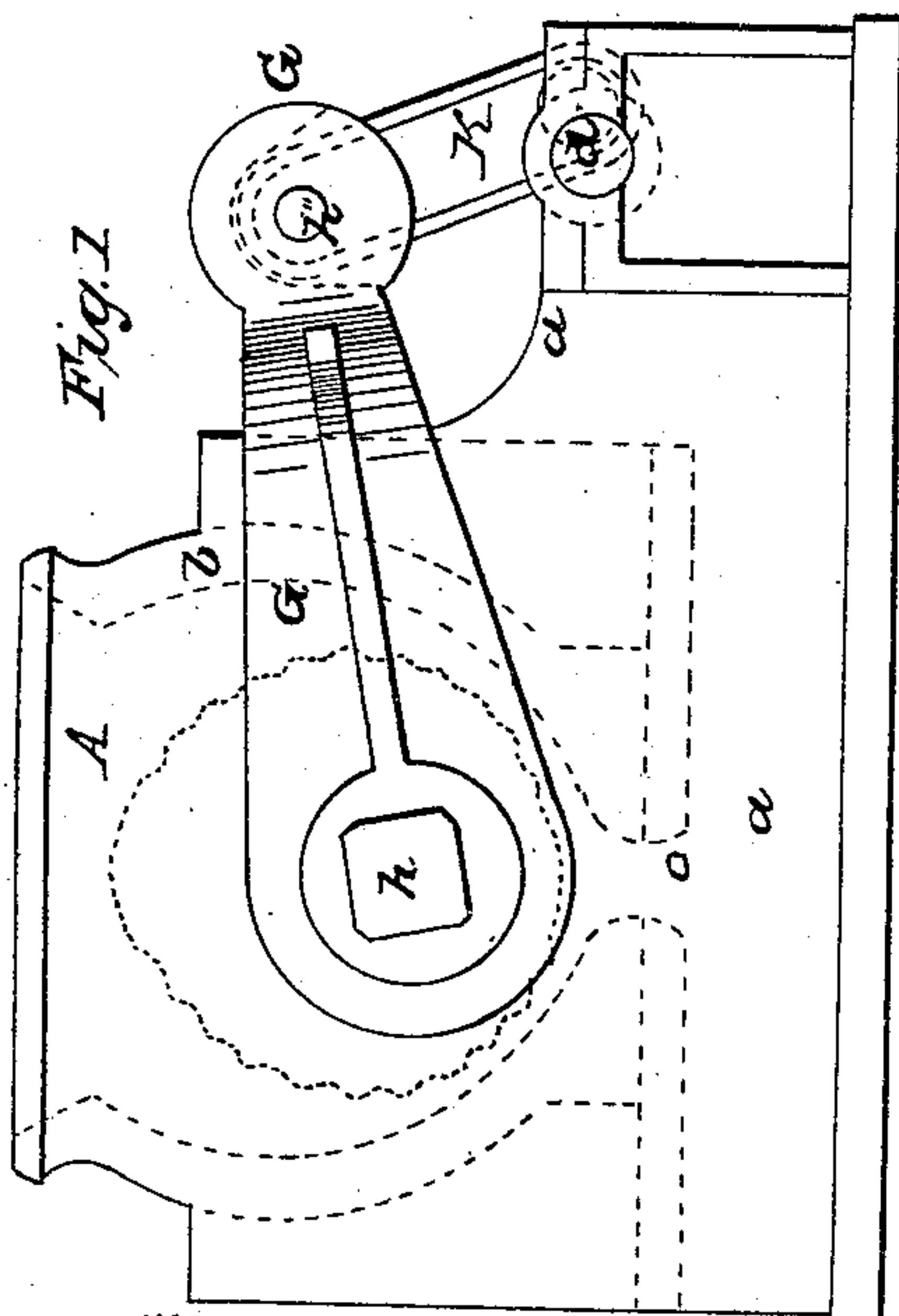
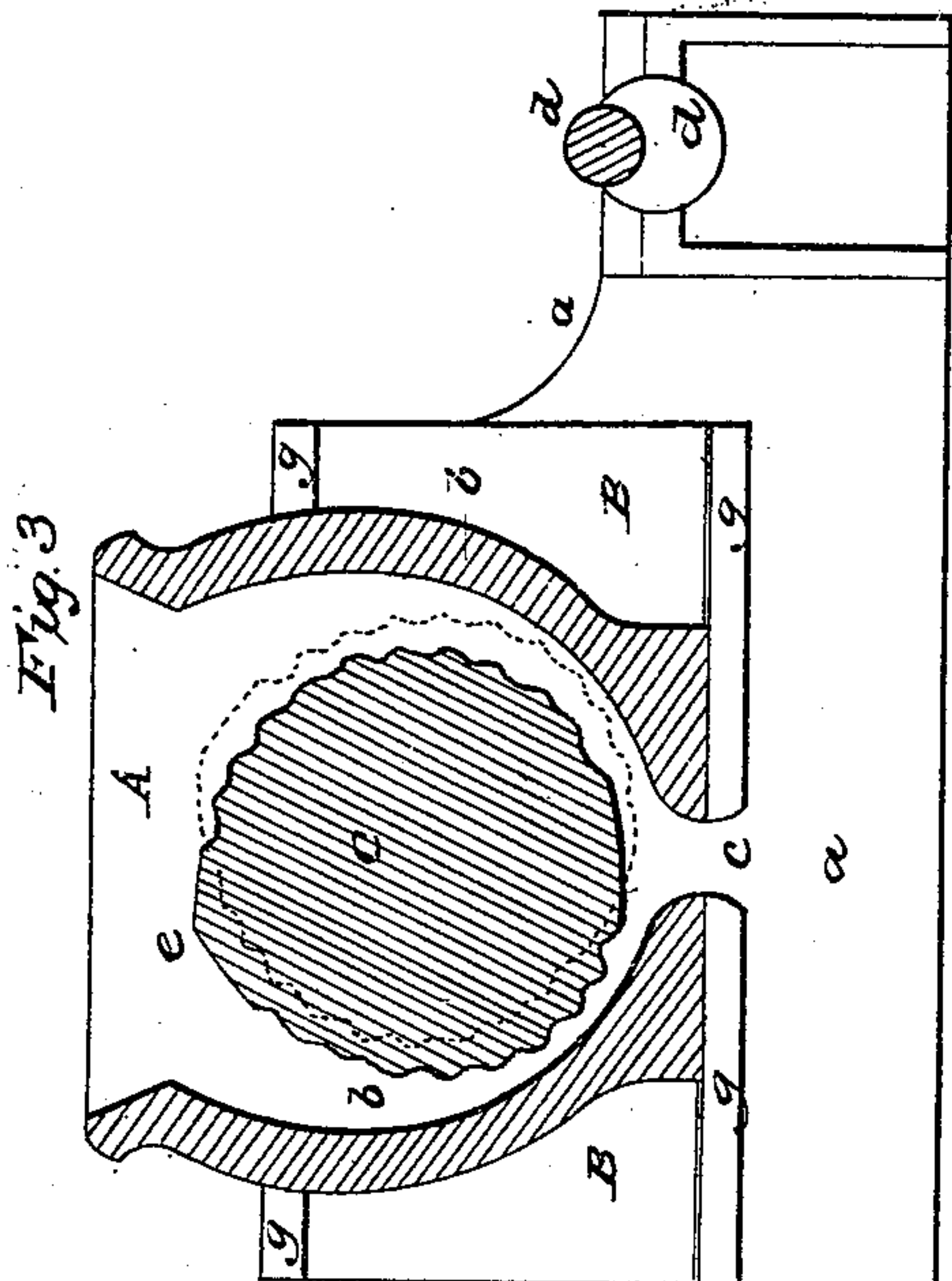


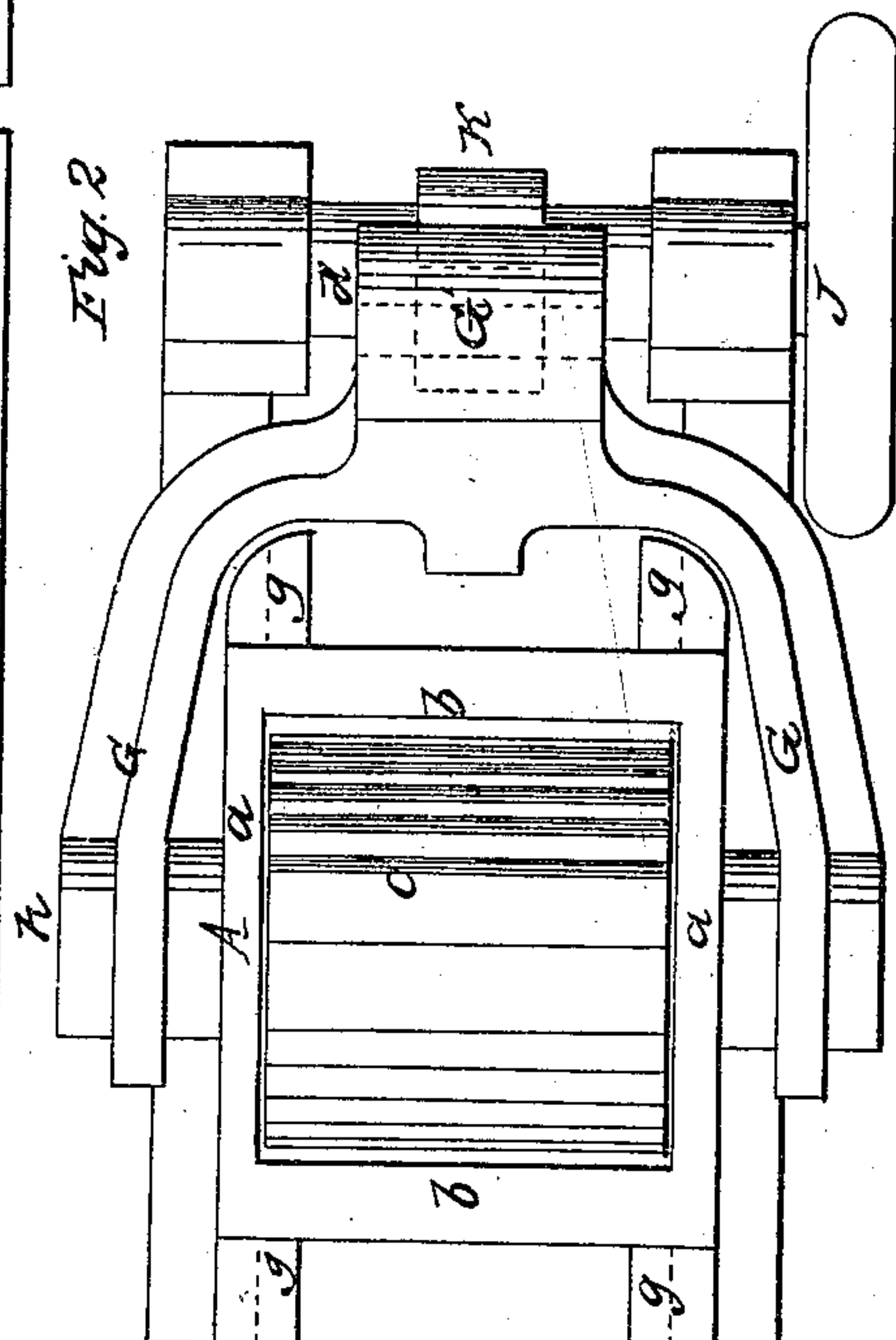
# GATES & FRASER. Quartz Crusher.

No. 50,573.

Patented Oct. 24, 1865.



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# UNITED STATES PATENT OFFICE.

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## IMPROVEMENT IN QUARTZ-CRUSHERS.

Specification forming part of Letters Patent No. 50,573, dated October 24, 1865.

*To all whom it may concern:*

Be it known that we, P. W. GATES and D. R. FRASER, of Chicago, Cook county, State of Illinois, have invented a new and Improved Stone-Breaker; and we do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making a part of this specification, in which—

Figure 1 is an elevation of one side of our improved stone-breaker. Fig. 2 is a plan view. Fig. 3 is a longitudinal section taken in a vertical plane through the machine, with the yoked lever and connecting-rod omitted.

Similar letters of reference indicate corresponding parts in the three figures.

This invention relates to certain novel improvements in the construction of machinery for breaking stone or crushing quartz-rock, the object of the invention being to obtain a double-acting oscillating breaker which, when it is arranged within a flaring hopper, will perform the crushing operation at every stroke, and at the same time be self feeding and discharging to a considerable extent, as will be hereinafter described.

To enable others skilled in the art to understand our invention, we will describe its construction and operation.

In the accompanying drawings, A represents a hopper, which is composed of two vertical sides, *a a*, and two curved sides, *b b*, which latter are inclined so as to leave a contracted discharge-opening, *c*, at the bottom of the hopper and a wide mouth at the top of the hopper.

The two sides *a a* of the machine form its frame for supporting at one end the eccentric driving-shaft *d* and the concaves *b b*. These two concaves are made of sufficient strength to resist the strain upon them during the operation of crushing, and they are provided with back supports, *B B*, which are guided between parallel ledges *g g* projecting from the vertical side plates, *a a*. It is intended to fix these concaves to said plates *a a* by means of bolts passing through horizontal slots, so that when the bolts are loosened the concaves may be adjusted nearer to or farther from each other for crushing or reducing the stone to the required degree of fineness. We prefer to make such

provision in the machine, although the two concaves may be permanently secured in place.

Within the hopper *a* is arranged the oscillating breaker C, which has two convex breaking-surfaces that taper or converge to a point at *e*, giving a wide rounded base, which approaches very near the sides of the hopper at and near its lowest point, or point of discharge, while at and near the upper end or apex of the breaker a wide space is left on each side, to allow the rock to enter freely between the crushing-surfaces and gradually work its way downward toward the discharge-aperture *c* as it is reduced.

The surfaces of the breaker are corrugated or serrated, and these surfaces may be made up of steel strips properly secured in place, so that when worn out they can be renewed at pleasure.

The trunnions *h h* of the oscillating breaker C have their bearing in the side plates, *a a*, and project from the sides thereof sufficiently far to receive eyes which are formed on the ends of a yoke-lever, *G*, as shown in Figs. 1 and 2. This lever is keyed rigidly to the trunnions *h h*, and its arms are united in the form of an enlargement at *G'*, to which latter the upper end of a connecting rod or pitman, *k*, is pivoted by a horizontal transverse pin, *k'*. The upper end of the pitman *k* is fitted to work in a recess in the enlargement *G'* of the yoke *G*, and the lower end of this pitman is attached to an eccentric, *d'*, of the driving-shaft *d*, as shown in Figs. 1 and 2.

By constructing the lever *G* in the form of a yoke it can be driven by one pitman arranged in the center of the width of the machine, and it will act upon both ends of the breaker alike, so as to prevent the latter from being twisted or strained during the operation of crushing rock.

If desirable, a fly or balance wheel, *J*, may be applied on the driving-shaft *d* to equalize the movements of the breaker.

By means of the oscillating breaker herein described, arranged within a hopper having concave sides, we obtain a double-acting machine with two crushing-passages, terminating in a common discharge-passage. The rock is parted over the apex *e*, and descends on both sides of the breaker into converging passages,



which are alternately increased and diminished in width as the breaker oscillates toward and from the concaves. The peculiar form of the breaker causes it to press, grind, and force the particles or lumps of rock downward at the same time, thus discharging the rock very rapidly.

If desirable, one of the concaves *a* may be moved closer to the breaker than the other, so that the rock which passes down one passage will be finer than that which passes down the other side. This advantage is incidental to the double-acting breaker.

We are aware that double-acting quartz-crushers have been used before our invention, which consisted of a partially-corrugated cylinder supported by a concentric shaft and arranged to oscillate between two concaves, which discharged into a chute leading out of one side of the machine; but it will be seen by reference to Figs. 1 and 3 of the drawings that no part of the acting-surface of the breaker *C* is concentric with its axis of motion. For this reason the stones which pass between the crushing-surfaces will be subjected to a crushing action, as well as to a rubbing or grinding action. The curve of each side of the crusher increases in distance from the axis of motion thereof as it rises to form the ridge *e*, so that the upper portion of the crusher above the axis of motion is considerably elongated, while that portion which is below this axis is shortened. It is this peculiar form of crusher which distinguishes it from a right cylinder moving about a concentric axis. In the former instance the crushing-surfaces approach the concaves during the act of breaking the stone, and that portion of the crusher which is below the axis of motion serves to force the broken stone directly through the discharge-opening *c* and prevents its accumulation at this point. In the latter instance the crushing-surfaces always remain at the same distance from the concaves. The direct discharge-opening *c*, extending the entire length, or nearly so, across the bottom of the hopper, will allow the broken stone which has passed between the crushing-surfaces to be forced directly from the machine by the eccentric action of the bottom of the crusher, as above mentioned.

With regard to the mode of oscillating the crusher *C*, we will state that it is important to have a free and unobstructed space leading into the hopper, so that the large stones shall not become clogged in their passage into it.

This can only be done when a double-acting crusher is used by taking hold of it at its ends, for which purpose a yoked lever should be employed which will act upon both ends of the crusher simultaneously, in order to give a uniform pressure and to prevent twisting and undue strain upon one end of the crusher more than upon the other.

The crusher *C* operates against two concaves of the hopper, and its action upon the stone is the same in its back as it is in its forward movement, and hence it is a double-acting crusher. The ovate form of the crusher is preferable to any other, we think, as it presents a parting-ridge at its top; but in some cases we shall make the crusher in its transverse section a true circle and locate the journals upon which it oscillates below the center of that circle. This construction will, to a certain extent, both crush and grind in the manner that the cam or ovate form of crusher does. It is the placing of the journals below the center of a square, rectangular, or any other geometrical figure which would inclose the crusher in its transverse section circumferentially that constitutes the leading part of our invention—that is, in connection with the double-acting character of the crusher.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. A double-acting oscillating crusher, *C*, which has its journals arranged below the center of a square, rectangular, or any other geometrical figure which would inclose its transverse section circumferentially, substantially as described.

2. Constructing a double-acting oscillating crusher, *C*, which has its journals located as described, with a ridge, *e*, at its highest point, for dividing the material to be crushed and ground in its passage into the machine, substantially as described.

3. The arrangement consisting of the yoke *G*, which takes hold of both ends of the shaft of the crusher outside the bearings of said shaft and is worked by one crank, the double-acting crusher, and the double-concave hopper, substantially as and for the purpose described.

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Witnesses:

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