

(No Model.)

3 Sheets—Sheet 1.

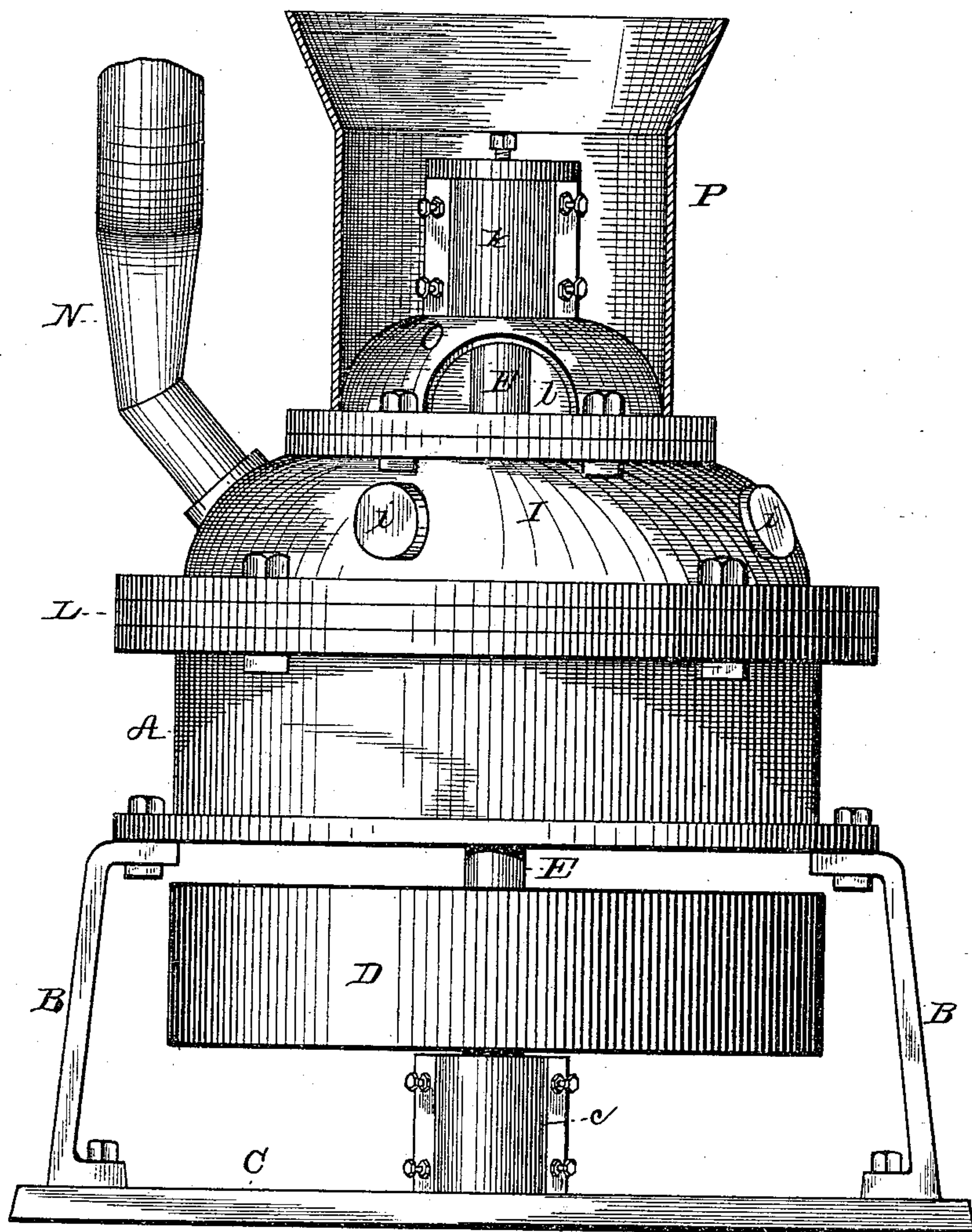
W. M. FULLER & J. J. HAYES.

PULVERIZING MACHINE.

No. 335,573.

Patented Feb. 9, 1886.

Fig. 1.



ATTEST:
Edw. Rowland
T. H. Fiddler

INVENTORS:
William M. Fuller
John J. Hayes
By Oyer & Sully
Attorneys

(No Model.)

3 Sheets—Sheet 2.

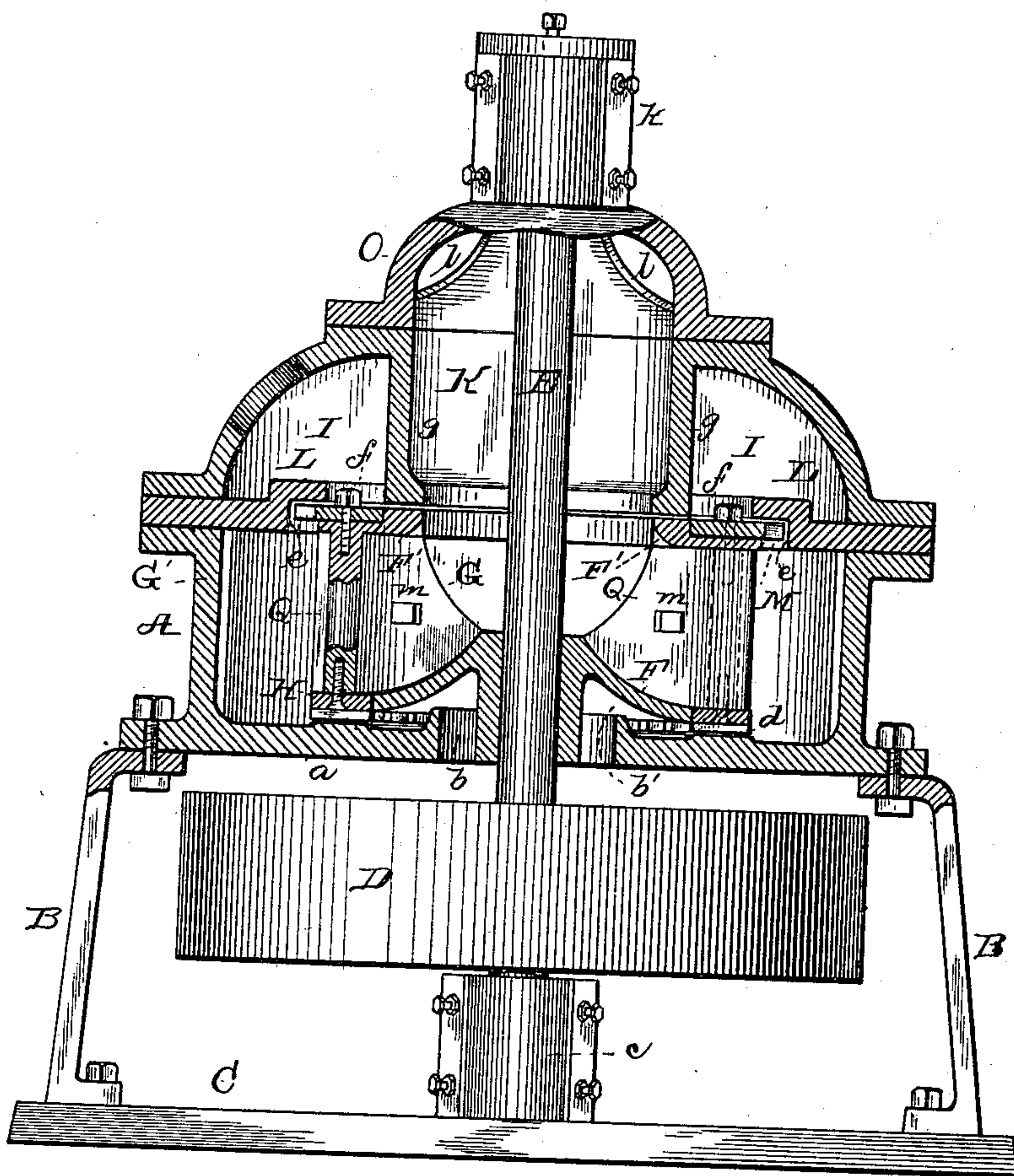
W. M. FULLER & J. J. HAYES.

PULVERIZING MACHINE.

No. 335,573.

Patented Feb. 9, 1886.

Fig. 2.



ATTEST:
E. C. Rowland
P. W. Kiddle

INVENTORS:
Wm. M. Fuller,
John J. Hayes,
By Sigsbee & Leely
Attys.

(No Model.)

3 Sheets—Sheet 3.

W. M. FULLER & J. J. HAYES.

PULVERIZING MACHINE.

No. 335,573.

Patented Feb. 9, 1886.

Fig. 3.

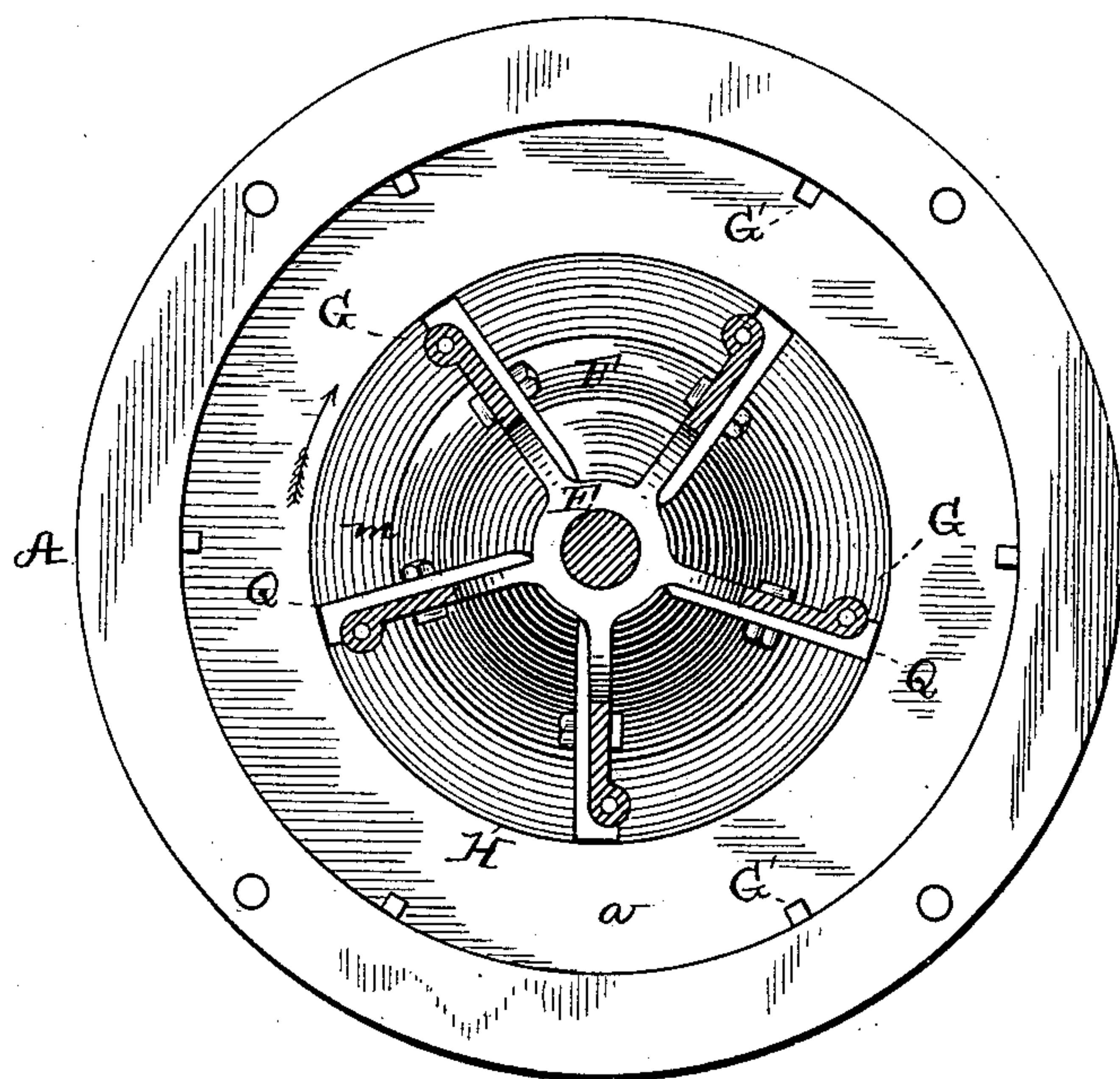


Fig. 4.

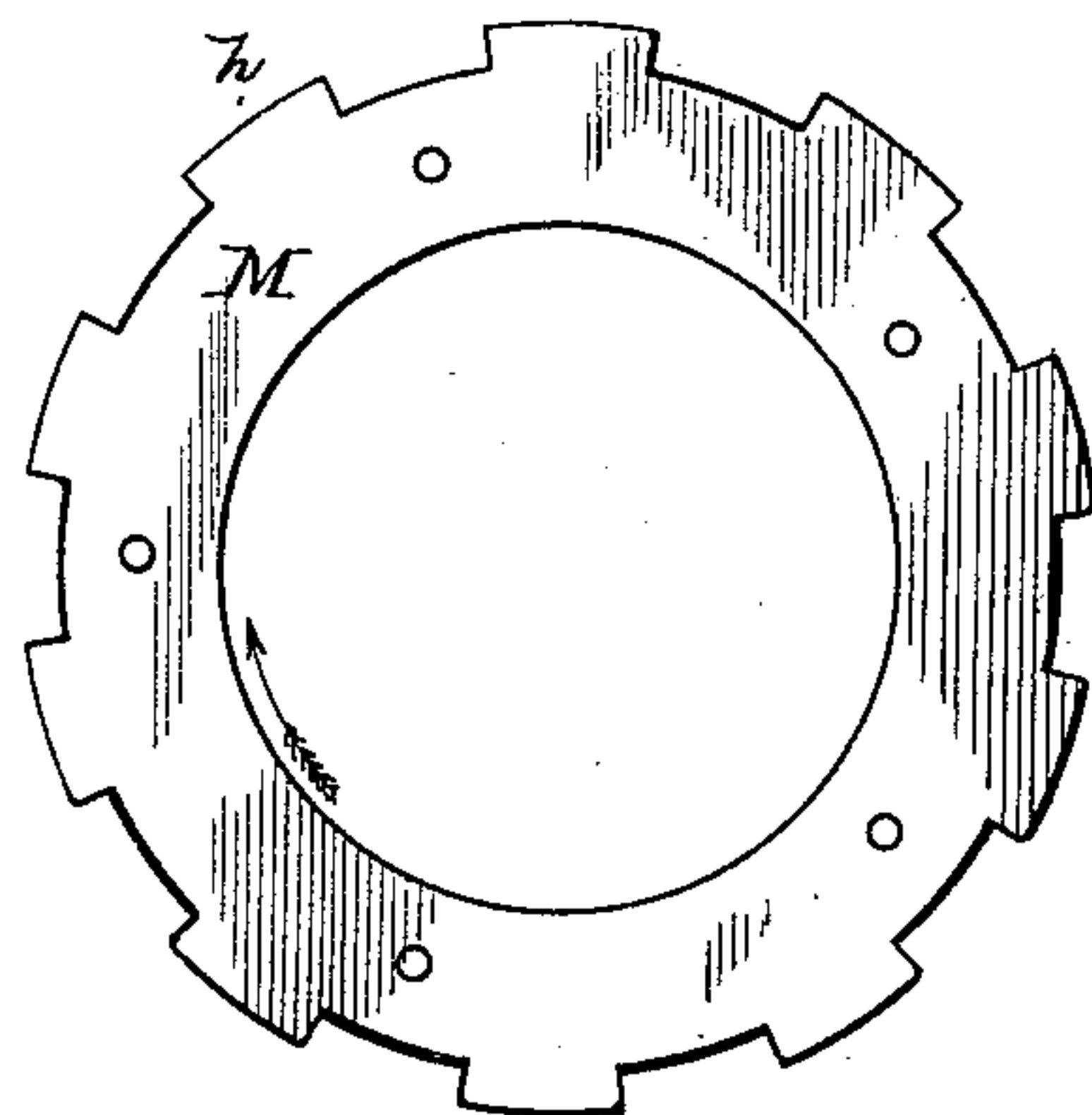


Fig. 5.

Fig. 6.

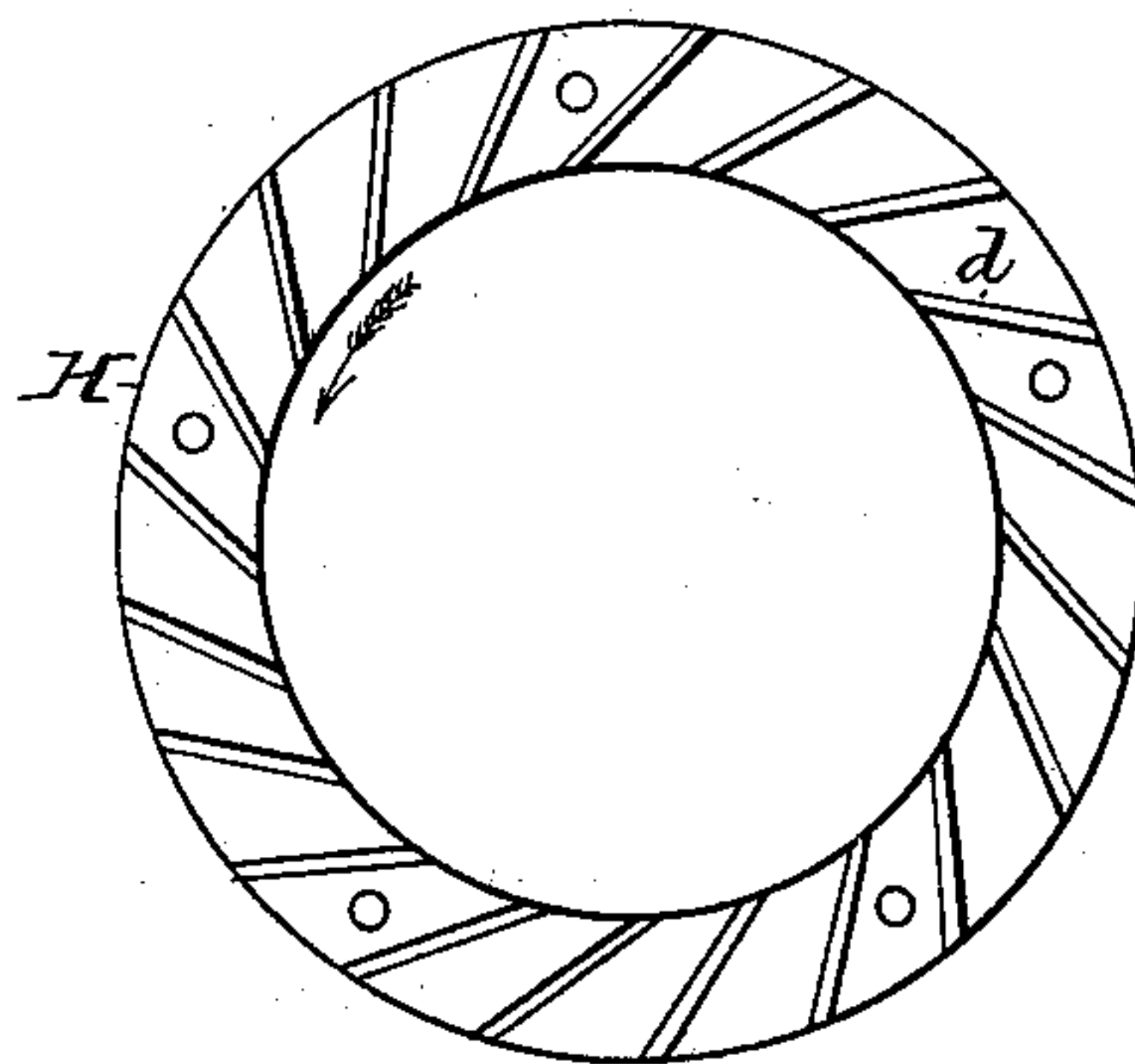
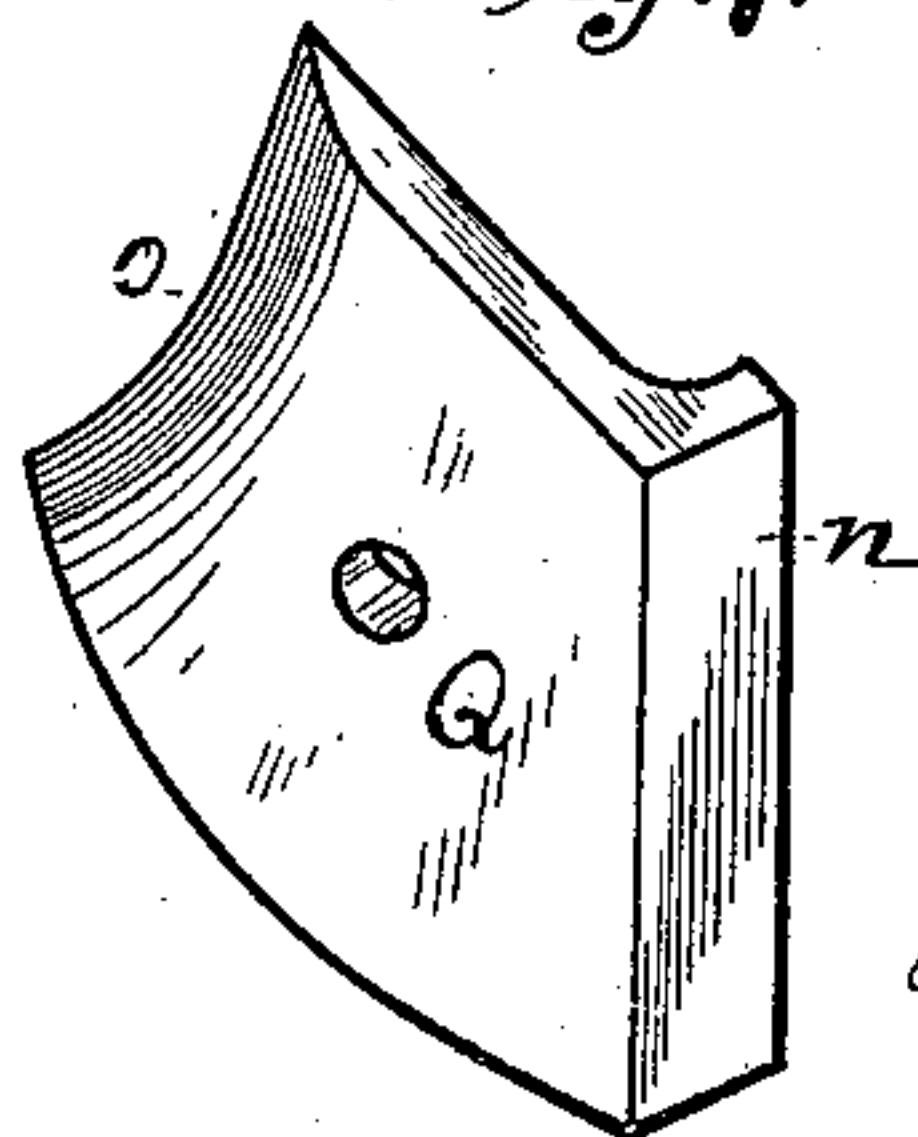


Fig. 7.



ATTEST:
E. C. Rowland
Atty. Genl.

INVENTORS:
William M. Fuller
John J. Hayes
By Dyer & Sons
Atty.

UNITED STATES PATENT OFFICE.

WILLARD M. FULLER, OF NEW YORK, AND JOHN J. HAYES, OF
BROOKLYN, N. Y.

PULVERIZING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 335,573, dated February 9, 1886.

Application filed May 20, 1885. Serial No. 166,090. (No model.)

To all whom it may concern:

Be it known that we, WILLARD M. FULLER, of New York city, in the county and State of New York, and JOHN J. HAYES, of Brooklyn, in the county of Kings and State of New York, have jointly invented a certain new and useful Improvement in Pulverizing-Machines, of which the following is a specification.

10 The object we have in view is to produce a practical and efficient machine for reducing in a dry state to a pulverulent condition rock of all characters, including ores, gas-retort carbon, and other materials which are
15 sufficiently hard to be ground by the attrition of masses of the material.

Our invention relates more particularly to the construction of the machine and to combinations of its parts for permitting the finely-
20 powdered material to be effectively withdrawn from the machine by an exhaust-fan at the same time that the material being ground is kept within the grinding-cylinder of the machine and prevented from forcing
25 itself out through or into the air-passages.

The invention also relates to other details of construction and to further combinations of parts, as fully hereinafter pointed out by the claims.

30 In the accompanying drawings, forming a part hereof, Figure 1 is an elevation of the machine with feed-hopper in section; Fig. 2, a vertical section of the machine with shaft-bearings and driving-pulley in elevation;
35 Fig. 3, a top view with the parts above the grinding-cylinder removed and the revolving center in horizontal section below its top ring; Figs. 4 and 5, a top and an edge view of the ring guarding the air-passage from the grind-
40 ing-cylinder to the superimposed annular air-chamber; Fig. 6, a bottom view of the ring guarding the air-passage at the bottom of the grinding-cylinder, and Fig. 7 a perspective view of one of the wearing-plates upon the
45 wings of the revolving center.

A is the grinding-cylinder, which is a cylindrical casting open at top, and having a bottom floor, *a*, provided with a central opening, *b*, around which opening the floor *a* may have
50 a raised flange, *b'*. This casting forms a shal-

low cylindrical vessel, which is supported by legs B at an elevation above a base-plate, C, to give room for the driving-pulley D, which is preferably made heavy enough to act as a balance-wheel. Centrally through the grinding-cylinder passes the vertical shaft E, stepped
55 in a bearing, *c*, on base-plate C, and held at its upper end by a bearing above the grinding-cylinder, as will be presently explained. Keyed upon this shaft, and located within the
60 grinding-cylinder, is the revolving center, which is composed of a conical disk, F, keyed to the shaft, and a top ring, F', supported from the disk by a number of radial wings, G. The
65 ring F' provides for the central feeding of the material to be pulverized, while the wings G divide the revolving center into pockets, out through which the material is thrown by cen-
70 trifugal action against the wall of material in the grinding-cylinder, which is kept from turning with the material in the revolving center by vertical ribs G' on the interior of such grinding-cylinder.

The revolving center fills the central portion of the grinding-cylinder and rises slightly
75 above its upper edge. Its diameter, however, is less than the grinding-cylinder, leaving a clear annular space around it, in which the grinding takes place by the attrition of the material carried around and thrown outwardly
80 by the revolving center against the mass of material held stationary by the ribs of the grinding-cylinder.

The disk F of the revolving center is larger than the central opening, *b*, in the bottom *a* of
85 the grinding-cylinder around the shaft, and at its periphery it approaches close to said bottom *a*, leaving, however, sufficient space for the admission of air through opening *b* into the grinding cylinder. To guard this
90 opening and prevent the material being ground from forcing pieces out through this space, we provide a steel ring, H, which is secured by bolts to the ends of wings G, which are enlarged for this purpose, and which ring forms
95 an extension of the periphery of the disk F. On its under side ring H is provided with oblique ribs *d*, which move in close proximity to a planed annular surface on floor *a* of the grinding-cylinder. These ribs are so set with
100

relation to the direction of rotation (see Fig. 6) that they form oblique blades, which act to force the material outwardly from the shaft and into the grinding-chamber. These blades also assist the exhaust-fan in producing a blast into the machine at this point.

Above the grinding-cylinder is an annular air-chamber, I, the inner walls of which form a central feed-passage, K, surrounded by the annular air-chamber and communicating with the open top of the revolving center. The annular air-chamber is divided from the grinding-cylinder by a horizontal annular partition, L, which is an annular plate resting on the walls of the grinding-cylinder and extending inwardly toward the top ring, F', of the revolving center. Near such ring the partition L has a shoulder, e, from which point it rises, as shown in Fig. 2, above ring F', and then extends horizontally partly over such ring, leaving, however, a clear space, f, between the inner edge of partition L and the vertical inner wall, g, of the air-chamber I, which wall g approaches at its lower edge close to the top ring, F', of the revolving center.

Upon ring F', which is shouldered for that purpose, is secured, by bolts extending into enlarged ends of wings G, a steel ring, M, extending beyond the ring F' and approaching close to the shoulder e of partition L. The ring M has its outer edge notched, as shown in Figs. 4 and 5, to permit the air and dust to pass freely up into chamber I. The projections h on the periphery of ring M are beveled on their under sides, as shown in Fig. 5, forming oblique blades, which guard this air-passage and force downwardly the material in the grinding-cylinder, preventing it from getting into the chamber I or from clogging the annular air-passage from the grinding-cylinder into such chamber.

A pipe, N, connects the chamber I with an exhaust-fan, (not shown,) which is kept in rapid motion during the operation of the machine, and sight-holes, covered by caps i, may be provided in the sides of the chamber I. Upon chamber I is mounted a cap-piece, O, carrying the upper bearing, k, for the shaft. This cap is pierced by feed-openings l, through which the material to be pulverized is fed to the machine. A cylindrical hopper, P, may be placed on top of the cap-piece, as shown in Fig. 1, including all the openings l; or a feed-spout may be connected with one of such openings.

In the operation of the machine the cylinder A and the revolving center will be kept filled entirely with the pulverable material, as will also be the central cylindrical feed-passage, K, and the hopper P. The revolving center having a top ring under which the material is fed, the material is not ground against the top of the grinding-cylinder. The air enters the grinding-cylinder centrally at the top and bottom—at the top through the material in

the hopper and feed-passage, at the bottom through the opening b. The air passes through the mass of material being ground, and taking up the dust carries it into the air-chamber I and off through pipe N.

A further feature of novelty in the machine is the peculiar wearing-plates for the wings G of the revolving center. This is a plate, Q, one of which is removably secured by a bolt, m, to the front side of each wing G, (with relation to direction of rotation,) and covers the entire surface of the wing. The plate Q has its outer end, n, formed at right angles to the body of the plate, this flanged outer end extending over the end of the wing, as shown, while the inner end, o, of the plate Q is beveled to an edge, so as not to interfere with the free feeding of the material to be ground. These removable wearing-plates completely protect the wings from being worn by the action of the machine, and can themselves be readily replaced when necessary.

What we claim is—

1. In a pulverizing-machine, the combination, with a grinding-cylinder and a revolving center therein for pulverizing by attrition of masses of the material, of an exhaust-chamber connected with the grinding-cylinder by an annular exhaust-passage extending entirely around the grinding-cylinder, through which the pulverulent material is withdrawn from the grinding-cylinder, substantially as set forth.

2. In a pulverizing-machine, the combination, with the grinding-cylinder and the revolving center therein, of the annular exhaust-chamber above the grinding-cylinder, connected therewith by an annular passage extending entirely around the top of the grinding-cylinder, and a central feed-passage formed by the inner walls of such annular exhaust-chamber, substantially as set forth.

3. In a pulverizing-machine, the combination, with the grinding-cylinder and a revolving center therein composed of a bottom disk, a top ring, and connecting radial wings, of an annular exhaust-chamber surmounting the grinding-cylinder and connected therewith by an annular exhaust-passage extending entirely around the grinding-cylinder and connecting such chamber with the grinding-cylinder around the top ring of the revolving center, substantially as set forth.

4. In a pulverizing-machine, the combination, with the grinding-cylinder and the revolving center therein, of an annular exhaust-chamber surmounting the grinding-cylinder and connected therewith by an annular passage, the inner walls of the annular exhaust-chamber forming a central top feeding-passage, and the grinding-cylinder having a central bottom opening for admitting air into the grinding-cylinder, substantially as set forth.

5. In a pulverizing-machine, a chamber provided with grinding mechanism therein for

pulverizing the material, and air inlet and outlet openings, the latter being connected with an exhaust-chamber for withdrawing the pulverulent material, in combination with
5 oblique blades moving in or across one or more of such openings, substantially as and for the purpose set forth.

6. In a pulverizing-machine, the combination, with the grinding-cylinder and the re-
10 volving center therein, of the exhaust-chamber above the grinding-cylinder, and connected therewith by an annular air and dust passage extending around the revolving center, and oblique blades carried by such revolving cen-
15 ter and moving over such air and dust passage, substantially as set forth.

7. In a pulverizing-machine, the combination of the grinding-cylinder and revolving center therein, the former having a central
20 bottom opening forming an air-inlet and ob-

lique blades carried by the revolving center and preventing escape of material through such opening, substantially as set forth.

8. In a pulverizing-machine, the combination, with the grinding-cylinder, of the re- 25
volving center therein, composed of a bottom disk, a top ring, and radial wings, and removable wearing-plates Q on the front sides of such wings, said wearing-plates having turned ends n, extending over the outer ends of the 30
radial wings and beveled to an edge, o, at their inner ends, substantially as set forth.

This specification signed and witnessed this 15th day of May, 1885.

WILLARD M. FULLER.

JOHN J. HAYES.

Witnesses:

A. W. KIDDLE,

H. W. SEELY.