

(No Model.)

3 Sheets—Sheet 1.

L. SMITH.

Mills for Grinding and Reducing Grain, &c.
No. 232,419. Patented Sept. 21, 1880.

Fig. 1.

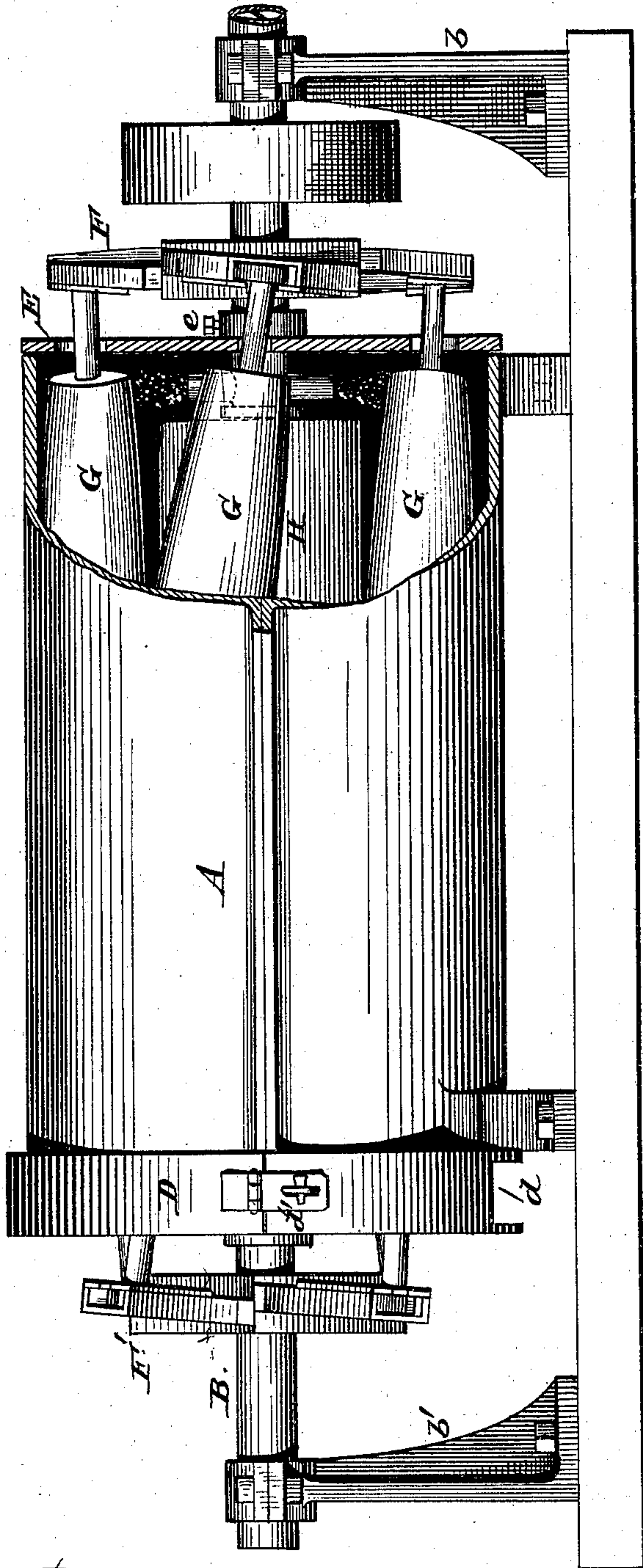
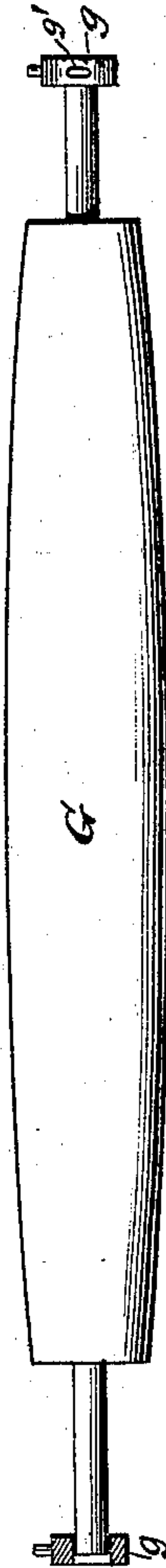


Fig. 7.



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Fig. 2.

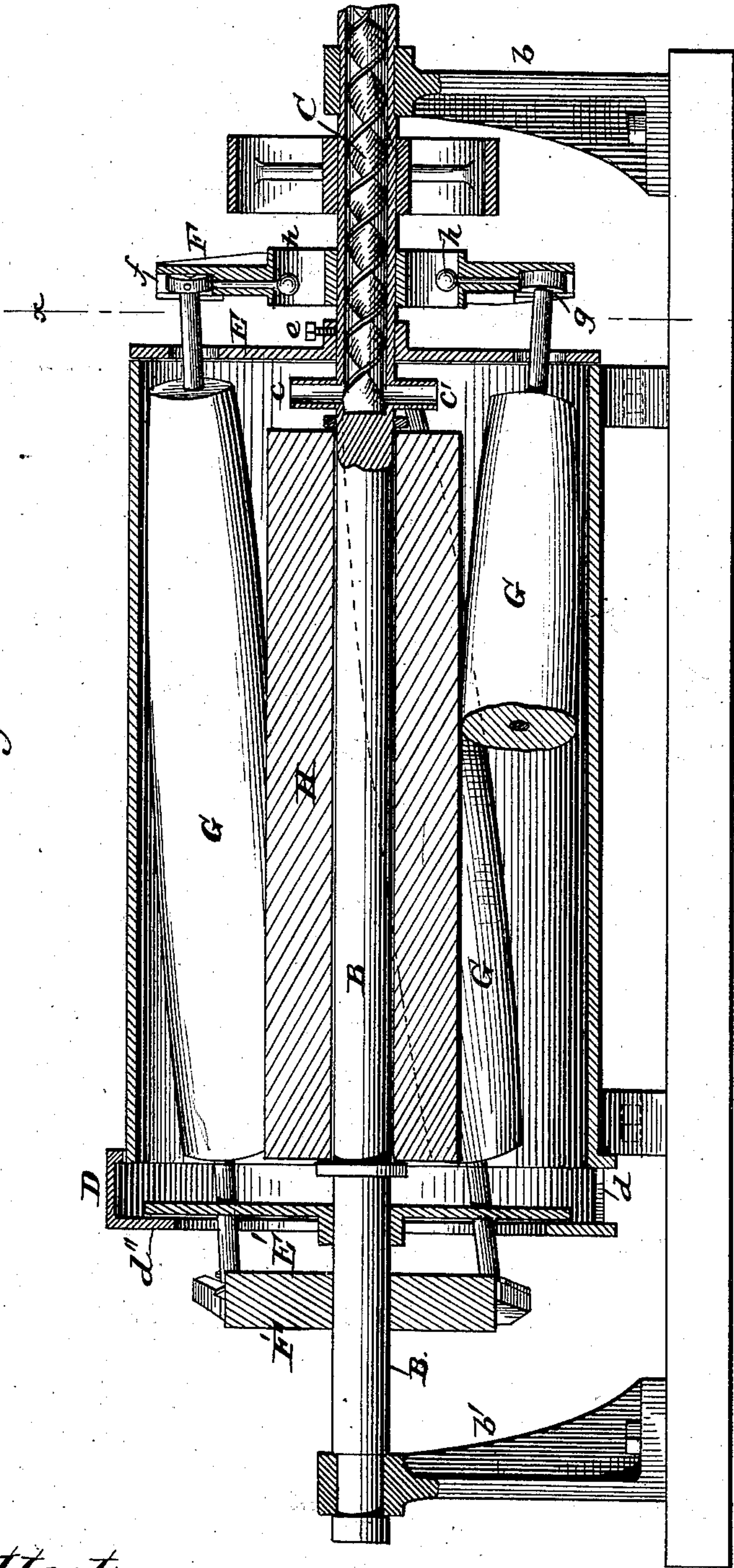


Fig. 8.

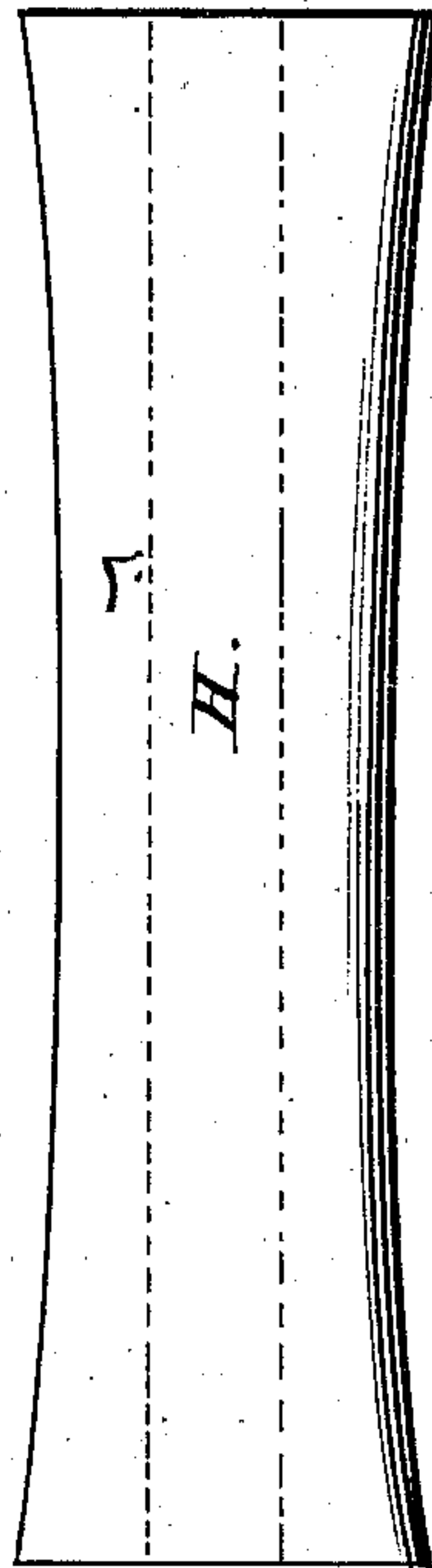
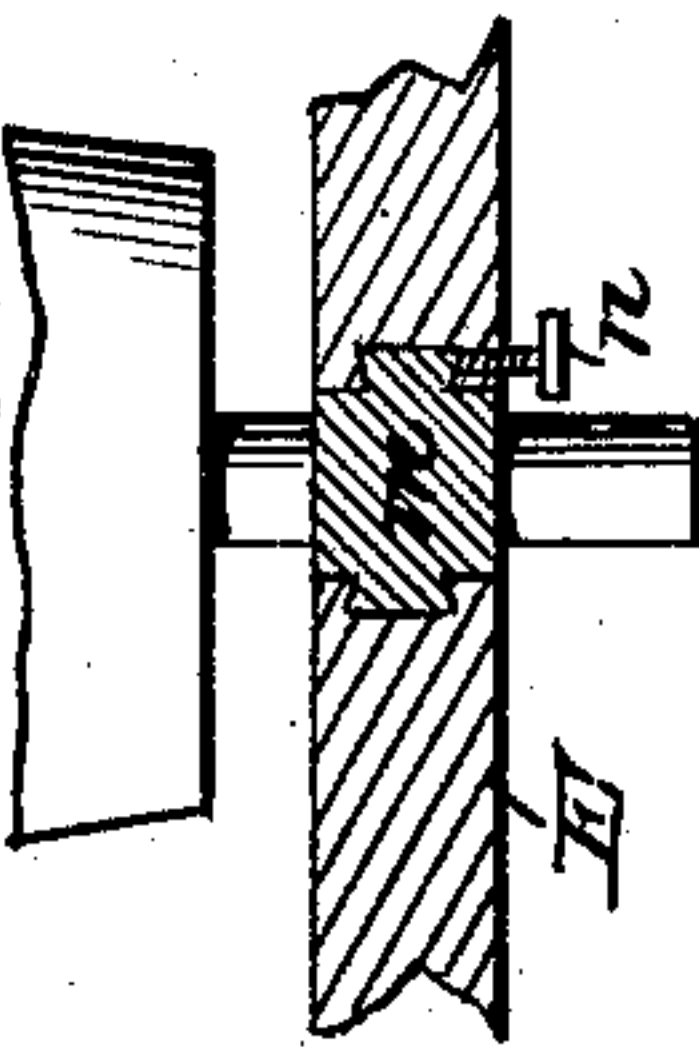


Fig. 9.



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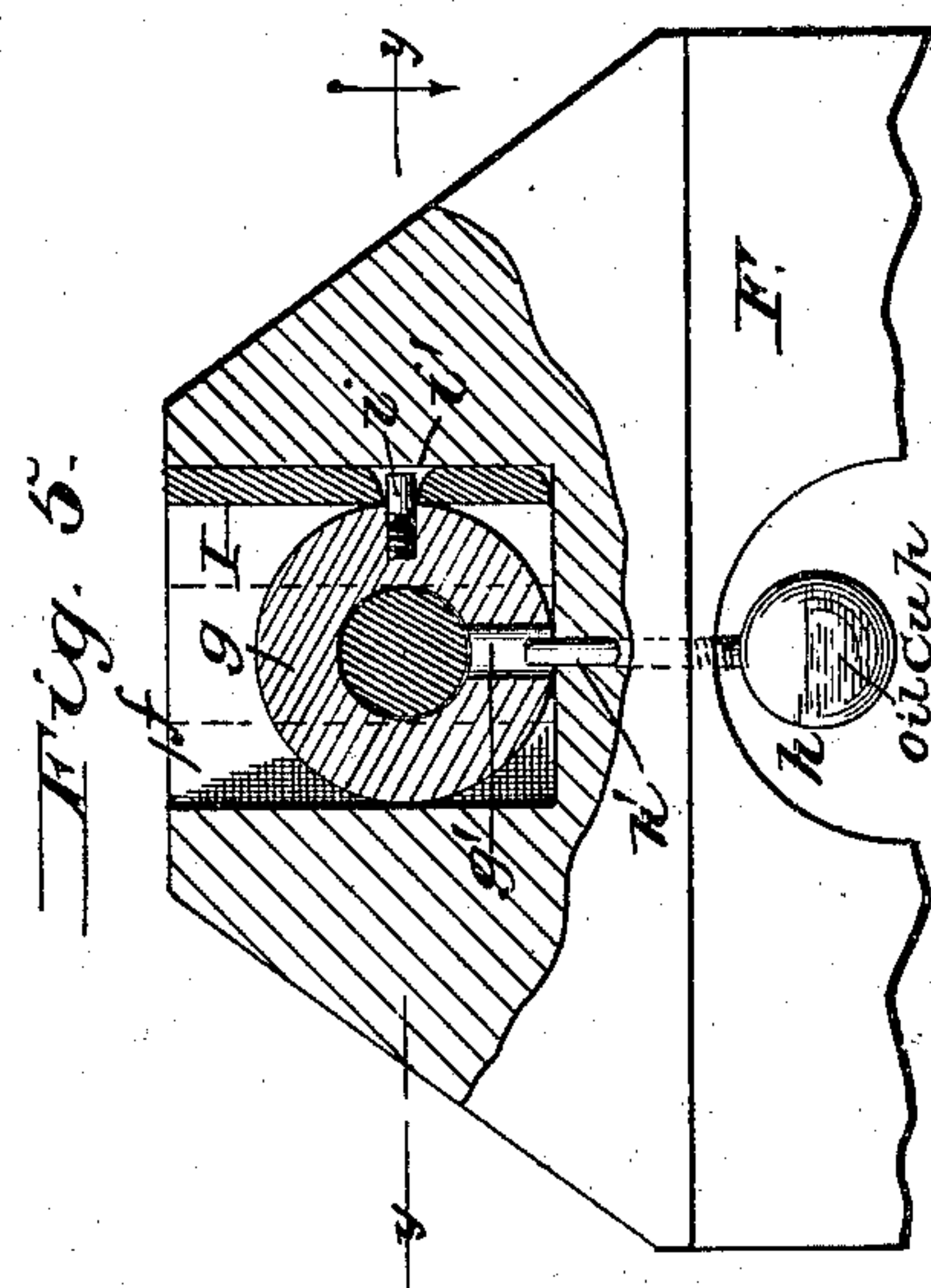
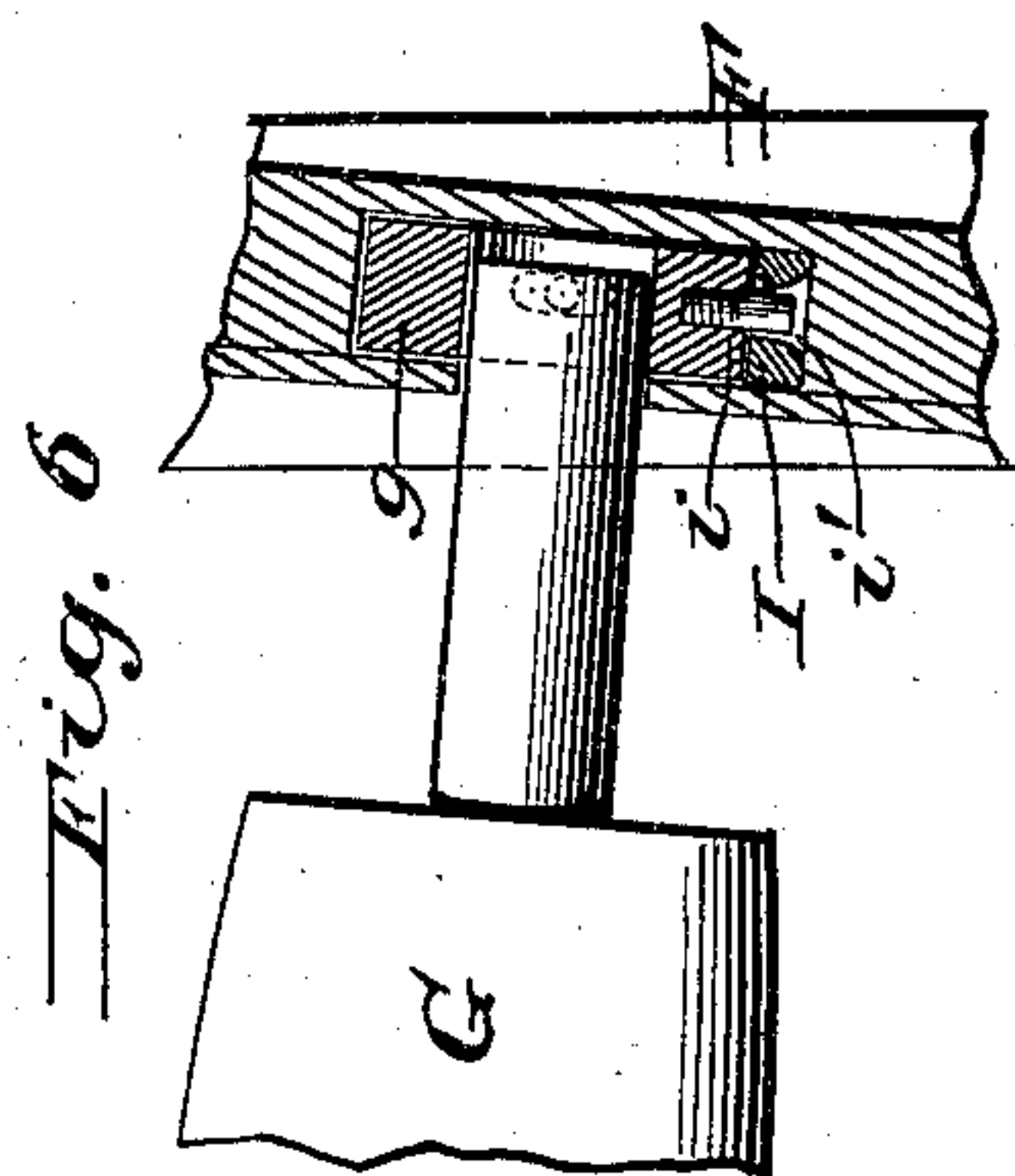
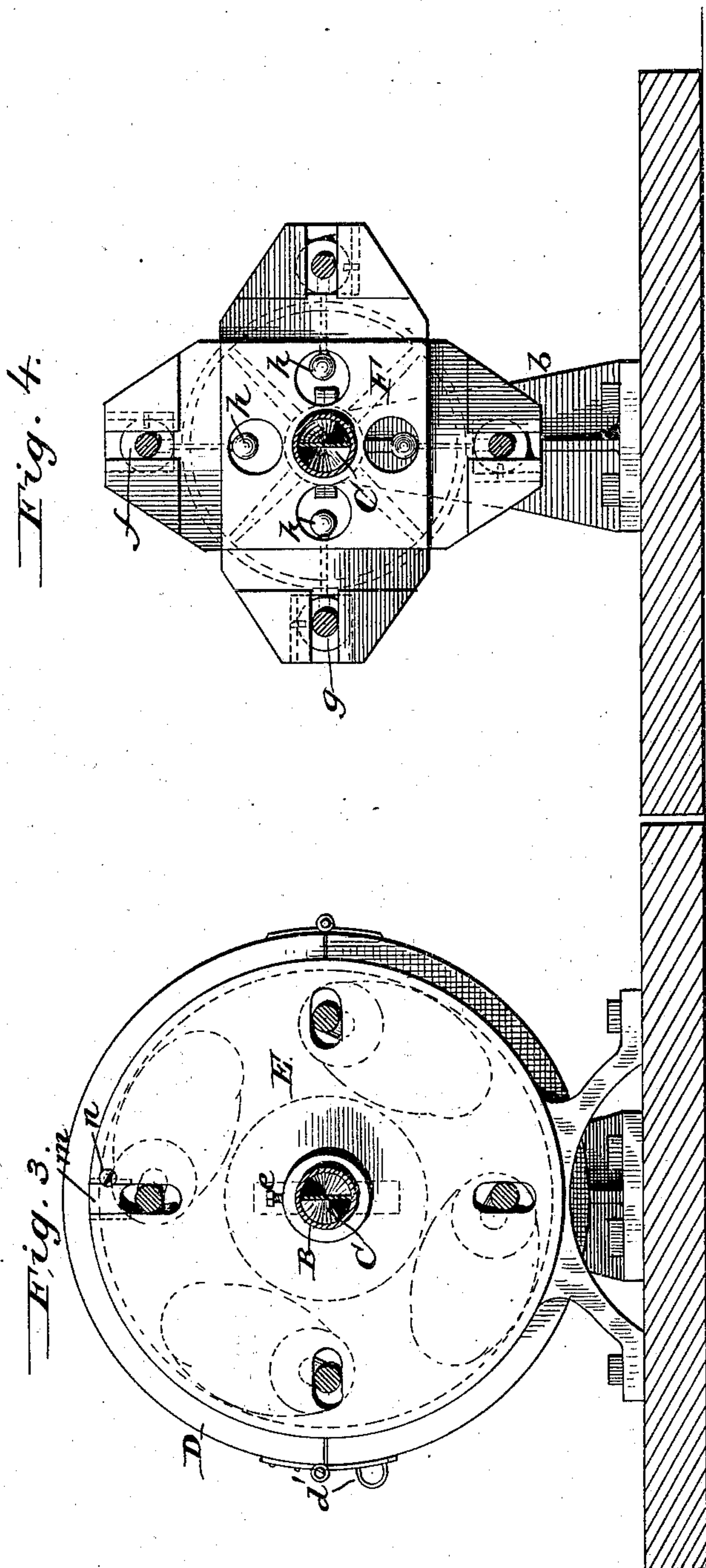
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UNITED STATES PATENT OFFICE.

LEANDER SMITH, OF CINCINNATI, OHIO.

MILL FOR GRINDING AND REDUCING GRAIN, &c.

SPECIFICATION forming part of Letters Patent No. 232,419, dated September 21, 1880.

Application filed May 11, 1880. (No model.)

To all whom it may concern:

Be it known that I, LEANDER SMITH, of Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful
5 Improvements in Mills for Grinding, Comminuting, and Levigating Grain and other Substances, of which the following is a specification.

My invention relates to that class of grinding or pulverizing mills in which a roll or rolls are caused to travel within an inclosing drum or cylinder and the material is comminuted between the internal periphery of the drum and the face of the roll or rolls; and it consists in
15 means for supporting and oiling the journals of the rolls outside the drum; in diaphragms closing the heads of the drum while permitting the movement of the rolls; in the provision of a secondary roll mounted axially of the drum within the path described by the first-named roll or rolls, and in the various combinations and details of construction hereinafter pointed out and claimed.

Letters Patent of the United States were
25 granted me January 20, 1880, No. 223,769, for such a construction of rolls and cylinder that the rolls are laid diagonally within the latter and in contact with its internal periphery throughout their entire length.

My present improvements, while applicable to machines wherein the rolls are laid straight or parallel with the axis of the drum, have for their object mainly to facilitate dry grinding with this patented device, and are therefore
35 illustrated in connection therewith.

In the drawings, Figure 1 is a side elevation of the machine with a portion of the casing or drum broken away. Fig. 2 is a vertical longitudinal section; Fig. 3, an end elevation; Fig. 4, an elevation of the spider-frame which carries the journal-bearings. Figs. 5, 6, 7, 8, and 9 are details.

A is the drum, suitably mounted in a strong frame-work, and formed in halves, flanged and
45 secured together by hinging or by bolts and screws, so that the upper section may be readily removed from the lower. Axially through this drum passes a shaft, B, journaled in brackets or standards *b b'* from the bed-plate of the machine. That part passing through the
50 standard *b* and entering the head of the drum

has its outer termination in a hopper, and is made hollow to receive a conveyer or Archimedean screw, C, by which the material is fed from the hopper and discharged through the openings *c c'* into the drum. 55

A rim or skeleton-cap, D, is fitted over the drum at the eduction end. This rim is formed in halves corresponding with the sections of the drum. The lower half is fixed and has in it the spout or discharge-opening *d*. The upper half is hinged to the lower and locked down by a hasp and staple, *d'*, or other means, so that it may be readily opened to permit inspection of the interior, or to allow the upper section of the drum to be thrown open or removed. 65
The ends of the drum are closed by diaphragms E E', which are sleeved upon the shaft and turn therewith. The diaphragm E, at the head of the drum, sits up close against the end of the casing, and is held in position by a screw, *e*, passing through its hub and clamping it upon the shaft. The diaphragm E' is also held in position upon the shaft and sits against the inside of a flange, *d''*, depending inwardly from the rim D. A rim may also be used at the head of the drum, or any other appropriate device may be adopted to prevent the escape of material at the joints between the drum and diaphragms. 80
Exteriorly to the diaphragms, and as near thereto as may be convenient, the shaft is fitted with radiating arms or spider-frames F F', in which are borne the bearings for the journals or gudgeons of the comminuting-rolls G. These rolls, as in my former patent, are intended to be inclined to the length of the cylinder; but it is not necessary to the efficient use of my improvement that they should be. They are to be so mounted that the centrifugal force may carry them out radially from the shaft as it revolves, and cause them to press with force against the sides of the drum. They terminate inside of the diaphragms and their gudgeons only pass through the latter, which are radially slotted for the purpose. These slots may be closed to prevent the escape of material by aprons of rubber or leather, or by slides mounted upon the gudgeons and partaking of their radial movements, as will readily be apparent. 95
100

Each arm of the spider-frames is slotted or recessed, as at *f*, to receive a roller, *g*, in which

is formed the bearing for the gudgeon of the comminuting-roll.

Mounted upon the frames, at points nearer the shaft, and so as to be easily accessible, are
5 oil-cups *h*, from which ducts *h'* lead to and project slightly beyond the bottoms of the recesses. These oil-cups may be filled through their respective ducts, or may each have an aperture and cap whereby they can be filled
10 and then rendered tight. The vacuum forming within them by the flow of the oil will ordinarily be sufficient to prevent waste from centrifugal action; but some one or other of the various known devices may at times be found
15 desirable to regulate or govern its flow.

The rollers *g* have each a perforation, *g'*, extending radially from the bearing to the periphery, to receive the end and form a continuation of the oil-duct. In order that the perforations may at all times match or substantially match with the ducts, notwithstanding the rise and fall of the comminuting-rolls, a pin, *i*, upon the bearing-roller takes into an aperture, *i'*, in a key-piece, *I*, at the side of
25 the recess, so that the roller may rock from this point, but cannot turn upon its axis.

Instead of the rollers with their pins and key-pieces, the bearing-blocks may be formed as slides fitted in the recesses in the spider-frames, so as to move in and out with the action of the comminuting-rolls. This arrangement will however involve more friction and less freedom of action than the one just described. The distance to which the bearings can play
35 may be limited by adjustable devices, so that the fineness of the product may be controlled at will.

Upon the shaft, or axially within the drum, is mounted a roll, *H*. In dry grinding this roll
40 may be fixed upon the shaft and turn therewith, serving to immediately return the material to the bottom as it falls from the outer or primary rolls. It may, however, be, and in levigation or wet grinding preferably is, loose
45 upon the shaft, so as to rest upon the primary rolls and be turned by them as they travel within the drum, serving then not only to conduct the falling material directly back for the grinding action, but to take part in that action
50 itself. When thus used it should have a longitudinal contour, as indicated in Fig. 8, adapted to bring every point in its length into contact with the primary rolls in their passage.

A jacket through which a current of steam
55 or water may be passed to heat or cool the material undergoing treatment may surround the drum, each section having its own jacket, with passages so arranged that when the sections are clamped together the current may
60 pass from one to the other.

In order to readily remove the rolls from the diaphragms I prefer to carry the radial slots in the latter outwardly until they reach the perimeter, and close their ends by blocks *m*,
65 hinged or feathered into the walls of the slot, as shown in cross-section in Fig. 9, and held in place by a set-screw, *n*, or other means.

I claim as my invention—

1. The combination of a drum or cylinder having closed heads, rolls inclosed within said
70 drum and traveling upon its internal periphery, and bearings for said rolls external to the drum.

2. The combination of a drum or cylinder having closed heads, rolls inclosed within said
75 drum and traveling upon its internal periphery, and movable bearings for said rolls external to the drum and yielding to the centrifugal action as the rolls are caused to travel.

3. The combination of a drum or cylinder, 80 rolls inclosed within said drum and traveling upon its internal periphery, diaphragms closing the heads of the drum and moving with the rolls, and bearings for said rolls external to the drum and diaphragms. 85

4. The combination of a drum or cylinder, rolls inclosed within said drum and traveling upon its internal periphery, radially-slotted diaphragms closing the heads of the drum and moving with the rolls, and yielding bearings
90 for said rolls external to the drum and diaphragms.

5. The combination, with the drum and its inclosed rolls, of spider-frames fitted upon the shaft exteriorly to the drum and provided
95 with movable bearings for the gudgeons of the rolls, and oil-cups communicating with said bearings.

6. In combination with the rolls, the spider-frames having radial ways or slots, and bearing-boxes for the gudgeons of the rolls mounted in said ways or slots and movable therein. 100

7. In combination with the rolls, the spider-frames having radial ways or slots, bearing-boxes for the gudgeons of the rolls mounted
105 and movable in said ways, and oil-ducts communicating through said ways with apertures in the movable boxes to lubricate the bearings.

8. The combination of the drum or cylinder, rolls inclosed within said drum and traveling
110 upon its internal periphery, and a central roll mounted axially of the drum within the primary rolls.

9. The combination of the drum or cylinder, rolls inclosed within said drum and traveling
115 upon its internal periphery, and a central roll mounted loosely upon the shaft which passes axially through the drum and working against the inner faces of the primary rolls.

10. The combination of the drum or cylinder, rolls inclosed within said drum, lying diagonally thereof and having a longitudinal contour, bringing them evenly in contact with its sides, and a central roll mounted loosely upon the shaft which passes axially through
125 the drum, and having a longitudinal contour, bringing it evenly in contact with the inner faces of the first-named rolls.

11. In combination with the drum, the hinged rim shutting over the end and adapted to be
130 opened independently of the sections of the drum.

12. The cylindrical bearing-boxes mounted in ways in which they are free to travel with

the rise and fall of the journals or gudgeons which they support.

5 13. The cylindrical bearing-boxes of the rolls, mounted in ways or recesses in which they are free to travel, in combination with oil-ducts projecting above the bottoms of said recesses and matching with apertures in said bearing-boxes.

10 14. The cylindrical bearing-box formed with a pin or tooth which takes into an aperture at the side of the way in which it moves.

15 15. The cylindrical bearing-box formed with a pin or tooth which takes into an aperture at the side of the way in which it moves, and with an oil-passage communicating with the bearing proper, in combination with an oil-duct projecting from the bottom of the way and matching with said passage.

20 16. The cylindrical bearing-box formed with a radial pin or tooth, in combination with a

key-piece apertured to receive said tooth and forming one side of the way in which the box moves.

17. The rotary spider-frames formed, as described, with radial arms, ways, or slots at 25 the end of each of said arms to receive movable bearings of journals or gudgeons, oil-cups upon the frames interaxial to the ways, and ducts leading from said oil-cups to the bottoms of the ways.

30 18. In combination with the rolls and with the radially-slotted diaphragms, the removable blocks closing the ends of said slots, whereby the rolls may be readily separated from the diaphragms.

LEANDER SMITH.

Witnesses:

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