(No Model.) 2 Sheets—Sheet 1.

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GYRATING CRUSHER.

No. 525,443. Patented Sept. 4, 1894.

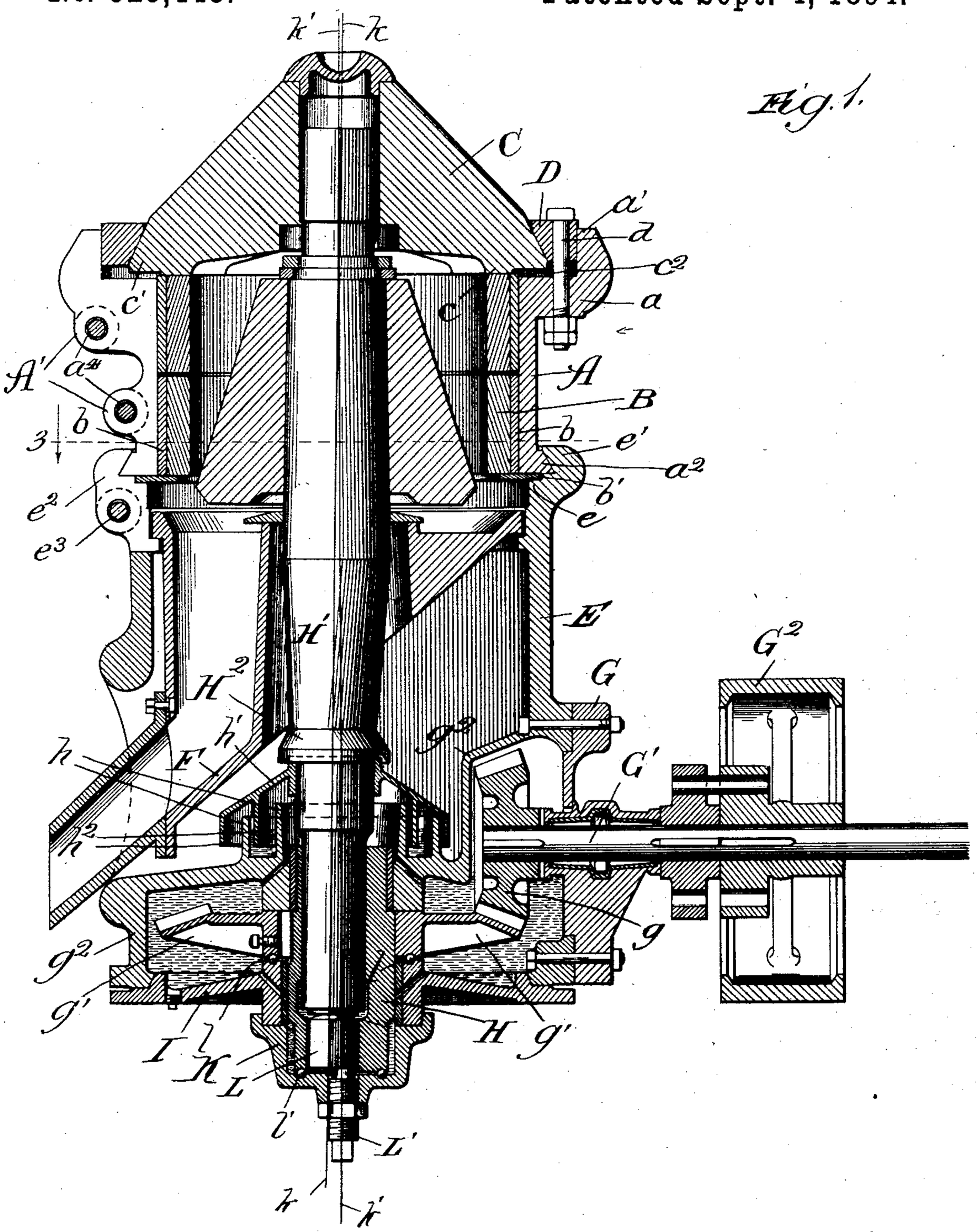

Fig. 1.

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Fig. 2.

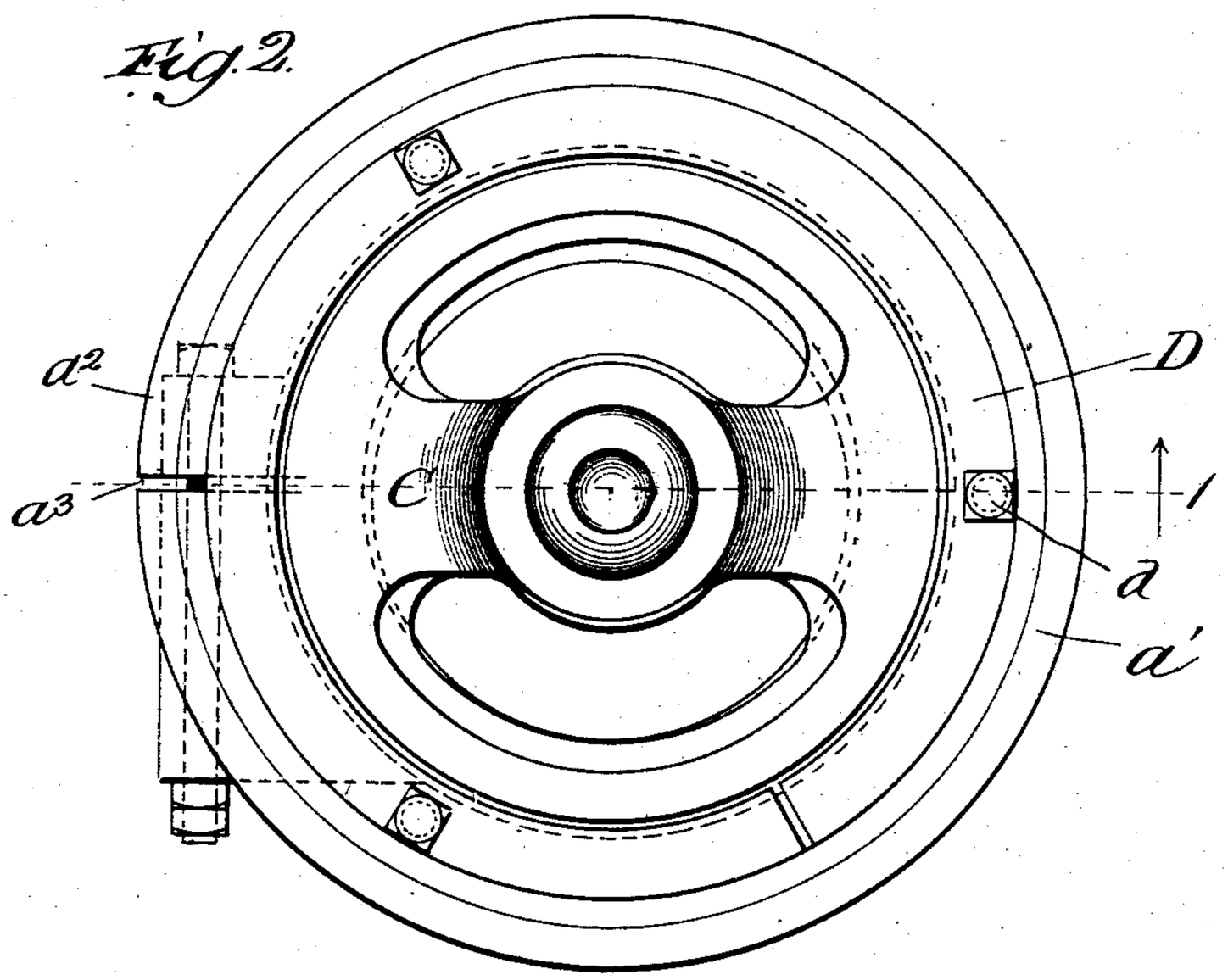
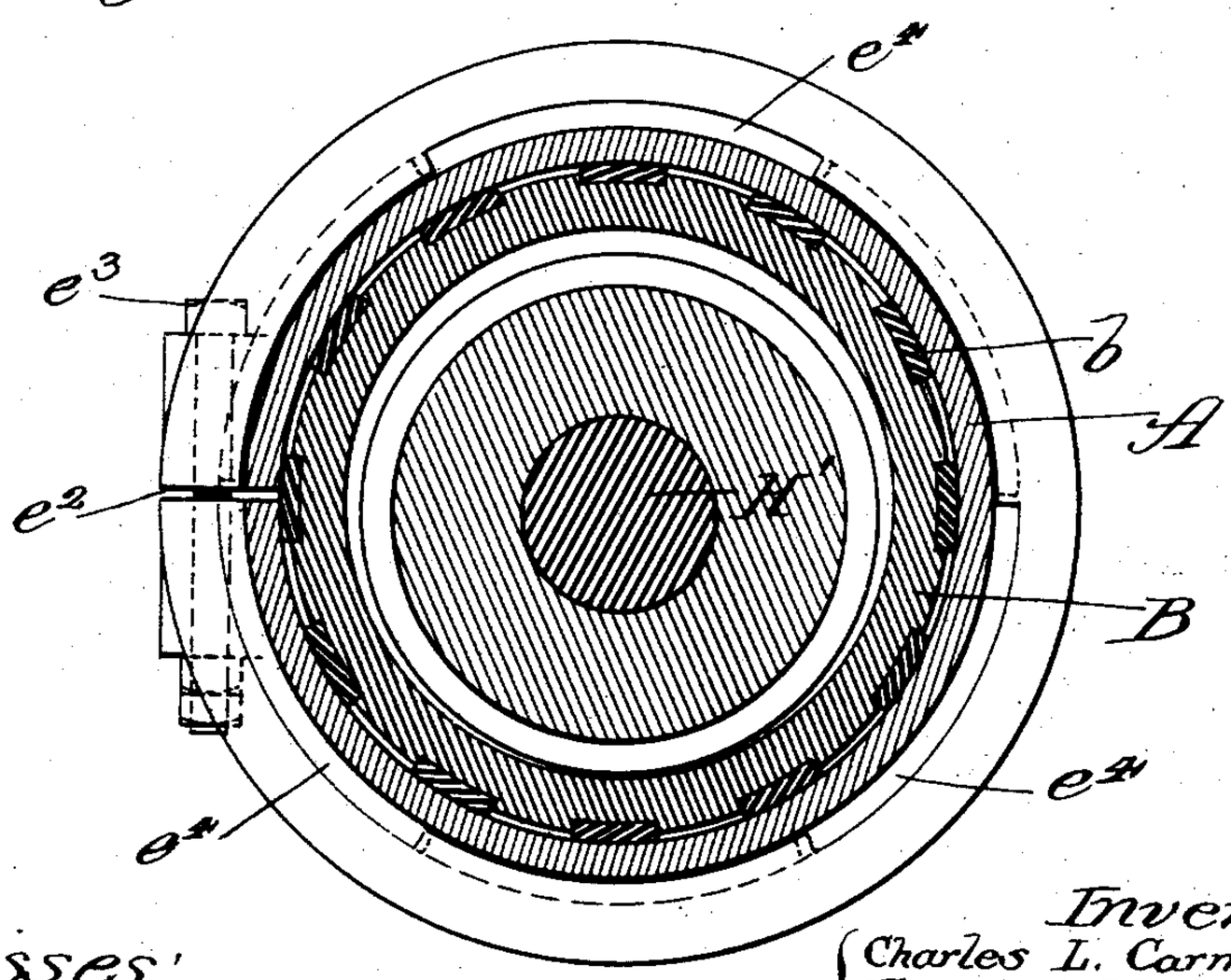


Fig. 3.



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UNITED STATES PATENT OFFICE.

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GYRATING CRUSHER.

SPECIFICATION forming part of Letters Patent No. 525,443, dated September 4, 1894.

Application filed November 3, 1893. Serial No. 489,945. (No model.)

To all whom it may concern:

Be it known that we, CHARLES L. CARMAN, ELMER E. HANNA, and PHILETUS WARREN GATES, citizens of the United States, residing at Chicago, Illinois, have invented certain new and useful Improvements in Gyrating Crushers, of which the following is a specification.

In the drawings, Figure 1 is a vertical longitudinal section through our improved crusher; Fig. 2 a plan view of the crusher; and Fig. 3 a plan view of a section taken in line 3 of Fig. 1.

In making our improved crusher for crushing ores, rocks, and other substances, we make a shell, A, which we will term the upper shell. This shell terminates at the top in a lateral flange, a, provided with a vertical outer rim, a', and at the lower end in an outwardly flaring flange, a^2. This shell is what may be termed a split shell. In casting, it is provided with a slit, a^3, through from one end to the other. It is provided with lateral lugs, A', on each side of the split, through which horizontal bolts, a^4, may be passed, so that the shell may be drawn together by screwing on the nuts of the bolts. In finishing the shell, we draw it together to the desired extent, bore out the interior as much as desired, and then loosen the bolts to permit the shell to spring out and resume its original position. We make a lining, B, which forms the crushing surface, and which is intended to be arranged within the upper shell. In casting, this lining or crushing surface is preferably provided on its outer surface with a number of vertical strips, b, of soft metal, which protrude somewhat beyond the surface. This facilitates the finishing of the lining to the proper size, as of course it is easier to finish the soft metal strips than the hard casting. After the lining or crushing surface has been finished, it is inserted in the shell, A, and the bolts, a^4, screwed up so as to securely clamp the shell upon the lining. The bottom of the lining may be even with the bottom of the shell, and is intended to rest upon the removable ring, b', arranged at the bottom of the upper shell and at the top of the lower shell hereinafter described, which ring, however, we may say need not be an entire circle, but may be made in segments if desired. We arrange a spider, C, at the top of the upper shell, provided with a circumferential flange, c, extending downwardly and resting on the top of the lining or crushing surface, so that it will hold the same down securely in the desired position when the parts are fastened together. The spider is also provided with a downwardly inclined circumferential flange, C', that overhangs, but preferably does not rest upon, the top of the upper shell. As shown in the drawings, the space, c^2, is left between them.

In order to fasten the spider and the upper shell securely together and hold the spider in its proper position, we arrange a ring, D, provided with an inclined surface on its inner side adapted to rest upon the inclined surface of the spider, as shown in Fig. 1, so that the two surfaces may be wedged or dovetailed together. We provide this ring with the desired number of holes, and pass bolts, d, through it and through the lateral flange, a, of the upper shell, and tighten them with nuts until the ring, D, has been drawn down and the spider, C, secured with the desired degree of tightness. While we prefer that the ring, D, shall be an entire circle, yet we mean by the term "ring" to cover it whether made in one or several parts.

We make a lower shell, E, which is provided at its upper end with a shoulder, e, on which the ring, b', is intended to rest, and with a circumferential inwardly inclined flange, e'. This shell is also split for a portion of its length from the top down, and it is provided with lugs, e^2, on the respective sides of the split to permit of the shell being drawn together by horizontal bolts, e^3. The flange, a^2 on the lower end of the upper shell is fitted into place in the upper end of the lower shell when the parts are drawn to-

gether by the bolts, e^3, so as to securely fasten them in place. The flanges, a^2 and e', are made segmental, with spaces, e^4, in them, as shown in Fig. 3. These spaces are intended to be equal to the length of the segments, so that the segmental flanges, a^2, may be inserted in the segmental spaces, e^4, and then the shell turned around until they fit into the flanges, e', as shown in Fig. 1, when the bolts are tightened and the parts fastened together, as above explained. We also provide an inclined, removable diaphragm, F, for carrying off the crushed material.

The lower shell is provided with an opening, closed by a plate, G, which is provided with a horizontal bearing in which is arranged a shaft, G′, carrying a pulley, G^2, so that it may be rotated by the application of any convenient motive power. A pinion, g, is arranged on the inner end of the shaft so as to rotate with it, and its teeth are intended to engage or mesh with the teeth of a gear, g', removably attached or connected to an eccentric box, H, but so that the two will rotate together. The pinion, g, and gear, g', are covered or inclosed by a portion, g^2, of the shell E, which surrounds and overlaps it, as shown in Fig. 1. This portion may, however, if preferred, be made as a separate diaphragm and afterward inserted.

The portion of the shell surrounding the shaft, H′, is provided with two upwardly extending flanges, h, which afford an annular channel or space between them, which may be filled with water or oil, and which is covered by a cap, h', provided with downwardly extending flanges, h^2, one of which extends down into the water or oil with which the channel between the flanges, h, is intended to be filled. This makes or affords a fluid seal to prevent dust, dirt, or other foreign substances from getting into the eccentric box or gearing. Of course, it will be understood that the cover, h', is attached to the shaft, H′, and moves and is covered and protected by a water lip, H^2, fastened to the shaft and overhanging the top of the cap, h'. The shell is provided with a removable bottom, I, which may be removably secured to the shell in any desired manner. When it is in place, there is formed between it and the part, g^2, a chamber in which the actuating mechanism operates, and which may be filled with oil to act as a lubricant, as will be readily understood from an inspection of Fig. 1. The bottom of the eccentric box is supported in a cap, K, which is held in place in any desired manner, and the bottom of the shaft, H′, rests and is supported upon the top of the step-block, L, which in turn rests upon a lighter-screw, L′, by which it may be raised or lowered, or adjusted to the desired position. By taking off the cap, K, the eccentric, H, may be readily removed and another put in its place should it become worn, or should we desire to remove it for any other cause, and the gyrating shaft is supported in place by its head falling down until it contacts and rests upon the dust cap, which is on the top of the pipe of diaphragm F. To still further prevent friction, we arrange anti-friction balls or rolls, l, between the gear, g', and the top of the bottom, I, and also friction balls or rolls, l', between the bottom of the eccentric box and the cap, K, as will be understood from an inspection of the drawings. It will be noticed that the step-block, L, is arranged within the eccentric box, and that its vertical axis is in line with the vertical axis of the shaft, H′, represented by the line, k, while the vertical axis of the lighter-screw, L′, is not in line with the vertical axis of the step block or shaft, but is in line with the vertical axis of the machine, represented by the line k'. This arrangement of the shaft and the lighter-screw on independent vertical axes prevents the friction caused by the rubbing that would ensue if they were not so arranged. As the mechanism is operated, the eccentric box will be rotated and a gyratory motion imparted to the shaft, H′, and the parts which it carries.

What we regard as new, and desire to secure by Letters Patent, is—

1. The combination of a shaft, a cap surrounding the shaft provided with downwardly extending flanges, a portion of the shell surrounding the shaft beneath the cap provided with flanges extending upwardly and forming with the downwardly extending flanges of the cap a fluid seal and the upper wall of a chamber adapted to contain actuating mechanism and a lubricant, and actuating mechanism inclosed in such chamber within the shell, where it is hermetically sealed and protected from the ingress of water and other foreign substances and submerged in a lubricant, substantially as described.

2. The combination of a gyrating shaft, an eccentric box surrounding the journaled end of the shaft, a step block within the eccentric box supporting the shaft, and means for supporting the step block, substantially as described.

3. The combination of a gyrating shaft, an eccentric box surrounding the journaled end of the shaft, a step block within the eccentric box supporting the shaft, and means for supporting the step block and vertically adjusting it with the shaft and parts carried by it, substantially as described.

4. The combination of a gyrating shaft, an eccentric box surrounding the journaled end of the shaft, a removable step block arranged within the eccentric box supporting the shaft and arranged with its vertical axis in line with the vertical axis of the shaft, and a lighter screw for supporting the step block arranged with its vertical axis eccentric to the vertical axis of the step block and shaft and

in line with the vertical axis of the machine, substantially as described.

5. The combination of a gyrating shaft, actuating mechanism for gyrating the same, a chamber inclosing the actuating mechanism containing a top through which the shaft enters, a removable bottom, and a removable side provided with a horizontal bearing through which the means for actuating the mechanism enters, substantially as described.

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