This invention relates to a device for cutting so-called unbreakable crystals to accurate size and shape for fitting into the seats of watch bezels and more particularly for the formation of fancy shaped crystals for wrist watches. The device of this invention embodies improvements upon the crystal cutting apparatus of Curt J. Rohland, filed December 24, 1928, Serial No. 898,132.

The objects of the present invention are to improve upon the prior construction, so as to render the cutting of crystals from appropriate blanks more expeditious and accurate, to facilitate this operation and to render the apparatus susceptible of cutting crystals for wrist watch bezels of all shapes and sizes. With this in view, the present invention embodies numerous novel features. One of these novel features consists in so forming the jaws of the chuck for holding the bezel that relatively high, as well as relatively low or thin bezels can be properly held in place therein.

Another feature of the invention consists in a novel formation of the guiding point of the device which enables it to properly traverse the contour of a bezel even though the bezel seat is badly mutilated or broken away. Another feature of the invention consists in a novel form of cutter adapted to effectually scribe or cut a blank in such a way that the crystal when broken therefrom will have smooth and clean edges adapting it more readily to cooperate with the seat of the bezel.

Other and additional features will be apparent from the following detailed description and the accompanying drawing and from the appended claim.

The accompanying drawing illustrates one practical embodiment of the invention, but the construction therein shown is to be understood as illustrative, only, and not as defining the limits of the invention.

Figure 1 is a plan view of a crystal cutting device embodying the present invention.

Figure 2 is a side elevation of such device.

Figures 3 and 4 are sections on the line 3—3 of Figure 2.

Figure 5 shows a novel follower embodying this invention, partly in section and partly in elevation.

Figure 6 is an end view of said follower.

Figure 7 is a central longitudinal section through a novel form of cutter embodying this invention.

Referring to the drawing, 1 designates the frame of the device, the same being provided at one end with an upright standard 2 supporting a spindle 3. On one end of the spindle is a blank holder 4 and the other end a chuck 5 is mounted fixedly with respect to the holder 4, so that these parts are secured to one another against relative rotation. Furthermore, the spindle is preferably supported in a standard 2 against rotation so that neither the chuck nor holder are normally adapted to rotate. The holder is provided with pins 5 adapted to support the blank to be cut in rigid position and in centered relation with respect to the spindle. The chuck 5 is of the self-centering type and is provided with jaws 6 and 7. These jaws have opposed gripping faces and in accordance with this invention, these gripping faces are stopped or rabbeted as shown to provide for two distinct gripping relations. For example, it will be noted from the drawing that said jaws are rabbeted as indicated at 8 to provide a seat 9 which is relatively shallow and that in addition to said seat there are the normal gripping faces 10. Thus if it is desired to grip a relatively shallow or thin bezel said bezel may be engaged with the seats 9 as shown in Fig. 3 wherein the bezel is designated by the reference character 10.

In other words, in this view the thin bezel is supported in the rabbeted portions of the jaws, so that the outer face of the bezel will project beyond the outer faces of the jaws in order that the follower may properly cooperate with the bezel seat without striking or engaging the jaws. If it is desired to clamp a thick or high bezel this may be accomplished as shown in Figure 4 by engaging the bezel with the gripping faces 10 as illustrated in this figure, wherein the bezel is designated 10a. With this arrangement, therefore, it is possible to properly support both thick and thin bezels in proper centered relation and without the necessity of changing jaws. This constitutes a highly important
advancement because in the fitting of crystals, bezels of widely differing sizes are continually required to be fitted and in the absence of such an arrangement as that illustrated a change in jaws would be essential for thin bezels. Positioned at the rear end of the frame 1 are a pair of ears 11 supporting a pin 12 on which are pivoted a pair of links 13 and the upper ends of these links carry a pin 14. On this pin is mounted a carrier 15 to the opposite sides of which are pivoted connected a pair of arms 16 and 17. These arms are connected to the carrier in the following manner. The lateral edges of the carrier are in the form of flat vertical faces and near the back ends of each of these two vertical faces are two semi-spherical depressions in which are seated ball bearings 18. The inner faces of the arms bear against said vertical faces and are provided with registering semi-spherical depressions into which the ball bearings also project. Screws 19 pass loosely through the carrier and are threaded into the arms 16 and 17 and rubber cushions 20 connected with the screws to hold the inner faces of the arms yieldably against the outer lateral faces of the carrier. The arms are provided with slots 21 which embrace the opposite ends of the pin 14, and while these slots permit a lateral separation of the free ends of the arms, they will maintain said arms at the same transverse horizontal level. The free ends of the arms 16 and 17 have finger pieces 22 whereby they may be grasped and manipulated. Said arms are by this form of mounting adapted to back and forth as well as up and down movement and while their free ends may be laterally separated, they are normally forced together by the rubber cushions 20.

Mounted in perfect axial alignment on the two arms are a cutter 23 and a follower 24, the cutter being carried by the arm 16 and the follower by the arm 17. These parts are removably held in place by the set screws 25 and 26. The follower is shown in detail in Figure 5. It embodies a pin 27 which is clamped in place as stated. This pin is of hollow tubular section, is closed at its outer end and flanged inwardly at its inner end to provide a constricted opening 28. Extending through the pin 27 is a rod 29, the rear end of which is rigidly anchored as at 30, while the forward end projects through the opening 28 and carries a follower head 31. Extending coaxially beyond this head 31 is a follower point 32. This point 32 is adapted to coact with the crystal seat of the watch bezel, while the head 31 functions as a flange to bear against the outer face of the bezel. By thus cooperating with the face of the bezel as the point 32 traverses the seat as will be understood, it will be apparent that if the seat is uneven, broken away, or mutilated, the follower point will not slip off of the seat, but will be held in proper relation thereto by the flange or head 31, so as to permit of the fitting of a crystal to a badly mutilated seat. The head 31 may be of any appropriate shape, but is shown as substantially frusto conical. This shape has been found to work with high efficiency in cooperation with a wide variety of bezel contours and particularly to curved contours where a perfectly flat flange would tend to produce an irregularity in cutting.

Viewed from a practical standpoint, the use of the head 31 acting as a stop to preclude the following point 32 from disengagement with the seat is of considerable importance and solves the problem which has been a serious one in crystal cutting machines. Moreover, it solves this problem in a simple and efficient way and without materially adding to the cost of the machine.

The follower shown in Figures 5 and 6 is of the compensating type, the rod 29 being resilient and of a somewhat less diameter than the opening 28. In fact the diameter of the rod 29 is preferably about one half of that of the opening 28. Thus if the finger is forced laterally to engage with one side of said opening, it will be apparent that the point 32 will be tangent to the axis of the pin 27. It therefore follows that if the point is engaged with the crystal seat of a watch bezel, the point of tangency between the follower point 32 as well as the axis of the cutter 23 are coaxial and it therefore follows that the cut or score line of such cutter will correspond exactly to the corresponding point in the bezel seat. Accordingly absolute accuracy in cutting of the crystal will result.

I wish it understood in connection with the follower that the employment of the follower point and follower head for the purposes stated is not limited to the compensating type of follower which I have described, but that it may be associated with any type of follower without departing from this invention.

The cutter 23 which forms an important part of this invention is shown in detail in Figure 7. It embodies a pin 33 into one end of which is fitted, by force fit or screw connection, a holder 24 and in the outer end of this holder is gripped a diamond point 35. The diamond point may be secured to the holder in any suitable way, but this attachment is perfectly accomplished by spinning or burning as shown so that the diamond point is permanently and securely fastened to the holder against displacement. My experimentation and research in connection with cutters has shown that diamond points ordinarily employed for cutting glass and similar materials are wholly inefficient in the cutting of non-breakable crystals from celluloid and similar substances used for these articles.
I have discovered in contradistinction that a conical shaped cutter operates with the highest efficiency and that there is an optimum apex angle which operates at the highest efficiency. This angle I have discovered to be 45 degrees. In other words, the cutter point 35 is in the form of a cone having a 45 degree angle at the apex. Such a cutter will efficiently score celluloid and similar material without too deep a cut and with a cut of sufficient depth to provide efficient breakage of the material along the line thus scored. Furthermore, there is no tendency of such a cutter to tear or shred the material and such a cutter will be moreover maintained sharp indefinitely.

It will of course be understood that the cutting point 35 is positioned coaxially of the pin 33 and as stated this pin is maintained coaxially with respect to the follower 24, and it thus follows that when the follower is caused to traverse a bezel seat while the cutter is in engagement with the crystal blank held in the holder 4, said blank will be accurately scored to produce a crystal which will properly cooperate with a bezel seat.

The apparatus which I have described has been found in practice to be highly superior to any structure which has been heretofore suggested for the cutting of crystals for watch bezels. It is simple in construction, economical to manufacture and thoroughly efficient in the performance of its intended functions.

The drawing illustrates the invention in its preferred practical form, but the invention is to be understood as fully commensurate with the appended claim.

Having thus fully described the invention, what I claim as new and desire to secure by Letters Patent is:

A watch crystal cutting device embodying means to support a watch bezel to be fitted and a crystal blank in centered axial alinement and against relative movement with respect to one another, in combination with a crystal cutter, and a follower positioned in axial alinement with the crystal cutter, said follower comprising a head adapted to bear on the face of the bezel adjacent the crystal seat and having a follower point projecting from said head and adapted to engage with the seat of the bezel.

In testimony whereof I have signed the foregoing specification.

SAMUEL H. STEIN.