

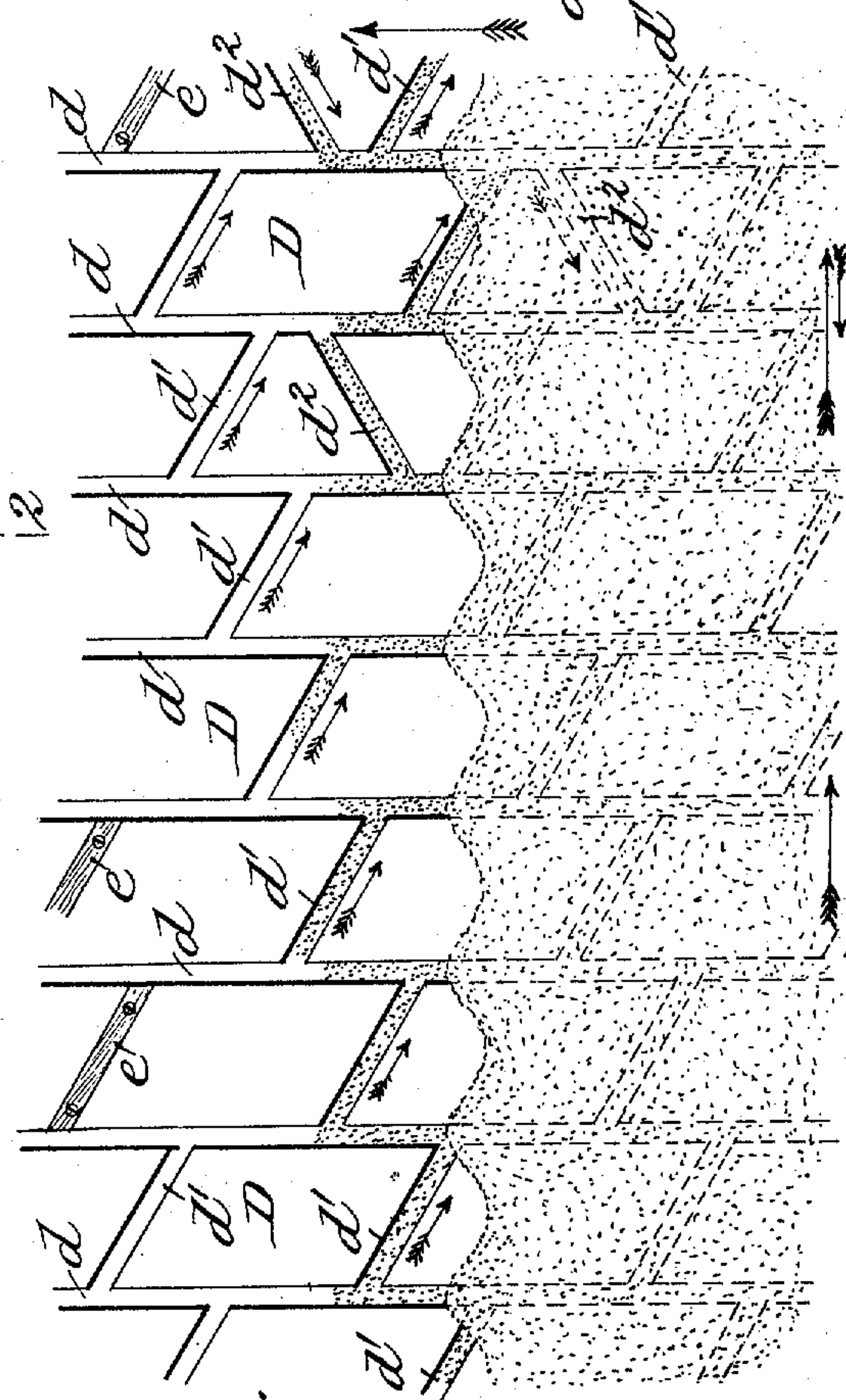
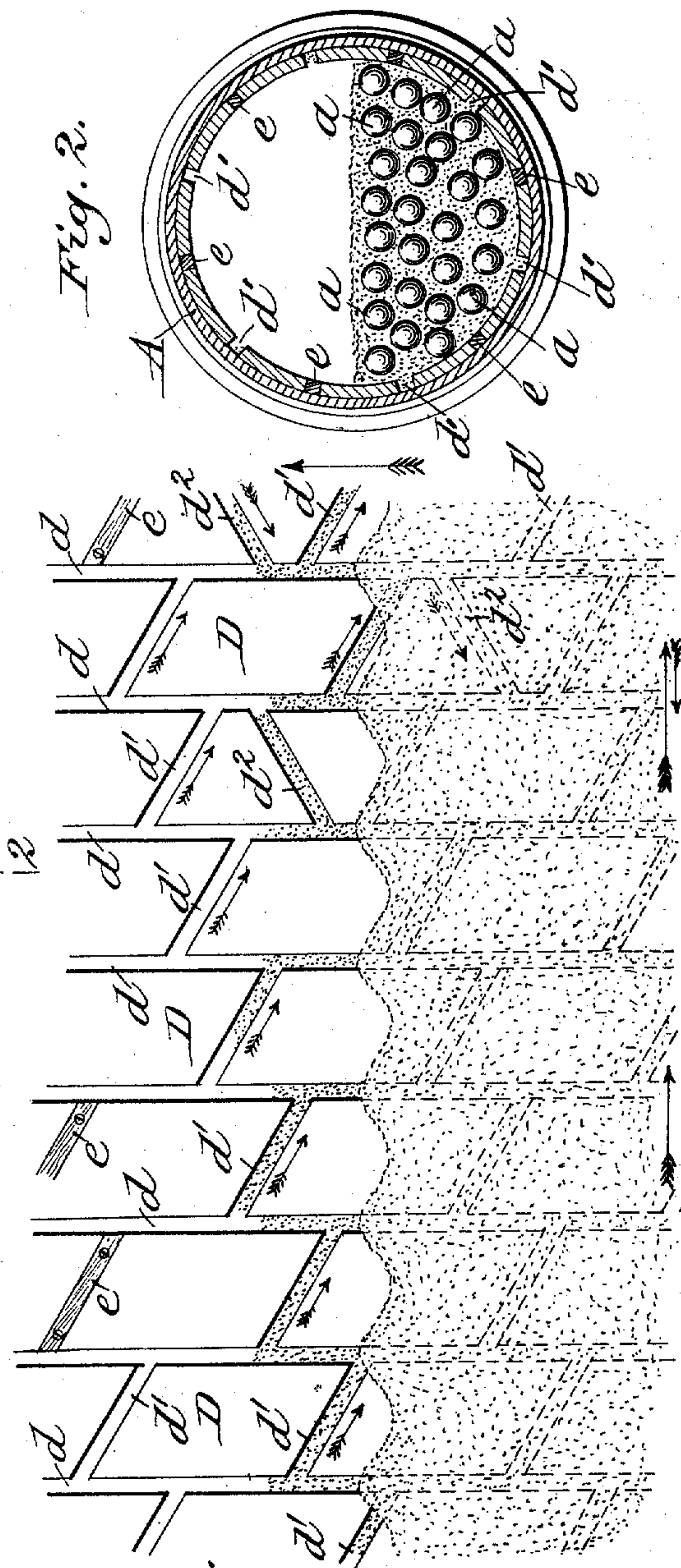
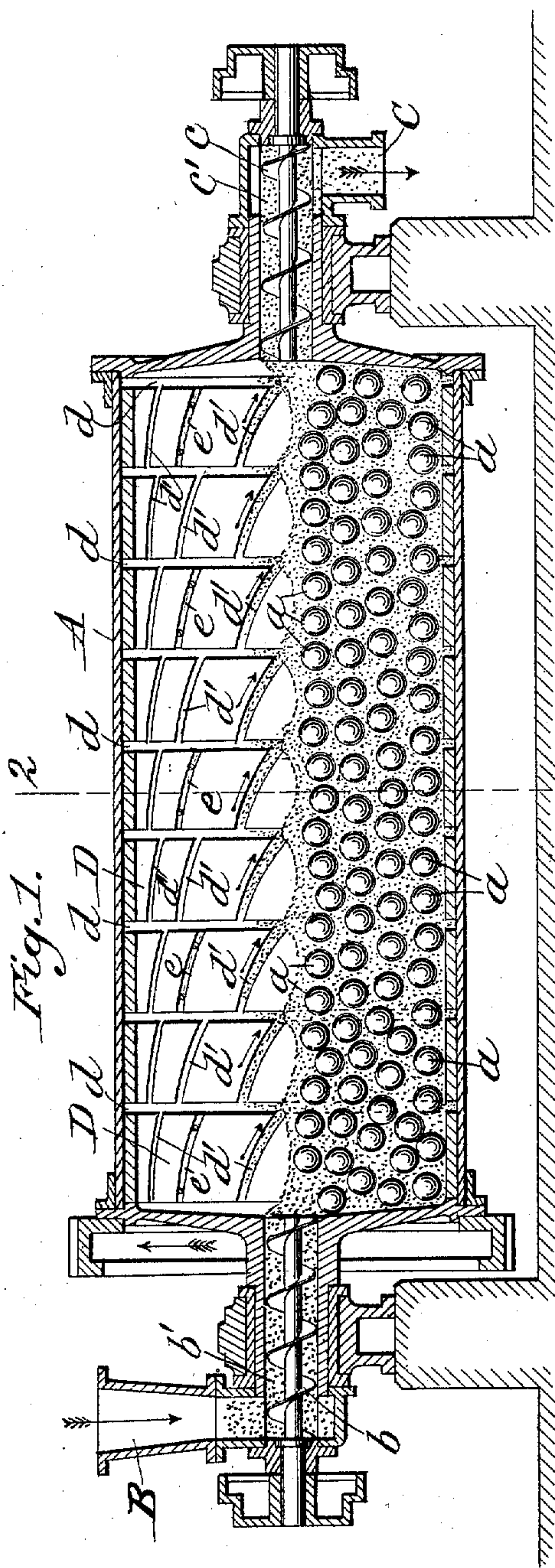
No. 688,018.

Patented Dec. 3, 1901.

F. HUNDESHAGEN.
BALL GRINDING MILL.

(Application filed Aug. 6, 1901.)

(No Model.)



WITNESSES:

J. H. Schott
Anton A. Doctner

INVENTOR
Eritz Hundeshagen
BY Max Georgie
Attorney

UNITED STATES PATENT OFFICE.

FRITZ HUNDESHAGEN, OF MULHEIM-ON-THE-RHINE, GERMANY.

BALL GRINDING-MILL.

SPECIFICATION forming part of Letters Patent No. 688,018, dated December 3, 1901.

Application filed August 6, 1901. Serial No. 71,033. (No model.)

To all whom it may concern:

Be it known that I, FRITZ HUNDESHAGEN, a citizen of Saxony-Weimar, residing at Mulheim-on-the-Rhine, Germany, have invented
5 certain new and useful Improvements in Ball Grinding-Mills; 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
10 to make and use the same.

The present invention relates to grist-mills wherein the material to be ground is comminuted by the action of a number of balls arranged within a drum, the said material
15 being subjected to the attrition between the balls and the walls of the drum.

The object of the present invention is to provide means whereby the material to be ground is gradually fed forward from the
20 supply end of the drum to the point of delivery and to make such feed regulatable and consistent with simplicity of construction. Such a feed of the material has hitherto been effected by inclining the axis of the
25 drum of the mill, and the velocity of the feed was governed by the difference of height between the two ends of the drum or, in other words, the incline of the same. Under the present invention the feed is effected and
30 regulated without resorting to any inclination of the drum; but the travel of the material is brought about by providing the interior of the periphery of the drum with suitable inclined grooves or gutters, said inclined grooves being arranged in zones, which
35 zones extend the length of the drum. Between each zone or inclined groove is preferably arranged an annular groove or trough. By this arrangement the material in process
40 of grinding is caused to fall out of the inclined or annular grooves, where the latter are employed, and as the walls of the drum rise above the level of the contents of said drums the material in each inclined groove
45 tends to slide forward to the delivery end of the drum, and so that a portion of the same will reach a position in the said drum, where it will subsequently be taken up by the
50 grooves in the next zone, and so on.

Other features of the invention will be set forth hereinafter.

In the accompanying drawings, Figure 1

represents a vertical longitudinal section of a ball grinding-mill embodying my invention; Fig. 2, a transverse section of the same; and
55 Fig. 3 a view of the inner periphery of the drum of said mill, developed or spread out into a plane.

By referring to the drawings it will be noted that the ball-mill embodying my invention comprises a drum A, horizontally
60 journaled, as shown, said drum being filled to the proper level with the grinding-balls *a*, the material to be ground being fed into the drum through the upper or feed end B and
65 delivered from the mill at the point of discharge C. At the feed and delivery end the said drum is provided with the helical conveyers *b* and *c* of the shown construction and arranged in the feed and delivery throats B
70 and C.

The parts thus far described are well known in the art; but my invention consists in the arrangement now to be described.

As seen by reference to the drawings, the
75 inner periphery of the drum A is divided into a series of zones D, which zones start at vertical annular grooves or troughs *d*. Between these annular grooves *d* are arranged the inclined grooves or channels *d'*, the number of inclined grooves or channels *d'* in each
80 zone being governed by the speed with which it is desired to feed forward the grist material. In order to adjust the amount of feed, it is preferred to provide a number of inclined
85 grooves *d'*, corresponding to the greatest amount of feed. When it is desired to reduce the speed, a number of these inclined grooves are closed up or obliterated by securing in them strips or plugs *e*, as shown in
90 Fig. 1, which strips may be held in place in any suitable manner. In order to retard the amount of feed, particularly at the delivery end of the drum, a number of grooves or channels *d''*, inclined oppositely to the inclined
95 grooves *d'*, may be arranged in the zones D, as shown in Fig. 3.

The mode of operation of a ball-mill constructed in accordance with the above is as follows: The portion of the material undergoing the grinding process occupies the grooves
100 *d*, *d'*, and *d''*, while these grooves are in their lowermost position. Shortly after the lower end of such grooves *d'* and *d''* emerges above

the level of the contents of the mill the material in the annular grooves d below such lower end drops back into the drum, whereupon the material in the inclined grooves d' and d^2 slides down the respective grooves into the vacant space thus created and forms heaps, where it is discharged from the respective grooves, as indicated in Figs. 1 and 2. Since the contents of the inclined grooves are derived from the material which is included within the respective zone to which said inclined grooves belong, between two annular grooves d and d , which bound such zone, and is continually deposited at the boundary-line of said zones, the propelled grist material consequently is caused to move forward by the width of a zone on an average, and for the grooves d' such movement is always toward the delivery end. Since this operation is continually repeated, the entire contents of the mill are gradually fed forward, while at the same time its comminution progresses and the parts are subjected to the most intimate commingling. As stated above, this feed may be somewhat retarded by the inclined grooves d^2 . A further regulation is effected by the removable bars or plugs e , described above. The fewer inclined grooves there are in action the less will be the yield of the mill per revolution. On the other hand, such a reduction of the grooves increases the duration of the grinding action for the same length of drum.

Grist-mills heretofore constructed have not been made adaptable for large or small con-

cerns. The principle underlying the present invention, however, enables me to provide a mill which can be adaptable for large or for small industries and put it into the power of the operator to regulate them in a simple and inexpensive manner with reference to the quantity and the fineness of the product.

What I claim, and desire to secure by Letters Patent of the United States, is—

1. In a ball-mill, a drum, provided on its interior periphery with a series of zones of inclined grooves or channels for feeding the grist material.

2. In a grist-mill, a drum, provided on its interior periphery with a series of annular grooves in combination with inclined grooves, arranged within and communicating with the annular grooves.

3. In a grist-mill, a drum, provided on its interior periphery with a series of inclined grooves in combination with removable blocks or bars, arranged to be secured in the said grooves.

4. In a ball-mill, a drum, provided on its interior periphery with inclined grooves for feeding the material forward, in combination with grooves inclined in an opposite direction, for retarding the feed.

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

FRITZ HUNDESHAGEN.

Witnesses:

CHARLES LE SIMPLE,
CARL SCHMITT.