No. 646,484. Patented Apr. 3, 1900.

J. F. WISWELL & F. B. SMITH.

GRINDER FOR CRUSHED ORES, &c.

(Application filed May 4, 1899.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1a

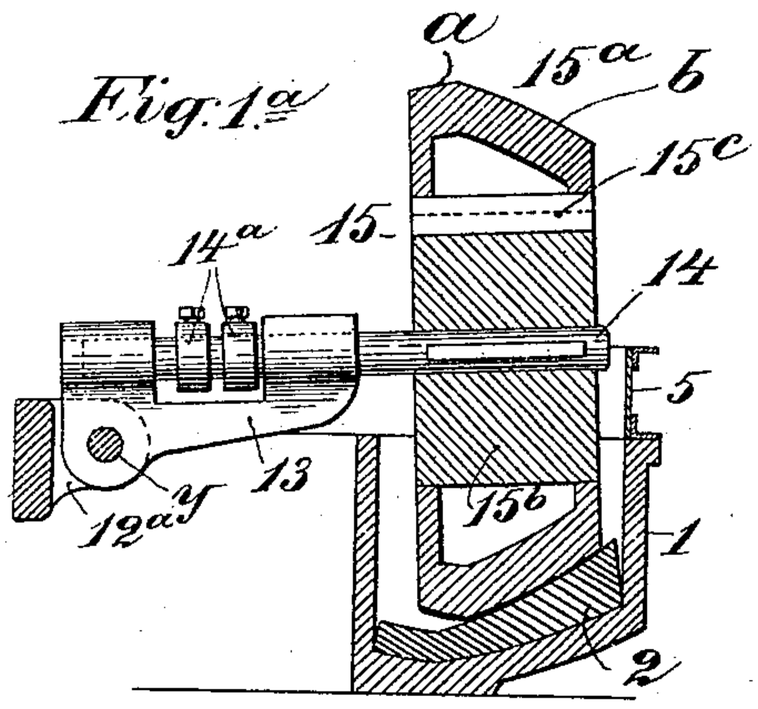

Fig. 1.

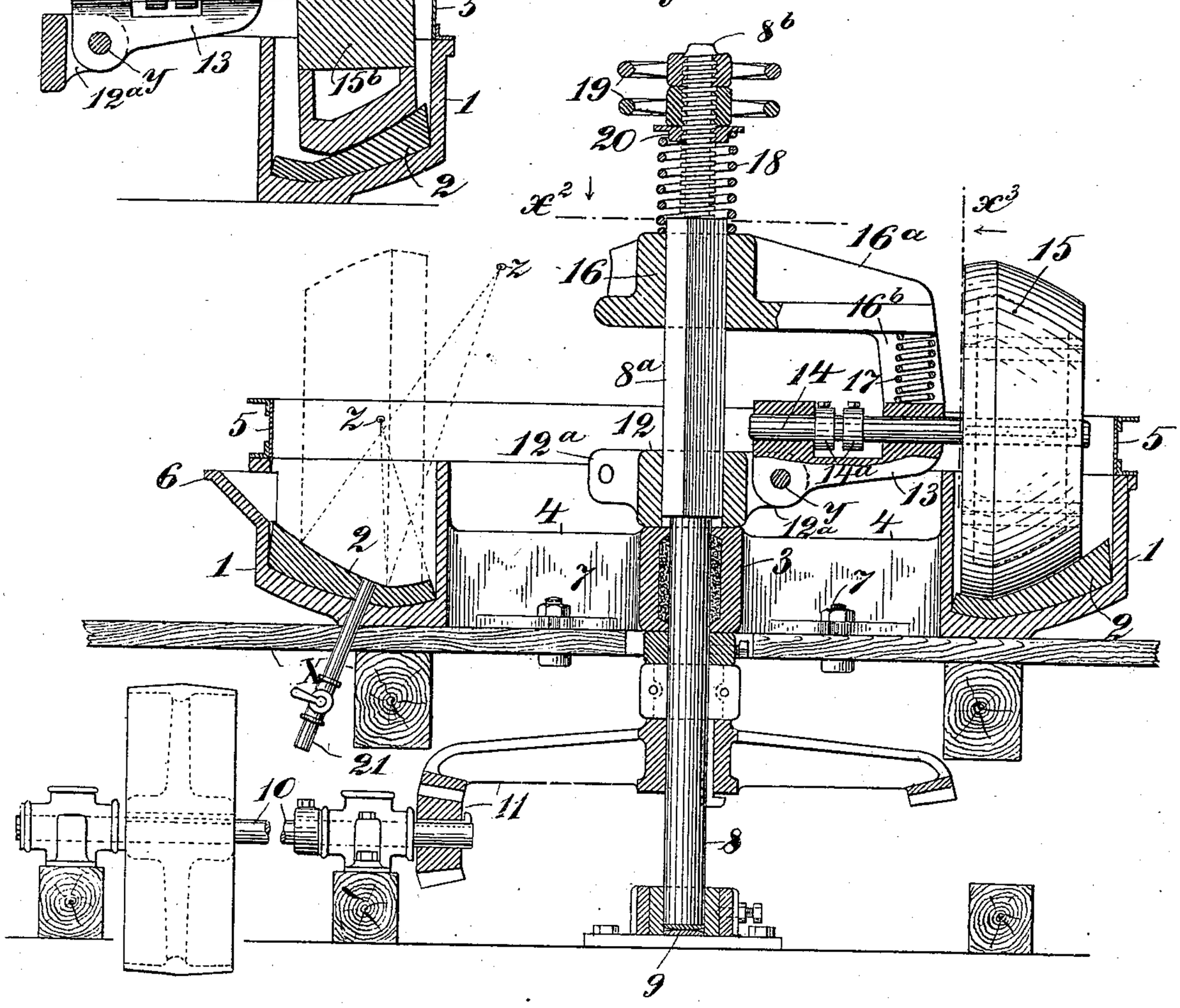

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Fig. 4.

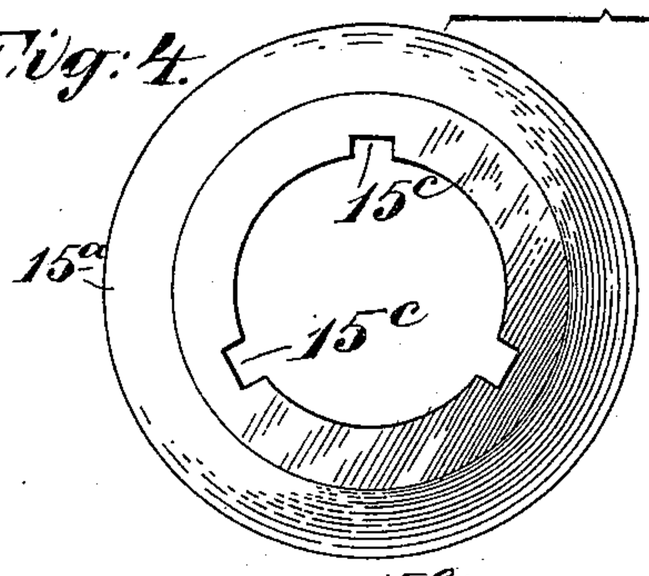


Fig. 3.

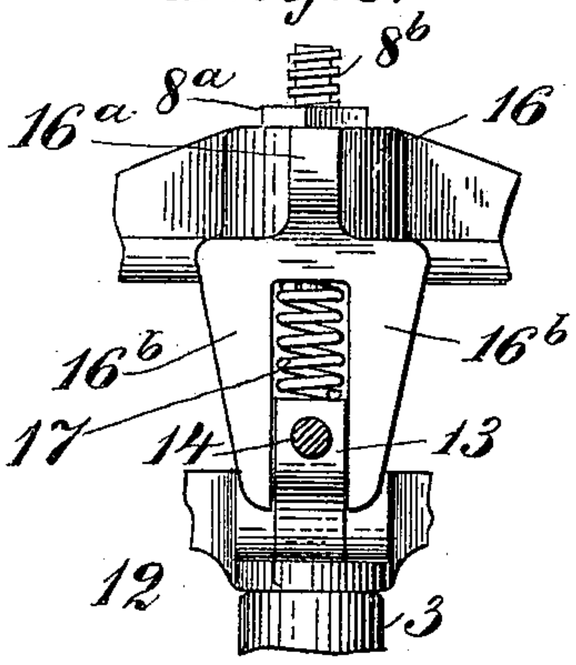


Fig. 5.

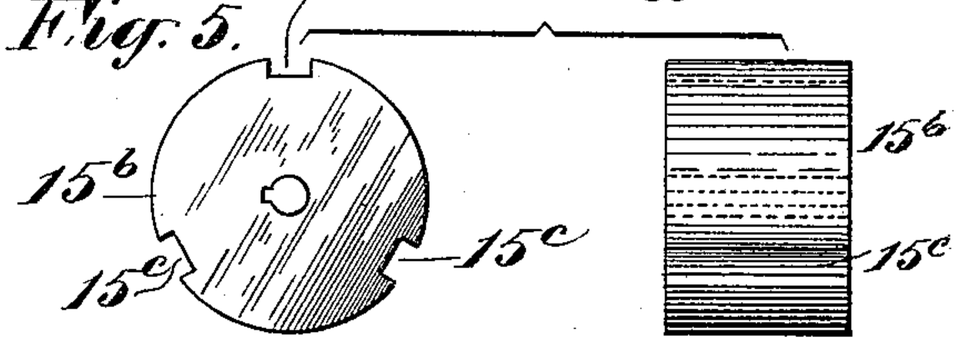
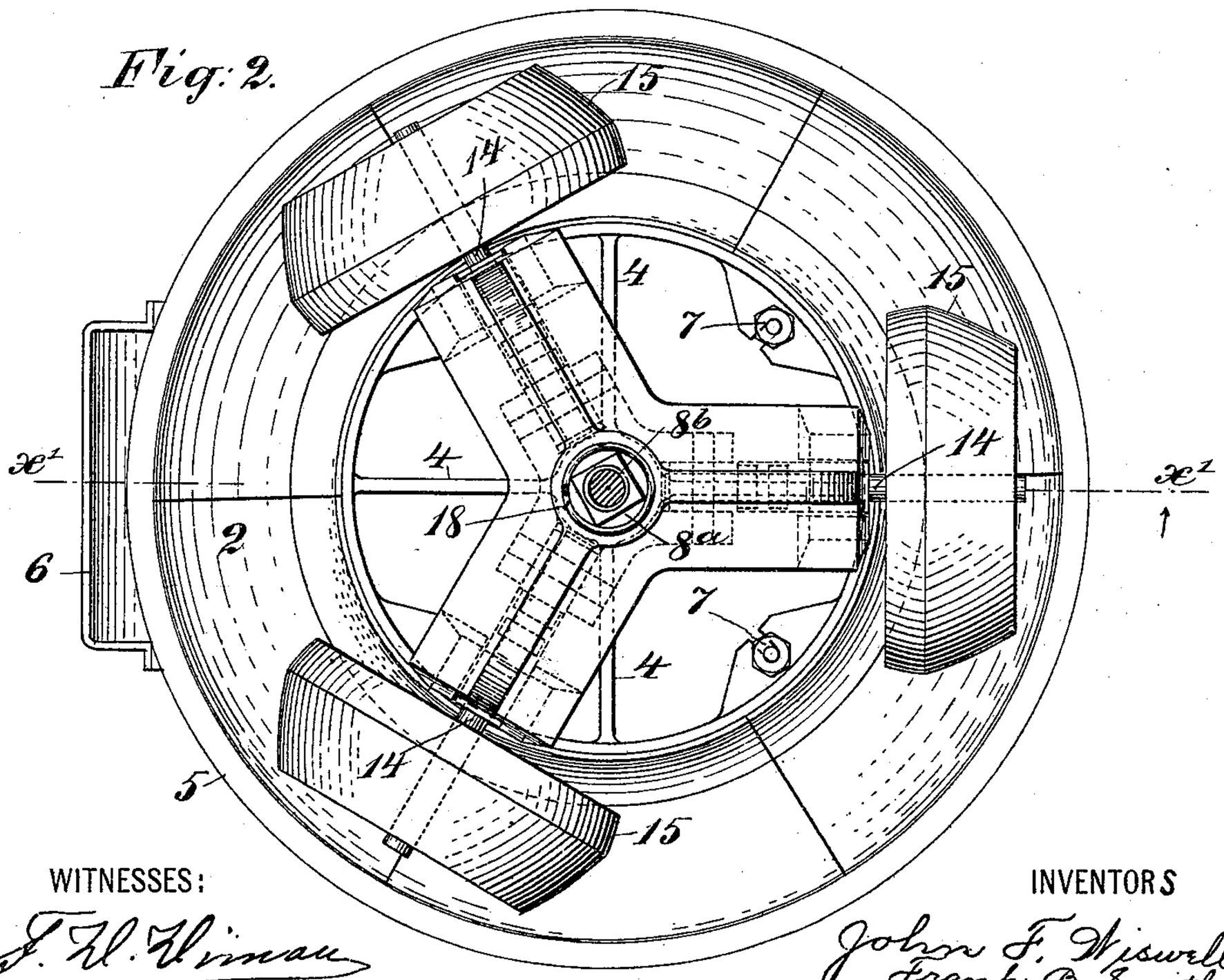


Fig. 2.



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UNITED STATES PATENT OFFICE.

JOHN F. WISWELL AND FRANK B. SMITH, OF NEW YORK, N. Y., ASSIGNORS OF SEVEN-SIXTEENTHS TO ROBERT H. LAIRD, OF SAME PLACE.

GRINDER FOR CRUSHED ORES, &c.

SPECIFICATION forming part of Letters Patent No. 646,484, dated April 3, 1900.

Application filed May 4, 1899. Serial No. 715,512. (No model.)

To all whom it may concern:

Be it known that we, JOHN F. WISWELL and FRANK B. SMITH, citizens of the United States, residing at New York, in the borough of Manhattan, county and State of New York, have invented certain new and useful Improvements in Grinders for Crushed Ores and the Like, of which the following is a specification.

This invention relates to the class of roller-grinders used for preparing crushed ores, metal-bearing sand, and the like for the amalgamating process; and the object of the invention is to obtain lightness, durability, portability, and effectiveness in a greater degree than is ordinarily found in this class of apparatuses.

The apparatus will be hereinafter described with reference to the accompanying drawings and its novel features carefully defined in the claims.

In the said drawings, which illustrate an embodiment of the invention, Figure 1 is a vertical axial section of the apparatus on line x' in Fig. 2, and Fig. 1^a is an illustrative view showing the form of the grinding-roll. Fig. 2 is a sectional plan on line x^2 in Fig. 1. Fig. 3 is a fragmentary sectional detail, the plane of the section being indicated by the line x^3 in Fig. 1. Fig. 4 includes a face view and a diametrical section of the removable rim of one of the grinding-rolls of the apparatus, and Fig. 5 includes an end view and a side view of the boss of the roll.

1 represents a circular trough, preferably of cast metal, provided with removable bottom plates 2; a central bearing-boss 3, connected by arms 4 to the trough; a sheet-metal rim 5, and an overflow-lip 6. This trough is adapted to be secured by bolts 7 to a frame or platform X. An upright driving-shaft 8 has a lower step-bearing at 9 and an upper bearing in the boss 3. This shaft is or may be driven from a horizontal shaft 10 through the medium of bevel-gears 11. The shaft 8 has a square portion 8^a above the bearing-boss 3 and above this square portion a screw-threaded portion 8^b. On the square 8^a is loosely mounted a center or hub 12, capable of sliding up and down on the square shaft and provided with pairs of hinging-lugs 12^a, and in each pair of such lugs is hinged at y a bearing piece or block 13, having in it two bearings for the radially-arranged roll-shaft 14, on which is mounted the crushing-roll 15, adapted to roll about the annular trough 1 when the shaft 8 is rotated. It may be stated here that three of these rolls 15 are shown in the apparatus illustrated, Fig. 2; but the number employed is not important so far as the present invention is concerned. In Fig. 1 only one roll is represented in full lines, as the other roll beyond would appear in oblique projection. The position of the roll at the opposite side of the trough is indicated in dotted lines in Fig. 1.

The construction of the roll 15 is illustrated in Figs. 4 and 5. The outer shell or rim 15^a of the roll is cast hollow and is formed and apertured to receive a central core or boss 15^b, which is in the form of a solid cylinder adapted to be keyed to the shaft 14. The shell 15^a is passed over the boss 15^b and secured removably but rigidly thereto by suitable keys, which occupy keyways 15^c in the respective parts.

The rolls are relatively light in weight and are pressed down elastically by means that will now be described.

On the square 8^a of the upright shaft is loosely mounted a spider comprising a boss 16, with as many arms 16^a as there are rolls 15, each of said arms being situated directly over a bearing-block 13 and having two depending guide-cheeks 16^b, which embrace said bearing-block. Between the arm 16^a and the outer end of the bearing-block is placed a spring 17. On the boss 16 and embracing the upper part of the shaft 8 is a strong spiral spring 18, and screwed onto the screw-threaded upper end 8^b of the upright shaft are nuts 19, the lower one of which bears on a washer 20, interposed between it and the upper end of the spring 18, and the upper one serves as a lock-nut.

The object of the spring 18 is to press the light rolls 15 down into or onto the material to be ground in the trough 1 with a strong but yielding pressure, which may be varied at will by the nuts 19, which regulate the tension of the spring 18.

The shaft 13, on which the roll 15 is secured, is capable of some endwise movement in its

bearings, this movement being limited by a stop collar or collars 14^a on said shaft between the bearings therefor in the hinged block 13.

The operation of the apparatus is as follows: The shaft 8 being set in motion, the rolls 15 are caused to roll about the annular trough 1. Water and solid material to be ground or pulped are fed into the trough and are ground or pulverized by the rolls. The spring 18 presses the entire roller system down with elastic pressure; but the ability of the hub 12 to move up and down on the square portion of the shaft permits the rolls and their shafts to rise without disturbing the horizontal position of the roll-shaft 14 and to thus adapt themselves by rising to the charge of material in the trough at any time. The hinging of the block 13 allows the conical roll 15 to move outward and upward over the inclined surface of the bottom plates 2, so that the shaft 14 is inclined, and this hinging, together with the auxiliary spring 17, permits the rolls to pass over irregularities in the material in the trough or bed.

Fig. 1^a illustrates the peculiar form of the periphery of the roll. The two faces *a* and *b* of the roll are coned and convex, one of the faces having a slightly-different degree of incline and convex curvatures, the inner one *a* being much narrower than the outer one *b*. The wearing-plates 2 in the trough are shaped to fit the coned faces on the roll, as clearly shown in Fig. 1. By giving the faces of the roll this form the entire breadth of the coned face *b* is kept in bearing when the roll moves outward under the influence of centrifugal action, as illustrated in Fig. 1^a. The centers from which the curved faces *a* and *b* are drawn are seen at *z* at the left in Fig. 1.

The wearing or bottom plates 2 are in segments and are simply placed in the bottom of the annular trough, but not secured by bolts or other fastenings. By this means the bottom of the trough is kept intact and leakage prevented. The only aperture in the bottom of the trough is that for the passage of a drainage-tube 21, Fig. 1, fixed to one of the plates 2 and fitting snugly in the aperture in the trough. This tube serves as well to prevent the bottom plates 2 from shifting in the trough as they fit together snugly end to end.

It will be noted that the leading general feature of novelty in our grinding apparatus is the employment of the main central spring for pressing down the entire system of rolls and the auxiliary individual springs for the several rolls used in connection with hinged arms carrying the rolls.

While especially adapted and designed for use in preparing metal-bearing materials for the separate operation of amalgamation, our apparatus is also well adapted for pulverizing other materials, such as feldspar, for example.

Having thus described our invention, we claim—

1. In an apparatus for the purpose specified, the combination with a circular trough or bed, an upright, a rotating shaft concentric therewith, a hinged bearing-block carried by said shaft and movable up and down on the shaft as well as about its hinge, a spring bearing on the outer end of said block to depress it, a radial shaft mounted in said block and free to slide endwise therein, limiting-collars on said shaft, and a grinding-roll secured on said shaft, the face of said roll having two convex conical faces of unequal width, and the trough having a bottom with a contour which matches the faces on the roll.

2. In an apparatus for the purpose specified, the combination with the trough or bed, the upright driving-shaft, having a square portion, the boss 12 slidable on said square portion, the bearing-block 13, hinged to said boss, the radial, roll-shaft 14, mounted rotatably and slidably endwise in said block, the roll 15, fixed on said shaft and adapted to roll in the trough, the spider mounted slidably on the upright shaft and having springs between its arms and the blocks 13, and a centrally-arranged spring bearing on and pressing said spider downward.

3. In an apparatus for the purpose specified, the combination with the trough or bed, the upright driving-shaft, 8, and the grinding-rolls, of the boss 12 on the shaft 8, the bearing-blocks 13 hinged thereto, the longitudinally-slidable, radial roll-shafts 14, mounted in the bearing-blocks 13, the spider, having a boss 16, arms 16^a, and pairs of pendent cheeks 16^b embracing the respective blocks 13, said spider being slidable on but rotative with the shaft 8, the springs 17, between the arms 16^a and the respective bearing-blocks, the spring 18, on the upper end of the shaft 8 and pressing on the boss 16, and nuts on the upper end of the shaft 8 for regulating the tension of the spring 18.

In witness whereof we have hereunto signed our names, this 1st day of May, 1899, in the presence of two subscribing witnesses.

JOHN F. WISWELL.
FRANK B. SMITH.

Witnesses:
HENRY CONNETT,
PETER A. ROSS.