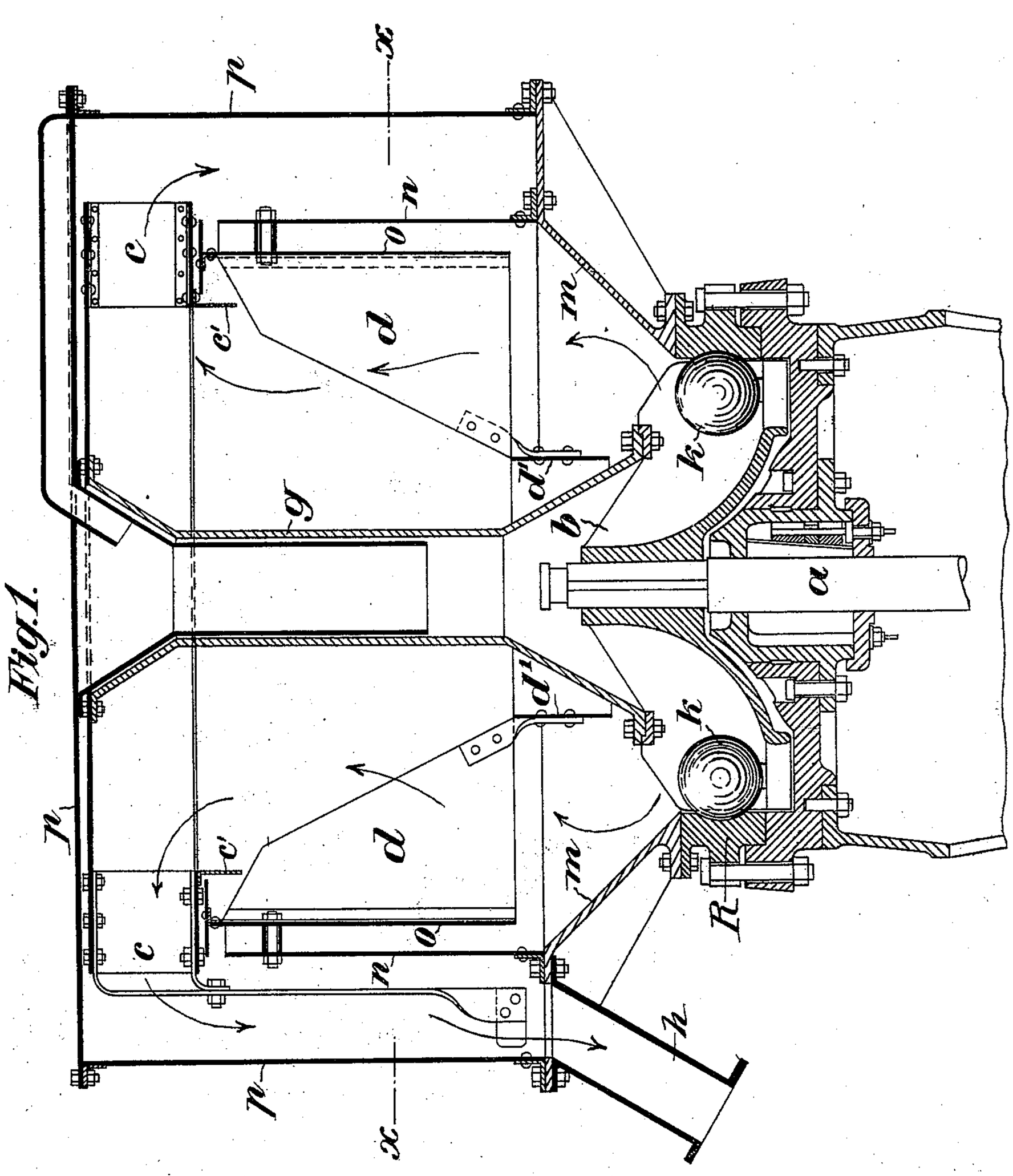
(No Model.) 2 Sheets—Sheet 1.

J. PFEIFFER.

GRINDING MILL.

No. 577,319. Patented Feb. 16, 1897.



WITNESSES.

C. Sedgwick

Isaac B. Owens

INVENTOR:

J. Pfeiffer

BY Munn & Co

ATTORNEYS.

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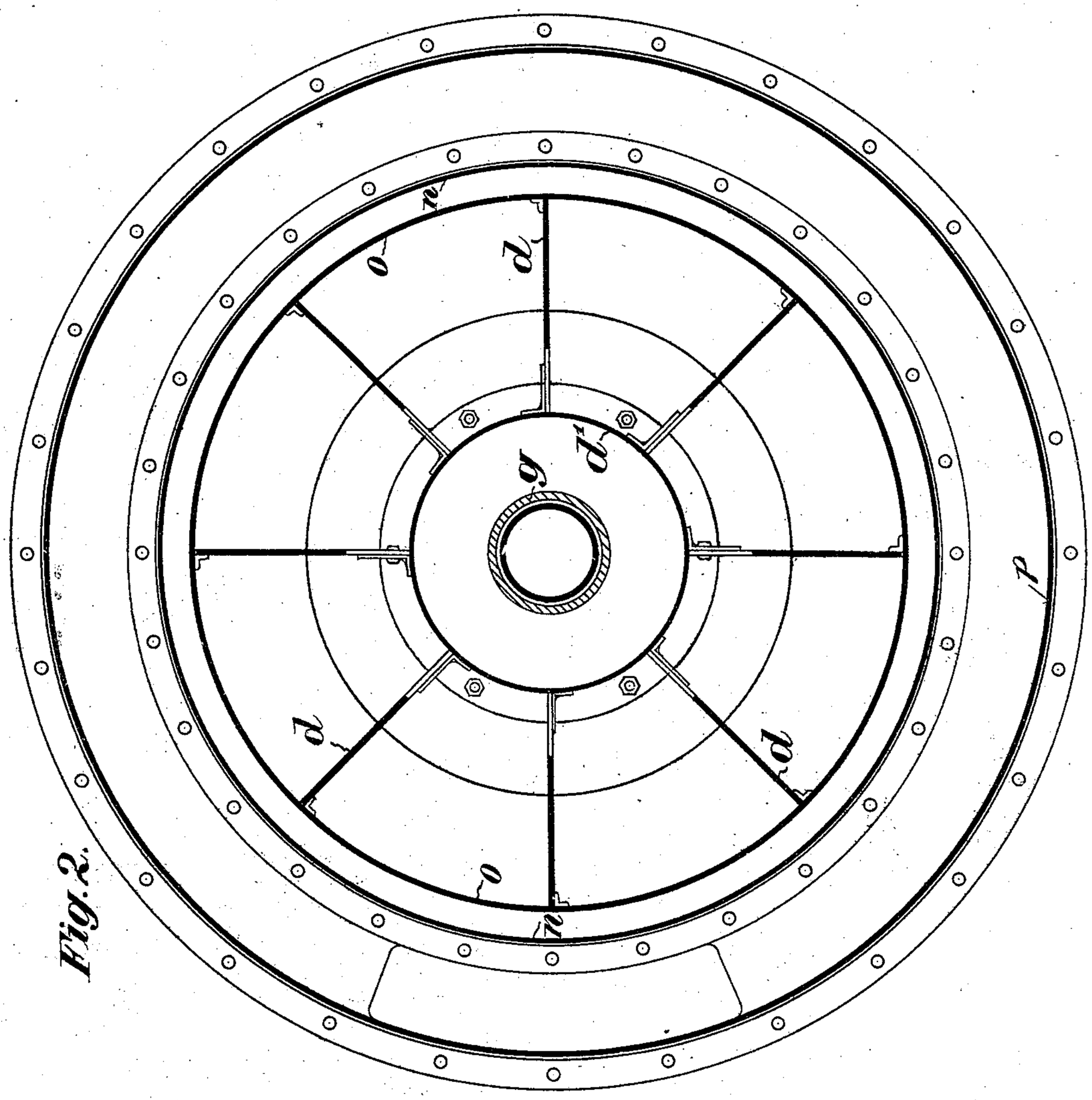

Fig. 2.

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UNITED STATES PATENT OFFICE.

JACOB PFEIFFER, OF KAISERSLAUTERN, GERMANY.

GRINDING-MILL.

SPECIFICATION forming part of Letters Patent No. 577,319, dated February 16, 1897.

Application filed September 4, 1895. Serial No. 561,446. (No model.)

To all whom it may concern:

Be it known that I, JACOB PFEIFFER, a subject of the King of Bavaria, residing at Kaiserslautern, in the Kingdom of Bavaria, Germany, have invented new and useful Improvements in Grinding-Mills, of which the following is a specification.

My invention relates to an improved construction of ball grinding-mills with wind-separator, wherein the use of sieves is avoided.

The new ball grinding-mill is shown in the accompanying drawings, in which—

Figure 1 is a vertical section, and Fig. 2 a horizontal section, of the mill on the line *x x* in Fig. 1.

In a hollowed grinding-ring R balls *k* are driven round by arms *b*, actuated by a shaft *a*, and they effect the grinding of the material introduced through a central hopper *g*. The grinding-ring R carries a casing *m*, enlarged at the top and to which is secured the cylindrical casing *n*. To the latter is fixed a second casing *o* in such a manner that the casing *n* is concentric with respect to the casing *o*, which extends downward nearly to the casing *m*. Above the casings *n* and *o* a fan is arranged, which is connected with the central hopper *g*. The hopper *g* is secured to the arms *b*, so that it is also revolved by the shaft *a*. A casing *p* incloses the whole arrangement in such a manner that it covers the fan *c* at the top up to the central hopper, while laterally there is left between the casings *p* and *n* an annular space, which is closed at the bottom and provided with the tubular discharge-pipe *h*.

The above-described mill works in such a manner that the reduced pulverized material rises upward in the casing *o* and is drawn out by the fan and thrown into the annular space between the casings *p* and *n*, whence it is discharged through the discharge-pipe *h*.

In the above-described construction I have found a disadvantage, namely, that not only reduced pulverized material but also grits are led off by the fan *c*. The reason thereof is that the air layer contained in the interior of the casing *o* is put in revolution corresponding to the revolving parts, *i. e.*, to the hopper *g* and to the arms *b*, so that the incompletely-reduced parts of the material, that is to say, grits, are raised by the produced air whirl and pass through the fan *c* to the discharge-pipe. To remedy this drawback, I have made the following arrangement, which is the essential new feature and attains the object of this invention.

Within the casing *o* there are inserted radially-arranged vanes *d*, firmly connected with the casing *o*, as shown in Figs. 1 and 2. The inner lower border of these vanes is connected with a ring *d'*, embracing the flaring lower end of the central hopper or feed-tube *g*. By means of this ring and the vanes the grits whirled up are thrown against the revolving central hopper *g* and thus raised upward. Furthermore, by means of the vanes *d* a revolving air column is formed within the mill, which carries away upward the coarser parts, *i. e.*, the grits, as above explained. When the mill provided with these improvements is working, the grits thrown against the vanes *d* fall down again into the grinding-space, so that only reduced pulverized material is drawn out.

The flat rings on the upper end of the casing *o* and the flange *c'* on the fans *c* serve to prevent the ground grain from passing between the fans and the casings and going into the space between the casings *o* and *n*. The casings *o* and *n* are provided for the purpose of rendering the structure rigid and durable. They do not affect the principle of the apparatus.

I claim—

1. In a grinding-mill, the combination of a shaft, grinding mechanism actuated thereby, a casing inclosing the grinding mechanism, a feed-hopper extending centrally through the casing, an exhaust-fan, a vane rigid with the casing and interposed between the fan and grinding mechanism, and a ring held to the vanes and below the same and embracing the feed-hopper, substantially as described.

2. In a grinding-mill, the combination of a casing, a shaft, grinding mechanism carried by the shaft and within the casing, a hopper axially coincident to and revolving with the shaft, a casing *n* concentric with and within the first casing and arranged to leave an annular space between the two, a casing *o* within the casing *n* and secured thereto, a fan carried by the hopper and above the casings *n* and *o*, vanes projecting inwardly from the

casing *o*, and a ring held by and below the vanes and embracing the hopper, substantially as described.

3. In a grinding-mill, the combination with a base, of a drive-shaft, a series of radial arms carried by the drive-shaft, a grinding-ring held on the base and embracing the arms, grinding-balls confined by the ring and driven by the arms, a centrally-disposed hopper leading downward to the arms and grinding-ring and carried by the arms, an exterior casing rigid with the base, a second casing within the first and also rigid with the base, the two casings forming between them an outlet-passage for the pulverized material, a fan carried by the hopper and moving therewith, the fan being located at the upper edge of the inner casing, and a series of radial vanes rigidly carried by the inner casing, the vanes projecting into the space surrounding said hopper to prevent the formation of a swirling current of air, substantially as described.

4. In a grinding-mill, a base having a grinding-ring, a driving-shaft, arms mounted on the shaft and inclosed by the ring, balls driven by the arms, a hopper carried by the arms and rising from the same, the hopper leading to the space inclosed by the ring, a fan carried and driven by the hopper, a casing rigid with the base, the casing being located beneath the fan and the parts being arranged so that a current of pulverized material may pass upward through the casing, and a series of vanes rigid on the interior of the casing, the vanes projecting radially and inward to prevent the formation of a swirling current of air, substantially as described.

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

JACOB PFEIFFER.

Witnesses:
P. BENDER,
E. SCHIMPER.