

No. 693,289.

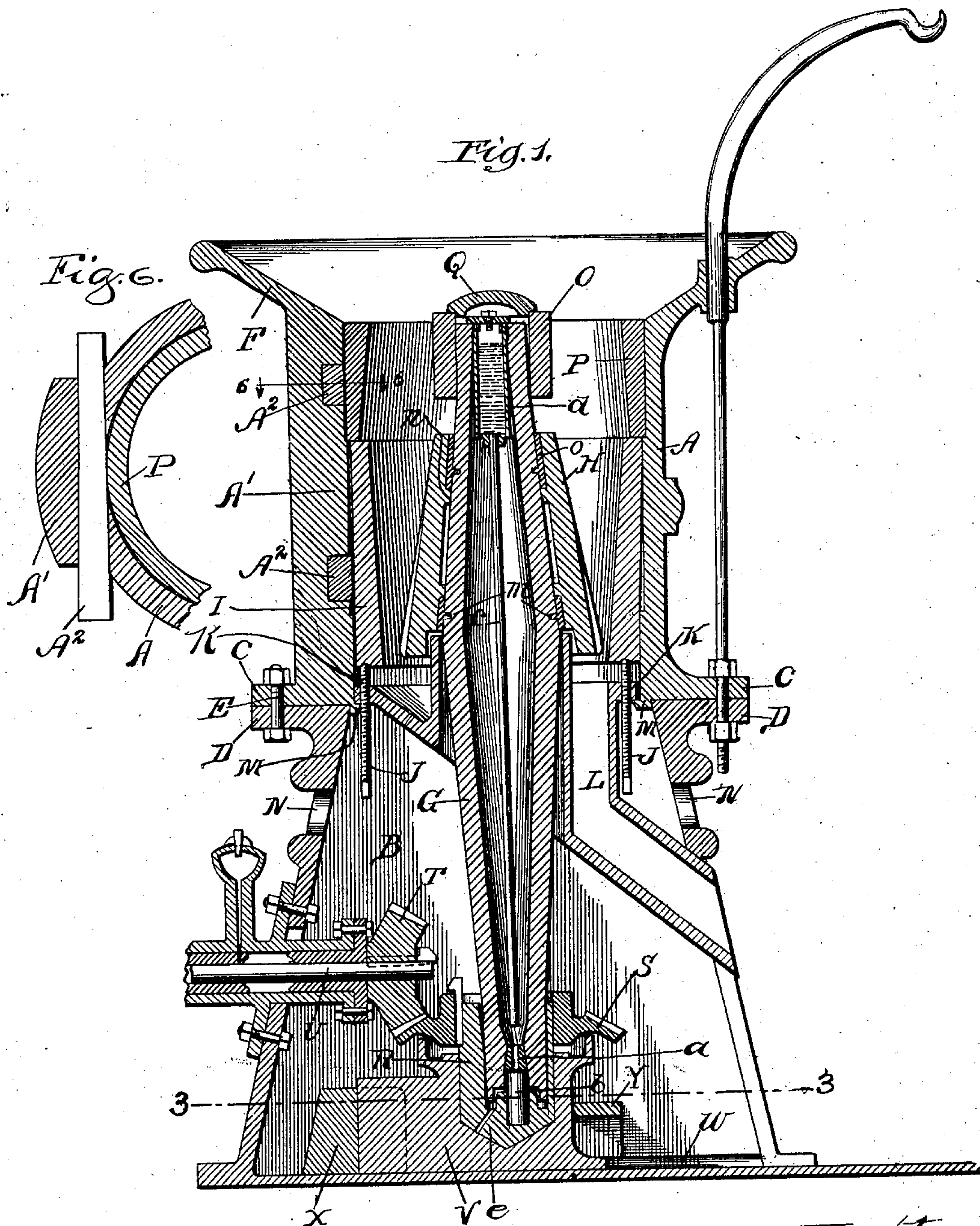
Patented Feb. 11, 1902.

G. LOWRY.
STONE CRUSHER.

(Application filed May 14, 1900.)

(No Model.)

3 Sheets—Sheet 1.



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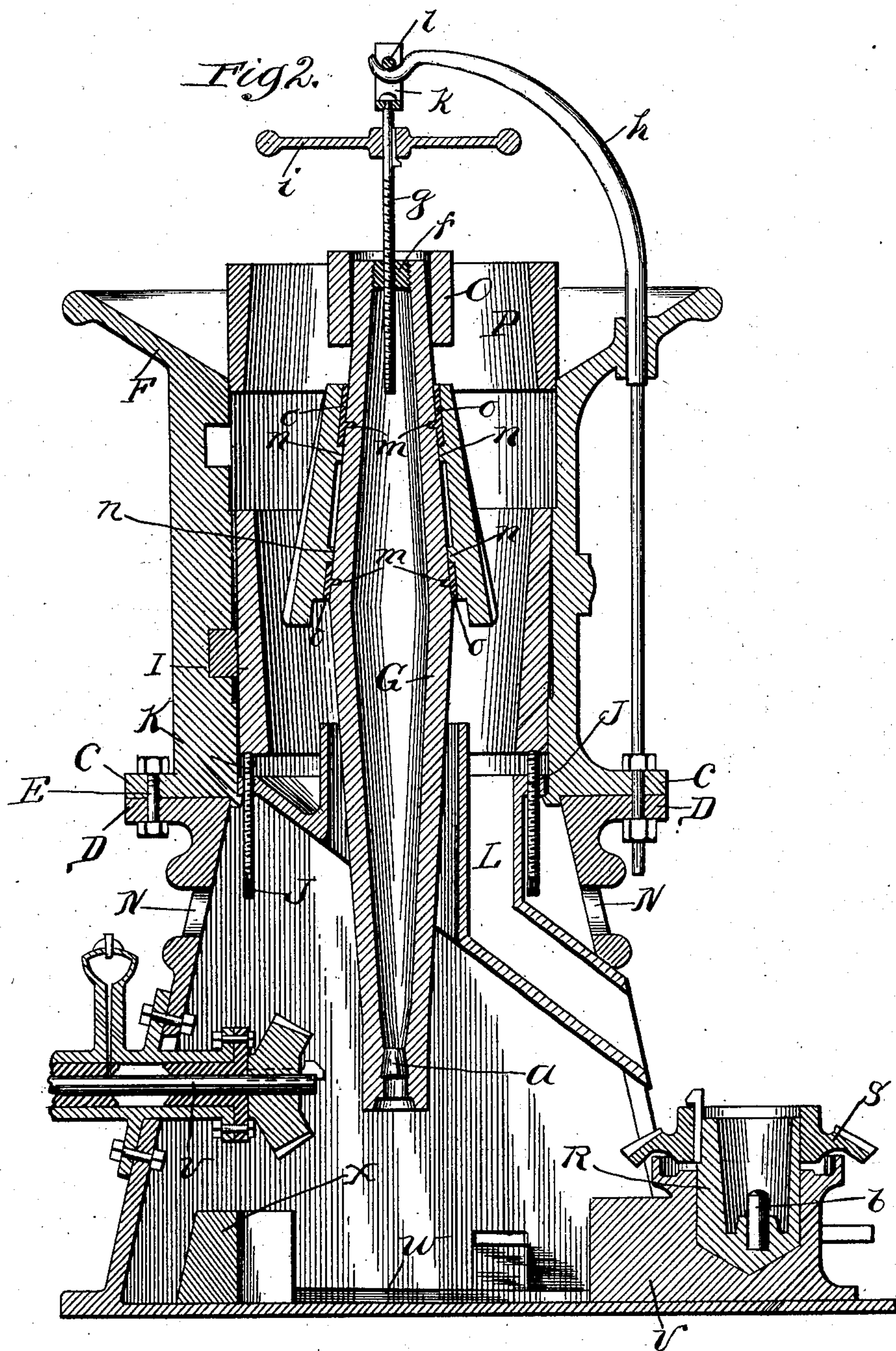
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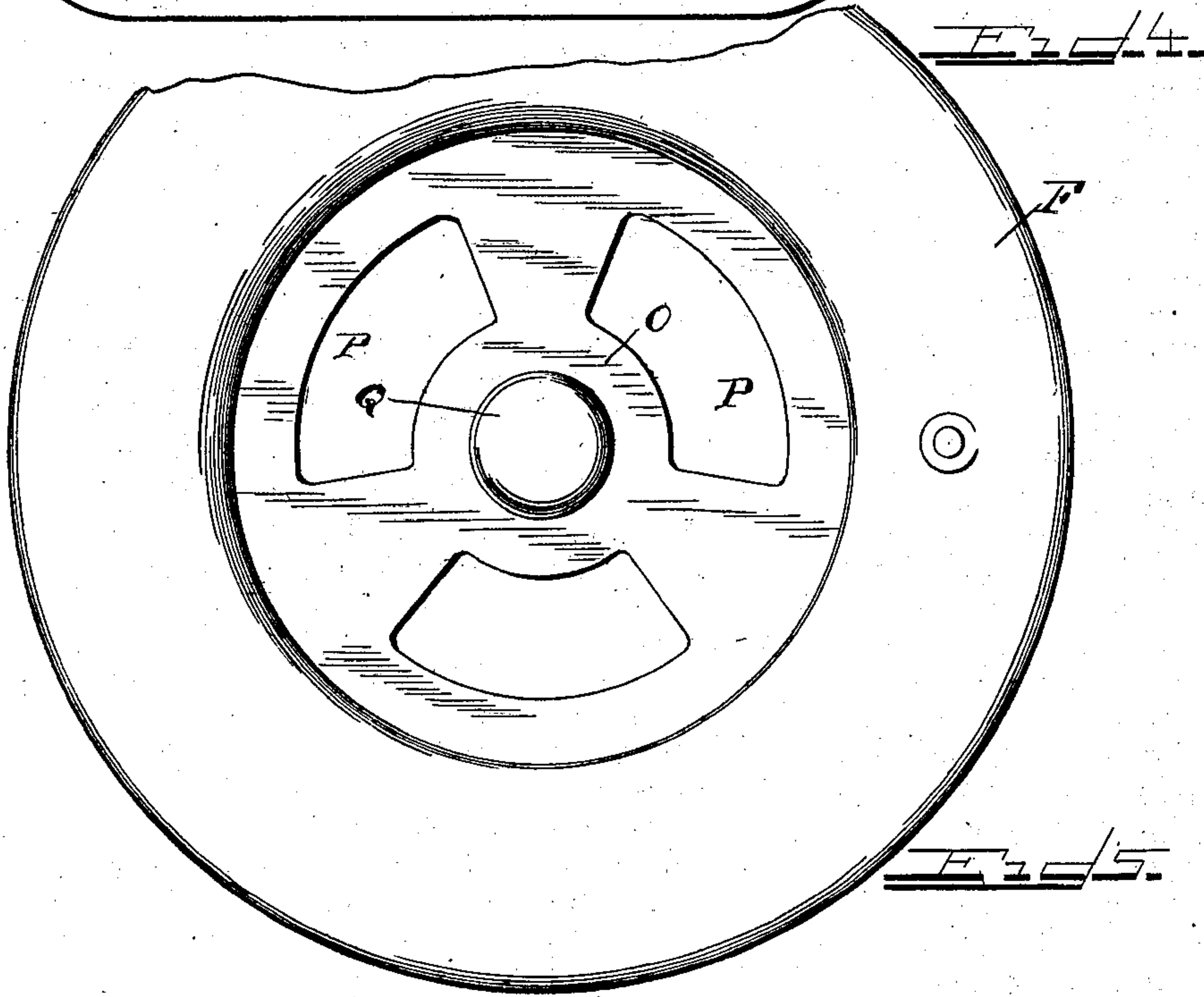
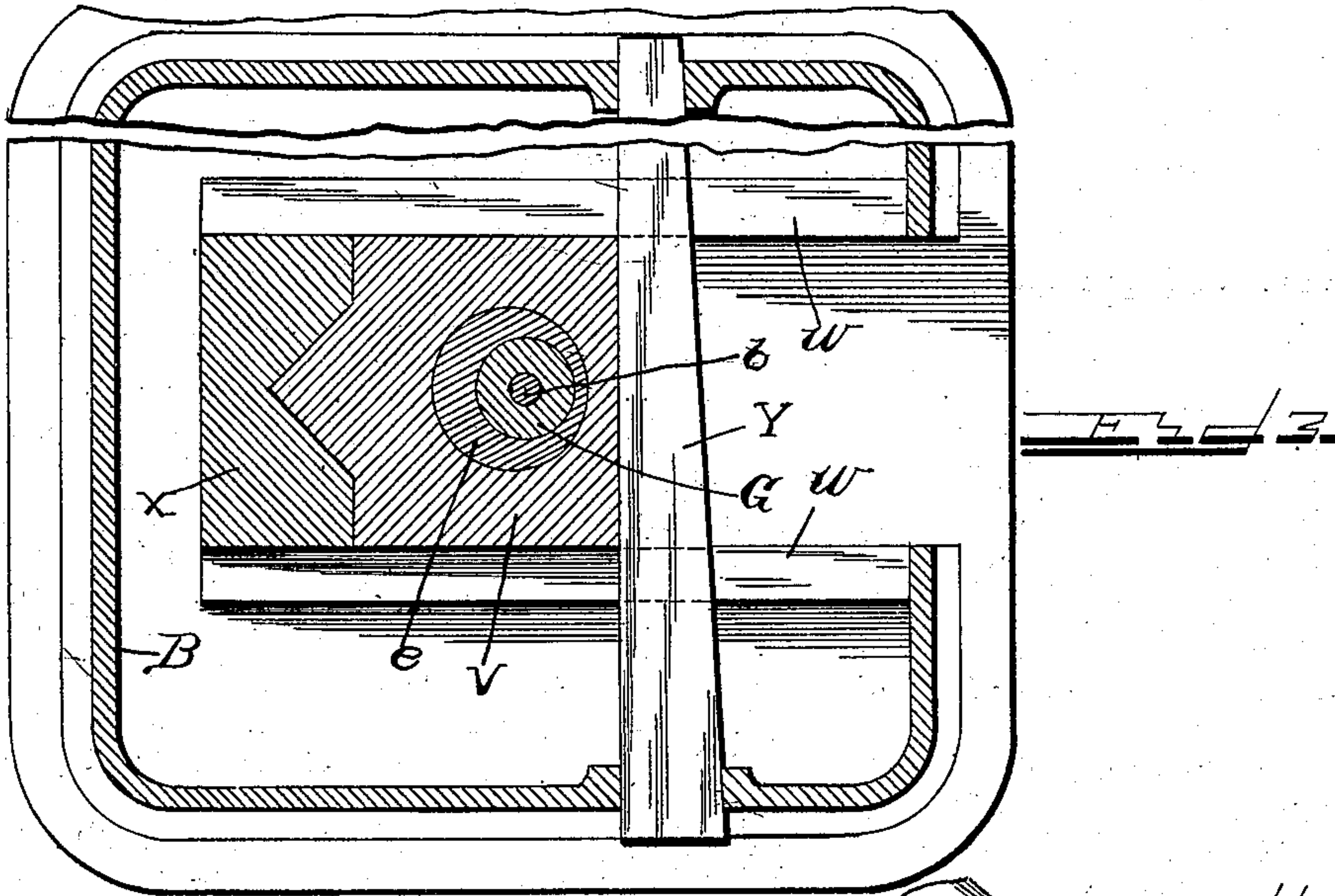
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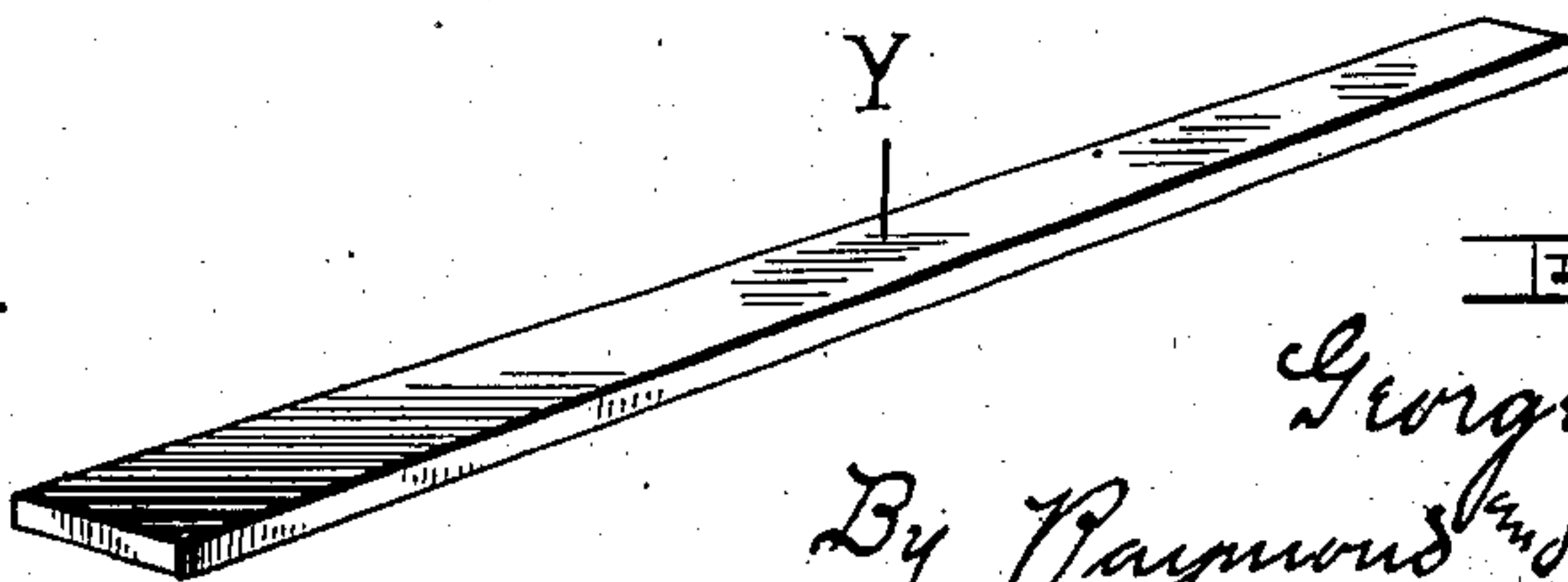
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3 Sheets—Sheet 3.



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UNITED STATES PATENT OFFICE.

GEORGE LOWRY, OF TIFFIN, OHIO.

STONE-CRUSHER.

SPECIFICATION forming part of Letters Patent No. 693,289, dated February 11, 1902.

Application filed May 14, 1900. Serial No. 16,652. (No model.)

To all whom it may concern:

Be it known that I, GEORGE LOWRY, a subject of the Queen of Great Britain, residing at 201 Monroe street, Tiffin, in the county of Seneca and State of Ohio, have invented certain new and useful Improvements in Stone-Crushers, of which the following is a specification.

This invention relates to improvements in that class of stone-crushers in which the crusher-head is mounted upon a gyratory shaft driven by suitable crown-gearing at the lower end thereof, from which the shaft is separable.

This invention has for its objects generally to simplify and cheapen the construction of such machines, to facilitate access to the various parts thereof for the purpose of repairing or renewing the same, to secure greater compactness, and to promote the general efficiency of such machines.

My invention has more particularly for its objects to provide a hollow gyratory shaft of novel construction, from which flows many advantages in the operation of the machine, especially in insuring constant oiling of the working faces; to provide for a very rapid, direct, and prompt feed to the crusher-head, which avoids the slow and racking nibbling heretofore occurring when the crusher-head is taking hold of the lumps as they are fed in; to provide for the ready removal of the crown-gear and eccentric bearing for the gyratory shaft whenever it is desired to inspect, repair, or renew the same without the necessity for dismantling the machine; to provide simple and expeditious means for raising and supporting the gyratory shaft whenever it is desired to withdraw its driving-gear; to save labor as well as secure a better fit between the gyratory shaft and the crusher-head by a novel style of packing, which at the same time reduces to the minimum the liability of breakage to said shaft, and to secure certain other novel and advantageous features in the construction of machines of this class, all as will hereinafter appear by reference to the accompanying drawings, in which—

Figure 1 is a central vertical section through a stone-crusher embodying my invention, showing it in condition for work. Fig. 2 is a view similar to Fig. 1 but showing the gy-

ratory shaft raised and suspended and the eccentric bearing and driving-gear thereof drawn outside of the casing. Fig. 3 is a horizontal section on the line 3 3 of Fig. 1. Fig. 4 is a plan view. Fig. 5 is a detail perspective view of the wedge, and Fig. 6 is a detail section on line 6 6 of Fig. 1.

Similar letters of reference indicate the same parts in the several figures of the drawings.

Referring by letter to the accompanying drawings, A indicates the main shell or casing, in which the crusher-head is located and works, and B the base upon which the casing A rests and to which it is detachably secured, registering holes being provided in the horizontal flanges C and D on the opposing ends of said casing and base, through which the fastening-bolts E pass to firmly unite the parts together. It will be observed that the hopper F is cast in a single part with the casing A, which makes for greater strength and simplicity in the construction of the machine. Extending axially through the base and casing is the gyratory shaft G, carrying thereon, near its upper end, the crusher-head H, which works within the crushing-ring I, fitting within the casing A, the working faces of said ring and head being oblique or at an angle to each other, so that by adjusting the vertical position of the ring within the casing the degree of fineness with which the stone will be crushed will be correspondingly adjusted, as is usual in machines of this class. In the present instance I show the interior of the casing as cylindric, with corresponding circular bearings upon the outer periphery of the ring, which permits endwise movement of the ring in the casing, the ring resting at its lower edge upon the ends of screw-bolts J, working through screw-threaded holes in the annular flange K of the chute L, said bolts forming the seat for said ring and said flange in turn resting upon the internal annular shoulder M, formed upon the casing A at the lower end thereof. This construction affords a ready means for adjusting the position of the ring within the casing, suitable hand-holes being provided in the base through which the proper tools may be inserted and applied to said adjusting-bolts. It will thus be seen that the weight of the crushing-ring I is utilized to hold the

flange of the chute firmly upon the annular shoulder of the casing by reason of being supported upon the screw-bolts J, passing through said flange, and thus is effected a practically dust-proof joint between the chute and the casing, so as to reduce to the minimum the liability of dust passing into the lower part or base of the machine, where the gear is located. This is a most important advantage in a machine of this character, because it not only serves to retain the chute in rigid position, but also protects the gearing as against clogging by reason of the lodgment of dust thereon, which is a common difficulty with machines of this class.

The upper end of the gyratory shaft is journaled in the hub O of a bearing-ring P, in which the hub is centrally supported by spider-arms, as more clearly shown in Fig. 4, the bearing-ring having a snug fit in the upper end of the crushing-ring I, the gravity of the bearing-ring being sufficient to hold it firmly in place during operation. As seen, the bearing-ring P is located entirely below the hopper F, leaving the latter entirely free (with the exception of the cap Q) from projecting portions of the crushing mechanism. In practice I prefer to have the bore of the hub O extend entirely through the same and a cap Q provided therefor to cover the bearing-orifice when the machine is in use. When, however, it is desired to have access to the interior of the casing or of the bearing for the upper end of the gyratory shaft or to remove the gyratory shaft from the crusher E, the cap Q can be readily removed, and by means of appliances which will be described farther on the gyratory shaft, carrying with it the bearing-ring, may be bodily lifted and replaced in position without the necessity for unbolting any of the parts. The lower end of the gyratory shaft rests in an eccentric bearing R, to which a rotary motion is imparted by a crown-gear S, keyed to said bearing, and with which gear meshes a beveled gear T, keyed upon a shaft U, journaled in the base B of the crusher at one side thereof, to which power may be communicated in any well-known and convenient manner. It will be understood that the eccentric bearing R when rotated imparts a gyratory action to the shaft G in the usual way, and as there is always considerable wear at this point and danger of clogging both in the bearing and in its operating mechanism it is desirable to have the bearing and the operating-gear readily accessible. To this end I have the bearing R stepped with a snug fit into a foot-block V, resting, preferably, upon the bottom of the base and guided between suitable ways W, cast upon or otherwise rigidly secured to the base, an opening being provided in the base, at one side thereof, of sufficient size to permit the foot-block, with the bearing and crown-gear in place, to be drawn outside of the base whenever the gyratory shaft is lifted out of the eccentric

bearing, so as to permit of such movement. When in working position, the foot-block fits tight against an abutment X, extending across the base between the guideways W and having a V-shaped recess to receive a similar projection formed on the block, the recess and projection combining to form a substantially interlocking connection, which is held firmly in position by the key Y, extending across the opposite front face of the foot-block, as clearly shown in Fig. 3, the key finding a bearing at its ends, respectively, in the base of the machine. Of course whenever it is desired to draw the foot-block out of the base the key must be first withdrawn or driven out; but when it is in proper and working position it serves to hold the bearing as firmly as if it formed a part of the base. By this construction I provide an exceedingly simple and effective means for readily removing the eccentric bearing from the case where it can be readily and thoroughly inspected and repaired and at the same time affording access to the lower end of the gyratory shaft and the driving-gears while the bearing is removed. This readily-removable bearing constitutes an important feature of my invention and is of great advantage in the construction as well as operation of machines of this class, because the base of the machine is solid and may be rested directly upon a solid foundation, for it is not necessary, as heretofore, to remove the bearing through the bottom of the machine, which requires the machine to be supported on insecure foundations, with the bottom thereof free to permit access to and removal of the bearings.

Besides these general features of construction my invention embodies numerous other novel and important features that are advantageous and beneficial to both the manufacturer and the user, which I will now proceed to point out.

First, I employ a hollow cast steel gyratory shaft, the walls of which are substantially uniform in thickness from end to end, which, while considerably lighter and cheaper than the solid shafts, is equally strong, while it affords an entirely satisfactory means for oiling the eccentric bearing thoroughly, which is all important in a machine of this kind. Thus the bore of the shaft is somewhat contracted near the lower end thereof, and a hardened-steel plug *a* is driven firmly into the contracted portion of the shaft, the lower end of said plug being preferably concave or tapering to rest upon the correspondingly convexed or tapered end of a pin *b*, which projects up from the bottom of the eccentric bearing, and upon which pin is carried the entire weight of the shaft, there being sufficient play between the shaft and the bearing to allow of the necessary gyration thereof without undue friction. The plug *a* is centrally bored by a small hole, through which oil is fed constantly and directly to the bearing either by a pipe *c* or a rope suspended

from the bottom of an oil-tank *d*, which is suitably secured in the upper end of the bore of the shaft. In the drawings the upper end of the tank is shown as screw-threaded to fit corresponding threads formed at the end of the bore in the shaft. Thus it will be seen that there is a constant supply of oil direct to the bearing, which is wholly isolated from contact with the dust resulting from the crushing operation, and by means of suitable passages, such as the passage *e* through the eccentric bearing from the shaft-socket therein, said bearing as it works in the foot-block will be likewise thoroughly oiled from the same source.

When it is desired to raise the gyratory shaft, the oil-tank will be removed, an interiorly and exteriorly threaded block *f* will be screwed into its place, a threaded rod *g* will be passed through said block, and the upper end of the rod will have a pivot or swivel connection with and be suspended from a swinging crane or gibbet-arm *h*, pivoted to the casing A, at one side thereof, as plainly shown in Fig. 2. When not in use for this purpose, the gibbet-arm will be swung around out of the way of the feed, as shown in Fig. 1. Upon the screw-rod *g* is keyed a hand-wheel *i*, by means of which the rod may be rotated, and thus lift the gyratory shaft, carrying with it the bearing-ring P, which parts may be held suspended as long as desired and high enough to permit the eccentric bearing to be drawn outside of the base, if desired. Obviously other means may be employed for raising the shaft, or an ordinary block and tackle, with a proper engaging device for the upper end of the gyratory shaft, would answer the same purpose; but the particular means herein shown I believe to be entirely novel and are quite satisfactory. A convenient means of supporting and attaching the screw-rod *g* to the gibbet-arm is furnished by the link *k*, which is U-shaped, so that the sides thereof embrace a hook on the end of the gibbet-arm and have a cross-pin *l* therethrough, which rests upon the hook and which enables the link to be readily detached from the hook whenever it is desired to remove the lifting mechanism.

Another important feature is the manner of securing the crusher-head upon the gyratory shaft by providing annular grooves *m* in the upper taper of the shaft and internal annular flanges *n* upon the head, of a diameter substantially equal to the periphery of the shaft at the points where they come to a bearing. This provides, as between the upper and lower ends of the crusher-head and the shaft, annular spaces located between the ends of the crushing-head and said flanges, which flanges have direct contact with the periphery of the shaft, into which I run a filling of Babbitt or other suitable metal *o*, which metal also runs into the grooves *m* in the shaft and becomes firmly keyed in position. Of course this arrangement may be reversed and the flanges be provided on the shaft instead of on the

crusher-head, without materially changing the result. After cooling the joint can be calked up tight from the outside and all boring, planing, and fitting, can be dispensed with, as the chilled casting constituting the head can be taken direct from the foundry and placed upon the shaft and rigidly secured there in the manner described. When the crusher-head is used up, it can be driven off and another put on and calked hard and fast without any fitting or boring. I have found by experience that when so used the Babbitt metal will last as long as the shaft will last, and it will thus be seen that a great deal of labor and expense is avoided, both in the original construction of the machine as well as replacing worn or broken parts. With such a construction no lock-nut, key, or other fastening device is necessary to hold the head in place, as the Babbitt-metal filling and the metal of the crusher-head and shaft will adhere to each other so tightly, and especially when fitted on a taper, as to render it unnecessary to employ such extra fastening devices. Another advantage which results from this construction is that the liability to breakage of the shaft is reduced to the minimum, first, because of the large diameter of the shaft at the usual breaking-point afforded by my method of construction, and, second, because of the interposition between the shaft and the crusher-head of the relatively-yielding packing of Babbitt metal, which also reduces the tendency to crystallize the shaft immediately below the crusher-head, where the breakage usually occurs.

As before stated, the bearing-ring P will be held in position by gravity alone and can therefore be readily removed without the necessity for removing any bolts or fastening device. This construction of the ring also affords a wide open top for feeding, as shown in Fig. 4, permitting very large stones to be fed into the machine. The inner periphery of the fulcrum bearing-ring, it will be noticed, tapers from the bottom to the top, thus giving freedom for a long straight drop for stones right into the crusher-jaws and tending to prevent an upward or return movement of the stones, thereby avoiding the time lost in nibbling for a grip or bite, as in the prior style of machines where the taper of the feed-opening is exactly the reverse. When the stone passes into the feed-opening, it is instantly free on all sides, and instead of tending to drag back and resist the bite of the crusher it allows the stones to go directly to the crusher-jaws with its full gravity, thus giving a quick and rapid feed, which greatly increases the capacity of the machine.

It will be observed that the gyratory shaft, the fulcrum-bearing for the upper end thereof, the crushing-ring, and the chute may all be removed from the machine without disconnecting the casing from the base or moving the base from its foundation, as all of

these members may be drawn out of the upper end of the casing, which construction is of great convenience and considerable advantage in a machine of this class.

- 5 In machines of this class quick feed and prompt crushing action, facility of access to the interior of the machine and the interiorly-located parts thereof, both in the casing and the base, as well as simplicity in construction and the reduction of liability to breakage of any of the parts, coupled with the capability of rapid repair, are of the utmost importance, both practically and commercially, saving cost in original construction, in operation, in repairs, and in the loss of time and service of the machine incident to repairs, and in my machine all of these desirable features, advantages, and capabilities are embodied.
- 20 It is necessary in machines of this class to secure the fulcrum-ring and the crushing-ring in the casing as against endwise movement during operation, and many means have heretofore been provided for accomplishing this result. I have devised a novel means for this purpose, (shown more clearly in Figs. 1 and 6,) whereby the fulcrum-ring and the crushing-ring may have a loose fit in the casing, so that they may be readily inserted therein and removed therefrom. To this end I provide an enlargement A' of the casing A at one side thereof and pierce the same tangentially through to the inner periphery thereof, so as to expose the outer periphery of the fulcrum and crushing-rings, and into such openings I drive the tapered keys or wedges A², which bind tightly against the peripheries of said rings, and thus lock them firmly within their seats in the casing. This provision is both novel and important in a machine of this class, as it avoids the usual screw-threaded fastening devices, which are difficult to maintain and which could not be dispensed with without such a snug and tight fit of the rings in the casing as to not only require expensively-accurate machine-work, but which would render it very difficult to remove the rings after the machine was once in operation.
- 50 Obviously various modifications of my invention may be made without departing from the spirit thereof, and all such changes are contemplated by the claims.

55 Having thus fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a stone-crusher, the combination with the casing, the gyratory shaft and the crusher-head, of a crushing-ring longitudinally adjustable in said casing, a chute provided with a horizontal external flange, an internal annular shoulder on the casing on which said flange rests and screw-bolts threaded through said flange and forming an adjustable seat for the crushing-ring, substantially as described.
- 65 2. In a stone-crusher, the combination with the casing, the gyratory shaft and the crusher-

head, of a crushing-ring longitudinally adjustable in said casing, a chute provided with a horizontal external flange, an internal annular shoulder on the casing on which said flange rests, and an adjustable seat carried by said flange, for the crushing-ring. 70

3. In a stone-crusher, the combination with the casing, a gyratory shaft and the crusher-head, of a crushing-ring longitudinally adjustable in said casing, a chute provided with a horizontal external flange, an internal annular shoulder on the casing on which said flange rests, an adjustable seat carried by said flange, for the crushing-ring, and means for retaining said ring in fixed position on its seat. 75 80

4. In a stone-crusher, the combination with a gyratory shaft having a tapering body portion, of a crusher-head having a correspondingly-tapering axle-opening therethrough and provided with annular flanges on the inner periphery thereof, said flanges closely fitting the shaft, of a filling of Babbitt metal in the annular spaces at the opposite ends of said head beyond said flanges, substantially as described. 85 90

5. In a stone-crusher, the combination with a gyratory shaft having a tapering portion, of a crusher-head having a correspondingly-tapering axle-opening therethrough and internal annular flanges on said head closely fitting on said shaft, said shaft being provided with annular grooves above and below said flanges and a filling of Babbitt metal in the annular spaces at opposite ends of said head, substantially as described. 95 100

6. In a stone-crusher, the combination with a gyratory shaft, a power-shaft carried by the frame of the crusher, an eccentric bearing for the lower end of said shaft, and operating mechanism mounted on said bearing and normally connected with said power-shaft, of a foot-block in which said bearing is stepped, having a sliding connection with the base of the machine, and means for securing the same in position, the movement of said block disconnecting the power connections. 105 110

7. In a stone-crusher, the combination with the gyratory shaft, means for operating the same and an eccentric bearing for the lower end thereof, of a foot-block in which said bearing is stepped, said bearing being removably seated in and having an interlocking connection with the base of the machine and a key for locking the same in position, substantially as described. 115 120

8. In a stone-crusher, the combination with a gyratory shaft, the eccentric bearing and the crown-gear keyed thereto, of the foot-block in which said bearing is stepped, guides for said block, an abutment on one side thereof in interlocking connection therewith, and a key on the opposite side thereof for holding the same against said abutment whereby said block carrying the bearing is removably secured in fixed position and may be drawn out through an opening in the side of the ma- 125 130

chine-base, substantially as and for the purpose described.

9. In a stone-crusher the combination with a gyratory shaft, of a crusher-head of greater
5 internal diameter at its ends than the body of said shaft, projecting flanges upon one of said members closely fitting the periphery of the other member, the annular spaces between the flanges and the ends of the crushing-head

being open at their outer ends, and a filling 10 of Babbitt metal in said annular spaces, at the opposite ends of said head, substantially as described.

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