This invention relates to dry shavers and has more particular reference to the structure and function of the part known as the comb or comb plate which is provided with hair receiving openings and is moved over the face so that whiskers will enter said openings and be severed by a cutter which coasts with cutting edges on the inner side of the comb plate.

An objective in this art is to improve the shaving efficiency by improving the construction and operation of the comb plate and the cutter with the view to obtaining the desired closeness of shaving, quickly and with comfort, that is, with freedom from irritation of the skin incidental to the cutting operation. This objective involves many problems particularly when it is desired that the comb plate should be of such structure as to permit of manufacture at a reasonable cost and it should be capable of use over a comparatively long period of time at the desired degree of shaving efficiency.

The primary object of this invention is, therefore, to provide an improved dry shaver with the view to obtaining close shaving with comfort and freedom of irritation, in less time than heretofore required.

In furtherance of this general object my invention contemplates the provision of an improved comb plate characterized by novel features of structure and function and capable of production manufacture at comparatively low cost.

In particular, my invention aims to provide a comb plate constructed in such novel manner that the whiskers even though of substantial length will be readily admitted to the cutting edges in a succession of openings gradually decreasing in size and with gradual diminishing of thickness of the comb plate so that at each stage of the shaving operation the skin around each whisker is properly supported with relation to the closeness of cutting or severing of the whisker and the openings are so closely positioned and arranged in coaction with the movable cutting means that the successive cutting operations are performed almost simultaneously in a manual stroke of the shaving head across the face. In the preferred embodiment, described more in detail hereinafter, the hair receiving openings are round and closely positioned one with respect to another and gradually increasing in diameter from a minimum size at the close shaving area to a maximum size at a remote area, and the thickness of the comb plate gradually increases from a minimum in which the smallest openings are located to a maximum in which the largest openings are located and so that the gradually larger openings are located in corresponding gradually thicker portions.

Other objects and attendant advantages will be appreciated by those skilled in this art as the invention becomes better understood by reference to the following description when considered in connection with the accompanying drawing, in which:

Figure 1 is a transverse section through a comb plate in coaction with a cutter, illustrating a preferred embodiment of my invention, showing the parts on a large scale.

Fig. 2 is a transverse section through the perforated portion of the comb plate shown in Fig. 1, on a further enlarged scale.

Fig. 3 is a face view of said comb plate before it is arched; and

Fig. 4 is a fragmentary section longitudinally of the comb plate taken substantially on the section line 4—4 of Fig. 3, showing a cutter blade in coaction with the comb plate.

In the illustrative form of my invention shown in the drawing the comb plate designated generally by 11 is of spring steel flexed to an arc preferably of relatively large radius. The relatively large radius will be apparent when compared with prior commercial practice utilizing a comb plate of the type shown in the Bruecker patents, Numbers 2,001,494, granted May 26, 1937, and 2,234,891, granted March 11, 1941, in which the comb plate is relatively of the size shown in the dotted lines 12 in Fig. 1 of the present drawing. The comb plate may be maintained in this arched shape by any suitable or desired means such, for example, as by a supporting frame having longitudinal side bars 13 joined by arched end bars 14 and correspondingly arched intermediate bars 15, as disclosed in said Bruecker Patent No. 2,234,891. The comb plate in this embodiment being fixed to the supporting frame by suitable means known in this art. While I have here illustrated my invention in a form embodying a comb plate of spring steel flexed to arcuate form, it should be understood that the invention in its broader phase is applicable to an arched comb plate of other steel stock formed to the desired shape by suitable machine or die operations known in this art.

In the present embodiment a cutter blade 16 extends lengthwise of the comb plate in coaction with the inner side thereof and is adapted to be oscillated transversely in cutting strokes between the positions shown in full and dotted lines in
Fig. 1. Suitable means may be provided for oscillating the cutting blade, such as a cutter holder 17 pivotal about a center pivot 16 concentric with the inner surface of the comb plate. The cutter holder may be rapidly oscillated to move the blade back and forth in cutting strokes. I prefer to employ power means, such as a small electric motor for so oscillating the cutter holder, and to incorporate the motor in the handle or casing (not shown) to one end of which the comb plate is mounted and by means of which the shaver is manipulated in the shaving operation. It should be understood, however, that any suitable means may be employed for oscillating the cutting blade 18 and also that any suitable cutting means other than a single blade may be employed in coaction with the inner side of the comb plate, whether moving in a cutting stroke transversely or longitudinally of the comb plate. In the embodiment shown and in actual practice the motor operates at about 7500 R. P. M. and the cutter blade is moved 15,000 complete shaving strokes per minute across the perforated area of the comb plate. In this operation the cutter blade is urged outwardly into good shearing contact with the inner surface of the comb plate by centrifugal force and by some spring pressure, if desired, as is known in this art.

The portions 10, 18, and 20 of the comb plate located between the supporting arches 19 are perforated to provide closely positioned hair receiving openings from end to end of the area traversed by the cutter blade in said cutting strokes. Each such perforated portion has novel shape characteristics in accordance with the present invention. The portions 21 and 22 at the longitudinal ends of the comb plate are perforated to provide openings 23 and opposed rows of small cutting teeth. These openings 23 and small teeth are adapted for facilitating the cutting of long loose hairs as disclosed in said Bruecker Patent No. 2,344,801. These openings 23 are not, however, essential to the present invention.

It will now be observed that each portion 18, 19 and 20 is composed from end to end transversely of the comb, of a plurality of portions each of which has hair receiving openings gradually increasing in size of opening area from the central portion or that portion I term the close shaving area, outwardly to a remote portion, in this instance outwardly in opposite directions to the opposite remote portions adjacent to the opposite ends of the cutter stroke. That is, in the embodiment here shown the centermost portion 24 has openings 25 of minimum size or area; the next outer adjoining portions 26 have openings 27 of larger area; the next outer adjoining portions 28 have openings 29 of still larger area; and the next outer adjoining portions 30 have openings 31 of the largest area. It will now be observed from Fig. 2 that the comb plate is of minimum thickness through the central portion 24 and gradually increases in thickness to the outermost perforated portions. It will also be observed from Fig. 2 that the openings 26, 27, 29 and 31 are arranged in closely substantially uniformly spaced relation one with respect to another. This gives a maximum total opening for admission of the whisksers and it also provides a maximum number of cutting edges. The nature of my invention is obtained in a particularly advantageous manner by using a shear plate of approximately .004" thickness, grinding the outside surface area 32 to reduce the thickness of the comb plate to approximately .002" at the center portion 24 and gradually increasing in thickness outwardly to or in the region of the outermost portions 30, and providing perforations of approximately .018" diameter for the openings 26, .021" diameter for the openings 27, .024" diameter for the openings 28, and .026" diameter for the openings 31. These openings may be other sizes, relatively, and of other shapes, but I prefer to make them round because of the problems involved in die making and in maintaining dies for such small, precision stamping in tempered steel as I have found in production manufacture of this kind. The round holes are also advantageous in that they provide relatively large open areas for admission of the whiskers and at the same time the smaller imperforate body of the metal provides maximum strength and uniformity of metal body which serves to promote uniform cutting edges. The body of the comb plate defining these round hair receiving openings also gives support to the skin continuously and uniformly around the openings so as to more definitely and positively control projection of the skin into the openings and avoid cutting and irritating of the skin from the cutter action. In this embodiment the surface 22 is ground on an arc 33 struck from axes 34 located in a vertical plane passing through the center 35 which is the comb plate center.

My new shaver may be used to best advantage according to the condition of the beard, that is, if the beard is comparatively long the shaving stroke by hand operation of the head should start at the largest openings 31 at either side of the head and draw transversely toward the center thereof, thus first admitting the longest whiskers into the largest openings where they are cut off to reduced length, and then successfully admitting the whiskers to the smaller openings, and correspondingly cutting the whiskers shorter until a close shave is obtained. When the beard is shorter the shaving may be done almost entirely in the central area. Under any circumstances, after the whiskers have been shaved to a desired length, the close shaving result is obtained by use of the central area. It will be observed that with the novel shape characteristics herein disclosed, the long whiskers are freely admitted to the cutting edges while the skin is supported entirely around the whiskers and invented from engaging between the cutting edges, and this condition prevails at each successive opening until at the smallest opening the projection of the skin is such as to result in the whisker being held firmly but slightly projecting with relation to the skin, as a result of which condition the whisker will be severed substantially at right angles. This shaving action is enhanced by the relatively large curvature of the comb plate transversely of the shaving head which serves to stretch the skin over a wide area and by such stretching causes the whiskers to readily enter the openings.

I have found that a dry shaver made in accordance with my invention gives a material reduction in the shaving time. Also, with this short shaving time I obtain the desired closeness of shave measured by the length of residual hair or stubble with respect to the skin level after shaving. At the same time these results are obtained without after-effects, inconvenience and irritation which are common to certain prior types of shavers, particularly in cases where the skin is sensitive.
It should be understood that the dimensions recited above in connection with the preferred embodiment are for purpose of illustration and that in the practice of my invention changes may be made in the size, shape, and arrangement of the respective parts within the spirit and scope of the appended claims, in which I claim:

1. In a shaver, a comb plate of relatively thin sheet steel having a shaving portion arched transversely, a cutter blade having exposed cutting edges coacting with the inner side of the comb plate extending lengthwise thereof and mounted to be oscillated transversely in cutting strokes across said shaving portion, closely spaced circular hair receiving openings throughout said shaving portion, said openings being of smallest diameter at the center of said portion and gradually increasing in diameter toward each end adjacent to the end of the cutting stroke, said shaving portion being of minimum thickness at its portion having said smallest openings and gradually increasing in thickness toward said ends so that said gradually larger openings are located in coronal maximum the gradual cutting portions of the comb plate whereby the cutting edge at each side of the blade has cutting coaction in each stroke with all openings in all said portions for both close shaving and long hair cutting.

2. A dry shaver having a comb plate comprising a strip of sheet steel having a shaving portion arched about a given axis, said shaving portion being composed of a perforated central portion and a plurality of perforated side portions at opposite sides of the central portion, the side portions including a first portion adjoining the central portion and a second portion at the outer side of the first portion, the comb having an inner arched surface common to all said portions and finished for coaction with a cutter, the central portion being of minimum thickness and having closely positioned circular hair receiving perforations of minimum diameter, each side portion in succession outwardly from each side of the central portion being respectively of increasing thickness relative to the thickness of said central portion and having closely positioned circular hair receiving perforations respectively increasing in diameter relative to the diameter of the perforations in said central portion, and a cutter blade having opposed cutting edges coacting with the inner side of the comb plate extending lengthwise thereof and mounted for oscillation about said given axis whereby the cutting edge at each side of the blade has cutting coaction in each stroke with all said openings in all said perforated portions.

3. A dry shaver having a comb plate comprising a strip of sheet steel having a shaving portion arched about a given axis, said shaving portion being composed of a perforated central portion and a plurality of perforated side portions at opposite sides of the central portion, the central portion being of minimum thickness and having hair receiving perforations of approximately .018" diameter, the next adjoining side portion being thicker than said central portion and having hair receiving perforations of approximately .020" diameter, the next adjoining side portions being thicker than the first mentioned side portions and having hair receiving openings of approximately .024" diameter, and the next outer adjoining side portions being thicker than the second mentioned side portions and having hair receiving openings of approximately .038" diameter, and a cutter blade having opposed cutting edges coacting with the inner side of the comb plate extending lengthwise thereof and mounted for oscillation about said given axis whereby the cutting edge at each side of the blade has cutting coaction in each stroke with all said openings in all said perforated portions.

4. A shaver as set forth in claim 3, in which the comb sheet is of approximately .004" stock, which thickness of stock is the thickness of the third mentioned outer side portions, and the thickness of the second and first mentioned side portions is gradually reduced toward the center portion, which latter portion at its center is of approximately .002" thickness.

5. In a shaving device, a comb plate arched transversely of its length and having closely positioned hair receiving openings throughout a shaving area, each opening bounded by a continuous skin supporting edge and being of a shape having substantially the same maximum dimension taken at right angles one dimension with respect to the other, said openings in a portion of said area being of relatively small size adapted for close shaving, said openings in a portion of said area arcuate spaced from the first mentioned portion being of relatively large size adapted for long shaving, said openings in an intermediate portion of said area being of a size intermediate said small and large openings, the thickness of the comb plate gradually increasing from a minimum in the first mentioned portion to a maximum in the second mentioned portion, and a cutter coacting with the inner side of the comb plate for rapid movement in cutting coaction with edges of said openings whereby to simultaneously effect close shaving and long hair cutting upon movement of the comb plate in the direction of its curvature in a shaving stroke of the device.

6. In a shaving device, a comb plate arched transversely of its length and having closely positioned hair receiving openings throughout a shaving area, each opening bounded by a continuous skin supporting edge and being of a shape having substantially the same maximum dimension taken at right angles one dimension with respect to the other, said openings in a central portion of said area being of relatively small size adapted for close shaving, said openings in portions of said area arcuate spaced at opposite sides of said central portion having openings of relatively large size adapted for long hair cutting, said openings in portions of said area intermediate said central and outer portions being of a size intermediate said small and large openings, the thickness of the comb plate gradually increasing from a minimum in the central portion to a maximum in the outer portions, and a cutter blade coacting with the inner side of the comb plate for rapid oscillation in the arc thereof in cutting coaction with edges of said openings whereby to simultaneously effect close shaving and long hair cutting upon movement of the comb plate in the direction of its curvature in a shaving stroke of the device.

IYAR JEPSON.
CERTIFICATE OF CORRECTION.


IVAR JEPSON.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, first column, line 27, for "furthermore" read --furtherance--; page 3, first column, line 10, for "exposed" read --opposed--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 30th day of May, A. D. 1944.

Leslie Frazer

(Seal) Acting Commissioner of Patents.