout, respectively, will be caused to accurately align themselves and thus provide a tight seal between these parts.

The finished faces 19^a on the spout are arranged about the discharge opening 20 and are of semi-cylindrical form (Fig. 5), the spout being enlarged at this point. Projecting laterally from this enlarged portion of the spout are finished lugs 28 to which are connected by bolts 29 the finished lugs 30 on two deflector spout sections 31; these sections joining each other at a point perpendicular to the longitudinal axis of the shaft 8 and being further connected together by a bolt 32 passing through coinciding ears 33 on the respective spout sections. The spout sections are further secured to the edge of the circularly recessed portion of the wall 7 by cap screws 34; both wall and spout sections at the points of juncture being finished. By this manner of connecting the spout sections to the spout proper, these faces of these parts to which the seal ring is attached are brought into accurate vertical alignment.

The seal ring is formed in two equally divided sections, an upper section 35 and a lower section 36 (Fig. 3), so that when the ring is in position it is horizontally divided at the center. The ring is preferably cast in one piece and cracked or broken in two parts so that in assembling the ring section there will be a snug and accurate fit between the sections. The opposite side of the ring section 35 from that shown in Fig. 3, or that side which fits the spout, is provided with finished faces 35^a, as shown in dotted lines, and the spout 19 about its opening 20 has finished faces 19^b to receive the finished faces of the section 35, the parts being secured together by bolts which pass through the opening 19^c and 35^b in the respective parts.

The lower section 36 of the seal ring has finished faces 36^a, (shown in dotted lines in Fig. 3) on that side thereof adjacent the spout section 31 and the entire surfaces of those faces of said sections 31 viewed in Fig. 5 are finished as indicated at 31^a to receive the finished faces of this ring section 36, the parts being secured together by bolts which pass through the openings 31^b and 36^b in the respective parts.

The faces 19^b and 31^a are in concentric relation with the axes of the shaft 8 and its bearing housings and this can be accurately determined in finishing these faces by assembling the spout and its sections before finishing and resting the lugs 21 after finishing upon a suitable mounting of the finishing machine, the surface of which mounting is in a plane which passes through the center of the axis of rotation of the finishing tools so that the finished faces and their shoulders will be in concentric relation to the shaft 8 after the lugs 21 have been attached to the lugs 22. Consequently the seal ring when it is assembled will be brought in concentric relation with the shaft 8 by these faces and their shoulders and also by the concentric face 7^a in the wall 7.

The wall of the upper section of the seal ring is inclined toward the central openings 12 of the grinding member 11, as well as the wall 19^d of the spout, to convey the material to said openings, the lower section 36 of the seal ring having a wiper 36^c to direct the material to these openings. The lower edge of the spout wall 19^d and upper edges of the spout sections 31 are formed with an opening 37 to receive the shaft 8.

Cooperating with the seal ring is a wear ring carried by the grinding member formed in two sections as shown in Fig. 4, the ring consisting of a rim 38 having a plurality of arms 39 secured to the grinding member 11 by screws or other suitable removable fastening devices, the coinciding faces of the arms and member 11 being finished to provide the correct positioning of the wear ring to bring the same in axial alignment with the shaft. The rim 38 of the seal ring is inclined inwardly to the axis of the shaft and the edge thereof is formed with a finished axially aligned concentric face 38^a which snugly fits the finished shouldered portions 35^d and 36^d on the seal ring members, the vertical faces of which are, by reason of the construction described axially aligned and concentric

with the shaft. The alignment of the shaft 8 in its bearings is accurately made to cause the shaft to assume a true longitudinal position and thereby accurately position the wear ring relatively to the seal ring.

By the arrangement described the sealing faces between the seal and wear rings will be in accurate concentric relation with the axis of the shaft 8. In this present machine this accuracy is secured by using the center of the axis of the finished housings as the center for the tools for finishing the faces to which the rings are secured to the spout sections and grinding head, whereas in the construction of other machines of this character it has been the common practice to determine these centers by vertical measurement from some fixed point on the base, which is of a built-up character in that the bearing housings and standards which support the same are formed separately from each other and separately from the base. By forming the bearing housings and base en bloc these housings can be accurately finished with respect to each other by inserting therethrough a boring bar having a boring tool thereon which can be first used to finish one housing and then moved on the bar to the other housing. The points of support on the wall 7 previously described can also be thus accurately made with respect to the axial centers of the finished bearing housings. Using the axial centers of the bearing housings as centers for the faces to which the seal and wear rings are attached to the spout and head and also as centers for finishing the seal faces on these rings, it is apparent that when the parts of the mill are assembled the sealing faces must be in accurate concentric relation with the axis of the shaft 8.

The wear ring is adjusted relatively to the seal ring by the following devices: The retainer 40 for the ball bearing 9 has pinned thereto a screw 41, which projects through the housing cap and has threaded thereon a nut 42, confined against longitudinal movement by a ring 43 on the cap 5^b, which projects in an annular groove in the nut. The retainer 40 is held against rotation by a spline 45 and is connected to the ball rings by a pair of double gib keys 46, one only of which is shown in dotted lines, and a lock nut 47 on a reduced threaded portion of the shaft, clamps the inner ball ring to a shoulder on the shaft. By unloosening the lock nut 44, the adjusting nut 42 may be turned to thereby move the shaft and its head 11 in or out, thereby enabling the wear ring to be accurately positioned relatively the seal ring.

When it is desired to remove the seal or wear rings, or both, this may be accomplished without disturbing the feed spout proper by first removing the spout sections 31, after which the rings may be removed through the space above the wall 7 which was occupied by the spout sections.

The rings may also be removed from the top by swinging back the casing members 13 and adjusting the shaft and its grinding head inwardly until the rings clear each other.

From the construction described, it will be seen that the cooperating faces on the wear and seal rings may be brought in true axial and concentric relation with the axis of rotation of the shaft and hence with each other and also in true facial relation with each other, the two rings, by reason of the manner of mounting described, automatically assuming their correct positions when assembled. It will also be seen that provision is made for conveniently adjusting the space between the rings and also for removing the rings.

Having thus described my invention, I claim:

1. In an attrition mill, a main supporting base, a shaft mounted on said base, a grinding member connected with said shaft, a wear ring carried by said grinding member in concentric relation with said shaft, a supporting face formed on said base in concentric relation with the axis of said shaft, and a seal ring mounted on said supporting face in concentric relation with the axis of said shaft and cooperating with said wear ring.

2. In an attrition mill, a main supporting base having a plurality of bearing housings cast en bloc to permit the finishing of the housings at one setting, a shaft mounted in said housings, a grinding member connected with said shaft, a wear ring on said grinding member, a wall on said base having a supporting face formed on the arc of a circle whose center is the longitudinal axis of said shaft, and a seal ring seated on said supporting face and cooperating with said wear ring.

3. In an attrition mill, a main supporting base having a plurality of bearing housings cast en bloc to permit the finishing of the housings at one setting, said base also having horizontal supporting faces finished with relation to the axes of said housings, said base also having a recessed portion with the wall of said recess extending on an arc whose center is the axes of said housings, a spout member having a positioning face for a seal ring finished with relation to the axes of said housings, and a seal ring secured to said face, whereby when said spout and seal ring are mounted upon the horizontal faces of said base and concentric face of said recessed wall said seal ring will be in concentric relation with the axes of said housings.

In testimony whereof, I have hereunto set my hand this 27 day of March, 1922.

ALLAN P. DANIEL.