Closing spaces in orthodontic cases*

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A number of years ago I constructed a demonstration appliance on artificial teeth which were mounted in a rubber base. The rubber was later replaced with acrylic, but before doing so, an edgewise arch was fitted as passively as possible into each bracket and was finally ligated into place. The rubber mold was then removed, making it possible to observe the positions in which the arch was holding each individual root. Irregularities in tooth form and inaccuracy of band placement were expressed by displacements in root position sufficiently extreme to be alarming. It was obvious that these same inaccuracies exist when working in the mouth, but the results seem less conspicuous because of the protection offered by occlusal forces, paradental attachments, and resistance of adjacent tissues including musculature. While this was a crude experiment it did serve to make me more conscious of the potential for tissue damage in the manipulation of orthodontic appliances.

In closing spaces, the complete control of tooth units is very important. A study of the various methods used would give one the impression that two extremes in appliance therapy exist. The one with appliances so simple that there is not sufficient control of tooth units. The other with bands on every tooth with sufficient bends and torques in the arch wires to make it difficult to determine what the resulting tooth movements are, and with a strong possibility of the orthodontist becoming exhausted in the process of treating cases.

I shudder when I think of the resultant forces when an edgwise appliance is adjusted with closing loops, second order bends and elastic force whether intermaxillary or occipital. Radiographs may lead one to a false sense of security. It must be realized that they do not reveal a detailed picture of root and bone structure. Much damage can be present in structures and still not be visible on radiographic records.

In some extraction cases it is necessary to change the inclination of teeth, incisors particularly, to a great degree. However, the pattern which we attempt to create should comply with or fit as harmoniously as possible into the structures of the face according to type. To always place lower incisors in relation to the mandibular lower border according to a fixed formula, is to ignore the extremes in facial types, and discrepancies between maxillary and mandibular structures. Adjusting the dentition so that it harmonizes as completely as possible with facial structure, and doing it with a minimum of torque and bends in arch wires will accomplish three things.

1. Reduce the damage to tissues.
2. Increase the stability of the treated case, and maintain future health of the tissues.
3. Decrease the amount of time and effort required by the orthodontist.

Conclusions have been made in re-

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gard to the nature of tooth movements effected by orthodontic forces without the use of an accurate method of measuring changes. The more one makes serial studies of tooth movements and growth changes in cephalometric radiographs, the more one is impressed with the necessity for a favorable growth pattern, and favorable relation of structures if the changes produced by mechanical therapy are to have satisfactory results.

A very common characteristic of malocclusions, is a deep overbite. Many of the cases requiring extraction also have a deep overbite. A very effective way of complicating such a case is to use arch sections to move cuspids distally into areas of first bicuspid extractions. It is very difficult to prevent the posterior teeth from tipping mesially and depressing as the cuspid is moved distally. The result of such movement would be an increase in the overbite, and a migration of teeth into positions very difficult to correct. This can be avoided by banding all the teeth and using a full archwire, fitting it carefully into the brackets of the incisors. I prefer for the most part, to use a .021 round archwire to obtain bracket engagement and to reduce the curve of spee. This is then replaced with a .021 x .024 archwire with stops in contact with the molar buccal tubes. A pull coil spring is fastened to the end of the arch on each side, and ligated to the cuspids. In this way all of the teeth serve as anchorage to create the movement on the cuspids. If the cuspids are tipped mesially as they often are, they are not engaged on the arch wire until they have been tipped distally to correct axial inclination. If their original axial position is correct, they may be engaged on the arch, and made to slide along the arch by the pull of the coil until their mesial contacts are clear. Frequently the coil springs may be discontinued at this time. If moving the incisors as much as possible to the lingual is an urgency, the second permanent molars should be included in the anchorage and the cuspids should be moved along the arch with the coil springs until they contact the second bicuspids. This makes it possible to move the incisors as a group, and thus get the maximum of distal movement. Whether the incisors are moved distally as a unit, or are moved along with the cuspids, closing loops incorporated in the arch provide an efficient means of making such movements.

In order to discuss the use of closing loops, a case will be selected where the cuspids have been moved distally just sufficiently to eliminate the crowding of the lateral cuspid contacts and to accommodate any incisor crowding. The teeth are all engaged on a .021 round archwire, and all rotations are eliminated. I prefer to use steel arches. A .021 x 0.24 arch is then applied with a closed loop immediately distal to each cuspid bracket. If the loops are kept close to the cuspid brackets, space will be made available for making the closure without repositioning the loops. Precaution is taken to prevent the cuspids from rotating distolingually. If necessary, rotating springs are soldered to the cuspid bands for this purpose. When the anterior teeth are ligated into place, the loops are activated by a ligature passing in a figure eight pattern from the distal of the buccal tube over the brackets on each posterior tooth to a spur on the distal leg of each closing loop. The ligature is tightened sufficiently to open the loops slightly. Care should be taken to keep the legs of the loops close to a parallel position so as to avoid any permanent distortion. At succeeding appointments the loops can be reactivated by pulling the ligature tighter, and occasionally replacing it. It is possible by this simple method to close

bicuspid spaces without conspicious tipping of teeth. I have in some cases closed spaces without removing an arch-wire during the process.

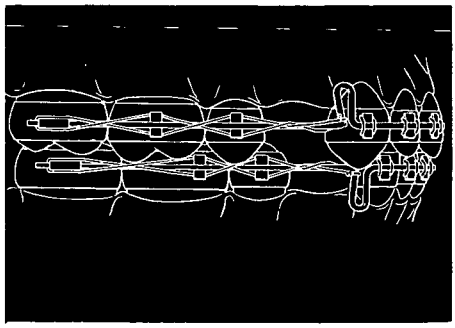

Fig. 1. Drawing of an activated edgewise closing archwire, the appliance is all on the same plane. There are no second order bends.

The use of the figure eight ligature from the distal of the buccal tube, engaging each tooth and finally ligated to the loop, aids in preventing mesial rotation of the buccal teeth as the loop is activated. The ligature creates a distal rotating force on each tooth as it is ligated into position.

Second order bends if used in conjunction with closing loops, make it necessary to change the location of the bends frequently to avoid moving each tooth along an incline plane, caused by the second order bend. This adjusting is not only time consuming, but it is most difficult to make frequent changes of this nature without traumatizing tissues unnecessarily.

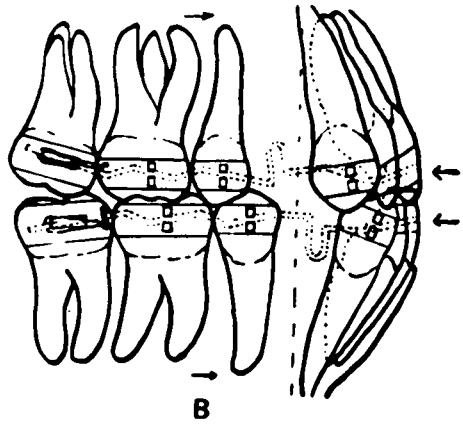

Fig. 2 Drawing of closing loops used in conjunction with second order bends. Taken from Tweed in Strang's text.

The elimination of second order bends when closing loops are used minimizes trauma, and makes a very simple procedure. The resulting action on the teeth is similar to the use of a spur and ligature tie on a continuous arch without loops, which I believe would create a most satisfactory type of tooth movement with adequate control of tooth units. The application of force is kept on a single plane.

Special precaution should be given to the placing of buccal tubes. The mandibular buccal tube may be in an ideal position if it is tangent mesio-distally to the buccal surface of the molar on which it is located. If the tube is placed on the maxillary first permanent molar, it is advantageous to tip the distal portion of the tube away from the tooth so that lingual bend in the arch wire will not be required at the mesio-buccal cusp of each first molar. In this way, the molar will not be rotated as the space closes and the archwire passes distally through the buccal tube. If this is not done, it will necessitate removing the archwire frequently and changing the location of the lingual bend in the area of the mesio-buccal cusp of the molar, to prevent molar rotation. If the appliance extends to the maxillary second permanent molars, and it frequently should, there is not much to be gained in changing the tube on the second permanent molar band from its normal position on the buccal surface. To do so would cause frequent cheek irritation. It would still be necessary to remove the arch frequently to reposition the bend in the arch at the mesio-buccal cusp of the first permanent molar.

When spaces are closed, new edgewise archwires, .021 x .024, without closing loops should be placed, to create a refinement in tooth position. If appliance adjustments have been made carefully, and precaution taken to avoid unfavorable tooth movements, this should not be a complicated procedure. Frequently it will be possible to place ideal arches and obtain complete bracket engagement. This will partially correct tipping of teeth. At succeeding appointments, second order bends can be placed to improve the axial position of the teeth. A reverse bend frequently is required on the cuspids upper and lower to move the roots into correct position. In completing cases special attention should be given to the accuracy of band placement, and variations in tooth anatomy. The use of a rigidly ideal pattern in an appliance is excellent when uniformly ideal tooth material is available. However it may be necessary with variations in tooth anatomy, to make compensations in appliance adjustments.

In indicating the gauges and materials used in archwires, I do not want to give the impression that those which I use are necessarily the best. I select them because I like to work with them. Some will prefer to use many more gauges of archwires and make frequent changes. The adjustment of the archwire is largely responsible for the nature of the forces applied to teeth. A small gauge wire may be severe, while it is also possible to place a mild adjustment in a larger gauge wire.

The records of two cases are presented, to illustrate the type of tooth movements that have been made with the procedure as outlined.

The first case was a girl 18 years of age. The face was in excellent balance. Both maxillary and mandibular arches were constricted, with considerable loss of arch length. A distocclusion was present on the right side. All four third molars were present. Four first bicuspids were extracted as a part of treatment. Treatment was completed in eleven months.

The second case was a boy 18 years of age. The face had quite a satisfactory relation of tissues considering the severity of the malocclusion. The teeth were in a Class II relation. For the most part the mandibular teeth were in satisfactory relationship to supporting structure. The mandibular incisors were very slightly crowded. The mandibular right second bicuspid was crowded, and in a lingual position, with a forward migration of the molars. The maxillary anterior teeth were inclined strongly to the labial, with an extreme overjet, and a conspicuous open bite. All four third molars were present.

In treatment the maxillary first bicuspids and the mandibular right second bicuspid were extracted. No extraction was made on the left side of the mandibular arch, since it was considered that to do so would remove too much tooth material from the arch, and would complicate treatment. Treatment was completed in fourteen months.

While there are many aspects of treatment which have not been discussed in this presentation, they have been presented very adequately in the literature, so that further repetition is not indicated. This brief discussion and the accompanying illustrations portray a simple, but an adequate application of the edgewise appliance in closing spaces.

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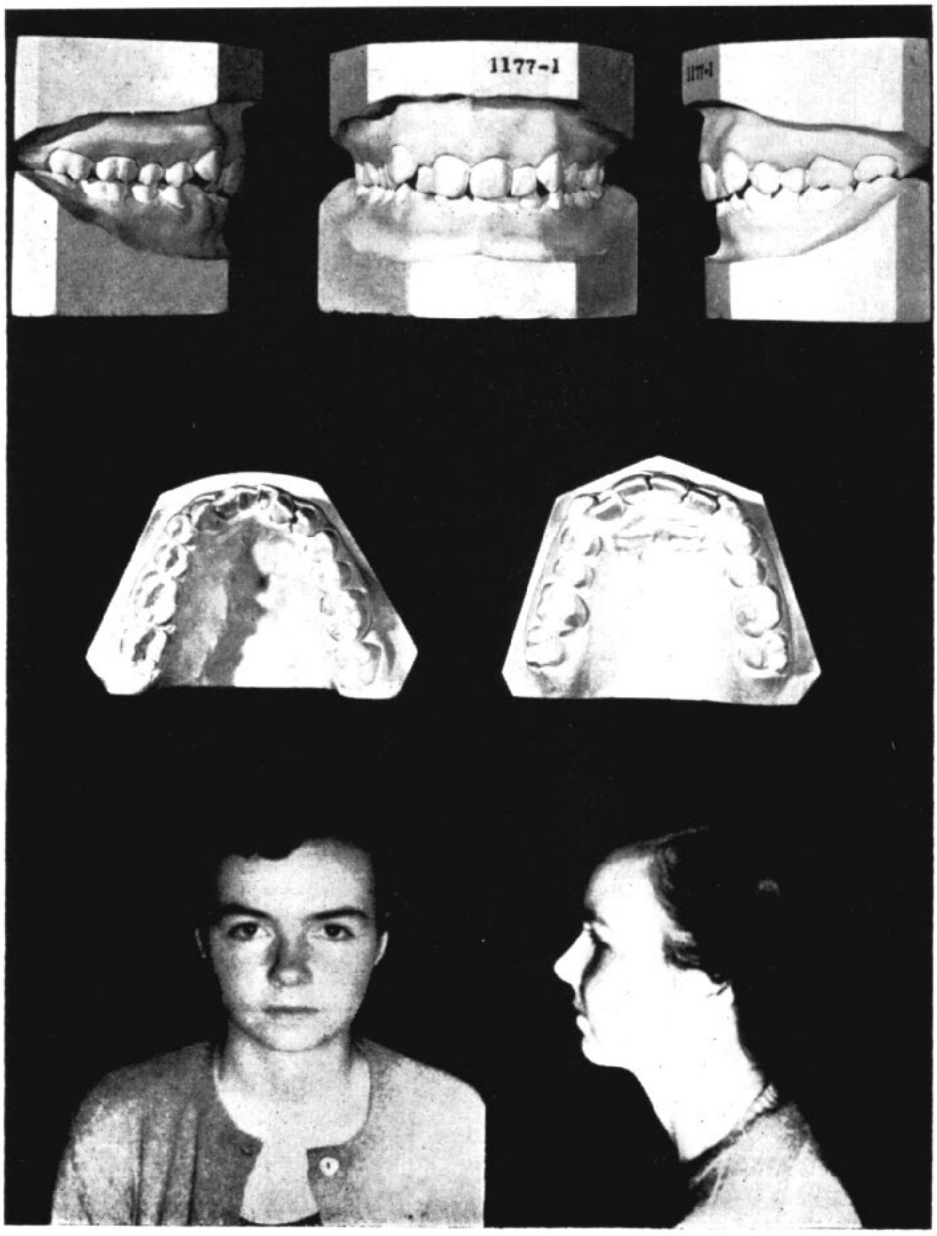

Fig. 3 Models and photographs of Case 1 before treatment.

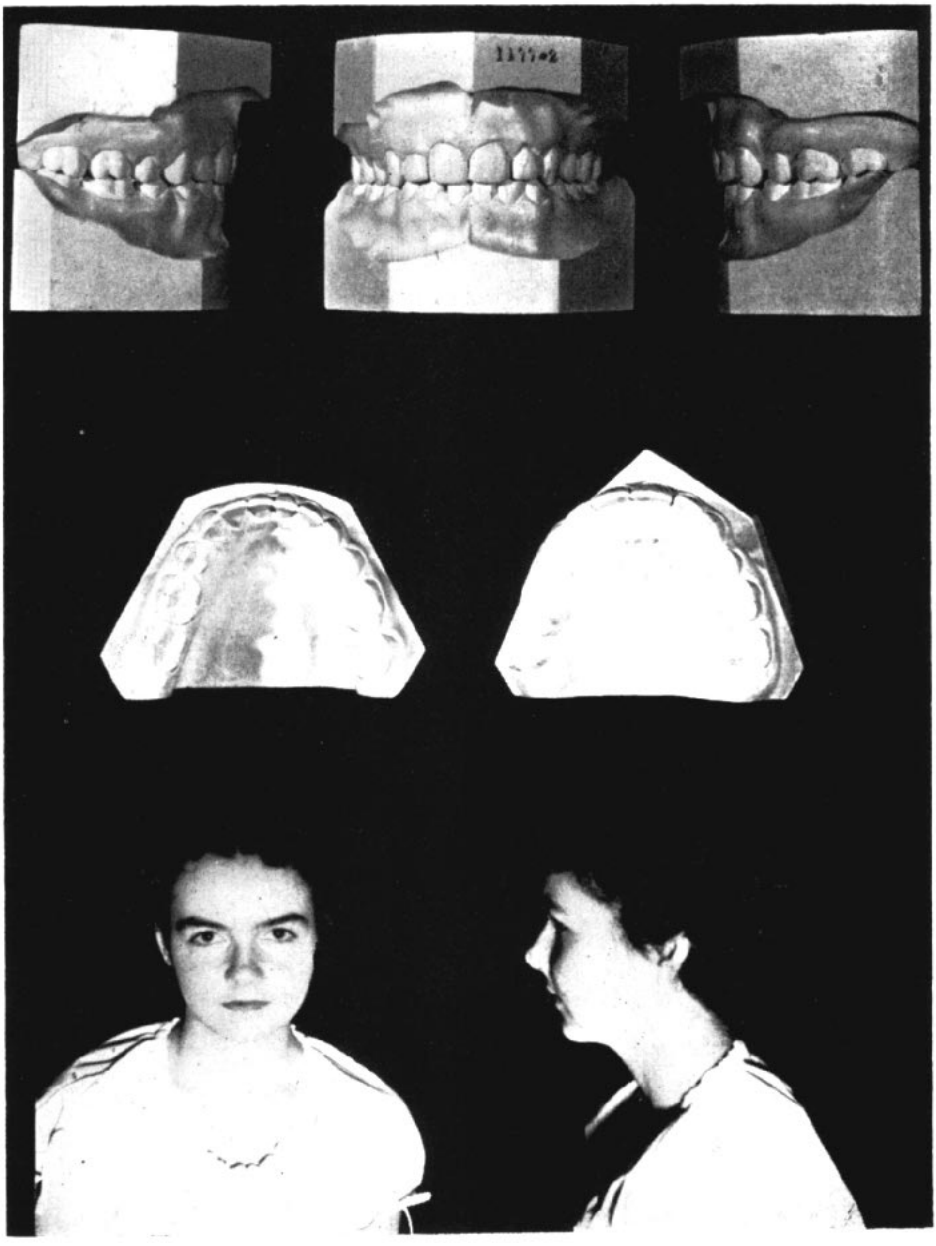

Fig. 4 Models and photographs of Case 1 after treatment.

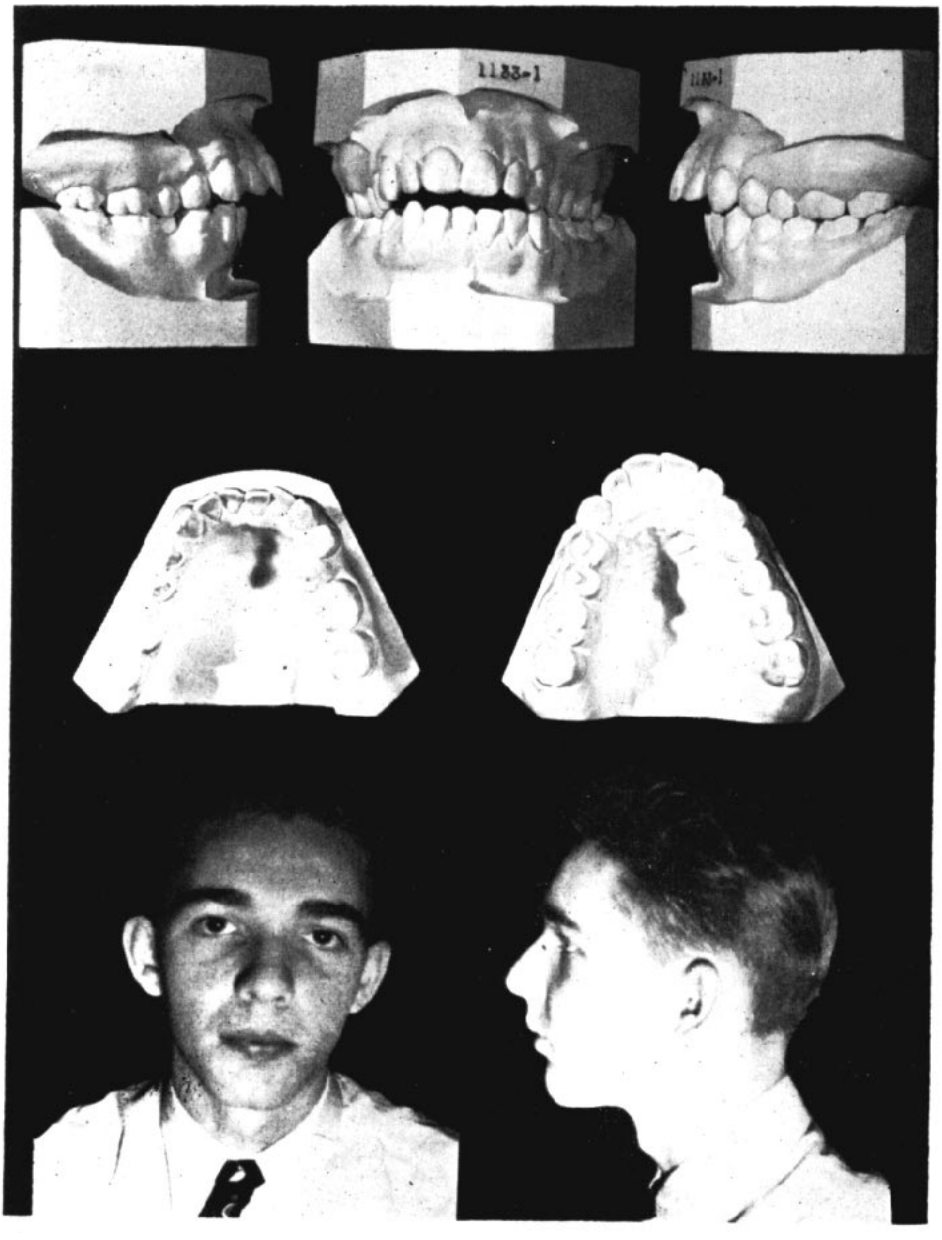

Fig. 5 Models and photographs of Case 2 before treatment.

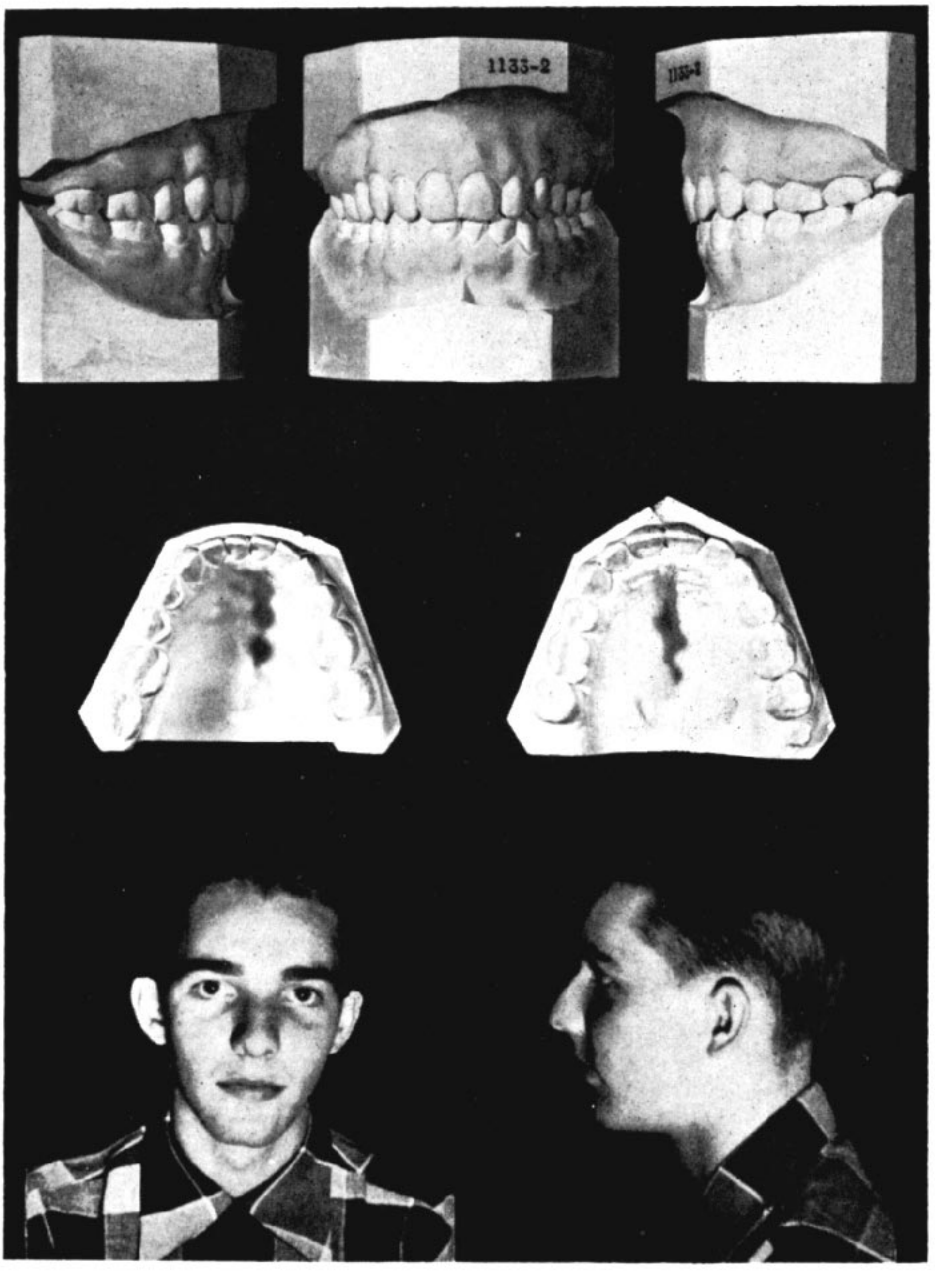

Fig. 6 Models and photographs of Case 2 after treatment.

REFERENCE

1. Strang, Robert H. W., Treatment of Bimaxillary Protrusion Deformities, Text Book of Orthodontia, Second Edition.