

Dec. 1, 1931.

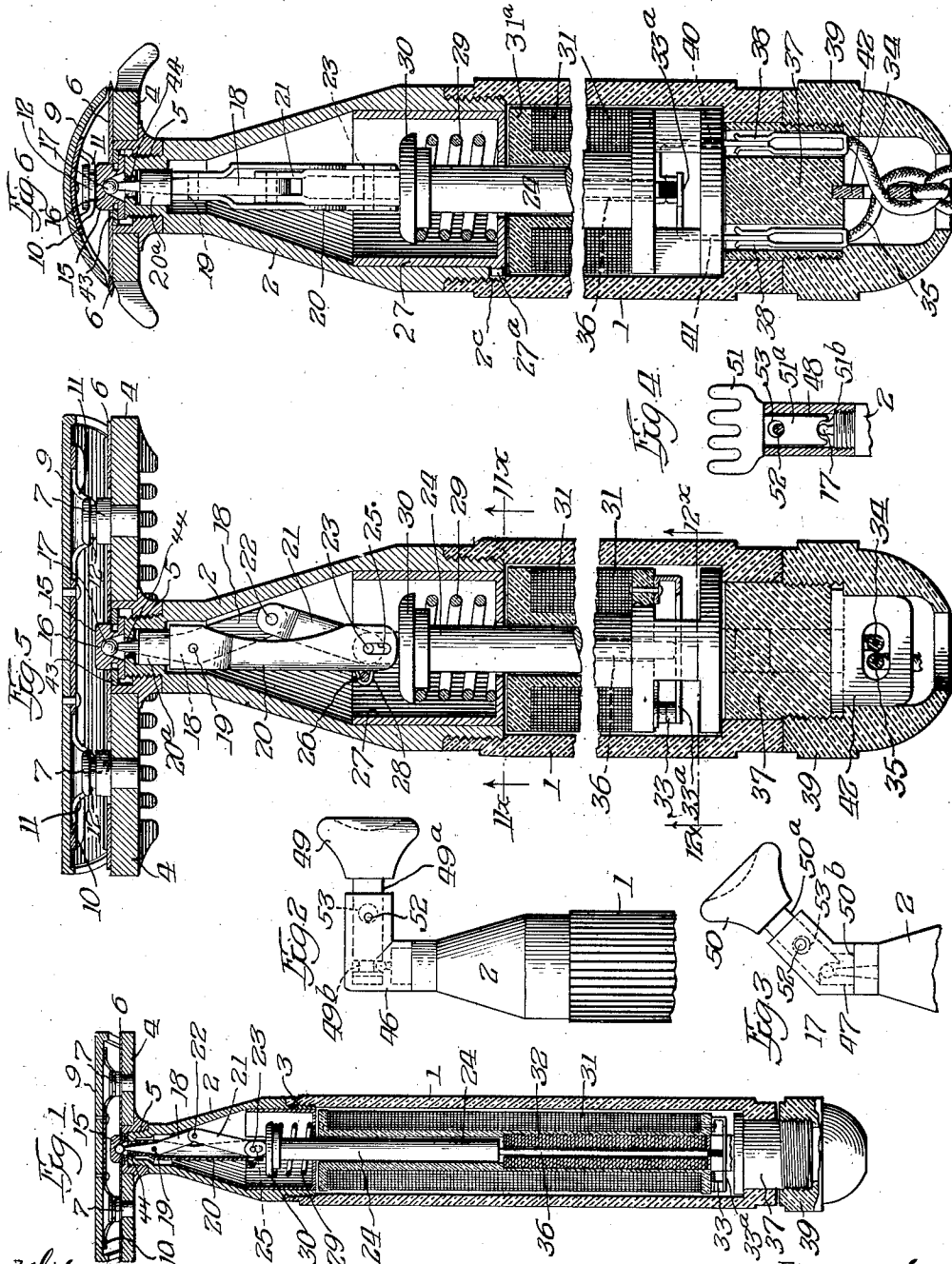
S. SHALER

1,833,916

ELECTRIC RAZOR

Filed Dec. 3, 1923

2 Sheets-Sheet 1



Witness:
Geo. C. Brown.

Inventor
Saul Shaler
By *Wilkinson, Hurley, Byron Knight*
Attys

Dec. 1, 1931.

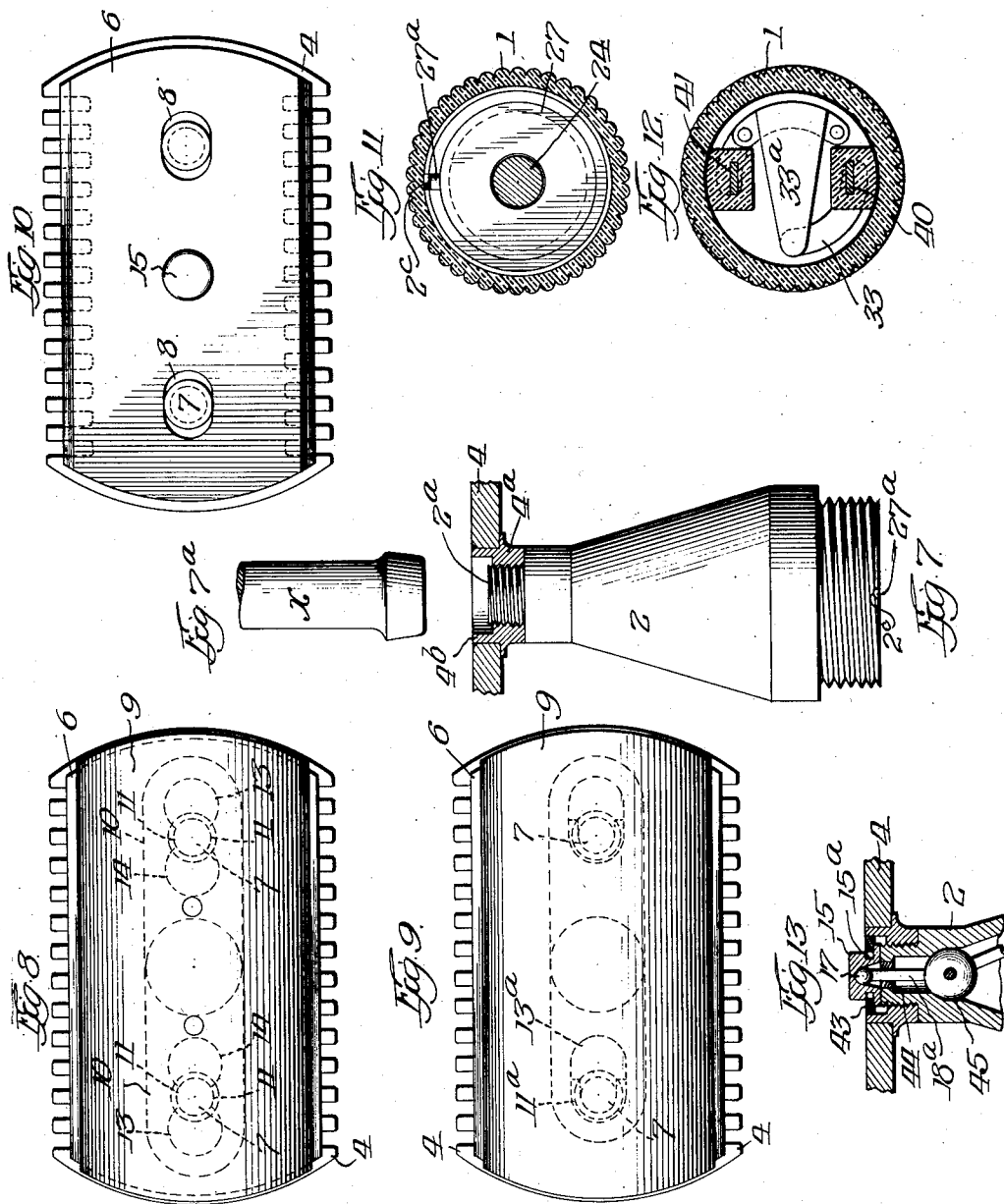
S. SHALER

1,833,916

ELECTRIC RAZOR

Filed Dec. 3, 1923

2 Sheets-Sheet 2



Witness:

Ed. C. Johnson

Inventor
Saul Shaler

By *Wilkinson, Hurley Byron & Knight*
Attys.

UNITED STATES PATENT OFFICE

SAUL SHALER, OF NEW YORK, N. Y., ASSIGNOR, BY MESNE ASSIGNMENTS, TO ELECTRIC RAZOR CORPORATION OF AMERICA, OF BALTIMORE, MARYLAND, A CORPORATION OF MARYLAND

ELECTRIC RAZOR

Application filed December 3, 1923. Serial No. 678,136.

This invention relates to an instrument designed primarily for use in shaving, but embodying in its organization operative principles and features of construction which are useful in other instruments where a vibratory action is desired.

One object of the invention is to provide an instrument in which the member to be vibrated, for instance, a razor blade or massage tip, or the like, can be actuated without developing disagreeable vibratory effects in the handle through which the instrument is held, or oscillation in the instrument as a whole, which renders unsteady the application of the vibratory instrument to the surface being shaved or otherwise treated; and to this end, one feature of the invention consists in having a razor blade, massage tip, or other working member of very light mass relatively to the whole mass of the instrument, and imparting to it vibration at such a high rate of speed that the inertia of the instrument as a whole will respond so slightly to the oscillations set up as to be practically negligible; one feature subordinate or collateral to this part of the invention consisting in mounting the blade or other working part directly in bearings in which it moves, without the intervention of a carriage or other supporting means vibrating with it, and another feature collateral to this part of the invention consisting in developing the rapid vibration from a magnet armature which is in the form of a rod or plunger reciprocating in the geometrical axis of the handle of the instrument, and converting the axial reciprocations into reciprocations of the working member in a plane transverse to said core.

Another object of the invention is to provide an efficient means of very cheap but durable construction for converting the right line axial movements of the magnet core which take place within the handle into transverse movements of the blade or other working part mounted on the head; and to this end, another feature of the invention consists in supporting, in alignment with the magnet core, a frame having pivoted within it a lever forming one element of a toggle,

the said lever having a free end projecting beyond the handle through which its oscillation develops reciprocation in the working member, and a link has its end, remote from the joint of the toggle lever, connected for sliding movement in the frame, and is jointed to the magnet core so that by alternately straightening and deflecting the toggle lever by the reciprocations of the magnet core, a corresponding oscillation in a transverse plane is developed in the working end of the toggle lever.

Another object of the invention is to provide improved means for holding a razor blade upon a guard or base, preferably constructed with marginal teeth, and hereinafter referred to as the comb, with freedom to reciprocate in response to the working end of the toggle lever; also to provide an improved means for transferring motion from the free end of the toggle lever to the blade. Accordingly, additional features of the invention consist in aligning the blade upon the comb through means of studs passing through openings in the blade, elongated in the direction of reciprocation, and confining the blade upon the comb by means of a cap or cover which, while assuming a fixed relation to the comb, will present confining edges over the blade that hold it in the plane of its reciprocation without imposing resistance to its movement, the cover being held to the comb by a clip or clips carried by the one thereof and engaging the heads of studs carried by the other thereof, the clip being preferably mounted on and offset from the inner face of the cover, and the headed studs being enclosed by the cover and preferably those which serve to guide the blade in its movements; and in order to impart reciprocation to the blade when so secured, a third stud enclosed by the cover mounted in the comb or base, with universal movement in the plane of the base as well as rotatable therein, but confined against movement vertical thereto and fitting an opening in the blade, has a socket through which it receives the working end of the toggle lever in any position of location.

The opening in the blade which receives

the movable stud is disposed centrally of the blade; the central stud and opening are of circular section in order to avoid any restraint of the blade as the latter is brought into alignment with the fixed studs; the movable stud fits its opening in the blade with great accuracy in order to avoid any loss in transmitting motion of the stud, which is of very high frequency but very small amplitude; and the stud is movable not only in the direction of blade vibration but transversely thereto as well, so that the movable stud may accommodate itself to the central blade opening, when the blade is aligned by the fixed studs, without any tendency to binding the blade against the fixed studs or in any way interfering with the oscillation of the blade. Hence, other features of the invention consist in providing a single central blade driving stud of circular section; also in providing a single blade driving stud which is movable transversely to the direction of blade movement as well as in the direction of its drive; and in providing a razor blade of the reciprocating type having a pair of pin-receiving aligning openings elongated in the direction of blade movement, and a single driving opening which is central to the aligning pins and which is circular in section. Preferably, the central driving opening of the blade is of relatively large diameter in order that the stud which fits it may present correspondingly large surface for impingement of the blade, and thus reduce tendency to enlargement of the opening or deformation of the driving stud which would result in lost motion.

Another object of the invention is to provide a simple and cheap method of positively assembling the comb or base upon which the blade reciprocates, with the handle which carries the mechanism for developing reciprocating movement in the blade, and insuring absolute coincidence of the direction of reciprocation of the blade and the plane of oscillation of the working end of the toggle lever. To this end, another feature of the invention consists in fixing the toggle lever frame in axial alignment with the handle and against rotary displacement therein, and then assembling the comb or base with the handle through means of a riveting flange, or the like, and after insuring the coincidence of the stated functions, setting the rivet so that the parts will be thereafter permanently held in their assembled relation; the handle being, for the sake of taking down and packing the instrument, constructed with a detachable shank through which it receives the comb, and this shank being assembled with the main portion of the handle through means of screw threads which seat always at the same limit of rotation.

Another object of the invention is to pro-

vide means for effectively packing against the intrusion of moisture, the interior of the handle which constitutes the housing for the actuating parts of the instrument. To this end, other features of the invention consists in providing a packing ring around the working stud which, while centered around the stud, works in an annular groove of the latter in order not to resist the movement of the stud in response to the working end of the toggle lever; also in providing a resilient packing around the free end of the toggle lever below the working end of the latter, which by its resiliency keeps the space closed without interfering with the movement of the lever; and finally, by providing the fixed pivot of the toggle lever with a packing ball that works in a socket concentric with the pivotal action of the lever link. While all of these packing elements may be employed if desired, any one of them may be employed alone if desired.

Another object of the invention is to provide an electro-magnetic motor which will develop, efficiently and reliably at a comparatively low cost of production, vibrations of a very high periodicity, and to this end, another feature of the invention consists in providing within the handle a solenoid magnet receiving the core hereinbefore mentioned, acting upon the same to develop motion in at least one direction, motion in the opposite direction being preferably developed by a spring surrounding the core; and providing a make and break device for the circuit of the solenoid magnet at the end of the magnet remote from the core; the magnet being preferably designed with a helix that is of substantially greater axial dimension than the core which it vibrates, and having a fixed iron core in the portion of its length which lies beyond the vibrating core, such fixed core being preferably of laminated construction; and a thrust rod for actuating the make and break being extended from the vibrating core through the fixed core to the circuit closer so that the circuit is interrupted on each stroke of the vibrating core toward the magnet.

Another object of the invention is to provide an improved means for supplying energizing current to the magnet through means of an extension cord connected to the end of the handle; and to this end, another feature of the invention consists in providing the handle, which is preferably developed in substantially cylindrical form, with a rear end cap through which the cord enters axially, and providing within said cap a receptacle block carrying terminals to which the ends of the conductors are united, and which are held by the cap in engagement with terminals extending from the make and break of the magnet.

Another object of the invention is to pro-

vide a suitable massage tip or similar instrument that can be substituted for the razor mounting in a device of the character described, and caused to enter into operative relationship to the free end of the toggle lever when assembled with the handle, the working member of such tip, or the like, being mounted with freedom to develop a complex motion, the elements of which are mainly percussive but also abrasive or rubbing.

In the accompanying drawings, in which the preferred embodiments of the several features of the invention are shown by way of illustration—

Figure 1 is an axial section of the complete instrument equipped for purposes of shaving.

Figures 2, 3, and 4, are views in side elevation, with internal parts shown in dotted lines, of the forward end of the instrument, with three different attachments for purposes of massage, or the like.

Figures 5 and 6 are, respectively, an axial section of the instrument corresponding to Figure 1, and an axial section in a plane at right angles thereto, the scale being greatly enlarged, and intermediate portions of the electro-magnet motor being broken away.

Figures 7 and 7a are detail views showing the outer end of the handle, partly in section, and a swaging tool cooperating therewith, in the method of assembling the comb or base of the razor therewith at a definite and permanent angle of rotation with reference to the handle.

Figure 8 is an end view of the instrument on an enlarged scale, the clip for holding the cover in place and studs coacting therewith being shown in dotted lines.

Figure 9 is a view similar to Figure 8, in which a modified construction of cover attaching clip is shown in dotted lines.

Figure 10 is an end view of the instrument with the cover removed, but with the blade in place.

Figure 11 is a section on the line 11x—11x of Figure 5.

Figure 12 is a section on the line 12x—12x of Figure 5.

Figure 13 is a detail view of the outer end of the handle, and showing the method of packing the same against the intrusion of moisture.

1 represents the handle grip carrying a conical ferrule 2, which is preferably united therewith through the medium of a threaded joint 3, and 4 represents a comb threaded to the ferrule at 5 and constituting a base upon which is mounted, with freedom of reciprocation, a razor blade 6 of suitable construction, which is preferably of very light mass, but adapted for confinement upon the comb and to have movement imparted to it in the direction of its cutting edge. In order to

guide the blade 6 upon the comb 4, while permitting it to reciprocate in the direction of its edge, the comb is provided with studs 7 which are received in perforations 8 of the blade, elongated in the direction of reciprocation of the blade, but fitting the studs in the direction transverse thereto; and the blade is confined in its plane of movement by means of a cover 9 that covers the stud 7 and provides a smooth outer surface for contact with the face, and is suitably fixed with relation to the comb 4 at a distance which permits the edges of the blade to extrude in position for work, but confining the blade against movement perpendicularly to the plane of its intended movement. To secure the cover 9 upon the blade 6, said cover is provided with clips 10, which are offset from the inner surface of the cover and constructed, either as shown in Figure 8 with double key-hole slots having lips 11 entering circumferential grooves 12 in the studs 7, but with enlarged openings 13, 14 on either side of said lips which are sufficient for the passage of the heads of the studs 7, or as shown in Figure 9 with single key-hole slots in which flanges 11a engage in the grooves of the studs 7, while enlargements 13a permit the passage of the studs; the effect in either instance being to permit assembly of the cover with the comb in a relation that confines the blade movably upon the latter by simply passing enlargements on the slots over the studs 7, and then sliding the cover in the direction of reciprocation of the blade until the lips or flanges of the key-hole openings engage the grooves of the studs.

Mounted centrally in the comb 4 with freedom of movement equal to the reciprocation which is to be imparted to the blade 6 and passing through a central driving perforation 8a (Figure 10) in said blade, is a driving stud 15. This stud, as will be seen by comparing Figures 5 and 6, has a limited movement relatively to the comb 4, both in the direction of blade movement (Figure 5) and in the direction transverse thereto (Figure 6); hence, any slight imperfection in the punching of the blades will not result in undue impingement of the blade against the aligning stud 7, and the blade is left free to move without binding. As shown in Figure 10, both the opening 8a and driving stud 15 are of circular form so that the stud will receive the blade at any angle of rotation and avoid any restraint upon aligning the openings 8 with the stud 7. In order to impart movement to the driving stud, it has a bearing socket 16 that receives at any angle of the stud's rotation the ball-end 17 upon an extended link 18 of a toggle lever, which said link is pivoted at 19 in a frame 20, while the other link 21 of the toggle lever, pivoted to the first-named link at 22, has its inner end united by a pintle 23 to the outer end of a solenoid

armature 24, said pintle 23 being also extended through a slot 25 in the lower end of the frame 20 to guide the controlled end of the toggle link 21 in the line of reciprocation of said armature. Frame 20 is positioned at its outer end by means of a tubular extension 20a fitting in the extreme end of the ferrule 2, and is positioned at its inner end through means of a pin 26 extending across the cylindrical housing 27 and through an eye 28 of said frame 20, the fit of the eye 28 upon the pin 26 being preferably quite free, so as to permit the parts to align themselves freely with the armature.

With the described construction, it is obvious that inward movement of the armature 24 will tend to straighten the toggle 18—21 and develop a transverse movement of the ball-end 17 to the right in Figure 5, whereas a return or outward movement of armature 24 flexes the toggle lever and develops movement of the ball-end 17 to the left as viewed in said figure. To develop outward movement in the armature 24, a spring 29 is located between the bottom of the housing 27 and the head 30 on said armature, but movement in the opposite or inward direction is developed by a solenoid magnet 31, in which the armature 24 works as a core. To insure proper efficiency in the attractive force of the magnet 31 upon the armature 24, said magnet is extended a substantial distance inward beyond the end of the armature 24, and is provided with a fixed core 32 in alignment with the armature 24, which fixed core is preferably of laminated construction, being built up of a series of thin iron rings. Magnet 31 is provided with a make and break 33, but this is located at its end remote from the armature 24 in order to be free from interference with the latter, and at the same time to permit the supply conductors 34, 35 to proceed from the make and break in the general longitudinal direction of the handle.

But to control the make and break from the armature 24, a rod 36, preferably of non-metallic material and wholly detached from the armature 24, is threaded through the fixed core 32 and rests upon a resilient arm 33a of the make and break, so that whenever the armature 24 is drawn inwardly, the pull upon the armature will be immediately interrupted by the opening of the make and break, and as promptly as the armature, when thus released, is moved outwardly from the spring 29, circuit through the solenoid will be re-established and the action repeated. To hold the magnet coil 31 against rotation in the handle 1, the upper confining flange 31a of the magnet will be faced upon its periphery and bear against a similar face on the interior of the handle, so that by merely inserting it longitudinally into the handle it will always be held at the proper angle of revo-

lution with reference to its armature 24, which by reason of its connection 23 is not free to rotate.

It is found by experiment that the described arrangement of reciprocating electric motor is peculiarly adapted for the purposes of the present invention, in that it is capable of reciprocating with extreme rapidity, vibrations as frequent as 8000 per minute being readily developed with the particular design herein shown, and this vibration being, by the described motion translating device, imparted to the razor blade or other vibrator working member at a rate that develops a radically new departure in the new action of the razor blade, and insures a shaving efficiency never before realized. Moreover, the substantial mass of the handle with its contained parts, the confinement of the armature to the axis of the handle in its movements, the extremely light mass of the elements which move transversely to said axis, and the relatively small transverse component in the movement of the toggle lever, coupled with the high vibratory rate avoids objectionable vibration in the handle or unsteadiness in the application of the razor blade to the skin.

In order to removably connect the conductors 34, 35 with the make and break of the magnet, a receptacle block 37, equipped with receiving terminals 38 to which the conductors 34, 35 are soldered or otherwise connected, is held in place by the screw cap 39 and in position to receive the terminals 40, 41 projecting from the elements of the make and break. An anchoring plate 42 extending from the receptacle block 37 is suitably perforated to permit the conductors 34, 35 to be woven therethrough, and thus resist any pull that may be imposed upon the conductors, and thus protect the relatively delicate connections of the said conductors with the terminals 38.

As shown in Figure 13, the vibratory stud 15 may be packed through means of a washer 43 surrounding it and adapted to enter the groove 15a upon the vibration of the stud in order not to oppose such vibration. A packing may also be provided at 44 around the end 18a of the toggle member to further pack the handle against moisture; and, finally, such packing may be further insured by a ball 45 bearing accurately in the ferrule 2 and constituting the oscillatory bearing of the toggle lever.

It is very important to the commercial success of the device herein described, that the comb 4 be assembled with the ferrule through means which will be very economical in cost but absolutely accurate in results. To accomplish this, the ferrule 2 is provided with a screw stem 2a that receives a shank 4a intended to be applied to the comb 4, and after this shank 4a is screwed to a firm seating upon the ferrule 2, the comb 4 is placed over the

riveting flange 4b of the shank, as shown in Figure 7, and in an angular position thereon which will insure absolute coincidence of the line of the guiding stud 7 with the plane of oscillation of the ball-end 17 of the toggle lever, and thereupon a swaging tool X (Figure 7a) is forced downwardly upon the riveting flange 4b to firmly and permanently unite the assembled parts. The position of the frame 20 in the ferrule 2 with respect to relative rotation therein and in the plane of oscillation of the toggle lever 18—21 is determined by fixing the cylindrical housing 27 against rotation in the ferrule 2, as, for instance, by means of a stud 27a on the base of the housing entering a recess 2c in the base of the ferrule. Since the frame 20 is at a definitely fixed angle of revolution relatively to the housing 27, it is merely necessary in assuring proper assembly, to slip the upper end 20a into the end 5 of the ferrule and register the stud 27a with the recess 2c in order to insure movement of the lever end 17 in a plane appropriate to the movement of the razor 6.

The handle with the electro-magnetic means contained therein for developing vibratory motion in a direction transverse to the axis of the handle, as hereinbefore described, is applicable to massage devices as well as to a razor blade. For instance, as suggested in Figures 2, 3, and 4, a tip housing 46, 47, or 48 may be screwed on to the threaded end 5 of the ferrule 2 and equipped with a massage tip 49, 50, or 51, each of which is pivoted in its housing through means of a transverse pin 52 passing through an enlarged opening 53 in the shank 49a, 50a, or 51a of the tip, so that the tip can move not only in a direction to deliver percussive effects but abrasive or rubbing effects as well; and the inner ends of the several shanks of the massage tips can be provided with grooves or recesses 49b, 50b, or 51b which will receive the ball-end 17 of the toggle lever extension, with the result that an exceedingly rapid and complex motion is set up in the tip.

An important result obtained with the invention herein described, is that the blade or other working member is of such light mass relatively, and the handle and vibratory parts are relatively of such great mass, that the working member can respond to vibrations of extreme periodicity, whereas, the handle and mountings in general will not respond to such rapid vibrations, and therefore the instrument as a whole can be held with steadiness and convenience while developing very high efficiency in its intended functions. This result is also contributed to by the right line movement of the vibratory mechanism in the axis of the handle and the development of a motion translating device, the connected end of which is free to respond to the right line movements of the armature

without tendency to deflect the latter in its path of movement.

In the claims appended hereto the description of the mounting of the stud "for universal movement in one plane—" or similar wording is intended to include the improved feature by which the stud is mounted by being confined against movement away from its plane but is free to have a limited movement in all directions in the plane which is transverse to the axis of the stud; this limited movement permitting the stud to compensate for inaccuracies in the blade construction by correctly lining up with the central opening of the blade. Thus the stud is capable of being given determined reciprocal movement in one direction and it is also free to have a slightly lateral movement without interfering with its reciprocation.

I claim:

1. In a vibratory instrument of substantially the character described, a vibratory tool element, a driving element, and an actuating element; each of said elements having its own mounting independent of the others of said elements and defining its path of movement; said tool element standing in releasable driven connection with said driving element; and said driving element being universally movable in the plane in which the tool vibrates, but fixed against movement perpendicularly thereto.

2. In a vibratory instrument of substantially the character described, a vibratory tool element, a driving element, and an actuating element; each of said elements having its own mounting independent of the others of said elements and defining its path of movement; said tool element standing in releasable driven connection with said driving element, and said driving element standing in releasable driven connection with said actuating element; said tool element having vibratory movement in a fixed plane and direction, and said driving element being universally movable in said plane and receiving the tool element at different angles of revolution, and thereby leaving it free to assume its intended line of vibration.

3. In a vibratory instrument of substantially the character described, a supporting base, a handle separable from said base, a driving element confined on said base with universal movement in the plane of a working stroke to be imparted but with confinement against movement perpendicularly to said plane, a tool element free to vibrate in a fixed direction in said plane, releasably mounted on said base and in releasable driven relation to said driving element, and an actuating element mounted in the handle and having driving connection with said driving element releasable by removal of the handle from the base.

4. In a vibratory razor, a base having

blade-engaging studs and adapted to receive a slotted blade in direct mounting thereon without the intervention of a carriage, and by engagement of its studs with slots in the blade to define the path of movement of the blade, a driving element confined on said base independently of the blade, with universal movement and rotation in the plane in which the blade moves, a releasable cover enclosing the studs and the driving element and holding the blade upon the base, a handle, and an actuating element mounted in said handle and having driving connection with the driving element at any angle of rotation of the driving element.

5. In a reciprocatory instrument, a handle having a reciprocatory motor acting in a right line parallel with the longitudinal axis of the handle, a mounting carried by said handle, a vibratory working member supported and guided by said mounting with freedom to reciprocate in a direction transverse to the axis of the handle, and a motion translating element interposed between the motor and said vibratory member, comprising a toggle having a pivoted lever acting upon the vibratory member, and a link jointed to said pivoted lever and having an end connected with said motor.

6. In a reciprocatory instrument, a handle having a reciprocatory motor acting in a right line parallel with the longitudinal axis of the handle, a mounting carried by said handle, a vibratory working member supported and guided by said mounting with freedom to reciprocate in a direction transverse to the axis of the handle, and a motion translating element interposed between the motor and said vibratory member, comprising a toggle having a pivoted lever acting upon the vibratory member and a link jointed to said pivoted lever and having an end connected with said motor; said translating element also including a frame upon which the lever is pivoted and which has guiding connection with the link that guides the end thereof in the line of movement of the motor.

7. In a vibratory instrument, a handle, a motor in said handle developing motion in the direction of the longitudinal axis thereof, a translating element converting said motion into a direction transverse to said axis, a vibratory member, a mounting confining and guiding said vibratory member with freedom to move in a direction transverse to said axis, and means for separably assembling said mounting with said handle, comprising a shank threaded upon the end of the handle with limited relative rotary movement between them, and a circular flange carried by said shank, extending through the mounting and swaged into permanent union with the mounting while the mounting is in a position of rotation that brings the line of movement of its vibratory member into coin-

cidence with the direction of transverse movement of the motion translating element.

8. In a vibratory instrument, a vibrating member, a mounting supporting and guiding said member and fixing the line of vibration thereof, a handle to which said mounting is secured, a motion translating element in said handle receiving movement in the direction of the longitudinal axis of the handle and delivering movement to the vibratory member in a direction at an angle to said axis, said translating element comprising a pair of toggle links, a frame in which one of said links is pivoted intermediate of the ends of said link, and having a guide directing an end of the other link parallel with said longitudinal axis, a housing supporting said frame adjacent to said guide, a solenoid armature working in said housing and connected to the guided end of said link, a spring in said housing acting in one direction upon said armature, and a magnet acting in the other direction upon said armature.

9. In a vibratory instrument, a handle, a vibratory member mounted on said handle, and means for imparting vibratory movement to said member, comprising a reciprocatory motor having a solenoid magnet extending longitudinally of the handle within the same and keyed against rotation relatively thereto, a solenoid armature coacting with said magnet, and a motion translating device having connection with said armature which prevents relative rotation between them and in driving relation to said vibratory member.

10. In a vibratory instrument, a vibratory member, a mounting for said vibratory member, a handle carrying said mounting, a motor in said handle, a motion translating device extending from said motor through said mounting comprising an oscillating lever, a driving stud receiving an end of said lever and transmitting the motion thereof to the vibratory member, and a packing around said stud to exclude moisture from the handle.

11. In a vibratory instrument, a vibratory member, a mounting for said vibratory member, a handle carrying said mounting, a motor in said handle, a motion translating device extending from the handle into said mounting and comprising an oscillating lever; said lever being provided with a ball and socket bearing upon which it pivots, and which constitutes a packing to exclude moisture from the handle.

12. In a vibratory razor, a supporting base, aligning studs on said base, a driving stud intermediate of said aligning studs, having bearing in said base which confines it against movement perpendicular to the plane of the base, while leaving it free to move in all directions in said plane, and a blade having elongated openings receiving said aligning studs

and a central opening of circular section receiving said driving stud.

13. In a vibratory razor, a supporting base, aligning studs on said base, a driving stud intermediate of said aligning studs having bearing in said base which confines it against movement perpendicular to the plane of the base while leaving it free to move in all directions in said plane and to rotate therein, and the blade having elongated openings receiving said aligning studs and a central opening fitting said stud.

14. In a vibratory razor, a supporting base, aligning studs on said base, a driving stud mounted in said base intermediate of said aligning studs, and a blade having elongated openings receiving said aligning studs and a central opening of circular section receiving said driving stud; said driving stud being movable in the mounting transversely to as well as in the direction of its driving movement.

15. In a safety razor, a supporting base, a blade adapted to slide upon said base, having aligning openings elongated in the direction of their alignment, studs on said base entering said aligning openings, and a driving stud on said base intermediate of said aligning studs; said blade having a central opening through which it receives said driving stud, and said driving stud affording the blade rotation about its center sufficiently to register its aligning openings with the aligning studs.

16. In a safety razor, a supporting base, a blade adapted to slide upon said base, said blade having spaced guiding slots, guiding studs on said base received by said slots and a driving stud on said base intermediate of said guiding studs, said blade having a central opening to receive said driving stud, said opening allowing rotation of said blade relative to said driving stud sufficient to register its guiding openings with the guiding studs, and means to reciprocate said driving stud in one direction in the plane of said blade.

17. In a safety razor, a supporting base, a blade adapted to slide upon said base having aligning openings elongated in the direction of their alignment; studs on said base entering said aligning openings, and a driving stud on said base intermediate of said aligning studs; said blade having a central opening through which it receives said driving stud, and said driving stud affording the blade rotation about its center sufficiently to register its aligning openings with the aligning studs, and also yielding transversely to the direction of blade movement to avoid binding the blade upon the aligning studs.

18. A safety razor blade of vibratory type, having a single central circular driving opening, and a pair of aligning openings symmetrically disposed between said central opening and the respective ends of the blade;

said aligning openings being elongated in the direction of the length of the blade.

19. A safety razor blade of vibratory type, having a single central driving opening, and a pair of aligning openings symmetrically disposed between said central opening and the respective ends of the blade; said aligning openings being elongated in the direction of the length of the blade; and said central driving opening being of a section which permits the blade to rotate upon the driving member.

20. In a vibratory razor, a blade, means guiding said blade for reciprocation in one direction in the plane of said blade, said blade having a driving opening, a single driving stud closely cooperating with said opening to vibrate said blade said blade and stud moving as a unit in one plane and means supporting said blade for actuation by said stud said blade having an unconfined mounting on said stud against movement axial thereof.

Signed at New York, New York, this 30 day of November, 1923.

SAUL SHALER.