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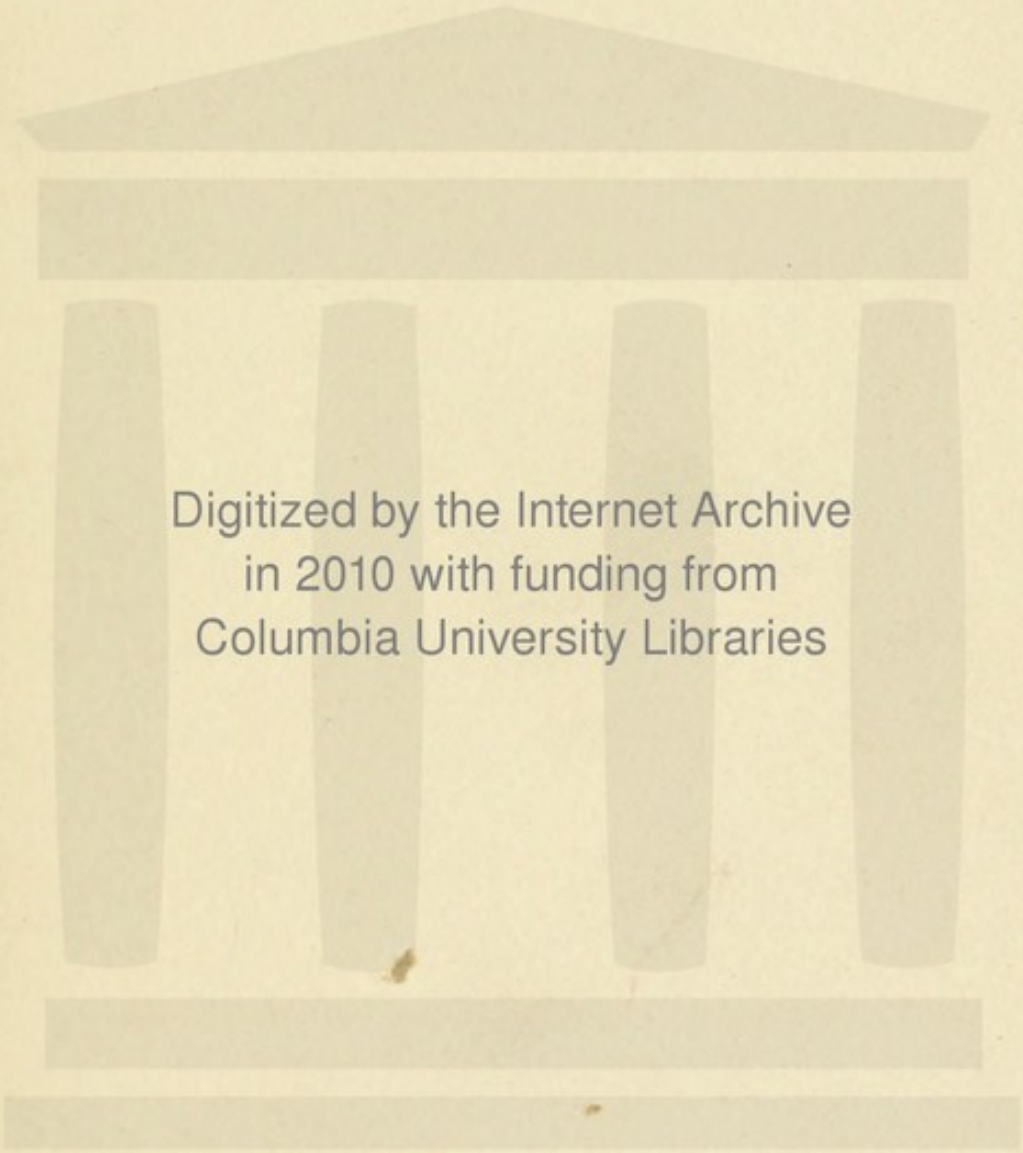

ESSENTIALS OF ORTHODONTIA

DALTON

ESSENTIALS OF ORTHODONTIA

WITH ESPECIAL REFERENCE TO NOMENCLATURE INCLUDING AN OUTLINED COURSE IN PRACTICAL TECHNICS FOR STUDENTS

BY

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WITH 167 ILLUSTRATIONS

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PREFACE

This book is intended to fill a need for a work that shall contain only the essentials of orthodontia. It is not meant to displace or supersede any modern text-book on this important subject, but rather to be an aid and incentive to deeper study and research in this branch of dental science.

Up to a few years ago orthodontic terminology was quite inadequate, but now there seems to be a sufficiency of terms, by the aid of which one is able to describe any case of malocclusion.

In the writer's opinion, far more good can be accomplished by adhering to one good classification than by presenting to the student an assemblage of classifications by different authors, consequently he has given preference to the Angle Classification which appears to be the only one that is based upon a really firm foundation, although, at least one other, namely, that of Lischer's, has received recognition of late.

In preparing the first chapter, which deals solely with nomenclature, the author has freely culled from the various text-books and writings on the subject. Immediately following this chapter comes that on occlusion, and it is to be earnestly hoped that the student will thoroughly acquaint himself with the relations of each individual tooth in normal occlusion. Until he so does he can never thoroughly comprehend malocclusion nor understand the classifications.

Verification of the student's thoroughness in the study of occlusion can be had by referring to the chart diagram on occlusion, which is to be used during the quiz on this chapter.

During the past seven years the author has made an

especial study of causal factors entering into the production of malocclusion and he believes that the personal conjectures and purely hypothetical causes mentioned by some authors deserve no notice as etiological factors, and wishes to call especial attention to the discovery of what he believes to be the cause, at least in the great majority of cases, of open-bite malocclusion.

The author hopes that he has accomplished his long cherished aim to present a book wherein the terminology and classification have been so grouped and indexed that the student can readily find the meaning of a certain term without having to read several pages.

Following are the text-books and writings freely consulted in the preparation of this work:

ANGLE: Malocclusion of the Teeth, Seventh Edition.

LISCHER: Principles and Methods of Orthodontics.

LISCHER: Elements of Orthodontia.

CASE: Dental Orthopedia.

GUILFORD: Orthodontia or Malposition of the Human Teeth; Its Prevention and Remedy, Fourth Edition.

JOHNSON: Operative Dentistry, Second Edition (Chapter by Pullen).

Transactions of the National Dental Association.

Reports of the Committee on Nomenclature American Institute of Dental Teachers.

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CINCINNATI, OHIO.

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ESSENTIALS OF ORTHODONTIA

CHAPTER I

TERMINOLOGY

Orthodontia.—The word is of Greek origin and means straight tooth. It is defined by Dr. Angle as "that science which has for its object the correction of malocclusion of the teeth." It is also defined by Dr. Pullen as "that science which treats of the etiology, diagnosis and correction of oral and facial deformities, resulting from dental malocclusion or from abnormality of contiguous tissues."

Orthodontics.—This term was proposed by Sir James Murray, and advocated by Dr. Lischer and others and defined by Lischer as "that branch of dentistry which deals with the principles and practices involved in *the prevention and correction of malocclusion of the teeth*, and such other malformations and abnormalities as may be associated therewith." Dr. Frederick B. Noyes defines it as "the study of the relation of the teeth to the development of the face, and the correction of arrested and perverted development."

Dental Orthopedia.—The word "orthopedia" is also of Greek origin and means "straight child." It is applied to that branch of surgery that straightens or adjusts anatomical deformities. The term "dental orthopedia" has been advanced by Dr. C. S. Case as suitably applicable to indicate that specialty which deals with the correction of dental and facial deformities by orthopedic movements of the teeth and connecting bones. The term no doubt is a very good one but it will never displace the term "orthodontia." The meaning of the word "orthodontia" when literally translated is a little misleading from the fact that *we do not straighten or*

correct the shape of an individual tooth, but simply correct the position of the teeth.

Dento-facial orthopedia, as the word implies, refers to the correction of irregularities of the teeth and related facial bones. It is defined by Pullen as "that art which deals with the restoration of facial symmetry, through the prevention and treatment of abnormal development of dental and maxillary arches."

Dento-facial area is the facial area which is supported and characterized by the teeth and the alveolar process.

Dento-facial relation refers to the relation which the teeth in occlusion bear to the physiognomy. "In normal dento-facial relations, or dento-facial harmony, the teeth and overlying features are in the most perfect harmony to the general facial outlines."

Naso-labial folds, depressions, or lines extend from the lateral borders of the wings of the nose diagonally downward to a point slightly below the corners of the mouth, marked by the action of the orbicularis oris and risorius muscles.

Irregularity.—The terms "irregular" and "irregularity," when used in reference to the position of the teeth, mean that the said teeth are not in the regular or established anatomical relations. Teeth are irregular when they are (1) not in normal alignment; (2) not in normal occlusion; and (3) not in dento-facial harmony.

Posed and Malposed.—Teeth are normally posed when they are regular or in normal positions. The term "malposed" and "malposition" are used with varying shades of distinction as synonymous with irregular and irregularity.

Alignment and Malalignment.—Teeth are in alignment when they are in proper relation to the line of their dental arch. A tooth or teeth in malalignment constitute an irregularity.

Occlusal relation refers to the relation in position which the upper and lower teeth bear to each other.

Normal occlusion, typical occlusion and normal dental relations refer to the established anatomical or standard occlusion. The word "normal" means "according to rule" or "that which is in conformity to natural law."

Interdigitate and interdigitation have reference to any closure of the buccal teeth in which the cusps of one denture strike fairly into the occluding sulci of the other, as opposed to that which is sometimes called an "end-to-end occlusion." When the teeth are in normal occlusion the buccal cusps are in normal interdigitation.

Malinterdigitation.—When the buccal cusps fairly interdigitate with the teeth in abnormal occlusion, as in upper protrusions, for instance, where the upper buccal cusps are fully the width of a bicuspid mesial to a normal occlusion with the lower, the cusps are in abnormal interdigitation or "malinterdigitation."

See Dental Orthopedia, p. 8.

Open-bite Malocclusion.—When upon occlusion of the posterior teeth the anterior or "biting" teeth do not come together, but leave a space of more or less width between, the irregularity may be properly termed an "open-bite malocclusion."

Close-bite Malocclusion.—The contrary of the above would, therefore, apply to those cases in which a closure of the posterior teeth causes the anterior teeth to pass their normal occlusal planes, frequently forcing the lower incisors deeply into the gum to the lingual of the upper anterior teeth.

Short-bite Malocclusion.—When all of the teeth—both posterior and anterior—are too short in relation to the normal occlusal plane, or to a plane in line with the normal closure

of the lips, the irregularity is spoken of in Case's work as "short-bite malocclusion." He says further, "it is characterized by a great redundancy of labial and buccal tissue.

Long-bite malocclusion would be the contrary position, with all of the teeth too long in relation to the normal occlusal plane, and characterized by elongated features, abnormal exposure of the teeth in talking, difficulty in closing the lips, etc.

Arch.—The dental arch is that inscribed by the teeth.

Arch malrelation, where the lower arch is mesial or distal to normal in its relation to the upper arch.

Alveolar arch is that arch inscribed by the alveolar process and overlying gum.

Dome.—The dome of the oral arch refers to the roof of the mouth.

Maleruption.—Abnormal eruption of teeth, resulting in malposition.

Malturned is used in reference to a tooth so turned on its central axis as to stand in malposition. The term "malturned" is sometimes used synonymously with "torsion" and "torso-occlusion."

Rotate is used in reference to the process of turning a tooth.

Zone is a favorable word for locating sections of the dental and alveolar arches that we frequently wish to refer to in describing different characters of general malpositions and movements.

Dental zones may be considered as narrow areas extending along the dental arch parallel to the occlusal plane as Occlusal, Apical and Gingival Zones.

Anterior and posterior are terms more commonly used to define relative position or movement in a direction parallel to the median line of the dome.

Protrusion.—The incisor teeth in labial malposition.

Retrusion.—The incisor teeth in lingual malposition.

Extrude and intrude are used to denote the action of correction of malposition, for instance in extrusion, we refer to the act of forcibly erupting a tooth, or bringing it further from its socket, while "intrusion" refers to the act of forcing a tooth into its socket.

Contrude is a word used to indicate an abnormal lingual curve of any portion of the line of the dental arch.

Superior and **inferior** when used with reference to the teeth, mean the teeth of the upper and lower jaw.

Unilateral, indicating location, refers to one side.

Bilateral, indicating location, refers to both sides.

Unimaxillary, indicating location, refers to one jaw.

Bimaxillary, indicating location, refers to both jaws.

Cast.—The literal meaning of the term refers to anything which is made by pouring a crystallizable substance such as plaster or fusible metal into an impression or mold.

See Dental Orthopedia, p. 9.

Model is indicative of an object which is employed, modeled, or fashioned as a pattern for duplication, although the term model has been used extensively by writers in referring to plaster casts of the teeth.

Infra-occlusion, or lack of occlusion of the teeth, is a condition where the teeth of one arch do not occlude with those of the opposite arch. Infra-occlusion may occur in several different forms, being associated more or less with all classes of malocclusion.

Infra-occlusion of the Incisors, Cuspids and Bicuspids.—The most common form of infra-occlusion is observed in lack of occlusion of the incisors and cuspids, although the bicuspids may be involved, and even the first and second permanent molars in rare cases.

Bilateral Infra-occlusion of Bicuspids and Molars.—Extensive infra-occlusion involving the bicuspids and molars on both sides.

Unilateral Infra-occlusion of the Bicuspids and Molars.—Lack of occlusion of the molars and bicuspids on one side only.

Bimaxillary Infra-occlusion.—Lack of occlusion of all the teeth in both arches. A case of this kind was described by Dr. C. S. Case, in the *Dental Cosmos*, for December, 1905, page 1411.

Mandibular Retroversion.—Where the mandible is in an abnormal distal position. Dr. M. N. Federspiel defines Mandibular Retroversion, as pertaining to a distal shifting of the mandible during the growth and formation of the temporo-mandibular articulation. This usually takes place during the period of eruption of the teeth.

Mandibular anteversion is a forward shifting of the mandible during the formation of the temporo-mandibular articulation and is often called mandibular protrusion (Federspiel).

Arch Predetermination.—The mechanically and anatomically reconstructed arch has been made a possibility by the application of the laws of Bonwill in the synthetic reproduction of the normal arch for any given case, as worked out geometrically by Dr. C. A. Hawley, whose method is fully described by Pullen in Johnsons' Operative Dentistry, second edition, page 561.

Supra-occlusion.—When a tooth has erupted further from its socket than normal, being in a state of extrusion, the condition is known as supra-occlusion. Infra-occlusion and supra-occlusion are usually associated together, for where there is infra-occlusion of the incisors, there is, as a rule, supra-occlusion of the molars; while the opposite does not always prevail.

Prognathism.—Abnormal protrusion of the lower teeth

and jaw. Where there is lack of development of the upper jaw, it gives the lower jaw the appearance of abnormal protrusion, so that what appears to be a prominent lower jaw to the casual observer, upon close study is seen to be normal, the mistaken diagnosis being caused by the inharmonious relation of the upper to the lower jaw.

Open-bite Malocclusion, Anterior Non-occlusion.—These terms have been used synonymously with infra-occlusion, although it appears that infra-occlusion is more often used to indicate the lack of occlusion of a single tooth, while open-bite or non-occlusion refers to the lack of occlusion of several teeth, as for example, lack of occlusion of the incisors.

Occlusion.—The normal relation of the occlusal inclined planes of the teeth when the jaws are closed. **Normal occlusion** is defined by Pullen as a condition of perfect relationship existing between the normally formed and arranged teeth of normally developed dental arches when in antagonism, the mandible being in its farthest posterior position, and in exact medium register with the maxilla, and both in normal relationship with contiguous tissues.

Malocclusion.—The perversion of normal occlusal relations of the teeth. It is defined by Pullen as any variation from a normal occlusion, either in size, shape or relation of dental arches, or perversion of inclined cusp planes.

Key to Occlusion.—The relation of the first permanent molars, upper and lower, in *normal occlusion.* The mesio-buccal cusp of the upper first molar strikes in the groove between the mesio-buccal cusp and middle-buccal cusp of the lower first molar. Any deviation will show *malocclusion* to the extent of the deviation.

Line of Occlusion.—The line with which in form and position, according to type, the teeth must be in harmony if in normal occlusion (Angle).

Buccal Occlusion.—A bicuspid or molar tooth outside the line of occlusion.

Labial Occlusion.—An incisor or cuspid tooth outside the line of occlusion.

Lingual Occlusion.—Refers to a tooth inside the line of occlusion.

Mesial Occlusion.—When a tooth is nearer the median line than normal.

Distal Occlusion.—When a tooth is posterior to normal.

Torso-Occlusion.—A tooth turned on its axis.

Etiology of Malposition.—The causes which produce malocclusions of the teeth.

Gothic Arch.—Another almost obsolete term which was used to distinguish the V-shaped arch, a condition which is sometimes met with in the upper arch.

Constricted Arch.—A term applied to the upper arch where the bicuspids are in lingual occlusion.

Saddle-shaped Arch.—A term having practically the same meaning as constricted arch.

Facial Harmony.—Normal and proportionate development of facial contour, dependent upon the corresponding normal development and growth of the underlying osseous structures and sinuses, together with normal occlusion of the teeth.

Physiology of Tooth Movement.—The physiological changes which take place in the movement of teeth.

Anchorage.—The resistance selected as a base from which force is to be delivered for the movement of teeth (Pullen).

Intermaxillary Anchorage.—The use of anchor teeth in both arches to move a tooth or teeth in one or both arches. **Intermaxillary anchorage** is defined by Pullen as the opposing of the resistance of the teeth in one arch against the resistance of the teeth of the other arch, partially or completely, to the

advantage of tooth movement in the arch in which the lesser resistance is established.

Occipital Anchorage.—The use of a head gear or occipital cap for the movement of the teeth posteriorly. **Occipital anchorage** is the resistance obtained through the use of the top and back of the head, in connection with the head gear for assisting tooth movement or maxillary and mandibular movements.

Simple anchorage is the obtaining of a sufficient resistance in one part of the arch for tooth movement in another part of the same arch, the anchorage resistance being relatively greater than that of the teeth to be moved, although admitting of some instability of the anchor tooth (Pullen).

Stationary Anchorage.—The use of an appliance which prevents tipping of the anchor tooth; controlled in most cases by long tubing or sheaths soldered on the anchor band or if the anchor tooth should move at all, it would move bodily. Defined by Pullen, *Stationary anchorage* represents an anchorage which is stable and unvarying in its resistance for tooth movement.

Intramaxillary Anchorage.—Where the resistances selected as anchorage for movement of malposed teeth is in the same dental arch as the teeth to be moved.

Extramaxillary Anchorage.—Where the resistances selected to move malposed teeth are outside the dental arches. Example, use of the occipital cap.

Primary Anchorage.—"The attachment to single molar or bicuspid teeth, on each side of the arch, may be designated as primary anchorage" (Pullen).

Secondary Anchorage.—"hSould it be desired to add the resistance of other teeth in the same arch, or in the opposite arch, or the resistances from the teeth of the opposite arch, the additional anchorage obtained would be designated as

secondary anchorage, and would include any of the other forms of anchorage" (Pullen).

Reinforced anchorage is the adding of the resistance of teeth in the same arch or opposite arch, through the use of other forms of anchorage, as auxiliaries, in combination with the already established simple anchorage.

Reciprocal anchorage represents the counterbalancing of anchorage resistance between teeth located in different parts of the same arch, or in opposite arches, to the mutual advantage of tooth movements (Pullen).

Movement of Teeth in Phalanx.—The movement of two or more teeth in the same direction at the same time.

Expansion Arch.—A metallic wire bent in conformity to the shape of the dental arch.

Alignment Wire.—A later term designed to succeed the term Expansion Arch.

Jack Screw.—A threaded wire for movement of teeth through its pushing power controlled by a threaded nut.

Retracting Screw.—An appliance practically the same as the jack screw, except it is used to draw the tooth to be moved toward the anchor tooth.

Regulating appliances "are devices for exerting pressure upon malposed teeth in order to move them into harmony with the line of occlusion" (Angle).

Developmental Spaces.—Separation of the deciduous incisors as development progresses, due to an interstitial growth in the alveolar process and maxillæ. These spaces are most prominent just before loss of the deciduous incisors.

Regional Development.—In their further growth, the maxillary arches do not develop uniformly, as might be supposed, but in regions corresponding to the periods of eruption of the different teeth (Pullen).

Preservative forces of arch integrity are:

(1) The interdigitation of the cusps of the teeth.
(2) The reaction and dependence of one arch upon the other.
(3) The muscular influence of the lips, cheeks and tongue, labially, buccally and lingually.

Articulation is the relation between the antagonizing surfaces of the teeth of maxilla and mandible during the lateral and protrusive excursions of the latter, dependent upon its universal articulation in the glenoid fossa. There are three stages of articulation, viz., *prehension*, *attrition* and *occlusion*. The first two stages represent the mandible in motion; the last, the mandible at rest—the teeth being closed (Pullen).

Distinction between Occlusion and Articulation.—Occlusion is the passive phase of articulation, as compared to the active phases of prehension and attrition. **Occlusion** represents the static, and **articulation** the dynamic relation between the arches of the teeth.

Facial symmetry consists of the normal and proportionate development of facial contour, dependent upon the corresponding development and growth of the underlying osseous structures and sinuses.

Facial asymmetry consists of the abnormal and disproportionate development of the contour of the face, dependent upon a corresponding abnormal development and growth of the underlying osseous structures and sinuses.

Force-producing appliances are embodied in the principles of the *spring*, the *screw*, the *lever*, the *elasticity of rubber*, and the *contraction of silk* when moistened.

Anchor bands are bands adapted to teeth selected as a base from which force is to be directed in the movement of

teeth. They may be grouped under two divisions, *adjustable* and *non-adjustable*. The non-adjustable designs were the first to be used, and they were variously described as cribs, clasps, crowns, and ferrules.

The following terms are those advocated by Dr. Lischer, using the ending *version* from the (Lat. *verteræ* to turn; to change position) being prefixed by the various terms which indicate conditions with scientific exactness.

Labioversion is a term used to denote labially malposed incisors and cuspids.

Buccoversion denotes buccal malpositions of the bicuspids and molars.

Linguoversion denotes lingual malposition, lingual to normal.

Distoversion denotes distal malposition, distal to normal.

Mesioversion denotes mesial malposition, mesial to normal.

Torsoversion—a tooth rotated on its axis.

Supraversion denotes extrusion.

Infraversion denotes depression or intrusion.

Perversion denotes impaction; impacted teeth.

Transversion denotes transposition; transposed teeth.

Hyperplastic Formation of Connective Tissue.—The coalescence of previously inflamed membranous surfaces, resulting in a tough fibrous adhesion.

"Lischer recognizes three conditions, each reducible to elementary divisions, regardless of their manifold combinations. These are: (1) Malformation of the Jaws and Their Processes; (2) Malrelation of the Dental Arches; (3) Malposition of the Teeth.

MALFORMATION OF THE JAWS

1. *Macrognathism*—over-development.
2. *Micrognathism*—arrested development.

Prefixes: a. Mandibular or lower.
b. Maxillary or upper.
c. Bimaxillary—when both jaws are similarly affected.

Suffix: *'Gnathia'*—meaning jaw.

MALRELATION OF THE ARCHES

1. *Distoclusion*—distal relation of lower.
   Unilateral—one side only.
   Bilateral—both sides.
2. *Mesioclusion*—mesial relation of lower.
   Unilateral—one side only.
   Bilateral—both sides.
3. *Neutroclusion*—in neither direction.
   Neutral relation of lower to upper (Angle's class I).
   The ending *clusion* from the Latin *claudere-clausum* to close."[1]

[1] From a consideration of certain Types of Dento-facial Deformity. By M. N. Federspiel, D. D. S., M. D. Read before the American Society of Orthodontists, Boston, July, 1911.

CHAPTER II

OCCLUSION

The importance of the study of occlusion cannot easily be over-estimated. It is as essential to a complete understanding of malocclusion as is the study of anatomy to a complete understanding of any deviation caused by disease.

The pathologist would not be able to diagnose the changes in disease without first being familiar with physiology and

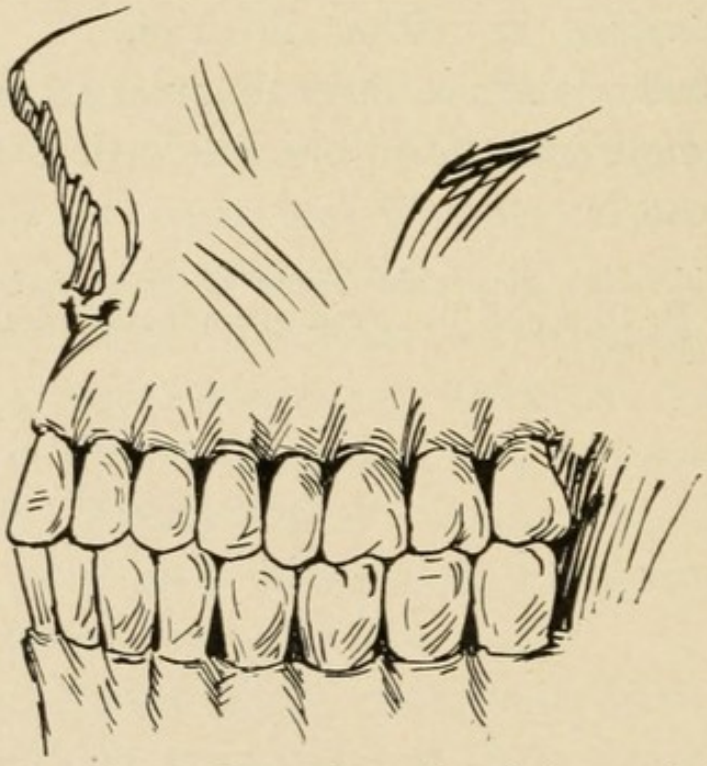


FIG. 1.—Reproduction from a large chart of occlusion used by the writer for teaching the relation of the teeth in normal occlusion.

histology. Therefore, it naturally follows that no one can comprehend malocclusion without first having an accurate knowledge of normal occlusion. No mere smattering idea of the arrangement of the teeth will suffice. How many readers can tell what teeth in the upper arch oppose the lower

second bicuspid in normal occlusion, without referring to the diagram of occlusion? Fig. 1. Occlusion is the basis of the science of orthodontia, for the anatomy of each individual tooth, its arrangement and attachment are planned chiefly for the purpose of occlusion in order that they may best serve the purpose for which they were designed; namely, the preparation of the food for the stomach.

The arrangement of the teeth of man constitutes one of the most wonderful works of nature.

One should stop to consider how beautiful and useful is the arrangement of the teeth in occlusion, where there has been no impediment in nature's plan, each tooth serving its purpose and serving it well.

Consider also that in nature's plan, the arrangement of each individual tooth is such as to give the greatest possible support, both singly and collectively, to each other.

Each tooth has two opponents in occlusion, except the lower central incisors and upper third molars.

Next consider the relationship of the lower and upper first permanent molars.

Fig. 2 shows a negro skull with beautiful occlusion, though not exactly perfect because of slight protrusion of the incisors, which is characteristic of this race. The interdigitation of the cusps of the teeth from and including cuspid to third molar is absolutely as normal and accurate as could be desired.

Fig. 3 shows opposite side of the same skull. This specimen is from the Museum of the Ohio College of Dental Surgery.

In the study of occlusion let us first consider the arrangement of the temporary teeth. Ordinarily, at the age of two years all the temporary teeth are erupted and occlusion is established. The deciduous teeth comprise twenty in number.

These teeth erupt far more harmoniously than their permanent successors, due undoubtedly to the fact that there is little, if any, interference with nature's plan. The relationship of the upper and lower second deciduous molars is similar to that of the first permanent molars; the first temporary molars and

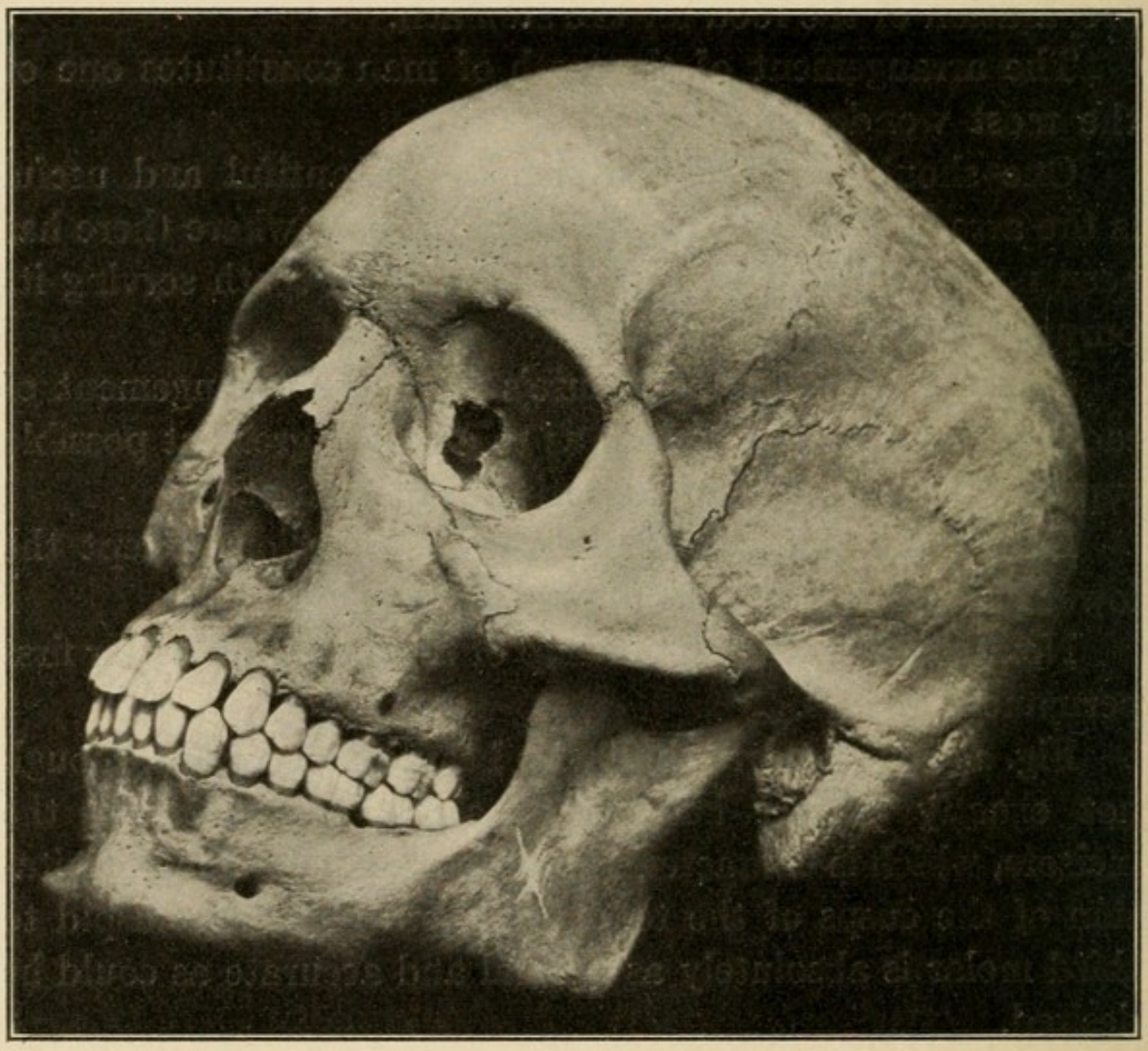


FIG. 2.

cuspid have similar interdigitations to that of the bicuspids, although not so perfect—the incisors also having similar relations to the permanent incisors in occlusal relations. The first permanent molars erupt just posterior to the second temporary molars at the age of six years. These teeth,

through a wise provision of nature, are guided into place and interlock before the loss of the temporary molars, thereby becoming the landmarks or keys to occlusion. In order to have these keys in normal occlusal relations it is necessary to preserve the temporary molars until the eruption and interlocking of the first permanent molars.

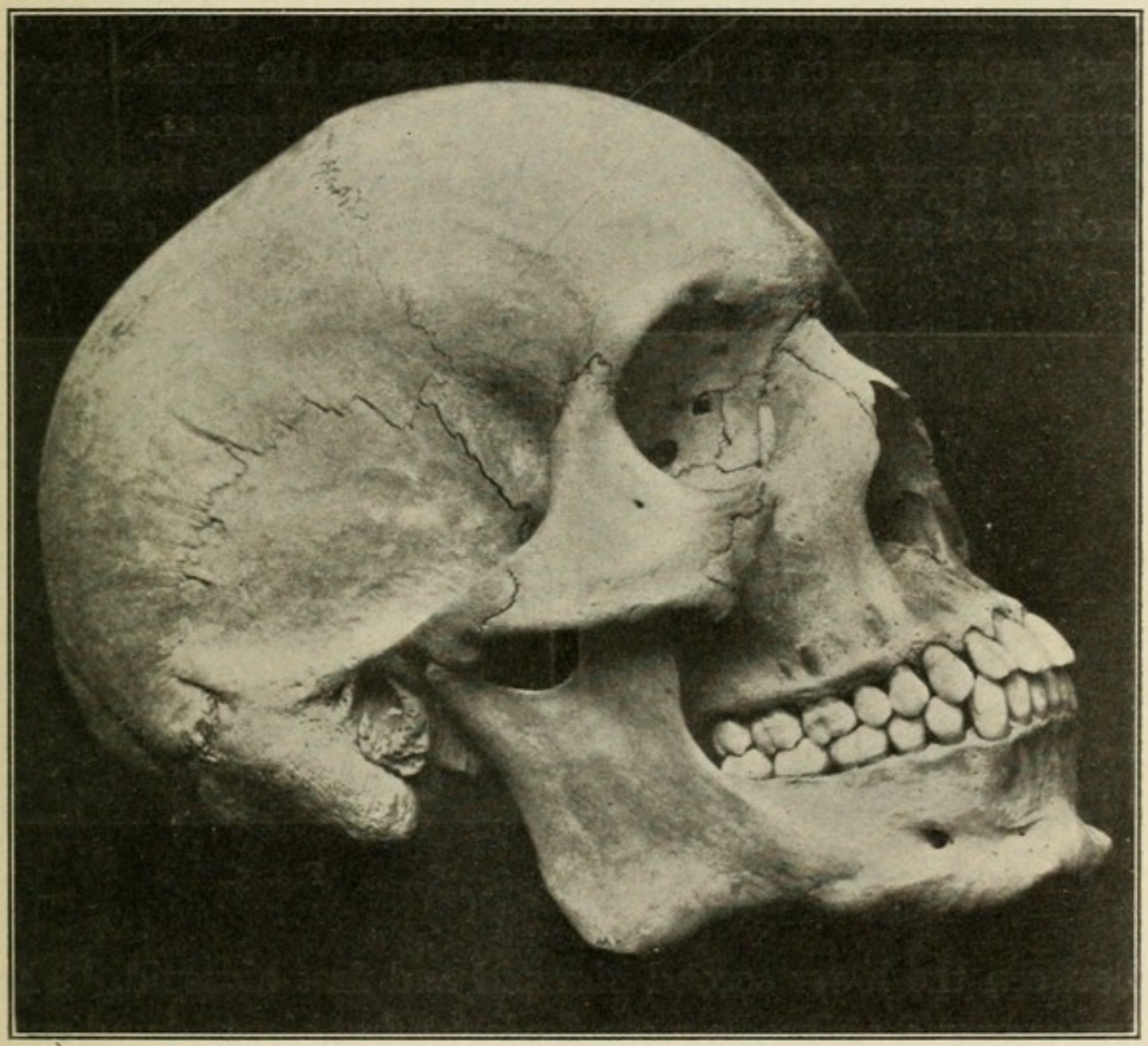


FIG. 3.

These first permanent molars are the largest and strongest of the permanent set, although they are the most neglected because of their early eruption, parents often mistaking them for temporary teeth. As they are the most important teeth

of the permanent set, their loss becomes a serious menace in the establishment of normal occlusion. The width of the temporary molars from distal to mesial is a little greater than that of the bicuspids. This provision of nature is undoubtedly for the purpose of allowing the bicuspids room to properly interdigitate before the pressure of approximal contact is brought to bear upon them.

In **normal occlusion** the mesio-buccal cusp of the upper first molar strikes in the groove between the mesio-buccal cusp and middle-buccal cusp of the lower first molar.

The upper second bicuspid strikes between the lower first molar and second bicuspid. The upper first bicuspid strikes

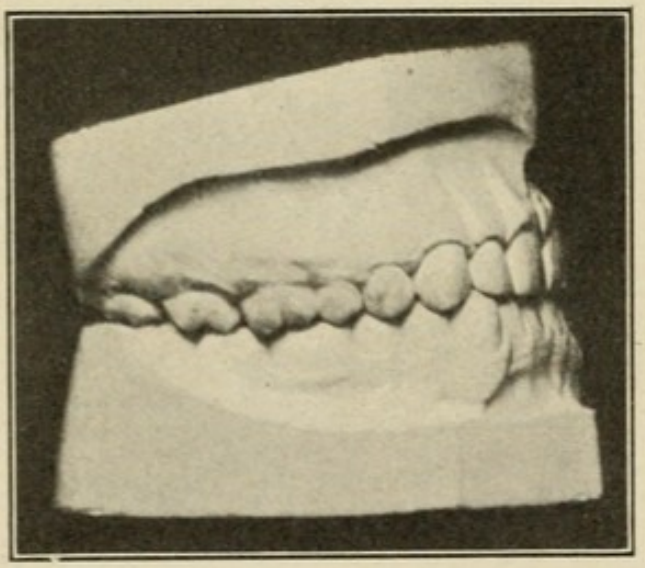


FIG. 4.

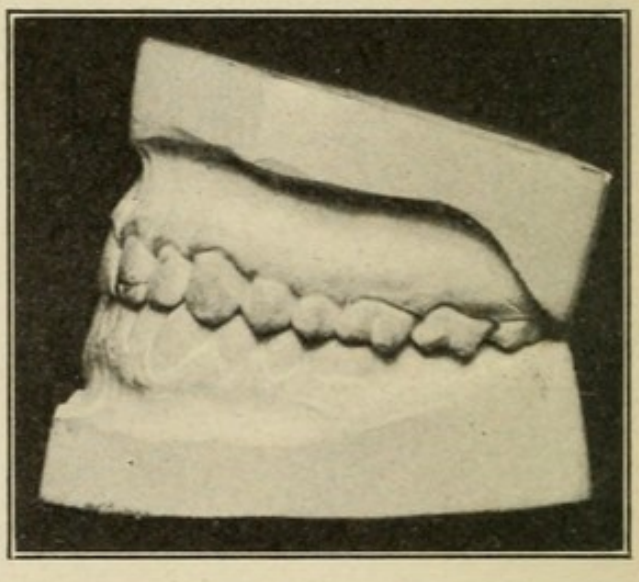


FIG. 5.

between the lower second bicuspid and first bicuspid. The upper cuspid strikes between the lower first bicuspid and cuspid. The relation of the upper cuspid to the lower cuspid and first bicuspid forms landmarks or lines of diagnosis for determining deviations in malocclusions. This point of diagnosis is especially useful in cases which come under Class I (Angle classification).

The upper lateral incisor strikes the mesial third of the

lower cuspid and distal half of lower lateral. The upper central incisor strikes the mesial half of lower lateral and entire labio-incisal surface of lower central incisor. The upper second molar strikes the distal two-thirds of lower

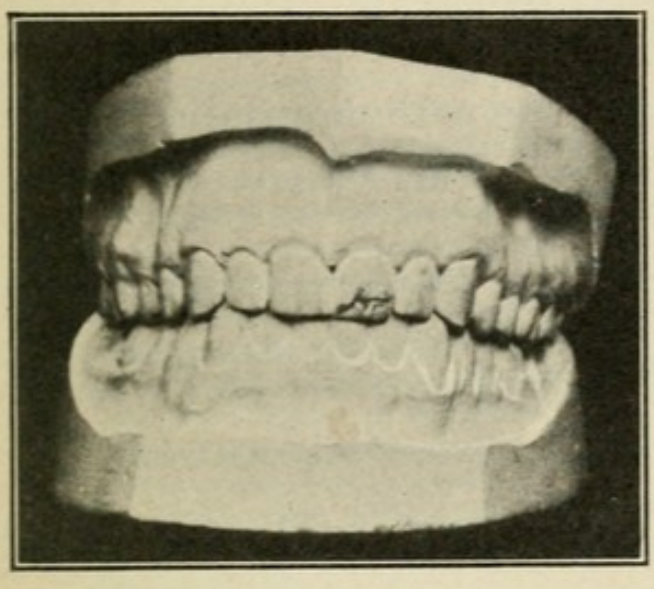


FIG. 6.

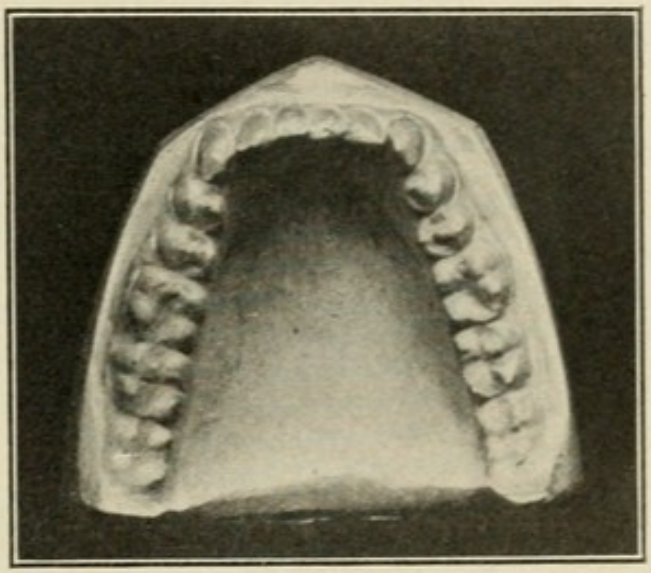


FIG. 7.

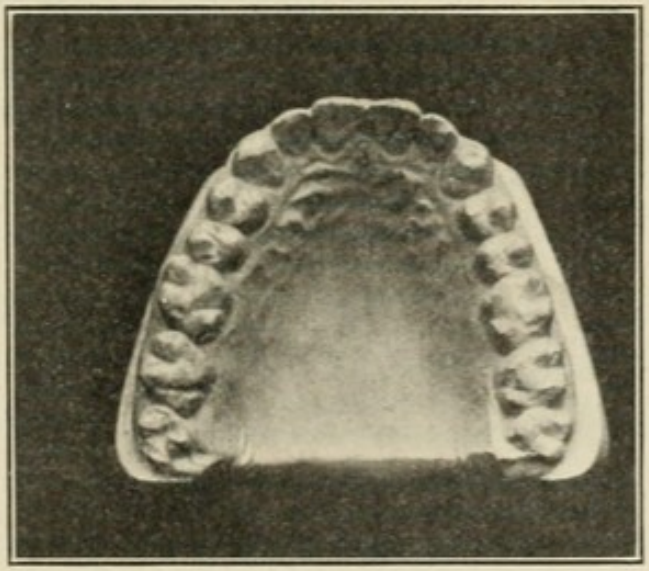


FIG. 8.

second molar and mesial third of lower third molar. The upper third molar strikes the distal two-thirds of lower third molar. Normal occlusion is shown in Figs. 4, 5, and 6. Figs. 7 and 8 show occlusal views of the case.

ANGLE'S CLASSIFICATION

Class I.—Arches in normal mesio-distal relations.

Class II.—Lower arch distal to normal in its relation to the upper arch.

Division 1.—Bilaterally distal, protruding upper incisors.

Primarily, at least, associated with mouth-breathing.

Subdivision.—Unilaterally distal, protruding upper incisors.

Primarily, at least, associated with mouth-breathing.

Division 2.—Bilaterally distal, retruding upper incisors.

Normal breathers.

Subdivision.—Unilaterally distal, retruding upper incisors.

Normal breathers.

Class III.—Lower arch mesial to normal in its relation to the upper arch.

Division.—Bilaterally mesial.

Subdivision.—Unilaterally mesial.

CHAPTER III

ETIOLOGY

In summing up the causes which produce malocclusion, a great many have been assigned, several of which are imperfectly understood, and some entirely devoid of reason. The causes which have been given most prominence of late are:

Early loss of the deciduous teeth.

Prolonged retention of the deciduous teeth.

Loss of the permanent teeth.

Accidents.

Obstruction in the nasal and naso-pharyngeal passages, such as adenoids, hypertrophy, etc.

Imperfect fillings and crowns.

Delayed eruption of the permanent teeth.

Absence of tooth germs.

Habits.

Transposed teeth and **torsion.**

It seems that transposed teeth and torsion are conditions of malpositions, and should therefore not be classed as causal factors. In Class I the irregularity is restricted usually to the teeth anterior to the first molars, the exception being that the molars may be in either buccal or lingual malposition. The cases which usually come under this most prevalent class consist of deflection of teeth from their normal course in eruption; also by the early loss of the temporary teeth which leaves the arch so narrow that the permanent teeth, when they are ready to take their place in the arch, are either badly crowded or are prevented from erupting altogether.

In Class II, where the lower arch is distal to normal in its relation to the upper arch, the cause may be varied from premature loss of the lower temporary teeth, which would cause a crowded condition in this arch; to lack of development through loss of lower permanent teeth. The crowns of the biscuspids lie embedded between the roots of the temporary molars and are rarely deflected from their normal course in erupting, except it be in cases where caries has separated the roots of the temporary molars and a small portion of a root has been retained, diverting the bicuspid from its normal course.

In too long retention of the lower temporary central incisors, the permanent centrals usually erupt lingual to normal, thus producing a condition which necessitates the use of the expansion arch. It is obvious that it is easier to correct malpositions which are caused by too long retention of the deciduous teeth than malpositions resulting from premature loss of the deciduous teeth.

Notice Figs. 9 and 10. This case of Class II, Division 2, was caused by the loss of the left lower first permanent molar at the age of eleven years, thus allowing the lower bicuspids, cuspid and incisors to drift back the width of a bicuspid tooth, which nearly closed up the space made through loss of the molar on this side.

In Class III, the cause of irregularity is usually associated with the upper arch, which in most cases is lacking in development. Owing to the difficulty in treating this class of cases, it is advisable to begin treatment as early as possible. Open-bite malocclusion may appear in any one of the three classes; but it is more often found in Class I or neutroclusion. It is characterized by a space between the upper and lower anterior teeth from cuspid to cuspid, in some cases involving the bicuspids and even the first molars.

"The cause of open-bite, or lack of occlusion of the anterior teeth, is somewhat shrouded in mystery. Various theories have been suggested, notable among which is that of tongue-sucking and mouth-breathing. However, it is the writer's belief that *prolonged retention of the second deciduous molars* is responsible for this condition of malocclusion in the great majority of such cases. *In all cases of the typical form of open-bite malocclusion there is supra-occlusion of the molars.*

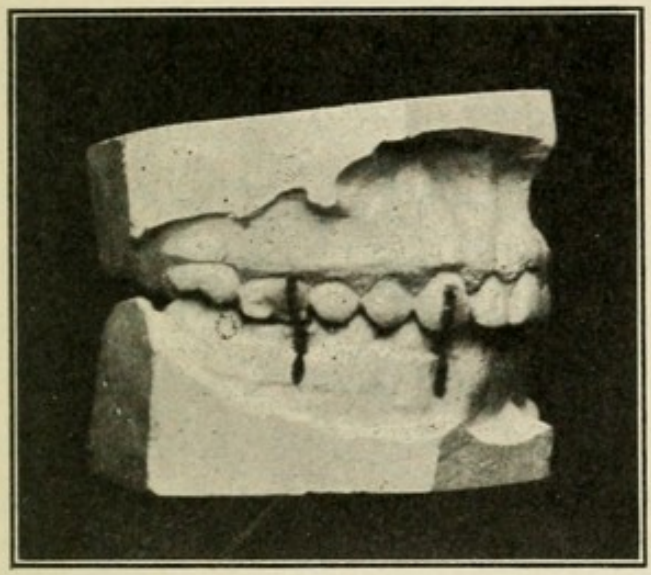


FIG. 9.

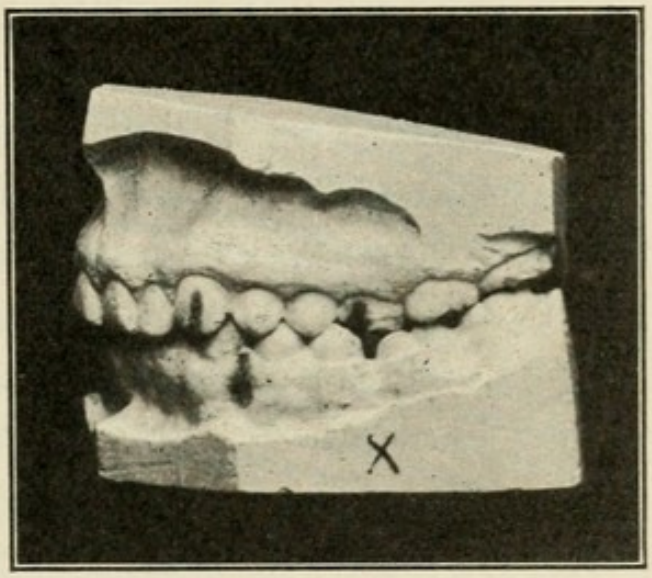


FIG. 10.

FIGS. 9 and 10.—The loss of the left lower first permanent molar has changed the occlusal relations of all the teeth in both arches from the right cuspids to the left third molars. The space made by the loss of the lower first molar has nearly closed up, not by the mesial drifting of the second and third molars on this side, but by the distal drifting of the left lower bicuspids, cuspids and incisors. This has resulted in malinterdigitation and excessive over-bite of the upper incisors.

This supra-occlusion of the molars should receive more attention than is generally conceded, since it is really *the cause of the infra-occlusion. This supra-occlusion of the molars is directly traceable to prolonged retention of the deciduous second molars.*

The writer has models which clearly show this, as will be seen from the accompanying illustrations, which speak for themselves. The germs of the first permanent molars are

the first permanent tooth germs formed, and they are as a rule the first permanent teeth to erupt, and are the largest and strongest of the permanent teeth. These first permanent molars are the teeth which determine the length of bite; that is, the length of over-bite of the upper anterior teeth, erupting as they do just back of the second temporary molars at the age of six years, and becoming firmly locked before the loss of the deciduous molars.

These teeth, the first permanent molars, serve as props to hold the jaws apart while the temporary molars are being shed, and their permanent successors—the bicuspids—are erupted into place and interlock."*

If in the course of the eruption of the second bicuspids the temporary molars are forced slightly from their sockets, the bite is lengthened and the anterior teeth do not occlude, the incisors being propped apart by the extruded second temporary molars. In some cases these temporary molars become sore, mastication is thereby impaired, and the child refrains as much as possible from using the teeth. The evil is thus enhanced, for the first permanent molars being held further apart than normal, erupt until they occlude and become firmly locked, and finally the temporary molars are lost, or are in some instances pushed out by the erupting bicuspids. The bicuspids being held further apart than normal by the already locked molars, erupt until they occlude. The anterior teeth being held still further apart never erupt sufficiently to occlude. Thus we have open-bite malocclusion. This class of malocclusion interferes greatly with mastication, and also with the speech of the patient, causing the characteristic lisping. Infra-occlusion is by far the most difficult class of malocclusion to treat, so that the

* See paper read by the writer before the New Jersey State Dental Society, July 21, 1911. Published in the *Items of Interest*, December, 1911.

prevention of the primary cause, *too long retention of the deciduous second molars*, is the only correct treatment. Great caution should be used, however, as too early extraction of these teeth would cause another form of malocclusion, namely, an excessive over-bite of the upper anterior teeth, together with other associated forms of irregularity.

Too early loss of the deciduous molars would allow the jaws to come too close together, thereby preventing the permanent molars from erupting as far as normal, which causes permanent excessive over-bite of the upper incisors, as well as prevents normal development of the jaws, resulting in a crowded condition of the bicuspids when they erupt, or preventing their normal eruption. *In no case should the second temporary molars be extracted before the eruption and interlocking of the first permanent molars.*

Good judgment should be used in preserving the temporary teeth, for in some cases where decay exists—and even where decay does not exist—the normal absorption and loosening of the deciduous molars does not take place.

The law laid down by Dr. Angle covers this point very thoroughly. "Whenever a temporary tooth is found interfering with the eruption of its permanent successor, it should be removed regardless of the time."

"The thickened process over the roots of the temporary teeth usually indicates the eruptive force of the permanent teeth, and is a *warning for extraction.* If greater care were given the temporary teeth, there would be fewer cases of malocclusion. Treatment of the temporary teeth is very much neglected, and injudicious extraction is too often practised.

There are some cases of this class of malocclusion, where the infra-occlusion of the incisors is very slight, that will yield to the treatment of extruding the anterior teeth, pro-

vided the tension on the lips is not overtaxed and proper nasal breathing is established.

In patients who have advanced in years, treatment is not successful, yet some relief is afforded by grinding the occlusal surfaces of the supra-occluded molars. The practice of extruding the anterior teeth is not a very satisfactory one, the results not being permanent, for development never takes place normally. *In fact, to lengthen the bite in this manner is abnormal.*"[1]

Fig. 11 illustrates the beginning of a case of open-bite malocclusion in a girl thirteen years of age. Notice that the extruded upper second temporary molar is the sole cause of

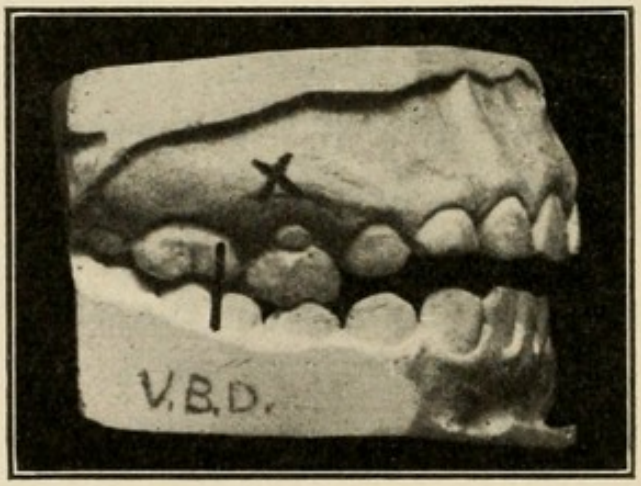


FIG. 11.

the infra-occlusion of the anterior teeth. The upper second bicuspid, instead of being deflected from its course, is erupting in a normal line, pushing the deciduous molar from its socket. The same condition prevailed on the opposite side, but unfortunately the temporary molar was extracted before the writer's attention was called to the case.

Fig. 12 shows front view of the case illustrated in Fig.

[1] Dalton, "La Cause De La Béance De L'Occlusion." Le Laboratoire et Le Progrés Dentaire, Jan., 1912.

11. Notice how great a space is produced in the incisor region by only slight supra-occlusion of the first permanent molars. The infra-occlusion was slightly reduced after extraction of the temporary molars and still further reduced by grinding the first permanent molars.

Fig. 13 illustrates another case of too long retention of the temporary molars. The cusps of the lower cuspid and first bicuspid are just showing. The first temporary molar was lost only the day before the impression was taken.

Fig. 14 shows the anterior view of the case illustrated in Fig. 13. Note the shifting of the median line in the upper arch toward the affected side.

Fig. 15 illustrates a case showing the second upper temporary molar in the model. The tooth came away with the plaster impression. This patient has an almost end-to-end bite.

Fig. 16 illustrates the beginning of a case of open-bite malocclusion in a patient only eight years of age.

Figs. 17 and 18 illustrate the models of two cases secured immediately after extraction of the temporary molars which had been retained too long, causing supra-occlusion of the first permanent molars with consequent infra-occlusion of the incisors.

Figs. 19, 20 and 21 illustrate a case where the lower arch and teeth are beautifully developed while great irregularity and inharmony prevails in the upper arch, caused primarily at least by too long retention of the upper second deciduous molars. The temporary teeth show dark in the illustration because they are the natural teeth which came away with the impression, plaster being used as impression material.

Figs. 22, 23 and 24 show another case where the retention of the eight temporary molars was causing complicated trouble. Unfortunately the illustrations do not give a very

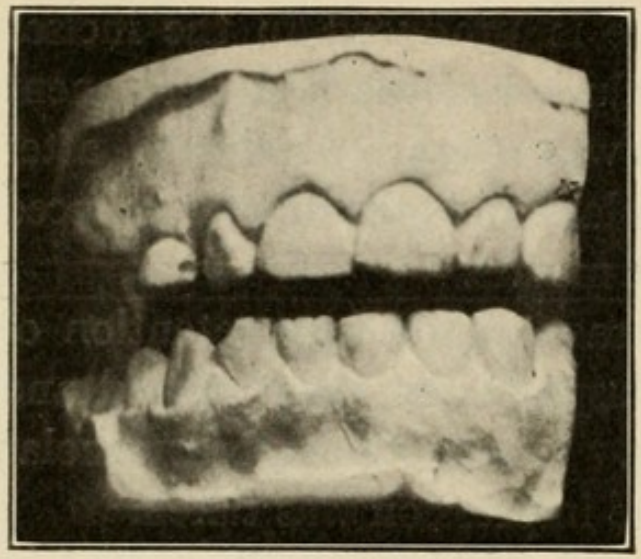


FIG. 12.

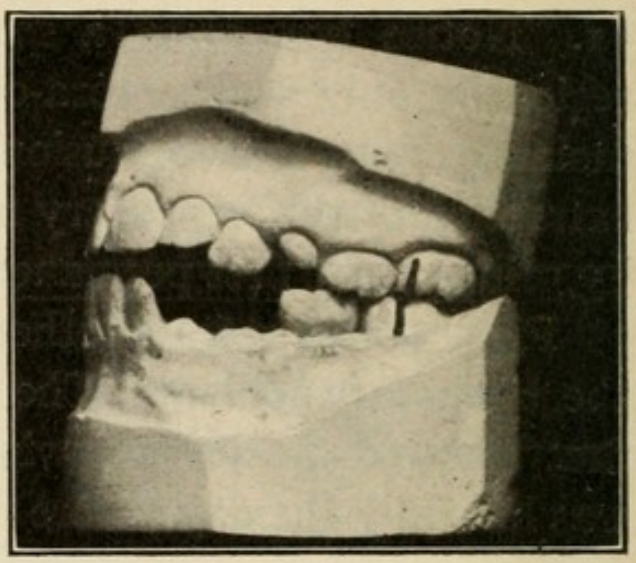


FIG. 13.

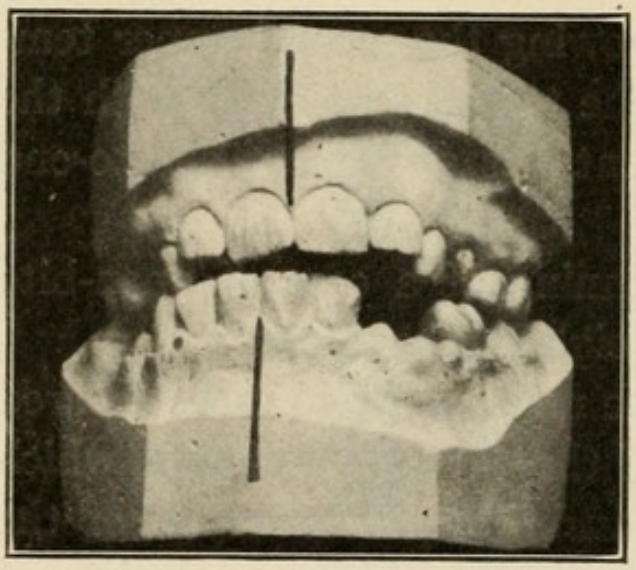


FIG. 14.

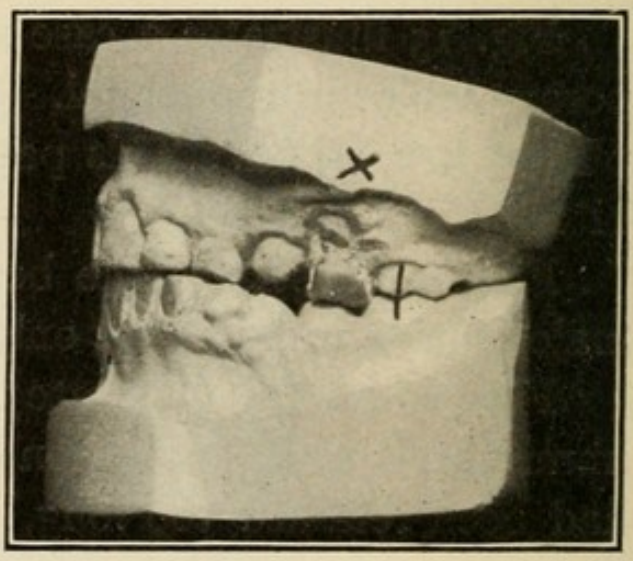


FIG. 15.

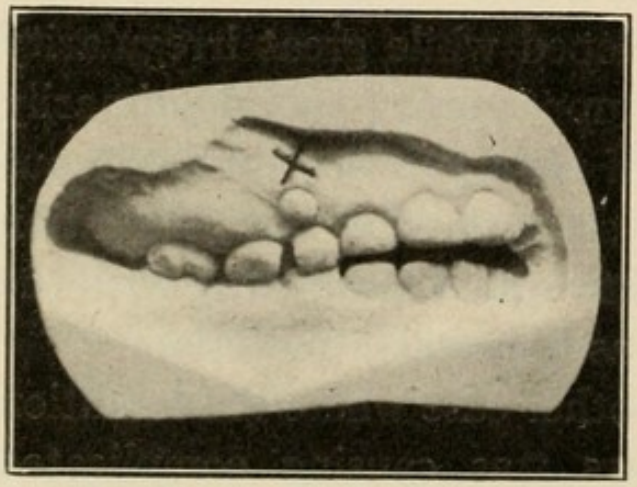


FIG. 16.

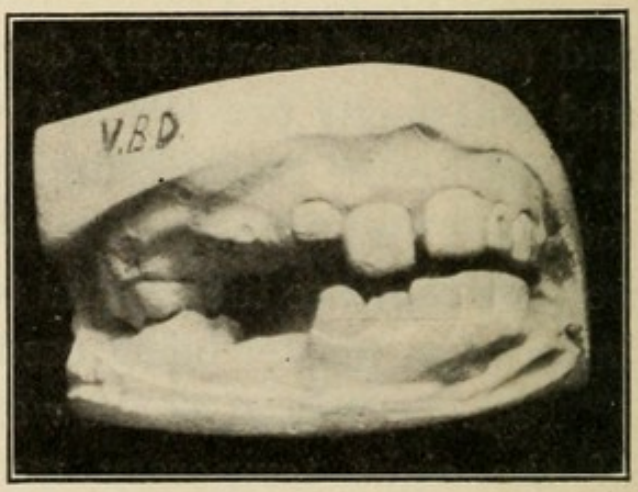
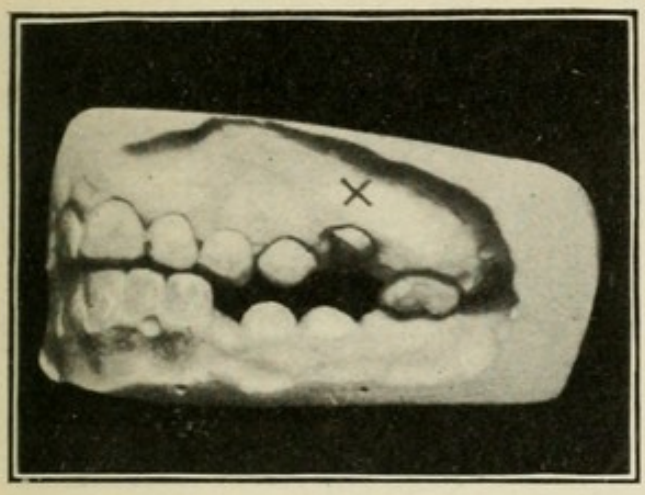


FIG. 17.



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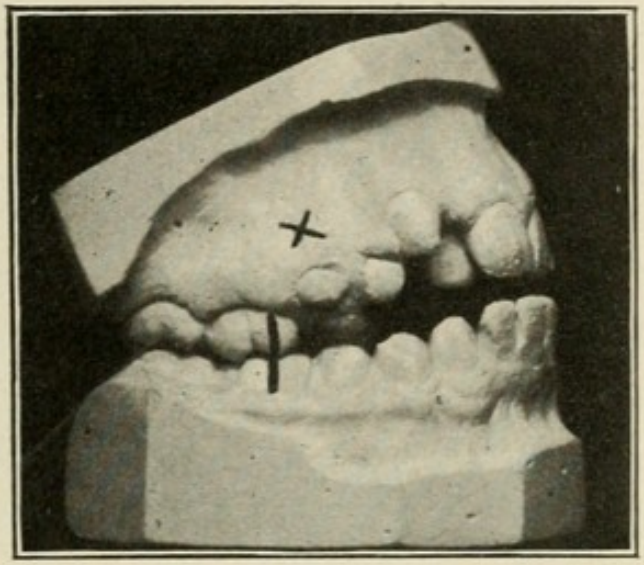
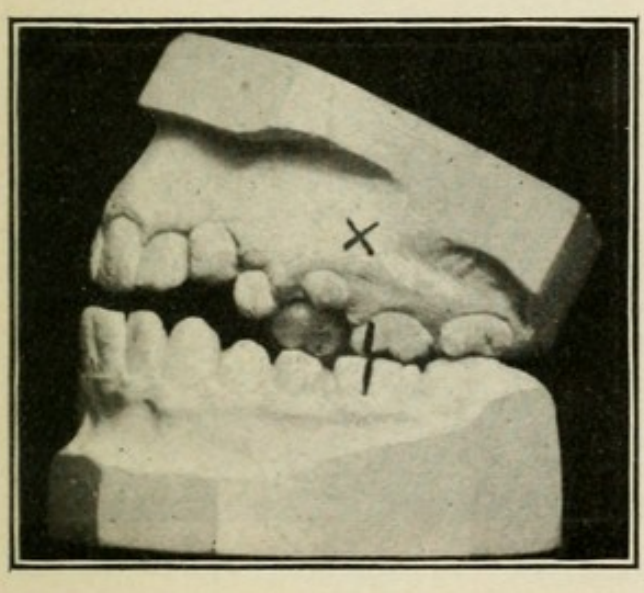


FIG. 19.



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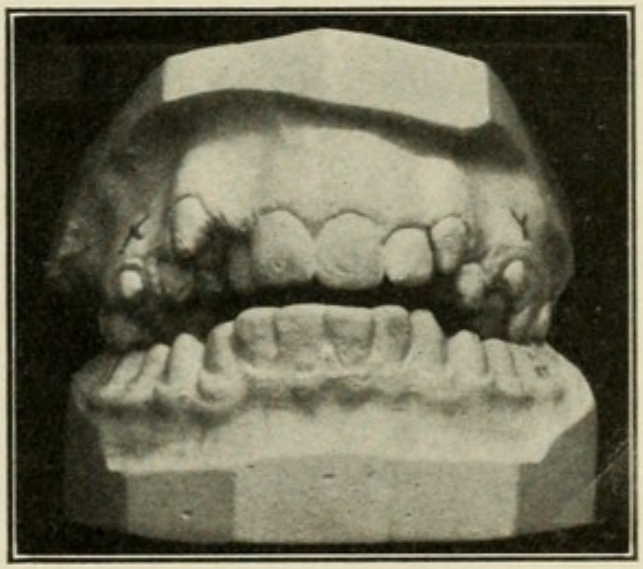

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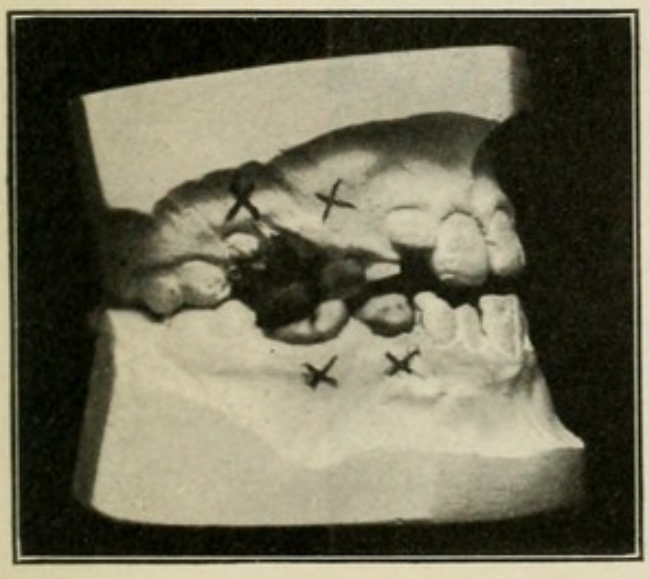
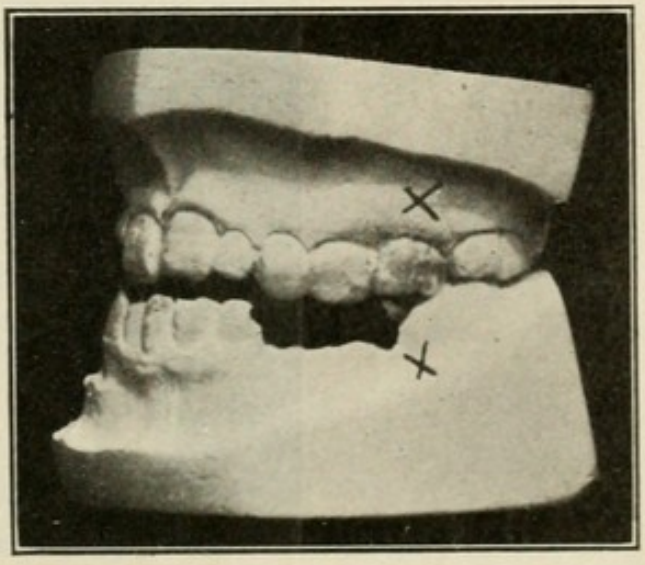


FIG. 22.



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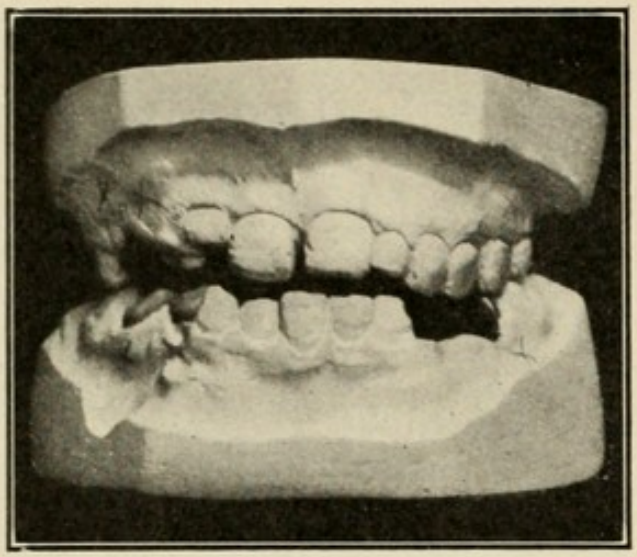

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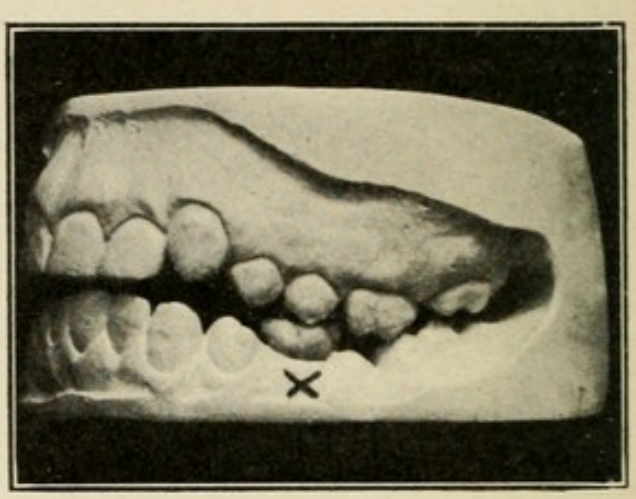

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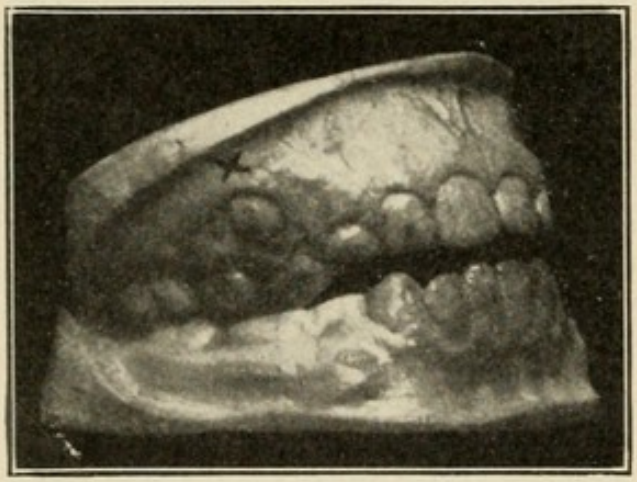

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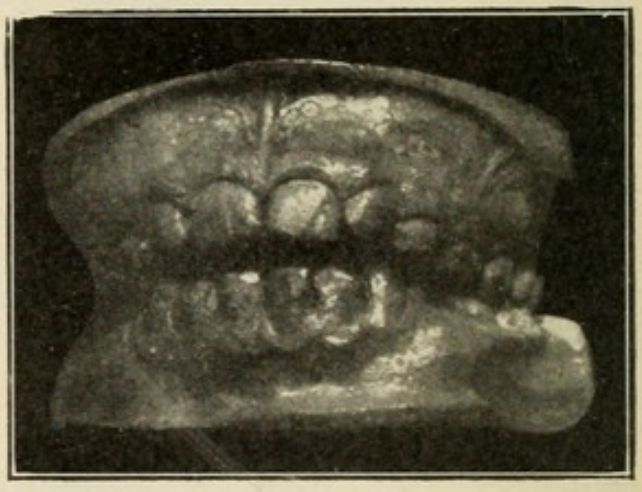

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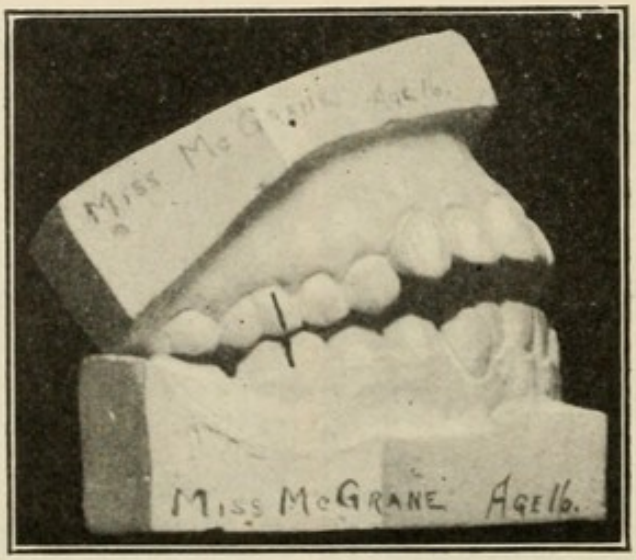


FIG. 28.

good idea of the conditions which existed in this case. Immediately after the impressions were taken the eight temporary molars were extracted and placed in the impression, because it was the writer's intention to get models which represented the original condition as nearly as possible.

Fig. 25 illustrates a peculiar case. The lower first and second bicuspids are erupting mesial and distal to the lower second temporary molar. The reason for this is that the lower first permanent molar had been extracted. This temporary molar was extracted because it was producing infra-occlusion.

Figs. 26 and 27 illustrate a case where the upper temporary molars on the right side had caused open-bite malocclusion. This model was found in the college collection and bears the date of 1884, clearly showing that the same conditions existed years ago.

Fig. 28 illustrates a typical case of open-bite malocclusion which was doubtless caused by too long retention of the deciduous molars, for the patient is not a mouth breather, nor does she remember ever having been addicted to any of the so-called "habits" of childhood, although she does remember having temporary teeth extracted only three years prior to treatment.

CHAPTER IV

FACIAL ART

It has already been pointed out by a great writer in Orthodontia that a large number of our patients would not reach us were it not for the fact that great inharmony in the features of the face is so closely associated with malocclusion. In fact, facial harmony is so closely connected with normal occlusion that there cannot be deviation in the one without proportionate disturbance in the other. To those who understand the classifications, it is easy to diagnose pronounced cases which belong to Classes II and III, without even *examining* the teeth or *taking the impression.* And the writer believes it would be good practice for the student, being assigned a case in the clinic, to make such diagnosis mentally before examining the teeth and taking the impression, so that comparison could later be made for verification.

The use of the clay model of the face in lectures is for the purpose of impressing upon the student the indissoluble association of facial harmony and occlusion, of facial inharmony and malocclusion. The plaster cast, Fig. 29, was taken from a face where normal occlusion is evidenced by proportionate harmonious development of the facial lines.

In Fig. 30, the profile of a patient suffering with marked distoclusion is represented in moldable clay. The upper part of the face is molded along lines similar to those shown on the upper part of the plaster cast, Fig. 29 but the lower jaw is set back in a *receding* manner, which is typical of pronounced cases of this type.

In Class III, Fig. 31, the apparent protruding chin is

effected by *retruding* the upper jaw and lips, this also being typical of this class of malocclusion. Of course there might be complications arising in both Classes II and III, for instance

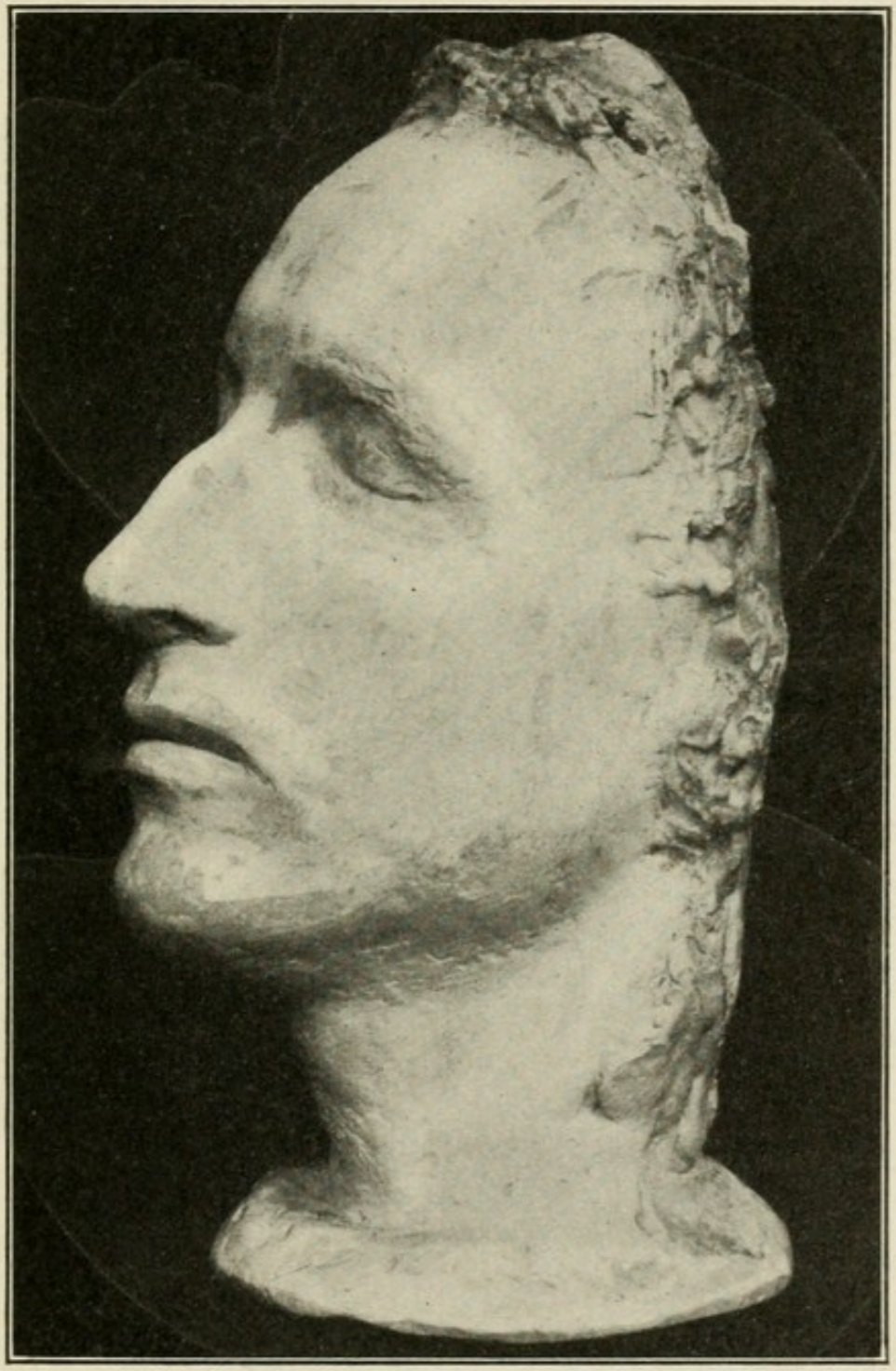


FIG. 29.

in Class III there might be lack of development in the upper arch associated with pronounced development of the lower arch, although this is rare, and when seen is probably

due to loss of the interdigitating relations of the occlusal inclined planes of the cusps of the teeth; for where the lingual surfaces of the lower incisors occlude against the labial

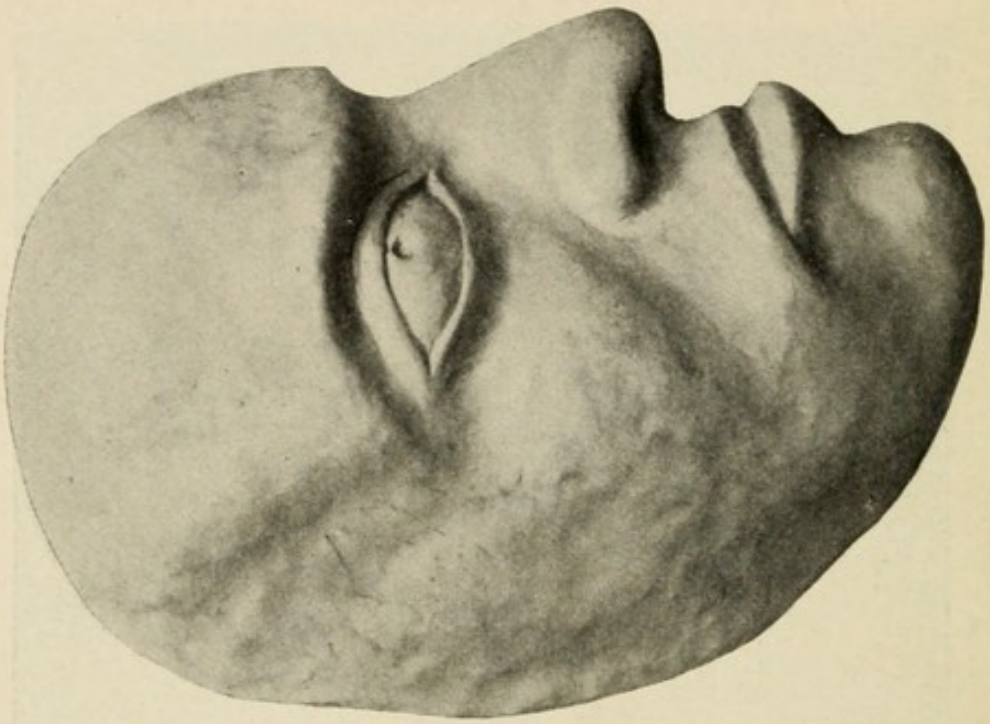


FIG. 31.

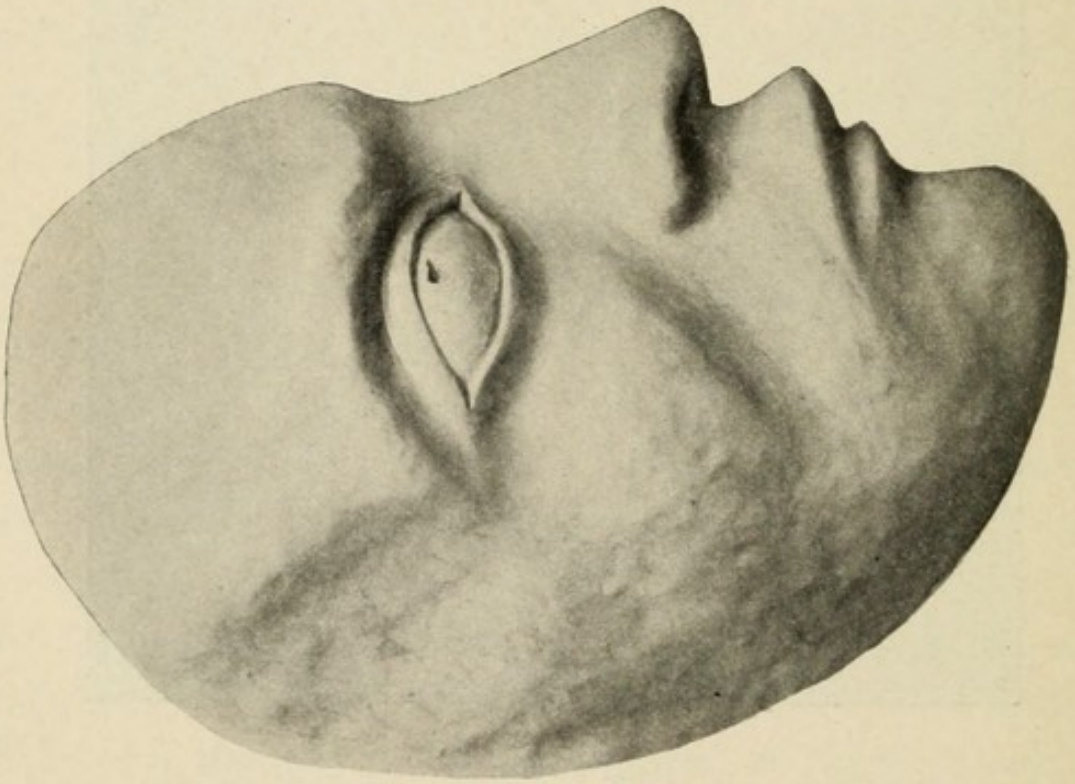


FIG. 30.

surfaces of those of the upper jaw, would not that be a factor in causing greater inharmony in the relations of the dental arches?

The constant labial pressure against the upper teeth prevents any further development of that arch, while the force exerted against the lingual surfaces of the lower teeth would stimulate that arch to further development, as is sometimes seen where there are spaces between the lower cuspid and bicuspid, Figs. 32 and 33, while the upper arch is sadly lacking in development.

In cases of this abnormal inlocking of the upper incisors, should the supper arch succeed in further development there would be likewise further development (abnormal) of the

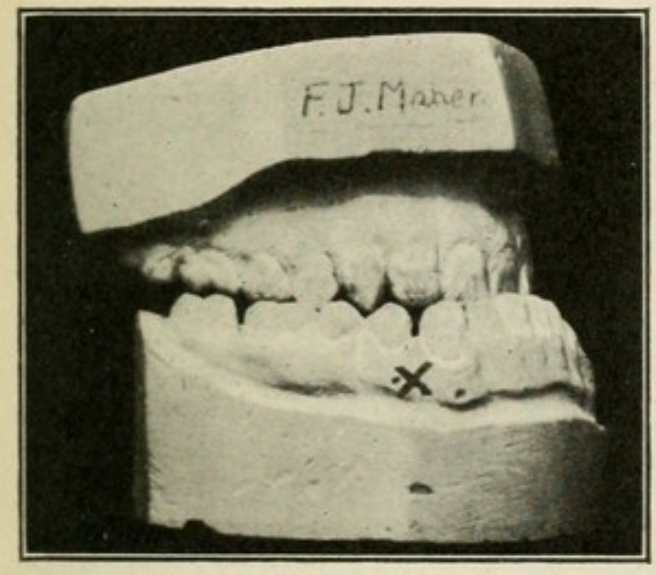


FIG. 32.

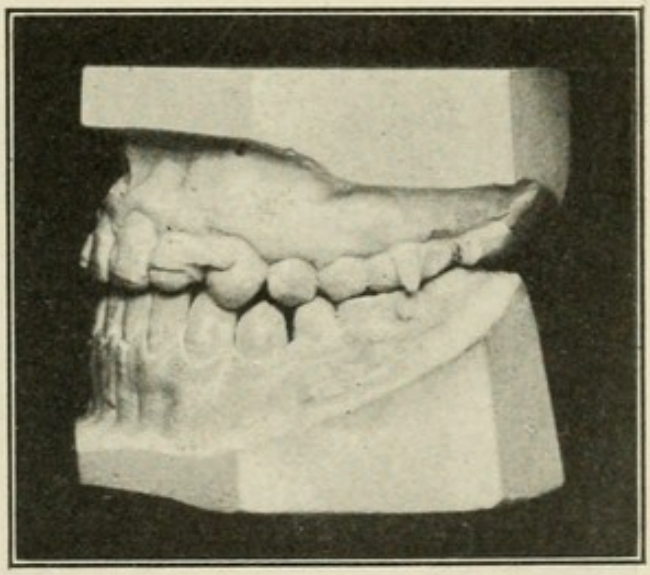


FIG. 33.

lower arch, which would complicate matters still more, for the distal movement of the lower teeth in this class is not so easily accomplished as mesial movement of the upper teeth.

The importance of early treatment in this class of cases can hardly be over-estimated. Figs. 34 and 35 show a typical, though not pronounced, case of Class III in a young girl of thirteen. The inlocked upper incisors were undoubtedly carrying the lower anterior teeth further forward than normal, although there was loss of molar teeth on both sides in the lower arch some three years before treatment.

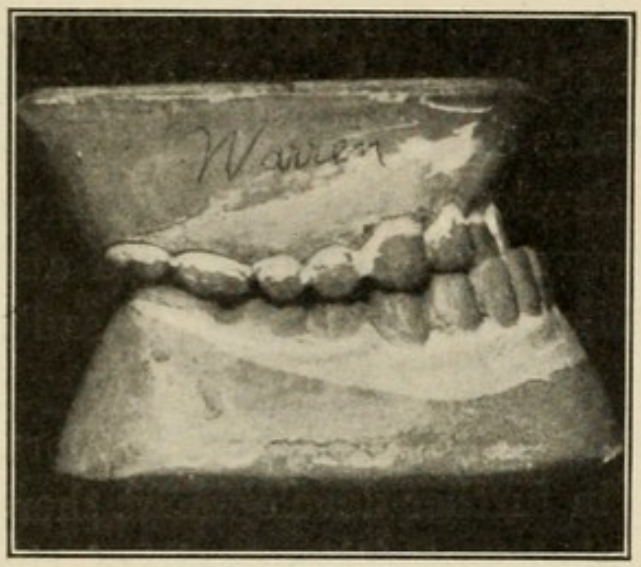


FIG. 34.

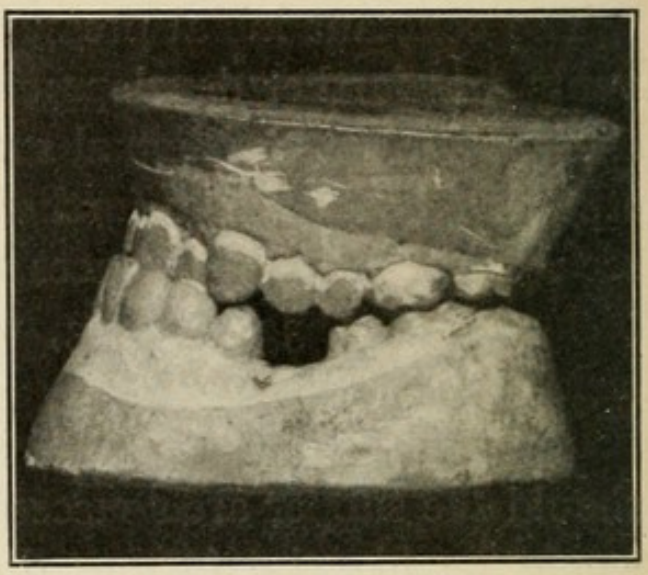


FIG. 35.

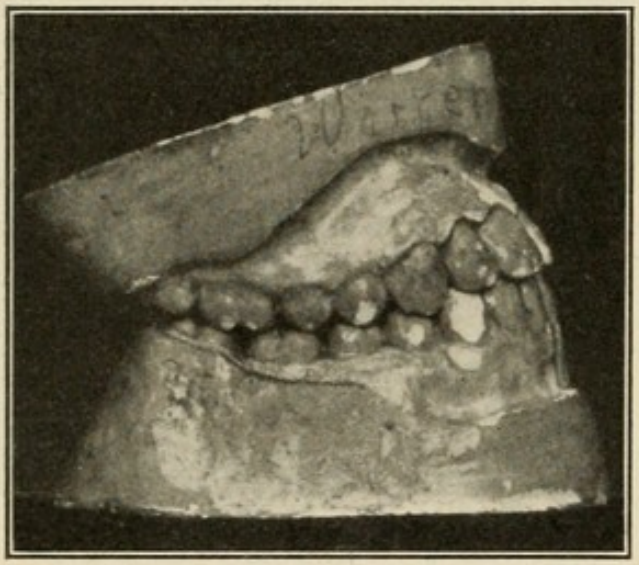


FIG. 36.

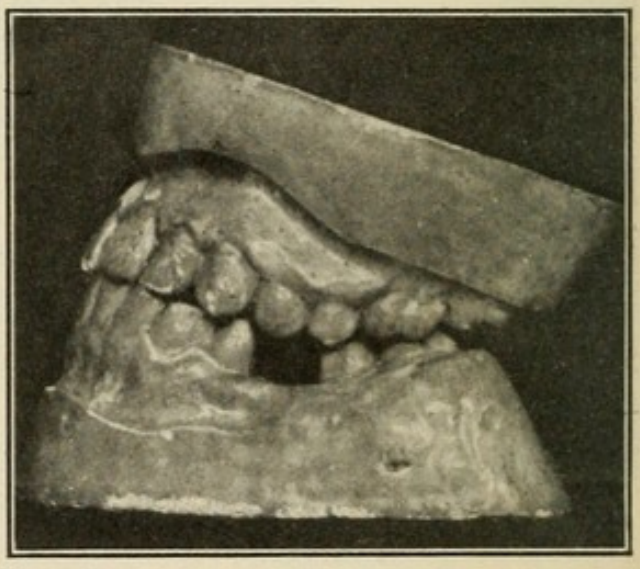


FIG. 37.

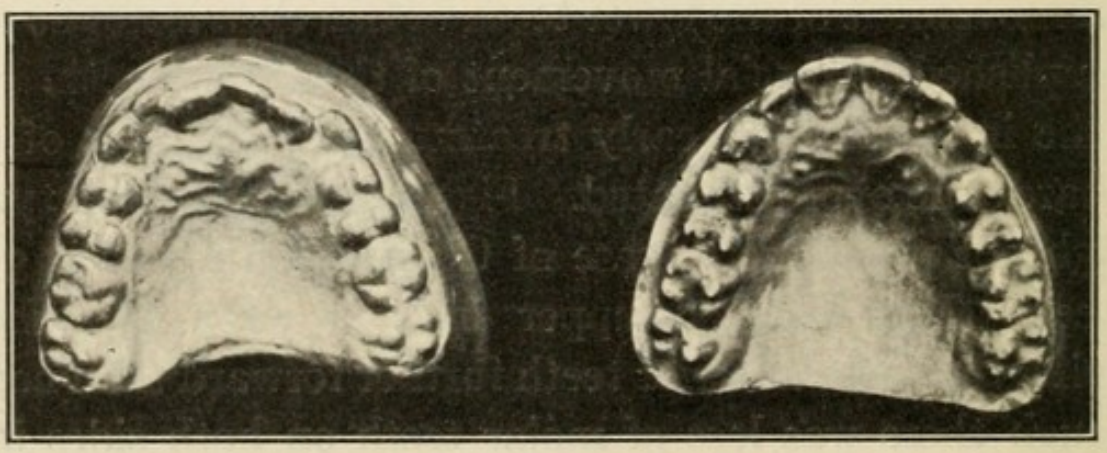


FIG. 38.

FIG. 39.

Figs. 36 and 37 show the case immediately after treatment. This is a peculiarly interesting case from the fact that this same case has, six years later, developed into a Class II case, the lower anterior teeth having drifted back into the space made through the loss of molar teeth at the age of ten years, for after the pressure was removed from the lower anterior teeth, they slowly drifted distally. Figs. 38 and 39 show occlusal views of the case before and after expansion of the upper arch.

It is the writer's belief that the use of the clay model is far more effective in teaching facial art in its relation to occlusion than the use of chart diagrams of the face. Surely the indisputable fact of the close association of the two could not be portrayed more vividly than in Figs. 29 and 30.

CHAPTER V

IMPRESSION AND MODEL MAKING

The majority of orthodontists agree on plaster as an impression material, and there is no doubt of its superiority over other impression materials; however, it is the writer's belief that it is better for the student to use modeling compound.

Good models can be made from modeling compound impressions, if carefully and intelligently handled. The writer has reached this conclusion, after having tried to start classes to take plaster impressions from the beginning. In 95 per cent. of these cases failure resulted, due no doubt to the fact that the beginners were not familiar enough with the working of plaster to handle it with self-confidence, for as soon as they experienced any trouble in dislodging a portion of the impression they became excited and nervous and this was quickly transmitted to the patient, with disastrous results.

After one has become familiar with the taking of impressions, then it would be wise to use plaster and proceed along prescribed rules for using this material.

In the use of modeling compound select trays that are slightly larger than the arch, always using the specially made trays, for they are the only ones which will carry the impression material high up underneath the lip and cheek, which is very essential in order to obtain good models (Figs. 40 and 41).

After selecting the proper tray and trying it in the mouth, soften the compound in warm water, as this more evenly

distributes the heat than where dry heat is employed. Place the softened compound in the selected tray, using a larger amount of compound in the anterior part of the tray for either upper or lower impression. Then force well into position and hold securely in place with the second finger of the left hand in the palatine portion of the tray (Fig. 42). Then place the index finger of the right hand at the heel of the tray and go around the edge of the tray, forcing the compound well under the lip, after which the lip should be pressed gently against the compound and tray in order to adapt the impression material more accurately.

Next take a syringe, which has been previously filled with cold water and chill the impression thoroughly, then carefully remove the impression and wash it immediately in cold water, after which it may be poured at an opportune time.

TAKING PLASTER IMPRESSIONS

Before proceeding to take an impression, it is well to remove any tartar which may be present and polish the teeth thoroughly with an orangewood stick and pumice. *Never use bristle brush wheels in the engine.* Select a tray that is slightly larger than the arch, practically the same as if using modeling compound, with the exception that the tray must be absolutely smooth and free from scratches. Any bending of trays must be outward, and not inward, as it is necessary to remove the tray from the plaster.

Place medium stiff plaster in the anterior part of the tray, and with the spatula distribute a little to each heel of the tray. Always have an excess of plaster in the anterior part of the tray so as to get a high impression (Fig. 43).

In taking an upper impression care should be exercised to avoid getting any plaster in the palatine part of the tray, as

this would force back on the soft palate, annoy the patient and possibly spoil the impression altogether. Gently force the tray into position and hold it as when using modeling compound. Never attempt to hold the tray by the handle. Then with the index finger of the right hand, force plaster

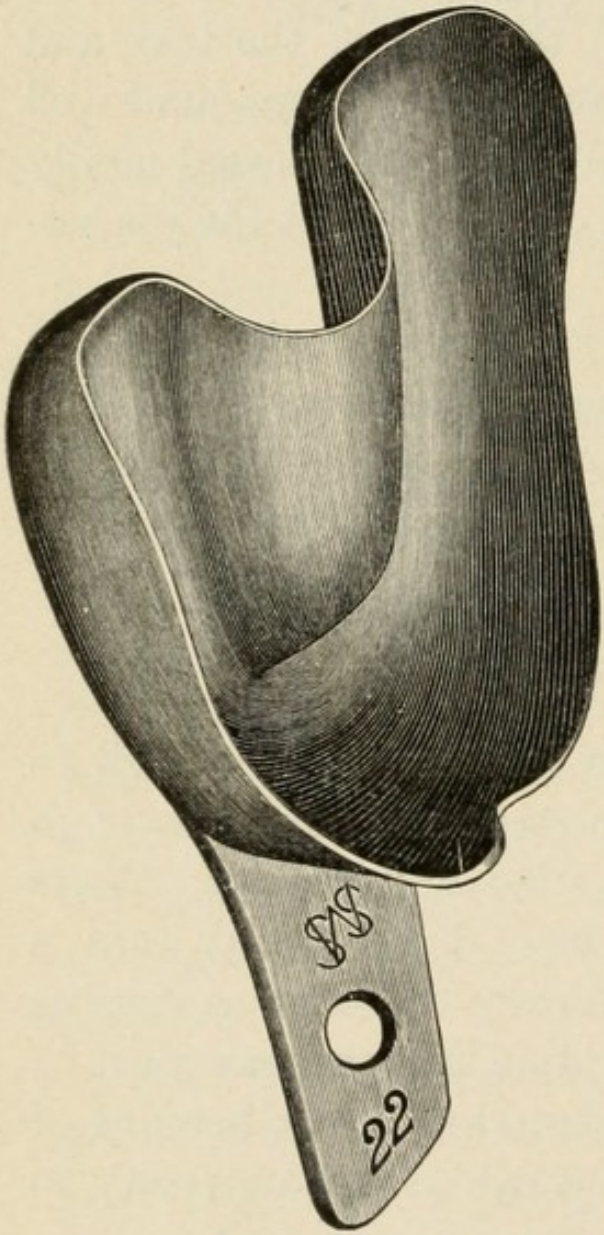


Fig. 40.

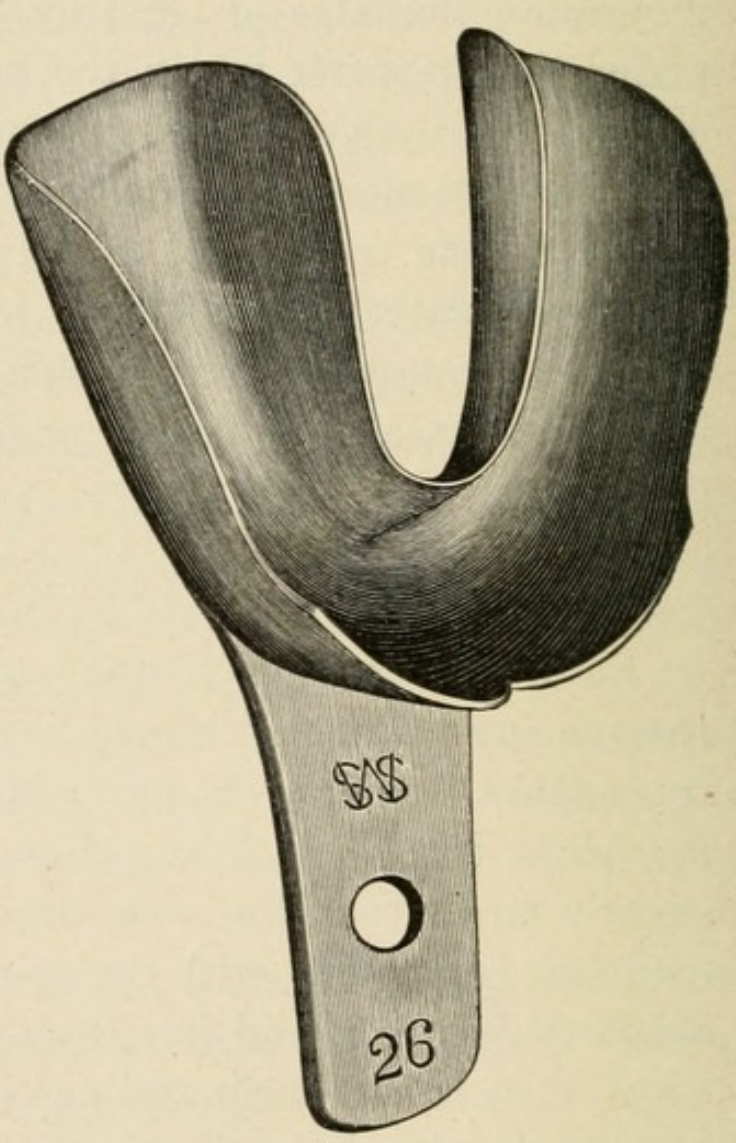


Fig. 41.

well up under the lip, after which the lip should be drawn gently toward the handle of the tray and released. The excess plaster on the handle of the tray should next be removed with pledgets of cotton.

After the plaster has hardened sufficiently (use remaining

plaster in bowl as a test), remove the tray, being careful to avoid removing any plaster with the tray (Fig. 44). Cut two grooves almost through the plaster at the cuspid region (Fig. 45). Then break away the labial section, using the impression remover (Fig. 46). Next break the two buccal sections away, using the impression remover as before. With the special impression remover (Fig. 47), gently loosen the lingual section, and if the tray has been forced well into position and care been exercised there should be only four pieces of the impression to assemble (Figs. 48 and 49), although more pieces than this should occasion no regrets. The assembling of the impression should be done outside the tray,

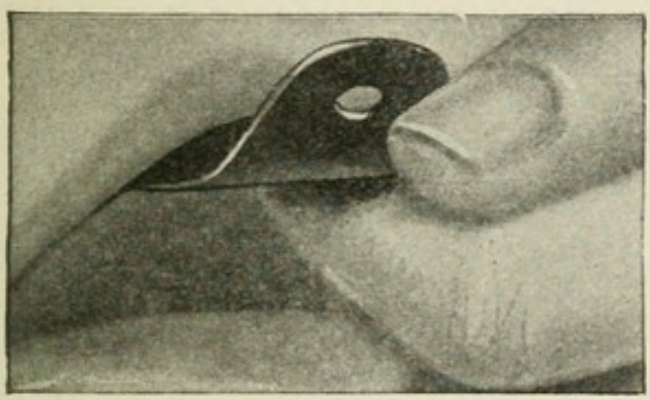


FIG. 42.

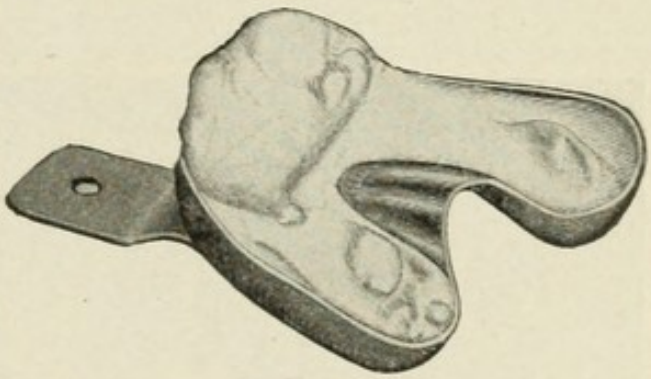


FIG. 43.

unless the impression is badly broken, when it is advisable to use the tray, as this will aid in assembling the small fragments, preventing loss of the fine serrations, which would otherwise happen with frequent handling. The united parts should be held by means of melted wax flowed over the outside of the impression.

IMPORTANCE OF GOOD MODELS

It is of the utmost importance that the models shall be as nearly perfect as possible, and it is impossible to get perfect models without first securing good impressions. On the other

hand, models, no matter how perfect the impression, lose their value if poured in a haphazard style. Plenty of plaster should be used in pouring up impressions so that they may be trimmed along certain prescribed artistic lines. Never build up a model higher at the anterior part than at the heel. (See Fig. 50.) The correctly trimmed model is shown in Fig. 51. The lower model is trimmed along similar lines to that of the upper with the exception that the lower is usually rounded from cuspid to cuspid as shown in Fig. 52.

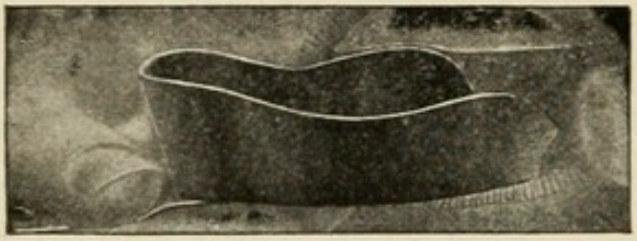


FIG. 44.

During the progress of treatment of cases reference should

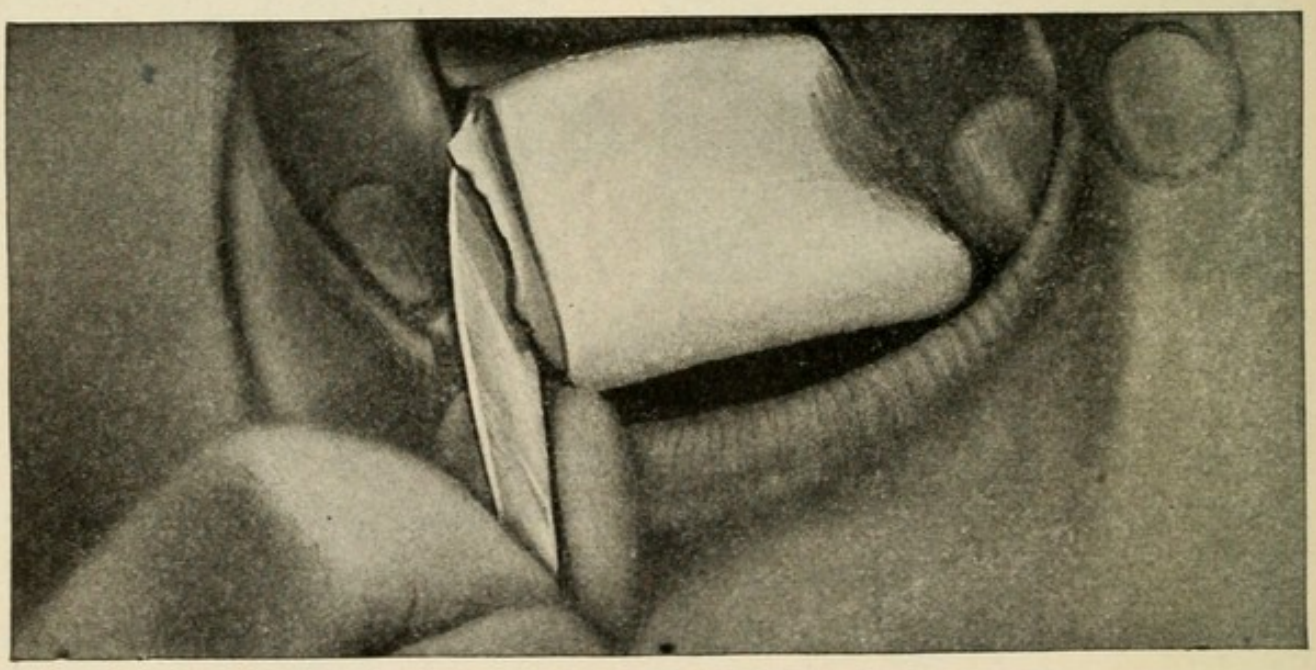


FIG. 45.

frequently be made to the original models. This is important, for patients are quick to note changes which occur in their teeth.

Models should not be varnished; nor should they be articulated. Comparing the models with the occlusion of the

teeth in the patient's mouth, marking them lightly in order to serve as a guide for their relation, is far better and more artistic than to detract from their appearance through the use of articulators.

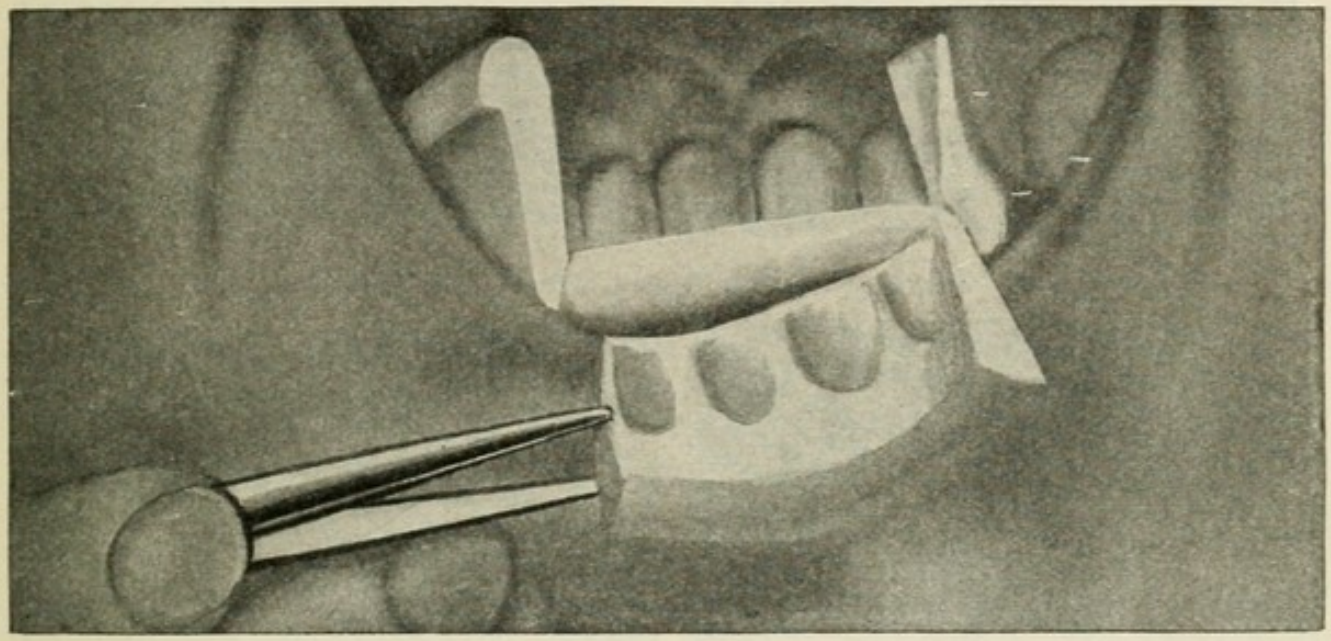


FIG. 46.

After the desired tooth movement has been accomplished; the appliance removed and teeth cleaned preparatory to fitting retention devices, impressions should again be taken in order to obtain models of the corrected case. These models should

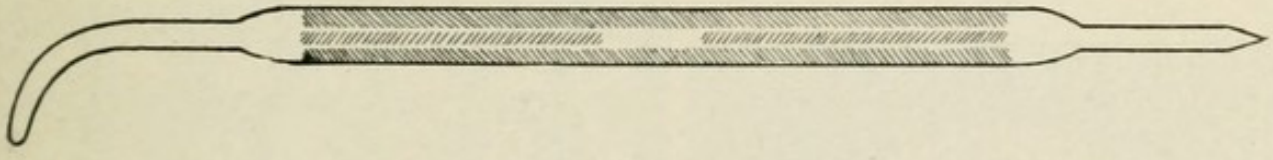


FIG. 47.

be deposited in the cabinet alongside those secured at the beginning of the treatment so that comparison may be made, and a study of the changes in position of the teeth be noted, which is of material importance in deciding on a means of retention.

Models should be labeled and placed in a suitable cabinet for future study and reference. (See Fig. 53.)

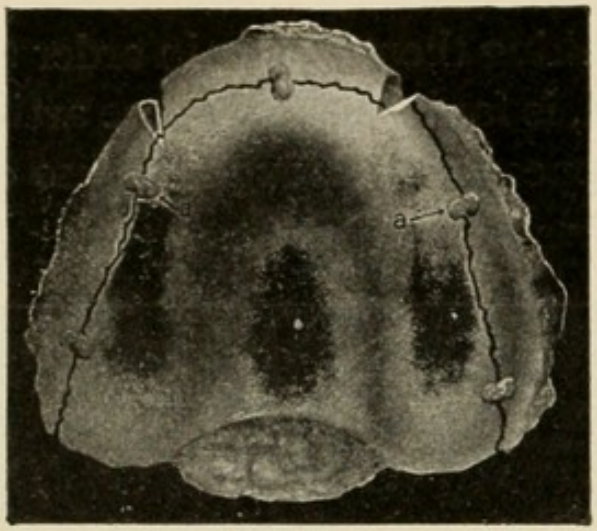


FIG. 48.

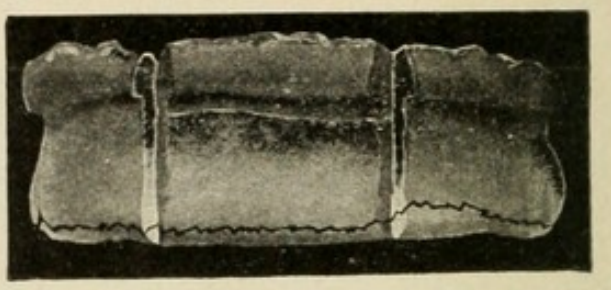


FIG. 49.

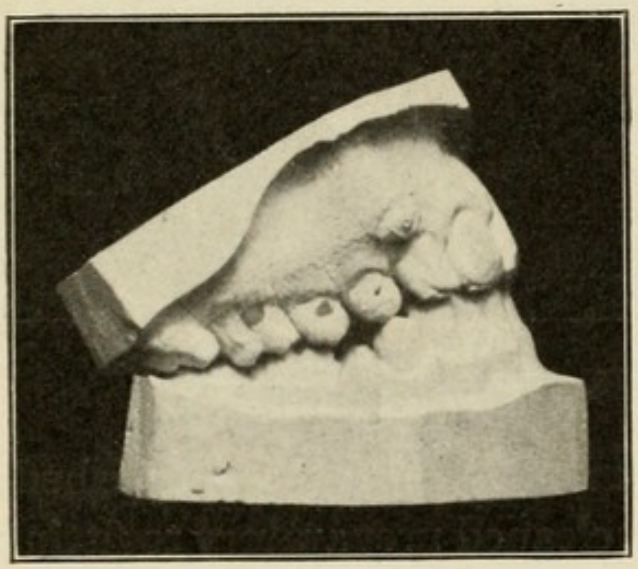


FIG. 50.

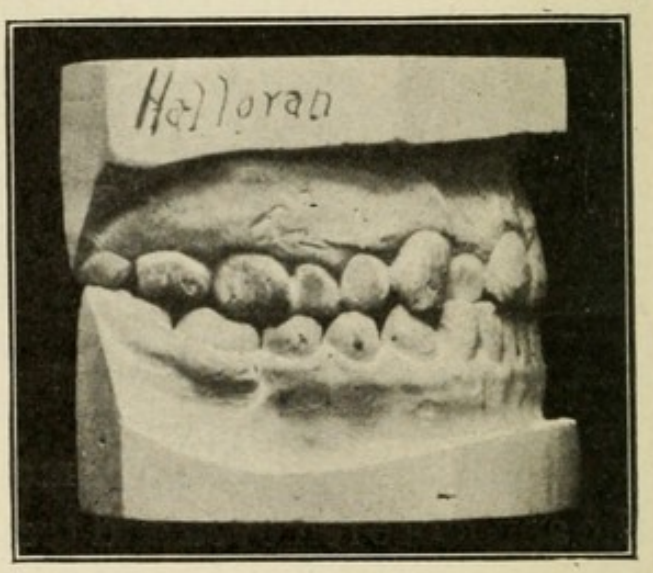


FIG. 51.

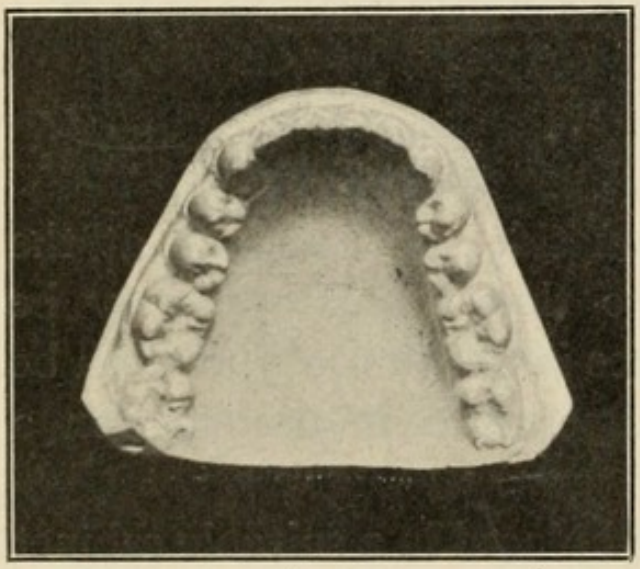


FIG. 52.

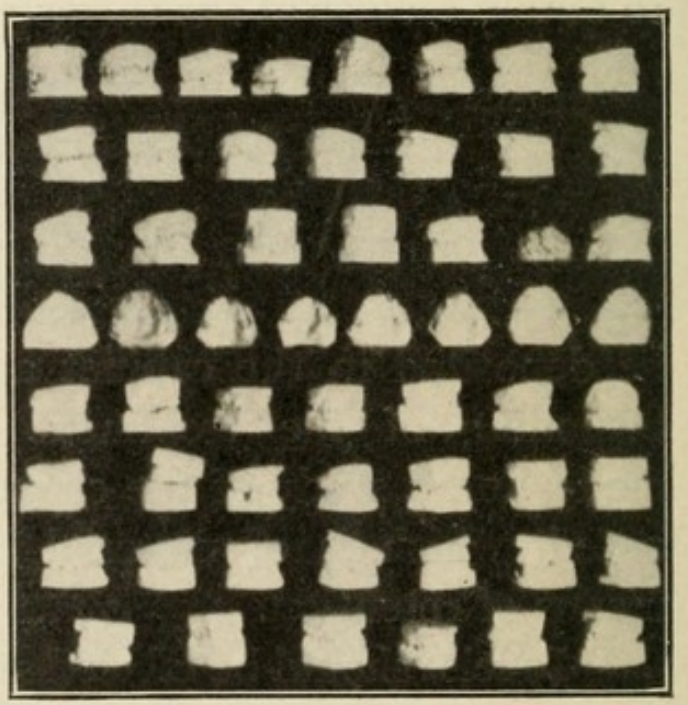


FIG. 53.

CHAPTER VI

BAND-MAKING

There are various kinds of ready-made bands on the market, but a carefully made plain band is far better than any of these, and they can be made and adapted in about the same length of time that it takes to adjust a ready-made band. The writer's method is to cut strips of nickel silver of two thicknesses, about 34 and 35 gauge and place in a suitable box (Fig. 54) ready for use.

On being assigned a case, and after having determined upon the method of procedure, select a strip of band material from the stock box of suitable width, *then draw it through the band-forming pliers* (Fig. 55) in order to smooth down the upturned edges. Next adapt around the tooth to be banded and pinch together on the lingual surface of the tooth, *always drawing the band together on the lingual side in order to leave the buccal side free for the soldering of the sheath or tube.*

Still holding the ends of the band together with the band-forming pliers, remove as a whole by manipulating the pliers.

If the teeth are badly crowded together this may be impossible. In such cases release the grasp on the band material with the pliers, then work the band from the proximal surfaces. After removal, adapt the ends together and hold with the band-soldering pliers.

Do not weaken the band by cutting it out on the proximal.

In order to be stable the band should remain the same width all around and should go under the gum on the proximal surfaces.

Plain bands adapted to teeth and allowed to be worn for a day or two before soldering the sheaths or tubes, will gain space, and allow of greater ease in cementing.

Bands should not, however, be allowed to remain in posi-

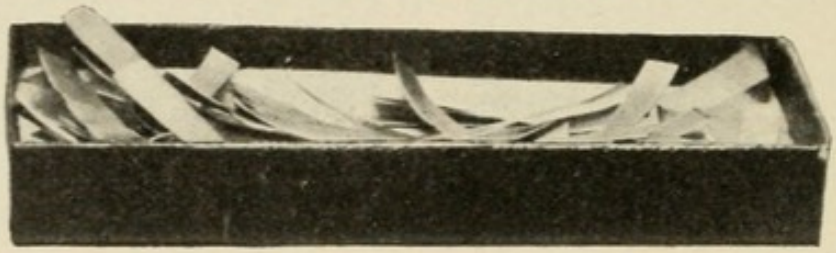


FIG. 54.

tion longer than two days uncemented, for fear of injury to the enamel.

Where the teeth are wedged together near or approximating the tooth to be banded, it is well to secure a space on one proximal surface of the tooth to be banded by means of a

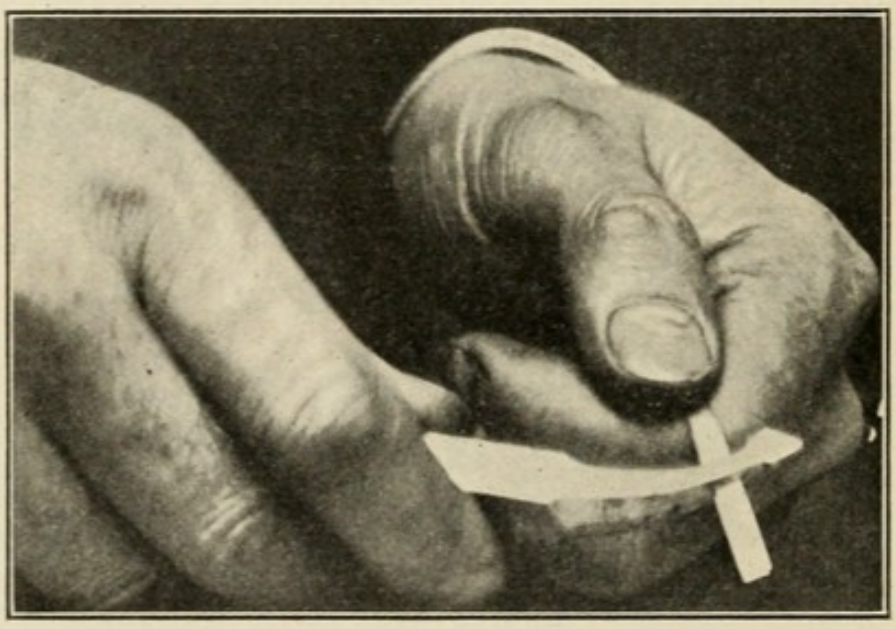


FIG. 55.

thin separating rubber strip, placed in position on the day previous to the construction of bands. *Never allow the rubber strip to remain in position longer than one day and night, for fear of injury to the gums.* Remember that the contact point

of the teeth is near the occlusal surface, so do not allow the rubber to slip entirely into the inter-proximal space (Fig. 56). The correctly placed rubber is shown in Fig. 57.

One rubber strip is sufficient to each tooth to be banded. *Never use two*, as this would cause soreness of the tooth and is altogether unnecessary.

The securing of space is advisable in most cases, for where the teeth are close together the band material will not slip in between them on being drawn together with the pliers, although it might be difficult to remove, giving the beginner the false impression of a close-fitting band, when the difficulty was altogether in the inter-proximal spaces.

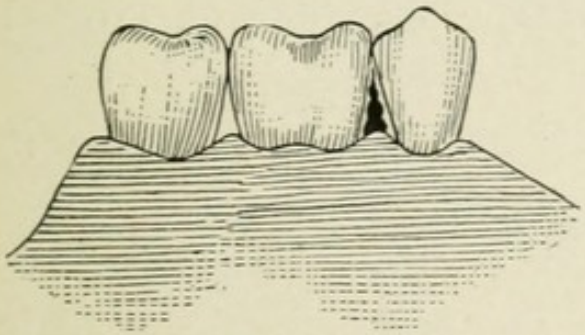


FIG. 56.

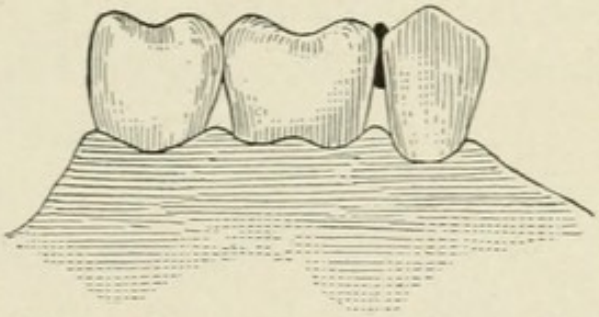


FIG. 57.

Where it is necessary to band any of the anterior teeth gold or gold and platinum plate may be substituted for nickel silver. Cut the plate into strips similar to the nickel silver, but the gold must be of a greater thickness, as it is not nearly so tough.

Plain bands possess a distinct advantage over ready-made bands in that the tubing can be readily changed and re-aligned to suit the needs of each individual case. This is not so easily done in certain forms of ready-made adaptable bands, although there are other makes of adjustable bands which permit this, but, unfortunately, they have adjusting nuts on the lingual side which interfere more or less with the tongue.

Soldering.—Cleanliness is very essential in all departments of orthodontia, but nowhere is it more so than in soldering.

After the band material has been adapted and removed from the mouth it should be held in running water to remove the saliva.

After having adjusted the ends together, grasp them with the band-soldering pliers, place a little flux just at the contact point, then hold in the flame just long enough to dry the whole band; this will prevent the solder from jumping. Place the solder in the desired position. The use of the wire solder is recommended in soldering bands. Now remember that solder will flow in the direction of the greatest amount of heat, so in order to prevent its flowing out on the sides of the band, hold not the whole band in the flame, but only that part to be soldered, as shown in Fig. 58.

A small pointed flame is essential to good soldering in orthodontia work. The ordinary Bunsen burner is unsuited for this work. The writer has made good use of an S. S. W. gold annealer Bunsen (Fig. 59). The flame from this little Bunsen can be controlled almost as well as that of a blowpipe with the advantage of being more convenient, for soldering bands. But for soldering spurs and other more delicate parts of an appliance, the use of a Grünberg blowpipe is recommended, as shown in Fig. 60.

The correct method of soldering the buccal tubes and spurs is shown in Fig. 61. Notice that it is necessary to steady the hands by contact of the third and little fingers.

Soft Soldering.—Where it is necessary to retain the temper in the expansion arch and at the same time spurs are required, it is advisable to use jewelers' soft solder; it can be obtained in very thin sheets. Only a very small piece is necessary for these attachments. Phosphoric acid makes a very good flux (cement liquid).

Great care should be exercised in order to avoid heating the expansion arch any more than is necessary. Very little heat is required; the only trouble is in confining it tc the part to be soldered.

TREATMENT OF CASES

The application of the expansion arch and ligation of loose teeth in accidents and fractures.

When such cases present themselves for treatment immediate attention is necessary and it devolves upon the general practitioner either to give the treatment or else refer the

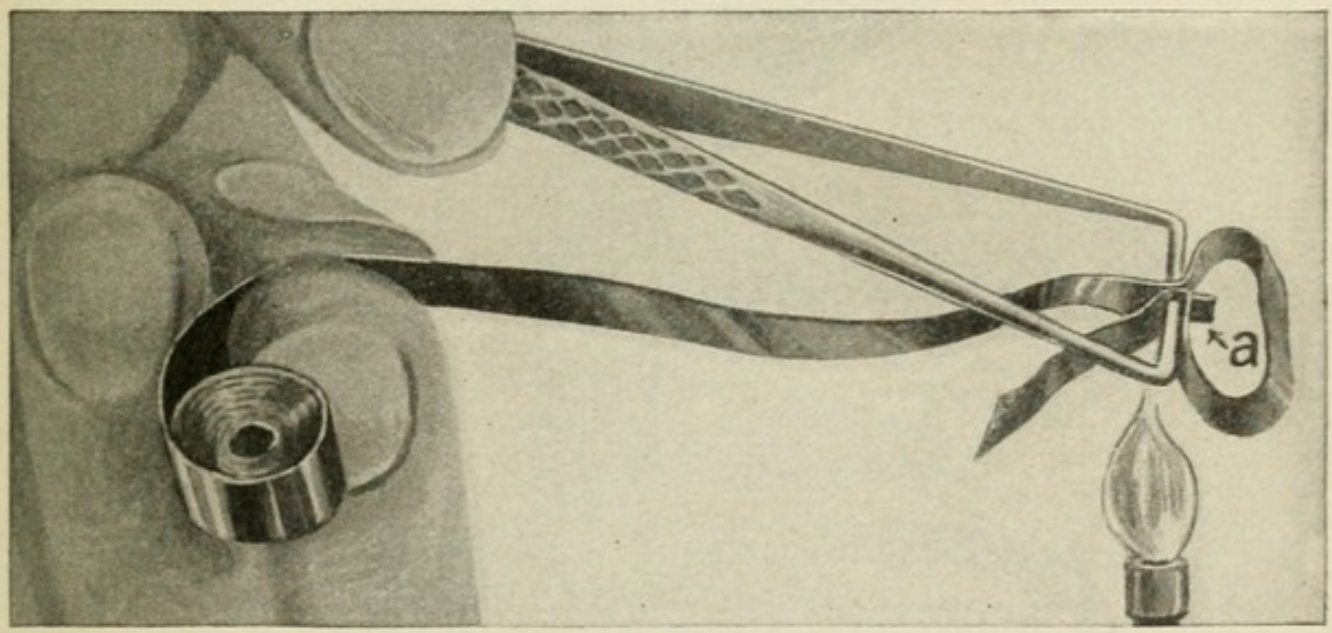


FIG. 58.

patient to a specialist. To the country practitioner this is an important subject, for it is his duty to treat such cases if there is not an orthodontist near enough to give his services.

The community expects and demands that the dentist give intelligent advice and service in such cases, and if there be no one to whom he can refer such patients it becomes his duty to render service in these cases. The city dentist has advantages over the country practitioner in that he is relieved from

further obligation on his part by sending his patients to a specialist.

The country dentist may have no such advantage, consequently he must be able to render service in such cases so far as his time will permit.

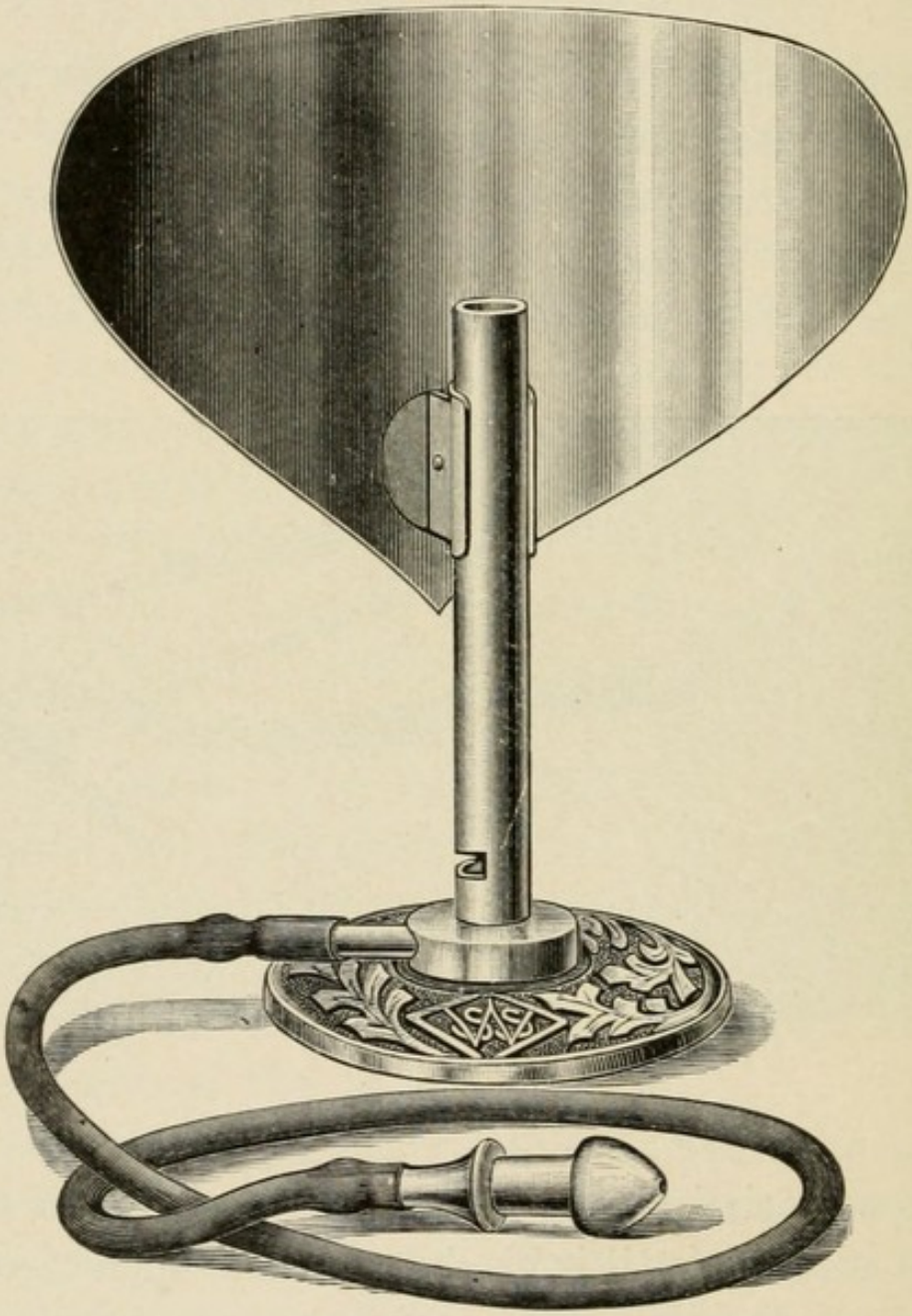


FIG. 59.

The remark is often made by students that they do not intend to do orthodontia work. Such students slight the course in this subject. It is all very well and good for the dentist to refer his patients to one who specializes in ortho-

dontia work, indeed it is the proper thing to do, but nevertheless he ought to be able to diagnose any case of malocclusion which might come under his observation and give such patients intelligent advice as to the need and importance of orthodontia work being done. Consequently, more attention

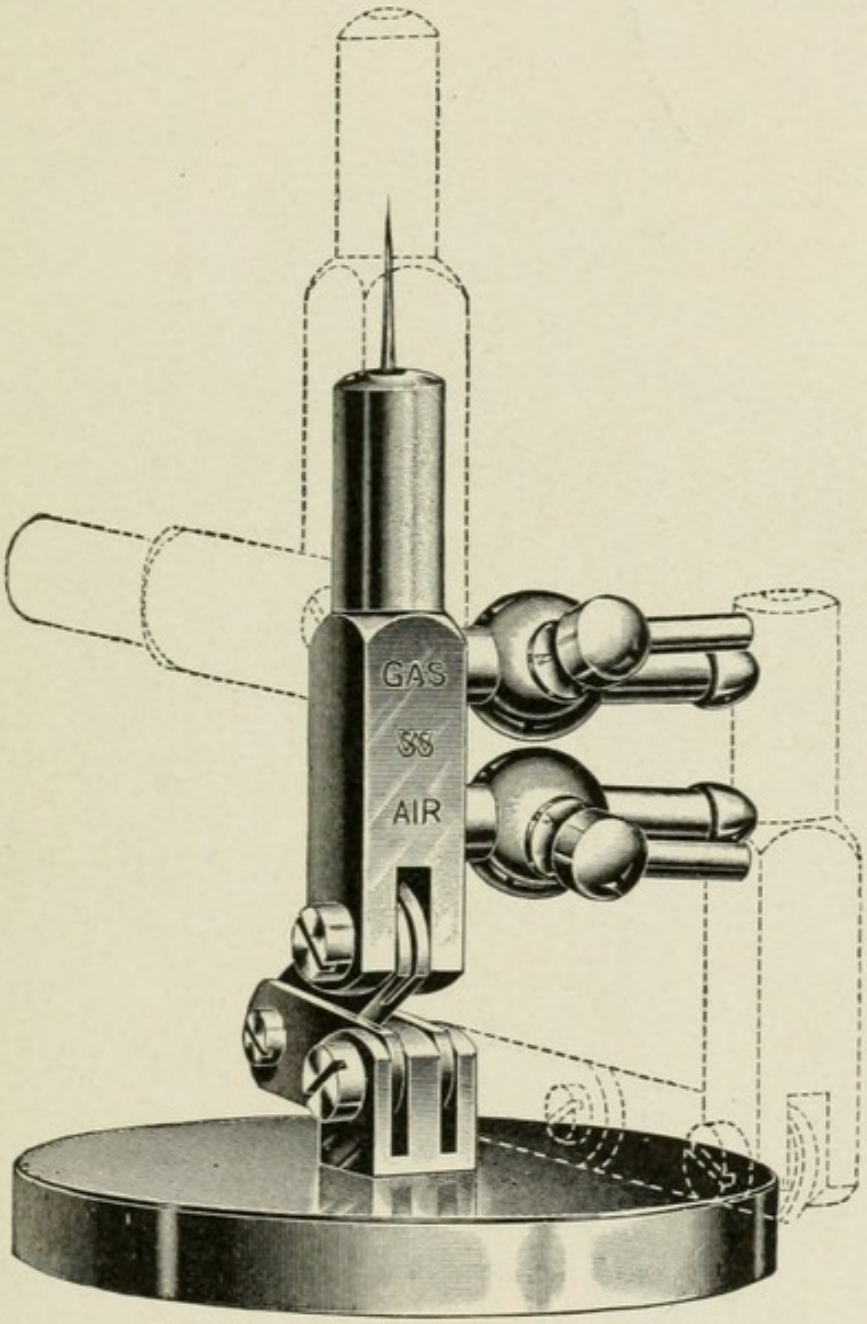


FIG. 60.—The Grünberg blowpipe.

ought to be paid to this very important subject by the students of general dentistry.

It will always devolve upon the country dentist to do the orthodontic work for those of his patients who have not the means to go to the city and be treated by the specialist.

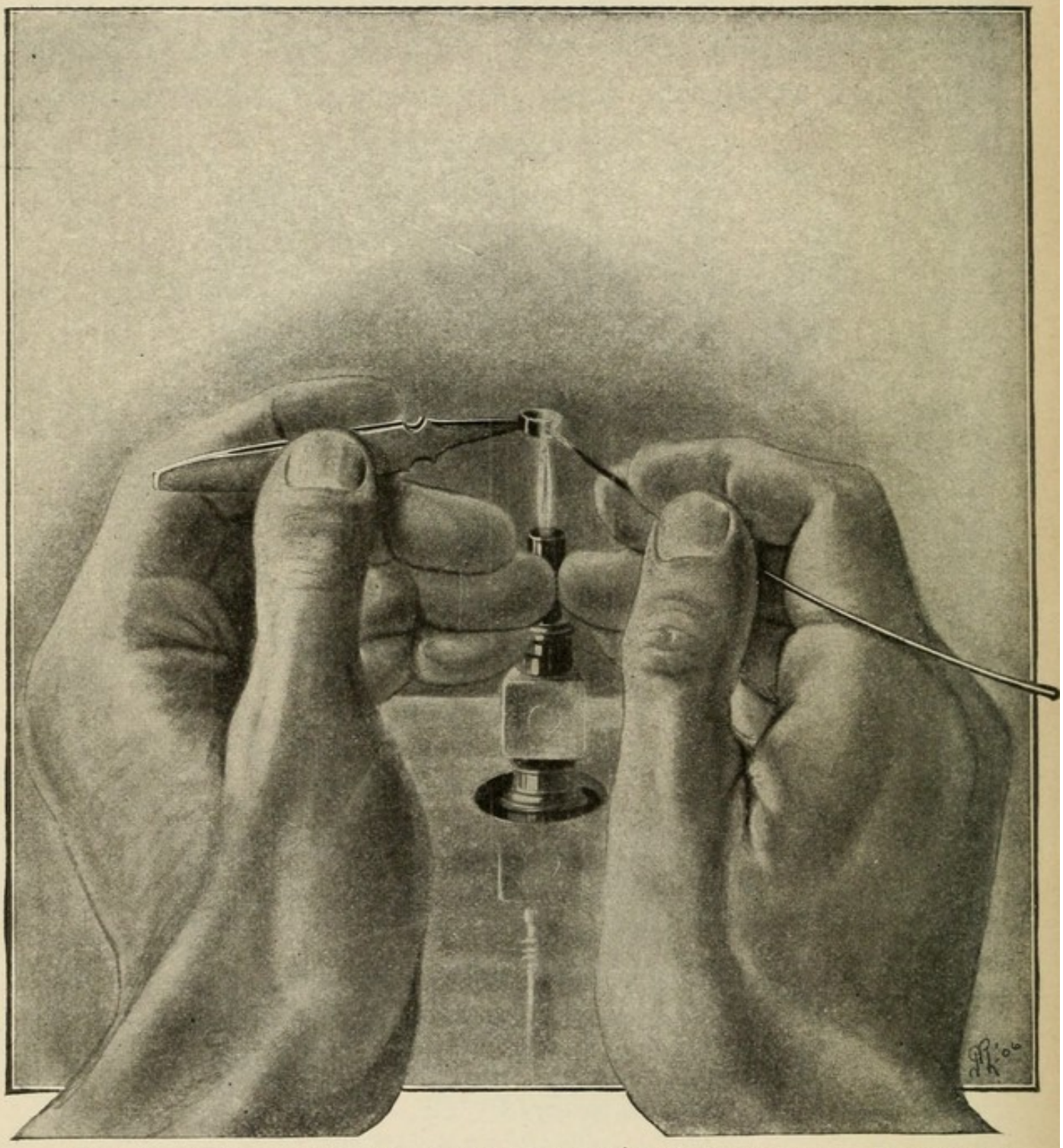


FIG. 61.—The correct method of soldering spurs is here shown. In soldering sheaths on anchor bands the tubing is held in a similar manner, except where the tubing has been cut to correct length, in which case it is held in contact with the band by means of a long piece of 16-gauge wire.

The writer does not wish to be quoted as advising dentists to do orthodontic work indiscriminately, for no one should attempt to take care of a case of malocclusion unless he has carefully prepared himself for this work.

A large number of dentists have done, and are still doing a great deal of harm by unintelligent handling of cases of orthodontia, as is evidenced by these same cases which later come under the care of the specialist, but not until after irreparable damage has been done. In nearly all such cases extraction has been resorted to through the mistaken idea that it would simplify the work.

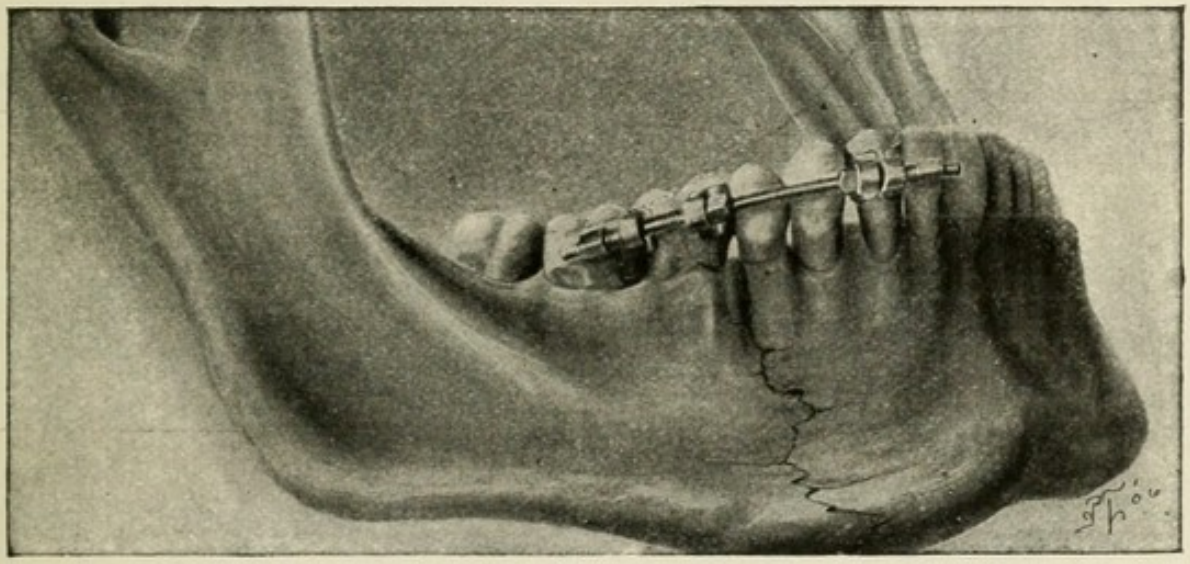


FIG. 62.—(After Lukens.)

The treatment of these cases becomes very difficult after extraction has been done, leaving the arches narrow and constricted through lack of development and the loss of cuspal interdigitation. In the light of present day teaching and literature on this particular branch of dental science, no one can be excused for mutilating the occlusal relationship of the dental arches through extraction.

The adaptation of anchor bands, with certain modifications, is called for in cases of fracture; where the teeth to be used for this purpose are not too sore and loose, the results

obtained are good, and moreover this method of treatment is more confortable and sanitary than where an interdental splint is used. (See Fig. 62.) The writer has also met with cases of accidents where the application of the alignment

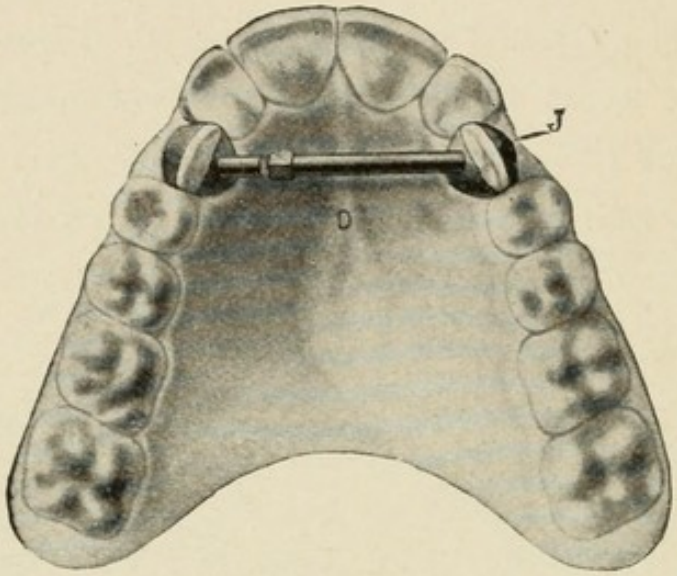


FIG. 63.—(After Lukens.)

wire rendered inestimable service. Most of these cases of accidents occurred in boys who had been engaged in the great American game and had suffered the misfortune of having

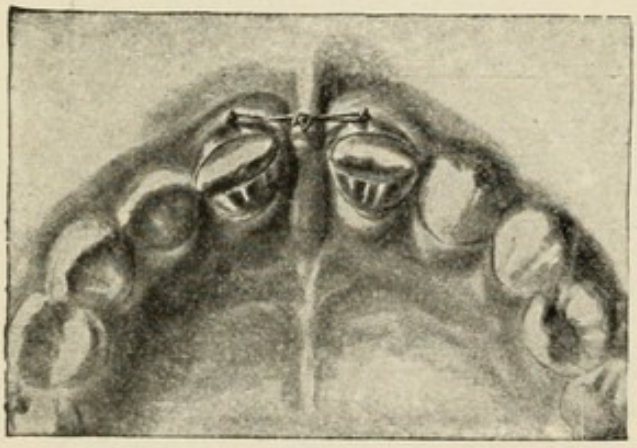


FIG. 64.—(After Lukens.)

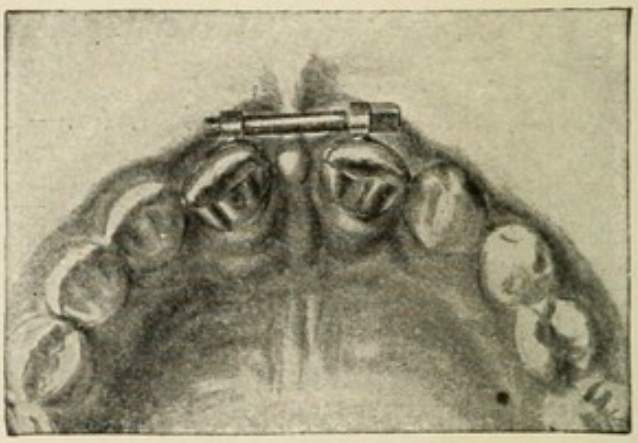


FIG. 65.—(After Lukens.)

the two, and in some cases the four, incisors badly loosened. These loosened teeth were ligated firmly to the alignment wire and antiseptic mouth washes daily prescribed until all soreness subsided. In such cases after four or five days, note

carefully the color of the teeth to see if the pulps have been involved. If death has ensued, the pulp chamber should be opened from the lingual, cleansed, treated and filled.

Application of the jack screw for the movement of upper cuspids that are in linguoversion is shown in Fig. 63.

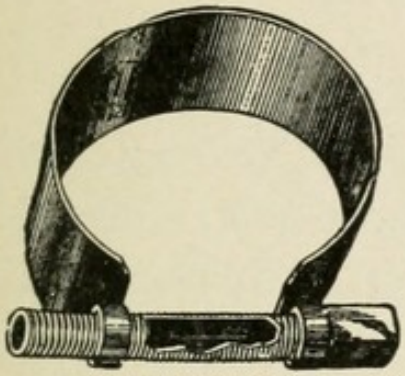


FIG. 66.

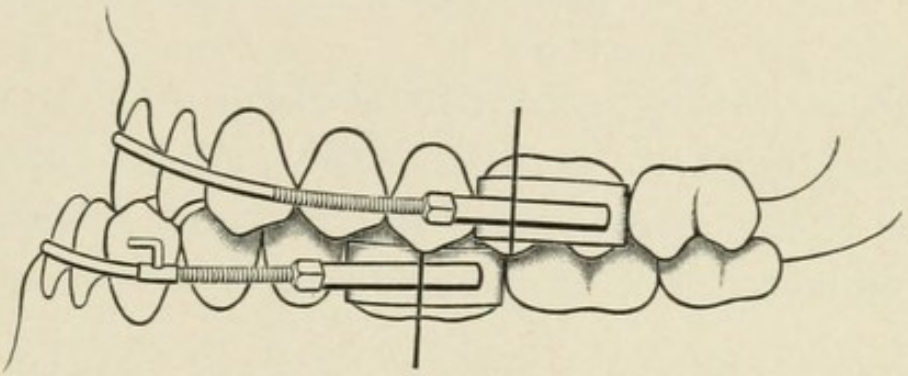


FIG. 67.—(After Angle.)

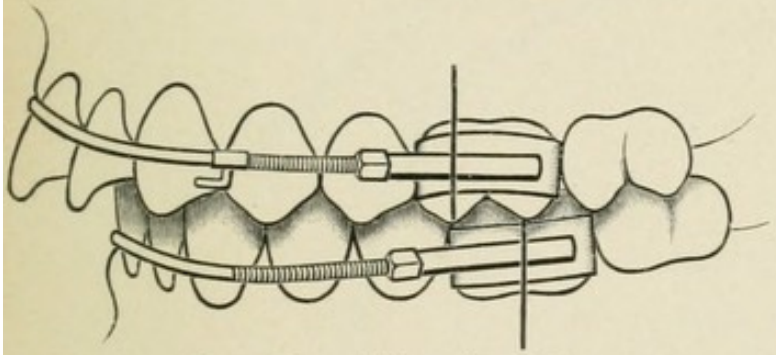


FIG. 68.—(After Angle.)

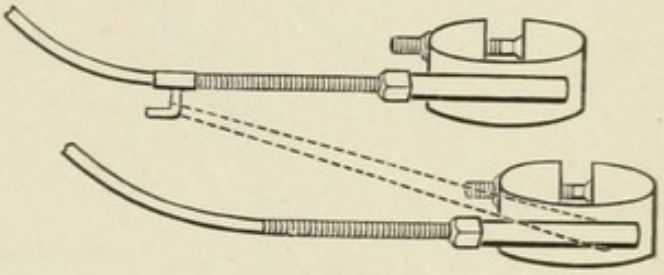


FIG. 69.—(After Angle.)

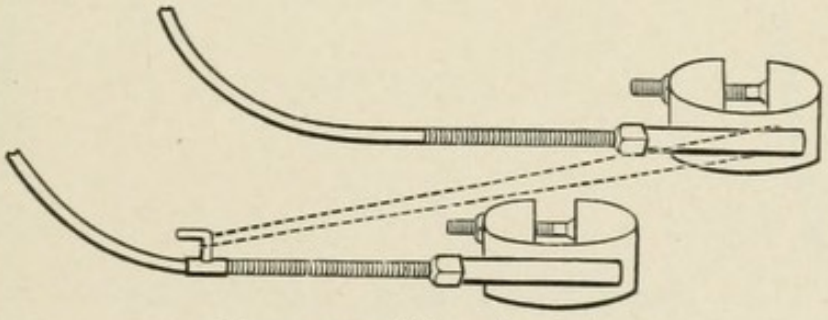


FIG. 70.—(After Angle.)

Effective methods for closure of spaces between the superior central incisors is shown in Figs. 64 and 65.

Fig. 65 shows a rather unique method of closing a space between the centrals. This is obtained by fitting plain bands

on the two central incisors, and instead of soldering spurs to the plain bands, the smooth bore and threaded eyelets are removed from a Lukens' molar clamp band K, Fig. 66, and soldered to the plain bands. The employment of two expansion arches to form an intermaxillary appliance is shown in Figs. 67, 68, 69 and 70.

CHAPTER VII

METHODS AND APPLIANCES

The expansion arch is the greatest and most efficient single appliance to be found in the whole category of regulating devices. The wonderful simplicity and ease with which it can be adapted, together with its efficiency in accomplishing

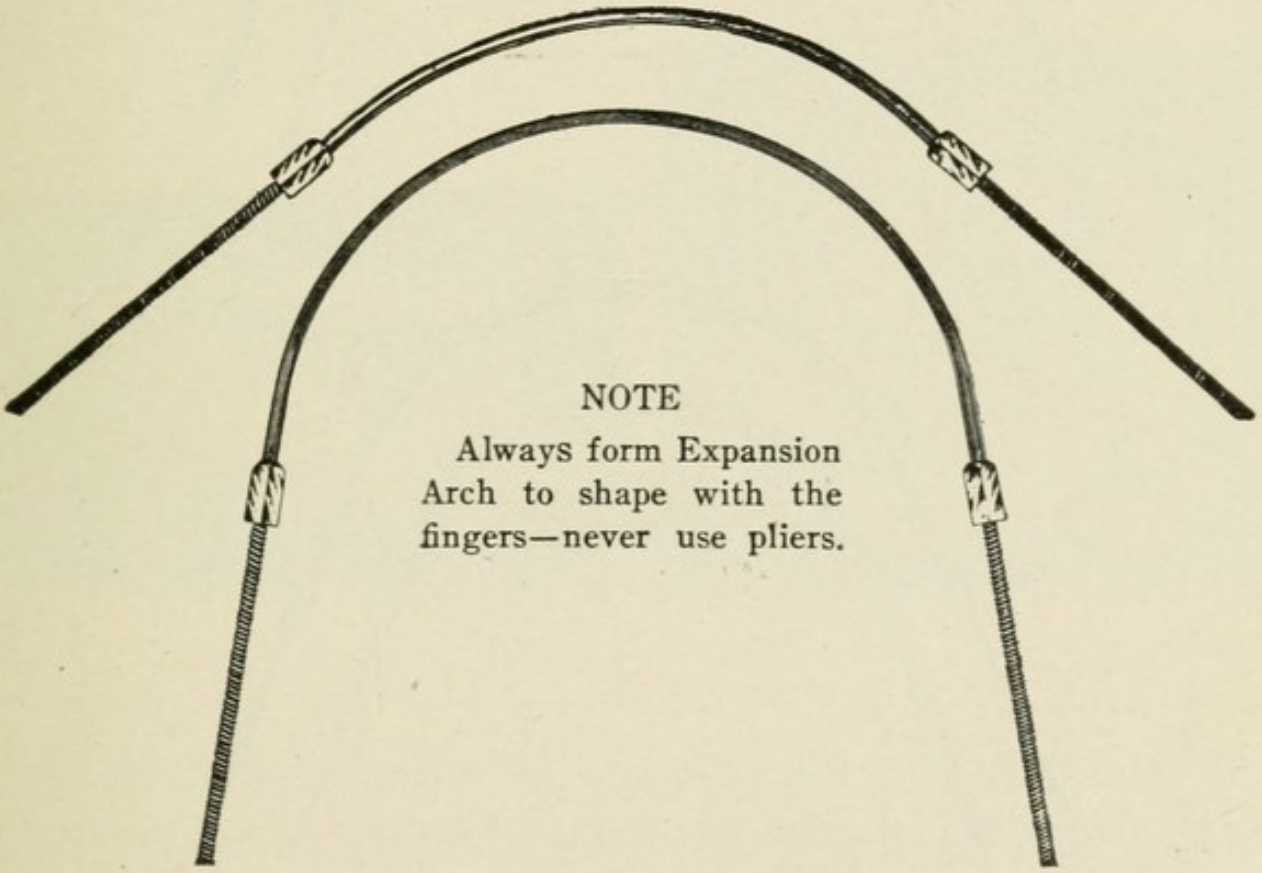


FIG. 71.—The Lukens expansion arch.

the various tooth movements, make it pre-eminent among all discoveries and inventions relating to orthodontia work. (See Figs. 71, 72 and 73.) By use of bands and wire ligatures in conjunction with the expansion arch, all of the seven possible tooth movements can be satisfactorily accomplished, viz.,

rotation, *intrusion*, *extrusion*, *retrusion*, *protrusion*, *mesial* and *distal* movement. In Fig. 74 the proper adaptation of the expansion arch is shown for the movement of the upper incisor teeth which are in linguoversion. Note that the alignment of

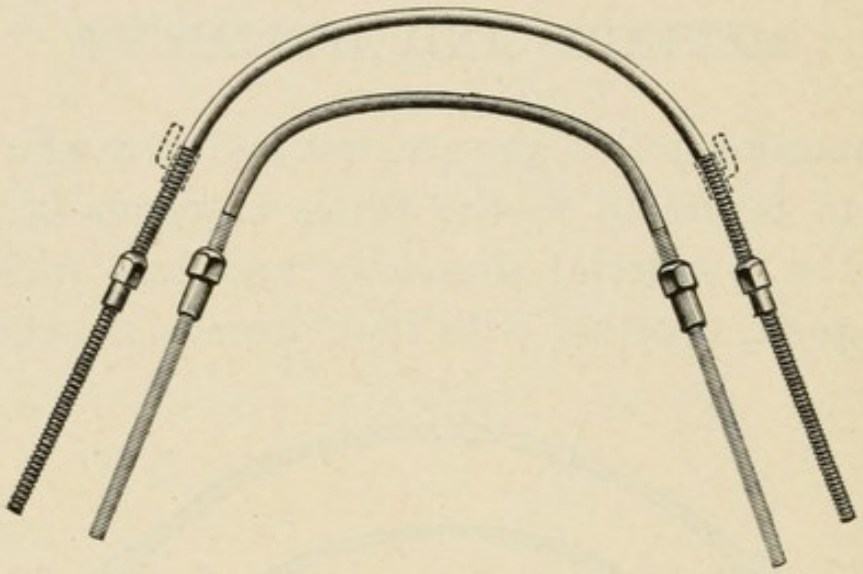


FIG. 72.—The Angle expansion arch.

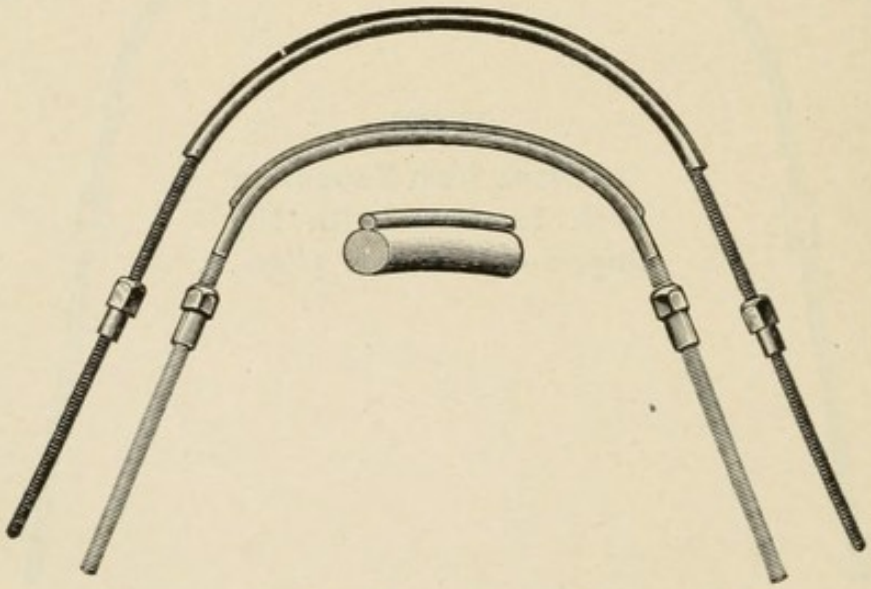


FIG. 73.—The Angle expansion arch (ribbed).

the expansion arch is such that the incisor teeth when brought out against the arch will be in normal relation to the line of occlusion. "As the twig is bent, so is the tree inclined." It is also true that as the expansion arch is bent so will the teeth align.

A tooth may occupy any one of nine possible malpositions, as pointed out by Dr. Lischer, namely, that of *labioversion*, *buccoversion*, *linguoversion*, *distoversion*, *mesioversion*, *torsoversion*, *infraversion*, *supraversion*, *perversion* and *transversion*.

An expansion arch which is correctly aligned to the upper arch is shown in Fig. 75. The lateral incisors which are in linguoversion can be moved labially into contact with the expansion arch. The central incisors which are in torsoversion can be rotated until their labial surfaces are in contact with the expansion arch, likewise the bicuspids and first molar on the right side.

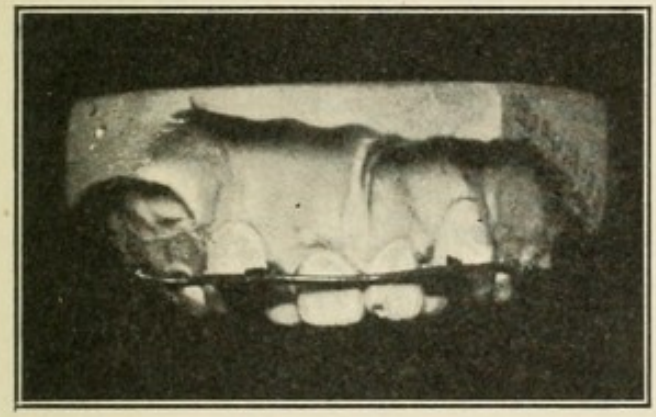


FIG. 74.

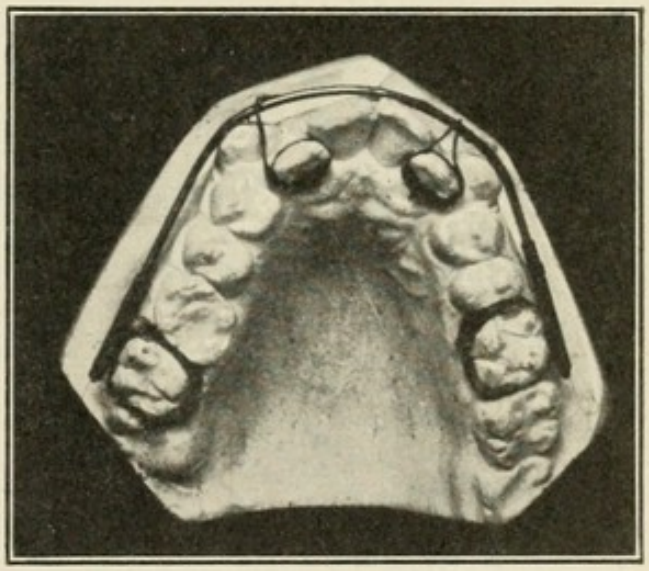


FIG. 75.

This in a measure is arch predetermination, for after examining the relation of the lower arch to the upper, it was found that the upper arch needed expanding in the bicuspid region and that the lateral incisors should be moved labially until they were in line with the cuspids, and that was done in this particular case.

Great care should be exercised in adapting an expansion arch. For instance, where it is desired to move only the anterior teeth and the expansion arch is placed in position with a

slight spring toward the buccal, it will surely move the anchor teeth buccally if worn for any length of time. Likewise, if the spring is in lingually the anchor teeth will move in that direction.

In mounting anchor bands which are later to receive the expansion arch, beginners often fail to properly align the tubing on the band and later in adapting the arch they will bend it out of shape.

It is better to remove the anchor band and properly align the tubing by aid of the arch before cementing the band to place.

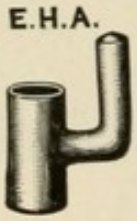


FIG. 76.—Sheath hook. (After Angle.)

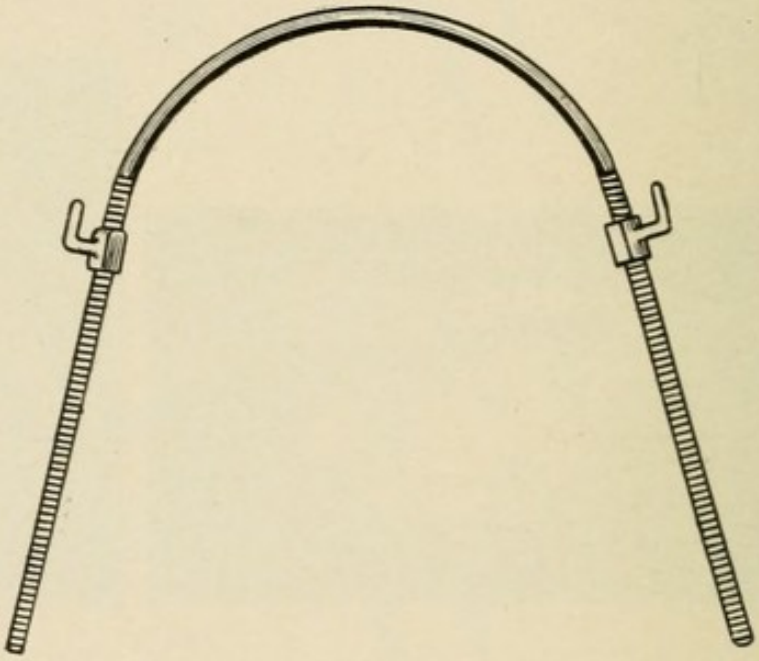


FIG. 77.

Do not spoil the expansion arch by bending, when the trouble lies with the incorrectly placed tubing. It is far better to align the tubing properly by resoldering, besides being the work of only a minute. When tightening the wire ligatures, place the index finger of the left hand on the lingual of the tooth which is ligated and with the ball of the thumb on the expansion arch exert pressure. The twisting of the ligature must be done at the time pressure is being exerted.

A sheath hook used in connection with the intermaxillary appliance to engage the rubber elastics is shown in Fig. 76.

The writer's method of utilizing the threaded nut to which has been soldered a piece of retaining wire forming a hook is shown in Fig. 77. These little sheath hooks make excellent attachments for the intermaxillary elastics, and avoid the necessity of heating the alignment wire.

THE EXPANSION ARCH IN ITS PRESENT PERFECTION

The new appliance bids fair to revolutionize orthodontic treatment. It is described by Dr. Angle as follows:[1]

"The ideal principle in an orthodontic appliance, that of the expansion arch, is still employed, but the arch now used is of necessity of much greater delicacy than the one formerly employed, and it is also further modified for greater convenience in use. It is divided into three sections, a middle and two end sections. The middle section is very elastic, is smooth, round, and very delicate in size, being only .030 inch in diameter. It has squared ends which accurately fit into

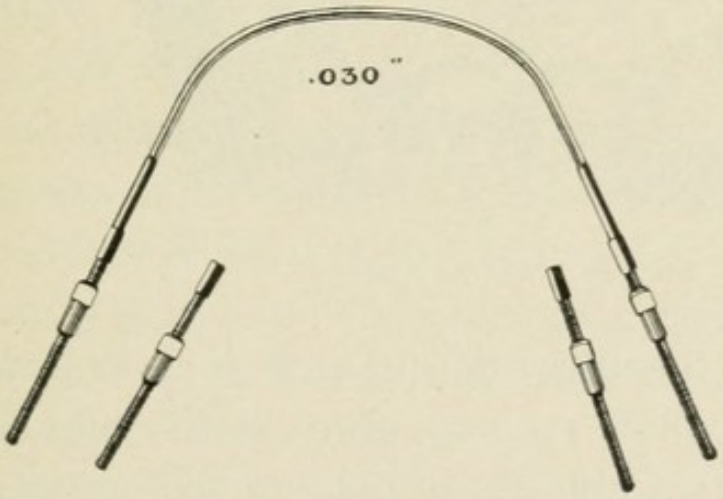


FIG. 78.—The middle and two end sections of the new Angle appliance.

FIG. 79.

[1] Angle, *Dental Cosmos*, Jan., 1913.

square holes in the ends of the threaded end sections (Fig. 78). In operation the end sections are slipped into the sheaths of the anchor bands on the teeth used as anchorage. The middle section is carefully bent so that it will lie passively in close relation with the buccal and labial surfaces of the teeth in their malpositions, with its ends telescoping with the threaded end sections for about one-eighth of an inch.

Instead of being attached to the teeth to be moved as heretofore by means of wire ligatures, bands, and spurs, the attachment of the arch is now made more direct and positive by means of delicate pins soldered to it, which engage delicate tubes soldered to bands on the teeth to be moved. The pins and tubes are shown in Fig. 79, and the whole appliance

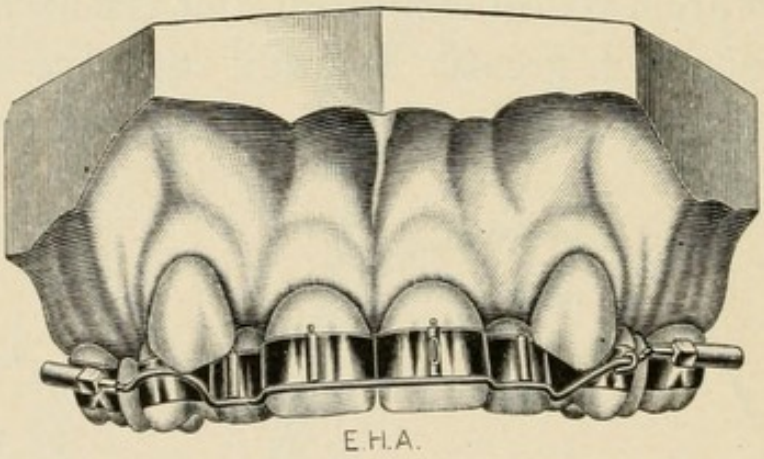


FIG. 80.—(After Angle.)

(Fig. 80) is shown on the upper dental arch of an ordinary case belonging to Class I, which requires much bodily movement of the incisors, with a large amount of bone development.

Force is exerted on the teeth to be moved by the elasticity of the middle section of the arch and the pins, the middle section being occasionally removed from the teeth and one or more of the bends in it slightly straightened, after which it is again sprung into position on the teeth. This is repeated at intervals until both crowns and roots of the teeth have been carried into their normal positions in the line of occlusion.

It will thus be seen that the force derived from the elasticity of the arch and pins is so distributed to the teeth that the latter will be carried bodily, apices of roots as well as crowns, in the direction in which force is exerted."

DESCRIPTION OF PRACTICAL CASES TREATED

Figs. 81 and 82, right and left side, respectively, show a case of malocclusion of a young lady before treatment. Figs. 83 and 84 taken from photographs a few days before treatment was begun clearly show the facial asymmetry. The lower arch being distal to normal on the right side only makes this a Class II case Division 2 subdivision. In all probability this would have been a Class I case had not her dentist extracted the right upper first bicuspid at twelve years of age, making room, as he said, for the cuspid tooth to take its place. This inexcusable act of the dentist complicated matters a great deal, as is so plainly to be seen in the models of the finished case (Figs. 85 and 86). While fairly good occlusion has been gained in this *compromise treatment*, for that in reality is what it amounted to, since considerable difficulty was experienced in retaining the right upper lateral incisor because of lack of development in the incisal and cuspid region, due to loss of the bicuspid tooth. Still, the writer feels that he has made a mistake and that it would have been better to have further expanded the upper arch and made room for an artificial first bicuspid. Contrast the right and left sides of the models showing the finished case, noting the normal over-bite on the left side and its sad lacking on the right. Someone might ask, why was not the over-bite lengthened on the right side by bringing the cuspid and lateral further from their sockets? The writer will answer by stating that this was done and then retained for two years, but because of lack of development and of normal interdigitation,

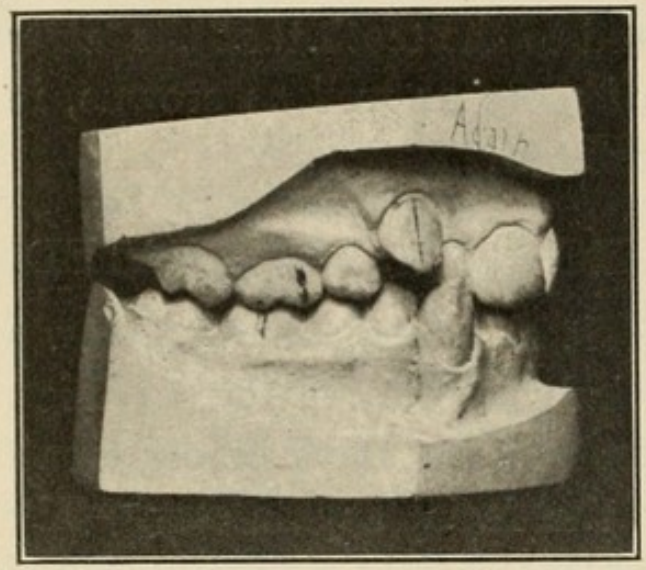


FIG. 81.

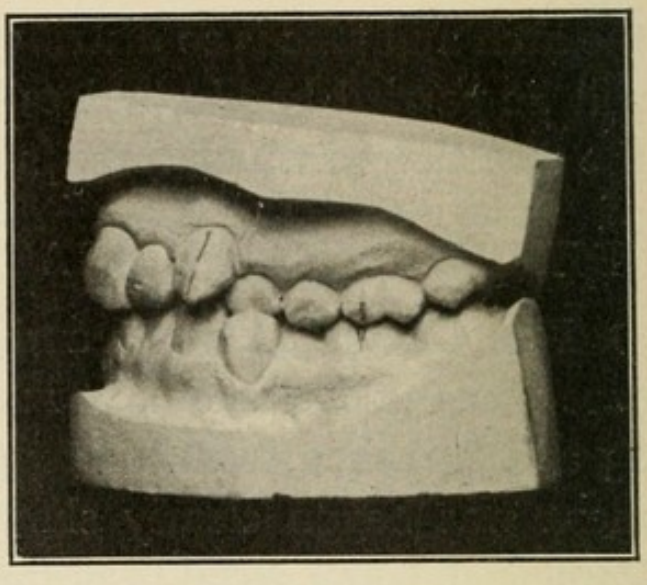


FIG. 82.

FIG. 83.

FIG. 84.

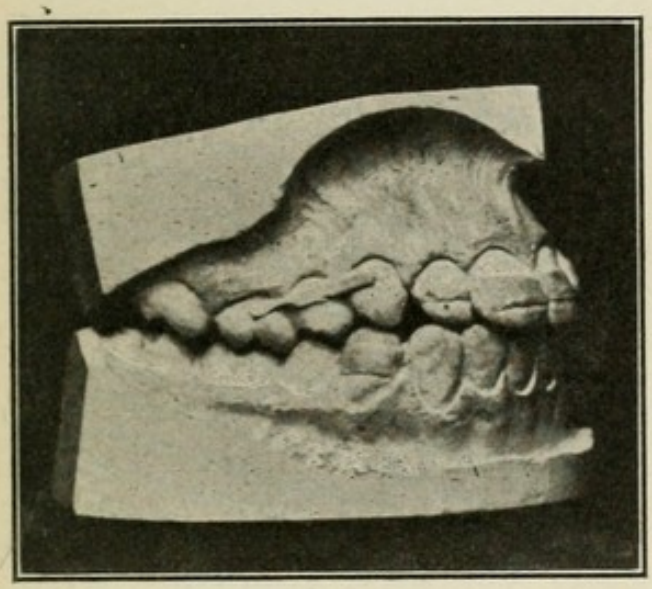


FIG. 85.

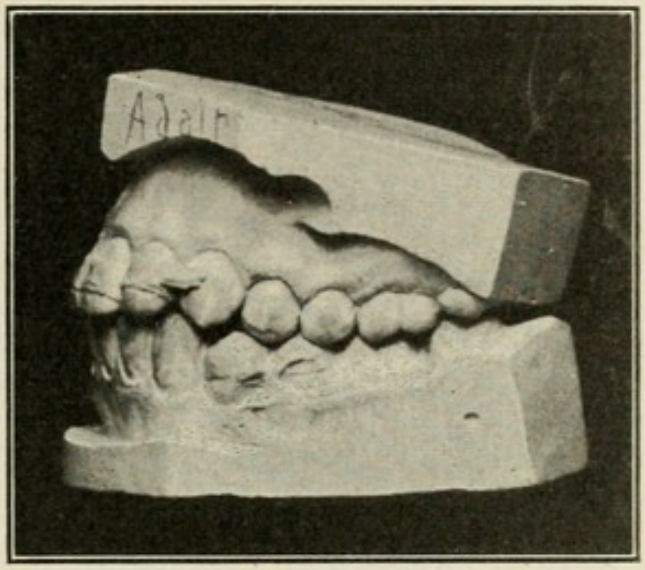


FIG. 86.

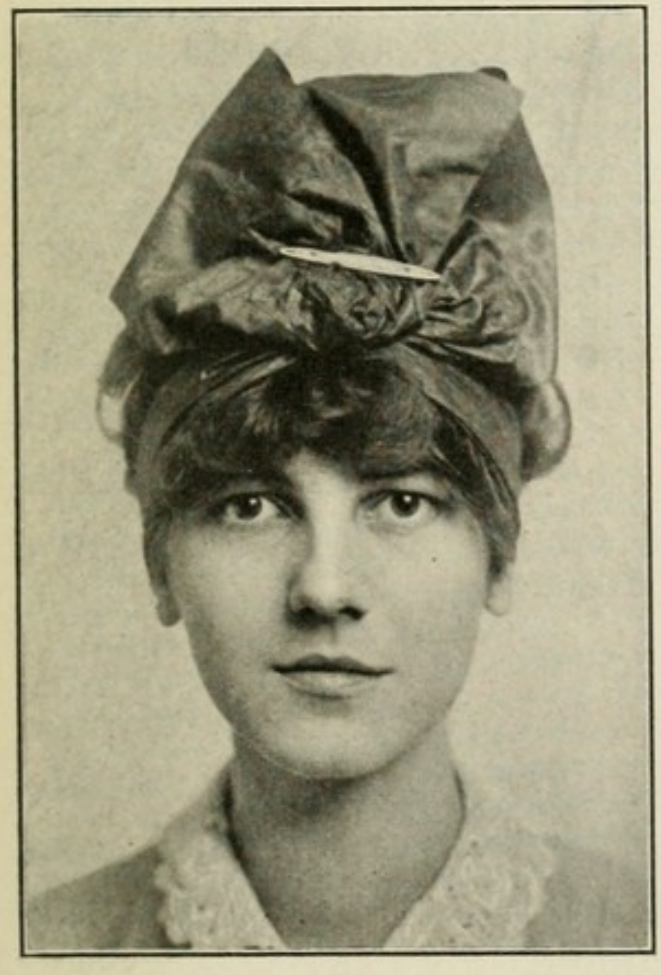


FIG. 87.

FIG. 88.

through loss of this one bicuspid, these two teeth drifted back into an almost end-to-end occlusion. This inharmony of occlusal relations is plainly to be seen in the photograph (front view) taken after the case was completed (Fig. 87). A profile of the patient after completion of treatment is shown in Fig. 88. Front views of the case before and after correction are shown in Figs. 89 and 90. Occlusal views of the case before and after tooth movement are shown in Figs. 91 and 92.

Figs. 93 and 94 show the right and left sides of a case of malocclusion of a young man belonging to Class II, Division I, complicated by protruding upper incisors, together with torsoversion of the right upper second bicuspid and linguoversion of the left upper first molar. Figs. 95 and 96 show the right and left sides of the case immediately after tooth movement was completed and just prior to the mounting of retention appliances. Figs. 97 and 98 show occlusal views of the upper arch before and after treatment.

Considerable difficulty was experienced in the rotation of the upper second bicuspid tooth, due to the fact that the patient was nineteen years of age and also to the malformation of this particular tooth. It will be observed that the lingual surface of the right upper second bicuspid is presented toward the buccal, and owing to the fact that a much lesser tooth movement would have to be accomplished by making the lingual surface serve for the buccal, and after considering the malformation of the cusps of the tooth, this was done.

By referring to the occlusal view of the completed case (Fig. 98) it will be seen that this bicuspid tooth is in complete torso-occlusion, the lingual surface presenting to the buccal and the buccal surface to the lingual, the writer offering as excuse for this the reason cited above.

It might be of interest to add that the time required for the completion of tooth movement in this case was less

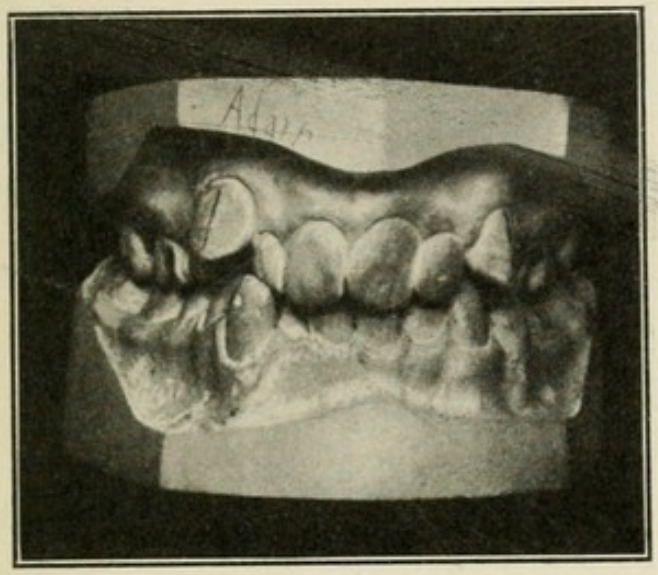


FIG. 89.

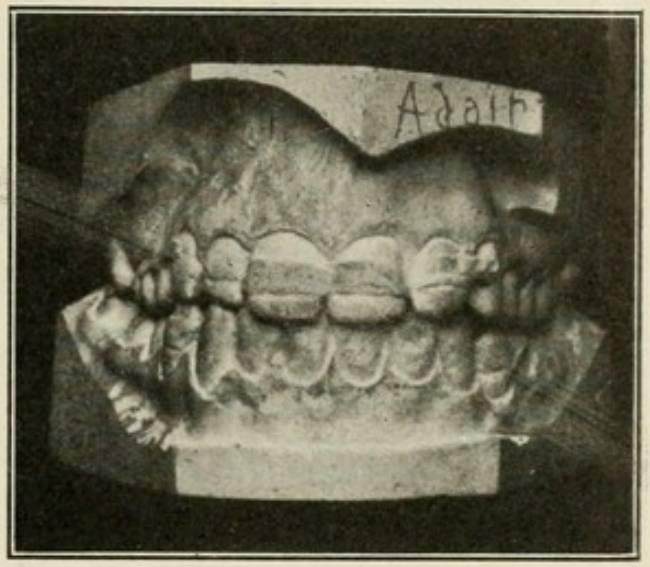


FIG. 90.

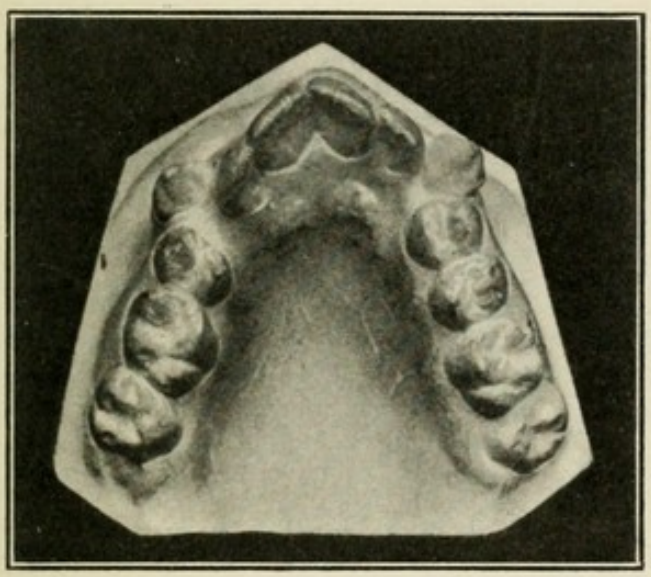


FIG. 91.

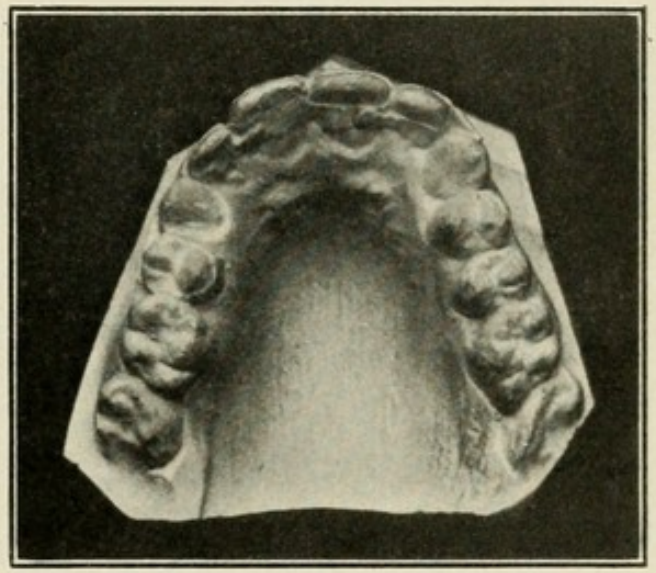


FIG. 92.

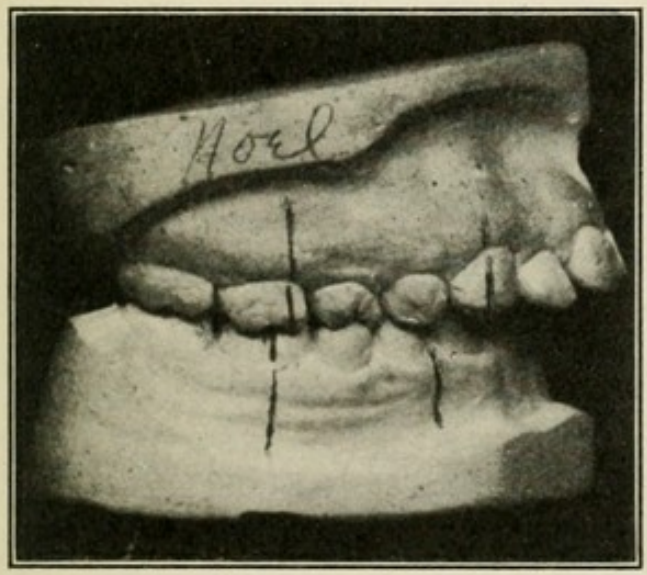


FIG. 93.

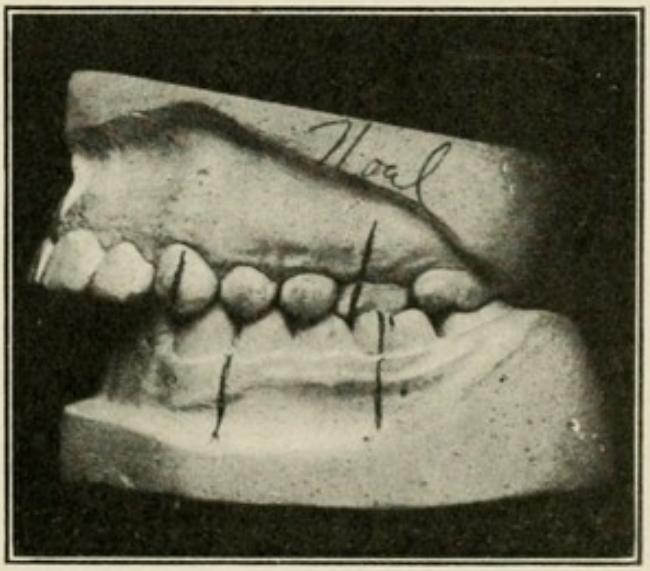


FIG. 94.

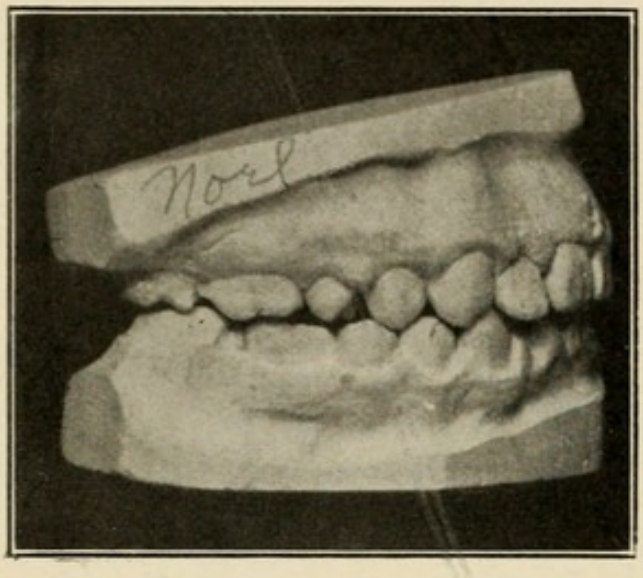


FIG. 95.

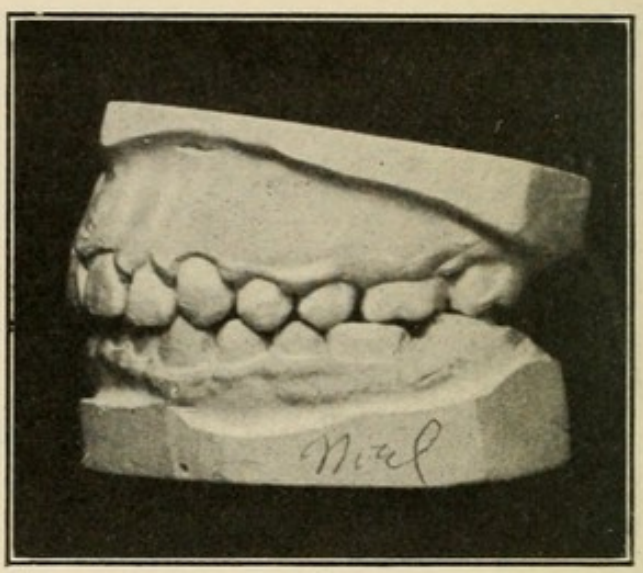


FIG. 96.

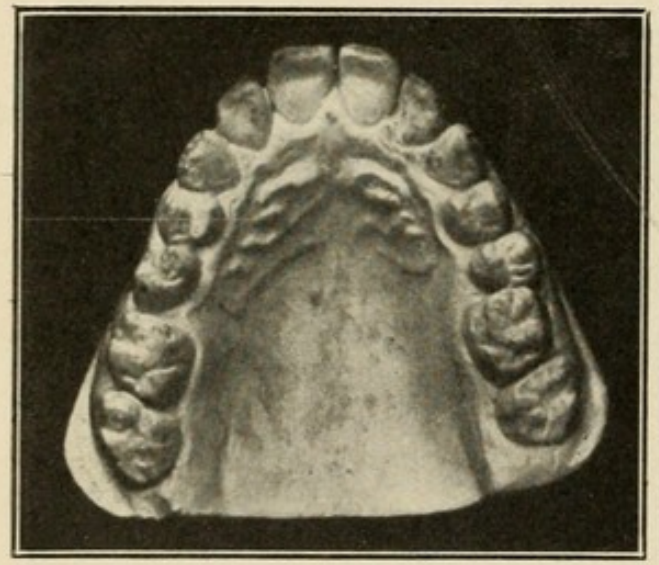


FIG. 97.

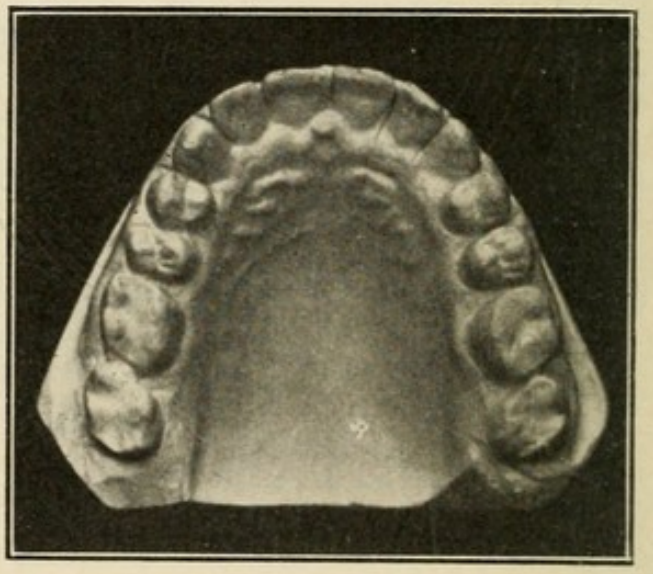


FIG. 98.

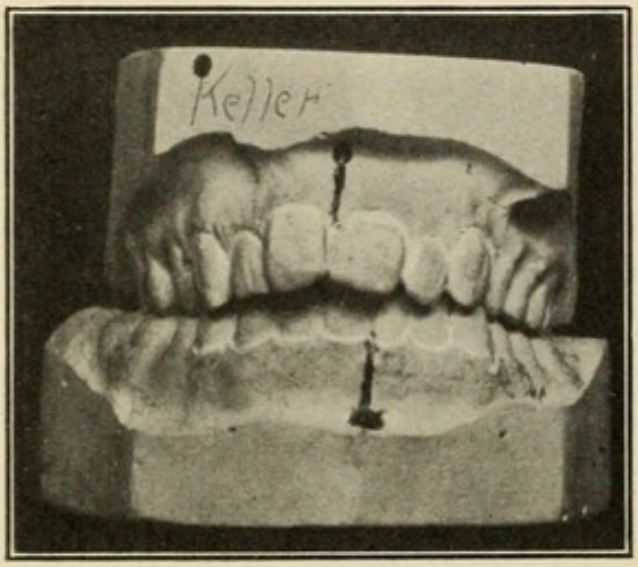


FIG. 99.

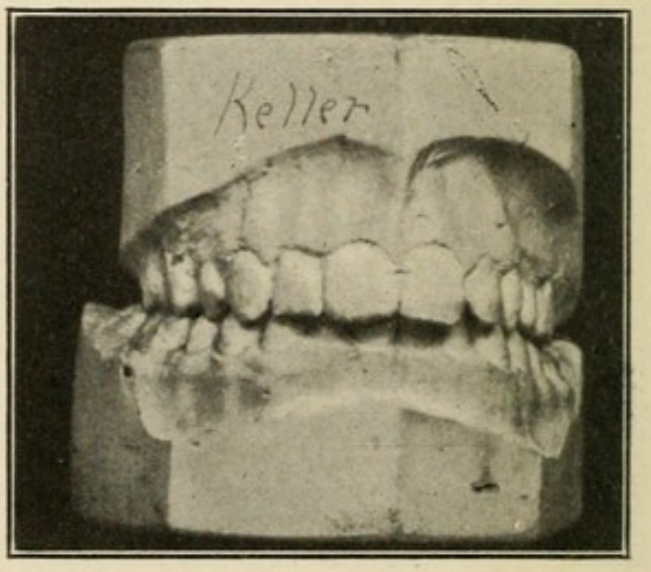


FIG. 100.

than eight months, and at this writing (five years later) the patient has written that the teeth have retained their new positions and are entirely satisfactory to him.

A rare case of malocclusion is shown in Fig. 99, which comes under Class IV, the lower arch being in distoclusion on the left side and in mesioclusion on the right side.

Treatment consisted in the employment of the intermaxillary appliance, rubber elastics being used on the left side only at first. Later, rubber elastics were employed on the right side, being attached from the lower cuspid region to the distal end of the upper expansion arch. The result of treatment is shown in Fig. 100.

An interesting case of malocclusion belonging to Class I, which was caused by a supernumerary tooth appearing between the upper central incisors, is shown in Fig. 101. A palatine view of the case is shown in Fig. 102. The model here represented contains the supernumerary tooth, it having been extracted and placed in the impression before pouring with plaster. Very little difficulty was experienced in the treatment of this case. The upper first molars were used for anchor teeth, plain bands being placed on them, with tubing on the buccal sides for reception of the expansion arch. On the left side the nut was placed to the distal of the tubing on the anchor band, thereby pitting the resistance of all the teeth on this side in front of the anchor band in the movement of the three malposed teeth. Small lugs were soldered to the expansion arch on the left side corresponding to the region of the central, lateral and cuspid teeth. Tooth movement was accomplished through the use of rubber elastic in conjunction with wire ligatures. The result of treatment is shown in Figs. 103 and 104.

Figs. 105, 106 and 107 show the right and left sides and occlusal view of a case of malocclusion belonging to Class I.

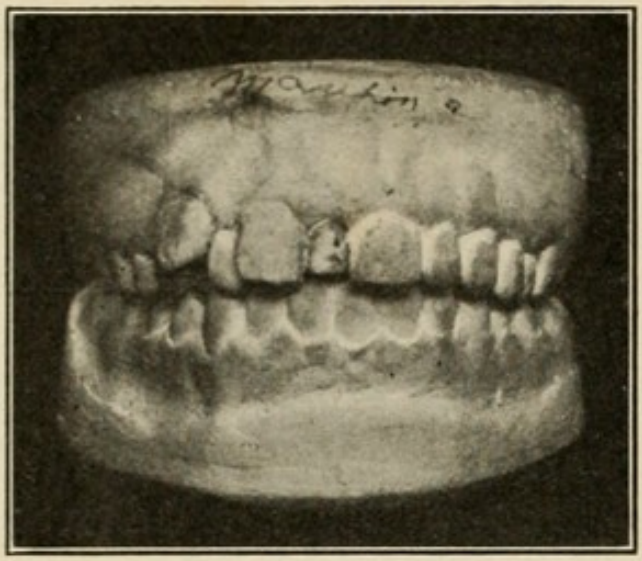


FIG. 101.

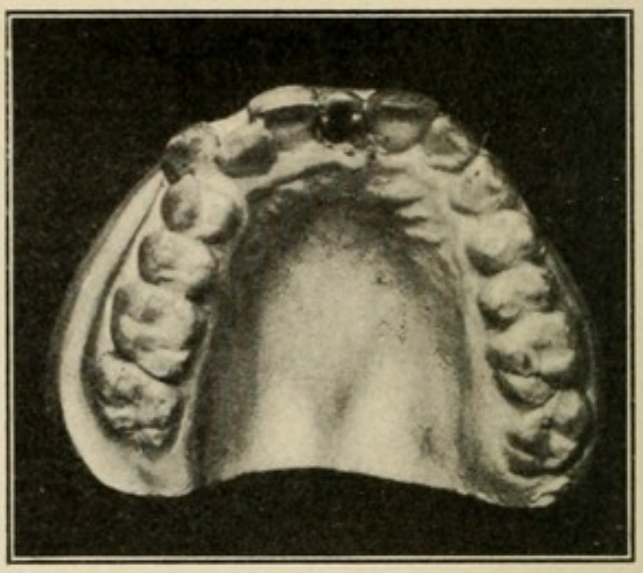


FIG. 102.

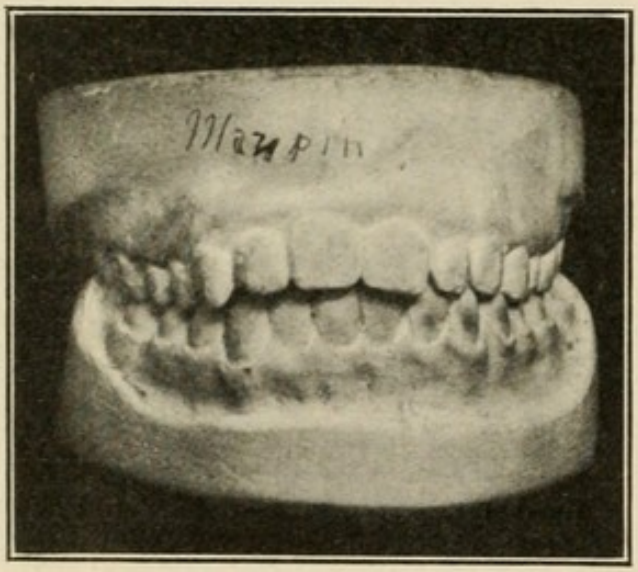


FIG. 103.

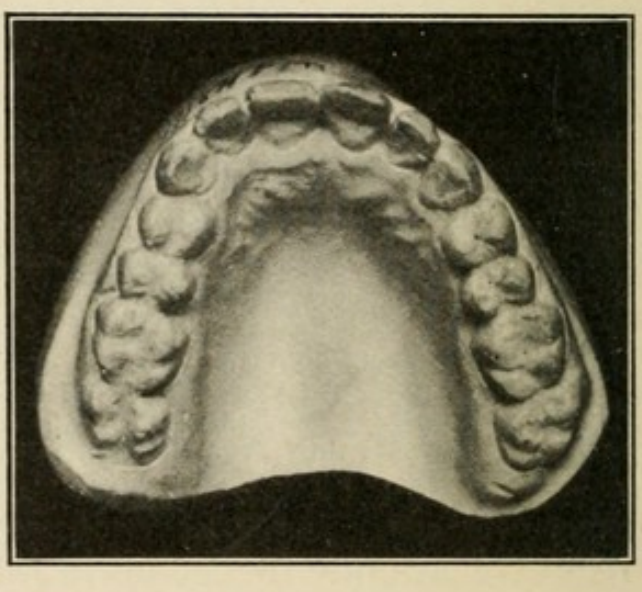


FIG. 104.

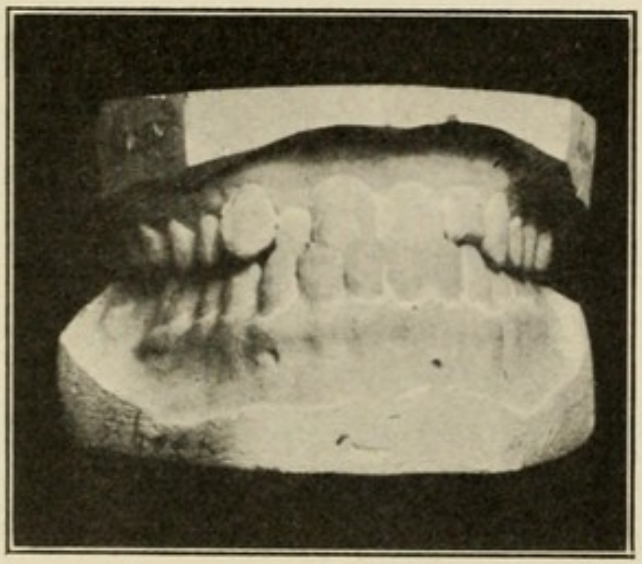
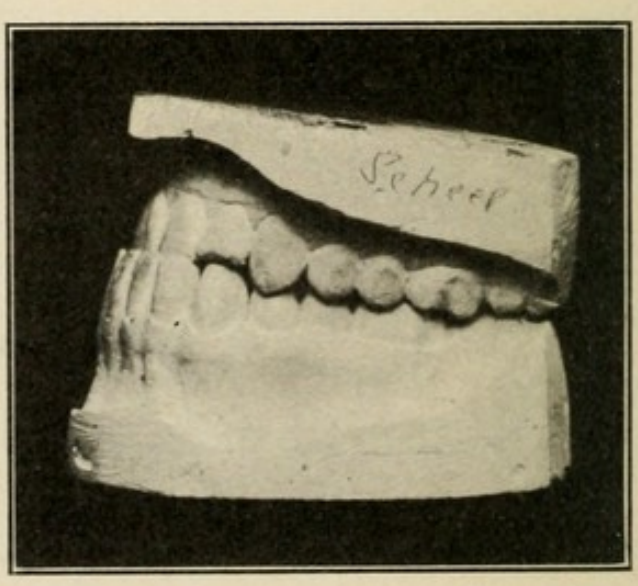


FIG. 105.



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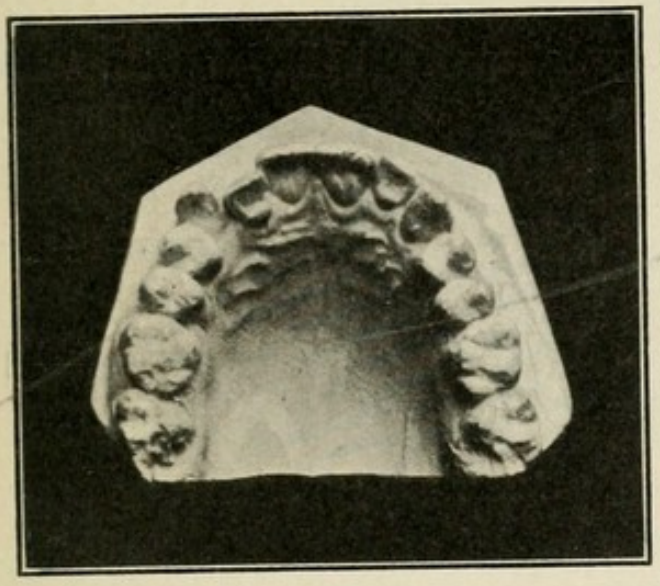


FIG. 107.

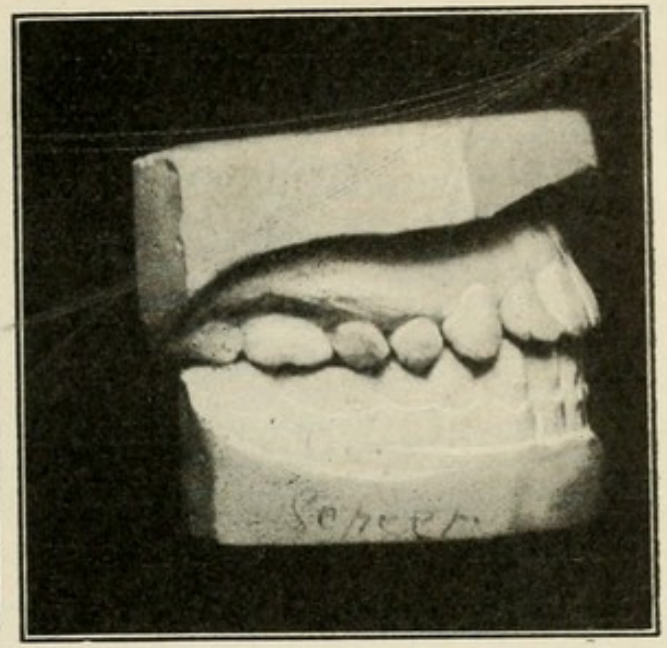


FIG. 108.

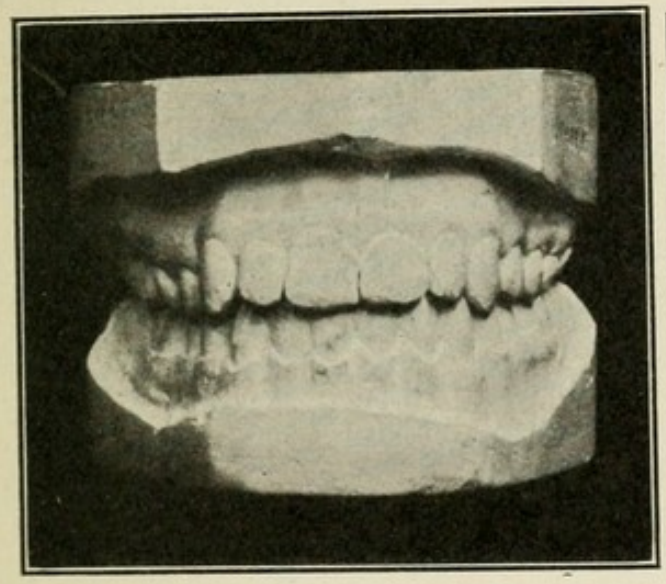


FIG. 109.

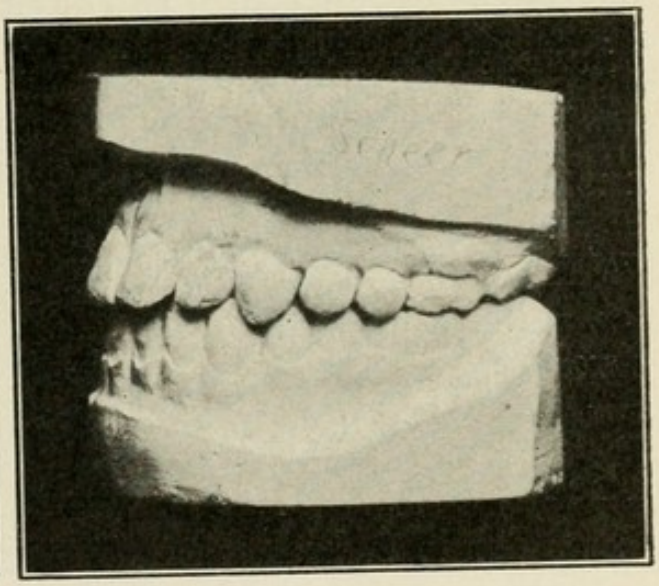


FIG. 110.

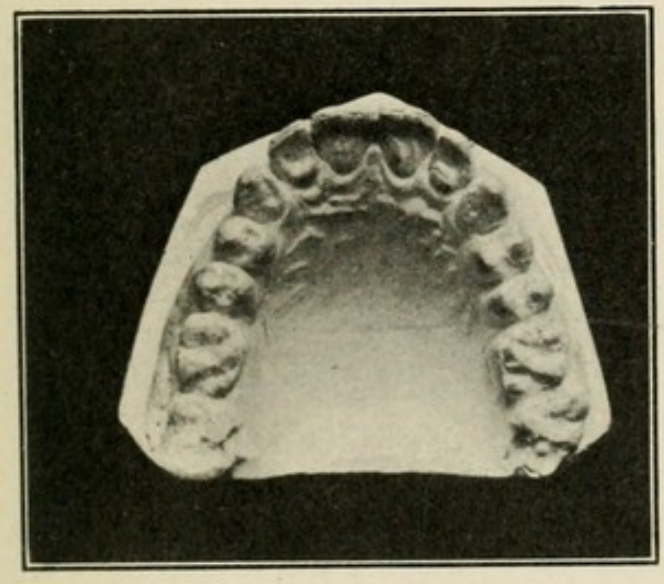


FIG. 111.

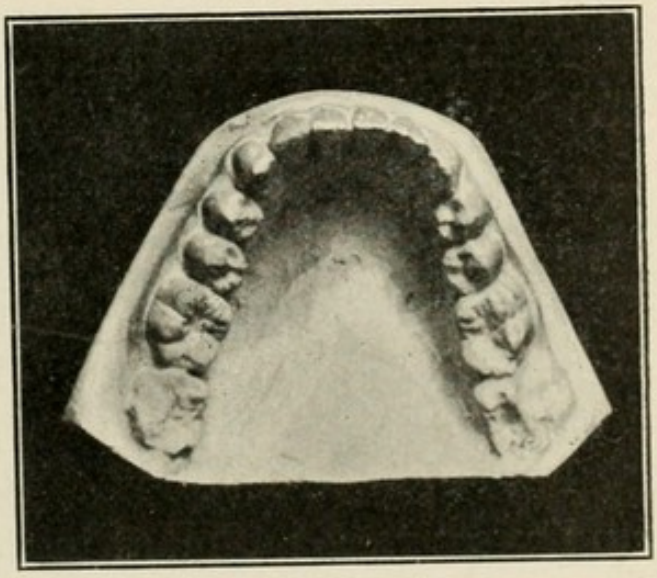


FIG. 112.

Although there was slight mesioclusion on the left side, after labial movement of the incisors was accomplished, so that an over-bite was established, occlusion shifted on this side without further treatment. The result is shown in Figs. 108, 109 and 110. In Figs. 111 and 112 occlusal views are shown after tooth movement was accomplished.

Fig. 113 represents the model of a case of very marked malocclusion. The patient suffering with this anomalous condition was referred to a specialist in cleft-palate work by a dentist who thought from the speech of the patient that he was suffering from a cleft palate. He was finally referred to the writer, but on account of the fact that he was twenty-five years of age, no treatment was undertaken.

This is the most marked case of irregularity that the writer has ever seen on record. The possessor of this abnormal condition presented no other signs of physical defects.

Figs. 114 and 115 show the right and left sides, respectively, of a case of malocclusion belonging to division of Class III, complicated by torsoversion of the upper lateral incisors. The models were photographed with the two expansion arches in position (which constitutes the intermaxillary appliance) in order to show the method employed in the treatment of this case.

Note the position of the spurs soldered to the expansion arch on the lower model. Rubber elastics were engaged to these spurs and hooked over the distal ends of the expansion arch on the upper.

Rotation of the upper laterals was accomplished by means of bands with spurs soldered on the lingual to engage wire ligatures.

Figs. 116 and 117 show two views of the case after retaining appliances were mounted in position. Notice that retention is accomplished in this case by use of six bands. The bands

FIG. 113.

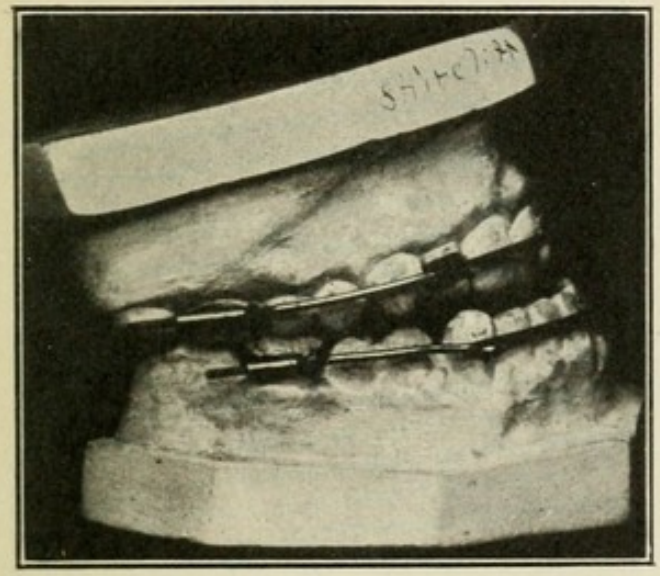


FIG. 114.

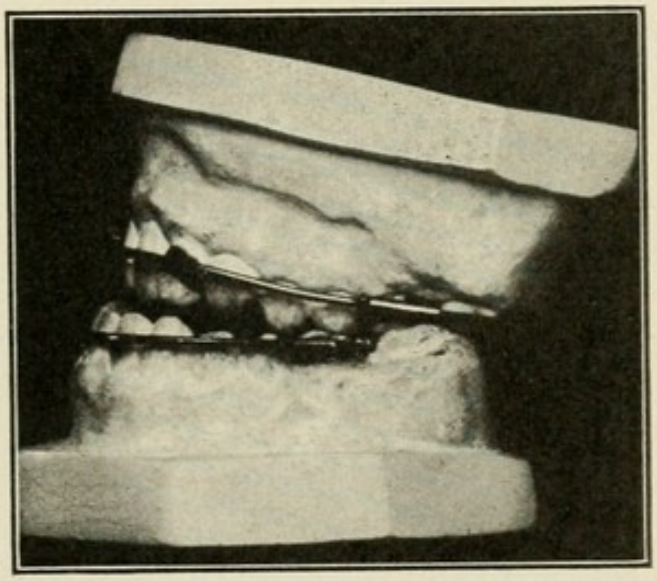


FIG. 115.

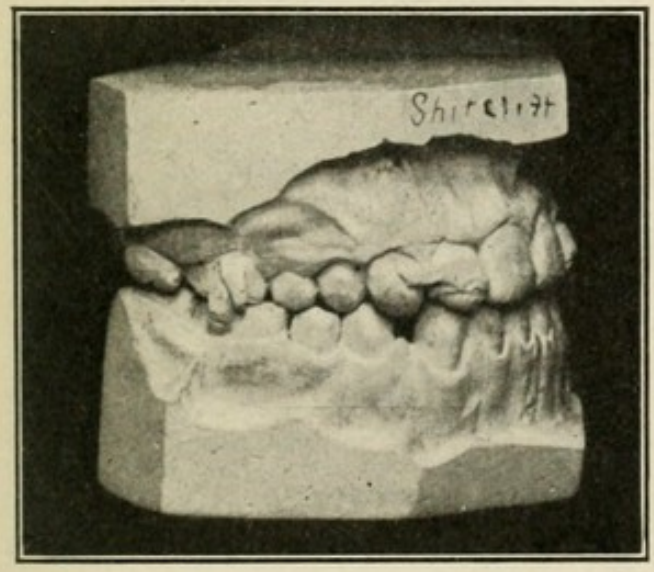


FIG. 116.

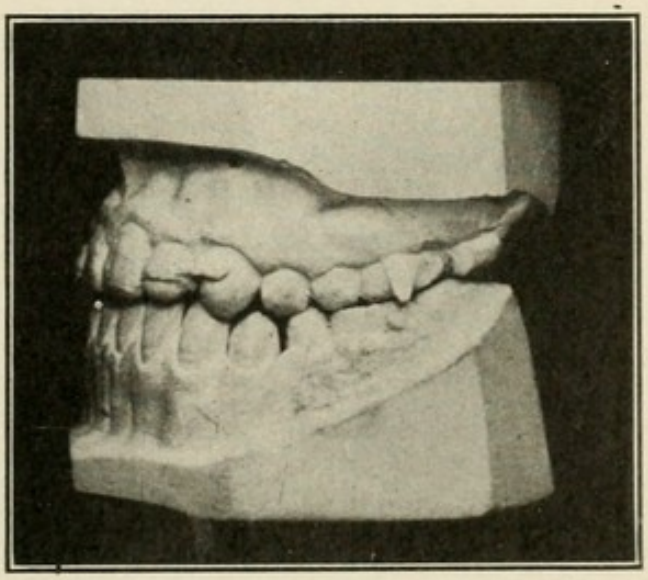


FIG. 117.

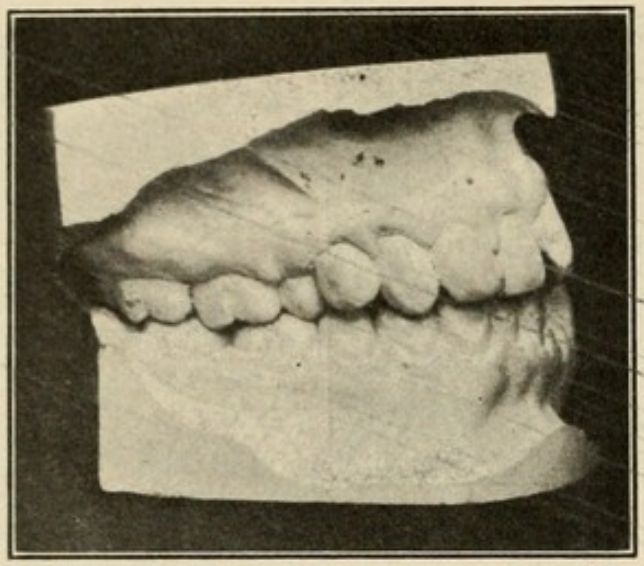


FIG. 118.

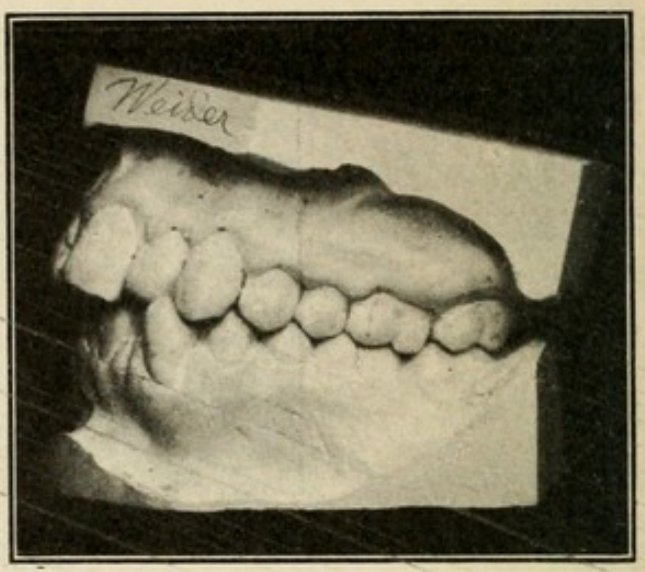


FIG. 119.

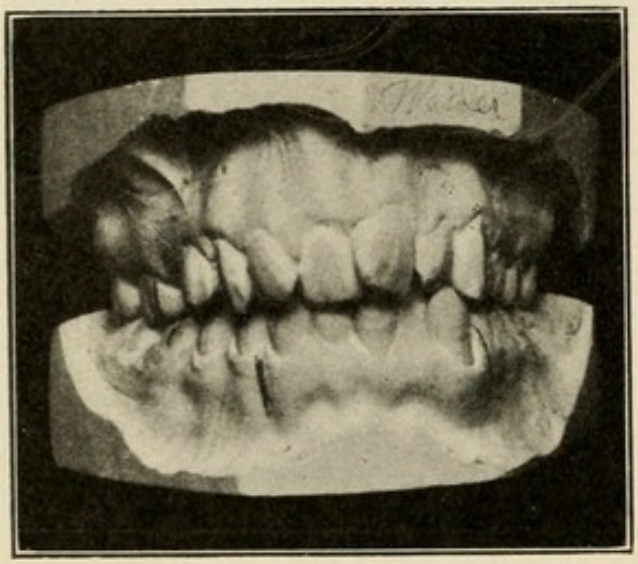


FIG. 120.

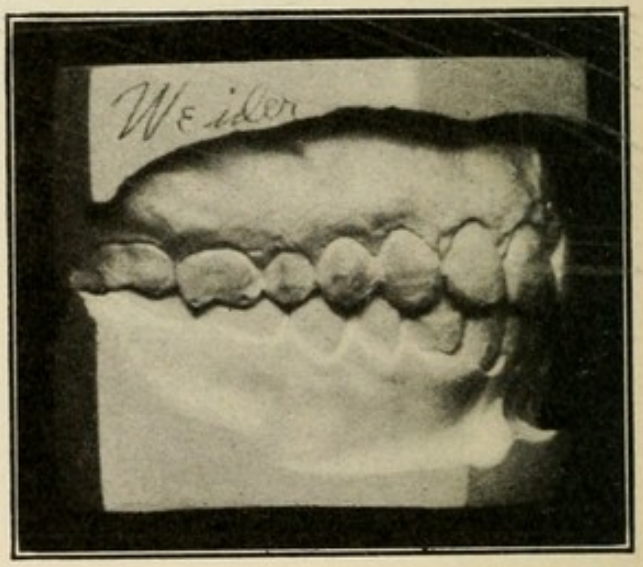


FIG. 121.

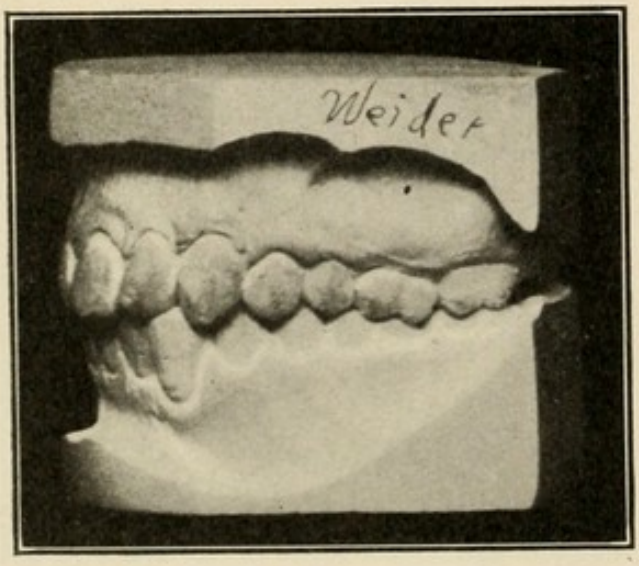


FIG. 122.

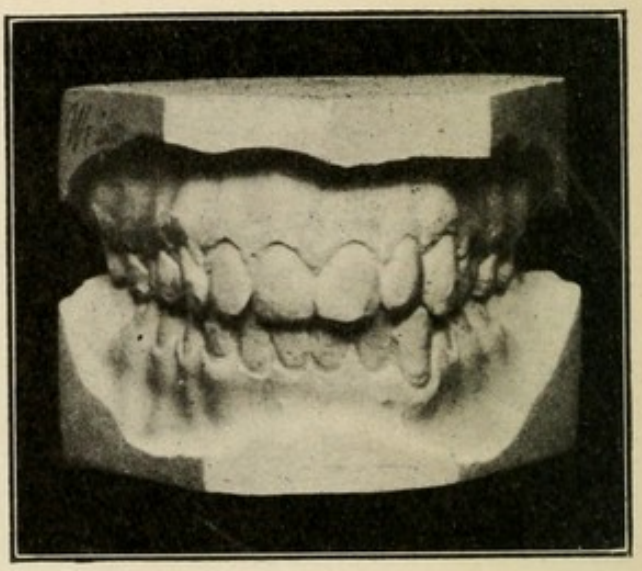


FIG. 123.

on the four first molars have spurs soldered on the buccal, and through the reciprocating force thus exerted the arches are held in their new relations. The retaining bands on the laterals have spurs soldered so as to engage the labial surfaces of the cuspids and lingual surfaces of the centrals. It is now considered better practice to use the round wire for retaining lugs as there is less tooth structure in contact with the lug than in the old form of clasp metal.

Figs. 118, 119 and 120 show the right and left sides and front view, respectively, of a case of malocclusion belonging to Class I (Angle Classification). This is a typical case of

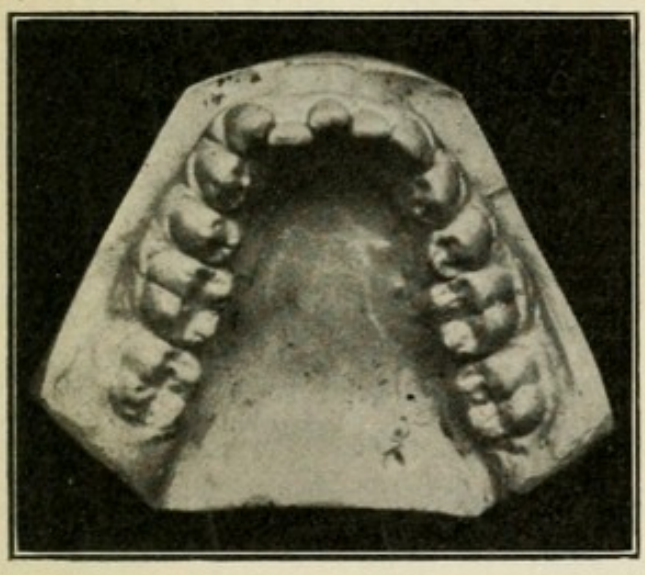


FIG. 124.

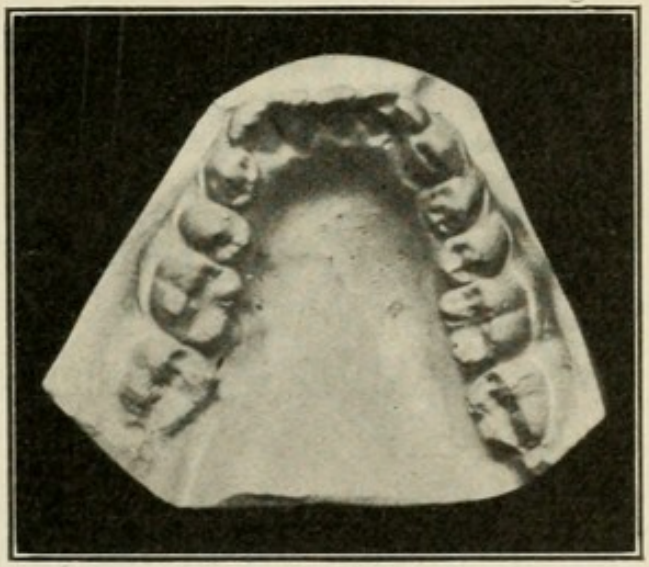


FIG. 125.

Class I as both upper and lower first molars (the keys to occlusion) are in normal mesio-distal relations. The right upper second bicuspid is in linguoversion, while the first bicuspid is in buccoversion. The anterior view shows the crowded condition and torsoversion of the four upper incisors.

Treatment consisted in the employment of expansion arches adapted to both upper and lower arches. Tooth movement was first begun in the upper arch, preceding the fitting of an expansion arch to the lower teeth by some there

or four weeks. The four upper incisors were banded, with small lugs soldered to the lingual surfaces of the bands for the purpose of engaging the wire ligatures used in their rotation.

Tooth movement progressed very rapidly, despite the fact that the patient was past twenty-two years of age.

Figs. 121, 122 and 123 show the right and left sides and front view of the case after tooth movement was accomplished. Far better occlusion would have been gained had the case not been complicated by the extraction of the right lower lateral incisor early in life.

Figs. 124 and 125 show occlusal views of the lower arch before and after tooth movement. These views are shown for the purpose of illustrating the method of retaining the lower incisors, and that of substituting a right lower lateral incisor for this missing tooth. The patient was a student of the writer's and he objected to a bridge whereby the pulp in at least one tooth would have to be sacrificed. The plan finally agreed upon consisted in the making of a gold band on the lower cuspid, being pinched together on the lingual surface in the usual way. To this band was soldered a lateral facing having a spur which rested against the lingual surface of the central incisor. The model shown in Fig. 125 is from an impression taken three years after completion of the case.

CHAPTER VIII

RETENTION

The frequently asked question, "How long should retaining appliances be worn?" can never be definitely answered. The occlusion gained in the movement of malposed teeth plays the most important part in the time required for the retaining appliances to remain in position. Of course the obstacles to overcome in tooth movement, age and health of the patient, etc., are to be reckoned with. In no other phase of Orthodontia work is the constructive ingenuity of the operator taxed so much as in the mounting of proper retaining appliances. Retention appliances must possess stability, and yet should be as inconspicuous as possible. After normal occlusion is established for a short while, a great number of patients seem to forget that they ever suffered with malocclusion, and ask to have the retaining appliance removed soon after it is cemented in position. Ofttimes these appliances are removed too early, before sufficient development has taken place, with the consequence that the teeth quickly return to their old positions. Caution should be used after the removal of retaining appliances. These appliances should not be destroyed after removal, but laid away in a convenient place and the patient seen regularly to note if there is any tendency of the teeth to return to their old malposition; for in this way only can you be sure. Exceptions to this rule may arise in non-complicated cases where a single inlocked upper incisor has been moved out into its proper position. In such cases the normal over-bite in occlusion is sufficient to retain the tooth

without the use of a retaining band, providing the regulating apparatus has been allowed to remain in position after tooth movement, until all soreness has disappeared. Figs. 135, 136, 137 and 138 show successful methods of retaining certain cases.

Intermaxillary reciprocating buccal spurs are shown in Fig. 139. In removing bands where it is desirable to keep the appliance intact for possible future use, especially retention appliances, a good method is to roll a napkin up tightly and place it on the occlusal or incisal of the banded tooth, then place one beak of a flat-nose pliers on the napkin, working the opposite beak over the edge of the band at the cervical and with slight pressure the band can be loosened. Then by alternately changing from buccal to lingual the band can be removed without distortion and with even less danger of scratching the enamel of the tooth than where band slitters or band-removing pliers are employed. Bands and retainers removed in this way can be sterilized and placed in an envelope on which is written the patient's name and date of removal.[1]

TECHNIC COURSE

Junior students will be required to construct the following illustrated parts, which constitute the technic course in Orthodontia.

In advancing the Technic Course to the junior class, it is with the intention that the student become familiar with the construction and mounting of appliances that he may the better be enabled to take care of a practical case which he is later to receive. The technic exercises will be assigned to the class one at a time, and it is expected that this particular piece of technic will be finished and handed to the teacher for

[1] There are special pliers made for the purpose of removing bands, but the method described above is used with preference by the writer.

his acceptance or rejection before another exercise is given to the class in the course of a week or so, as announced. This is not for the purpose of rushing matters at all, but is rather for the student's good, since if the technic construction is put off until the eleventh hour, so to speak, he will do it in a hurried, haphazard way, failing utterly to get the benefit for which the course is intended.

Exercise No. 1. Take an Impression and Trim a Model.—Models secured from the impression of dies will not be accepted, for they are unsuited to this work. Probably the best way would be to take an impression of a fellow student's mouth; obtaining a model in this way gives practical experience in a convenient way, for no student who is interested in the work will refuse to have his impression taken. Pour the impression and trim the model as shown in Fig. 51.

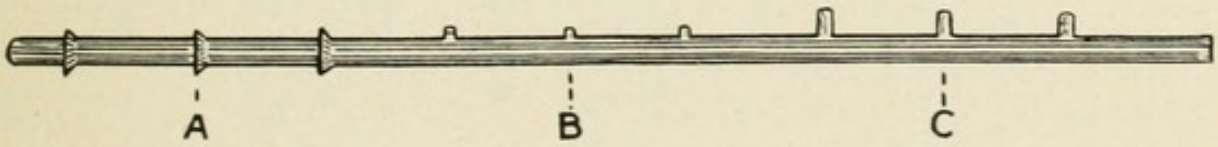


FIG. 126.

Exercise No. 2. Soft Soldering.—Select a piece of spur wire, 16 gauge, 3 inches in length; with soft solder unite three loops of ligature wire No. 26 gauge shown at "A" in Fig. 126. Then unite to the spur wire an end of a ligature wire shown at "B," and cut it about one-thirty-second of an inch long. This operation is repeated until you have the three short spurs as shown above. Next, take a piece of spur wire, 18 gauge, and soft-solder one end to the main wire shown at "C," and cut it about one-sixteenth of an inch long. This is repeated until you have the three spurs shown above. By the use of these heavier spurs, attachments are afforded for intermaxillary elastics in connection with alignment wires. Use very small

Note.—The drawing illustrating the technic exercises were made by student Willis G. Pieck, Class of 1915, O. C. D. S.

pieces of solder in all of these attachments, as very little is required. Avoid an excess of heat. This is important, for it is desirable to retain the temper in the main spur wire. The technic piece should now be carefully polished and mounted on a piece of cardboard, on which is written the student's name.

Exercise No. 3. Hard Soldering.—A good exercise in the use of silver solder is shown in the illustration below (Fig. 127). Take a piece of spur wire, 16 gauge, shown at "A" below; then unite the piece of spur wire, No. 18 gauge, shown at "B" in the illustration. Repeat this until you have the four spurs shown below. Each succeeding attachment is cut slightly longer

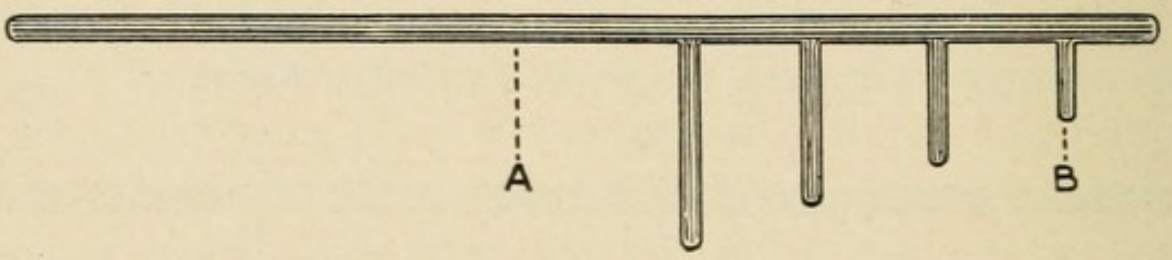


FIG. 127.

than the one previously united. They should be made from long pieces of spur wire and cut to accurate lengths after soldering. They should be arranged in pairs, though each attachment is soldered on separately. The student will find it a difficult and interesting procedure to unite the last attachment of any one of the pair, but the experience gained will be of great benefit in the exercises which follow and in the construction of appliances later, especially in the soldering of pins whenever the new Angle appliance is used. After soldering the attachments and cutting them to accurate lengths, round the ends with a file or sandpaper disc. Mount the technic piece on cardboard, as indicated in the previous exercise.

Exercise No. 4. Band Construction.—This technic exercise in band construction consists of a plain band adapted to an upper central or lateral incisor (Fig. 128). In the movement of individual malposed teeth, some form of secure attachment is necessary in the majority of cases for the accurate movement into line of occlusion. This exercise has a great range of usefulness, as will be seen later in the application of appliances. Properly constructed bands are the fundamental requirement in the application of any regulating or retaining appliance. Plain bands should have as nearly perfect adaptation to the teeth upon which they are placed as it is possible to obtain. The use of the band-forming pliers is absolutely

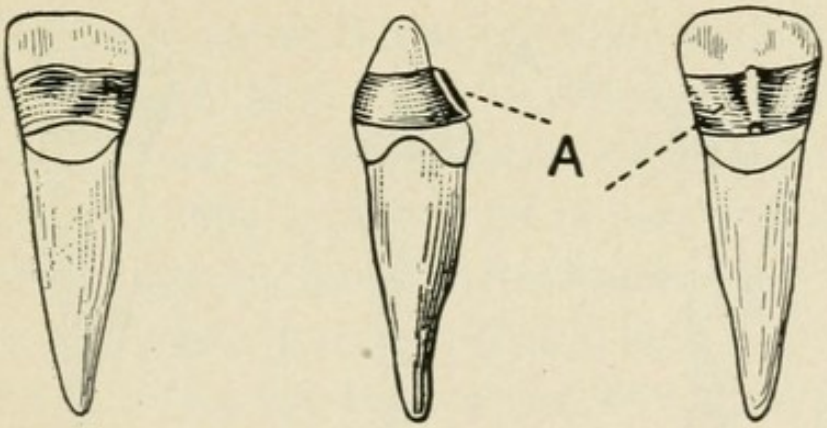


FIG. 128.

essential in the construction of any plain band. The band material is pinched or drawn together on the lingual surface of the tooth, locating the seam on the lingual surface. After soldering, the excess band material is cut away and the joint carefully polished in order not to interfere with the tongue. *Do not take the measure of a tooth and attempt to construct a band from the measurement taken.* Use the vulcanite technic model for the making of all plain bands. Place the band metal around the tooth on the model and draw together on the lingual side with the band-forming pliers, which is very similar to working conditions met with in the mouths of patients.

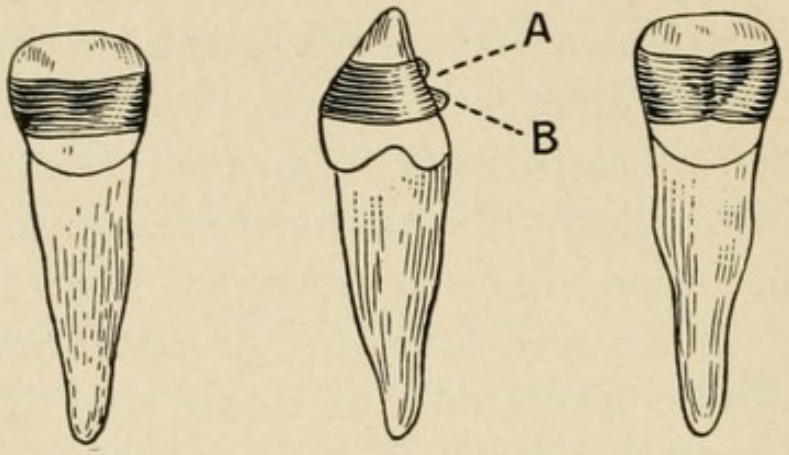


FIG. 129.

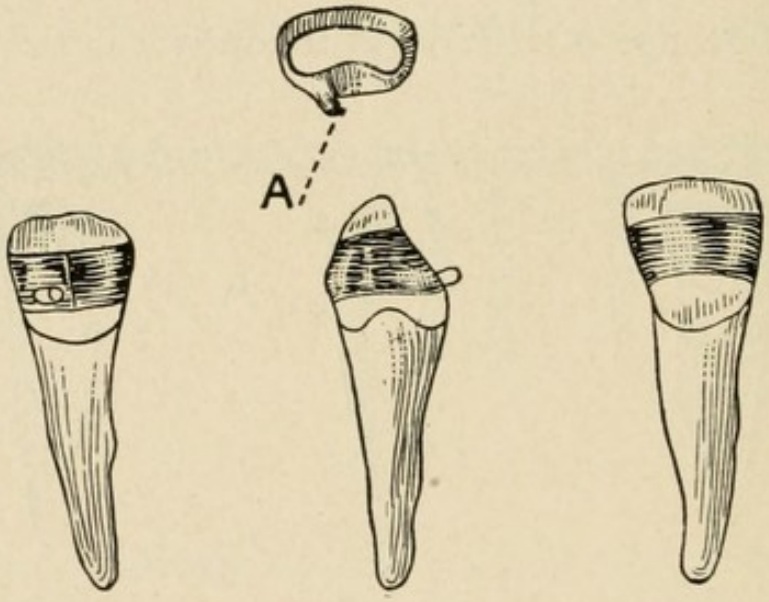


FIG. 130.

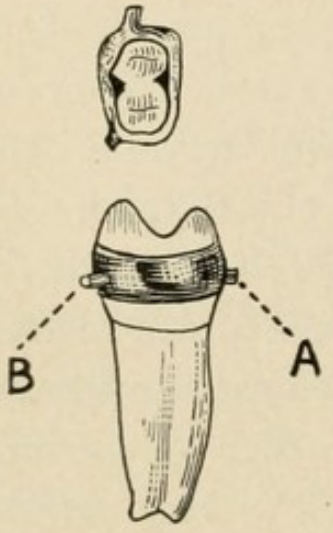


FIG. 131.

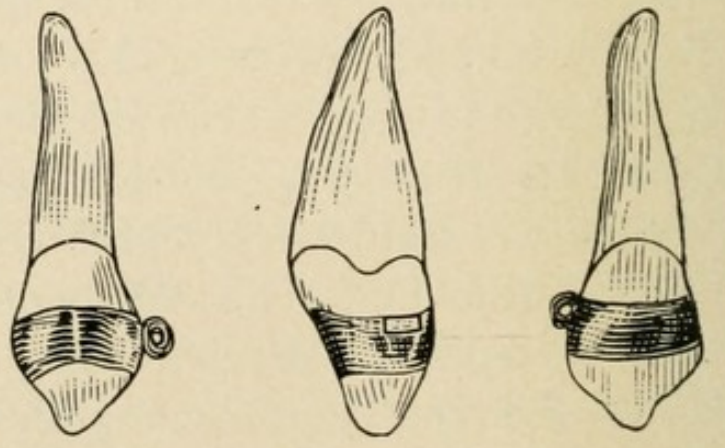


FIG. 132.

Exercise No. 5.—This exercise in band construction is similar to the previous exercise, except that a groove or notch is formed at the seam on the lingual surface of the band. This is done by leaving an excess when cutting away the surplus band metal, and with a file, a notch is formed in the center of the band through the seam shown at "A" (Fig. 129). This groove affords secure attachment for wire ligatures or rubber elastics in the labial or buccal movement of teeth that are in linguoversion. Pickle and carefully polish the band after soldering, making sure that the edges of the seam shown at "B" are smooth in order to prevent irritation of the tongue.

Exercise No. 6.—This exercise consists of a plain band fitted to an upper central or lateral incisor on the technic model. Upon the mesio-lingual or disto-lingual border, well toward the cervical, solder a spur which inclines toward the median line, forming an acute angle with the lingual surface "A" (Fig. 130). The spur should be made of No. 16 gauge wire and cut to correct length after soldering. This form of attachment to a plain band is useful in rotating teeth that are in torsoversion. In soldering the spur be careful to confine the heat to the area to be soldered; otherwise there will be danger of opening the joint of the band. The spur should be rounded and polished.

Exercise No. 7.—This exercise consists of a plain band fitted to an upper first or second bicuspid, with spurs, on the lingual and buccal sides as shown at "A" and "B" (Fig. 131). The spurs should incline in opposite directions in order that attachments can be had for a pushing and pulling movement, which is sometimes desirable for the forcible rotation of these teeth. The spurs are made from 18 gauge wire. The seam of the band should be on the lingual surface, near the mesial or distal surface, according to the location of the lingual spur. This is to permit the soldering of the spur without opening the

joint. A band of this kind permits of the use of a threaded bar or jackscrew anchored on the buccal surface of the molar, and an elastic ring on the lingual surface, or *vice versa*, as the case may require. The ends of the spurs should be carefully rounded and polished.

Exercise No. 8.—This problem shows a method of attachment for distal movement of cuspids. The seam is located as usual on the lingual surface. A piece of seamless tubing about one-eighth of an inch long, and No. 16 gauge bore, is soldered near the cervical border of the band on the distal surface (Fig. 132). This affords attachment for a retraction screw which is very efficient for distal and lingual movement of cuspids that are in labial and mesial prominence. Owing to their subjection to heavy strain these little tubes should be well soldered, but care must be taken to prevent solder from flowing into the inner side of the tube. This can be avoided by preventing flux from entering the inner side of the tube, or by placing a little antiflux in the inner side of the tube. A small amount of solder evenly flowed is better than a large amount unevenly flowed.

Exercise No. 9.—The problem illustrated (Fig. 133) consists of a plain band adapted to an upper central incisor. The band metal in this instance is drawn or pinched together on the labial surface of the tooth, thereby locating the seam in the median line of the labial surface. The joint should be well soldered and an excess of about one-sixteenth of an inch left in cutting away the excess band metal. A notch, A, is then cut in the projection of the band metal at the seam similar to the exercise illustrated in Fig. 129. This notch is for the reception of an alignment wire, and its size should correspond to the gauge of the alignment wire used, which in the majority of cases is made of No. 16 gauge wire. This band is useful in the lingual movement of central incisors that are protruding; also for the

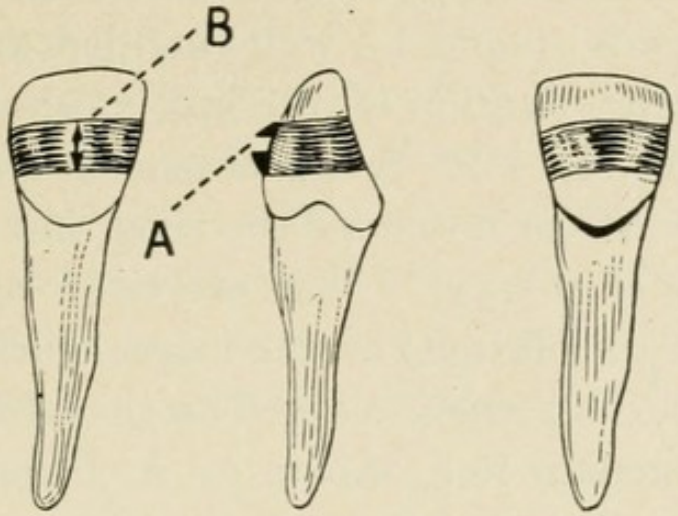


FIG. 133.

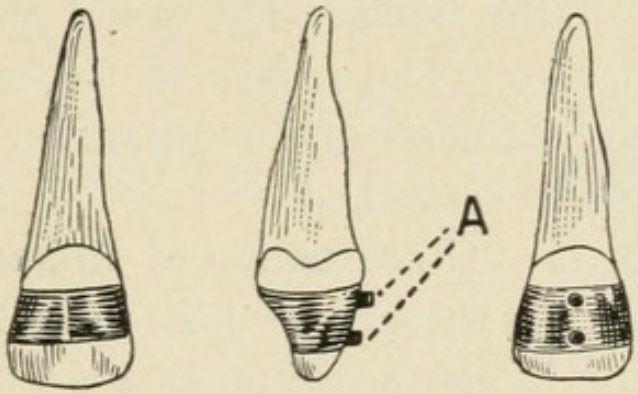


FIG. 134.

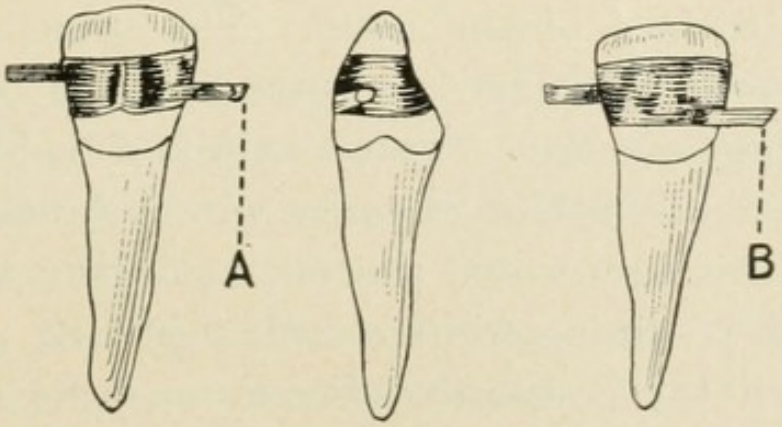


FIG. 135.

extrusion in cases of open-bite malocclusion. The incisal and cervical ends should be well rounded and smoothed in order to prevent irritation of the lips, as shown at B.

Exercise No. 10.—In this problem another method of providing a groove or notch for the reception of an alignment wire is shown (Fig. 134). This exercise consists of a plain band with the joint formed on the lingual surface in the usual way. Two spurs are then soldered on the labial surface of the band in the median line, shown at A, being separated the distance of the diameter of an expansion arch. This is best done by bringing an expansion arch in contact with the labial surface of the band, while the band is in position on the tooth, and marking with a pointed instrument on the cervical and incisal borders of the band. The spurs are then soldered, using 18 gauge wire. The length of the spurs should also correspond to the diameter of the expansion arch and should be well rounded and smoothed.

Exercise No. 11. Construction of Retaining Bands.—In the previous exercises the bands constructed have been for the purpose of aiding in the accomplishing of tooth movement. It is now well to consider the construction of bands with attachments, which will retain the teeth after the desired tooth movement has been gained. Construct a plain band in the usual way and solder two spurs, one on the labial and one on the lingual surface of the band. The spurs should be of sufficient length to engage the approximating teeth, on their labial and lingual surfaces, shown at A and B, Fig. 135. The spurs are made from No. 18 gauge wire. A band with spurs soldered in this way would prevent an incisor that has been rotated from returning to its old malposition. In the retention of teeth the resistance offered must be constant and unvarying. The band here illustrated makes an ideal retainer for a tooth that has been rotated. Teeth that have been

rotated require a longer period of retention than for labial or lingual movements.

Exercise No. 12.—After elimination of an abnormal space between the central incisors, shown at A in the illustration below (Fig. 136) a retainer is provided as shown below at B. This exercise consists of two plain bands made in the usual way, and having their mesial approximating surfaces united with solder. Notice that the union of the bands should

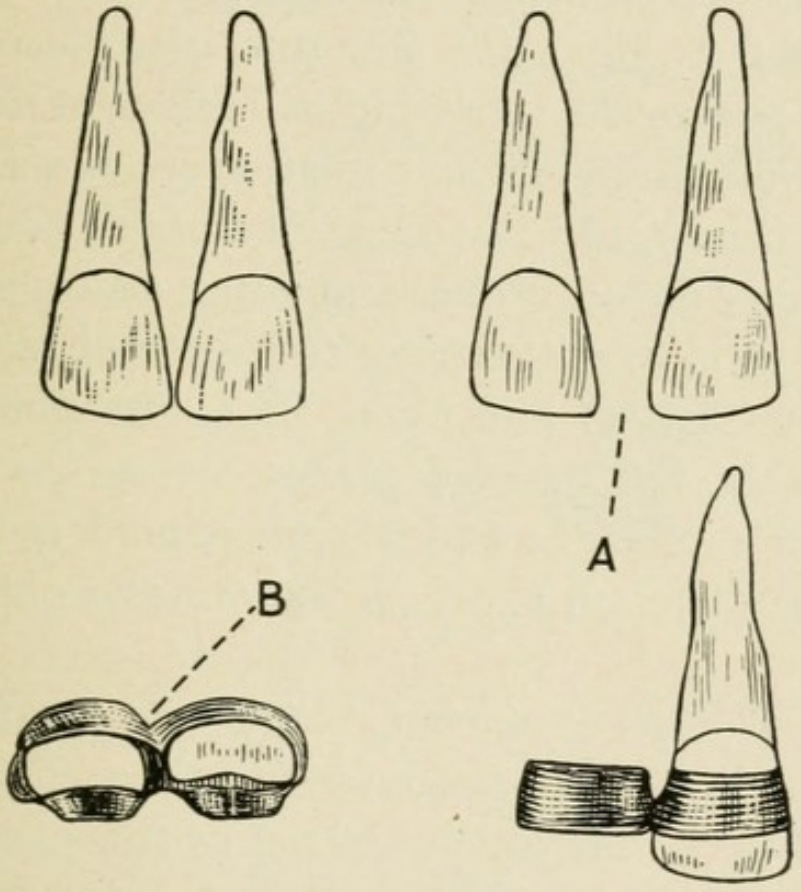


Fig. 136.

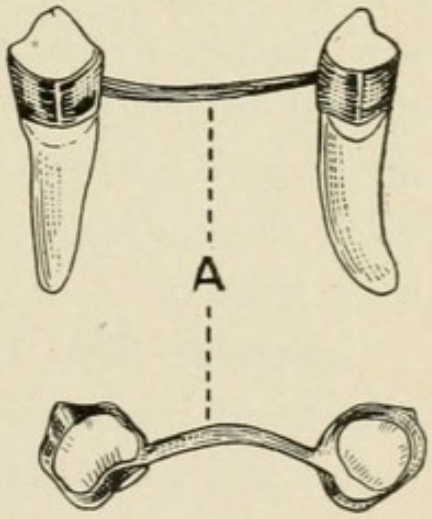


Fig. 137.

be near their incisal borders. Very little solder is required for the uniting of the bands, and they should be accurately aligned before soldering in order to permit of ease in application and cementation.

Exercise No. 13.—The retaining appliance here shown (Fig. 137) consists of two plain bands adapted to the cuspids and united with a lingual bar of spur wire, No. 18 gauge, shown at A above. This form of retaining appliance is very effective

for the retention of cuspids that have been rotated, especially lower cuspids. It also forms a good retainer for the four incisors that have been moved labially. Such a retainer is also shown applied to the upper arch in Fig. 138, the bar resting against the lingual surfaces of the incisors, preventing their return to positions of linguoversion.

Exercise No. 14.—An entirely different form of retainer is here shown. It consists of a rather wide, plain band, adapted to a lower cuspid tooth, with an inclined spur soldered on the labial surface of the band A, Fig. 139. The spur is so placed that its distal incline opposes the mesio-incisal surface of the upper cuspid. This maintains normal arch relation and is used after the shifting of occlusion in Class II. Two bands used in combination on the first molars, upper and lower, shown at B, Fig. 139, also afford good retention after correction of arch malrelation in cases of Class II and Class III. The spurs should be so placed that the inclined planes oppose each other in occlusion, the manner in which they oppose each other depending on the direction in which the occlusion has been shifted.

Exercise No. 15.—Construct anchor bands and adapt alignment wire to vulcanite model of malposed teeth, as illustrated in Figs. 140 and 141. The advantages of constructing an appliance on such a model is readily apparent, since the bands can be brought together on the lingual surface of the anchor teeth, and incisors also, by use of the band-forming pliers, practically the same as working in the mouth. *The only correct method of constructing bands for orthodontic purposes is to form them around the teeth in the mouth.* The vulcanite model permits of similar working conditions as found in the mouth, and should give the student a good idea of conditions which he will meet with later in practice. The bending of the expansion arch should always be with the fingers. Never

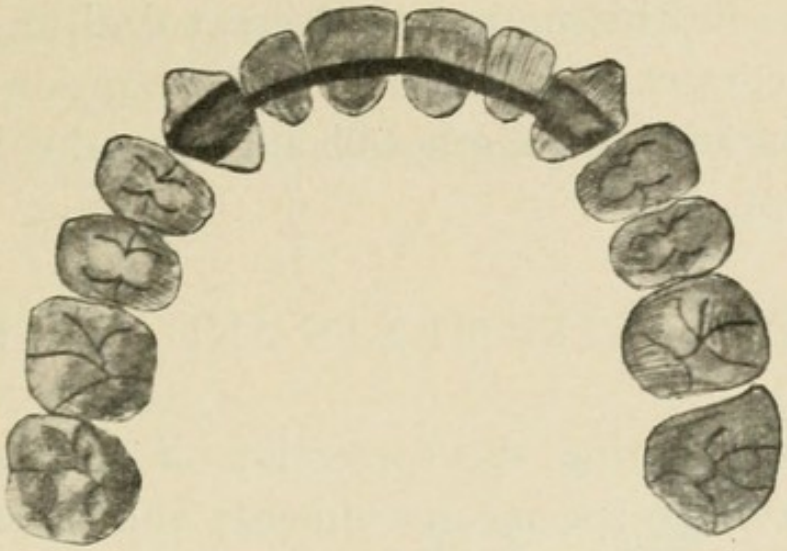


FIG. 138.

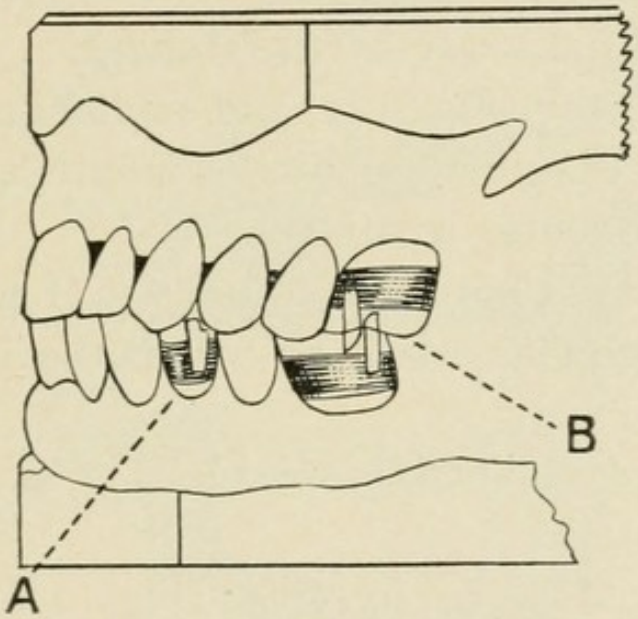


FIG. 139.

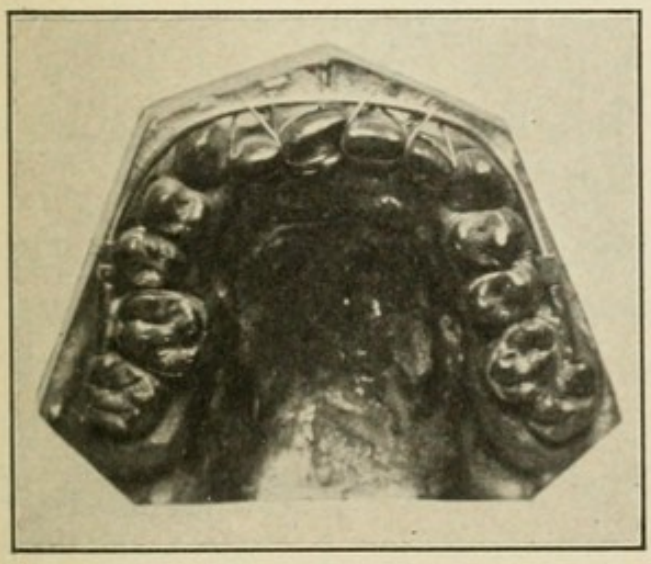


FIG. 140.

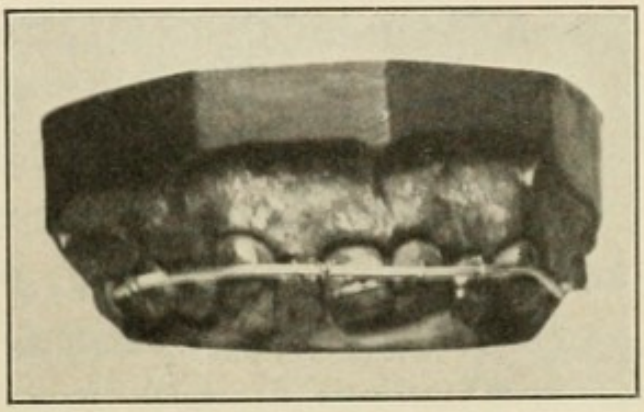


FIG. 141.

use the pliers for this purpose. A great deal of care is essential to the correct adaptation of the expansion arch, for, as previously stated, the teeth will align to the bent form of the expansion arch.

LIST OF INSTRUMENTS AND MATERIALS

Before attempting the correction of malocclusion, it is necessary to have special instruments and materials for the construction of various parts of an orthodontic appliance.

The use of instruments and materials should here become an object of special study by the student.

A mouth mirror (Fig. 142) and explorer are indispensable for the careful examination of the mouth and teeth before beginning orthodontic treatment.

A rubber plaster bowl of medium size (Fig. 143) for mixing plaster. A large glass slab, on which the impression is inverted after pouring.

A large square end plaster spatula (Fig. 144) should be used in mixing the plaster.

A set of special impression trays (Figs. 40 and 41) is essential in order to obtain good impressions. They should be kept neat and clean. A fixed-blade plaster knife for the trimming of the model is shown in Fig. 145.

The two plaster knives shown in Figs. 146 and 147 are very useful for grooving and removing plaster impressions.

For accurate trimming of models, a try-square is useful. The plaster plane (Fig. 148) for the artistic trimming and proportioning of the model completes the list of plaster instruments. A blowpipe (Fig. 60) designed especially for the purpose is absolutely necessary for soldering delicate parts of an appliance. A small Bunsen burner (Fig. 59) for soldering bands. Band-forming pliers (Fig. 149) are essential. The

writer's modification of band-forming pliers is shown in Figs. 150 and 151.

Band-soldering pliers as shown in Fig. 152 are indispensable.

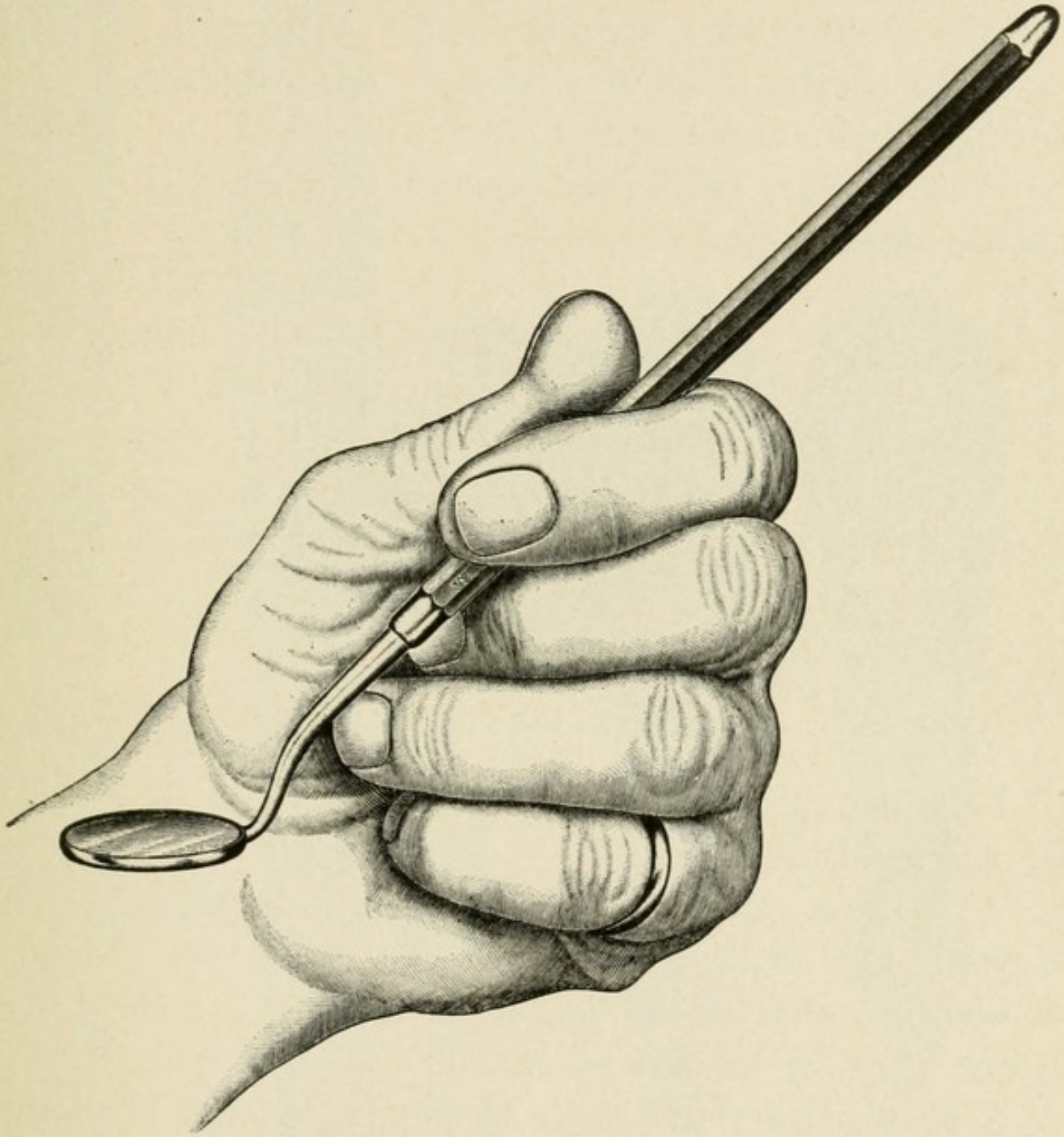


FIG. 142.

The points of these pliers are bent at right angles, which allow the flame to pass around the joint, thus allowing the solder to flow easily without overheating the band.

Solder tweezers (Fig. 154) for holding and placing small pieces of solder.

Wire nippers (Fig. 155) for cutting off the ends of the alignment wire, spur wire, etc.

Flat-nose and laboratory pliers (Figs. 156 and 157) for twisting the ligatures.

Locking tweezers (Fig. 158) for holding bands while the sheaths or spurs are realigned.

Plate shears, small size, straight pattern (Fig. 159) for cutting band material and solder.

Plate shears, small size, curved pattern (Fig. 160) for cutting ligature wire.

FIG. 143.—Medium size plain bowl.

Band driver and small mallet (Figs. 161 and 162) for forcing the band to place.

Wrench for manipulation of nuts of an expansion arch is shown in Fig. 163.

Ligature wire for the ligating of malposed teeth is shown in Fig. 164. Spool of ligature silk.

A small, half round, smooth cutting, metal file, for the finishing of spurs, etc.

A burnisher, of the double end design (Fig. 165) is used in adapting the bands accurately to the teeth.

A shallow, saucer-shaped glass dish with cover (Fig. 166) for holding small pieces of solder and flux.

A cement spatula (Fig. 167) and large glass slab.

A round sable hair brush, small size, for application of flux in soldering.

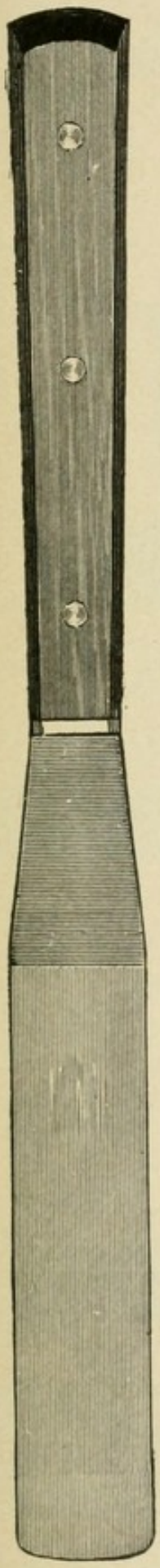


FIG. 144.—Plaster spatula.

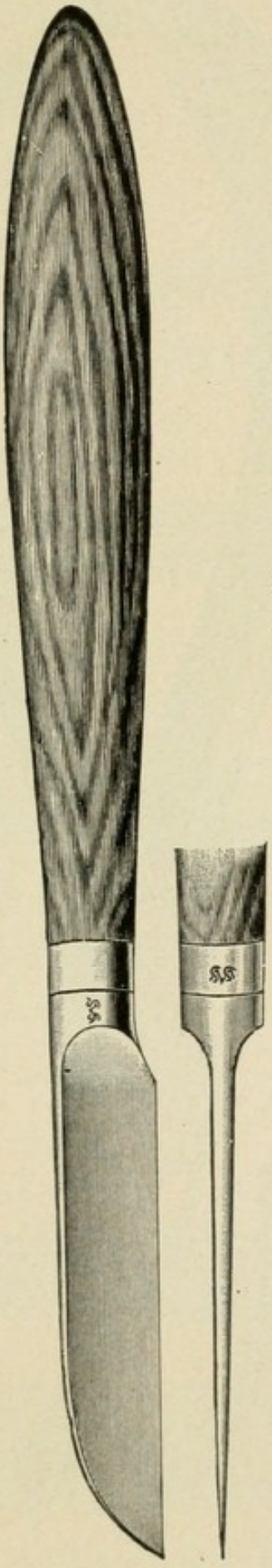
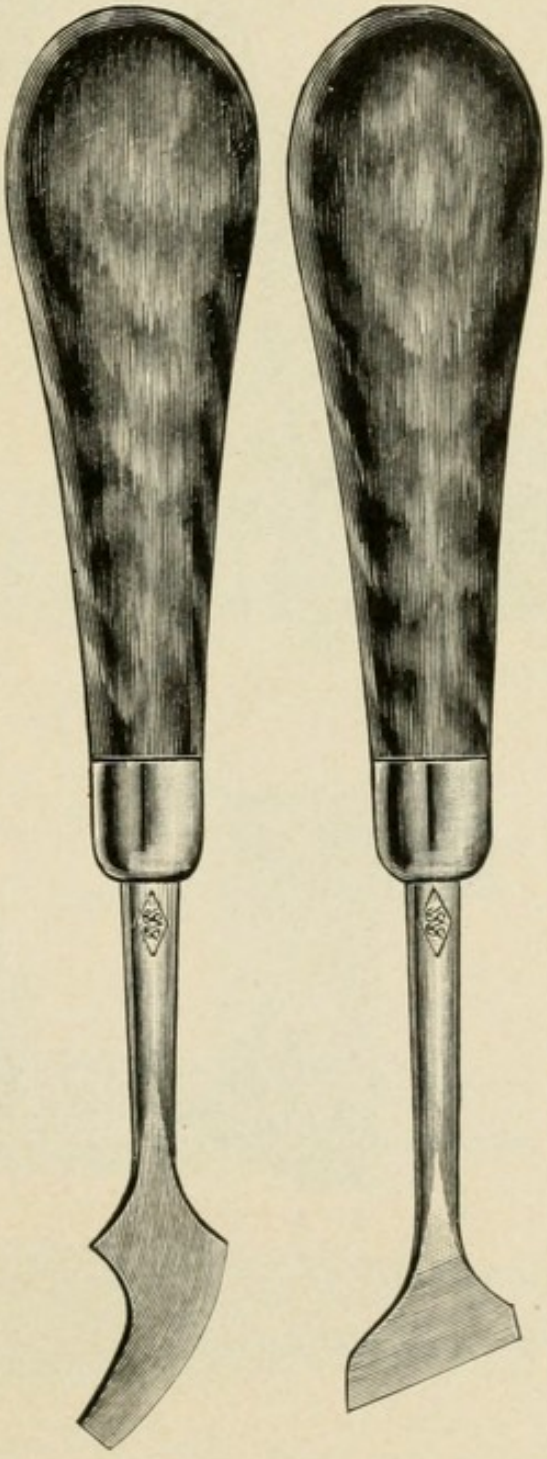


FIG. 145.—Plaster knife.



FIGS. 146 and 147.—Plaster knives for grooving impression.

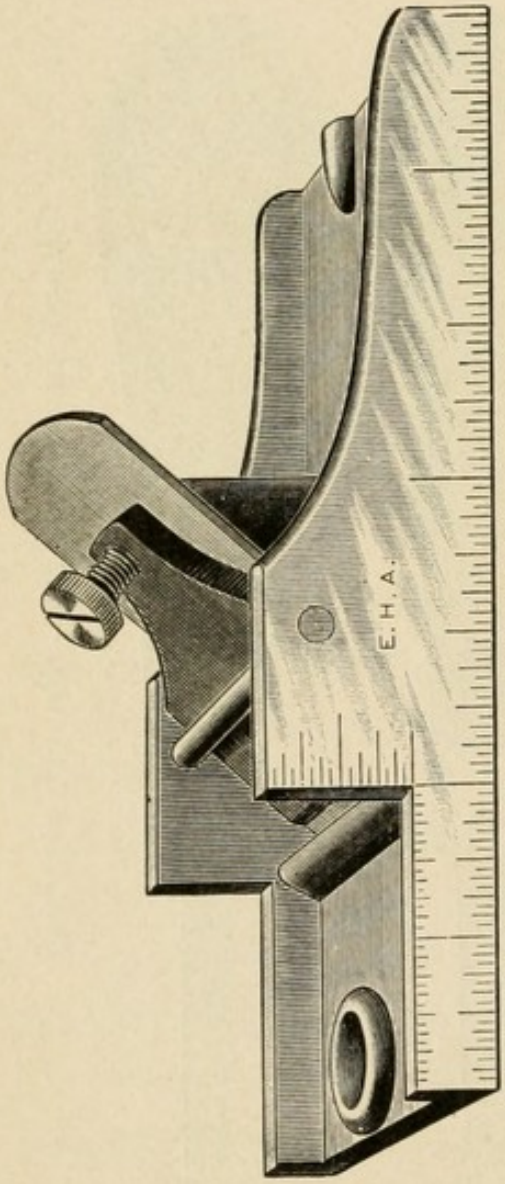


FIG. 148.—The Angle plaster plane.

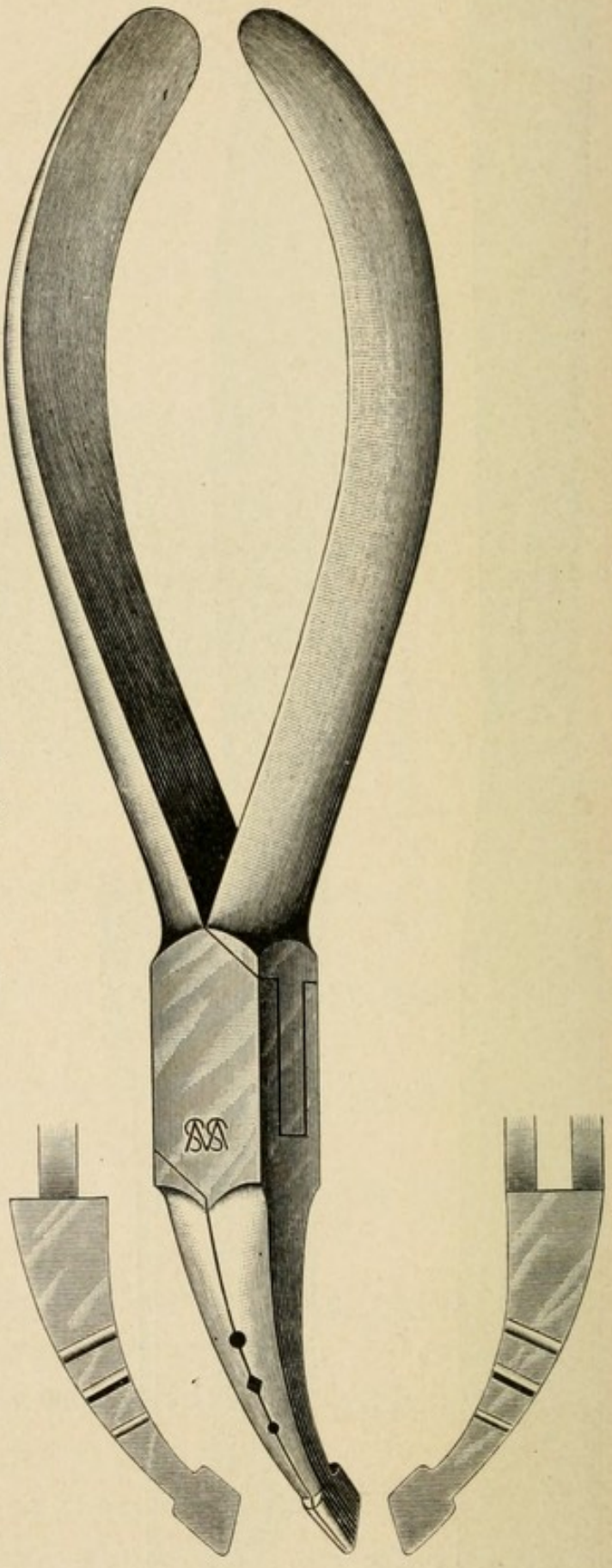


FIG. 149.—The Angle band-forming pliers.

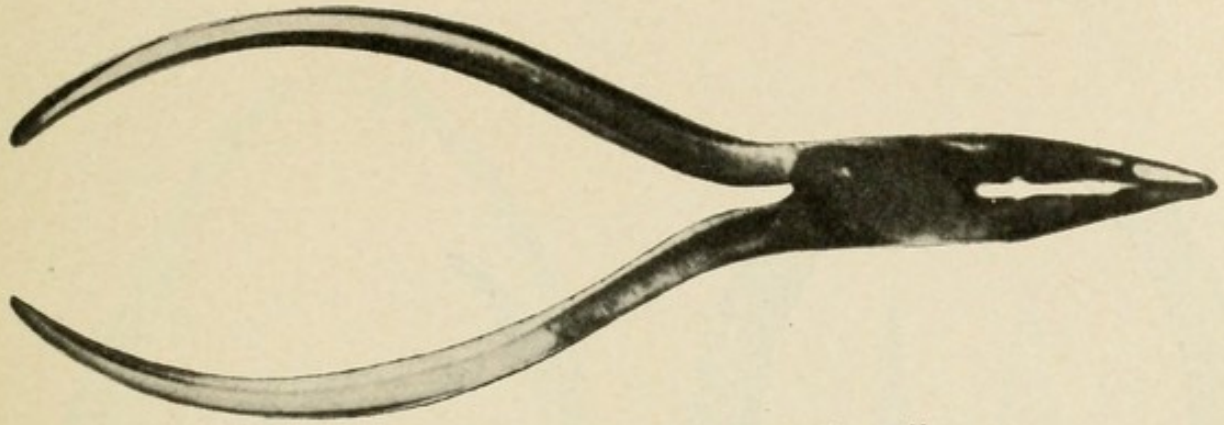


FIG. 150.—The author's band-forming pliers.

FIG. 151.—Another view of the author's band-forming pliers

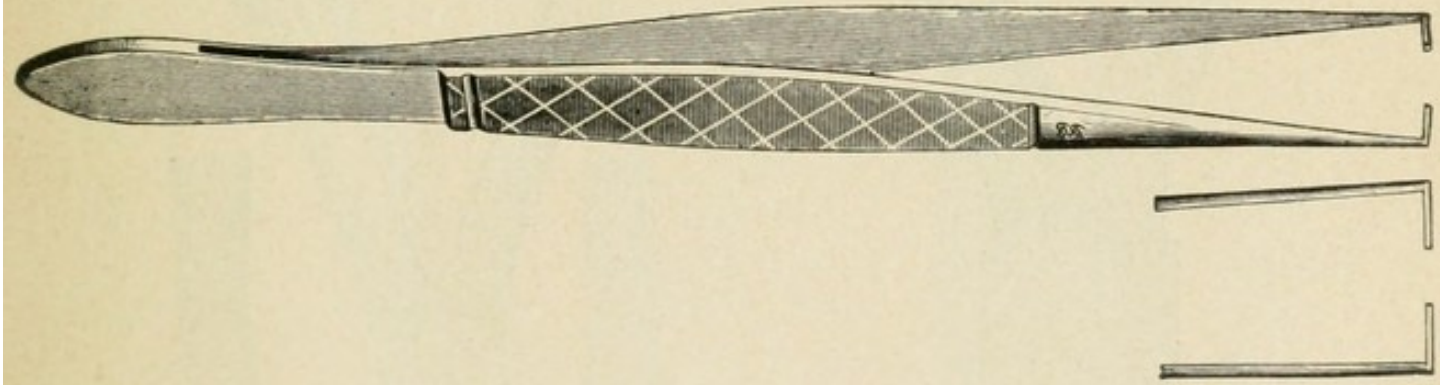


FIG. 152.—Band-soldering pliers.

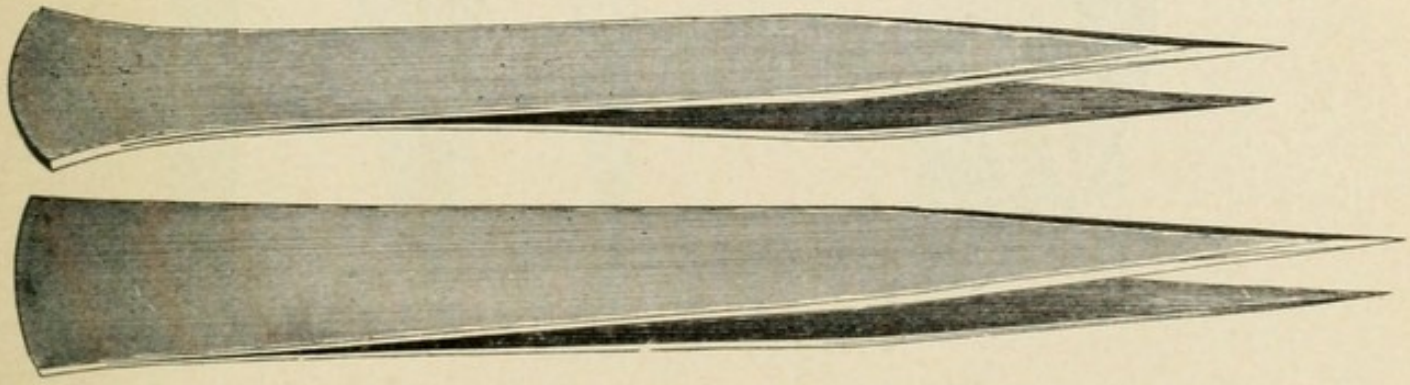


FIG. 153.—Solder tweezers. Small size.
FIG. 154.—Solder tweezers. Medium size.

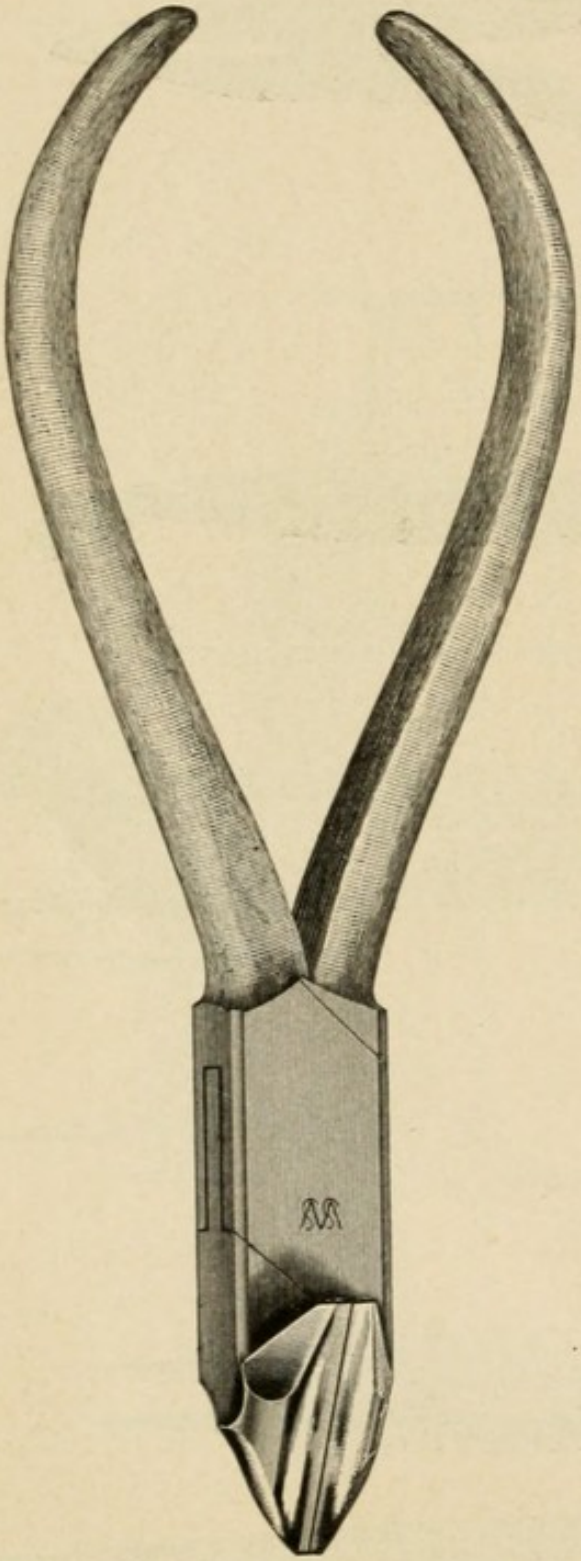


FIG. 155.—Wire nippers.

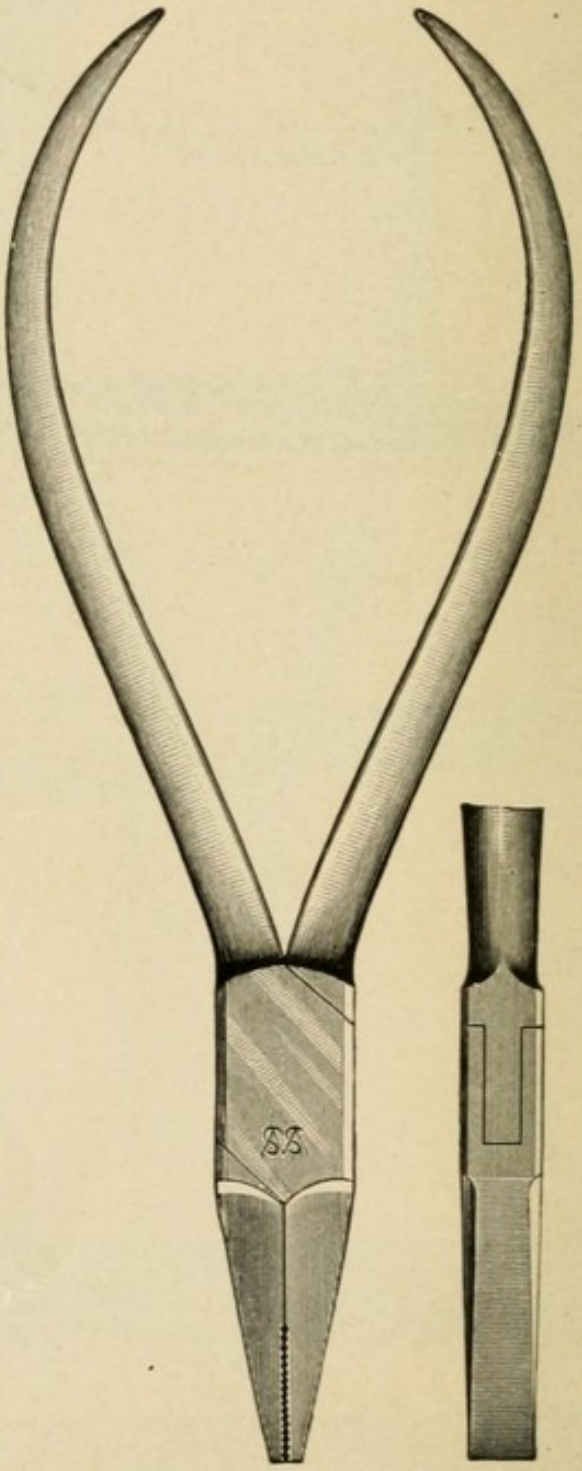


FIG. 156.—Flat-nose pliers.

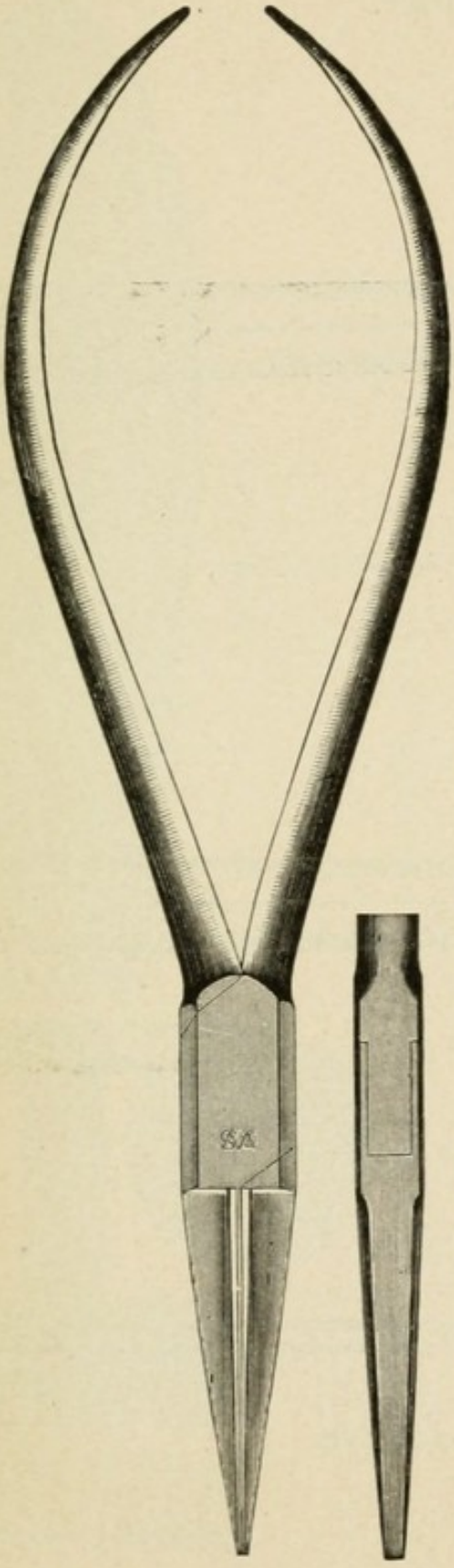


FIG. 157.—Laboratory pliers.

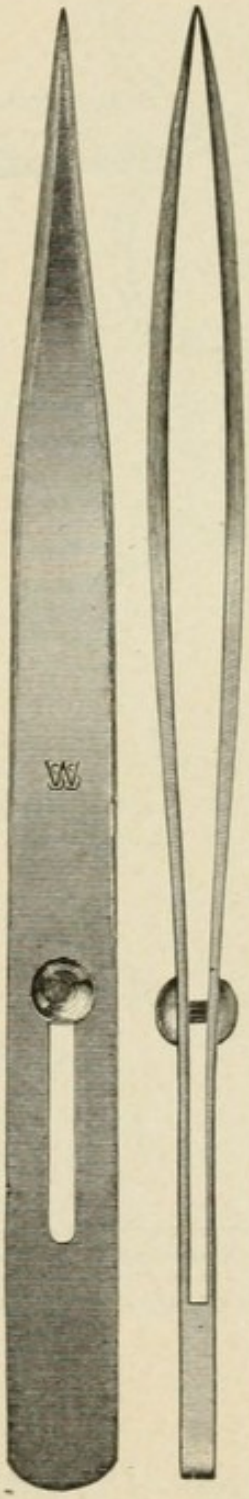


FIG. 158.—Locking tweezers.

A small solarization case for pickling.

One piece of silver solder, easy flowing 5 dwt.

Package of jeweler's soft solder.

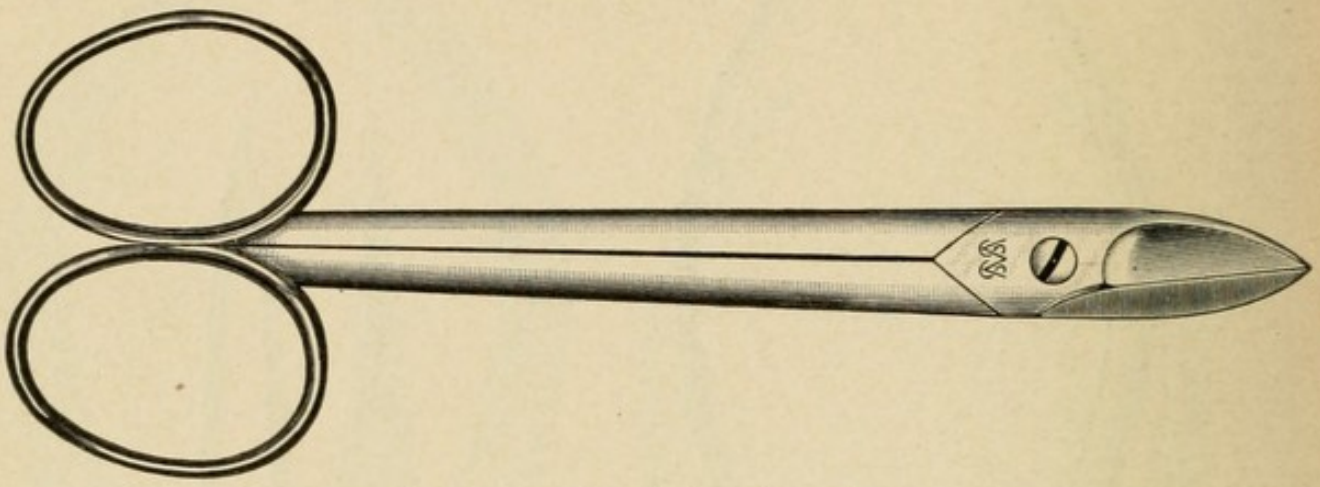


FIG. 159.—Small size plate shears.

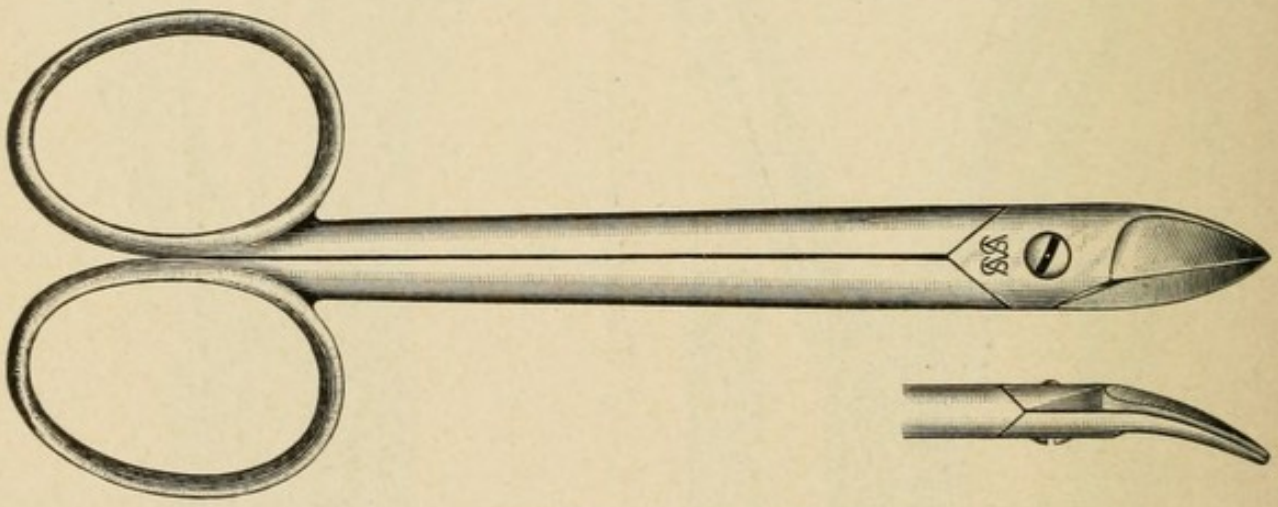


FIG. 160.—Plate shears (curved).

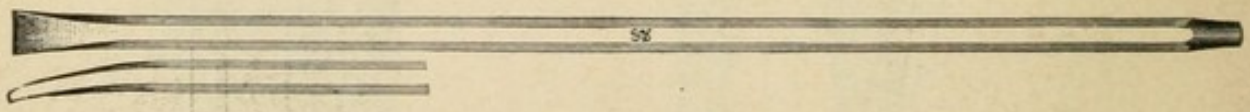


FIG. 161.—Band driver.

Package of crystal borax.

Four ounces of dilute sulphuric acid, to be used for pickling bands after soldering.

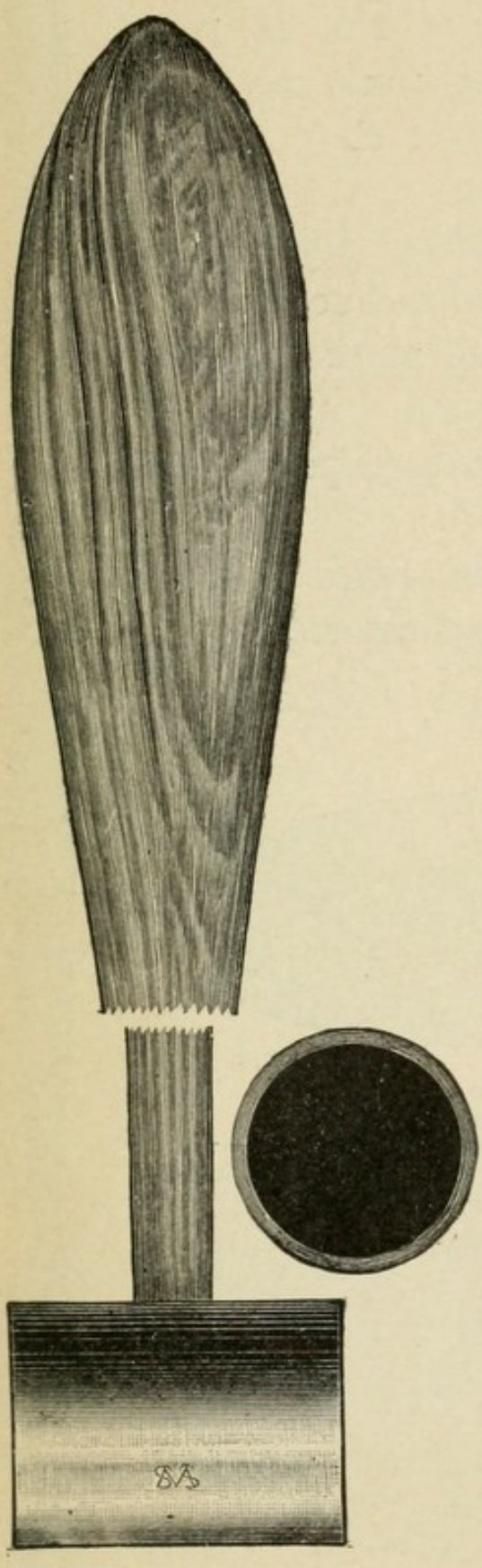


FIG. 162.—Small mallet.

FIG. 163.—Wrench.

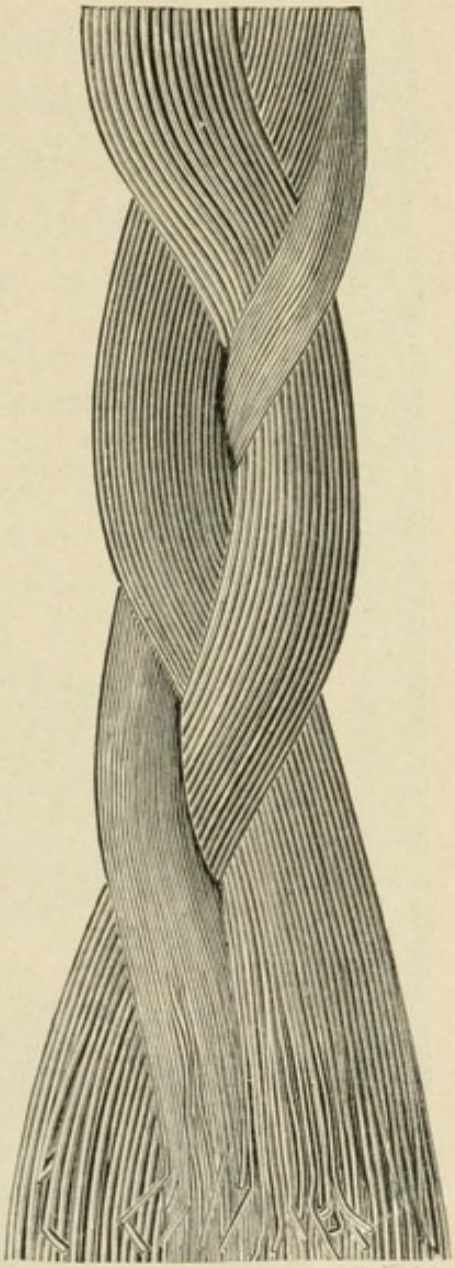


FIG. 164.—Angle ligature wire.

Two or three coils of nickel silver band material, five-thirty-seconds of an inch wide and No. 36 gauge.

Three or four pieces of No. 18 gauge nickel silver alloy wire, for spurs, etc.

One piece of nickel silver alloy seamless tubing, No. 16 gauge bore.

One piece of nickel silver alloy square bar, for the construction of inclined spurs.

Ten dwt. nickel silver plate 34 gauge for anchor band construction.

Box of separating rubber strips, assorted sizes.

Assortment of expansion arches.

One box of napkins and assorted cotton rolls.

One box of cement.

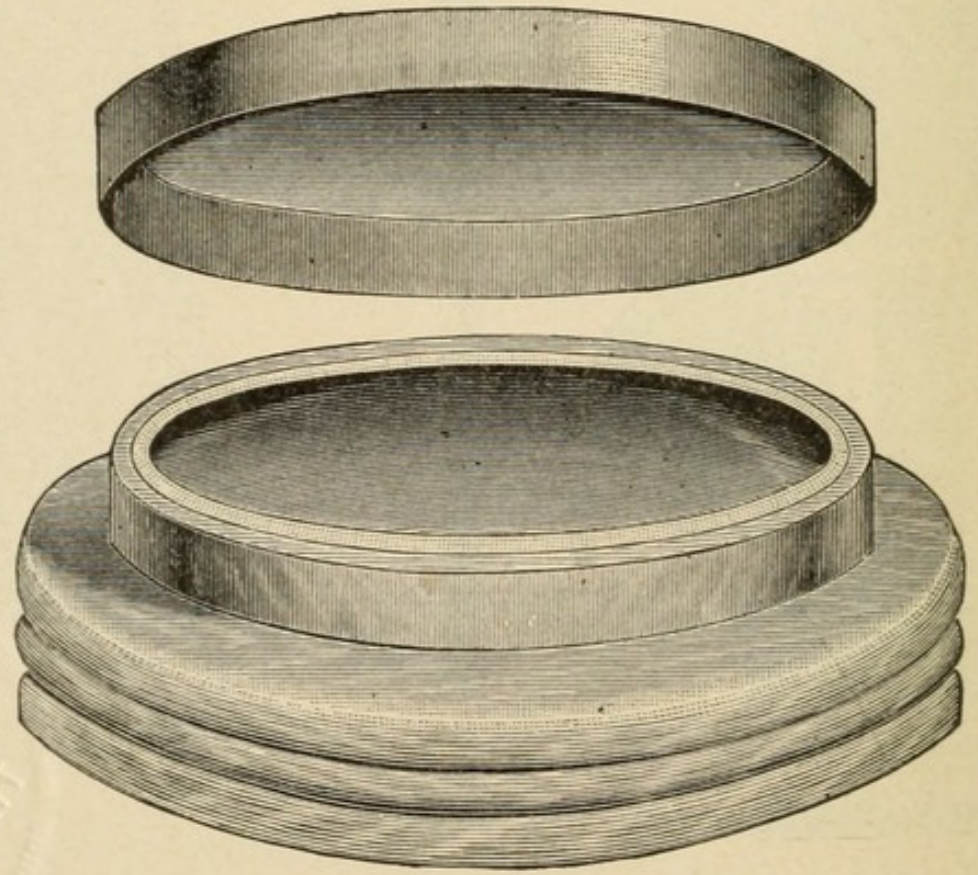


FIG. 166.—Glass dish.

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