

Sept. 6, 1949.

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2,481,177

INTRAORAL FRACTURE REDUCTION APPLIANCE

Filed Aug. 22, 1944

3 Sheets-Sheet 1

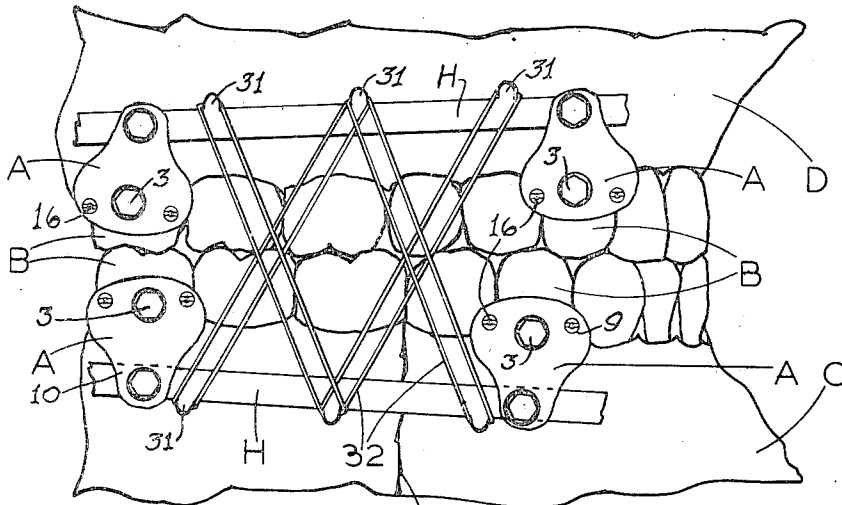


FIG. 1.

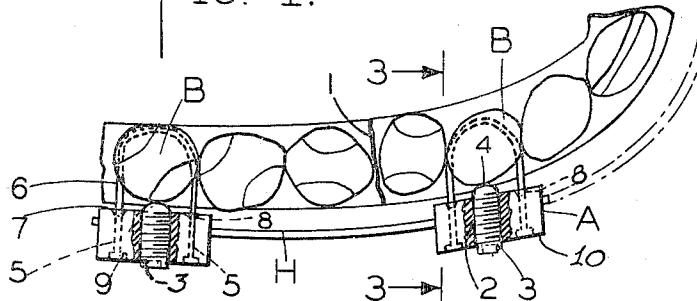


FIG. 2.

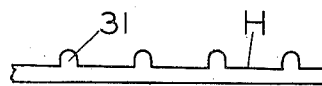


FIG. 4

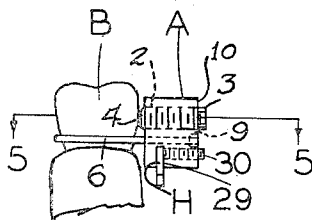


FIG. 3.

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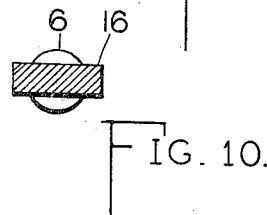
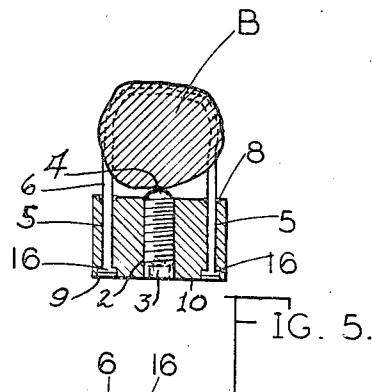
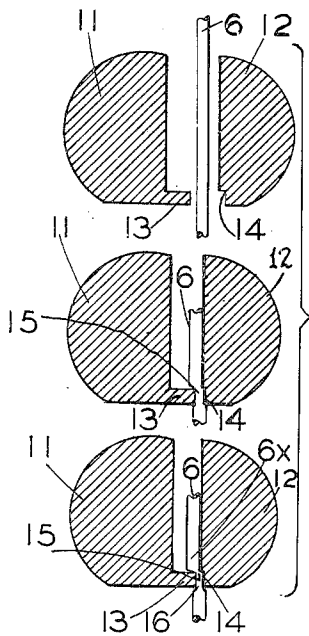
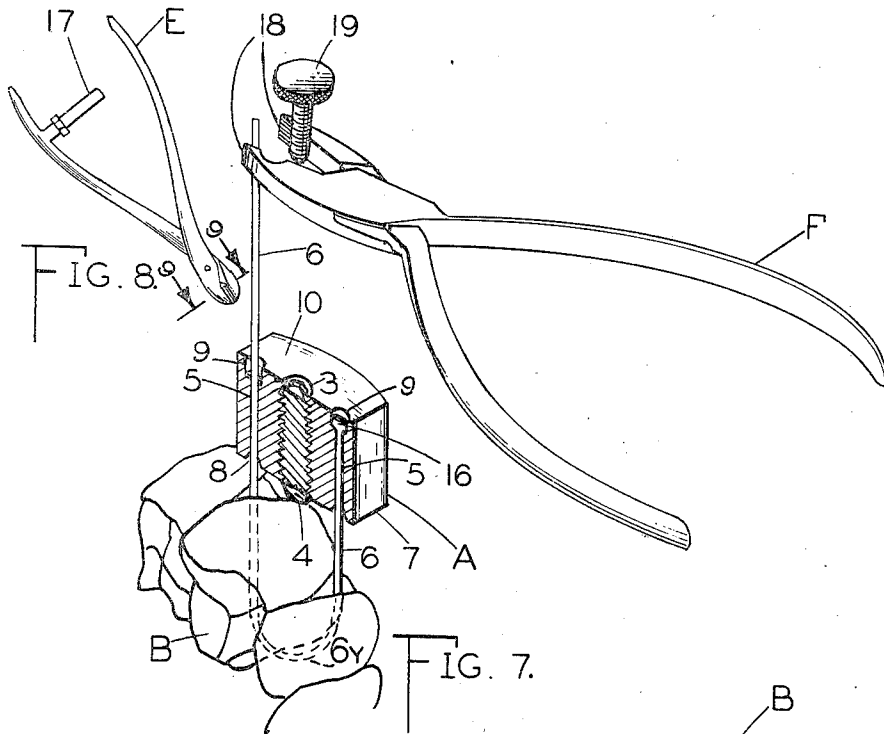
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3 Sheets-Sheet 2



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INTRAORAL FRACTURE REDUCTION APPLIANCE

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3 Sheets-Sheet 3

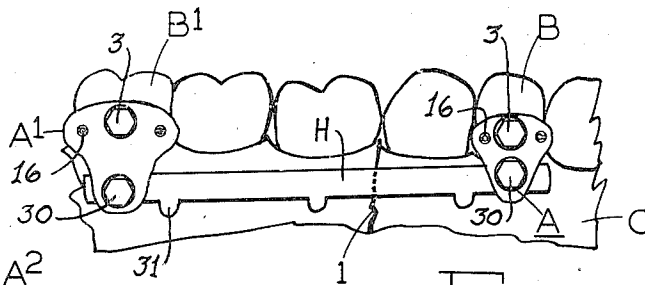


FIG. 6

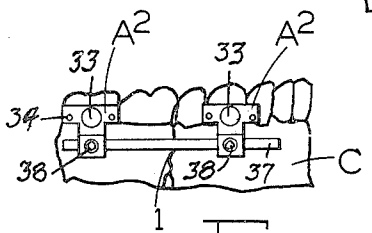


FIG. 12

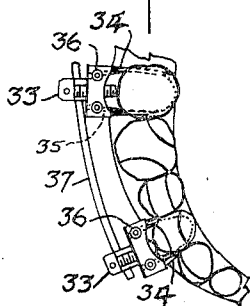


FIG. 13

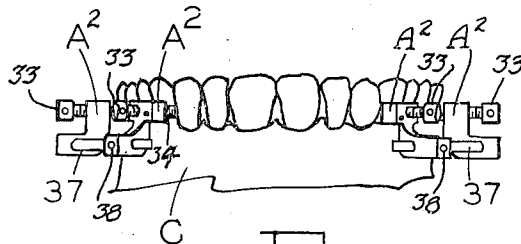


FIG. 14

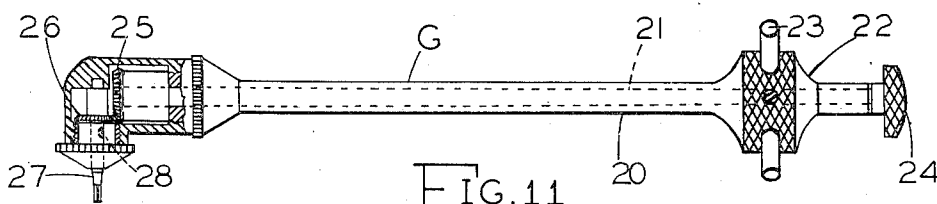


FIG. 11

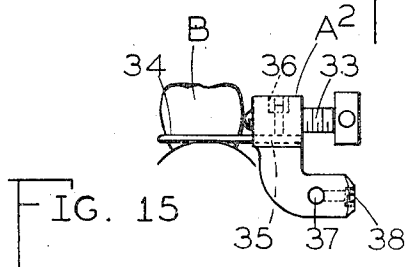


FIG. 15

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UNITED STATES PATENT OFFICE

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INTRAORAL FRACTURE REDUCTION
APPLIANCE

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Application August 22, 1944, Serial No. 550,621

4 Claims. (Cl. 128—89)

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My invention relates to improvements in fracture appliances especially designed for the reduction and fixation of mandibular fractures and it consists of the combinations, constructions and arrangements hereinafter described and claimed.

An object of my invention is to provide an intraoral fracture appliance which may be applied to the sound teeth of a fractured jawbone and will hold the broken pieces of the bone in an abutting relation and in a rigid manner so that the bone can heal at the place of break. In my co-pending application on a fracture appliance, Serial Number 496,241, filed July 26, 1943, now Patent No. 2,372,866, I show bone pins entering the cheeks of the patient and passing on into the jawbone for holding the broken jawbone in proper position while it is healing. The pin-fixation appliance is predicated upon the absence of natural teeth or the so called edentulous cases. The present invention is limited to cases with remaining natural teeth and the device is concealed in the mouth. Each device has a place to fulfill in fracture work.

In case the break involves only one side and presents no displacement, a unilateral fracture appliance may be used without having to involve the teeth on the opposite jaw. Where displacement exists, however, both opposing jaws must be utilized to provide occlusion and then the two appliances may be interconnected by rubber bands or in some necessary cases, by rigid intermaxillary wiring.

The device has novel means for tightening the fracture appliance to the teeth from time to time as this becomes necessary. The points of contact between the appliance and the teeth are at rounded contact points and the resulting contacting areas between the appliance and the teeth is so small as to permit the oral cavity to be kept readily cleansed from food particles and the like. The device is simple in construction and is durable and efficient for the purpose intended.

Other objects and advantages will appear in the following specification, and the novel features of the device will be particularly pointed out in the appended claims.

My invention is illustrated in the accompanying drawings forming a part of this application, in which:

Figure 1 is a side elevation of two unilateral appliances attached to the teeth of an upper and a lower jaw;

Figure 2 is a plan view of a portion of the lower jaw showing my device operatively applied thereto;

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Figure 3 is a transverse section taken along the line 3—3 of Figure 2;

Figure 4 is a side view of one of the bars;

Figure 5 is a horizontal section taken along the line 5—5 of Figure 3;

Figure 6 is a side view of a lower jaw portion showing my device operatively applied;

Figure 7 is a schematic view setting forth the application of the device to a tooth;

Figure 8 is a plan view of a wire cutting and crimping tool;

Figure 9 is a section along the line 9—9 of Figure 8 and illustrates diagrammatically the cutting and crimping of a wire by the tool;

Figure 10 is an enlarged transverse section through the crimped portion of the wire;

Figure 11 is a side elevation of a wrench, portions being shown in section;

Figures 12, 13 and 14 are side, plan and front views respectively, of a modified form of the invention; and

Figure 15 is a side elevation of the abutment illustrated in Figures 12, 13 and 14 and shown in an enlarged scale.

While I have shown only the preferred forms of my invention, it should be understood that various changes or modifications may be made within the scope of the appended claims without departing from the spirit and scope of the invention.

In carrying out my invention I provide an abutment indicated generally at A, in Figures 1, 2, 3 and 5. Two of the abutments or fixation blocks are secured to anchor teeth B on a lower jaw C, these teeth being disposed on opposite sides of a fracture, shown at 1. I show two additional abutments A secured to anchor teeth B on an upper jaw D. I will first describe the particular construction of the abutment A and then will show how the abutments are interconnected.

Figures 1 and 2 show the abutment provided with a threaded opening 2 for receiving an Allen-head set screw 3. The screw has a rounded end 4 and this end bears against the anchor tooth B, there being a single point contact between the screw end 4 and the tooth. This type of "Marble Contact" permits the tooth area to be cleansed and there is no chance for food to accumulate between the screw and the tooth. A slight bur-nishing action between the screw end and the tooth results and prevents the entrapping of residual food with resulting fermentation and putrefication.

The abutment A has two bores 5 that are substantially in line with the threaded bore 2 and

a wire staple 6 is passed around the anchor tooth and through the bores for securing the abutment to the tooth. It will be noted from Figure 2 that the entrances to the bores 5 from the inner face 7 of the abutment are conical shaped as at 8 and this permits the staple ends to be fed into the bores. The other ends of the bores have cylindrical recesses 9 of a larger diameter than the bores for a purpose now to be described. The ends of the staple are passed through the interproximal embrasures at the cervical margins of the teeth from the inside of the jaw to the outside and then the wires are guided into the bores by the funnel ends.

In Figure 7 I show the wire staple 6 passed through the bores 5 of the abutment A. Both ends of the wire staple initially extend beyond the outer face 10 of the abutment. A wire crimping and cutting tool, shown generally at E, in Figure 8, is used for cutting the portions of the wire that project beyond the outer face 10 of the abutment. In Figure 9, I show a greatly enlarged cross section of the tool jaws 11 and 12. The jaw 11 has a lip or die 13 that is designed to be received in a recess 14 formed in the jaw 12. The tool is placed adjacent to the face 10 of the abutment with the lip 13 disposed next to the face. The handles of the tool E are now moved toward each other and this will cause the lip 13 (see the center sketch in Figure 9) to force the wire 6 into the recess 14. The edge 15 disposed adjacent to the recess will cooperate with the edge of the lip 13 to pinch the wire at the point 15. Further movement of the tool handles E toward each other will cause the lip 13 and the recess wall 14 to flatten or crimp the wire at 16 for enlarging this portion of the wire laterally, as shown in Figure 7. At the same time the wire is practically severed at 15 but sufficient metal remains to connect the end 6x of the wire to the rest of the wire so that this small portion will not drop into the patient's throat. A stop 17 carried by one of the jaw handles contacts with the other jaw handle to limit the movement of the jaws 11 and 12 toward each other so that at the extreme compressing of the jaw handles, the wire 6 will be flattened at 16 and the wire will be substantially severed at the point 15. It is now a simple matter to grip the portion 6x of the wire with the tool and bend it for breaking the wire at the point 15.

After one end of the wire staple 6 is formed with a flattened enlarged portion 16 a second tool, known as a wire-gripping tool F, is used for grasping the other end of the wire staple that projects beyond the bore 5. The jaws 18 of the tool F are serrated for gripping the wire 6 and for pulling the wire so that its looped portion 6y will be forced around the anchor tooth B, as shown in Figure 7. The Allen-head set screw 3 is backed away so that the rounded end 4 will project only a slight distance, if any, beyond the inner face 7 of the abutment.

The tool F carries a screw 19 on one of its jaws and this screw is brought into contact with the outer face 10 of the abutment. A rotation of the screw will move it against the abutment and since the jaws 18 grip the wire 6, this screw rotation will pull the wire taut around the tooth. After this operation, the tool E is used again for cutting and flattening the other wire staple end in the manner already described. The flattened end portions 15 of the staple, shown in Figure 5, are larger than the bores 5 and will be received

in the recesses 9. A tightening of the screw 3 against the anchor tooth B will now move the flattened ends down to the bottom of the recesses and will anchor the wire to the tooth to thereby rigidly secure the abutment in place.

All of the abutments shown in Figure 1 are secured to the teeth in this manner. The wrench for rotating the screws 3 is shown in Figure 11. The wrench G illustrated in this figure, has a shank 20 in which a shaft 21 is rotatably mounted. The shank 20 has an enlargement 22 with radially extending anti-torque arms 23. The shaft 21 has an actuating knob 24 at its outer end and a bevel gear 25 at its inner end. The bevel gear 25 meshes with a second bevel gear 26 that rotates a magnetized bit 27. The gear 26 is connected to the bit 27 by a key 28. The bit 27 is designed to enter the recess in the Allen-head set screw 3. A rotation of the knob 24 will rotate the bit and the screw. The operator grasps the enlargement 22 between the arms 23 and prevents torque from being applied to the shank 20. The arms prevent the instrument from rolling when placed on a supporting surface.

The case-hardened bit or hexagon insert is magnetized so that it will hold the steel Allen-head set screws even though the insert is not inserted into the hollow head of the screw. The screws are small and there is an advantage in magnetizing the bit. No loose metal such as screws should be in the mouth particularly if the patient is having the work performed while under a general anesthetic. The long handle gives an unobstructed field of vision. The head or knob 24 rotates the bit and the arms 23 prevent torque being developed in the shank 20. After the bit 27 has been inserted into the recess of the Allen-head set screw, the knurled knob 24 is rotated for rotating the bit and tightening the screw. The holding of the collar or enlargement 22 prevents any torque from developing in the shank. The patient need not open his mouth to any appreciable extent during the tightening of the screws by the wrench.

After the abutments A have been secured to the anchor teeth B in the manner indicated, alignment bars H are secured to the abutments. Figure 3 shows the abutment A provided with a slot 29 for receiving the bar H. Each abutment is provided with a slot 29 and an Allen-head set screw 30 is carried by the abutment and contacts with the bar for securing it to the abutment. The bar H shown in Figure 4, has projections 31 and Figure 1 shows these projections as receiving rubber bands 32 which yieldingly urge the bars toward each other. Since the bars are connected to the abutments this force will exert sufficient traction to urge the two jaws C and D toward each other and keep the occlusion during the healing process. Where the fracture presents displacement of the fragments, the rubber bands will reduce the fracture.

In Figure 6 I show an abutment A1 which is larger than the abutment A and is for the purpose of spacing the wire staple ends 6 further apart so that the staple can encircle a larger tooth such as a molar B'. The other abutment shown in Figure 6 is of the same type as that already described. The abutment A1 is identical in all other respects to the abutment A and like reference numerals will therefore be applied to similar parts.

In Figures 12, 13 and 14 I show a modified form of abutment used. In this form the abutment

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A2 is L-shaped and the spanner screw 33 extends entirely through the base of the abutment and has its rounded shank end contacting with the anchor tooth B. The ends of a wire staple 34 are secured in bores 35 by Allen-head set screws 36. The adjacent abutments A2 disposed on each side of the fracture 1 in the jaw C are interconnected by an alignment bar 37 which in turn, is secured to the abutments by Allen-head set screws 38. The operation of this form of the device is identical to that described for the preferred form. Figure 14 shows two bars 37 disposed on opposite sides of the jaw C, these bars interconnect pairs of abutments A2.

When a "green-stick" fracture occurs without displacement, one might apply a fixation block on either side of the fracture line and insert an alignment bar between the two retainers and secure them together. In such a case one unilateral appliance would merely act as a retainer during healing. The safer practice of course, would be to apply an upper unilateral appliance on the involved side with rubber elastic traction between the upper and lower teeth to draw the teeth into normal occlusion.

The fixation blocks may be tightened as needed for stretching the wire staple and this is accomplished by turning the screws 3. My invention is so designed that it may be secured to the teeth without the necessity of the patient opening his mouth to any appreciable extent. Each wire staple may be held by a small haemostat and inserted into the mouth and the ends passed through the interproximal embrasures of the selected tooth toward the cheek, from the lingual surface, and then passed through the openings in the fixation block, whereupon they may be secured by the Allen-type set screws.

One feature of the invention lies in the fact that the alignment rods and the wire staples may be purchased in large quantities and cut to the desired lengths. The twisting of the wires around the teeth is done away with and this prevents the gums from being abused. The rounded end of the screw shank contacts with the buccal enamel of the tooth at a definite point known as "Marble-Contact." A single wire loop of the staple encircles the lingual surface of the tooth and contacts along a single line which may be kept clean by daily irrigation under pressure during the healing period. Any loosening of the staples can be taken up by the screw without discomfort to the patient. The staple wire can also be renewed if necessary, without disturbing the rest of the appliance.

In connection with the crimping of the wire 6 to form the flattened portion 16 it will be noted that the flattened portions on all wires will have the same width and thickness because the stop 17 limits the movement of the handles of the tool E toward each other and stops the jaws at the same point each time. In this way all of the flattened portions 16 are standardized as to size and by means of this regulated control it is certain that no flattened portion 16 will be over compressed thereby preventing its withdrawal into the recess 9 nor on the other hand will any flattened portion be insufficiently expanded so that this portion will move past the recess and into the bore 5. Each flattened portion will bear against the bottom of the recess 9 to act as the necessary lock for the abutment A. From Figure 5 it will be noted that no portion of the flattened ends 16 project beyond the recesses 9. The ends of the wire staple 6 will either lie flush with the

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face 10 or will be received within the recess 9. This causes the face 10 to be smooth and the device will be incapable of traumatizing the cheek tissues.

It is possible for the bar H to be formed in a U so as to encircle the jaw. I have indicated this fact in Figure 2 where I show the bar H extended by the dot-dash lines and curving so as to conform to the contour of the lower jaw C. The U-shaped bar H will extend around both sides of the jaw and will have abutments secured to anchor teeth on both jaw sides. The U-shaped bar H can be used for multi-fractures of the jaw bone or it can be used where additional support is desired for holding the opposed parts of a single fracture in proper alignment during the healing process. My invention therefore, contemplates the use of a U-shaped bar H as well as the shorter bars shown in Figures 1, 6 and 12.

I claim:

1. An abutment for an intra oral fracture appliance having two wire receiving openings with enlarged recesses at the ends of the openings disposed on the face of the abutment lying adjacent to the cheek, said abutment having shoulders at the juncture of the bores and recesses, a wire staple passed around a tooth and having its legs received in the openings, the ends of the staple being enlarged and bearing against the shoulders for securing the staple to the abutment, and a screw carried by the abutment and having a rounded end for contacting with the tooth, said screw being adapted to tighten the abutment on the staple for anchoring the abutment rigidly to the tooth.

2. An abutment for an intra oral fracture appliance having two wire receiving openings with enlarged recesses at the ends of the openings disposed on the face of the abutment lying adjacent to the cheek, said abutment having shoulders at the juncture of the bores and recesses, a wire staple passed around a tooth and having its legs received in the openings, the ends of the staple being enlarged and bearing against the shoulders for securing the staple to the abutment, and a screw carried by the abutment and having a rounded end for contacting with the tooth, said screw being adapted to tighten the abutment on the staple for anchoring the abutment rigidly to the tooth, said abutment having a groove therein, a guide bar removably received in the groove, and means for securing the guide bar in the groove.

3. An abutment for an intra oral fracture appliance having two wire receiving openings therein, a wire staple passed around a tooth and having its legs received in the openings, means for securing the legs to the abutment, and a screw carried by the abutment and having its inner end bearing against the tooth, said screw being adapted to tighten the abutment on the staple for anchoring the abutment rigidly to the tooth.

4. A unilateral intra oral fracture appliance comprising L-shaped abutments securable to teeth on opposite sides of a jaw fracture, said abutments having openings, wire staples passed around the teeth and having their ends received in the openings, set screws for securing the staple ends in place, screws for bearing against the teeth for tightening the staples with respect to the abutments, the L-shaped portions of the abutments having openings therein, an alignment bar receivable in the last-named openings,

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and set screws for clamping the bar to the
abutments.

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The following references are of record in the
file of this patent:

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