(No Model.)

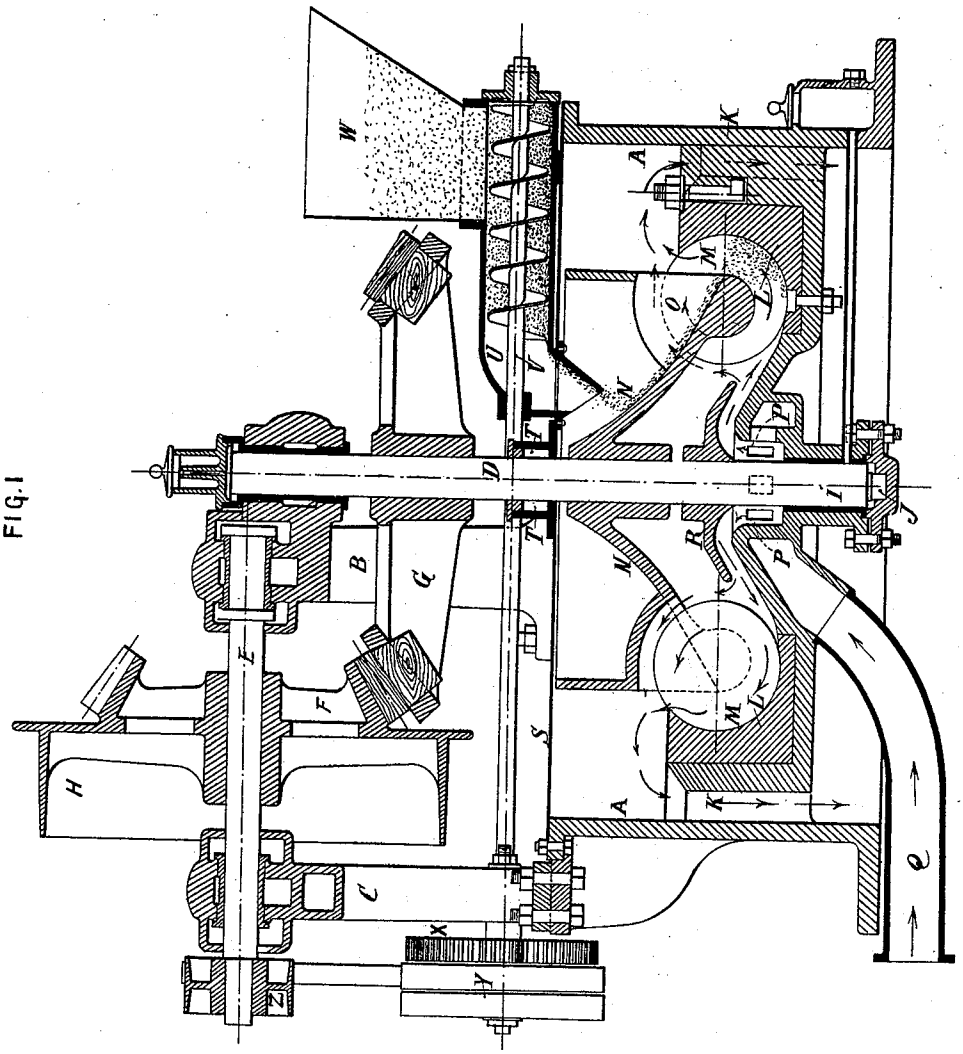
2 Sheets—Sheet 1.

E. BAILLY.

GRINDING MILL.

No. 568,289. Patented Sept. 22, 1896.

FIG. 1



Witnesses
Geo. W. Rea.
Robert Everett.

Inventor.
Emile Bailly.
By
James L. Norris.
Atty.

(No Model.)

2 Sheets—Sheet 2.

E. BAILLY.

GRINDING MILL.

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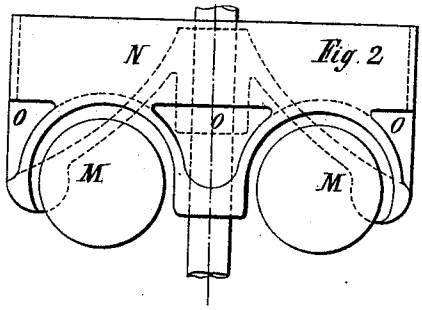
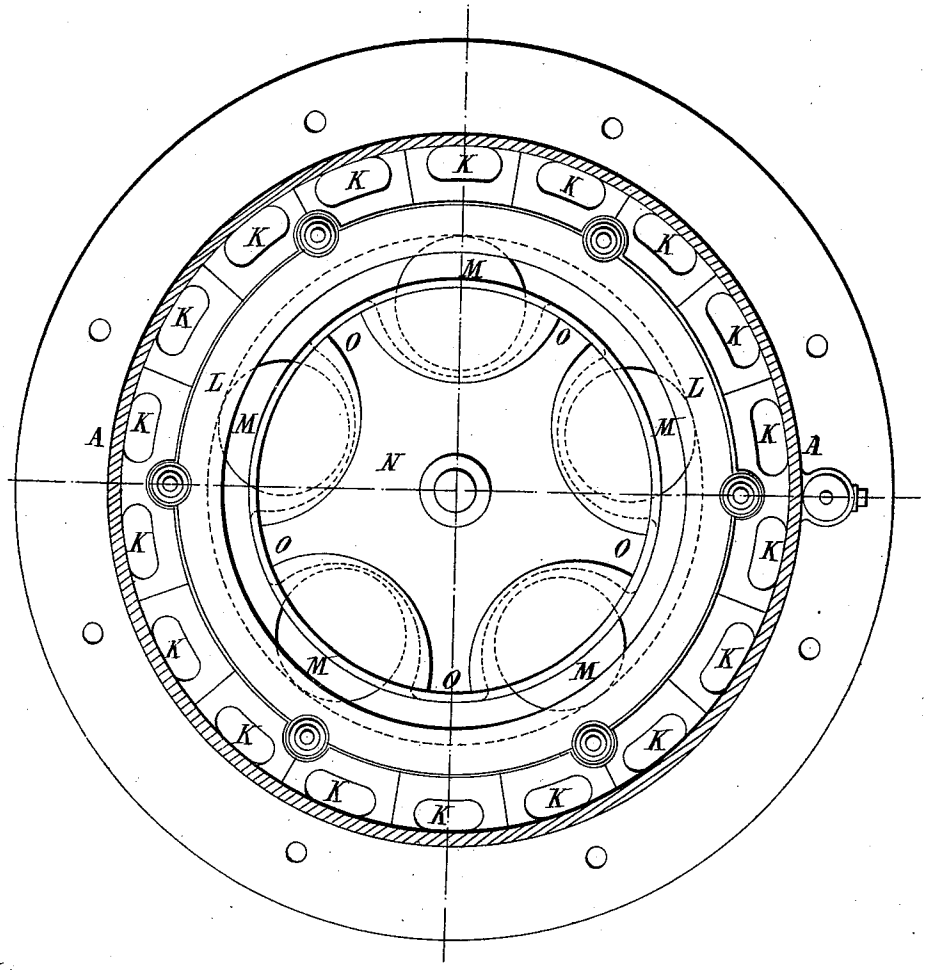


Fig. 2

FIG. 3



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UNITED STATES PATENT OFFICE.

EMILE BAILLY, OF NANCY, FRANCE.

GRINDING-MILL.

SPECIFICATION forming part of Letters Patent No. 568,289, dated September 22, 1896.

Application filed February 1, 1896. Serial No. 577,734. (No model.) Patented in France June 18, 1895, No. 248,142.

To all whom it may concern:

Be it known that I, EMILE BAILLY, a citizen of France, and a resident of Nancy, in the Department of Meurthe-et-Moselle, have invented a new and useful Improvement in Grinding-Mills, (for which I have obtained a patent in France, No. 248,142, dated June 18, 1895,) of which the following is a specification.

The object of this invention is to provide improved and simple apparatus for efficiently crushing, pulverizing, or grinding any substances capable of being more or less finely divided, such as lime, cement, gypsum, (plaster-of-paris,) porcelain-clay, (kaolin,) quartz, barytes, phosphates, slag or cinders, coal, coke, colors, chemicals, and the like.

The invention consists in the features of construction and combination of parts in a grinding-mill, as hereinafter described and claimed.

In the annexed drawings, Figure 1 is a sectional elevation of my improved grinding-mill. Fig. 2 is an elevation of the grinding-balls and their propelling-disk. Fig. 3 is a partly sectional plan, the upper part of the mill being omitted.

The letter A designates a cylindrical cast-metal chamber or pan constituting the main support or framework of the machine. To this pan A are bolted the standards B C, provided with bearings for a vertical shaft D and horizontal shaft E, that are operatively connected by a pair of bevel-wheels F G, to one of which a driving-pulley H is attached. Instead of the particular driving mechanism shown, it is obvious that any other may be provided, according to the special condition under which the machine may have to be erected. The cylindrical pan A is provided at the bottom with a step-bearing I for the vertical shaft D, which has a pivot J to turn on.

In the bottom of the pan A and next to its vertical wall is an annular series of discharge-openings K for exit of the ground or pulverized material. Immediately within the circle formed by these discharge-openings and concentric therewith is secured an annular trough L, composed of some suitable metal or other very hard material. This annular trough L supports a series of grinding-balls M, the number of which may be varied at will. The balls M are made of steel or other very hard material and are intended to perform the operation of crushing or grinding within the trough.

To the vertical shaft D is secured a flanged and conoidal disk N, constructed of steel or other suitable hard material. The under side of the disk N is provided, adjacent to its periphery, with a series of recesses to receive and partly cover the balls M. The depending portions of the disk between said recesses are intermediate the balls and serve to propel them when the disk is rotated. In the vertically-flanged periphery of the disk N, above the depending portions or ribs that separate the ball-recesses, are formed openings O for the purpose of distributing throughout the annular trough L the material to be crushed.

There is formed in the bottom portion of the pan A, surrounding the central vertical shaft D, a wind-chest or twyer P, provided with a series of lateral inlet-openings that connect with a pipe Q for supplying a blast of air, under pressure, from a fan or blower. (Not shown.) The air-blast issues from the twyer through an opening at the top surrounding the shaft D, on which is secured a deflecting plate or disk R, by which the air is distributed throughout the annular trough L, in which the crushing-balls M operate.

At its top the pan A is closed by a lid or cover S, provided with a stuffing-box T, through which the vertical shaft D is passed.

The material to be crushed or ground is continuously fed onto the disk N from a cylinder U, in which is mounted a screw conveyer V, that receives the material from a hopper W, into which it is first charged. The shaft of the screw conveyer V may be driven by any suitable speed-reducing gearing, as X Y Z, from the shaft E, on which the main driving-pulley H is secured.

When the machine is supplied with material and set in motion, the material to be crushed is conducted from the hopper W, which is kept constantly filled, and is conveyed by the screw V onto the upper inclined surface of the disk N, whence, owing to rotary motion of said disk, it is driven outward through the openings O into the trough L in the path of the balls M, which crush and pulverize it.

The blast issuing from the twyer P, around the vertical shaft D, is deflected downwardly

by the deflection-plate R onto the bottom of the pan A, which it sweeps, as it does also the trough L, while another portion of the blast escapes through the spaces between the balls M and the recesses of the disk N, this last-mentioned current then meeting the first-mentioned one, which tends to rise vertically, and the two currents mix and flow on toward the discharge-openings K, as indicated by the arrows in Fig. 1. It is obvious that as the material is reduced to powder it is carried off by the blast and passes through any of the discharge-openings K into a suitable receptacle. The heavier part of the material to be crushed drops into the bottom of the trough L and may travel nearly or quite around the trough while being crushed, but the lighter and finer portions, which remain on or rise to a higher level, are held for a time in suspension by the currents of air at different levels within the trough, and need scarcely be touched by the revolving balls to be reduced to dust and expelled with the blast. Owing to this arrangement and mode of operation, the crushing is effectively and thoroughly accomplished with considerable economy of power. By arranging the blast so that it will enter the pan centrally, or surrounding the lower part of the vertical shaft D, the material is prevented from collecting at the bottom of the pan-center to obstruct the rotation of the shaft and disks thereon; and, furthermore, the step-bearing of the vertical shaft is kept cool and free from dust.

What I claim as my invention is—

1. In a grinding-mill, the combination of the pan A provided with an annular series of discharge-openings, the annular trough L located within the pan and surrounded by said series of discharge-openings, the balls M located in said trough, a vertical rotary shaft having secured thereon a flanged and conoidal disk N provided with recesses to receive the said balls and with openings O for passage of material from the top of the disk into said trough, and a twyer P surrounding the lower part of said vertical shaft for the admission of a blast to carry off the ground material through the said discharge-openings, substantially as described.

2. In a grinding-mill, the combination of the pan A having in its bottom an annular series of discharge-openings, K, the annular trough L located within the circle formed by said discharge-openings, the balls M in said trough, the vertical rotary shaft D, the flanged and conoidal disk N secured to said shaft and provided with recesses to receive said balls and with openings O for passage of material from the top of the disk into said trough, a twyer P surrounding the lower part of the vertical shaft, and a deflecting-disk R on said shaft intermediate the twyer and the disk N and adapted to distribute air throughout the trough and between the balls therein, and mechanism for continuously feeding onto said disk N the material to be crushed, substantially as described.

3. In a grinding-mill, the combination of the pan A having an annular series of openings K for discharge of pulverized material, the annular trough L having balls M therein, the rotary vertical shaft D carrying the disk N provided with recesses for said balls and with openings O for discharge into the trough L of material to be crushed, the air-deflecting plate R secured to the shaft D, the twyer P surrounding the shaft below said deflecting-plate, the main driving-shaft E geared with the vertical disk-carrying shaft, and continuous-feed mechanism driven by speed-reducing gearing from said main shaft, substantially as described.

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

EMILE BAILLY.

Witnesses:
ATENY MÓËTZ,
C. VIALARD.