Prosthetic articulation / by George Wood Clapp, D. D. S.

PROSTHETIC ARTICULATION

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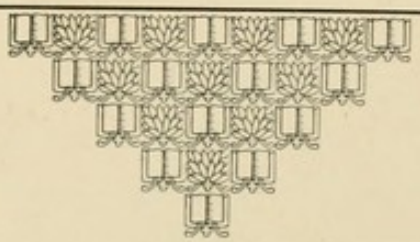

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PREFACE.

This book is intended to make plain the principles of impression taking and prosthetic articulation, but not to cover all applications of those principles or to explain every minute detail of technic.

What is here presented has been learned from many sources. I wish to disclaim originality in connection with anything appearing in the book, and to express my thanks to all who have aided in any way. Especial thanks are due to three helpers, as follows:

Mr. S. G. Supplee taught me the method of taking impressions and helped in preparing this presentation. He follows Dr. Greene's method, but has effected important improvements in finishing the impressions with the mouth closed and under normal biting stress. For this reason I have called the method herein described the Greene-Supplee method. Impressions finished in this way form excellent bases for recording mandibular movements by Professor Gysi's methods.

Dr. J. Leon Williams has permitted the use of his methods of selecting porcelain tooth forms. I believe these to be the first really scientific methods of selecting tooth forms ever offered. By means of them a person untrained in dentistry can select tooth forms better than has heretofore been possible to even skilled dentists.

Professor Gysi's methods of articulation seem to me far superior to any others. They demand more of the dentist in the early stages of the work than other methods. But they yield results not otherwise obtainable. And, once mastered, they really save time.

Gysi articulators and Trubyte teeth are described and illustrated here because I believe them to be unapproached by any other products in their respective lines.

The Author.

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PART I.

IMPRESSION TAKING

THE OBJECT IN IMPRESSION TAKING

is to secure models over which to make dentures that exhibit

Relative stability in all positions of the mouth,
Efficiency in speech and mastication, and
Comfort to the patient.

Impressions finished with the mouth closed facilitate the making of such dentures for the following reasons:

When the mouth is opened, the soft tissues on the buccal sides of the upper ridge, and overlying the hard palate are distended. Impressions taken with the mouth open yield models of the tissues in distended positions. Dentures made over such models are often not stable in all positions of the lips and cheeks.

When the mouth is open, the two prominent bands of soft tissue on the buccal side of each upper ridge are distended backward from their attachment to the ridge. For want of a better term I have called this the "posterior position." When the mouth is closed and at rest, the anterior band occupies what I have called the "middle position," while the posterior band seems to lose its individuality.

When the mouth is closed and the lips are thrust forward as in whistling or seizing food, the anterior band occupies what I have called the "anterior position." The posterior band is rarely prominent in this position.

The positions of these bands are shown in Figures 2-3-4.

If the buccal margins of the impression are trimmed to fit these bands in the posterior position, the act of thrusting the lips out in biting food is very likely to dislodge the upper denture. But if the margins of the impression be trimmed to fit the attachments in the anterior position, it will be impossible to dislodge the denture by any movements of the lips.

Impressions with properly trimmed margins can be taken only while the mouth is closed and the upper and lower impressions support each other under normal biting strain. The effects of such trimming are shown in the illustrations on page 15.

NAUSEA FROM DENTURES.

Nausea is not caused by a properly fitting upper denture extending too far backward, but by an imperfect fit of the posterior margin of the denture, so that the soft tissues in moving up and down just touch the denture, and a tickling sensation is caused, which results in nausea.

If an effort is made to secure a fit by carving the model so that the posterior margin of the denture presses up into the soft tissues, nausea may result.

If the impression be finished with the mouth closed and the impressions under normal biting strain, the upper denture may be carried as far back as is required, without causing nausea.

IMPRESSION MATERIAL.

Modeling compound is preferred for impression taking because:

It permits taking the impression in "stages."

Impressions may be finished with the mouth closed and under normal biting stress. This permits such adaptation of the dentures to the soft tissues as is not otherwise possible, and seems to the writer the most important advance in impression taking methods of recent years.

The dentist may know from the impressions whether or not the dentures will fit the mouth.

Minor imperfections in the impressions can be easily corrected.

The impressions are built into trial plates. This expedites denture completion.

None of these procedures is practicable with plaster of paris.

ESSENTIAL STEPS IN IMPRESSION TAKING.

Examining the mouth.
Trimming the upper and lower trays.
Shaping the compound in the trays.
Taking the working impressions.
Making upper and lower trial plates.
Finishing the impressions.

EXAMINING THE MOUTH.

Figure No. 1.

Every mouth should be examined as to:

The character and extent of soft tissues overlying the hard palate.

Where the movable portion of the soft palate begins.

The character and extent of soft tissues in the ridges.

The location and strength of the muscular attachments on the buccal sides of the upper ridge and both sides of the lower ridge.

The space between the tuberosities of the upper ridge and the rami of the mandible when the mouth is closed.

Examinations should be made with the finger, with the mouth open and closed.

All unusual conditions should be recorded on a chart. They may aid in making the dentures or in satisfying the patient.

The chart used at the Gysi School of Articulation is reproduced on page 17. It follows very closely Dr. McLeran's design.

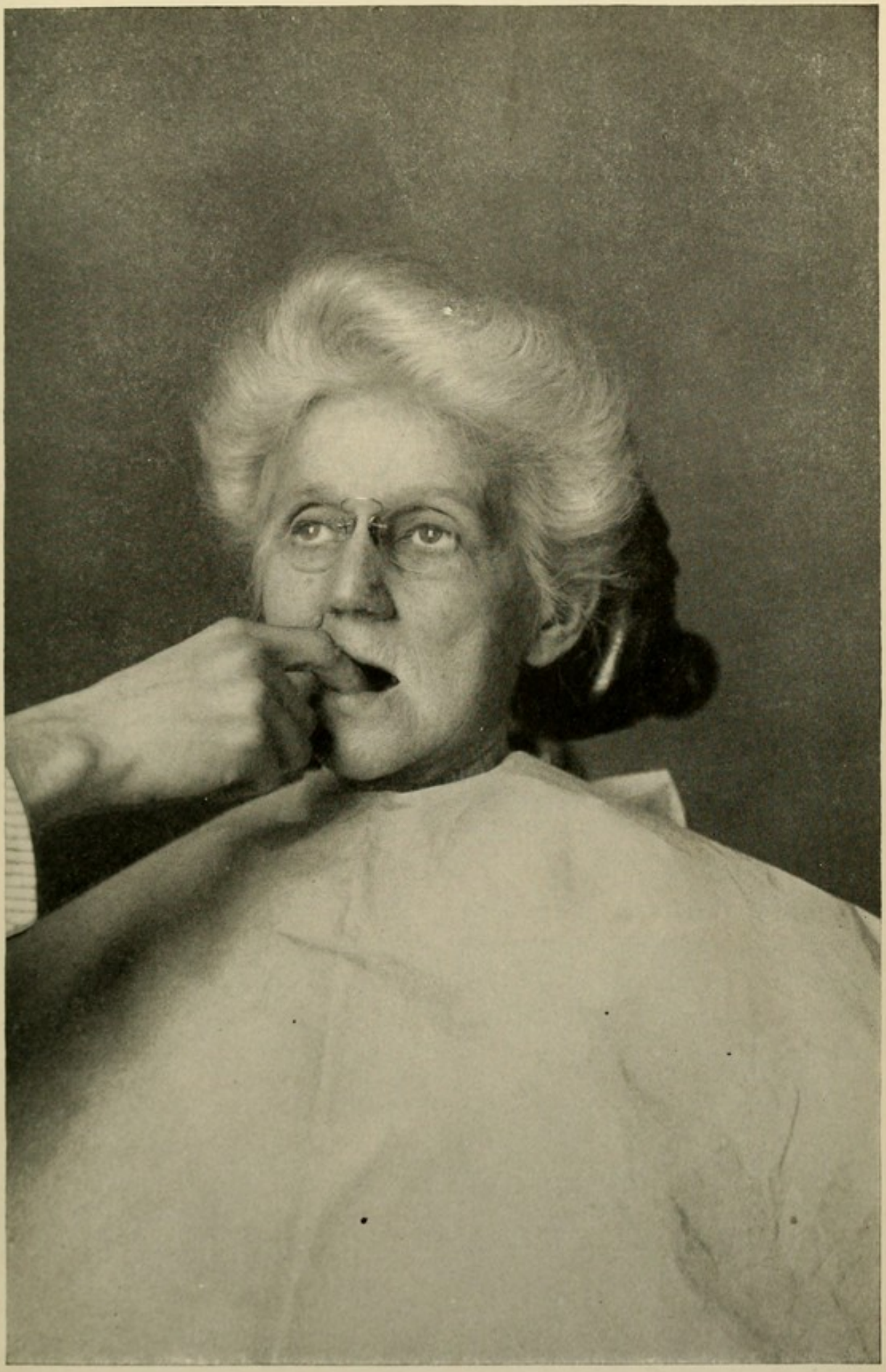


Fig. 1.

Examining the mouth by the aid of the finger.

POSITIONS OF THE UPPER BUCCAL ATTACHMENTS.

Figures Nos. 2, 3, 4.

The darkened areas in Figure 2A show the two prominent bands of tissue attached to the buccal side of the upper ridge, in the position they occupy when the mouth is wide open. I call this "the posterior position." Both bands are prominent.

The blackened area in Figure 2B shows the position occupied by the anterior band when the mouth is closed and the tissues are relaxed. I call this "the middle position." Under this condition the posterior band seems to lose its definition and merge into the other tissues.

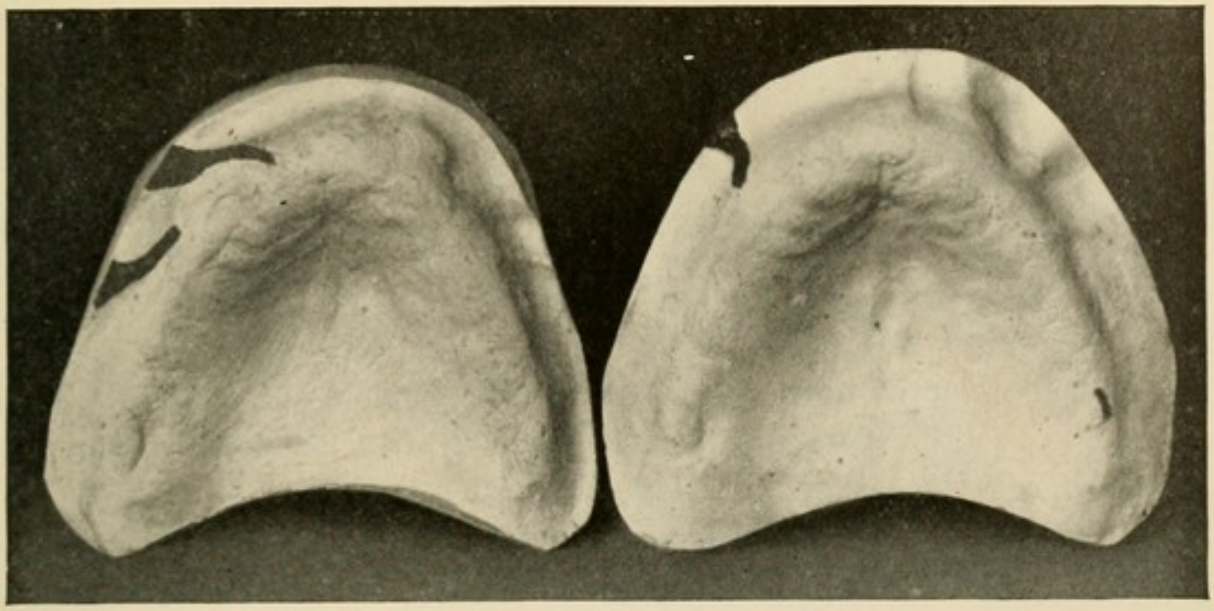
When the lips are projected, as in whistling or taking food, the anterior band moves forward with its attachment to the ridge as a center, to what I call "the anterior position." This position cannot be easily shown in a model but its influence on the margin of an impression can be seen in Figure 31C. The posterior band does not seem to be prominent in this position.

The Greene-Supplee method of impression taking allows both bands to "trim" the buccal margin of the upper impression to all of their positions, and then condenses the margin against the buccal tissues with the mouth closed, the muscles relaxed, and the anterior band in middle position. Dentures thus "muscle trimmed" are generally stable in all positions of the mouth.

Figure 3A shows a model of a mouth with the tissues in the posterior position and a metal plate adapted to it. Figure 3B shows a model of a mouth made with the buccal tissues relaxed in middle positions, and the same metal plate on it. The space between the model and the margin of the plate is noticeable.

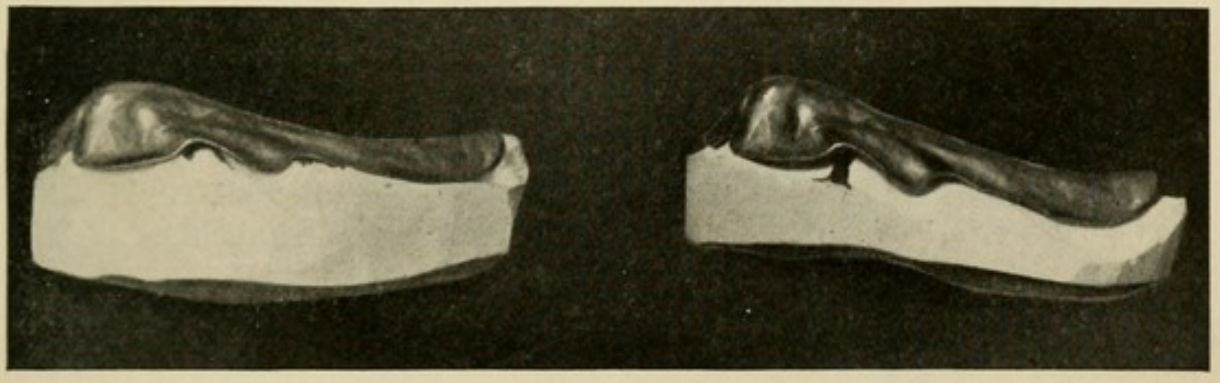
Figure 4A shows a plaster impression of a lower jaw, as usually taken. There is a great excess of material, which has distended the tissues on both sides of the ridge. This distension prevents the adaptation of the margins of the denture to the tissues at the base of the lower ridge. Such adaptation is essential to comfort and efficiency in a lower denture.

Figure 4B shows a lower impression taken after the Greene-Supplee method and properly adapted to the tissues at the side of the ridge. This impression is comfortable and relatively stable in all positions of the mouth.



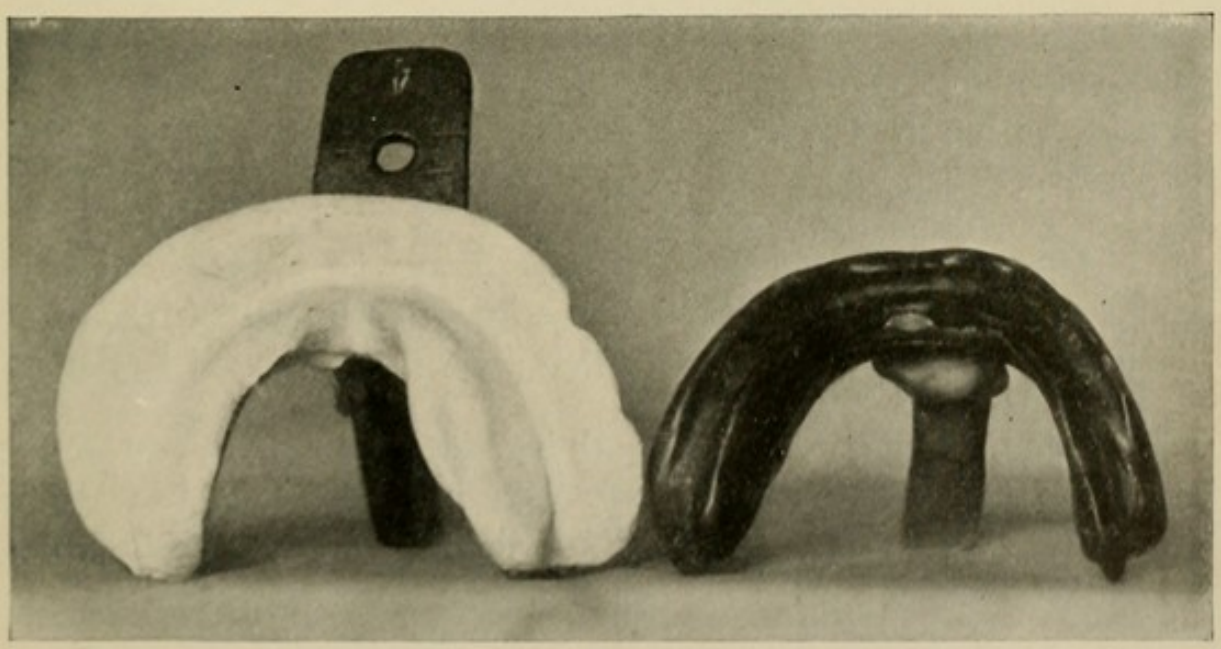
A B

Fig. 2.



A B

Fig. 3.



A B

Fig. 4.

GUIDANCE BY FACTS LEARNED DURING EXAMINATION OF THE MOUTH.

The upper denture should extend far enough back of the hard palate so that its margin will make a valve with the soft tissues. In cases of firm ridges in the front of the mouth, the denture need not extend back onto the movable soft tissues. When the ridge in front is very soft, the denture must extend farther backward to prevent being thrown down in biting.

Care must be taken not to displace the tissues in soft ridges. In cases with very flabby ridges, special steps to prevent displacement must be taken. Care must be taken also not to stretch the tissues on the upper surface of the lower ridge, and cause pain.

The muscular attachments on the buccal side of the upper ridge may be extensive or small, and strong or weak. The firmer the muscles, the greater care must be taken to provide for their accommodation by the margins of the denture.

The muscles on both sides of the lower ridge must be accommodated. They are weak but effective in dislodging a denture. Perhaps even more care is necessary here than in the upper denture. In cases with narrow lower ridges, the lower denture may need to ride partly on the muscles. But it must be evenly raised and lowered by the muscles during movements with the mouth open, and not thrown out of position.

Care must be taken that the upper tray and impression are so trimmed between the tuberosity of the upper ridge and the ramus of the lower jaw, that the denture shall not cause congestion of the tissues.

Spots of very hard tissue overlying the hard palate must be relieved by laying tin of proper thickness over the model just before vulcanizing. This applies especially to the tissues of the median line.

Chart for Artificial Dentures

(After that compiled by J. W. McLeran, Omaha, Neb.)

Name _____

Address _____

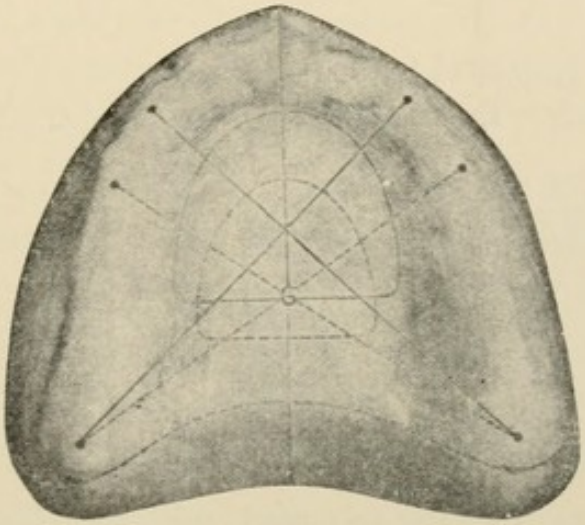
Membrane.		Arch and Vault.			Gums.	
Healthy.	Inflamed.	High.	Flat.	Oval.	Fresh.	Permanent.
					Regular.	
					Firm.	Flabby

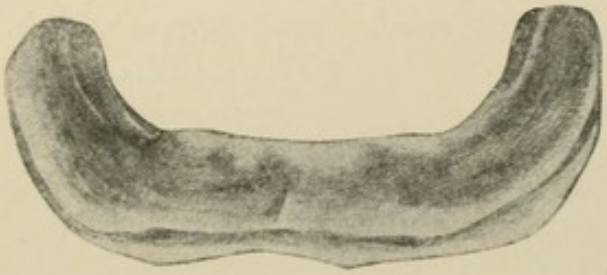
Flabby submucous tissue. _____

Abnormal muscular or gland. attachment. _____

Bony prominence. _____

Undercut. _____





Lateral condyle paths.

Right _____ °

Left _____ °

Forward condyle paths.

Right _____ °

Left _____ °

Rotation points out from center

Right at No. _____

Left " No. _____

Selection of Teeth.

Upper	Measurements.	Lower.
_____ mm.	Length of Central Incisors.	_____ mm.
_____ mm.	Combined Bite and Shut.	_____ mm.
_____ mm.	Ridge Lap.	_____ mm.
_____ mm.	Width 6 Anteriors	_____ mm.
_____ mm.	Width Full Set, 14.	_____ mm.

Upper mould number _____

Lower mould number _____

Shade Upper Central _____

Kind of Teeth _____

Figure 5

IMPRESSION TRAYS.

The trays here illustrated are those designed by Dr. Greene. Those designed by Mr. Supplee are more convenient in some respects. Other trays can be used by proper trimming, and are used by some followers of this method.

Trim the upper tray for antero-posterior length first. If the alveolar ridge in the anterior portion of the upper jaw was found to be hard, trim the center of the posterior margin to rest on the soft tissues immediately posterior to the margin of the hard palate. If the ridge was soft, trim the tray to extend back a little way onto the tissues which can be seen to vibrate when the patient opens the mouth and says "Ah."

Bend the posterior margin of the tray to lie in easy contact with the tissues from the ridge on one side to the ridge on the other.

Trim the buccal margins of the tray until they "clear" all muscular attachments, so that the patient cannot bring any pressure on the tray by lip or cheek movements. Bend these margins so that they follow the outer sides of the ridge, about ⅛ inch away.

The upper tray, as thus trimmed, will be "shorter" in all directions, than the impression is to be. This permits manipulation of the margins of impression material, where they extend beyond the margins of the tray.

Trim the height of the "heels" of the buccal margins according to the amount of free space between the tuberosity of the upper jaw and the ramus of the lower.

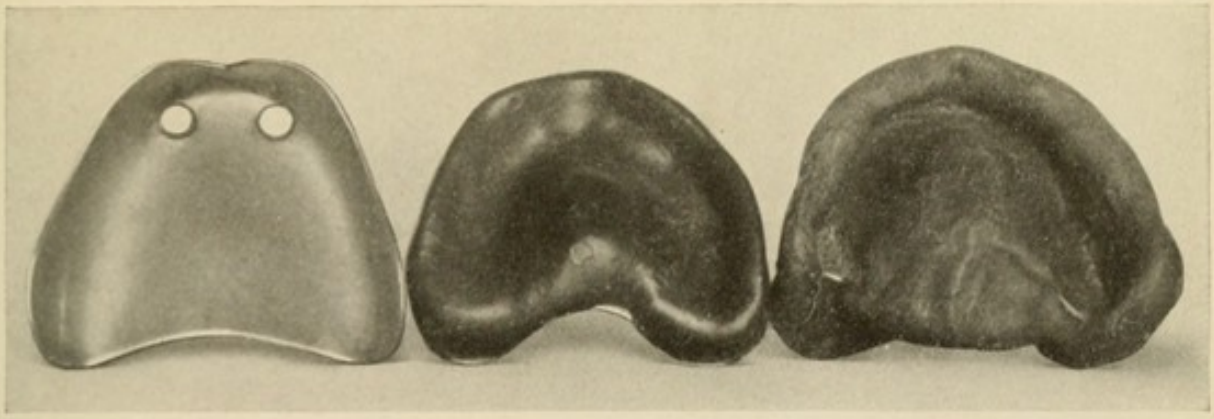
Trim the labial and buccal margins of the lower tray until it cannot be dislodged by lifting the cheeks and lips.

Trim the inner margin until lifting the tongue does not dislodge it.

The tray as thus trimmed may be extremely narrow. This need not cause apprehension. The only function of a lower tray is to carry the compound to place.

Bend the handles of both trays out of the way of the lips.

Dry both trays to receive compound.



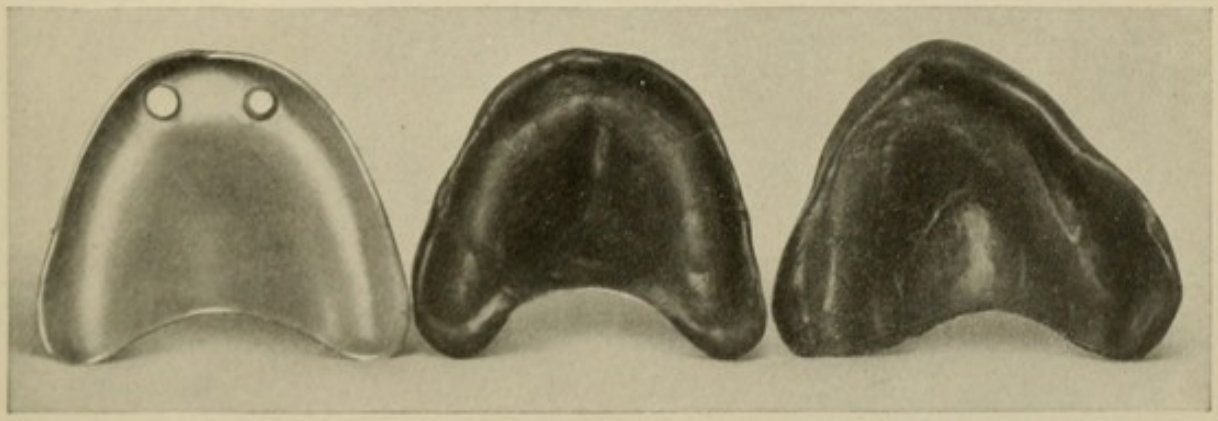
A B C

Fig. 6

A. A Greene tray, untrimmed for height or length and not fitted to the curvature of the vault or ridge. This tray is likely to distend the tissues. It locates the posterior margin of the denture without reference to the conditions in the mouth. It prevents adaptation of the impression margins at all the borders.

B. An excess of compound arranged with more care than is customary, in the tray shown in "A." Note the thickness of compound at the posterior margin of the tray.

C. The impression taken with the tray and compound shown in "A" and "B." This compound was evenly hot throughout the mass. The posterior margin of the tray has come into contact with the tissues at two spots, while the center of this margin was too far from the tissues. This impression was taken with the mouth open and without "muscle trimming."



A B C

Fig. 7

A. The same tray as is shown in 6A, but trimmed for length, and bent to easy contact with the tissues of the vault at the posterior margin. The buccal and labial margins trimmed to "clear" all muscles and to follow the curvature of the ridge. This tray permits manipulation of all impression margins.

B. About the right amount of compound, properly arranged in tray. Note that the compound does not extend quite to the rear margin of the tray in the median line.

C. A baseplate impression from the same mouth as the impression in 6C. The massage illustrated in Fig. 17 has been applied. This incomplete impression is better than the supposedly complete one in Fig. 6C.

WARMING THE COMPOUND.

Figure No. 8.

Less than half a sheet of compound is usually sufficient for an upper impression of ordinary size. The more skillful the operator the less compound he requires.

The compound is to be immersed in hot but not boiling water, and heated until the sharp margins begin to round down. It should then be kneaded until the mass is of equal softness throughout.

If the fingers are kept wet, the hot compound will not stick to them.

If the vessel containing the water is heated from below, a piece of blotter may be laid in the bottom to prevent the compound sticking to the dish. If the blotter extends above the water on two sides, it will be useful in lifting the compound.

Electric heaters which heat the upper surface of the water more than that in the bottom of the dish may be had, and are advantageous.

Form the soft compound into a smooth ball.

ATTACHING THE COMPOUND TO THE TRAY.

Figure No. 9.

Heat one side of the compound above a tiny gas flame or an alcohol flame until it sizzles.

Attach the sizzling side to the center of the dry upper tray.

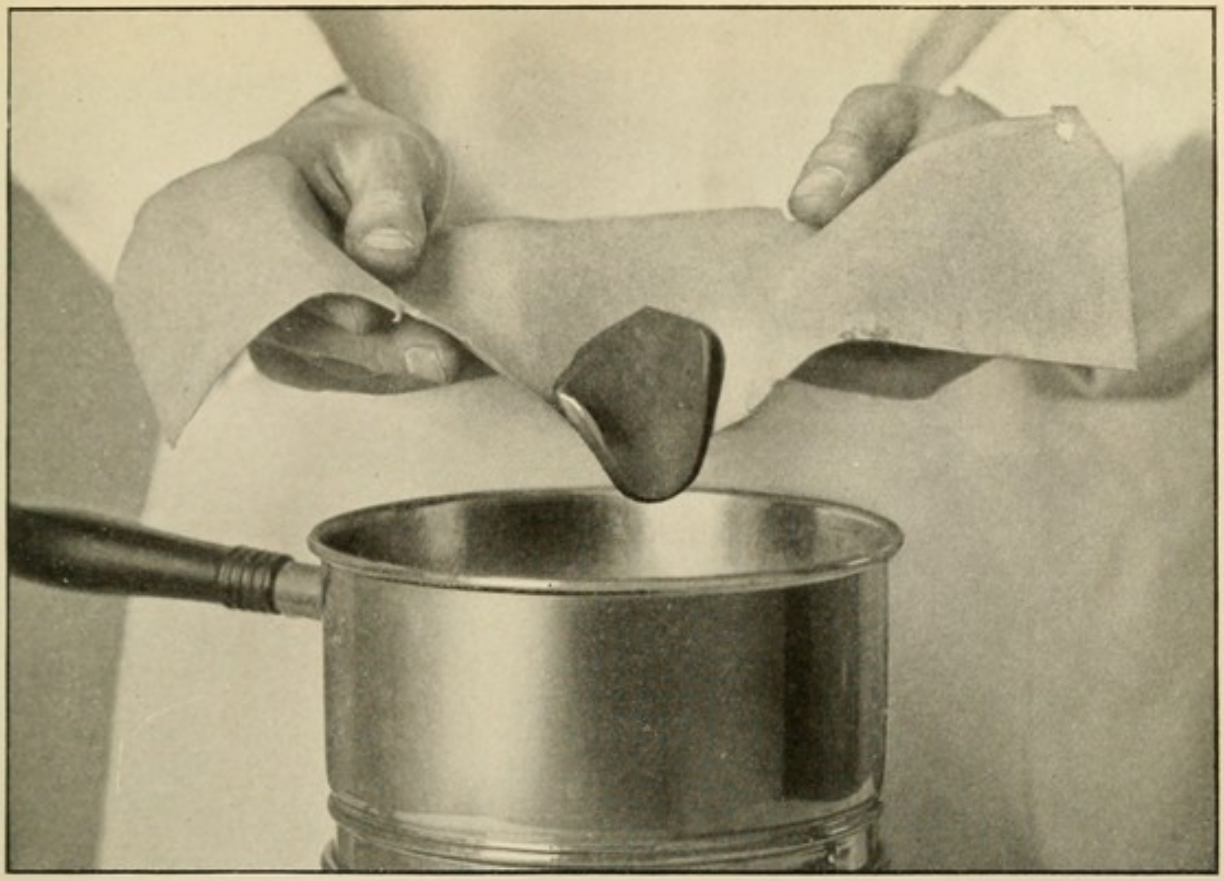


Fig. 8

Less than half a sheet of compound is required for an upper impression of medium size. It is heated in water of a temperature of about 160° until the sharp margins begin to round. It should be kneaded until it is an even softness throughout the mass and shaped into a ball.

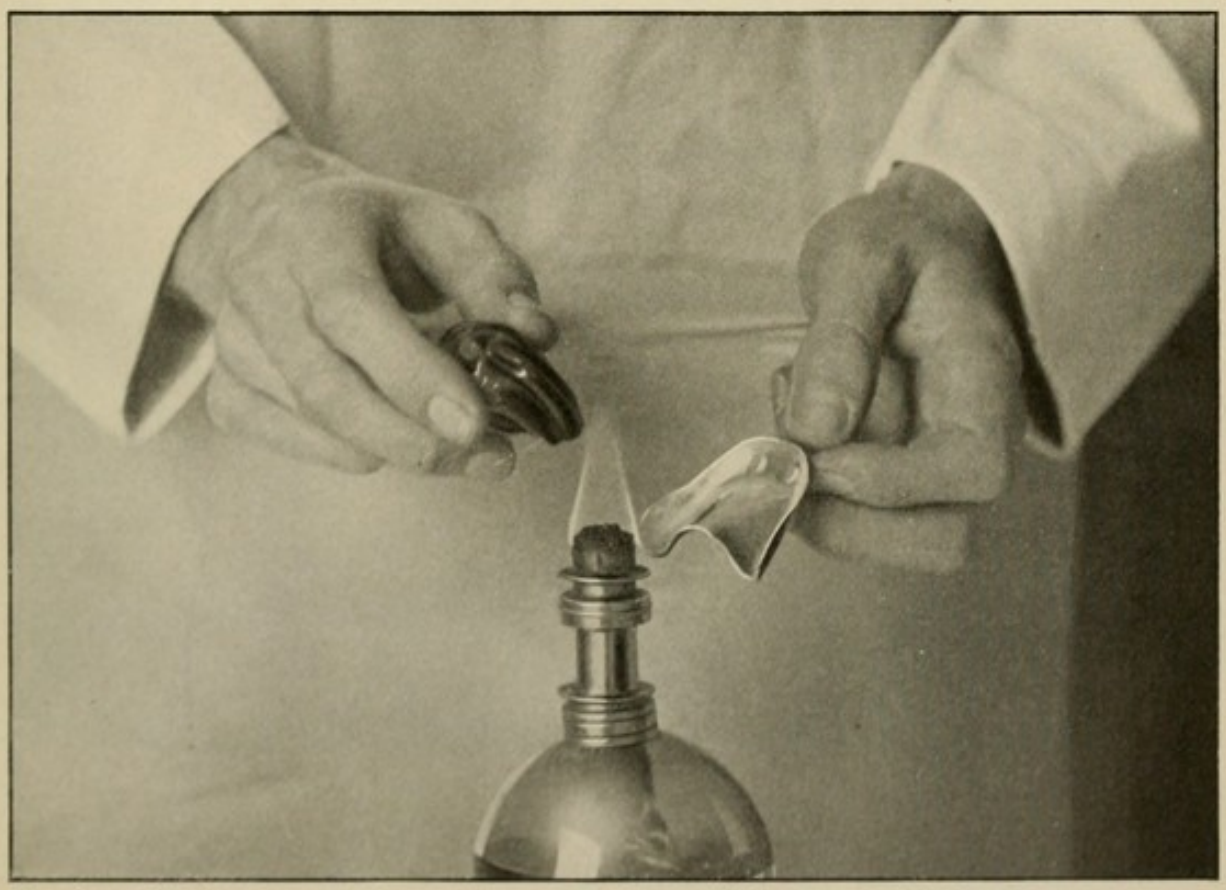


Fig. 9

The upper impression tray is dried. One side of the ball of compound is heated over the flame until it sizzles and is at once attached to the center of the vault of the dried tray.

SHAPING THE COMPOUND FOR THE IMPRESSION.

Figure Nos. 10 and 11.

With wet fingers quickly shape the soft compound into a mound in the center of the tray, a depression all along where the alveolar ridge will come, and a relatively high ridge to go up under the lip and cheeks.

Do not allow the compound to extend quite to the posterior border of the tray.

The compound is shaped as described above to cause it to come first into contact with the tissues as shown in Figure 11. It should strike first the centre of the vault of the palate, and the labial and buccal sides of the ridge, and flow from both directions to the alveolar border. In this way, distortion or displacement of soft ridges is avoided and perfect impressions obtained.

When the ridge is extremely soft, that portion of the working impression which came into contact with the soft ridge tissues may be cut away, very soft plaster flowed into that portion of the tray, and the impression replaced in the mouth. In this way, impressions of very soft ridges may be obtained.

Care must be taken not to push forward the ridge in the anterior part of the mouth, or pain may result from pressure on the blood vessels and nerves passing through the anterior palatine canal in the median line, just back of the incisors.

When taking the lower impression, the tissues on top of the ridge must not be stretched or pain will be caused.

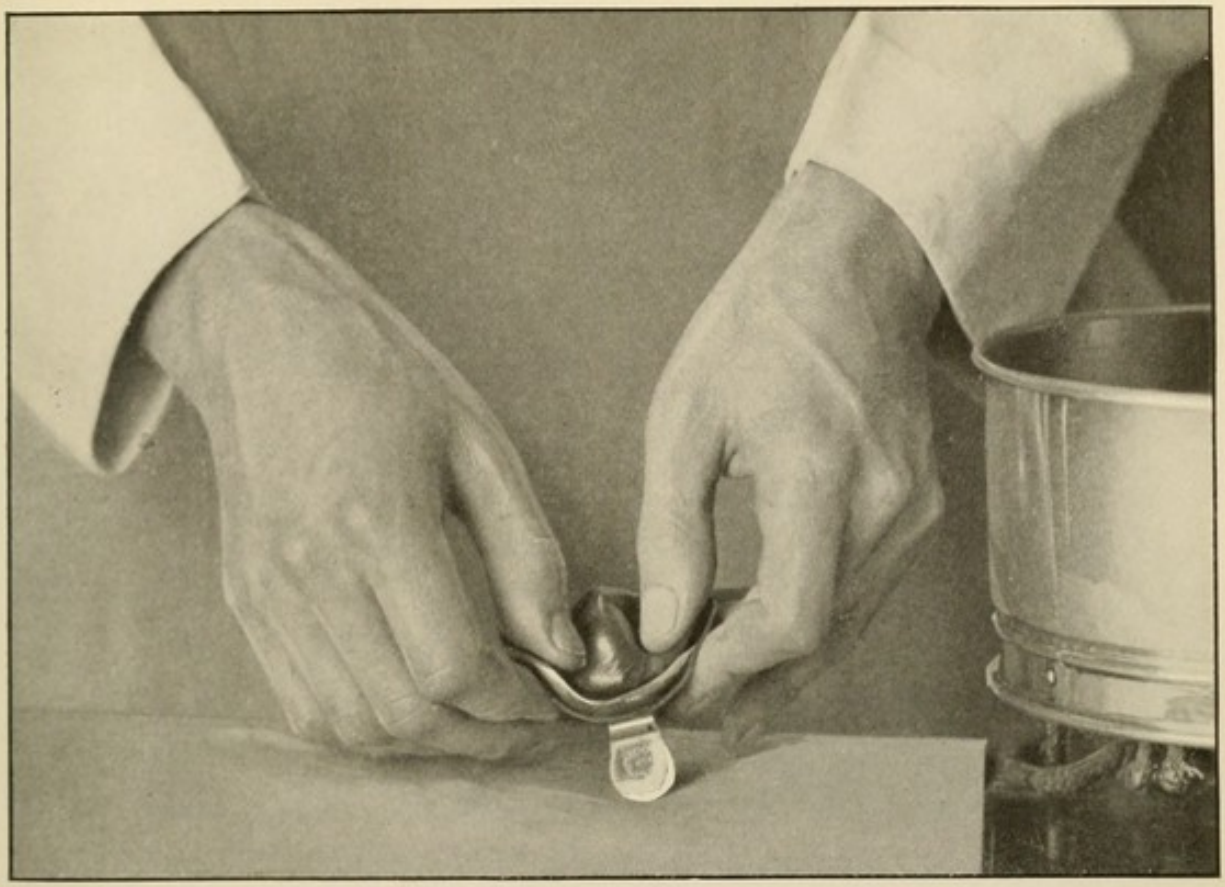


Fig. 10

With wet fingers shape the ball of compound to present a trough where the alveolar ridge will come, a high ridge to go up under the lip and cheeks and a mound in the center of the vault. Do not allow the compound to extend quite to the posterior margin of the tray.

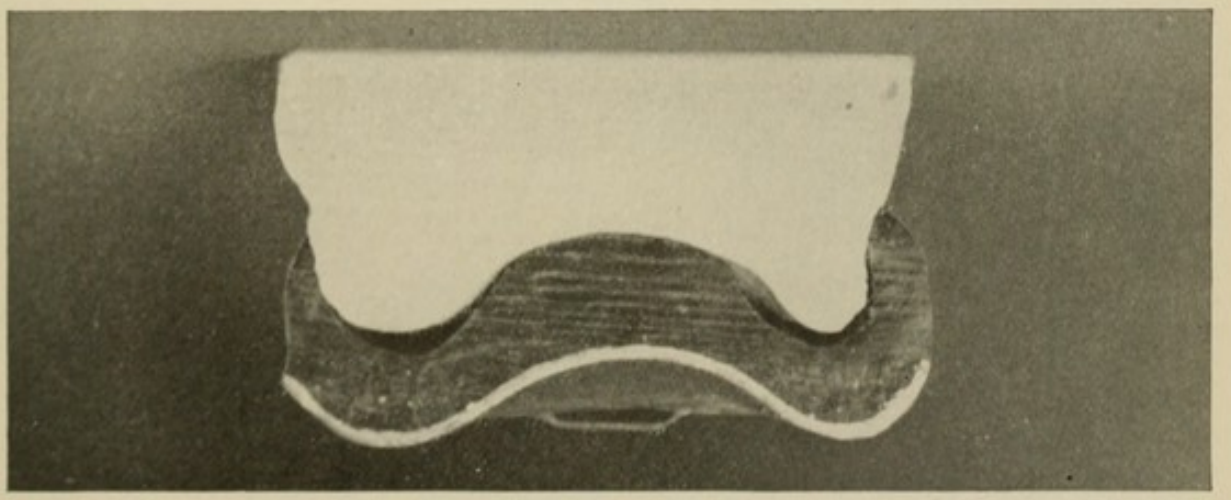


Fig. 11

The compound is intended to strike first the center of the vault and on the buccal and labial sides of the ridge and to flow to the crest of the ridge by pressure from both sides. This prevents condensation or displacement of even soft ridges. Note that the buccal margins of the tray are lower than the margins of the impression will be.

SHAPING THE COMPOUND FOR AN UPPER IMPRESSION —Continued.

Figures Nos. 12 and 13.

Draw the compound into a hill which shall come in the center of the vault. If there is more compound than is likely to be required, it can be pinched off as shown here. Keep the compound from extending to the posterior margin of the tray.

Warm the "hill" of compound over a gentle flame so that its top shall round down, but shall still present a higher cone than will be required by the formation of the vault.

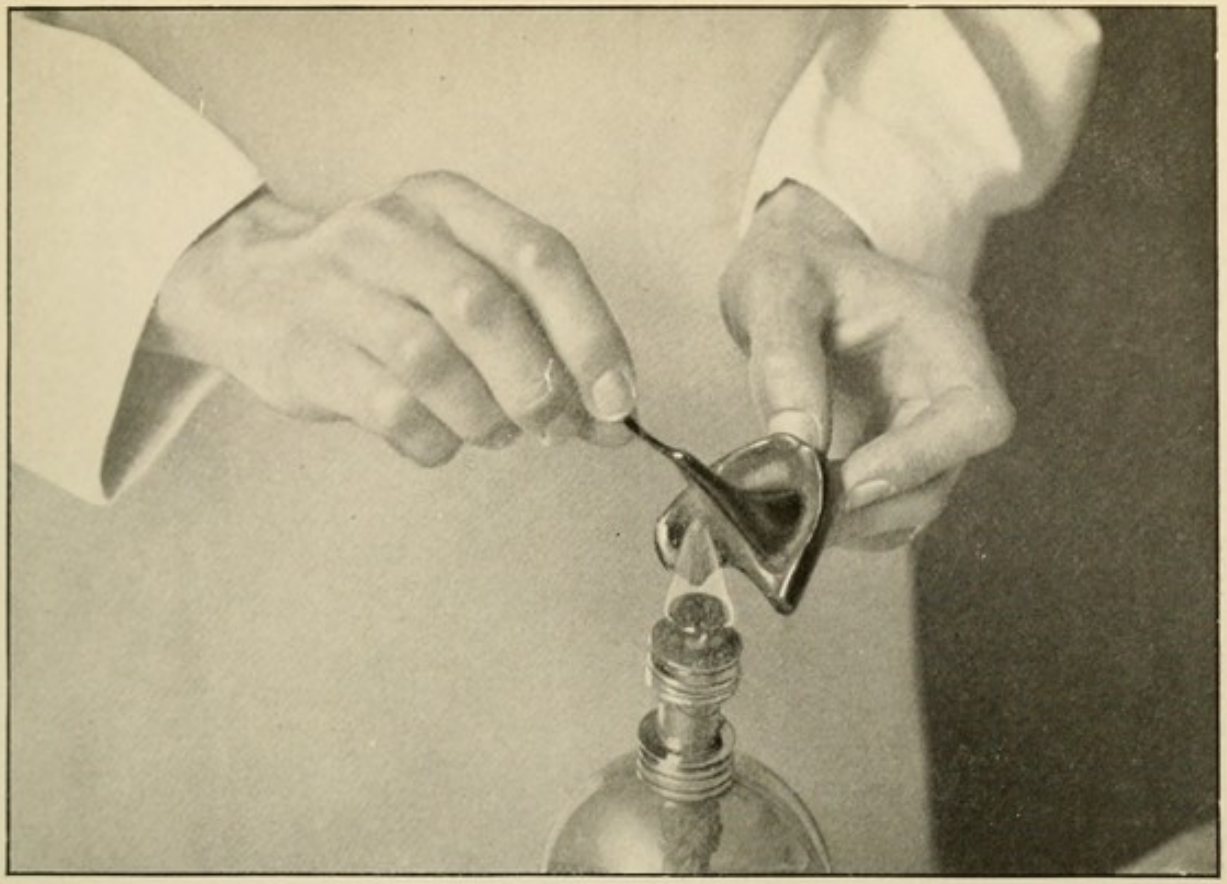


Fig. 12
Shape the compound into the form of a hill in the center of the tray. Keep it warm over the flame and pinch off any excess at the top of the hill.

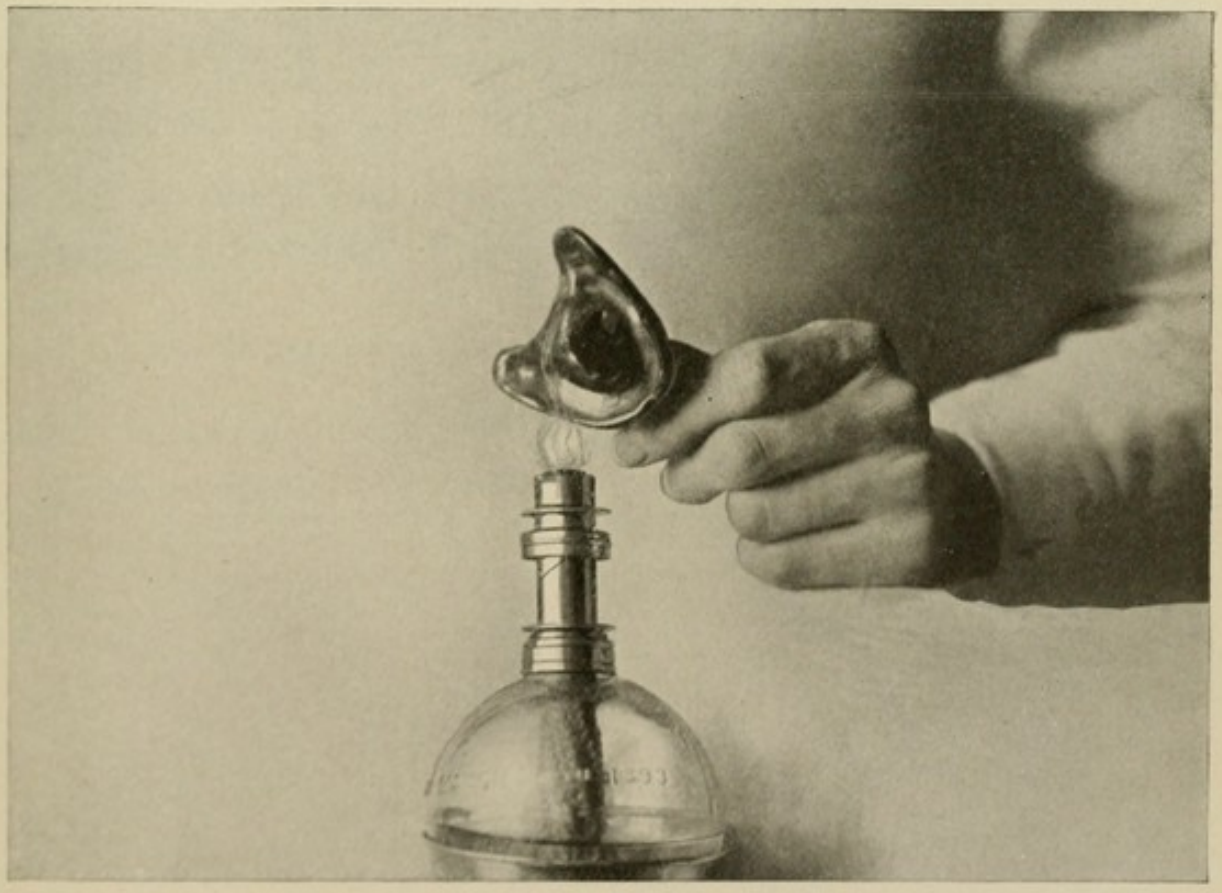


Fig. 13
When the compound has been properly shaped and the excess pinched off, warm the top of the hill over the flame so that it can be shaped down to a smooth surface. Then pass the entire impression surface of the compound above a small flame, so that the surface may be rendered softer than the underlying portions. Dip the tray and compound into hot water to equalize the heat.

SHAPING THE COMPOUND FOR AN UPPER IMPRESSION.

Figures Nos. 14 and 15.

When the top of the "hill" of compound has been properly warmed over the flame, dip the entire tray into hot, but not boiling water, to equalize the heat and avoid burning the patient.

When the heat has been equalized in this manner, it is desirable to heat the surface of the compound more than that which lies deeper in the tray, so that the surface shall be in condition to "flow" easily and shall be supported by the slightly cooler compound between what may be spoken of as "the surface layer" and the tray.

This additional heating of the surface compound may be effected by turning the tray so that the palatal surface is downward and in this position immersing the margins of compound and the "hill" in water, of a temperature about 160 degrees, but not immersing the tray.

The tray should then be quickly inserted into the mouth, since the surface will be in the finest possible condition for impression taking.

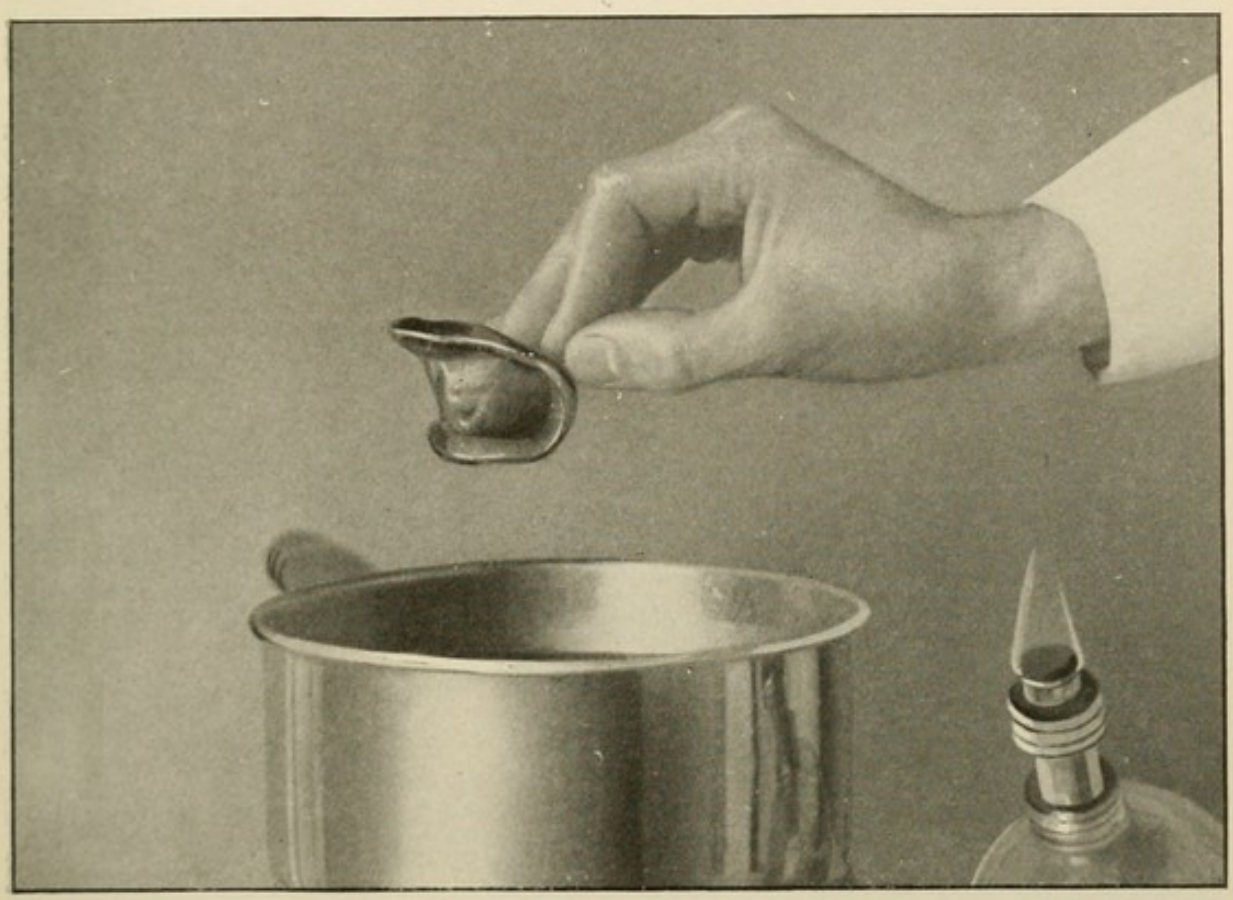


Fig. 14

It is a principle of this method of impression taking that the surface of the compound shall be as soft as may be without changing form, while the underlying portions of the compound shall be slightly cooler and firmer.

When the surface has been heated as described and the heat has been equalized, the tray may be held with the impression side down and the hill and margins of the impression immersed for a little in hot water. The tray should not be immersed. When it is removed, the surface should be just ready to flow, while the underlying portions of compound will not be quite so soft. The tray is then quickly inserted in the mouth.

THE UPPER BASEPLATE IMPRESSION.

Figure No. 15.

The tray is passed into the mouth and pressed about half way "home" with a slight wave-like, side to side motion. The compound on the buccal and labial surfaces of the ridge is pressed upward and against the ridge by putting the finger into the mouth as here shown.

This carries the compound against the ridge and higher than the margins of the impression will finally be. It makes possible the proper trimming of the margins by the muscles.

If the compound is not carried up by the finger, the margins of the impression may be deficient, and much of the value of this method may be lost.

Fig. 15

Carrying the compound up under the lip and cheeks to insure sufficiently high rims.

THE UPPER BASEPLATE IMPRESSION—Continued.

Figure No. 16.

While the cup is being pressed "home," have the patient draw back the lips as in hearty laughing and then push them well out, as in the position for whistling. These motions of the cheeks and lips call into action the muscles which extend over the margins of the impression, and enable them to shape the compound to forms which will accommodate their movements without dislodging the denture. That is, the muscles "trim" the margins of the impression. The importance of this will be more apparent, later.

The necessities of illustrating the action of the upper lip, required the dentist to stand well back for this picture. In practice, it is impossible to stand back in this way and hold the hand so far back without rocking the impression, which will cause the denture to rock also.

The dentist must stand in front of the patient, must see that his finger extends well back under the tray, must press the tray up at the back first, and when it is in position, must hold it firmly against the palate, with just the slightest forward pressure to carry it toward the highest part of the vault.

The patient will probably make the lip motions more intelligently if the dentist instructs the patient how to make them before commencing impression taking, and if he makes them when he directs the patient to.

Fig. 16

Patient "muscle-trimming" upper impression by lip movements.

THE UPPER BASEPLATE IMPRESSION—Continued.

Figure No. 17.

When the compound was pressed up under the lip and cheeks as shown in Figure 13, it was carried higher than the margin of the impression will be, in order that it might be trimmed by the action of the muscles.

The motions of the cheeks and lip shown in Figure 17 trimmed the margins of the compound, by turning it outward and downward where it interfered with their movements. In doing this, they frequently turn it too far downward, and it is necessary to press it inward against the tissues and carry it again a little upward.

These ends can be achieved by applying the thumb and forefinger of the left hand to the cheeks and lip, *below the upper margin of the tray,* and giving them a slight rotary motion, with gentle inward pressure. Care must be taken not to pull downward. The tray is meantime held firmly in position by the finger of the right hand in the vault.

This massage will also continue the downward movement of the excess compound and turn it beneath the tray.

When this massage has been completed, an impression should be sufficiently well adapted to the vault of the mouth and the surface of the ridges so that it will not rock. If it rocks, it must be corrected or remade, since the rocking will invariably lead to trouble.

As a general thing, an impression which has been carefully taken, this far, will have also enough of what Dr. Greene calls "sticktion" to permit its use in the later stages of impression taking.

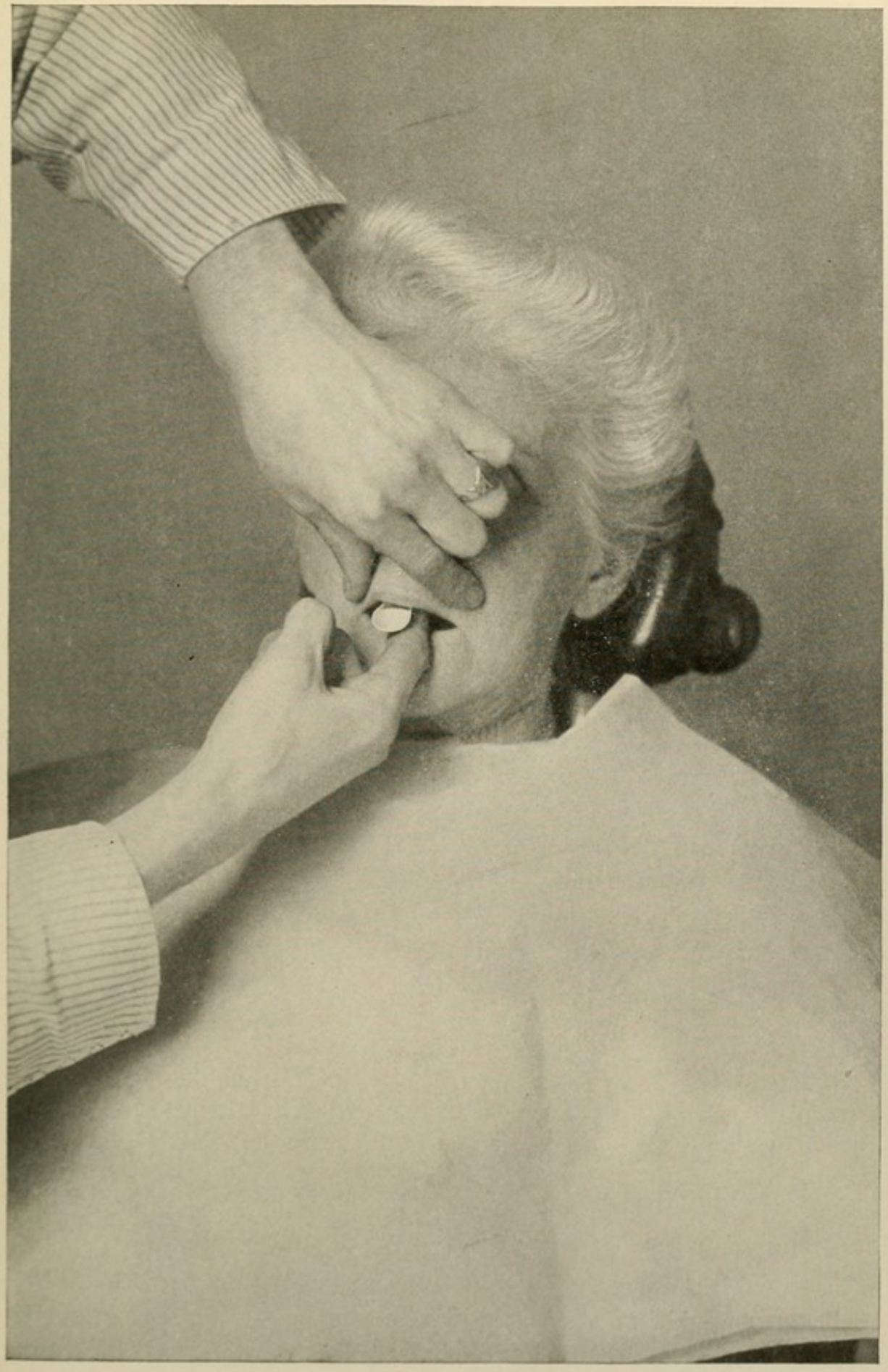


Fig. 17

First massage, below upper margin of tray.

TRIMMING THE UPPER BASEPLATE IMPRESSION.

Figures Nos. 18 and 19.

The margins of the impression, as it first comes from the mouth, are generally thick enough to distend the tissues of the cheeks and lips, a condition which must be avoided.

Trim the buccal and labial margins after the manner shown in Figure No. 18, until they are of the thickness desired in the finished denture, and give the patient's face the desired expression. Care should be taken not to alter the form of the margins or to break the compound. If the compound is broken in trimming, no effort should be made to repair it until after the bite is taken. Efforts to repair it before that stage is reached, usually result in spoiling the impression. If the posterior margin of the impression cup was exposed in taking the impression, it should be bent backward out of contact with the tissues. The exposed area will later on be covered with compound.

In trimming the labial and buccal margins, much care should be taken to restore the expression, especially in the region of the canine eminences. Figure 19 shows a patient without trial plates and again with properly built trial plates.

The posterior margin of the impression should be trimmed to the exact length desired in the finished denture. When the alveolar ridge in front is hard, the denture will extend on to the relatively immovable soft tissues immediately posterior to the hard palate. When the anterior alveolar ridge is soft, the denture will extend back onto the movable soft tissues.

The "heels" of the buccal margins should be trimmed thin, so that they will not distend the cheeks, and so that they can be warmed and massaged into the desired contact with the tissues.

The possibility of softening the margins and adapting them by pressure with the mouth closed and the impressions supported in place under normal biting strain, constitutes the great advantage of the Greene-Supplee method of impression taking. The impression is now laid aside until the lower impression has been taken.

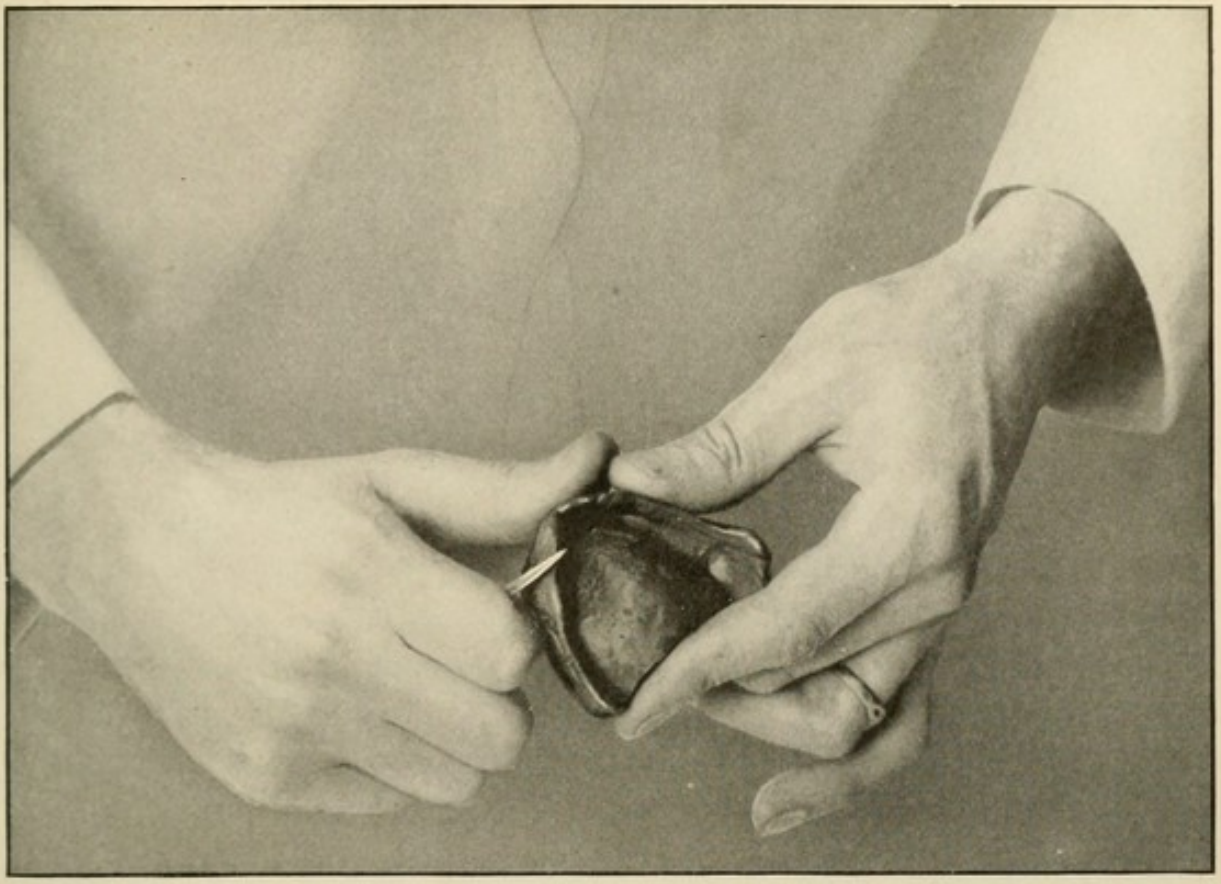


Fig. 18
Trimming impression to proper buccal and labial thickness.

Fig. 19
By properly filling out and "lifting" the tissues, great changes in the expression can be effected.

TAKING THE LOWER BASEPLATE IMPRESSION.

Figures Nos. 20 and 21.

Soften the compound in hot but not boiling water, in the same manner as for the upper impression. Form it into a roll about half as thick again as a lead pencil. Lay it aside to cool slightly while drying the tray. Heat one side of the roll over a small flame until it sizzles. Attach this side to the dry tray. Pinch off the excess of compound at the ends of the tray. Hold the tray with the compound side up, and immerse the tray but not the compound, for an instant in cold water. This will cool the tray and the compound next to it and cause the cooler portions of the compound to act as a tray to keep the softer portions from getting too far out of place.

Soften the surface of the compound over the flame and then dip the compound but not the tray, into hot water to equalize the heat. It is then ready for prompt insertion into the mouth.

For lower impressions, the compound should have begun to cool a little on the side next to the tray as mentioned above but should be ready to "flow" on the surface. If the compound be too soft all the way through, the tray is likely to come into contact with the tissues and cause muscle strain and an imperfect impression.

If the tray comes into contact with the tissues, it must be cut away at the exposed points until it is lower than the adjoining compound.

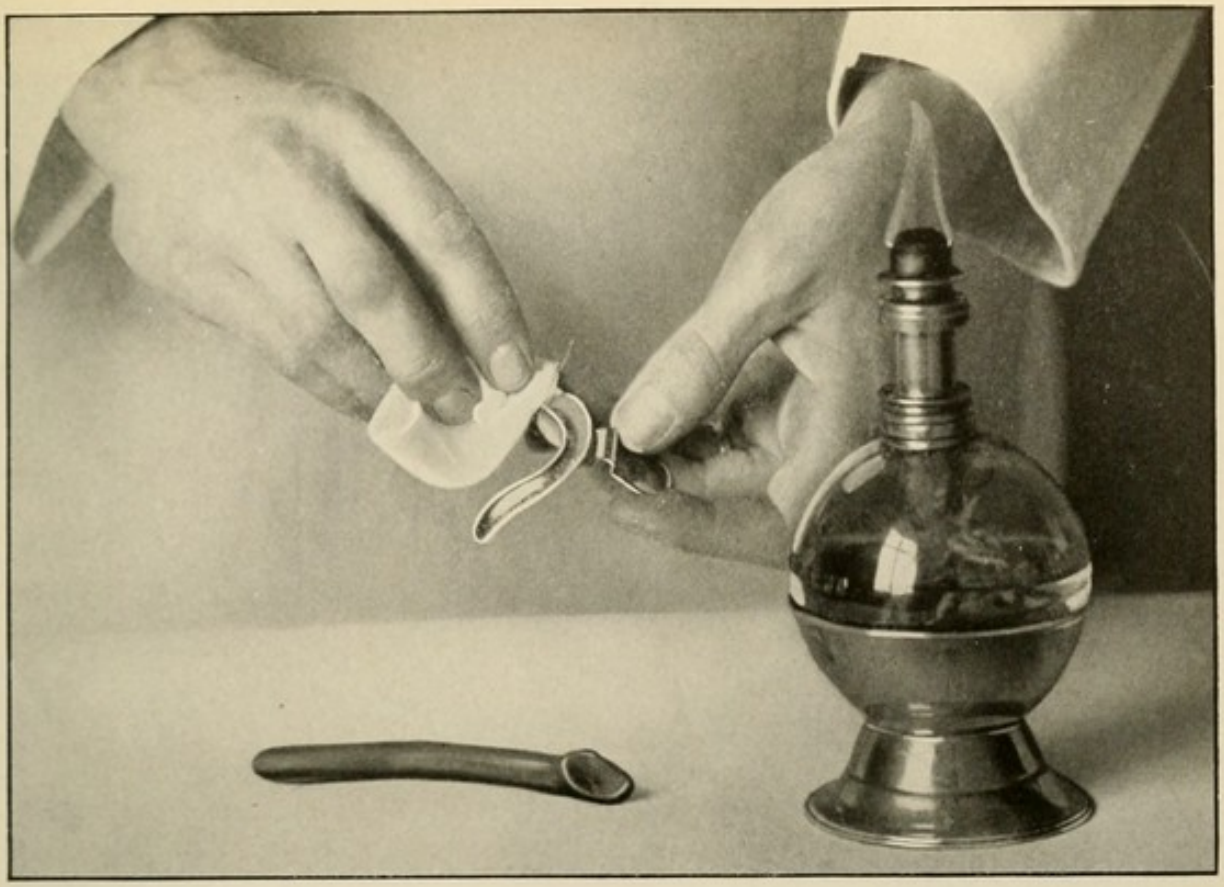


Fig. 20

Shape a roll of compound about as thick again as an ordinary lead pencil and as long as the arch of the lower tray. Lay it aside to cool a little while drying the tray.

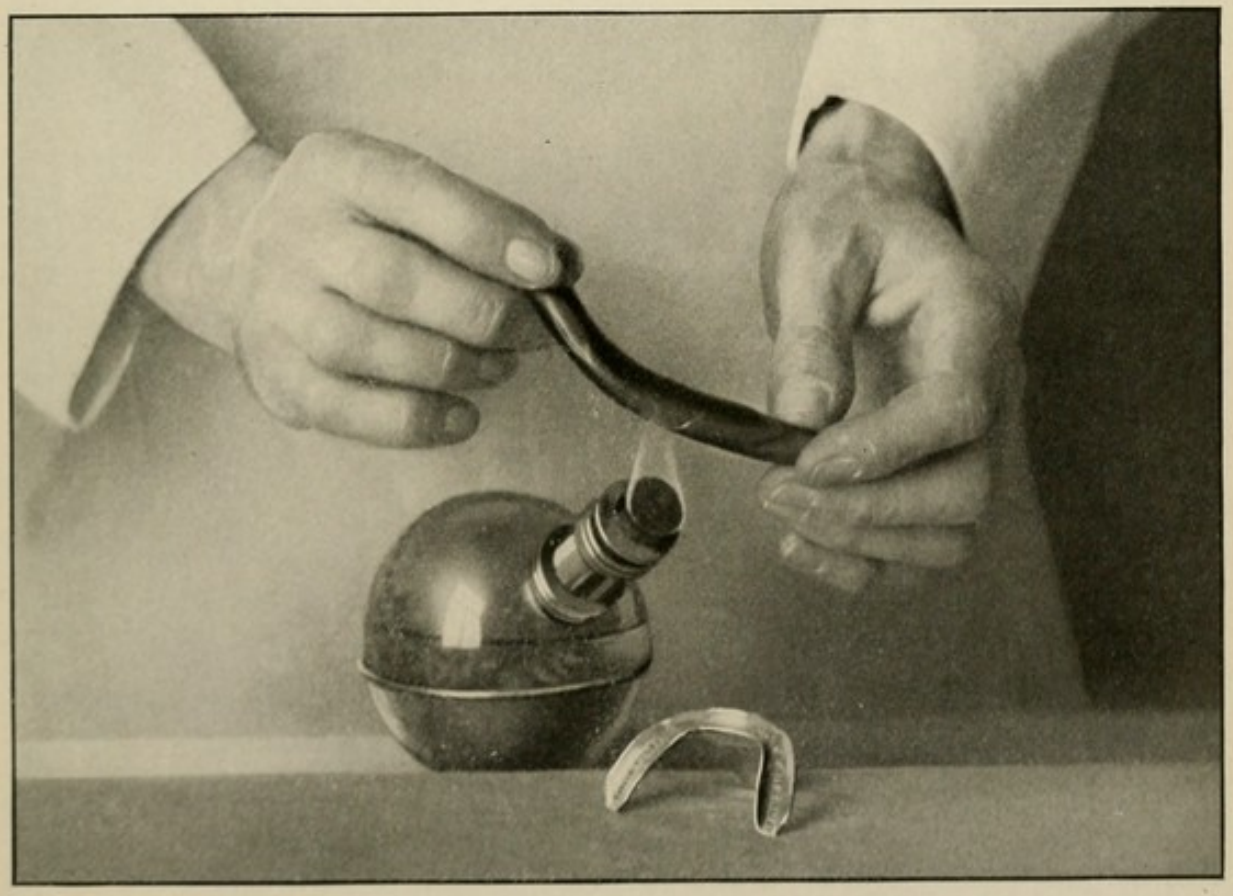


Fig. 21

Warm one side of the roll till it sizzles and attach it to the dry tray. Pinch off excess compound at the ends. Soften the impression surface of the compound over the flame until it is nearly ready to flow. Dip the impression surface but not the tray or the compound next to it, into hot water to equalize the heat. It is then ready to place in the mouth.

TAKING THE LOWER BASEPLATE IMPRESSION.

Figure No. 22.

Place the tray and compound in the mouth and locate them directly over the ridge, or a little to the lingual of the anterior part of the ridge. When they are properly in place, have the patient open the mouth as wide as possible. Stand in front of the patient, place a forefinger on the bicuspid region of each side, and make very light pressure on the tray. If the tray was placed a little to lingual of the ridge, this pressure can be slightly forward as well as downward, which is an advantage, because it forces the excess compound to flow to the lingual side of the ridge, where it can be easily controlled.

Change the position of the hands so as to bring the first and middle fingers of the left hand on the two sides of the tray in the bicuspid region, and hold the tray steadily in place with very light pressure. Ask the patient to close slightly, so as to relax the muscles. Reach under the left wrist, and with a thumb and finger of the right hand make a quick, *light* massage on the outside of the cheeks in the region of the bicuspids and molars.

Place the index finger of one hand on each side of the tray in the bicuspid region, and, if the patient is sufficiently intelligent to cooperate with your efforts, ask her to make one effort to swallow. If the patient is not intelligent and might bite the fingers, ask her to raise the tongue a little. The contraction of the muscles in swallowing will begin the "trimming" of the compound on the lingual margin of the impression.

Remove the impression from the mouth and trim away all surplus compound until the impression is smaller than the lower denture is to be. This impression is intended only to lie on top of the ridge and serve as the base for a trial plate. No corrections should be attempted at this time unless the impression rocks. If the impression rocks, it should be corrected by warming the entire ridge surface evenly, replacing in the mouth and holding down with light but firm pressure. If this does not correct it, a new impression should be taken.

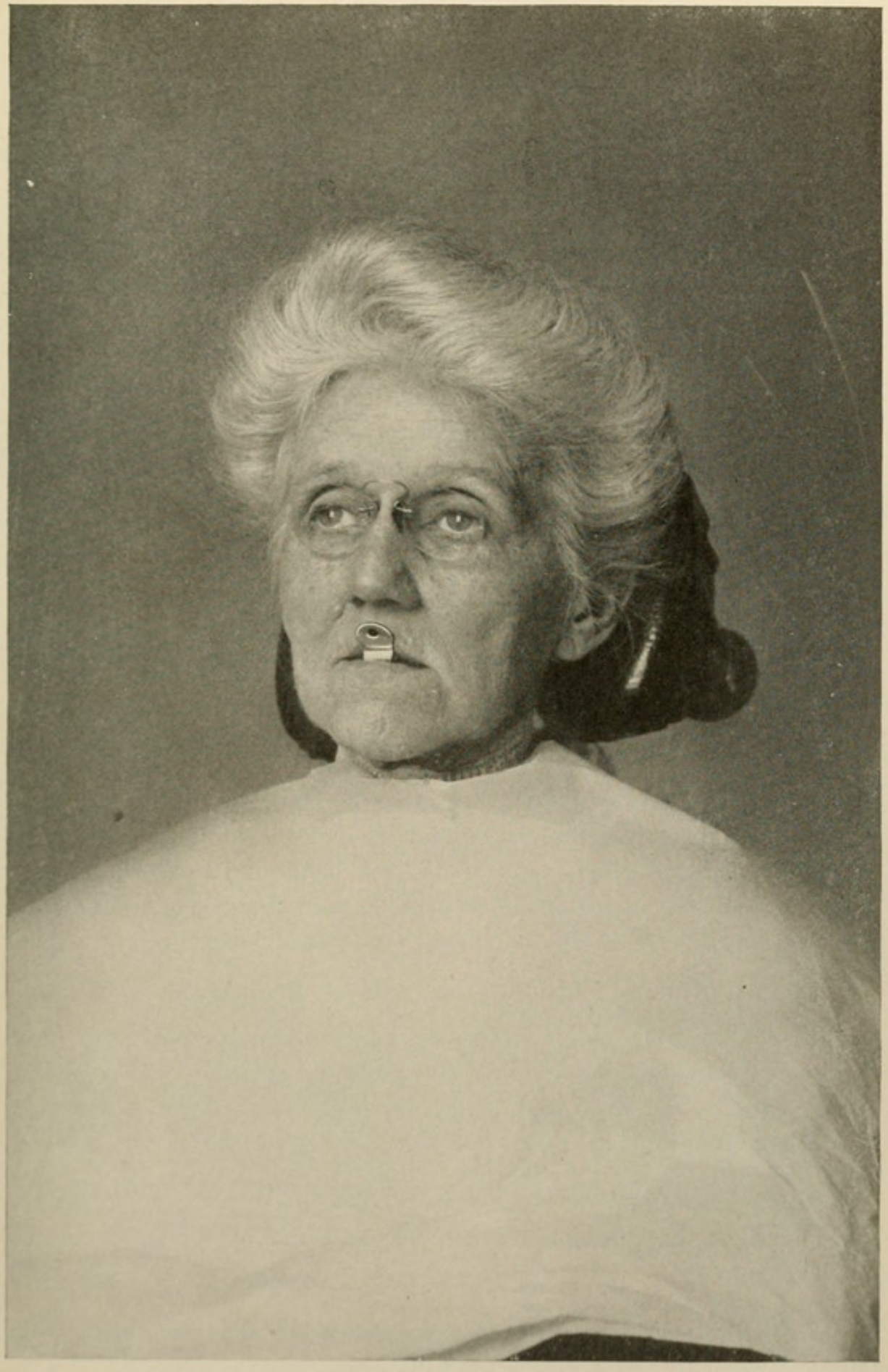


Fig. 22

Locate the lower tray and compound directly over or a little to the lingual of the ridge.

MAKING THE BASEPLATE IMPRESSIONS INTO TRIAL PLATES.

Figures Nos. 23 and 24.

The working impressions are made into trial plates by adding a roll of compound to each and trimming it to indicate the positions to which the teeth are to be set.

Shape a roll of compound a little larger than was used for the lower impression, and as long as the lower ridge, from heel around to heel. Heat the middle portion of one side until it sizzles and attach it to the anterior portion of the ridge of the lower tray, leaving the ends free. Direct the heat of a tiny flame between the tray and the unattached portion of the roll, and when each end is hot enough, attach it to the tray, taking care to keep the hands moist during the work.

Shape the occlusal edge of the roll to the form of a wedge. Soften the wedge deeply, so that it can be moulded, and quickly place the trial plate in the mouth. Either of two methods can now be followed.

If a Gysi Adaptable Articulator is to be used, press the Horseshoe-plate which comes with the articulator, into the lower trial plate until its labio-incisal margin is about 1/16 inch below the level of the edge of the lip, when at rest, and the occlusal surface of the heel is on a level with the upper surface of the tuberosity at each posterior termination of the lower ridge, or

Press the compound of one side to the same level with a short, straight knife blade, like that of some plaster spatulas. Then invert the trial plate on a wet piece of glass and by pressure shape the other side to the same level as the pressed side. Trim away excess compound.

Trim the arch of the lower trial plate to make plenty of room for the tongue, so that the denture will not be lifted by the tongue being crowded.

Trim the buccal margins to make the ridge about as thick, from tongue to lip and cheek, as the teeth will be.

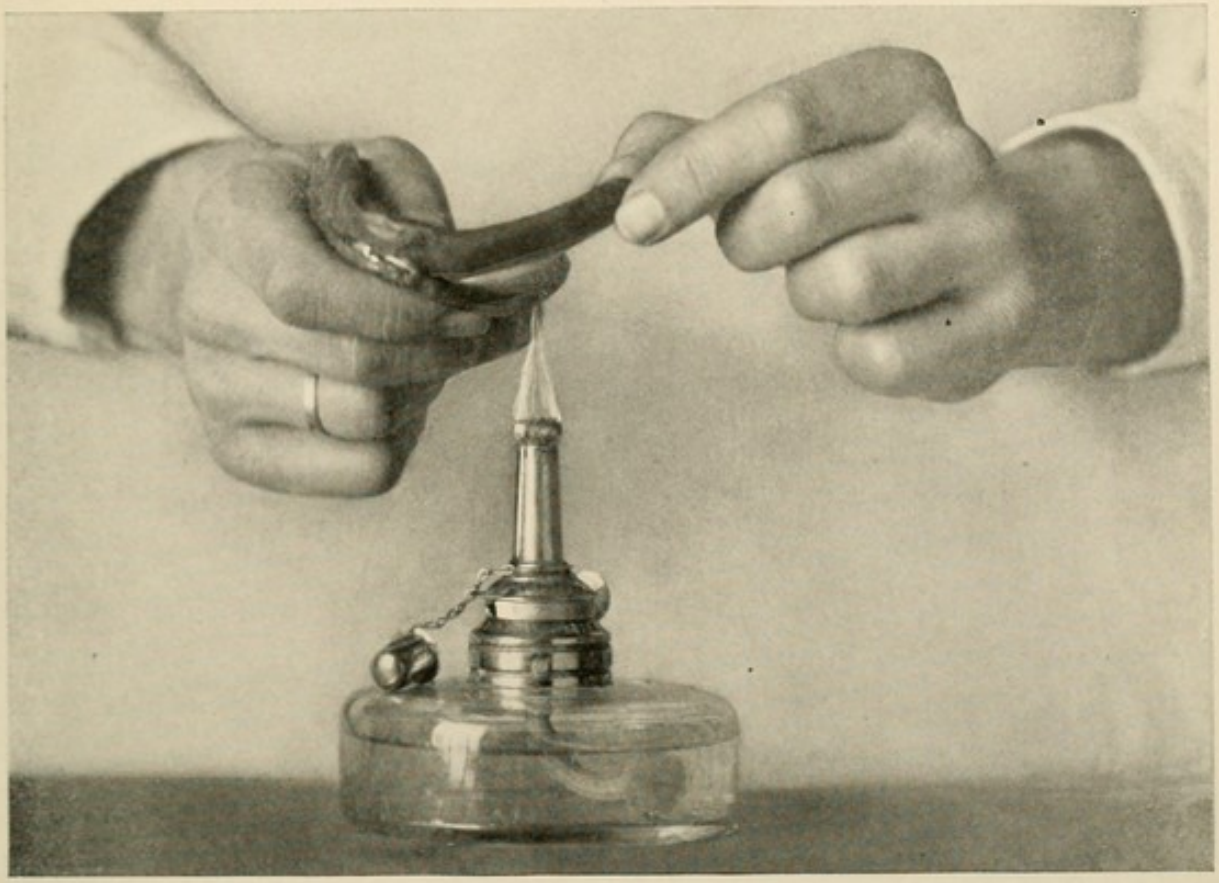


Fig. 23.

Attaching the roll firmly to the baseplate impression to form the trial plate.

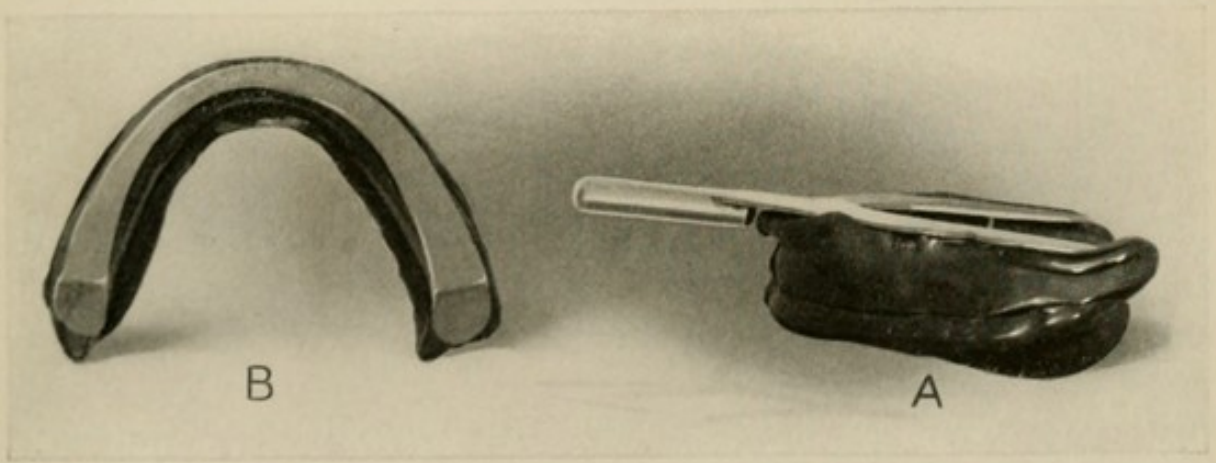


Fig. 24.

A. Lower trial plate with horseshoe plate pressed into it. B. Lower trial plate with ridge properly formed without use of horseshoe plate. Note the wide space for tongue, the shortened "heels", and the form of ridge.

MAKING THE BASEPLATE IMPRESSIONS INTO TRIAL PLATES—Continued.

Attach a roll of compound to the ridge of the upper impression in like manner, shape it to the form of a wedge, place it in the mouth with the lower trial plate in position, and have the patient close the jaws until the lips nearly touch in repose.

Most patients, when instructed to bring the jaws together till the lips touch, stretch the lips but do not bring the jaws close enough together. When they do this, the lower jaw is nearly always in the retruded position. When a patient does this, remove the upper trial plate from the mouth and trim it to the impression made in its occlusal surface by the cold lower trial plate. Cut away the "heels" of the ridges of both trial plates as far forward as to where the middle of the second molars will come. Warm the occlusal surface of the upper over the flame, dip into hot water to equalize the heat, replace in the mouth, and have the patient relax all muscles and then close the jaws until the lips touch lightly in repose.

This determines the correct heights of the trial plates, equalizes the pressure on both sides, which is most important, and practically insures a correct bite.

For some years, I have advocated the method of shaping the occlusal surface of the upper trial plate to be parallel to a line drawn on the face, from the ear to the nose. Two or three years ago Dr. Ulsaver and I conducted some experiments which satisfied us that the location of the heels of the occlusal plane could be moved upward or downward somewhat without affecting the articulation or efficiency of the teeth, and sometimes with mechanical advantage. We learned later that Professor Gysi had conducted similar experiments and arrived at similar conclusions. We have lately followed Mr. Supplee's modification of the method, as described above, and find it easier and quicker.

RECORDING THE BITE.

Figures Nos. 25, 26, 27, and 28.

When correct biting relations have been established by the methods just suggested or any others the dentist may prefer, it is important to register them in such way that the patient will be compelled to bite correctly during the finishing of the impressions, since a wrong bite at that time may destroy all accuracy in the fit of the impressions and subsequently of the dentures.

Dr. Greene's method of doing this is probably one of the best. It is to cut a notch in the occlusal surface of a separate trial plate at the median line, and one at each side, in the bicuspid region. The occlusal surface of the lower trial plate is then dried and a little soft compound added to it, opposite the notches. While this added compound is still soft, the patient is caused to bite in right position. This forms three eminences on the lower trial plate, corresponding to the depressions in the upper, and compels the patient to bite in right relations during subsequent proceedings. Mr. Supplee has shortened the work and facilitated accurate bite taking by making the impressions into trial plates and using the notches in the same way.

This method demands that the bite be accurate when the notches are filled with compound, or it will continually thereafter be wrong.

The dentist who uses the Gysi Adaptable Articulator has the most nearly positive method of determining the correct closure that I know of. If the Incisor Path Register is used in connection with the Horseshoe plate, blackened in front, the point of the Register will trace, in nine cases out of ten, a round pointed pattern as long as the jaw is protruded, and a sharp pointed pattern when the jaw is in its resting position. This record alone is so important as to justify the use of this articulator, for dentures and extensive bridges.

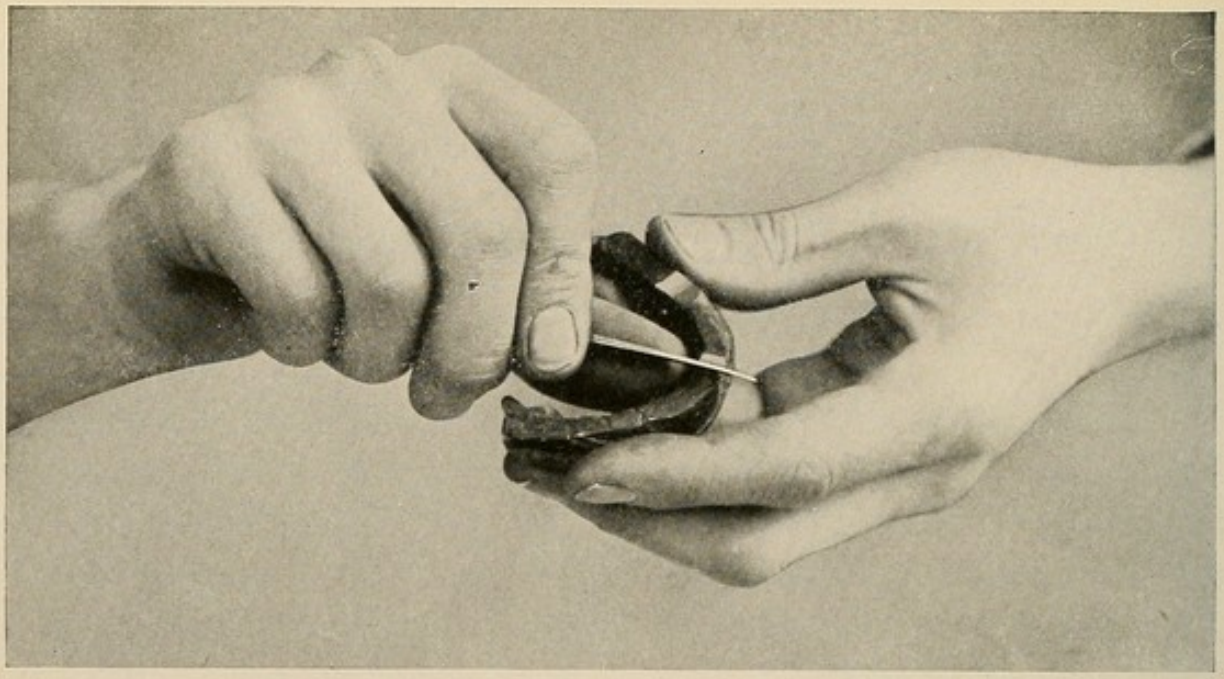


Fig. 25.
Cutting notches in the lower trial plate to record correct biting relations.

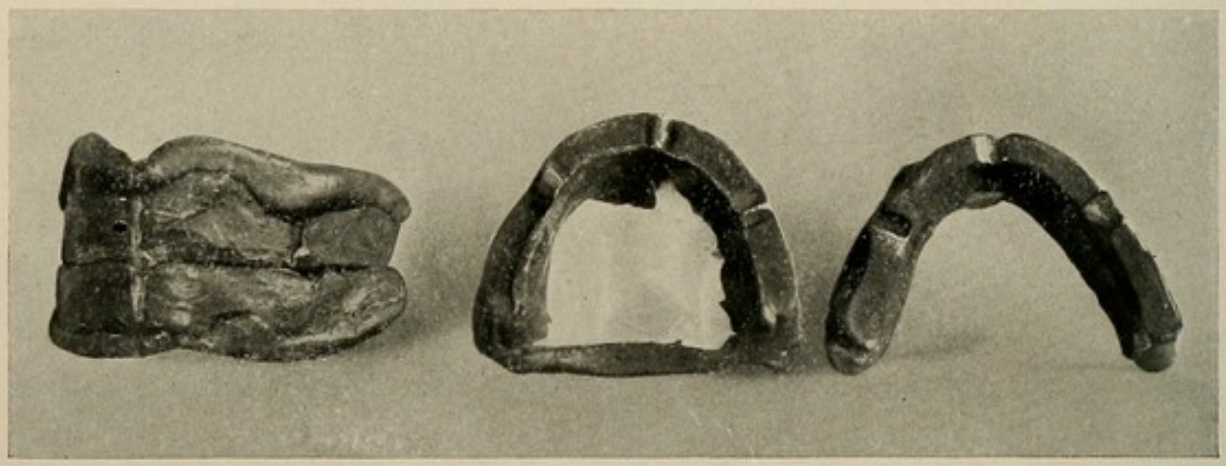


Fig. 26.
On the left, the trial plates as bitten together in the mouth. The other two illustrations show the elevations on the upper trial plate and the notches in the lower.

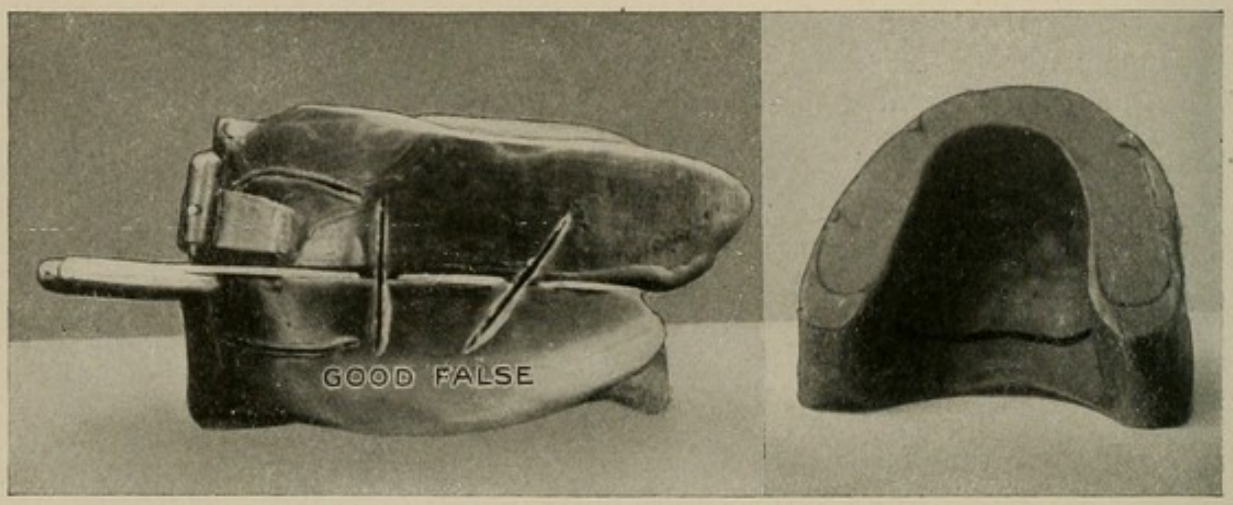


Fig. 27.
The festoons in the upper trial plate, shown on the right, help in correctly replacing the trial plates.
The vertical marks on the left are good, while the sloping marks are false and misleading. (Photograph by Prof. Dr. Gysi.)

Fig. 28.

Recording the bite by means of the Gysi Incisor Path Register and Horseshoe Plate.

BUILDING UP THE MARGINS OF THE UPPER IMPRESSIONS.

Figures Nos. 29 and 30.

When the trial plates have been shaped to satisfactorily support each other with the mouth closed, and the bite has been taken and registered, the upper impression may be finished under normal biting strain. This finishing is accomplished by modifying the margins of the impression to conform to certain positions of the tissues.

The first step in finishing the impression is to make sure that the margins are high enough. The experienced operator will be able to detect low places in the margins of the impression at a glance, but the inexperienced operator cannot do this. For his first cases, he will do well to add compound all along the margins by heating a stick of compound and building onto the impression as shown in Figure No. 29. He should quickly insert the impression in the mouth, the lower being always in position, have the patient close in correct bite and perform the laughing and whistling motions, and immediately afterward apply gentle massage as illustrated in Figure 31.

As soon as the margin is high enough all around and has been "muscle trimmed" and massaged, the entire buccal and labial margin should be warmed beside a small flame, until the compound is soft enough to permit adaptation by massage, but not soft enough to change its form. The impression should be quickly inserted in the mouth, the patient caused to again make laughing and whistling movements, and the compound massaged into better adaptation to the buccal and labial tissues in the manner shown in Figure 31.

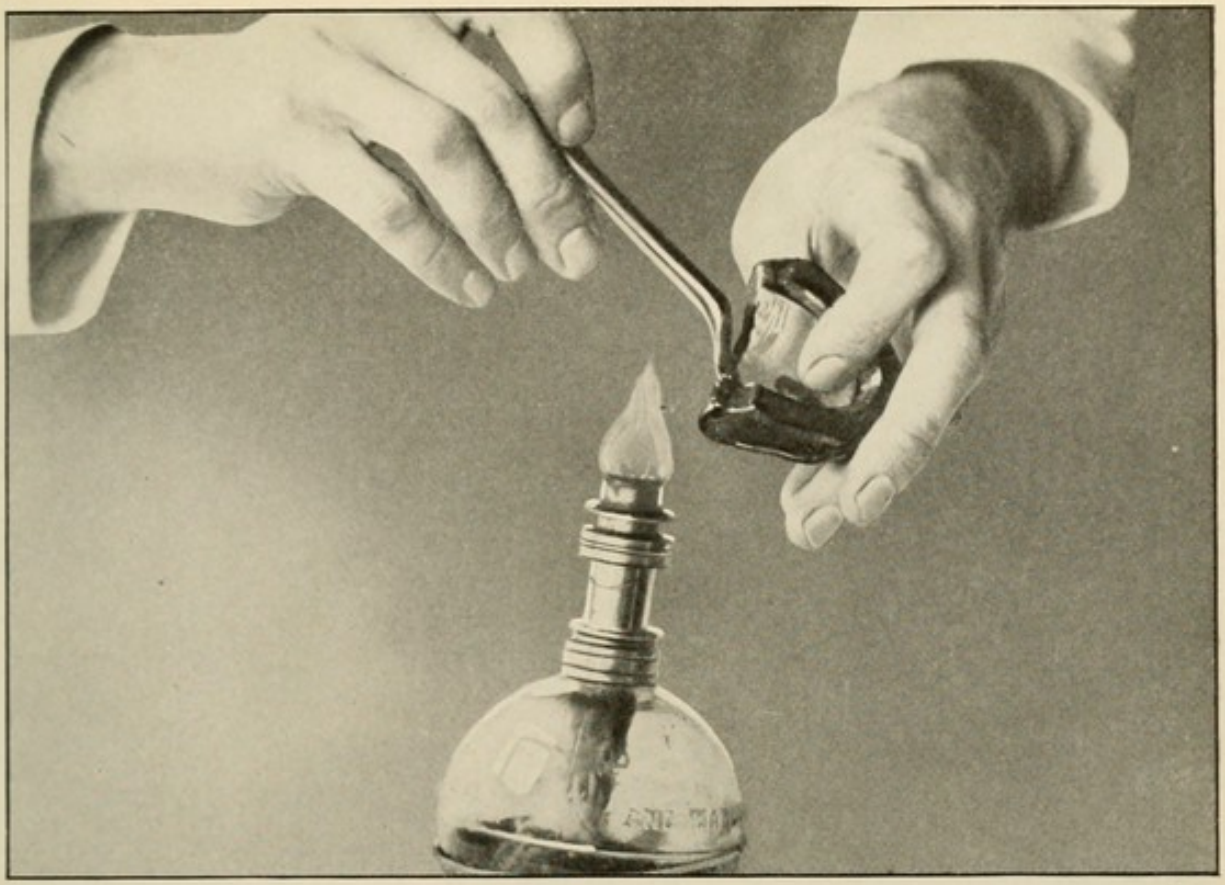


Fig. 29.
Tracing on compound from a stick softened over the flame to repair broken margin. Compound for building up margins is traced on the side of the impression in contact with the tissues.

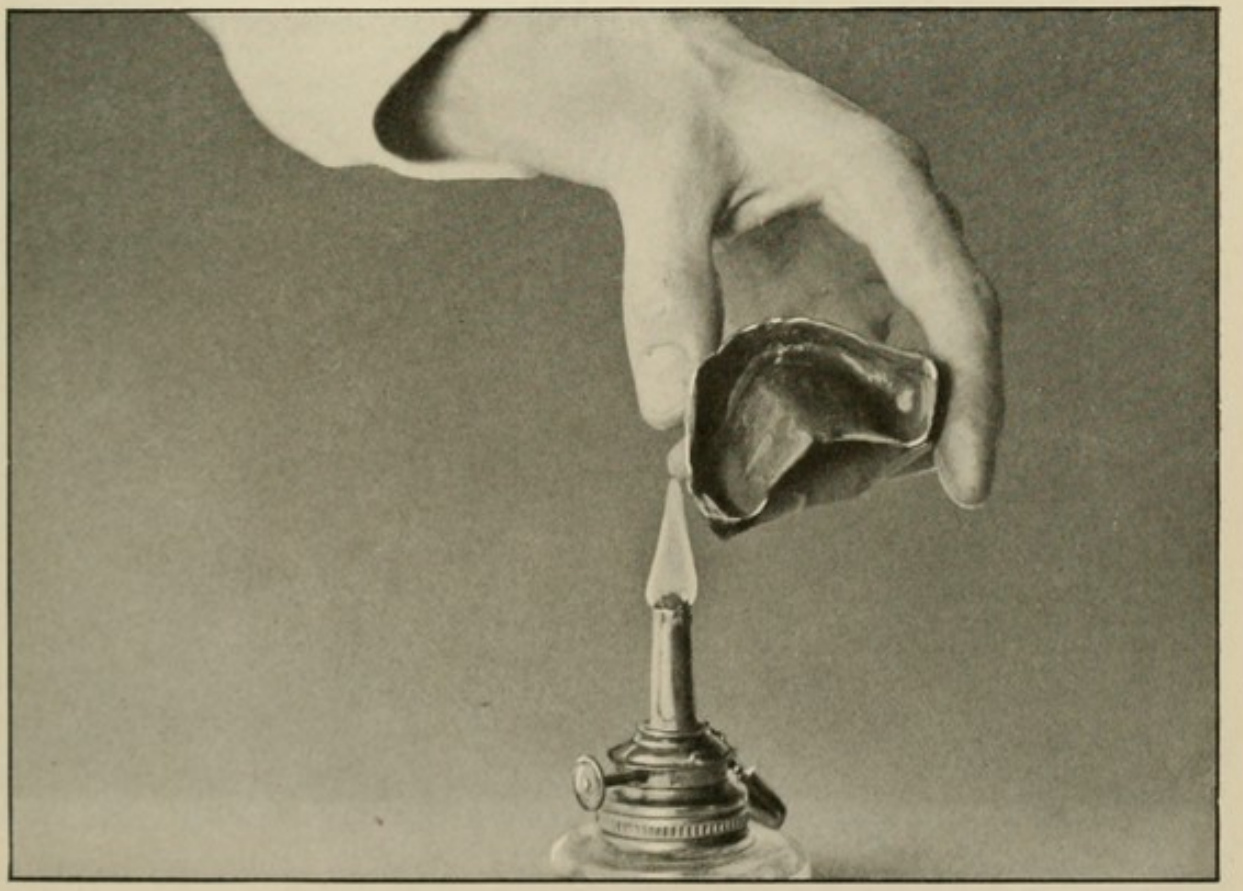


Fig. 30.
Softening the margins without changing their form.

MASSAGING THE MARGINS OF THE UPPER IMPRESSION.

Figure No. 30.

When the upper trial plate, with the buccal and labial margins softened as described, has been put into the mouth, and the lip and cheek movements have been made with the mouth closed and the trial plates supporting each other, and the patient has relaxed all muscle tension, the softened margins are adapted to the buccal tissues by massage. To effect this massage, the finger and thumb are applied first to the cheeks and then to the lip, on the level of the softened margins. A gentle inward pressure is exerted against the tissues, and the thumb and finger are given a slight rotary motion.

This massage is not intended to carry the compound of the softened margins either up or down, or to change its form, but merely to press the already formed margins inward against the buccal and labial tissues, while the attachments to the buccal side of the ridge are in what I have called "the middle position." During the laughing and whistling movements of the cheeks and lip, these attachments have travelled back and forth under the margin of the compound and have made a space for themselves. When the patient has relaxed all muscular tension, the massage will adapt the margins of the impression to these attachments in "the middle position." Following such adaptation, the denture will be stable in all positions of the lips and cheeks. Similar light massage will be applied to the margins of the lower trial plate.

Some ideas of the possibilities of conformation by massage may be gained from Figures 31 and 32.

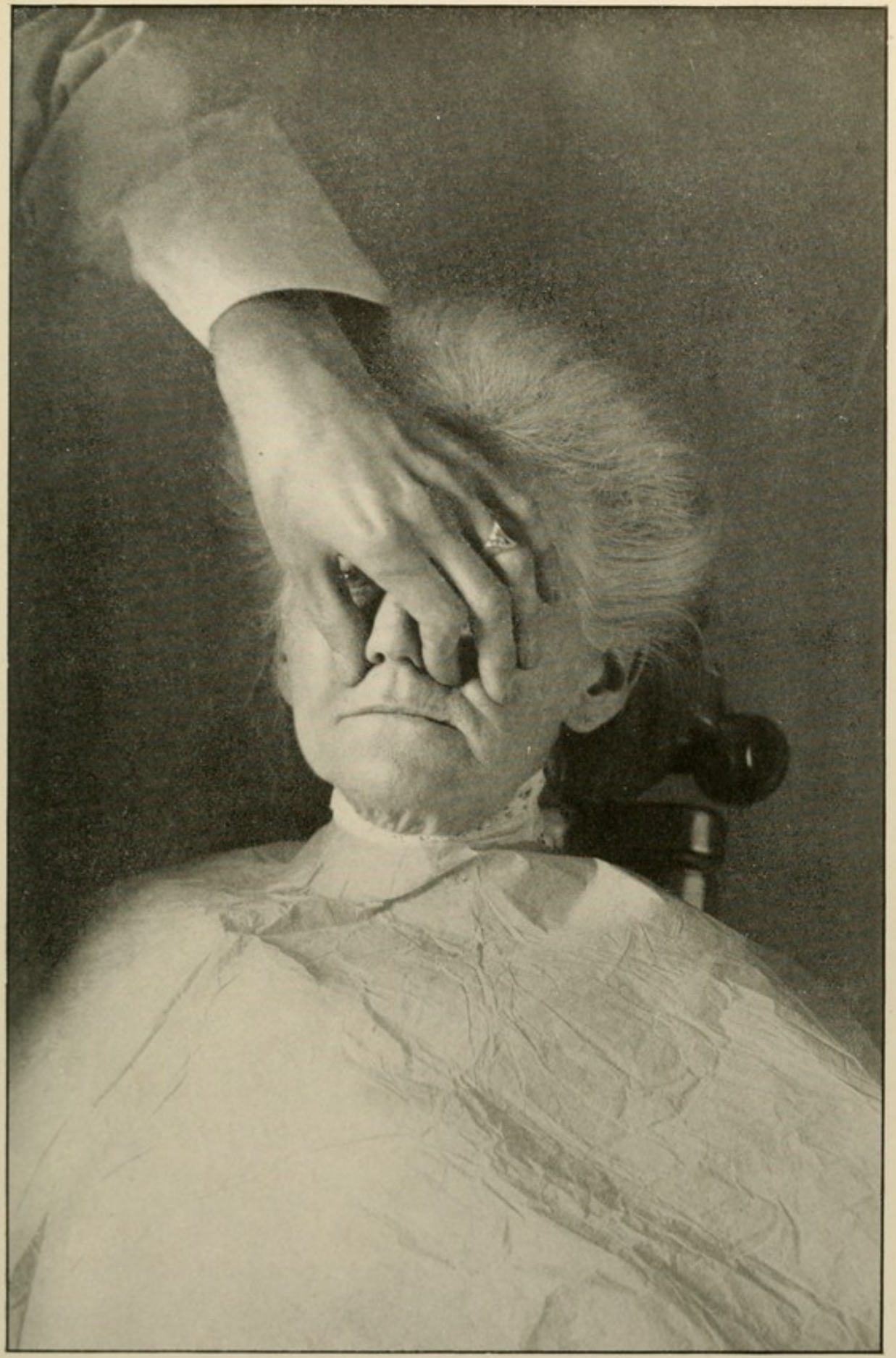


Fig. 30.

Final massage of margins of upper impression, above the tray.

CONDENSING THE UPPER BUCCAL AND LABIAL ATTACHMENTS.

Figures Nos. 31 and 32.

It is difficult to overstate the advantages which result from proper adaptation of the margins of the impressions to the buccal and labial soft tissues, in what may be called "the middle position." The several impressions from one mouth shown in Figures Nos. 31 and 32 may help to make the possibilities of such adaptation clear.

Figure 31A is an impression taken with a poorly adapted tray, with an excess of compound, and with the mouth wide open. The formation of the margin shows the buccal attachments to be in the posterior position.

Figure 31B shows an impression of the same mouth, taken with a properly adapted tray, a correct amount of compound, and "muscle trimmed" with the mouth open. The effect of the muscle trimming on the form of the buccal margins is very marked.

Figure 31C shows an impression of the same mouth which has been "muscle trimmed" with the mouth closed under normal biting strain, by carrying the buccal attachments into the "anterior position" in the whistling movement, but without adaptation of the margins by massage. The movement of the buccal attachments into the "anterior position" has noticeably altered the form of the margin from the median line to the bicuspids.

Figure 31D shows an impression like that in 33C except that after carrying the buccal attachments into the "anterior position" the patient relaxed all muscle tension. The buccal attachments then took the "middle position" and the compound was adapted to them in this position. Such adaptation seems to condense the buccal attachments and in part to destroy their definition, since they do not cut the impression margin to anything like the depth shown in Figure 31A, B or C. This impression is practically perfect and cannot be dislodged by any movements of the patient's lips and cheeks. After failures to obtain satisfactory dentures at the hands of several dentists, the patient is wearing, with great satisfaction, an upper denture made from a duplicate of this impression.

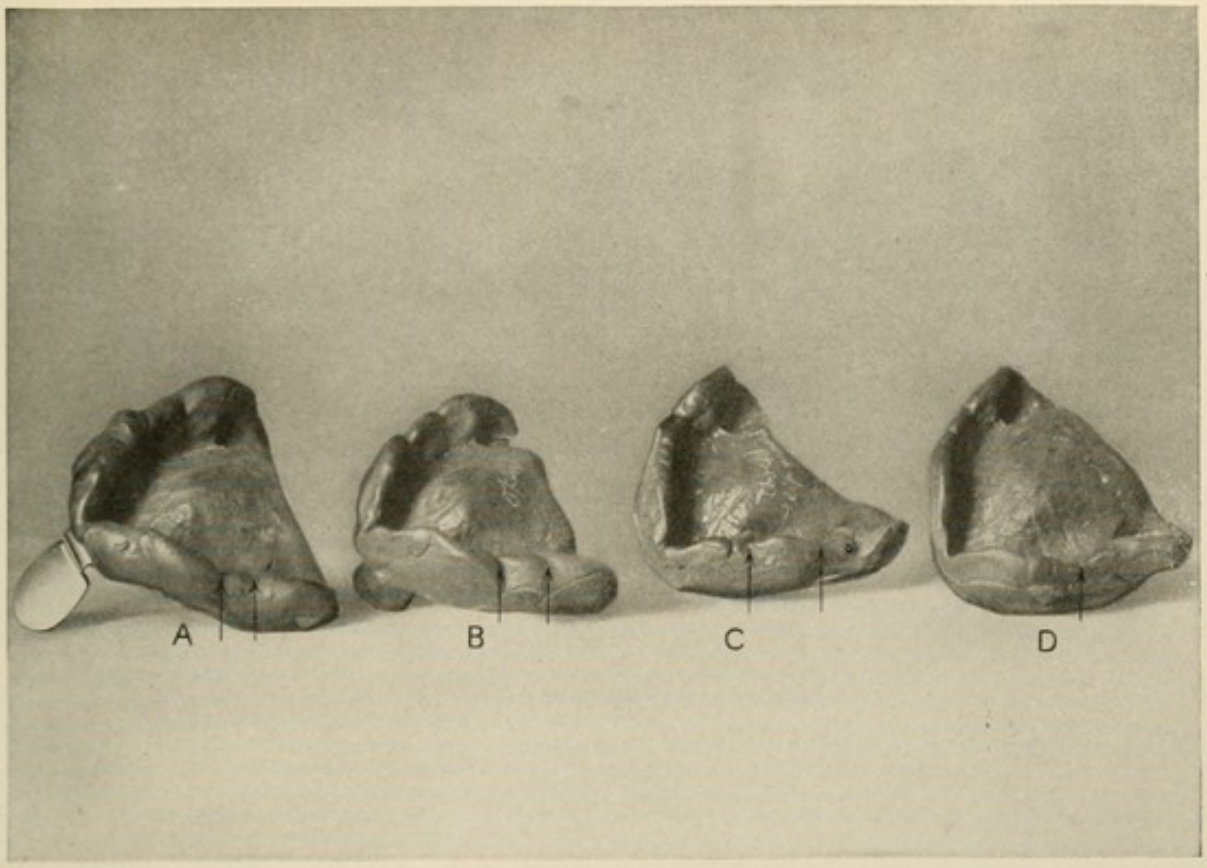
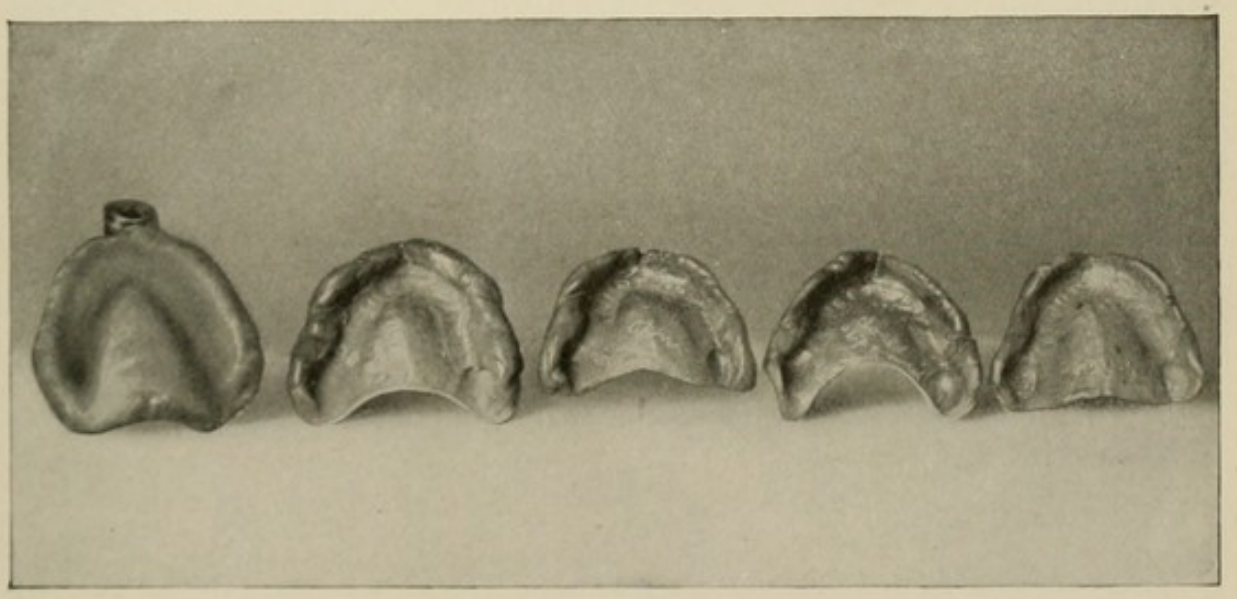


Fig. 31.

Four impressions of the same mouth. A and B. The direction of the pull of the buccal attachments is strongly backward, in these two impressions taken with the mouth open.

C. The anterior attachment has muscle-trimmed the impression nearer the median line and much less deeply.

D. The margin seems much less deeply trimmed, yet the impression is better adapted. See opposite page.



A B C D

Fig. 32.

The same impressions as in Fig. 31 with a plaster impression of the same mouth on the left.

THE ANTERO-POSTERIOR LENGTH OF THE UPPER IMPRESSION.

The upper impression should be of the length desired in the finished denture. This length will be determined by the condition of the tissues. If the alveolar ridge in the front of the mouth is hard, the denture should extend on to the soft tissues immediately posterior to the hard palate. If the alveolar ridge in front is soft, the denture will need to extend farther backward, on to the movable soft tissues, in order that it may be stable in biting.

The nausea which frequently results from dentures has been generally thought to be caused by the upper denture extending too far backward, and efforts are made to relieve the condition by shortening the denture.

Nausea is caused by imperfect adaptation of the posterior margin of the denture. If the margin be adapted to lie in close contact with the tissues when relaxed, the denture may be carried back as far as the dentist desires, without causing nausea. But if the denture is made over a model of the soft tissues in a distended position, the posterior margin will not lie in close contact with those tissues when they are relaxed. The soft tissues will then sustain an intermittent, vibrating contact, which will tickle the nerve endings and cause nausea.

If the tray be trimmed as suggested on page 18, and the posterior margin adapted as suggested on page 54, nausea will not result, however long may be the denture. I have seen many patients who had previously been unable to wear dentures because of nausea, and for whom dentures had repeatedly been shortened, who are wearing with complete satisfaction very long dentures with the margins adapted to close contact with the tissues when relaxed.

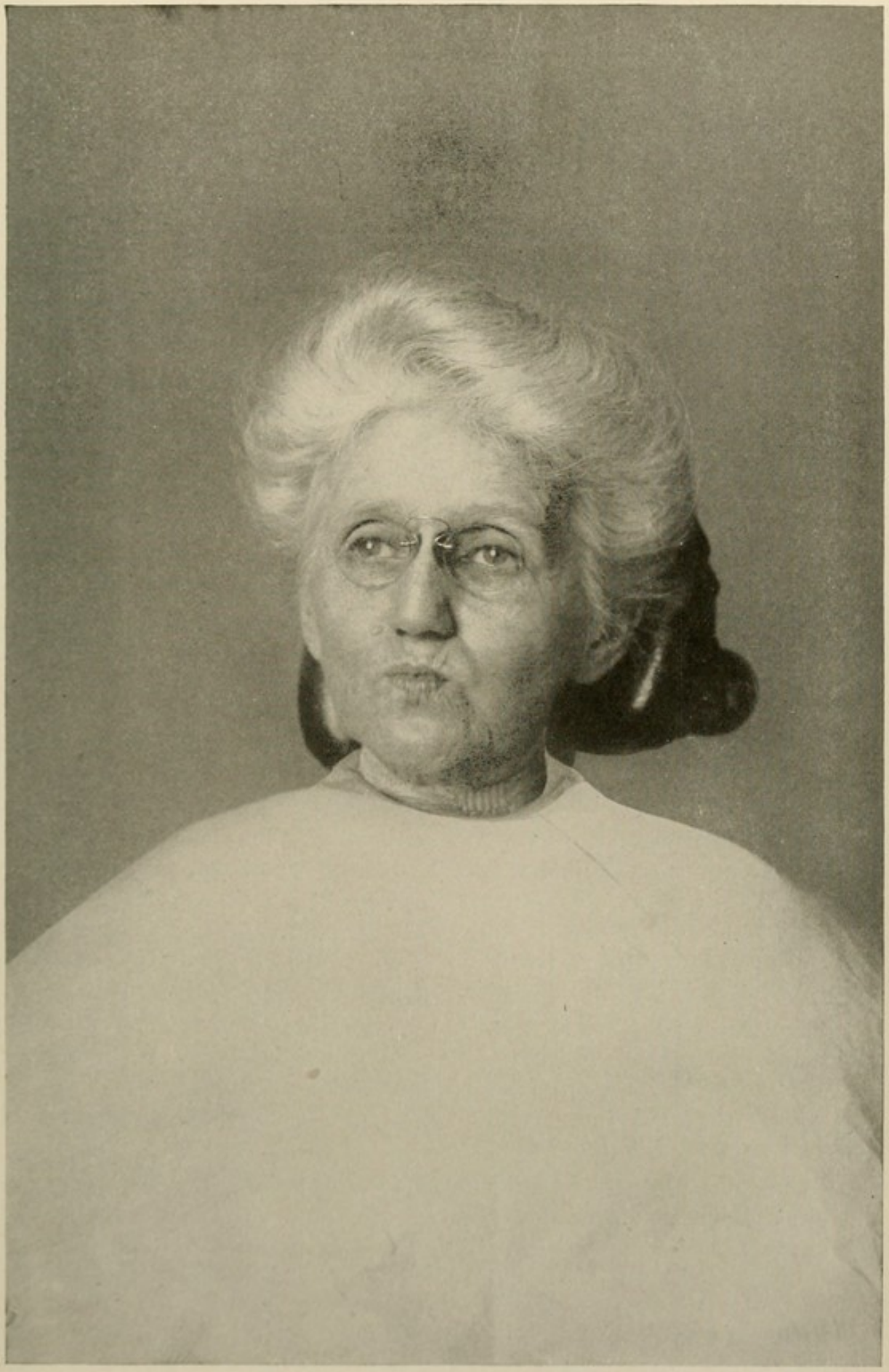


Fig. 33.
Whistling movements to carry the buccal attachments into the anterior position.

ADAPTING THE UPPER IMPRESSION TO THE PALATAL SOFT TISSUES.

Figs. Nos. 34 and 35.

It is important that the upper impression should be adapted to the soft tissues which overlie the posterior part of the hard palate on either side of the median line as shown in Fig. No. 35A when these tissues are relaxed.

Impressions taken with the mouth open, yield models of these tissues in distended positions. When the mouth is closed, these tissues occupy very different positions, and a denture made over a model of their distended positions may fit them so poorly as to cause the nausea described on page 52. If the denture fits these tissues in the relaxed position, it will be stable at all times and will not cause nausea, no matter how long it may be.

The impression is adapted to the relaxed position of these tissues by adding compound from a stick over the entire area occupied by these tissues, and while it is very soft, inserting the impression into the mouth, the lower trial plate being in place, and having the patient close the mouth and swallow two or three times. The tongue is automatically carried to the roof of the mouth during swallowing, and this action drives the softened compound into firm contact with these tissues and holds it there until it cools. It may be necessary to add compound in this way two or three times before the added compound blends smoothly with the rest of the palatal surface. Trim the impression to the exact length desired in the finished plate. Then warm the posterior border of the impression again and have the patient swallow a few times.

While the jaws are still closed together, the patient's lips are parted, the upper trial plate is seized with the left thumb and forefinger in the bicuspid regions, and held firmly against the vault, the patient is caused to open the mouth and the right forefinger is passed across the heel of the plate with gentle but firm pressure and the compound is more firmly adapted against the vault and posterior to the tuberosities.

The finger pressure may carry the compound to a point which will cause muscle strain. Have the patient immediately close the mouth and swallow. If the compound be not too hard, this will equalize the strain. If the compound hardens before these steps are completed, it should be warmed and the process repeated.

The trial plate is now removed from the mouth and the buccal margin of each side over the tuberosities should be warmed deeply, by the aid of a small flame, without changing its form. The trial plate is now quickly replaced in the mouth. The patient is caused to close the jaws lightly in correct bite, and then to exert strong force in biting. This pressure properly "muscle trims" the posterior parts of the buccal margins to the movements of the muscles in this region. This trimming is very important and often prevents mutilation of the tissues due to congestion, or a tendency to force the plate forward in biting.

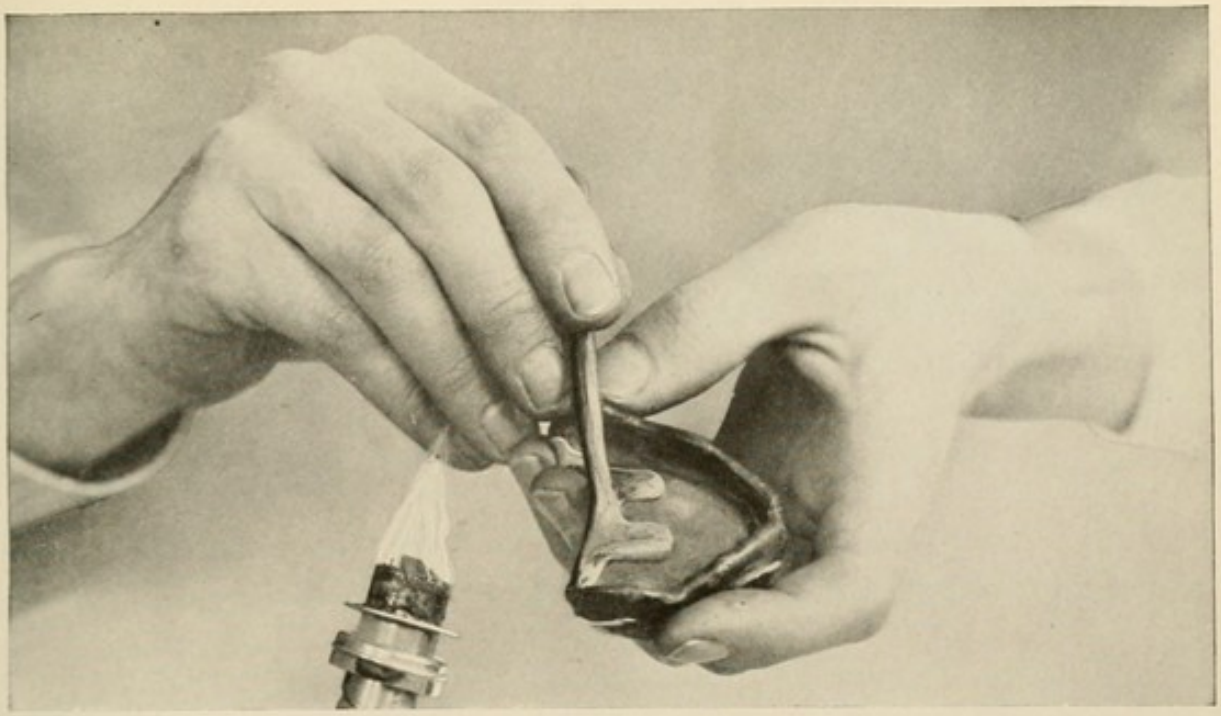


Fig. 34.

A stick of compound is softened over the flames and compound from it is added to the palatal surface of the impression over the area occupied by soft tissues in the mouth being fitted.

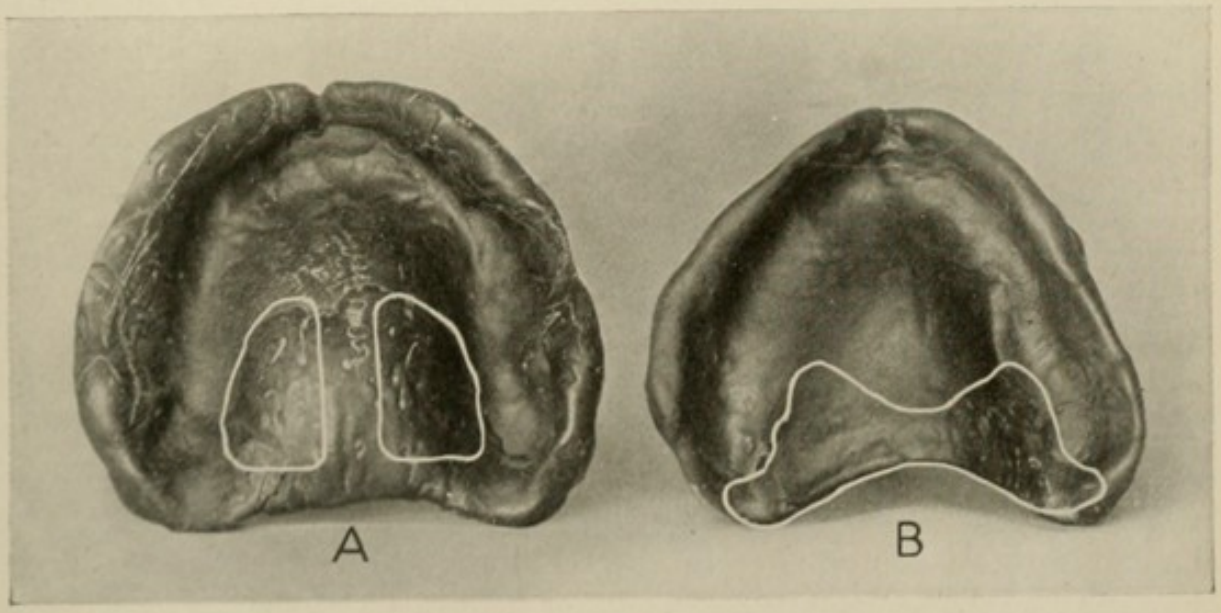


Fig. 35.

The areas within the white lines in "A" are the theoretical locations of the muscular tissues overlying the hard palate. The area within the white line in "B" is that over which compound was added in adaptation of this denture to the relaxed position of these muscles.

THE EFFECT OF ADAPTATION TO THE PALATE.

Figs. Nos. 36, 37 and 38.

This Adaptation of the impression to the soft tissues mentioned often effects an almost unbelievable change in form in this part of the denture. An impression taken with the mouth open rounds downward in this area, while one which has been adapted to the relaxed tissues either runs out nearly horizontal or actually turns upward.

Fig. No. 37 shows on the left an impression taken with the mouth open and the tissues rounding downward in this region.

Fig. No. 37 shows on the right an impression of the same mouth with the soft tissues compressed in their relaxed position. Note that the impression runs out horizontally. The difference in thickness of buccal margins and amount of compound may be disregarded.

Fig. No. 38 shows on the right a cross section of the impression on the left in Figure No. 37. Note the very decided rounding down of the soft tissues in the posterior portion of the impression.

A denture made over a model from this impression will fit the relaxed soft tissues so poorly as to probably cause nausea by vibrating contact between denture and tissues.

Figure No. 38 shows on the left a cross section of the impression shown on the right in Figure No. 37. Note the horizontal formation in the posterior portion. This impression is much more stable in all positions of the mouth. A denture having this form could be extended as far backward as the condition of the ridge in the anterior section required, without causing nausea.

Similar differences of form in other impressions can be seen by referring to Figure No. 36.

This completes the work on the upper impression. It should now be stable in all positions of the lips and cheeks, and should fit snugly but not be uncomfortably tight. That impression is best which while in position in the mouth, can be rotated slightly from side to side without breaking suction.

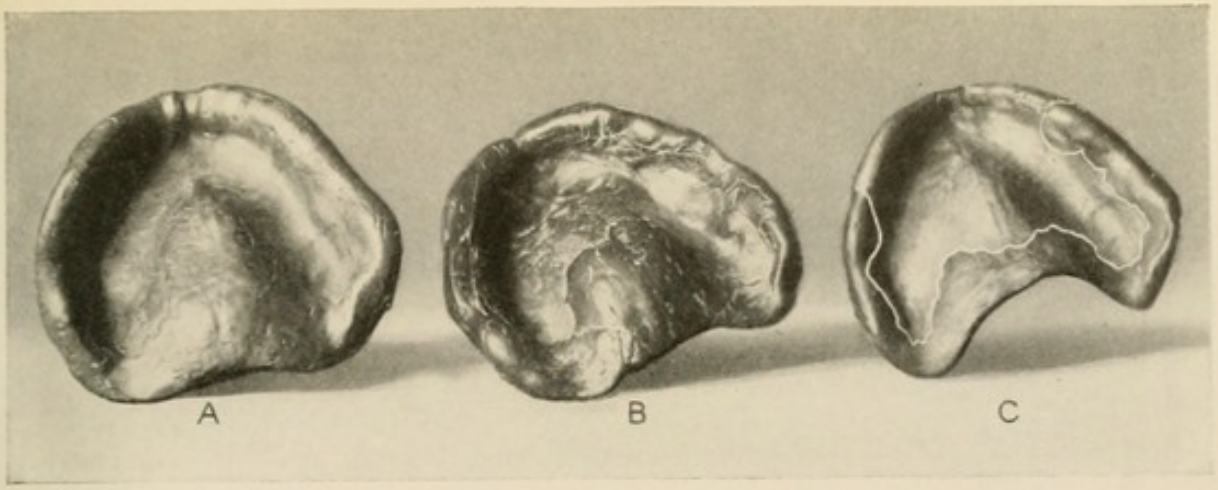


Fig. 36.

A. Impression of open mouth. Poorly adapted tray. Excess of compound. No muscle-trimming.

B. Impression of same mouth, open. Margins built up but not trimmed thin. Muscle-trimmed.

C. Impression of same mouth, muscle-trimmed and massaged with mouth closed. Adapted to palatal soft tissues. White line outlines area over which compound was added.

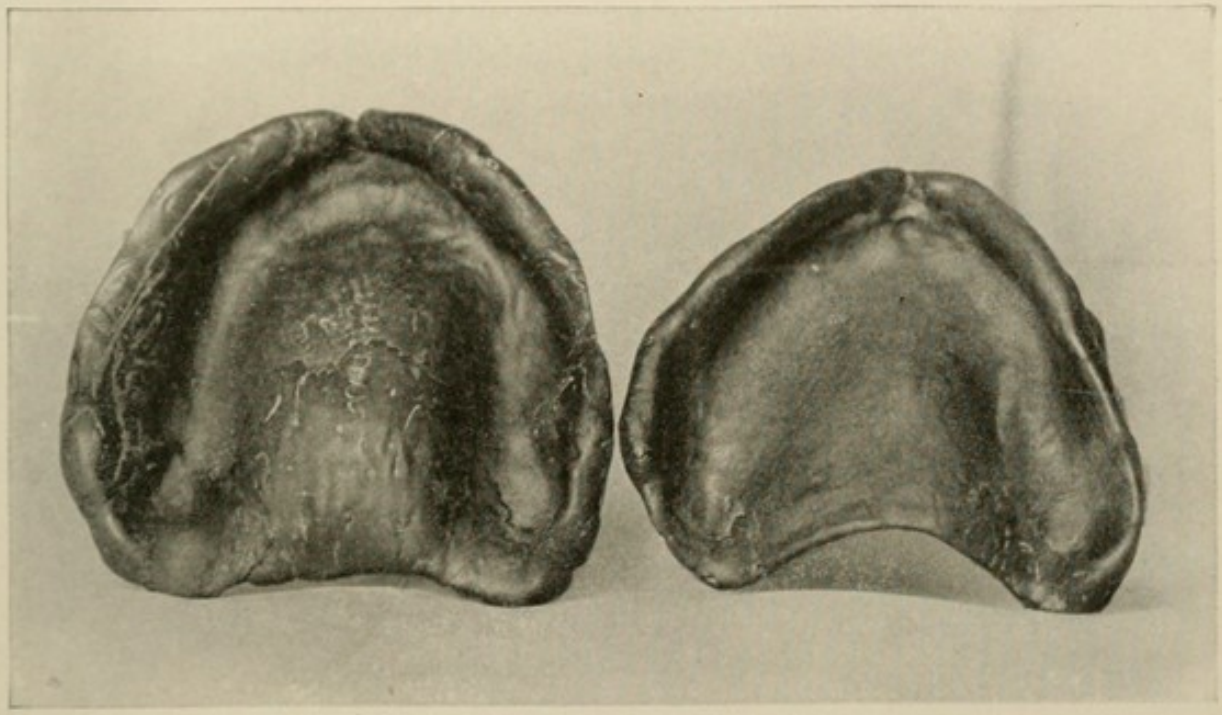


Fig. 37.

On the left, an impression of a mouth, open, with palatal soft tissues distended and rounding down. On the right an impression of the same mouth which has been adapted to the palatal soft tissues in relaxed positions.

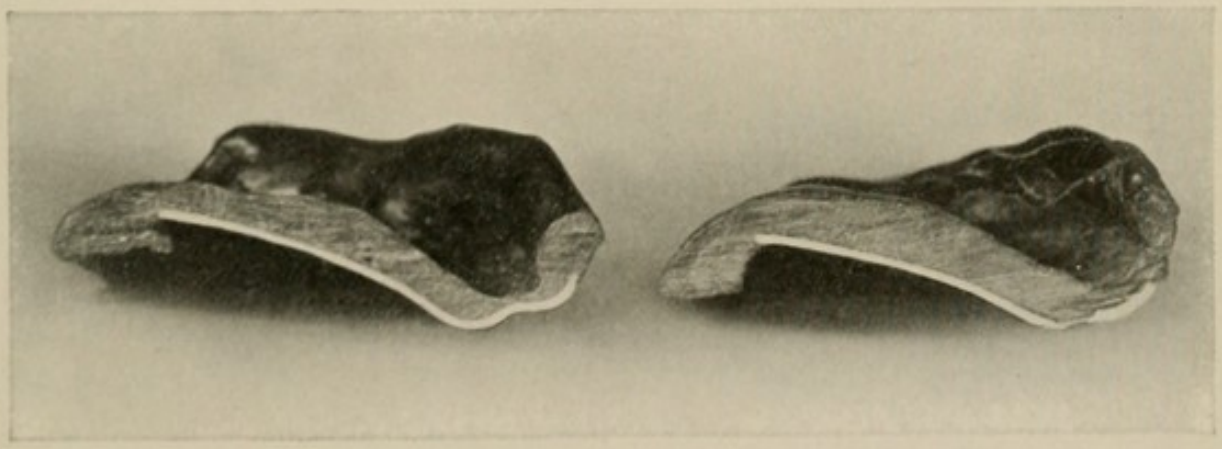


Fig. 38.

On the right, a cross section of an impression taken with the mouth open. Note how it rounds down in the posterior part. On the left, an impression of the same mouth properly adapted to the soft tissues overlying the hard palate.

ESSENTIALS OF COMFORT IN A LOWER DENTURE.

The acme of comfort in the average lower denture is secured only when the denture is supported by pressure of its buccal and lingual margins on the soft tissues at the base or sides of the ridge, rather than on the top of the ridge. The margins of the denture must be adapted to accommodate these tissues in their positions of extreme distention, and sufficiently short so that the tissues will either not raise the denture or if they raise it, will automatically re-seat it when the mouth closes.

An impression which will yield such a denture requires adaptation by three distinct steps:

1. The outer rim must be "muscle trimmed" to the buccal and labial tissues in positions of maximum distention. This can be done only with the mouth open and conformed to the ridge with the mouth closed.

2. The lingual rim, in the region of the bicuspids and molars, is trimmed to the distended position of the sublingual tissues with the mouth closed and the patient swallowing. The anterior portion of the lingual rim is to be trimmed by the patient sticking out the tongue or licking the upper lip.

3. After the margins have been trimmed as described under Nos. 1 and 2, the ridge surface in contact with extremely hard or very soft tissue must be cut out considerably and then the entire ridge portion of the impression is softened and the pressure at all points is equalized under biting stress. This point is most important.

The experienced operator will be able to secure these adaptations in not more than three operations, but whether three or ten are required, they must be effected if the lower denture is to be comfortable and efficient.

FINISHING THE LOWER IMPRESSION.

If the outer margin of the lower baseplate impression was cut short, as directed on page 38, trace on additional compound from median line to heel on one side, making it higher than the finished rim will be, but not thick from ridge to cheek. Put the trial plate into the mouth, have the patient open wide, and by pressure on the bicuspid region of each side, force it down to place. Then have the patient close the mouth and perform the whistling and laughing movements. While the mouth is closed and the cheeks are relaxed, make a quick, light massage over the warm margin.

The movements of the cheeks will doubtless turn upward any excess of compound that was built on. This should be trimmed away, and the procedure repeated until no more compound is turned upward.

When the margin is high enough on one side and is properly trimmed, repeat the process on the other side of the outer margin.

If the lingual margin of the impression was cut short, trace on compound in like manner, and at the same time warm the entire balance of the lingual margin evenly and deeply, because the sublingual are very weak but effective. Insert the trial plate into the mouth, the upper being always in place, and have the patient close the mouth and swallow. This will muscle trim the margins in the bicuspid and molar region. Trim away excess and repeat till no more excess is turned up.

Warm the lingual margin of the anterior region, hold the trial plate down on the ridge by pressure in the bicuspid regions, and have the patient project the tongue or lick the upper lip. When the tongue is withdrawn, pass the finger over the warmed margin and gently press the compound against the ridge, without changing its form.

With a spoon instrument, deepen the impression of any prominent hard spots or very soft or flabby places on the ridge.

The final step is perhaps most important of all. If the ridge surface of the impression is flat, immerse it in hot water to soften it without changing its form and replace in the mouth and have the patient bite very lightly in right relations, and whistle, laugh and swallow.

If the ridge is high, warm the impression surface in contact with top of ridge with hot water from a syringe. This final softening and biting permits all muscle strain to be equalized and causes excess compound to flow toward top of ridge.

TAKING PARTIAL IMPRESSIONS.

(For the benefit of dentists who desire to take partial impressions the following skeleton of Mr. Supplee's method is appended. Such impressions will be found valuable in making models for partial dentures and for extensive bridgework.

Lack of space forbids proper treatment of this subject. Those desiring detailed information are respectfully referred to Mr. Supplee's writings.)

The buccal flange is trimmed away from the tray. The impression material is prepared as described for full impressions and is shaped to cover the surface of the hard palate, the lingual surfaces of the remaining teeth and all surfaces of the ridge where teeth are missing.

Press the cup "home" and hold it until the compound has partly set. Remove the tray and compound from the mouth in the direction in which the finished denture is to be removed. Dip the surface of the compound into cold water to slightly chill it; then quickly insert the tray again in the mouth and drive it "home" with pressure.

Cut the margins of compound about adjoining teeth to square edges. Shape a roll of compound as for a lower impression and lay it over the labial and buccal surfaces of the teeth. Pull the lip over it, press the compound in place, allow it to cool.

The above steps, if properly followed, obviate the taking of an impression of the bell-shaped necks of teeth, which cannot be used in the finished denture. They make it possible to produce a partial plate which can be inserted into the mouth without trimming.

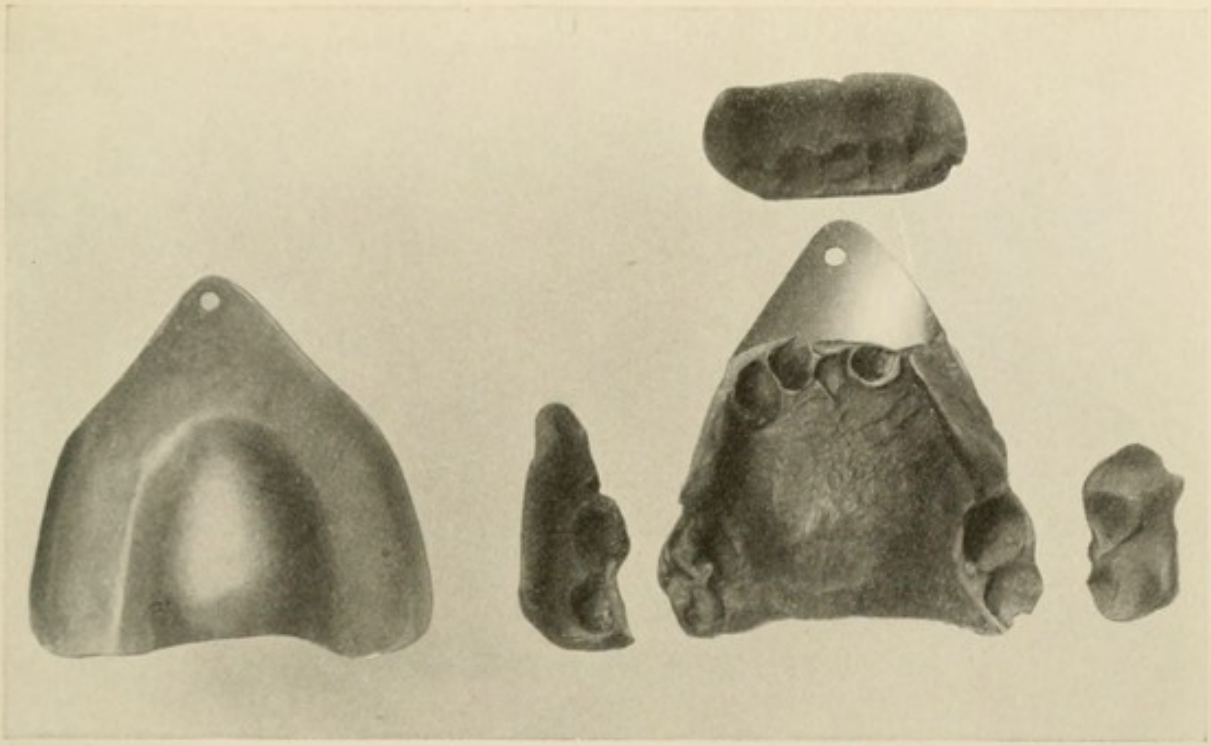


Fig. 39.

On the left, a Supplee upper tray for partial impressions.

On the right, the impression of the vault and the lingual surfaces of the teeth, with the outside pieces laid back to show impressions of outer surfaces of teeth.

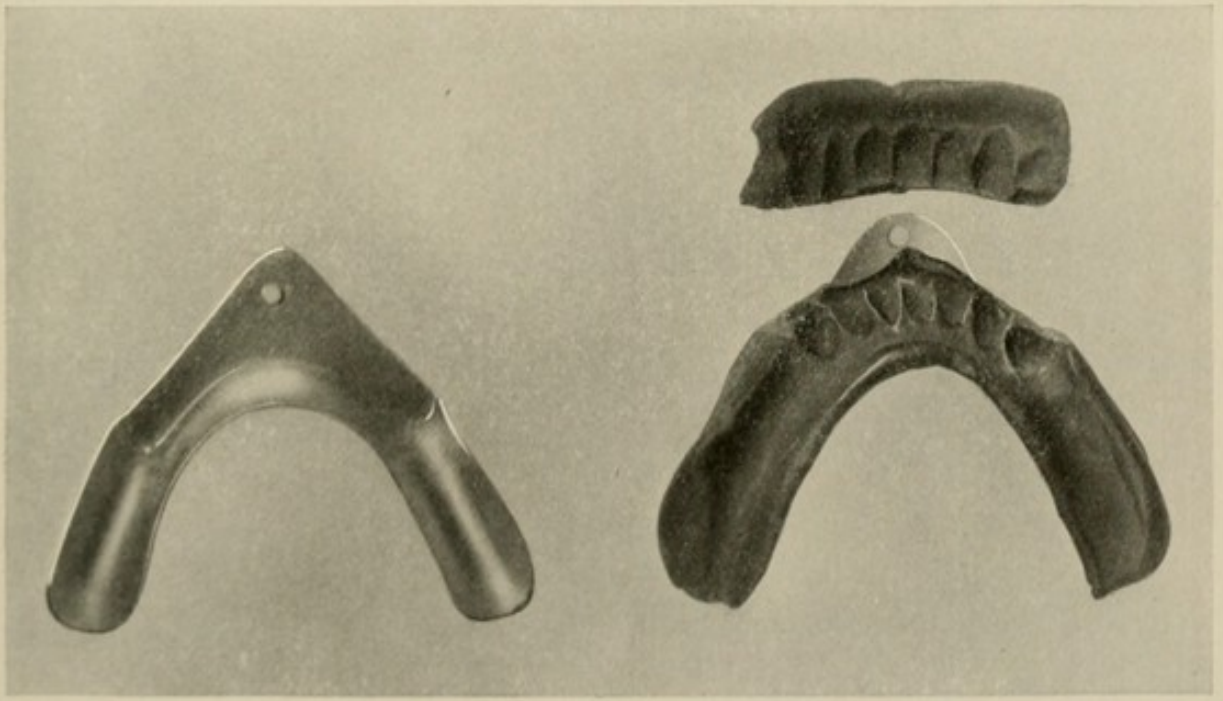


Fig. 40.

On the left, a Supplee tray for partial lower impressions.

On the right, a lower partial impression with the anterior piece laid back to show impression of labial surfaces of anteriors.

POINTS TO BE REMEMBERED IN REFITTING UPPER PLATES OR IN TAKING NEW IMPRESSIONS.

1. Always examine the mouth, first by feeling the tension of the muscles with the mouth as nearly closed as possible, using the index finger, and you will get an entirely different idea of the existing conditions and the possible height of rim than by looking it over.

Put the finger in the mouth over the tuberosities and let the patient close to find out the relation of the lower jaw to the upper. Many plates are thrown by the passing of the two in mastication. Cut off points of cusps which interfere with trituration.

2. Don't push plate all the way home. Let patient do that.

3. When patient can tip plate with tongue, it is too short in the back,—or not imbedded deep enough into the soft tissues.

4. When plate drops in talking, the edge is not imbedded into the soft tissues in the roof of the mouth and back of tuberosities.

5. When the plate drops from mastication, it either rocks on the hard palate or is too low on the sides. Incidentally, see that there are no prominent cusps catching on the opposite side from which it drops first.

6. When the plate drops only when the mouth is opened wide, it is generally too high in front. Shorten it or add material on the inner edge; it may also extend back too far on the dilating soft palate.

7. If the patient gags, the plate is probably not long enough or is not compressing the soft tissues, so as to eliminate the tickling caused by the vibration of the soft tissues over the edge of the plate.

8. Build out plumpers, if required, in compound, when impression is being taken.

9. After plate has been worn, always cut out some of the old material where you expect to add.

10. Don't build only on the edge of the rim, otherwise you will get suction only by contact with the cheek, and the plate will soon get loose or cut the cheek. Add the compound half between the rim and the bottom of the ridge so as to compress the muscles at their base.

Fig. 41.
Very firm closure of the jaws to trim the impression margins to forward position of the masseter muscles.

PART II.

SELECTING THE FORMS AND SIZES IN ANTERIOR TEETH

FOREWORD.

It gives me great pleasure to be able to introduce here the methods of tooth selection made possible by the researches of Dr. J. Leon Williams, and by the production of Trubyte Teeth in harmony with his findings. These methods are so much more scientific and certain than those in former use, and yield such superior results, that I am sure they will replace all other methods as soon as perception of their scientific worth and utility becomes common.

The dentist who must select teeth for a full upper denture, or for an upper partial denture extending across the front of the mouth, or for a bridge replacing the upper anterior teeth, must solve three problems, which are:

To Select a Mould Harmonious with the Face.

To Select Teeth of the Proper Size.

To Select a Shade.

When only a portion of the anterior teeth are to be selected, as in the case of some partial dentures, short bridges, and porcelain crowns, the dentist must select a mould of like character with the remaining natural teeth, and of the sizes determined by the mechanical requirements.

I have briefly set forth Dr. Williams' findings regarding the selection of moulds in my own words in the following pages.

THE ORIGIN OF FACE FORMS AND TOOTH FORMS.

In the days when the human face first assumed its present proportions, nature shaped three types of face, the square, the tapering, and the ovoid (with the big end down) and made all other forms by blending these. They were rough days and it took rough men to survive, even to maturity. It is natural, therefore, that the types should have been severe and strong, rather than what we should call pleasing.

From those days to these, nature has formed all human faces in these typal forms or by blending these forms, usually with one form sufficiently prominent to give its character to the face as a whole. Consequently, though we rarely have the severe types of faces now, faces may be classified as modifications of the square, the tapering or the ovoid.

In those early days when nature was forming types, she formed also three types of teeth, and as she seeks always beauty and harmony, the types of teeth were harmonious with the types of face, square, tapering and ovoid. Since that time she has modelled all human teeth upon these three forms.

The circumstances which have modified the forms of faces, seem to have modified the forms of teeth in like manner, so that all teeth which are not of the severe typal forms may be classified as modifications of the square, the tapering or the ovoid.

Dr Williams has conducted extensive studies of face-forms and tooth-forms, in those museums which contain the finest collections of human skulls. He has demonstrated that in every race from which we have any considerable collection of skulls, nature has produced the same typal forms of teeth and made all other forms by blending these. These races are ancient and modern, savage and civilized, and from every quarter of the earth.

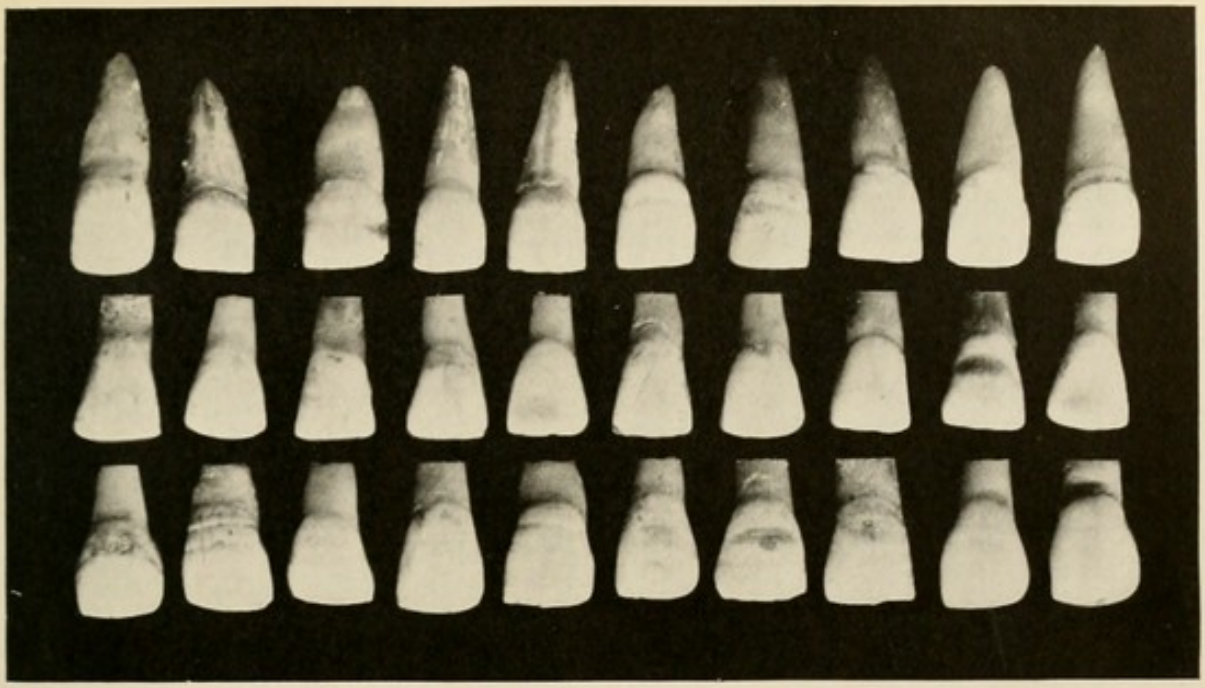


Fig. 41. Typal forms in upper centrals. Class I at top.

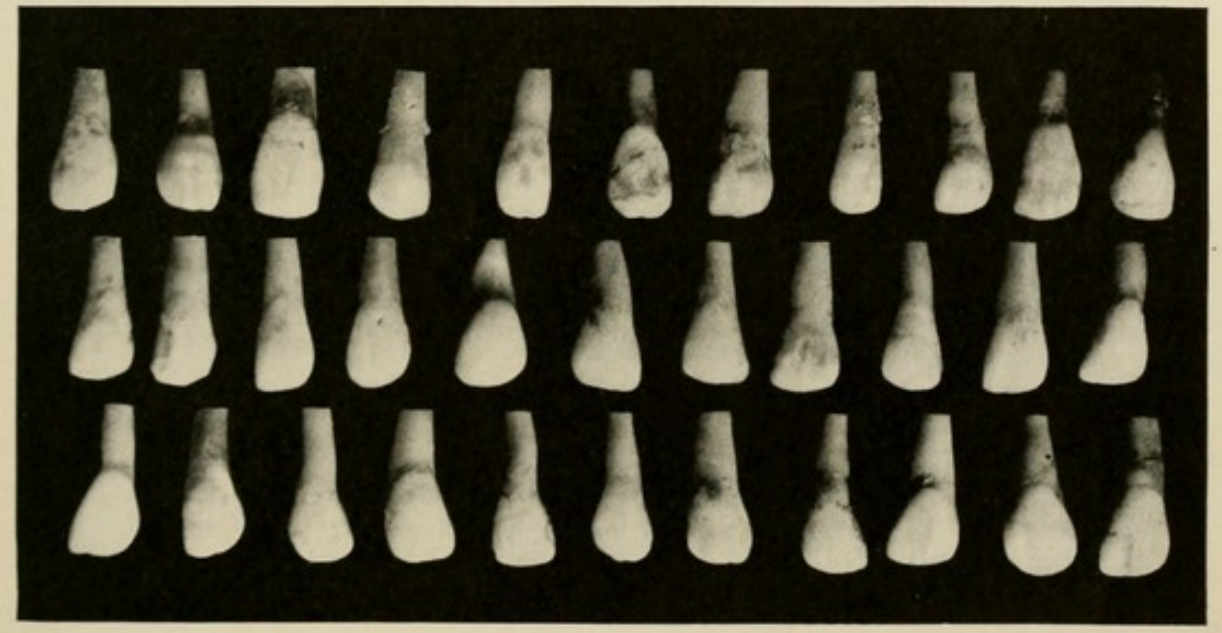


Fig. 42. Typal forms in upper laterals. Class I at top.

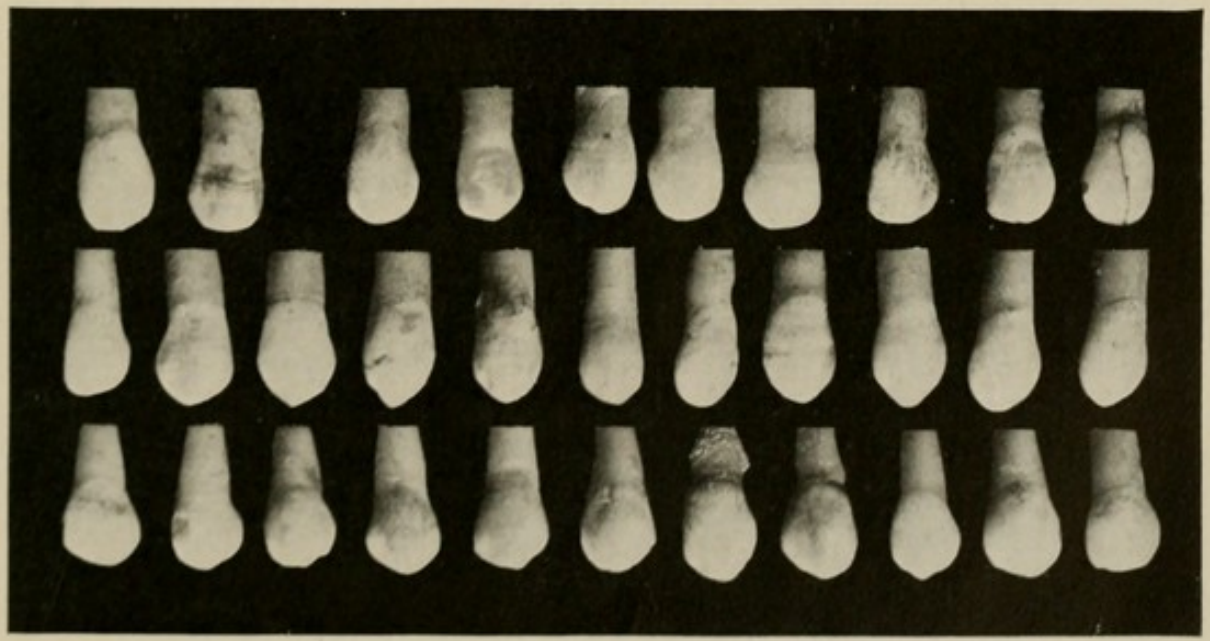


Fig. 43. Typal forms in upper cuspids. Class I at top.

HARMONY BETWEEN FACIAL FORMS AND TOOTH FORMS.

In the days before modifications of facial forms and tooth forms became the rule, it is possible that nature always placed square teeth in square faces, tapering teeth in tapering faces and ovoid teeth in ovoid faces. If so, she secured harmony, even if the forms were too severe for our notions of beauty.

As modifications of typal forms in faces and teeth multiplied, nature seems to have lost control of the situation, and to have frequently allowed like modifications to become separated, so that there is no longer any necessary relation between the type of the face and the form of the teeth. While there are many examples of harmony, there seem to be even more examples of disharmony. Square teeth are now often found in ovoid faces and ovoid teeth in square faces. The extent of the disharmony and of its effect is determined by the character of the modifications in face and teeth. If both modifications tend toward a common type, the effect may not be unpleasant. But if they tend toward different types, the result may not be pleasing.

This knowledge of typal forms in faces and teeth, of their modifications, and of the laws of harmony between them, liberates the dentist who is to select all the anterior teeth, from any servitude to the form of teeth which the patient may have exhibited. His guidance is to be found in the type of face, and his task is to select teeth to harmonize with the face rather than with any teeth which have gone before.

When some natural anterior teeth remain, as in many crown and bridge cases, the dentist will disregard the type of face and select a mould to harmonize with the natural teeth.

Dr. Williams' methods make such selection very easy and rapid, but before taking them up it may be well to devote a few words to a description of the methods of selection which have been in force up to this time, but which I believe will speedily become obsolete.

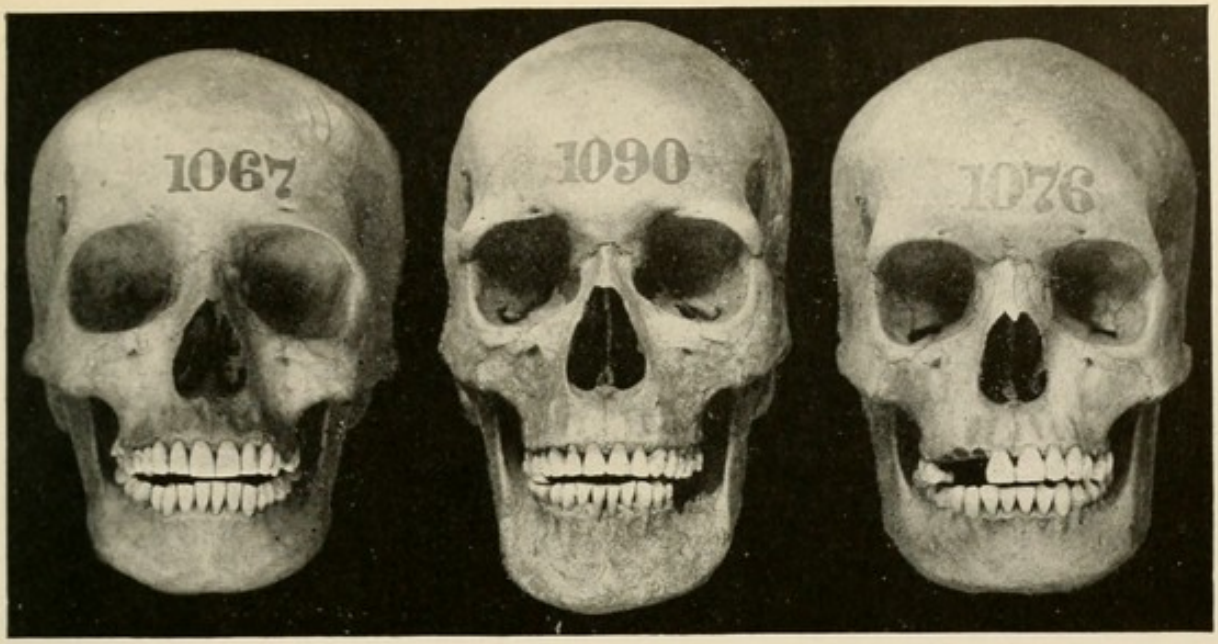


Fig. 44. Sandwich Islanders, showing Classes I, II and III, in natural teeth.

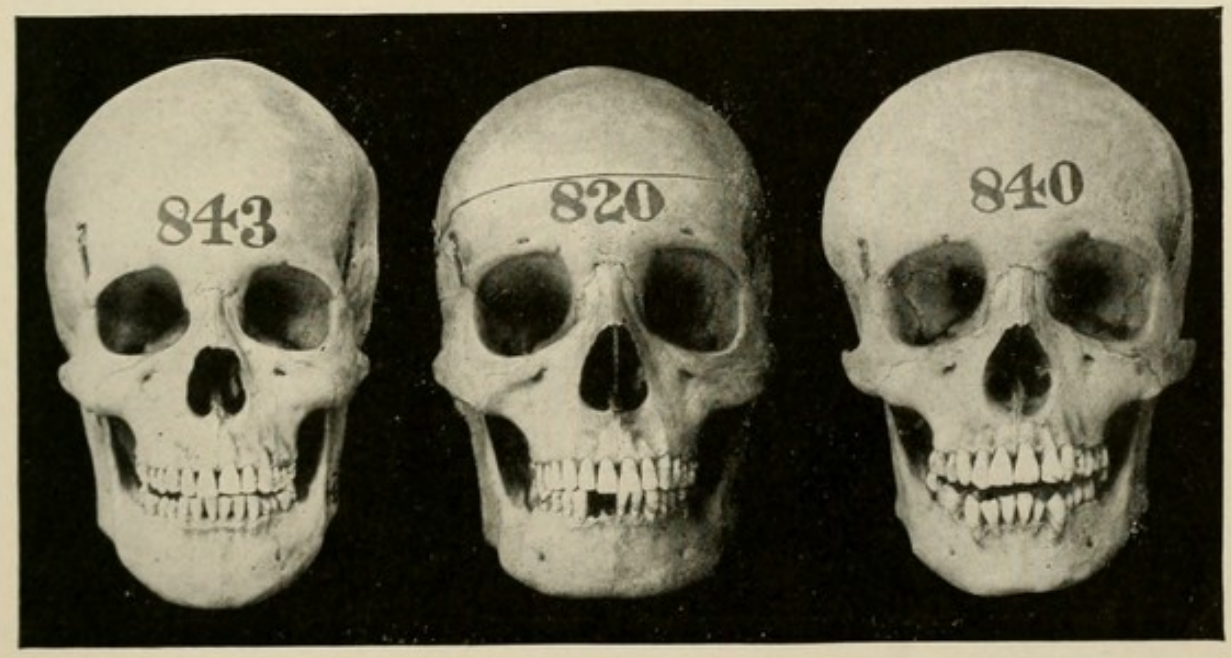


Fig. 45. Chinese Skulls, showing Classes I, II and III, in teeth.

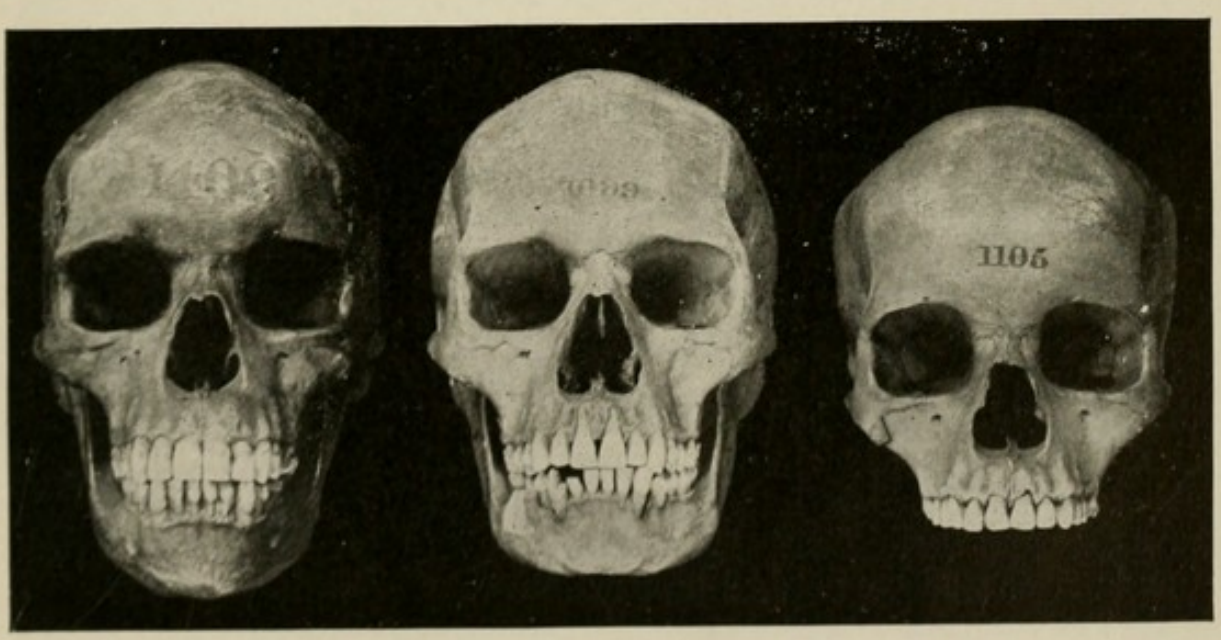


Fig. 46. Tasmanians, showing Classes I, II and III, in teeth.

THE TEMPERAMENTAL THEORY OF TOOTH FORMS.

The theory which has most commonly served as a basis for the selection of teeth assumes that people can be divided into four groups, according to the color of the hair, skin, and eyes, and the physical characteristics of size and form. It assumes also that the people of each group exhibit a characteristic form of tooth, so that we have a bilious form, a sanguine form, a nervous form, and a lymphatic form. The temperaments were supposed to be blended together in different proportions and the tooth forms to be similarly blended.

I have studied this theory of temperaments, but the more I studied the less I knew. I believe this to be the usual experience, and I doubt if it is taken seriously by many dentists. It has long since been abandoned in all the other great departments of medicine.

The temperamental theory assumes also that there is in each human body a governing principle which insures harmony of form and size among its several parts, so that all teeth are harmonious in size and form with the contour of the skull and face. If this part of the theory were true, we should all be examples of symmetry if not of beauty, instead of exhibiting the rather heterogeneous collection of eyes, ears, noses, mouths and teeth which are so common to-day.

Dr. Williams' studies have clearly established that there are no temperamental forms of teeth by showing:

1st. That people of every variation of stature and color had identical tooth forms.

2nd. That people of like stature, contour and color had very unlike forms of teeth.

The following illustrations so establish these points that we may dismiss forever from our minds the notion of temperamental or racial forms of teeth.

Certain leading manufacturers claim to have produced porcelain teeth in moulds characteristic of the four great temperaments. Unfortunately they have differed so radically among themselves as to have produced entirely unlike moulds for the same temperaments.

It is very doubtful whether the manufacturers ever took the temperamental theory any more seriously than as a means of satisfying certain dentists, obtaining unpaid-for advertising, and securing additional tooth orders. Certain it is that most of the moulds of porcelain teeth have been carved by copying natural teeth, and that largely without relation to the dentist's needs. There has been no system of graded sizes, so that a mould could be had a little larger or a little smaller than a given size. And many of our finest efforts have been thwarted because suitable teeth could not be had. I believe Dr. Williams is right when he says that prosthetic dentistry has sunk to its present neglected condition because we have not had proper teeth to work with.

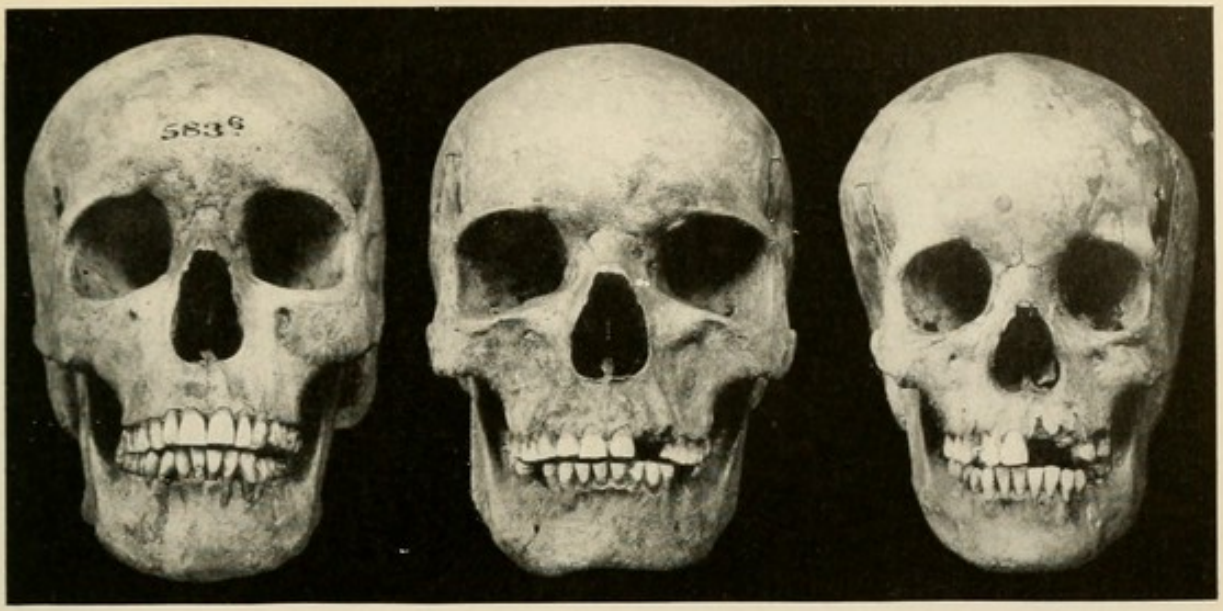


Fig. 47. Ancient Egyptian Skulls, illustrating the three typal forms of teeth.

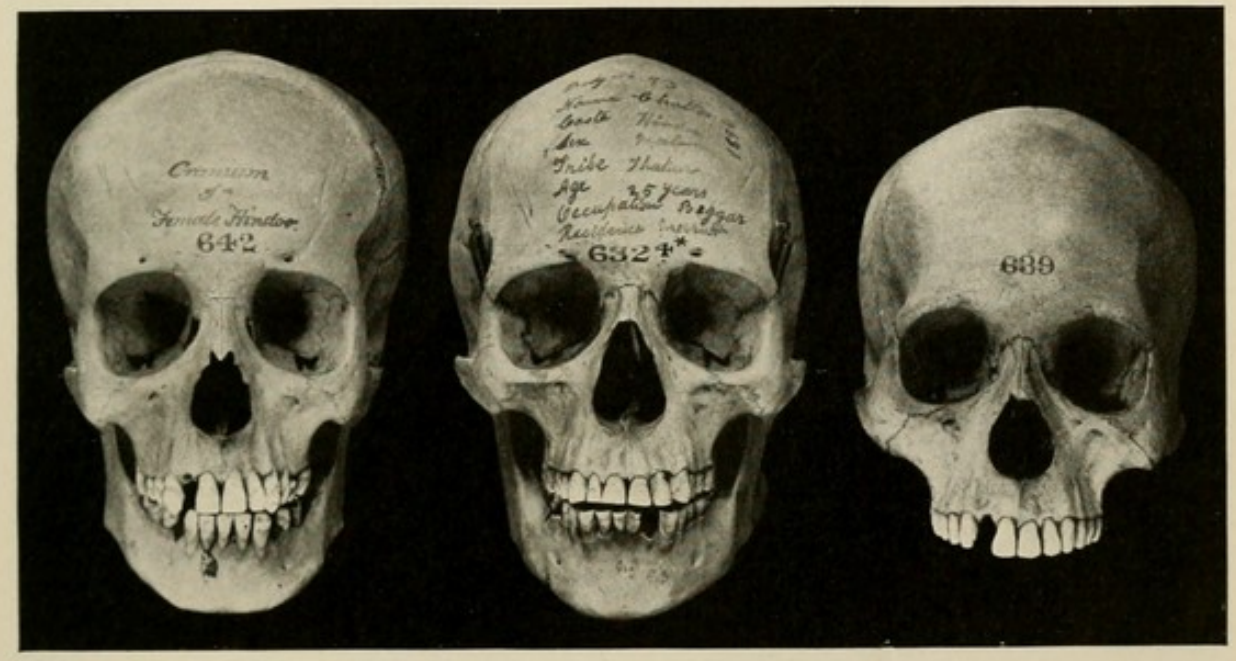


Fig. 48. Skulls of modern Hindoos—excellent specimens of Classes I, II and III.

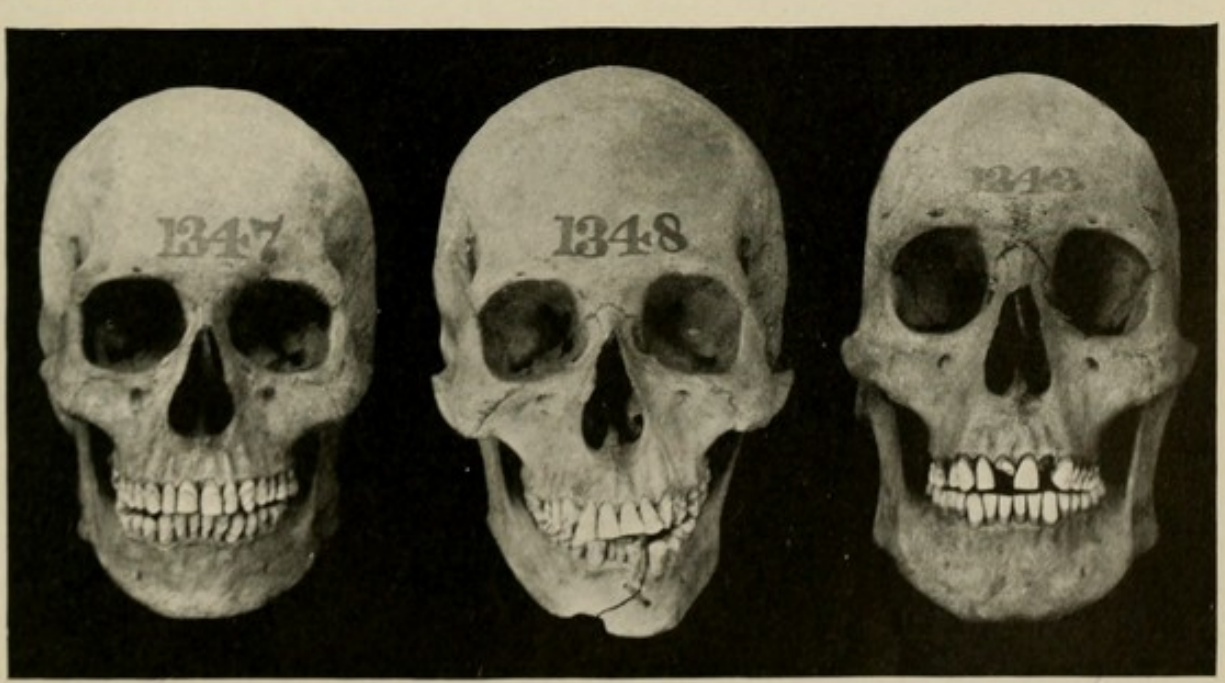


Fig. 49. Three Patagonian Skulls, exhibiting the three typal forms.

THE APPLICATION OF THESE DISCOVERIES TO PORCELAIN TEETH.

The discovery of the typal forms of natural teeth and their modifications, would be of little value to us or our patients if no porcelain teeth like them could be had. Dr. Williams knew this. He had labored for this discovery with the intention of producing porcelain teeth, which should be harmonious with all forms of faces and natural teeth. Porcelain anterior teeth shaped in accordance with his discoveries and bicuspids and molars shaped in accordance with Prof. Dr. Gysi's discoveries, have been produced under the distinctive name TRUBYTE TEETH.

Dr. Williams calls the Square Type "Class I", the Tapering Type "Class II", and the Ovoid Type "Class III".

Dr. Williams has isolated five modifications of tooth forms in Class I; four in Class II, and four in Class III.

These modifications have not been made by copying natural teeth. That method has proven a failure in the hands of every one who has given it serious trial. They have been made by studying nature's work, until her object and her methods were known. The defects which appear in nearly all sets of natural teeth were eliminated, and the fundamental principles of beauty in tooth form were discovered and utilized. The laws of harmony, as exhibited in nature's finest achievements, were applied to the accomplishment of nature's object, this time in porcelain.

A number of practical advantages to us as prosthetic workers result from this method. They may be briefly summarized as follows:

We are taught how to classify faces for selection of teeth for full dentures, and how to classify natural teeth so that we may know what type of artificial teeth we should select in partial cases.

We may use the drawings of facial outlines in this book and quickly determine the type and modification of face, or the drawings of teeth and determine the type and modification of natural teeth.

The endless and seemingly planless collection of artificial teeth from which we have selected in the past gives way to a comparatively few moulds, so arranged as to have greater matching power than all the moulds of the past.

The availability of the comparatively few moulds is much greater than their number would indicate. A given face may lie on the border line between types, that is, be a blending modification of, say Class I and Class II. It may be that two moulds in either class would be suitable. We are thus furnished four moulds in, say four sizes each, suitable for that face, a thing unknown before.

Each mould is produced in several sizes. These sizes vary about one millimeter in the length of the labial surface of the upper central, exclusive of collar.

The illustration of each mould and the dimensions of its several sizes are tabulated to make them immediately available.

Identical moulds will be available in vulcanite teeth, in porcelain crowns, and in facings for bridge work.

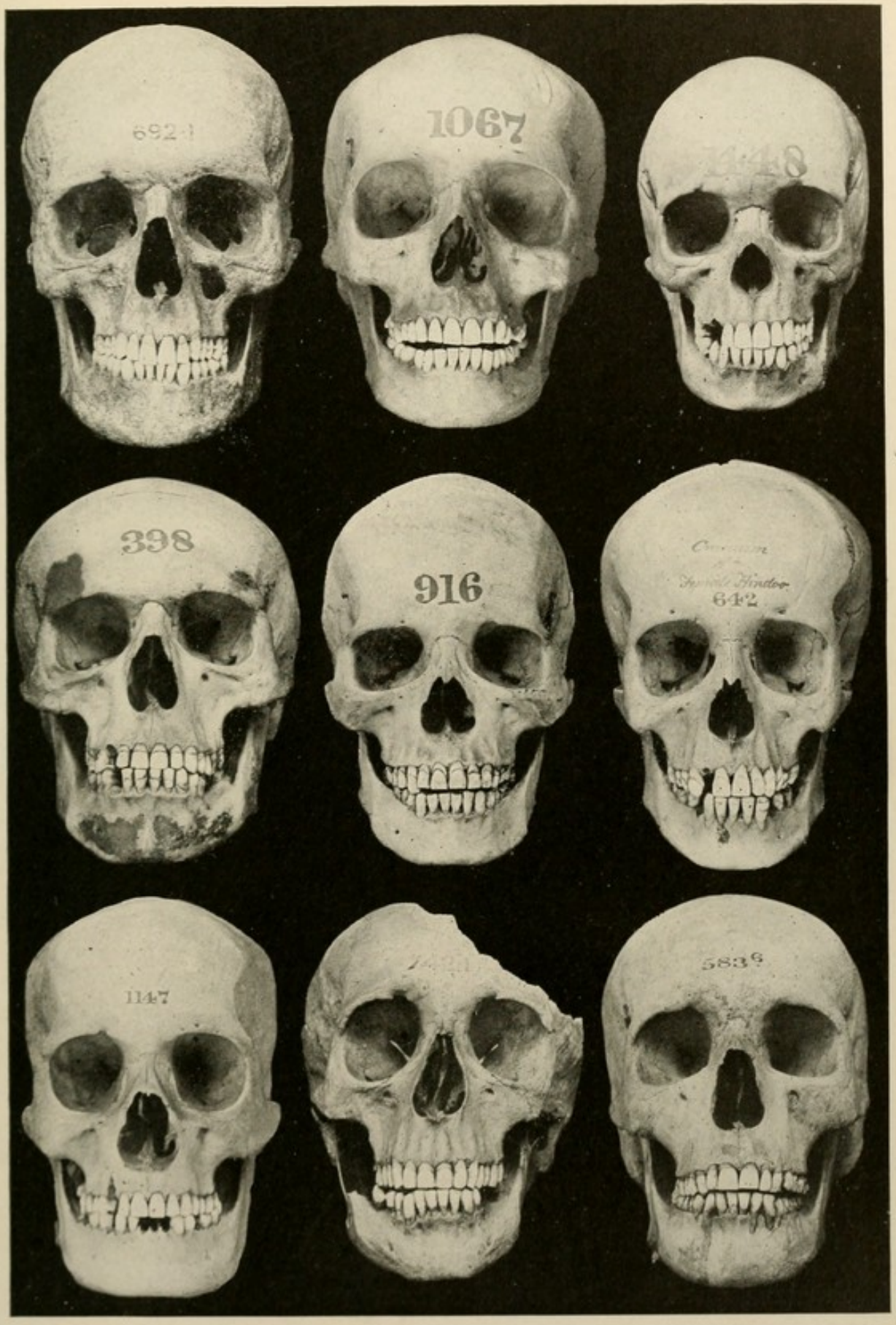


Fig. 50.

Nine skulls of different races and unlike size and contour, all with teeth of Class I. The form and size of the teeth bear no relation to the form or size of the skull.

Nationalities from left to right are:

Spanish, Sandwich Islander, New Hebridean, German, Javanese, Hindoo, Fiji Islander, Italian, Ancient Egyptian.

DETERMINING THE TYPE OF FACE AND OF TEETH.

If one has illustrations of the chief modifications of the three typal forms of faces, it is easy to determine the dominant type in the face, and the character of the modification. One has only to compare illustrations with the face, till the illustration most like the face is found. Such illustrations will be found on pages 79, 81 and 83.

Below the illustration of each facial modification will be found a notation as to which Trubyte mould is suitable for faces of that particular form. The size of the teeth will be determined by mechanical conditions which will be described later.

Because this method of selection is so easy and rapid, it must not be thought that it is unscientific. It is in the highest degree scientific and artistic, and is only made easy because the preliminary work has been completed by Dr. Williams.

When remaining natural teeth are to be matched, the outline illustrations of tooth forms on pages 85, 87 and 89 should be used to select the most suitable mould of porcelain teeth. The size will be determined by the mechanical conditions.

An illustration exactly like every face is not necessary to successfully determine the type and modification. There are nearly as many minute modifications as there are faces, since a feature or a line here and there will differ from that found in any other face. But the proportions of length and width are relatively constant in the several chief modifications. And the lines which bound the outline of the face, when seen full front, will have one of three general directions, parallel, converging downward or diverging downward. They are of three general characters, straight lines, flat curves, full curves. It is really surprising how rapidly and how accurately the faces which present may be classified, and how close many of them are to the standard modifications.

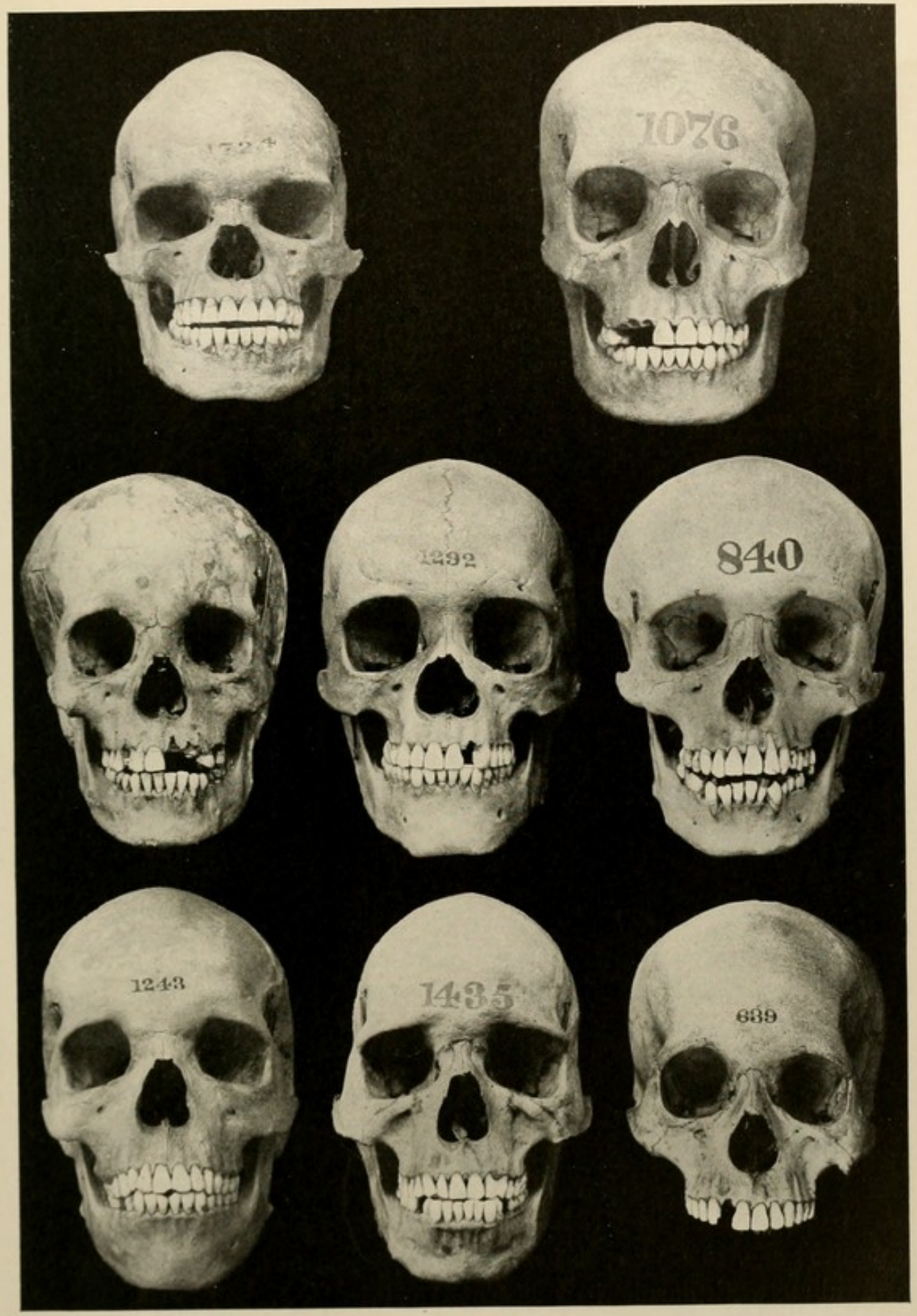


Fig. 51.

Eight skulls of unlike size and form. All exhibit teeth of Class III. The form and size of the teeth bear no relation to the form or size of the skull.

Nationalities from left to right: An Australian, Sandwich Islander, Ancient Egyptian, Kaffir, Chinese, African Savage, New Hebridean, Hindoo.

MODIFICATIONS OF THE SQUARE TYPE OF FACE.

Faces exhibiting modifications of the square type are more numerous than any others—perhaps as many in number as all the other types combined.

Most faces of this type exhibit nearly parallel sides, bounded by straight lines or flat curves, with short curves at the angles of the jaw, and rather wide chins.

Five modifications of this type are worthy of careful attention. Teeth harmonious with these five will be found harmonious with practically all faces of the square type.

The first modification is one in which the length of the face is much greater than its width.

The second modification is one in which the length of the face is but little greater than its width.

The third modification is one in which the length and width of the face are about equal.

The fourth modification is one in which the outline has been a trifle softened by slightly lengthening the curves at the neck. It is usually found only in female faces, and may be called a feminine modification.

The fifth modification is one in which the curves at the angles of the face have been noticeably lengthened, and the approximal curves somewhat rounded. This constitutes the oval face.

Outlines illustrating these facial modifications are shown on the opposite page. Below each has been placed a notation as to the mould of Trubyte teeth harmonious with that particular form of face.

Square face—long.
Class I, Mould 1.

Square face—long.
Class I, Mould 1.

Square face—medium.
Class I, Mould 2.

Square face—medium.
Class I, Mould 2.

Oval.

Oval.

MODIFICATIONS OF THE TAPERING TYPE OF FACE.

Faces of this type are wider above the eyes than below, and taper to the chin by straight lines or flat curves. The chins are wider in some faces than in others, but they are not the wide, square chins of the square type of face.

The severe typal form of this face expresses great force and endurance. It is most likely to be found among people who have lived physically strenuous lives, generally outside the softening influence of luxury. It is not pleasing in modern eyes.

The crossing of races and the influences of civilization have produced modifications of this type by blending with the square or ovoid types, and many of these faces are pleasing in appearance. Such faces are perhaps most often found before the period of life when the body takes on excess tissue and its outlines change.

Faces of the tapering type do not exhibit the same character of variation between length and width that square faces do. There are, of course, all proportions of lengths and widths, but when faces of different proportions are compared, they are generally seen to be different modifications of the typal form, rather than similar modifications with different proportions.

It is believed that the illustrations on the opposite page are sufficient to enable the dentist to classify practically all the facial modifications of this type which appear.

Tapering face—long.
Class II, Moulds.

Tapering face—long.
Class II, Moulds.

Tapering face.
Class II, Moulds.

Tapering face.
Class II, Moulds.

MODIFICATIONS OF THE OVOID TYPE OF FACE.

The ovoid type of face is distinguished by being wider below the eyes than above them. Faces of this type are nearly always bounded by lines exhibiting compound curves. They frequently exhibit wide chins, but the differences in the contour of the sides of the face save faces of this type from confusion with faces of the square type.

Ovoid faces do not exhibit the same kind of variation between length and width that is found in the square type. They are, of course, of all sizes and of many proportions, but it will usually be found that faces of this type which differ markedly in proportion of length to width are different modifications of the typal form, rather than the same modifications with different proportions.

Faces of this type are more common among people of mature age than among young people. Very often people take on flesh with the passing of the years, and the whole body changes in outline. The face fills out in the lower part and adipose tissue may make this part wider than the face above the eyes. People who live in luxury and without much bodily exercise, are more apt to exhibit this type of face than those of abstemious lives and active physical habits.

The border line of demarcation between some faces of this type and some of the square type is often very delicate and there are faces for which a modification of either type may be suitable.

The illustration of the faces on the opposite page will assist in classifying faces of this type.

Ovoid face
Class III, Forms

Ovoid face
Class III, Forms

Ovoid face
Class III, Forms

Ovoid face
Class III, Forms

MODIFICATIONS OF THE SQUARE TYPE IN TEETH—CLASS I.

Natural teeth of this type are more common than any others. The upper centrals exhibit parallel or nearly parallel approximal sides for 1/3 or 1/2 of the length of the crown upward from the incisal edge. The upper laterals and cuspids exhibit similar formation, though not always to the same degree.

The necks of the teeth are wider than in either of the other types and join the approximal surfaces by rather short curves. All the anteriors have the appearance described by the word "square."

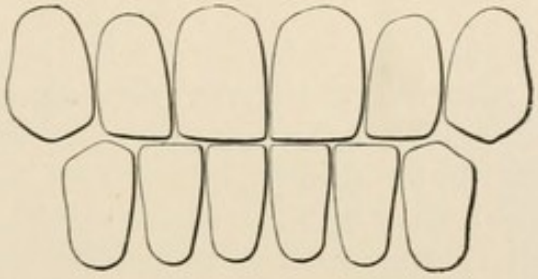
The teeth of this class exhibit three relations of length to width. In one, the length is much greater than the width. In another the length is but little greater than the width. In the third, the length and width are about equal. No other type of teeth exhibits this peculiar variation of length to width. These modifications are exhibited in Forms 1, 2 and 3, Class I.

A very pleasing modification of this type is found almost exclusively in female faces. It is usually small in size, and the square appearance has been somewhat softened by lengthening the curves a little. This modification is exhibited in Form 4, Class I.

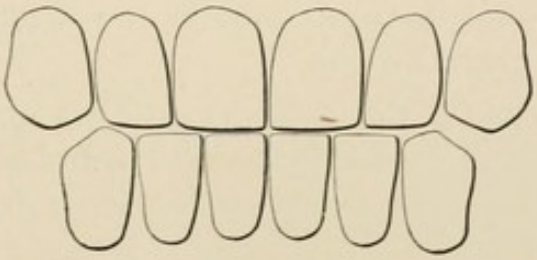
The oval tooth is a modification of the square type and is made by lengthening the curves of the neck and approximal sides. This modification is exhibited in Form 5, Class I.

Square faces and square teeth are more common than any others, and the five modifications here shown will meet the requirements of a great number of cases.

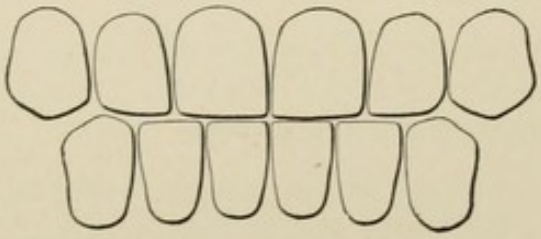
A detailed description of each of these forms appears in connection with the illustrations and table of sizes in the back of the book.



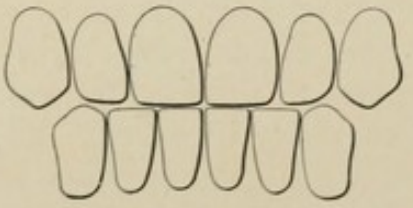
Form 1. The long square form.
The sizes are marked as Moulds 1C, 1D, 1E, 1F, 1H.



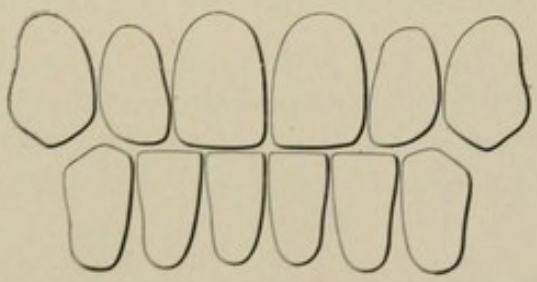
Form 2. The medium long square form.
The sizes are marked as Moulds 2C, 2D, 2E, 2F, 2H.



Form 3. The short square form.
The sizes are marked as Moulds 3C, 3D, 3E, 3F, 3H.



Form 4. A delicate feminine modification of Mould I.
The sizes are marked as Moulds 4D, 4E.



Form 5. The oval form.
The sizes are marked as Moulds 5C, 5D, 5E, 5F.

MODIFICATIONS OF THE TAPERING TYPE OF TEETH—

CLASS II.

Teeth of the severe typal form are distinguished by nearly straight approximal surfaces which converge so rapidly in some cases that they would meet at the middle of the root, and in other cases at the end of the root. These severe forms are rarely pleasing and there is no necessity for their reproduction in porcelain, since the modifications exhibit all the typal characteristics in more pleasing form.

Teeth of this type do not exhibit the same kind of variations of length to width that are seen in Class I. Teeth of this type exhibiting widely varying relations between length and width will usually be found to be different modifications.

Form 1 in this class is the severe typal form modified just enough to rob it of the severity and exhibit the beauty of the type. It is a very striking mould and has commended itself to the artistic sense of discriminating workers.

Form 2 differs from Form 1 in that the severity of the typal form is slightly more softened. This is suitable for faces in which the cheek lines are a little fuller and not quite so straight.

Form 3 exhibits fuller curves on the distal surfaces of the upper anteriors and is suitable for faces in which the cheek lines are filled out enough to present slightly convex curves.

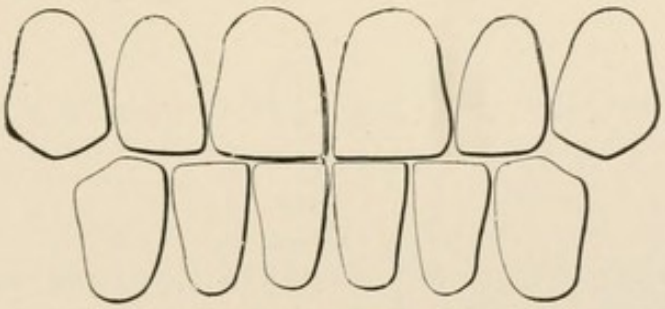
Form 4 is probably the softest modification of this type which will be required. It will be found useful for faces and teeth which are just this side the border line between this type and the ovoid.

Each of these moulds is offered in a series of convenient sizes.

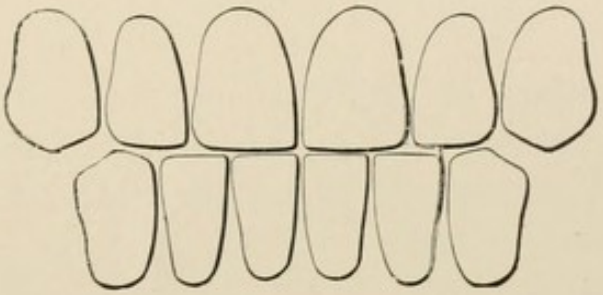
When Dr. Williams first brought this type of tooth to my attention, it appeared to me as the least beautiful of the typal forms, and I thought it would find less use in prosthesis than either of the others. I know now that I felt that way because I had never properly observed it in natural teeth. Since I have learned to look for it in natural teeth, I find it common in what I might perhaps call the typical American face, that is, the clean cut face with straight cheeks and no superfluous tissue. I find also that in such faces this form of tooth is very pleasing and it now seems to me quite as fine as either of the other two.

I have seen these teeth in prosthetic cases, and the effects are very pleasing. There is an appearance of clean cut vigor about them which neither of the other types exhibits, and dentists who wish to break away from the usual forms of teeth will find the modifications of this type very useful.

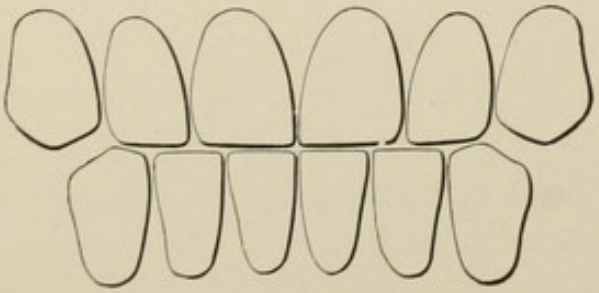
A detailed description of each of these forms appears in connection with the illustrations and table of sizes in the back of the book.



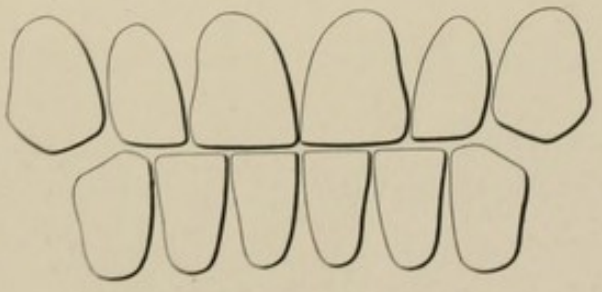
Form 1.
A severe, nearly typal form.
The sizes are marked as Moulds 1L, 1M, 1N, 1P, 1R.



Form 2.
The severity of Mould 1 is here noticeably softened.
The sizes form Moulds 2L, 2M, 2N, 2P, 2R.



Form 3.
A still softer modification.
The sizes form Moulds 3L, 3M, 3N, 3P, 3R.



Form 4.
The softest modification.
The sizes form Moulds 4L, 4M, 4N, 4P, 4R.

MODIFICATIONS IN THE OVOID TYPE OF TEETH—CLASS III.

The severe typal form of these teeth is, as the word ovoid shows, distinctly egg-shaped, the big end of the egg being downward. It is distinguished by a strong convex curve on the mesial approximal surface and a well marked double curve high on the distal surface. The severe typal form would be harmonious only with faces of very strongly marked character and would not be beautiful then.

The modifications of this type are, however, by far the most graceful, and in some ways the most beautiful of natural teeth. They exhibit a delicacy and beauty of contour which neither of the other types can show, and in faces for which they are suitable cannot but achieve the finest of results.

The modifications of this type do not show the same form of variation in length and width as did the square type. Different modifications may be of different length for a given width, but in any given modification the proportions of length and width are relatively constant.

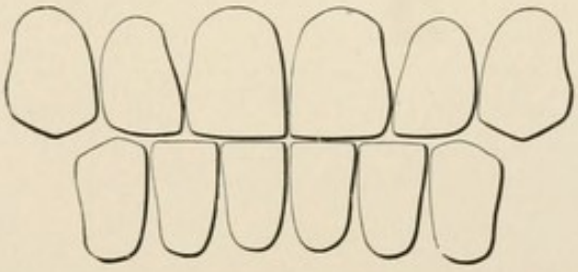
Form 1 is the nearest to the typal form that a modification can be and exhibits the beautiful curves which are characteristic of this type.

Form 2 is a slightly softer modification and is suitable for faces not quite as strong in type as those requiring Mould 1.

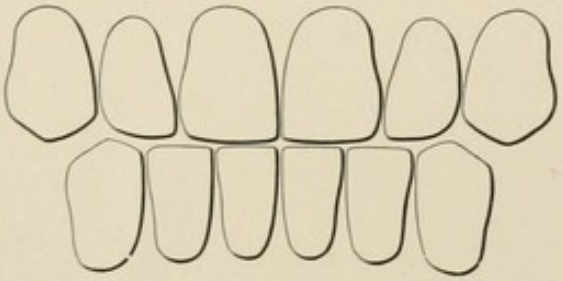
Forms 3 and 4 of this type are still softer modifications.

Each of these forms is offered in a series of convenient sizes.

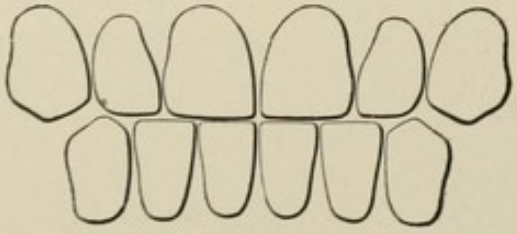
A detailed description of each of these forms appears in connection with the illustrations and the table of sizes, in the back of the book.



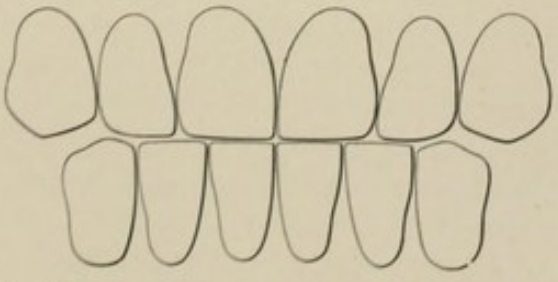
Form 1. A nearly typal form of much strength, suitable for masculine faces.
The sizes are marked as Moulds 1U, 1W, 1X, 1Y, 1Z.



Form 2. The typal form is here modified and softened. This form is suitable for feminine faces.
The sizes are marked as Moulds 2U, 2W, 2X, 2Y, 2Z.



Form 3. The typal form is here more modified than in forms 1 and 2.
The sizes are marked as Moulds 3U, 3W, 3X, 3Y, 3Z.



Form 4. The typal form is here extensively modified.
The sizes are marked as Moulds 4U, 4W, 4X, 4Y, 4Z.

SELECTING ANTERIOR TEETH OF PROPER SIZES.

Two methods of selecting artificial teeth were in vogue in my early days in practice. One was for the dentist to go to the depot and there select from among the hundreds of moulds the one he thought most suitable. The other was for the dentist to send a model and let a clerk who had never seen the patient, make the selection. Both were wasteful of time and often unsatisfactory in result.

It seemed to me that if I could learn in advance just what mould of teeth was required by a case, selection could be greatly facilitated. By measuring with a millimeter gauge the distance between the marks which I had been taught to make on the trial plates for the high lip line and the low lip line, and adding one or two other marks, it became very easy to tell just how long a central was needed, how wide a set of anteriors, and how wide a full set of fourteen.

When this method was published under the title of The Twentieth Century Method of Selecting teeth, accompanied by tables of tooth dimensions in millimeters, it was necessary only to scan the tables until the mould most nearly like the requirements was found. The order could then be sent by mould number. It was quicker, easier, and more satisfactory than the old method.

Experience has shown no reason for changing this method for selecting sizes. It has found its way into all corners of the world, has become standard practice in many offices and is taught in several colleges. It has placed selection in the hands of the dentist, who is most competent to select well; has made it evident that teeth for full dentures must be selected from the trial plates and not from the model; has shortened the time required for selecting moulds, has insured the receipt by the dentist of just the teeth he had in mind for the case; and has resulted in the selection of more satisfactory teeth in most cases.

The length of upper central should be marked first, then the length of the lower central, then the width of the six upper anteriors. The width of the upper central is determined by the form which was selected by means of Dr. Williams' drawings.

The patient is asked to raise the upper lip in smiling, and the location of its edge is marked on the trial plate. If the necks of the upper centrals are located on this line, the gums will not be exposed in smiling.

The chances are better than 3 in 5 that this is the right location for the necks of the upper centrals, because out of some thousands of people whom I counted smiling, 3 in every 5 raised the lip to the level of the necks of the upper central. Even if this would make the teeth a little long, it is more artistic to have them so than to expose pink rubber in smiling and a greater expanse of it in laughing.

If the lower lip is depressed by the action of the depressor muscles and the location of its edge is marked in the same way, it will indicate the point to which the lower centrals must extend to prevent exposure of the lower gum in smiling.

If the orifice of the mouth is well proportioned to the face, the distal angles of the upper cuspids may with advantage come close to the angles of the orifice. To locate these angles, an instrument is in-

Fig. 52.

The upper lip was raised by the elevator muscles and is held by the finger merely for purposes of illustration.

troduced between the lips, in the median line, and moved to one angle and then the other and a mark on the trial plate at the location of each, after the manner shown in Figure No. 53. If the orifice is unduly large or small for the other features, the distance between the marks may be shortened or lengthened. But it should be remembered that the teeth are closer to the orifice than to the other features, and that it is better, on the whole, for them to be a little large or small for the other features than noticeably large or small for the orifice.

One other dimension in anterior teeth is important at least in cases where the absorption of gum tissue is so slight as to leave little room between the upper and lower ridges. It is the dimension of that part of the teeth intended to sit below the level of the upper ridge, or above the level of the lower ridge. It is the dimension of the greatest combined bite and shut available in the case. A short study of an artificial anterior tooth will make plain the meaning and importance of this dimension.

Figure No. 54 represents a vertical section through an upper anterior tooth. It will be seen that the lingual surface has three divisions, the bite, the shut, and the ridge-lap. Of these, the shut and ridge-lap are intended to sit below the level of the ridge in those cases where the denture must be so thin in front that the teeth be close to the ridge. In cases where the absorption of the anterior plate of the upper alveolus is complete, the teeth will usually be placed a little way in advance of the ridge, and the length of the combined bite and shut is therefore not so important. But in those close bite cases, where little room is available at best, attention to this detail will enable the dentist to select teeth of a size which will not need to be ground.

Before I adopted Mr. Supplee's method of making the impression into a trial plate, it was easy to thrust a pin through the wax of the trial plate on a level with the surface of the ridge. But the presence of the impression tray in the trial plate renders this method impracticable. It is, however, easy to measure, on the palatal side of the impression, the distance from the top of the rim to the deepest part of the impression, and transfer this measurement to the labial surface of the trial plate, where it answers every purpose accomplished by the pin hole.

The area to be filled with anterior teeth is now well defined on the trial plates, and it is necessary only to determine the distances in millimeters, and to have at hand the dimensions of the required teeth. The distance from the high line to the incisal edge of the trial plate is the length of the labial surface of the upper central incisor. The distance from the low line to a point a millimeter above the incisal edge of the lower trial plate is the length of the labial surface of the lower central incisor. The distance from the mark at one corner of the orifice around the trial plate to the other similar mark, is the width of the upper anteriors, when set up. If the bite is close, the distance from

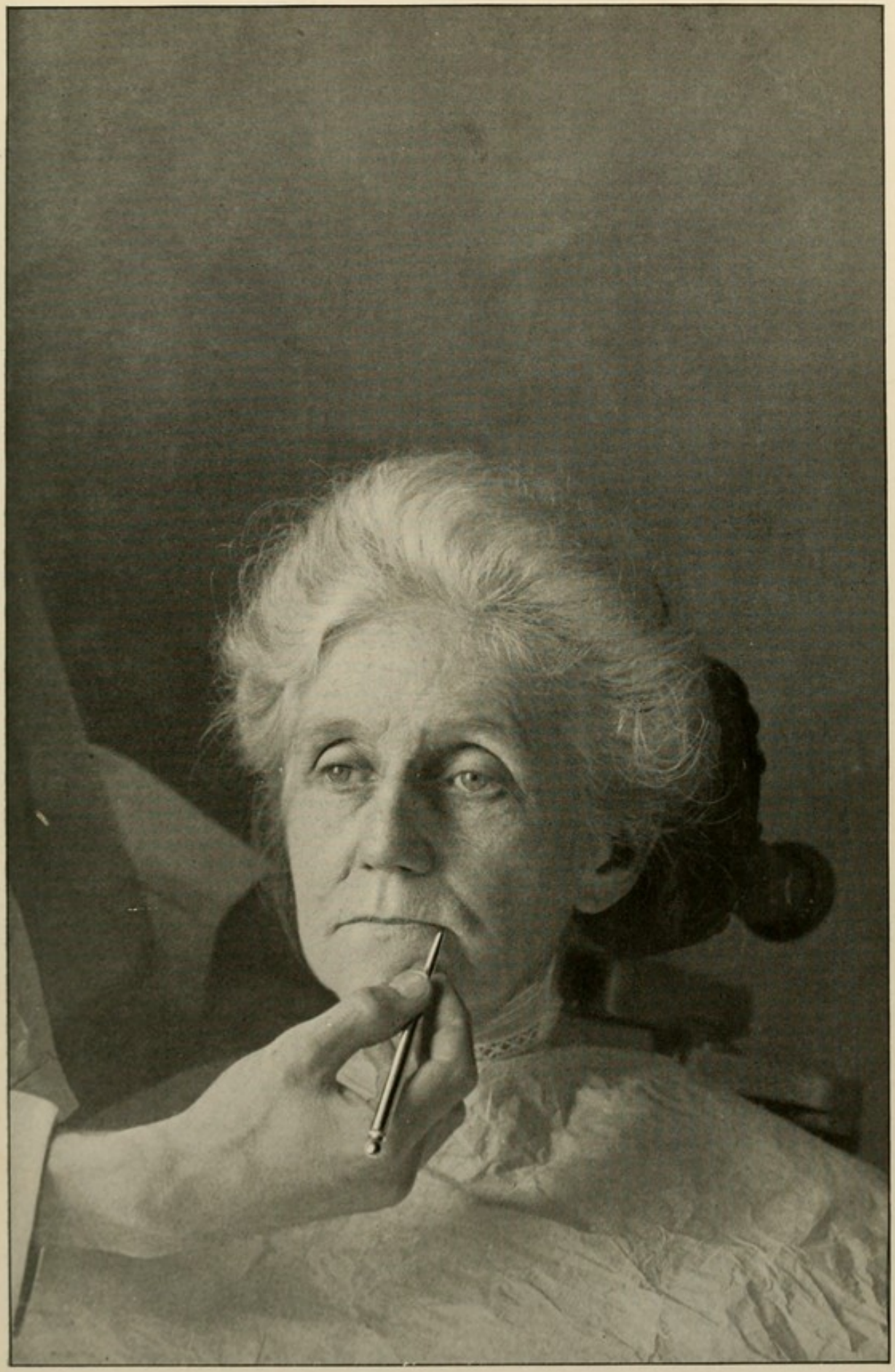


Fig. 53.

It is better to insert the instrument in the median line and move it to the angles. The patient is less likely to draw the lip back and give a false location.

the surface of the upper ridge to the incisal edge of the trial plate is the required combined bite and shut of the upper central.

If now, reference is had to table in which the dimensions of the several sizes of the required type of tooth are listed in millimeters, the size most suitable can readily be selected. It can then be ordered by mould number.

Millimeter measurements of Dentsply, Solila, Twentieth Century and Trubyte teeth are given as tables in the back of this book. With all the variations possible to the human mouth, one must not expect to always find a mould exactly right in every particular. But with surprising frequency a mould will be found which will closely approximate the required dimensions. And selection by this method is likely to be more satisfactory than by the haphazard methods of the past.

Dr. Williams' classification of faces and teeth and standardization of sizes greatly facilitate satisfactory selection. Many faces exhibit modifications which lie between two types of teeth, as between the square and ovoid types. For such faces a modification of the square type and a modification of the ovoid type may be equally suitable. If, in such a case, the required dimensions cannot be found in the mould of the square class, it is possible that they may be obtained in an equally suitable mould in the ovoid class.

DETERMINING THE WIDTH OF THE FULL SET.

When the trial plates have been taken from the mouth, it can be determined how far back on each side the teeth should extend. A mark can then be made to locate the distal side of each second molar. This location cannot be made in the mouth, or from any measurements taken in the mouth, but is determined wholly by the dentist's judgment.

By measuring around the trial plate from one of the marks to the other, the width of the full fourteen, in millimeters, is determined. This measurement affords an example of the importance of selecting teeth from the trial plate rather than from the model. The width of the full set, when in place on the model, is from 2 to 4 or 5 millimeters greater than the width of the set when flat on the wax. It is important therefore that sizes should be selected from tables having the dimensions of the anteriors and full sets when set up.

It is not uncommon for a mouth to be so ill-proportioned as to require wide anteriors and narrow posteriors. If full sets do not come carded to meet such requirements, the dentist may make up his own sets ordering anteriors and posteriors separately.

Trubyte posteriors are made in four mesio-distal widths, 28 m.m., 30 m.m., 32 m.m., and 34 m.m. The dentist may order any of these for use with any anteriors, but if disproportionate sizes are ordered, it will be necessary to grind for adjustment where the posteriors and anteriors join.

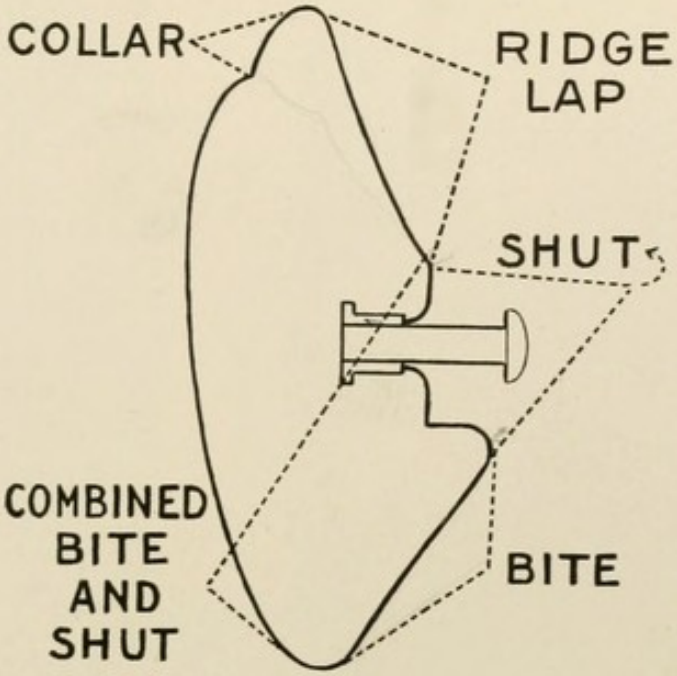


Fig 54.

Section through an upper central showing the divisions of the lingual surface

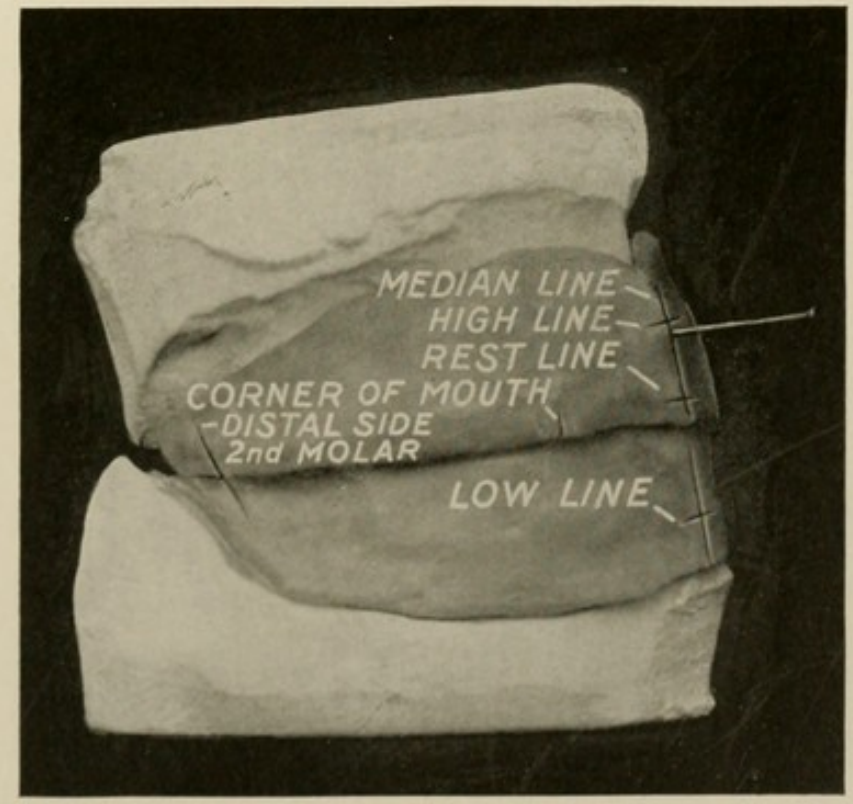


Fig. 55.

Trial plates marked for measuring.

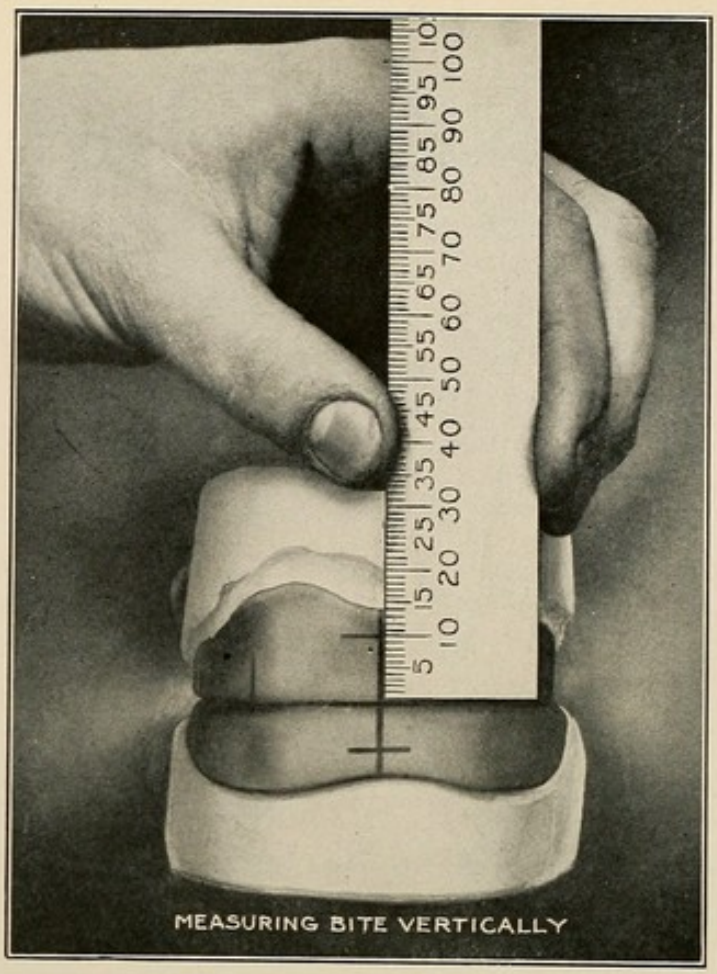


Fig. 56.

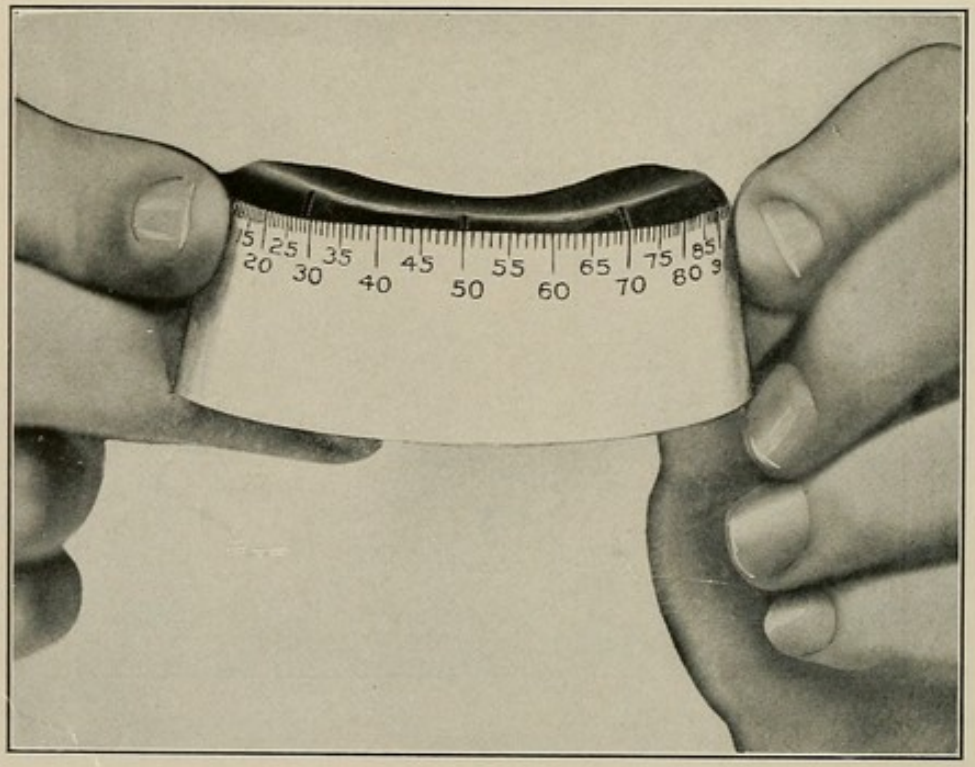


Fig. 57.

Measuring bite horizontally to get combined width of six anteriors and full set of 14.

SELECTING TEETH FOR PARTIAL CASES, BRIDGES AND CROWNS.

The most satisfactory and economical method of selecting any form of teeth for cases where less than the full denture is to be restored is to have at hand a Mould Guide of the make of the teeth to be used, and to fit sample teeth from that guide onto the case. By this means, both dentist and patient can see just what the effect is to be. The order for the teeth can be made out by mould and shade number, and the results will be as desired. Or regular stock teeth can be kept on hand and tried in this way.

This method is far more available with Trubyte teeth than with any others, because identical moulds of vulcanite teeth, platinum pin facings and porcelain crowns will be produced. It therefore requires the dentist to keep fewer teeth on hand. For the selection of a porcelain crown, the vulcanite teeth may be tried in place. The labial surface of the porcelain crown will be like that of the vulcanite tooth, and the mould will have the same number in crowns.

Dentists who do not wish to purchase a Mould Guide or stock teeth to use as such, may apply the Twentieth Century Method of Selecting Teeth, and procure the dimensions of the required teeth in millimeters, by using calipers to measure the space for a single tooth, or by making a partial trial plate and measuring around the curves. Selections can be made from the tables in the back of this book.

SELECTING LOWER TEETH.

When full upper and lower sets are selected at one time, no measurements for the lowers need be taken. If upper teeth are not being selected, the sizes of the required lowers should be marked on the lower trial plate, the dimensions obtained in millimeters, and selections made from the tables in this book.

For full dentures, the bicuspids and molars should be of the combined mesio-distal width necessary to extend the full set back to the locations marked for the distal sides of the second molars.

For full cases Trubyte Molar Blocks will be found superior to plain teeth. They are made in the same moulds and shades as the plain vulcanite teeth. They are described in connection with Trubyte bicuspids and molars.

For partial cases, the plain teeth or Molar Blocks should be selected from a Trubyte Mould Guide. Much better selection results from trying in the sample tooth than is possible by any system of measurement.

PART III.

COLORS IN NATURAL AND ARTIFICIAL TEETH

FOREWORD.

Color plays as important a part in determining the beauty of artificial teeth and their suitability for any given case as does form or size. If the color and shade selected are harmonious with that of the general complexion in edentulous cases, or the other teeth in partial cases, minor discrepancies in form or size are seen only on close examination. But if the color or shade is noticeably wrong, the falseness of the restoration is at once detected. And no perfection of form or size can make up for the visible defect in color.

When Dr. Williams entered upon the work of incorporating into porcelain teeth all the perfections of natural teeth, it quickly became evident that the number of subjects concerning which knowledge must be crystallized and systematized was too great for one man to cover the whole field. The subject of color was assigned to me for investigation. I have given the subject extensive study and have at least some of the results in concrete form. They have been applied to Trubyte teeth, and I shall try to make plain in what ways they enable the prosthetist to improve the appearance of his work.

THE COLOR SCHEME IN NATURAL TEETH.

Until one has studied the colors in natural teeth, he cannot realize how complicated, how delicate and how beautiful is the color scheme by which nature adorns a really fine set of teeth.

When the lips are parted in smiling, so that parts of both sets are seen, the teeth form a band of color which shades away in all directions from the point of highest light in the incisal halves of the upper centrals, to softer colors and shadows in the upper cuspids, bicuspids and molars, and darker shades and softer shadows in the lower anteriors. Nature thus introduces into the face a spot of very high light and blends it away so softly that no sense of disharmony is created.

Only when the eye has time to penetrate the shadows between the teeth, do the forms or sizes of individual teeth become visible. If the color of the teeth is harmonious with that of the patient's complexion, the general appearance will be pleasing, even if the teeth are not exactly harmonious in form and size with the face. Dentists who are confronted with the necessity of selecting teeth too large for the features, other than the orifice, may do much to conceal the size, by selecting a suitable color and shade.

Natural teeth exhibit every color of the rainbow. The primary colors, red, blue and yellow are found in every human tooth. At least one of the secondary colors, orange, green or violet is found in every tooth, generally with an excess of some primary color which gives to the tooth its recognized color as a blue, a yellow or a pink. Gray teeth occur when there is no excess of primary color.

The coloring in natural teeth is ingeniously designed to enhance the value of the mechanical effects. The anteriors round outward and backward from the median line. This is in harmony with the rounding away of the features, but it is rendered much more pleasing to the eye by the subtle change in the colors of the laterals and cuspids. The light rounds away with the form.

Nature's skill as a craftsman is exhibited in the effects which she achieves by changing the depth and distribution of color in the lower anteriors, as compared with the uppers. This effect greatly enhances the overhanging effect of the upper anteriors, softens the contrast between the lower lip and the teeth, and when aided by the red reflection from the lip, seems to merge the necks of the lower anteriors into a band of soft color which serves as a base for the whole color scheme of the anteriors. One can hardly appreciate the delicacy and beauty of this effect until he studies a set in which the shading is strong enough to be noticeable, and sees how nature has used the deep, soft colors of the lower incisors and the soft shadows that fall between them, as a foundation for the lighter colors in the upper anteriors. The most beautiful sets are those in which the color scheme is so delicately worked out that its elements can be recognized only by careful study.

HOW COLOR IN NATURAL TEETH WAS STUDIED.

While much has been written and more has been said about the colors and shadings in natural teeth, as compared with those in porcelain teeth, nothing written could be found which was of value in arriving at the definite, workable conclusions that are necessary when the fruits of an investigation are to be incorporated into articles of manufacture. It therefore became necessary to undertake this study from the beginning.

The services of experts in colors were obtained, and a number of persons with beautifully colored and shaded natural teeth were selected. Laboratory conditions in cleanliness of teeth, purity of light, absence of shadows and reflections, and other such conditions as fine color work requires, were established.

The method of measuring color values now approved by the finest color analysts was adopted. This system accepts as a unit of color, the smallest amount of red, yellow or blue that can be perceived by the eye of an intelligent person not specially trained in color work. This depth of color is marked with the figure "1" and is multiplied to measure stronger colors and divided to measure fainter colors. The experts who assisted in this work, or more accurately whom I assisted, could perceive and place 1/100 of a unit in any color.

By means of special appliances devised for the work, the cervical half of each tooth was isolated for color measurement, and the incisal half was later isolated in like manner. The anteriors, the bicuspids and the first molars were measured in this way. The work is very difficult; in fact, it is by far the most difficult ever attempted by these experts, on account of the character of the tooth substance, and the delicacy, complexity and soft blending of the shades. The difficulties may be partly appreciated when it is stated that after a steady look of 5 seconds the vision is no longer true for color and that two hours of continuous work exhausts a strong person for a day.

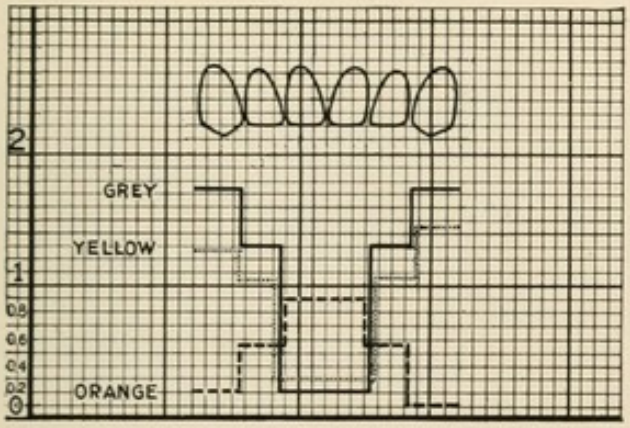
The amount of color seen in the tooth as a whole was first determined. This color was then broken up into its component parts and the proportions of the several parts determined. The work was checked by making a sample color like the portion of the tooth which it represented.

I spent a great deal of time and about two thousand dollars of The Dentists' Supply Company's money in studying and reproducing tooth colors, and am able to offer what is, I believe, the first exact knowledge concerning the colors of natural teeth and certainly the first application of that knowledge to the manufacture of porcelain teeth. No claim is made for originality and the work is far from being as complete as I should like to see it. But until some one has not less than two years to study the subject, and a large sum of money for the employment of experts, little more can be accomplished.

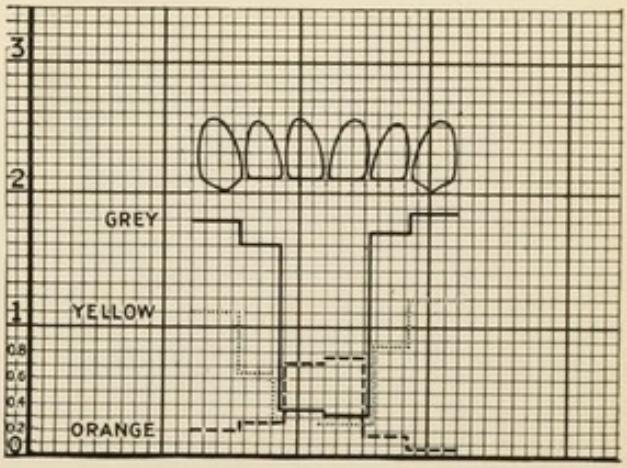
COLOR ANALYSIS

Miss D. A.	Age 19 Ht. 5.6″ Wt. 119 lbs.	Red	Yellow	Blue	Color Developed		
					Black	Orange	
	Eyes	17.5	43.0	16.0	16.0	1.5	25.5 yel.
	Hair	Dead	Black				
	Skin	4.1	3.0	.88	.88	2.12	1.1 red
UPPERS							
U. R. Central	Cervical	1.1	1.4	.20	.20	.90	.3 yel.
	Incisal	1.1	1.35	.34	.34	.76	.25 "
" Lateral	Cervical	1.85	2.9	1.3	1.3	.55	1.05 "
	Incisal	1 85	2.7	1.7	1.7	.15	.85 "
" Cuspid	Cervical	1.85	3 3	1.75	1.75	.10	1.45 "
	Incisal	1.9	3.1	1 85	1.85	.05	1.2 "
" 1st bicuspid	Cervical	2.0	2.7	1.6	1.6	.40	.7 "
	Incisal	2.0	2.6	1.7	1.7	.30	.6 "
" 2nd "	Cervical / Incisal	2.0	2.3	1.6	1.6	.40	.3 "
" 1st molar	Cervical / Incisal	2.4	3.7	2.3	2.3	.10	1.3 "
U. L. Central	Cervical	1.1	1 5	.20	.20	.90	.4 "
	Incisal	1.1	1.4	.38	.38	.72	.3 "
" Lateral	Cervical	1.85	2.9	1.3	1 3	.55	1.05 "
	Incisal	1 85	2.5	1.6	1.6	.25	.65 "
" Cuspid	Cervical	1.95	3.2	1.75	1.75	.20	1.25 "
	Incisal	2.0	3.1	1.8	1.8	.20	1.1 "
" 1st bicuspid	Cervical / Incisal	2.0	2.7	1 6	1.6	.40	.7 "
" 2nd "	Cervical / Incisal	2.0	2.3	1.6	1.6	.40	.3 "
" 1st molar	Cervical / Incisal	2.4	3.6	2.3	2.3	.10	1.2 "
LOWERS							
L. R. Central	Cervical	1.0	2.5	.74	.74	.26	1.5 "
	Incisal	1.0	2.4	.76	.76	.24	1.4 "
" Lateral	Cervical	2.4	3.4	1.6	1.6	.80	1.0 "
	Incisal	2.3	2.9	1.8	1.8	.50	.6 "
" Cuspid	Cervical	2.6	3.3	1.5	1.5	1.1	.7 "
	Incisal	2.3	2.7	1.55	1.55	.75	.4 "
" 1st bicuspid	Cervical / Incisal	2.0	2.5	1.5	1.5	.50	.5 "
L. L. Central	Cervical	1.0	2.5	.74	.74	.26	1.5 "
	Incisal	1.25	2 4	.95	.95	.30	1 15 "
" Lateral	Cervical	2.4	3.4	1.6	1.6	.80	1.0 "
	Incisal	2 3	2.9	1.8	1.8	.50	.6 "
" Cuspid	Cervical	2.4	3.1	1.45	1.45	.95	.7 "
	Incisal	2.2	2.6	1.5	1.5	.70	.4 "
" 1st bicuspid	Cervical / Incisal	2.0	2.5	1.5	1 5	.50	.5 "

(For convenience of those not accustomed to studying such charts, I have put the colors in the right hand teeth on the reader's right hand, and not in the reverse form common to dental charts.)



Depths of colors in the necks of the upper anteriors.



Depths of colors in the incisal halves of the upper anteriors.

DIAGRAMMATIC REPRESENTATION OF THE DEPTHS OF COLOR TABULATED ON PAGE 104.

The different depths of color in different parts of a tooth and in different teeth can be diagrammatically shown in charts like those here reproduced.

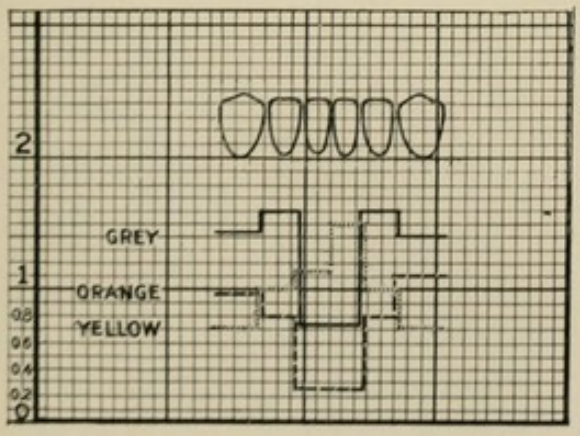
The horizontal base line of the charts represents 0 in color. Each of the parallel horizontal chart lines represents a depth of 1/10 of a unit, upward from 0. The line locating the gray in the teeth is drawn solid. That representing the orange is drawn in dashes and that representing the yellow, in dots. This set of teeth showed no other colors.

This person's hair is dead black, the eyes are brown, and the skin showed a good deal of red.

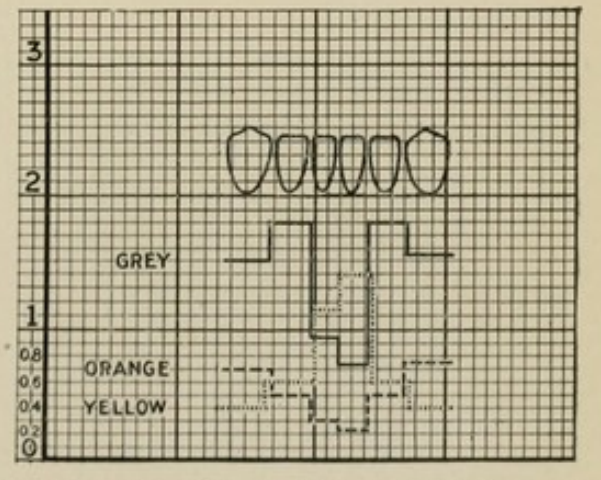
The charts show that the necks of the upper centrals and laterals in this set exhibit less gray than the cutting edges, but more orange and yellow. The cuspids exhibit practically the same amount of gray and orange throughout the teeth, but the necks show more yellow than the cutting edges. This free yellow gives these cuspids their character.

The necks of one lower central and both lower laterals in this set, exhibit less gray than the cutting edges, but the necks of the lower laterals exhibit more orange and yellow. The lower cuspids exhibit practically an even depth of gray throughout, but much more orange and yellow in the necks. There is a good deal more orange in the lower cuspids than in the upper cuspids.

A study of these charts shows how the color deepens and softens in all directions from the incisal halves of the upper centrals, and how utterly impossible it is for artificial teeth all of a shade to meet the artistic requirements of prosthesis.



Depths of colors in the necks of the lower anteriors.

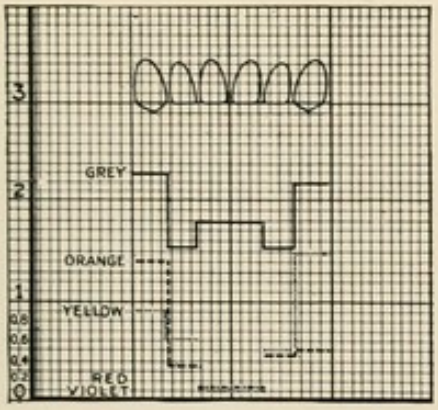


Depths of colors in the incisal halves of the lower anteriors.

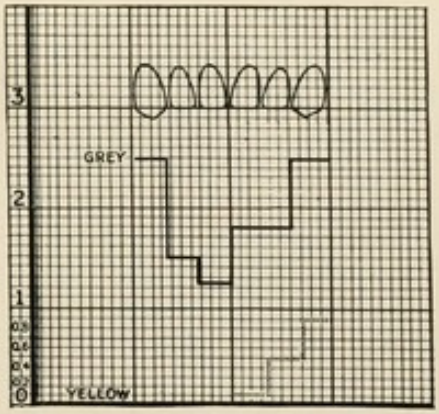
COLOR ANALYSIS

Miss K. B. G.	Age 31 Ht. 5.4½″ Wt. 113 lbs.	Red	Yellow	Blue	Color Developed		
					Black		
	Eyes	16.5	17.5	13.5	13.5	3.0 or.	1.0 yel.
	Hair	17.0	23.0	14.0	14.0	3.0 "	6.0 "
	Skin	4.1	2.4	.70	.70	1.7 "	1.7 red
UPPERS							
U. R. Central	Cervical	2.0	1.8	1.9	1.8	.1 vio.	.1 red
	Incisal	1.8	1.9	1.8	1.8	....	.1 yel.
" Lateral	Cervical	2.0	2.5	1.55	1.55	.45 or.	.5 "
	Incisal	1.8	1.9	2.4	1 8	.1 gr.	.5 blue
" Cuspid	Cervical	2.7	4.2	2.2	2.2	.5 or.	1.5 yel.
	Incisal	3.6	4.5	2.5	2.5	1.1 "	.9 "
" 1st bicuspid	.....	2.7	2.4	1.7	1.7	.7 "	.3 red
" 2nd "	.....	2.4	2.1	1.6	1.6	.5 "	.3 "
" 1st molar	.....	3.5	3.3	2.9	2.9	.4 "	.2 "
U. L. Central	Cervical	2.0	1.8	1.9	1.8	.1 vio.	.1 "
	Incisal	1.8	1.9	1.25	1.25	.55 or.	.1 yel.
" Lateral	Cervical	1.9	2.5	1.55	1.55	.35 "	.6 "
	Incisal	1.8	2.2	1.5	1.5	.3 "	.4 "
" Cuspid	Cervical	3.7	4.6	2.3	2.3	1.4 "	.9 "
	Incisal	3.6	3.8	2.5	2.5	1.1 "	.2 "
" 1st bicuspid	.....	2.7	2.5	1.7	1.7	.8 "	.2 red
" 2nd "	.....	2.5	2.2	1.6	1.6	.6 "	.3 "
LOWERS							
L. R. Central	Cervical	2.9	3.0	2.2	2.2	.7 "	.1 yel.
	Incisal	1.9	1.7	1.7	1.7	.....	.2 red
" Lateral	Cervical	3.0	3.0	2.2	2.2	.8 "	
	Incisal	1.9	1.7	1.7	1.7	.....	.2 "
" Cuspid	Cervical	3.6	3.6	2.4	2.4	1.2 "	
	Incisal	2.1	2.0	1.9	1.9	.1 "	.1 "
" 1st bicuspid	.....	3.2	3.1	2.2	2.2	.9 "	.1 "
" 2nd "	.....	3.3	3.3	2.3	2.3	1.0 "	
" 1st molar	.....	3.4	3.3	2.6	2.6	.7 "	.1 "
L. L. Central	Cervical	2.7	2.9	1.9	1.9	.8 "	.2 yel.
	Incisal	2.0	1.8	1.8	1.8	.....	.2 red
" Lateral	Cervical	3.0	3.0	2.2	2.2	.8 "	
	Incisal	1.9	1.7	1.7	1.7		.2 "
" Cuspid	Cervical	3.6	3.6	2.4	2.4	1.2 "	
	Incisal	2.1	2.0	1.9	1.9	.1 "	.1 "
" 1st bicuspid	.....	3.1	3.1	2.2	2.2	.9 "	
" 2nd "	.....	3.3	3.3	2.3	2.3	1.0 "	
" 1st molar	.....	3.5	3.3	2.5	2.5	.8 "	.2 "

(For convenience of those not accustomed to studying such charts, I have put the colors in the right hand teeth on the reader's right hand, and not in the reverse form common to dental charts.)



Depths of colors in the necks of the upper anteriors.



Depths of colors in the incisal halves of the upper anteriors.

DIAGRAMMATIC REPRESENTATION OF THE DEPTHS OF COLOR TABULATED ON PAGE 106.

The patient's hair and eyes are of very nearly the same depth of brown, except that the eyes have more of a yellow tinge. The excess of red in the skin renders it very light.

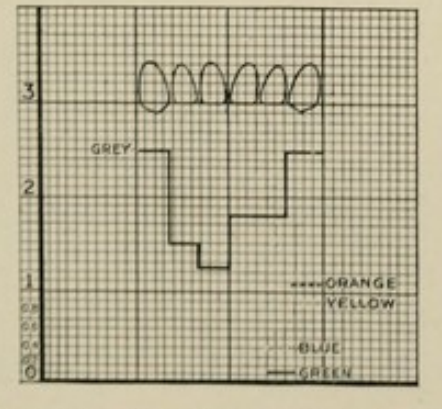
The teeth differ from those charted on the foregoing page in that the proportion of red is greater, sometimes enough so that it remains as a free color and gives the teeth a pink shade.

The upper right central is of even depth of gray throughout. The color in the neck is much softened by the presence of violet and red, while the incisal half exhibits free yellow. The upper left central exhibits much deeper gray in the neck than in the tip. It shows violet and red in the neck but only gray in the cutting edge.

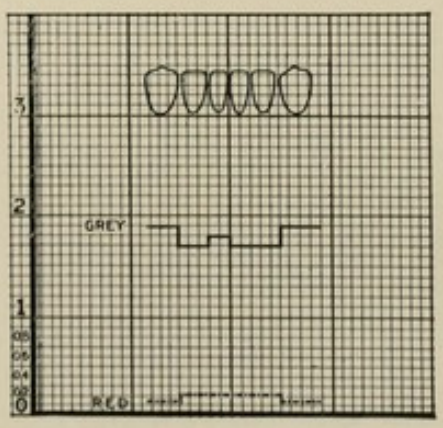
The upper right lateral exhibits deeper gray in the tip than in the neck, but the neck exhibits orange which is lacking in the tip, and the yellow is much deeper in the neck than in the tip. The upper left lateral is of even gray throughout, and shows orange and yellow in the neck. The tip is of pure gray.

The upper right cuspid is of deeper gray in the tip than in the neck, but the neck exhibits orange which is lacking in the tip, and the yellow is much deeper in the neck than in the tip. The upper left cuspid shows slightly more gray in the tip than in the neck, but the neck shows deep orange and considerable yellow.

The necks of the lower anteriors show much more gray than do the tips, and this depth of color is increased by the presence of considerable orange. The color in the incisal halves of the lower centrals and laterals is deeper than in the incisal halves of the upper centrals and laterals.

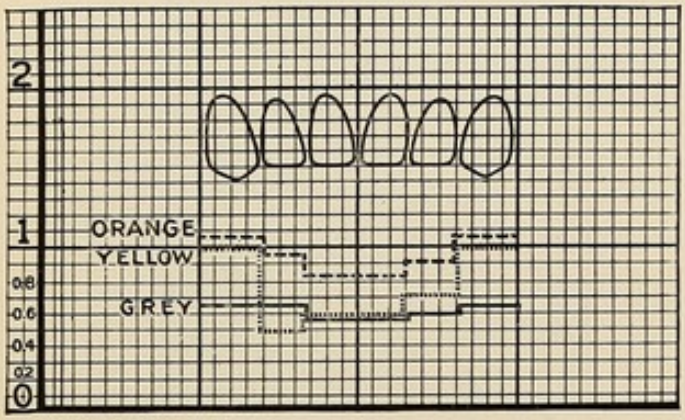


Depths of colors in the necks of the lower anteriors.

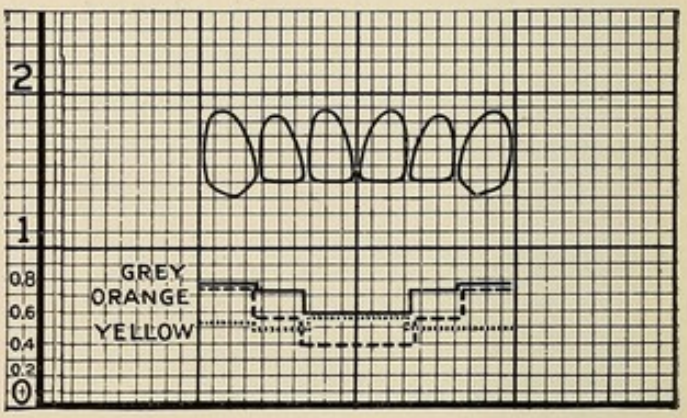


Depths of colors in the incisal halves of the lower anteriors.

(For convenience of those not accustomed to studying such charts, I have put the colors in the right hand teeth on the reader's right hand, and not in the reverse form common to dental charts.)



Depths of colors in the necks of the upper anteriors.



Depths of colors in the incisal halves of the upper anteriors.

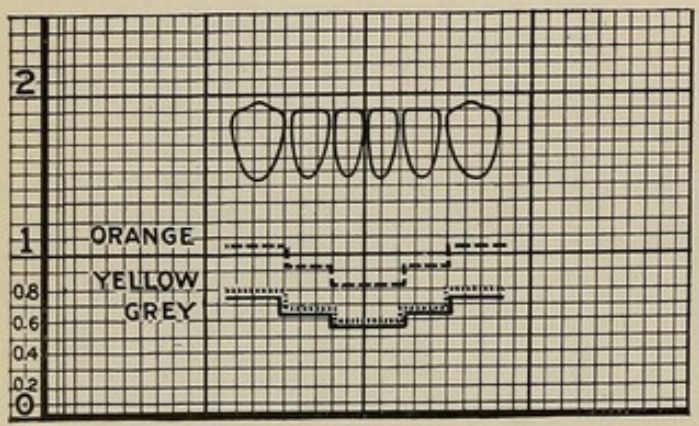
DIAGRAMMATIC REPRESENTATION OF THE DEPTHS OF COLOR IN A SET OF TEETH NOT TABULATED.

The anteriors of this set of teeth exhibit only gray, orange and yellow. The depth of gray is so nearly uniform in the necks of the upper anteriors, that it varies only 1/10 of a unit from central to cuspid. The orange is unusually deep in the necks of the centrals and still deeper in the laterals and cuspids. The yellow is much deeper in the neck of one lateral than in the other, and is strong in the cuspids.

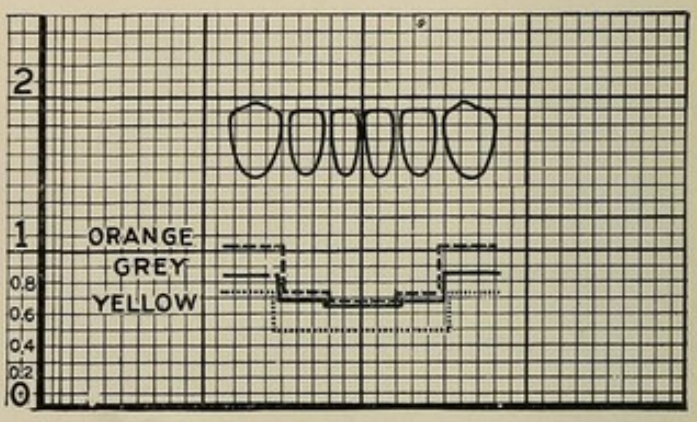
The gray and yellow are practically as deep in the incisal halves of the upper incisors as in the necks, but the orange is only half as deep. There is only half as much yellow in the incisal halves of the upper cuspids as in the necks, and about 2/3 as much orange.

The lower incisors exhibit practically a uniform depth of gray in necks and incisal halves, but there is less orange and a good deal less yellow in the incisal halves. The lower cuspids are of nearly uniform color throughout, and exhibit deeper color than any of the other anterior teeth.

The above colors combine to produce a set of natural anteriors of a grayish yellow cast, with enough red in the color to give brilliance. The lower anteriors are darker than the uppers and serve as a base for the color scheme. The incisal halves of the upper centrals form the spot of high light, and the color deepens beautifully into the necks of the upper centrals. The color deepens gradually and effectively through the upper laterals and cuspids.



Depths of colors in the necks of the lower anteriors.



Depths of colors in the incisal halves of the lower anteriors.

HOW THE COLORS ARE PLACED IN NATURAL TEETH.

Nature exhibits in the coloring of the teeth the infinite variety of her other works. No two sets exhibit exactly the same depth or location of color, and no two teeth in any of the sets studied are exactly alike. Indeed, the depth of color in the teeth on one side of the mouth is often different from that on the other.

Those sets of natural teeth in which the colors blend so softly that the separate parts of the color schemes are seen only when studied, are most beautiful. Others are more striking, but after a time they seem less pleasing, because of the strong contrasts.

In order that Trubyte teeth might exhibit the colorings of the finest sets of natural teeth, an average of the colorings in several beautiful sets has been made and incorporated into the porcelain.

In finely colored sets of natural teeth, the incisal halves of the upper centrals, taken together, form the spot of highest light in the face, except the white of the eyes, which is so sheltered as not to form a striking point. The shade usually deepens as one goes toward the necks of the teeth, though this is not always the case. Centrals which are lighter in the incisal halves carry out better the color scheme of the teeth as a whole, than those with darker cutting edges. The two centrals exhibit minute differences of color, but the color effect as a whole is very much alike in the two teeth.

The color in the upper laterals is usually deeper than that in the centrals and it is more evenly distributed throughout the area of the tooth. The incisal half of the lateral is therefore of deeper shade than the incisal half of the central. The two upper laterals are rarely exactly alike.

The color in the upper cuspids is nearly always deeper in shade than in either the centrals or the laterals. The neck is sometimes much deeper than the incisal half, sometimes but little deeper, and sometimes the tooth is nearly of uniform color throughout. The finest cuspids are undoubtedly those in which the color is deeper in the cervical half.

The color deepens through the bicuspids and molars, in some cases more rapidly than in others. Those sets are most beautiful in which it deepens softly. The sets in which it deepens very rapidly appear too deeply colored at the cervical margins.

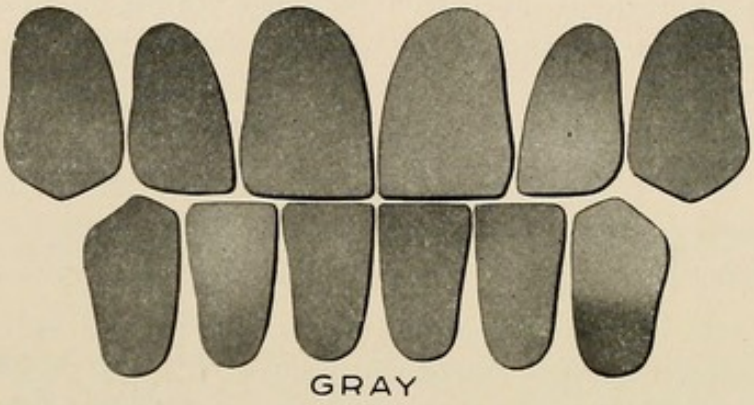
The color in the incisal halves of the lower incisors is deeper than in the incisal halves of the upper anteriors. The color in the necks is deeper than in the incisal edges. The lower cuspids usually present deeper colors than the incisors in both the cervical and incisal halves.

Nature seems to appreciate that the color scheme of the teeth does not usually contemplate the exhibition of the lower bicuspids and molars and they present no noticeable differences from similar upper teeth.

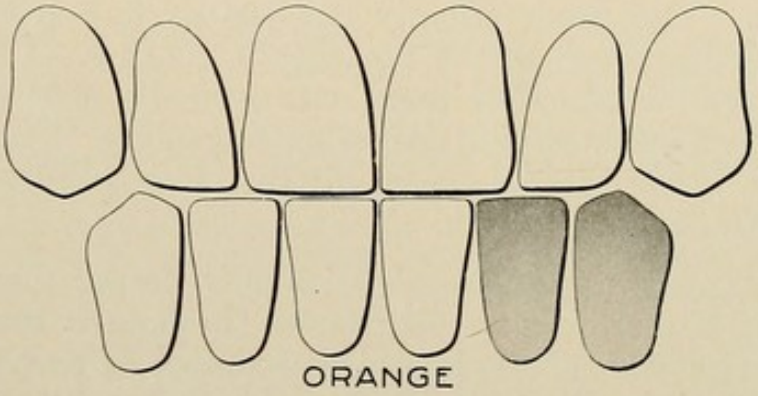
THE VAGARIES OF COLOR IN NATURAL TEETH.

These illustrations show, in pictorial form, the colors present in one set of natural anterior teeth; their locations in the several teeth and their relative densities. The color was measured for each half of each tooth.

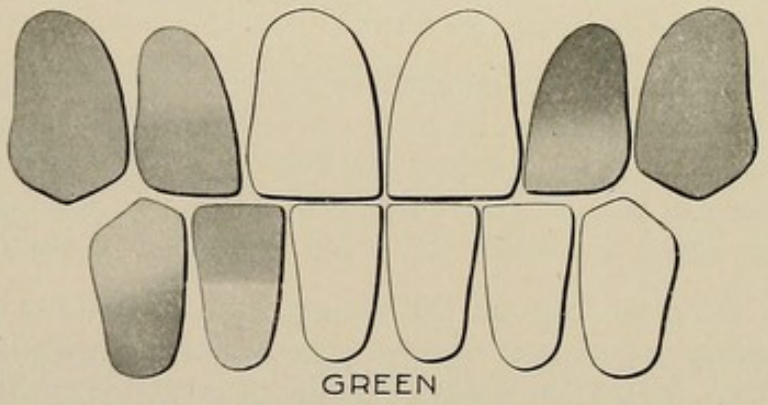
This is not one of the sets previously illustrated.



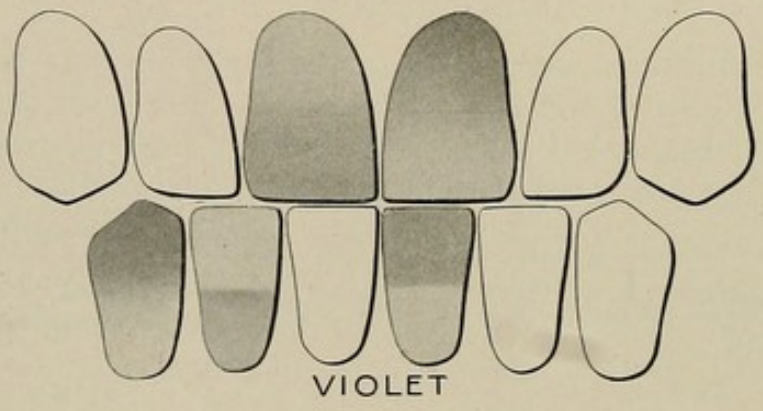
GRAY



ORANGE



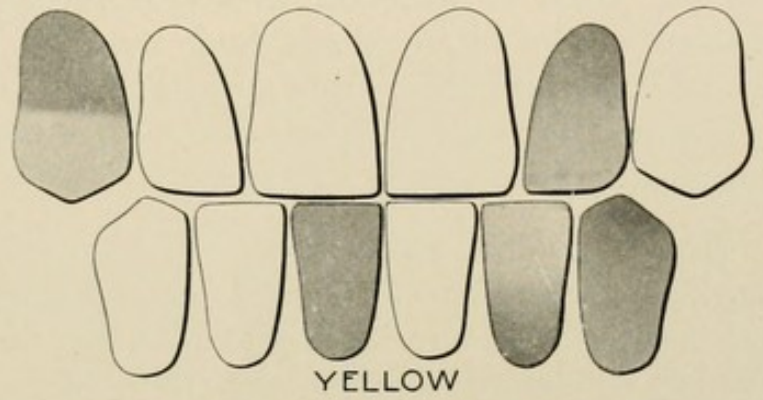
GREEN



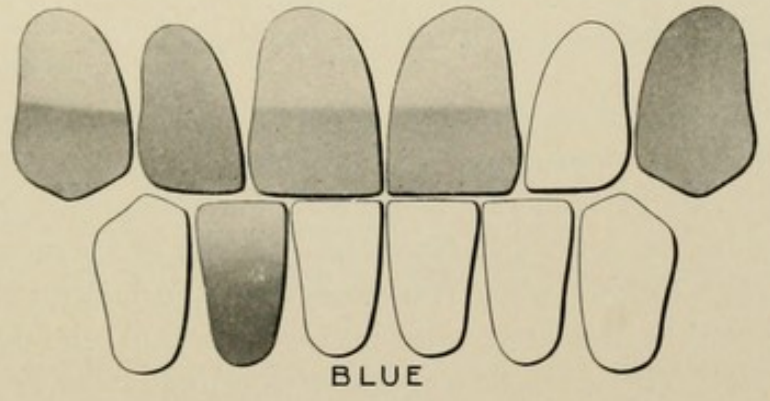
VIOLET

THE VAGARIES OF COLOR IN NATURAL TEETH—Cont.

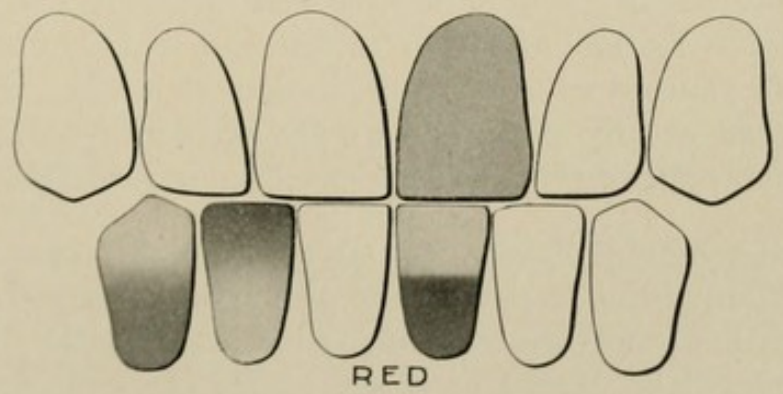
The secondary colors, shown on the opposite page, are nearly always accompanied by an excess of one or more primary colors and this excess of color gives the teeth their character. The three primary colors were in evidence in this set as follows:



YELLOW



BLUE



RED

Artificial teeth, as regularly furnished, have heretofore been of one shade throughout the full upper and lower sets. This has made it impossible for dentists to select a shade which was satisfactory for the high lights in the upper centrals and the deeper colors in the other teeth.

Individual dentists have made efforts to change this condition by grinding or staining teeth, or by selecting teeth from different shades and assembling them into one set. In the hands of a few dentists the staining method has yielded beautiful results, but the time and skill required for each case were such as rendered a high fee necessary. The method of selecting teeth of different shades is rarely satisfactory because the different shades in any shade guide were not intended for such selection, and teeth assembled from such shades show variations unlike those in fine natural teeth. Moreover, the method requires the expenditure of much time and access to a large stock of teeth.

Naturally shaded artificial teeth have never been available before for three reasons, which come directly home to us as dentists. The first is that we have never offered any intelligent plan for the coloring of teeth. We have left it to manufacturers who are not dentists, and who cannot see our work as we see it, to solve the difficult problems as to what true tooth colors are and how they are placed.

The second reason is that we have not known when teeth were properly shaded. I persuaded certain manufacturers to shade very beautifully 100 sets of vulcanite teeth and send them out in the regular course of business, without any comment. Some of them were accepted without remark. Others were returned with the comment that if the manufacturer could not match teeth better than that, the dentists would trade elsewhere. Not a single favorable comment was received. Our attitude as a profession has been that we were entitled to ask for a thing and then to leave the manufacturer to find out what we need, how to make it and to educate us to an appreciation of it when made. Such an attitude is not worthy of us, and we are entitled to make little complaint if the solutions of the past have not been to our liking.

The third reason is hardly less strong than the other two. Most of us have been unwilling to pay for the production of superior products. We know so little of our own costs of production, that we do not understand why fine articles cannot be produced for the same price as ordinary articles. It is economically impossible. The superior quality results from the application of a greater amount of intelligence and skill. That demands more time, and more wages and slower production.

COLORS AND SHADES IN TRUBYTE TEETH.

Trubyte teeth are "shaded" in the sets, on the basis of extensive data similar to that described in the foregoing pages. They are made in all of the 25 shades on the Twentieth Century Shade Guide.

The upper central is always of the shade on the Guide. The shading of the set is accomplished by varying the depth of this color. No other colors are added to get the effects.

The color in the upper laterals is more evenly distributed throughout the tooth, as was described in connection with natural laterals. The upper cuspids are more deeply shaded in both cervical and incisal halves than either the centrals or laterals. The color in the bicuspids and molars deepens softly.

The shade in the incisal halves of the lower anteriors is deeper than that in the incisal halves of the upper anteriors, while the color in the necks is deeper still. This permits the artistic effect of the overhanging upper teeth to be achieved, and builds up the color scheme as has been described. I believe this to be the first time that this beautiful color scheme has ever been applied to porcelain teeth produced in commercial quantities and available to all dentists.

All teeth may be ordered from the number on the Shade Guide. The only difference from the teeth heretofore furnished will be that teeth, crowns and facings for laterals, cuspids, bicuspids and molars, will be properly shaded.

Great artistic and economic advantages result from this shading:

It is unnecessary to stain teeth, save in rare cases. The colors in the tooth are finer than can be gotten by staining. The teeth are available without any loss of time and at surprisingly low cost considering the additional cost of production.

It is unnecessary to select teeth of different shades and assemble them into a set. Teeth thus assembled cannot exhibit the beauty of coloring found in these teeth. No time need now be lost in such selection.

Dentures made with properly shaded teeth are artistically so superior to those made with teeth all of one shade, that no comparison can well be made.

The beauty of a fine arrangement is greatly increased.

We are enabled to offer to appreciative patients, the finest product of our time for all prosthetic work requiring porcelain. Such work demands a fee commensurate with the results. And many of us who have hesitated to ask remunerative fees for prosthetic work because we were not satisfied with the appearance of our own work, may now have the confidence to undertake such work with pleasure and with the courage to demand adequate reward.

SUGGESTIONS FOR SELECTING COLORS AND SHADES.

While the teeth exhibit much less color than the skin, the iris of the eyes, and the hair in most cases, they exhibit much deeper colors than appear when contrasted with the skin. And few dentists have the courage to select artificial teeth with sufficient depth of color.

Useful information about the colors in teeth may be gained by forming dark paper into a roll about an inch in diameter and ten inches long, shaping one end to fit about the eye to exclude the side lights, and covering the other end of the tube with dark paper in the center of which is a hole about ⅛ inch in diameter.

Seat the patient in good but not brilliant light and in such manner that neither the natural teeth nor the shade teeth exhibit shadows or reflections. Reflections from brightly colored walls sometimes change the color seen. Apply the paper tube to the eye and isolate the tooth to be matched from all others and from the lip. This permits one to perceive the color more truly. When the color is determined, select the sample tooth of the proper color by trying in the usual manner, beginning with the darkest. Beware of light colors and shades. Use them only when certain that nothing else will appear so well in the mouth. The basic color in all teeth is gray. It is most commonly affected by yellow, so that the color is really a yellow built on a gray base. It is sometimes affected toward the blue, and in rare instances toward red or green.

Dentists who distrust their own skill in selecting shades will be greatly aided by the natural shading in Trubyte teeth. This helps to hide any slight error in shade and makes the laterals and cuspids appear more natural than is possible with teeth all of one shade. This will be found especially helpful in the selection of facings and porcelain crowns.

When teeth for full dentures are to be selected, the dentist should select a color and shade that harmonize with the skin of the lip. All reference to the hair and eyes can be omitted, for they show such extreme variations of color, that no rules can be laid down for establishing harmony with all three.

If the skin is examined through the paper tube, it will often be found to exhibit a surprising amount of red. In such cases, teeth with a good deal of life in the color, as in Twentieth Century Shades 7 and 9, will often be found suitable. When the color in the skin is deeper, the color in the teeth should be deeper.

A shade guide of the same make as the teeth to be used should always be employed in selecting shades. Shade Guides may now be had on such liberal terms that a dentist should always have on hand at least two of his favorite make, in order that in very particular cases the sample tooth may be sent with the order for more exact matching.

A TABLE OF THE COLORS IN THE TWENTIETH CENTURY SHADE GUIDE.

Shade No. 1. Lightest shade in use. No coloring.

Shade No. 2. Trace of purple.

Shade No. 3. Trace of blue. Trace of yellow. Lightest blue.

Shade No. 4. Trace of yellow. Lightest yellow.

Shade No. 5. Trifle of gray and trace of yellow. Point same as No. 4. Neck darker.

Shade No. 6. Same as No. 4, with a little gray in the tip. Neck not so bright a yellow as No. 5. Lightest gray.

Shade No. 7. Light yellow. Darker than No. 5, with color decidedly stronger in neck.

Shade No. 8. Light yellow. Tip darker than No. 5 or No. 7. Neck lighter than No. 7, and makes tooth look a straw color. More uniform than No. 7. Yellow is the only color present.

Shade No. 9. A little yellow, a little gray, a little pink. Light brown yellow neck. Tip pink gray, follows No. 11.

Shade No. 10. Gray. Lighter than No. 9. Darker than No. 6.

Shade No. 11. Uniform gray throughout. Neck grayish yellow slightly darker than 10, which it follows.

Shade No. 12. Grayish blue. Follows No. 3 in the blues.

Shade No. 13. Grayish blue. Follows No. 9.

Shade No. 14. Yellowish gray. Gray yellow neck. Follows No. 13.

Shade No. 15. Pinkish gray. Decidedly darker and shows more pink than No. 9. The other grays are bluish grays. This follows No. 14.

Shade No. 16. Yellow. Follows No. 8.

Shade No. 17. Greenish yellow. Green tip and yellow neck.

Shade No. 18. Dark yellowish gray. Follows No. 14.

Shade No. 19. Dark greenish yellow. Follows No. 17.

Shade No. 20. Brownish yellow. Follows No. 16.

Shade No. 21. Dark brown yellow. Follows No. 20, which it is like, only darker.

Shade No. 22. Dark gray. Follows No. 18.

Shade No. 23. Darkest brown yellow. Follows No. 21.

Shade No. 24. Dark grayish brown. Follows No. 22.

Shade No. 25. Dark yellowish brown. Follows No. 23.

Shades in order of depth from light to dark.

Light shades, 1-2.
Yellows, 4-5-7-8-16-17-19-20-21-23-25.
Grays, 6-10-11-9-13-14-15-18-2-24.
Blues, 3-12.

ENAMEL MARKINGS IN NATURAL AND PORCELAIN TEETH.

The labial surfaces of the finest specimens of natural teeth are not smooth, but are marked by a series of fine, horizontal striations, which vary in character in different parts of each tooth.

These markings break up and diffuse the light, so that portions of it from all surfaces are directed away from the eye, while portions of it from all surfaces reach the eye. The effect is to soften both the brilliant lights and the shadows. In natural teeth in which the labial surfaces have been worn smooth, the light is not so diffused. The teeth have a hard look, and it is concerning such teeth that criticism is sometimes passed that they must be false.

Artificial teeth in the past have exhibited smooth labial surfaces, sometimes broken by strong developmental grooves, or horizontal grooves, probably intended to represent defective calcification. Such grooves, however, were not of the character required to diffuse the light and give to the teeth a natural appearance.

Artificial teeth have looked false partly because the surfaces have been too glassy and because they have reflected strong high lights surrounded by deep shadows. Such teeth cannot be made natural in appearance.

In connection with the studies in color, I took up the study of the markings in anterior teeth. With the co-operation of Dr. Williams and Prof. Gysi, the most satisfactory forms of markings for reproduction in porcelain teeth were determined. The methods in use for the production of the ordinary porcelain teeth could not produce teeth with the desired markings. The manufacturer undertook the invention of methods which should produce the required results. After two years of experimentation, the methods were perfected and teeth with proper markings produced. Teeth with these markings are superior to teeth without them for the following reasons:

The markings are anatomically correct and produce the proper diffusion of light.

The diffusion of light greatly softens the appearance of the teeth, so that teeth with the markings appear more like fine natural teeth than teeth of identical size, color and porcelain without the markings.

The high lights on each tooth are greatly softened and the glassy reflection is taken away.

The shadows are softened so that the teeth do not present such strong contrasts of light and shade.

The shading in the teeth is greatly enhanced in naturalness and value.

The color scheme in each set of anterior teeth and in the two sets can be very much better reproduced by the dentist in crowns, facings and vulcanite teeth.

PART IV.

EFFICIENCY IN BICUSPIDS AND MOLARS

FOREWORD.

With the exception of the anatomical forms offered by The Dentists' Supply Company, the porcelain bicuspid and molar teeth of the past seem to have been designed to afford the smallest possible amount of efficiency in mastication.

The best of them have been copies of well worn natural teeth which are efficient only when firmly supported by healthy tissues and under a pressure of from 150 to 300 pounds. The others have been conventional forms which could be articulated only by such grinding as destroyed any possibility of masticating efficiency.

Professor Gysi believes that well made full dentures are incapable of exerting more than 18 or 20 pounds of pressure. It is evident that teeth which function only at a pressure of, say 150 pounds, cannot be efficient at a pressure of 18 pounds.

Professor Gysi has demonstrated that efficient forms of porcelain bicuspids and molars can be shaped only by applying nature's engineering principles to the formations of the occlusal surfaces, with such modifications as the movable bases and slighter pressure require. He has applied these principles to the production of Trubyte bicuspids and molars, which are joined with Trubyte anteriors to make full sets. Such teeth cannot be produced by copying natural teeth because while natural teeth present all the necessary factors at different times in their history, they never present all those factors at any one time.

With Professor Gysi's permission, and by the aid of his illustrations, I have here set forth in my own words the principles which underlie the formation of correctly formed porcelain bicuspids and molars.

THE FUNCTIONS OF THE NATURAL BICUSPIDS AND MOLARS.

Before we can determine the requirements for efficiency in artificial teeth, we must understand the plan by which nature causes the natural teeth to discharge the several functions of mastication, and the tasks of the four groups of teeth in each half of one jaw.

For the natural teeth are divided into groups by difference of function quite as effectually as they are by formation. Indeed the two go together.

The incisors are intended to bite the food from the mass.

The cuspids are the guides of the motion of the anterior part of the jaw in lateral movements, and the shock absorbers in mastication.

The bicuspids are the crackers of all hard and brittle foods and the tearers and separators of fibres.

The molars are designed to cut up the separated fibres, to isolate the individual cells and crush the cell walls to permit insalivation of the contents.

All teeth take part in crushing out the fluid portion of foods.

The buccal and lingual cusps of well articulated natural molars interdigitate so perfectly, on the "working side" during lateral occlusion, as to prevent the escape of solid portions of food. On the opposite side, the proper cusps articulate to maintain balance. The cusps of both sides articulate to maintain balance in the incising bite.

The occlusal surfaces permit the escape of semi-fluid portions of food from between grinding cusps, and ready escape of fluid portions of food.

Artificial teeth which are to be efficient in mastication must discharge these functions.

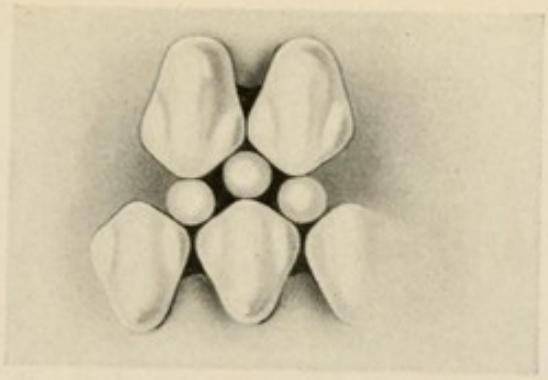


Fig. 58.

Cracking action of bicuspids.

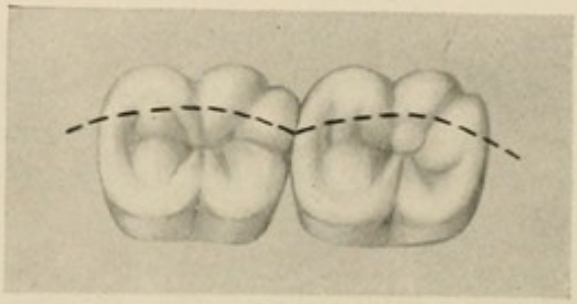


Fig. 59.

Dotted line shows position of section of molars.

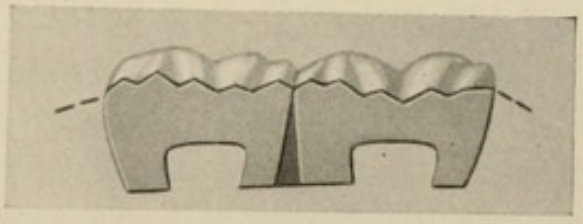


Fig. 60.

Diagram of the ridges of the molars at dotted line in Fig. 59 which cut food. Slightly exaggerated.

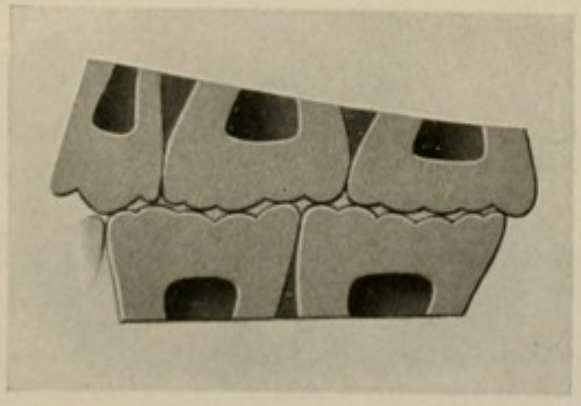


Fig. 61.

The ridges as they appear in porcelain before the facets are sharpened by grinding with carborundum and glycerine.

MODIFICATIONS OF NATURAL FORMS NECESSARY IN PORCELAIN TEETH.

The fact that teeth for dentures and bridges will be mounted on bases which are either movable or less in number and strength than the full number of roots in healthy tissues, makes it impossible for them to transmit the heavy pressures possible to natural teeth. Probably dentures cannot exert more than 1/10 of the average power of healthy natural teeth, and bridges from ¼ to possibly ½. This great difference in transmitted power requires certain changes in form to make the porcelain teeth efficient at small pressures.

The relatively broad opposing planes of well worn natural teeth cannot be made efficient at the pressure possible to dentures and bridges, because not enough power can be exercised to force such large areas to tear, cut and grind the food. A larger number of small, relatively sharp areas must be substituted for the few large ones, and these must interact, as between uppers and lowers, in such way as to discharge the proper cutting and grinding functions.

The cusps must be high, as they are in newly erupted teeth, but with the important difference that the depth of bite must be less than in any sharp natural teeth, in order that dentures and bridges may not be dislodged by lateral stress.

The three molars in the perfect natural denture must be replaced by two in the artificial denture, requiring some modification in form.

The fossae must be deep to permit escape of partly ground food from between the cusps but not from between the teeth. The sulci must be deep to permit the rapid escape of fluids and a shallow bite.

The teeth must be so carved as to be easy to arrange on any articulator or for any case and to render the best service possible under the conditions, when the dentist desires to merely occlude them and not to articulate them.

WHAT CONSTITUTES DEPTH OF BITE.

The depth of bite is the distance the teeth move vertically in articulation.

There are three depths of bite to each tooth, the "working" bite, the "incising" bite and the "balancing" bite.

The working bite is the shallowest and the balancing bite the deepest. The incising bite is between the two.

The working and balancing bites are described on the following pages. The incising bite needs no description.

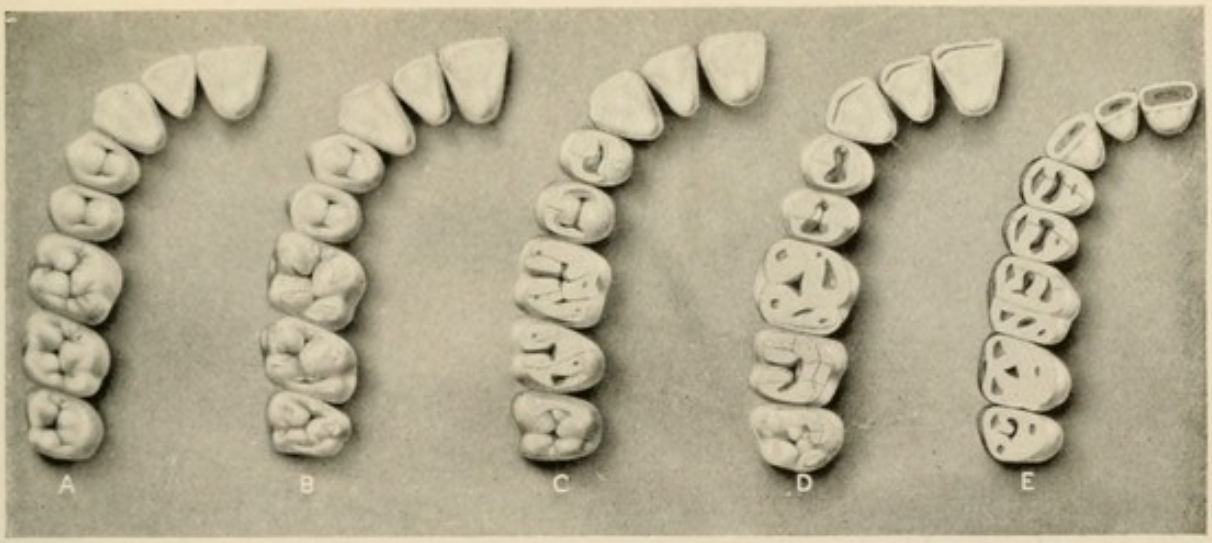


Fig. 62.

FIVE STAGES OF WEAR OF NATURAL TEETH.

A. Unworn Stage. Newly erupted natural teeth exhibiting high cusps and deep fossae and sulci with deep bite. These teeth are efficient with the relatively small muscular power of the child, but have not been worn to perfect articulation. The bite is far deeper than is practicable in artificial teeth.

B. Greatest Efficiency Stage. Natural teeth worn to the stage of greatest efficiency. Wear has shaped sharp edged facets on the cusps, which are very efficient in cutting up fibres and in providing rolling surfaces for grinding cells. This is the stage of wear reproduced in Trubyte teeth. The bite in the natural teeth at this stage is deeper than can be advantageously employed in artificial teeth.

C. Reduced Efficiency Stage. Wear has formulated such broad opposing planes on the molars that they can be forced through the food only by the exercise of great power. The cutting action of the molars is now limited to the action of the edges of the few sulci. In persons of great muscular power, these teeth will be efficient in grinding.

The bite has been worn shallow but the opposing areas are much too broad to be forced through food by the exercise of the relatively slight power possible to dentures.

This is about the degree of wear which has been advocated for the forms of artificial teeth. Such formations for porcelain bicuspids and molars is now known to make efficiency impossible to the dentures.

D. Much Worn Stage. The bite is shallow but the opposing areas are broad and require the exertion of great force to make them efficient.

E. Stage of Extreme Wear. The cutting power is possible only by the making of extreme movements and the exercise of great force.

Trubyte teeth exhibit the stage of wear shown in Figure B and the depth of bite shown in Figure D.

The depth of this bite is the distance the lower teeth on the working side move vertically in passing from the position of central occlusion to that of lateral occlusion, or vice versa.

The distance the teeth move vertically is determined by the degree of vertical inclination of the occlusal grooves of either set as they pass from the main longitudinal groove, upward over the buccal or lingual margin of the tooth.

Figure 65 on the opposite page represents cross sections of Trubyte upper and lower molars in central occlusion. Note that the upper lingual cusp does not reach the bottom of the fossa in the lower tooth, and the lower buccal cusp does not reach the deepest part of the fossa in the upper tooth. When these teeth move into a position of lateral occlusion, as shown in Figure 68, the slightly inclined buccal groove on the lower tooth articulates with the relatively flat lingual incline of the buccal cusp of the upper tooth, and causes the lower teeth to move vertically downward, through the distance from Point 1 to Point 2. The slightly inclined lingual groove on the lower tooth articulates with the upper lingual cusp. This does not increase the vertical movement of the lower teeth.

The movement of the whole jaw is illustrated in Figure 67. The lower central incisor has moved downward from the position occupied by the dotted outline of that tooth. The depth of the bite in the first molars is here less than in the incisors, and is equal to the vertical distance from the Point 1 to Point 2.

The relative vertical distances moved by the central incisor and the left condyle are shown in Figure 69. It will be seen that the condyle has moved downward very little. This movement, combined with the movement of the molars through the opposing grooves, as shown in Figure 68, results in the working bite being very shallow, provided the teeth are carved to articulate properly.

Figure 70 illustrates the movements of the several parts of the condyles and teeth in extreme lateral position as seen from the side and from above. The left condyle has moved strongly out of the fossa, while the right condyle has moved forward and inward. This lateral movement has an important influence on the depth of bite. When it is present in considerable degree the bite is shallow. When it is absent, the bite is required to be deeper to maintain the necessary relations between the dentures.

The depth of the working bite in Trubyte teeth has been determined on an engineering basis. It is much shallower than in any good specimens of natural teeth, or any other artificial teeth which even approach the principles of efficiency as here laid down. It is adapted to the average inclination of the downward path of the condyle (33 degrees) the average inclination of the inward lateral path (16 degrees) and the inclination of the incisor incline most advantageous in artificial teeth (40 degrees).

(Continued on Page 126)

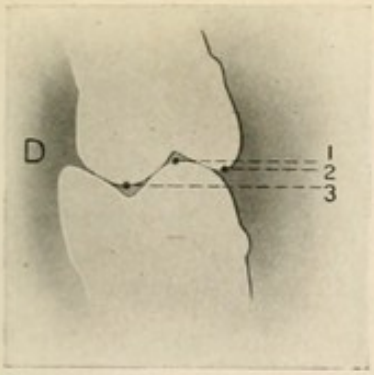


Fig. 65.
The depth of the working bite is from 1 to 3.

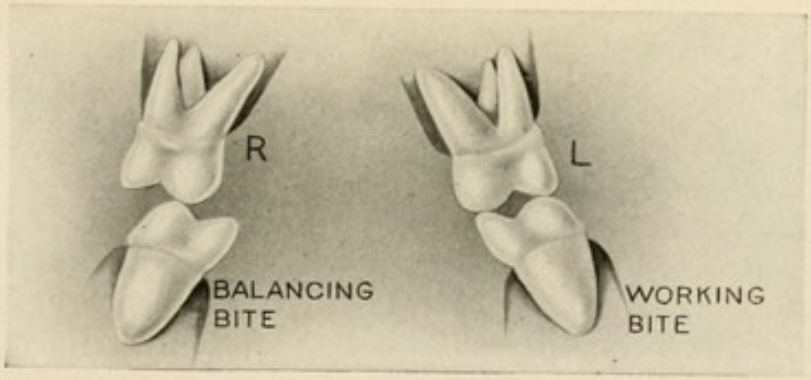


Fig. 66.
Relations of the first molars in working bite.

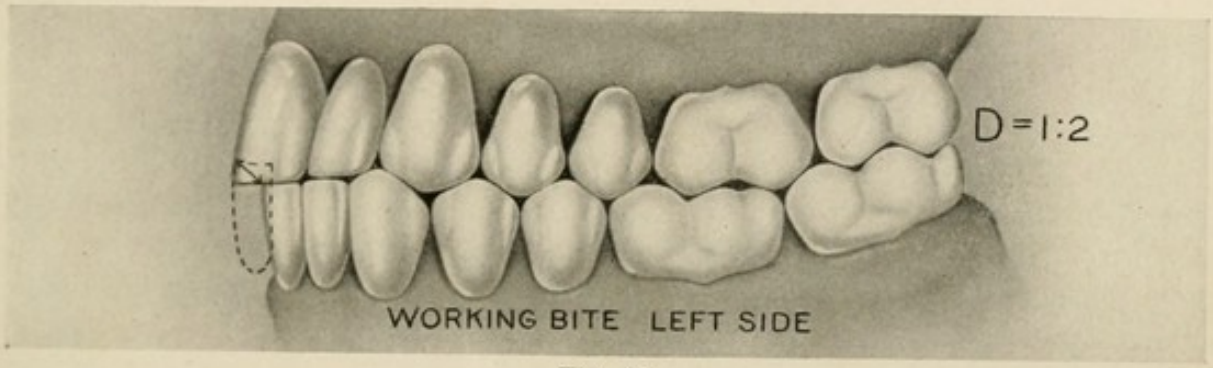


Fig. 67.

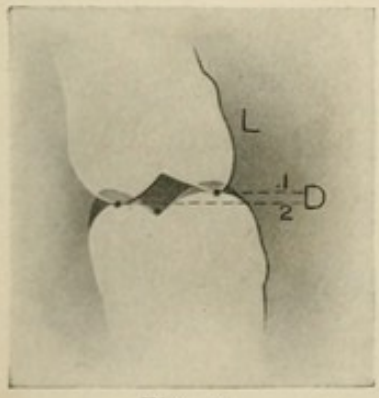


Fig. 68.
Note articulation of cusps and grooves.

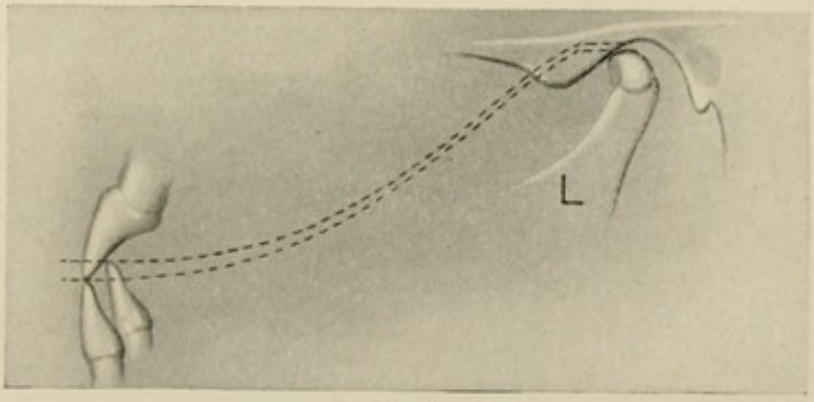


Fig. 69.
Incisor and condyle movements in working bite.

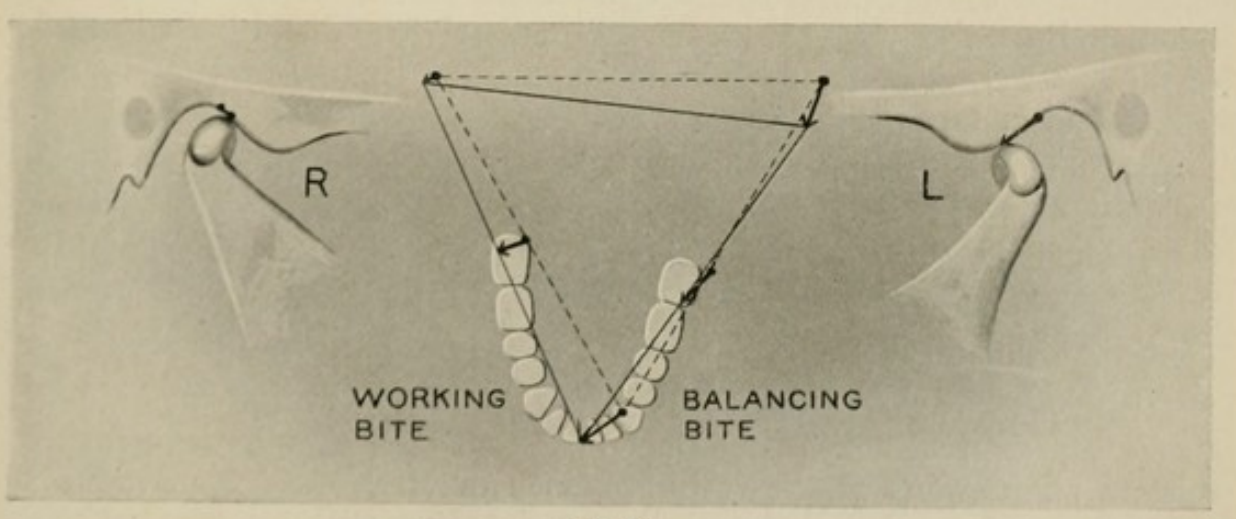


Fig. 70.
R—Vertical movement of advancing condyle.
L—Vertical movement of stationary condyle.
In the center a diagram of molar and incisor movements in extreme lateral occlusion.

Properly articulated Trubyte teeth will be found to move vertically a shorter distance than any other teeth in the working bite, and to practically preclude the occurrence of undue lateral strains on dentures or abutments.

It is not necessary to provide bicuspids and molars with different depths of bite for different inclinations of the condyle paths. When the teeth have been articulated, the necessary changes in the occlusal surfaces can be easily and quickly made by grinding the sets together with carborundum powder and glycerine. This process, which should be followed in all cases, will make adaptations which could not be made in carving or by other forms of grinding.

THE BALANCING BITE.

The depth of this bite is the distance the lower teeth on the balancing side move vertically to maintain balancing relations between the dentures during articulation. It is much greater than the depth of the working bite, because the steep lingual inclines of the lower buccal cusps articulate with the steep inclines of the lingual cusps of the upper teeth, and because the lower cusps often travel directly across the steepest parts of the upper cusps instead of following the sulci.

Figure No. 71 on the opposite page shows upper and lower Trubyte molars in central occlusion. "D" equals the depth of bite.

In Figure No. 72 the left lower molars have moved into the position of the extreme balancing bite, through the vertical distance 1-3 in Figure No. 71.

Figure No. 73 shows the relations of all the teeth on the balancing side. The lower jaw has moved downward to the right, away from the observer. The buccal cusps of the lower bicuspids have climbed the lingual cusps of the upper bicuspids. The middle buccal cusp of the lower first molar has climbed the mesio-lingual cusp of the upper first molar. The mesio-buccal cusp of the lower second molar has climbed the disto-lingual cusp of the upper first molar. The distal buccal groove of the lower second molar has climbed the long lingual cusp of the upper second molar.

Figure No. 74 shows the vertical distance which the condyle on the balancing side has traveled downward from its position of rest in central occlusion.

Figure No. 75 shows the movements of the two condyles as seen from the side and the movements of the condyles and teeth as seen from above. The lateral movements of both condyles are here plainly shown.

Different inclinations of the condyle and incisor paths require only minute adaptations of the teeth to the balancing bite. Such adaptations cannot be well made by carving or grinding with a stone, but they can be quickly made by rubbing the articulated sets together in carborundum powder and glycerine.

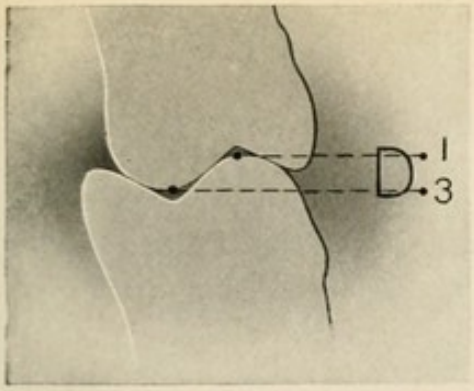


Fig. 71.
Depth of balancing bite is from 1 to 3.

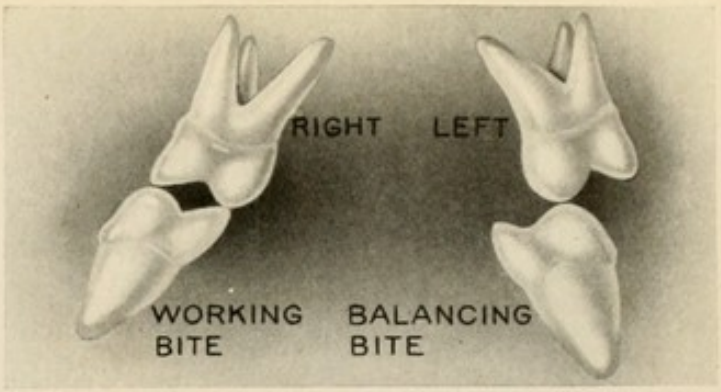


Fig. 72.
Relations of first molars in balancing bite.

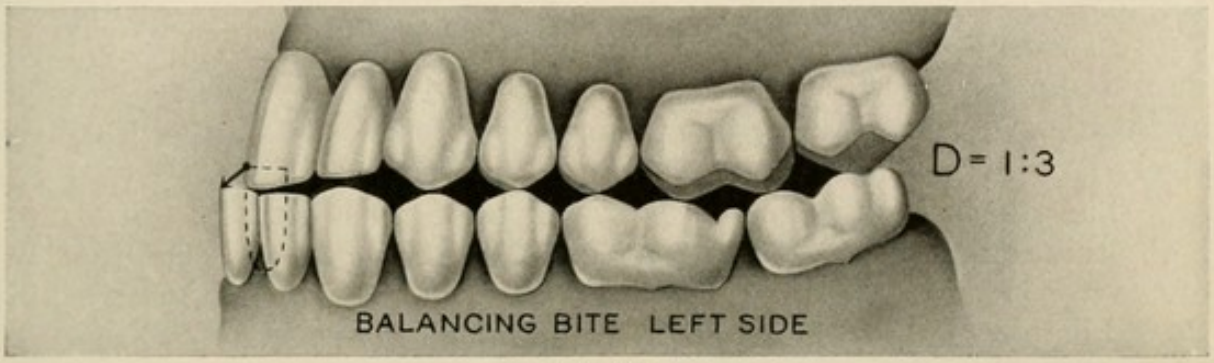


Fig. 73.
The centrals have moved from the position shown by the central in dotted outline.

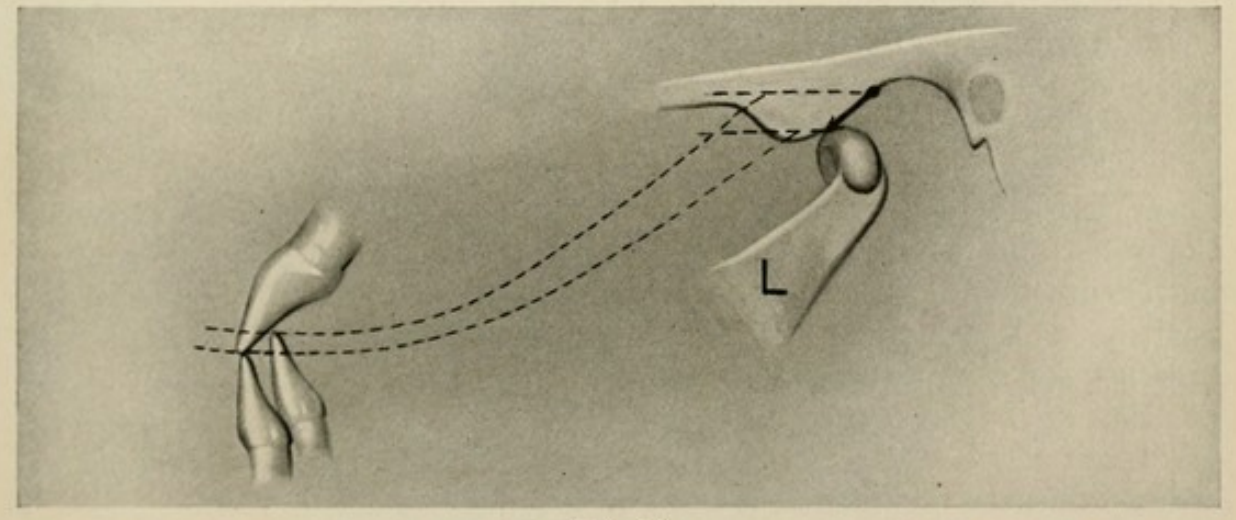


Fig. 74.
Vertical depth of condyle and incisor movements in the balancing bite.

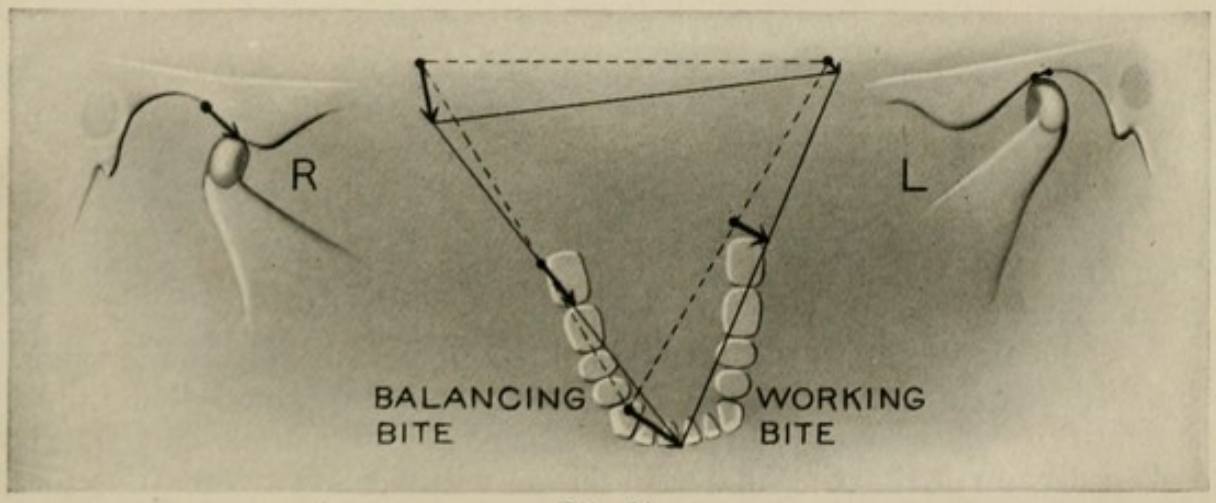


Fig. 75.
R—Vertical movement of stationary condyle.
L—Vertical movement of advancing condyle. In the center a diagram of molar and incisor movements in extreme lateral occlusion.

PROPER FORMATION OF CUSPID EDGES.

It may seem a little late to refer here to the formation of the edges of the cuspids, since from some points of view they should have been discussed in Part II. But they are the most anterior teeth in which the application of engineering principles effects important changes of form.

The upper and lower cuspids are probably the most difficult teeth in either dentures or bridges to place in right relations. They are wrongly placed in 99 cases out of 100 and neither dentist nor patient is the wiser. But when they are rightly shaped and placed, the stability and efficiency of the dentures are so increased as to yield gratifying results.

Properly formed artificial upper cuspids exhibit relatively long mesial cutting facets and a shorter distal facet. Properly formed artificial lower cuspids exhibit a short mesial cutting facet and a relatively long distal facet.

The short facet on the mesial surface of the lower cuspid should both occlude and articulate with a short distal facet on the cutting edge of the upper lateral. A long facet on the mesial side of the upper cuspid should both occlude and articulate with a long facet on the distal surface of the lower cuspid. And the short facet on the distal surface of the upper cuspid should articulate with the mesial facet on the buccal cusp of the lower first bicuspid. In other words, the upper lateral and cuspid should occlude with the lower cuspid when the jaw is in central position, and during articulation these relations should continue undisturbed. Figure 76.

The purpose of these relations is to guide the anterior part of the lower jaw during lateral movements, and to take up the shock when the upper and lower jaws come into contact. For when the lower jaw is moved downward, sideways and upward against the upper jaw in the position of lateral occlusion, the jaws come into contact first and with greatest force at the cuspids. And only as the jaw starts back to the position of central occlusion do the bicuspids and molars come into powerful contact. Hence the importance of correctly placed cuspids, to either dentures or bridges.

This articulation of the cuspids serves another important purpose. When food has been bitten from the mass by the incisors, it is started toward the back of the mouth by the action of the tongue and cheeks. When the jaws are separated, the action of the tongue and cheeks is to place morsels lengthwise of the teeth. The cuspids coming into contact before the other teeth, seize and hold the anterior ends of such morsels. The molars, as they come into contact, hold the posterior ends, and thus the fibres are held stretched while the bicuspids with their peculiar open and shut articulation, come down upon them, to stretch and tear them apart, and pierce between them.

The articulation of the cuspids will be more fully considered under the subject of articulation. But it should be remembered that unless the cutting edges have been properly formed, they cannot be properly occluded or articulated and the discharge of their important functions is rendered impossible.

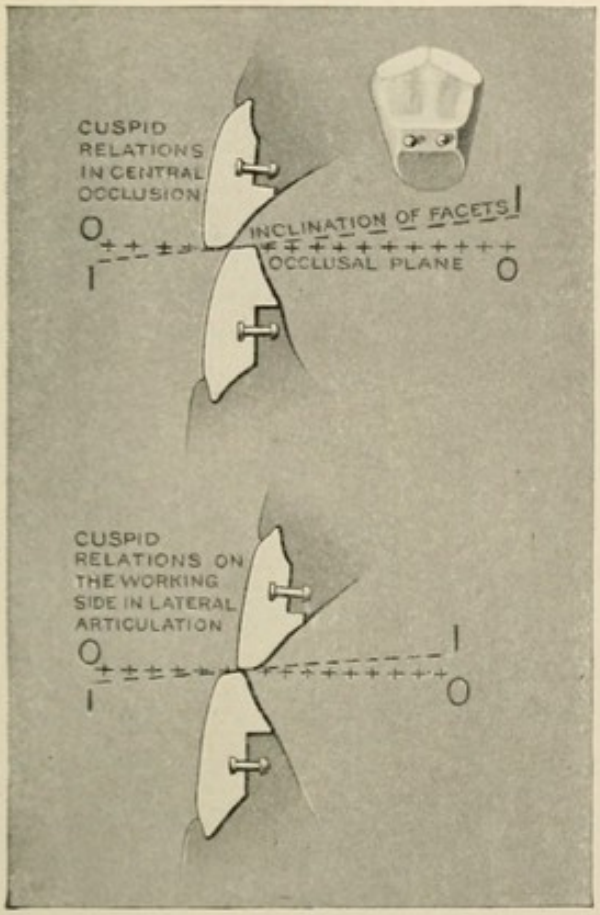


Fig. 76.

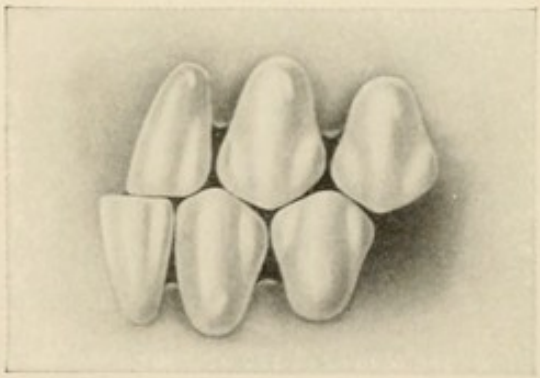


Fig. 77.
Proper relations of upper and lower cuspids in articulation.

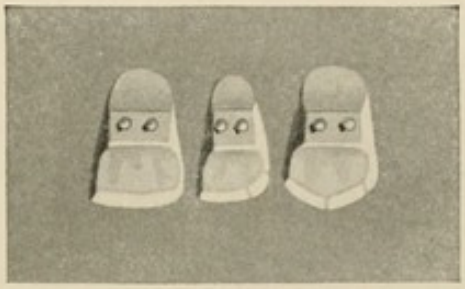


Fig. 79.
Facets on upper centrals, laterals and cuspids.

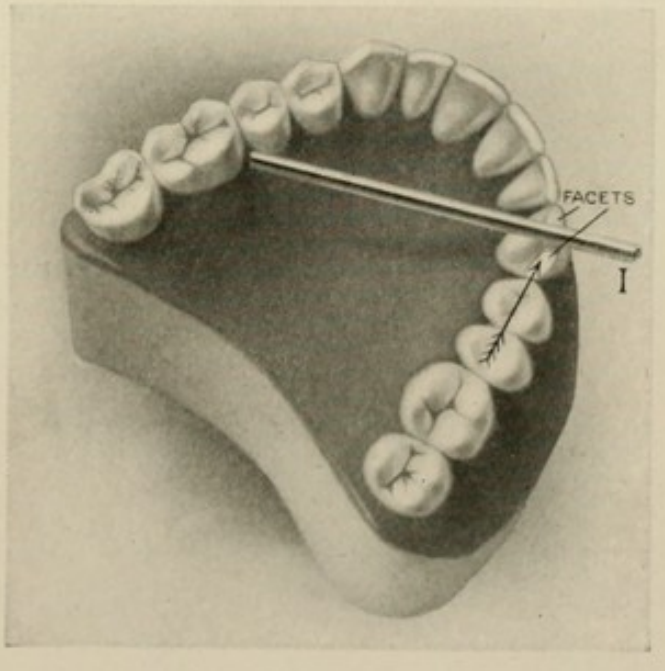


Fig. 78.
How the facets on artificial upper cuspids must slope.

CRACKING AND TEARING POWER IN THE BICUSPIDS.

The human bicuspids are the lineal descendants of the bone cracking teeth in meat eating animals like the dog, Figure 80, and are given their special location in the denture that they may crack all hard and brittle foods and tear, stretch and separate all fibres.

In order that these teeth may crack all hard and brittle foods, it is essential that the occlusal surface of each bicuspid shall be formed into a grain trap for holding small seeds and grains, and that the two adjoining bicuspids shall form traps for holding similar articles of food too large for one tooth, as is shown in Figure 81. The occlusal surface of a properly formed bicuspid will therefore present two small traps like that diagrammatically illustrated in Figure 82 on the opposite page. Only such a form as this will prevent the escape of small grains as the upper and lower teeth come together. Such a formation is shown in Figure 84.

The tearing action of the bicuspids on fibres is made possible by the formation of the occlusal surfaces and the peculiar open and shut form of articulation, which will be more fully considered later. The cuspids come into contact first during articulation, and the molars come into contact before the lingual cusps of the bicuspids do, and hold fibres firmly at both ends, while the bicuspids, with their open and shut articulation, stretch the fibres, tear one from another, and pierce between and separate them. This tearing action is diagrammatically illustrated in Figure 85.

Trubyte bicuspids have been designed with a knowledge of these functions and so shaped as to discharge them with the exercise of slight force. So far as I know, they are the first bicuspids which have ever been designed with any intelligent understanding of the functions they must perform.

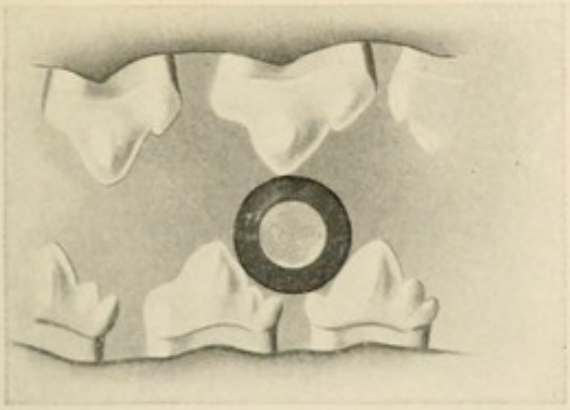


Fig. 80.
The bone cracking teeth of the dog.

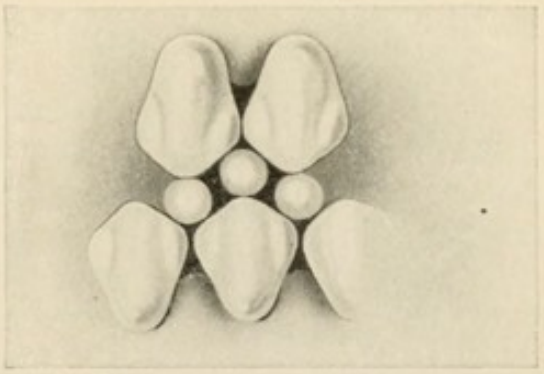


Fig. 81.
Similar cracking action by human bicuspids.

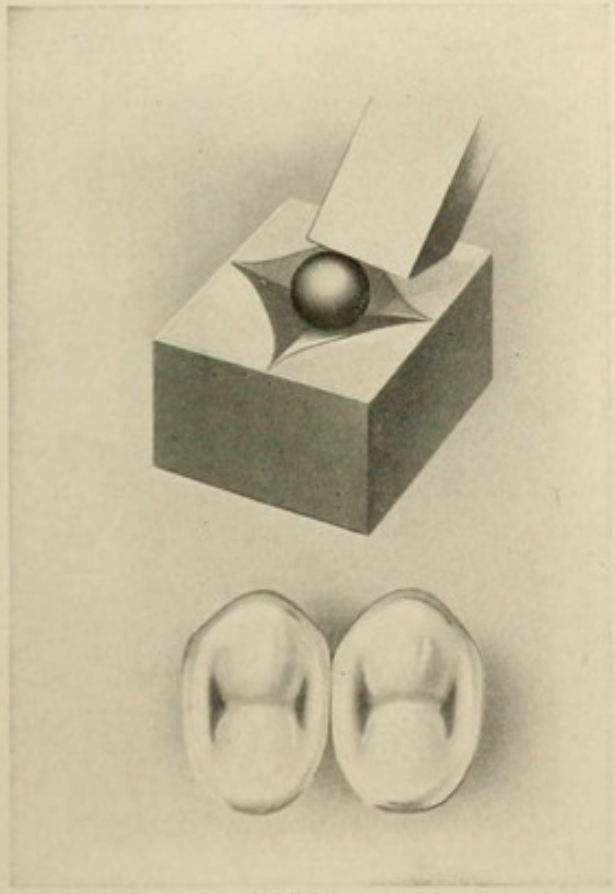


Fig. 82.
Diagrammatic representation of a grain trap. Same trap in Trubyte bicuspids.

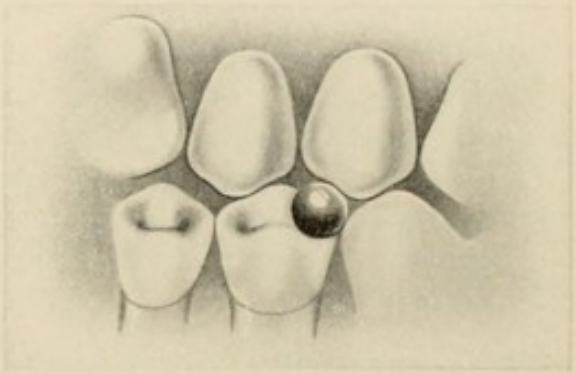


Fig. 83.
Lingual cusps open to receive seeds and grains.

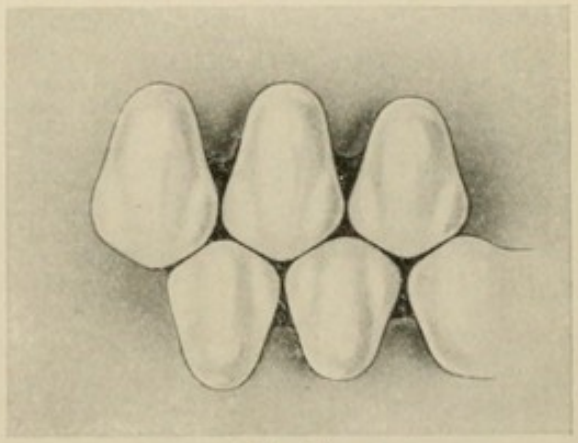


Fig. 84.
Buccal cusps interdigitate in articulation.

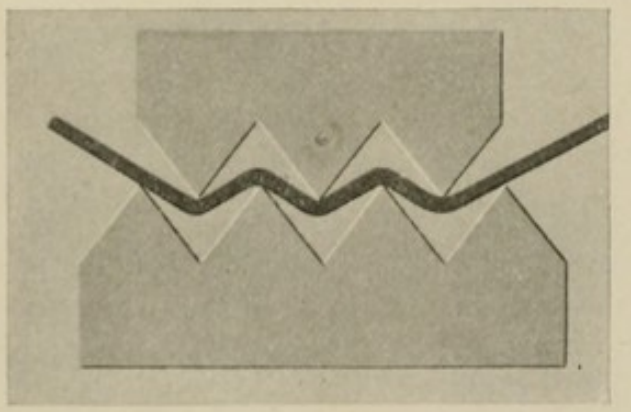


Fig. 85.
Diagram of tearing action.

CUTTING AND GRINDING POWER IN THE MOLARS.

The functions of the molars are to hold the posterior ends of fibers which are being torn by the bicuspids, to cut the torn fibers into short pieces, and to roll fibers in such way as to isolate individual cells and smash the cell walls to permit insalivation. The importance of this smashing power is seen when it is understood that starches which have not been insalivated are not digested.

Artificial molars are enabled to discharge these functions by a smooth sliding articulation, which, in its form of greatest efficiency, opposes a number of small, relatively sharp facets in such way that they interact to produce the required effect.

The efficiency of the molars in cutting will be determined in no small degree by the manner in which these facets interact. If they merely press directly against each other, their efficiency will be small. If they can be made to draw across each other, as one draws a knife in cutting a substance, the efficiency will be greatly increased. The ideal of cutting efficiency is diagrammatically shown in Figure 86 on the opposite page.

The grinding power of the molars is dependent on the continued opposition or contact of the facets during the time that the molars are returning from lateral occlusion to central occlusion. Such opposition or contact is made possible only by the application of engineering principles to the formation of occlusal surfaces which will interact with the necessary accuracy and efficiency.

The occlusal surfaces should exhibit deep fossæ to permit the escape of partly ground food from between the facets but not from between the teeth. This leaves only fibers and unground cells between the facets.

The sulci should be deep to permit easy escape of such portion of the food as has been rendered fluid.

The dentist should not expect that the manufacturer can furnish him porcelain teeth which are exactly designed for the conditions peculiar to any given case or to his own methods of arrangement. Differences in the kind of articulator used, in the manner of setting up, in the lateral path, in the location of the rotation points and other factors, will render slight modifications of the form of the teeth necessary. The highest degree of efficiency in the dentures requires that the dentist make these minute adjustments himself.

But the manufacturer can furnish teeth which are correct in proportions, in shallowness of bite, in height of cusps and depth of fossæ and sulci. Most important of all, he can furnish teeth with properly interacting ridges and facets, so that the grinding of what may be called the individual facets on the teeth shall be only their modification to the peculiarities of the case in hand.

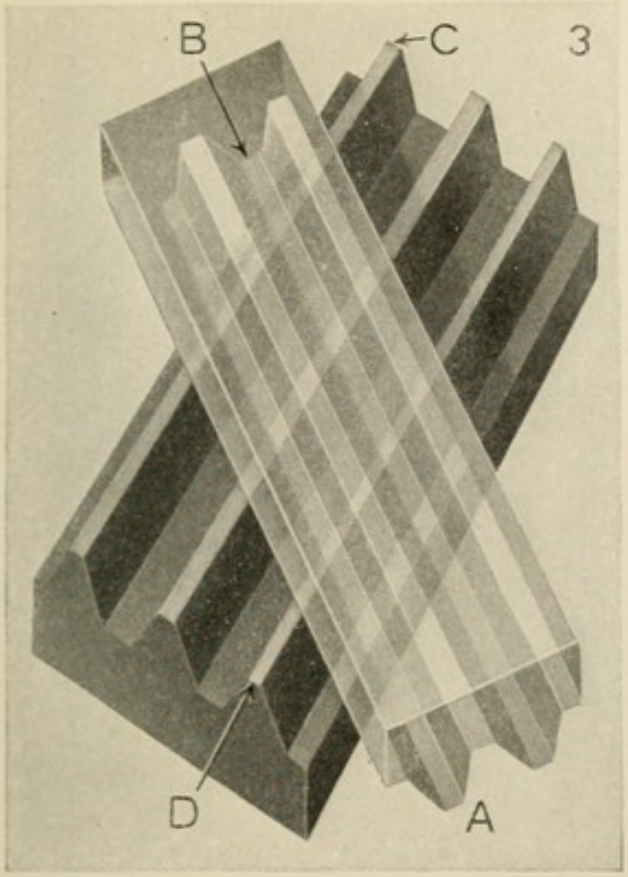


Fig. 86.

Diagrammatic illustration of the cutting action exhibited by opposed ridges and facets in Trubyte molars. If the point A of the upper block be carried to the point C of the lower block, and then the upper block be so moved as to bring the point B directly over the point D of the lower block, each of the opposed ridges will cut throughout its length with a drawing motion. This is the longest and most efficient "cut" possible to these ridges.

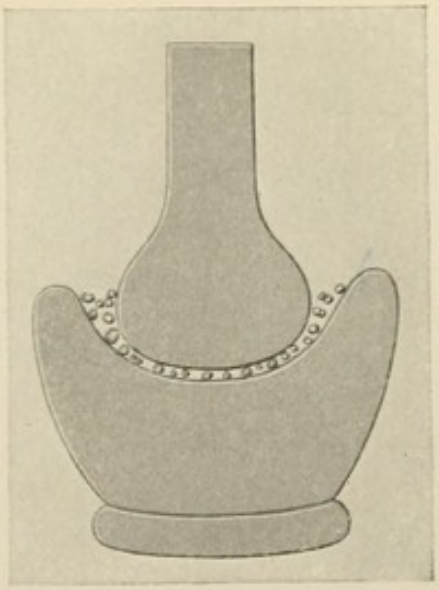


Fig. 87.

Food cells are isolated and the cell walls broken by the rubbing together of the facets. The rubbing action is diagrammatically shown by the mortar and pestle in which substances are pulverized.

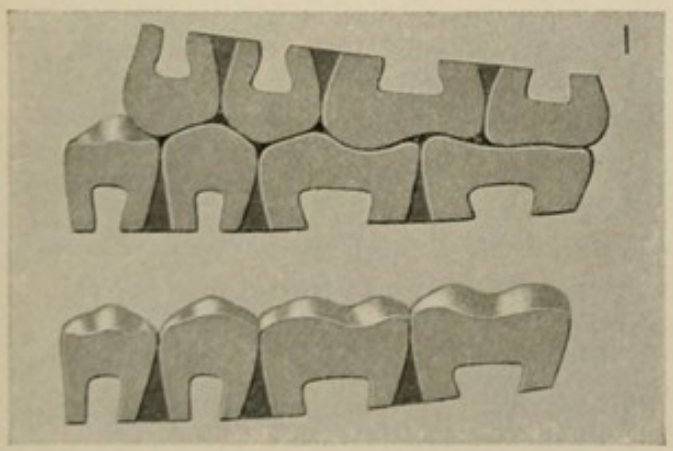


Fig. 88.

Diagrammatic representation of the plan on which artificial molars have generally been shaped in the past. The broad surfaces can not cut up foods to isolate the cells. They can be approximated only by the exercise of great force.

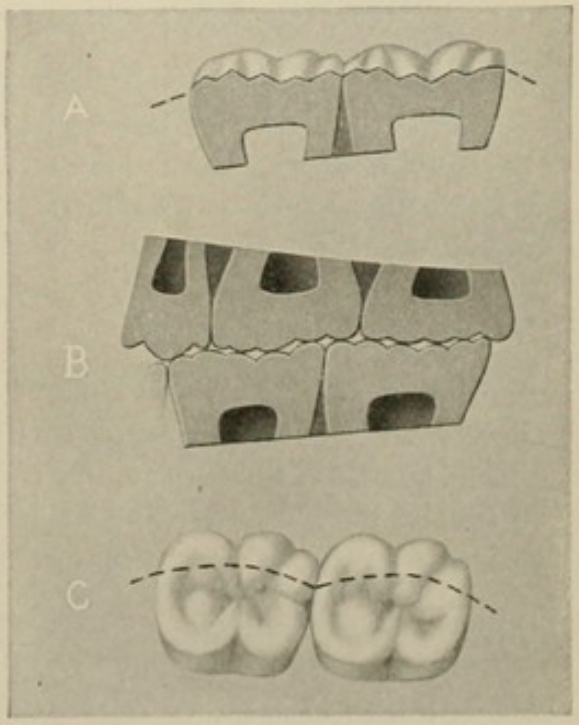


Fig. 89.

A. A cross section of Trubyte lower first and second molars showing five ridges in each tooth. B. Ridges and facets in Trubyte upper and lower molars opposed. C. The cross sections shown above were made at the dotted line in this figure.

THE IMPOSSIBILITY OF GRINDING IMPROPERLY FORMED TEETH TO PROPER BITES OR TO EFFICIENT FORMS.

If teeth are not given the correct depth of bite by the manufacturer and carved to efficient forms, it is practically impossible for the dentist to grind them to advantageous bites, or to efficient forms of masticating surface, as is made plain by Figure 90 on the opposite page.

Figure A shows the occlusal surfaces of upper and lower molars ground to articulating form after the method formulated by Dr. Bonwill. It will be noted that this method grinds a broadly concave occlusal surface on each of the molars. Figure B shows the same molars occluded. It will be noted that very broad opposing planes are brought into contact, such as could be made efficient only by the exercise of a force which neither bridges nor dentures can transmit. The cracking and cutting formations which have been described are entirely lacking, and no escapeways are provided for semi-fluid food.

It is impracticable for the dentist to grind buccal cusps and grooves which shall interact properly, and articulation is attained only by cusp climbing cusp. The buccal cusp of the lower molar must climb the long overhanging buccal cusp of the upper molar. This necessitates a marked vertical movement even in the working bite. The bite of the teeth is therefore deep, and dentures articulated after this manner are easily displaced.

Figure C shows a longitudinal section of the same teeth. The broad occlusal surfaces and the absence of cracking, tearing and cutting formations are plainly seen. This is the only form to which improperly formed teeth can be ground with a stone. Unfortunately there are still dentists who use teeth thus ground.

Figure D shows the occlusal surfaces of the anatomical moulds of The Dentists' Supply Company. These are carved to much more nearly correct anatomical form than were the teeth of Dr. Bonwill's time. The elevations of the cusps are more nearly correct, and sulci and fossæ are provided for the escape of food and for the articulation of the cusps of one set with the grooves of the opposing set.

Figure E shows the molars occluded. The longitudinal groove is entirely different in character than that shown in Figure B. The upper lingual cusp and the lower buccal cusp no longer reach the bottom of the fossæ. Escapeways are provided for partly ground food and buccal and lingual grooves, through which the opposing teeth move. The upper buccal cusp does not overhang the lower molar as in Figure B. The depth of bite in these teeth is only half as great as in those shown in Figure B.

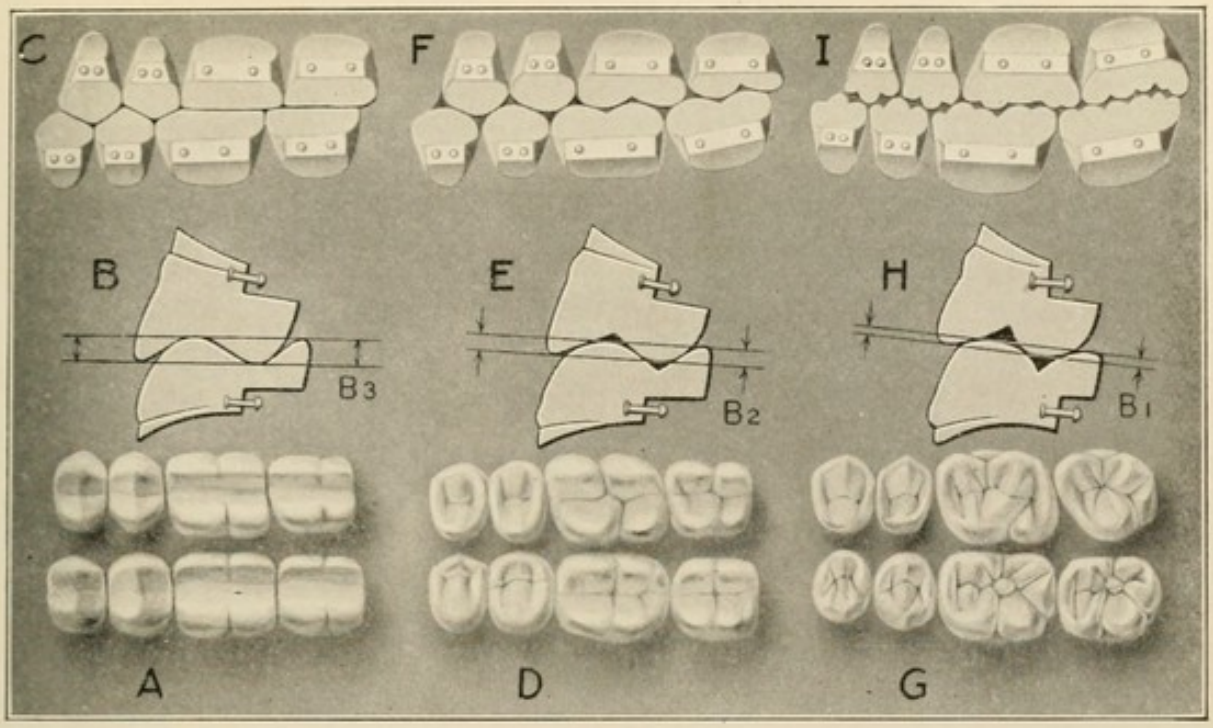


Fig. 90.

Figure F shows a longitudinal section of the same teeth, with the smaller opposed surfaces, the proper relations of cusps and grooves, and the escapeways for food. These teeth were a great improvement over the forms in Figure C.

Figure G shows the occlusal surfaces of Trubyte teeth, with the formations for cracking, tearing and cutting which have been described.

Figure H shows Trubyte first molars occluded. The character of the longitudinal main groove and of the cusps, has been entirely changed by making the cuspal inclines which form that groove, convex, in both the upper and lower teeth. The convex surfaces of the several cusps prevent the opposing cusps reaching the deepest parts of the fossæ, and provide large escapeways for partly crushed food. The upper buccal cusp overhangs to only half the vertical depth of the buccal cusp in the anatomical moulds and one-quarter the depth of the same cusp ground after Dr. Bonwill's plan. The bite is proportionately less deep and dentures made with these teeth are less easily dislodged.

Figure I shows a longitudinal section of these teeth. Instead of presenting the flat opposed surfaces, shown in Figure C, or the single convex surfaces shown in Figure F, these teeth exhibit from two to five grooves, and from three to six cusps each. The cusps and cuspal ridges are accurately opposed to grooves in the other set.

The grooves present escapeways for fluids or semi-fluid food, and when the articulated teeth have been rubbed together with glycerine and carborundum to form tiny, sharp edged facets on each of these cuspal ridges, the tearing, cutting and grinding powers are the greatest possible to porcelain teeth.

PART V.

THE SELECTION OF AN ARTICULATOR

The articulation of the adult natural teeth probably determines the formation of the articulating surfaces in the condyles and fossæ, the muscular actions, and the habitual masticating movements of the jaw. The arrangement of the artificial teeth will determine whether the patient shall be enabled to continue those movements, which are the most efficient he will ever have, or whether these movements shall be destroyed, with a strong probability that other efficient movements cannot be substituted.

Teeth are articulated when they are arranged to maintain grinding and balancing relations with the masticating movements peculiar to the patient for whom they are intended. If the work is intelligently done, the patient is enabled to continue the habitual masticating movements. The use of the dentures or bridges is learned with comparative ease. The patient is given the greatest possible masticating power, and food may be properly prepared for digestion.

Teeth are occluded when they are arranged merely for the opening and closing movement. Occluded dentures generally destroy the efficient masticating movements habitual to the patient, and finally destroy the formation of the articulating surfaces which were essential to the continuance of those movements. They rarely, if ever, substitute efficient masticating movements. And it is common history for patients with occluded dentures to lose all definite control of the jaw movements. It is difficult for patients to learn to use such dentures, and the fact that some do finally learn is rather a tribute to the marvellous adaptive power of the human frame than to the dentist's skill. The average masticating power of occluded dentures is slight.

The dentist practically determines what quality of service he will render his patients when he selects an articulator, because the limitations of the appliance become his limitations. The selection of the articulator is therefore very important.

My own belief is that in every case where the patient can be brought to see the benefits of superior service and to pay a fee which permits such service, the dentist should determine and reproduce the movements of the patient's jaw and arrange the teeth to harmonize with those movements.

I believe also that it costs the dentist little, if any more, to articulate the teeth so that they will be satisfactory from the beginning, than to grind and fit and remake occluded dentures in the effort "to make them do."

In cases where such service is not possible, the dentist should arrange the teeth in harmony with average masticating movements, especially since this takes but little more time than to merely occlude them.

I have endeavored to set forth in this section the reasons why articulators which meet certain requirements (do not confuse that with certain articulators) should be used.

SELECTING AN ARTICULATOR.

It seems to me that an articulator cannot be intelligently selected without at least an elementary knowledge of the normal jaw movements in biting and mastication, a knowledge of some of the changes effected in those movements by the irregular loss of the natural teeth, and a knowledge of the limitations of the articulator itself.

An articulator is a mechanical device in which artificial teeth may be arranged to articulate in the mouth. In order that teeth may be articulated, it must reproduce the masticating movements of the jaw with at least reasonable accuracy. If it is capable of only the opening and closing movements, it cannot reproduce the movements of articulation, and is therefore merely an occluding frame.

It is not necessary that an articulator should resemble in form the human jaw, as some have thought, or that it be mounted with the upper artificial jaw fixed and the lower movable, as others have held. If it reproduces with reasonable accuracy the more important jaw movements, it makes little difference how unlike the jaw in appearance it may be.

The first important step for him who would select an articulator intelligently, is to know what are the more important jaw movements to which the teeth will be subjected when they are placed in the mouth. The jaw movements in order of importance from least to greatest are the straight opening and closing, the incising and the lateral movements of mastication.

I believe that the character of these movements has been exhaustively known for less than 10 years. At least the facts which have been learned within that period have greatly extended our knowledge and have permitted the construction of articulators which reproduce the movements with greater accuracy than those of earlier days.

The present knowledge of these movements is the result of the labors of many workers. Without disparaging the labors of any others, I wish to call especial attention to the labors of two men, Mr. Norman G. Bennett and Prof. Dr. Gysi, since they establish two points of the utmost importance, as follows:

1. An articulator in which the upper jaw hinges or rotates on the condyles cannot properly reproduce the average opening or lateral movements.

2. An articulator which is to accurately reproduce the movements peculiar to any given patient, must have rotation points which are movable at least in certain directions.

Such conclusions could be reached only after accurately recording the movements of many jaws. It will be worth while, therefore, to see how such movements were accurately recorded.

HOW THE JAW MOVEMENTS WERE RECORDED.

Mr. Bennett recorded the movements of the several parts of the jaw by projecting the illumination of lights fixed over those points on the walls and ceiling. By an elaborate mathematical demonstration, he showed that the recorded movements could not be reproduced with the condyles as centers, but that the different movements had many centers in different locations. So wide apart were some of the locations that he doubted whether a practicable articulator could take cognizance of them.

Prof. Gysi and his assistants gave almost two weeks of continuous labor to confirming the discoveries by Mr. Bennett, and to devising methods whereby jaw movements could be more easily recorded. Prof. Gysi has lost some of the posterior teeth on either side of his lower jaw. He made a partial plate which fitted the spaces, and which could be clamped firmly in place by means of bands around teeth adjoining the spaces. Stiff wires from both sides of this plate were brought to the median line of the mouth where they passed out between the lips. These wires were continued in to three ends, one of which was opposite the head of each condyle and one opposite the symphysis of the chin. Each of the three ends was fitted to receive a tiny lead pencil. A horizontal plane representing the occlusal plane was affixed to the wires to facilitate more accurate record taking. The whole appliance was stable in position and made all the movements the jaw made. The locations of the pencils and occlusal plane are shown in Figure No. 91.

RECORDING OPENING AND CLOSING MOVEMENTS.

To record the movements of the condyles and chin in straight opening and closing, a frame like that shown in Fig. No. 92 was held immovably against the head, and the pencils recorded upon it as the jaw moved. The pencil and arm on the right side have been removed, to permit a better view of the path, but their location is shown by dotted lines. The chin pencil and its path are shown. The points in both paths numbered from 1 to 5 inclusive are known as "stations" and indicate that when the pencil recording the condyle path was arrested at any given point, the pencil recording the chin path was located at the point of like number, as at station 3 in both paths.

It will be noticed that the chin path describes a loop. This is because this pencil regularly took one path in the opening movement and another in the closing movement.

The importance of these records and their meaning will be described after the method of recording the movements in the horizontal plane has been described.

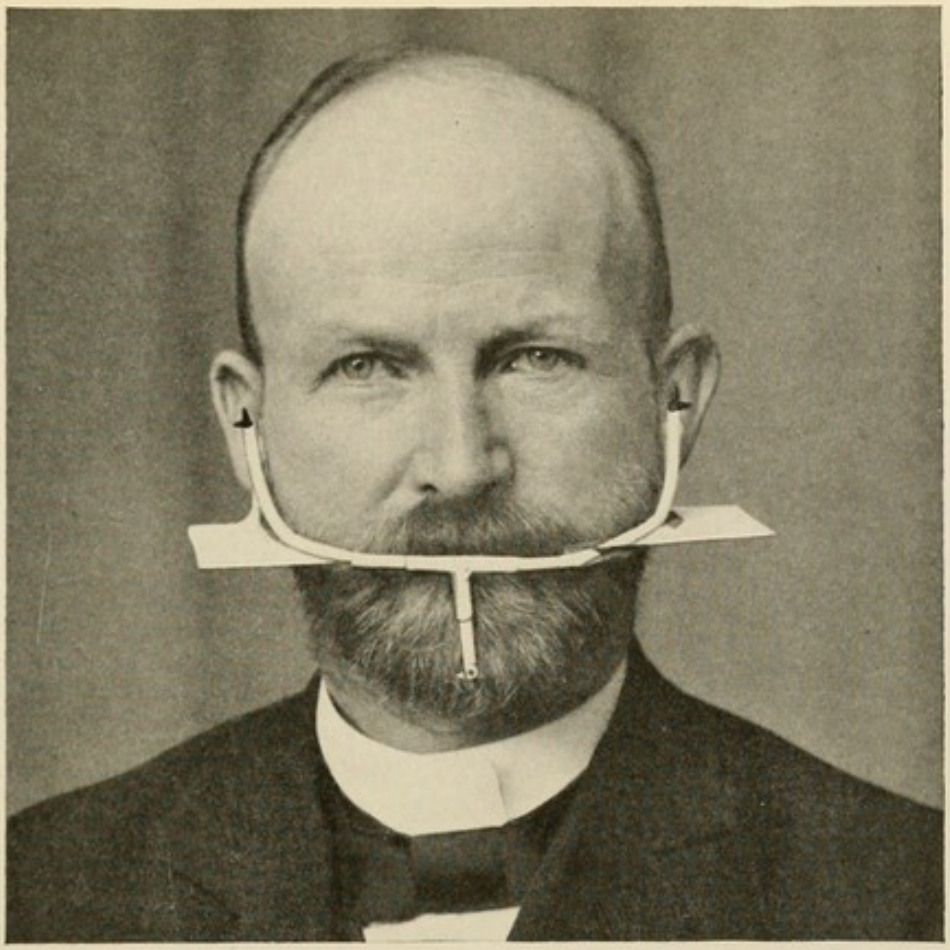


Fig. 91.

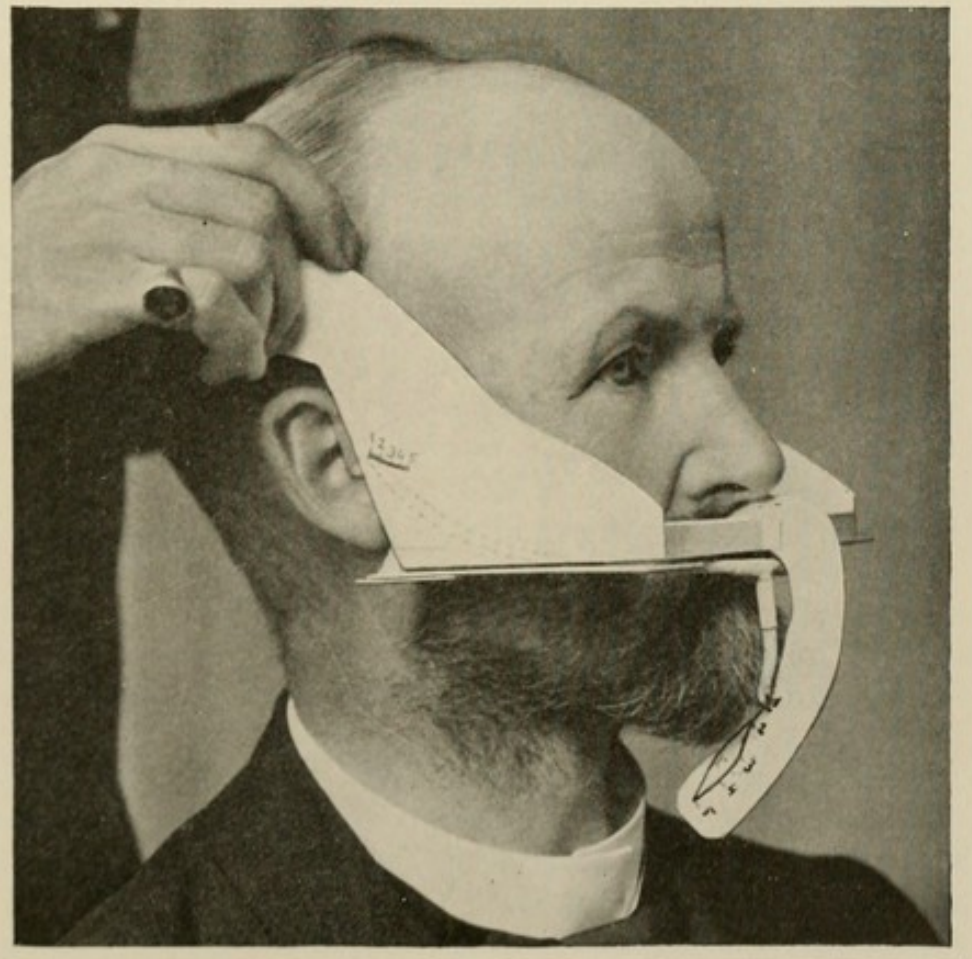


Fig. 92.

THE IMPORTANCE OF THE RECORDS OF THE OPENING AND CLOSING MOVEMENTS.

They establish the fact that these movements cannot be reproduced with the condyles as the centers of movement.

Only the portion of the condyle path numbered 1-2 is employed while the teeth are in articulation, and the teeth pass out of contact when the condyle reaches station 3.

Records of condyle and chin movements made in the manner described on page 142 were transferred to flat sheets, and a common center for portions 1-2 of the condyle path and portions 1-2 of the chin path was located by erecting right angles from each path and prolonging them until they met, as in Figure No. 93.

This center is located vertically about half way between the level of the occlusal plane and the heads of the condyles, and a little back of the condyle. Patients occasionally present with the rotation points on the level of the condyles or the occlusal plane, but they are greatly in the minority.

The mechanical accuracy of such a location can be easily seen by tracing on paper the outlines of Figs. Nos. 94 and 95 and performing a simple experiment.

Fig. No. 94 shows the outline of a mandible with the correct average paths of the condyles and incisors. Fig. 95 shows an outline of a similar mandible, with the points A-B-C as possible rotation points. A is the rotation point common to all articulators where the condyles are the centers of motion. C is located on the level of the occlusal plane. B is the point determined upon by erecting perpendiculars on the portions 1-2 of the condyle and chin paths in Fig. 93.

If Fig. No. 93 be superimposed on Fig. No. 94 and if a pin be thrust successively through the points A-B-C and the mandible be moved vertically across the outline from Fig. 94, it can be seen that when the pin is at the point A there are no correct opening and closing movements of the condyles. The lower incisors move through the path A-2, which is inclined too far forward as it goes upward and too far backward as it goes downward. The molars move very much too far forward and backward in like manner.

When the pin is at C, the condyle describes the movement indicated by the dotted line in Fig. 95. This is unlike the movement of the condyle in opening and closing. The incisors move through the line C-c, which inclines too far forward as it descends and too far backward as it goes upward. The molars move in like manner and on a shorter curve.

With the pin at B, the condyle follows very closely along the condyle path in Fig. 94, while the incisors move through the path B-b, which reproduces portion 1-2 of the incisor path. The molars move in like manner. It is evident, therefore, that if an articulator is to correctly reproduce opening and closing movements, the rotation points must be in the vicinity of the point B.

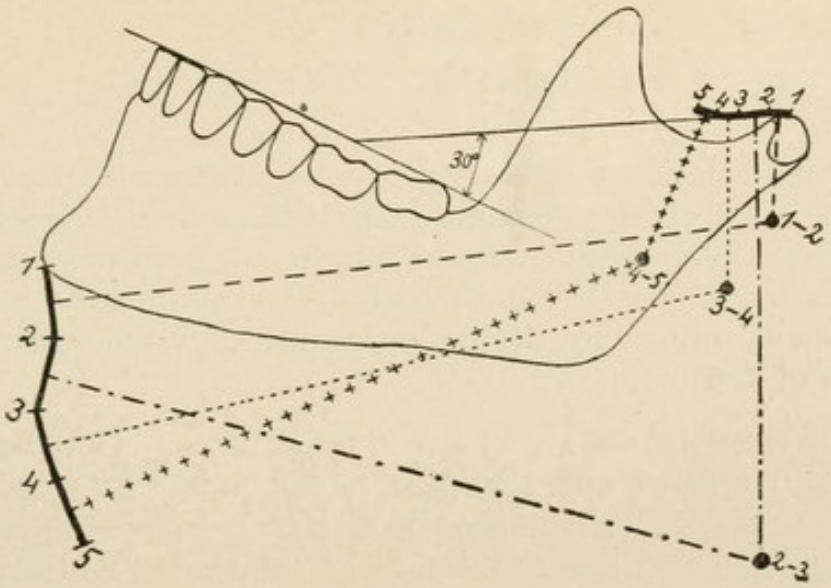


Fig. 93.

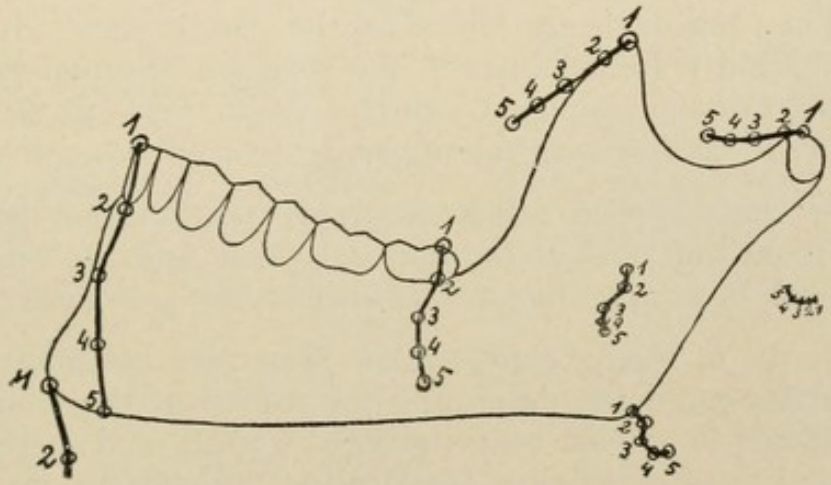


Fig. 94.

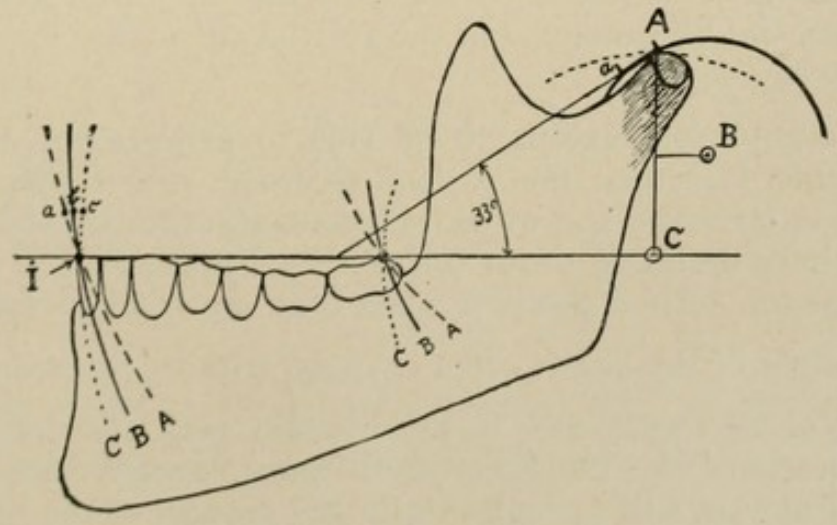


Fig. 95.

THE PRACTICAL IMPORTANCE OF CORRECT OPENING AND CLOSING MOVEMENTS.

When the rotation points of the articulator are in correct vertical locations, it is not quite so essential that the models be mounted on the articulator with the distance from condyles to incisors exactly like the corresponding distance in the mouth. The bite may be raised or lowered at will, either by design or accident, without deranging the articulation of the teeth.

Both of these points are of great importance. If it be noted how much too far forward and back the molar path "A" passes, in Fig. No. 95, page 145, it can be seen that if the models be mounted too near the condyles and the rotation point of the articulator be in the location of "A" or "C", in the same figure, the teeth will rapidly pass into wrong relations if the bite be raised or lowered.

The effect of raising the bite when the rotation point of the articulator is in the condyles, is diagrammatically illustrated in Fig. No. 96. When the teeth are placed in the mouth where, in all probability the rotation points are not in the condyles, the molars come into contact before the anterior teeth. Such contact either thrusts the lower denture forward or displaces the upper.

Exactly the opposite result occurs if the rotation point of the articulator is on the level of the occlusal plane and the bite is raised. The front teeth then come into contact before the posteriors.

Such forms of wrong contact have been very common in the past because dentists could not determine the source of the trouble. They are very difficult to correct by grinding the teeth, and teeth so ground lose all their power of efficient mastication. Moreover, such dentures require repeated grindings to keep them even comfortable.

When the rotation points of the articulator are located at about the point "B," the bite may be raised or lowered as desired without deranging the articulation when the teeth are put into the mouth. In one test case, the bite was closed the full length of the upper centrals without any bad effects.

It is often advantageous to be able to arrange the teeth for a slightly higher bite than the patient recorded, either that the cheek tissues may be stretched and wrinkles taken out, or for esthetic purposes. It is sometimes desirable to set the teeth a little high and close them down to just the desired position when they are tried in the mouth.

The height of the bite is often changed without intention.

Fig. No. 97 shows that if the rotation point of the articulator is at the location "B," the lower teeth move through such lines that the cusps of one set will articulate with the grooves of the other set, no matter how far the movement may be carried.

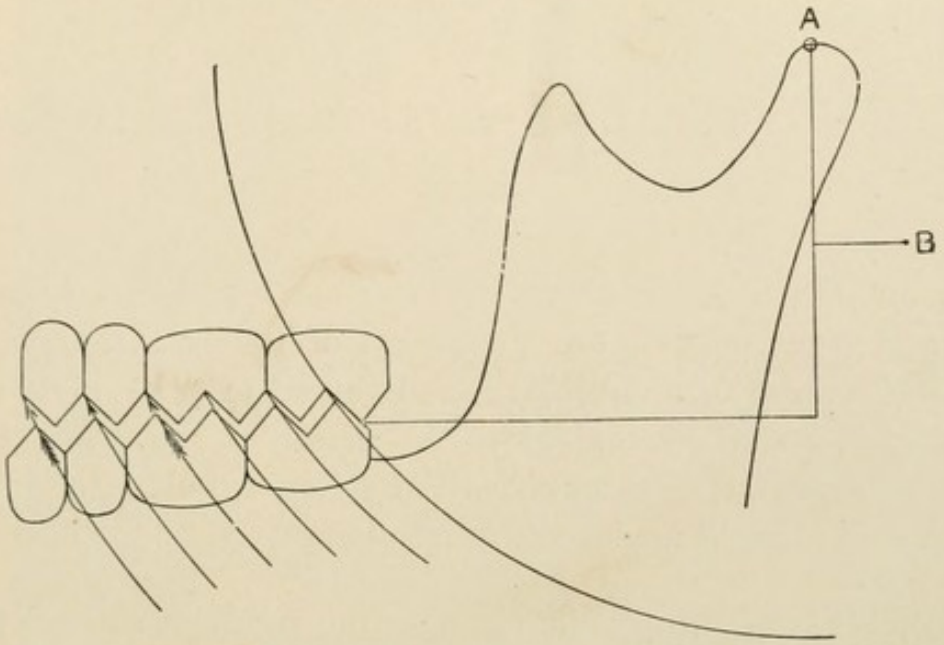


Fig. 96.

Schematic illustration of the effect of raising the bite in an articulator having the rotation points in the condyles "A."

On close examination it is seen that the distal slopes of the lower cusps come in contact with the mesial slopes of the upper cusps long before the other slopes antagonize. The molars strike before the bicuspids do. This is not articulation, and these teeth cannot be ground to anything more than the crudest form of articulation.

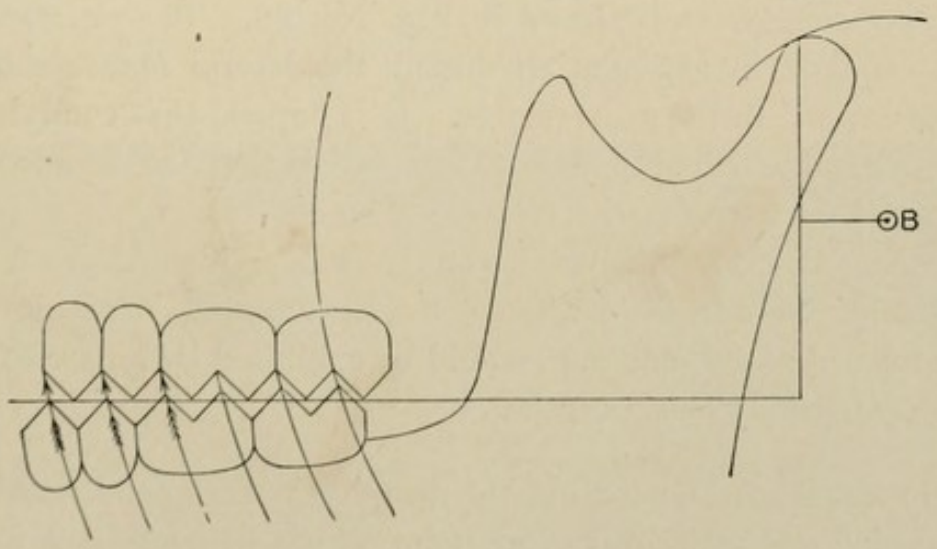


Fig. 97.

Schematic illustration of the opposition of teeth with "B" as rotation point. The condyle moves through its normal path. The cusps of the lower teeth move through lines which bring them into proper relations, when the bite is raised or lowered.

RECORDING LATERAL MOVEMENTS OF CONDYLES AND CHIN.

For the purpose of recording the movements of the condyles during lateral movements of the jaw, the points of the pencils opposite the condyle heads were turned upward, and caused to register on a frame supporting pieces of ground glass, as shown in Fig. No. 98. The pencil at the symphysis was turned with the Sagittal plane, and recorded on a card held at right angles with that plane.

The records of the pencils opposite the condyles showed that the condyles have movements which were practically unknown and which had not been incorporated into articulators. The condyle on the "working side" moved out of the fossa, away from the median line, while the advancing condyle moved strongly inward. Measurements of the movements of other jaws showed that these records differed in degree but not in character.

It is not unnatural that these movements should be present, as is seen when the bony formation of the glenoid fossae and condyles is examined. The articulating surfaces of the fossae face inward, sometimes very strongly, as is shown in Fig. No. 99. The portions of the condyles engaged in articulation during the lateral movements of the jaw, faces inward in the same degree. It is natural that condyles which face inward and which articulate with surfaces that face inward, should move inward as they move forward. The records of a large number of cases show that the advancing condyle moves inward at an average inclination of 16 degrees with the Sagittal plane. This is a much stronger inward movement than would be exhibited by an arc of a circle with the other condyle as a center.

The records of the pencil at the symphysis were portions of curves. They revealed one very important point which will be more fully considered later, namely, that they were not arcs of circles of which the condyles were the centers.

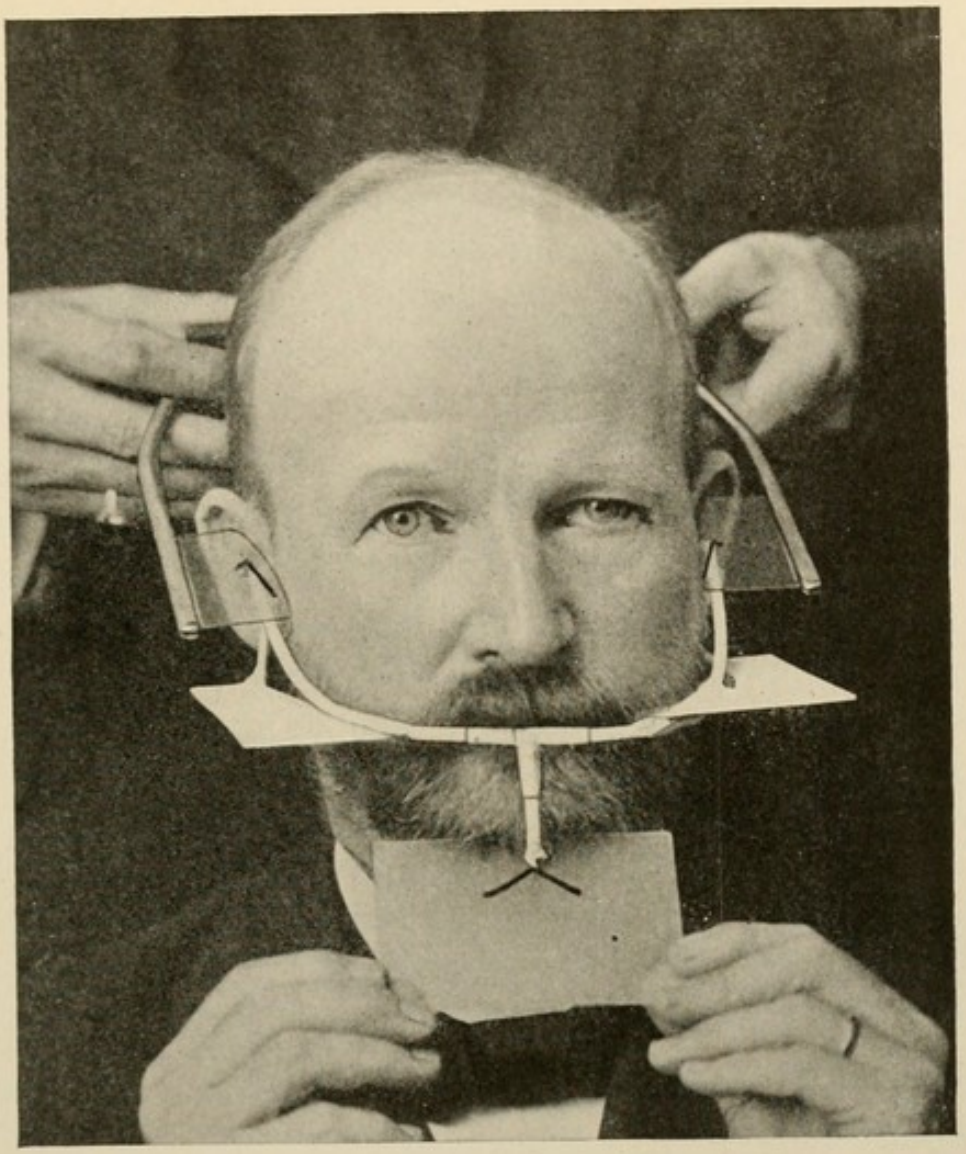


Fig. 98.

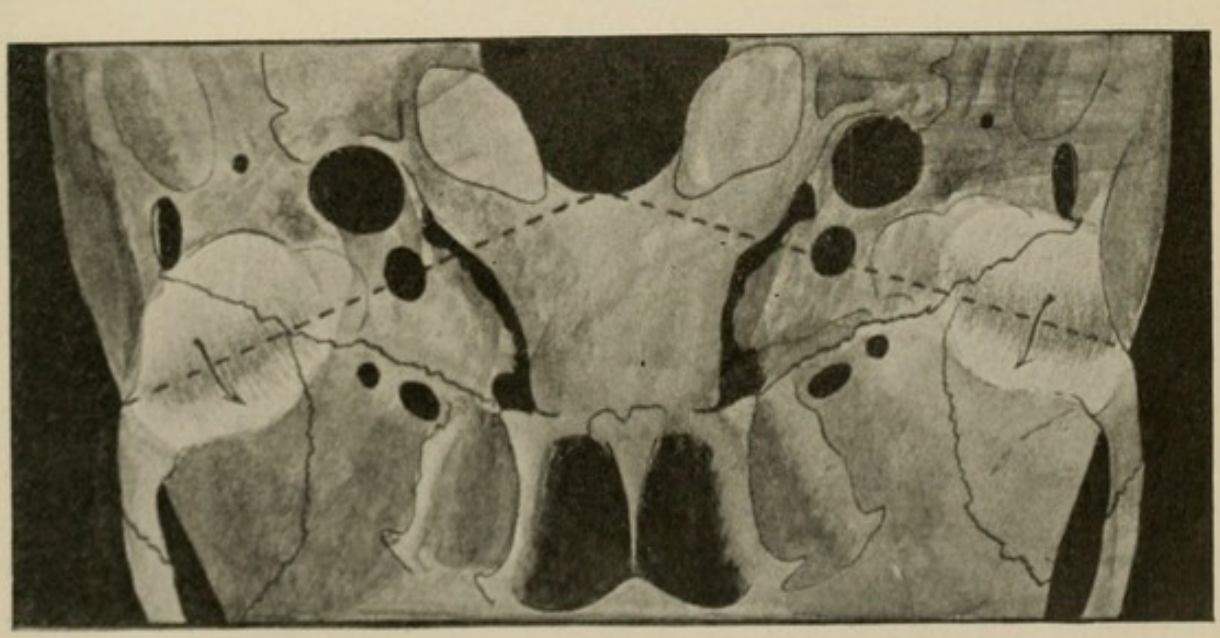


Fig. 99.

THE IMPORTANCE OF THE RECORDS OF THE LATERAL MOVEMENTS.

The records of the lateral movements seem to me more important than the records of the opening and closing movements, because the lateral movements are more numerous than the incising movements, and because these are the movements which usually dislodge dentures which have been merely occluded.

The records show that the condyles are rarely if ever the centers from which the movements have been produced, and that they cannot be reproduced by articulators having the rotation points in the condyles.

These records show also that the location of the rotation points, as to distance outward from the median line, differs greatly in different mouths, and sometimes on different sides of the same mouth. It appears that when the teeth are lost irregularly, the horizontal location of the rotation point changes to accommodate changed movements in mastication. Sometimes the rotation points are between the condyles and the median line, in which case they are said to be "inside the condyles." Sometimes they are farther from the median line than the condyles, in which case they are said to be "outside the condyles."

These records help us to understand why we have failed in articulating many dentures to which we have given our best efforts. If we had been able to record the jaw movements in such cases, we should doubtless have found the rotation point on one side of the head "inside the condyle," and the rotation point on the other side "outside the condyle," and that the articulator on which we arranged the teeth could not be adjusted to such locations, and could not correctly reproduce the jaw movements.

Figs. Nos. 100 and 101 illustrate the movements of two extreme cases. The horizontal location of the rotation points is determined by the same method employed to determine the vertical location, that is by erecting perpendiculars on the recorded lateral paths of the condyles and incisor point. The locations are marked Ro. R. and Ro. L.

Fig. 102 illustrates the movements in a case where the position of the right condyle is identical with that in Fig. 101 and the position of the left condyle is identical with that in Fig. 100. The great difference in the movements on the opposite sides of this mouth shows very clearly the importance of locating with at least approximate accuracy the positions of the condyles.

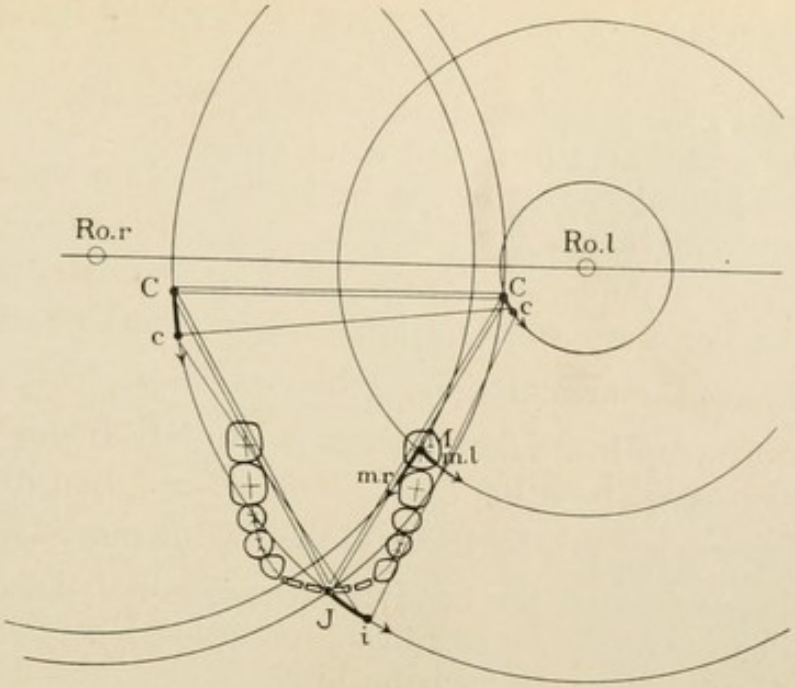


Fig. 100

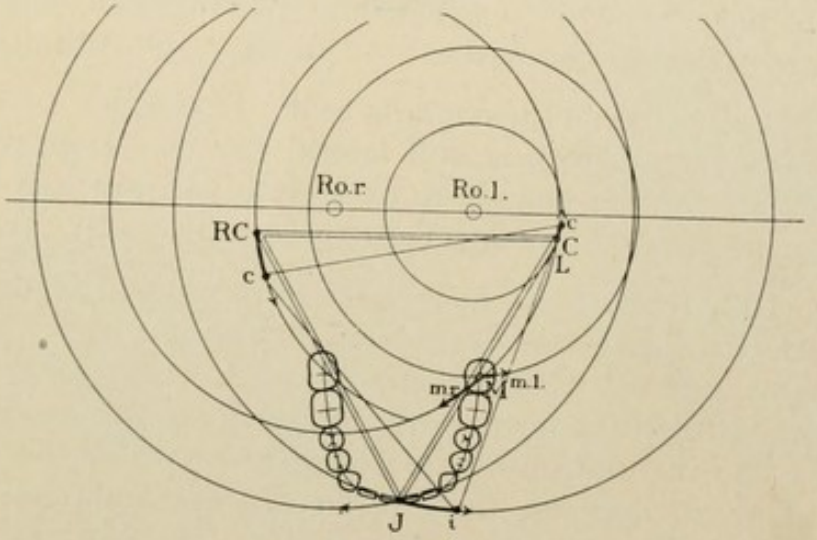


Fig. 101

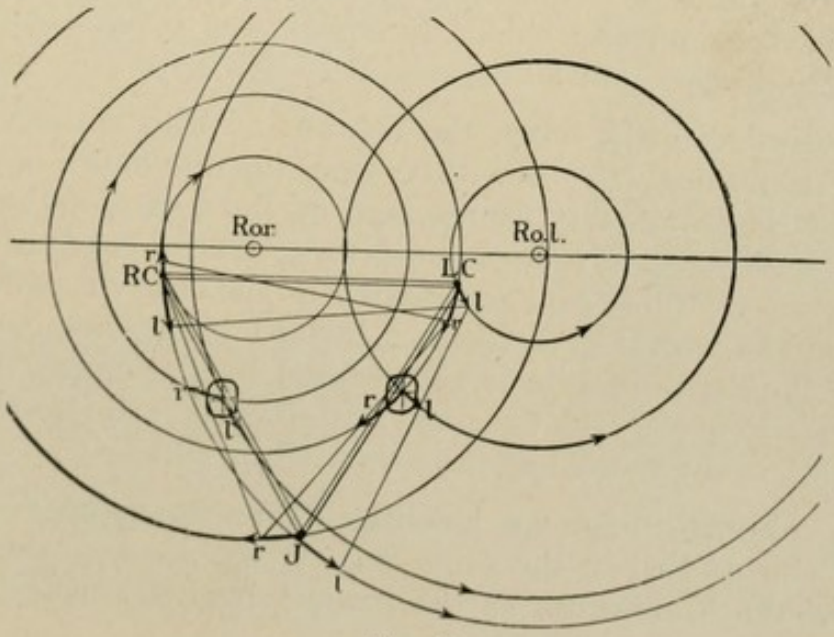


Fig. 102

They reduce the steepness of the downward path of the condyle as we have been accustomed to record it on articulators, so that the compensating and lateral curves of the dentures need not be so steep as when no lateral movements are present.

They permit articulation with much shallower bites in the molars than would be necessary were no lateral movements present.

They change the articulation of the posteriors.

They often permit the lower anteriors to be set to deeper underbite without being set back too far.

In most cases they greatly increase the cutting power of the incisors.

It is not uncommon for condyles to register a downward movement of 60 degrees or 90 degrees to the occlusal plane, when the lower jaw is thrust forward in the incising bite. When the combined downward and lateral movements are recorded, the downward inclination is rarely more than 50 degrees, and two-thirds of all movements seem to fall between 30 degrees and 40 degrees in inclination.

The more slightly inclined paths make it possible to set the dentures with flatter compensating and lateral curves. Dentures with flat curves are easier for the dentist to articulate and are less likely to be dislodged during jaw movements than those with steep curves.

In Fig. 103, Prof. Gysi has charted the required depth of bite in first molars with different degrees of inclination of the lateral path. The articulator was set with the condyles 12.5 centimeters apart, the rotation point 10 centimeters apart, and the incisor guide incline at 40 degrees. The inclination of the downward path of the condyle was at first fixed at 20 degrees, then at 30 degrees and lastly at 40 degrees. The lateral path was at first given no inclination and the advancing condyle described merely the arc of a circle about the rotation point of the opposite side. Later, it was given inclinations of 10 degrees, 20 degrees and 30 degrees.

By reading directly down the column of illustrations under the heading "Con. 20 degrees," it will be seen that the depth of bite in the molars, which is graphically represented by the figures 40 degrees, 125 degrees, 15 degrees when there is no definite lateral condyle movement, grows less steep as the lateral inclination of the condyle path increases, so that when the lateral path inclines inward 30 degrees, as it does in some cases, the depth of bite is represented by the figures 18 degrees, 157 degrees, 5 degrees. The vertical lift of these latter teeth in articulation would be very much less than that of the former.

If the columns under the headings "Con. 30 degrees" and "Con. 40 degrees" be studied in the same way, it will be seen that a similar flattening of the bite occurs as the inward inclination of the condyle path becomes more pronounced.

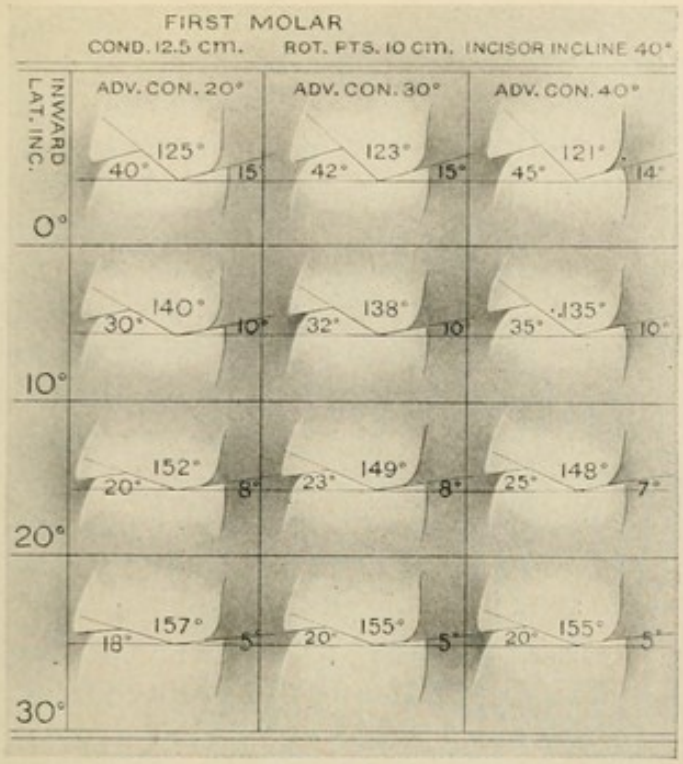


Fig. 103.

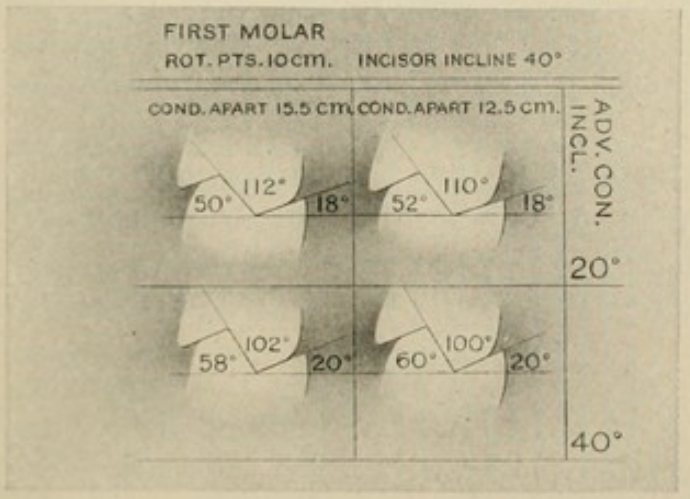


Fig. 104.

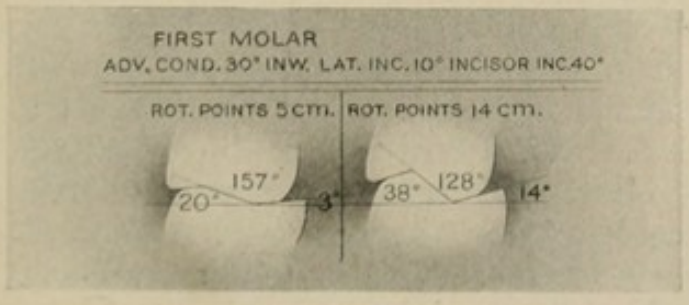


Fig. 105.

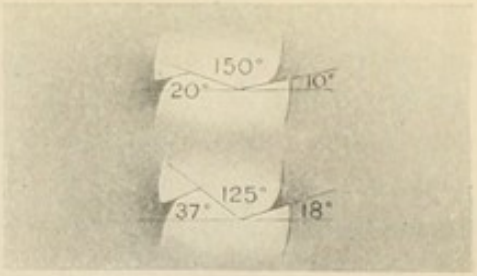
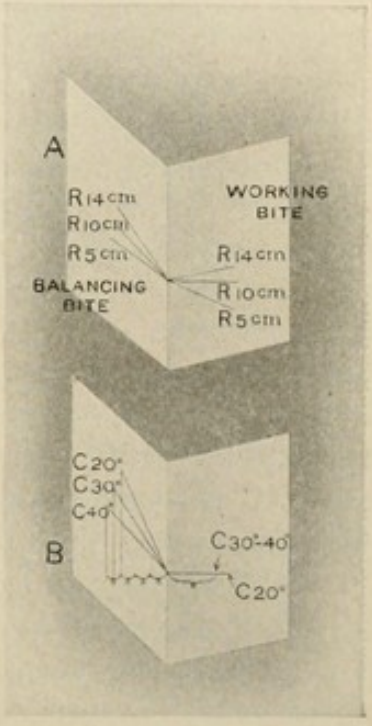


Fig. 106.



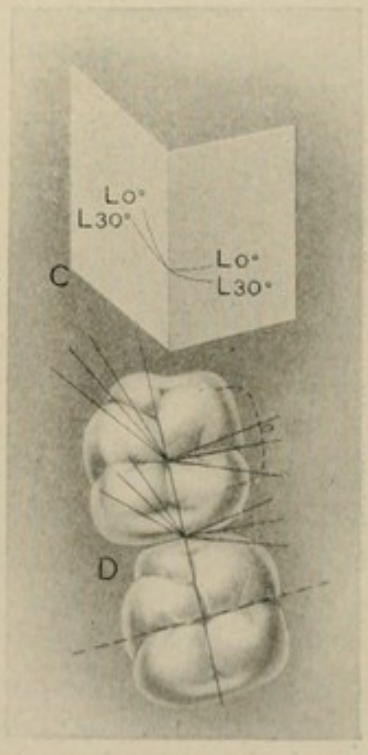


Fig. 107.

If the depth of bite required by articulators in which the advancing condyle moves only through the arc of a circle about the other condyle is represented by the upper figures in the three rows here shown, and the depth of bite required by an articulator with properly located rotation points and properly inclined lateral paths is represented by the depth shown in the three figures in which the lateral path is inclined at 20 degrees, it appears evident that properly formed teeth can be much better articulated in an articulator with properly inclined lateral paths. It is evident also that dentures with such teeth, thus arranged will be more stable in the mouth during mastication than teeth shaped without reference to the lateral paths or arranged in articulators which make no provision for lateral movements.

If, now, the diagrams in Fig. No. 103 be read across from left to right, the relatively slight influence of the downward path on the depth of bite in bicuspids and molars will be made plain.

When there is no definite lateral movement, the change of the inclination of the downward path from 20 degrees to 40 degrees, changes the depth of the working bite only 1 degree, from 15 degrees when the downward path is at 20 degrees, to 14 degrees when the downward path is at 40 degrees. When the lateral path is at 10 degrees, the change of the downward path from 20 degrees to 40 degrees, effects no change whatever in the depth of bite. When the lateral movement is at 20 degrees, the change of the downward path from 20 degrees to 40 degrees changes the depth of working bite only 1 degree. When the lateral path is at 30 degrees, the change of the downward path from 20 degrees to 40 degrees, effects no change whatever in the depth of working bite.

These figures seem to me to indicate that the lateral path of the condyles exerts more effect on the articulation of the bicuspids and molars than does the downward path. It is partly for this reason that I regard the lateral path as more important in an articulator than the downward path.

Fig. 104 shows the depth of bite required when the advancing condyle of an articulator moves straight forward without describing even an arc of a circle. The rotation points were fixed 10 centimeters apart, and the incisor guide incline at 40 degrees. In the columns of diagrams on the left, the condyles were fixed 15.5 centimeters apart. In the column on the right, the condyles were fixed 12.5 centimeters apart.

The diagrams show that when the downward condyle path is inclined 20 degrees, the depth of the working bite is 18 degrees, as against 8 degrees when the path of the combined downward and inward condyle movements register 20 degrees. When the advancing condyle moves straight forward at a downward inclination of 40 degrees, the depth of the working bite is 20 degrees, as compared with 5 degrees, 7 degrees, or 10 degrees, when the combined downward and inward movement registers 40 degrees. This is another evidence of the influence of the lateral path of the condyle on the depth of bite.

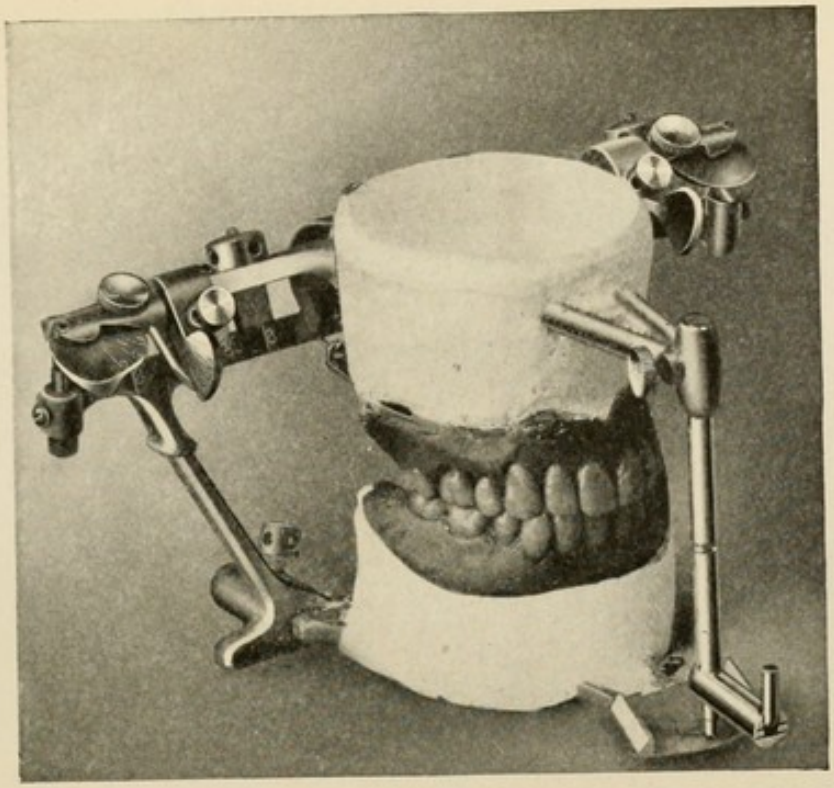


Fig. 108

The dentures here shown are illustrations of the difficulties often encountered in articulating teeth without adequate records.

A dentist of no mean skill made for the patient full upper and lower dentures using the articulator which had been most highly regarded up to the time of the discovery of the rotation points and lateral paths. By painstaking care he had secured excellent articulation of the dentures on the left side of the mouth, but had been unable to articulate the teeth on the right side to be efficient in mastication, though they balanced the dentures pretty well. Efforts to arrange the teeth in the mouth had been unsuccessful.

When the condyle paths were recorded by Prof. Gysi's methods, it was found that the downward path differed as follows: on the two sides, that the lateral paths of the condyle differed also, and that the lateral path of the incisor point was so different on the two sides of the mouth as to require that one rotation point be located as far outward horizontally, as the condyle, while the other was less than half as far outward from the median line.

Here, then, was a mouth in which the movements of the two sides differed in every important particular. It is not wonderful that teeth could not be arranged for such conditions in an articulator which employed the condyles as fixed rotation points and in which the lateral paths of the condyles and incisors could not be correctly reproduced.

When the movements peculiar to this mouth had been reproduced in an articulator, the teeth were arranged, and when tried in for the first time, articulated perfectly on both sides of the mouth.

THE PRACTICAL VALUE OF THE LATERAL MOVEMENTS, (Continued.)

These figures show that the downward path of the condyle has relatively slight influence on the formation of the teeth and depth of bite, for a difference of 20 degrees in the inclination of the straight forward and downward movement changes the depth of the bite only 2 degrees.

Fig. 104 should be interesting to those dentists who have desired articulators with the condyles adjustable for different distances from the median line. The vertical column on the left shows records from an articulator with the condyles set at a width of 15.5 centimeters, while the column on the right shows similar records with the condyles set 12.5 centimeters apart. It will be noticed that the difference in the distance of separation has made no change in the working bite, and has only rendered the working bite slightly steeper for the more widely separated condyles. It is quite possible that dentists who have expressed wishes for articulators with adjustable condyles have in reality desired articulators with adjustable rotation points.

Fig. 105 shows that considerable changes in depth of working bite result from wide differences in the horizontal positions of the condyles. If the rotation points be close to the median line, only 5 centimeters apart, the working bite will have an inclination of only 3 degrees, when the downward path is inclined 30 degrees, the lateral path 10 degrees, and the incisor path 40 degrees. If, however, the rotation points be moved until they are 14 centimeters apart in the same horizontal plane, the working bite will have a depth of 14 degrees, while the lingual cusps of the molars will have quite a different buccal slope. The average distance between the rotation points is 10 centimeters. It is evident, therefore, that the horizontal distance between the rotation points is much more important than the horizontal distance between the condyles.

The vertical inclination of the incisor path has more influence on the forms of the teeth and the ease of articulation, than has the downward movement of the condyle path. Fig. 106 shows the forms of first molars necessary with different vertical inclinations of the incisor path. The condyles were fixed at 12.5 centimeters apart, the rotation points at 10 centimeters, the downward path of the condyle at 30 degrees, and the lateral inclination of the advancing condyle path at 15 degrees. In the upper diagram the incisor path inclines vertically at 20 degrees. The depth of the working bite is 10 degrees and the buccal incline of the upper lingual cusp is fixed at 20 degrees. The inclination of the incisor path was then changed to 60 degrees, which is approximately what it is in the natural teeth at the period of greatest efficiency. The depth of the working bite is increased to 18 degrees and the inclination of the buccal incline of the upper lingual cusp becomes much steeper. Prof. Gysi believes that an inclination of 40 degrees for the incisor incline is better in prosthetic work than the steep inclination of that incline in the natural teeth.

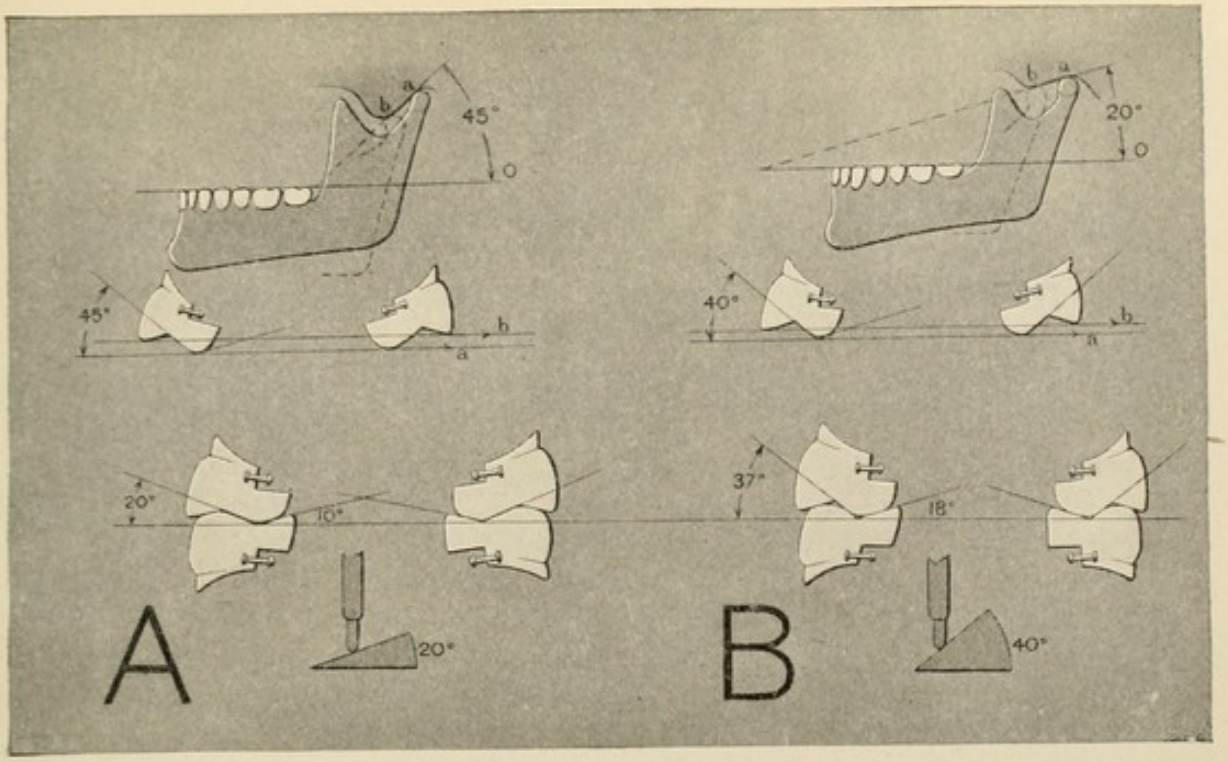


Fig. 109.

These diagrams seem to show that the steepness of the vertical inclination of the incisor path has more influence on the depth of bite in the incisors, bicuspids and first molars, than has the vertical inclination of the condyle path, but that the influence of the condyle path governs the positions of the second molars.

Fig. No. 109A shows at the bottom an incisor guide incline, with a vertical inclination of 20 degrees to the occlusal plane. At the top is a diagram of a downward condyle path inclined 45 degrees. Just above the incisor guide is shown the position of the first molars required by these inclinations of incisor and condyle paths. The position of the second molars is shown above that of the first molar.

Fig. No. 109B shows at the bottom an incisor guide incline with a vertical inclination of 40 degrees, and at top a diagram of a downward condyle path inclined 20 degrees. The position of the first molars required by these inclinations is shown just above the incisor incline, and the position of the second molars just above the first.

It will be noted that the incisor path which is vertically inclined 40 degrees has deepened the working and balancing bites in the first molar, as compared with those in Fig. A where the incisor path inclines vertically only half as much. It will be seen that in the second molars the balancing bite is deeper in Fig. A, where the condyle path is more steeply inclined.

These facts seem to be evidence that the very steep inclinations of the condyle path frequently obtained by means of the incising bite, merely result in arranging dentures to very steep lateral and compensating curves in the second molars, whereas the less steeply inclined paths recorded by Dr. Gysi's methods, especially when aided by correct incisor supports, result in the arrangement of dentures to flatter curves, with increased stability.

THE INFLUENCE OF THESE ADJUSTMENTS ON THE MOVEMENTS OF THE BICUSPIDS AND MOLARS.

The adjustments of the downward condyle path, the inward lateral path, the vertical incisor path and the distance between the rotation points affect the movements of the teeth, 107 A B C D.

In Fig. 107A, the effect on molar movements in balancing bite of three locations of the rotation points in the same horizontal plane are shown in the three lines marked "R.5 cm.," which indicates a separation of 5 centimeters between the rotation points, the lines marked "10 cm.," which indicates a separation of 10 centimeters, and the lines marked "14 cm." which indicate a separation of 14 centimeters.

The influence of the several inclinations of the downward path of the condyle is confined to the balancing bite, as is shown in Fig. 107B. The line marked "C20 degrees," indicates the movement of the teeth when all the other adjustments are average and the advancing condyle path inclines downward 20 degrees. The line marked "C 30 degrees" indicates the movements of the teeth when the other adjustments are unchanged but the advancing condyle path inclines downward 30 degrees. The inclination of the line marked "C 40 degrees" indicates the movements of the teeth when the adjustments are as above except that the advancing condyle path inclines downward 40 degrees. It will be noticed that in the working bite the movements of the teeth are identical in all three of these inclinations.

In Fig. 107C the influence of the lateral inclination of the advancing condyle movement is shown. The line marked "L 0 degrees" is the path taken by the teeth when the downward path of the condyle is inclined 33 degrees, the vertical incisor path 40 degrees, and the advancing condyle moves forward only through the arc of a circle with the other condyle as the center. The lines marked "L 30 degrees," indicate the movements of the teeth when the other adjustments of the articulator are as mentioned, but the rotation points are so adjusted that the advancing condyle path inclines inward 30 degrees.

Fig. 107D shows two lower molar teeth with three lines drawn to lingual and three to buccal. The anterior and posterior lines in each group of three, indicate the extreme difference in direction and extent of tooth movement as affected by the adjustments in Figs. 107 A-B-C.

The middle line in each group of three represents the medium course between these extremes of movement. It is secured by a medium adjustment of an articulator, so that the rotation points are 10 centimeters apart, the advancing condyle path inclines downward at about 33 degrees and inward at about 16 degrees, and the incisor path inclines vertically at 40 degrees.

Prof. Gysi believes that such adjustments will meet the requirements of about two-thirds of all cases.

PERMIT DEEPER UNDERBITE OF LOWER INCISORS.

The lower incisors should generally be set far enough back of the upper incisors so that they are just out of contact with the uppers when the jaw is at rest in central occlusion. The depth of underbite to which they may be set, when in this position, is determined by the degree in which they move forward across the upper incisors, as the jaw moves laterally. The more strongly forward they move, the less may be the depth of underbite. The more sideways they move, the deeper may be the underbite.

The degree of forward movement of the incisors, in lateral movements of the jaw, is determined by the horizontal location of the rotation points. If the rotation points are located well inside the condyles, the incisors will pass strongly sideways, and may be set to a relatively deep underbite. If the rotation points are located at the condyles, the movement will be rather strongly forward, and the lower incisors can usually be set to only a very shallow underbite. If the rotation points are outside the condyles, the underbite will be extremely shallow. If one rotation point is inside the condyle and one outside, the depth of underbite will vary on different sides of the median line.

The movements of the incisors which determine the depth of underbite possible in these three conditions can be better understood by a study of the incisor movements in Figs. 100, 101, 102.

The average locations of the rotation points are one centimeter inside each condyle. That is, if the condyles are four inches apart, on the average, the rotation points would be a little over three inches apart. This position permits the articulator to reproduce the average lateral inclination of the condyle paths and of the incisor path. With the rotation points in this location, the lower incisors pass sideways and forward in a path which permits setting them to a deeper underbite than when the rotation points are as far from the median line as the condyles. The artistic effect of the deeper underbite is pleasing, and the more strongly inclined sideways path of the lower incisors seems less likely to dislodge the dentures.

INCREASE THE CUTTING POWER OF THE INCISORS.

The cutting power of the incisor teeth is determined not alone by the forms of the teeth and the power of the jaw, but in no small degree by the direction of the movement by which the lower incisors cross the uppers. The more directly the lower incisors move across the uppers, the less the cutting power. The more the lower incisors move sideways in moving across the uppers, the greater the cutting power. This is often important in artificial dentures, where patients frequently require the maximum cutting power possible.

The relative cutting powers of the straight forward movement and the strong lateral movement are diagrammatically shown in Figs. Nos. 110-11-12-13.

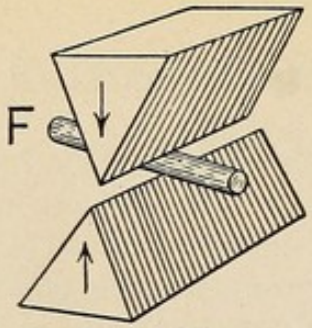


Fig. 110.

Upper and lower teeth set to only straight up and down movement may be diagrammatically illustrated by the two wedges here shown. It requires much force to push them through the food, shown as F.

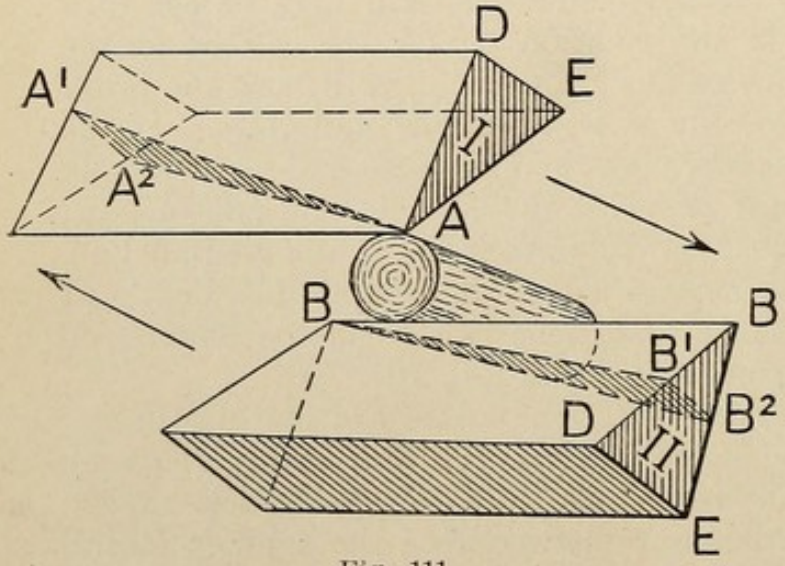


Fig. 111.

The sideways movement of the teeth may be here diagrammatically represented by two wedges and the food by the round body between them. If the wedges are forced vertically through, great pressure will be required.

If the wedges be moved in the direction shown by the arrows, very much less force will be required. The reason is that the cutting form of the wedges is changed. With this motion the form of the wedge is not the triangle formed by the lines A D E, but the much sharper triangle which is drawn inside each triangle and lettered A—A¹—A² in the upper, and B—B¹—B² in the lower.

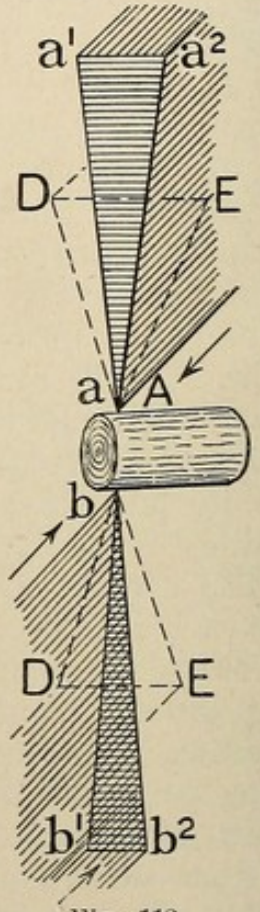


Fig. 112.

The dotted outlines reproduce the triangles A—D—E and B—D—E, while the solid outlines a—a¹—a² and b—b¹—b² reproduce the triangles A—A¹—A² and B—B¹—B² which were produced by the lateral movement of the triangles in Figure No. 111. The sharper triangles have about three times the cutting power of the triangles A—D—E and B—D—E.

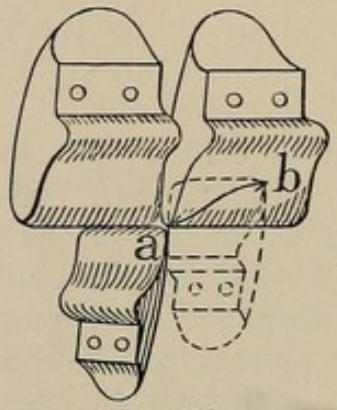


Fig. 113.

The left lower incisor at "a" is in the position of articulation with the upper right central. In cases with strong lateral inclination of the incisor path, it will return to occlusion, at "b" by following the direction of the arrow. This path of return permits a relatively deep underbite and great cutting power.

THE GYSI ADAPTABLE ARTICULATOR.

Figs. Nos. 114 and 115.

There may be several articulators which enable the dentist to record and reproduce the movements of the human mandible, but I am familiar with only one—the Gysi Adaptable Articulator.

The recording instruments which accompany this articulator permit the dentist to record the downward and lateral paths of the condyles and the horizontal path of the incisor point. The glenoid fossæ of the articulator are so arranged that the inward inclination of the lateral path of the advancing condyle, and the downward path can both be reproduced. By means of the pattern which is traced on the Horseshoe Plate, the horizontal location of the rotation points is easily determined.

This articulator offers a very important improvement over others in an Incisor Guide Incline on the lower model bow and a pin attached to the upper model bow which travels on the incline. This pin supports the anterior part of the upper model bow during lateral movements of the mandible. This support is important to correct movements of the incisor point and, as shown on page 157, the vertical inclination of the horizontal path of the incisors exercises a good deal of influence on the positions of the teeth as far back as the first molar.

The vertical inclination of this path on the articulator is much less than in the natural teeth, because, as Prof. Gysi has repeatedly pointed out, the construction of artificial dentures is an engineering problem, and should be executed in that manner which seems to promise the greatest degree of success under the working conditions. The Incisor Guide Incline slopes vertically at an angle of 40 degrees to the occlusal plane. But the Incisor Guide Pin moves diagonally across it, and the actual vertical inclination of its path is only 23 degrees.

When the movements peculiar to the patient have been reproduced, the teeth may be as easily arranged as on any other articulator.

The technic of using this articulator is not difficult after one understands the succession of steps and how to perform them. I believe it a conservative statement that this articulator demands not more than one hour additional time in the beginning of a case and less time in the final adaptation of a case than any other articulator with which I am familiar.

If one were to take 50 full denture cases and agree to make them comfortable and efficient for the patients, I believe it could be done in less time with this articulator than with even a plain line, because teeth arranged on this articulator rarely require any changes when tried in the mouth.

The service which this articulator makes possible to patients entitles the dentist to a higher fee than dentures made on other articulators because they cost more in time and money and are of greater value. The service is really cheaper to the patient at the advanced fee, because the improved comfort and efficiency of the dentures are of greater worth to the patient's health.

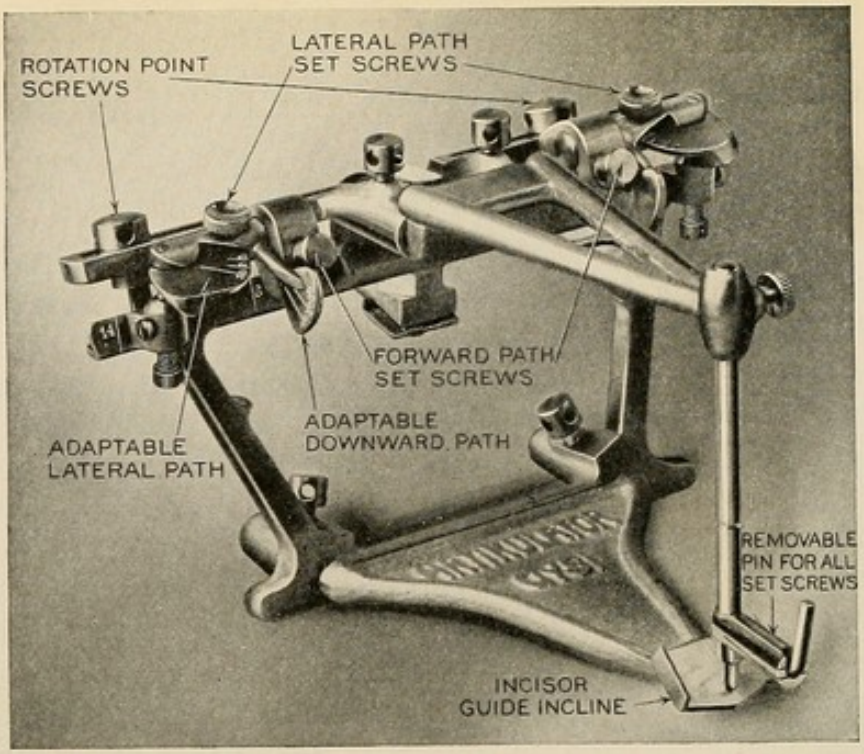


Fig. 114.
The articulating frame without measuring instruments.

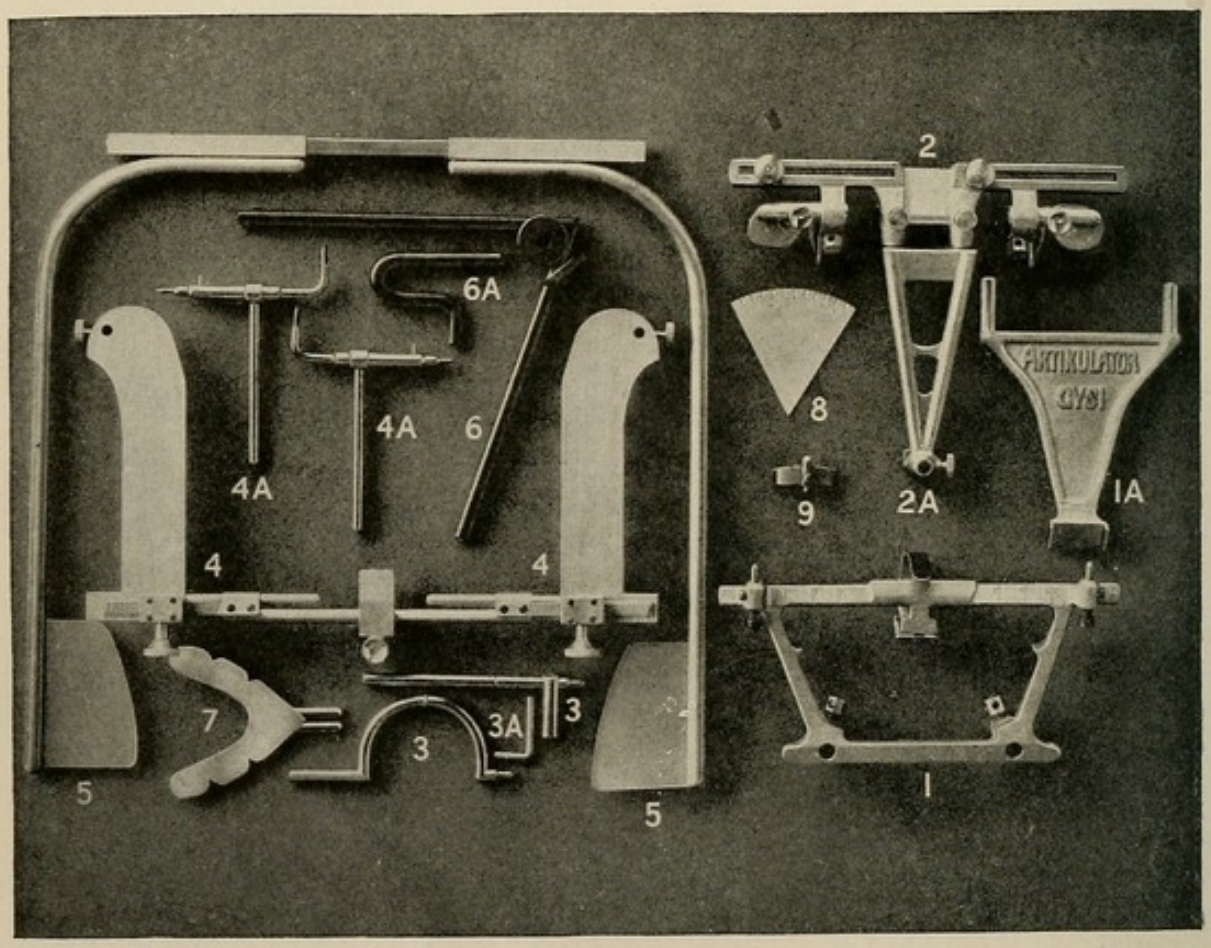


Fig. 115.

The parts of the Gysi Adaptable Articulator are as follows:

Nos. 1-2, upper and lower parts of articulator frame which carry the upper and lower model bows.

Nos. 1A and 2A, upper and lower model bows.

Nos. 3-3 Straight Incisor Guide Pin and Curved Incisor Guide Pin. The curved pin is used only when mounting models or setting anteriors.

No. 3A Small pin for all set screws.

Nos. 4-4 Frame work of Condyle Path Register.

Nos. 4A-4A Pencil holders and pencils of Condyle Path Register.

Nos. 5-5 Lateral Path Register.

Nos. 6-6A Stand and gooseneck for holding Condyle Path Register and models.

No. 7 Horseshoe plate.

No. 8 Degree plate for measuring inclinations of paths.

No. 9 Incisor Path Register.

THE GYSI SIMPLEX ARTICULATOR.

Fig. No. 116.

Soon after Prof. Gysi had perfected the Gysi Adaptable Articulator and its advantages became apparent, he was earnestly besought by many members of the dental profession to devise an articulator which should embody the principles of the Adaptable, but which did not require measurements on the patient and adjustments according to those measurements.

Prof. Gysi therefore perfected the Gysi Simplex, fixing the relations by the average inclinations of several hundred condyle and incisor paths which he had recorded by means of the Adaptable Articulator.

He employed the same form of condyle and fossa, but fixed the inclination of the downward path at 33 degrees and the lateral inclination of the advancing condyle path at 16 degrees. The rotation points were fixed half way between the heads of the condyles and the occlusal plane, and ten centimeters apart. The same form of Incisor Guide Incline and Incisor Guide Pin was employed. An Incisor Guide was placed on the Incisor Guide Pin so that if the dentist did not wish to employ a face bow for determining the relations of the models to the condyles, he could fix them upon the basis of the four inch triangle suggested by Dr. Bonwill.

I have now been familiar with this articulator for about two years and I have no hestitation in saying that in my opinion no other simple articulator approaches it in facilitating arrangement of the teeth in harmony with correct mandibular movements. If the inclination of the condyle paths and incisor paths and the horizontal location of the rotation points are not to be determined for each patient by accurate methods, it is better to employ the average of a large number of locations and inclinations determined by correct methods, than to employ methods which are inadequate or incorrect for determining them in the individual case.

Prof. Gysi is of the opinion that this articulator meets the requirements of about two-thirds of the cases as they present, though of course it does not indicate which are the unusual cases.

A clever American dentist has devised a method which I believe largely increases the usefulness of this articulator. He sets the upper teeth first and waxes them firmly in position. When he sets the lower teeth on the ridge, he places the pins of each lower tooth on a cone of hard wax and then surrounds the tooth with a softer wax. After articulating the teeth out of the mouth, he puts the upper and lower trial dentures, in wax, into the mouth and causes the patient to make gentle lateral movements of the mandible with the upper and lower teeth in contact. If this is carefully done, the lower teeth are rotated upon the cones of hard wax by the action of the uppers until they assume those positions which are most harmonious with the patient's jaw movements. He reports very satisfactory results.

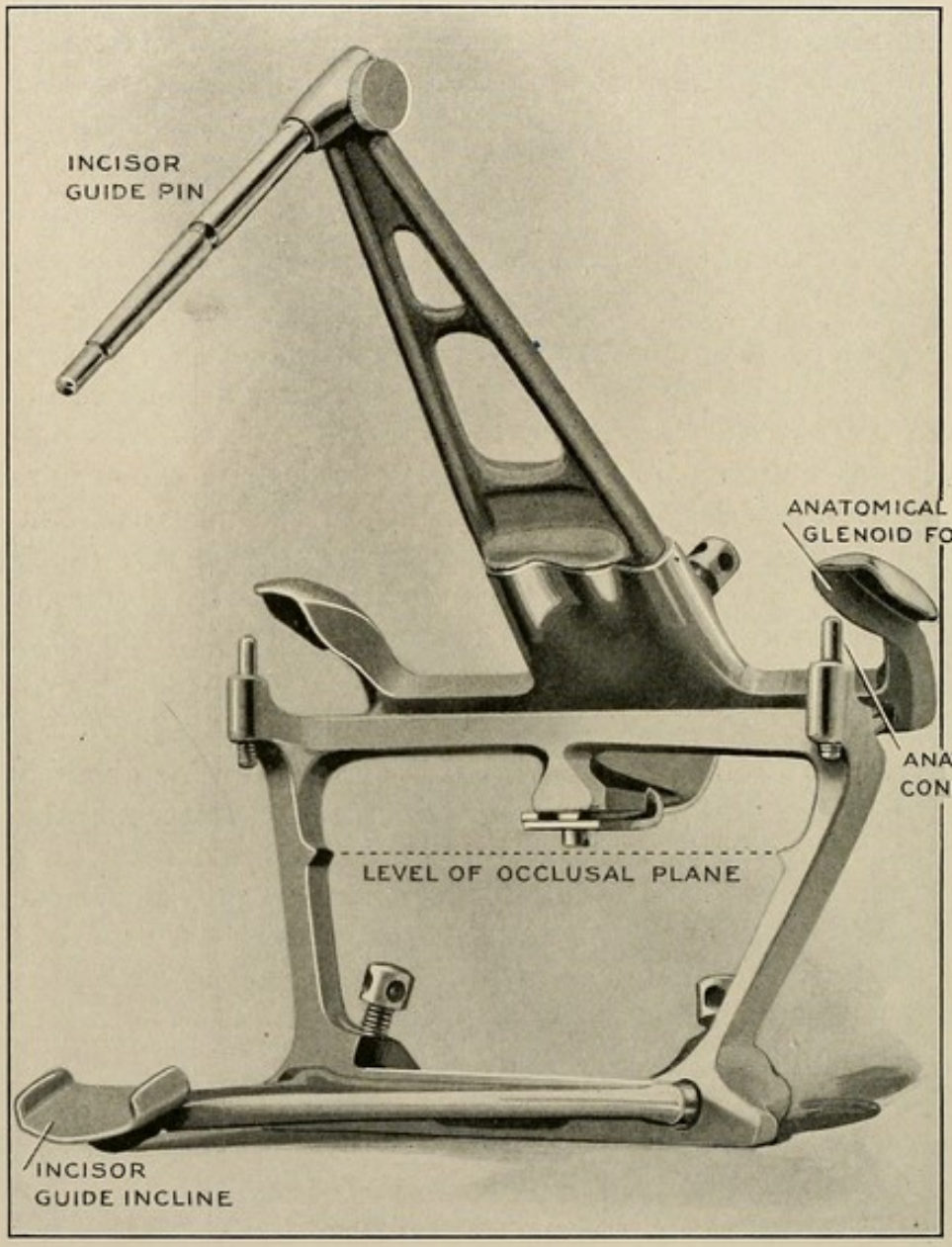


Fig. 116.

The Gysi Simplex Articulator Open.

The Gysi Simplex Articulator open showing some of the improvements which are important to all plate workers. The condyles are formed by upright steel pins working in properly formed glenoid fossæ which direct them downward at an inclination of 33 degrees and inward at an inclination of 16 degrees. The weight of the upper model bow is carried on the Rotation Points, shown in Fig. No. 117. The Incisor Guide Incline and Incisor Guide Pin secure for the anterior part of the upper model bow a more accurate movement than can be had when this form of support is lacking.

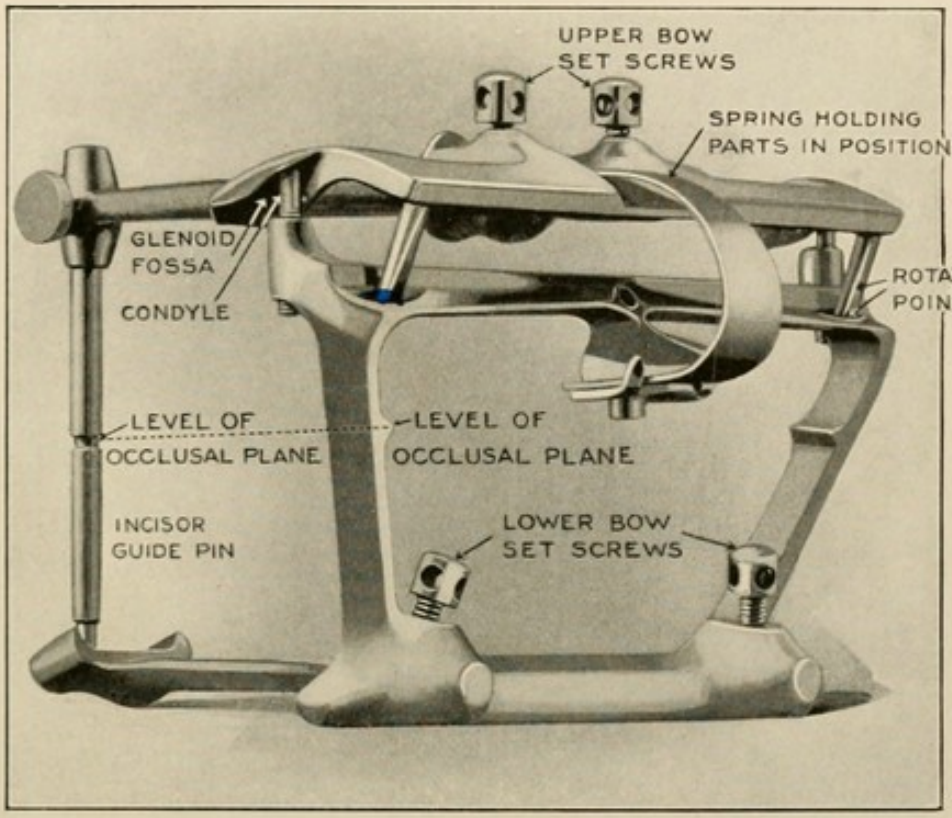


Fig. 117.

Rear View Gysi Simplex Articulator.

The vertical location of the rotation points half way between the heads of the condyles and the level of the occlusal plane is here clearly shown. This location permits the artificial mandible to perform correct opening and closing movements, so that the height of the bite may be altered without deranging the articulation.

The horizontal location of the rotation points, each one centimeter inside the condyle, is shown. This location is important because it permits the advancing condyle to describe an inward lateral movement of 16 degrees, and the other condyle to move out of the fossa in the way the natural condyle does. In other words, it permits the entire mandible to shift to the side in close imitation of the shifting of the natural mandible.

This horizontal location of the rotation points also imparts to the incisor point a more strongly lateral movement than occurs when the rotation points are at the condyles. This location permits a deeper underbite of the lower anteriors and increases the biting power of the teeth.

The Incisor Guide is not shown in this illustration but is shown in Fig. 116.

PART VI.

Mounting The Trial Plates On The Articulator

MEASURING THE PATIENT'S MANDIBULAR MOVEMENTS.

Figs. Nos. 118-119-120-121-122-123-124.

If the Horseshoe Plate was applied to the lower trial plate and the Incisor Path Register was mounted on the upper trial plate in the process of taking the bite, and the horizontal path of the incisor point of the upper jaw was registered as described on page 43, the taking of the other records of the patient's mandibular movements is very simple.

If the Horseshoe Plate was not attached to the lower trial plate at that time, it should be now. Before putting it into position, the portion of its occlusal surface anterior to the first indentation on each side is blackened by smoke from burning oil of cloves or vaseline on cotton, and a thin film of wax is spread over the blackened area with a hot spatula to make a place for a permanent record, or the plate may be coated with wax mixed with lampblack. The lower surface of the Horseshoe Plate is then pressed upon the occlusal surface of the lower trial plate so that the blackened area projects forward of the anterior margin of the lower trial plate, and that the whole Horseshoe Plate is evenly placed on the two sides of the median line of the trial plate, with the two bars projecting forward in that line, as shown in Fig. No. 118. Any elevations in the upper trial plate caused by pressure of the Horseshoe Plate should be trimmed away and a little vaseline rubbed on the Horseshoe Plate to facilitate movements.

The Incisor Path Register is mounted on the labial surface of the upper trial plate in such manner that the recording pin is over the median line, and that when the pin is all the way down it will press on the blackened area of the Horseshoe Plate. The position of this pin is controlled by a spring and a handle, and when not in use it should be lifted and turned so that the point does not rest on the Horseshoe Plate.

The heads of the condyles are located, either by feeling, or by measuring one-half inch forward from the tragus of the ear, on a line toward the outer corner of the eye. The location of the head of each condyle is plainly marked on the face.

Place both trial plates in the mouth.

The Condyle Path Register is placed in position by mounting it on the two bars projecting forward from the Horseshoe Plate as shown in Fig. 119.

The pencil holders at the rear terminations of the Condyle Path Register are turned so that the ends of the pencils which point vertically are about one-half inch from the sides of the face and opposite the marks locating the heads of the condyles. They are locked in those positions. See Fig. 119.

The patient is requested to move the mandible from side to side, keeping it in contact with the upper jaw. Some patients find it difficult to do this, and it is often necessary to instruct patients by standing in front of them and performing similar movements until they learn how. Patients who have worn occluded or poorly articulated dentures for long periods often lose all control of the jaw movements, and in some cases

is is quite impossible to make records of definite movements. In such cases the articulator should be set at average adjustments.

The frame supporting the glass or celluloid tabs and called the Lateral Path Register, is held about the head in the manner shown in Figs. No. 119 and 120, and so that the tabs are in contact with the ends of the vertical pencils. The frame is held at an inclination of about 40 degrees to the occlusal plane, and firmly supported in position by pressing the fingers on the sides of the head. It need not necessarily be held exactly straight front and back. As the pencils move, it can be noted whether the Register is so inclined that the pencils continue contact with it, and it should be inclined until the pencils maintain contact with it throughout the movement.

One lateral path may be recorded at a time, but it is then necessary to hold the Register so that when the pencil records the second lateral path, the pencil which recorded the first one is at the rear termination of the path. The Register must be held in the same front and back axis during the making of both records.

The dentist should not be discouraged if his first or second efforts do not afford the character of records he desires. Some patients are incapable of making them for reasons explained above or because of defects in the articulating mechanism. One patient who gave trouble in this respect was found to have sustained an injury to the joint thirty years before, which greatly limited its movement. There is also a slight technic, as there is to every operation in dentistry, and the dentist will be a much better master of it after one or two attempts.

When the records of the lateral paths of the condyles are sufficiently clear, the Lateral Path Register is laid aside, and the points of the horizontal pencils are placed opposite the heads of the condyles as in Figure No. 121. They should be firmly locked in this position since they are to serve as guides for mounting the models in correct positions on the articulator.

When the pencils are in proper positions, a visiting card is placed between one pencil and the side of the face so that its lower edge is parallel with the broad plate supporting the pencil holder. This makes the lower edge of the card parallel with the occlusal plane of the trial plates. With the card in this position, the thumb screw controlling the horizontal position of the broad plate is turned until the spring behind the pencil is about half compressed by pressure of the pencil against the card. The patient is then asked to make lateral movements of the mandible with the jaws in contact, or if this is not possible to make vertical opening and closing movements. The card is held steady until three or four movements have been made. Some patients record very uncertainly at first, but after a few moments, settle into the record of a definite path. In a few cases, the records are so indefinite as to have no value. In such cases it is necessary to employ average adjustments. See Fig. No. 122.

(Continued on Page 178.)

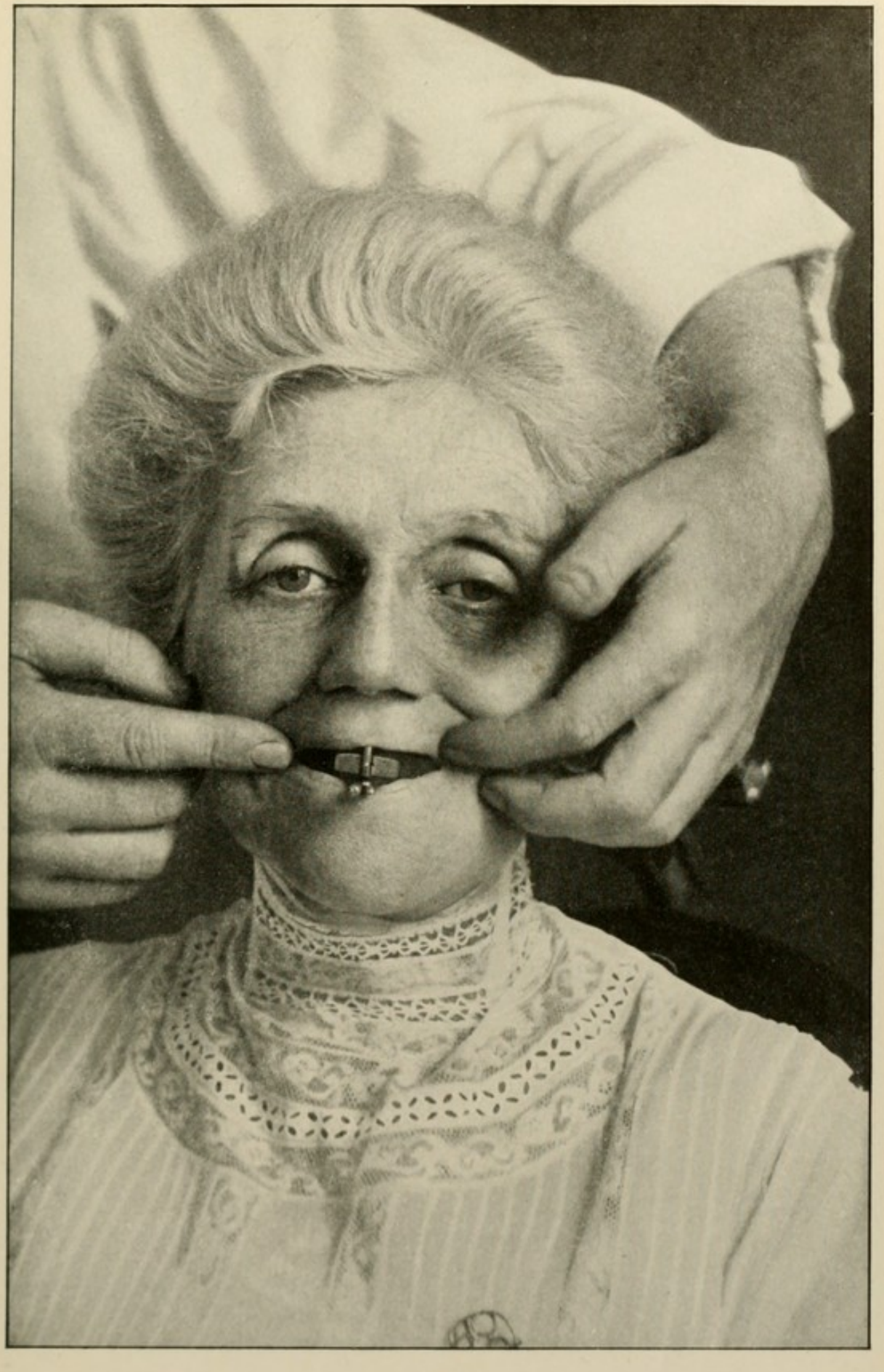


Fig. 118.

The Incisor Path Register and Horseshoe Plate in Position.

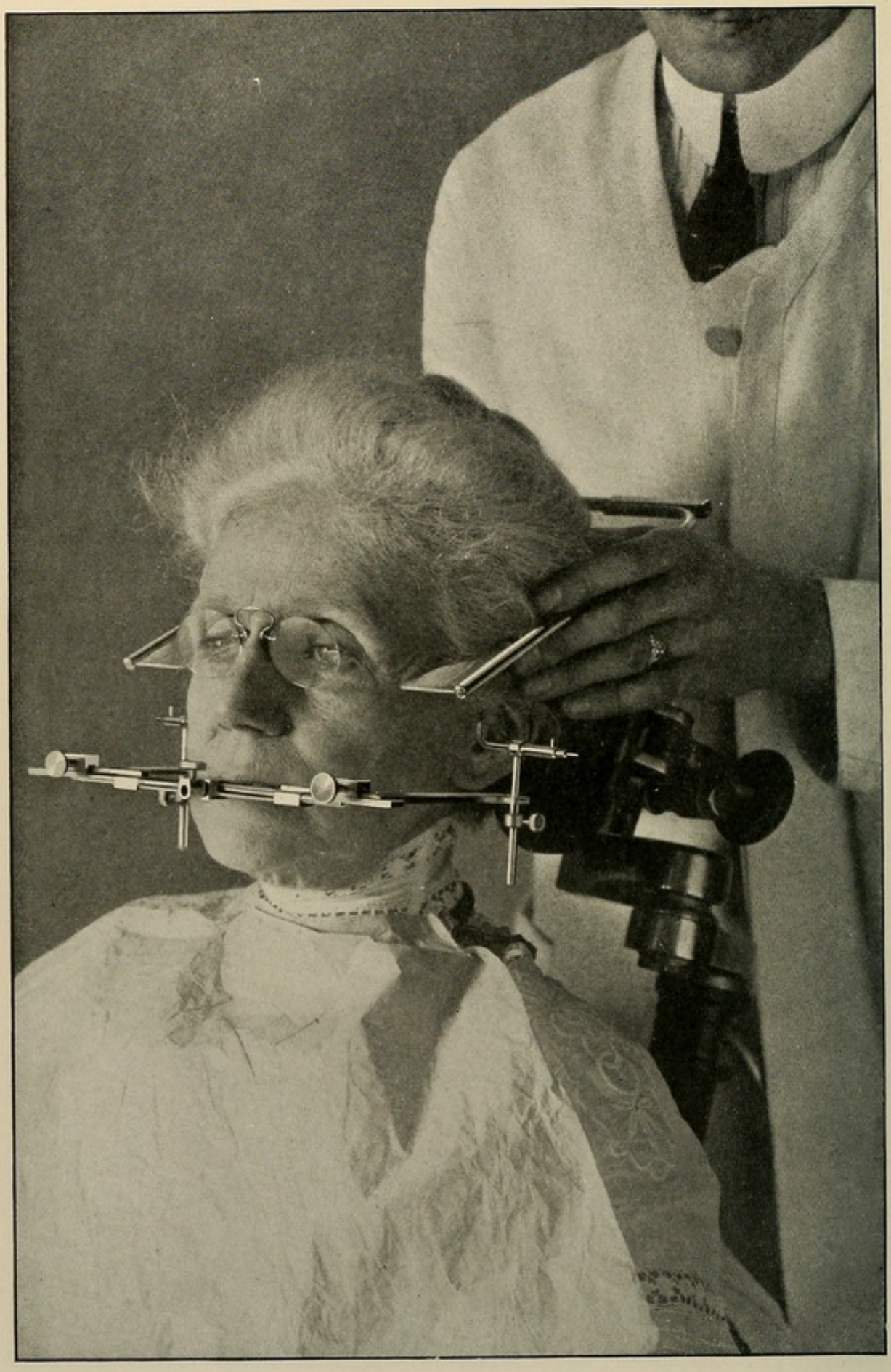


Fig. 119.

Vertical pencils adjusted in position. Lateral Path Register approaching position. One method of holding steady.

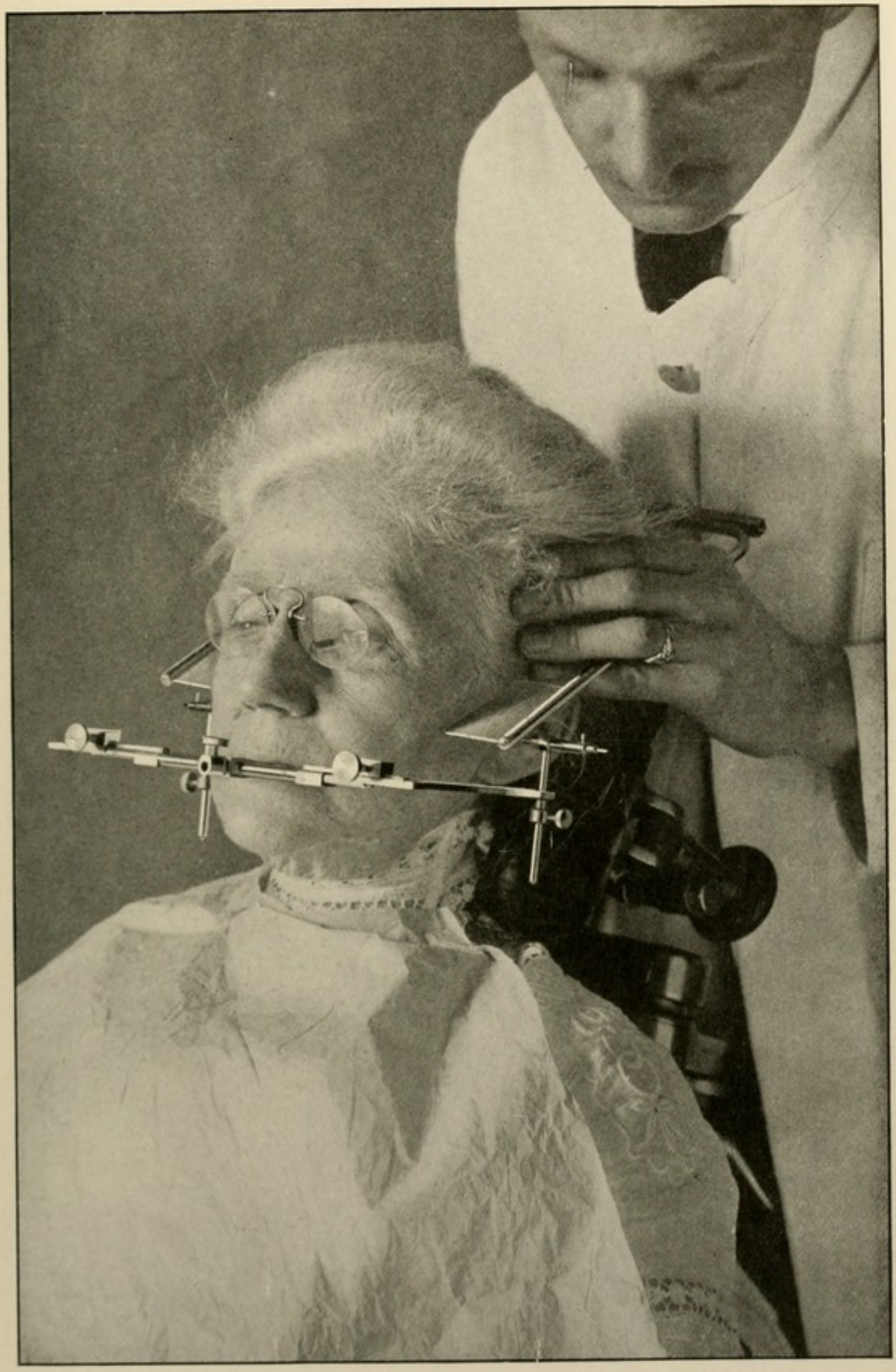


Fig. 120.

Lateral Path Register in contact with pencils. Another position for holding register steady.

Fig. 121.

Horizontal pencils in position and firmly locked.

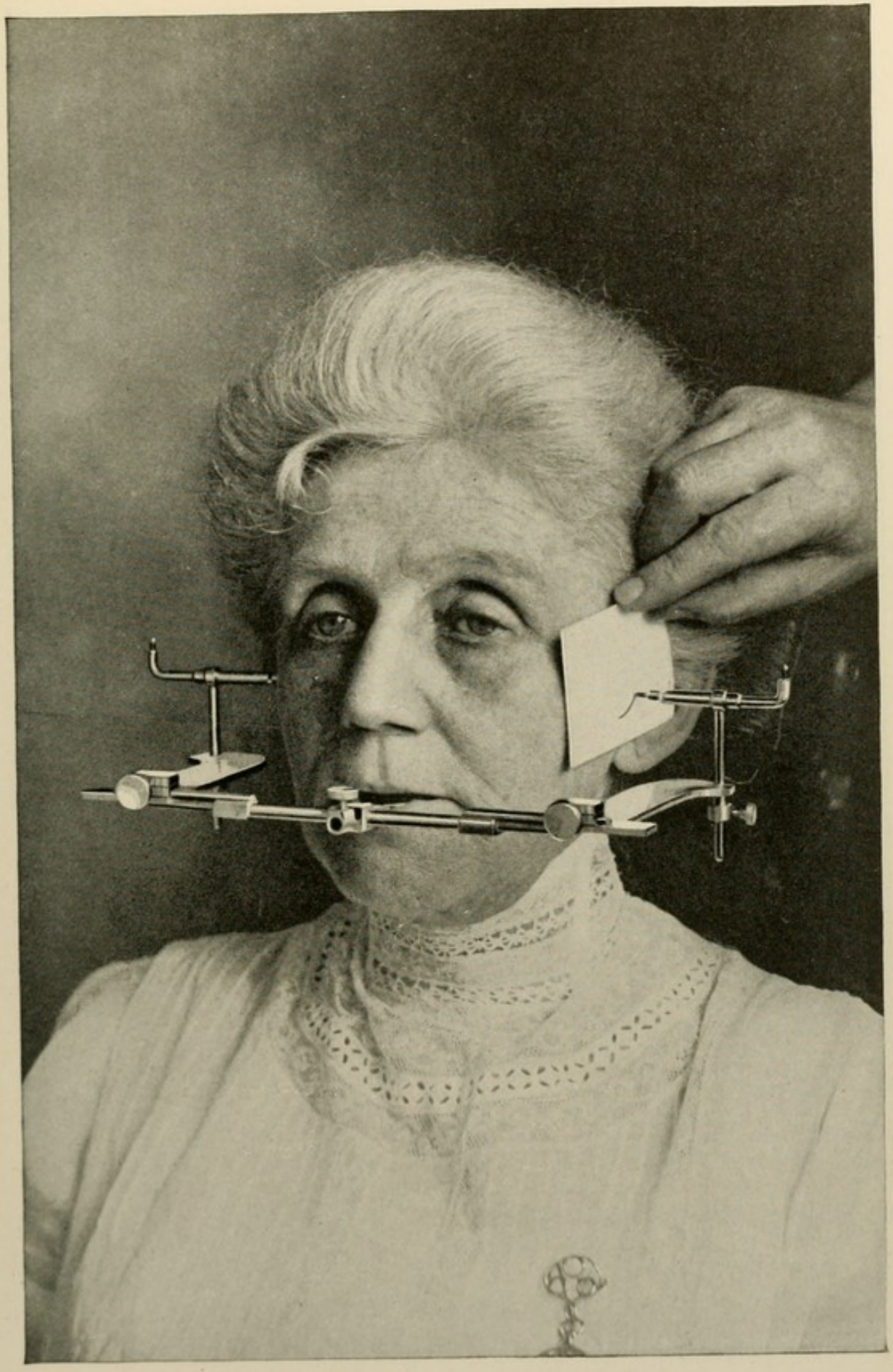


Fig. 122.

Recording the Forward Path of the Condyle.

Fig. 123.

Incisor Path Register recording horizontal path of incisor point. When the operator is sufficiently skillful, this path may be recorded at the same time as the lateral path.

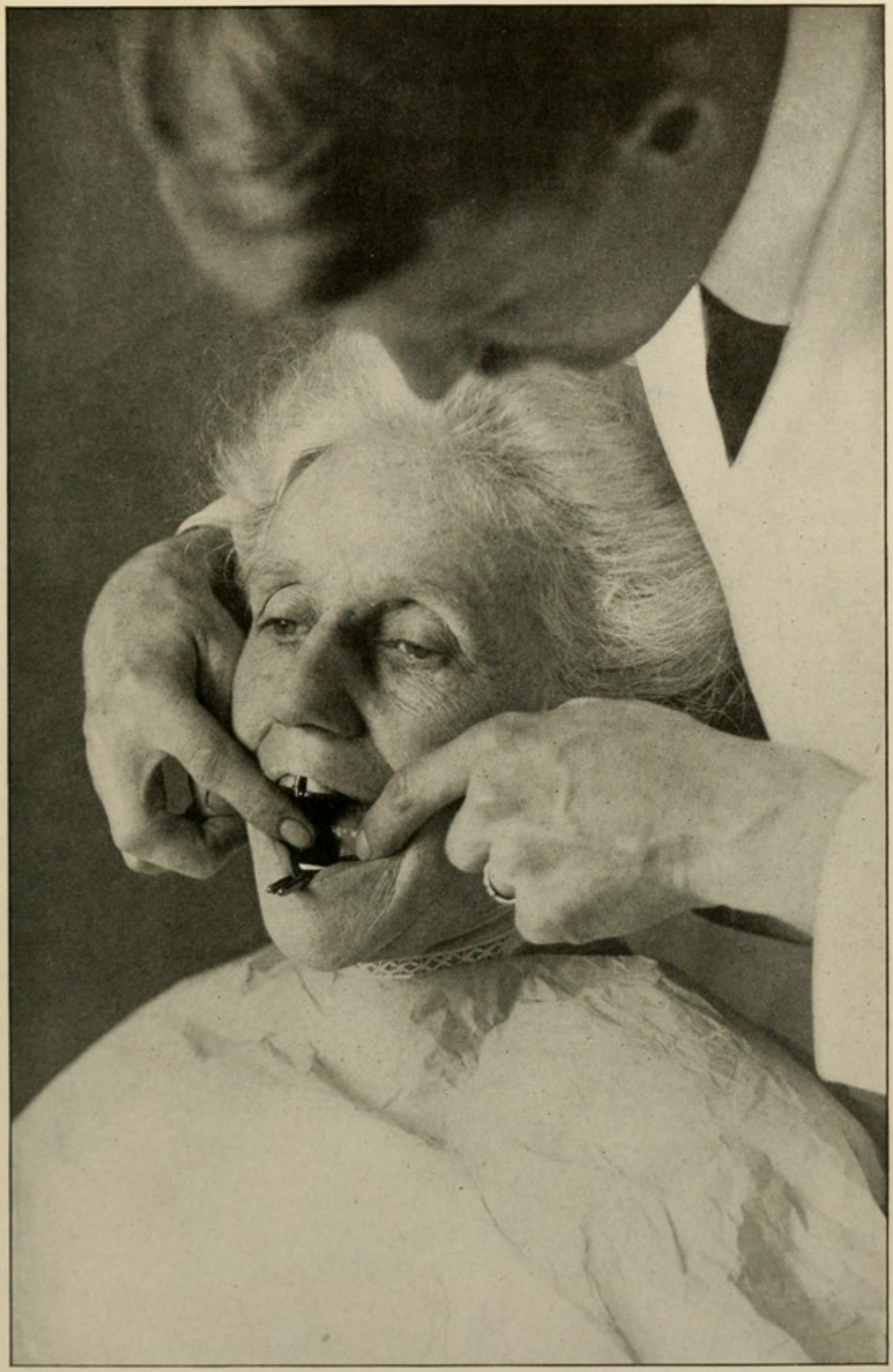


Fig. 124.

An incisor path idealized for purposes of illustration.

(Continued from Page 170.)

When the record of one condyle path has been obtained in this manner, the other end of the card is employed to register the other condyle path in like manner. The card is laid aside with the Lateral Path Register, for future use. It is important to mark the paths "right" and "left" to avoid confusion later.

The Condyle Path Register is now removed from the Horseshoe Plate and the pin of the Incisor Path Register is released so that it can record upon the blackened area of the Horseshoe Plate. The patient is caused to make lateral movements of the mandible, with the trial plates in contact, and the pin will trace a record in the black wax. Sometimes this record will be very indefinite; at others its margins will be sharply defined. Only a few intelligent movements are necessary.

If the Incisor Path Register was mounted high enough above the Horseshoe Plate so that the pattern traced by the pin can be watched, the dentist may gain useful information. In ninety-nine cases out of a hundred the pattern traced in the wax will have a round point as long as the lower jaw is projected forward from its natural position of rest, and a sharp point when the jaw is in a position of rest. This is very important.

When the pattern is satisfactory, or is as good as can be gotten, the patient is allowed to rest a moment so that the point of the pin is in the point of the pattern it has traced. Marks are made vertically across both trial plates indicating their relative positions, or better still, staples are inserted into the buccal surfaces of both plates fastening them in correct positions.

The trial plates, with the Horseshoe Plate and Incisor Path Register in place are then removed from the mouth.

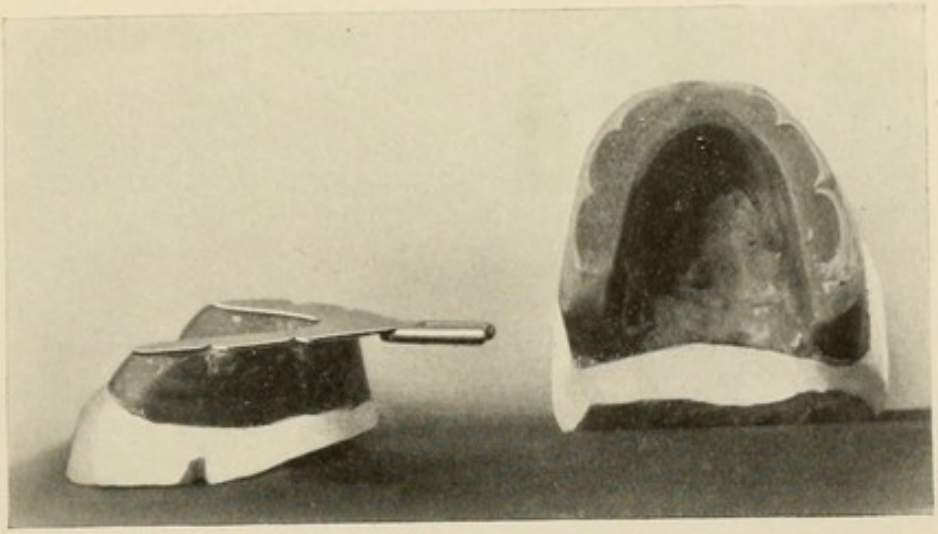


Fig. 125.

On the left, the lower trial plate with the Horseshoe Plate properly mounted. On the right, the upper trial plate which has been pressed down upon the Horseshoe Plate and built up in places and pressed down again until the pressure is even all around. It is important to have this pressure even. Before recording the condyle paths the festoons made by the Horseshoe Plate must be trimmed away, leaving a plane surface. A little vaseline is applied over the surface of the Horseshoe Plate.

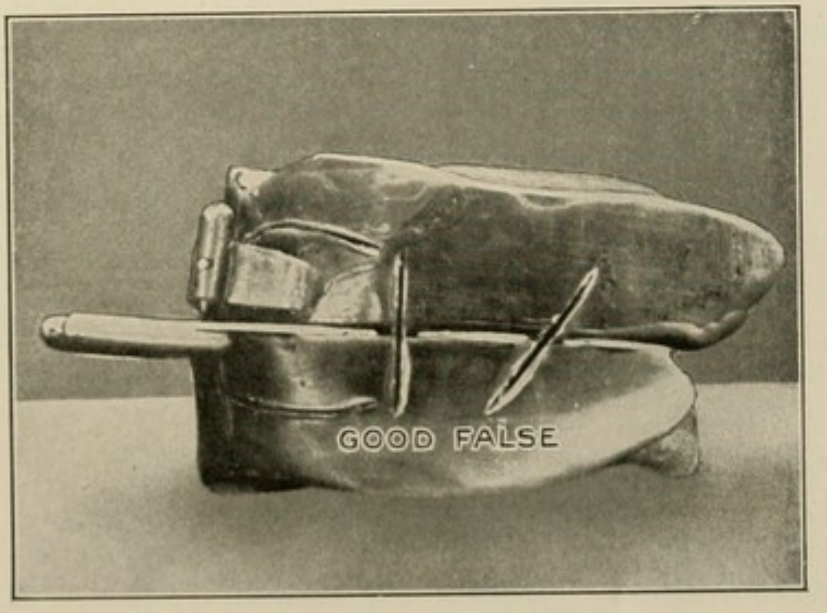


Fig. 126.

Upper and lower trial plates positioned by Incisor Guide Pin in pattern on Horseshoe Plate and marks on buccal surfaces. Correct vertical marks and incorrect sloping marks shown.

DETERMINING THE INCLINATIONS OF THE LATERAL PATH OF THE CONDYLE.

Figs. Nos. 127-128.

If the lateral paths of the condyles were properly recorded, there may be visible a spot, near the beginning of each path, where the line seems to have started and from which it has gone a little backward and then a much longer distance forward. This spot is visible only when the rotation centers of the human jaw are "inside the condyles," a fact which cannot be determined at this time.

If such a point is present on each lateral path, a straight line is drawn from the point in one path to the similar point in the other path, by aid of a ruler. This line serves as a base line for the calculations that are to be made.

If no such point is present in either path, a ruler is laid touching the beginnings of both lines, and a line drawn across each path like the line A-B in Fig. No. 127. This is the base line.

The fact that the base line is drawn in this manner from the beginning of one path to the beginning of the other, makes it unnecessary to hold the Lateral Path Register in any particular front and back line about the head when recording these paths.

By means of any object presenting a right angle, such as a visiting card, a perpendicular line is erected on the base line at the point where it crosses each lateral path. The tracing of the lateral path is now prolonged by laying a ruler along its central part and carrying the line out to the end of the tab. The Degree Plate which accompanies the Gysi Adaptable Articulator, is now laid with its 0 degree side along the perpendicular erected on the base line, and the line of the lateral path is prolonged with any convenient object until it crosses the edge of the Degree Plate. The inclination of the lateral path in degrees may then be read off and recorded for future use. Such records should be made in a permanent form as they are often found useful at future dates.

The inward inclination of the advancing condyle path may vary from 2 degrees or 3 degrees in a few cases, to 30 degrees or more in a few cases at the other extreme. The average inclination of a large number of records is 16 degrees.

The stationary condyle often records a short but well defined path which generally leads outward from the median line, and may be inclined either forward or backward. This path is of no known significance except as a testimony that the centers of movement of the human mandible are not in the condyles, but that lateral movements of the chin are often or always accompanied by a shifting of both condyles, the chin and all intervening points, to the same side as the chin. It is an evidence of Prof. Gysi's wonderful power of analysis that in both the Adaptable and Simplex Articulators, the artificial mandible can make this form of lateral motion.

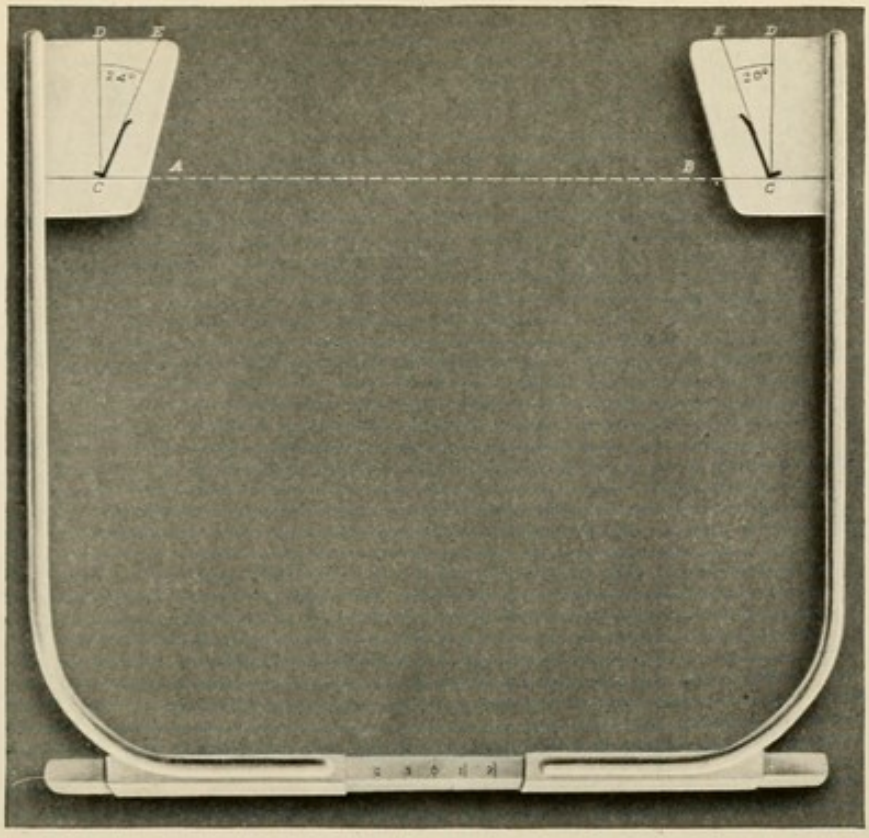


Fig. 127.

Lateral condyle paths recorded and strengthened. A-B line drawn from "resting point" in one path to "resting point" in the other, and perpendiculars erected at these points. Angles may be measured with the Degree Plate used for measuring forward paths.

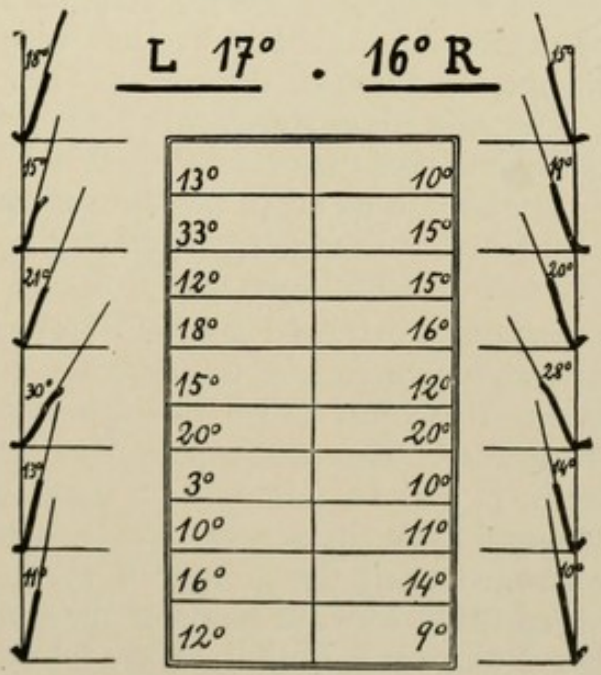


Fig. 128.

Six pairs of condyles have their **inward lateral movements** recorded in the tracings. Ten other pairs have their degrees of inward lateral movement recorded in the central columns, but the tracings are not given. The average inward movement of these 16 pairs of condyles is 17 degrees for the left condyle and 16 degrees for the right.

MEASURING THE INCLINATION OF THE DOWNWARD CONDYLE PATHS.

Figs. Nos. 129-130-131.

The downward paths of both condyles are recorded on the visiting card and each is marked with an initial showing its proper side of the head.

A line is drawn along the center of each path, ignoring both ends if they are much curved, and prolonged to the base line of the card. The Degree Plate is laid with its 0 degree side along the base line of the card and its sharp angle at the point where the line through the condyle path joins the edge of the card. The point where the line crosses the degree measurements on the Degree Plate will indicate the number of degrees that the path is inclined to the occlusal plane.

Both paths are measured in this way and the degrees of inclination are noted by the initial indicating the side. As mentioned in Part 1, all these factors should form part of a permanent record of each case.

ADJUSTING THE ARTICULATOR TO THE CONDYLE PATH INCLINATIONS.

At the points marked "Lateral Path Set Screws" in Fig. No. 114 will be found set screws which govern the lateral inclination of the artificial glenoid fossæ. If these screws are loosened, the plates forming the roofs of the fossæ and marked "Adaptable Lateral Path" may be turned until the inward wall of the fossa has been inclined to the median line the number of degrees indicated in the lateral paths, by means of the figures on the upper surfaces of the plates. For lack of space for numbers, the Fig. 1 on this plate stands for 10 degrees, Fig. 2 for 20 degrees, etc. These adjustments should be made for both sides and the screws tightened. Care should be taken not to confuse the sides, since it is very easy to mistake the left for the right unless the articulator is held before one, with the incisor point forward.

At the points marked "Forward Path Set Screws," in Fig. No. 114 will be found set screws which control the downward inclination of the glenoid fossae. If the little pin which projects from the base of the Incisor Guide Pin marked "Removable Pin For All Set Screws" be taken from its sheath, it will be found to fit the hole pierced through each of these screws, and by it the screws may be loosened. The plates may be turned downward until the pointer is at the inclination indicated by the records of the downward paths of the condyles on the plate marked "Adaptable Downward Path." Care must be taken not to confuse the sides, in cases where they are different.

The record of the horizontal path of the Incisor Point cannot be used until the models are mounted on the articulator. It will then be used to determine the horizontal positions of the Rotation Points.

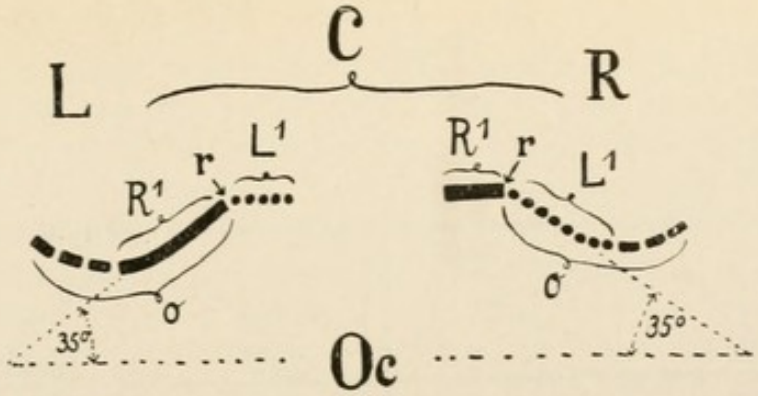


Fig. 129.

(From The Dental Cosmos.)

Analysis of right and left condyle paths as secured by the method shown in Fig. 122, C, Condyle path. L, Left. R, Right. Oc, Plane of occlusion. 35°, Angle of middle part of path to plane of occlusion. r, Resting position of condyle. R¹, Path of condyle in a right lateral movement. L¹, The same in a left lateral movement. o, Forward bite or wide opening and closing movement.

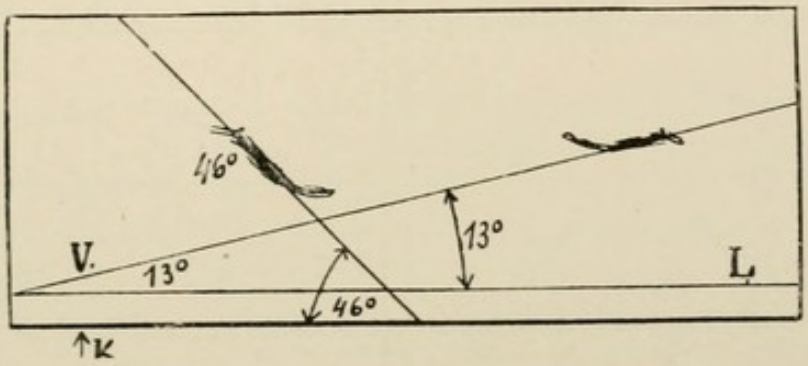


Fig. 130.

Lines drawn through the central portions of forward paths of condyles.

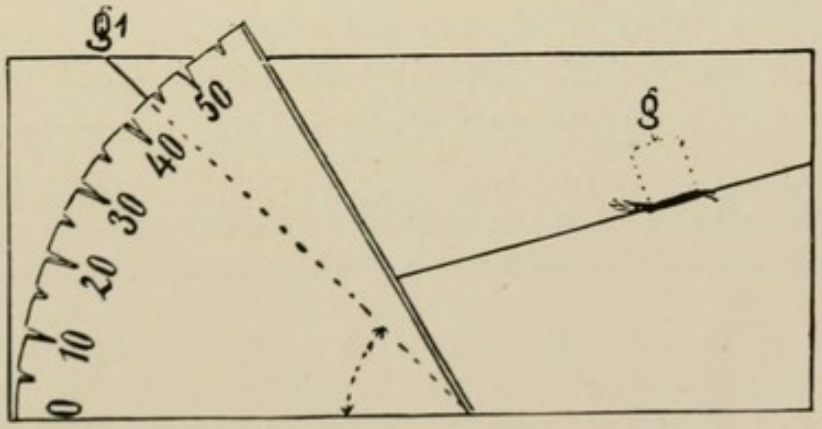
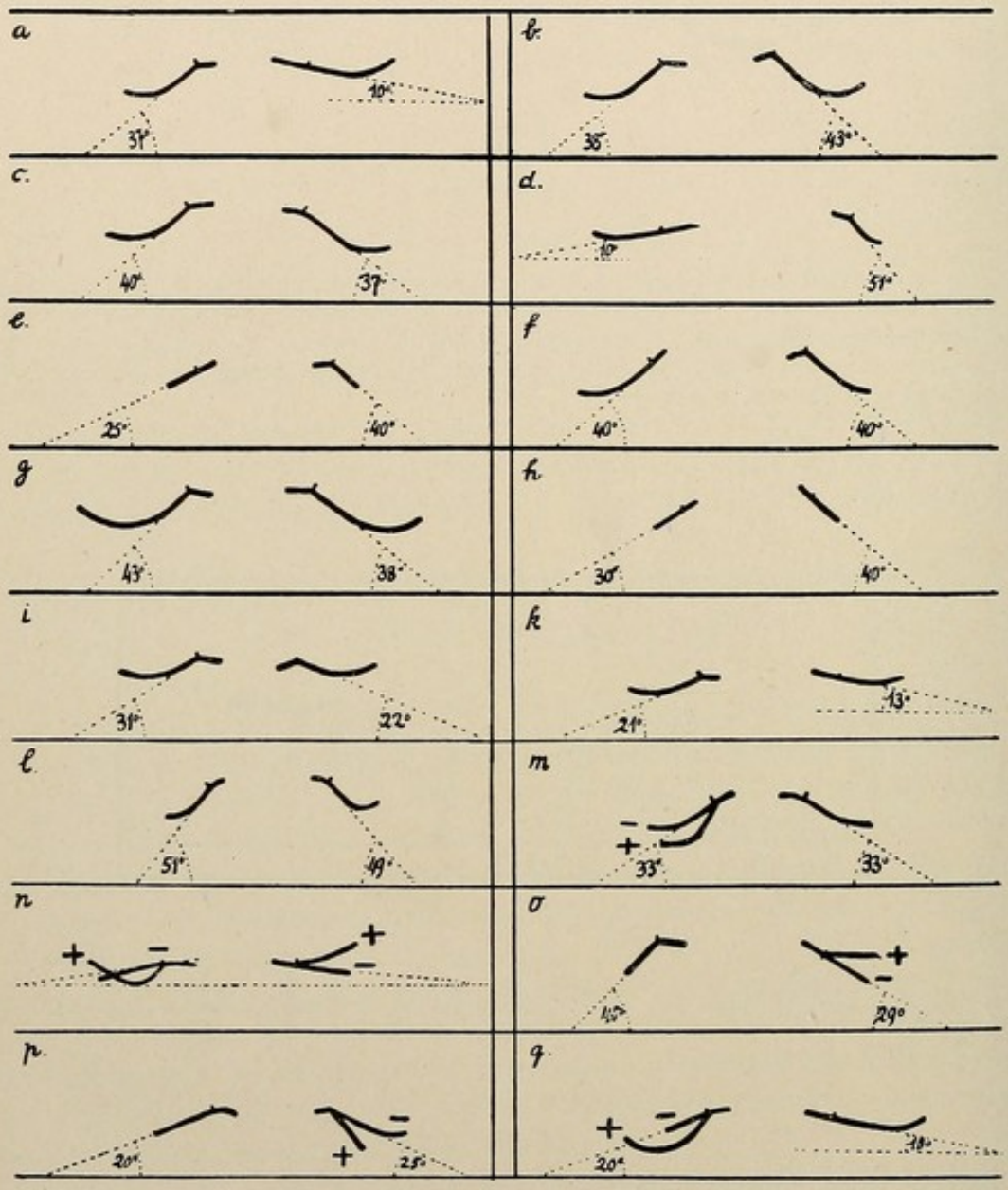


Fig. 131.

Measuring two paths similar to those shown in Figure No. 130.



(From The Dental Cosmos.)

Fig. No. 132. Typical Forward Condyle Paths.

The paths "a" to "i" inclusive show differences in form and slant of the right and left paths in the same patient.

The paths "m" to "q" show that other differences in form or slant may occur between the path of the opening movement and the path of the lateral movement of the mandible.

The path of the lateral movement alone has value in the articulation of artificial teeth.

POURING THE MODELS.

The material of which the models are made and the manner of pouring may have a great deal to do with the fit of the dentures.

It is my custom to cause the rugae on the palatal surface of the impression to be deepened by carving and to have the models poured with Spence's plaster. I am indebted to Dr. Tench for the following technic which we regularly employ and which yields as fine models as I have ever seen.

The compound impression is given a thin coat of either sandarach or shellac varnish. This is allowed to dry and is followed by a coating of a water solution of silex (water glass). This also is allowed to dry.

Put from one to one and one-half ounces of water into a clean plaster bowl and slowly add the plaster by sifting it from the blade of a spatula, at the same time lightly jarring the bowl on the bench to hasten saturation. Continue adding plaster until no free water can be seen. Then spatulate the mass against the side of the bowl, occasionally adding dry plaster till the mass becomes too stiff to work easily. As it sets very slowly, no special haste is necessary.

Turn the contents of the plaster bowl out on a glass slab and spread it into the form of a layer about 3-16 inches thick, by a quick tapping motion of the spatula. This helps to eliminate air bubbles and improves the mix.

Test the consistency of the mix by shaping some of it into a cone and standing it on the slab. If it is as resistant as fairly thick putty and retains its shape, it is ready for use. If it is too thin to retain its form, sprinkle dry plaster over the mass and incorporate it by the same tapping motion used for forming it into a slab.

If a smooth model is desired, this plaster should never be mixed so dry that the surface will not glaze when it is spread out and patted as described.

Carry a strip of the material about ½ inch wide to the depression formed by the alveolar ridge, and pack it, glazed side down, by a quick tapping motion with the ball of the index finger, working from the center of the strip toward the heel of the impression. When the material is in place, jar the impression on the bench until the surface of the plaster glazes. Add another portion of plaster to that already in position by building it on, and patting and tapping in the same way. In this way the palatine surface of the impression may be covered, working from ridge to center.

The model should be built up until it is about ¼ of an inch thick at its thinnest place. The margins of the model should be shaped to be vertical while the material is soft, since it can be trimmed only with difficulty after it has set. These margins should be flush with the labial and buccal surfaces of the impression.

The lower model is packed in the same manner except that a bridge of base plate wax is formed to cover the opening in the center of the mouth occupied by the tongue. Plaster is built over this, in the same manner as in the upper impression. The resulting model is much stronger than it would be if the center were left open.

THE RELATIONS OF THE INCISOR POINT TO THE CONDYLES.

I believe it to be important to mount the trial plates so that the incisor point is at the same distance from the artificial condyles that it is from the natural condyles in the patient for whom the dentures are intended. I believe it to be well also that the occlusal plane shall be at the same distance below the level of the condyles as in that particular patient. Both of these ends may be easily achieved.

It was shown on page 153 that the horizontal distance between the condyles had little effect on the forms of the teeth or the depth of the bite. It has less influence on the movements of the teeth, because the condyles are not the centers of movement. But if the trial plates are mounted at the right distance from the condyles, they must be at right distances forward from the rotation points also. And that comes much nearer the re-establishment of the mandibular triangle for that patient, than the mounting of the trial plates by chance. The more nearly the mandibular triangle is reproduced, the more nearly correct will be the incisor movements of the trial plates, and the more comfortable and efficient the dentures will be. The movements of the incisor points are, as has been explained, the most important of the denture movements, because if they are correct, the movements of the other parts are nearly sure to be right.

There is another important reason why the trial plates should be mounted on the articulator in right relations to the condyles. It is that the triangle formed by the two condyles and the incisor point, commonly referred to as "Bonwill's triangle," is rarely symmetrical; that is, it is rarely four inches on a side. The incisor point is often so far to one side of where Bonwill's measurements would bring it, that it may make considerable difference as to whether or not it is correctly located.

The illustrations on the opposite page, from Dr. Frahm's article in The Dental Cosmos of May 1914, illustrate not only the difference in size of different human mandibles, but the fact that the triangles erected on the bases of different human skulls are often not equilateral, as Bonwill thought, and that the incisor point is often considerably at one side of the point where Bonwill located it.

The trial plates may be mounted on the articulator so that the incisor point is at the right distance forward of the condyles and the occlusal plane is at the right distance below the condyles, and the incisor point is in the horizontal position peculiar to that patient, by the use of the Condyle Path Register accompanying the Gysi Adaptable Articulator, or the Snow Face Bow which may be used with the Gysi Simplex Articulator.

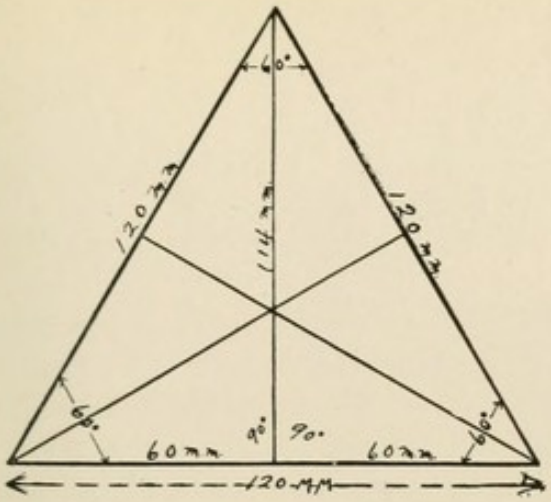


Fig. A.
Theoretical equilateral triangle.

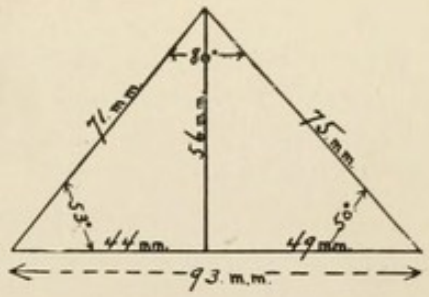


Fig. B.
Not four inches on a side and not equilateral.

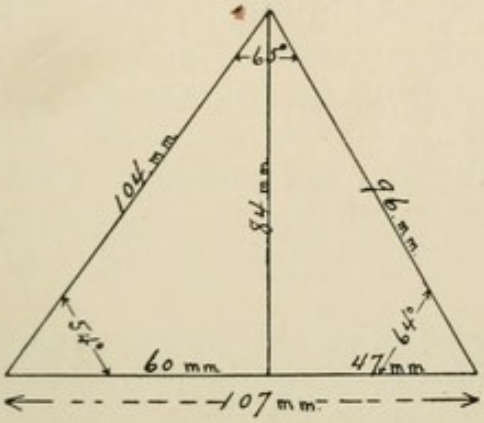


Fig. C.
Incisor point at right of middle of base.

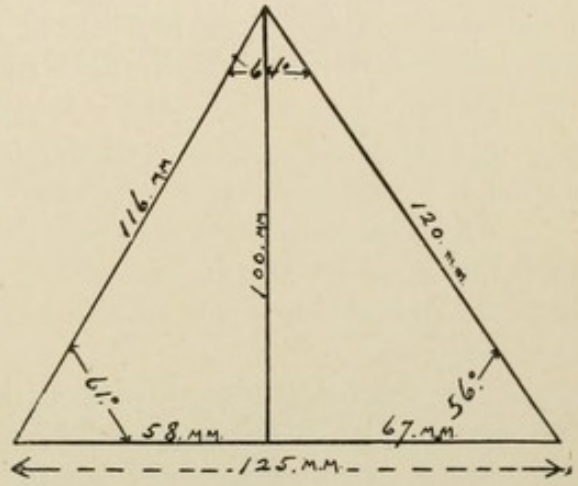


Fig. D.
Incisor point at left of middle of base.

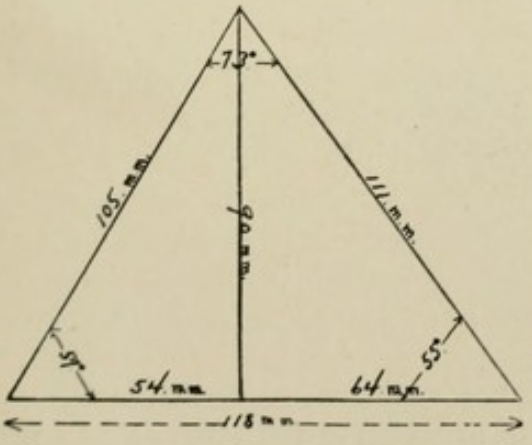


Fig. E.
Incisor point at left of middle of base.

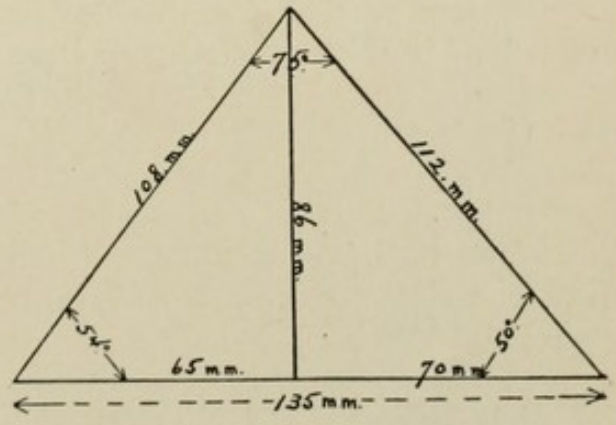


Fig. F.
Far from equilateral.

Fig. 133.

Dr. Frahm's drawings showing that the mandibular triangle is not equal sided and that the incisor point is often not in the median line of the base. (From the Dental Cosmos.)

MOUNTING THE MODELS ON THE ADAPTABLE ARTICULATOR.

Fig. No. 134.

When the models are ready for mounting, the Condyle Path Register is mounted on the Gooseneck and its holder, see Figs. Nos. 115 and 134, by fitting the hole in the front of the block on the Register over the end of the Gooseneck.

The models are put into the trial plates and preferably fastened there by the application of wax along the margins of the trial plates. The tops of the models are soaked in water to facilitate attachment to the model bows. If the trial plates were not fastened together in correct relations, as described on page 178, they are now placed in right relations by locating the pin of the Incisor Path Register in the apex of the pattern traced on the Horseshoe Plate, and bringing the marks across the buccal surfaces of both trial plates into right relations. These relations will be much more easily established if the marks have been made vertically after the manner marked "good" in Fig. No. 126. When the trial plates are in right relations, they are fastened so by warming the wax at their occlusal edges, or by putting staples into the buccal surfaces or by passing a cord around both.

The Horseshoe Plate, with the trial plates and models attached, is now mounted on the inside of the Condyle Path Register, by thrusting the two projecting arms of the plate into the two holes in the block of the Register.

The curved Incisor Guide Pin, (part 3, Fig. 115) is now placed in the opening in the upper model bow, with the top of the pin flush with the top of the opening. The Gooseneck, with its attachments is moved until the ends of the horizontal pencils are opposite and equally distant from the ends of the condyles. These vertical relations can be attained by raising or depressing the Gooseneck in its holder. The plates supporting the pencil holders must not be moved.

Plaster may be poured onto the upper model attaching it to the upper bow in these relations, or the Gooseneck and attachments may be moved away and plaster poured over the lower model bow and the Gooseneck replaced so that the pencils are in right relations. If the plaster is poured over the upper model first, it will be necessary to invert the articulator and models when the plaster is hard and attach the lower model to its bow. If the lower model is moved into the plaster on the lower bow, it is necessary only to pour plaster on the upper model and let all harden.

DETERMINING THE HORIZONTAL LOCATIONS OF THE ROTATION POINTS.

Fig. No. 135.

When the models are firmly attached to the model bows, remove the Gooseneck and Condyle Path Register. Loosen the trial plates so that

(Continued on Page 190.)

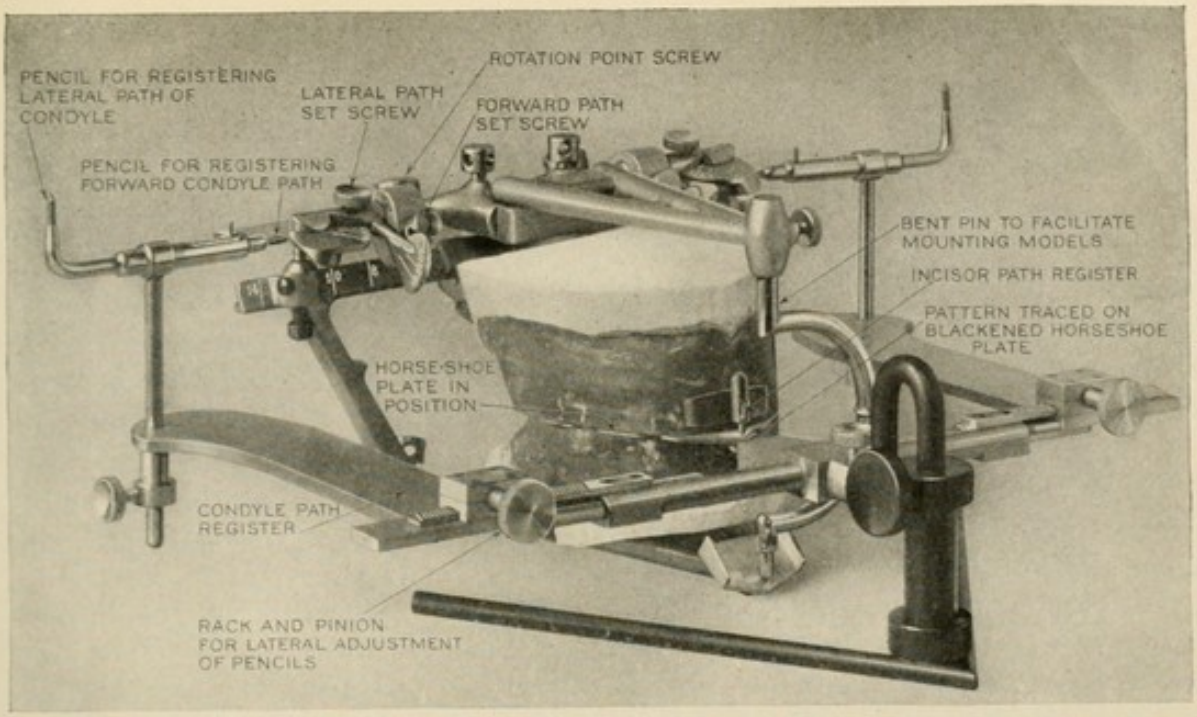


Fig. 134.

Mounting the trial plates and models by means of The Condyle Path Register, and the bent Incisor Guide Pin.

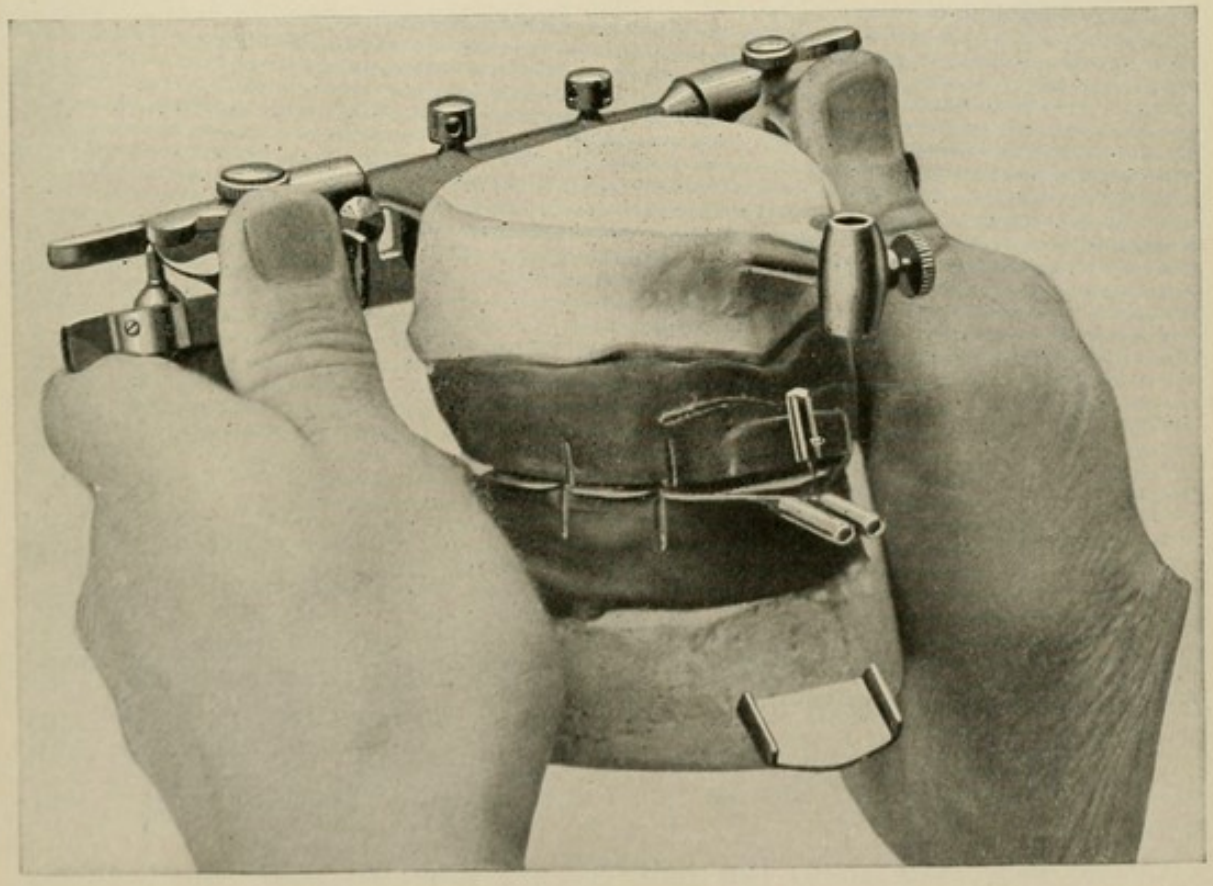


Fig. 135.

Locating the Horizontal Position of the Rotation Points.

(Continued from Page 188.)

one can move on the other. Lift the Incisor Path Register Pin from the Horseshoe Plate. Push both Rotation Points as near the median line as possible. Move the upper model laterally and see if the center of the Incisor Path Register follows the outline of the pattern on the Horseshoe Plate. Move the Rotation Point in action for that movement outward until it does follow, and lock it in that position. Adjust the other Rotation Point so that the Incisor Path Register follows the other side of the pattern on the Horseshoe Plate. Then lower the pin of the Incisor Path Register and make sure that it follows the margins of the pattern as closely as possible in both lateral movements.

If the pattern on the Horseshoe Plate was unlike on the two sides of the median line, the Rotation Points will be unequally distant from the median line.

The articulator and trial plates are now ready for the teeth.

ATTACHING THE MODELS TO THE GYSI SIMPLEX ARTICULATOR.

Figs. Nos. 136, 137, 138, 139.

The models may be attached to this articulator by the use of the Snow Face Bow or by establishing on the articulator the equilateral triangle commonly referred to as "Bonwill's triangle."

If the Snow Face Bow is to be used, the semicircular end of the Mouth Piece accompanying the Bow must be warmed and thrust into the labial surface of a trial plate, preferably the upper, a short distance above the occlusal plane, and as nearly parallel with the occlusal plane as is convenient, and with the stem of the Mouth Piece projecting forward in the median line of the plate. It must be firmly seated.

The location of the head of each condyle is marked on the face. The trial plates, fastened together in proper biting relations, and with the mouth piece attached as described, are placed in the mouth and the patient is asked to close the jaws into them.

When the trial plates and mouth piece are in position, the Face Bow is passed about the face, the stem of the Mouth Piece goes through the swivel nut, and the ends of the pointers are placed over the marks locating the heads of the condyles. The swivel pointers are pressed firmly in against the face, and the bow is moved from side to side until an equal number of marks on each pointer is between the lock nut and the face. The lock nuts about the swivel pointers are then tightened.

The lock nut of the swivel block is then tightened very firmly. This locks the mouth piece in proper relations to the arch of the Face Bow. It establishes the distance of the incisor point from the condyles as it is in that patient, and the correct relation of the incisor point to the median line.

The lock nuts about the pointers are now loosened, the pointers moved outward, the patient is asked to open the mouth, and the arch, mouth piece and trial plates are removed as one piece. The models may

now be poured into the trial plates and trimmed for mounting on the articulator.

On the condyles of the Gysi Simplex Articulator, will be found two Face Bow Adapters for receiving the depressions in the inner ends of the sliding pointers of the Face Bow of the articulator. Push the sliding pointers as far in as they will go and lock them there. Lift the upper model bow. Spring the ends of the sliding pointers over the knobs on the Face Bow Adapters.

Wet the models. Pour plaster over the lower model bow and move the models down into it until the occlusal plane of the trial plates is level with the table on which the articulator sits. When the attachment to the lower bow is hard, remove the face bow and mouth piece by heating the stem, wet the upper model and pour plaster on it, and bring the upper model bow down until the pin is touching the Incisor Guide Incline. The top of the pin should be level with the top of the opening which holds it.

If it is not desired to attach the models to the articulator by means of the Face Bow, they may easily be attached so that distance from the condyles to the incisor point shall be equal to the distance between the condyles. This forms Bonwill's Triangle.

On the Incisor Guide Pin will be found a pointed metal block called The Incisor Guide, because it locates the incisor point in this method of mounting. Plaster should be poured over the lower model bow and the upper model bow closed so that the Incisor Guide Pin rests on the Incisor Guide Incline, the top of the pin being flush with the top of the opening in which it is held. The models having been previously wet, the models and trial plates are passed between the model bows and so located that the incisor point of the trial plates touches the Incisor Guide, while the occlusal plane is on the level from the Incisor Guide to the projections on the inner sides of the upright part of the articulator frame. Care should be taken that the models are located evenly on both sides of the upper model bow. Plaster may now be poured on the upper model and model bow.

When the plaster has hardened, the attachment of the models to the articulator is complete.

This method is open to the objection that it is purely arbitrary and is not suited to the requirements of the individual patient. It is, however, more satisfactory in this articulator than in other simple articulators because the Rotation Points are here in the proper vertical position, and, as explained in connection with Figs. Nos. 94 and 95, this fact has great influence on the articulation of the dentures.

Fig. 136.
Patient with Snow Face Bow in position.

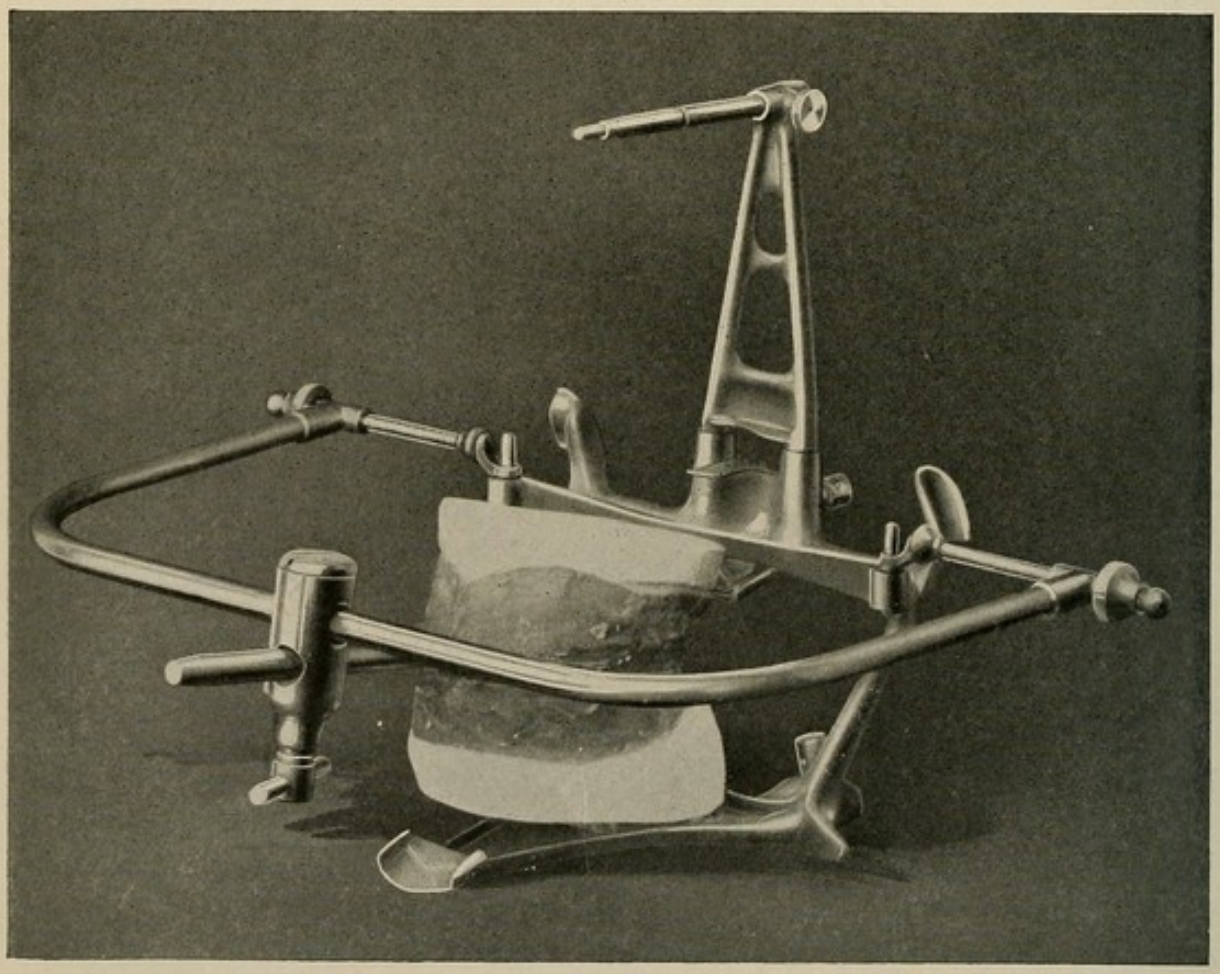


Fig. 137.
Trial plates mounted on Simplex articulator with Face Bow.

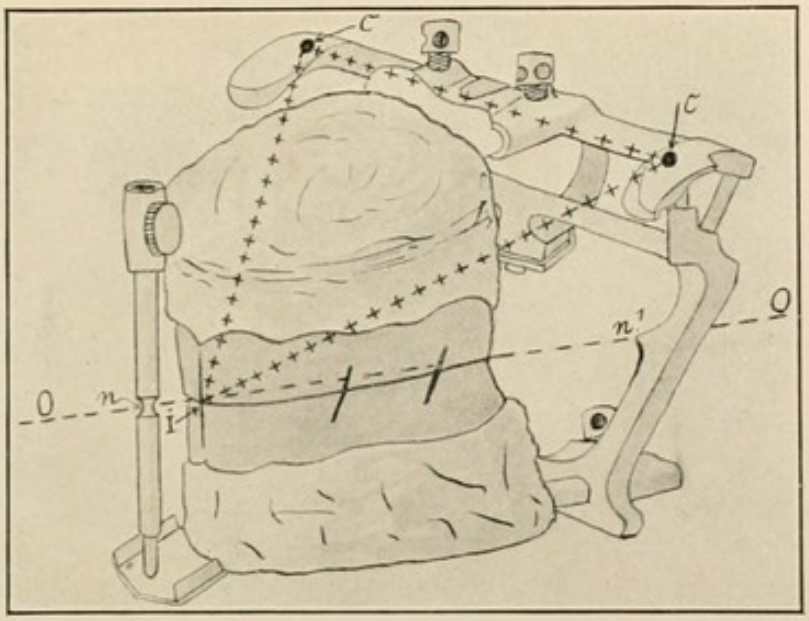


Fig. 138.

If the models be so mounted that the distance to the median line of the trial plates, at the occlusal plane, equals the distance between the depressions on the horizontal plates over the fossæ, they will conform to Dr. Bonwill's measurements. The line O-O from the center of the depression in The Incisor Guide Pin to the projection N^1 on the inner side of the frame represents the proper level of the occlusal plane.

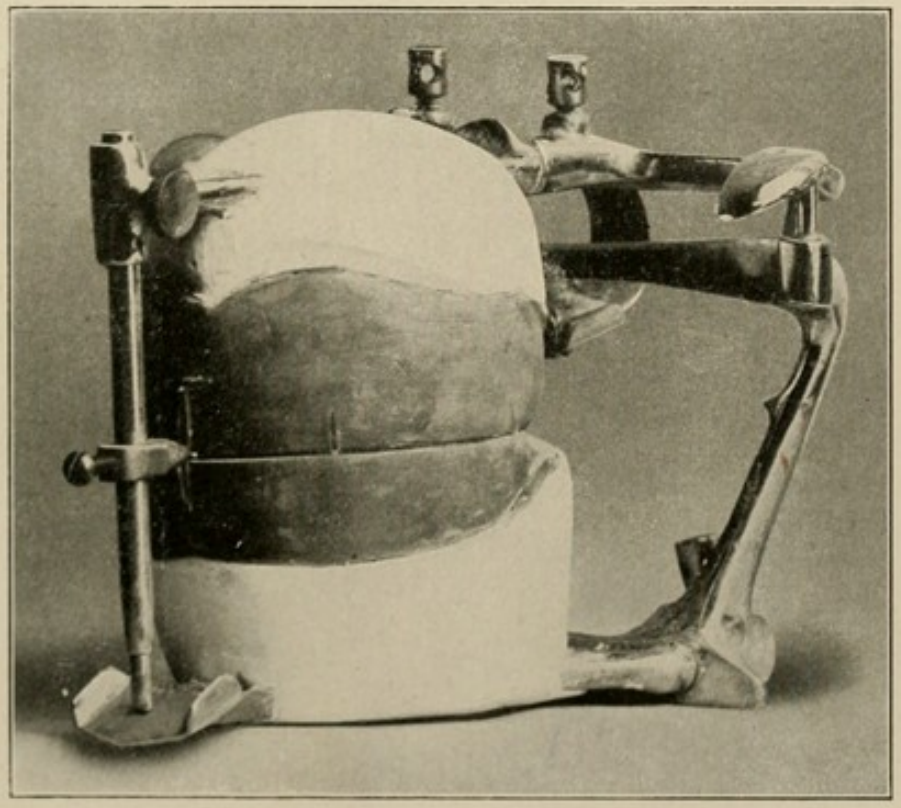


Fig. 139.

Models mounted by means of the Incisor Guide.

PART VII.

ARTICULATING THE TEETH

MAKING WAX TRIAL PLATES.

Fig. No. 140.

If the impression taking and trial plate making methods outlined in Part I have been followed, the trial plates now on the models are made of modelling compound and are not suitable for the arrangement of the teeth. These trial plates must be replaced with others.

Before removing either of the trial plates, continue the median line marked on the plates across both plaster models. Mark on the upper plaster model a line parallel to the occlusal plane, as in Fig. No. 140, line A-A. Mark off on this line a distance from the median line equal to the distance from the line A-A to the high lip line and a distance equal to the distance from this line to the occlusal plane, so that if by any accident the height of the bite is lost, it may be re-established. It is well also to make a similar horizontal line on the lower trial plate and mark the distance from the low lip line, and the occlusal plane.

Take the upper trial plate from the model, marring it as little as may be. It may usually be removed by warming or carving the edges of the impression part. Shape over the upper model a base and adapt it carefully, especially between the rugae which have been made a little higher than normal by carving the impression. Such adaptation may prevent the trial plate taking a false position when tried into the mouth.

For such bases I prefer Dentsply Baseplate Composition because it is stiffer than wax, does not need to be wired to prevent warping, as wax does, and because in especial cases it may be strengthened by building additional composition about the rim in the same way that the margins of the impression were built up. It should be warmed over a small flame, roughly adapted and trimmed and then further adapted until it is of the form of the finished denture.

The ridge of the trial plate is to be made of baseplate wax, and should be shaped like the ridge of the upper trial plate which has been removed. This can usually be well done by building it out to the margin of the lower trial plate, and then building the labial fullness up as desired.

The kind of wax used for these ridges makes a good deal of difference in the future work. Some baseplate waxes hold the teeth well in position, while others make it impossible to keep the teeth in position. I believe the final work is often unsatisfactory because a wax was used which allowed the teeth to easily change position during the final steps of articulation.

In order that Prof. Gysi's method of automatic articulation may be put into operation, the wax must hold the teeth well in position. I prefer Dentsply Baseplate Wax for this purpose.

The lower trial plate of modelling compound is now removed from the model, a base of baseplate composition is carefully adapted to the ridge, and a wax ridge is built upon it after the manner employed in making the upper trial plate. This plate should be given any peculiarities of form which suit it to the case in hand.

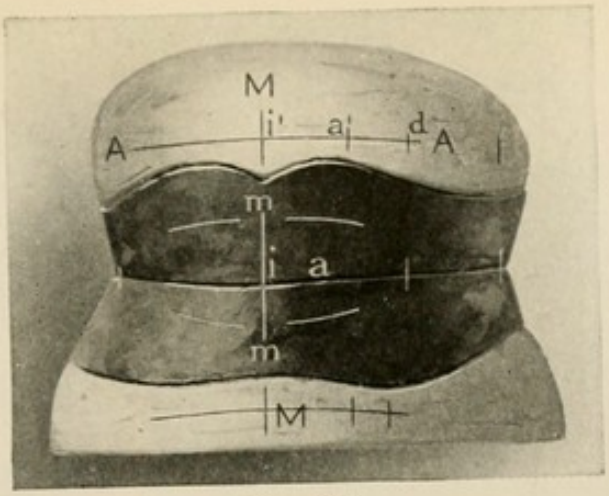


Fig. 140.

Horizontal lines on upper and lower models, with distances to high and low lines and occlusal planes marked on them.

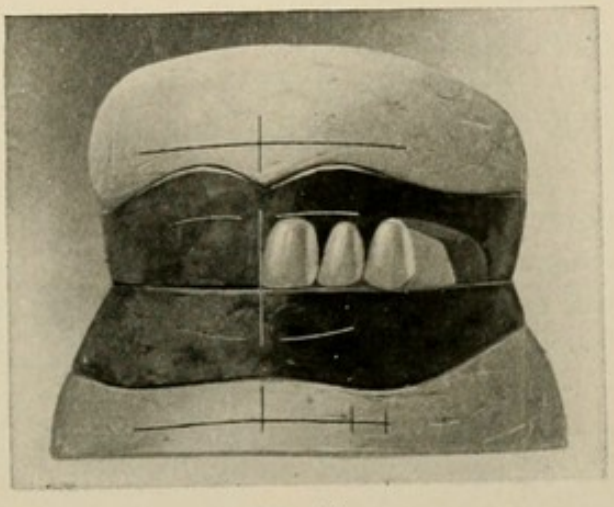


Fig. 141.

Setting upper anteriors, beginning at median line.

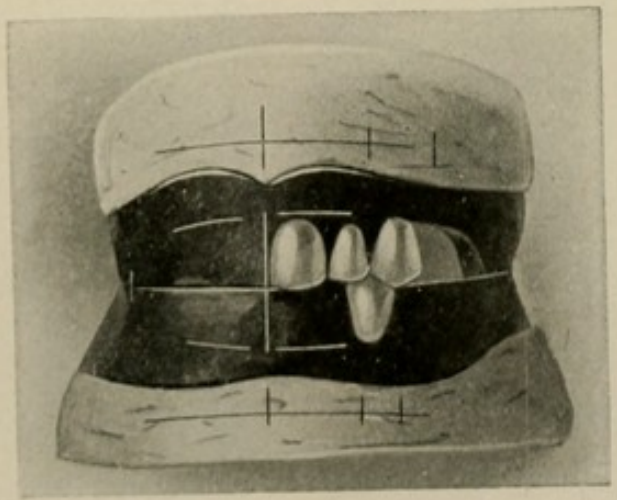


Fig. 142.

Setting lower cuspids in right relations to upper cuspids and laterals.

SETTING THE ANTERIOR TEETH.

Figs. Nos. 141, 142, 143, 144, 145, 146.

Recesses may now be cut in the wax of the upper trial plate on one side of the median line, and the upper central, lateral and cuspid for that side put in position, making sure that their labial surfaces restore the contour of the wax.

Set the upper central lateral and cuspid of the other side in like manner.

The position given the upper and lower cuspids will have a great effect on the appearance of the denture. If the cuspids be rotated as in Fig. No. 000, the result will be pleasing, but if the distal portion of the labial surface of the upper cuspid be inclined too much forward, the appearance will be displeasing. This position will be governed slightly by the width of the arch, but an effort should be made to turn this surface as shown in the illustration.

When the upper anteriors are set, recesses are cut in the wax of the lower trial plate and the lower cuspids are set. These are the most difficult teeth in both dentures to arrange, and a little care spent at this time will be repaid in better results.

The distal angle of each lower cuspid should come just below the tip of the upper cuspid. The distal facet on the cutting edge of the lower cuspid should occlude with the mesial facet on the upper cuspid, while the mesial facet on the cutting edge of the lower cuspid should occlude with the short facet on the distal portion of the cutting edge of the upper lateral. On all teeth except Trubyte teeth, it will be necessary to grind these facets with care. When the jaw moves laterally these teeth must articulate without leaving contact. A careful study of the relations shown in Figures 143 and 144 will be helpful in learning to establish these relations.

When both lower cuspids are in correct positions, the lower incisors may be set between them. Some little grinding may be necessary on the distal surfaces of the lower laterals to establish right relations, and it may be thought that this is an evidence that the teeth have not been carefully manufactured. If much grinding is necessary, such a conclusion is just, but when only a little grinding is required, the conclusion is not just.

The ideal arrangement of the lower anteriors is for them to underbite the upper anteriors, just enough so that the lower incisors are out of contact with the uppers when the jaw is in central occlusion, and so that the edges of the uppers and lowers articulate during lateral movements. Very deep underbites should not be sought, since they tend to dislodge the dentures, and since they are hardly possible with correct relations of the upper and lower cuspids. Fig. 145 illustrates correct and incorrect incisor relations.

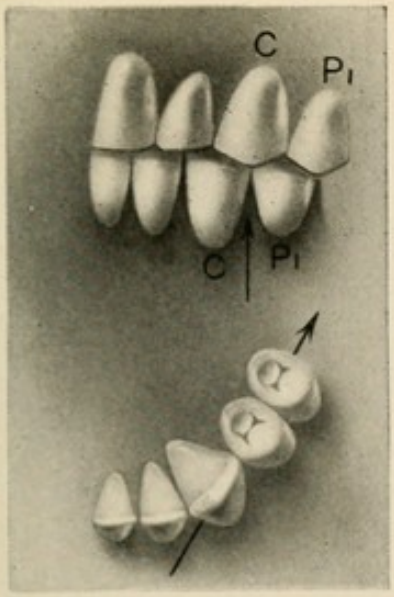


Fig. 143.
Above, correct vertical relations of upper and lower anteriors. Below, correctly formed facets on lower cuspid. Lower cuspid properly rotated and bicuspids partly hidden behind it.

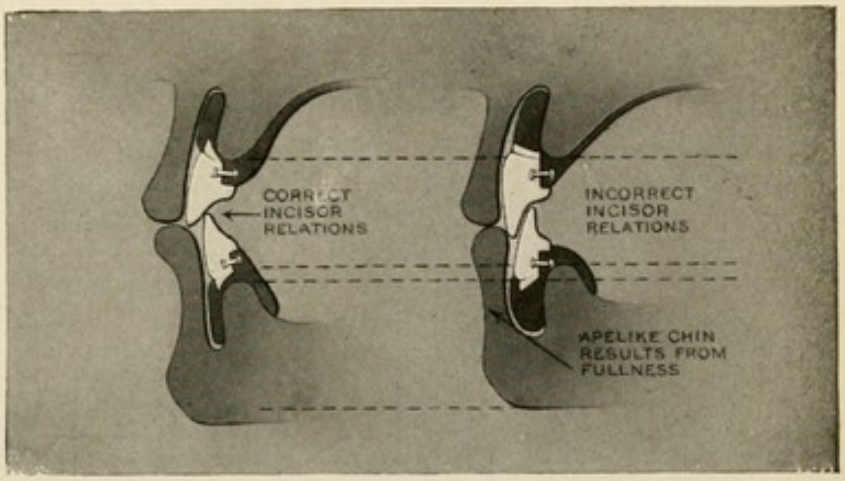


Fig. 145.
The effect on the stability of the dentures and on the expression of correct and incorrect relations of upper and lower incisors.

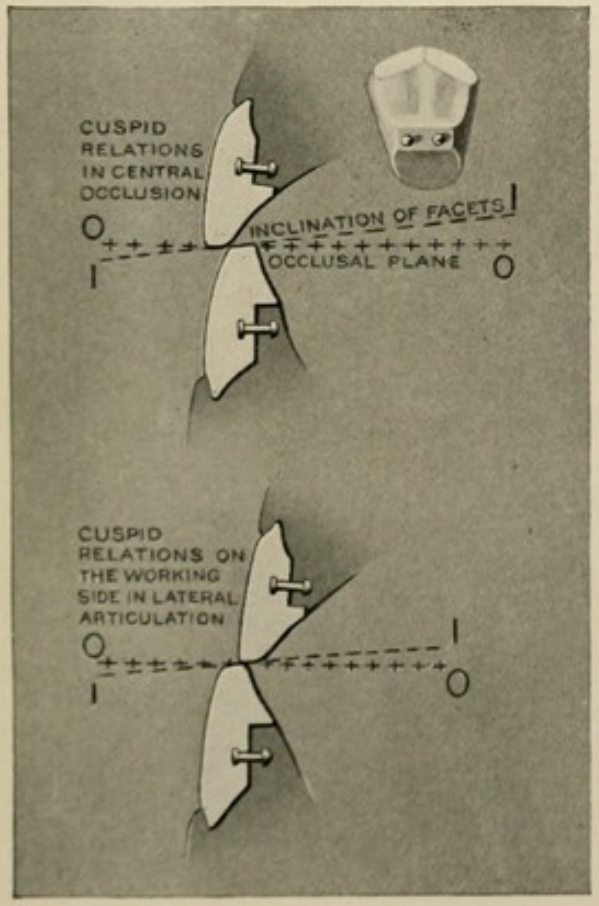


Fig. 144.

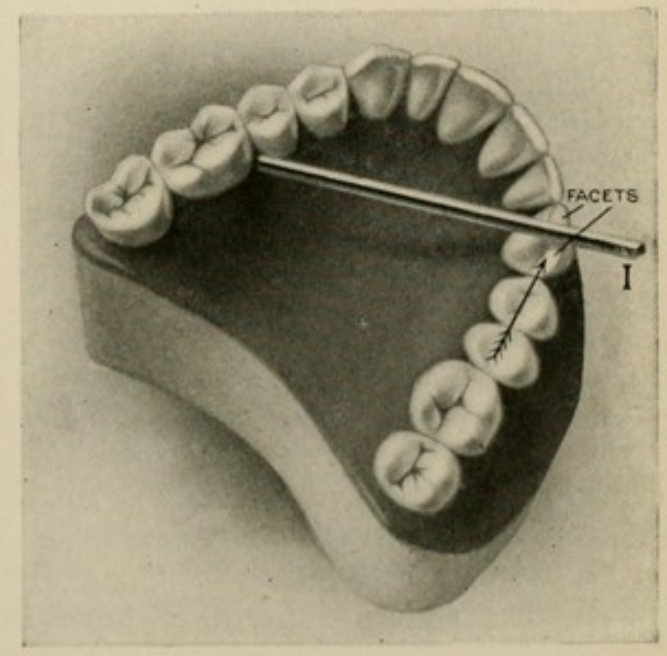


Fig. 146.
A straight edge laid on the mesial facet of the upper cuspid, as here shown, will touch the gum at the mesio-lingual root of the first molar of the opposite side.

SETTING THE ANTERIOR TEETH—Continued.

Figs. Nos. 147 and 148.

The beauty of the dentures will be largely influenced by the positions of the anterior teeth.

The first of these relations to attract the dentist's attention is that determined by the distal divergence of the roots. In the typical case, the roots of the upper centrals are parallel; the roots of the upper laterals diverge distally from those of the centrals; the roots of the upper cuspids diverge distally less than do the laterals; the roots of the two upper bicuspids are parallel with those of the upper centrals, and the root axis of the upper first molar actually slopes forward toward the centrals. These relations are shown in Fig. No. 147.

The roots of the four lower incisors do not diverge distally from the median line, but the roots of the lower cuspids diverge distally in a marked degree. The root positions of the lower bicuspids and molars will be determined by articulation with the upper teeth.

The labial inclination of the anteriors is equally important, because more dentures are made to look unnatural from errors in this inclination than in any other. The tendency is always to place the necks of the incisors too far forward in relation to the positions of the cutting edges. As can be seen by reference to Fig. No. 145, this gives the lips an unnatural fullness.

The correct inclination for the upper centrals is shown in "c" of Fig. No. 148. This inclination brings the facets on the cutting edges into the most effective articulation with the edges of the lower incisors. The neck of each upper lateral is set a little farther back than the necks of the upper centrals, as shown in "l" of Fig. No. 148.

The upper cuspids stand more nearly upright than either the centrals or laterals. This helps to build up the cuspid eminences as shown in "C" of Fig. No. 148. The articulating facets on the cuspids are but little inclined upward from horizontal.

The labial positions of the lower centrals, laterals and cuspids, are shown in "c," "l" and "C" of Fig. No. 148. The edges of the lower centrals incline strongly forward. Dentures are very common in which these teeth are either set vertically or inclined inward. The effect on the expression of the lip is shown in Fig. No. 145.

The lower cuspid necks are prominent and help build out the cuspid eminences. The articulating facets on the lower cuspids are parallel to those on the upper cuspids.

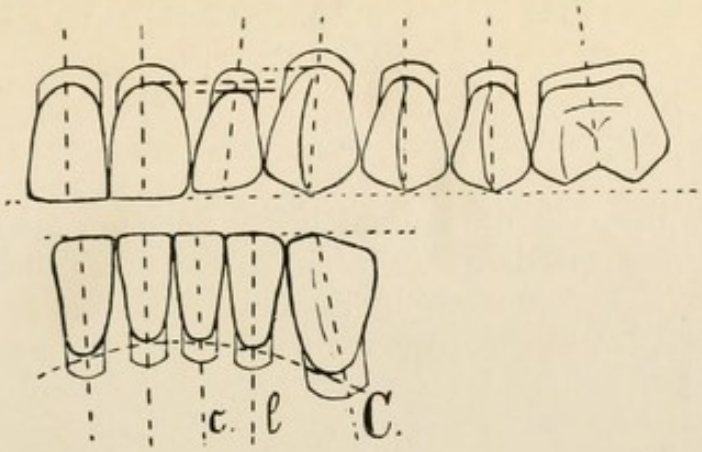


Fig. 147.

Mesio-Distal inclination of the teeth.

The roots of the upper centrals are parallel. The roots of the upper laterals and cuspids diverge from the median line, the laterals diverging slightly more than the cuspids. The roots of the upper bicuspids are parallel with those of the upper centrals, while the roots of the first molars incline slightly toward the mesial. This position of the upper first artificial molar is probably a compromise between the positions of the first and second natural molars.

The roots of the lower centrals and laterals are parallel, but those of the lower cuspids diverge strongly.

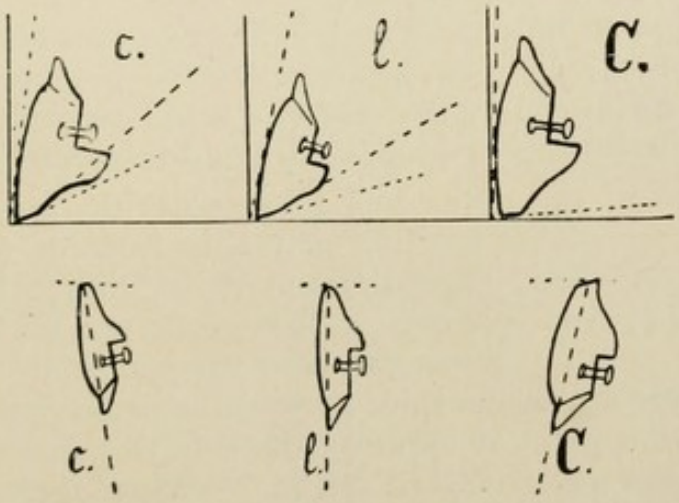


Fig. 148.

Forward inclinations of the anterior teeth.

The best effects are obtained by inclining the upper centrals as shown at "c." This not only gives the most pleasing esthetic effect, but brings the facets on the cutting edges into the inclination which articulates most efficiently with the lower incisors.

The necks of the upper laterals should sit back more than those of the upper centrals, though the cutting edges are nearly as far forward. It will be noted that the articulating facet on the cutting edge is less steeply inclined than that on the central. This is the inclination of the mesial facet on the lateral.

The cuspids stand more nearly vertical than either the centrals or laterals, and the facets on the edges are nearly horizontal.

The lower centrals slope strongly outward from neck to incisal edge. This prevents the over fullness of the gums so common to lower dentures, and illustrated in Fig. No. 145.

The lower laterals slope outward very much less than do the centrals.

The necks of the lower cuspids are very prominent while the cutting edges are pretty well back. This causes the necks to be prominent and fill out the cuspid eminence, and causes the teeth to slope inward from the gum up.

RELATIVE WIDTHS OF UPPER AND LOWER ANTERIOR TEETH.

Fig. No. 149.

It is rare that the upper and lower anterior teeth go exactly to place without some grinding of one set or the other to establish correct relative widths. The amount of grinding depends on the care with which the manufacturer has complied with the requirements of articulation, on the particular arrangement of anterior teeth favored by the dentist, and on the articulating movements in the case in hand. The best results will be obtained if the dentist and manufacturer both understand what part of the work each should perform.

It is the manufacturer's duty to supply upper and lower anteriors of such relative widths that the dentist can easily adapt them to the requirements of any ordinary case. They should not be much too wide for the dentist who wishes to set the lower incisors pretty well back ot the upper incisors, or much too narrow for the dentist who wishes to set them irregularly.

On the other hand, the dentist must not expect that the manufacturer can supply upper and lower anteriors which are of exactly the correct relative widths to permit different forms of arrangement. This would require hundreds of moulds of anteriors, nor could the dentist know which of the hundreds of moulds was needed until he set the teeth on the case. He, the dentist, should recognize it as his task to adapt a correctly formed product to his own special requirements.

The widths of the upper and lower anteriors are affected by the horizontal location of the rotation points, as is made clear by a study of Fig. No. 149. The large diagram shows the path of the buccal cusp of the upper first bicuspid in three different horizontal locations of the rotation points. When the rotation points are in the position marked "R i," the upper bicuspids move through the path marked "R i." When the rotation point is opposite the condyles, the upper bicuspids move through the path marked "R m." When it is outside of the condyles, the upper bicuspids move through the path marked "R a." The practical application of these movements to the width of the upper and lower anteriors is seen in Figs. D-E-F.

In Fig. 149D the relative widths of upper and lower anteriors necessary for the path "R i" is shown. The upper anteriors are here quite a little wider than the lower anteriors so that the tip of the upper cuspid may pass through the interdental space distal to the lower cuspid during lateral movements. In Fig. 149E the tip of the upper cuspid is just above the distal angle of the lower cuspid. In Fig. 149F the tip of the upper cuspid is just anterior to the distal angle of the lower cuspid, in order that it may pass through the interdental space posterior to the lower cuspid when the rotation point is located at "R.a."

Trubyte teeth are designed to produce the cuspid relations shown in Fig. 149E, with a minimum of grinding.

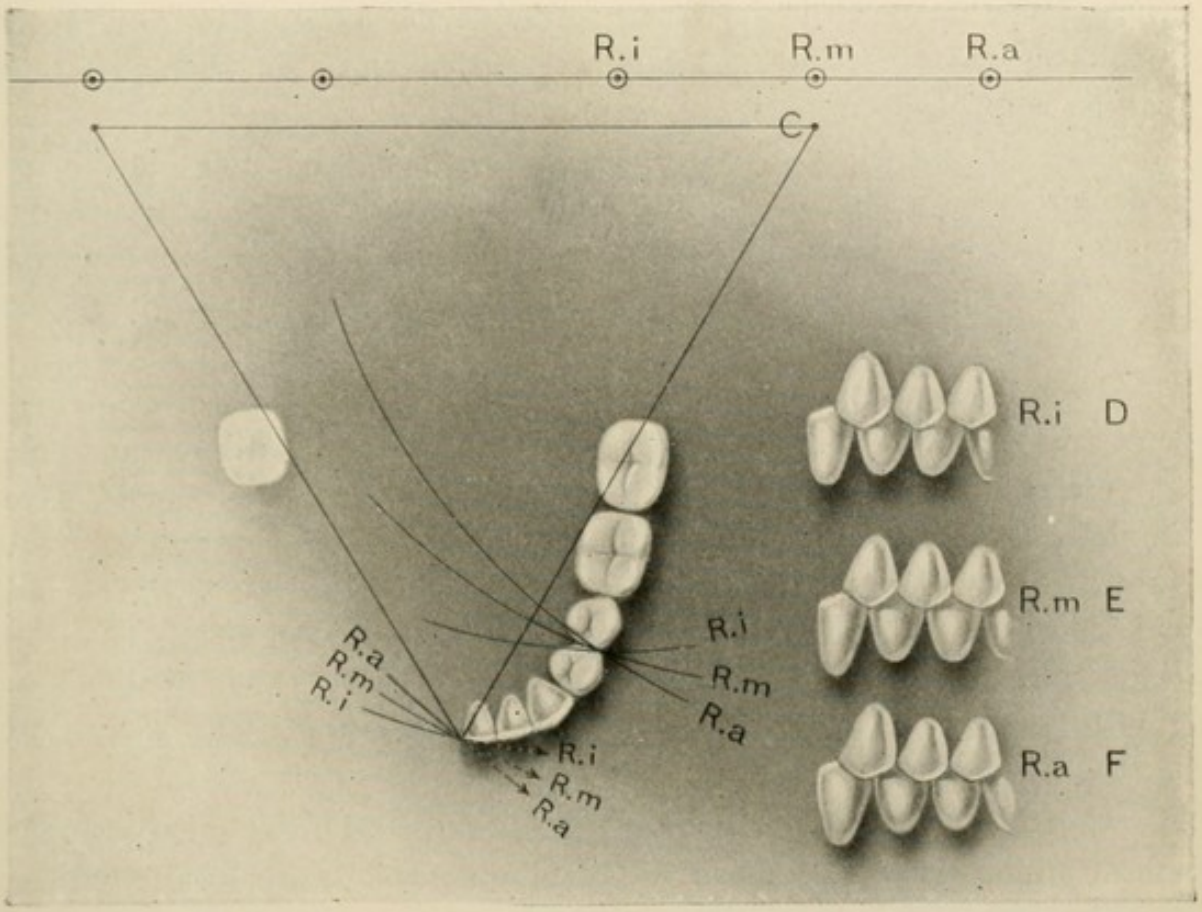


Fig. 149.

Diagram showing three paths of the upper left first bicuspid with three different horizontal locations of the rotation points. "R i" indicates a location of the rotation points between the condyles and the median line. "R m" indicates a location at the condyles, and "R a" a location outside the condyles.

The movements of the upper first bicuspid are indicated by the paths numbered like the rotation point from which each movement is inscribed.

The movements of the incisor point are shown by three paths drawn from the incisor point and numbered like the centers from which they are taken.

The figures "D-E-F" show the relative widths of the upper and lower anteriors necessary to make possible the correct movement of the points of the upper cuspids through these three paths.

It will be noted that in Fig. D the points of the upper anteriors are quite a little wider than the lower anteriors and the points of the upper cuspids need to come a little to the distal of the distal angles of the lower cuspid, to make it possible for the point of the upper cuspid to follow the path "R i."

In Figure F the points of the upper cuspids need to come a little anterior to the distal angle of the lower cuspids, to make it possible to follow the path "R a."

This diagram helps make it plain why a given width of upper and lower anteriors is not exactly suitable for all cases.

GRINDING ANTERIOR TEETH TO FORM.

Figs. Nos. 143, 144, 146, 148, 149.

Dentists who prefer not to use Trubyte teeth may grind any other anterior teeth to such articulating forms as the teeth permit and their own skill makes possible. A few simple directions for such grinding may be helpful.

The cutting edges of the upper incisors should present facets for articulation with the lower anteriors. If the teeth are to be set in the typical positions shown in Figs. Nos. 143 and 144, the facets should be of the forms shown in Fig. No. 146 and have the inclinations shown in Figs. Nos. 144 and 148.

It will be noted that the cutting edge of each upper lateral presents two facets, of which the mesial is the longer. This mesial facet articulates with the cutting edge of the lower lateral, and should have the inclination of the facet shown in the upper lateral in Fig. No. 148. The distal facet articulates with the mesial facet on the lower cuspid and should be of a length to correspond to the facet which is to be ground on that cuspid. As this cannot always be known in advance, it will doubtless be necessary to try the teeth in position and adjust the lengths of the facets.

Care should be taken not to grind this distal facet on the upper lateral at the same inclination as the mesial facet, since its inclination should correspond in all directions to the inclination of the mesial facet on the lower cuspid. It must be borne in mind that this distal facet on the lateral is to both articulate and occlude with the lower cuspid.

The mesial facet on each upper cuspid will be of the general form shown in Fig. No. 144, but it will be governed somewhat by the relative widths of the upper and lower six anteriors, as received from the manufacturer and the positions in which the teeth are set. The important point is that the tip of the upper cuspid must pass through the interdental space between the lower cuspid and first bicuspid during lateral movements, and that the upper and lower cuspids on the working side should both occlude and articulate as long as the dentures are in contact.

In order to bring about these relations, it will probably be best to grind the upper incisors and cuspids to place, and then the lower cuspids, governing the grinding by the necessity of establishing right relations during occlusion and articulation. The inclination of the facets on the upper cuspids will be as shown in the drawings of the cuspids in Fig. No. 148, and the relations which are to be established are shown in Fig. No. 149. If the teeth are all in position before the grinding is begun, the inclination of the facets on the upper cuspids

may be determined by shaping the facets so that a match laid on them, as in Fig. No. 146, will come at the mesial root of the upper first molar, as there shown.

The difficulty which I have experienced in grinding these facets and which has been experienced by practically all whom I know, is an unwillingness to grind the mesial facets long enough on the upper cuspids. There seems to be a strange unwillingness to do this, and even after careful demonstration I have found men leaving these facets so short that the point of the upper cuspid passes over the lower cuspid in articulation, a serious fault.

One is somewhat deterred also by the fact that grinding those cuspids which have not been shaped correctly, often spoils the appearance of the tooth, and sometimes shortens it so that it is no longer suitable for the case.

It is not usually necessary or desirable to grind facets on the cutting edges of the lower incisors, the edges they present being sufficient for all practical purposes.

It is however essential to grind facets on the lower cuspids, a short facet on the mesial of each, and a long facet on the distal, as shown in Fig. No. 143.

The short mesial facet must be of the same length as the distal facet on the opposing upper lateral, so that when the teeth are occluded the tip of the lower cuspid shall be opposite the interdental space between the upper lateral and cuspid. These facets must be of such inclination that the lateral will not be forced out of place by articulation with the cuspids. I find this a most dangerous point for a contact which dislodges dentures during articulation.

The distal facets on the lower cuspids are of the same length as the mesial facets on the upper cuspids, so that the distal angle of each lower cuspid is directly below or slightly mesial to the tip of the upper cuspid. This relation will be slightly affected by the location of the rotation points if The Gysi Adaptable Articulator is used, but the distal angle of the lower cuspid does not often come distal to the tip of the upper. The inclination of this facet must be complementary to that on the opposing facet of the upper cuspid, as shown in the drawings of these teeth in Fig. No. 148. The best method of getting the inclination of this facet is to place the upper and lower cuspids in position and grind the distal facet on the lower so that it is parallel to the mesial facet of the upper with which it articulates.

SETTING UP THE BICUSPIDS AND MOLARS.

Figs. Nos. 150 to 159 Inclusive.

Prof. Gysi's methods of articulating bicuspids and molars are so much shorter and better than those I advocated in the book entitled "The Mechanical Side of Anatomical Articulation" that I have given up the working out of the articulating curves and now follow his methods, which I am glad to present here. The technic is rather long to describe because so many specifications are required, but is really shorter than most other methods, once it has been mastered. These methods are, in brief, to set the upper bicuspids and molars in certain positions against the flat occlusal surface of the lower trial plate, establishing the curves by tilting the teeth laterally; to set the lower teeth to occlusion with the uppers and then make them perfect their own articulation by a method which he calls "automatic articulation." To employ this method, he sets both the upper and lower bicuspids and molars higher than they are to be in the finished denture and makes them adjust each other by pressure as they are closed together.

When the upper and lower anteriors are set and waxed firmly to position, open the bite about 1.5 m.m. (1/16 inch) by moving the Incisor Guide Pin downward and locking there. Set the upper bicuspids and molars of both sides in contact with the lower trial plate, as in Fig. No. 150. Then raise the bite another 1.5 m.m. and set the lower bicuspids and molars to occlusion with the uppers. This leaves the upper and lower anteriors separated 3 m.m. and the upper and lower bicuspids and molars in occlusion.

The arrangement of the teeth will be determined in large part by the type of arch. All arches may be described under three headings, as narrow, medium wide, or broad. As Dr. Williams showed long ago, the form of the arch is closely parallel to that of the face just below the level of the eyes, and it is neither good mechanics nor good esthetics to try to make all arches conform to one type.

Illustrations of the three types of arches are shown in Figs. Nos. 152, 153, and 154. Fig. 152 represents the medium arch. The lines touching the mesio-buccal ridges of the first molars, the buccal ridges of both bicuspids and the labial ridges of the cuspids meet at the point "C" which is nearly as far in advance of the point "B" as the point "B" is in front of the point "A." The triangle B-B-B is equilateral, and so is the small triangle in dotted lines, with its apex at the point "A" and its other termini at the distal angles of the cuspids. It will be noted also that the straight lines which touch the distal portions of the buccal surface of the first molar and the buccal surfaces of the second molars are nearly parallel.

In arches of the narrow type, Fig. No. 153, the arch between the cuspids is not as narrow as might be expected. It is, if anything, flatter than in the medium arch. The bicuspids and molars are arranged in straighter lines and more directly back of the cuspids. The lines touching the cuspids, bicuspids and molars do not converge at

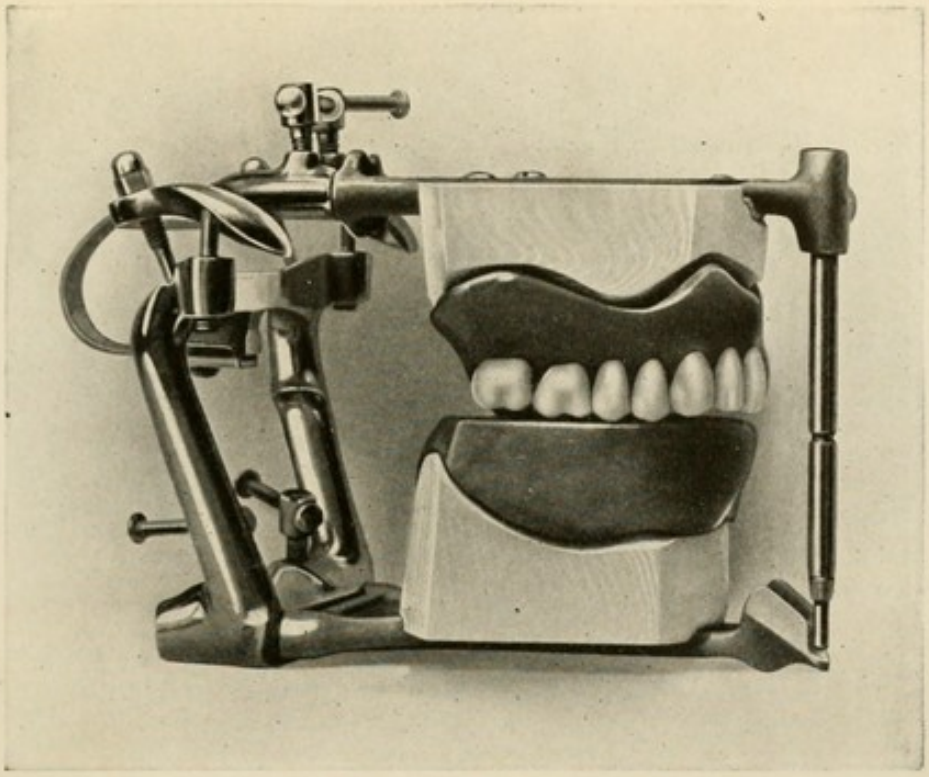


Fig. 150.

When the upper and lower anteriors have been arranged at the desired height of bite, the articulator should be opened about 1.5 m.m. (1-16 inch) and the upper bicuspids and molars on both sides set into place.

The articulator should then be opened another 1.5 m.m. and the lower bicuspids and molars of both sides set in position to occlude with the uppers.

The difference of 3 m.m. in height permits the use of Prof. Gysi's method of automatic articulation, by which the teeth may be adjusted to articulating positions.

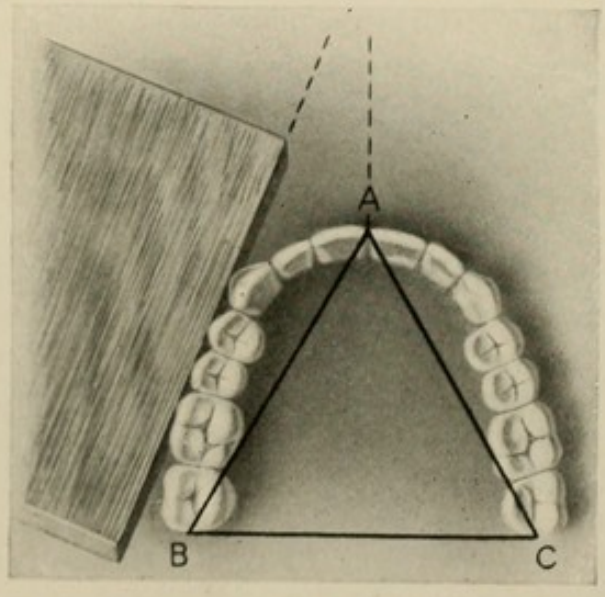


Fig. 151.

If a piece of cigar box be squared to a size of about three inches, it will be found very useful in determining the positions of the teeth.

the point "C" but farther forward. The lines touching the first and second molars converge slightly more than the similar lines in the medium arch. The base of the equilateral triangle B-B-B does not terminate in the buccal grooves, as in the medium arch, but extends to the buccal surfaces of the second molars.

In arches of the wide type, Fig. No. 154, the arrangement of the upper anteriors is very similar to that in the medium arches, and the positions of the second molars are almost identical. The first molars are rotated so that the mesio-buccal cusps are farther from the median line and the longitudinal groove is more nearly straight forward and back. The bicuspids are not so directly behind the cuspids, and the lines touching the cuspids, bicuspids and first molars converge before they reach the point "C."

If the trial plates have been carved to restore the fullness desired in the patient's face, the curves of the bicuspid and molar region will probably indicate which type of arch the case presents.

If a small piece of wood, preferably cigar box wood, be cut to the form of a square, three inches on a side as in Fig. No. 151 will prove very useful in establishing the relations indicated by the several lines in Figs. Nos. 152, 153, 154.

Having determined the type of arch, the upper bicuspids and molars are set with their vertical axes in the lines shown in Fig. No. 155. The buccal cusp of the upper first bicuspid touches the occlusal surface of the lower trial plate, but the lingual cusp does not quite touch. Both cusps of the upper second bicuspid touch the wax. Both lingual cusps of the upper first molar touch the wax, but the buccal cusps are elevated about a millimeter above the wax and begin the compensating curve formed by the buccal cusps of both upper molars.

The lingual cusps of the upper second molars are in contact with the opposing trial plate, but the buccal cusps are elevated about 2 m.m. above the wax. They continue the compensating curve which the buccal cusps of the first molars began.

It is necessary, while establishing these relations, to secure such positions of the teeth over the ridges as will give the dentures maximum stability and efficiency. This can be done best by keeping the teeth below the upper alveolar ridge, after the manner shown in the upper illustration of Fig. No. 156. Properly articulated dentures are not easily dislodged during articulation, even if the teeth are outside the ridge. But during the time when the mouth is open and the dentures do not support each other, dentures are more easily dislodged if the upper teeth are set outside the ridge. In all cases, the molars and bicuspids should be kept as nearly in line with the ridges, as the other conditions of the case permit. If the trial plates were formed after the manner shown in Fig. No. 156, the teeth should come in these positions merely by setting them in proper relations to the opposing wax.

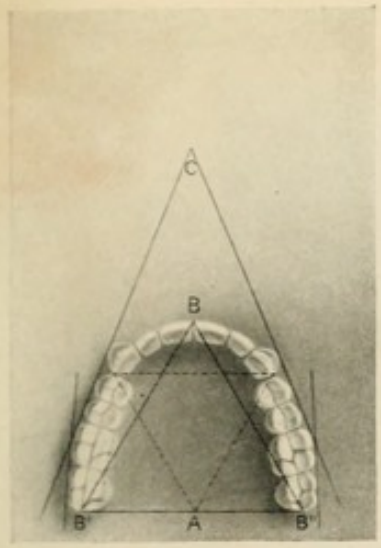


Fig. 152

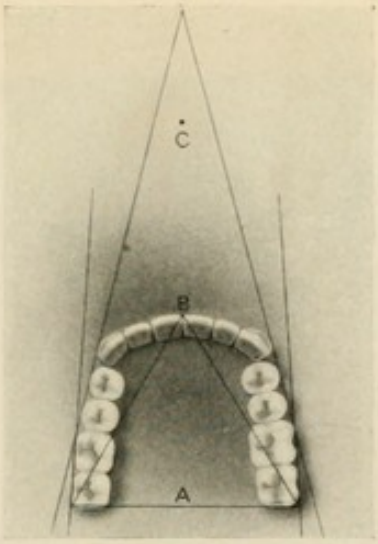


Fig. 153.

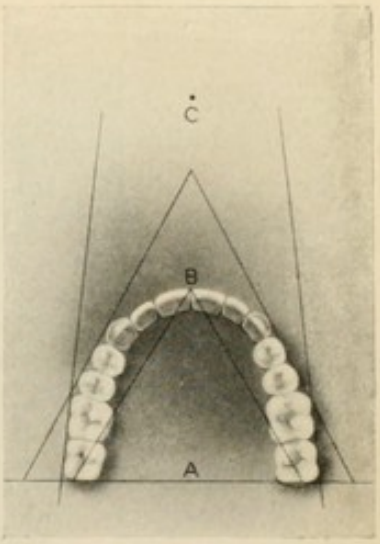


Fig. 154.

Fig. No. 152 represents an occlusal view of the medium arch on the basis of Dr. Bonwill's theory. The triangle B—B¹—B² is equal sided. It will be noted that one point rests between the points of the upper incisors and the other points at the distal ends of the longitudinal groove on the occlusal surfaces of the upper second molars.

The outside converging lines which meet at the point "C" touch the buccal ridges of the cuspids, the bicuspids and the mesio-buccal ridges of the first molars. The distance from the point "C" to the point "B" is nearly equal to the distance from "A" to "B."

Fig. No. 153 represents the narrow arch in the same way. The equilateral triangle no longer ends in the longitudinal groove of the second molars, but extends outside of the disto-buccal angles. The lines which touch the molars, the bicuspids and the cuspids, do not meet at the point "C" but considerably in advance of it.

Fig. No. 154 represents a similar view of the broad arch. This arch is distinguished by its width in the bicuspid section rather than in the region of the second molars. The posterior ends of the equilateral triangle end about where they did in the medium arch, but the bicuspids set so much farther out that the lines which touch the molars, bicuspids and cuspids converge long before they reach the point "C."

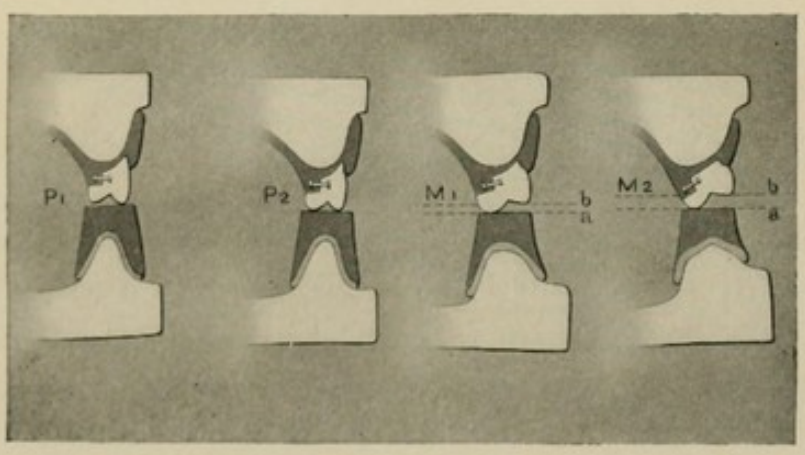


Fig. 155.

"P¹" indicates the proper vertical position of the upper first bicuspid against the occlusal surface of the lower trial plate. "P²" indicates the position of the second upper bicuspid. "M¹" indicates the position of the upper first molar and "M²" the position of the upper second molar.

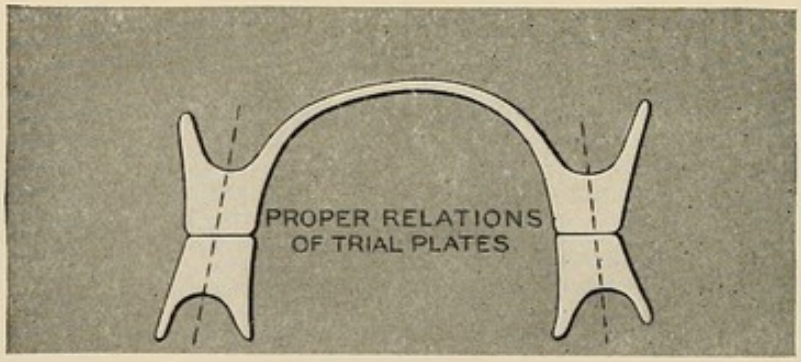


Fig. 156.

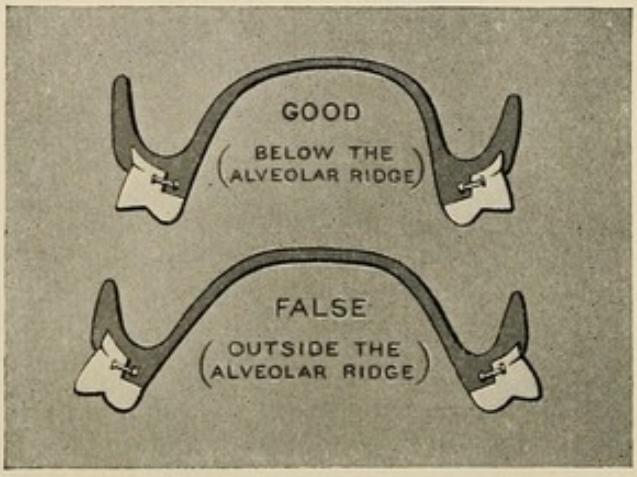


Fig. 157.

Diagrammatic illustration of good and false relations of the upper posteriors to the ridge. If the upper molars are kept in the line from the crest of the upper ridge to the crest of the lower ridge, the dentures will be more stable in position.

When the teeth have been placed in these positions, the relations may be tested by means of the little piece of squared wood. With a pair of dividers, the terminations of the triangle here marked B-B-B may be located as guides in establishing right proportions in normal cases.

When the upper bicuspids and molars have been set in the elevation of 1.5 m.m. above the upper anteriors, the articulator is opened 1.5 m.m. additional, and the lower bicuspids and molars are set to occlusion with the uppers, and both sets are waxed firmly in position. The relations of the teeth are established as accurately as possible without making lateral movements of the articulator and without grinding the teeth. They will be very much easier to establish if correctly formed teeth are used. Indeed, unless such teeth are used, the steps which are to follow cannot well be performed.

The teeth are now more accurately adapted by a process which Prof. Gysi calls "automatic articulation."

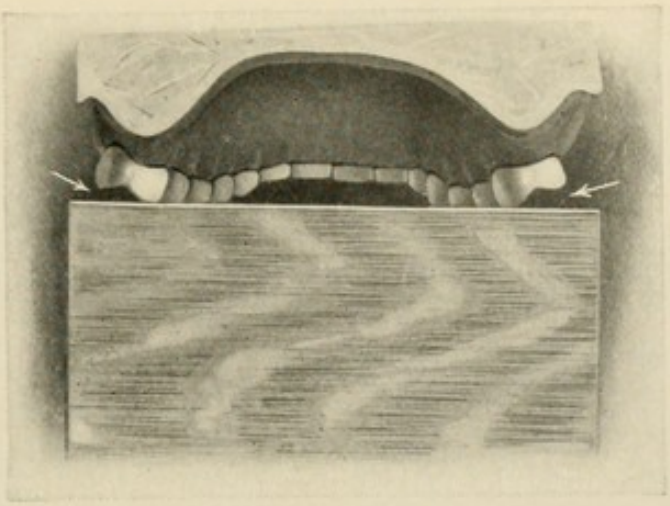


Fig. 158.

By means of the piece of cigar box, the degree of outward inclination given to any of the teeth can be easily seen, and both sides can be kept alike. This is especially useful when, for any reason, the trial plate has been taken from the model.

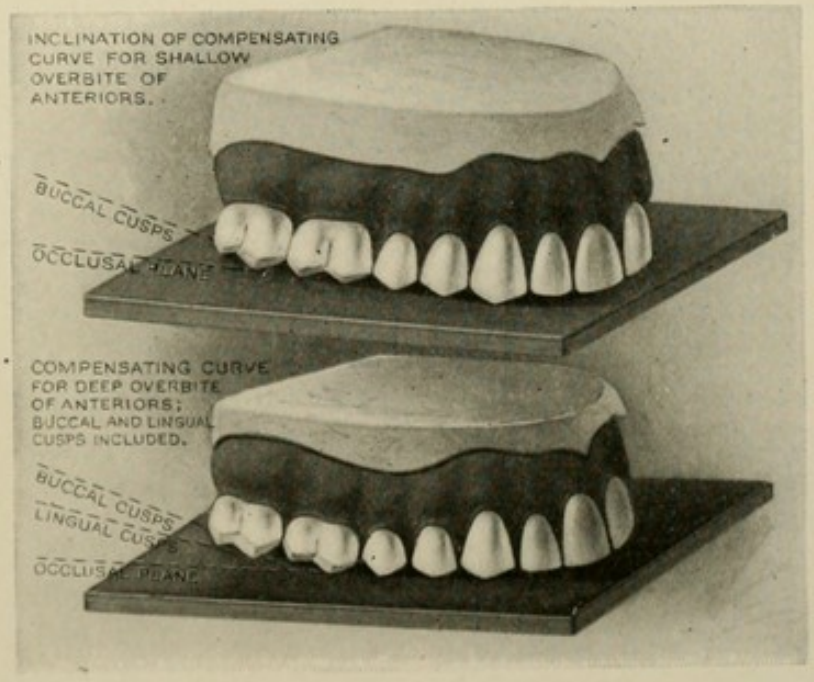


Fig. 159.

In cases where the anteriors exhibit shallow overbite, the compensating curve of the upper teeth does not include the disto-lingual cusps of the upper first molars or the mesio-lingual cusps of the upper second molars. But in cases where the upper anteriors exhibit deep overbite, the compensating curve of the upper teeth lifts the disto-lingual cusps of the upper first molars and the mesio-lingual cusps of the second molars above the occlusal plane.

AUTOMATIC ARTICULATION.

Fig. No. 160.

This is a process of making the teeth adapt themselves to exact positions by throwing the dentures into lateral occlusion and pressing them together first on one side and then on the other. It can be put into advantageous execution only after the bicuspids and molars have been set at higher than ordinary levels, as described on page 206 to 210 inclusive.

The Incisor Guide Pin is raised about 1 m.m. out of contact with the Inclined Plane and the set screw tightened. The wax about the necks of the teeth is slightly warmed so that the teeth can be moved by pressure. The articulator is opened and moved into lateral occlusion on one side and closed with the upper and lower buccal cusps of that side interdigitated. Slight pressure is exerted.

The denture is then opened and returned to a position of central occlusion and pressure is exerted in that relation of the dentures. The wax about the teeth is kept in such a state of softness by occasional warming, as permits the adaptations of one set of teeth by the other. The wax can be warmed for this process best by applying the heat of a small flame to the occlusal surfaces of the bicuspids and molars, and letting it reach the wax through the porcelain.

The dentures are now carried into a position of lateral occlusion on the side opposite that first occluded, and pressure is made with the buccal cusps interdigitated. They are then returned to the position of central occlusion and pressed together.

By this time it will be necessary to lift the Incisor Guide Pin another millimeter out of contact with the Inclined Plane and tighten the set screw. The former steps are then repeated until the pin comes into contact with the Incisor Guide Incline. A third lifting of the pin will bring the upper and lower anteriors into articulating relations.

A few points require especial attention during this process. First of all, the teeth must be mounted in a wax which holds them against sliding. Some waxes defeat the efforts to automatically articulate dentures because the teeth slide so that it is impossible to keep them in position while exerting pressure in lateral occlusion. I have failed with several waxes but have had good results with Dentsply Baseplate wax.

The teeth must be held on the buccal surface against the tendency to slide which results from pressure in lateral occlusion. If the thumbs are placed against the buccal surfaces of the bicuspids and molars during the time of pressure, slipping can be prevented. Fig. No. 161 shows how Prof. Gysi holds dentures for automatic articulation.

No sliding movements should be made during this operation. The teeth are probably not accurately adapted, and such movements will merely dislodge them.

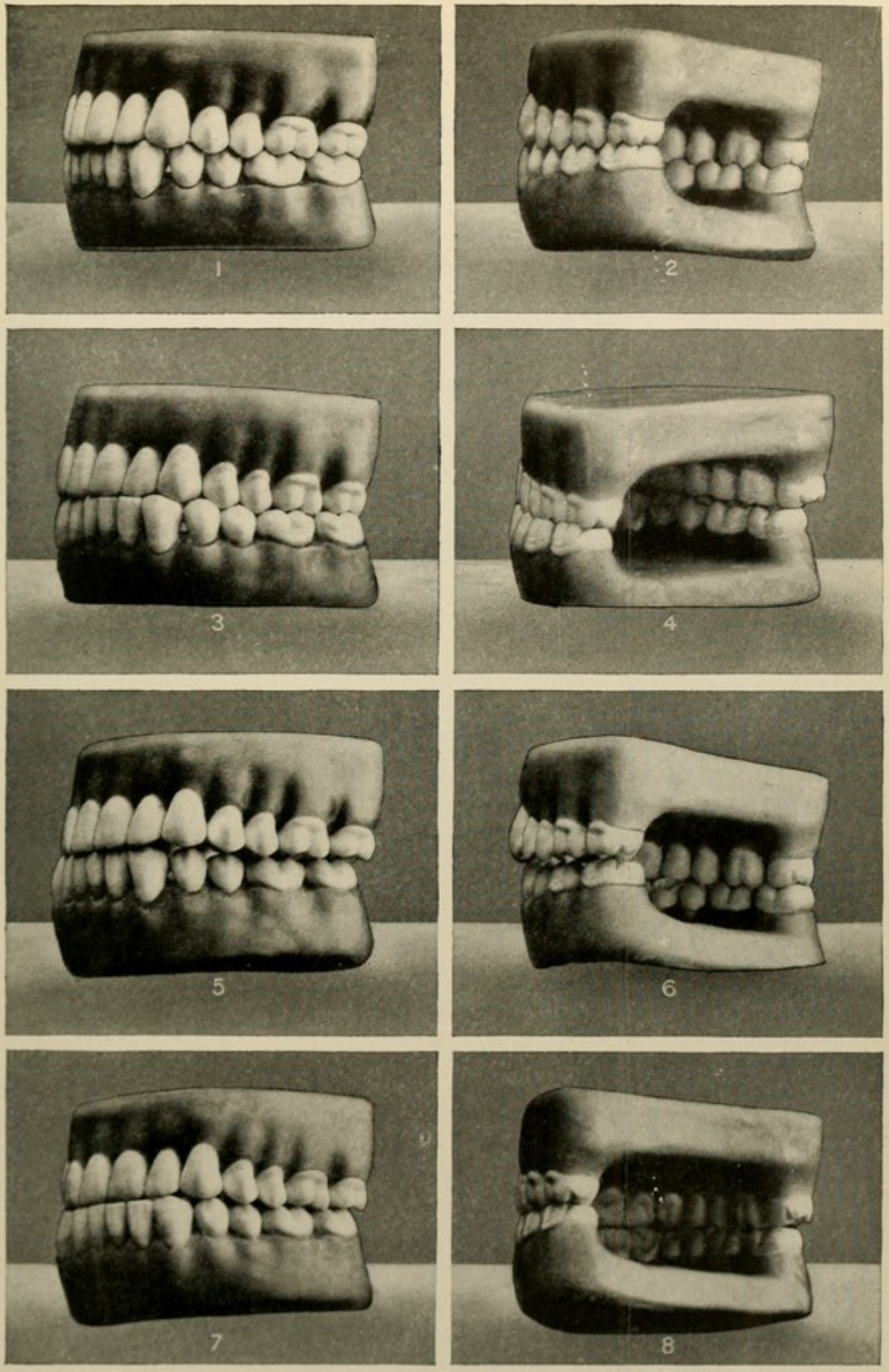


Fig. 160.

In the left column side views of the several positions in automatic articulation. In the right column, rear views of the same positions.

Fig. 161.

Prof. Gysi holding the teeth from sliding during the movements of automatic articulation.

If automatic articulation is properly carried out it establishes in a few moments relations which most of us have spent hours seeking to establish by other methods. It adjusts the inclinations of the several teeth to the movements of the mandible of the articulator. In cases where the Gysi Adaptable Articulator is used, that means to the movements peculiar to the patient.

It determines the steepness of the compensating and lateral curves better than it can be done by any other method. In cases where the overbite of the incisors is shallow, this curve will include only the buccal cusps of the first and second molars and the disto-lingual cusps of the upper second molars. In cases where the overbite of the incisors is deep, this curve will affect the lingual cusps of both molars as can be seen from a study of Fig. No. 159.

Automatic articulation also rotates the teeth on their vertical axes to afford the most satisfactory relations with the opposing teeth.

The intelligent dentist who masters the slight technic of this operation, will appreciate more than ever before the skill with which Prof. Gysi has formed Trubyte bicuspids and molars, because with them relations may be very quickly and satisfactorily established. With some forms of teeth this method is ineffectual because the teeth are not shaped to make it effective.

GRINDING THE TEETH TO FINISHED ARTICULATION.

When the process of automatic articulation has been completed, the teeth should be in the most advantageous positions which can be secured by moving each tooth as a whole. The articulation must be completed by grinding.

There seems to be a general impression among dentists that the need for grinding is evidence that the teeth are not correctly formed, and that if they were rightly formed no grinding would be needed. Such an idea is a mistake.

If teeth require to be extensively ground to permit articulation, it is evidence that they were not rightly formed or not rightly selected or placed. But grinding has its proper and important place in the scheme of articulation, and dentures which have been properly ground are better than those which have not.

But little if any grinding should be necessary with a stone. Occasionally a little porcelain will flow out of its appointed place and will need taking down with a stone. Occasionally the conditions of the case will require minor adjustments of widths with a stone. But no reshaping of the teeth or other extensive changes should be necessary.

The articulation of the dentures is finished by grinding the sets together with a paste of carborundum powder and glycerine between the cutting edges and occlusal surfaces. The dentures should be held in contact with light but firm pressure and made to perform the lateral movements of mastication. This may be continued until the right relations are established to the dentist's satisfaction, and the proper facets have been perfected on the anteriors and formed on the bicuspids and molars. This should not require more than 20 minutes.

The formation of these facets on the bicuspids and molars is very important to the efficiency of the dentures, and they cannot be formed in any other manner than by grinding the sets together in this manner.

It may be helpful to some to understand just why these facets cannot be formed by the manufacturer and why they must be formed by the dentist. They cannot be formed by the manufacturer, because they cannot be formed at all until the teeth are articulated. The utmost that the manufacturer can do is to furnish teeth properly formed to receive the facets. That requires the most extensive knowledge of articulation and the most advanced methods of tooth formation.

The facets cannot be formed until the teeth are articulated because their location and extent are determined by the positions of the teeth and no one can foresee those positions. The facets have little value if the facets of one set are not complementary to those of the other set, so that the edges, when passing, cut up fibres and the surfaces roll the cells and smash the cell walls.

The grinding removes the glaze from the facets and leaves it on the other portions of the occlusal surfaces so that food shall not lodge there.

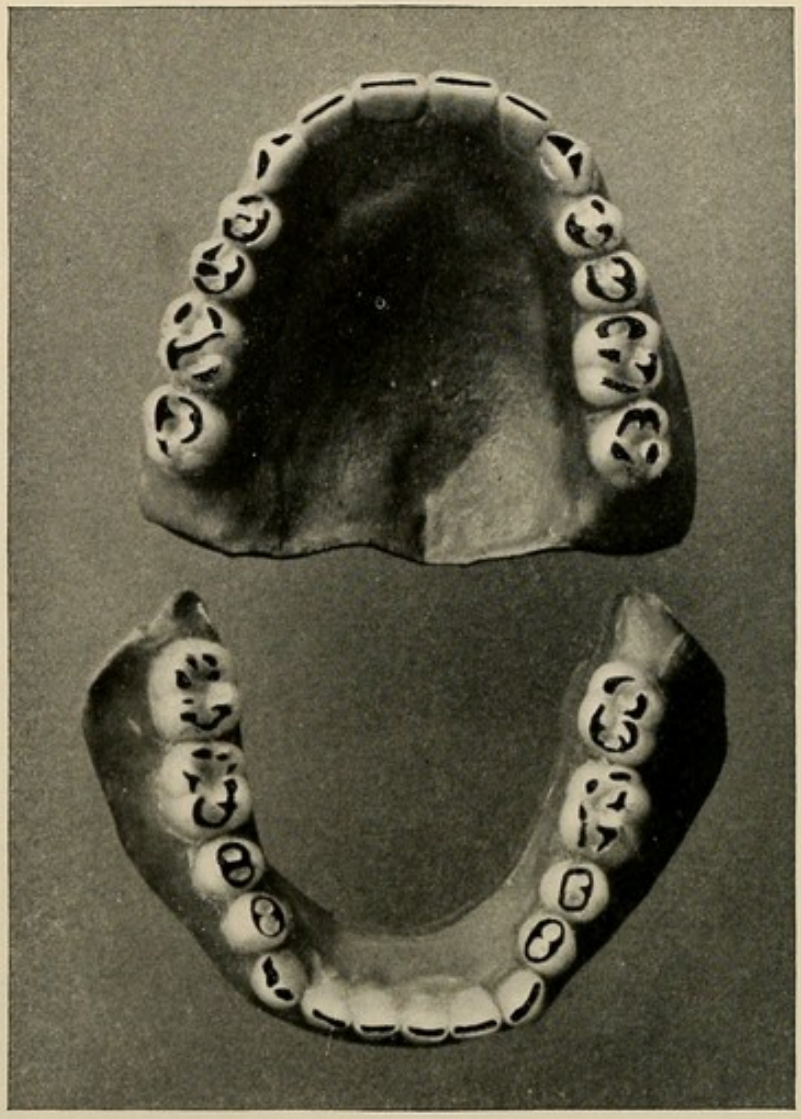


Fig. 162.

Photograph showing upper and lower dentures in a practical case after they had been ground by automatic articulation and the facets had been perfected on the cutting edges of the anterior teeth and formed on the occlusal surfaces of the bicuspids and molars, by rubbing the sets together in lateral movements with a paste of carborundum and glycerine between them.

The facets indicate clearly what portions of each tooth are in articulation with the opposing tooth during movements to both sides. By far the larger portion of each surface never enters into articulation when the teeth are properly formed. The portions which articulate in a single lateral movement are relatively small, since it proved impossible to here separate the facets engaged in one movement only, and more than one facet is here shown in nearly every ground section.

While the margins of the facets are not sharp in the way a knife is, they are clearly differentiated from the rest of the tooth surface and are sharp enough to cut food when drawn across opposing facets.

Enough power can be transmitted through dentures to make teeth formed and articulated in this way effective in mastication, when the ordinary forms of teeth would be wholly ineffective.

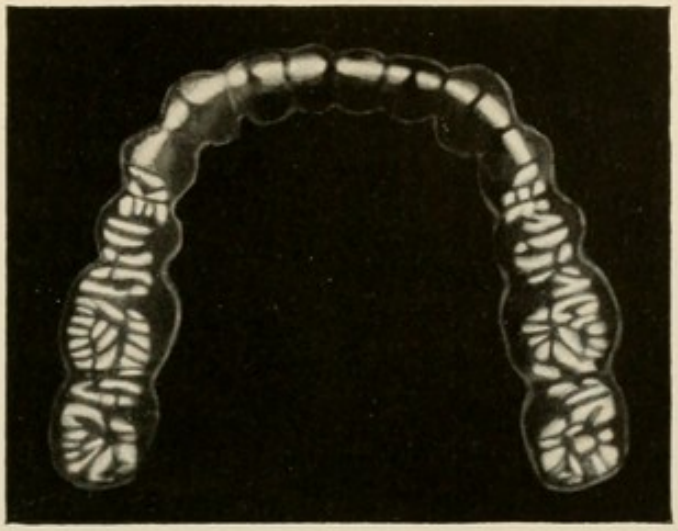


Fig. 163.

How properly formed teeth masticate food. This is from a photograph of a sheet of modelling compound into which properly articulated sets of Trubyte teeth were closed. The rather wide and shadowy outline shows where the crowns of the teeth bit into the compound. The smaller, lighter areas show where the teeth bit practically through the compound.

It will be noted that the teeth nowhere bit through in a large area, but at all the points of closest opposition of the teeth are small. It will be noted also that each spot of close approximation resembles somewhat a short knife blade, blunt when compared to a real knife, but sharp when compared to the opposed areas of artificial teeth in the past.

No lateral movements were made in this case, but it is easy to see that with so many small, closely opposed areas, the lateral movement of the teeth would be very effective in masticating the food.

The relatively small power which can be transmitted through artificial dentures can make these small areas effective, in cutting up the fibres and in smashing the cell walls so that the contents of the cells may be insalivated.

TRUBYTE MOLAR BLOCKS.

Fig. No. 164.

Prof. Gysi has perfected an improvement in bicuspids and molars which goes farther toward simplifying articulation in full dentures than any other one thing of which I know. He has combined the four bicuspids and molars of one side of one jaw into a solid block the occlusal surface of which presents the curves essential to articulation. There are two of these blocks for the upper denture and two for the lower.

The curves of the occlusal surfaces are designed for the average adaptations, as exhibited in The Simplex Articulator. They may be arranged for any required depth of curve by merely elevating the upper second molars to the desired extent.

The upper block is properly placed by setting the buccal cusp of the upper first bicuspid and both cusps of the second bicuspid in contact with the flat occlusal surface of the lower trial plate.

The advantages attending the use of these blocks are as follows:

The teeth can be set in about one-fourth of the time required to set the single teeth.

No curves need be worked out even by the eye. When the bicuspid cusps touch, as described above, the upper block is in correct position for automatic articulation.

The position of each of the teeth in the block is fixed as regards the other posteriors on the same side.

The lower blocks go to definite places, and require only grinding against the uppers to perfect the articulation.

The teeth do not change positions during vulcanization.

The hold of each block on the plate is very strong.

The interdental spaces on the lingual are filled with porcelain and make a fine finish for the tongue. The buccal sides appear as plain teeth, that is, there is no pink porcelain gum.

The moulds are the same as in the plain teeth. They present the same deep fossæ and sulci, the same high cusps and the same shallow bite.

I believe these blocks will become very popular.

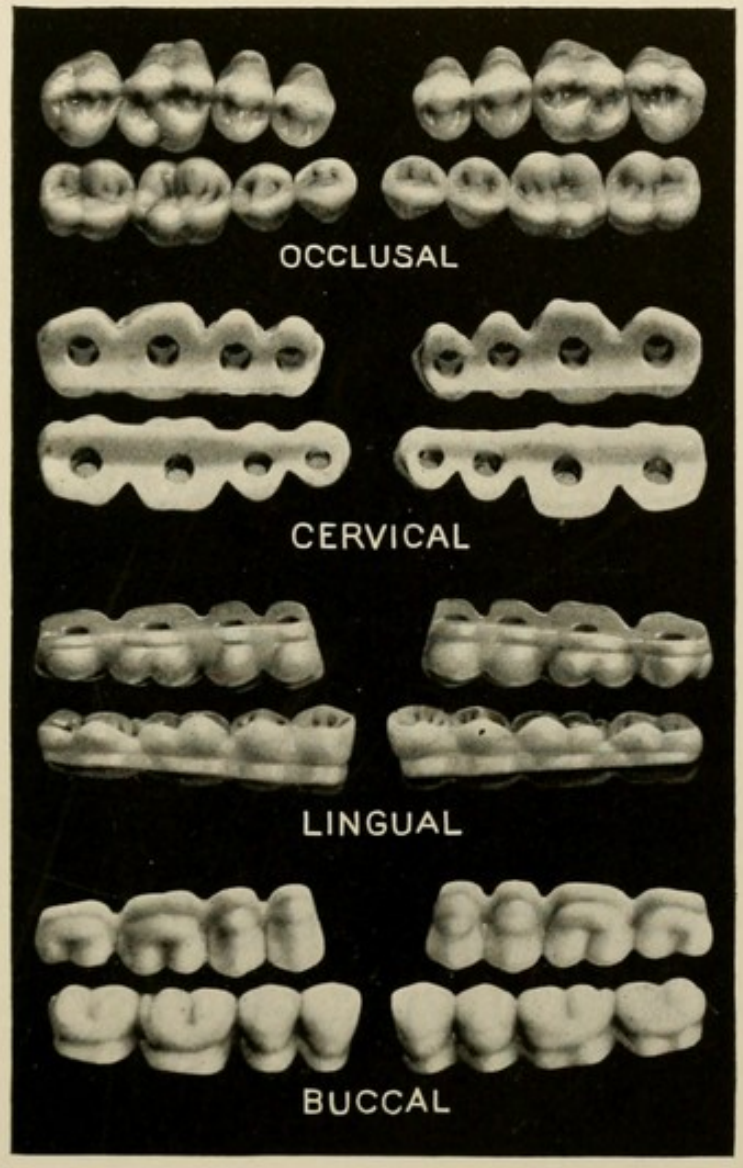


Fig. 164.
Trubyte Molar Blocks.

WAXING PLATES TO FACILITATE PRONUNCIATION.

Fig. No. 165.

Try the waxed up dentures in the patient's mouth. Have the patient read aloud and watch the mouth for length of teeth, fulness of lips, etc.

If the upper plate is hollowed behind the upper incisors as shown on the left in Figure 165, the patient will have difficulty in pronouncing words containing s, st, th, ch, j, x, etc., such as "Peace satisfies the soul."

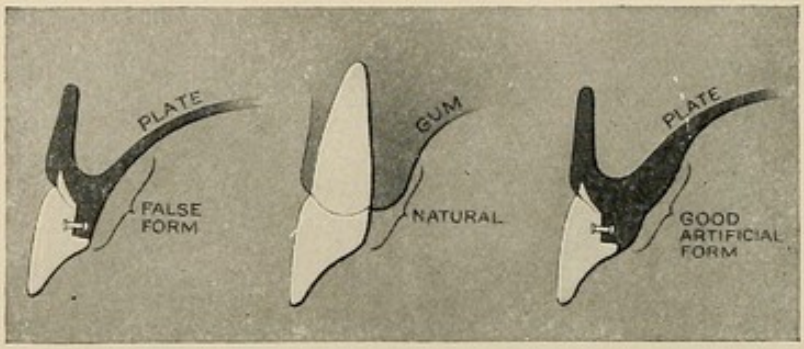


Fig. 165.

The anterior portion of the natural vault is convex behind the upper incisors and facilitates clear pronunciation. This form can be reproduced by waxing the upper denture to the form shown at the right in Figure 165.

INVESTING THE BICUSPIDS AND MOLARS.

A fine articulation is sometimes destroyed by a tooth changing place during vulcanizing. The simplest way to prevent this is to use the Molar Blocks, which are not likely to change.

If single teeth are used, the danger of change in position can be reduced to a minimum by keeping on hand a supply of sheet copper such as tinners use for water conductors. When the teeth are ready to flask, make a trough of this copper, the bottom of which will lie along the occlusal surfaces of the bicuspids and molars, and a wall of which will extend up along the buccal surfaces. Fill this with Spence's Plaster, mixed thin enough to permit tapping it down to place when inverted on the teeth. Invert on the teeth and tap down to touch all the occlusal surfaces. Be careful not to leave any Spence's plaster on the wax.

Invest as usual. The teeth should not change positions.

ARTICULATING THE VULCANIZED DENTURES.

The vulcanized dentures should be articulated in the mouth by means of articulation paper, or double faced carbon paper, or ordinary carbon paper doubled.

The patient should be instructed to close the mouth in the position of central occlusion and make slight rubbing movements. Points of undue prominence will be marked on both upper and lower teeth.

To remove such spots, *grind only the one that is out of contact during central occlusion.* If the other is ground, it destroys the occlusion.

Fig. 166.

The final result. Teeth harmonious in form, size and color, stable in position, and efficient.

PART VIII.

Illustrations And Descriptions Of Teeth And Tables Of Dimensions

GENERAL INFORMATION CONCERNING FORMS AND MARKINGS.

The forms in Trubyte teeth are comprised in three classes, each class comprising the modifications of one typal form.

Class I comprises all modifications of the square type.

Class II comprises all modifications of the tapering type.

Class III comprises all modifications of the ovoid type.

Each modification is represented by a form, and each form is produced in a series of graded sizes suited to the characteristics of that form. Each size of each form constitutes a separate mould. Each mould is marked with the number of the form and with a letter indicating the size.

Different letters are used to indicate sizes in the different classes. In Class I the letters are C-D-E-F-H. In Class II the letters are L-M-N-P-R. In Class III they are T-U-W-X-Y.

The number and letter should always be given. It is then not necessary to name the Class, since the same letters do not appear in two classes.

There are five forms in Class I, representing five modifications of the long square form. They are numbered 1-2-3-4-5, and the sizes are 1C-1D, etc., and 2C-2D, etc. Outlines of the forms in this class are shown on page 85.

There are four forms in Class II, representing four modifications of the tapering form. They are numbered 1-2-3-4, and the sizes are 1L-1M, etc., 2L-2M, etc. Outlines of the forms in this class are shown on page 87.

There are four forms in Class III, representing four modifications of the ovoid form. They are numbered 1-2-3-4, and the sizes are 1T-1U, etc., 2T-2U, etc. Outlines of this form are shown on page 89, but the letters indicating sizes should be T-U-W-X-Y.

At the time of the publication of this book, Class III forms are not far enough completed to permit offering them to the profession, but spaces are provided for filling in their dimensions when they appear.

This is the long modification of the Square Type, in which the length of the labial surface of the upper central, exclusive of collar, markedly exceeds the width.

The upper centrals and laterals are distinguished by nearly parallel sides for a considerable distance upward from the incisal edges, and by rather flat approximal curves and wide necks. These curves combine to give the teeth a generally square appearance, though the severe typal form has been so far modified that the angularity and rudeness are lost.

The upper cuspids present flat curves on the mesial surfaces, but pronounced curvatures of the distal surface. The shoulders of these cuspids are set well forward, enabling the dentist to hide the bicuspids, and secure pleasing effects. The points of the cuspids are cut well back to facilitate articulation with the lower cuspids with a minimum of grinding.

The collars of the upper and lower anteriors are fairly deep, permitting the dentist to imitate recession of the gums.

The lower incisors are distinguishable from the lower incisors of the past, by retaining the character of the uppers. The approximal surfaces are nearly parallel for a short distance downward from the incisal edge, then curve inward to medium wide necks. The mesial surfaces present convex curves, while the distal surfaces exhibit distinct compound curves which greatly increase the beauty of the teeth.

The lower cuspids carry out the character seen in the upper cuspids and have their shoulders well to the mesial. This will greatly assist in building up the lower cuspid eminences.

The upper and lower anterior teeth are shaded as described on page 113. Both sets present natural enamel markings.

The upper central in each shade is shaded like the sample tooth on the Twentieth Century shade ring, and no other colors appear in the teeth.

Indications. Teeth of this form are indicated in faces which are much longer than they are wide, and which exhibit nearly parallel sides and chins of full medium width or more. Such faces are common. Many faces lie on the border line between this form and Form II in Class I, and also between this form and Form I in Class II.

DIMENSIONS OF TRUBYTE TEETH

CLASS I

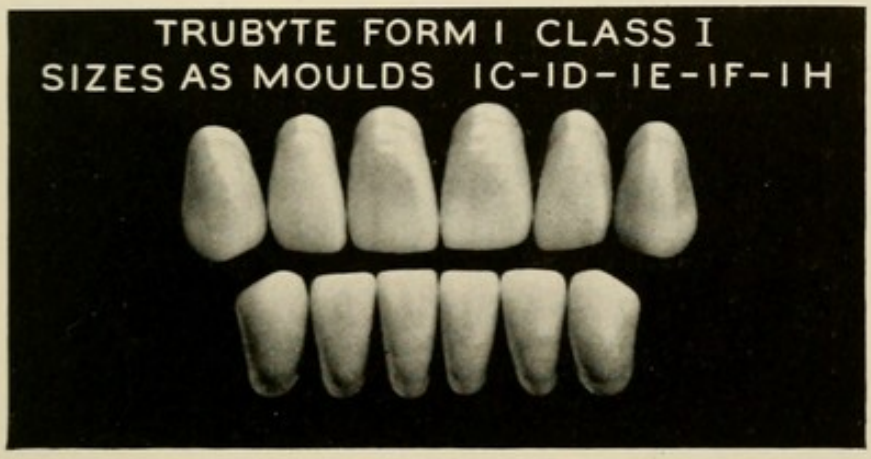
MODIFICATIONS OF THE SQUARE TYPE

FIVE FORMS IN GRADED SIZES

WHEN DIMENSIONS ARE NOT GIVEN THE SIZES ARE IN PREPARATION.
ALL DIMENSIONS ARE IN MILLIMETERS.

Similar dimensions in plain vulcanite pin teeth; combination sets with individual diatoric posteriors, and combination sets with molar blocks.

FORM 1. THE LONG MODIFICATION OF THE SQUARE TYPE.



UPPERS

Mould No.	Length Central Without Collar	Width 6 anteriors Set up	Width Full 14 Set up	Combined Bite and Shut of Central	Width of Central
1C					
1D	9.75	42-43	103.	8.	7.
1E	10.25	45.	108.	9.	7.5
1F	10.75	46-47	109-110	9.5	8.
1H	11.50	51.	123-124	9.5	8.5

LOWERS

Mould No.	Length Central Without Collar	Width 6 anteriors Set up	Width Full 14 Set up	Combined Bite and Shut of Central	Width Four Incisors
1C					
1D	9.	32.5	102.	9.	21.
1E	9.	36.	104.	9.	22.5
1F	9.5	36.	106.	9.	23.
1H	10.25	40.	115.	9.5	25.

FORM 2—CLASS I.

This is the medium long modification of the Square Form, in which the length of the labial surface of the upper centrals, exclusive of collar, considerably exceeds the width of that surface, but not to such a degree as in Form I.

The approximal surfaces of the upper centrals and laterals are not parallel quite so far upward from the incisal edge, as in Form I, and because of the shortness of the teeth, the approximal curves seem more rounding, especially in the small sizes. The necks are medium wide.

The upper cuspids carry out very well indeed, the character of the centrals and laterals. The shoulders are thrown well to the mesial, and the cutting edges are cut back to facilitate articulation with the lower teeth.

The lower incisors have the character first seen in the lower incisors of Form I, the convex mesial surfaces and the compound curves on the distal surfaces. The labial surfaces of these teeth stand well forward from the collars, enabling the dentist to finish the vulcanite for fine effects.

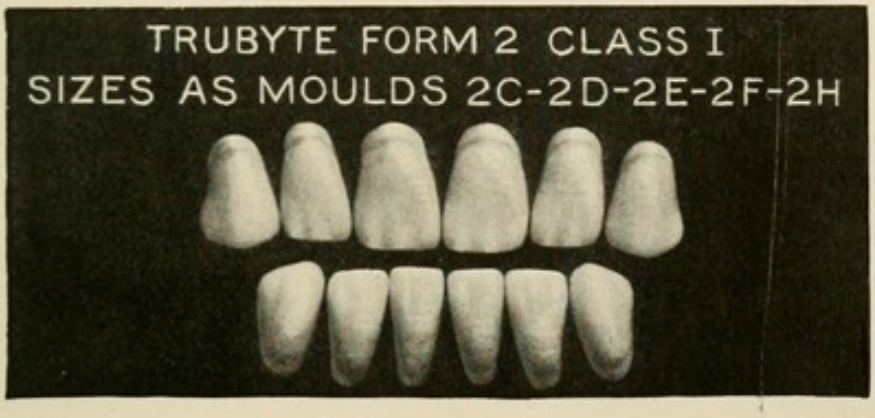
Both the upper and lower sets are shaded as described in the foregoing pages. Both sets present natural enamel markings on the labial surfaces.

Indications. The teeth of this form are indicated in faces slightly longer than they are wide, with fairly straight sides and medium wide chins. Such faces are very common and the various sizes of this form will find extensive use.

Many faces lie in the border land between this form and Form I in this class, and also between this form and Form II in Class II. In many cases a mould from either form may be suitable. This increases the availability of the moulds by affording suitable teeth of other dimensions.

CLASS I.

FORM 2—Medium Long, Square.



UPPERS

Mould No.	Length Central Without Collar	Width 6 anteriors Set up	Width Full 14 Set up	Combined Bite and Shut of Central	Width of Central
2 C	8.50	42-43	102-103	8.	7.
2 D	9.25	44	103	8.5	7.5
2 E	10.	46-47	108-109	9.25	8.
2 F	10.75	48-49	110-111	9.5	8.25
2 H					

LOWERS

Mould No.	Length Central Without Collar	Width 6 anteriors Set up	Width Full 14 Set up	Combined Bite and Shut of Central	Width Four Incisors
2 C	8.5	33.	100	7.5	20.
2 D	9.	34.	101	9.	21.5
2 E	9.	36.5	106	9.	23.
2 F	10.	37.	106	9.5	23.5
2 H					

FORM 3—CLASS I.

This is the short modification of the Square Type, in which the length of the labial surfaces of the upper centrals, exclusive of collar, slightly exceeds the width.

The approximal surfaces of the upper centrals are, in general, nearly parallel throughout a considerable portion of the length of the tooth, but the sides are so delicately curved as to take away any appearance of blockiness which might otherwise result. The necks are wide and the interdental spaces small. The sides of the upper laterals are not quite so nearly parallel as those in the centrals but the generally square character is well carried out. The cuspids are excellently suited to the centrals and laterals, the mesial approximal surfaces being strongly convex, the shoulders prominent and well to the mesial, and the distal angles prominent.

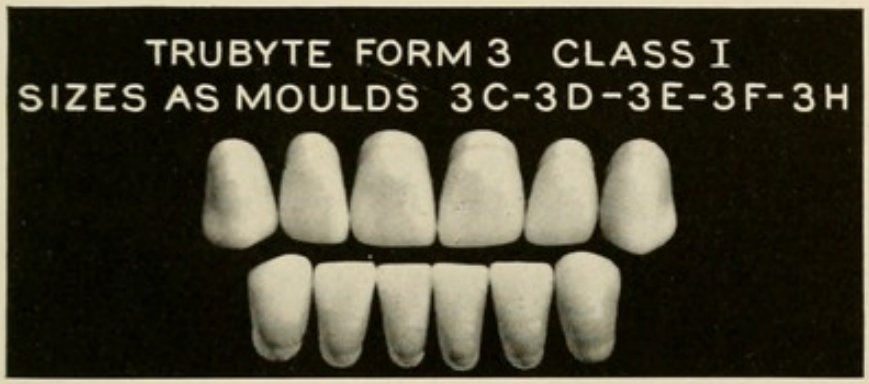
The lower incisors appear more nearly square than in Forms I and II but they present the same convex curves on the mesial approximal surfaces and somewhat of the same double curve on the distal approximal surfaces. They are admirably suited in character to the upper anteriors. The lower cuspids are very much like the uppers in character, except that the distal angles are not so prominent.

Both the upper and lower sets are shaded as described in the foregoing pages. They present the enamel markings on the labial surfaces.

Indications. The teeth of this form are suited for faces which are nearly as wide as they are long, and which present nearly parallel sides with flat curves and wide chins. Such faces sometimes present in rather large sizes but it is not believed that teeth of a size larger than 3D will be required for any ordinary case.

CLASS I.

FORM 3—Short Square.



UPPERS

Mould No.	Length Central Without Collar	Width 6 anteriors Set up	Width Full 14 Set up	Combined Bite and Shut of Central	Width of Central
3 C	8.	44-45	105-106	8.	7.75
3 D	8.75	45-46	108-109	8.	8.
3 E					

LOWERS

Mould No.	Length Central Without Collar	Width 6 anteriors Set up	Width Full 14 Set up	Combined Bite and Shut of Central	Width Four Incisors
3 C	7.75	35.	103.	8.	23.
3 D	8.75	36.	106.	8.50	23.
3 E					

FORM 4—CLASS I.

While the majority of faces of the square type present one of the modifications exhibited in Forms 1, 2, 3 or 5, a feminine face sometimes presents which differs from these in presenting a square form which is somewhat softened by greater delicacy of outline and yet does not present the type of chin seen in oval faces.

To permit artistic restorations in faces of this modification, Form 4 has been provided. It is distinguished from Forms 1, 2, 3 by greater convexity of the approximal surfaces, especially on the distal, including a greater rounding away of the distal incisal angles. The upper laterals are delicate and beautiful in form, and the upper cuspids are rather small as compared with the centrals, being intended to produce the impression of softness and beauty rather than of the rugged strength which characterizes most of the square forms.

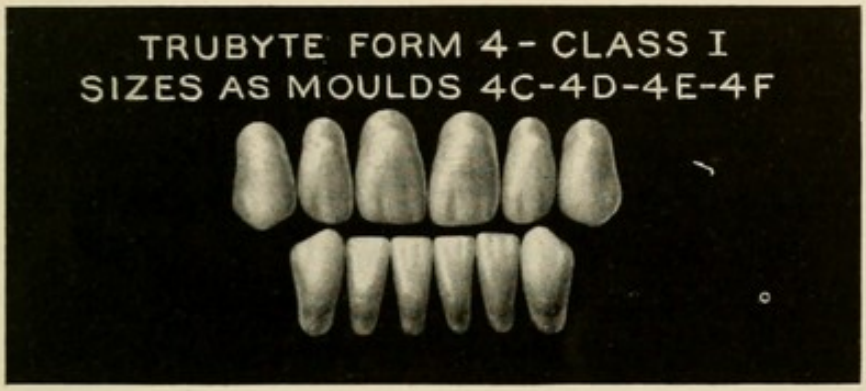
The collars of both upper and lower anteriors are fairly deep and permit the dentist to establish imitations of slightly receding gums.

The lower incisors are small and dainty but are full of character. The mesial approximal surfaces are gently rounding, and the distal approximal surfaces present the compound curves seen in this type of tooth. The lower cuspids are small and carry out the impression of daintiness given by the upper cuspids.

Indications. For feminine faces in which the cheek curves are more rounding than in the stronger forms illustrated on page 79, and where the face has a rather dainty appearance, but the chin is fairly wide. Such faces are often small, and the sizes 4C and 4D will be found very useful in this mould.

CLASS I.

FORM 4—The Feminine Modification of The Square Type.



UPPERS

Mould No.	Length Central Without Collar	Width 6 anteriors Set up	Width Full 14 Set up	Combined Bite and Shut of Central	Width of Central
4 C					
4 D	9.	40.	97.	8.	7.
4 E					
4 F	10.0	45.	107.	9.	8.

LOWERS

Mould No.	Length Central Without Collar	Width 6 anteriors Set up	Width Full 14 Set up	Combined Bite and Shut of Central	Width Four Incisors
4 C					
4 D	8.	29.	93.	8.	18.
4 E					
4 F	9.	33.	102-103	8.	21.

FORM 5—CLASS I.

This is the oval modification of the square type, formed by a slight modification of the curves of the mesial and distal approximal sides. Where the sides were relatively straight in Forms 1, 2, 3, and rounded into the necks and incisal edges by short curves, the approximal curves in the oval form converge more gradually, forming narrower necks and leaving larger interdental spaces. The widest part of the upper centrals is a little above the incisal edge, and the mesial and distal incisal angles are more rounded than in the first three forms in this class.

The upper laterals present quite different characteristics, showing much more of a compound curve on the mesial, and a marked rounding away of the distal incisal angle. Indeed, in this form, the upper laterals contribute a great deal to the appearance which separates the oval form from the more severely square forms.

The upper cuspids are very much of the same character as the laterals and help to differentiate these anteriors from any other square form. The mesial approximal surfaces show pronounced convex curves with a typical rounding away at the neck. The distal surfaces present very noticeable compound curves.

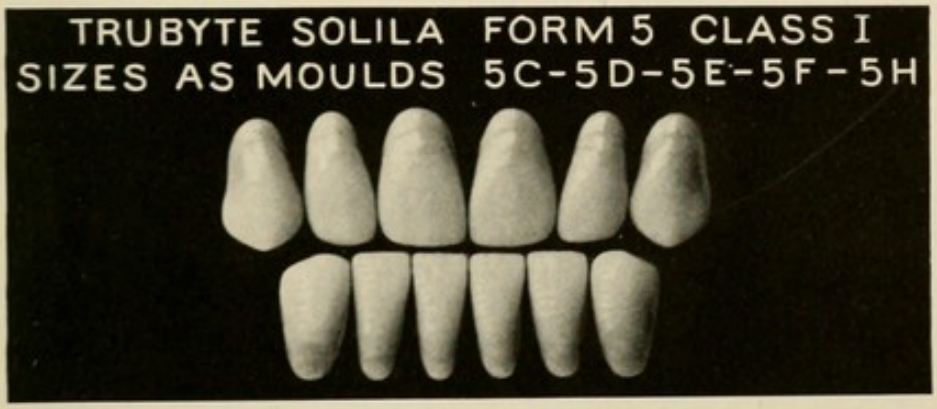
The mesial approximal surfaces of the lower incisors present the convex curves of the same character as those seen in the upper anteriors, and strong compound curves on the distal sides. The necks are wide and the interdental spaces small. The lower cuspids present only a trace of the rounding away of the mesial surface seen in the upper cuspids, but this, taken with the compound curve on the distal surfaces, reproduces in a pleasing way the character seen in the upper cuspids.

Indications. For faces in which the square character has been changed to the oval form by the lengthening of the curves of the cheeks, but in which the chin is medium wide, enough so that the tapering form is not quite suitable.

A good many faces lie on the border land between this form and the form illustrated on pages 239 and 241, and in some cases moulds from any of these forms may be suitable.

CLASS I.

FORM 5—The Oval Modification of The Square Type.



UPPERS

Mould No.	Length Central Without Collar	Width 6 anteriors Set up	Width Full 14 Set up	Combined Bite and Shut of Central	Width of Central
5 C					
5 D					
5 E					
5 F					
5 H					

LOWERS

Mould No.	Length Central Without Collar	Width 6 anteriors Set up	Width Full 14 Set up	Combined Bite and Shut of Central	Width Four Incisors
5 C					
5 D					
5 E					
5 F					
5 H					

FORM 1 — CLASS II.

The severe form of the Tapering Type presents, in the upper centrals, practically straight approximal sides which converge so rapidly that they would sometimes meet at the middle of the root, and at other times at the apex of the root. This severe form is not pleasing, but when modified by combination with the square or ovoid types, presents some of the most pleasing and effective forms known to porcelain teeth.

Form 1 is the first and most severe modification of the tapering type. It is removed as little from the primitive form as may be and lose the rudeness which that form presents, but it preserves to a remarkable degree the strength and character of the original.

The approximal surfaces of the upper centrals are nearly straight, but the slight convexity of the mesial surfaces and the just noticeable double curves in the distal surfaces, save the teeth from blockiness.

The upper laterals and cuspids are strongly convex on the mesial surfaces and both present on the distal surfaces the same compound curves seen in the centrals. These curves are quite different in character from those seen in the forms in Class III.

The lower incisors are of like character with the uppers. The mesial approximal surfaces are slightly convex and taper to necks harmonious in width with the uppers. The distal approximal surfaces are slightly concave and save the teeth from an appearance of straightness. The lower cuspids are of like forms with the incisors.

Indications. These teeth are indicated for faces which taper by straight, firm lines to chins sometimes of less than medium width. In many cases the difference in width of the chin will determine whether a form from this class or one from the square class is indicated, the wide chins calling for the square teeth.

This is one of the forms in teeth which is much more pleasing in the mouth than out of it. The medium sizes will be found harmonious with the type of face often spoken of as "The American Business Man's Face," with its appearance of clean cut strength.

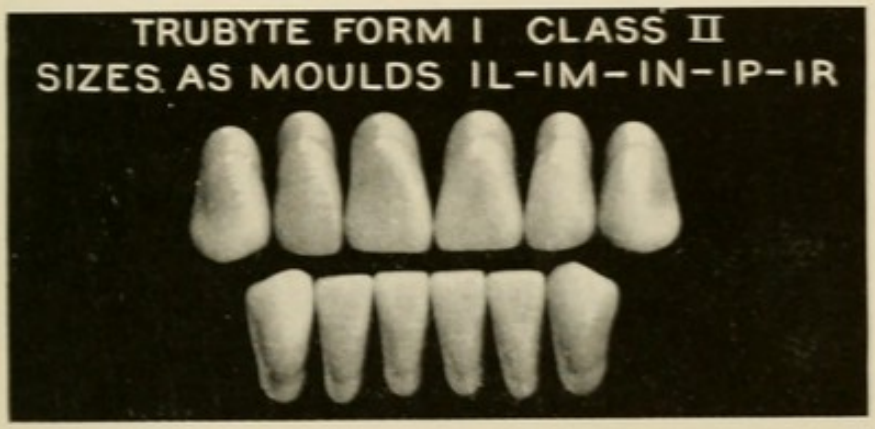
Teeth of this form are likely to grow into great favor. They should be set without overlapping of the laterals.

CLASS II.

MODIFICATIONS OF TAPERING TYPE

FOUR FORMS IN GRADED SIZES

FORM 1.—The Severe Modification of The Tapering Type.



UPPERS

Mould No.	Length Central Without Collar	Width 6 anteriors Set up	Width 14 Set up	Combined Bite and Shut of Central	Width of Central
1 L					
1 M					
1 N	10.5	53.	120.	9.5	8.5
1 P	11.	55.	122.	9.5	9.
1 R					

LOWERS

Mould No.	Length Central Without Collar	Width 6 anteriors Set up	Width 14 Set up	Combined Bite and Shut of Central	Width Four Incisors
1 L					
1 M					
1 N	10.	42.	112.	8.5	26.
1 P	10.	44.	114.	10.	27.
1 R					

FORM 2 — CLASS II.

This is the second modification of the Tapering Type and is a little further removed from the severity of the typal form than Form 1. The approximal surfaces of the upper centrals are more convex and turn apart more at the necks. The distal approximal surfaces show more of a compound curve and altogether the teeth are less straight.

The laterals and cuspids carry out the character of the centrals so that the appearance of the upper anteriors is even better expressed by all of the teeth than in some of the other forms.

The lower incisors do not show quite as much departure from the straight form as do the uppers, but they serve as beautiful and characteristic bases for the uppers. The mesial approximal surfaces are convex, but do not turn quite so much apart as in the upper teeth. The distal surfaces exhibit the same compound curve as in the uppers. The necks are fairly wide.

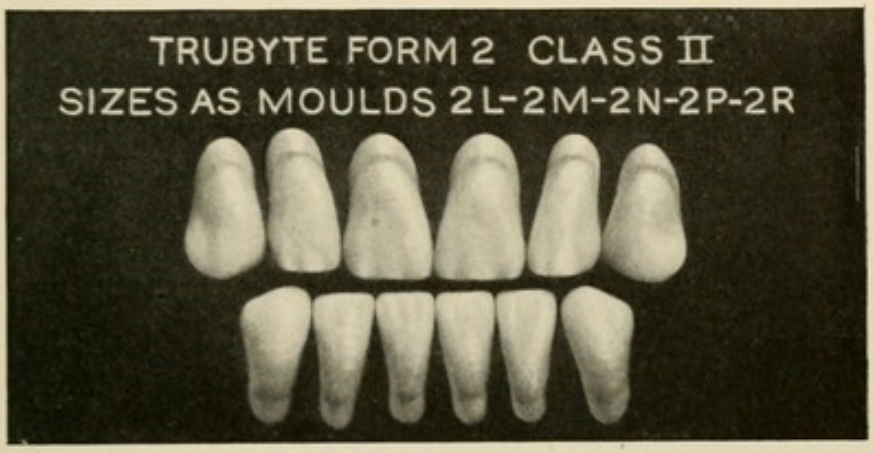
The character of the lower cuspids is identical with that of the incisors except that the distal angle is more pronounced.

Indications. This form is particularly suited for masculine faces of less strength than those requiring Form 1 and for some feminine faces of the tapering type.

The beauty of these teeth is increased by setting the upper laterals to overlap the centrals when conditions warrant it.

CLASS II.

FORM 2—Second Modification of Tapering Type.



UPPERS

Mould No.	Length Central Without Collar	Width 6 anteriors set up	Width 14 Set up	Combined Bite and Shut of Central	Width of Central
L					
2 M	8.75	41.	103.	8.	7.
2 N	9.75	44.	106.	8.	7.5
2 P	10.50	47-48	111.	9.	8.
R					

LOWERS

Mould No.	Length Central Without Collar	Width 6 anteriors set up	Width 14 Set up	Combined Bite and Shut of Central	Width Four Incisors
L					
2 M	8.	33.	99-100	8.	20.
2 N	9.	34.	102.	9.	21-22
2 P	10.	37.	108.	9.5	23-24
R					

FORM 3.—CLASS II.

This form is the third modification of the severe typal form, and is somewhat softer in outline than Form 2. The mesial approximal surfaces of the upper centrals and laterals show convex curves, but these surfaces are not so straight up and down in the incisal thirds and turn more widely apart at the necks, leaving wider interdental spaces.

The distal surfaces do not show the compound curves of Form 2 but are gently convex from cutting edges to necks.

The curves in the mesial surfaces of the cuspids are quite different from those in Form 2, being more nearly straight but with a slight tendency toward a double curve.

The lower anteriors are much like those in Form 2, with the difference that the necks are narrower and the interdental spaces are wider. The cuspids are straighter in character than in Form 2.

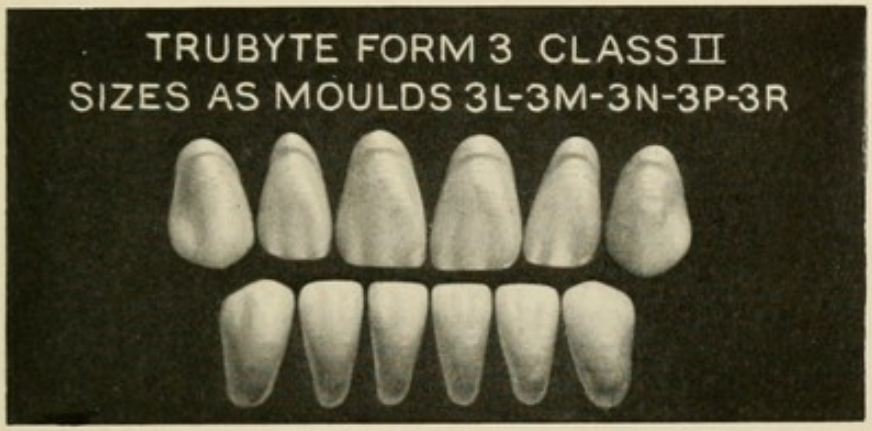
Indications. This form and Form 4 are particularly suited to feminine faces of the tapering type. These faces are often very beautiful. They have been selected by many great masters as the subjects of their paintings, and they have always commanded admiration.

This form will be found suitable for many such faces, as well as some male faces.

The upper laterals may well be set to lap the centrals.

CLASS II.

FORM 3—The Third Modification of Tapering Type.



UPPERS

Mould No.	Length Central Without Collar	Width 6 anteriors Set up	Width 14 Set up	Combined Bite and Shut of Central	Width of Central
L					
M					
3 N	9.75	45.	105.	8.	8.
3 P	10.50	50.	124.	8.5	8.5
R					

LOWERS

Mould No.	Length Central Without Collar	With 6 anteriors Set up	Width 14 Set Up	Combined Bite and Shut of Central	Width Four Incisors
L					
M					
3 N	9^2	36.	103.	9.	22.
3 P	9^2	38.	114.	8.	25.
R					

FORM 4 — CLASS II.

The softest modification of the tapering type and exhibiting the greatest modification of the original form by combinations with Types 1 and 3.

The mesial approximal surfaces of the upper centrals are decidedly convex and begin to separate at the incisal edges. They turn apart quite a distance and leave a rather wide interdental space. The distal approximal surfaces exhibit marked compound curves.

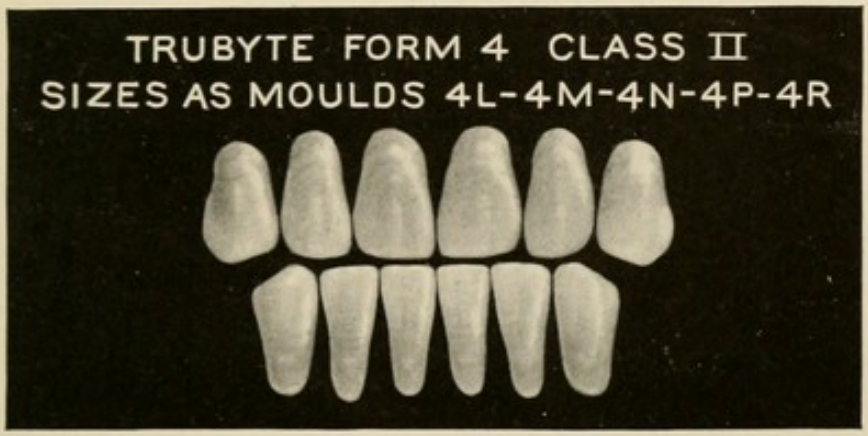
The laterals show much more strongly than the centrals the modifying influences of the other types of teeth. Both approximal surfaces are convex, and the compound curve seen on the distal of the centrals is not in evidence. The cuspids are more like the centrals in character.

The lower incisors express strongly the character seen in the upper centrals, the compound curve on the distal approximal surfaces giving them much character. The lower cuspids are rather straight but have well defined distal angles.

Indications. This form is well suited for feminine faces which taper from eyes to chin by soft curves, often quite rounding. It is particularly suited to the character of faces seen in illustrations and in great paintings and typical for beauty. The laterals may be set to lap the upper centrals slightly which increases the beauty.

CLASS II.

FORM 4.—THE FOURTH AND SOFTEST MODIFICATION OF THE TAPERING TYPE.



UPPERS

Mould No.	Length Central Without Collar	Width 6 anteriors Set up	Width 14 Set up	Combined Bite and Shut of Central	Width of Central
4 L					
4 M	8 75	41.	98-99	9.	8.
4 N	9.75	44-45	106.		
4 P					
4 R					

LOWERS

Mould No.	Length Central Without Collar	Width 6 anteriors Set up	Width 14 Set up	Combined Bite and Shut of Central	Width Four Incisors
4 L					
4 M	9.	31.5	95.	9.5	19.5
4 N	9.	35.	103.	9.5	22.
4 P					
4 R					

Form 1—Class III.

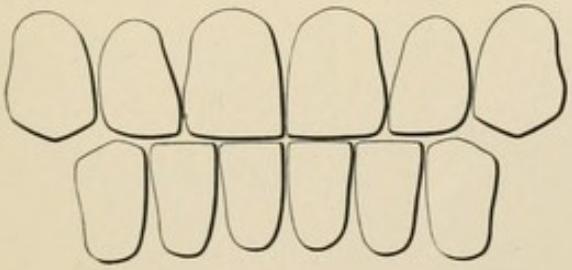
When the description is published in The Dental Digest it may be placed here.

CLASS III.

MODIFICATIONS OF THE OVOID TYPE

FOUR FORMS IN GRADED SIZES

FORM 1—The Severe Modification of The Ovoid Type.



UPPERS

Mould No.	Length Central Without Collar	Width 6 anteriors Set up	Width Full 14 Set up	Combined Bite and Shut of Central	Width of Central
1 T 1 U 1 W 1 X 1 Y					

LOWERS

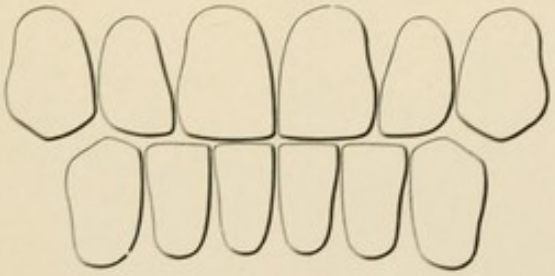
Mould No.	Length Central Without Collar	Width 6 anteriors Set up	Width Full 14 Set up	Combined Bite and Shut of Central	Width Four Incisors
1 T 1 U 1 W 1 X 1 Y					

Form 2—Class III.

When the description is published in The Dental Digest it may be placed here.

CLASS III.

FORM 2—The Second Modification of The Ovoid Type.



UPPERS

Mould No.	Length Central Without Collar	Width 6 anteriors Set up	Width 14 Set up	Combined Bite and Shut of Central	Width of Central
2 T					
2 U					
2 W					
2 X					
2 Y					

LOWERS

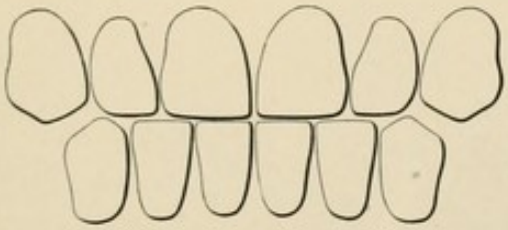
Mould No.	Length Central Without Collar	Width 6 anteriors Set up	Width 14 Set up	Combined Bite and Shut of Central	Width Four Incisors
2 T					
2 U					
2 W					
2 X					
2 Y					

Form 3—Class III.

When the description is published in The Dental Digest it may be placed here.

CLASS III.

FORM 3—The Third Modification of The Ovoid Type.



UPPERS

Mould No.	Length Central Without Collar	Width 6 anteriors Set up	Width 14 Set up	Combined Bite and Shut of Central	Width of Central
3 T					
3 U					
3 W					
3 X					
3 Y					

LOWERS

Mould No.	Length Central Without Collar	Width 6 anteriors Set up	Width 14 Set up	Combined Bite and Shut of Central	Width Four Incisors
3 T					
3 U					
3 W					
3 X					
3 Y					

Form 4—Class III.

When the description is published in The Dental Digest it may be placed here.