

The Angle Orthodontist

VOL. I

No. 2

APRIL, 1931

*A magazine established by the co-workers of
Edward H. Angle, in his memory.*

A NEW X-RAY TECHNIQUE *and* ITS APPLICATION TO ORTHODONTIA

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*Read before the Orthodontia Section of the Mid-Winter Meeting of the Chicago Dental
Society, February 4, 1931.*

DURING the last few years numerous scientific papers have been presented before orthodontic societies by men in the field of physical anthropology. These men have made us realize the value of their precise methods of measuring biological problems and made us hope that we might learn to apply anthropometric technique to our orthodontic practices. Most orthodontists still measure dental and facial deformities very largely by the inter-relations of the teeth and jaws both before and after treatment.

Recently we have made a decided advance, by the application of cephalometric methods to record and measure the changes in the jaw in relation to the rest of the head. Careful and detailed analytic studies on this problem bear the names of Todd, Keith, Hellman, Krogman, Lewis, Simon, Dewey, Stanton—and others whose names merit but space does not permit mention. It is in the light of contributions made by these workers to the accumulated common understanding that the method about to be described has been developed. Previous methods use landmarks in the skull of the living child which unfortunately have to be approached through the skin and soft tissues. The uncertainty of such technique led the author to search for a means of recording craniometric (hard tissue) landmarks on the living child as accurately as it is done with a craniostat in measuring the dead skull.

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Align Ex. 1019
U.S. Patent No. 9,962,244

The problem then was first, to design and build a headholder along the lines of the skull holders, and second, to find a means of recording precisely the craniometric as well as the cephalometric landmarks of the face and cranial base of the living head.

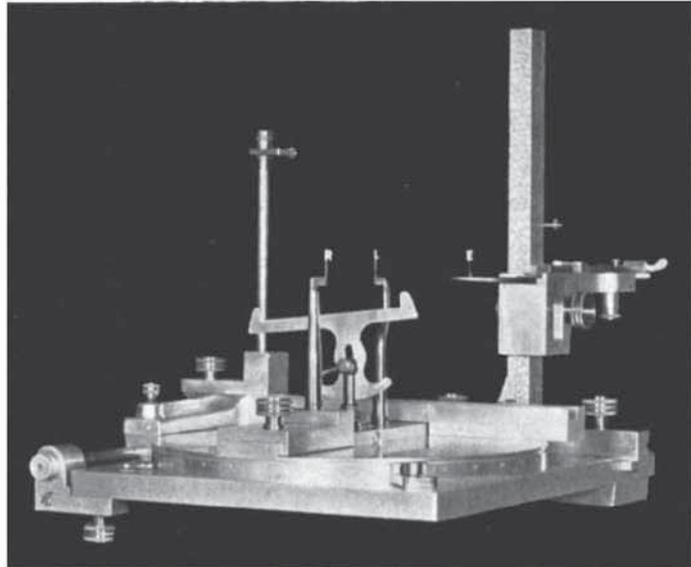


Fig. 1 Special Reserve Craniostat built for roentgenographic studies of skulls.

With the Reserve craniostat as a basis, and with the help of our machinist, the first part of our problem was promptly accomplished. Then the greater problem of registering the internal landmarks of the face and cranial base was solved through the perfection of a roentgenographic technique that records these points accurately on the photographic film. The films, like orthodiagraphic tracings, permit accurate measurement with drafting instruments. Many experiments were made over a period of several years to test its accuracy and to bring this technique to its present state of usefulness. These experiments were first made with skulls on the specially constructed craniostat illustrated by Figure 1.

The skulls were prepared by drilling a minute hole at many of the internal and external cranial landmarks and inserting very small pieces of lead that would register their exact position on the photographic film. Similar bits of lead were placed on dental and facial points. The skulls were then clamped in the instrument with the under surface of the upper side of the

ear holes (external auditory meatus) resting on the supports R and L, Figure 1, and the skull fixed in the Frankfort relation with its left orbital point at E in the horizontal plane when E is level with R and L. The pointer E can be moved vertically, laterally, and antero-posteriorly. The vertical scale V (Figure 2) gives us the distances above and below the Frankfort horizontal in a sagittal plane. The horizontal scale (AH) records the antero-posterior distances in the sagittal plane while the lateral distances in the

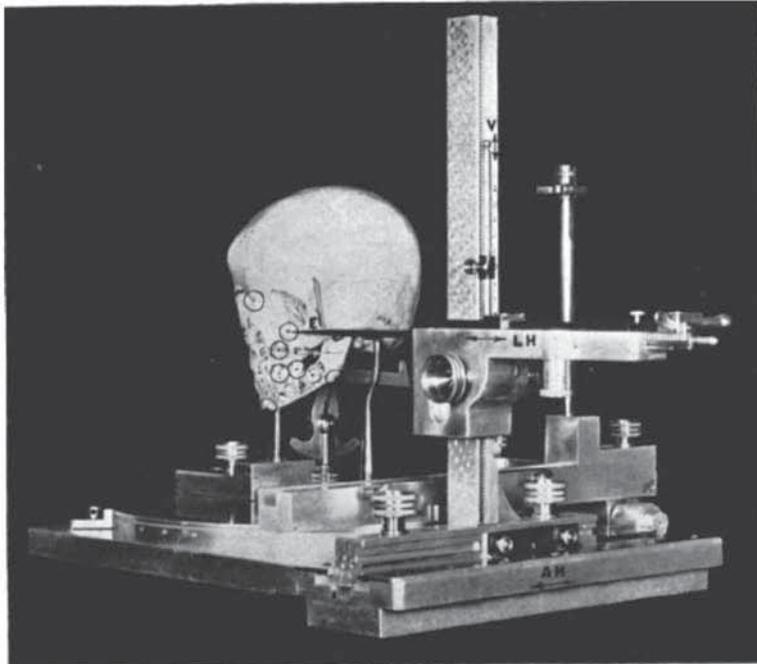


Fig. 2 Skull in the craniostat in the Frankfort Plane. Note some of the sites of the lead pieces have been accentuated and enclosed in small circles for illustration.

frontal planes are registered on the lateral scale (LH) on the upper surface of the pointer carriage. Points in the interior of the skull can be reached with curved pointers (Figure 3) when the calvarium is removed. These readings were then plotted on millimeter cross section paper in frontal and sagittal planes.

After the sites of the lead pieces were plotted in graphic projection in the sagittal plane and their relationships defined by measurement, the skulls were x-rayed for the lateral picture. Each skull was then rotated ninety

degrees and measured in the frontal plane, the graph made, and the frontal x-ray picture taken. Superimposing these roentgenograms upon their respective graphs gave us a measure of technical precision and clearly indicated that a reliable method of recording internal as well as external craniometric points had been successfully accomplished.

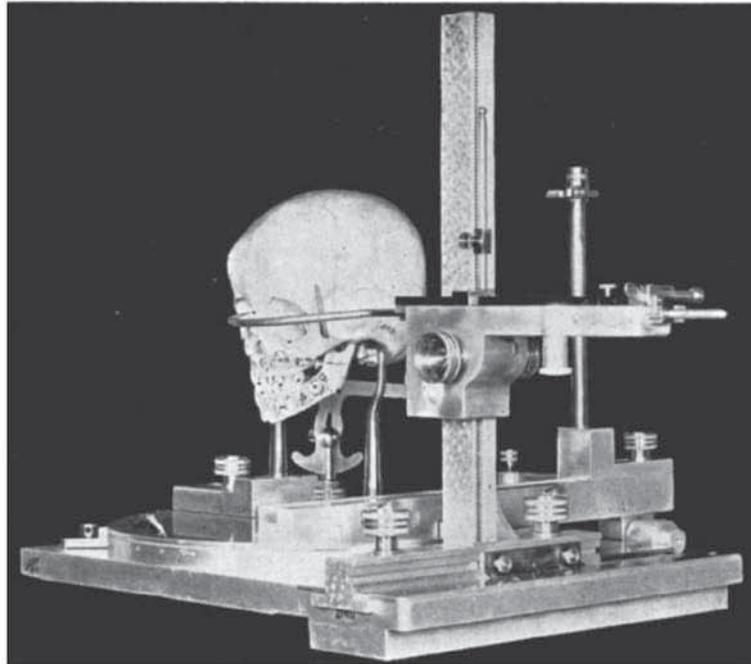


Fig. 3 Skull in the craniostat. Note that the pointer has been moved to Nasion.

The sagittal planes are at right angles to the Frankfort plane and to the Frontal planes, while the Frontal planes are at right angles to Frankfort and parallel to a line joining the tops of the ear posts R and L (Figure 1), i.e. a line passing through the right and left Porion points.

Figure 4 shows the cassette (film holder) in place for the lateral picture. The film is supported in a sagittal plane at right angles in all directions to a line through the top of the right and left ear supports. The distance of the film from the median sagittal plane of the instrument is determined on the lateral scale, and recorded along with the distance of the x-ray source from this plane.

Two relations are necessary to produce two or more identical x-ray

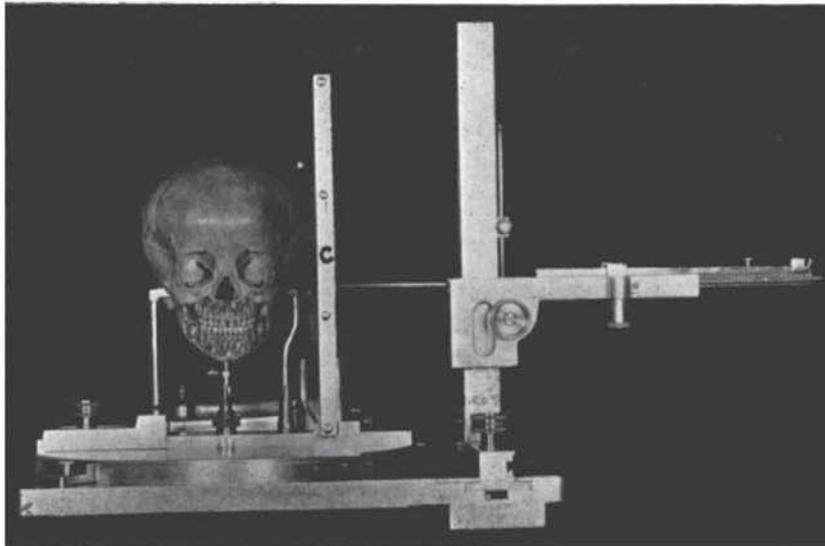


Fig. 4 Skull in the craniostat with the cassette in place for the lateral roentgenogram.

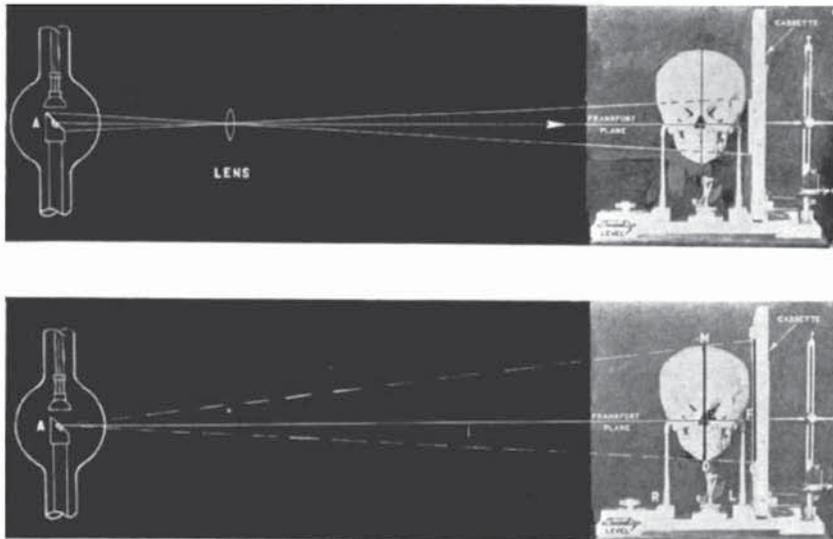


Fig. 5A Diagram of the relation of the Anode Target to the craniostat secured with the aid of a projection lens.

Fig. 5B Diagram of the relation of the Anode Target to the craniostat illustrating the path of the rays and relation of the size of the picture to the skull.

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