Jan. 21, 1941. A. F. WINTERCORN ET AL 2,229,159

ELECTRIC SAFETY RAZOR

Filed June 14, 1937 2 Sheets-Sheet 1

Fig. 3

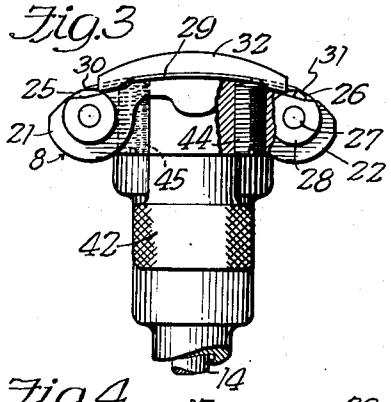


Fig. 2

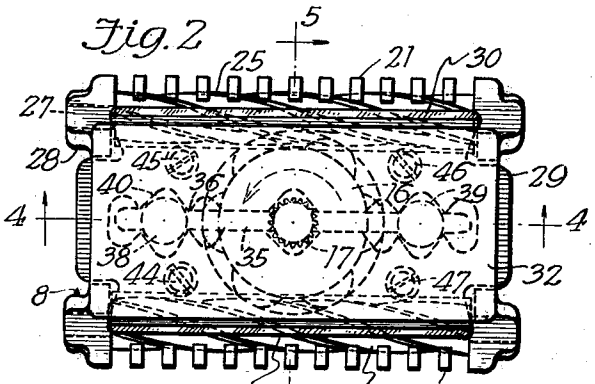


Fig. 4

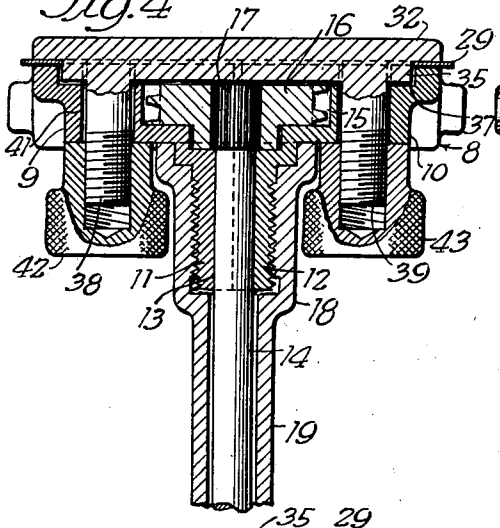


Fig. 1

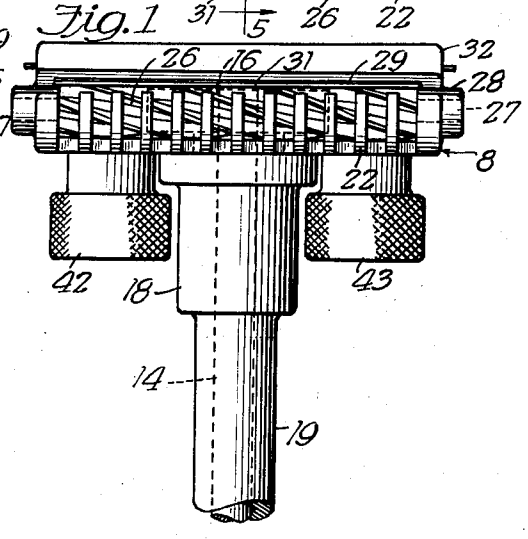


Fig. 5

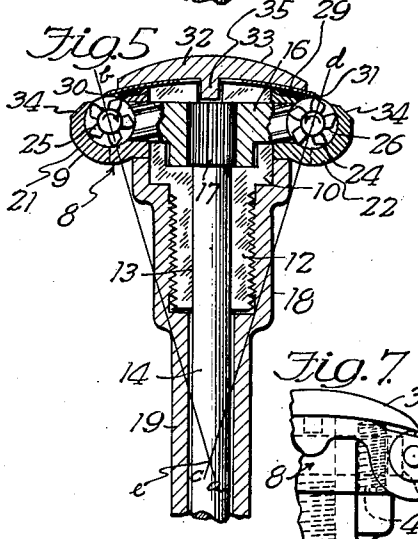


Fig. 6

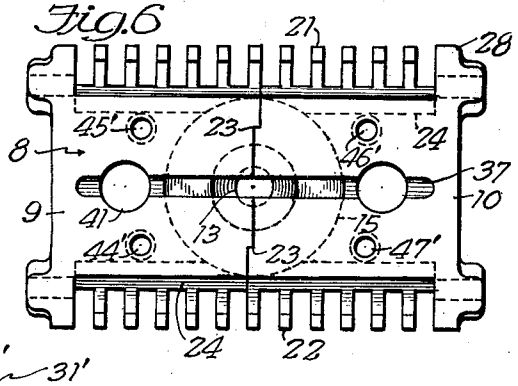
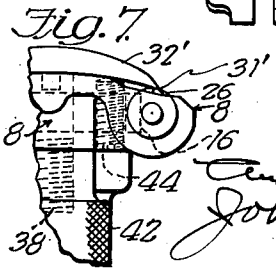


Fig. 7



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Jan. 21, 1941. A. F. WINTERCORN ET AL 2,229,159

ELECTRIC SAFETY RAZOR

Filed June 14, 1937 2 Sheets-Sheet 2

Fig. 8

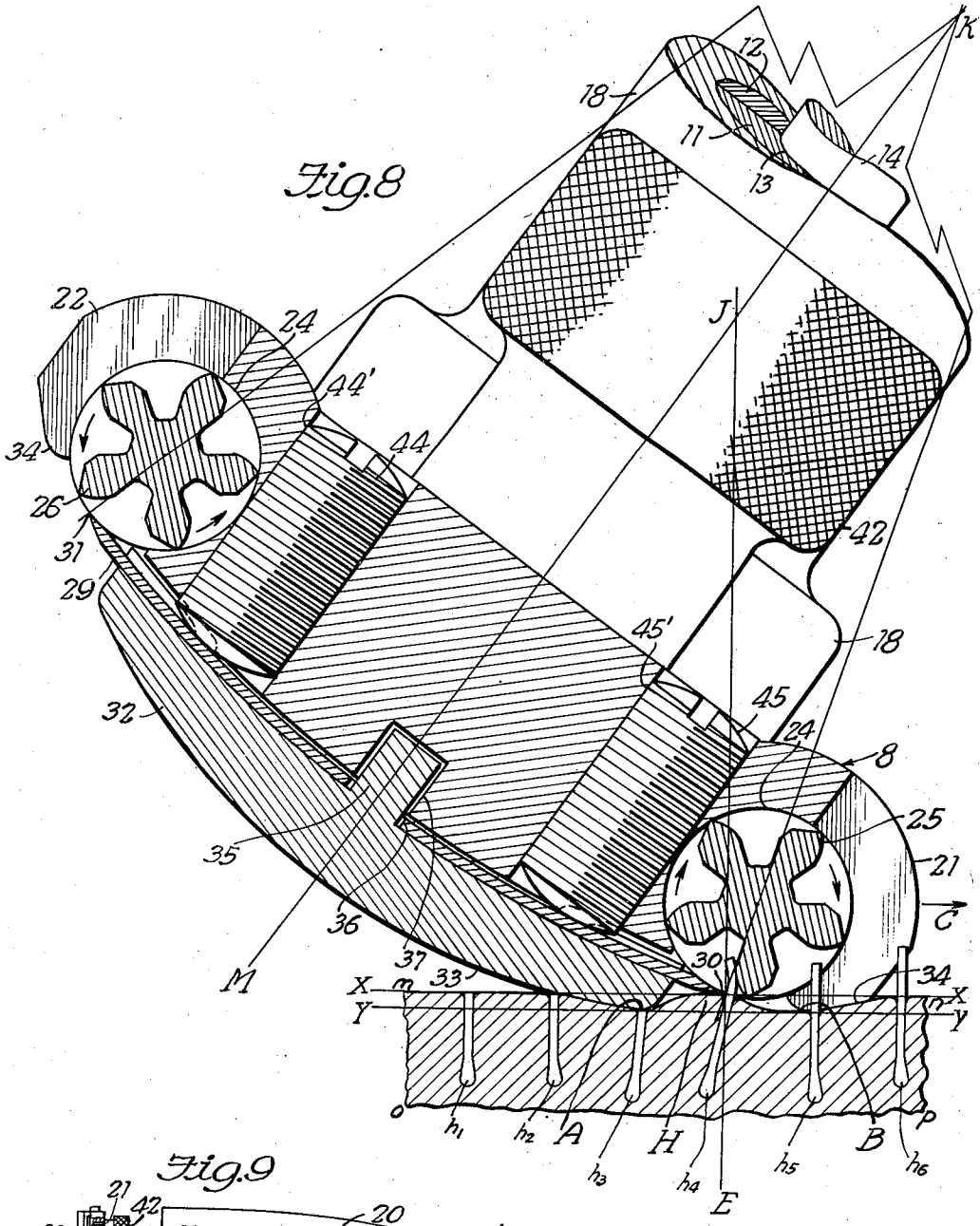
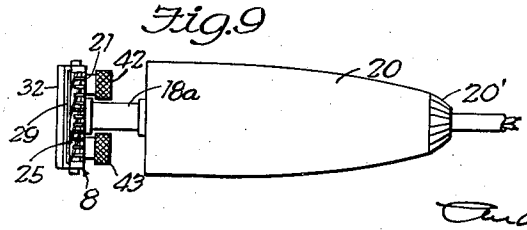


Fig. 9



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2,229,159

ELECTRIC SAFETY RAZOR

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Application June 14, 1937, Serial No. 148,158

25 Claims. (Cl. 30—43)

This invention relates to razors, and more particularly a power operated safety razor designed for "wet" and "dry" shaving.

We are aware of the sudden commercial success of certain well known makes of electric razors of the reciprocating cutter type, and that thus far there has been no successful competitive device having a rotary cutter, despite the fact, at once apparent to those skilled in machine design, that a rotary action has several important fundamental advantages over the reciprocatory action, such as continuous cutting, and usually less vibration, and consequently less noise and less wear. It is apparently believed, rightly or wrongly, that the reciprocatory type can be made to operate with greater safety than the rotary type. However, it can hardly be denied that regardless of the number of reciprocating cutter type razors that have been sold, many of these have been shelved by their owners who have gone back to using their old safety and straight razors to get the clean, close shaves they were accustomed to and which they found they couldn't get with the new electric razors. The objection usually mentioned by these persons is that the operation is too slow and tedious because the razor has to be worked back and forth and again and again over each area until all of the stubby hair has been entered into the fine slots in the guard or head and cut off. Naturally, many users, accustomed to the speedier operation of their old style razors, are not patient enough to do this, and, as a result, the shaves are not satisfactory. Many find they can't get a satisfactory close shave, no matter how hard they try. Then too, many notice that the beard on the neck, where the hair doesn't stand out as elsewhere, is hard to work into the slots. Many also experience difficulty in shaving the upper lip, especially around their mustache, because of the razor's unwieldiness. Then too, these other razors are limited to "dry" shaving, which many accustomed to shaving with lather do not find satisfactory. It is the principal object of our invention to avoid these objections by providing a truly "safety" type electric razor, similar to the ordinary safety razor and retaining its safety features, as well as its handiness and facility of operation, but embodying power operated rotary cutters to permit "dry shaving" or "wet shaving," whichever is preferred.

A salient feature of the invention is the employment of elongated rotary cutters disposed longitudinally within the slotted guards of the otherwise conventional safety razor and cooperating with the cutting edges of the conventional replaceable blade held in substantially the conventional relation to the guards.

Another feature is the provision of adjustable set screws in the head under the four corners of the blade which permit finely adjusting the two edges of the blade relative to the two rotary cutters to obtain good shearing action and permit tightly clamping the blade without having it bear too heavily on the cutters and act as a brake.

Another important object of our invention is to provide a simple and practical drive for the rotary cutters whereby to obtain unusual compactness, reduce power consumption to a minimum, avoid excessive heating due to friction, and obtain smoother and quieter operation. A single helical pinion is provided, in accordance with our invention, centrally located in the head and meshed directly with the two helically grooved rotary cutters at their middles, thus reducing the mechanism to the smallest possible number of parts and making for a light weight, well balanced device, and one which may be produced at low cost.

Still another important object is to construct as much of the device of die cast parts as possible to further reduce weight and lower the cost of production, and incidentally facilitate assembly and disassembly and make removal and replacement of worn cutters and pinions a simple matter. In accordance with this object the body is made up of two interchangeable interfitting die cast parts that are formed with halves of the pinion chamber therein and are formed to provide complementary halves of the pinion shaft bearing, and these are adapted to be assembled together encasing the pinion and shaft therebetween with the cutters meshed with the opposite sides of the pinion and fitting with their end journals in aligned bearings on the ends of the guard portions of the two halves.

The invention will be better understood as reference is made in the following description to the accompanying drawings, in which—

Figure 1 is a front view of an electric safety razor made in accordance with our invention;

Fig. 2 is a top view;

Fig. 3 is a side view with a portion thereof broken away to reveal one of the blade adjusting screws;

Figs. 4 and 5 are vertical sections on the correspondingly numbered lines of Fig. 2;

Fig. 6 is a top view of the two-piece head by itself;

Fig. 7 is a fragmentary side view similar to Fig. 3, showing a modified or alternative construction;

Fig. 8 is a greatly enlarged fragmentary sectional view illustrating the operation of the razor, and

Fig. 9 illustrates a razor like that of Figs. 1 to 8 but having a motor for driving the same, forming the handle thereof.

Similar reference numerals are applied to corresponding parts throughout the views.

The safety razor in connection with which we have disclosed our invention is of the well known Gillette type using double edged blades, but it must be understood that the invention should not be construed as limited in its application to this one particular type of safety razor, inasmuch as the rotary cutter and novel drive therefor may be employed in connection with any safety razor blade, whether it be a single edged or double edged blade. Furthermore, while we at present prefer to utilize removable blades of the conventional safety razor type, because of the facility and economy with which the razors' cutting edges may thus be replaced, it should be understood that the invention is not to be regarded as limited to such a construction, because a more or less permanent part may be provided on the razor furnishing the cutting edge or edges cooperating with the rotary cutter or cutters. Furthermore, while we have shown in Figs. 1 and 3 to 5 a pinion drive shaft in a slender handle, adapted for a flexible shaft drive similar to those employed in connection with dental drills, the invention is by no means to be construed as limited to such a drive, inasmuch as the handle may be provided by the motor for driving the razor, as illustrated at **20** in Fig. 9, and in that case the device can be turned on and off by turning a switch knob **20'** on the end of the motor housing. In other words, the present disclosure has been confined mainly to the improved razor head construction, inasmuch as there are any number of motive means available, and it would only unnecessarily encumber this disclosure to go into that phase.

The head **8** is made of two die-cast parts **9** and **10** which are alike and are therefore interchangeable, thus greatly simplifying production and reducing cost. The two halves **9** and **10** have half round shanks **11** and **12** which when the two halves are placed together end to end, as in Fig. 6, form a bearing **13** for the drive shaft **14**. Half round recesses **15** formed in the abutting ends of the two halves **9** and **10** provide a circular chamber in the head **8** for the drive pinion **16** connected to the enlarged fluted end **17** of the shaft **14**. The two halves **9** and **10** of the head may, if desired, have the shank portions **11** and **12** thereof left blank in the die casting of these parts, so that the two halves can be identical, and then later when the two halves are suitably held in assembled relation, the shank portions can be threaded to thread in the internally threaded enlarged upper end **18** of the handle **19** or the corresponding part **18a** on the end of the housing of motor **20**, whereby to secure the two halves of the head together. At the same time that the shank portions **11** and **12** are threaded, the bearing **13** can, if desired, be reamed to insure a good fit for the shaft **14** therein. The latter, it will be noted, extends through the hollow handle **19** and in the case of a flexible shaft drive, will be suitably coupled at the outer end of the handle to the flexible shaft, the casing of which will be attached to the handle. However, in the case of a direct motor drive, the shaft **14** can be regarded as the armature shaft of the motor, or the shaft coupled directly to the armature shaft. The head **8** has guards **21** and **22** on opposite sides thereof provided by a series of laterally spaced prongs similar to what are provided on the conventional Gillette safety razor. It will be noticed that each half of the head has five of these prongs on one side and six on the other and that the sixth prong necessitates the small shoulder **23** on the end of each half, which, however, is not at all objectionable, but is really an advantage from the standpoint of interlocking the two halves of the head more firmly in assembled relation and securing better alignment between the halves. The head is recessed longitudinally on opposite sides, as at **24**, adjacent the guards **21** and **22** to provide spaces for the two elongated rotary cutters **25** and **26**. These are helically grooved similarly as twist drills and will be manufactured in much the same manner and consequently will be available at low cost. The pinion **16** is a helical pinion and meshes directly with the cutters **25** and **26**, as indicated clearly in Figs. 2 and 5. With the pinion turning in a counter-clockwise direction, as shown by the dotted arrow in Fig. 2, the cutters **25** and **26** turn in opposite directions, toward the adjacent cutting edges of the associated blade, as indicated by the small arrows in Fig. 5. The fact that the drive is a helical gear drive manifestly makes for smooth, quiet operation even though the pinion cannot operate with lubricant, for obvious reasons. The razor is also well balanced with rotary cutters placed on opposite sides of the handle axis, and this arrangement also means reduced vibration because there is balanced drive thrust on opposite sides of the pinion drive shaft. The opposite ends of the cutters **25** and **26** are reduced to provide coaxial journals **27** that are received in bearings **28** formed on the ends of the head as integral parts of the halves **9** and **10** thereof. It is obvious that in the assembling of the razor, the cutters **25** and **26** will be assembled in the one half of the head in meshing engagement with the pinion **16** also assembled in that half, and then the other half of the head will be brought into position thus encasing the working parts in the head in proper assembled relation, whereupon the handle **19** or motor **20**, as the case may be, will be attached to the head, securing the two halves thereof together. Obviously if either or both of the cutters **25** and **26** should require replacement at any time due to wear, it is a simple matter for the user or a service man to disassemble the razor, substitute new cutters, and reassemble the razor.

The blade **29** is a conventional Gillette safety razor blade having the two cutting edges **30** and **31** adapted to cooperate with the cutters **25** and **26**, respectively, the latter being located so that when the blade is clamped down and is thereby arched slightly its edge portions will come directly over the centers of the cutters and be substantially tangent to the peripheries thereof, as indicated by the fact that the lines *a*—*b* and *c*—*d* drawn from the center of the arc of the blade through the centers of the cutters intersect the cutting edges **30** and **31** (see Fig. 5). The edges **30** and **31** are double bevel edges, and the bottom bevel of each edge will permit adjusting the

blade so that the edges have the requisite small working clearances with respect to the peripheries of the cutters for good shearing action. At the same time, since the cap **32** has its arcuate top surface **33** on the same arc with the top surfaces **34** of the guards **21** and **22**, providing for the same, or substantially the same, clearance with respect to the cutting edges **30** and **31** as in the conventional Gillette safety razor, it follows that the present razor, although power operated, will be capable of shaving just as closely as the conventional hand power Gillette safety razor operated the old way, and with the same degree of safety as well as the same degree of handiness and facility of operation. An important difference, however, in the operation of this razor, aside, of course, from the fact that it enables "dry" or "wet" shaving, as preferred, is the freedom from "pulling," regardless of the fact that the blade **29** may not be a new sharp blade. The stubby hair coming into the path of the cutting edge **30** or **31**, at the crown of the ridge of skin, in accordance with the Gillette principle, and, as illustrated at H in the enlarged sectional view, Fig. 8, is in accordance with the novel principle of our invention, sheared off by being worked against the cutting edge by the associated cutter **25** or **26**, and the hair is cut off squarely and without discomfort to the operator, because the cutting action does not depend upon the movement of the razor by hand against the hair as in the old conventional hand power Gillette razor, but, instead, the power-operated cutter cooperating with the blade does the work. It is manifest that the operation of this razor will be just as speedy, if not speedier, than the hand-operated type, because in one stroke of the blade and cutter over a given area, all of the beard in the path of the blade will be shaved off. In other words, there will usually be no necessity for going over the same area more than once, any more so than with the ordinary Gillette safety razor. The fact that the entire cutting edge of the blade is used instead of having to work the hair through fine slots to get them into the path of the cutter makes the shaving action with this razor so much quicker and more positive than with the razors with the reciprocating type cutters and is the thing which makes the razor good for wet or dry shaving. Incidentally, the use of the cutting edge of the razor blade, as distinguished from the use of a slotted or perforated guard or head on the clipper type razors, permits as close shaving as the operator desires, because there is no limitation inherent in the construction of the razor, such as the thickness of the intervening wall of the guard or head. It is also quite an advantage for the user to be in a position to replace the blade **29** after a reasonable amount of service when he will probably experience better and smoother operation with a new blade because of the sharper edges. However, due to the novel shearing action obtained with the power-operated cutters **25** and **26**, it is obvious that keen cutting edges on the blade are not so essential as in the ordinary hand power safety razor. Then, too, the rotating helical cutters will have a distinct honing effect on the cutting edges of the blade, assuring long life. In passing, attention is also directed to the fact that the rotary cutters **25** and **26** are exposed very little between the guards **21** and **22** and the edges of the blade **29** so that there is no danger of the operator getting the flesh pinched between the cutter and the edge of the blade, bearing in mind the fact that Fig. 5, like the other views, with the exception of Fig. 8, shows the razor about twice its actual size. Fig. 8 clearly illustrates that there is no danger of cutting or pinching the skin, inasmuch as the skin is bulged, as at H, only enough to barely reach the skin engaging side of the blade's cutting edge portion, and since the rotary cutter is on the opposite side of said cutting edge portion, it cannot possibly pinch or clip the skin, although it is close enough to the crown of the ridge of skin to give a close shave. If the operator merely exercises ordinary care equivalent to the care he would exercise with the conventional hand power safety razor, there is no danger of his cutting himself with this razor.

The cap **32** is generally similar to the blade-clamping cap on the ordinary Gillette safety razor, and has a longitudinal rib **35** extending along the middle of the bottom thereof which fits in the slot **36** in the blade and the slot **37** in the head **8** so as to accurately locate the blade **29** with respect to the head at the same time that it is clamped in place. There are two studs **38** and **39** projecting downwardly from the cap **32** near its opposite ends, and these pass through holes **40** in the blade at opposite ends of the slot **36**, and then through holes **41** in the head **8** to receive knurled nuts **42** and **43** arranged to be tightened up against the flat bottom of the head in the manner clearly shown in Fig. 4. Realizing the importance of correct clearance between the edges **30** and **31** of the blade **29** and the cutters **25** and **26**, and also the importance of avoiding having the tightly clamped blade bearing too heavily on the cutters, or either of them, and acting as a brake, we provide four adjusting screws **44**—**47** in the vertical holes **44'**—**47'** in the head **8** in the vicinity of the four corners of the blade **29** arranged to be adjusted up and down in these holes to provide adjustable seats for the blade at the four corners so that, regardless of minor variations in the manufacture of the head or in the cutters **25** and **26**, it will be possible to align both ends of each cutting edge in the proper relation to the associated cutter and thereby obtain good shaving action by reason of the uniform operating clearance between the cutting edge and rotary cutter from end to end. When all of the screws have been adjusted, it is apparent that there will be sufficient spring in the cap **32** for it to seat the blade firmly on the ends of all of the screws when the nuts **42** and **43** are properly tightened. These screws **44**—**47** when once properly adjusted at the factory should not require subsequent readjustment so long as the razor is not taken apart, excepting, of course, where the wear on the ends of the screws occasioned by oft repeated tight clamping of the blade has resulted either in uneven clearance relationship between the blade edges and cutters, or too heavy pressure of the blade on the cutters, resisting turning thereof, especially when the blade is clamped tightly. In such cases, a slight adjustment of the screws will compensate for the wear and re-establish the correct close working clearance so that the razor will run freely and shave properly and the blade may be clamped tightly. The adjustment of these screws is a fairly simple matter, so that a person of average mechanical ability should have no difficulty in making the adjustment.

Fig. 7 shows a modified or alternative construction in which the cap **32'** has cutting edges thereon cooperating directly with the rotary cutters

25 and 26 in the manner indicated by the cooperation of the cutting edge 31' with the cutter 26. This cap will seat directly on the screws 44—47 and be clamped in the same manner as the cap 32. The adjustment of the screws 44—47 at the four corners of the cap will insure uniform clearance between the cutting edges on the cap and the peripheries of the cutters 25 and 26 in much the same way as in the other construction. With this construction, the cap 32' will, of course, be made of steel of fairly good quality so as to provide fairly durable cutting edges. These caps if made in large quantities would be available at a low enough cost to make their replacement at less frequent intervals than in the case of the blades 29, feasible, even though the cap 32' would cost several times what one of the blades 29 does. The operation with this construction would obviously be practically the same as with the other construction.

In conclusion, attention is called to Fig. 8 in connection with which the operation of the razor of our invention will now be explained in greater detail. Section *m*—*n*—*o*—*p* shows a greatly enlarged section of human skin being shaved by the razor tilted forward in the direction of the shaving motion indicated by the arrow, so that the axis K—M of the drive shaft 14 (also of the handle 19, or motor 20) is inclined at the angle shown, about 36 degrees, to the line J—E perpendicular to the plane X—X of the outside surface *m*—*n* of the skin. The normal amount of pressure exerted by the operator's hand on the handle 19 (or motor 20) during the shaving operation causes the portions of the cap 32 and of the guard prongs 21 contacting with the surface *m*—*n* of the skin to be impressed into the skin an appreciable amount below the level of plane X—X as shown. This is, of course, true the full length of the cap 32 and guard 21. The bulge or ridge H of skin formed parallel to the cap and guard, as well as cutting edge 30 and cutter 25, has a lateral width at the base extending from point A on cap 32 to point B on the guard 21, the ridge H being continuously and progressively formed as described in the motion of the razor in the direction C. Such a ridge is, of course, likewise formed if the razor is held motionless in a similar position in contact with the skin. Obviously, shaving of the beard on the skin surface *m*—*n* can take place only on the crown of the ridge H, as the latter is presented in the relation shown to the cutting edge 30 of blade 29 and the teeth of cutter 25 cooperating with edge 30. The closeness of the shave is dependent upon the nearness of the crown of the ridge H to the cutting edge 30 and the teeth of cutter 25, so that for close shaving the crown of ridge H will be in contact with the cutting edge 30, which the operator learns by trial to secure by modifying the pressure on the razor handle. The hairs *h*—1 *h*—2, and *h*—3 of the beard lying in a line in the section *m*—*n*—*o*—*p* are shown as having been shaved off flush with the surface *m*—*n* of the skin, and hair *h*—4 on the forward slope of the ridge H is seen in the process of being sheared off between the cutting edge 30 of blade 29 and one of the helical teeth of cutter 25, while other hairs *h*—5 and *h*—6 are seen between two of the prongs of guard 21 in the path of motion of the razor about to appear upon similar ridges as ridge H to be sheared off. Other hairs not shown, lying directly in the path of the individual prongs of the guard 21, are not in the path of the spaces between the prongs as occurred in the case of hairs *h*—5 and *h*—6 shown here, are pressed downwardly into the surface *m*—*n* of the skin momentarily, but spring erect once more after passing point B within the small space between the point B and the cutting edge 30 of blade 29, to be similarly presented to cutting edge 30 on similar ridges as ridge H and to be shaved off in the same manner as hairs *h*—1, *h*—2, and *h*—3 as the razor moves forward in the direction C. In the razor of our invention, the cutting edge 30 of blade 29 is located in the plane X—X a predetermined appreciable distance above the plane Y—Y tangent to the points A and B, so that the cutting edge 30 barely contacts in a tangential relation with the forward sloping side of the ridge H of the skin only when the operator shaves as closely as possible, and there is therefore no danger of gouging or cutting into the ridge H of skin. In the present razor, the rotary cutter 25 cooperates with the cutting edge 30 of blade 29 in such manner that the safety feature, heretofore found only in the hand power safety razors of the Gillette type employing only the razor blade similar to blade 29, is maintained unimpaired, while at the same time permitting dry and wet shaving, and making for greater comfort and efficiency in shaving than was possible hitherto when shaving with the razor blade alone. In this connection we would point out that the critical dimensions, namely, the space between the points A and B, and the space between point B and the cutting edge 30 correspond to the dimensions on the hand power Gillette safety razors, the correctness of which has been demonstrated by years of practical experience, and we consider it an important feature of our invention that it enables power operation as herein disclosed without necessitating any change in these all important critical dimensions. The peripheries of the teeth of cutter 25 contacting with the cutting edge 30 of blade 29 (or having a minute clearance therebetween, as elected), and adapted to shear off the hairs of the beard appearing upon the ridge H by working them against the cutting edge 30, which are seen as a circle in this view, are tangent to the forward slope of the ridge at the same point as the cutting edge 30, so that it is obviously true that if the cutting edge 30 cannot gouge or cut into the ridge H, neither can the teeth of the cutter 25 cooperating with edge 30 do so. The hairs cut off in dry shaving will be thrown out by the cutters through the spaces between the prongs of the guards. In wet shaving, the lather works out between the prongs similarly as on the hand power Gillette razors. The fact that the spaces between the prongs expose about half of the periphery of the cutters, as indicated in Figs. 1 and 5, is of advantage both for clearing out accumulations easily and for keeping the cutters operating cool.

It is believed the foregoing description conveys a good understanding of the objects and advantages of our invention. The appended claims have been drawn with a view to covering all legitimate modifications and adaptations.

We claim:

1. A safety razor comprising a handle carrying a head adapted to support a blade, a blade mounted thereon having a straight cutting edge, a clamp for holding the blade in operative position on the head, a guard on said head in front of the blade's cutting edge serving with the clamp to guide and gauge the same in operation over the skin contacted by the clamp and guard, an

elongated rotary cutter disposed longitudinally under the blade and behind the guard in close hair shearing relationship to said cutting edge, said clamp being arranged to move the blade toward the head and cutter and hold it in operative relation thereto, screw threaded adjustments under opposite ends of the blade adjacent the cutting edge independently adjustable for adjusting the blade away from the head and cutter and into parallel relation to the cutter and to an adjustable clearance relationship therewith, and means for driving said cutter.

2. A Gillette type safety razor comprising a handle carrying a head adapted to support a blade, a blade mounted thereon having opposed parallel straight cutting edges, a blade hold-down clamp member over said blade having smooth top surfaces spaced to the rear of and above the two cutting edges, and guards on said head in front of the cutting edges each having a smooth top surface which in slidably contacting the skin being operated over by the cutting edge cooperates with the related surface on the clamp member similarly contacting the skin to guide and gauge the operation of said cutting edge, an elongated rotary cutter for each cutting edge disposed longitudinally under the blade and behind the guard in close hair shearing relationship to the associated cutting edge, said clamp member being arranged to move the blade toward the head and cutters and hold it in operative relation thereto, screw threaded adjustments under opposite ends of the blade adjacent the two cutting edges, said adjustments being adjustable independently of one another for adjusting both edge portions of the blade away from the head and cutters and into parallel relation to the cutters and to an adjustable clearance relationship therewith, and means for driving said cutters.

3. In combination, a safety razor head having opposite longitudinal edges formed to provide guard portions for contact in front of the cutting edge with the skin being shaved, a blade having opposed longitudinal straight cutting edges and mounted on the head with said edges in spaced posterior relation to said guard portions, two elongated helically grooved rotary cutters in parallel relation in longitudinal recesses provided therefor in said guard portions for operation under the cutting edges of said blade in close hair shearing relation thereto, and a single helical drive pinion of a diameter nearly equal to the width of the blade from one cutting edge to the other and disposed beneath and substantially parallel to the blade between and meshed with both cutters to turn the same in opposite directions toward the blade's cutting edges.

4. In combination, a safety razor head having opposite longitudinal edges formed to provide guard portions for contact in front of the cutting edge with the skin being shaved, a blade having opposed longitudinal straight cutting edges and mounted on the head with said edges in spaced posterior relation to said guard portions, two elongated rotary cutters in parallel relation in longitudinal recesses provided therefor in said guard portions for operation under the cutting edges of said blade in close hair shearing relation thereto, both of said cutters being helically grooved, a single power-operated helical pinion of a diameter nearly equal to the width of the blade from one cutting edge to the other and disposed beneath and substantially parallel to the blade between and meshing with the helically grooved cutters for driving the same in opposite directions so as to turn toward the associated cutting edges, a hollow handle for supporting and moving the head extending therefrom in concentric relation to said pinion, and a drive shaft extending from said pinion into said handle.

5. In combination, a safety razor head having opposite longitudinal edges formed to provide guard portions for contact in front of the cutting edge with the skin being shaved, a demountable blade having opposed longitudinal straight cutting edges and mounted on the head with said edges in spaced posterior relation to said guard portions, blade clamping means, two elongated rotary cutters in parallel relation in longitudinal recesses provided therefor in said guard portions for operation under the cutting edges of said blade in close hair shearing relation thereto, said blade clamping means being arranged to move the blade toward the head and cutters and hold it in operative relation thereto, four adjustable screws providing elevated adjustable blade seats on the head under the four corners of the blade, one at each end of a cutting edge, for adjusting the cutting edge portions independently of one another away from the head and cutters to substantially parallel relation to the associated cutters and to an adjustable clearance relationship therewith, and means for driving said cutters.

6. In combination, a Gillette type safety razor body adapted to support a straight double edged removable and replaceable blade, and separate guards on the body for the two edges of the blade, two elongated rotary helically grooved cutters in parallel relation on said body in longitudinal recesses provided therefor in the guards for hair shearing action with the edges of a blade removably mounted on said body, and a single helical drive pinion disposed between and meshed with said cutters to turn the same in opposite directions toward the blade's cutting edges.

7. In combination, a Gillette type safety razor body adapted to support a straight double edged removable and replaceable blade, and separate guards on the body for the two edges of the blade, two elongated rotary cutters in parallel relation on said body in longitudinal recesses provided therefor in the guards for hair shearing action with the edges of a blade removably mounted on said body, both of said cutters being helically grooved, single power operated helical pinion between and meshing with the helically grooved cutters for driving the same in opposite directions so as to turn toward the associated cutting edges, a hollow handle for supporting and moving the head extending therefrom in concentric relation to said pinion, and a drive shaft extending from said pinion into said handle.

8. In combination, a Gillette type safety razor body adapted to support a straight double edged removable and replaceable blade, a blade holder on said body, and separate guards on the body for the two edges of the blade, two elongated rotary cutters in parallel relation on said body in longitudinal recesses provided therefor in the guards for hair shearing action with the edges of a blade removably mounted on said body, said blade holder being arranged to move the blade toward the head and cutters and hold it in operative relation thereto, four screws threadedly

mounted in said body for detachable engagement with the bottom of a blade at the four corners thereof, one at each end of a cutting edge, whereby to adjust the blade away from the head and cutters to substantially parallel relation to the cutters and to an adjustable clearance relationship therewith, and means for driving the cutters.

9. A razor comprising in combination, a substantially rectangular head having a centrally located handle projecting therefrom substantially at right angles to the bottom of the head, a rectangular blade being adapted to be placed on top of said head and held in register therewith with opposed straight cutting edges in parallel relation to guard portions provided on opposite sides of said head, a pair of parallel helically grooved rollers on said head adjacent said guard portions and parallel thereto and with the cutting edges of a blade when placed thereover, a helical gear rotatable in a recess provided in the center of said head substantially concentric with the handle, said gear disposed in the plane of said head in direct meshing engagement with said helically grooved rollers, and a driven shaft extending from the center of said gear into said handle for connection with a motive means.

10. A power-operated safety razor comprising a helical gear, a drive shaft therefor, two helically grooved gear-like rollers meshing therewith on diametrically opposite sides in substantially parallel relation, each having coaxial journals extending from opposite ends thereof, a two-piece head to encase and support said gear and rollers, each head piece having a pair of bearing portions to receive the journals on one end of said rollers and having a half-round recess provided therein at the middle of one side to receive one half of said gear and a half round bearing recess in concentric relation to the gear recess to engage said shaft from one side, whereby when the two pieces are positioned in abutment with their recesses in register the journals on said rollers are supported in their bearings and the shaft in its sectional bearing and the gear meshing with the rollers and disposed in a chamber formed by the mating recesses in the two pieces, means for securing said head pieces together with the other elements disposed therein as recited, and means for mounting a blade on said head in operative relation to said rollers.

11. A power operated safety razor comprising a handle carrying a head adapted to support a blade, a thin wafer-like blade mounted thereon having opposed parallel straight cutting edges, a clamp member superimposed on the blade having opposed edges in spaced relation to the cutting edges of the blade and holding the blade on the head, skin engaging guards on opposite sides of the head in front of and spaced from the cutting edges of the blade, gauge means for gauging the height and width of an elongated ridge of skin formed when the razor is operatively disposed with either of the cutting edges of the blade in normal shaving relation to the skin of a face to be shaved, said gauge means being provided on said clamp member and guards at a predetermined elevation and fore and aft spaced relationship with reference to the cutting edges of the blade so that the blade is disposed with the skin-engaging side of either cutting edge portion in operative engagement with the crown of the elongated ridge of skin bulged toward the blade from said gauge means, an elongated helically grooved rotary cutter associated with each cutting edge of the blade disposed in tangent relation to the opposite side of the cutting edge portion of the blade and substantially entirely within the associated guard in parallel close hair shearing relationship to the blade cutting edge, a single intermediate helical drive pinion centrally mounted in a recess in the head and meshing with said cutters, the aforesaid handle being hollow, and a drive shaft extending through said handle to the pinion driving the same so as to turn the two cutters in the direction of the associated cutting edges.

12. A power operated safety razor comprising a head adapted to support a blade, a thin wafer-like blade mounted thereon having a straight cutting edge, a clamp member superimposed on the blade in spaced relation to the cutting edge holding the blade in operating position on the head, a skin engaging guard on said head in front of and spaced from the cutting edge, gauge means for gauging the height and width of an elongated ridge of skin formed when the razor is operatively disposed in normal shaving relation to the skin of a face to be shaved, said gauge means being provided on said clamp and guard at a predetermined elevation and fore and aft spaced relationship with reference to the cutting edge so that the latter is disposed with the skin-engaging side of its cutting edge portion in operative engagement with the crown of the elongated ridge of skin bulged toward the blade from said gauge means, an elongated longitudinally grooved rotary cutter of a small diameter which is a small fraction of the width of the blade and disposed in tangent relation to the opposite side of the cutting edge portion of the blade and substantially entirely within the guard in parallel close hair shearing relationship to said cutting edge, means for driving said cutter to turn toward said cutting edge, and adjusting screws threaded in the head under opposite ends of the blade adjacent the cutting edge and adjustable independently of one another to space the blade with respect to the head with its cutting edge in exact parallelism with the periphery of the cutter and so as to permit clamping the blade with the clamp member without causing the blade to press against the cutter as a brake.

13. A power operated safety razor comprising a handle carrying a head adapted to support a blade, a thin wafer-like blade mounted thereon having opposed parallel straight cutting edges, a clamp member superimposed on the blade having opposed edges in spaced relation to the cutting edges of the blade and holding the blade on the head, skin engaging guards on opposite sides of the head in front of and spaced from the cutting edges of the blade, gauge means for gauging the height and width of an elongated ridge of skin formed when the razor is operatively disposed with either of the cutting edges of the blade in normal shaving relation to the skin of a face to be shaved, said gauge means being provided on said clamp member and guards at a predetermined elevation and fore and aft spaced relationship with reference to the cutting edges of the blade so that the blade is disposed with the skin-engaging side of either cutting edge portion in operative engagement with the crown of the elongated ridge of skin bulged toward the blade from said gauge means, an elongated helically grooved rotary cutter associated with each cutting edge of the blade disposed in tangent relation to the opposite side of the cutting edge portion of the blade and substantially entirely

within the associated guard in parallel close hair shearing relationship to the blade cutting edge, a single intermediate helical drive pinion centrally mounted in a recess in the head and meshing with said cutters, the aforesaid handle being hollow, a drive shaft extending through said handle to the pinion driving the same so as to turn the two cutters in the direction of the associated cutting edges, and two screws associated with each cutting edge of the blade adjustably threaded in the head under opposite ends of the blade adjacent the cutting edge associated therewith, said screws adjustable independently of one another to space the blade with respect to the head with its cutting edges in exact parallelism with the periphery of the cutters and so as to permit clamping the blade with the clamp member without causing the blade to press against the cutters as a brake.

14. A power-operated shaver comprising, in combination, a handle carrying a blade supporting head, said head having a guard portion on one of its longitudinal edges and having a longitudinal cutter receiving recess provided therein parallel to and adjacent said guard portion, a thin flexible blade on said head providing a cutting edge portion overhanging said recess, a rotary cutter in said recess, drive means therefor, and clamp means on said head for flexing said blade with respect to the head so that the cutting edge portion is held in hair shearing relation to said cutter, said rotary cutter being positioned spaced below the common plane of the face contacting surfaces of said guard and clamp means, the cutting edge portion of said blade in the shaving operation lying approximately tangent to the ridge of a rounded elongated bulge of skin formed by the device on the face, similarly as in wet shaving with a Gillette safety razor, whereby to keep the skin clear of the rotary cutter while permitting shearing off hair therefrom close to the surface of the skin.

15. A power-operated shaver comprising, in combination, a handle carrying a blade supporting head, said head having guard portions on its opposed parallel longitudinal edges and having longitudinal cutter receiving recesses provided therein parallel to and adjacent said guard portions, a thin flexible blade on said head providing opposed cutting edge portions overhanging both of said recesses, a rotary cutter in each recess having helical grooves therein for shearing and driving purposes, said head having a central recess provided therein concentric with the handle and communicating at diametrically opposite sides with the cutter receiving recesses, a helical drive pinion in said recess in substantially parallel relation with the blade and having direct meshing engagement in the helical grooves in said cutters to drive the same in opposite directions, means for driving said pinion extending through the handle, and clamp means on said head for flexing said blade so that the cutting edge portions thereof are held in hair shearing relation to said cutters, said clamp means and either of said guard portions cooperating by engagement with the face of the operator in shaving to space the cutting edge portions of the blade from the face so as to lie approximately tangent to the ridge of a rounded elongated bulge of skin formed by the device on the face, similarly as in wet shaving with a Gillette safety razor, whereby to keep the skin clear of the rotary cutter while permitting shearing off hair therefrom close to the surface of the skin.

16. A power-operated safety razor comprising a helical gear, a drive shaft therefor, a helically grooved gear-like roller meshing with said gear having coaxial journals extending from opposite ends thereof, a two-piece head to encase and support said gear and roller, each head piece having a bearing portion to receive the journal on one end of said roller and having a half-round recess provided therein at the middle of one side to receive one half of said gear and a half round bearing recess in concentric relation to the gear recess to engage said shaft from one side, whereby when the two pieces are positioned in abutment with their recesses in register the journals on said roller are supported in their bearings and the shaft in its sectional bearing and the gear meshing with the roller and disposed in a chamber formed by the mating recesses in the two pieces, means for securing said head pieces together with the other elements disposed therein as recited, and means for mounting a blade on said head in operative relation to said roller.

17. As an article of manufacture, a Gillette type safety razor head of two-piece construction divided transversely through the middle in a plane at right angle to the plane of the head, each piece comprising a substantially rectangular head portion and half-round shank portion projecting at right angles from one end thereof, the shank portion having a concentric half-round bearing recess formed therein extending lengthwise thereof adapted to accommodate a drive shaft, the head portion having a half-round recess provided in the end thereof concentric with the half-round bearing recess adapted to accommodate a helical drive pinion on the aforesaid drive shaft, the head portion being further formed on one side thereof to provide a longitudinal recess at right angles to the aforesaid bearing recess and communicating with one side of the pinion recess in the head portion and adapted to accommodate a helically grooved cutter meshed with the drive pinion.

18. An article of manufacture as set forth in claim 17, wherein each of the head pieces has the head portion thereof further formed to provide at the end of the longitudinal cutter recess a bearing opening substantially concentric with the recess and adapted to receive one of the bearing journals on the ends of the cutter adapted to operate in the recess.

19. An article of manufacture as set forth in claim 17, wherein the two head pieces when placed end to end define with the two half-round shank portions a cylindrical shank, and wherein said shank portions are externally threaded so as to be adapted to be threadedly received in an internally threaded member for fastening together said head pieces.

20. An article of manufacture as set forth in claim 17, wherein the head pieces have the head portions thereof further formed to provide screw threaded holes therein substantially at right angles to the plane of the head portions alongside the longitudinal cutter recess and adapted to receive adjusting screws adapted to project from the top of the head portions to serve as adjustable blade seats on the head portions.

21. An article of manufacture as set forth in claim 17, wherein each of the head pieces is further formed to provide two parallel shoulders on the end of the head portion adjacent the pin-

ion recess at right angles to the plane of the head portion and spaced equidistant from the center of the bearing recess, the one shoulder being defined by a cut-away portion on one side of the head and the other shoulder being defined by a projecting portion on the other side of the head, the cut-away and projecting portions both having faces parallel with the end of the head portion and with the flat side of the half-round shank portion.

22. In combination, a safety razor head having opposite longitudinal edges formed to provide guard portions for contact in front of the cutting edge with the skin being shaved, a blade having opposed longitudinal straight cutting edges and mounted on the head with said edges in spaced posterior relation to said guard portions, an elongated helically grooved rotary cutter in a longitudinal recess provided therefor in one of said guard portions for operation under the adjacent cutting edge of the blade in close hair shearing relation thereto, and a helical drive pinion of a diameter slightly smaller than the width of the blade from one cutting edge to the other and disposed beneath and substantially parallel to the blade and meshed with said cutter to turn the same toward the cutting edge of the blade.

23. A razor comprising in combination, a substantially rectangular head having a handle projecting therefrom substantially at right angles to the bottom of the head, said head having a guard portion provided on at least one of its longitudinal edges, a rectangular blade adapted to be placed on top of said head and held in register therewith with a longitudinal straight cutting edge in parallel relation to said guard portion, a helically grooved roller on said head adjacent said guard portion and parallel thereto and in hair shearing relation with the adjacent cutting edge of a blade when placed thereover, said roller being positioned spaced below the plane of the face contacting surface of said guard portion, a helical gear rotatable in a recess provided in said head substantially concentric with the handle, said gear disposed in said head in direct meshing engagement with the helically grooved roller, said gear and roller being in a plane substantially parallel to the general plane of the blade, and a driven shaft extending from the center of said gear into said handle for connection with a motive means.

24. A power-operated shaver comprising, in combination, a handle carrying a blade supporting head, said head having a guard portion on one of its longitudinal edges and having a longitudinal cutter receiving recess provided therein parallel to and adjacent said guard portion, a blade on said head providing a cutting edge portion overhanging said recess, a rotary cutter in said recess, drive means therefor, and means on said head for holding said blade with respect to the head so that the cutting edge portion is held in hair shearing relation to said cutter, said rotary cutter being positioned spaced below the common plane of the face contacting surfaces of said guard and blade-holding means, the cutting edge portion of said blade in the shaving operation lying approximately tangent to the ridge of a rounded elongated bulge of skin formed by the device on the face, similarly as in wet shaving with a Gillette safety razor, whereby to keep the skin clear of the rotary cutter while permitting shearing off hair therefrom close to the surface of the skin.

25. A power-operated shaver comprising, in combination, a handle carrying a blade supporting head, said head having a face contacting guard portion on one of its longitudinal edges and having a longitudinal cutter receiving recess provided therein parallel to and adjacent said guard portion, a blade on said head providing a cutting edge portion overhanging said recess, means on said head providing a face contacting portion in posterior relation to the cutting edge portion of said blade and in a common plane with the face contacting guard portion, which plane is spaced above the cutting edge portion of the blade, a rotary cutter in said recess, drive means therefor, and means for detachably securing said blade on the head with the cutting edge portion held in hair shearing relation to said cutter, said rotary cutter being positioned spaced below the common plane of the aforesaid face contacting portions, the cutting edge portion of said blade in the shaving operation lying approximately tangent to the ridge of a rounded elongated bulge of skin formed by engagement of the device with the face, similarly as in wet shaving with a Gillette safety razor, whereby to keep the skin clear of the rotary cutter while permitting shearing off hair therefrom close to the surface of the skin.

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