No. 841,728. PATENTED JAN. 22, 1907.

W. W. SLY.

CINDER MILL.

APPLICATION FILED MAR. 21, 1905.

3 SHEETS—SHEET 1.

Fig. 1.

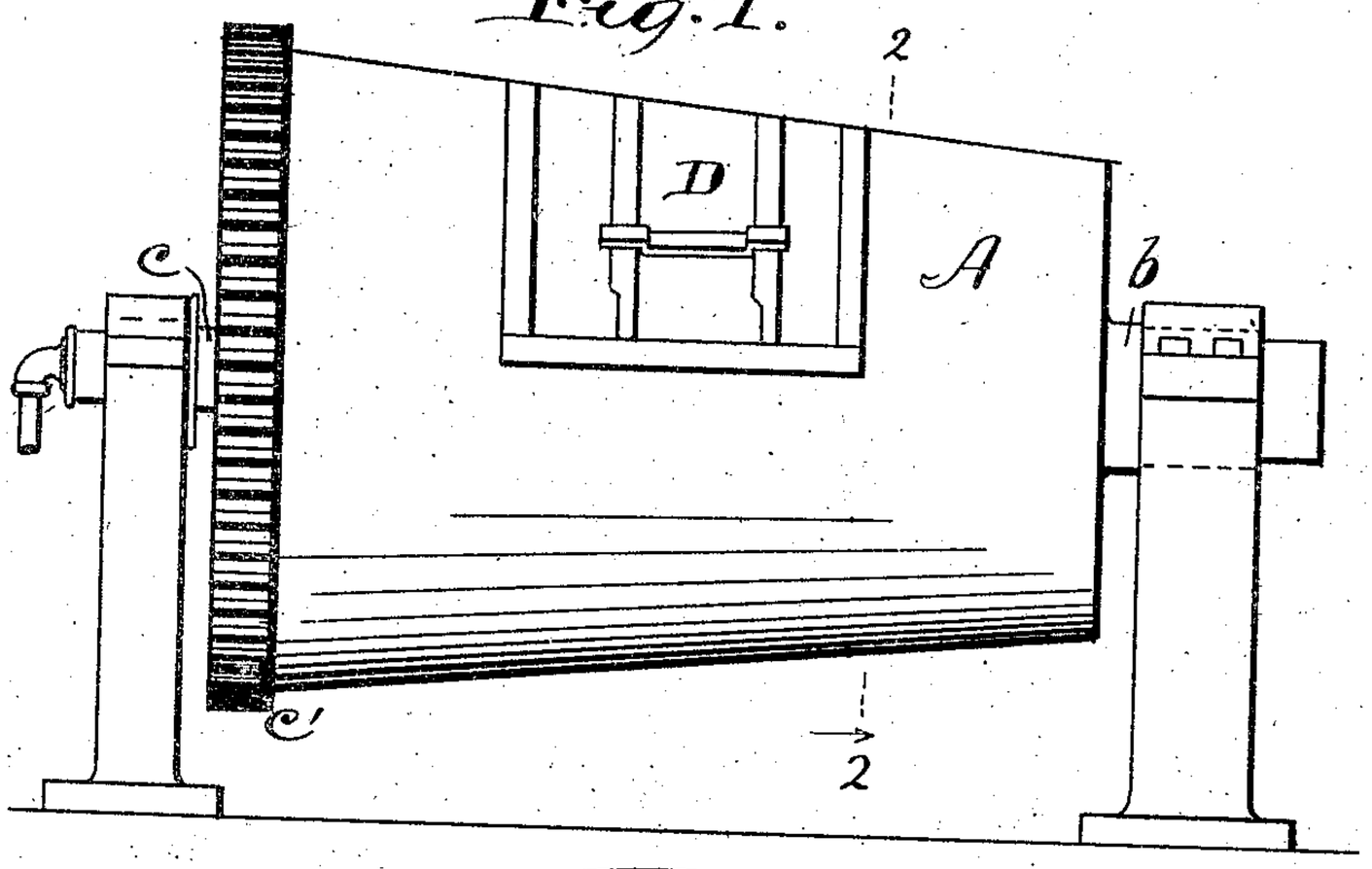


Fig. 2.

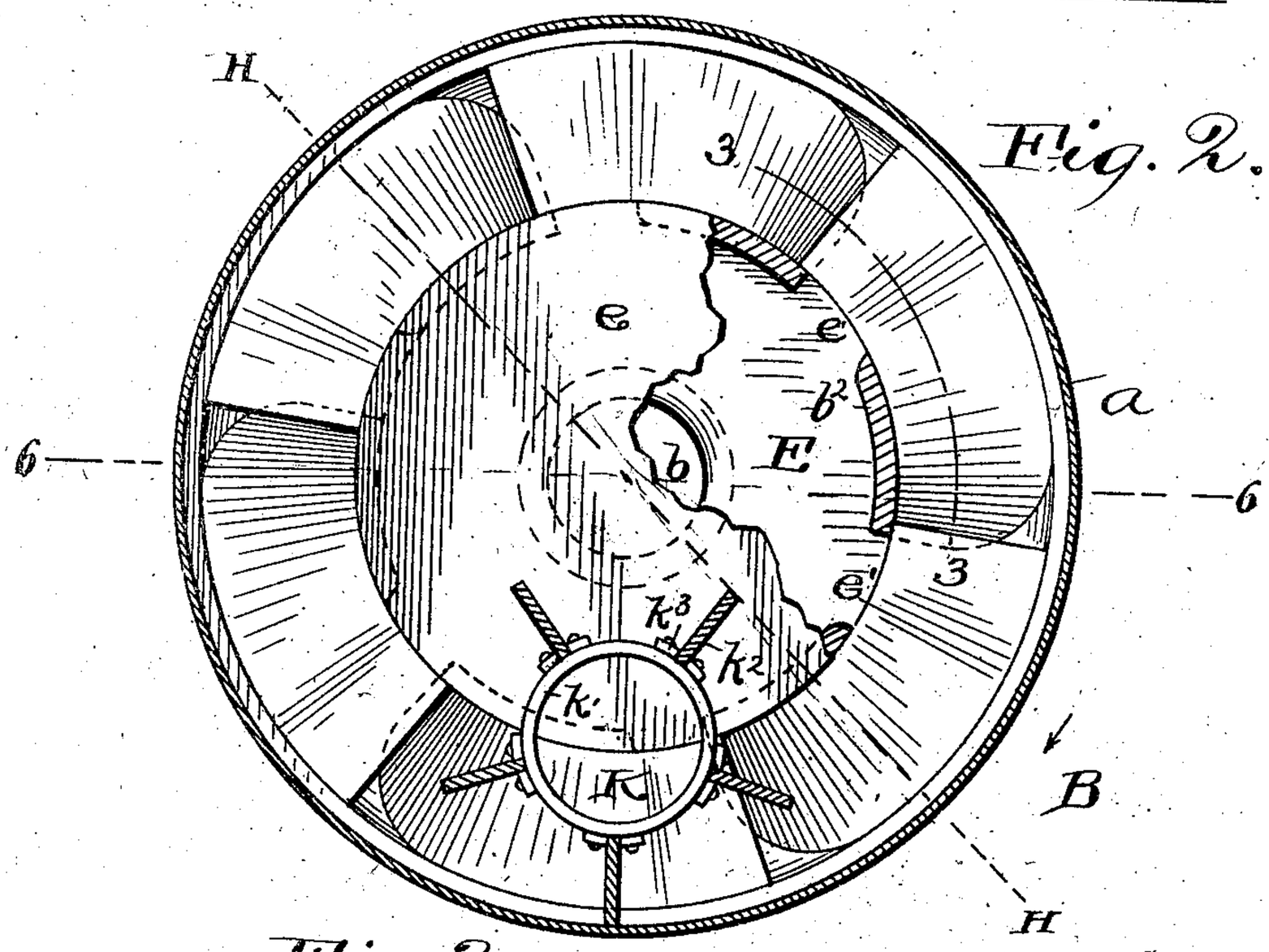
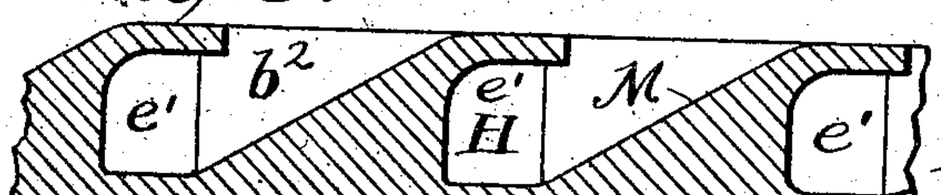


Fig. 3.



Witnesses.
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J. A. Rohr

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3 SHEETS—SHEET 2.

Fig. 4.

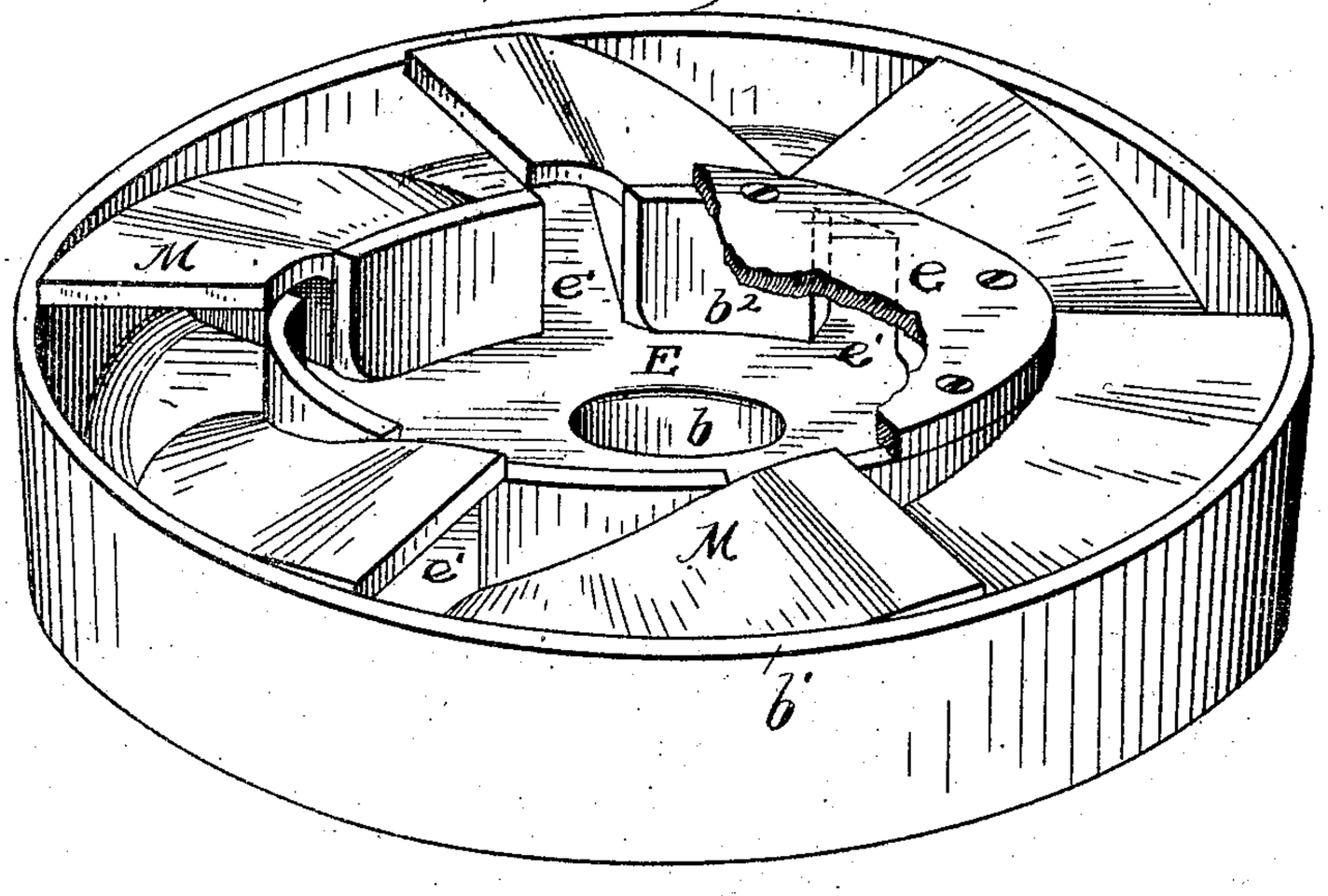
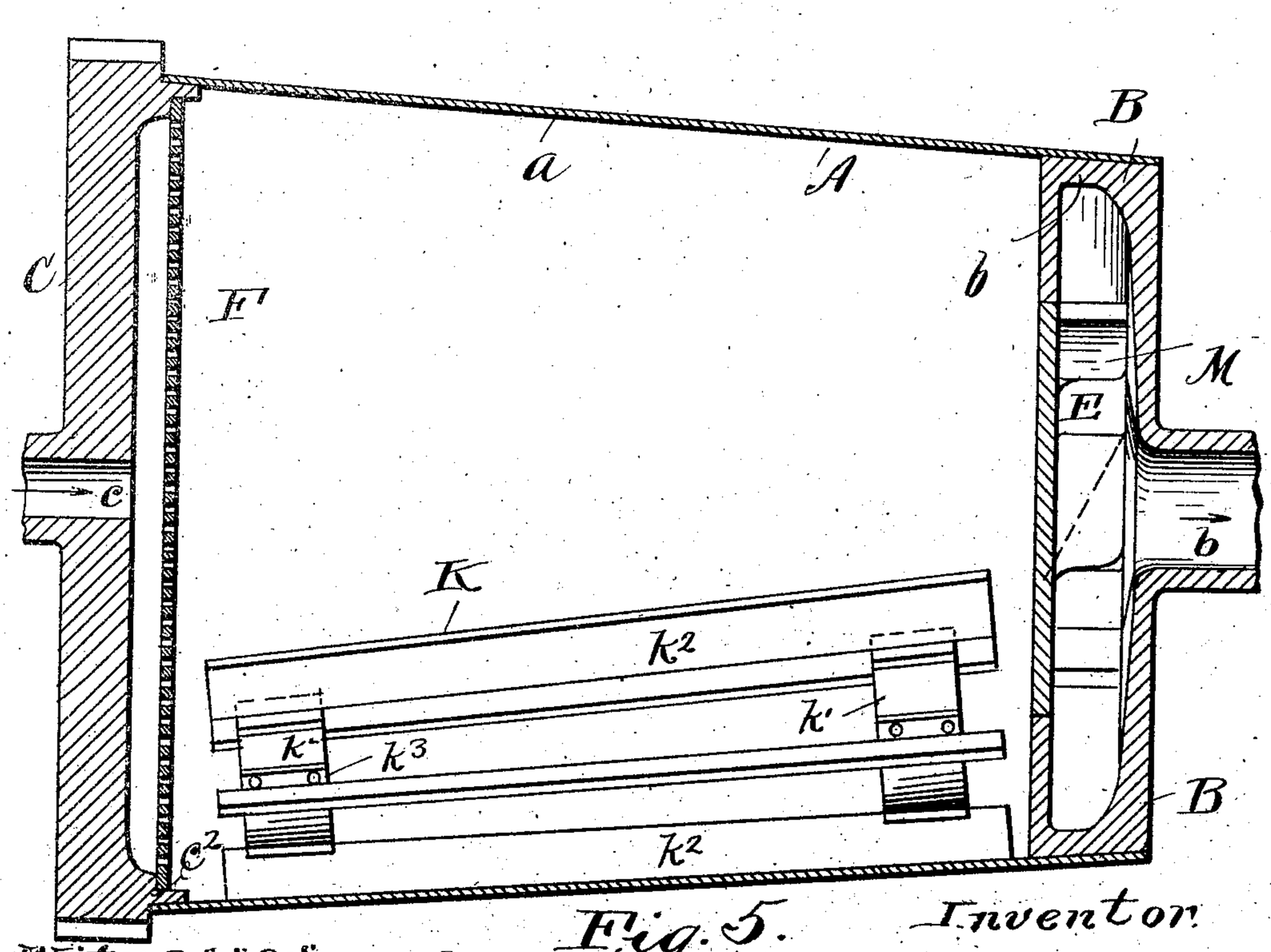


Fig. 5.



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3 SHEETS—SHEET 3.

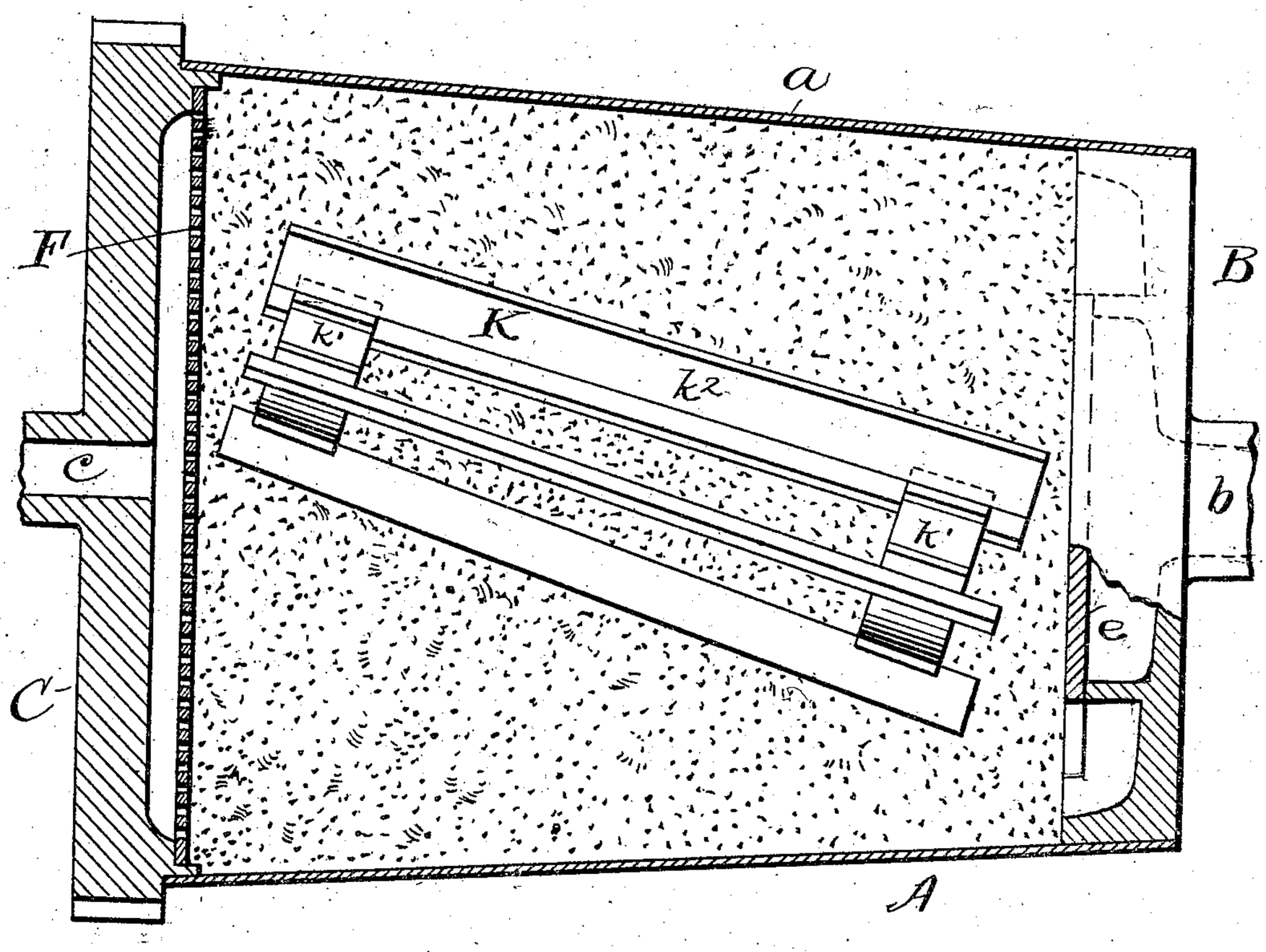

Fig. 6.

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UNITED STATES PATENT OFFICE.

WILLIAM W. SLY, OF CLEVELAND, OHIO, ASSIGNOR TO THE W. W. SLY MANUFACTURING COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

CINDER-MILL.

No. 841,728. Specification of Letters Patent. Patented Jan. 22, 1907.

Application filed March 21, 1905. Serial No. 251,248.

To all whom it may concern:

Be it known that I, WILLIAM W. SLY, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Cinder-Mills, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

This invention is intended especially for use in foundries for the purpose of economically crushing cinders and recovering the metal and coke contained therein.

The mill shown in the drawings embodying the invention is a development of and improvement upon the mill which is described and claimed in my prior patent, No. 514,097, the primary object of the invention being to increase the efficiency of the mill.

The invention consists in the construction and combination of parts shown in the drawings and hereinafter described and claimed.

In the drawings, Figure 1 is a side elevation of the mill. Fig. 2 is a vertical sectional view in the plane indicated by line 2 2 of Fig. 1 viewed in the direction of the arrow adjacent to said line. Fig. 3 is a development of a sectional view on the curved line 3 3 of Fig. 2. Fig. 4 is an enlarged perspective inside view of the discharge-head of the mill. Fig. 5 is a longitudinal vertical section of the mill when empty, and Fig. 6 is a longitudinal horizontal section of the mill containing material to be acted on.

Referring to the parts by letters, A represents a rotatable drum having the two ends or heads B and C. The two heads are respectively provided with two hollow trunnions *b* and *c*, upon which the drum rotates, said trunnions being mounted in suitable bearings. Water is pumped in through the trunnion *c*, and the light particles of the cinder crushed in the mill, as hereinafter explained, pass out through the trunnion *b*, the heavy uncrushed particles remaining in the mill. The structure is particularly designed to feed the material continually away from the exit and so that it shall not clog the outlet. This will be fully explained.

On the head C is preferably an external gear *c'*, by which the drum may be rotated. The two heads are preferably cast in the form shown, and the body portion, which may be made of sheet metal, is secured to them. The drum tapers slightly from end to end being smallest at the discharge end, whereby the body portion is attached to the head B. A perforated partition F is preferably secured to an annular flange c^2 on the inner face of the head C, the purpose of the partition being to prevent the material in the drum from working backward and out through the hollow trunnion *c*.

The head B has peripheral cylindrical flange *b'*, which fits within the body *a* and is secured thereto. There is also a concentric cylindrical flange b^2, projecting inward from the end plate of the head, the diameter of this flange being preferably somewhat more than half the diameter of the flange *b'*. A circular plate *e* is secured to the flange b^2, and this plate, together with said flange, constitutes a cylindrical chamber E, which communicates directly with the hollow trunnion *b*. In the annular space between the flanges b^2 and *b'* are a plurality of pockets H, and in the flange b^2 are a plurality of openings *e'*, each leading from one of said pockets into the cylindrical chamber E.

The only way in which anything in the drum can pass to the outlet in the trunnion *b* is through said pockets and openings *e'* into chamber E. These pockets are formed by blocks M, which project inward from the inner face of the end plate of the head B and extend from the flange *b'* to the flange b^2. Each of these blocks join said end plate near one edge of a hole *e'* and extends slightly past the next adjacent hole *e'*. Each block is undercut adjacent to the last-mentioned hole *e'*. The outer surface of each block—that is to say, the surface which faces the interior of the drum—is inclined at an angle of about thirty degrees, more or less, from the end plate of the head, and this facilitates the discharge into the drum of any large heavy pieces which may enter the pocket.

By reason of the described construction the pockets H are in open communication with the interior of the drum, and they also communicate with the chamber E through the holes *e'*.

Within the mill is a freely-movable crusher K. In the form shown it is composed of two

rings k k' and a plurality of long blades k^2, secured upon said rings and radiating therefrom. These blades are preferably flat metal bars having laterally-projecting feet k^3, which lie against and are bolted or riveted upon said rings. The crusher as an entirety is of greater diameter at one end than at the other. It is placed in the mill so that its greatest diameter is adjacent to that end of the mill which is of the smallest diameter—to wit, the end adjacent to the discharge-head B.

It will be understood that this mill is to be charged with the cinders to be treated through an opening which the cover-plate D will close. The drum being charged and the door being tightly closed, the drum is rotated in the direction indicated by the arrow in Fig. 2. A stream of water is pumped through the drum into the trunnion c and out through the trunnion b to maintain the water-level at about the axis of the drum.

As the drum rotates the crusher will be carried up with the cinders a short distance and will then drop backward and in so doing will crush some of the cinders. The cinders will be carried up by the mill, and the surface of the cinders will occupy substantially the position indicated by line H H, Fig. 2. This leaves an approximately triangular space below the water-level on one side of the mill and between the water-level and the top of the charge of cinders and extending from one head to the other. As the cinders are pulverized the water will take up the pulverized part thereof and will float it off, passing into the several pockets and through the openings e' into the cylindrical chamber E and thence out through the hollow trunnion b. Of course the metal will not be finely pulverized. More or less of it, however, will fall into the pockets referred to; but as the drum continues to revolve all such metal will fall by gravity out of these pockets back into the drum. This operation will go on until all of the cinders are pulverized and carried off, leaving only the metal in the drum.

The object of tapering the cylinder and locating the outlet in the smaller end is to cause the metal and heavier matter to gravitate away from the outlet, while the water suspends and carries with it the lighter matter toward the outlet. The crusher is tapered for a similar purpose. The larger end will travel faster than the smaller one. Therefore it will always be in advance, assuming a position somewhat diagonal to the axis of the cylinder, as shown in Fig. 6. The crusher being in the diagonal position, the trough-like spaces between the blades convey whatever is contained therein in a direction opposite to the outlet, while the water-current carries what it has in suspense toward and out through hollow trunnion. The coke being light enough to be carried by the water passes out as fast as it is liberated from the slag without being materially reduced in size. It is thereafter separated from the dirt and water by suitable means. (Not shown.)

Having described my invention, I claim—

1. In a cinder-mill, the combination of a rotatable drum which has an axial inlet-opening through one head C and an axial discharge-opening through the other head B, with a flange projecting into the drum from the head B around said discharge-opening, a plate fast to said flange and forming, with it and the head B, a chamber E, and means for forming a series of pockets in the annular space between said flange and the wall of the drum, which pockets communicate with the interior of the drum, the said flange having openings through it at the bottoms of said pockets.

2. In a cinder-mill, the combination of a rotatable drum, which is in the form of a truncated cone and which has an axial inlet-opening through the larger head C and an axial discharge-opening through the smaller head B, with a flange projecting into the cylinder from head B around said discharge-opening, a plate fast to said flange and forming, with it and the head, a chamber E, a plurality of blocks secured in the space between said flange and the wall of the drum in contact with head B and extending therefrom at an acute angle, thereby forming pockets which communicate with the interior drum, said flange having openings through it at the bottoms of said pockets, whereby communication is established between the bottoms of said pockets and chamber E.

3. In a cinder-mill, the combination of a rotatable drum, which is in the form of a truncated cone and which has an axial inlet-opening through the larger head C and an axial discharge-opening through the smaller head B, a flange projecting into the cylinder from head B around said discharge-opening, a plate fast to said flange and forming, with it and the head, a chamber E, a plurality of blocks secured in the annular space between said flange and the wall of the drum in contact with head B and extending therefrom at an acute angle, thereby forming pockets which communicate with the interior drum, said flange having openings through it at the bottoms of said pockets, whereby communication is established between the bottoms of said pockets and chamber E, with a crusher which is of gradually-increasing diameter from one end to the other and has a series of longitudinal outwardly-projecting blades, said crusher being placed loosely within the drum with its larger end adjacent to the smaller end of the drum.

4. In a cinder-mill, the combination of a

rotatable drum which is in the form of a truncated cone and which has an axial inlet-opening through the smaller head and an axial discharge-opening through the larger head, with a crusher which is of gradually-increasing diameter from one end to the other and has a plurality of longitudinal outwardly-projecting blades, said crusher being placed loosely in the drum with its larger end adjacent to the smaller end of the drum.

In testimony whereof I hereunto affix my signature in the presence of two witnesses.

WILLIAM W. SLY.

Witnesses:
ALBERT H. BATES,
C. E. NIXON.