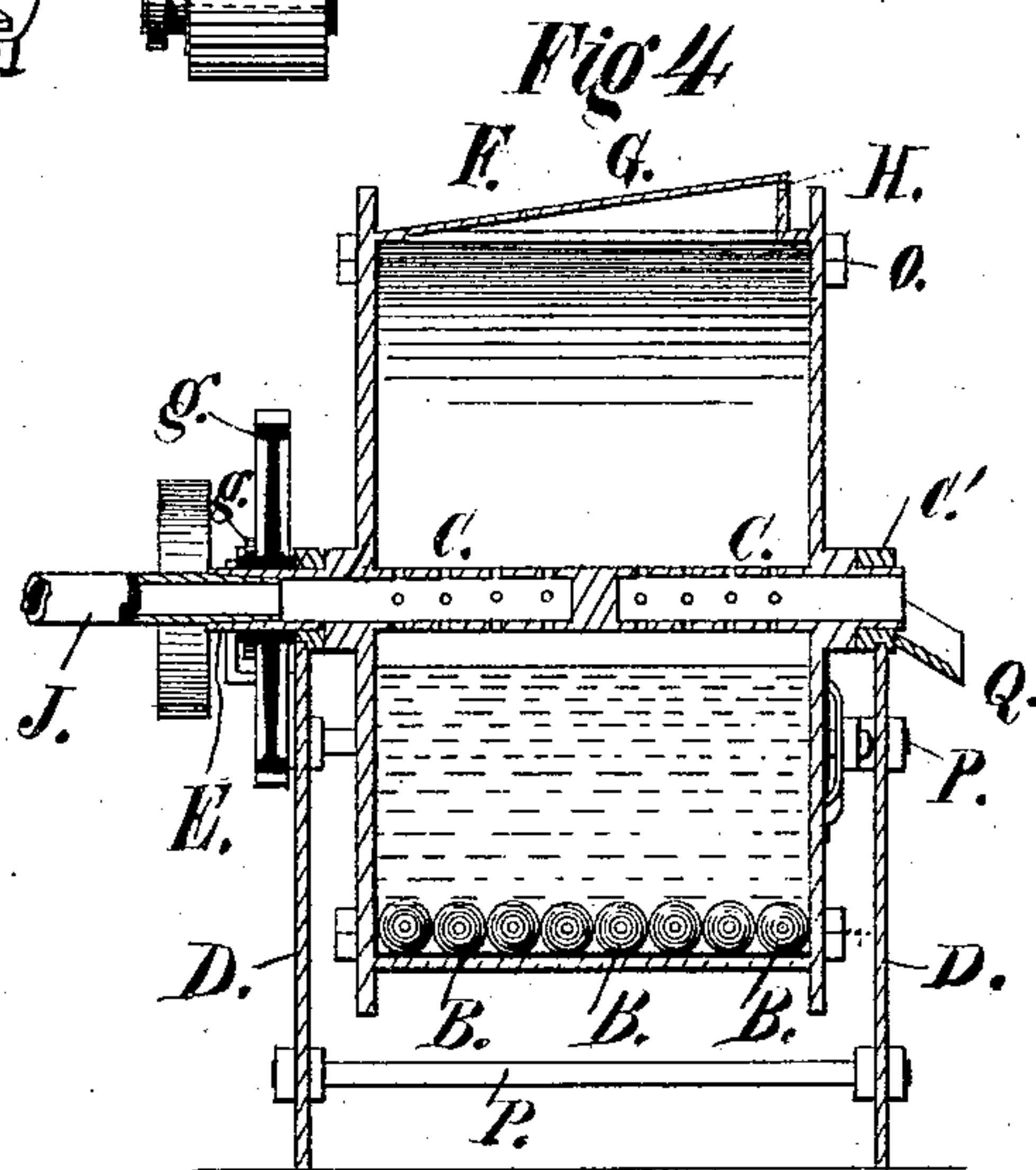
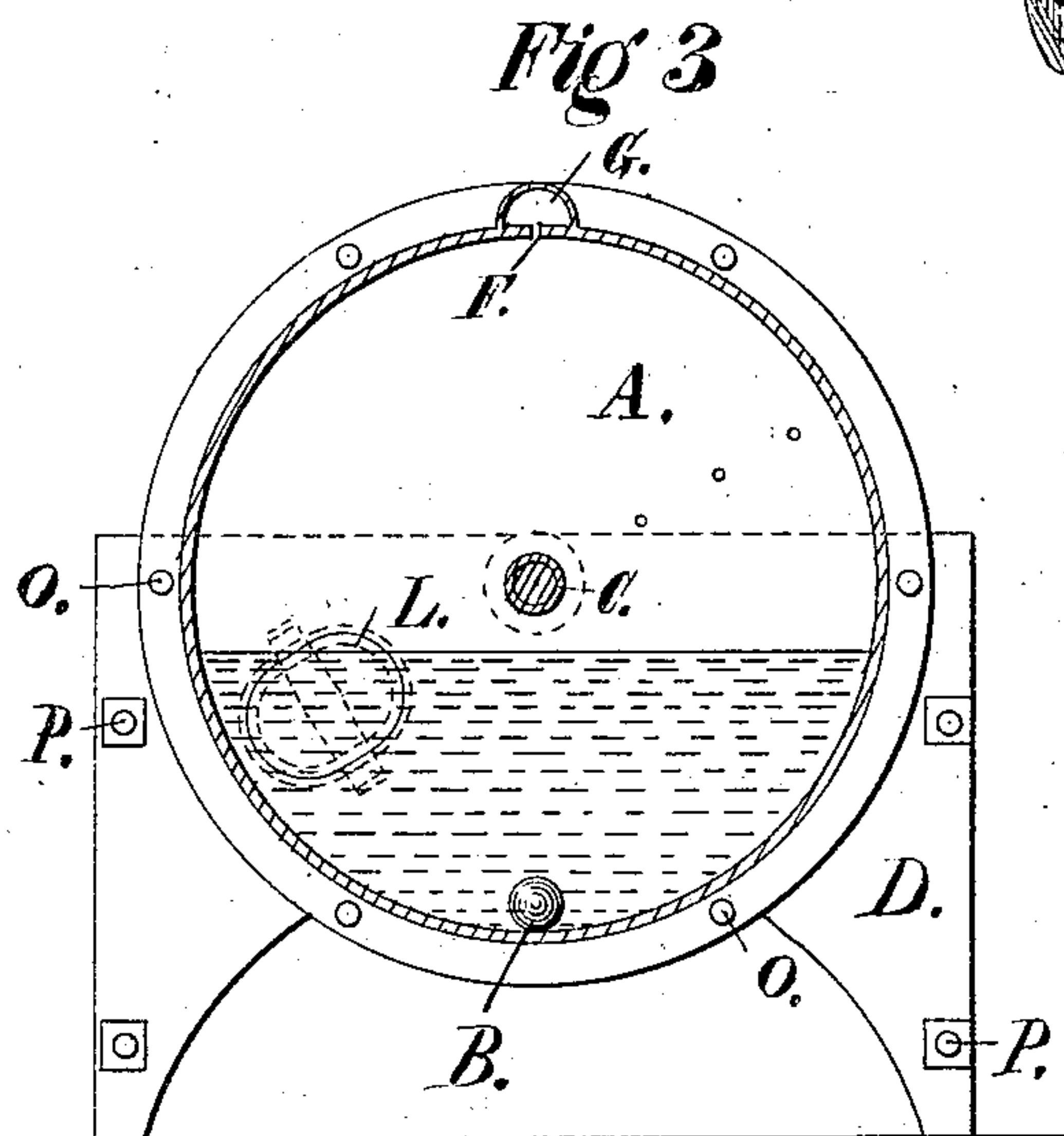
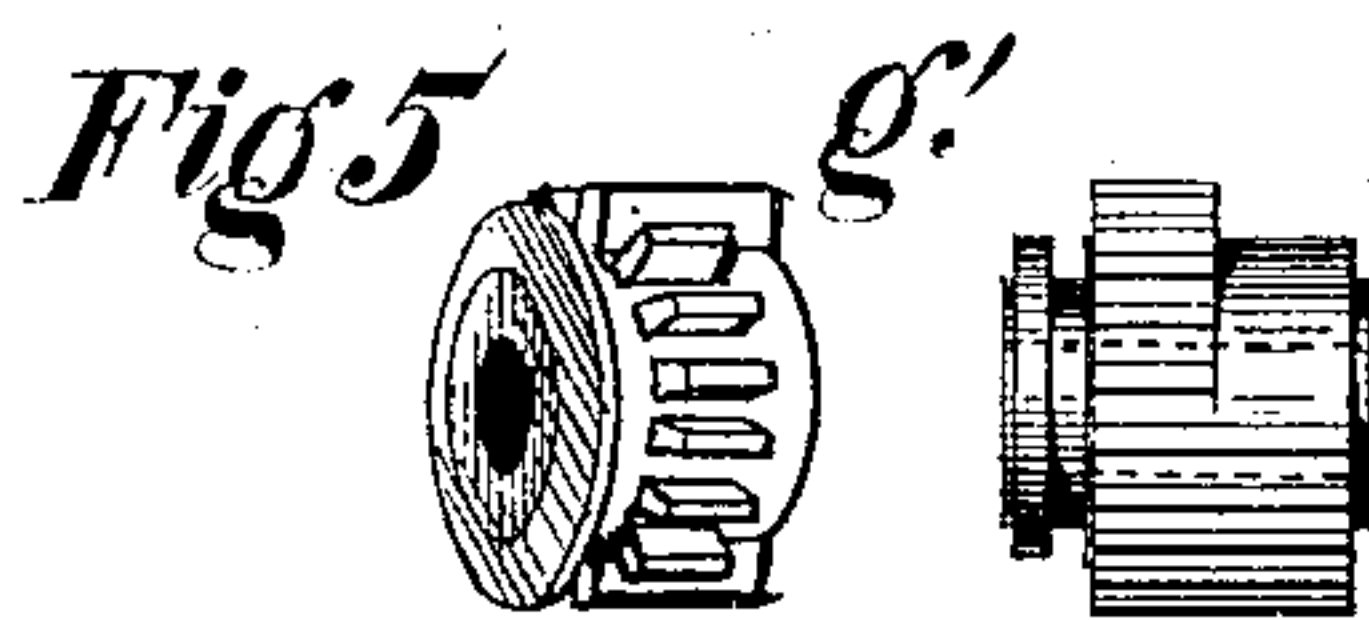
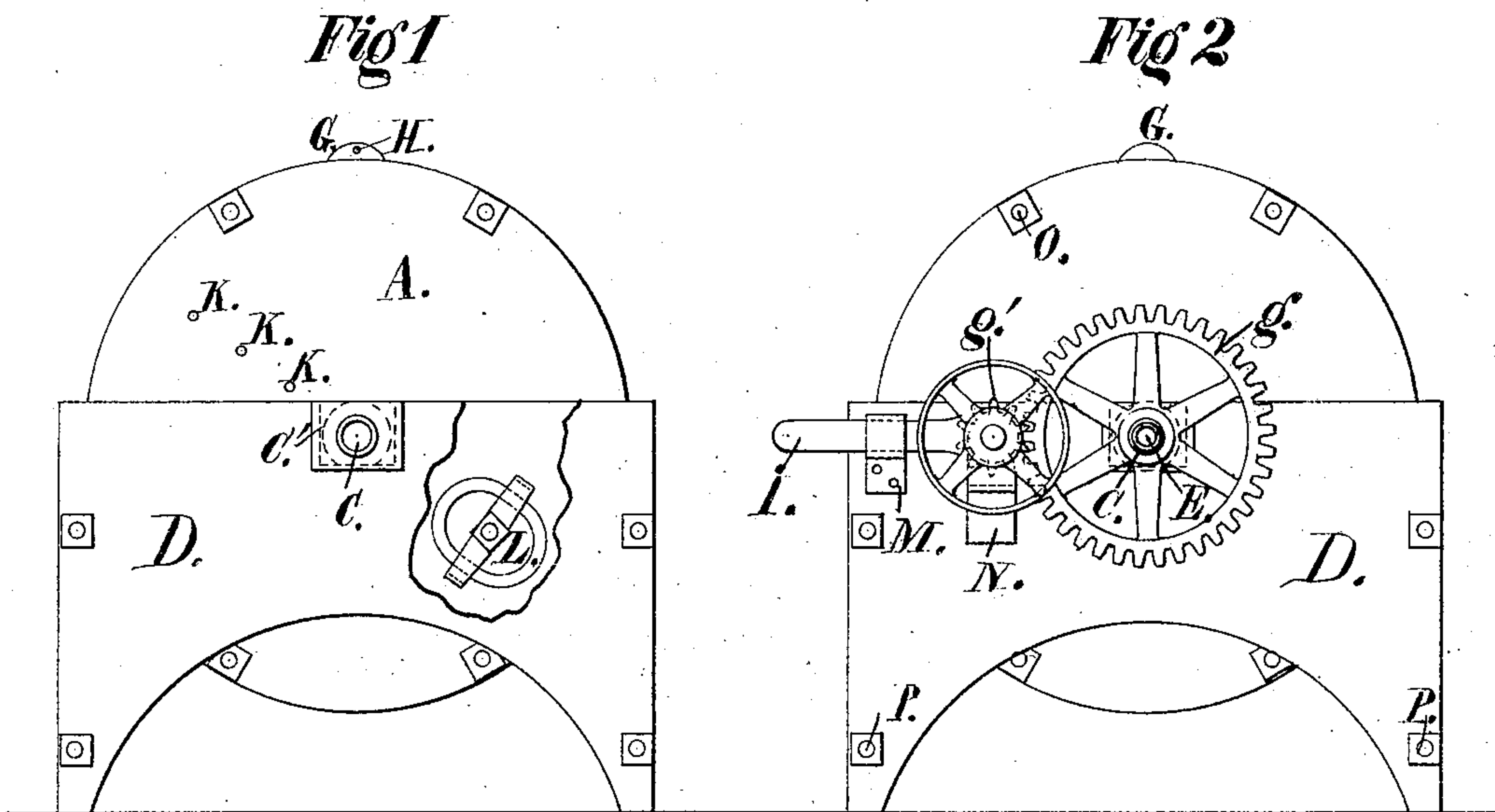


S. W. KIRK & G. R. AYRES.

Amalgamators for Ores.

No. 153,171.

Patented July 21, 1874.



Witnesses:

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UNITED STATES PATENT OFFICE.

SOLOMON W. KIRK AND GEORGE R. AYRES, OF PHILADELPHIA, PA.

IMPROVEMENT IN AMALGAMATORS FOR ORES.

Specification forming part of Letters Patent No. **153,171**, dated July 21, 1874; application filed December 16, 1873.

To all whom it may concern:

Be it known that we, SOLOMON W. KIRK and GEORGE R. AYRES, of Philadelphia, county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Amalgamators for Ores, of which the following is a specification:

The object of our invention is to separate gold and other precious metals from their ores by producing an amalgam, and while doing this to wash out and carry away with water all extraneous matters, and leave the amalgam clean and free, and to do this in a manner that is thorough, cheap, and rapid.

The machine embracing our improvements for the accomplishment of this object is hereinafter described with reference to the accompanying drawings, in which—

Figure 1 is an elevation of one end of the machine or amalgamator, while Fig. 2 is an elevation of the other end thereof. Fig. 3 is a cross vertical section, and Fig. 4 a central vertical longitudinal section, of the same; and Fig. 5 is a perspective view in detail of the pinion by which motion is given to the main cylinder A of the machine.

The walls D D and the brace-rods P P P P constitute the frame to sustain and furnish bearings for the hollow cast-iron cylinder A, provided with two heads, as shown. Centrally through the two heads extends the hollow spindle C, the outer ends of which are provided with suitable bearings in the walls D D. This spindle is not hollow all the way through, from end to end, but in boring it out a small portion, midway its length, is left solid, and on each side of this solid portion the hollow portions are, in a regular manner, perforated with holes of suitable size, for the purposes hereinafter explained. Upon one end of this hollow spindle or axle is fixed a cog-wheel, *g*, by which the cylinder A is to be revolved or oscillated by means of the double pinion *g'*, which has a shaft of its own to turn upon, as shown. The opposite end of the spindle C is furnished with a lip, *Q*, to facilitate the discharge of muddy water; but the end of that spindle bearing the cog-wheel *g* projects beyond it, and by means of a suitable bushing, *E*, forms a close joint with the pipe *J*, which is provided for the introduction of

water into the interior of the cylinder A. The said cylinder is provided in its interior with wrought-iron balls *B*, suitable in size and number for the purpose hereinafter specified, and also with a longitudinal slot, *F*, extending clear through it from end to end, and on the outside of the cylinder is attached to the same, so as to cover the slot, the trough or recess *G*, which increases in depth from one end to the other, at the rate of, say, three-fourths of an inch to every lineal foot of its length, and is provided with a discharge-orifice at *H*. The cylinder A is provided with discharge-holes *k k k*, which may be closed by wooden plugs, and a feed-hole, *L*, which is closed by a plate, as shown in Figs. 1 and 3, the inner surface of the plate being flush with the same surface of the cylinder itself. The pinion *g'* is made sufficiently long for two divisions or parts, one of which is a full one, having a regular series of teeth, while the other has likewise a regular series; but it extends only half-way around, or less, and the pinion-shaft has sufficient play lengthwise so that, by means of the lever *i* and catch *M*, either the full or the mutilated portion of the pinion may be thrown into gear with the cog-wheel *g*, and so held in position as may be desired. On the pinion-shaft is a band-pulley for the communication of power to the pinion.

The operation of the machine is substantially as follows: The cylinder A is duly charged with a quantity of prepared pulp, according to its capacity, and with a quantity of mercury sufficient for amalgamation, with the precious metals contained therein, and the full portion of the pinion is thrown into gear with the cog-wheel *g*, and then the power applied, so as to cause the cylinder to make from fifteen to twenty revolutions per minute, and the water is introduced through the pipe *J* into the hollow spindle C, from which it is forced through the holes therein into the interior of the cylinder A, to soften and wash the contents of the same, and at the end of five or six hours or more the contents will have become of a thin creamy consistence, the wrought-iron balls *B* acting as grinders to reduce and disintegrate the ores; and during the operation the extraneous matter of lighter character will float in the water, and will be

constantly discharged with it through the discharge end of the hollow spindle at Q. Water also bearing these refuse matters will be discharged through the holes *k k k*. When this part of the process has been completed, the mutilated portion of the pinion will be thrown into gear with the cog-wheel *g*, and will impart to it an irregular oscillating or rocking motion, and, the trough *G* being at the lowest point, the amalgam will be sifted through the slot *F*; and while this last operation is going on, fresh water continues to flow into the cylinder and become loaded with refuse matter, and then be discharged through the holes in the rear end of the hollow spindle and out at Q. In this operation the mercury will not flower, and at the end of it the amalgam all ought to find its way into the trough *G*, and all other matters find their way outside of the cylinder in the form of muddy water; and then, by reason of the inclined bottom of the trough *G*, upon removing the plug from *H*, the amalgam will be discharged in a condition ready for the retort.

We are aware that wrought-iron cylinders with wrought-iron balls have been heretofore used for pulverizing ores. We, therefore, disclaim them for that purpose.

We are aware, also, that a revolving wooden barrel containing pieces of wrought-iron for the purpose of taking up the chlorine, known as the Freiburg amalgamator, has been used for amalgamation, and we disclaim that, also.

We are also aware that in the United States patent of F. N. Du Bois, dated April 3, 1866, No. 53,590, for an improved amalgamator, there is shown and described a hollow cylin-

der serving as the axle or spindle of a large revolving cylinder, and that said hollow spindle is provided in the inside of the large cylinder with two orifices or openings only, and the hollow between these two openings is entirely closed up. Now, we disclaim that construction and confine ourselves to our own, as herein described; and

What we do claim as our said invention is—

1. The combination of the large cylinder *A* and the hollow spindle *C*, which is perforated in a regular manner with small holes, except in the solid central portion, constructed substantially as shown and described, for the purpose set forth.

2. The combination of the pinion *g'*, having two divisions and an adjustable shaft, as and for the purpose described, the cog-wheel *g*, the spindle *C*, and cylinder *A*, substantially as and for the purpose set forth and described.

3. The cylinder *A*, having the narrow slit *F* through its shell, extending its length, and provided with the trough *G*, having the discharge-hole *H* fastened upon the outside thereof, so that said slit shall be opposite the center of the trough *G*, and so that there shall be on the outside of the cylinder *A*, and inside the trough *G*, a pocket on each side of the slit *F* for the retention of the amalgam, constructed and arranged substantially as and for the purpose described.

SOLOMON W. KIRK.
GEO. R. AYRES.

Witnesses:

J. TYSON,
HIRAM KIRK.