Ney® Surveyor

Directions For Use
Ney first introduced the dental surveyor in 1923.
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Parts List
To insure prompt and accurate service when ordering parts, please provide the item letter, part number and description of each part.

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<thead>
<tr>
<th>ITEM</th>
<th>PART NO.</th>
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<tr>
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<td>Cross Arm with Spindle Bearing*</td>
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<td>C</td>
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<td>D</td>
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Accessories

| S    | 999-54-46 | Universal Handpiece Holder |
| T    | 999-54-47 | Ney Handpiece Holder |
If the keyways do not reciprocate each other, any force that is applied to displace the removable appliance will disengage the contacting surfaces and negate the retentive ability of the milled attachment.

The system used with the familiar "C" clamp is applicable to the "milled in" attachment. An object having parallel sides placed between the holding plates of the "C" clamp at a minimal or 0 pressure will resist any attempt to be removed when a torquing force is applied in any direction other than the parallel planes of the object or holding plates of the clamp.

If a lingual shelf is used on the retainer it should be kept on the same level as the base of the keyway and follow the contour of the tooth axially. The shelf is stopped (or radically reduced in depth) short of the retentive area to take advantage of the retentive ability of the flexible portion of the male.

When milled semi-precision locks are incorporated into the framework of porcelain to metal restorations, the metal should be designed in such a way as to protect the porcelain from having to absorb any stresses or torquing created by the removal or insertion of the removable appliance (Fig. 15).

Where milling is to be done on anterior casings metal thickness is an important consideration. Many times it is necessary to "step" the milled female in order to gain the necessary length and access to it. This "stepping" of the "mill in" does not reduce the retentive ability of the milled attachment as the total occluso-gingival length is not reduced (Fig. 16).

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**NEY Surveyor**

*Parallelometer*

**For Partial Dentures, Precision and Semi-Precision Restoration Design**

The Ney Surveyor is an ideal instrument for determining the parallelism of two or more surfaces of teeth or other parts of the cast of a dental arch. The professional's choice for designing removable partial dentures, precision and semi-precision fixed restorations.

The Ney Surveyor features a horizontal platform, an adjusting spindle for the vertical indicator and a survey table that can be tilted and locked at the desired angle.

The handpiece holder accessory attachments convert the Ney Surveyor to a tool for powered milling operations.
Description of the Ney Surveyor

The Ney Company was first to market the dental surveyor, in 1923. The present instrument is the result of more than seventy years' continuous experience in this specialized field. The Ney Surveyor is designed for laboratory usage, precision made, durable and is easy to use.

The principal parts of the instrument are as follows: the base (A), an accurately machined horizontal surface on which the survey table moves freely; the vertical upright column (B) carrying a fixed crossarm with spindle bearing (C) at right angles to the base, and spindle tightening screw (E) at the end of the crossarm; the vertical spindles (P) collet style and (D), with black knob which can be rotated and moved vertically in its bearing, always remaining at right angles to the base; the survey table (H) with its adjustable tilt-top clamp (J) mounted on a ball-and-socket joint (L).

The end of the spindle is designed with a precision V-way and self-adjusting tool holder and locking nut (parts F and G) to hold the analyzing rod, the carbon marker in its reinforcing sheath, the wax trimmer, and the three undercut gauges, all of which are supplied as standard equipment. The tool holder also has adequate capacity to take all standard mandrels.

The analyzing rod is used in the preliminary survey of the cast. It is not a marker and will not draw the survey line on the tooth. This is accomplished by the round carbon marker which is mounted in a metal reinforcing sheath to reduce breakage. The undercut gauges are an important aid in the correct positioning of clasp arm tips in the undercuts on abutment teeth. A primary function of the wax trimmer is to make sure that waxed out undercuts will be trimmed parallel to each other. These small tools have their own storage compartment (O) which is reached by unscrewing the knurled top of the upright column (B). At the foot of the column, a convenient rack (N) has been provided for holding them when the surveyor is being used.

The survey table (H) has a built-in clamp (J) for attaching the cast securely to the tilt-top. The clamp has two fixed lugs and a moveable jaw which moves back and forth on an adjusting screw to grip casts securely at three points. By releasing the locking screw (K), the table top can be tilted to any desired angle and then locked securely in that position by a turn of the screw. A simple device permits resetting the tilt-top to any previously selected position. The ball pivot (L) has two fine lines engraved on it. To reset the top it is only necessary to continue these lines onto the ball retaining ring (M) by marking their continuation with a sharp pencil. When the engraved marks are later realigned with the pencil marks, the tilt-top will be returned to its original position.

Milled Attachments

Dental laboratories are often requested to fabricate retainer castings that eventually will be used to retain and support a removable partial denture. The question that arises in these cases is, "where does the technician create the undercut or retention area on this crown?"

Unless full arch impressions or models are available it is impossible to design and develop proper axial contours in relation to other proposed abutments to be utilized in the design of the removable restoration. Retainer castings made on quadrant models that do not include all necessary information generally result in a less than acceptable end product. Full arch models afford the technician the opportunity to design the crowns and the removable appliance as a unit.

The semi-precision milled attachment is completely fabricated by the technician. The female portion is milled into the cast retainer and consists of a keyway, a reciprocating parallel groove and/or a dimple that are engaged by the male retentive portion (Fig. 13).

The basic rules to be followed in the designing and fabrication of the milled attachment are that the main locking milled area be reciprocated by another parallel groove or retentive dimple cut into the retainer casting at a point 180° from the original keyway. The milled areas must reciprocate each other and be as close to parallel vertically as possible (Fig. 14).
pattern. Painting the patterns, sprues and crucible former with Ney Wax-Wet (a surface tension breaker) prior to investing will aid in producing a nodule free casting.

The castings are divested and placed on their respective dies. Frame (f) Fig. 12 shows the molar coping and pontic being positioned. The metal design of each unit was developed to properly support the porcelain to be fused to its surfaces. Note also the position of the female portion of the Mortice Rest. The castings after finishing demonstrate a high quality fit at the Mortice Rest connection. The design of the pontic provides hygienic open interproximal embrasures. (g) Fig. 12. Porcelain is processed to the substructure in the usual manner. Care should be taken to prevent porcelain powder from entering the female during the build-up procedure.

The completed restoration, (h) Fig. 12, fabricated in this manner meets the requirements of a broken stress or non-rigid connector. In addition, a greater esthetic benefit is realized by not displaying metal on the occlusal surfaces. This same positioning variation can be employed in splinting adjacent abutment retainer castings and also as extra-coronal attachments on fixed retainer castings that will support removable partial denture restorations.

### Description of Surveyor Parts


Note: Item S comes with the Collet Style Ney Surveyor.

#### Accessories

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<tr>
<th>ITEM</th>
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<td>Upright Column**</td>
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<td>Built-in Rack for Accessories</td>
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<tr>
<td>T</td>
<td>Universal Handpiece Holder</td>
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<td>U</td>
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Using the Ney Surveyor

The Ney Surveyor-Parallelogram has a variety of uses in fixed bridge construction as well as in clasp design and attachment work. These include the planning of fixed bridges and the cutting of precision rests and key lock seats. In Fig. 1 the Ney Handpiece Holder (A) and the Universal Handpiece Holder (B) are accessories for clamping straight dental handpieces to the vertical spindle of the Surveyor. In effect, the handpiece holder applies a machine shop principle to dental laboratory equipment, namely, that a cylindrical object can be held securely in any desired position in a V-block. The Ney Handpiece Holder (A) and the, Universal Handpiece Holder (B) have two recesses parallel to each other, one for the spindle of the Surveyor and the other for the dental handpiece. The handpiece itself is always parallel to the Surveyor spindle, and, all preparations made with it will necessarily be parallel to each other. The survey table on which the model is mounted is ruggedly made to withstand the pressures necessary in milling and drilling without danger of slipping or changing the angle at which the tilt-top has been set.

Below are applications of a Surveyor equipped with a Handpiece Holder:

1. Cutting rests or key locks in one abutment of loose-end fixed bridges parallel to the cavity preparation of the fixed-end abutment.
2. Cutting parallel recesses in the wax pattern for a cast metal abutment to receive the female portion of a Ney attachment.
3. Preparing study models for all fixed bridgework and removable cases. The stone model is mounted on the survey table and tilted to determine the angle which will involve the least possible tooth preparation. Using proper size burs, all cavities are then prepared in the stone teeth with the model locked at the chosen angle so as to provide a common path of insertion. This prepared study model serves as a blueprint for the operator to follow at the chair during the actual work in the mouth and eliminates the possibility of having to change cavity preparations later on due to an unnoticed tilt of one or more of the abutment teeth.
4. Preparing the proper slot to receive the Ney Mini-Rest, Ney Mortice Rest, Ney MS Attachment, Contact Connector, or the MiniEx2 attachment.

The mandrel portion of the male Mortice Rest is removed and attached to the bottom of the female Mortice Rest and cast, (arrow, b) in Fig. 11. This provides a permanent reversed mandrel for positioning of the male Mortice Rest. Shown in (b) Fig. 11 is a cast male Mortice Rest used to position the female portion when used in the conventional manner. The plastic male, with mandrel removed, is placed on the cast female/mandrel and positioned against the proximal wall of the bicuspid wax pattern. It is luted in place with wax, (c) Fig. 11. The flat proximal plate of the male should be aligned with the other preparation to insure a parallel path of insertion and removal.

The proximal surface and attached male of the completed bicuspid wax pattern are lightly lubricated with Ney Die Lube and the female Mortice Rest is placed on the male, (d) Fig. 11. Prior to seating the posterior patterns that will receive the female, wax is removed from the proximal surface of the pontic. The removal of wax provides space to accept the female. The posterior section is then seated on the model over the assembled Mortice Rest and the female is sealed in position with molten wax. The wax patterns are sprued using Ney 13 gauge offset reservoir sprues and prepared for investing, (e) Fig. 12. The reservoir on the sprue attached to the pontic has been made larger in crosssection than the pattern to ensure that a porosity free casting will be achieved. The reservoir must be no further than 1/16", 1/32mm, from the
The male and female are wire-brushed and checked for discrepancies such as nodules or fins. Should any roughness be present it is removed with tripoli on a #11 soft Robinson brush. Both male and female are cleansed of finishing debris and placed together. Finishing and polishing of the restoration is then completed in the usual manner.

The *Ney Contact Connector* (Fig. 10A) is the smallest non-rigid connector in the Ney line of attachments. It allows splinting in the restricted space between parallel or non-parallel adjacent abutments and limits mesiodistal or faciolingual movement. Advantages provided by this small connector include the ease of use on minimal preparations, eliminating crown over contouring. It also allows one-step waxing, investing and casting of multiple tooth broken stress restorations. Finally, it offers an excellent, snug fit for maximum stability in the recommended application. The *Contact Connectors* not recommended for use with pontics since it is extremely small and may not sufficiently stabilize bridge spans. Fabrication techniques for placement and casting are identical to those used for the other attachments in the Ney line. However, for most efficient placement, slight optical magnification is recommended.

**Non-Rigid Broken Stress Connector Variations**

Prefabricated Ney Plastic Attachments provide the technician with easy to use connectors and result in accurate well fitting broken stress or non-rigid connections. They are generally placed in a retainer pattern within the normal anatomical axial contour of that tooth. In some instances this is difficult because of non-parallel tooth to tooth relationship or lack of tooth reduction. By varying the positioning procedure the attachments can be utilized. The following step-by-step illustrations show how this can be accomplished. The Ney Mini Rest, the Ney MS Attachment and the Ney Mortice Rest can all be employed using the technic variations to be described.

A three-unit bridge with non-parallel abutments, (a) Fig. 11, was selected to demonstrate the procedure. Additional reduction on the distal of the bicuspids could not be made. In addition, it was requested on the work authorization form that no metal was to show on the occlusal table.

**The Surveyed Line**

A surveyed line is a mark drawn by the Carbon of the surveyor on a tooth in such a manner that it outlines the largest dimensions of that tooth in every direction perpendicular to the Spindle of the Surveyor. To obtain this mark the model is mounted on the survey table and, after setting the table to the desired angle, the tooth is brought in contact with the carbon rod and rotated so as to draw the line of contact around the tooth. Without changing the angle at which the Survey Table is set, all of the teeth to be clasped are surveyed and marked in the same manner.

Fig. 2 represents two cones with a common base at the surveyed line on a tooth. The upper cone includes that portion of the tooth above the surveyed line; the lower cone includes that portion of the tooth between the surveyed line and the gingival, the undercut area of the tooth.

In the Surveyor system of partial denture designing, the type of clasp that can be used on each individual tooth is determined by the location of the surveyed line on that tooth.
The Path of Insertion

A round mandrel, secured in the collet (tool holder) of the vertical spindle, is used for analyzing the undercuts of the teeth and tissue to determine the proper path of insertion.

The path of insertion of a removable appliance is the direction in which it seats itself on the teeth. Since the positions of all clasps on the appliance are fixed to each other they must all seat along the same path of insertion. In the Surveyor system of designing partial dentures, each clasp is designed to seat itself in a direction parallel to the Spindle of the Surveyor. Since all of the clasps on the appliance are designed with the model set at the same fixed angle to the Spindle, a common path of insertion is automatically established.

Changing Path of Insertion to Improve Clasping Condition

As stated above, the path of insertion is determined by the angle of the model relative to the vertical Spindle. For this reason, the Table on which the model is mounted for surveying is provided with a ball and socket joint so that the model can be tilted to any desired angle to establish the most favorable path of insertion for each individual case. If the case is surveyed and designed with the occlusal plane at right angles to the spindle, the path of insertion will also be at right angles to the occlusal plane. This is undesirable because it offers little resistance to unseating of the partial by sticky foods. Usually it also results in an undesirable clasping condition. Whenever possible, avoid a path of insertion at right angles to the occlusal plane.

The above difficulties are overcome by using an anterior or posterior tilt (Fig. 3). When an anterior part of the model mounted on the Survey Table is down, it is an anterior tilt. When the posterior part of the model is down, this is a posterior tilt. It is also often possible to obtain better clasping conditions by tilting the model slightly to the right or left to obtain a better balance of undercuts, particularly in bilateral cases. For more on tilting see pages 7, 9, and 11.

The Ney MS (Minimal Space) Attachment, shown in Figure 9, is a parallel-sided interlock. The design feature of extremely small size allows the MS Attachment to be used on fixed bridgework, semi-precision removable partial dentures and also in conjunction with Ney Precision and Ney-Loc Attachment movable/removable partial dentures. An additional advantage lies in the fact that the parallel sides and the close fit of male and female provide a certain amount of frictional grip which adds to the retentive quality of the Ney MS Attachment. This close fit makes it imperative that the female portion be lined up parallel to the cavo-walls of the abutment or with other parallel-sided attachments used on the same prosthesis.

The technical steps of placement and casting are identical to those used for the Ney Mini-Rest and the Ney Mortice Rest. The MS Reamer removes all remaining debris and surface roughness and insures an accurate fit of male to female. The castings are cleansed of residue investment, pickled, and the sprues removed. Dip the MS Reamer (held in a pin vise or broach holder) in Ney Die Lube and rotate gently clockwise into the female (Fig. 10). The reamer is run all the way down to, and including, the bottom of the female before removing (also rotating clockwise). Waterproof Silicone Carbide paper (600-A) is placed on a flat, hard surface and the face of the female proximal plate stroked lightly to produce a flat, smooth surface.
After checking the fit of the castings on their respective dies, the male and female are wire brushed. This produces a smooth surface on the castings and make seating of the units easier.

The castings are finished and polished (Fig. 7). The Mini-Rest does not provide unlimited movement of the posterior abutment but does allow normal tooth movement.

The Ney Mortice Rest has an ideal design for a non-rigid connector on fixed bridges for abutments that cannot be prepared without severe reduction. The male of the Mortice Rest (Fig. 8) has a triangular-shaped body, a slightly tapered shank which attaches to a proximal plate. The mandrel is molded as an integral part of the male. The wall thickness of the female has been held to a minimum in order to utilize maximum occluso-gingival length of the attachment. Because of its tapered design, the occlusal portion of the male has the greatest area and occupies the greatest amount of space within the tooth. All three sides slope away to a “point” toward the gingiva which makes it possible to place the Mortice Rest within the natural circumference of the abutment with only minimal reduction of tooth structure at the gingiva. The laboratory procedure is the same as described for the Ney Mini-Rest.

General Rules For Tilting

A. On an all-tooth-bearing case supplying no anteriors, either a posterior or anterior tilt may be used, the choice being governed by the undercut conditions.

B. On partials with a free-end saddle on one or both sides, supplying posteriors only, a posterior tilt should be used. This provides an undercut on the side of the clasped tooth adjacent to the free-end saddle, and an undercut in this location is necessary to hold the free end of the saddle against the ridge.

C. When all the teeth supplied by a partial are anterior to the clasped teeth, an anterior tilt should be used. This is similar to the free-end saddle condition described in Rule B except that it is in the anterior region. For this reason, it is necessary to use an anterior tilt to provide undercuts on the anterior sides of the clasped teeth in order to hold the saddle against the ridge.

D. Whenever a free-end saddle condition exists either in the posterior or anterior region, the tilt should be toward that region. When free-end saddles exist in both the posterior and anterior regions, the choice of tilt is governed by the undercut conditions.

E. When no free-end saddle condition exists in either the posterior or anterior regions and the partial supplies both posterior and anterior teeth, a posterior tilt should be used. This makes it possible to seat the anteriors without excessive interproximal spaces.

Clasp Analysis

In the construction of a removable partial denture, clasps are utilized for the purposes of providing retention, bracing and support. “Retention” is that action of a clasp which holds the appliance in place or prevents it from becoming unseated. “Bracing” is that action of a clasp which braces the appliance against the sides of the teeth to avoid lateral movement. “Support” is that action of the clasp which supports the appliance on the occlusal surfaces of the teeth to avoid movement tissue-ward under occlusal forces.

The quality of retention is secured by the flexibility of a clasp. Bracing and support are obtained from the rigidity of a clasp. Both flexibility and rigidity are positively provided in a surveyed restoration through the proper selection and location of clasps.
The Ney Surveyor System

There are three basic partial denture conditions that can exist in partially edentulous mouths. They are the

Unilateral

Bilateral Free-End

Bilateral All-Tooth Supported

There are also three variations. One is the unilateral replacement that carries a bar with clasp to the opposite side of the arch. This type of case is automatically treated as a bilateral all-tooth-supported situation.

A second variation is the bilateral free-end condition where the missing teeth are in the anterior segment of the arch. The same rule applies to the anterior free-end saddle as to the posterior free-end, and the clasp treatment is the same. The basic problem in each case is to hold the saddle in contact with the ridge.

The third variation is the bilateral condition that is free-end on one side and all-tooth-supported on the other. This is automatically taken care of correctly if the recommended design procedure for a free-end case is followed.

The position of the Mini-Rest is determined by placing the mandrel (which is molded as an integral part of the male) in the Ney Surveyor (Fig. 4). The model is mounted in the tilt-top table and the most favorable location determined.

The wax patterns are completed and a recess created in the pattern that is to receive the female. The attachment is brought into this recess and sealed in position (Fig. 5).

Wax is removed from the proximal surface of the adjacent pattern and the male placed in the female. The wax units are checked for proper seating on their dies and the male seated and sealed in position (Fig. 6). During the waxing steps the proximal plate of the male and female should be flush at the base of the attachment. This minimizes the amount of finishing time and effort necessary once the castings have been accomplished. The plastic mandrel on the male is cut off with a hot spatula and the patterns are sprued. Care should be taken when placing the patterns on the sprue former to prevent entrapment of air during the investing procedure. Investing is done in the usual manner. The Mini-Rest will be completely eliminated during the burnout of the ring. Whenever plastic is used as part of the pattern extra burnout time should be allowed to insure complete elimination of the wax or plastic.
Broken-Stress Connectors

A broken-stress connector is used when a non-rigid connection is required. The advantages of this type of restoration are that the connector reduces interferences with the physiologic movement of the abutment teeth, and where abutments cannot be prepared parallel, the broken-stress bridge can still be seated. The use of non-rigid connections should be approached with caution. Factors of occlusion and biting forces are of paramount importance. They should not be used on bridges having long spans nor where the abutment teeth involved are unduly loose. A broken-stress bridge should not be used if it is opposed by a tissue borne appliance with a natural tooth opposing the abutment bearing the stress breaker, as the bridge may move occlusally out of the keyway.

The Ney Mini-Rest (red), the Ney Mortice Rest (blue), the Ney MS Attachment (white) (Fig. 2) and the Ney Contact Connector (yellow) (Fig. 2A) allow the dentist and the dental laboratory to determine and select the best attachment to fill the requirements of the restoration being fabricated. Mandrels are molded as an integral part of the male portions. (The Contact Connector also has a mandrel on the female). The attachments are precision molded of acrylic resin and are completely eliminated during the burnout procedure. Other advantages are:
1. Allows one-step waxing of multiple restorations.
2. Small size allows their use on minimal preparations without over-contouring the retainer casting.
4. Maximum shank strength is derived by design improvements.
5. Separate or special mandrels are not required.
6. Can be used on fixed or removable restorations.

The Ney Mini-Rest (Fig. 3) has a precision, slightly tapered dovetail design. The laboratory procedure is described in the following paragraphs and illustrations.

The Unilateral Case

Use only the #1, the #2, and the #1-2 combination on a unilateral case. These clasps provide double-bracing and double-retention and are the only cast clasps that will give satisfactory results without extending a bar and clasp to the opposite side of the arch for bracing and stability.

Unilateral models can generally be tilted laterally as well as anteroposteriorly so as to re-locate the undercuts for using these double-bracing, double-retaining clasps. Under proper conditions so developed, small unilateral replacements will give reasonable satisfaction. If, however, suitable clamping conditions cannot be found by tilting, the case will fail as a removable and a fixed bridge or attachment case is indicated.

The tilt that results in a good #1 clasp indication on one abutment very rarely produces that same indication on the abutment at the opposite end of the edentulous space. Normally the undercut conditions will require a #1 clasp for one end and a #2 or #1-2 combination for the other.

Never use a Back-action or Ring clasp on a unilateral replacement because they brace from one side only and retain from the opposite side and will work successfully only on bilateral cases.
The Free-end Saddle

A free-end saddle should be held securely against the ridge for proper function and patient comfort. The best mechanical method of doing this is to engage the tooth mesio-distally with retention at the distal holding the saddle down.

The clasps that offer the most in distal retention are the Back-action or the reverse Back-action because they completely embrace the distal retentive area on a tooth. This distal grip is supplemented by the flexible mesial tip of the Back-action clasp, also in an undercut.

When a Back-action cannot be used, the next choice is the #2 clasp because of its ability to use at least a portion of the distal undercut area for retention. It cannot embrace the entire distal area because part must be relieved to accommodate the occlusal rest truss arm.

The #1 clasp is never indicated for free-end saddle cases since it gets its retention bucco-lingually instead of mesio-distally. If the rigid portion of a #1 clasp is placed below the survey line in an attempt to get distal retention, it will not seat unless it is ground away. If forced to place, it would be bent out of shape.

The Ney Clasp and Undercut Gauge Chart

These Clasps Supply Single Bracing Only

BACK-ACTION CLASP
- USE .010” (0.25MM) GAUGE

For bilateral cases only. Retention is normally found at the distal and mesio-buccal, with the .010” (0.25mm) Gauge used at both areas. If there is no undercut at mesio-buccal, refill the case and use .020” (0.5mm) Undercut Gauge at the distal.

REVERSE BACK-ACTION
- USE .010” (0.25MM) GAUGE

For bilateral cases only when bicuspid abutments have extreme lingual tilt, placing retention area on the distal and lingual. The .010” (0.25mm) Undercut Gauge is used at the distal and mesio-lingual.

UPPER RINGS
- USE .020” (0.5MM) GAUGE

For bilateral cases only. When there are molars on both sides of the arch tilted buccally away from each other, use the .020” (0.5mm) Gauge on each abutment. If one side is free-end, the opposing Ring Clasp uses the .030” (0.75mm) Gauge. Maximum retention is at the mesio-buccal.

LOWER RINGS
- USE .020” (0.5MM) GAUGE

For bilateral cases only. When there are molars on both sides of the arch leaning lingually toward each other, use the .020” (0.5mm) Gauge on each abutment. If one side is free-end and the other is Ring Clasp, use the .030” (0.75mm) Gauge. Maximum retention is at the mesio-lingual.
The Ney Clasp and Undercut Gauge Chart

These Clasps Supply Double Bracing and Double Retention

#1 CLASP
- USE .020" (0.5MM) GAUGE

#1 Clasp is used in unilateral cases; and in bilateral cases where abutments stand straight in the arch in relation to each other. #1 Clasp retention is usually on side of tooth away from saddle. Use .020" (0.5mm) Undercut Gauge to measure retention.

#2 CLASP
- USE .020" (0.5MM) GAUGE

#2 Clasp can be used in unilateral cases and also in bilateral cases when abutments stand straight in the arch in relation to each other. #2 Clasp retention is always on side tooth next to saddle. Use .020" (0.5mm) Gauge at clasp tips to measure retention.

#1-#2 COMBINATION
- USE .020" (0.5MM) GAUGE

#1-#2 Combination Clasp is for unilateral and also for bilateral where tilted or rotated abutments present characteristic #1-#2 survey lines. Retention areas are next to the saddle on one side of the tooth, and away from the saddle on the opposite side. Use .020" (0.5mm) Gauge.

The Bilateral All-Tooth-Supported Case

A bilateral all-tooth-supported case might be regarded as two unilateral joined together across the arch with either a lingual or palatal bar. However, a single unilateral can be tilted laterally to find undercut conditions that will accept the double-bracing, double-retaining #1, the #2 and the #1-#2 combination clasps. A similar result can rarely be obtained on a bilateral case, as teeth normally lean lingually toward each other on lowers and flare buccally away from each other on uppers. It becomes necessary, therefore, to use the single-bracing, Back-action and Ring clasps on bilateral case abutments that lean toward or away from each other. The bracing and retention for a successful case is obtained across the arch, both on uppers and lowers.

All cases must be planned and designed as a unit with all of the clasp parts functioning together as a single unit when the partial is inserted or removed from the mouth.

If a bilateral case is all-tooth-supported on one side and free-end on the other, it is properly treated as a free-end problem.
The Bilateral All-Tooth-Supported Case (Cont'd)

If there are two posterior abutments and one or both are lost later on, the case then becomes a free-end problem. Therefore, the ideal method of designing an all-tooth-supported case with posterior abutments is to regard it as if it were already a free-end problem and first determine the proper clasps to use for the anterior abutments. The result will be normally either Back-action or #2 clasps.

Using the tilt established by the anterior abutments, the posterior abutments are surveyed and the clasps selected.

If the posterior teeth are lower and lean toward each other, use Ring clasps. If, as on an upper, the posteriors lean away from each other, Ring clasps are also used. If the posterior abutment teeth stand straight enough in the arch so that they individually present adequate undercut areas both buccally and lingually in relation to each other, use either the #1, the #2 or the #1-#2 combination double-bracing, double-retaining clasps, depending upon the mesial undercut conditions. If there is enough non-undercut area to accommodate #1 clasps, they are preferable because of their superior bracing; if not, #2 clasps should be used.

Ney Undercut Gauges

There are three gauges supplied with the Surveyor providing three exact amounts of horizontal undercut — .010" (0.25mm), .020" (0.56mm), and .030" (0.75mm). This measurement is the distance from the shank of the gauge to the rim of the gauge head, as illustrated. Each size is applicable to one or more of the clasps in the Ney System and indicates the correct amount of undercut that should be utilized in the design of the clasp of average length and thickness. Longer, thinner clasps can safely be used in greater undercuts, whereas clasps that are shorter and thicker than average will secure the same retention with somewhat less undercut.

Gauge Size can be determined by the quantity of incised rings on gauge shank.

One Ring

- .010"
- 0.25mm

Two Rings

- .020"
- 0.56mm

Three Rings

- .030"
- 0.75mm

Ney Undercut Gauges measure horizontally.

Consequently, with the general clasp design plan of the case in mind, it is possible to check accurately whether a certain experimental tilt will provide the right amount of undercut in the right location to accommodate the clasp that is being planned for that tooth.

The .010" (0.25mm) gauge is used only with Back-action clasps, and the .030" (0.75mm) exclusively with Ring clasps. The .020" (0.56mm) gauge is used with #1 clasps, #2 clasps, the #1-#2 combination, and in certain cases, with Ring clasps and Back-actions.