An Analysis of the Most Important Diagnostic Methods Used in Orthodontia

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(continued from Volume I, No. 4.)

AN ANALYSIS OF THE STANTON SYSTEM

Of all the diagnostic systems, this method deserves the first place of importance. With modifications this system will serve to solve a good many problems, while a more definite conception of the line of treatment may be formed by a study of our cases according to the principles here followed than is possible with either the Angle or the Simon concepts.

The Stanton system is based upon the requirement that occlusion must be established under all conditions. This is in accordance with Angle's principles, but the outstanding difference is that while Angle recognizes the possibility of establishing occlusion by a bodily change in the occlusal position of the mandible, in the Stanton system this is entirely disregarded. Occlusion is established by accomplishing tooth movement through the alveolar process only and the occlusal or malocclusal position of the mandible is retained when the case under consideration is completed. Thus, in the analysis of this system, we are faced by the question at the outset, "Should the position of the mandible be changed by orthodontic treatment?" In view of our experiences with the Baker intermaxillary anchorage, we must admit that this is a possibility, and we have in many instances established new and permanent jaw relationships. Whether this is due entirely to a change in position, or to a change in the body of the mandible, is not definitely known. The fact remains that such changes are possible and they must be fully considered in orthodontic diagnosis. On the other hand, it is true that in a smaller number of cases the newly established position of the mandible with respect to the maxillae is not permanent, and as soon as the retaining appliances are removed the mandible shows a tendency to resume its original position. This may be due to several factors. The maxillae as a whole may be displaced from normal position in the antero-posterior direction, (Simon); the measurements of the various parts of the mandible may be such that the mechanical requisites of the masticating apparatus cannot be satisfied in the new functional position of the mandible; or such habits may be present as have a direct influence in displacing the lower jaw.

It seems that of all orthodontic procedures, this latter factor is the most important one to consider, and the operator must have a thorough understanding of the conditions that must be overcome when a change in jaw relations is indicated. The whole Angle classification is based upon such changes. In other diagnostic systems this is entirely ignored, which, to a large extent, accounts for the difference of opinions arising when the

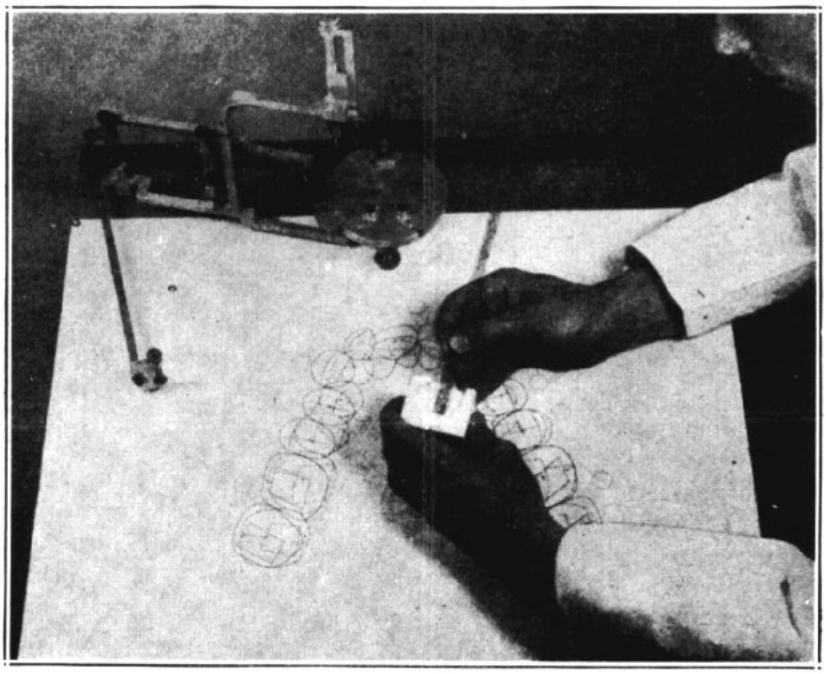
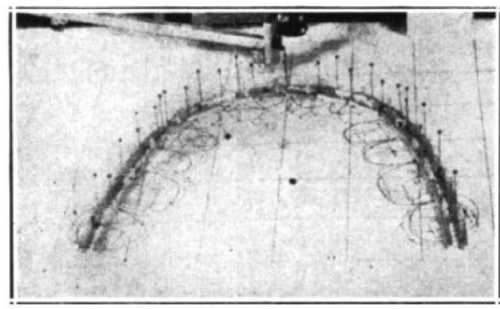


Figure 14

The Stanton Surveying Apparatus

results from other diagnostic systems are compared. At this point we may see the necessity of reconciliation between the various methods, for, in the proper determination of the change in jaw relationships, the work of Angle and Simon may play a very important role. And, again, even if the conditions recognized by Angle or Simon are satisfied, we must

inquire into the patient's waking and sleeping habits, and determine also whether the proposed change would not impose functional limitations upon the masticatory mechanism. We all know that tooth movement, as such, is a very simple procedure, but the establishment and retention of normal relationships between the teeth and jaws is extremely difficult. Diagnosis should include a prognosis in this respect, and perhaps if this is definitely established in advance, we may be able to recognize our possible failures before the case is treated.



The Occlusograph

In the Stanton system jaw relationships are not considered, and from this point of view the method is lacking in the most important phase of diagnosis. However, there are other good points in this work, even though the final results are not reliable. It deals with another phase of diagnosis, namely, arch predetermination and the predetermination of tooth movements. While the system does not give perfectly true information, the method of approach must be commented upon. Regardless of the above mentioned failing and other errors in the basic conceptions, it points the way to the most scientific method of diagnosis. When the various differences and fallacies are cleared up, diagnosis will consist of a procedure similar to that followed by Stanton.

In its basic conceptions the Stanton system consists of:

1. Making charts of the existing malocclusal positions of the teeth.
2. Making the proposed occlusal charts of the teeth.
3. Relating the proposed chart of occlusion to the chart of malocclusion in a prescribed manner. The difference between these two charts will indicate the direction and the amount of tooth movement.

This is a logical sequence of procedures. For the making of the charts and for the predetermination of the arch outlines various instruments are necessary which are properly designed for the Stanton system.

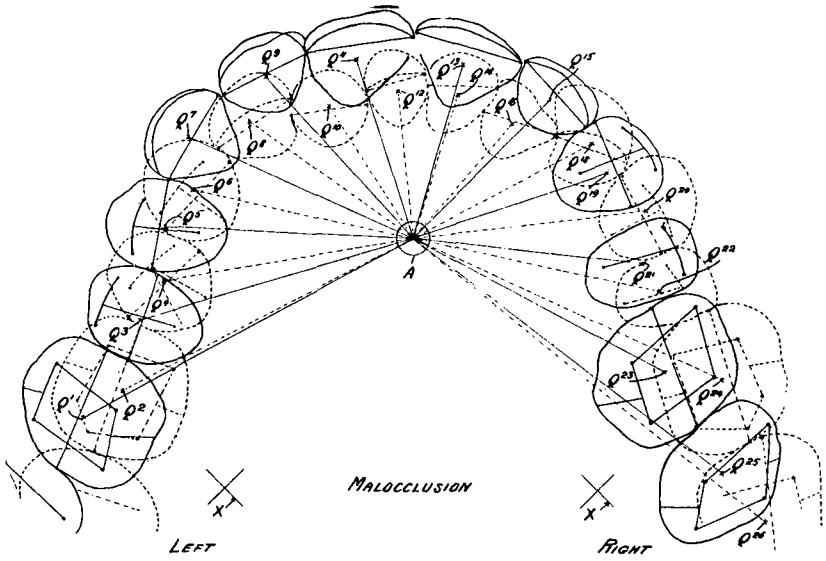


Figure 16

The charts of malocclusion are made from the models of malocclusion by means of the surveying instrument. (Fig. 14). Originally these were made in full size and later enlarged by a precision pentograph, but at present the enlargement is made simultaneously with the survey. The arch form is predetermined by means of the occlusograph (Fig. 15) and the chart of occlusion is drawn from this predetermination.

Now, the predetermined tooth movement depends upon the malocclusal position of the teeth, and also the predetermined arch outline. The arch form decided upon has an influence on the final result, but the value of this has been very much overestimated. The permanency of results does not depend very much upon the arch form but more upon the establishment of harmonious relationships. Arch form, even if not properly predetermined, will finally be adjusted by proper function, provided that such function is made possible by other adjustments in treatment. First of all, symmetry must be established with respect to the plane about which the denture, as a whole, and the associated parts tend to function in symmetry; and such adjustment of vertical relations must be made as will allow normal function.

The Stanton method of arch predetermination was fully covered by the author in a previous article* and in this discussion only the predetermination of tooth movements will be considered.

Quoting from the description of this method by Fish**, tooth movements are predetermined as follows:

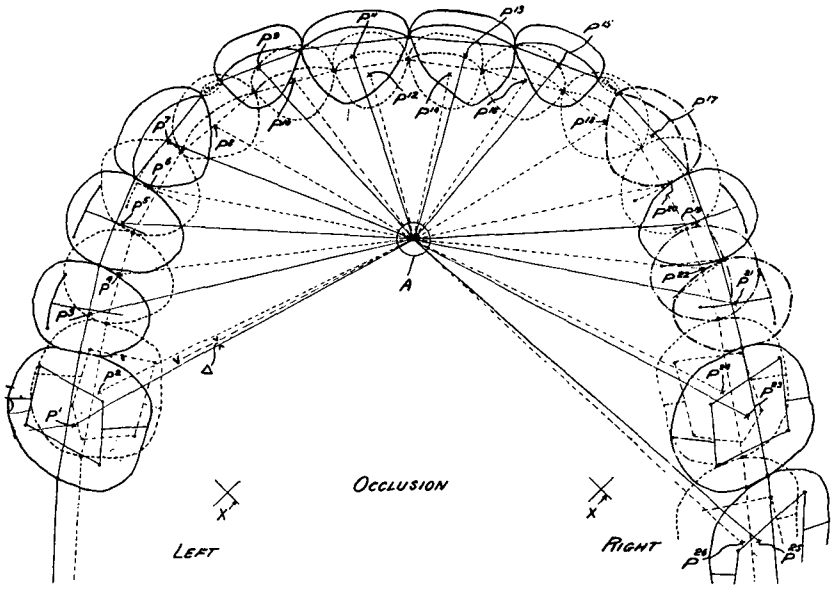


Figure 17

"The charts of occlusion and malocclusion are made on transparent paper or linen, 5 or 10 times the natural size."

These charts are shown in the accompanying figures. Figure 16 represents malocclusion. Figure 17 is the chart of occlusion and Figure 18 and 19 are the treatment sheets of the upper and lower teeth respectively.

Once the charts of malocclusion and occlusion are made, they are superimposed and combined as follows:

Beginning with the malocclusal chart, first locate, by inspection, the centroid of each tooth in the chart. In Figure 16 the upper and lower jaws

*The Application of Engineering Principles for the Predetermination of Arch Outlines, Alexander Sved—Dental Cosmos—July, 1918.
**U. S. Pat. No. 1,449,318.

are shown superimposed, the upper teeth being shown in full lines and the lower in dotted lines. Each centroid of an upper tooth is designated by the letter YQ and an odd number. These points will then be Q1, Q3, Q5, Q7, Q9, Q11, Q13, Q15, Q19, Q21, Q23, and Q25. It will be noted that Q17 is omitted. This is because the tooth to which this centroid belongs has not emerged and is crowded by the adjacent teeth whose centroids are Q15 and Q19. Also locate and designate the centroids of the teeth of the lower jaw in a similar manner using the characters Q2, Q4, etc.

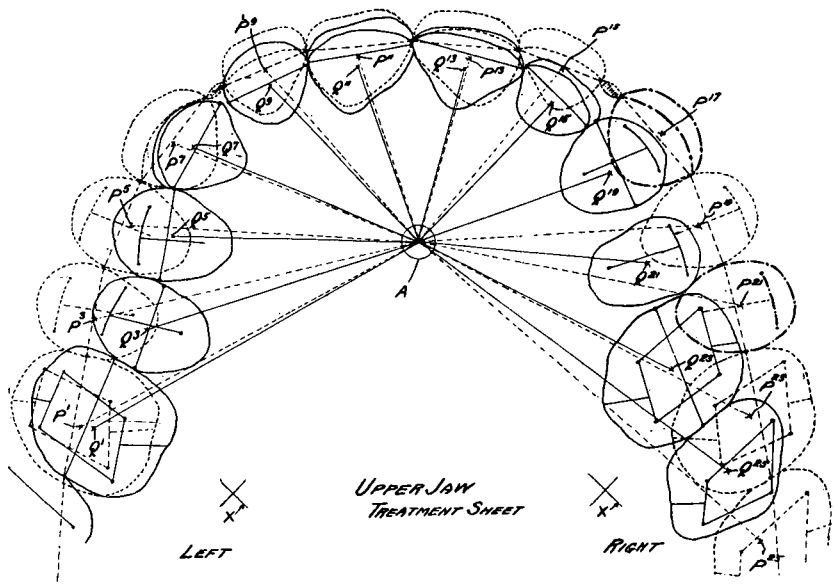


Figure 18

Second, take a suitable axis, as the edge of a drawing board, and measure the perpendicular distance from each centroid to this axis, add these distances to determine their sum, divide by the number of centroids and so determine the average distance. Draw a convenient line near the center of the dental arch, parallel to the assumed axis and separated from it by this average distance. Then turn the chart through a convenient angle, say 60°, and repeat the operation using the same axis as before. The lines so drawn will intersect. Again repeat the operation after turning the chart through another angle, say 60°, and if the three lines have a common intersection, the operation has been properly performed. If not it should be repeated, de novo, until this intersection occurs. This intersection is the check by which the accuracy of the work is proved.

Repeat this operation with the occlusal chart, (Fig. 17), and so locate its centroid. Let the centroids of the upper jaw of the occlusal chart be designated P1, P3, P5, etc; and the centroids of the lower jaw, P2, P4, P6, etc.

The points of intersection found, as above directed, are the centroids of each chart. Reinforce each chart with a cloth center, A, pasted over this intersection and pass a needle through the center and through the point of intersection. Now it is possible to superimpose one chart on another and pass a needle through all points of intersection so that these points will register when placed on a drawing board and the charts may be turned on the needle according to directions given below.

Before the charts are so placed, each must be completed separately by joining the centroid of the chart with the centroid of each tooth and measuring the distance so found and then recorded, as well as the angle between each of such lines and the line of the first tooth. These angles are all measured by means of a suitable protractor. Let these angles of the P groups be designated Φ, with the appropriate numeral to correspond with the tooth centroid to which the angle relates, and, similarly, let Θ, with its appropriate numeral, apply to the Q points. Let the difference between these angles, between occlusal and malocclusal centroids for the same tooth, be represented by δ, together with an appropriate numeral to correspond. As these angles are all small it is not necessary to go to the trouble of using the sine, as the angle itself will give sufficiently accurate results. Then multiply, when measured clockwise, this angle δ by the distances of the corresponding Q and P points from the chart centroid. Call the product positive when angle Φ is greater than the angle Θ and negative when the angle Θ is greater than the angle Φ. Add the positive products and the negative products separately and then subtract the greater from the less and the difference will be divided by the sum of the products of the lengths of the lines joining the common centroid of the jaw with the centroid of each tooth in both its occlusal and malocclusal positions and the angle thus determined is the angle Δ which will be either positive or negative. Lay off the angle Δ on the occlusal map, clockwise from line API, if positive, counter-clockwise if negative. The line AV, forming the angle Δ with API, will be made to coincide with the line AQI when the two maps are superimposed one upon the other.

Finally, place the map of malocclusion upon the map of occlusion so that the two charts' centroids coincide and so that the two lines joining this point with the centroids P1, Q1, will form the angle Δ. Assuming that the foregoing directions have been complied with and the angle Δ

determined, it is recorded and fixed by making registering crosses X on each chart as indicated. It is now possible to make the treatment charts shown in Figures 18 and 19, by tracing the malocclusional and occlusional positions of the teeth of the upper jaw as shown in Figure 19. These charts, when so made, indicate the minimum movements of the teeth when shifting from maloccusal to occlusal positions.

From this description it appears that the centroid of a denture is assumed to remain the same regardless of the changes that may take place in a denture. In other words the centroid of a denture is a point about which malarrangement of the teeth may take place without affecting its position. This is a supposition which is in error. It can be definitely shown by mathematics that the centroid is a variable point and for every type of malformation it occupies a different position. It is not a fixed point about which the denture as a whole is in equilibrium whether the teeth are in occlusion or malocclusion, but its position is changed with every change that may take place in the arrangement of the teeth. And even the change in the position of a single tooth may affect the position of the centroid. In order to show how much the variation is in the location of the centroid, the following considerations are offered.

There are various conditions which influence the centroid and a few illustrations with explanations will suffice.

1. Suppose that the centroid of a normal denture is determined by the method above described. The age of the patient is such that the second permanent molars have not yet erupted. If the centroid of the same normal denture is determined a year later when the second permanent molars are in position the newly determined centroid will occupy a position behind the first centroid. The reason for this is evident. The method adopted for the centroid determination is the well known method of determining the center of gravity of a system. In this instance the second molars represent four new units added to the posterior part of the arch, which is equivalent to assigning a greater weight to the posterior part of the denture. It is a mathematical law that the centroid of this new denture will be situated behind the centroid of the original denture.

This objection may be met by Stanton on the ground that since, for such dentures, both the centroid of occlusion and malocclusion are determined for the same number of units, the system still holds good. But the fallacy of this conception will become apparent from the other illustrations.

2. Let us assume now that we are dealing again with a normal denture in which the second molars have not made their appearance. All the other permanent teeth anterior to the second molars are in position with the exception of the right maxillary canine, which is yet to erupt. It is clear

that if we wish to determine the centroid of this denture, the unerupted tooth can not be left out of consideration. If we follow the description given in the quotation we simply leave this tooth out of our calculations.

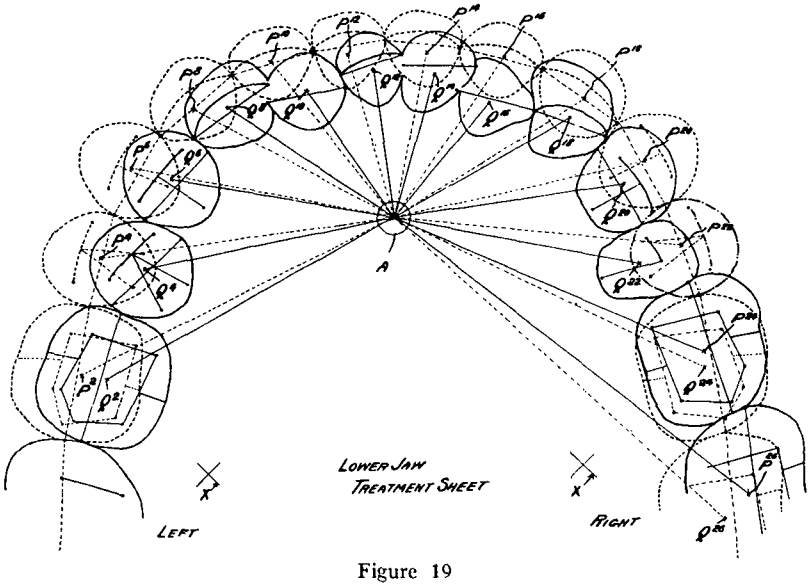


Figure 19

But in this particular instance this is not permissible, for if we carry out directions the centroid thus determined will be displaced toward the left and posteriorly. There is a surplus of units on the left side and toward the back of the denture. Such a displacement of the centroid can be proved mathematically. The only way by which the proper centroid of this denture can be determined is to estimate the position of the unerupted tooth. This can easily be done in normal cases and the distance used as if the tooth was present.

3. Let us assume now that we are dealing with a denture in which there are 24 permanent teeth present. The maxillary arch is normally developed on the left side, but the right side shows a deficiency of development and the whole right side is nearer to the median line. Let us further assume that the posterior teeth of the lower jaw are in perfect occlusion with the maxillary posterior teeth. This condition can only be satisfied under two possible arrangements.

(a) When the left side of the mandibular arch is normally developed and the right side shows a deficiency of development corresponding to the upper. In this case the lower median point between the central incisors registers exactly with the upper median point.

(b) When the right side of the mandibular arch is normally developed, and the left side shows a deficiency of development corresponding with the upper. In this case the lower median point will be displaced to the left of the upper. It is clear that these are cases commonly met in practice. They represent two different types of malocclusions which necessitate different kinds of treatment.

In case "a" the treatment consists of expanding the right half of both the maxillary and mandibular arches until symmetry is obtained with the left side.

In case "b" the treatment is more involved. The right side of the maxillary arch must be expanded, with a corresponding expansion of the left side of the mandibular arch. In order to allow for the change in the occlusal position of the mandible a slight distal movement of the left lower, and the right upper posterior teeth may be necessary.

The determination of the centroids for these two conditions must be the same irrespective of the fact that a right upper anterior tooth may be forced labially, and either a right or left mandibular anterior tooth crowded lingually. In both instances the centroid will be located to the left of the true median line of the denture. The amount of this displacement depends upon the degree of underdevelopment of the right half of the maxillary arch.

Furthermore, the treatment indicated by this diagnosis will be the same for both cases with the exception of the anterior portion of the mandibular arch. In case "b" the median point between the two lower central incisors will be required to be moved through the alveolar process to register with the median point of the upper.

That such requirements are made by the Stanton diagnosis is clearly indicated by Figure 19, where the lower central incisors distinctly show a need for movement through the alveolar processes, toward the left.

It must be noted that the movement of the median point through the alveolar processes is a difficult procedure in orthodontia. It is far easier to bring the upper and lower median points into perfect register by a change in the position of the mandible. This alone is an indication that the latter is the proper procedure, for it is an established fact in orthodontia that the teeth and jaws have a tendency to assume the positions designated for them by nature.

But these are not the only objections which may be raised. There are certain inconsistencies in this method which point toward the inaccuracy of the system. If we examine Figures 16 and 17, we will observe that the centroid of malocclusion is determined for a different condition than the centroid of occlusion. Regardless of the fact that the malocclusion in itself

may bring about differences in the position of the centroid, the position of that point is determined for 25 units in malocclusion and 26 units in occlusion. Mathematically this is not permissible, and, therefore, it is not logical to draw conclusions from these two points. It can be shown mathematically that these two points are not identical. Hence it is not consistent to superimpose them when malocclusion is studied in relation to occlusion. Furthermore, the median line does not pass through the centroid in every instance. In Figure 17, which is a map of occlusion, the maxillary and mandibular second molars are present on the right side, but on the left side they are not shown. Under such conditions the denture centroid must be located to the right of the true median line, and this mathematical fact can not be shaken by any argument. True enough, Stanton does not call this line the median line, but 'the axis of symmetry'. This, under the present condition, is misleading, for the map of occlusion can not be symmetrical about any line that passes through this particular centroid. The only axis about which the denture may be symmetrical is the median line, and mathematical conditions place the centroid to one side of the median line. There is another misconception in this method, which is believed to play such an important part in orthodontic treatment. The 'theory of least squares' is applied to predetermine the minimum amount of tooth movement necessary to bring the teeth into occlusal relationship. This is the greatest fallacy in connection with this system. First of all there can be no minimum amount of tooth movement in an orthodontic case. The case is either treated properly or not treated at all. And if the "minimum amount of tooth movement" has any meaning in this connection, it can only mean the proper amount of tooth movement. For if, by false economy, we bring the teeth into positions not designated for them by Nature, then we do not accomplish our purpose, because the retention of those teeth in their new positions becomes a greater problem than the correction of the original malocclusion. Secondly, the minimum amount of tooth movement is not determined by this method. On the contrary, in this particular instance, it will become the maximum amount of tooth movement. The charts clearly indicate that all the mandibular teeth must be moved through the alveolar process. Here the possible change in jaw relationships is not considered, and it is entirely overlooked that the amount of tooth movement may be minimized if the change in the position of the mandible, as a whole, is taken into consideration. Often a slight change in the mandibular teeth plus a bodily change in the position of the lower jaw, will accomplish the required result. On these charts this important phase of treatment is not indicated. From an engineering point of view they are extremely misleading. When

an attempt is made to indicate mandibular tooth movement, the actual distance the tooth is to be moved through the bone must be separated from the movements accomplished by a mere change of jaw position.

If we attempt to design appliances that will execute the tooth movements indicated on these charts, they will be of an entirely different nature from those which are actually required. And if the indicated tooth movements are performed during treatment, certain disharmonies in the associated parts will be brought about, which will make retention extremely difficult. Moreover, if the movements are not performed according to the charts, then it is useless to plan and do such unnecessary work in connection with our cases.

The application of the conception of the centroid as a means of solving our problems is unfortunate, and, from a scientific point of view, it cannot be regarded as having any value. If it could be shown that the centroid of a denture is a fixed point that does not show variation in position under the several conditions of malocclusion, then it could be applied to advantage. But it has been shown that under different conditions the centroid occupies different positions and for this reason it loses importance and dependability in diagnosis. It is true, however, that if a case of normal occlusion is analyzed by this method, the so called axis of symmetry coincides with the median line. But we must always remember that normal occlusion is only a special instance, and proof is lacking that such results can be obtained in malocclusion cases, for which this method is proposed to be applied with advantage.

On the other hand we must admit that we are dealing with an extremely difficult problem. In order to properly diagnose the conditions it is desirable that the median line be determined as accurately as possible. This is where every system we have at the present time fails, and the author's method is not excluded. But here we must take into consideration that in any method the median line is determined from points which in themselves are likely to be malposed, and in a biologic objct like the head we cannot expect to find fixed points that never show variation in position. It is possible, however, to devise a method for locating the median line so closely that the error in its position does not exceed the error that will be produced by our manipulative methods during treatment.

The other phase of this method of diagnosis, namely that of arch predetermination, has already been dealt with by the author* and it should be particularly noted that the value of the exact knowledge of the normal

*The Application of Engineering for the Predetermination of Arch Outlines, Alexander Sved, Dental Cosmos, January, 1919.

arch form is very much over estimated. The important points in every diagnostic scheme are the establishment of symmetry and the bringing about of normal jaw relationships. The final arch form in any case cannot be determined by the orthodontist, and whatever may be his conception of arch form when the retaining appliances are removed, Nature steps in and establishes the proper arch outline, provided symmetry has been established and normal jaw relationships are brought about during treatment.

From this it appears that diagnosis should not consist of accurate predetermination of minor details. Even if this could be done nothing would be gained, for the desirable accuracy of any system is limited by the accuracy possible in appliance manipulation. The diagnostic scheme should be more of a general character and should indicate how the masticatory mechanism could be made to function properly. The dominating feature should always be symmetry and arch relationship. It seems immaterial, from the practical point of view, whether one or another arch form is used in connection with any diagnostic scheme, provided the arch form is large enough to accommodate all the teeth present, and if the most important requirement, that of symmetry, is satisfied by the proposed arch, we can be sure that Nature will assist in establishing the final form.

These are points which touch upon the merits of the system, and while the method of approach is very logical and scientific it is built upon false premises. There are certain points which should be adopted from the Stanton method, but before they are finally adopted proper modifications must be made. The Angle system can not be left out of consideration in this connection and the modification of the method just discussed must take this into cognizance. Stanton has shown us a better method of approach but he failed to incorporate the truths upon which the Angle system is based. And, as stated before, the final method of orthodontic diagnosis will be one dominated by Angle's conceptions, but carried out in the fashion indicated to us by Stanton.

Analysis of the Author's Metiiod

It is difficult to enter into an impartial analysis of one's own system, but since the aim of this article is to clarify the conceptions relating to orthodontic diagnosis, regardless of the origin of the methods discussed, it becomes necessary to criticize this method in detail also. Perhaps it is too pretentious to place this system side by side with the previously presented methods, but it seems that their apparent shortcomings are answered by this comparatively simple system, at least to some extent. While there is no attempt in this particular work to establish a relationship between the masti-

catory mechanism and the cranium, from the previous articles of the writer it may be concluded that the form and location of the dental arches with respect to the cranium is governed by the relative dimension of the teeth the dimensions of the mandible, and its functional movements. It is not necessary to enter into details in reference to this point, for this must be covered under the heading of prognosis, and while it may have a direct bearing upon Simon's method it will be reserved for the future.

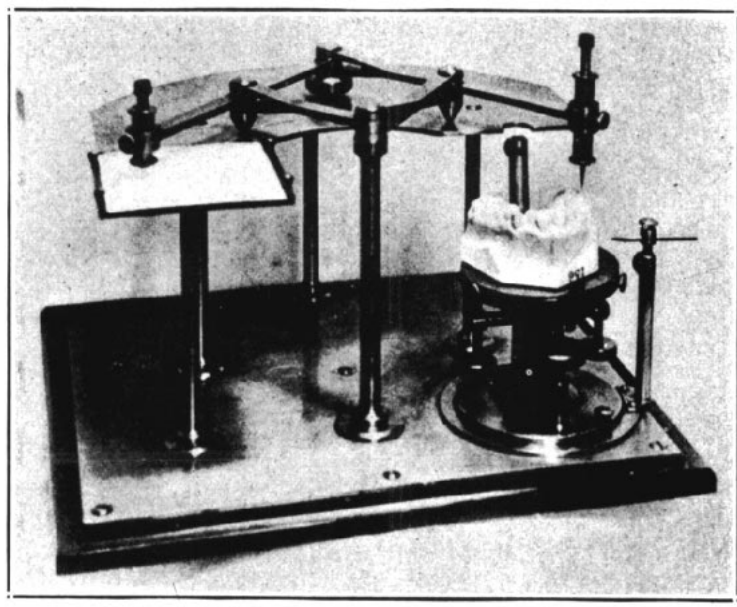


Figure 20

In this system the gap which exists between the Angle and Stanton methods is partially filled and the movement of the teeth through the alveolar processes is separated from the change in the position of the mandible. The Angle system is fully considered. Proper jaw relationship is established by bringing about symmetry and by shifting the mandible into the desired position.

As in the Stanton system, the commonly used methods of engineering are employed in the following manner. By means of an instrument (Fig. 20) surveys of both the maxillary and mandibular arches of the case of malocclusion are made. These surveys or charts are used for making the diagnosis. It is to be noted that the instrument is so designed that the projections of the upper and lower teeth are registered in the same horizontal

plane, so that the charts represent the upper and lower teeth in their malocciusal positions on that plane. The lower chart differs from the upper in that it contains three additional points, namely, the projection of the buccal grooves of the maxillary first molars and the median point between the two

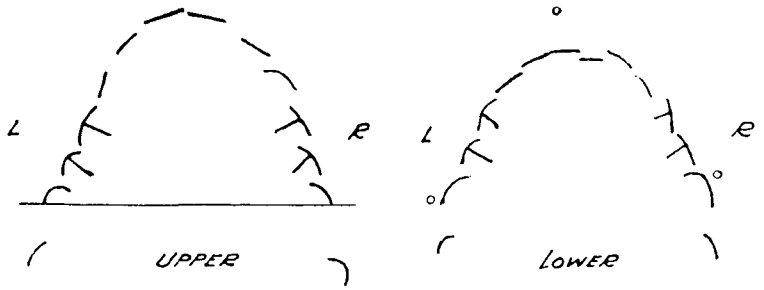


Figure 21

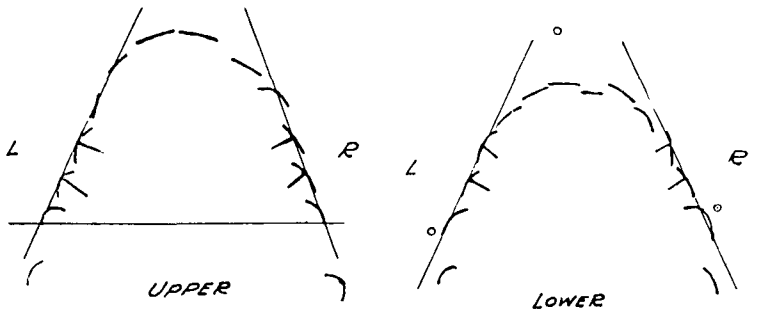


Figure 22

maxillary central incisors upon the lower model. The projection of these points is accomplished by means of the instrument.

After the charts of the malposed teeth are made (Fig. 21) a line may be drawn through the buccal cusps of the posterior teeth (Fig. 22) which will be designated as the line of development.

The point between the incisal edges of the two central incisors is on the median line in a very large percentage of cases, but in some instances it may be located to one side of the median line. This should be noted when the impressions are taken for the study models, and if it happens to be located to the side, its correct position should be marked on the models at a subsequent sitting. This point, designated as the median point, also appears on the chart, for it is used in the following step of the diagnosis.

After the lines of development are drawn, two other lines may be constructed to pass through the median point perpendicular to the lines of

development (Fig. 23) to intersect the latter. The length of these perpendiculars included between the median point and the lines of development, is the measure of the degree of lateral development. If they are of equal length the lateral development is the same on both sides but if they are unequal, the longer will indicate greater development on its side. The first molar on the better developed side may be assumed to be nearest to the normal position, and for that reason the molar on the other side should

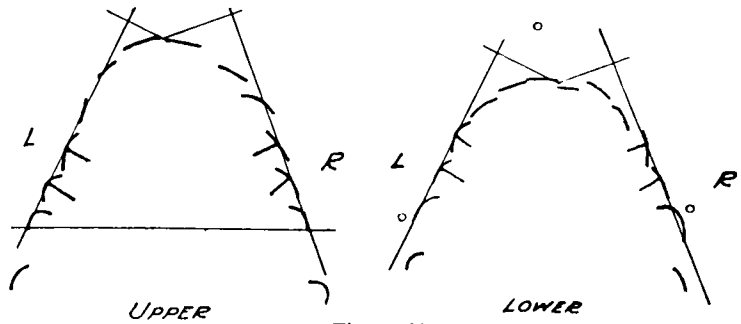


Figure 23

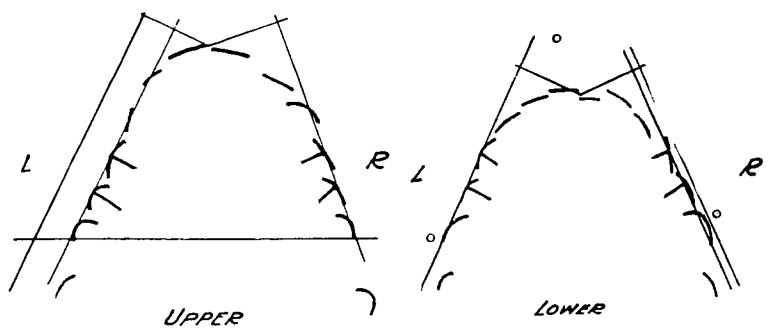


Figure 24

be placed in the same relative position with respect to the median point. This may be accomplished by drawing the corrected line of development, on the least developed half, the same distance from the median point as that on the more developed side (Fig. 24). Placing the needle point of a compass on the median point, an arc of a circle may be struck with a radius equal to the distance between the better situated molar and the median point, to cut the corrected line of development. This intersection represents the corrected position of the molar on the side of least development (Fig. 25).

By means of this method a condition is established which would be present in case of equal lateral development, or in other words, the molars

are placed symmetrically with respect to the median line. A point midway between the best positions of the molars must be on the median line. Thus a line which passes through that point represents the nearest position of the median line.

The median line is perpendicular to the line which joins the best positions of the molars (by construction) and, using the latter as a base, the correct outline may be laid out symmetrically about the median line (Fig. 26).

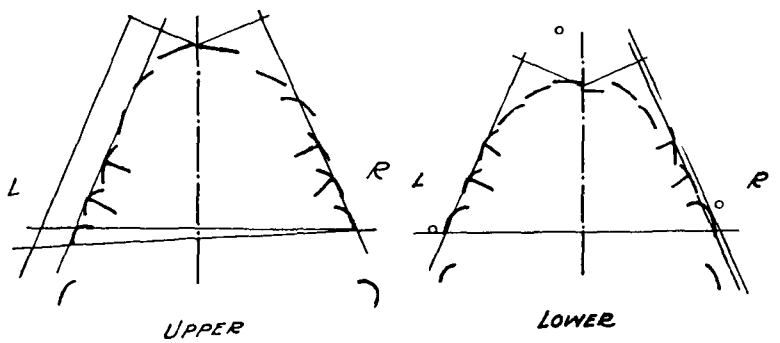


Figure 25

The method of constructing the arch outlines was given in previous articles. This method of predetermining tooth movement through the alveolar processes is applicable to both the maxillary and mandibular arches. It still remains to indicate how the two sets of teeth may be put into proper occlusion.

The Predetermination of the Change in the Occlusal Position of the Mandible

To predetermine the mandibular movement, draw two lines on the chart of the maxillary arch, one passing through the existing positions of the molars and the other through the proposed positions. Since the positions of the buccal grooves of the maxillary first molars were marked on the mandibular model and appear on the chart of the mandibular arch, a line can be drawn through these points on the chart of the mandibular teeth which corresponds to the line adjoining the existing positions of the maxillary first molars. But a point representing a point on the median line of the maxillary arch is also present on the mandibular chart, therefore we are able to construct the relative position of the maxillary median line on the mandibular chart as follows: Draw a line through the existing positions of the buccal

grooves of the maxillary first molars on the mandibular chart and transfer the proposed base line from the maxillary diagram by the aid of a ruler and compass. Then draw a line through the maxillary median point (on the mandibular chart) perpendicular to the proposed maxillary base line. This would indicate the position of the maxillary median line in relation to the mandibular (Fig. 27).

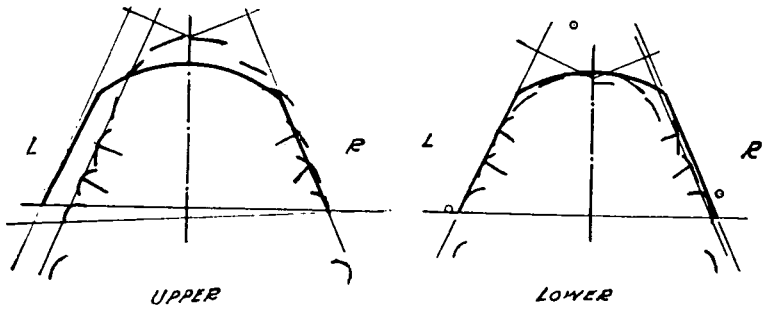


Figure 26

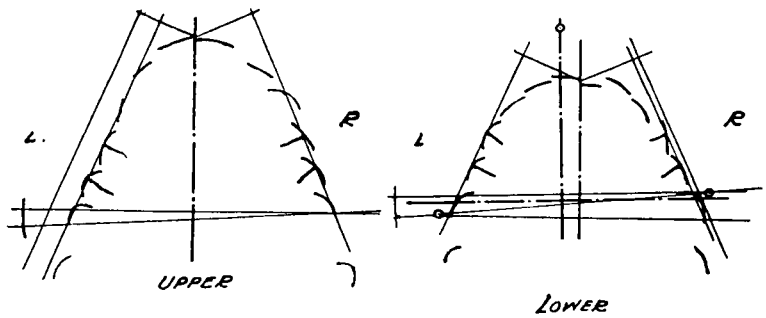


Figure 27

The relation of the mandibular median line to the constructed maxillary median line represents the amount and direction of the mandibular movement. It often happens that the movement of the teeth through the alveolar process and the mandibular movement are opposite in direction. This can not be determined simply by an ocular examination of the case.

In the evaluation of this system, our attention is directed to three points through which the accuracy of this method may be questioned.

1. The determination of the maxillary median point by inspection.
2. The assumption that the right and left lines of development always make equal angles with the median line.
3. The assumption that the mandibular median point is always located between the two mandibular central incisors.

The other steps in this method consist merely of geometric construction and if the above points are acceptable, the remaining details of the diagnostic scheme become also acceptable.

In order to determine the position of a line we must know at least one point through which the line must pass and a condition which determines its direction. In this particular instance the line in question is the median line, and for this reason a point which must be on the median line is selected. When we speak of selecting a point, we immediately direct attention to the point selected, and begin to question the advisability of choosing that particular point. In the Angle system the mesio-buccal cusp of the maxillary first molar is selected and the condition imposed is, that its position in the mesio-distal direction is constant. In the Simon system, on the other hand, several points are selected, and the imposed condition is a hypothetical geometric relationship. In the Stanton system a point is not chosen, but the complete denture is endowed with certain characteristics which is made a condition.

It is clear then, that all of these diagnostic methods have this much in common. Some point or condition must be chosen upon which a system can be built. As may be expected, just these fundamental conceptions are opened up for criticism, and little, if anything, can be said of the remaining steps which complete the respective systems.

Similarly, the method under consideration must be attacked from the same angle. The selection of the maxillary median point and its location by inspection, should be criticized, and if another point is found which can be more accurately located, by means of instruments or by any other method, then the author's selection should be promptly disregarded and substituted by the better located point. Here it must be emphasized that the necessary condition for the selection of this point is that it must be located on the median line as nearly as possible. Whether this point is located in the anterior part of the mouth or the posterior part, does not make a particle of difference, for it can be used in connection with this system just as well. The reason for this choice, however, is evident. When the point between the two maxillary central incisors shows a slight deviation from its proper position, it can be detected by the unaided eye. A deviation of 1 mm. to either side is distinctly noticeable. This deviation can be quite accurately determined by stretching a piece of dental floss over the apparent median line of the face. The error in the location of the median point, therefore, can not be as great as 1 mm. and it will never be more than a small fraction of a millimeter. It may be possible to devise a method which locates this point more

accurately, and in that case there can be no objection to its adoption. All that is required is a point on the true median line. The selection of a point on the raphe is subject to greater errors.

The assumption that the right and left lines of development always make equal angles with the median line is a more questionable condition. This implies that the growth of a part takes place parallel to itself. The imposition of a condition at this point, however, is a necessity. The direction of the median line can only be determined if another point on the median line can be located, or if a condition similar to that accepted here is utilized. The selection of another point may serve equally well for the location of the maxillary median line but in the mandibular arch we are more limited, for outside of the mandibular median point, no other point seems to be present which can be utilized in this connection. For this reason we must look for a more general condition which can be applied to both the maxillary and mandibular arches. That growth of a part takes place parallel to itself is not absolutely true. Growth is not uniform and at different periods of life the various parts of the masticatory mechanism show variations in the rate and direction of growth. In orthodontia we are concerned with under-development, and the application of the method here presented would be more justified if the under-development of every case were symmetrical. It is our experience, however, that symmetrical under-development is an exception, and since it is admitted that growth does not take place parallel to itself, the assumption under consideration must have its limitations. The determination of the true median line is probable, but not always possible, in all cases by this method, and, as in other instances, serious objections may be raised. But here we must realize that some such condition must be resorted to in order to develop any diagnostic scheme. We must have some point or condition of reference, which will form the basis of the system, and this must be so selected that the errors arising from its application will be reduced to a minimum. A very important relationship may be mentioned in this connection. Since the purpose of all orthodontic operations is measured from the median plane, we may place a different interpretation upon that plane. The position of the lines of development is an index to the position, activity, and interactivity of the associated parts. In a biologic object, no single point or line can be selected which is not subject to changes and variations, but it must be accepted that there is a concerted tendency in the parts of any biologic mechanism to grow and function in a definite direction. Moreover this tendency must be the same on both sides in a biologically symmetrical object; furthermore, the axis of symmetry of function must

approach the axis of anatomic symmetry. It is clear then, that while we can not expect to find a symmetry of positions, we may find symmetry of tendencies of growth and function, and the directions of the lines of development are an index to all these tendencies, which, by reason of the above discussion, must be symmetrical about the true median plane. This interpretation gives a special importance to the lines of development and a different conception of the true median line. However, it is especially stated that *this diagnostic scheme cannot be applied directly to cases receiving orthodontic treatment, until after a considerable period of rest,* for while treatment is going on, the lines of development indicate the conception of symmetry applied by the orthodontist to the case, and these may not be in conformity with the functional tendencies.

The determination of the median line is not affected by the degree of under-development as it is in the case of the Stanton system, but some deviation may be expected as a result in the variation of the inclination of the lines of development. Not having a more accurate method at the present time, this may be provisionally accepted, but if other more accurate methods are found they can easily be incorporated into this system. The selection of the mandibular median point may also be objected to, but at present there seems to be no other point that could take its place which would be more accurate. It may be noted, however, that Stanton stated this point to be the most constant in its position.

From this it appears that we are all laboring under difficulties. In order to connect our conceptions with the practical problems we must make certain assumptions which immediately open up the work for criticism. In this respect we must change our attitude. The merit of a system should not be judged from the point of view of an absolute solution, which under the circumstances is not possible, but rather from the point of view of practicability and reliability. It is apparent that the several methods here discussed will give divergent results, and it is for us to decide how much of each system may be adopted with absolute safety. There is a distinct incompatibility between the basic principles involved, which necessarily results in varying conclusions. It is to be noted that while there may be a difference in the method of treatment, there can be no difference in the final result, and it can not be granted that the results from one system may be just as good as that from another system. There can be but one final result and the final conclusions from each system must agree. If there is no agreement then one or all of the systems must be wrong and we must look for other methods which give us more reliable information. And this can not be decided by any

one individual. Peculiarly enough, in order to delve into the merits of these systems, one must assume a certain attitude. This attitude becomes fixed and every point which may be brought up for discussion is evaluated in the terms of that fixed attitude. The writer feels that all the criticisms here given were thoroughly justified, but we cannot cast aside the fact that this whole analysis was dominated by unconditionally accepted relationships. They were unconditionally accepted in this discussion, but discussion may arise with other members of the profession who are not so ready to accept those relationships, and they, too, may be thoroughly justified. It is all relative, and we will never come to definite conclusions by adopting individual attitudes. The sincerity of such attitudes can not be questioned, but misconceptions may creep in which can not be guarded against. On the other hand, we owe it to our patients to use the knowledge gained from the various sources, to the greatest advantage and it becomes the duty of the organizations of orthodontists to inform the individual orthodontist of the best combination of diagnostic methods given to us at the present time. An organization such as the American Society of Orthodontists should have a Standing Board on diagnosis, which should include all those who have done original research work on orthodontic diagnosis, and also such other members as are especially well informed on this subject. This will eliminate public controversies and result in the average orthodontist having a more definite plan to follow. The system thus subscribed to should be subject to change by the result of future research, but the profession at large should always be informed of the most approved method.

The criticisms here given are not destructive. They are not directed to discredit anything that is before the profession at the present moment. The purpose of this article is to attract attention to the fact that any system which may be devised will be met by the same difficulties. Conditions and relationships must be assumed and consequently they can always be criticized. But if the newer systems are submitted for consideration to a responsible body of men, then we can be sure that we will always have the best available diagnostic method.