No. 613,193. Patented Oct. 25, 1898.

T. CRUSE.

QUARTZ MILL.

(Application filed Aug. 20, 1897.)

(No Model.) 2 Sheets—Sheet 1.

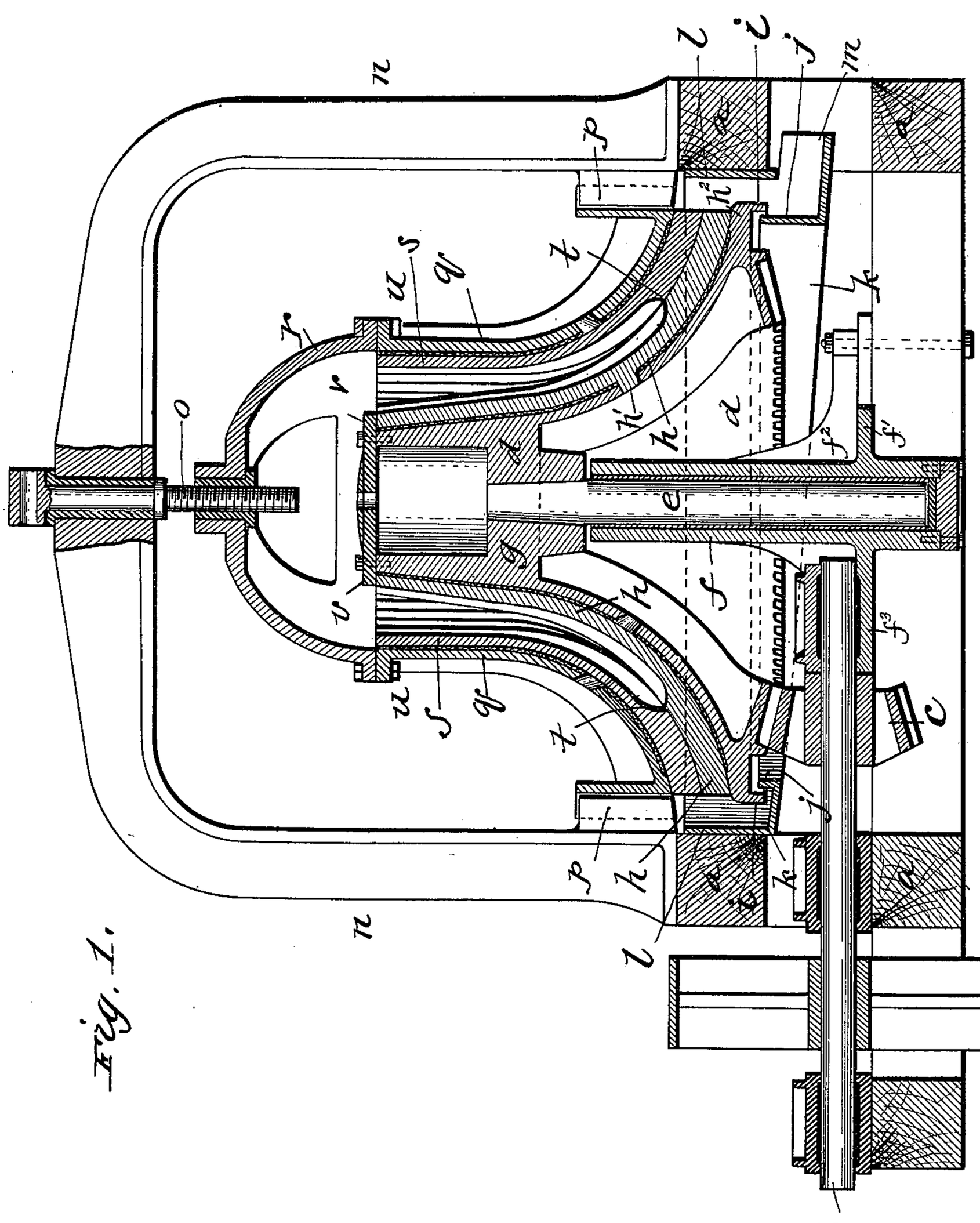

Fig. 1.

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Fig. 2.

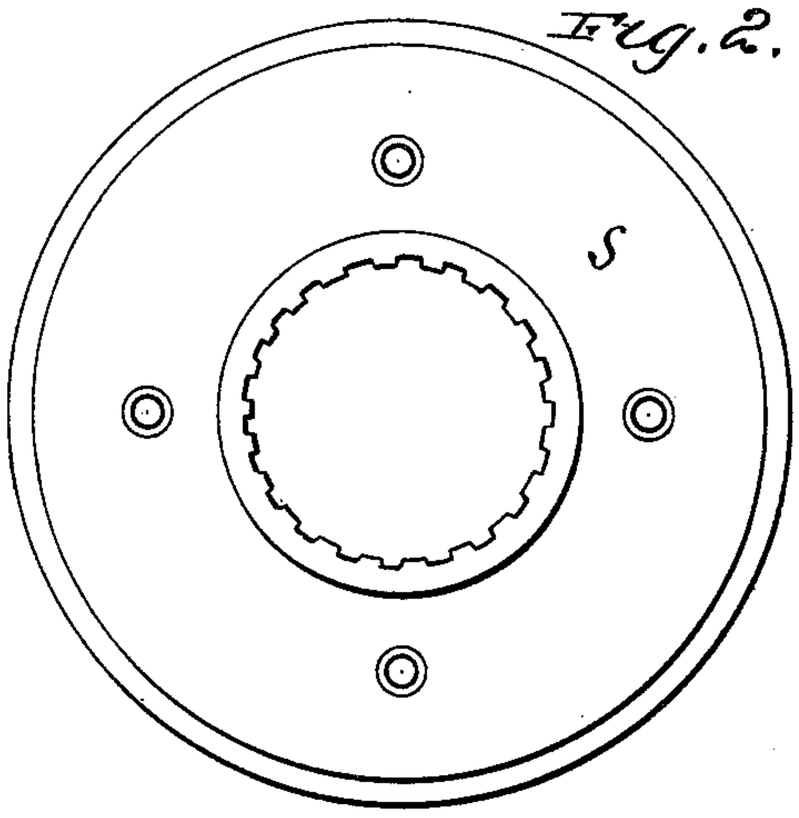


Fig. 3.

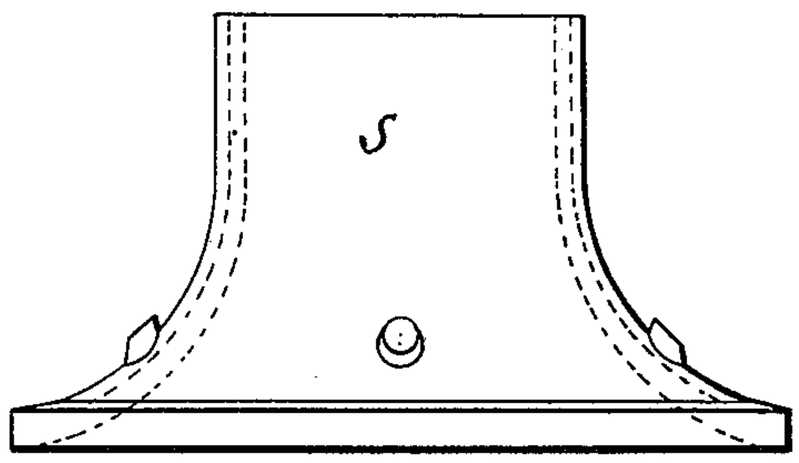


Fig. 5.

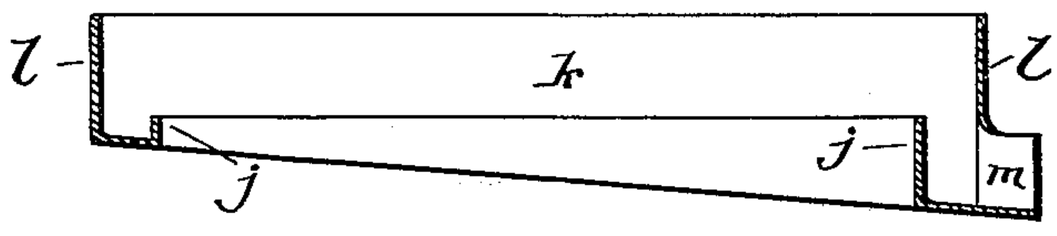


Fig. 4.

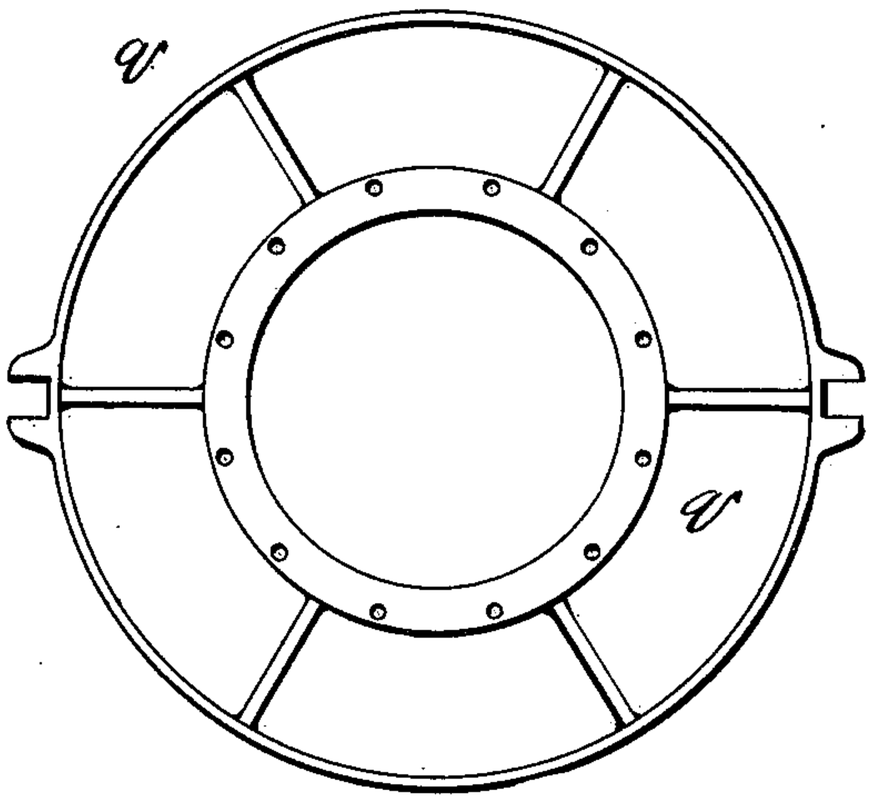
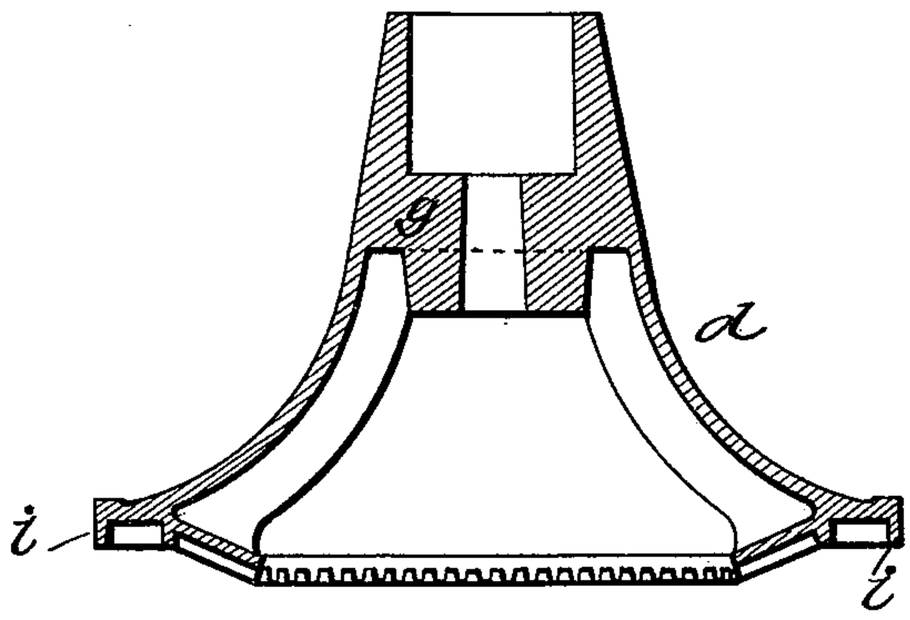


Fig. 6.



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UNITED STATES PATENT OFFICE.

THOMAS CRUSE, OF HELENA, MONTANA.

QUARTZ-MILL.

SPECIFICATION forming part of Letters Patent No. 613,193, dated October 25, 1898.

Application filed August 20, 1897. Serial No. 648,943. (No model.)

To all whom it may concern:

Be it known that I, THOMAS CRUSE, a citizen of the United States, residing at Helena, in the county of Lewis and Clarke and State of Montana, have invented certain new and useful Improvements in Quartz-Mills, of which the following is a specification, reference being had therein to the accompanying drawings, in which—

Figure 1 is a vertical transverse section of the complete apparatus; Fig. 2, a plan view of the stationary grinding-shell detached; Fig. 3, a side elevation thereof; Fig. 4, a plan view of the outer shell detached, and Fig. 5 a detail cross-section of the pan. Fig. 6 is a vertical section of the rotatable cone.

The object of this invention is to provide an efficient mill for grinding silver and gold quartz to a fine powder, the especial object in view being to render the machine extremely solid and durable, as more fully hereinafter set forth.

Referring to the drawings by letters, *a* designates the frame of the machine, which is constructed of a suitable number and arrangement of beams, and *b* the drive-shaft, journaled in the frame and provided with a pulley on its outer end and a drive-pinion *c* on its inner end. This pinion meshes with an annular rack or gear formed on the lower side of the upright cone *d*, this cone being carried on the upper end of a vertical shaft *e*, stepped in a long vertical bearing *f*, supported centrally in the frame, this bearing *f* extending up into the hollow cone *d* to near the hub portion *g* of the cone. The long bearing *f* has formed integral with it at its lower end a horizontal annular flange f', which rests upon and is bolted to the frame-beams and is braced to the upright part of the bearing by ribs f^2, and formed on this flange is a bearing f^3 for the inner end of shaft *b*. The cone *d*, as stated, is hollow and its upper end is cut off square. Fitted down over the cone is the rotatable grinding-shell *h*, which is curved downward and outward, its lower annular edge fitting and resting upon an annular flange h^2, formed on the cone near its lower edge. The shell is made slightly larger than the cone, whereby toward its lower end correspondingly to the surface of the cone a narrow space is left between the shell and the cone, into which a filling of molten lead is poured to solidly connect the cone and shell and to permit the shell to be readily removed for repair and renewal, it being simply necessary to melt out the lead when it is desired to remove the shell. To further connect the shell to the cone, the former is provided with a series of bosses h', which enter corresponding recesses in the shell.

The lower outer edge of the cone is provided with an annular depending flange *i*, which engages over the inner upturned flange *j* of the annular pan *k*, this pan being supported within the frame and having a high outer flange *l* and an inclined bottom leading to the delivery-spout *m*.

Mounted on the frame and extending up over the cone is a yoke *n*, and depending from the center of it is a swiveled screw *o*, and projecting inward from the lower ends of the legs of this arch are two vertical lugs or flanges *p*, arranged diametrically opposite each other and extending in over the pan. Guided and supported by these lugs or flanges is the non-rotatable shell *q*, which is recessed at its edges to embrace said lugs *p* and is bolted at its upper end to the closed cap or hopper *r*, this cap being supported by the depending screw *o*, the screw working through a threaded bushing in the center of the top of the cap and the cap being provided with an opening through which the quartz is introduced. Fastened to the shell *q* in any suitable manner is the stationary grinding-shell *s*, which curves downward and outward to conform to the curvature of the shell *q*. Into a narrow space between the two shells *q* and *s* is poured a filling of lead to attach the parts removably, but solidly, together in the same manner as the cone and its shell. The adjacent faces of the shells *h* and *s* are provided with vertical grinding-ribs, which extend to a point *t* near the lower edges of the grinding-surfaces and there terminate, the surface between the point *t* and the outer or lower edges of the grinding-surfaces being comparatively smooth and conforming in curvature to each other. The upper portion of the grinding-face of the shell *s* curves away from the inner shell *h* and terminates in an approximately vertical part *u*, whereby the space between the two grinding-surfaces gradually tapers downward to the

point t, from which point to the outer or lower edges of the grinding-surfaces said surfaces contact or nearly contact with each other. The shell h is further secured to the cone by means of a circular plate v, bolted down on the top of the cone and extending over the adjacent upper edge of the shell.

It will be observed that as the cone is rotated the quartz will be ground smaller and smaller as it passes down between the grinding-surfaces until it emerges from between the same at the lower edges of the grinding-surfaces reduced to a fine powder. The powder drops down over the annular flange i and into the pan, from whence it passes through the delivery-spout n. The central screw enables the stationary grinding-surface to be raised and lowered to regulate the fineness of the product, the flanges p serving to guide and support the non-rotatable parts in their vertical adjustments. It will thus be seen that the machine will be strong and solid, the vibration being reduced to a minimum. A feature which materially aids in solidifying the machine and destroying torsional strains is the forming of the rack or gear directly upon the cone directly below the grinding-surface. It will also be observed that the long step-bearing f entirely incloses the cone-carrying shaft e and that this bearing extends up into the hollow cone to the hub thereof and that the inner bearing of the drive-shaft is formed integral with this step-bearing, whereby the operative parts are tied together in a compact and strong manner and the vibration under heavy work is reduced to a minimum.

Another feature of importance is the shape of the crushing head or cone, it being evident that the greatest crushing force will be exerted upon the ore at the upper end of the head or cone, where the pieces of ore are coarsest. This is accomplished by reason of the fact that the head is smallest at its upper end, permitting a greater crushing force to be exerted, the power becoming less as the cone widens downward and the particles of ore become finer.

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

In a quartz-mill, the combination of a frame, a vertical cone hollowed out underneath, a vertical shaft extending up through the hollow portion of the cone and attached to its hub, an annular rack formed integral with said cone on its under side, near its outer edge, a step-bearing f inclosing the lower end of the cone-shaft and extending up into the cone to near the hub, this bearing being provided with a supporting-flange f' and this flange carrying a shaft-bearing f^3, a drive-shaft b having its inner end journaled in said bearing f^3, and a drive-pinion on shaft b adjacent the bearing f^3 and meshing with the rack on the cone, as and for the purposes set forth.

In testimony whereof I affix my signature in presence of two witnesses.

THOMAS CRUSE.

Witnesses:
T. J. WALSH,
W. J. SWEENEY.