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President's Message

PAUL T. DAWSON, D.D.S.

THIS REPORT OF THE FIRST ANNUAL INTERNATIONAL MEETING will be different. There are many things to relate to the general membership, especially to those who were unable to attend this great meeting. The excitement started with your President's arrival at the Miami International Airport and never ceased. It seemed that we no sooner finished our Annual Meeting, than we found ourselves knee-deep in the excitement and flutter of our Interim Meeting. The nicest part of these meetings, however, is seeing our long and cherished friends and having the pleasure of meeting the new faces to be added to our Academy.

I wish it had been possible for the entire membership to have attended this meeting held in beautiful San Juan.

The combination of the beauty of the isle and the gracious hospitality of the faculty and staff at the University of Puerto Rico led to an outstanding and successful meeting—one of the best since the inception of our Academy. Those who attended may reflect in the years to come of the beautiful places they were able to see and the beautiful tree, especially, in the courtyard of the dental school. A great deal of credit and thanks are due to Dr. Gill, our program chairman, and his committee who saw to our every need during this meeting.

As I made the rounds to each of the operating clinicians, it gave me a great deal of pleasure to announce their names and to see the beautiful preparations and completed direct gold restorations. Every patient was proud and grateful to have these lasting restorations. Here, again, I noted that the large number of students and staff contributed to the success of the meeting. A good attendance always has not been the case during our previous meetings. This was a most commendable site. It has been rather discouraging at times to give these presentations to a very limited audience, because certain teachers feel their subject is God's gift to humanity. I much prefer, or insist, that the doctor or

dentist who practices on my family have a pair of gentle hands and a good understanding of basic fundamentals. Our essayists of the scientific session are to be most highly complimented for an outstanding performance. It takes a great deal of effort to be an essayist and operating clinician on the same day. Both the essayists and clinicians made for a successful session.

During the afternoon session, our most able table clinicians were busy every minute. I took special note of these highly skilled men in action. Dr. Tjarnberg was so busy he had to call for help from an old pro, Dr. Floyd Hamstrom. "Gold Foil and Rubber Dam Procedures," a particular table clinic repeated time and time again, was well received, as always. Keep it up Floyd and Ralph.

A new concept of dry field dentistry was introduced by Dr. Duane Compton on the "Use of Oral Bandage for Rubber Dam Application." It is of much value when used around a fixed prosthesis. Well done, Duane.

More than ever before, the interest seems to lie in "Intraoral Photography." I could only see over the shoulders of the many visitors who were taking notes from our ardent enthusiastic member who never misses a meeting, Dr. Loren Hickey. Keep coming, Loren. We appreciate your time and effort. Our commercial exhibitors were a bit disappointed early in the afternoon because your esteemed President was unable to find their exact locations. After a few loud "cattle calls," business increased tremendously; and to tell the truth, they didn't close shop until the last gong of the bell. We need you fellows also. Please stay with us, even if we can't find your locations for you.

At this time, I wish to thank the membership and my friends for their confidence in allowing me this very special privilege and honor to serve as president during the coming year. I accept this most respected position with deep humility. With your ever continual and great cooperation, I will serve to the best of my ability.

As the world turns with all its complexities, I most willingly appreciate advice and suggestions. My hope and prayer is that the Academy will grow in number with young and dedicated men who realize the importance of striving for nothing but the best, every ready and willing to serve humanity to the best of their ability.

A Tribute to Donald A. Spratley

DENTISTRY AND the Academy of Gold Foil Operators lost one of its most able and respected members with the untimely death of Dr. Donald A. Spratley, July 22, 1968, in Mt. Vernon, Washington.

Dr. Spratley was born in Bellingham, Washington, 71 years ago and graduated from North Pacific College (now the University of Oregon Dental School) in 1919.

Don was a pioneer leader in Gold Foil Study Clubs for over forty years. He was one of the original members of the gold foil course given by the late W. I. Ferrier, in Seattle, in 1939. This was the foundation for the knowledge and techniques that made him a skilled and gifted gold foil study club leader. There was something about Don that inspired the men who came under his influence. Although a modest, shy, reserved man, he was an inspiration to all his students, for he possessed a keen knowledge and great ability for conservative and beautiful gold foil operations. He presented gold foil clinics at numerous meetings, both nationally and throughout Washington state, and operated at many of our Academy meetings. In addition, he was an instructor for a Gold Foil Seminar of his own. In 1957, he was honored by the naming of the "Don Spratley Gold Foil Study Club."

There are several instruments which Don Spratley devised for use in gold foil operations: two parallelogram pluggers, a burnisher

Continued on Page 32

An Appraisal of Ultrasonic Compaction of Gold Foil

JEAN T. HODSON, M.S., JERRY TURNBAUGH, SC.D.
GERALD D. STIBBS, D.M.D.

IN SPITE OF INTENSIVE SEARCHING for new materials, the most lasting restorative material in dentistry, to date, is gold foil. The public and the dental profession, alike, owe much to the men who saw the potential of gold foil as a filling material and were willing to discipline themselves to the extent necessary to render the best dental care for their patients. There is no need to say here that gold foil at its best is the quintessence of preventive dentistry. Recognition of that fact was the basis for the formation of the American Academy of Gold Foil Operators.

The Academy, moreover, is aware of the need to promote use of the technic in the profession by developing new forms of gold or new technics of compaction to make the method more easily accepted for general practice and, thus, more widely used. It is in this vein that we have experimented with several forms of gold under old and new technics. Among the pure golds, we have used Williams* mat gold and Morgan Hastings** gold foil and Goldent. Hardness and microstructure were studied under hand and pneumatic compaction.[1,2]

A thesis study by a graduate student in our Department of Operative Dentistry, showed better density and compaction with ultrasonic vibration.[3,4] However, there were problems with

*Williams Gold Refining Co., Buffalo, N.Y.
**Morgan, Hastings & Co., Philadelphia, Pa.

Dr. Jean Hodson, M.S., is an associate professor, department of operative dentistry, at the University of Washington, Seattle, Washington. Dr. Jerry Turnbaugh, Sc.D., formerly an assistant professor in the department of ceramic engineering, presently is a project engineer with Tektronix Inc., Beaverton, Oregon. Dr. Gerald Stibbs, D.M.D., is a professor and chairman of the department of operative dentistry, University of Washington.

The above report was delivered by Dr. Hodson before the annual session of the American Academy of Gold Foil Operators, October 28, 1967, at the US Naval Dental School, Bethesda, Maryland.

heating and vibration which raised grave doubts about clinical use of the method.

To continue the research, we obtained temperature measurements during compaction and experimented with changes in cavity and condenser design. The armamentarium for the experiments included the ultrasonic dental unit,† the pneumatic condenser,* spot welder,** recording potentionmeter, *** an alcohol lamp and small bench vise. Chromel and Alumal wires of 0.003 inch diameter were twisted and spot welded to form the thermocouple connections. Acrylic blocks were prepared with small round cavities into which the gold was compacted over the thermocouple. The cold junction was taped to the bench top near the work in progress to provide ambient temperature for reference. Number 4 gold foil †† was used in one-sixty-fourth and one-thirty-second hand-rolled pellets. The condenser nib was a tapered cylinder with a flat face of 1 mm diameter (the same instrument as was used in the previous study).[3]

The frequency of vibration in the handpiece was 25,000 cycles per second, and the magnitude was 0.001 inch in the direction of the long axis of the handle.[3] The technic of use was to place and compact each pellet by hand pressure and then to compress it into place with the ultrasonic tip. The foil seemed lumpy and hard under hand pressure, but, when the ultrasonic was activated, the gold softened and settled to place with no resistance.

The size of the cavity was kept as small in diameter as possible in order to avoid heat loss away from the thermocouple area. The diameter was slightly more than 1 mm, and the depth of the cavity was 3 to 5 mm. Although the space confined the foil, as many pellets were extruded from the cavity by the vibration as were kept in it. Compaction by three operators produced the same results.

The temperature recording chart showed that an average of ten to fifteen seconds was required for adequate compaction of the one-sixty-fourth and one-thirty-second pellets with both the pneumatic and the ultrasonic. The time for each pellet was forty seconds when the operator annealed just before insertion, but this procedure was discontinued when it was found that the pellets were forty to

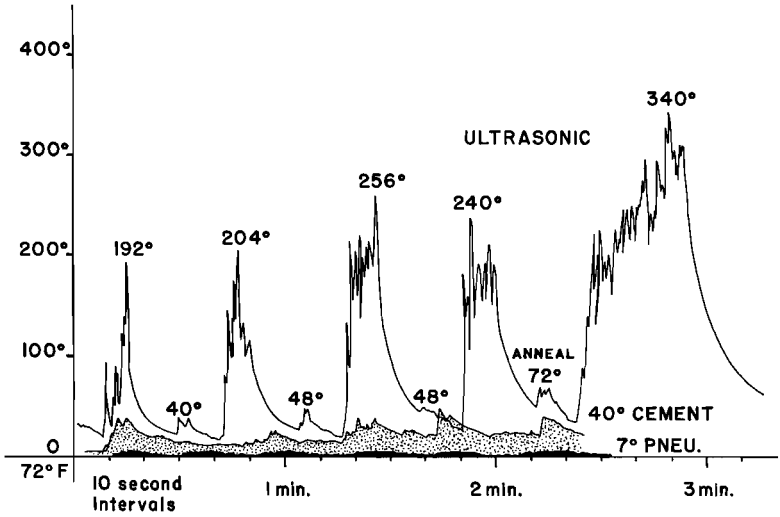
†Provided by courtesy of Dentsply-Cavitron, the Dentists Supply Company of New York, York, Pa.

*Clevedent-Hollenbeck, Cleveland Dental Mfg. Co., Cleveland, Ohio.

**Number 506 Spotwelder, Rocky Mountain Metal Products Company, Denver, Colorado.

***Electronik 19, Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.

††Morgan, Hastings and Co.



Temperature Record Tracings: The 192 to 340 degree ultrasonic temperature rises were produced by compaction of foil against the thermocouple. (For actual temperature, add 72 degrees.) Hot pellets produced the 40 to 70 degree "anneal" increase. The temperature was fairly consistent at 40 degrees under the cement base (stippled curve). The pneumatic condenser raised the temperature an average of 7 degrees at each impact.

seventy degrees above room temperature when they were placed in the cavity. The effect of the hot pellet was shown in the ultrasonic tracing by the small sharp peaks just preceding the higher compaction curves. The temperature was raised through the thickness of two gold foil pellets by two hundred degrees Fahrenheit during compaction with the ultrasonic. Finally, when held on the filled cavity for forty seconds, the ultrasonic condenser gave an ultimate increase of three hundred fifty degrees. By comparison, the pneumatic condenser recorded an average seven degree rise at each impact and the heat was immediately dissipated.

It was decided to try to overcome the ultrasonic temperature problem by placing a zinc phosphate cement lining between the gold and the thermocouple with a measured thickness of 0.25 mm. The temperature rise was reduced to a fairly consistent range of forty to fifty degrees. Judging from the temperature recorded for annealed pellets, the biologic effect on the tooth might be likened to placement of an occasionally warm pellet during regular procedures.

After finding that the temperature increase could be attenuated with a cement base, it was decided to study the microstructure of specimens prepared in the manner of Class V restorations. This

was considered to be an intermediate step toward temperature measurement in natural teeth if the structure compared favorably with previous studies on hand and pneumatic compaction. The thermocouple was omitted in order to facilitate sectioning and etching for the microscope and also to eliminate the nonclinical situation of working around the wires, even as small as they were.

Rectangular cavities of 2x3 mm were cut to a depth of approximately 1 mm in acrylic blocks. The cavities were filled with hand rolled one-sixty-fourth and one-thirty-second pellets. The taper of the 1 mm diameter condenser point from the temperature rise experiments did not adapt well to the walls of the cavity, so the sides of the point were made parallel by grinding, but the diameter was reduced to 0.7 mm on repolishing. The smaller point caused shredding of the foil, even when the peripheral edges were slightly rounded. A new point was used to make a cylinder of 1.5 mm diameter, and the compaction improved markedly. Further refinement was obtained by shortening and grinding the 0.7 mm point to a square face with 1.1 mm sides for better adaptation to line angles.

The amount of vibration observed in the narrow cavities for temperature measurement was greatly increased in the broader and shallower Class V cavity forms. Pellets were spun out of the cavity by surprisingly strong vibrations that were transmitted throughout the specimen. The amplitude of vibration increased proportionally with the increase in mass as the cavity was filled.

Because of the vibration, an instrument was used to hold the compacted portion in the cavity whenever a new pellet was being smoothed into place. A technique of placement was developed in which one-sixty-fourth pellets were added alternately at each end of the 2x3 mm cavity. This created an overlap of thin edges in the center. Often it was difficult to start the foil in the bottom of the cavity, but when the pellets went to place systematically, the compaction was very good. However, it was necessary to hold the gold in the cavity every time the ultrasonic was applied, even when smoothing the cavosurface.

In cross section under the microscope, the layers of pellets were smoother, and the density under the condenser was thicker and more uniform than in hand or pneumatic compacted specimens. There was no doubt that ultrasonic vibration gave better compaction than hand or pneumatic methods, with the added advantage of requiring no force beyond holding the handpiece. For this reason it was considered to be worthy of further investigation in the laboratory.

Mat gold and Goldent specimens were prepared in the 2x3 mm cavities for microscopic examination of the effects of ultrasonic compaction.[5] It was much easier to handle the mat gold in the cavity than either the gold foil or Goldent, and the density was highly improved. Although the residual, continuous, and ultra fine porosity around the small dendritic crystals remained a problem, it looked as if satisfactory results might be obtained if the gold could be applied in thin layers. The greatest improvement was the formation of smoother layers with greater surface density than is usually seen in mat gold.

At this point in the research, it is impossible to recommend or predict the use of ultrasonic compaction for pure gold restorative materials. The results from these preliminary studies indicate that vibration effects may prevent clinical use of the method, even though it has produced the best results of all the compaction methods tested. It may be possible that technics and methods from clinical dentistry could help to overcome the problem of vibration. Some factors to be considered are the design of the cavity and condenser point, the use of thermal and vibration insulators, and the use of different golds. Although measurements in the research laboratory provide needed quantitative information, dentists in private practice are well qualified to conduct similar tests on an empirical basis. One Academy member made such studies previous to the work reported here.[6] The need still remains, however, for a facile method of gold compaction.

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Clinical Performance in a Department of Operative Dentistry

A. W. Bull, B.D.S., D.D.S.

Sydney, Australia

Probably all teachers are conscious of some discrepancy existing between claims voiced in department meetings and actual clinical performance. Many would agree that a department of operative dentistry is only as good as the work produced in it, and that the clinic is the pulse of the department and gives the truest indication of its vitality.

The calibre of the teaching staff is of primary importance, and the quality of research, the standard of lectures, the nature of publications are all indicative of this calibre. However, the type of work performed in the clinic is the most significant guide to the effectiveness of the teaching program and gives a lead to the type of operative dentistry the graduate is likely to offer his patients.

Another mark of a department's excellence is the less easily defined matter of morale. Without this, a department is not as effective as it should be and, whereas the ideal probably does not exist, we do see it in different degrees within various dental schools.

Morale is probably at its highest when there is consistency between expressed policy and clinical application. This means that the entire staff is consistent in its teaching and its quality of clinical effort. When this results in a uniformly high clinical standard, we are then approaching the ideal.

With this aim in mind and applying it to the various operative procedures encountered in clinical operative dentistry, it seems that there is one safeguard which, if used routinely, will contribute much toward attaining uniformly high standards. I refer to the use of rubber dam.

Dr. A. W. Bull was born and raised in Sydney, Australia and received his dental degree from the University of Sydney. He has spent the majority of his teaching career at the University of Sydney, where he is a Senior Lecturer in Operative Dentistry. On two occasions he has taught at Northwestern University in the Operative Department and Crown and Bridge.

When a clinic operates without the rubber dam, it is extremely difficult to supervise. For instance, in cavity preparation, cavities are often presented as caries free when, in fact, soft and stained dentine is present. Toilet is ignored, and blood and debris frequently remain on the cavity walls and margins. The cavo-surface is neglected, and the gingival margin has unsupported enamel; there is no attempt to bevel, let alone to remove the weak and unsupported enamel. Undercuts are frequently present in inlay cavities, and all too often pulp exposures are made under saliva without the student being aware of the fact. All these faults occur because of the operator's inability to see the field of operation. The clinical instructor is unable to see any better than the student, unless the field is isolated and completely dry.

In one sense, the student should not be blamed for such a situation as described. If he is not required to use rubber dam and thus ensure a dry field, he cannot know the benefit. If, on the other hand, dam is properly placed and visibility is brought to a maximum level, the student is in a position to perfect the cavity, refine his work and heighten his efficiency.

The benefit is projected further in various procedures using the different restorative materials such as amalgam, gold foil, silicates and resins. In each case, the utmost from a filling material can only be achieved if a dry field exists.

Repeatedly one sees the lesson that is to be learned from a clinical session that is running well and one that is running poorly. A demonstrator is able to supervise more students with greater ease if dam is being used routinely. The student gets into less trouble because he has more control of each situation, whatever it may be. For example, he will proceed through cavity preparation, pulp protection, matrix application and an amalgam filling with a minimum of upset.

On the other hand, if the use of dam is not enforced, one is conscious of things going badly. Standards are lower at each stage; there is a sense of urgency in each operation and an awareness that all stages could be performed better.

It is in this latter situation that one sees the inconsistency between precept and practice. Compromise becomes respectable, and the flaw is obvious to the student. What happens is that this student and others similarly involved are actually being denied the opportunity of carrying out operative dentistry at a high level.

The two examples given are familiar to all teachers of clinical operative dentistry, and the conclusion reached by the author is that unless every department member uniformly carries out the requirements of routine dam application, variable standards will inevitably exist, and department morale will be undermined.

Mat Gold — Gold Foil Restoration

By Jose Medina, D.D.S.

During the past several years, the use of cohesive golds gradually has been increasing in the daily practice of dentistry. It is difficult to determine the motivating influence that has created the increase in interest in this type of restorative service. Perhaps some of the credit can be attributed to the research responsible for the development of new materials, the perfection of clinical techniques which have improved manipulative procedures and the ever-constant influence of the American Academy of Gold Foil Operators, which continually has been emphasizing the need for higher levels of operative services.[1]

The purpose of this presentation is not to delve into all forms of cohesive golds, but primarily to discuss mat gold and its relationship to total restorative services. Mat gold is only one of the many types of cohesive golds available to the profession today. Each of these golds possesses certain qualities and properties which are suitable for specific restorative procedures.

INDICATIONS

As a general rule operators prefer to use mat gold in areas not subjected to a great deal of stress. Most operators have found that if the material is subjected to these forces, the probability of failures is enhanced. When mat gold is covered with a veneer of cohesive gold foil, the surface is made more resistant to staining and fluid penetration. A veneer of this type also improves the burnishing potential and the marginal adaptation of the finished restoration. Hence, a large number of operators[2,3,4] prefer using mat gold primarily as a core in restoring the

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Dr. Jose Medina was the first editor of the Journal, *and one of our former presidents. His accomplishments are many and varied in the field of his chosen profession. He is presently associate dean and professor of clinical dentistry at the University of Florida; as well as director of postgraduate courses in operative dentistry. Dr. Medina holds many offices in scientific societies and has participated in more than 160 clinics. This paper was presented before the Annual Meeting of the American Academy of Gold Foil Operators in San Juan, Puerto Rico, October, 25, 1968.*

greatest bulk within a cavity preparation and covering its surface with a veneer of gold foil.

Perhaps the best indication for the use of mat gold is in Class V restorations, where success usually can be predicted with a restoration of mat gold-gold foil combination. The procedure enables the operator to restore the surface with great efficiency and with the least amount of trauma to the tooth and its supporting structures. However, it should be kept in mind that, even though mat gold seems easy to manipulate, it must be condensed in a systematic manner, paying particular attention to all the essential fundamental principles of cohesive gold condensation. Failures that occur from using mat gold can be attributed partially to the lack of application of fundamentals. The material appears to handle so easily that it gives the operator a "false sense of security" and a tendency to become haphazard in his approach.

This paper will discuss in some detail the insertion of mat gold in a Class V restoration. It is not the intent to de-emphasize its use in other areas of the mouth. Time and space preclude the detailed approach to all phases of restorative dentistry where mat gold could and is used in a dental practice.[3,4,5,6,7,8,9,10] The reader is requested to review the literature, particularly those articles found in the reference list, which describe in detail the uses of cohesive golds. The authors of these works are considered to be pioneers in this aspect of restorative dentistry.

PREPARATION OF THE AREA

All restorative procedures require the application of certain fundamental principles which in some instances should be employed universally and which in others are applied specifically to the service in question.[4,11,12,13,14,15] The application of a well-placed rubber dam is an essential fundamental for all restorative services; the application of a cervical tissue retractor is a procedure employed routinely for Class V restorations and almost entirely is restricted to this type of service.

Rubber Dam Application. A dark, extra-heavy, six inch by six inch rubber dam, including at least one tooth anterior and posterior to the one being restored, but preferably including a larger area, is an essential procedure before restorative services are started for a Class V lesion. The darkness of the dam provides greater contrast; the extra-heavy weight assures a better retracting ability of the surrounding soft tissues; the six inch by six inch size allows for sufficient dam to provide the necessary accessibility through the retraction of the lips and cheek where indicated. Figure 1 depicts the application of a rubber dam.

It is imperative that the rubber dam be punched in a manner

Fig. 1 – Application of rubber dams.

which will allow for complete dryness and for total coverage and protection of the interdental papillae and other gingival tissue. It stands to reason that the openings must be as small as possible in order to produce the necessary tightness around the teeth, yet large enough that, when passing the dam through the contacts, the possibility of tears is eliminated. The opening for the tooth to be restored for a Class V should not be punched in the same alignment with the remaining arch, but should be moved buccally or labially at least one millimeter or more, if necessary, in order to provide sufficient dam to cover and retract the soft gingival tissues. If this allowance is not made, the edge of the interdental rubber dam will rest under tension on the papilla or will slide into the gingival sulcus, thereby exerting excessive pressure and hindering the blood supply to this tissue.

The placement of the rubber dam can be facilitated by the use of a lubricant such as latherless cream, a small amount of mild liquid soap, or a water soluble ointment base. The use of a lubricant facilitates the insertion of the dam through the contacts. The utilization of the services of a dental assistant in holding the rubber dam, in applying air at the tooth surfaces and in all other aspects of rubber dam placement is an essential feature in the efficient use of the dam in dental practice.

Rubber dam clamps should be utilized when necessary; however, most operators are of the opinion that these clamps are helpful in the initial placement of the dam but should be removed as soon as possible to provide greater comfort for the patient during long operative procedures. The use of these clamps is restricted to the posterior or distal end of the dam, for the purpose of holding it in place while

inversion and adjustments are affected. The same result can be achieved by inserting a small piece of rubber of between the contacts of the posterior teeth, or by applying a ligature to which an anesthetic carpule rubber plunger or a burlew wheel previously has been attached. The latter method works extremely well when the tooth in question has an edentulous area on the distal.

Generally speaking, individual tooth ligatures may be used, if needed, but their use should be limited whenever possible because of the potential hazard of injuring the interseptal tissues.

Gingival Tissue Retracting Procedure. In order to provide an outline form to the final preparation which will allow maximum harmonious effect and the best physiological contour to the tooth surface, the gingival margin of the restoration should be carried under the free margin of the gingival tissue.[9,16] To accomplish this objective the tissue must be retracted and held in this position until the restoration has been completed. The best instrument for accomplishing this retraction is the Ferrier #212 clamp. The word "clamp" gives a connotation of a device used for grasping, clamping or grabbing onto a tooth. The term "tissue retractor" is preferred, since it is more explicit in denoting the use of the instrument. The retractor should in no way grasp the tooth, but rather it should allow for freedom of movement gingivally without tension on the tooth. It means, then, that the temper should be removed and the beaks of the retractor smoothed and reshaped to allow for its proper utilization.

The retractor is carried over the tooth by the aid of the rubber dam clamp holder and placed slightly supragingivally, avoiding any impingement upon the gingival tissues. The finger of one hand is used on the lingual surface to prevent the lingual beak from sliding gingivally. The other hand is used to slide the labial beak gingivally with the assistance of a modified crochet hook. It may be necessary to repeat the labial retracting motion after waiting a few minutes. Careful, intermittent pressure prevents damage to the gingival tissue. Once the retraction has been obtained, the retractor is held in place with one hand while modeling compound is adapted under its wings for stabilization. A small amount of varnish placed over the adjacent teeth greatly will enhance the application and maintenance of the compound. The dental assistant again plays an extremely useful role during this entire procedure.

It is always wise to apply additional compound on the lingual surface of the tooth to be restored, extending from the distal to the mesial wings of the retractor. This extra amount of material also will aid in the stabilization of the retractor and will afford additional support to the tooth, greatly reducing traumatic injury during preparation and, particularly, during condensation.

The Ferrier #212 "clamp" should be modified for every operation. Several of these "clamps" should be available in the event a wing has to be removed, a lingual beak bent occlusally, a labial beak bent gingivally, or any other change deemed necessary has to be affected. As a matter of fact, a variety of these modifications can be prepared in advance and made a part of the regular armamentarium.

Modifications in the placement of this tissue retractor (Ferrier #212), such as using cotton rolls under the lingual beak or making incisions on the gingival tissue, may be employed when judgment demands these variations in techniques. Regardless of procedure the important considerations are the protection and preservation of the vitality of all surrounding soft tissues. Prevention of loss of tissue health is of paramount importance in all restorative procedures.

CAVITY PREPARATION

The author feels that the Class V cavity design most conducive to the use of cohesive gold is the one which incorporates the basic principles originally described by Dr. W. I. Ferrier.[6] Basically, the preparation is made with sharply defined internal angles and parallel walls opposing each other. A trapezoidal design with the small base of the

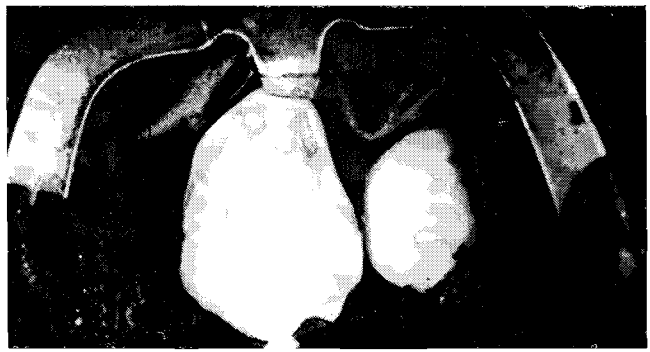

Fig. 2 — Outline form.

trapezoid at the gingival area provides an excellent outline for cohesive gold restorations. The mesial, gingival and distal margins of the preparation are placed in an area where the gingival tissue covers them; the occlusal or incisal margin is made to conform to either the occlusal plane or the cervical gingival contour. The choice of the shape of the occlusal or incisal margin depends upon the area of the mouth involved and the anatomical and physiological features of the particular patient. The ultimate goal is to provide an outline form that will be in complete harmony with the tooth and all its surrounding tissues. (Fig. 2)

The internal outline is made up essentially of right angles that are precisely defined. The axiogingival line angle is prepared acute to enhance the retentive potential of the preparation. The axial wall is made equi-distant from the surface of the tooth and almost invariably will present a convex surface. Instruments used for the preparation of the cavity are the #34 tungsten carbide bur, a small straight chisel, a small hoe, a small curved chisel and a pair of angle-forming chisels. Needless to say, the efficiency of the operation and the accuracy of every detail depend almost entirely upon the use of *sharp* rotary and hand cutting instruments. Sharp instruments are a prerequisite for all restorative services.

Upon completion of the cavity preparation, the walls should be cleansed by scrubbing with a pledget of cotton soaked in three percent hydrogen peroxide. This procedure tends to remove a large percentage of debris from all internal and external surfaces. A mild blast of warm air usually takes care of eliminating the excess hydrogen peroxide. After the cavity has been cleansed and dried in this fashion, the dentinal walls should be coated with two layers of varnish to seal the tubules from the potential hazard of microleakage. The varnish may be applied by using a minute piece of cotton on a pair of tweezers, or preferably, by using a small piece of cotton wrapped around the tip of a thin, old, root canal file. The most important consideration is to apply two thin, continuous layers of the varnish throughout the dentinal portions of the preparation. If some of the varnish adheres closely to a margin, it is best to allow it to remain undisturbed since an attempt to remove it may result in a disturbance of continuity of this coating necessary for the protection of all internal portions of the preparation.

SELECTION AND PREPARATION OF THE GOLD

Even though several types of gold are available, and various techniques for their placement are being practiced today,[17,3,18,19] time does not permit a full discussion of all these variations. This paper will be restricted to the use of one technique, realizing fully that other methods are just as acceptable or perhaps even better, depending upon the individual operator's knowledge and ability to perform the service. This discussion will deal mainly with the use of mat gold as a core with a gold foil veneer on its surface.[3,18]

The mat gold preferred by the author is the one commonly known as mat-foil. This term is used to describe an available mat gold which can be obtained in strips of two different widths and is wrapped or covered by a layer of gold foil. Mat gold by itself has certain weaknesses, particularly a tendency to crumble under condensing forces. The cover of gold foil gives mat-foil resistance to crumbling and

thereby affords the operator an opportunity to condense it with less difficulty.

The width of mat gold selected for the restoration is dependent upon the dimensions of the cavity occlusogingivally. The width should be the one that provides the greatest proximity to this dimension. The strip thus selected is then cut into trapezoidal cantles, the size of which is related to the mesiodistal dimension of the preparation.

The gold foil to be utilized for the veneer will be used in the form of pellets, preferably hand-rolled. The author feels that hand-rolled pellets are softer and are adapted more easily to the cavity preparation. The pellets are made from No. 4 gold foil (a sheet of gold, four inches by four inches, weight four grains) and are of a 1/64 size. There are times when a larger pellet (1/32) or smaller pellet (1/128) may have to be used during the condensation. It is important that the pellet size utilized be as small as possible to provide the means by which better adaptation and density can be achieved.

Both the mat-foil and the gold foil pellets must be annealed in order to remove prevailing contamination, such as moisture or NH_3 gas. This annealing process cleans the gold and makes it cohesive. One of the means for accomplishing this procedure is to pass the gold through an alcohol flame until the material turns cherry-red in color. The process takes a very short time and care must be exercised not to overheat the gold, which will make the material extremely harsh and difficult to work with. Underheating, of course, also should be avoided because the contamination remaining would result in gold that is only partially cohesive. The instrument used for picking up the gold and passing it through the flame should be made of a non-oxidizing metal to avoid the potential hazard of carbon contamination. For the same reason, the pellet of foil or cantle of mat gold should never touch the wick of the alcohol lamp. Extreme care in the proper preparation of the gold is essential for a successful restoration.

CONDENSATION

The technique of condensation for all forms of cohesive gold always has been the subject of great discussion whenever operators share experiences. Each operator, being an individualist, will develop a methodology and assemble an armamentarium that effectively accomplishes his objective. However, what one operator utilizes under a certain environmental setup with the assistance of his individual health team may in no way be a satisfactory nor efficient procedure for another operator under different conditions. In my opinion more emphasis should be given to an understanding of fundamental principles and to

the development of clinical judgment which can then be applied by any operator under any set of circumstances.

Fundamental Principles. The restoration of any cavity preparation with cohesive gold requires the development of a precise, systematic order of procedure. There is no place in this phase of dental service for a haphazard approach with a disregard for keen attention to every detail. The operator must develop a discipline whereby all biological and technical considerations constantly are observed if he is to render a long-lasting health service. The integrity of the tissues and their physiological importance always must be preserved.

One of the greatest side benefits derived from the utilization of cohesive golds in a dental practice is the development of a self-discipline which invariably affects all other aspects of patient care. Operators are more aware of their assets and liabilities, and they become more motivated to render excellence of service whether it be in the preventive, restorative, periodontal or any other aspect of patient care. Attention to detail, then, together with the development of a systematic order of procedure, are essential fundamentals in developing self-discipline. This discipline should go hand in hand with a sincere motivation for excellent of service regardless of its nature.

A fundamental principle greatly affecting the adaptation and density of the final restoration is the line of force used. This applied force always should be directed so as to bisect all internal line angles and trisect internal point angles. Such a line of force accomplishes an excellent wedging of the gold and consequently enhances its adaptation to all walls. If this line of force is maintained, the Class V restoration always will display a concave or saucer-shaped surface during its buildup. The concavity demonstrates the operator's self-discipline in applying this basic fundamental.

Stepping of the condensing point is another principle having great effect upon the density and adaptation of the restoration. This principle requires the operator to demonstrate a rigid self-discipline. Every time the point is raised and reapplied, it should overlap the previous condensing blow or step until a row of these steps or blows is accomplished. Every additional row of steps must overlap the previous row, always keeping in mind that the individual steps within the row also must overlap the preceding steps. The mass of gold always should be stepped from its center to the surrounding walls of the preparation. This movement of the point enhances the wedging ability of the gold. The entire procedure, paying careful attention to every detail, is known as "stepping" the gold and is perhaps the most important single factor during the entire condensation. When it is carried out with precision, the surface of the condensed gold will present a uniform, stippled ap-

pearance. This, coupled with the concavity resulting from proper line of force, will give assurance to the operator that fundamental principles are not being violated. The final restoration should have good adaptation, sufficient density and no porosity.

The technical principles described are basic in nature, but in no way reflect all the fundamentals to be considered. Preservation of the vitality of the pulp and the prevention of traumatic injury to the supporting structures of the tooth are also of paramount importance. The value derived from a beautifully condensed restoration with subsequent death of the pulp or damage to the periodontal structures leaves a great deal to be desired. Proper line of force is of great assistance in diminishing traumatic injury, but it must be supplemented by the exertion of minimal condensing blows and additional support to the tooth. The use of as small a point as possible (requiring less magnitude of force) and the utilization of a finger to offer additional support to the already compound-supported lingual surface are two essential fundamentals to minimize these biological complications. Condensing blows of less magnitude but delivered with greater frequency will do much to decrease trauma; the finger support will tend to prepare the tooth to receive the blows, will absorb or cushion the blows, will help to distribute the resultant forces, and, hence, will prevent sudden jarring of the tooth and its periodontium and, thereby, decrease the potential traumatic injury.

Another fundamental biological consideration is the prevention of damage to the enamel and cementum margins. Margins that have been prepared with precision, definition and smoothness for the purpose of obtaining maximal marginal seal and ideal harmonious relationship should be protected during the condensing procedure. Crushed or chipped enamel rods and dented or mashed cementum will result in margins that are subject to leakage with subsequent caries liability, margins that are in complete disharmony with the patient's esthetic requirements. This marginal protection can be accomplished either with non-cohesive gold cylinders or with cohesive gold foil pellets. The use of non-cohesive cylinders is not to be discussed in this paper but it is an extremely useful method to provide this support and protection to the margins. The protection by the cohesive gold foil method can be affected by using a double thickness of small pellets condensed first with *hand pressure* to the already condensed mass, then laterally against the walls and finally folded over the margins using the side of the condensing point. The process is carried out around all the margins until two thicknesses (two pellets) are adapted with hand pressure. This amount of gold provides the necessary cushion to preserve marginal integrity.

It should be pointed out that these technical and biological fundamental considerations indeed are applicable to all dental services.

However, while some other restorative procedures are capable of compensating for an operator's indifference, cohesive golds require strict adherence to every detail. The operator who constantly attempts to achieve perfection and who always is motivated by the desire to render high quality services will find that the previously mentioned fundamentals are essential to the routine daily practice of dentistry.

Armamentarium. The condensation of cohesive gold requires the use of hand pressure as well as malleting pressure. The malleting can be accomplished efficiently with a hand mallet or with mechanical devices that can be regulated insofar as the magnitude and frequency of the blow desired for condensation. The selection of the methodology of condensation (hand mallet vs. mechanical) is of less significance than the application of a technique designed around the fundamental principles outlined previously. However, the author considers hand malleting to be one of the least traumatic methods because the tooth is prepared to receive the blow (first tap) before the actual condensing blow is delivered (second blow). Electronic condensation also is relatively non-traumatic, since the magnitude of the condensing force can be maintained at a low level through an increase in the frequency of the blows. Regardless of method it is best to use small size points which require minimal force of condensation but which are capable of condensing the gold with adequate pressure for obtaining the necessary density and adaptation.

The cantels of mat-foil are condensed first with hand pressure and then with malleting pressure. The points used for the hand condensation have fine serrations that extend around the edges of their faces. Sharp edges are avoided to minimize tearing of the material. Small foot and parallelogram condensers usually are employed. The malleting procedure makes use of the usual points for building a gold foil restoration, such as the small round, parallelogram and foot condensers.

The pellets of gold foil used for the veneer are condensed also with a combination of hand and malleting pressures. Hand condensation is used: 1) to mold the pellets into place prior to malleting and 2) to condense the double thickness of pellets necessary for the protection of all margins. The major portion of the condensation is accomplished by using a small parallelogram or rectangular point; however, some operators prefer a small round point throughout the entire buildup. The parallelogram has the additional advantage of being an efficient instrument for the lateral hand condensation when covering the margins. Surface condensation following the marginal protection can be accomplished best with a small foot condenser.

After the condensation has been completed, it is advantageous to use a larger foot condenser with shallow serrations to recondense the

entire surface. The shallowness of the serrations permits a sliding effect on the point when the malleting is affected, and this movement results in surface burnishing with increased hardness and marginal seal. Small amounts of excess also can be removed with this point and some contour can be developed.

Technique. A trapezoidal cantle of mat-foil is placed on the axial wall and held in place with a holding instrument. The cantle is condensed with hand pressure following the systematic approach outlined earlier, beginning from the center of the axial mass and stepping the point towards the surrounding walls. The holding instrument must be moved from the mesial to the distal portions, or vice-versa, to allow for complete hand condensation of the cantle without dislodgement. This first cantle must be hand condensed thoroughly and accurately into all cavity internal angles. A second cantle is added and condensed in the same fashion. The entire mass then is stepped carefully, using the malleting procedure with a parallelogram point. Additional cantles are added, condensed first with hand pressure followed by malleting forces, until the mass of mat-foil approximates the margins (about 0.5 mm. distance away from cavosurface angle). Two layers of gold foil pellets (1/64 size) now are hand condensed around all margins to create the protection, support or banking as described earlier. The parallelogram point is excellent in performing this step of the procedure. The formation of the protective marginal layer with the folding of the pellets over the margins not only produces the cushioning effect desired but also serves as a guide in the development of the cervical surface convexity of the restoration. In essence, the two-pellet layer reduces the size of the cavity outline, and all additional foil pellets are condensed following this established guideline. The condensation of the final central depression or saucer-shaped concavity can be accomplished best with a small foot condenser. Pellets of 1/64 size or larger (1/32) may be used at this time, constantly observing the previously discussed principles.

At this time the restoration should possess a slight amount of excess, perhaps a bulk equivalent to the thickness of the two condensed marginal pellets. Minimal but adequate excess is imperative in order to minimize trimming time. The use of the foot condenser with shallow serrations and under high frequency of blows reduces further the amount of excess and begins to develop the necessary contour.

FINISHING

No two operators agree wholeheartedly upon a specific technique for the trimming and polishing of a Class V restoration. Each individual prefers the use of one method or another as it is related to his

Fig. 3 — Completed Class V restoration.

Fig. 4 — Completed Class V restoration.

own environmental set of conditions. However, all agree that the gold should be burnished, all excess should be removed, excessive heat should be avoided, marginal integrity should be preserved, the surface should be smooth and have at least a velvet polish, and, lastly, but yet of great importance, that the contour should provide the physiological morphology necessary for the protection and stimulation of the gingival soft tissues. As long as these fundamentals are observed, then it matters little what the armamentarium consists of or what technique is employed during the finishing procedures.

When excess gold is maintained at a minimum, an instrument such as the Spratley carver can be utilized effectively to remove all excess and to contour the restoration. This instrument can carve, shave, trim and burnish the gold. Its use can be followed by using 3/8 inch fine discs (cuttle and crocus) to complete the trimming. However, if large amounts of excess gold are present, it is best to start the trimming

by using 3/8 inch discs of a coarser grit (sandpaper – medium and fine), followed by finer grits. Smaller discs (¼ inch size) are ideal for discing the gold near the gingival margin. Whenever discs are utilized a thin coating of vaseline should be placed on the abrasive surface, and air should be applied as a coolant. Small head mandrels are essental to allow for adequate accessibility.

Files, push knives, pull knives, stones, finishing burs, chisels and any number of other instruments are employed by different individuals to accomplish the trimming and contouring procedure. All operators at one time or another have utilized these instruments for a specific restoration. The important consideration is that a simplified armamentarium should be instituted to afford the opportunity for accomplishing the end result in the most efficient manner.

The final polish can be developed by using dry, extra-fine flour of pumice in an unwebbed rubber cup. Intermittent light pressure for a few seconds using air as a coolant produces the so-called velvet finish which is sufficient for these restorations. An even higher gloss can be obtained by following this procedure with tin oxide or any other polishing material. Care must be exercised to avoid heat production and to prevent wearing of the cementum margins. Figures 3 and 4 are examples of completed Class V restorations.

Once the restoration has been polished, the tissue retractor (Ferrier #212) is removed with the aid of the crochet hook placed on the labial beak. The retractor is pulled labially and then occlusally, pivoting it on a finger placed under the lingual beak. The retractor thus can be removed with all its supporting compound without damaging the restoration or the surrounding tissues. The rubber dam then is removed and all gingival tissues are massaged carefully but vigorously. The patient is re-instructed as to his role in the maintenance care of this restorative service. Patient cooperation is essential if long-term service is to be achieved, particularly since it is a known fact that cohesive gold restorations are indeed the most durable, long-lasting and serviceable of any other available material in the practice of dentistry at the present time.

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Dam Gems

It is the intent of the Rubber Dam Committee to publicize, at regular intervals, various techniques that will be of use to students and practitioners. Some of these will be time-proven and others will be new. Your comments, suggestions and ideas for assisting others with various steps of dam techniques will be appreciated. If photographs are necessary, the Committee will make every effort to be of assistance to you. Please send your ideas to CDR. Loren V. Hickey, DC, USN, Naval Dental School, National Naval Medical Center, Bethesda, Maryland 20014.

RUBBER DAM GEMS HOLDERS

The Woodbury-True and the Wizzard rubber dam holders are preferred by many practitioners for routine use in operative dentistry. These holders are applied easily and afford the best retraction of lips and tongue for excellent access to the operative site.

The standard Young's frame is also used routinely by many, however, its use is primarily indicated in pedodontics and endodontics.

Various companies have recently introduced several innovations in rubber dam holders which might be of interest to the profession. With the exception of the holder designed by Dr. P. R. Cunningham, these holders are primarily indicated in pedodontics and endodontics.

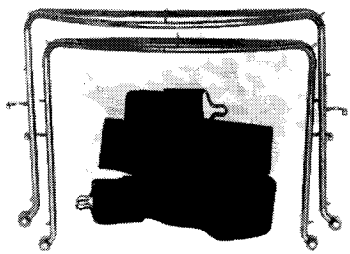

Fig. 1

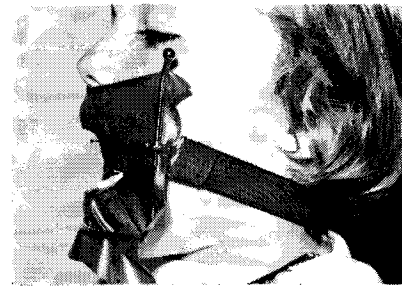

Fig. 2

The Young's improved U frame with a neck strap comes in both adult and children's sizes (Fig. 1). They are wider from side to side than the standard Young's frame. Figure 2 is a side view of the children's size holder.

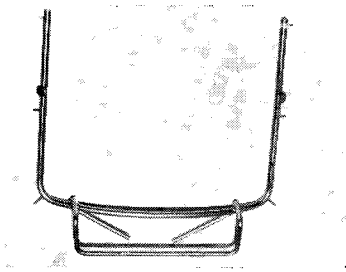

Fig. 3

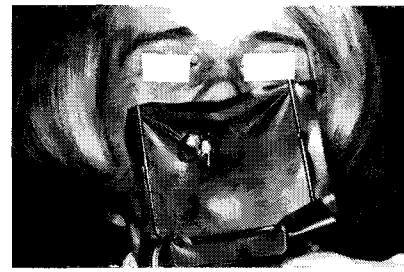

Fig. 4

Figure 3 is a modification of the standard Young's frame called the Enodon. This has an extra rigid extension fastened to the horizontal bar which provides for a pouch when the rubber dam is drawn around it. Figure 4 shows how irrigating solutions or water from the handpiece are evacuated with the saliva ejector or high velocity evacuator.

The Dam-E-Z-Ray by the Rinn Corporation was designed primarily for use in endodontics to facilitate the taking of roentgenograms at various steps in the procedure. Figure 5 shows the holder with a piece of 5" x 5" rubber dam. Figure 6 illustrates it in use for an endodontic procedure. The holder is simply folded to provide better access for taking the necessary roentgenograms. (Fig. 7)

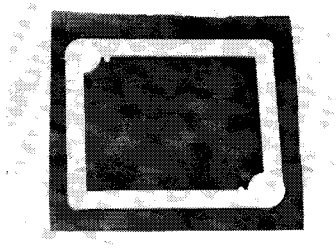

Fig. 5

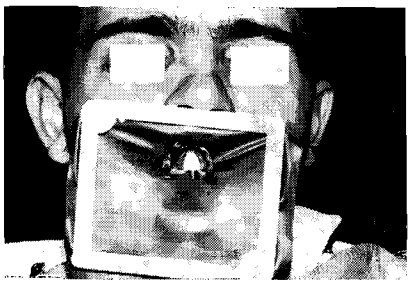

Fig. 6

Fig. 7

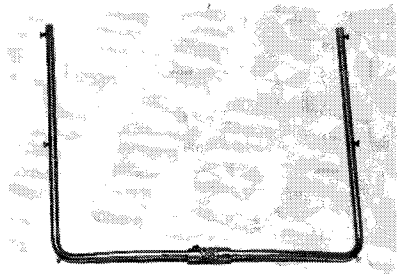

Fig. 8

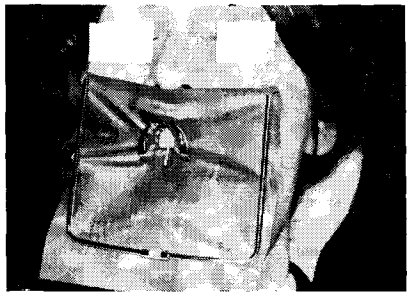

Fig. 9

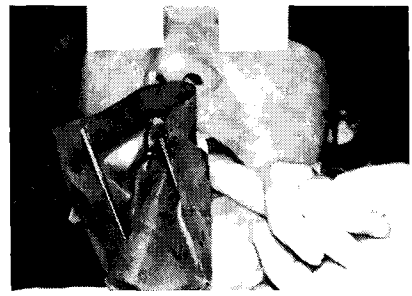

Fig. 10

The Young's hinged rubber dam frame (Fig. 8) is another innovation designed primarily for endodontics. There is a lock tube on the horizontal bar (Fig. 9) which is easily disengaged to permit folding of the frame to either side to provide access for taking of procedural roentgenograms. (Fig. 10)

The Nygaard-Ostby (Fig. 11) is also an excellent frame for easy application of the rubber dam for endodontics or pedodontics. It is contoured to the face and is made from a nylon base material. This frame is readily used for anterior or posterior applications. (Fig. 12)

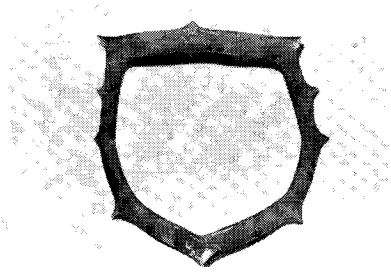

Fig. 11

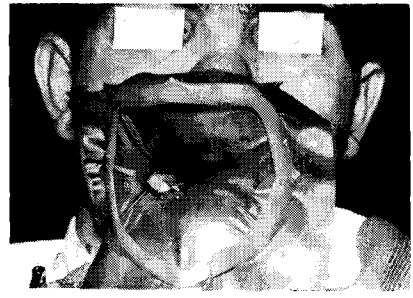

Fig. 12

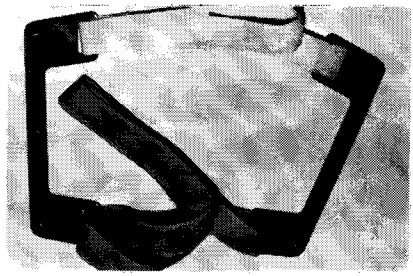

Fig. 13

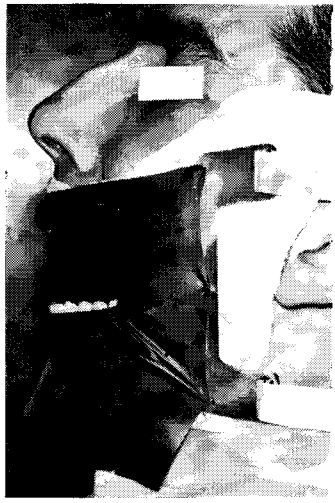

Fig. 14

Fig. 15

Dr. Peter R. Cunningham has designed a two strap holder which is going to be produced by the Hygienic Company. The side bars are of thin and flexible stainless steel, (Fig. 13) and the straps are of Velcro material for tightening. The rubber dam is fastened to the close-up of the basic design of this new holder. With this holder, there is a positive retraction of the rubber dam and cheeks and minimal bulk in the metal pieces. The Velcro straps remain adjusted throughout the operation and, since they are wider, there is greater patient comfort. (Fig. 14, 15)

Woodbury Study Club

THE UNIVERSITY of Nebraska College of Dentistry was host, October 11 and 12, 1968, to the Woodbury Study Club, a group of sixty Midwestern dentists and dental college faculty concerned with restorative dentistry and the rebuilding of tooth structure using gold foil.

The Woodbury Club, formed in 1906, is one of the oldest groups of its kind in the United States. It holds semi-annual meetings at Midwestern colleges, and its visit to the University of Nebraska was the first since the college moved into its new East Campus quarters.

While at the University, the group studied patients with particular decay problems and perfected techniques and skills in preparing cavity areas and using gold foil to rebuild decayed tooth structures.

Junior and senior dental students at the college acted as hosts and assistants. Four University of Nebraska faculty are members of the club.

In the accompanying photograph, a group of dental educators who attended the meeting are pictured. From left to right: Dr. E. J. LaPorte, Creighton University; Dr. Robert Taylor, Ohio State University; Dr. H. William Gilmore, Indiana University; Dr. Roger V. Chastain, West Virginia University; Dr. Donald Keys, University of Nebraska; and Dr. David L. Moore, University of Missouri at Kansas City.

Tribute to Donald Spratley, Continued from page 5

and a swegger, manufactured by the O. Suter Company. The instruments will be described in a forthcoming article in the Academy's Journal.

Dr. Spratley made a great contribution to the progress of his beloved profession, and with it all he found time for many hobbies in which he excelled. He had an elaborate workshop and was a master craftsman at working with wood materials. One of his creations is the beautiful walnut-grained alter at St. Paul's Episcopal Church in Mt. Vernon.

He loved the Northwest country and was a great outdoorsman, a superb hunter and an ardent fisherman. He created the "Spratley Fly," which has become a nation-wide favorite among fly-casters in the United States and Canada.

This great man always seemed to find time to give his tender care to a beautiful garden surrounding his home, a home he shared with his lovely and charming wife, Josephine. Surviving him are his wife, his daughter, Mrs. Joe Wikins, and his four grandchildren.

I knew Don as a quiet man, sincere, fair and charitable toward others who, as I did, sought his advice on many occasions.

Our memories of him are of his uncompromising honesty, his loyalty to his profession and to his friends, and his constant endeavor to reach the ideal in his every task.

HAROLD L. SONDHEIM, D.M.D.

Annual Meeting

The 1969 Annual Meeting has been planned for October 10 at the State University of New York at Buffalo. This will precede the ADA meeting in New York City. A detailed announcement will be mailed soon.

Academy Memberships Awarded

ACTIVE

Dr. John L. Bomba
Dr. Lawrence D. Brucker
Dr. Joseph L. Burke
Dr. Don Jack Fong
Dr. Keith R. Green
Dr. Carl H. Jepsen
Dr. Lael E. Long
Dr. Maurice P. Lord, II
Dr. Donald C. Mattison
Dr. Donald E. Nemer
Dr. James E. Newman
Dr. John W. Osborne
Dr. Willard L. Powell
Dr. Anthony D. Romano
Dr. Harris Silverstein
Dr. Julian J. Thomas
Dr. William J. Thompson
Dr. Richard V. Tucker
Dr. Donald A. Welk
Dr. Roy A. Wilko

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Dr. Samuel E. Bleakley
Dr. David A. Bleeke
Dr. George J. Capaldi
Dr. Alfred I. Coleman
Dr. Peter R. Cunningham, II
Dr. Ronald W. Curtis
Dr. Paul E. Farrell
Dr. Robert E. Garfield
Dr. Howard C. Giles, Jr.
Dr. Harlan L. Goodwin, Jr.
Dr. James V. Gourley
Dr. Alan J. Gross
Dr. Peder J. Hancher
Dr. J. Bennett Hooker
Dr. Robert C. Keene
Dr. Milton Latoni
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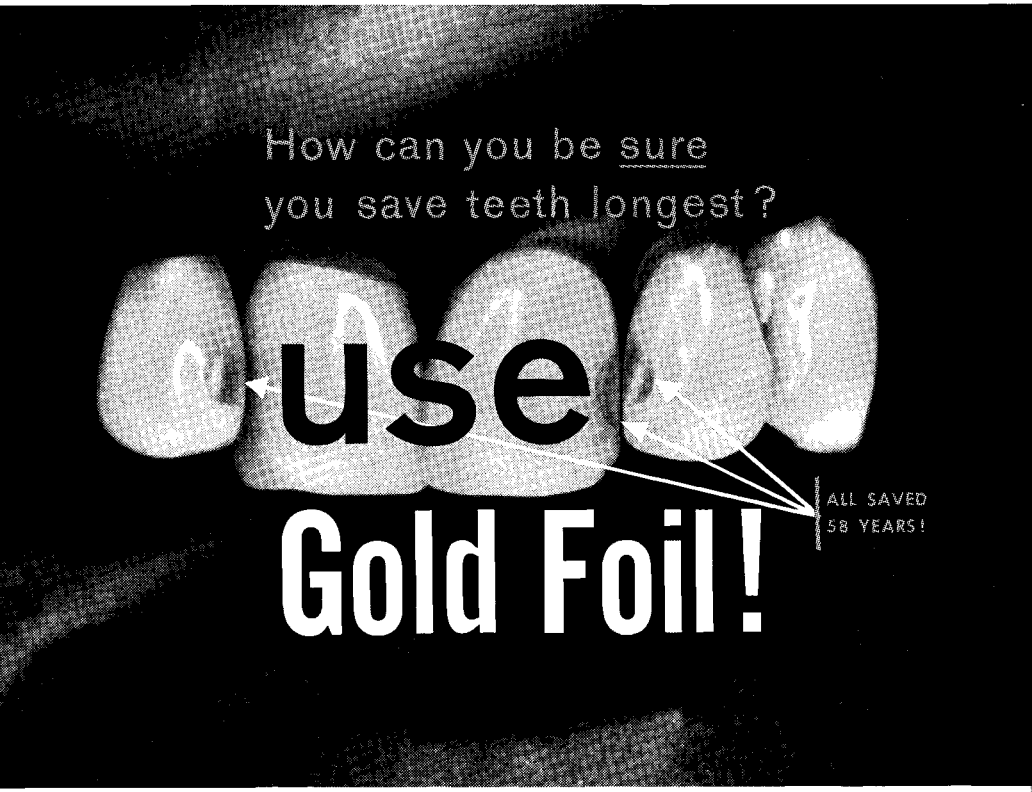
Dr. Maurice E. Logan
Dr. Ian Urquhart MacIntosh
Dr. David O. Marks
Dr. Walter C. Meyer
Dr. Maurice R. Michaud
Dr. David L. Moore
Dr. John A. Morris
Dr. William E. Murphy
Dr. George W. Northrup
Dr. Boris M. Nowakowsky
Dr. William T. Pike
Dr. Charles C. Puntillo
Dr. Francis W. Rennell
Dr. Lee Howard Roper
Dr. Leo B. Sanfacon
Dr. Willard E. Spearin
Dr. Van Roger Tibbetts
Dr. Jerome Silverstein
Dr. Duane R. Wacker
Dr. Paul O. Walker
Dr. H. Myer Weiner

FOREIGN

Dr. Maximiliano Benavente, Santiago, Chile
Dr. Richard J. Elderton, West Wickham, Kent, England
Dr. Luis Sanchez, Mexico City, Mexico

LIFE

Dr. Howard I. Gilbert
Dr. Collister M. Wheeler



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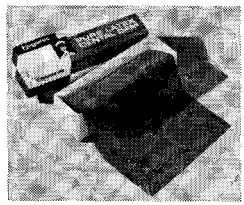

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Extra Heavy and Special
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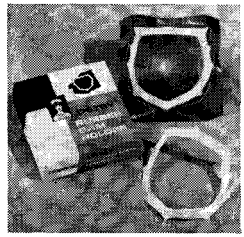

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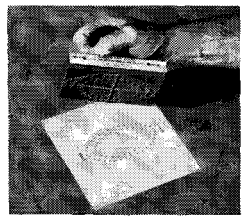

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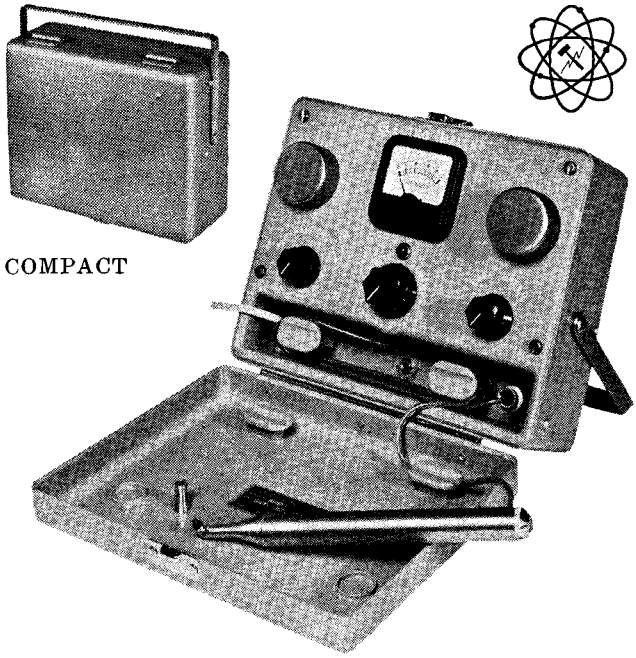

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