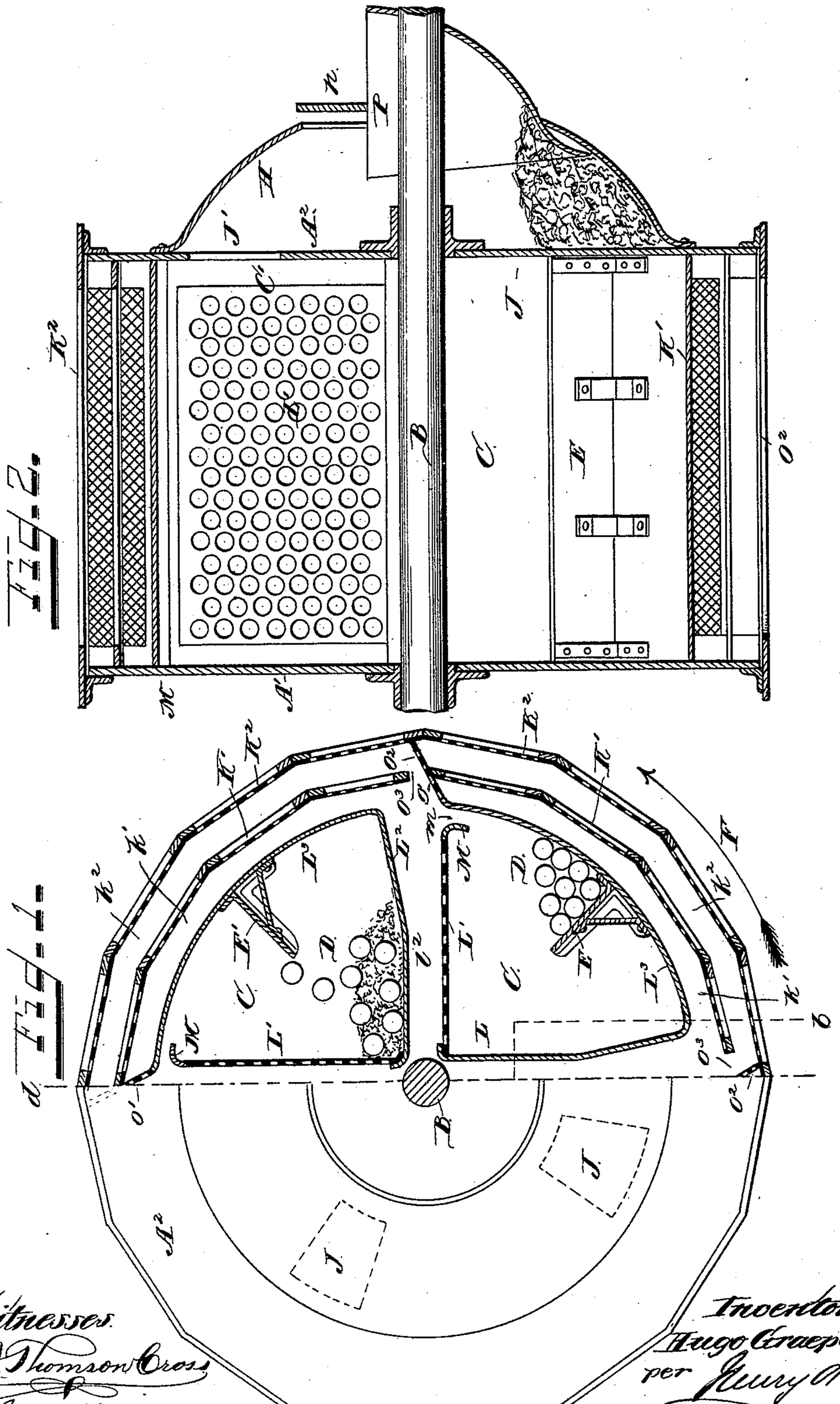
(No Model.) 2 Sheets—Sheet 1.

H. GRAEPEL.

GRINDING MILL.

No. 420,934. Patented Feb. 11, 1890.



Witnesses.
J. Thomson Cross
Geo. H. Dove.

Inventor.
Hugo Graepel.
per Henry A. Wise
Atty.

(No Model.)

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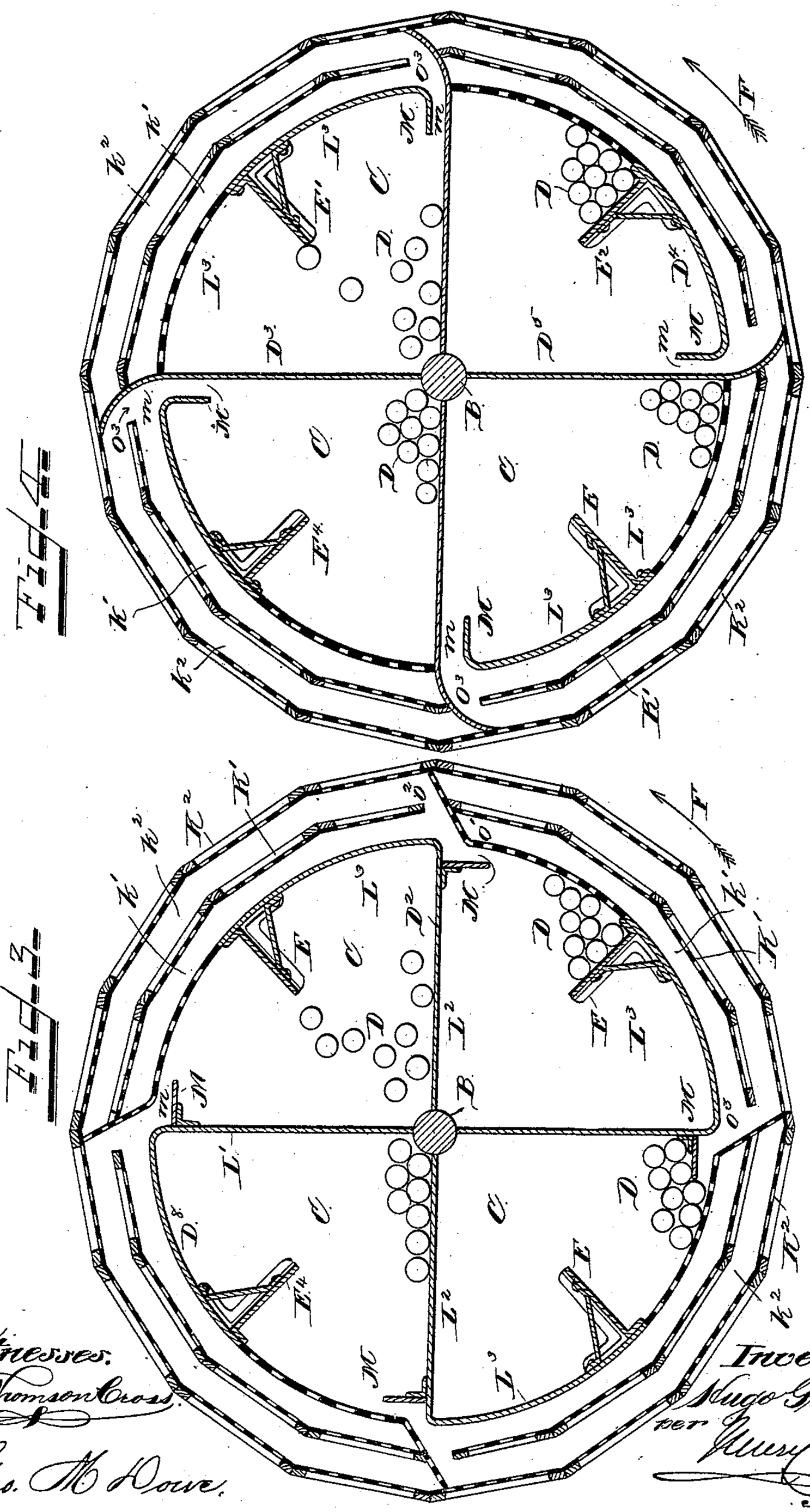

Witnesses:
J. Thomson Cross.
Geo. H. Dove.

Inventor:
Hugo Graepel.
per Henry Orth
Atty.

UNITED STATES PATENT OFFICE.

HUGO GRAEPEL, OF BUDA-PESTH, AUSTRIA-HUNGARY.

GRINDING-MILL.

SPECIFICATION forming part of Letters Patent No. 420,934, dated February 11, 1890.

Application filed November 15, 1888. Serial No. 290,952. (No model.) Patented in England January 10, 1888, No. 406, and in Austria-Hungary July 17, 1888, No. 21,794 and No. 5,836.

To all whom it may concern:

Be it known that I, HUGO GRAEPEL, a subject of the Queen of Great Britain, residing at Buda-Pesth, Austria-Hungary, have invented certain new and useful Improvements in Grinding-Mills, (for which I have obtained Letters Patent in Great Britain, January 10, 1888, No. 406, and in Austria-Hungary, July 17, 1888, Nos. 21,794 and 5,836;) 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 to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

Referring to the drawings, Figure 1 shows my improved ore-crusher by a half end elevation and a half vertical transverse section. Fig. 2 is a longitudinal section taken on interrupted line *d b* of Fig. 1. Figs. 3 and 4 are vertical transverse sections illustrating slight modifications in the construction of the crusher.

The invention relates to machines for comminuting solids or for reducing such into a more or less pulverulent form, and more especially to that class of revolving machines designed for the reduction or pulverization of ores, in which a rolling body is employed as a means of reduction or pulverization.

The invention has for its object to construct the machine so as to distribute the weight of the rolling crushers in such manner as to require a minimum driving-power, and also to increase the general efficiency of the machine.

To these ends the invention consists in structural features and combinations of parts, substantially as hereinafter fully described, and as set forth in the claims.

In the drawings, A' and A^2 indicate the opposite end plates of the crusher-drum whose peripheral wall is polygonal. The drum is divided longitudinally into a plurality of radial chambers C, and in the end plate A^2 are formed as many feed-apertures J as there are compartments or chambers, four such being shown in the drawings, said feed-apertures opening into a feed-chamber H, formed around the same and revolving with the drum around a stationary feed-hopper P, secured to a guard or feed plate *p*, as shown in Fig. 2. The chambers C are formed by an outer or peripheral wall L^3, the radial walls or partitions L' L^2, (the wall L' of which is perforated,) and the end walls A' A^2.

Between the outer shell K^2 of the drum and the peripheral walls L^3 of the chambers is arranged an intermediate shell K', having as many sides as the outer shell K and so arranged as to leave a passage between said intermediate shell K' and outer shell K^2, and between shell K' and the peripheral wall L^3 of the chambers C, said shells being formed of perforated material or woven-wire fabric, the perforations or meshes of the shell K' being larger than those of shell K^2, while the perforations of the radial walls L' are larger than the perforations or the meshes of said shell K'. The radial partitions are so arranged as to form a passage l^2 between them, one of said partitions—namely, the imperforate partition L^2—being so constructed as to gradually enlarge the passage in the direction of the periphery of the drum to the point where said passage merges into the peripheral passage k', while the radial perforated partition L' has its upper edge M bent inwardly to form a passage leading into the chamber.

In each compartment and secured to the peripheral wall L^3 thereof I prefer to arrange a radial ledge E, which, as the drum revolves in the direction of the arrow F, takes up the rolling crushers D and drops them again, so that said crushers are made to operate by impact as well as by their rolling or grinding action. Of course these ledges need not be constructed as shown in the drawings, nor need they be secured to the peripheral wall L^3 of the crushing-chamber, as they may be differently constructed and secured to the imperforate radial partition L^2, for example, and where a crushing action by impact is not desirable these ledges or shelves may be dispensed with.

As shown in Fig. 1, the material is fed automatically to the several chambers whenever their feed-openings are in or approximately in a vertical plane below the axis of rotation, and the feed of the material to the hopper P may be so regulated as to correspond with

the discharge of the reduced material, so as not to overcharge the chambers, the ore or other material being fed to the stationary feed-hopper P from a chute or in any other convenient manner.

The operation of the machine may be briefly described as follows, the rolling crushers shown being spheres of iron or steel, though other forms of metallic rolling bodies may be employed. The ore, being fed to the hopper P, passes thence to the chambers C consecutively, the spheres by their rolling action, as well as by impact, crushing and reducing or pulverizing the ore, the crushed ore passing through the perforations of the radial partition L′ into the radial passages l^2 as the drum rotates. From the radial passage l^2 the crushed material passes to the peripheral passage k', the finer material passing through the meshes of the peripheral shell K′ into the peripheral passage k^2, from which the material that is reduced to the desired degree of fineness passes out through the meshes of the outer shell K^2. The material too coarse to pass through the meshes of intermediate shell K′ and outer shell K^2 returns to the crushing-chambers, the alternate ends of said passages being closed by an inclined partition O′ O^2, Fig. 1, one end of the intermediate shell K′ of the alternate sections not extending quite to the partition, thus leaving a passage O^3 for the material to pass back into the chambers. The partition O′ O^2 has such an inclination as to perform the function of a chute or guide board or plate to direct the material into the slot or opening *m*, formed between the intermediate shell K′ and the bent end of the radial partition L′.

In practice I preferably employ a perforated directing or guide plate O′ O^2 for the passages k' k^2 with a view to retarding the return of the material from said passages to the chambers, thereby subjecting it for a longer period of time to the screening action of shells K′ K^2. Of course it will be understood that the passage *m* is not sufficiently large to allow any of the spheres to pass out from the chambers. The drum is mounted on a shaft B, on or with which it is or may be rotated by any well-known or desired means.

The construction of the machine may be somewhat modified without departing from the the spirit and nature of my invention. For instance, in Fig. 3 the passages k' k^2 are so arranged that the material therefrom passes into the next succeeding chamber, and in this construction that portion of the peripheral wall L^3 of the shell in front of the ledge E is perforated instead of one of the radial walls. This is also the case in the construction shown in Fig. 4, which construction differs from that shown in Figs. 1 to 3, in that the material is returned to the crushing-chamber, from which it has passed to the passages k' k^2, instead of returning to the next succeeding chamber or to any other of the chambers, as shown in Figs. 1 and 2. It is obvious, also, that the crusher need not necessarily be mounted on a shaft. The end plates may be provided with trunnions or journals, or said crusher may be caused to bear on friction-rollers and revolved thereby.

Having described my invention, what I claim is—

1. In a grinding-mill, a drum divided into a plurality of non-communicating chambers, loose rolling crushers contained in said chambers, a screen encompassing all of the chambers, an independent passage between each chamber and the screen, the initial opening of said passage being of such dimensions as to prevent the crushers passing therethrough, substantially as and for the purpose specified.

2. In a grinding-machine, a drum divided into a plurality of non-communicating chambers, loose rolling crushers contained in said chambers, a screen encompassing all the chambers divided by a foraminous partition into a corresponding number of sections, and an independent passage connecting each chamber with its screen-section, the initial opening of said passage being of such dimensions as to prevent the loose crushers passing therethrough, substantially as and for the purposes specified.

3. In a grinding-mill, a drum divided into a plurality of chambers, loose rolling crushers contained therein, a screen encompassing all the chambers, and a passage extending around two sides of the chambers and in communication therewith and with the screen, the outlet from the chambers to the passages being of such dimensions as to prevent the crushers passing therethrough, substantially as and for the purposes specified.

4. In a grinding-mill, a drum divided into a plurality of non-communicating chambers, loose rolling crushers contained therein, a screen encompassing all the chambers and divided by a foraminous partition into a corresponding number of sections, and intercommunicating passages extending around two sides of the chambers and communicating therewith and with the screen-sections, the outlet from the chambers to the passages being of such dimensions as to prevent the rolling crushers passing therethrough, substantially as and for the purposes specified.

5. In a grinding-mill, a drum divided into a plurality of chambers, one of whose radial walls is wholly or partly perforated, loose rolling crushers contained within the chambers, a screen encompassing the same, and intercommunicating passages extending around two sides of said chambers and communicating with the screen and with the chambers through the perforate partitions and through an independent passage, said passage being sufficiently contracted to prevent the crushers passing therethrough, substantially as and for the purposes specified.

6. In a grinding-mill, a drum divided into

a plurality of chambers, loose rolling crushers contained therein, a screen encompassing all the chambers and divided by a foraminous partition into a corresponding number of sections, intercommunicating passages extending around two sides of the chambers and communicating therewith and with all of the screen-sections, substantially as and for the purpose specified.

7. In a grinding-mill, a drum divided into a plurality of non-communicating chambers, loose rolling crushers contained therein, superposed screens of varying mesh encompassing all the chambers, and a passage for each of said chambers communicating with both screens, the initial opening of said passage being of such dimensions as to prevent the crushers passing therethrough, substantially as and for the purposes specified.

8. In a grinding-mill, a drum divided into a plurality of chambers, loose rolling crushers contained therein, superposed screens of varying mesh encompassing all the chambers, a passage between each two chambers in communication therewith and with the screens, said passage increasing in width toward its outer end and being sufficiently contracted at its point of communication with the respective chambers to prevent the crushers passing therethrough, substantially as and for the purposes specified.

9. In a grinding-mill, a drum divided into a plurality of non-communicating chambers, loose rolling crushers contained therein, superposed screens encompassing all the chambers and divided by a foraminous partition into a number of sections, and intercommunicating passages connecting the chambers with the screen-sections, substantially as and for the purpose specified.

10. A crushing-machine consisting of a revoluble drum composed of concentric screens varying in the size of their meshes, a series of radial chambers formed by perforate and imperforate partitions encompassed by said screens, loose rolling crushers contained in said chambers, and ducts between the concentric screens and peripheral walls of the chambers for conducting the material passing through the perforate walls of the latter to the inner screens and returning the material too coarse to pass through either screen back into the crushing-chambers, substantially as and for the purpose specified.

11. The combination, with a revoluble drum divided into a plurality of radial crushing-chambers and rolling crushing bodies contained in said chambers, of a radial board for each chamber secured to the peripheral wall thereof and projecting toward the axis of rotation of the drum, substantially as and for the purpose specified.

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

HUGO GRAEPEL.

Witnesses:
MAURICE BLACK,
ALICE EDITH PRATT.