

# A Discussion of Torque Force as Available in the Edgewise Arch Mechanism\*

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Torque force is the force obtained from a twisted spring wire in its effort to untwist itself.

This is the newest force that has entered the field of orthodontia and is probably the power that is the least understood and the least frequently used by operators. It is, however, one of the most helpful of the forces available and yet, at the same time, one of the most dangerous because it is so insidious and is often active when and where not expected. Therefore torque force should be carefully studied as a separate entity so that it may fully be appreciated and intelligently applied.

Torque force first became available when a flat archwire was introduced instead of a round one and when the mechanical attachments on the teeth were so stabilized and of such a form that this flat wire accurately fitted into them and was unable to turn upon itself without exerting the force, inherent in this turning, upon the attached tooth. The ribbon arch mechanism is ideal for the production and use of the torque force. The edgewise arch mechanism is likewise of such a form and construction as to render this force available. Fig. 1.

## **A Study of Torque Force in Relation to the Movement of Individual Teeth**

The torque force is named according to its action upon the tooth crown. Thus there is (a) lingual torque, that tends to tip the tooth crown lingually and its root labially; (b) labial torque, that tends to tip the tooth crown labially and the root lingually; and (c) buccal torque, that tips the tooth crown buccally and the root lingually. Usually when the crown is torqued labially, the root will shift lingually and when the crown is torqued lingually, the root goes labially. It is possible, however, by proper archwire manipulation to limit the movement by the torque force to either crown or root as desired.

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## Torque Force in the Incisor Section of the Archwire

This force is applicable for tipping an incisor crown or root lingually or labially. (a) *To tip the crown lingually and the root labially.* In this adjustment the lingual portion of the edgewise arch must be in slight gingival relationship to the lingual aspect of the gingival and occlusal

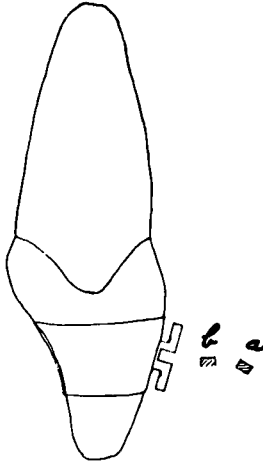


Fig. 1. The relationship that the archwire bears to the bracket in producing lingual and labial torque.

bracket walls while the labial edge of the archwire must be slightly occlusally related to the labial aspect of the above mentioned bracket walls before being seated. Fig. 2, A. Thus when this archwire is grasped with the arch bending iron and minutely twisted on itself so that it will seat easily in the bracket slot, it tries to untwist and in so doing binds on the slot walls and forces the tooth crown lingually and the root labially. The pivotal point of this reverse movement is at the bracket level.

If it is desirable to tip an incisor crown lingually with torque force without producing any labial root movement then an additional adjustment must be made in the archwire for the production of an ordinary lingual movement of the tooth crown. Thus the crown will be pushed lingually by two forces and these will overpower and effect greater action than the labial root tipping portion of the torque force. In such a movement the tooth swings on a pivotal point located at the apex of the root. Fig. 3, A.

If the operator wishes to effect only a labial *root* movement with the torque force then the archwire, after being properly lingually torqued, must also be so adjusted as to stand labially to the bracket on the tooth to be

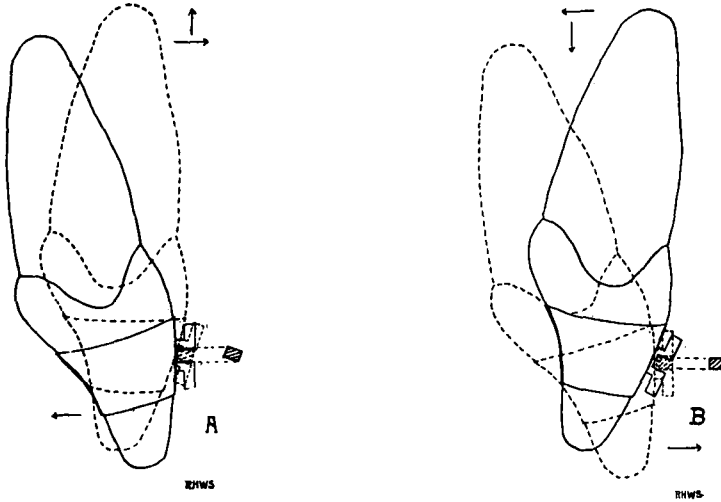


Fig. 2, A. The tooth movement taking place under the influence of lingual torque. The solid line shows the original tooth position and the dotted line illustrates the final position affected by the torque action.  
B. The tooth movement affected by labial torque.

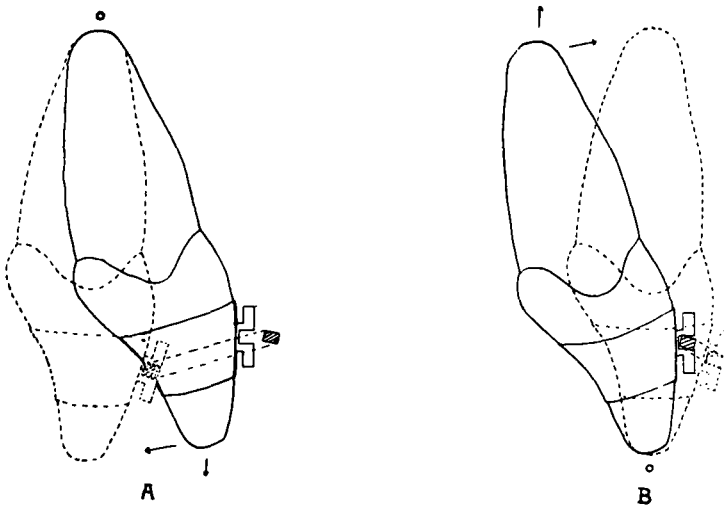


Fig. 3, A. Lingual torque action combined with lingual spring pressure by the archwire.  
B. Lingual torque combined with labial spring action.

moved. Thus there will be two forces in action when this wire is sprung into the bracket. One, the torque action, tends to move the root labially and the crown lingually; the other, a labial moving spring force tends to move the tooth bodily labially. This latter force will counteract the lingual tipping portion of the torque force so that the occlusal edge of the crown will remain stationary as the root moves labially. Fig. 3, B.

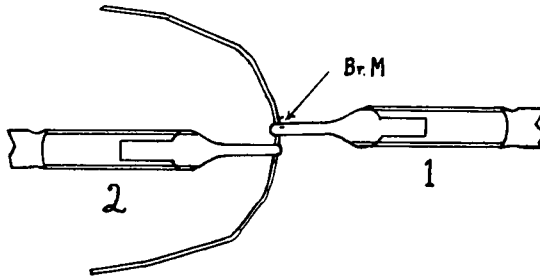


Fig. 4. Plier adjustment for incorporating localized torque action in the archwire.

### The Technic of Producing Lingual Torque Action on One Incisor Tooth

1. Before removing the archwire from the mouth, mark with file scratches the position of the mesial and distal sides of the bracket on the incisor that is to be shifted by the torque force.

2. Remove the archwire and record its form and the relationship of the two ends in the archeograph.

3. Grasp the edgewise arch with a pair of arch bending pliers No. 142, having the flat portion of their beaks just overlapping the mesial bracket marking. These pliers should extend labially from the archwire at an exact right angle and be held in the most convenient hand. Fig. 4, pliers No. 1.

4. With a second pair of arch bending pliers presenting from the lingual side, the archwire should be grasped about 1/16" mesial to the location of pliers No. 1. These should also be adjusted at right angles to the archwire. Fig. 4, pliers No. 2.

5. Twist the wire with pliers No. 1 in the direction that the root should move. This turns the bracket area of the archwire into the proper plane to produce the desired action. Make this twist of *minor* degree for the operator must remember that the movement is greatly magnified as the

root apex is approached. In effecting lingual torque the handles of pliers No. 1 are rotated occlusally.

6. In order to limit this modification to the one tooth demanding the action, the archwire on the distal side of the bracket marking must now

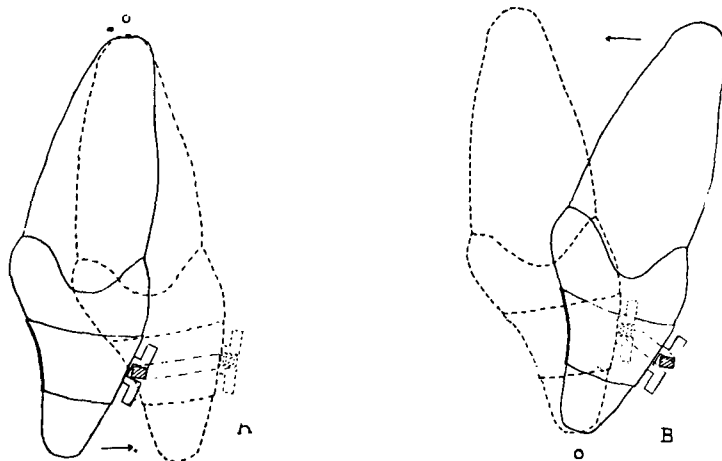


Fig. 5, A. Labial torque action combined with labial spring.  
B. Labial torque combined with lingual spring of the archwire.

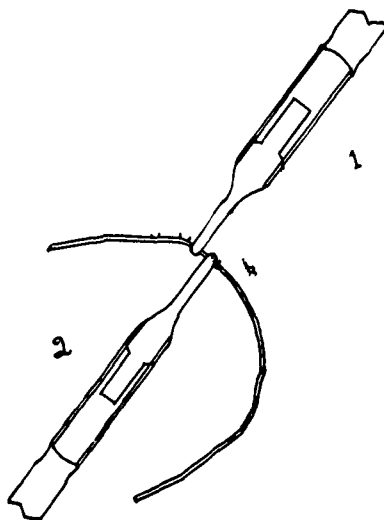


Fig. 6. Plier position for localized canine torque.

be brought back to its original plane. This is done by shifting pliers No. 1 distally until its distal side extends just beyond the distal bracket marking. Then transfer pliers No. 2 to a point  $1/16''$  distal to pliers No. 1.

7. Hold the archwire on a level with the eye so that the two molar ends can be gauged and rotate the distal archwire section with pliers No. 2 in the opposite direction from the rotation that produced the torque in the bracket area and make this twist of sufficient amount to bring the distorted molar end of the archwire back to the same level as the unmodified arch end.

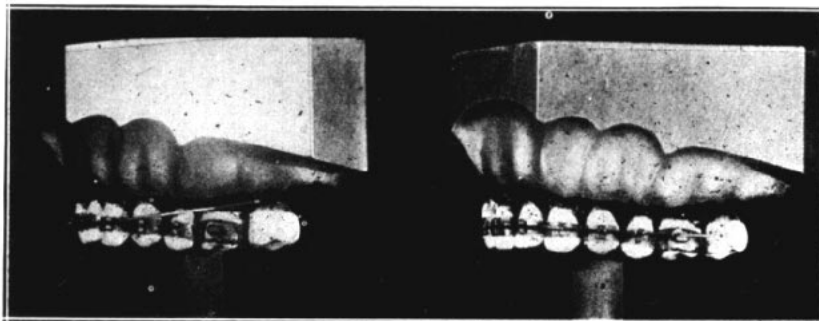


Fig. 7, A. The distortion of the archwire produced by the initial twist in affecting localized canine torque.  
B. The result of the corrective bends made in the canine torque technic.

8. The degree of lingual torque may now be tested by placing the torqued area in its proper bracket and noting how much the molar ends of the wire are displaced *occlusally* to their tubes. They should lie about  $1/8''$  occlusally to the plane of the occlusal surface of the molar.

9. When seating the archwire, after such a modification, the arch bending iron may be used and the torqued area twisted sufficiently to permit its sliding into the proper bracket. It should then be slowly and gently released by the iron.

### **To Torque an Incisor Crown Labially and its Root Lingually**

In this adjustment the lingual portion of the archwire must be occlusally related to the lingual aspect of the gingival and occlusal bracket walls while the labial edge of the archwire is a little gingivally located to the labial aspect of these bracket walls before the archwire is seated for action. Fig. 2, B. When such an adjusted archwire is placed in this bracket it assumes a twist from which evolves the torque force and in its effort to become passive the archwire tips the crown labially and the root lingually. The pivotal point on the tooth is at the bracket location.

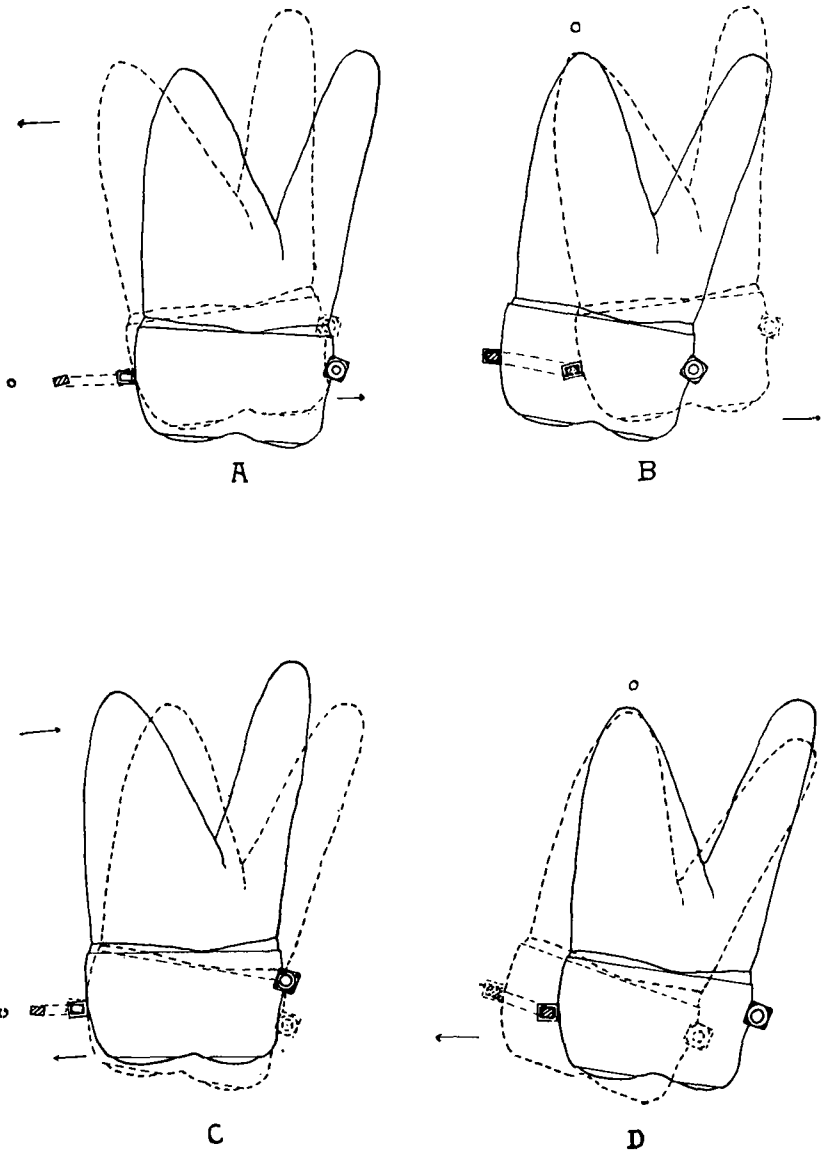


Fig. 8, A. The action of simple lingual torque.  
 B. Lingual torque combined with lingual spring action.  
 C. Simple buccal torque action.  
 D. Buccal torque combined with buccal spring action.

If it is desirable to limit the action to the crown only then a labial local bend must be placed in the wire in addition to the labial torque so that this will compensate for the torque effect on the root and hold this portion of the tooth without lingual change. The apex of the root then is the fixed point. Fig. 5, A. On the other hand, if the root is the only portion of the tooth that needs shifting and the crown is to be left without labial

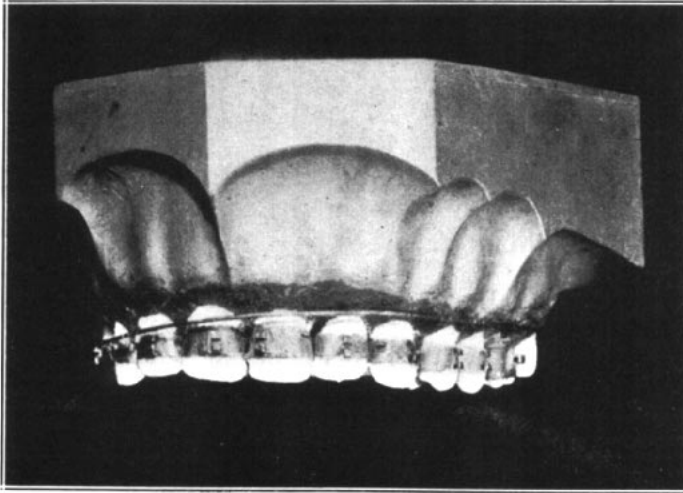


Fig. 9. Testing for buccal torque action.

movement, then a local lingual bend should be added to the labial torquing and these combined forces will give the desired root change and prevent the crown from shifting in the opposite direction. In this adjustment the occlusal edge of the crown is the stationary point from which pivoting occurs. Fig. 5, B.

The technic for producing localized labial torque is exactly the same as that for lingual torque except that all plier rotations are in the opposite directions. In testing out such a modified archwire by placing the modified bracket area in its proper bracket, the molar ends of the wire should lie gingivally to the molar tubes to the extent of  $3/16$ ".

### **Localized Torque Action on the Canine Teeth**

The technic of placing torque in the canine region of the edgewise arch is an exceedingly exacting and perplexing operation and one that must be done in quite a different manner than when enacted in the incisor region.



This is due to the fact that the location of such a torqued area will be at the junction of the two diverging planes of the archwire and consequently twisting of the wire in this region and on one of these plane lines, produces an extreme modification on the divergent plane area of the archwire. Hence the technic of this torquing modification must include such corrective bends as will compensate for this added divergence of the archwire.

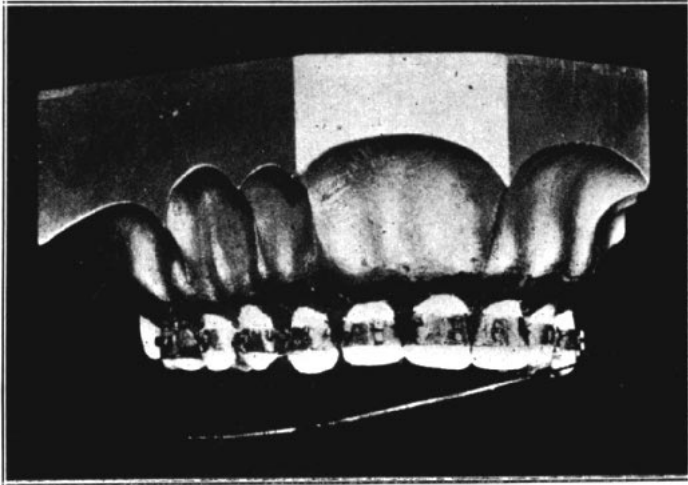


Fig. 10. Testing for lingual torque action.

This operation is performed as follows: 1. Mark the canine bracket area and the bracket areas of the corresponding lateral incisor and first pre-molar teeth, using a file for this purpose.

2. Remove the archwire and adjust it to the archeograph or make a tracing of the outline form on a paper. This is very important as the torquing and corrective adjustments, no matter how expertly done, are liable to change the shape of the archwire and hence disturb the molar relationship which, of course, should be avoided. If the operator has a drawing with which to compare the modified wire he can at once detect such undesirable changes.

3. Two pairs of pliers No. 142 are used. Pliers No. 1 are held in the right hand and the flat portion of its beaks is placed on the wire  $1/16$ " mesial to the bracket marking of the canine with the handles directed labially to the wire and at right angles to the general curve in the archwire at the

point of grasping. Fig. 6, No. 1.

4. Pliers No. 2 in the left hand are placed  $1/16''$  mesial to pliers No. 1, are parallel to these pliers but are located lingually to the archwire. Fig. 6, No. 2.

5. Rotate pliers No. 1 in the direction necessary to tip the crown and root as desired. In this description we will consider that the crown of an upper canine is being tipped lingually and its root labially. The handles of pliers No. 1 are therefore rotated occlusally.

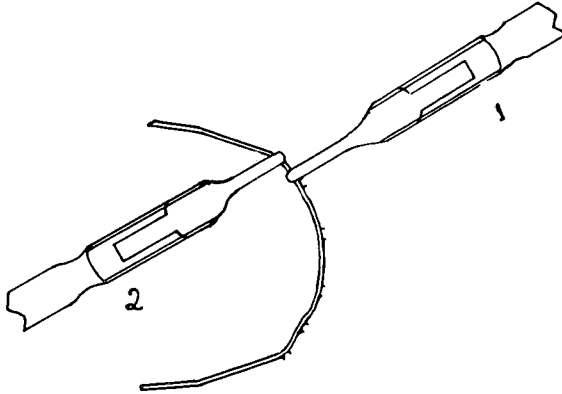


Fig. 11. Plier hold for producing the first change in mass torque of the incisors.

This will twist the canine bracket area of the archwire in such a manner that its lingual edge assumes a gingival relationship to the lingual aspect of the bracket slot while the labial edge of the wire lies occlusally to the labial section of the canine bracket slot which is the correct adjustment to give the crown and root the tipping that is desired.

But in making this twist the distal section of the archwire is deflected gingivally to a marked degree. Fig. 7, A. Such a modification also causes the archwire to cross the bracket opening of the canine in a manner that will produce a distal tipping of this tooth crown if the archwire is seated in its present form. Fig. 7, A. Hence this distortion must be removed.

To do this the corrective bend must be made in the *torqued area mesial* to the bracket marking. For this purpose the small "bird beaked" pliers, No. 139, are placed  $1/32''$  mesial to the bracket markings of the canine and at right angles to the wire, labially or lingually, and an occlusal bend is given in the posterior section of the wire, i. e., that portion containing

the canine bracket area. The degree of this occlusal bend is such that the archwire is made to lie parallel with the canine bracket opening. Fig. 7, B.

6. The next procedure is the removal of the lingual torque and any remaining gingival distortion from the premolar and molar regions of the archwire. Pliers No. 1 are now adjusted on the *lingual* side of the wire with their beaks  $1/16''$  *distal* to the canine bracket area marks and at right angles to the archwire and pliers No. 2 are placed  $1/32''$  distal to pliers No. 1, on the buccal side of the wire and also at right angles to the archwire.

7. Pliers No. 2 are now rotated by carrying their handles gingivally until the section of the archwire under their control will again be brought

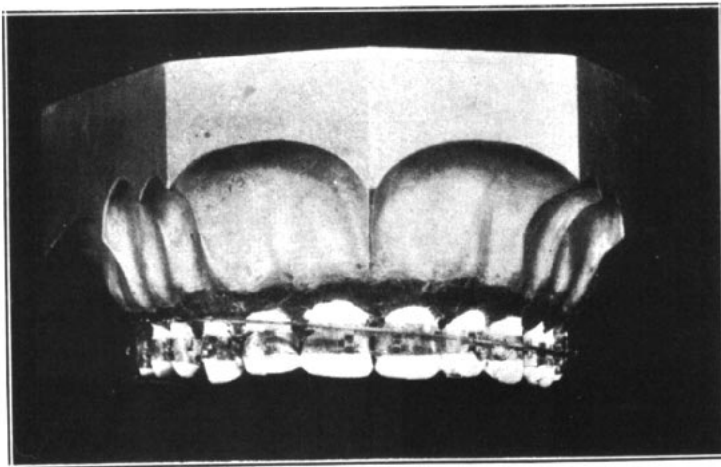


Fig. 12. The effect on the archwire of the first torquing twist in mass incisor torque modification.

to assume a passive relationship to the bracket openings on the premolars and to the walls of the opening in the buccal sheath on the clamp band.

In removing this undesired torque the posterior end of the archwire is also once more deflected occlusally so that it will again lie parallel to the horizontal plane in which the opposite archwire end is located and thus become passive, gingivo-occlusally, to its molar sheath and to the premolar bracket slots.

If it is found that the proper removal of the torque from the premolar and molar areas of the archwire does not correct the gingival displacement of the wire in this region then the gingival corrective bend made in Step 5 was not of sufficient amount and it should be increased until the horizontal

plane of the wire is correctly established. On the other hand, if the removal of the undesired torque carries the posterior end of the archwire too far occlusally, then the corrective bend in Step 5 was too much and should be proportionately reduced.

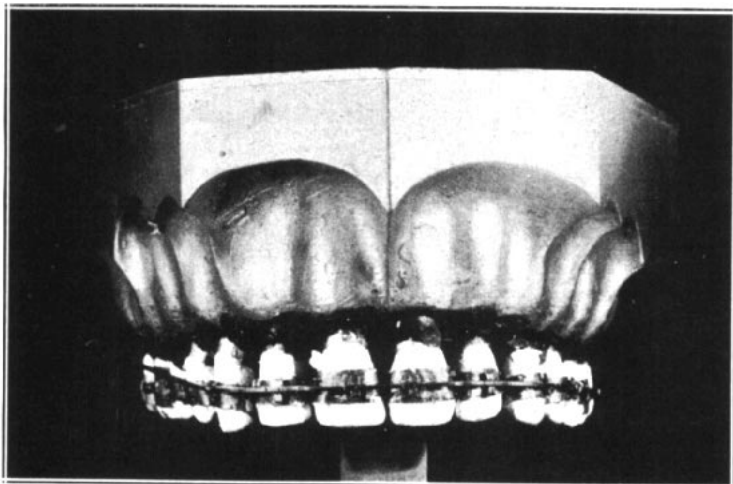


Fig. 13. The proper position of the archwire after removing the gingival distortion from the incisor area.

This procedure must be practiced many times before accuracy can be developed, but if carefully followed it will give the desired results.

*Labial torque in the canine area* is effected by the same technic only the rotation of plier No. 1 in Step 5, the corrective bend mesial to the bracket area and the secondary plier rotation in Step 6 are just reversed.

Lingual and labial torque of the canine teeth may be modified so as to limit its action to a crown or root movement only, by adding the same spring forces from the archwire as is done in the incisor section of the denture.

#### **Torque Action in the Premolar and Molar Areas of the Archwire**

Torque action on individual premolar and molar teeth gives lingual tipping of their crowns with buccal tipping of their roots (lingual torque) or buccal tipping of their crowns with lingual tipping of their roots (buccal torque). Fig. 8, A and C. It is an extremely useful force to combine with an expansion or contraction spring of the archwire for it will greatly exhilarate these movements as shown in Fig. 8, D and B.

On the other hand, when a unilateral expansion or contraction of the dental arch is desired, torque force can be used to increase the power of the archwire on the side where activity is needed and render the anchorage more stationary on the side that must not be modified. This is done by what the writer terms, "reversed torque". If, for example, the right maxillary

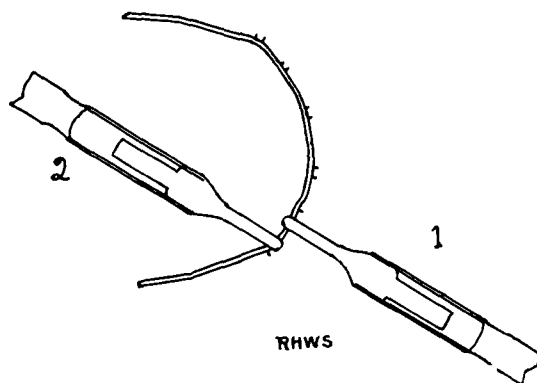


Fig. 14. The plier positions for correcting the distortion in the buccal section of the archwire.

molar must be moved buccally while the left molar must remain stationary, then the archwire is bent in the right canine region to produce unilateral expansion on the right side and buccal torque is placed in the right molar area. The right premolars are not attached to the archwire in this adjustment. Thus there are two buccal forces in action on the right molar, the spring and the torque. Fig. 8, D.

On the left molar a lingual torque, Fig. 8, A, is placed in action. Consequently if this left molar tends to move buccally because of the expansion spring force reacting from the right molar, the lingual torque action will pull the crown back and hence the tooth must remain practically stationary.

The technic of producing local torque action on a premolar tooth is just the same as that used for the incisors. In the molar area, it is even more simple because no corrective bend is necessary after the torque twist has been made because the free end of the archwire is being worked on.

The test for proper premolar and molar torque is made by placing the torqued area or end in its bracket or buccal tube and noting the position of the opposite side of the archwire in relation to the brackets on the premolars and the tube on the molar. If buccal torque is present then the opposite side of the archwire should fall gingivally to its brackets and molar tube, Fig. 9, while a lingually torqued archwire in the premolar or molar

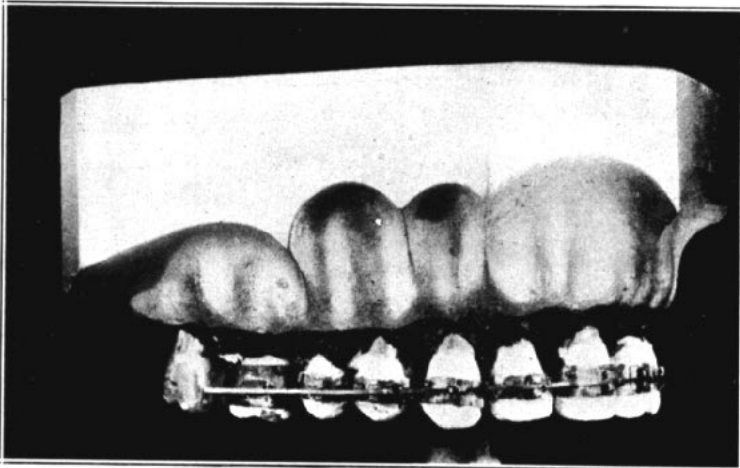


Fig. 15. Showing the passive relationship of the archwire to the brackets and buccal sheath after the corrective bend to remove the torque in this region. (Mass incisor torque technic.)

regions of one side causes the opposite free side to lie occlusally to its brackets and molar sheath. Fig. 10.

### **Torque Force in the Form of Mass Action**

Mass torque action is most frequently used in the incisor area of the upper archwire to aid in tipping the crowns of the maxillary incisors lingually in Class II, Division 1 cases; in the mandibular incisor region in similar malocclusion to aid in the production of stationary anchorage; and in the buccal sections of the archwire to aid in the buccal or lingual movement of the premolar and molar teeth or to effect a stationary anchorage in unilateral mass movements of this section of the denture.

### **Mass Torque in the Incisor Region**

While it would be perfectly possible to place this mass torque in the wire by locally modifying each bracket area, yet it would be a lengthy process and, especially on the lower archwire, a difficult one, because the

bracket areas are so close together. By means of the technic that was worked out by the writer when he was using the ribbon arch appliance and which can be adapted with slight modifications to the edgewise arch technic, this mass torque can quickly and accurately be placed in the entire incisor section of the wire with a comparatively few properly located twists and corrective bends.

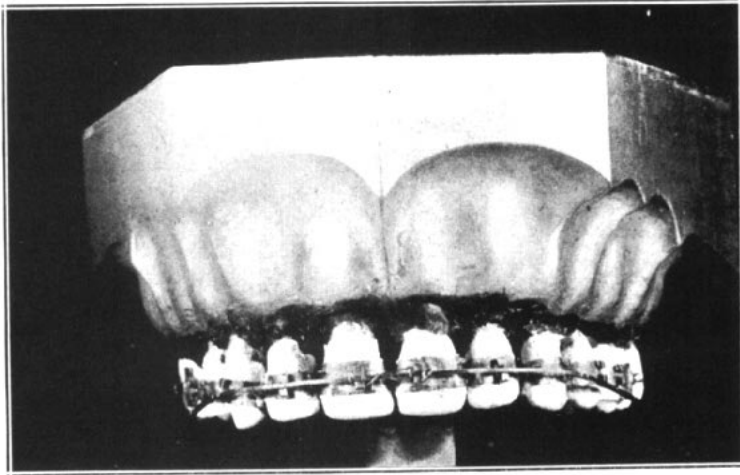


Fig. 16. Testing the amount of mass incisor torque. Note the position of the arch ends in the molar regions.

The technic associated with this archwire adjustment is not difficult but it must be carefully performed if the operator is to avoid undesirable tooth changes that are sure to accompany an improperly modified archwire. The important factor to remember is that in this adjustment for mass torque of the anterior teeth the changes in the wire must be strictly confined to the incisor section of the edgewise arch. The operative steps by which this modification can be made with certainty and precision, will now be given.

#### **Technical Steps for Producing Mass Torque in the Incisor Region**

1. Before removing the archwire from the mouth, carefully mark with file scratches the location of the mesial and distal edges of all of the incisor and canine brackets.
2. Remove the expansion arch and anneal it if necessary. Then place it in the archeograph or make a tracing of its form.

3. Place a pair of No. 142 pliers (arch bending pliers) that are held in the left hand in such a position on the archwire that the left edge of the plier beak lies on the scratch mark that designates the location of the distal edge of the left lateral incisor bracket. The flat portion of the plier beaks is used for grasping the wire, Fig. 11, No. 1, and they are applied from the labial aspect of the archwire, the beaks being placed at an exact right angle to the wire.

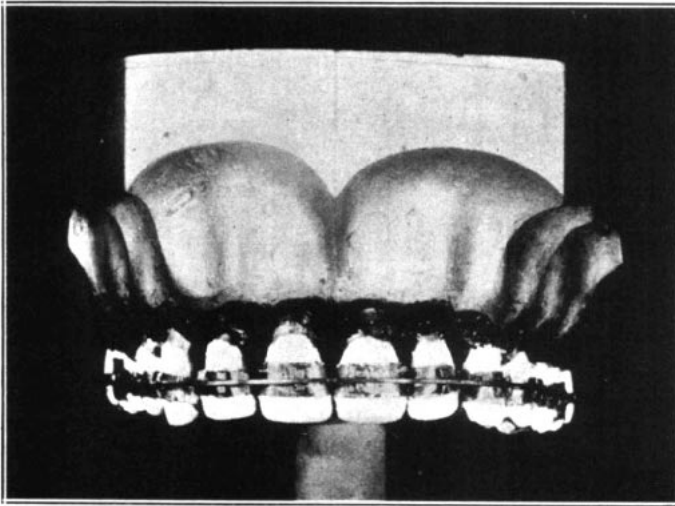


Fig. 17. The correct relationship of the archwire to the incisors in mass incisor torque when placed in the molar sheaths.

4. Place the flat portion of the beaks of a second pair of No. 142 pliers, held in the right hand, on the archwire at a point  $1/16$ " distal to pliers No. 1 and parallel to them. Pliers No. 2 are adjusted from the lingual side of the archwire. Fig. 11, No. 2.

5. Rotate pliers No. 1 (held in the left hand) in the direction that the crowns (or roots) of the incisors should move. If the crowns are to go lingually the plier handles should be rotated occlusally or for a labial tipping of the crowns the pliers must be rotated gingivally. In the succeeding steps we will consider that a lingual tipping of the crown and a labial tipping of the roots are desired. (Lingual torque.) If the opposite type of tooth change is indicated, then the following steps must be modified so as to produce an archwire bending that is just the reverse in each step.

6. When pliers No. 1 are rotated, handles occlusally, not only is a torque placed in the incisor section of the wire, but there is also a progressive



gingival distortion incorporated into the right side of the archwire that increases as the right molar is approached. Fig. 12. This must now be removed. It is eliminated first in the incisor region by grasping the wire with pliers No. 142, successively between each incisor bracket area, beginning first at the point where the torque twist was introduced, i. e., just distal to the left lateral bracket markings, and then giving the wire a slight occlusal bend at each of these points. The bends are made with the fingers of the left hand while the pliers are held in the right hand. After each bend the wire should be placed on a flat surface to see if the gingival deflection has been removed up to the point of bending. Then the pliers are shifted to a position midway between the next two incisor bracket markings and a slight occlusal bend is made there. Four of these bends are thus incorporated into the archwire, the last one being between the right central and the right lateral incisor bracket areas.

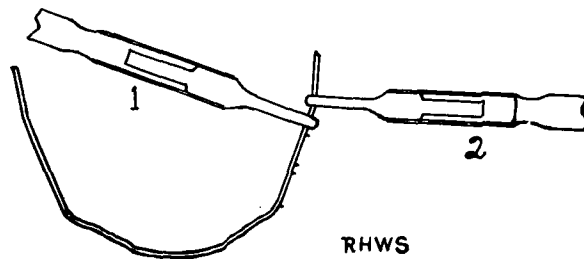


Fig. 18. The plier positions for making the first change in affecting buccal mass torque.

The anterior section of the wire should now be relocated on the same plane as that of the left buccal section of the archwire and should harmonize with the slots in the incisor brackets when inserted in the left buccal sheath. Fig. 13. The right buccal section of the wire, however, will be deflected gingivally for it still contains the effect of the torquing twist.

7. This step concerns itself with the correction of the undesirable deviation and modification that remains in this right buccal section of the archwire. To regain a passive relationship to the right canine and premolar brackets and to the rectangular sheath on the right clamp band, pliers No.

1 are taken in the right hand and placed with the side of the beak that is away from the operator's body, on the distal bracket mark of the right lateral incisor. The right side of the expansion arch is now facing the operator, Fig. 14, as these pliers are adjusted on the labial side of the wire. They are also placed at exact right angles to the expansion arch.

Pliers No. 2 are taken in the left hand and placed  $1/16''$  distal to pliers No. 1, approaching the archwire from the lingual side to make this plier adjustment. Pliers No. 2 should parallel the line of direction of pliers No. 1.

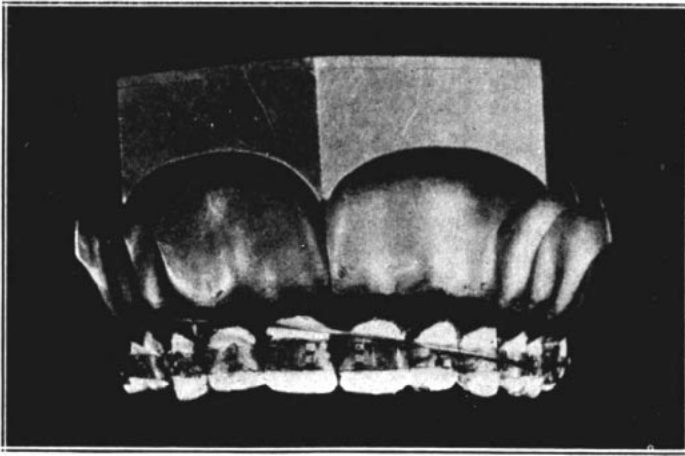


Fig. 19. The correct amount of distortion after the first change in buccal mass torque.

8. Pliers No. 2 are now rotated by moving the handles occlusally until the right buccal section and end of the wire is brought back to the same horizontal plane as that in which the left end lies. This will make the entire archwire again harmonize with all the bracket slots and the rectangular tubes of the clamp bands. Fig. 15.

9. A test for the degree of torque is now made by placing the archwire in the incisor brackets only and noting the relationship of the ends to the rectangular tubes on the clamp bands. They should be found to drop occlusally to these tubes. Fig. 16. When the archwire ends are placed in the clamp band tubes there should be no torque present in the molar area of the wire and the archwire should overlie the plane of the incisor bracket slots. Fig. 17.

It is well to again call the operator's attention to the fact that torquing the archwire in the above described manner to produce a labial root movement of all of the incisor teeth has a decided reaction upon the molar anchorage which is expressed in an occlusal pull tending to elongate these teeth. This is of considerable aid in the treatment of infraocclusion in the molar region, as seen in many closed-bite cases, and is a force that is only found in the edgewise and ribbon arch mechanisms.

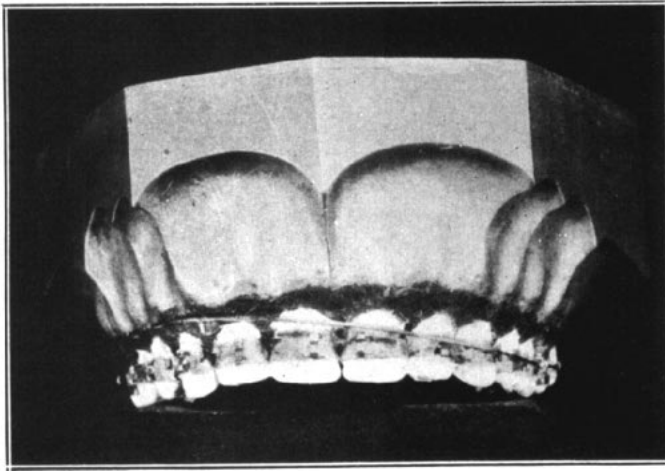


Fig. 20. The test for the proper degree of torque after the second archwire modification.

Such a mass torque adjustment will act upon the roots and crowns although the roots will be moved the greater distance because the point of pivoting is much farther away from the root apex than from the incisal edge of each tooth. If the operator wishes to limit the action to the roots entirely, holding the occlusal edge of the crown just where it is when the force is applied, then he must solder stop spurs on the archwire to rest against the mesial end of the molar tubes in such a location that the incisor section of the wire lies slightly labially to the brackets before these are engaged. Then when the archwire is seated in the brackets there will be a labial pull on the incisor crowns that will counteract the lingual tipping of the lingual torque. Fig. 3, B.

If the operator wishes to include the two canine teeth with the four incisors in this mass torque action then the torque adjustment for these two

teeth must be incorporated into the wire as two distinct and separate procedures, after the mass incisor torquing has been completed. This method has been found most practical because the only safe way to manipulate the wire in the canine regions is in the form of a local adjustment and then each bend can be carefully gauged and its effect accurately noted.

### **Mass Torque of the Premolar and Molar Teeth**

Allan G. Brodie was the first to call attention to the fact that in order

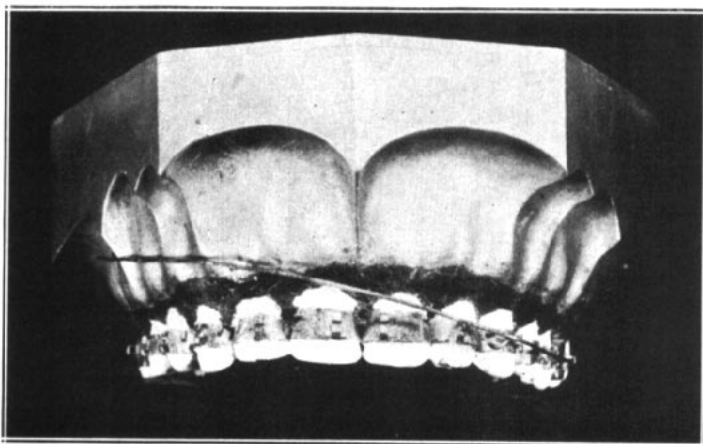


Fig. 21. The amount of distortion present after the second modification, when the archwire is engaged only in the molar sheath.

to have effective mass torque in the premolar and molar regions of the edgewise arch there must be a progressively increasing twist in the buccal segment of the archwire as the molar region is approached. This is true because when but one torquing twist is placed in the archwire just distal to the canine tooth of each side, this buccal or lingual tipping force is felt in the first premolar teeth when their bracket slots are engaged with the wire but, owing to the fact that they resist this power and so prevent the wire from untwisting, they also automatically remove all of the torque distortion from that part of the archwire that is distal to these first premolar brackets. Hence the posterior segment of the edgewise arch simply lies passive in the second premolar bracket slots and in the rectangular sheaths of the clamp bands instead of exerting the tipping action that is desired. As the writer understands it, Brodie's technic for incorporating this mass torque action into the buccal sections of the archwire is as follows:

1. Before removing the archwire from the mouth mark with file scratches, the location of the mesial and distal edges of the brackets of the canine, the first and second premolar teeth and the mesial end of the rectangular sheath of the molar clamp band.

2. The archwire is removed, its form is recorded on the archeograph or in some other way and the wire is annealed if necessary.

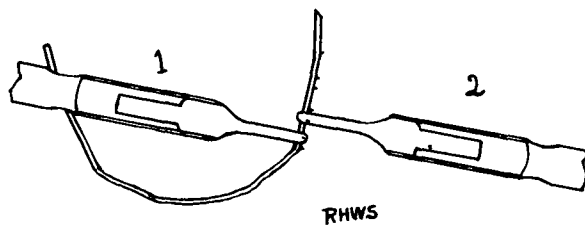


Fig. 22. The plier positions for affecting the last modification in mass buccal torque.

3. Two pairs of pliers No. 142 are used by the essayist.\* Pliers No. 1 are taken in the left hand and the flat portion of their beaks is adjusted to the left side of the archwire, approaching the latter from the lingual side, having the front of the archwire directed toward the operator. These pliers are placed  $1/16$ " mesial to the point of lingual deflection of the archwire. Fig. 18, No. 1.

Pliers No. 2, held in the right hand, are then placed with their mesial edge at the point of lingual deflection of the archwire end and adjusted at exact right angles to this lingually deflected section of the wire. Consequently these two pairs of pliers will not lie parallel to one another when properly located in their respective positions. Fig. 18.

4. Pliers No. 2 are now slightly rotated, handles gingivally or occlusally, according to the kind of torque desired. The degree of torque is now tested for by placing the torqued end in its proper rectangular sheath and the amount of displacement of the opposite end of the archwire from its holding tube is noted. If lingual torque has been applied then the free end should be displaced about  $3/16$ " occlusally from the tube while if

\*Brodie uses one pair of pliers as a holding instrument and then twists the archwire with the "arch bending instrument" or "torquing iron".

buccal torque is desired, the displacement of the free archwise end should be  $3/16$ " gingivally to its tube. Fig. 19.

5. The two pliers are now transferred to the archwire area lying between the second and first premolar bracket markings. Pliers No. 1, still held in the left hand and adjusted from the lingual aspect of the archwire, are placed just mesial to the midpoint between the second and first premolar bracket markings. These pliers are adjusted at an exact right angle to the wire. Pliers No. 2, held in the right hand and adjusted at right angles to the archwire from its buccal aspect, are placed  $1/16$ " distal to pliers No. 1. The pliers in this adjustment lie in parallel planes, Fig. 22.

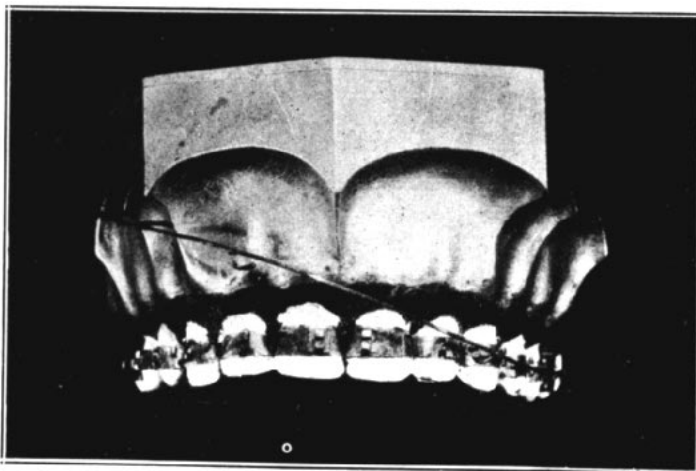


Fig. 23. The excessive distortion in the archwire after completing the modification for mass buccal torque. The archwire is engaged only in the molar sheath.

6. Pliers No. 2 are then slightly rotated in the direction that the tooth crowns should be tipped.

7. The degree of incorporated torque is again tested for by placing the torqued end of the archwire in its molar tube and springing the torqued second premolar section into the second premolar bracket. This is best done by placing the torquing iron on the archwire mesial to the second premolar bracket and gently twisting the wire until it easily slips into the bracket. If the amount of torque is correct, the opposite free end of the wire should again be displaced about  $3/16$ " occlusally or gingivally to its molar tube. Fig. 20. If the torqued end of the archwire is placed only in the molar tube and kept free from the second premolar bracket, the distortion noted in the control end is twice as great as before owing to the increased torque made in Step 6. Fig. 21.

8. The two pliers are next transferred to a similar location and a duplicate adjustment made between the bracket markings of the first premolar and the canine teeth. Fig. 22. Pliers No. 2 are again slightly rotated in the same direction as the previous rotations were made.

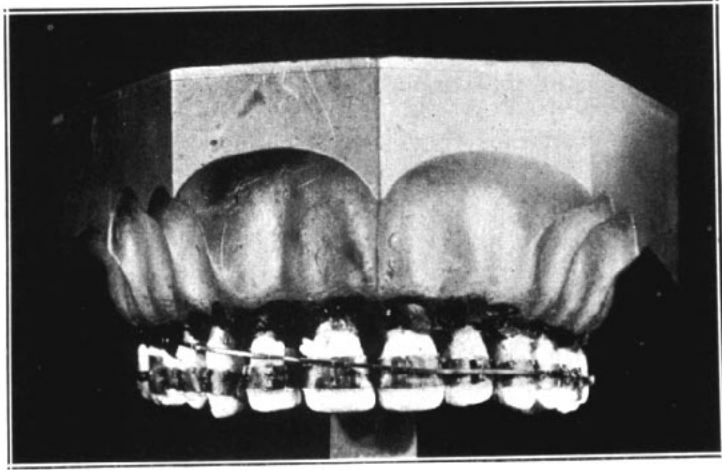


Fig. 24. The distortion present when engagement with the premolar brackets is affected after the completion of the mass buccal torque technic.

9. A third test is now taken by placing the torqued end of the archwire in its molar tube and springing it into the second and then the first premolar brackets using the torquing iron to gain the bracket seatings. When in the molar tube only, the opposite end of the archwire is greatly displaced, Fig. 23, but when adjusted to the two premolar brackets it only should lie about  $\frac{3}{16}$ " gingivally or occlusally to the rectangular sheath. Fig. 24.

10. If the canine teeth are to be included in this mass torque movement then a local canine torquing adjustment is now made. If they are not to be acted upon then this step is omitted.

11. The same technic is followed in effecting the mass torque on the right side of the archwire, if this is required, only pliers No. 1 are held in the right hand and pliers No. 2 in the left hand throughout the procedure.

When such a modified alinement arch is examined it will be found that the degree of torque twist is extremely marked in the molar area, but when adjusted to the mouth and the brackets of the premolars and canines are engaged with the wire, the power active against the molar is only of a degree equal to the initial rotating twist made in the wire in this area in performing Step 3 of the technic.

Of course if this wire is left in the mouth in such a torqued form sufficiently long to permit it to become passive in all the brackets and in the molar sheath then the tipping of the second premolar and molar teeth would indeed be excessive and dangerous. Therefore the operator should gradually remove this progressively stronger torque from the buccal segment of the archwire as the desired movements of the premolars and molars are accomplished.

To be accurate and skilful in placing torque in the edgewise arch requires a great deal of practice. This should be done on technic models until one has mastered the problem. Then he may safely apply it to practical use with great satisfaction and success. It has been termed a dangerous and forbidden force by many operators but the writer can assure you that its danger lies not in the force itself but in the ignorance of the one who uses it. It is certainly too valuable an aid to be dispensed with, hence the progressive orthodontist will never be satisfied until he has mastered the technic herein described so that he can avail himself of the advantages of this power wherever possible.

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