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B. E. SMITH
ORTHODONTAL INSTRUMENT

2,532,200

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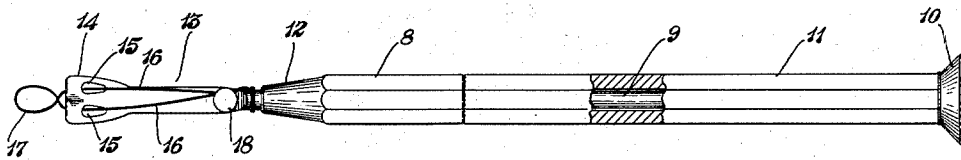


Fig. 1

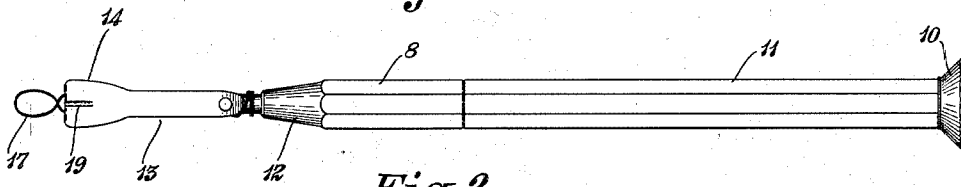


Fig. 2

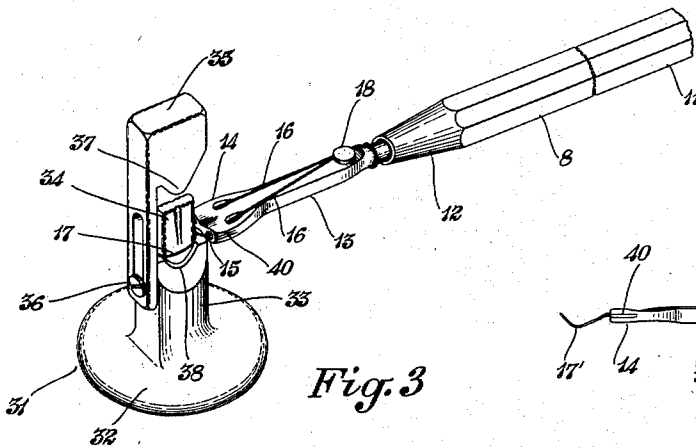


Fig. 3

Fig. 4

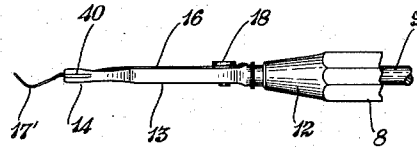


Fig. 7

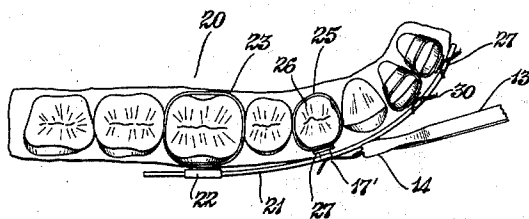
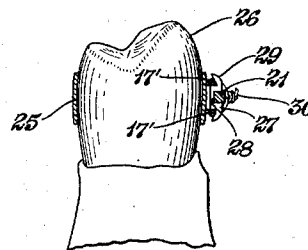


Fig. 5

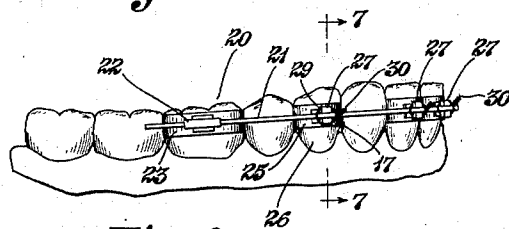


Fig. 6

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2,532,200.

ORTHODONTAL INSTRUMENT

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1 Claim. (Cl. 32—66)

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The invention relates generally to an instrument for facilitating the operation of straightening irregular teeth, and more particularly to an instrument for making ligatures to connect individual irregular teeth to an edgewise arch extending along the row of teeth in which the irregular teeth are located.

Conventional practice in straightening irregular teeth by using a so-called edgewise arch consists in mounting a wire arch alongside the row of teeth by cementing metal bands on several of the teeth and attaching the wire arch to the band. The teeth which are the farthest out of line may be connected to the arch by attaching a fine wire ligature to metal band on such a tooth and then tying the wire under tension to the arch to pull the tooth toward the arch. The straightening operation usually extends over a period of many months, depending upon the degree of irregularity, and the process is one of gradually pulling the irregular teeth into line.

For this purpose, it is customary to start out with a wire arch of considerable resiliency such as a wire .015" in diameter, and tie each of the several irregular teeth to the arch with a fine wire ligature. Under tension the resiliency of the arch wire prevents pulling the teeth too severely so as to cause pain or injury. After a suitable time, the arch wire is changed to a slightly larger diameter which is less resilient, and the diameter of the wire may be stepped up slightly three or four times at periods of several months each to gradually pull the irregular teeth into line. The last wire, or in some cases, the last two wires, preferably are rectangular in cross section and of the order of .022" by .028" in cross section, and positioned edgewise to the teeth, that is, with the longest dimension at right angles to the teeth.

With the exception of a few teeth which are quite far out of line at the beginning of the straightening process, all of the teeth being straightened are provided with metal bands which have grooved brackets thereon for receiving the arch wire, and these brackets are secured to the arch wire by looping the ligature wire over the arch wire and under the brackets and then twisting the ligature wire under tension to make a very tight connection. The operation of looping and tying the ligature wire around the band bracket and arch wire is a tedious and exacting one with the ordinary instruments which the dentist has at his disposal. Consequently, the dentist naturally tends to avoid changing the size of the arch wire any oftener than is necessary so as to

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eliminate as much as possible the tedious tying operation, with the result that frequently the straightening operation is not carried out properly by changing the size of the arch wire at short enough intervals to be most beneficial to the patient.

It is an object of the present invention to provide a novel and improved ligature tying instrument for quickly and easily securing irregular teeth to an edgewise arch.

Another object is to provide a novel ligature tying instrument for use in straightening irregular teeth, which instrument is designed to be easy on the patient, as well as beneficial to him.

Another object is to provide a novel ligature tying instrument which so facilitates the attaching of irregular teeth to an edgewise arch as to insure the performance of a proper and gradual process of straightening the teeth.

A further object is to provide a ligature tying instrument for use in connection with an edgewise arch, which instrument is of substantially the same size and shape as other ordinary instruments in constant use to which the dentist is accustomed.

A still further object is to provide a novel ligature tying instrument for use in straightening teeth, which is adapted to be prepared beforehand with a loop of ligature wire by an assistant for quick and easy use by the dentist in the tying operation.

These and other objects are accomplished by the parts, constructions, arrangements and combinations which comprise the present invention, the nature of which is set forth in the following general statement, and a preferred embodiment of which is set forth in the following description and illustrated in the accompanying drawings, and which is particularly and distinctly pointed out and set forth in the appended claims forming part hereof.

In general terms, the improved instrument comprising the present invention preferably includes an instrument having an elongated shank with a handle swiveled on the rear portion thereof, the front end of the instrument being provided with a pair of side-by-side holes extending from the front end substantially longitudinally of the instrument a short distance and opening out through the top thereof, said holes being adapted to have threaded therethrough the ends of a loop of ligature wire formed at the front end of the instrument and preferably shaped in a forming die, there being a post spaced from the holes for anchoring the ends of

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the ligature wire and a groove on the underside of the front end of the instrument for engaging the arch wire and pressing it into the band bracket groove when the ligature wire is being applied to connect the arch wire to a band bracket surrounding an irregular tooth.

Referring to the drawing forming part hereof in which a preferred embodiment of the invention is shown by way of example;

Figure 1 is a top plan elevation of the improved instrument on a somewhat enlarged scale, showing the ligature wire formed in a loop at the front end of the instrument and the ends of the loop wrapped around the anchor post;

Fig. 2 is a bottom plan elevation thereof;

Fig. 3 is a fragmentary perspective view showing the manner of forming the wire loop in a forming die adapted for shaping the loop to facilitate the subsequent tying operation;

Fig. 4 is a fragmentary side elevational view showing the bend in the loop produced by the forming tool;

Fig. 5 is a fragmentary plan view showing the arch wire of the edgewise arch mounted alongside a row of teeth with a loop of ligature wire held by the novel tool in position to connect the arch to a band bracket;

Fig. 6 is a side elevation of the edgewise arch in position on a row of teeth; and

Fig. 7 is an enlarged sectional view as on line 7—7, Fig. 6, showing the manner of connecting the loop of ligature wire to a band bracket on a tooth.

Similar numerals refer to similar parts throughout the several views of the drawing.

The novel instrument includes a front handle portion 8 which may have a reduced elongated shank 9 extending axially rearward therefrom with a flanged end piece 10 secured on the outer end of the shank. Preferably, a handle sleeve 11 is swiveled on the shank 9 between the front handle portion 8 and the end piece 10, and the handle portions 8 and 11 are preferably both provided with longitudinal flats to make them octagonal in cross section, for example, for facilitating gripping the handle portions in the fingers. Moreover, the handle portions 8 and 11 may be knurled if desired, for the same purpose.

The front end of the handle portion 8 is preferably tapered radially inward as indicated at 12, and a head portion indicated generally at 13 projects axially forward therefrom. As shown in the drawings, the head portion 13 is flattened substantially throughout its length, and the front end 14 of the head portion is preferably flared laterally outward to increase its width to some extent.

The head end 14 is provided with two side-by-side holes 15 which extend through the front end thereof in a substantially longitudinal direction and open outwardly through the upper side of the head portion as best shown in Figs. 1 and 3. These holes 15 are adapted to have threaded therethrough the two ends 16 of a loop 17 of fine ligature wire which may be formed in front of the head end 14 of the instrument. The head portion 13 is provided with an anchor post 18 which is preferably secured to the rear end of the head 13, and the post 18 provides an anchor for the two ends 16 of the loop, the end portions being twisted around the shank of the post and then the loose ends remaining may be wrapped around the rear end of the head portion, as indicated in the drawing. As shown in Fig. 2, the underside of the head portion 14 is preferably

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provided with a longitudinal groove 19 for a purpose to be described.

Referring to Figs. 5 and 6, a portion of the lower denture of a set of human teeth is indicated generally at 20 with an edgewise arch 21 mounted along the outer surface of the row of teeth. The arch is anchored at 22 to a bracket secured on a metal band 23 which is cemented on one of the molars, and the other end of the arch would be similarly secured to a molar on the other side of the lower denture. The individual teeth are attached to the arch 21 by metal bands cemented to the teeth and having brackets thereon for detachably engaging the band. Since these bands and brackets are all essentially the same except for the bands being shaped to fit individual teeth, only one set of them will be described.

The metal band 25 is cemented to the tooth 26 in a usual manner, and the band has a small metal bracket 27 secured to its outer side. The bracket 27 has a central groove 28 with overhanging upper and lower wings or flanges 29, and the groove 28 is adapted to detachably receive the arch wire 21 which is shown as being rectangular in cross section, although a round wire may be used during the earlier stages of the straightening process, as previously described.

Assuming the tooth 26 to be irregular or out of alignment, the process of straightening the tooth is gradually to pull it toward the arch 21, by tightly securing the bracket 27 to the arch wire under tension. Obviously, if the arch wire is of small enough diameter to be considerably resilient, the arch wire will give slightly inward so that the pull on the tooth will not be too great in the earlier stages of the straightening process.

The conventional method of securing the arch wire to the bracket 27 is to tie a loop of ligature wire around the arch wire and under the wings 29 of the bracket and then outwardly around the arch wire and twist the ends of the ligature together to tighten the loop. Since the ligature wire is very fine and the loop and bracket are both small, it is a very delicate and tedious operation properly to secure these loops, especially while working in the mouth of the patient.

In using the novel instrument in tying the loop of ligature wire around each bracket 27 to secure it tightly to the arch wire 21, the loop 17 is first formed in a piece of ligature wire and the loose ends 16 of the loop are threaded through the holes 15 and tightly wrapped around the post 18 for anchoring the loop. The dentist then holds the handles 8 and 11 in this hand in an accustomed manner and places the groove 19 on the underside of the head in engagement with the arch wire 21 adjacent to the bracket 27 to be tied, in the manner indicated in Fig. 5. The sides of the loop 17 are then engaged under the wings 29 and the dentist may then pull on the instrument and at the same time rotate the handle portion 8 in his thumb and forefinger to twist the ends of the loop tightly together and tie the bracket to the arch wire under tension. The twisted ends of the loop are then snipped off as indicated at 30, and the twisted ends may then be bent or tucked under the arch wire at the bracket to be out of the way of the patient's tongue and lips.

In order to facilitate engaging the sides of the loop 17 under the wings 29 of the loop, the loop may be pre-bent as indicated in Fig. 4, and for this purpose a forming tool or die indicated generally at 31 is preferably provided. This die is adapted to form the loop 17 of proper size and

also to bend the sides downwardly as indicated at 17' so that they can easily be engaged under the wings 29 when the loop is held in position adjacent a bracket 27, by slightly rotating the instrument so as to engage one side 17' under one wing 29 and then the other side under the other wing.

The forming die 31 preferably includes a base 32 having an upright post 33, and a mandrel 34 projects upwardly from the post and has an outer periphery substantially equivalent to the inner periphery of the loop 17 to be formed. When the loop 17 is positioned over the mandrel 34, a die piece 35 which is slidably connected at 36 to the post 33 may be brought down over the mandrel, and the die piece has depending flanges 37 on opposite sides which engage the sides of the loop 17 and bend them downwardly into the die sockets 38 on each side of the base of the mandrel 34 to form the bent sides 17'.

The forming die 31 is preferably secured on a suitable working table or the like, and may conveniently be used to form the loop 17 and then bend the same, by first placing the ligature wire loop 17 around the mandrel 34, then threading the ends 16 through the holes 15 and anchoring the free ends of the loop around the post 18. The die piece 35 is then forced downwardly to bend the sides of the loop as shown at 17', whereupon the loop may be removed from the mandrel and the instrument is prepared or loaded with a loop in readiness to make the connection between the band bracket 27 and the arch wire 21.

By having several of the novel instruments on hand, the operation of attaching a number of band brackets on irregular teeth to an arch wire is made very rapid and easy, because an assistant can load the instruments in advance with the ligature wire, having the sides of its loop bent into proper form, and then hand the loaded instrument to the dentist who merely slips the sides of the loop under the wings 29 of a bracket and tightens the loop under tension by twisting the front end of the instrument. The twisted ends are then cut off and tucked in between the arch and the tooth. For facilitating this last operation, one or both sides of the head portion 14 may be provided with a short groove or slot 40 which is adapted to engage the twisted ends of the ligature wire for bending the same into an out-of-the-way position.

The use of the novel ligature tying instrument, especially in connection with the loop forming die, as previously described herein, not only makes the tying operation more rapid and easy for the dentist, but also makes it easier on the patient

because it shortens the time and eliminates the awkwardness of the tying operation in the mouth. Moreover, since the tying operation is so simple and rapid, the dentist is much less apt to delay changing the arch wire and retying the irregular teeth thereto at the proper stages in the straightening operation. Accordingly, the straightening operation is performed with a minimum amount of pain or injury and with a maximum amount of benefit to the patient.

In the foregoing description, certain terms have been used for brevity, clearness and understanding, but no unnecessary limitations are to be implied therefrom beyond the requirements of the prior art, because such words are used for descriptive purposes herein and are intended to be broadly construed.

Moreover, the embodiment of the improved construction illustrated and described herein is by way of example, and the scope of the present invention is not limited to the exact details of construction.

Having now described the invention, the construction, the operation and use of a preferred embodiment thereof, and the advantageous new and useful results obtained thereby; the new and useful constructions, and reasonable mechanical equivalents thereof obvious to those skilled in the art, are set forth in the appended claim.

I claim:

In combination, an orthodontal ligature tying instrument for connecting an edgewise arch to a band bracket secured on an irregular tooth, and a loop forming die, said ligature tying instrument including a head at one end having a pair of side-by-side holes extending through the front of the head and opening out through the side thereof, an anchor element on said instrument for attaching the ends of a loop of ligature wire formed in front of said head and threaded through said holes, and said loop forming die including a mandrel for fitting within said loop and a movable die element for engaging the sides of the loop and bending them downwardly.

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