(No Model.)

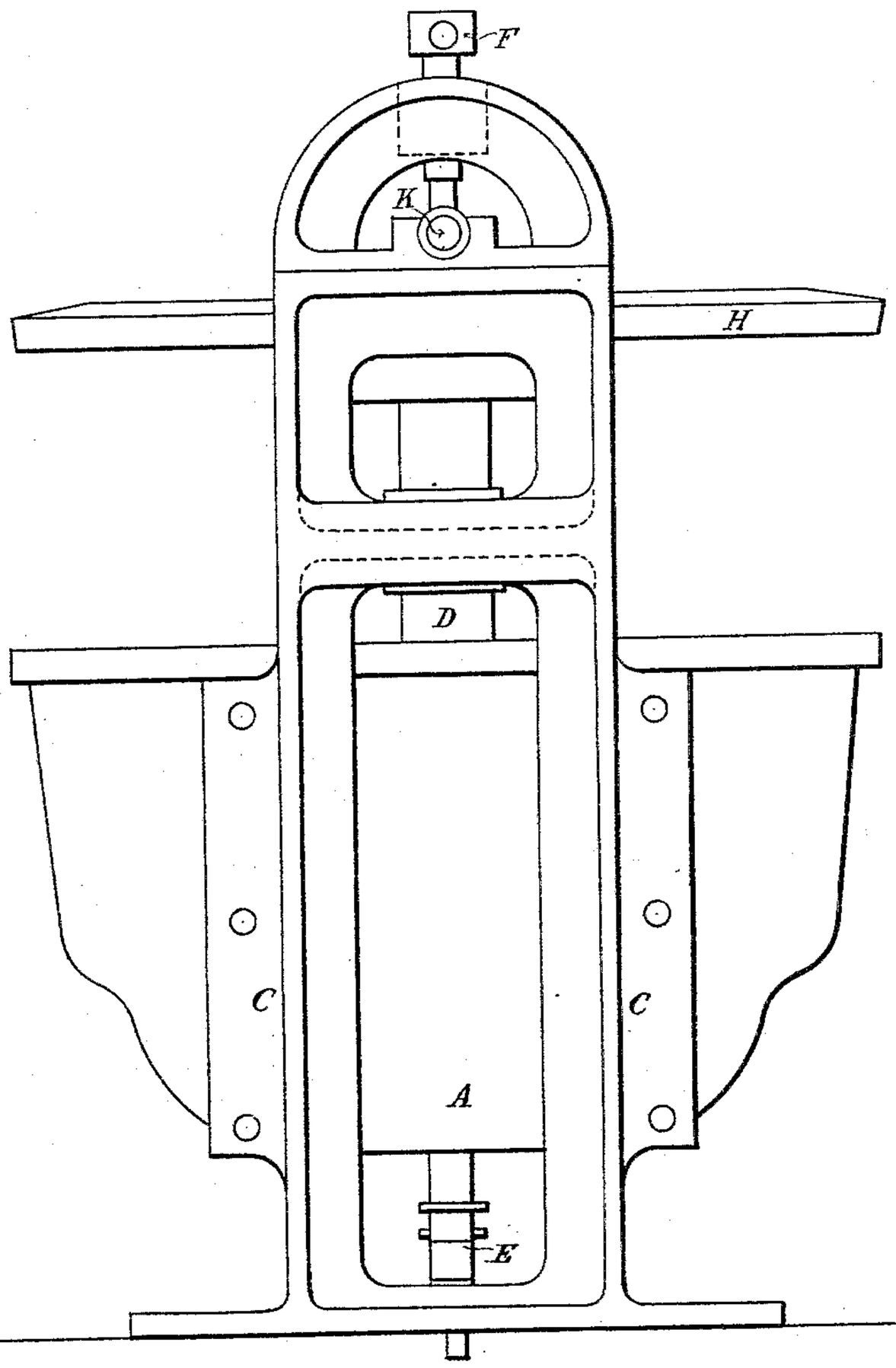
4 Sheets—Sheet 1.

H. SUTHERLAND.

QUARTZ CRUSHER OR MILL.

No. 300,529. Patented June 17, 1884.

Fig: 1.



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(No Model.)

4 Sheets—Sheet 2.

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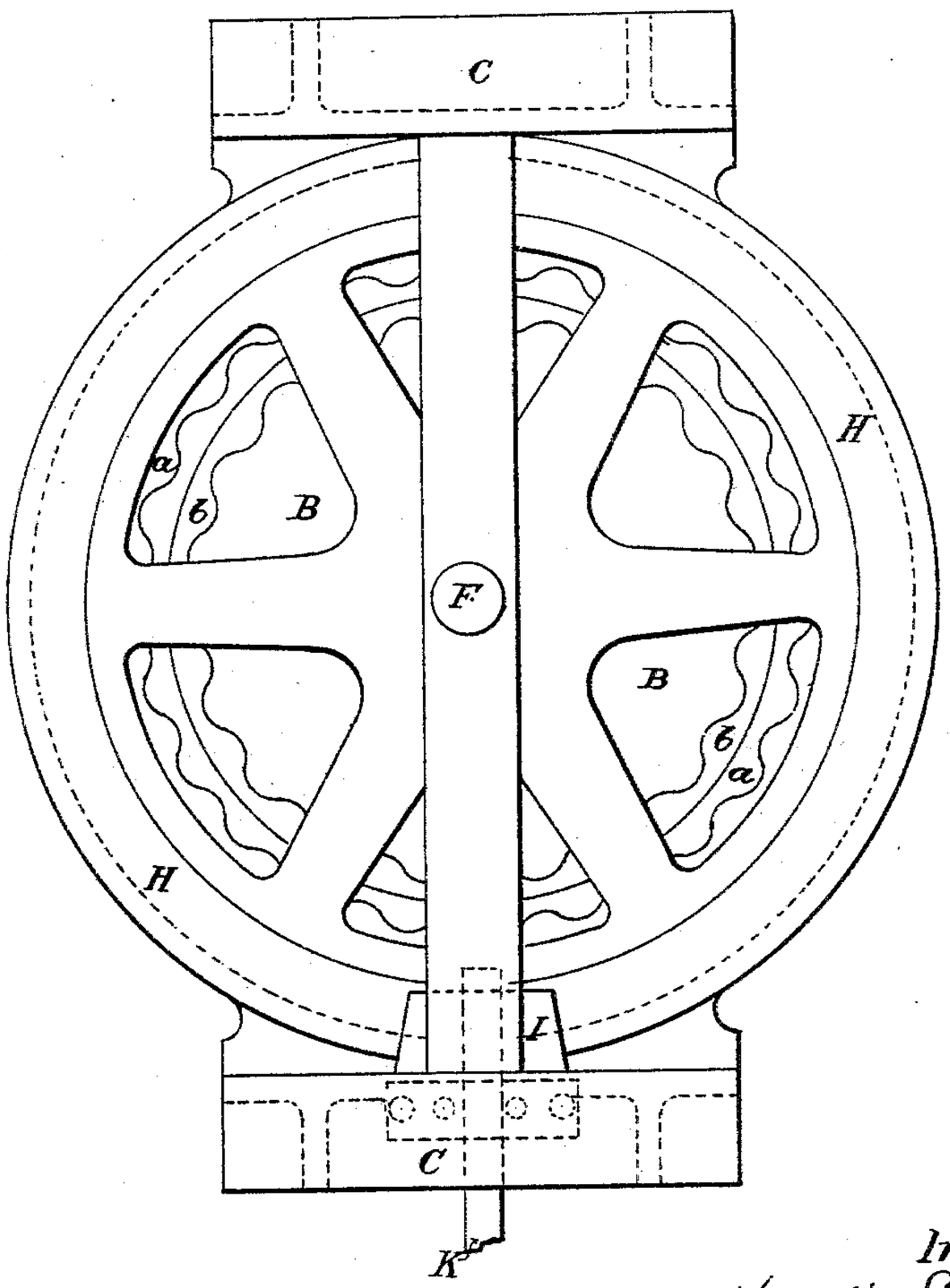
Fig: 2.



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(No Model.)

4 Sheets—Sheet 3.

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QUARTZ CRUSHER OR MILL.

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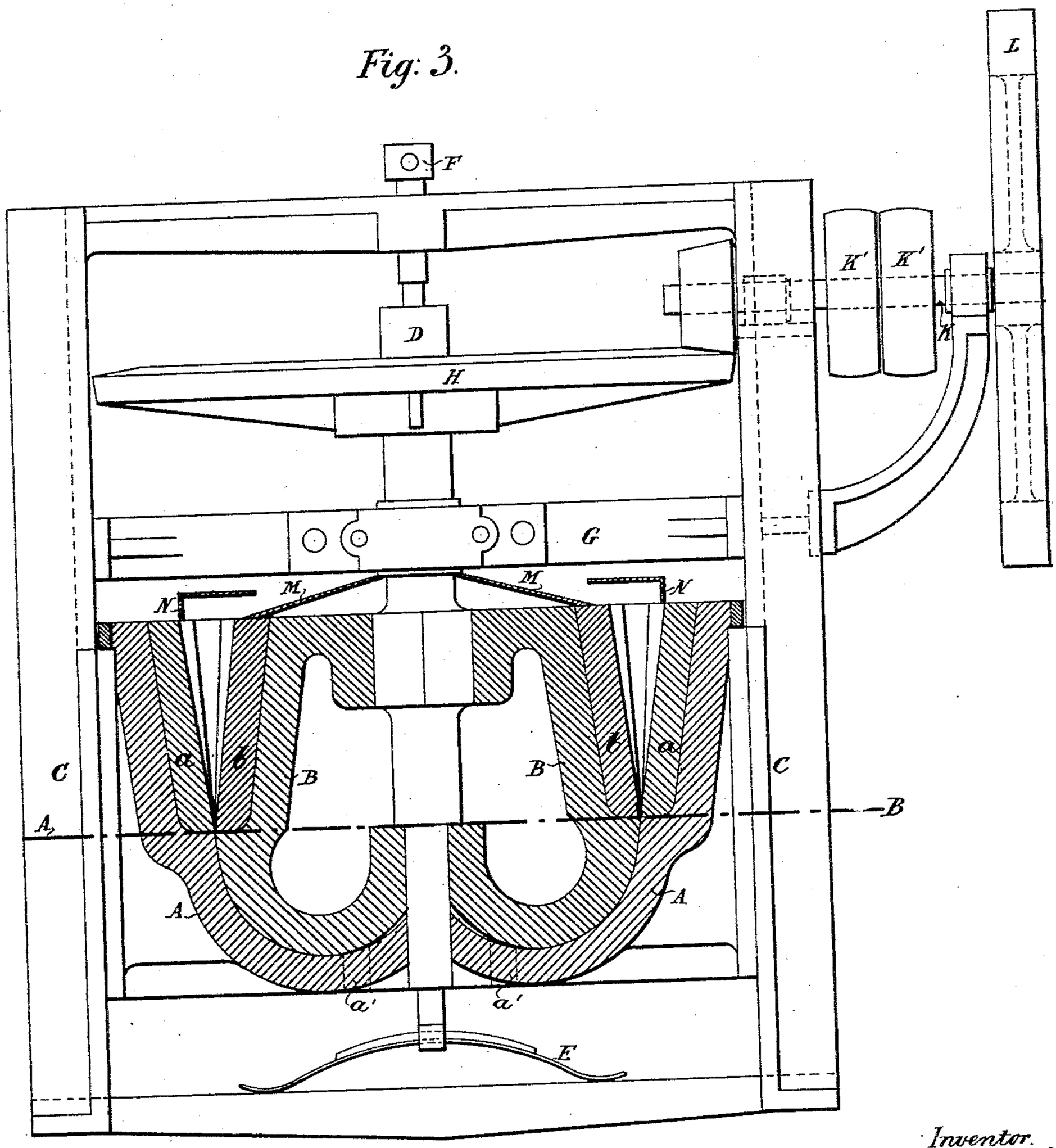
Fig: 3.



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(No Model.) 4 Sheets—Sheet 4.

H. SUTHERLAND.

QUARTZ CRUSHER OR MILL.

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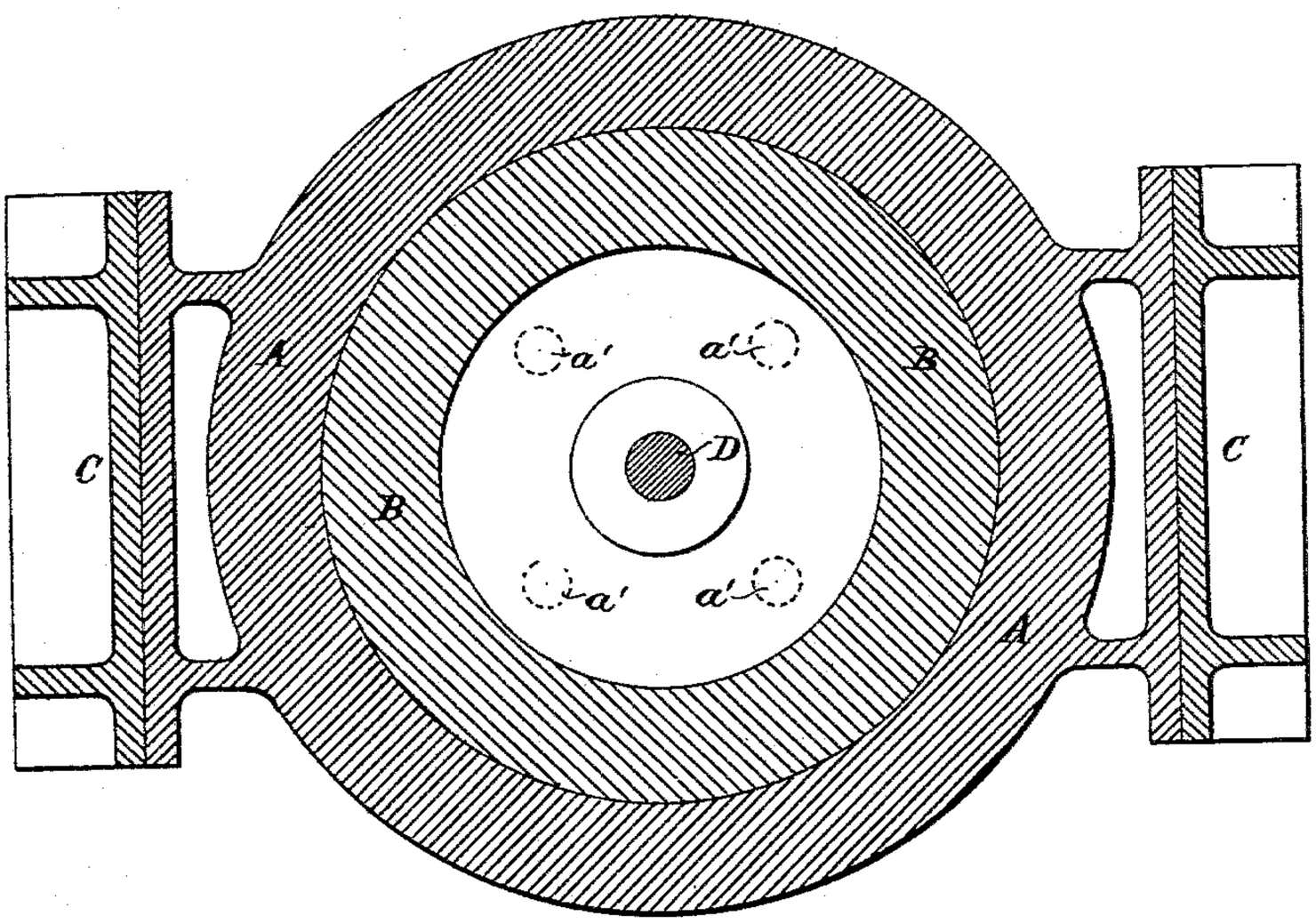
Fig: 4.



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UNITED STATES PATENT OFFICE.

HORATIO SUTHERLAND, OF LONDON, ENGLAND.

QUARTZ CRUSHER OR MILL.

SPECIFICATION forming part of Letters Patent No. 300,529, dated June 17, 1884.

Application filed October 29, 1883. (No model.) Patented in England June 8, 1883, No. 2,867; in France October 22, 1883, No. 158,163; in Belgium October 22, 1883, No. 62,944; in Victoria November 1, 1883, No. 3,585; in New South Wales January 16, 1884, No. 308; in Queensland January 17, 1884, No. 561, and in New Zealand January, 1884.

To all whom it may concern:

Be it known that I, HORATIO SUTHERLAND, a subject of the Queen of Great Britain, residing at 66 Holborn Viaduct, in the city of London, England, have invented an improved quartz crusher or mill to be used for crushing and pulverizing quartz and other minerals and materials, (for which I have received Letters Patent in Great Britain, No. 2,867, dated June 8, 1883; in France, No. 158,163, dated October 22, 1883; in Belgium, No. 62,944, dated October 22, 1883; in Victoria, No. 3,585, dated November 1, 1883; in Queensland, No. 561, dated January 17, 1884; in New South Wales, No. 308, dated January 16, 1884, and in New Zealand about January, 1884, and which will expire with the above-recited patent granted in Great Britain June 8, 1883,) of which the following is a specification.

This invention has for its object an improved quartz crusher or mill to be used for crushing and pulverizing quartz and other minerals and materials.

The improved crusher or mill consists of two main parts—one a cast-metal block with a cavity in it in form like a mortar, and the other another cast block like a pestle. The latter is contained within the former, and nearly fits it, except as hereinafter stated. The first block or mortar is stationary, and an axis passing up through its center and driven by water or steam power or in any convenient manner carries the pestle or second block, which is rotated concentrically within the mortar. The upper parts of the two blocks are corrugated where their surfaces are opposed, and the corrugations, which may be either vertical or inclined, are formed upon rings which are capable of being removed, in order that the rings may be replaced by others when they become worn. The corrugations are large at the upper parts of the rings, where the material fed into the crusher or mill first comes into contact with them, but become smaller as they descend. Intermediate corrugations are introduced into the spaces then left between the main corrugations. There is a space or interval between the blocks of about the same depth as the rings, and this is about half the height of the inner block. This space or interval is comparatively wide all around at the top where the material enters, and becomes narrower in descending, tapering away to nothing at the lower edges of the rings. Below this the inner block fits to the outer, except at the bottom around the axis. Here the inner block is recessed to leave a cavity, and the outer block is perforated with passages communicating with the cavity. By these passages the quartz or material when reduced sufficiently small passes out of the apparatus. A number of indentations may also be formed on the lower part of the inner block. These are useful where the material to be treated contains hard and soft portions, as the hard material becomes embedded in the indentations and aids in reducing the other and softer parts. The axis is supported at the bottom upon a spring, and is set down at the top by an adjustable screw-pivot. The upper block can thus be confined more or less closely against the lower block, according to the degree of fineness to which it is desired that the materials should be reduced.

In order that my said invention may be most fully understood and readily carried into effect, I will proceed to describe the drawings hereunto annexed.

In the drawings, Figure 1 is a side elevation of my improved crusher or mill. Fig. 2 is a plan of the same. Fig. 3 is a vertical section, and Fig. 4 is a horizontal section, on the line A B in Fig. 3.

A and B are the two main parts. A is the outer concave mortar-like part, and B is the inner convex pestle-like part. The mortar or part A is bolted to and carried by the standards C C of the frame. It may in some cases, for convenience of transport, be cast in two pieces, to meet and be bolted together about on the line A B in Fig. 3; or (as these drawings represent) the principal casting may be all of a piece. The part A receives within it a chilled cast-iron or steel ring, *a*, so formed that it will drop freely into its place. It is prevented, however, from rotating within the main casting by ribs upon the one part, which enter and engage with grooves on the other.

Upon the interior of the ring *a* ridges or corrugations are provided. These, as they appear at the upper part of the ring, are seen in Fig. 2. As they are continued downward the corrugations taper away, and at the lower edge of the ring they disappear, the ring *a* on its lower edge being truly circular within. Between these main corrugations other secondary corrugations are introduced. They rise gradually from the hollows between the main corrugations, and extend from the middle of the ring to its lower edge. They are similar in form to the lower parts of the main corrugations, and occupy positions midway between them. When the ring *a* becomes worn, it can readily be removed and replaced by a new ring with little loss of time and at a small cost.

a' a' are holes. They are formed at the base of a rising part or projection in the center of the bottom of the part A, where the pestle part B does not closely fit. The ground or reduced quartz or material passes out from the apparatus by these holes *a'*, and may be in some cases aided in doing so by a stream of water introduced at the top between the parts A and B. The pestle or part B is cast with a passage through it, into which the vertical shaft D is received. It is fixed firmly upon this shaft, which for a portion of its length is square. The part B is provided with a ring, *b*, similar to the ring *a*, but with exterior corrugations. This ring also, when it becomes worn, is intended to be removed and replaced by a new ring. The shaft D passes by a circular hole through the bottom of the part A, and is stepped into a cup-bearing, which is carried upon the top of the spring E. The spring E is sufficiently strong to sustain the shaft D and the parts upon it in such a position that the part B does not rest by its weight upon the part A; but the shaft can be set down to any extent desired by a screw, F, passing through a cross-bar which connects the standards C C. The screw bears upon the top of the shaft D, and by means of it the apparatus may be set to obtain any desired degree of reduction of the quartz or material passed through.

G is another cross-bar of the frame, on which there is a bearing to support the shaft D.

H is a beveled wheel upon the shaft near its upper end.

I is a beveled pinion, in gear with the wheel H. It is fixed upon the horizontal axis K, and this is carried by the frame in the manner indicated. On the axis K also are pulleys K' K', to receive a driving-belt. By this belt power is transmitted to the machine from any convenient motor, the axis K being made to rotate, say, at a speed of three hundred revolutions in the minute.

L is a fly-wheel upon the axis K. A shield, M, (seen in Fig. 3,) is provided. It covers the part B, and is inclined in such manner as to direct the material thrown upon it, and which has previously been reduced to pieces of a suitable size, into the space between the main crushing parts of the mechanism.

N is a stationary covering-ring, to prevent portions of the material from being projected out from between the crushing parts.

Sometimes I provide in the lower parts of the castings A and B small cavities of any convenient form, into which hard portions of the material may embed themselves, and so aid in the reduction of softer parts.

I claim as my invention—

1. The combination of the mortar provided with corrugations at its upper part, and uncorrugated at and near its lower part, and the concentrically-revolving pestle provided with corrugations opposite those of the mortar, and uncorrugated at its lower part, where it is adapted to fit closely within the mortar, substantially as and for the purpose hereinbefore set forth.

2. The combination of the mortar uncorrugated at its lower part, the corrugated ring within its upper part, the pestle uncorrugated at its lower part and adapted to fit within the corresponding part of the mortar, and the corrugated ring about the upper part of the pestle, substantially as and for the purpose hereinbefore set forth.

3. The combination of the mortar having the discharge-openings *a'* in its bottom, the driving-shaft, and the rotating pestle fitting within the mortar at its lower part, except about the driving-shaft, where a recess is provided which communicates with the discharge-openings, as and for the purpose described.

HORATIO SUTHERLAND.

Witnesses:
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HERBERT E. DALE,
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