Original Communications.

CAVITY PREPARATION FOR GOLD FOIL, GOLD INLAY AND AMALGAM OPERATIONS.

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A FEW years ago while looking over some magazines, a sentence on a cover page so impressed me by its aptness and truth that I have never forgotten it. The sentence is as follows: "What the world needs is not so much new knowledge as to be reminded of what it already knows." And it was with this in mind that I accepted an invitation to present a paper on what might seem to be a worn out subject.

However trite and seemingly worn the subject, there is probably no other cause, so prolific of failure in our operations of restoring lost tooth structure, as that of faulty cavity preparation, and the only help I can see at present for this state of affairs is by repeated demonstrations of

the principles of correct cavity preparation, which have so long been scientifically established.

May I add here my belief that one of the many splendid characteristics of that "grand old man" in dentistry, the late Dr. G. V. Black, was his unswerving interest and patience in the teaching and dissemination of these principles long since proved to be correct.

It would be difficult indeed, at this time, to find in the dental world any who are not willing to accept and acknowledge the correctness of these principles. And yet, how few appear to make use of this knowledge in their work at the chair from day to day.

The operation of preparing a cavity in

a tooth is not a simple one,—every day we are having forced upon us the responsibility of the dentist, as guardian of the health of the people; and cavity preparation is a very important link in the chain of our obligation to humanity. If there is one place in the world where the phrase, "a chain is not stronger than its weakest link," should be printed in type that never dims, that place is in front of the dental chair.

There is a mixture of art, science and mechanics necessary in the correct preparation of a cavity in a tooth that stamps it as an achievement of no ordinary character. Few men are to the manner born and it is only by means of years of earnest study and endeavor, that the majority of us attain proficiency that is commendable. The great difficulty is in stirring up in dentists generally an ambition to attain this proficiency. We all know it is the rarest thing in our practice to find teeth in which operations have been made, in any appreciable per cent of which, cavity preparation has been carried out in detail, consistent with well known scientifically proved principles.

Out west we have been engaged in study club work for a number of years and a more enthusiastic grateful crowd you have never met; enthusiasm for the future of dentistry, grateful to those who have spurred us on and because we have attained some degree of success. As I recall the organization of that first study club in Seattle some years ago, it is with a feeling of amusement. Of course we were dentists (?), our desire to study and improve even led us to believe we were good conscientious dentists—did not our college say we were dentists?—the great commonwealth of Washington said we were dentists—even some of our patients said we were dentists and if asked we would probably have admitted ourselves that we were dentists; but ladies and gentlemen, that first year's work so impressed us with our inefficiency that each and every one was willing to admit that someone had been "kidding."

A friend of mine told me that in conversation with Dr. G. V. Black, some years ago, Dr. Black made the statement that the great need of the dental profession was the scientific mind. If we as a profession could get hold of this idea I wonder if it would not stir us to renewed activity and enthusiasm for some of the subjects we think are old fashioned, and a lack of interest in which helps to swell the grand total of inefficiency and unhappiness in this old world of ours. Would not some of our offices be brighter with a new found joy in our work, because of the help we might be to those who trusted themselves to our care?

By the phrase "preparation of cavities" according to Black is meant such a mechanical treatment of the injuries to the teeth produced by dental caries as will best fit the remaining part of the tooth to receive a filling, restoring the original form, give it strength and prevent recurrence of decay in the same surface. That we may have a definite order of procedure he has divided cavities into five different classes, in each of which the cavities require similar treatment and instrumentation, namely:

Class one—Cavities beginning in structural defects in the teeth—pits and fissures.

Class two—Cavities in the proximal surfaces of the bicusps and molars.

Class three—Cavities in the proximal surfaces of incisors and cuspids which do not involve the removal and restoration of the incisal angle.

Class four—Cavities in the proximal surfaces of incisors and cuspids which do require the removal and restoration of the incisal angle.

Class five—Cavities in the gingival—third—not pit cavities—of the labial buccal or lingual surfaces of the teeth.

We will proceed to prepare cavities for each of the different classes, having in mind gold foil as the filling material, later giving such modification as is necessary when either gold inlays or amalgam is used. The procedure in preparing

cavities consists of obtaining the outline form, resistance form, retention form, convenience form, the removal of the remaining carious dentine, the finishing of the enamel wall and the making the toilet of the cavity.

Let us take for example the preparation of a cavity in the occlusal surface of the lower first molar. The tooth itself and the adjacent teeth are scaled, and the gums wiped carefully with a pledget of cotton, saturated with alcohol preliminary to placing the rubber dam. And here let me state my firm opinion that it is not possible to properly prepare a cavity without first isolating the tooth with the rubber dam. It seems to be the opinion of many operators that it expedites matters to dispense with the use of this valuable assistant. How frequently do we hear the assertion "the patient is gagged and made extremely uncomfortable by the use of the infernal dam." Carefully kept records in my own practice show that the average time consumed in placing the dam for all filling operations is less than five minutes. Patients are not gagged so far as I have observed and the use of an efficient saliva ejector, eliminates much of the discomfort. Furthermore, the rubber is a protection to the lips and cheeks, illuminates the cavity, excludes moisture, eliminates all unnecessary conversation which is no small factor in consuming time and really reduces the time of operating at least one-third. This is assuming that the same detail is carried out in the cavity preparation if such execution of detail were possible.

A number twenty-seven S. S. W. clamp is placed upon the second molar and all the teeth isolated by the rubber dam up to the central incisor, a small round bur is placed in the grove that seems to offer the least resistance to its penetration and by swaying motion and gentle pressure the bur soon enters the dentine. A larger round bur is selected and by the same procedure the opening is enlarged. This is the only use we have for the

round bur in preparing the cavity. Noteworthy in passing, the manufacturers inform us that the round bur is by far the most popular, and an examination of most of the operations that come under our observation seems to substantiate this claim. If the decay is somewhat extensive the overhanging enamel may be readily chipped away with a Black bi-angle chisel, 15-8-12 enamel hatchets or a small, Wedelstaedt chisel—personally I prefer the latter two mentioned. If the decay is incipient, an inverted cone bur is pressed against the axial walls of the cavity and the enamel undermined to such an extent that it can be readily chipped away.

This undermining and chipping is continued until the desired outline form is obtained. In such a cavity this should be only enough to obliterate all the grooves and so place the margins that the operation may be easily and smoothly finished. Extension for prevention does not apply to this class of cavity. They occur on self-cleansing areas and would be immune were it not for the structural defects in the enamel. Resistance and retention form are obtained by placing the square end of an inverted cone bur against the pulpal wall and carrying it entirely around the cavity. The pulpal wall is made flat and the pulpo-axial line-angle made sharp and definite; the axial walls are made perpendicular and at a right angle to the pulpal walls by the use of 15-8-12 Enamel hatchets. Here is where most error enters in the preparation of this class of cavities. Instead of having the pulpal wall meet the axial walls at right angles the two walls present a continuous concave surface, retention being obtained by tunneling and grooving some other portion of the cavity. Foil cannot be made to wedge in such a cavity and prevent leakage. Inlays have not the proper retention and amalgam has a tendency to spheroid. No convenience form is necessary in such a cavity, if any decay remains it can readily be removed

with the spoons, 10-6-12. The enamel wall may be prepared by planing with a sharp chisel, the line of force being in the direction of the length of the margin. The inclination of the enamel rods is toward the cavity and need no outward bevel. The cavo-surface angle is slightly beveled to prevent fracture of the enamel rods in placing the filling, but requires none in amalgam and inlay operations. The toilet of the cavity is made by the use of the chip-blower and dry cotton in the foil carriers. We have no use for alcohol or other medicaments in a clean freshly prepared cavity.

Class two cavities illustrate the meaning of extension for prevention. Beginning caries in the mesial surface of an upper first molar will serve our purpose well. Probably the best way to open up such a cavity is by introducing a bi-bevel drill in the central occlusal pit and advancing it to the dento-enamel junction. This is followed by a small inverted cone bur, the force being applied mesially and the instrument drawn occlusally, and repeated until a groove is cut thru the mesial marginal ridge. The bi-bevel drill may now be used again to unite the occlusal step with the cavity of decay. A number 558 cross cut fissure-bur with the force applied buccally and lingually followed by a sharp chisel to break down the enamel will so open up the cavity that a general survey may be made, and the required extension decided upon. It is well to go back to the occlusal step and finish its outline form. It is imperative that an occlusal step be made in this class of cavity in order that the proper resistance and retention form be obtained. Practically the same instrumentation is used as in the preparation of the Class One cavity, just described. The mesio-occlusal angle should be well rounded so that the recession line of the pulp cornu at this point be not exposed, resulting in its death and the demand for its subsequent removal.

We may now give our attention to the preparation of the outline form of the

proximal portion of the cavity. The number 558 cross-cut fissure-bur is used to extend the buccal and lingual walls to such a point that their cavo-surface angles when finished will lie in self-cleansing areas. Here is where the preparation for a gold foil or amalgam operation varies markedly from an inlay operation. The occlusal outline of the tooth—not the cavity—we are operating upon presents the form of a rhomboid, the mesio lingual angle being obtuse, the mesio-lingual cusp is somewhat rounded toward the occlusal and the lingual cusp of the second bicuspid is decidedly curved at the disto-lingual angle. The arrangement of these two teeth therefore is such that the embrasure opens occlusally as well as lingually, requiring less extension bucco-lingually in the occlusal third of the cavity than in the gingival third, resulting in the buccal and lingual walls, more decidedly the lingual, meeting the gingival wall at an acute angle rather than at a right angle. Considerable tooth structure is saved by such a preparation and the principle of extension for prevention is as well served as if the buccal and lingual walls were parallel as they must necessarily be in an inlay preparation. The mesial surface of an upper first molar is taken as an example of this form of cavity preparation, but the principle is applicable to most cavities of this class.

The retention and resistance forms are obtained principally in the step, by the same means used in Class One preparations, the axial walls are made to meet the pulpal walls at a right angle, the axial wall of the proximal portion of the cavity is slightly curved, its concavity presenting toward the pulp and meeting the gingival, buccal and lingual walls at definite and sharp angles. The buccogingivo-axial and linguo-gingivo-axial angles are made especially sharp by use of the smallest size inverted cone bur and number 6 hoe, as a convenience and retentive measure in placing the gold. A cavity so prepared needs no further con-

venience form, the paralleling of the buccal and lingual wall of the proximal portion would possibly be an added, but in most cases an unnecessary convenience. The remaining carious dentine may be removed with the spoons, 20-9-12. The enamel walls are now planed to form. On the occlusal step they are treated as in Class One preparations. In the proximal portion they are inclined to the buccal and lingual, the degree of inclination being governed by the enamel cleavage. The gingival enamel wall is inclined slightly toward the gingival. The cavo-surface angle is beveled with a chisel, followed by Dr. Searl's enamel planes, in all portions of the cavity outline, except the gingival. Here the gingival margin trimmers 20-(80)-9-12 right and left are used with a scraping motion to give the proper bevel and round out the bucco and linguo-gingival angles. The cavity toilet is now made when the tooth is ready to receive the filling material.

Class Three cavities in the proximal surfaces of incisors and cuspids which do not require the removal and restoration of the incisal angle present some difficulty in their retention, convenience and resistance form, due to the fact that these surfaces are triangular in shape, the apex of the triangle ending between two closely approximating walls of enamel. With a hoe 8-3-6 used as a chisel begin the preparation by chipping away the enamel from the labial margin. The smallest size inverted cone bur is now introduced and carried to such a point gingivally that the gingival margin will be covered with gum tissue when finished; the bur is moved from labial to lingual until the gingival outline is established. This outline form is not a straight line at right angles to the long axis of the tooth as is generally supposed, but presents the form of a curve, convex toward the incisal angle, the degree of curvature depending upon the outline of the free gingiva. This places the labio-gingival and linguo-gingival

angles under the gum. The cavity is extended incisally thru the contact point and to such a position that this angle may be readily finished and free from contact with the approximating tooth when the filling has been placed. The labial wall is extended to such a point that the finished operation will reflect the light and not appear as a dark line between the two teeth. A small chisel is used to make this line parallel with the developmental grooves, the extent of its gingival and middle thirds,—when it is curved rather abruptly to the point decided upon as the incisal angle of the cavity. Such a preparation gives us better access to this angle and renders its filling more convenient from the labial aspect. The lingual outline is placed on the lingual surface of the tooth where it may be kept clean by the movements of the tongue. In establishing this outline due regard must be had for convenience in placing the filling, especially at the linguo-gingival angle where most failures in this class of operations occur. The axial wall is made flat or slightly curved around the pulp with the hoe 6-2-23. The gingival wall is made at right angle to this wall with the Woodbury-Crandall hoes 7-85-2-6 and 12-85-5-6 right and left, resulting in a sharp and definite axio-gingival angle. The axio-labial angle is established with the hatchet 5-3-28 and the axio-lingual angle with the hoe 6-2-23.

Special resistance form is not required beyond the retention form in these cavities. The retention form is made by slightly undercutting the incisal angle with the hoe 6-2-23, giving the cavity a general triangular box-like form, special attention being given to the labio-gingivo-axial and linguo-gingivo-axial point angles. Convenience pits may be cut in these two angles, but usually all they require is to be made sharp and definite. The Perry separator is used as an added convenience in placing the gold and finishing the operation. The enamel walls should follow the line of cleavage of the enamel and be made

smooth by the use of a chisel and Searl's enamel planes. A slight cavo-surface bevel should be given to the wall thruout and the toilet of the cavity made.

Class Four cavities occur on the proximal surfaces of the incisors which require the removal and restoration of the incisal angle. Various means of operating in these cavities have been advanced by a number of writers, but the "L" filling or Johnson step is undoubtedly the operation of choice in the vast majority of cases. It is as necessary to the proper resistance and retention form to secure the operation with an incisal step in this class of cavity as in the proximo-occlusal operation of bicuspid and molars. It requires a painstaking effort and a high degree of skill to properly place proximo incisal operations, but the results fully justify the means. The principal argument advanced against such an operation is the conspicuous display of gold necessary in its completion. If, however, the outline form of the cavity is in complete harmony with the size and shape of the tooth, its appearance is at least not any more displeasing than an angle restoration without the incisal step.

The outline form is started by cutting away the angle with a sharp chisel, the incisal two-thirds of the tooth is cut gingivally with a stone to such a point that will bring the step to a pleasing proportion with the proximal part of the cavity and give a good base of dentin for resistance. The proximal part of the cavity is prepared as in Class Four operations, minus the incisal angle. With the smallest size inverted cone bur, sunk to the depth of its head, a groove is cut between the labial and lingual enamel plates, to the extent of the outline form given by the stone. The lingual enamel plate is now chipped away to the bottom of the groove, as a rule, governed of course, by the labio-lingual diameter of the incisal third of the tooth. The inverted cone bur is again started as before and the groove deepened keeping to-

ward the lingual surface so as to leave the labial and lingual walls supported by dentin. The enamel walls are now so treated that no short rods are left remaining, and it is here that this preparation is generally neglected. The enamel rods run diagonally from the labial and lingual cavo-surface angles to the center of the groove just cut and their line of cleavage must be particularly noted. A step so prepared will be flaring from the pulpal wall incisally, permitting a much larger mass of gold at this otherwise weak position and reducing to a minimum the amount of enamel the gold has to rest upon. The proximal incisal angle is rounded very slightly, both on the labial and lingual plates. The cavo-surface angles are beveled a trifle and altho many operators disagree, I believe a fine cuttle fish disk is best suited for this purpose. The toilet of the cavity is made and the tooth is ready to receive the filling. An operation so made with care and skill has as good a chance for lasting success as any operation in any tooth.

In connection with this class of cavity I want to speak of a special preparation for cavities of decay occurring in the distal surface of the upper left cuspid. For a right handed operator the distal surface of an upper left cuspid presents unusual difficulties of access. By converting the Class Four preparation into the Class Five preparation just described, the operation is practically as convenient as in an incisor. The shape of a cuspid, thick at the incisal angle, leads itself nicely to such a preparation, the middle lobe of the tooth effectually concealing the incisal step when viewed from any angle except a right angle to the tooth. This cavity preparation was first described by Dr. E. K. Wedelstaedt, of St. Paul, and taught to his study clubs. This type of preparation has been used by the writer for every cavity in the distal surface of the upper left cuspid that has presented in the past four years, and has given entire satisfaction.

Class Five—cavities in the gingival third—not pit cavities—in the buccal-labial or lingual surfaces of the teeth. These smooth surface cavities occur so rarely on the lingual surfaces that a detailed description of their preparation would not be within the province of this paper, nor will time permit more than a superficial description at all; the cavity outline must be placed well under the free margin of the gum gingivally and include all the affected enamel in all directions. Extension for prevention consists of placing the mesial and distal wall at the mesio-buccal or labial and disto-buccal or labial angles. Decay will rarely recur if intelligent cooperation of the patient is observed and the operation well placed.

Of cavity preparation for amalgam operations little need to be added to the foregoing. The same preparation will answer as well for gold foil as for amalgam. However, it is probably a better procedure to have no short cavo-surface bevel, but rather bevel the entire enamel wall, thereby leaving no thin edge of amalgam to chip away by the force of mastication.

For inlays we also have little to add. The walls must be parallel to permit of the removal of the wax, but not diverging to any appreciable extent. Tapered burs and stones have no place in the ordinary cavity preparation in bicusps and molars. The ideal inlay preparation would be absolutely parallel walls meeting flat bases at right angles, and we should approach it as closely as possible. Sharp and definite angles are essential, not only in the proper retention of the finished inlay but to the true wax pattern itself in the making. A cavo-surface bevel is not needed in the step portion of Class Two cavities, as we use no instruments to mar the margins in placing the operations. Should a discrepancy occur at the gingival margin it can frequently be rectified by grinding the pulpal surface of the inlay, allowing it to seat itself further gingivally in the cavity, and the cavo-surface bevel of the margins of

the step would prevent this procedure. Gold inlays are so rarely indicated in the anterior teeth that a description of cavity preparations will be omitted.

The necessity for more careful and painstaking effort on the part of the vast majority of the profession in the preparation of cavities for filling operations is evident. The dental profession has made rapid strides in the past few years in the prevention of dental disorders by prophylaxis. School children are being taught oral hygiene by competent self-sacrificing men the world over, and the results are becoming evident, but the bulk of the work of the general practitioner has been in the past and will be for many future years, the restoration of lost tooth structure and lost function of the teeth by operations made within the structure itself.

Discussions.

Dr. W. H. O. McGeehee, Cincinnati, Ohio.

It has been a great pleasure to listen to the excellent presentation of this subject by Dr. Farrier. I have enjoyed every bit of it. The subject is indeed a well-worn one, as said by the essayist, but at the same time my experience has been that it is always a very interesting one to the average dental audience. In former years, when I was called upon to read a paper on the subject of Cavity Preparation, I felt like offering an apology to the audience for traversing this well-known ground, but later, after having been thru the subject at different meetings, I felt that the work which I had put upon my paper was fully justified in the results which were obtained.

It seems to me that this subject of cavity preparation might almost be called the key-note of successful dental practice today, owing to the fact that the lasting qualities of our filling materials will depend largely on the proper preparation of the foundation upon which they are to rest. It makes no difference of what material the filling is composed, it makes no difference how well it is

shaped, if the cavity is not prepared along scientific lines the filling will be only a temporary expedient. That being the case, I feel that repeated demonstrations and repeated talks on this subject are extremely important.

Cavity preparation was a good many years ago placed on a definite scientific basis by Dr. G. V. Black and his co-workers. Black cavity preparation is being taught in practically all dental colleges of any repute in this country, and is the only form of cavity preparation which is described in any modern textbook on operative dentistry. That being the case, the average dentist is at least familiar with the principles of this form of cavity preparation, yet at the same time we will have to admit, with the essayist, that altho the profession as a whole may be familiar with the theories of cavity preparation, they are certainly not putting these theories into practice in the daily routine at the chair.

The essayist brought out the point that Dr. Black mentioned some time ago the great need in dentistry for the scientific mind. That is just as applicable to cavity preparation as to any other subject in the entire realm of dentistry. Cavity preparation, as I have stated, was placed on a definite scientific basis, and exact, definite rules have been laid down for its performance. All science is exact, else it cannot be called science at all. The forms which have been defined by the essayist are of course ideal forms, and the forms which are illustrated in the text-books, according to my way of thinking of the matter, are simply ideal forms toward which the operator must attempt to work. At the same time there are certain modifying factors, such as the shape of the teeth, age, physical and mental condition of the patient, and other environmental influences which have to be taken into consideration when we attempt to approach these ideal forms. That being the case, we cannot always prepare cavities according to the ideal forms but we should, depending upon the

conditions under which we are working, attempt to approach them as closely as possible. These ideal forms, it seems to me, offer us a definite working basis, an idealistic premise from which we may argue and proceed to a logical conclusion in our work of cavity preparation. In conversation with a noted educator several months ago he made the statement that you cannot measure up all cavities with a yard stick. I agree with him in that statement to the extent that you cannot always obtain those ideal forms which have been described in the excellent presentation of the essayist. At the same time I feel that, if we are going to have scientific cavity preparation, we must try to get down to exact and definite lines in the preparation of these cavities in the teeth upon which we are working and altho we may not be justified in using a yard-stick, I firmly believe that if we have the scientific mind, if we will try to build on a millimeter gauge instead of going at it haphazard, we will get much better results.

The essayist has mentioned the various steps in cavity preparation. It is important that the operator keep these five steps separate in his mind, altho there is frequently an overlapping of the various steps. Yet if we will try as far as possible to complete one step and make it as perfect as possible before proceeding to the next, in that way we will accomplish much more perfect results in the completion of the cavity.

It seems to me that this question of cavity preparation is an exceedingly serious matter. In fact, if one's ethical faculties, one's higher moral attributes are developed to the fullest extent it will be looked upon in the light of a ceremony—a ceremony almost as serious as that incident to the performance of a religious rite. I believe we ought to assume that attitude in regard to it, not only this morning in this room, but forever afterwards, if we want to get the best results in our work.

I agree with the essayist that as a rou-

time measure the rubber dam should be applied. At the same time, I feel there are certain cavities of a simple nature in which we are justified in dispensing with the rubber dam. I believe the saliva should be excluded from the cavity thruout the preparation if we expect to get good results, but at the same time I feel there are cases in which the rubber dam may be dispensed with. That being the case, I would not say a cavity cannot be successfully and perfectly prepared without the use of the rubber dam.

In regard to the mesio-occlusal cavity in the upper first molar, I desire to take issue to some extent with Dr. Ferrier's statements in that connection. One point the doctor brought out was the fact that he did not believe it absolutely necessary to parallel the buccal and lingual walls in cavities of this class, owing to the shape of the teeth on which we are working. I believe that if the buccal and lingual walls are made parallel, we will have much better access to the field of operation. In addition, the filling material will be much more readily adapted against the buccal and lingual walls if they are absolutely parallel instead of being allowed to approach each other as the occlusal surface of the tooth is reached.

The essayist made the statement that the principal resistance is obtained at the top of the step. This statement should be modified, for I believe that if the gingival wall be properly prepared, if the seat for the filling be made sufficiently broad in a mesio-distal direction and carried bucco-lingually to a sufficient extent, the greatest amount of resistance would be and should be obtained from the gingival wall instead of at the top of the step.

In regard to proximal cavities on anterior teeth, the essayist makes the statement that the gingival wall instead of being a flat wall or plane surface, should rather be allowed to follow the curvature of the gingival line, with the result that it will be more or less of a convex sur-

face with its convexity pointing toward the incisal angle of the cavity. In the preparation of cavities on the anterior teeth it is very rarely the case that I prepare the gingival wall in any other manner except an absolutely flat wall. About the only exception to that general rule, as laid down by G. V. Black, it seems to me, is the preparation of cavities of this class in the lateral. That is an exceedingly delicate tooth and I have some times felt justified in producing a convex gingival wall in this case, in order to secure a larger seat on that wall. With the exception of very small anterior teeth, however, it is good practice to make this wall absolutely flat.

Another point in regard to proximal cavities on anterior teeth is, that if the gingival walls are curved they will be so close that the gingivo-axial point angles would be placed under the gum. I think the gingival wall should rather be made flat, as I have stated, and that it should extend toward the labial or lingual surface, in order that the angles may be placed in immune areas instead of under the gum tissue.

In regard to this gingival wall I have in mind a piece of Biblical lore, which I am sure you will recall, in regard to a certain man who built his house upon the sands of the seashore. But it did not stand very long, owing to the fact that it was built on an insecure foundation. Another man built his house on a rock, and the waves beat against it, the storms came and the winds blew, but they could not prevail against it, because the house was founded upon a rock. And gentlemen, I desire to tell you this morning that my firm belief is that, instead of being concave or convex, that rock was absolutely flat—that rock on which he built his house. You realize that the stress during mastication is very great, averaging from 75 to 175 pounds. In many instances owing to contact with foreign substances, such as oyster shell or a small piece of bone or something of that character, this stress

is largely increased, sometimes to 250 or 300 pounds. It seems to me you can see at a glance the importance of having a flat seat for your filling in order that the stress may be resisted to the utmost.

The doctor made a statement in regard to proximal cavities in anterior teeth, saying that the incisal angle of the cavity under all circumstances, as I understand, should be extended beyond the contact point. That of course is the ideal condition, if it can be obtained. We will have to admit, however, owing to the shape of the anterior teeth, in many instances the contact point is very frequently close to the incisal angle. In these cases then, I think it would be much better, instead of extending the cavity thru to include the contact point, to resort to adequate separation and obtain a new contact point established on the filling itself.

In regard to the incisal step for cavities in anterior teeth, I agree with Dr. Ferrier that, with the proper incisal step, the form is ideal. I believe, however, that in many cases of lateral incisors the lingual step form will answer the purpose as well or better and will avoid the necessity of a great display of gold. This also holds true with reference to cuspid teeth. I do not believe it is necessary to remove a great deal of labial enamel in the preparation of forms in incisal cavities. In a majority of cases the labial enamel plate may be preserved, owing to the fact that the tooth has sufficient thickness in the labio-lingual direction to admit of its preparation in that manner.

Whenever I read a paper on cavity preparation with illustrations, either models or slides, after the lecture is over I frequently hear some one say, "Doctor, it is all very well to show us these beautifully prepared cavities in plaster forms, but under the conditions as we find them at the chair it would be impossible, almost, to obtain these ideal forms." Whenever I hear a man talk that way I immediately set him down as a careless, slipshod operator. It is possible to

obtain these forms in the mouth, not only possible, but really important that they should be obtained. And they can be obtained if you know how to do it and work; but you must use the right kind of instruments and take the necessary time to accomplish results.

I have in mind a certain furniture manufacturing concern in Cincinnati. As you probably know, Cincinnati is a great market for furniture. This firm manufactures what they call "saw-test" furniture. Years ago they concluded that if they wished to make a lasting success it would be necessary for them to place furniture on the market which would not only present a highly finished surface, but the details of the structure of which would stand inspection. Their advertisements show a library table, book-case or some similar article being sawed thru with a saw of heroic dimensions and underneath, this legend:

"If you saw it thru
"Twould prove it true,"

a quotation from the Bard of Avon, and following that is another statement, "What you cannot see, we will vouch for."

In conclusion, Mr. Chairman, I wish to leave this thought with you—that if we, as dentists, desire to make a lasting success, we must have uppermost in our minds the idea of service, and we must make our operations, not only our cavity preparation operations, but our filling operations and all routine work incident thereto, so that they will stand the "saw-test." I thank you very much.

DR. JOHN STEELE, Denver, Colorado: I have enjoyed this paper very much; I had the privilege of reading it before the meeting. I have also enjoyed the discussion. Many of the points in the paper I think would be of great value to all of us—in fact, I intend to preserve the paper and make use of it. It is a concise paper, one that we can refer to in our busy moments and make use of many of the points.

A new point was the preparation of cuspid, where the doctor spoke of stepping them. To me that sounds like a new idea, and I like it very much. There are some points where I do not just agree with him, for instance not using any medicine at all in your cavities. Really, I cannot see any harm in using a simple medicament sometimes. I always use some remedy, not that it is always required, but it does no harm and often makes the preparation easier on the patient.

Yesterday at the morning session Dr. Price took exception to the word "perfect." I would like to take exception to the word "scientific," which is used so much in speaking of dentistry. We call our work "scientific," the preparation of cavities, "scientific." Dr. Black, I have no doubt, prepared some of these cavity models along scientific lines, but cavities in teeth are different. If you are going to do anything scientific you will have to have the same scientific procedure for every tooth. As a matter of fact, we are not scientific. We use our eye when we make our measurements; we measure by our eye when we are preparing a cavity, and we guess at the strength of walls and margins. We have before us a good outline, the idea of a perfect cavity, but we cannot say that there is anything scientific in our procedure when we make no tests or measurements. I believe that dentistry is not an exact science at all. I see very little of our work that I would call scientific. It is mighty good, but I believe most of our work is done by having a good eye and measuring as well, as possible, and that dentistry is rather more artistic than scientific.

There is one point I want to take exception to, and that is where the essayist speaks of inlays, that in order to get a better fitting inlay at the gingival line the face of the inlay may be trimmed. I take exception to that. If your inlay does not fit—it is supposed to be as exact as you can make it—but if it does not fit you cannot make it fit by grinding the

face. Of course if there are bubbles it is all right to remove them, but if it does not fit—you had better make a new one.

I think this is a splendid paper. And I will be glad to take it home and study it more. I think this club in Washington has done a great deal of good and it is a lesson to us all. They started thinking they were proficient, and found out how very little they knew about the work. I think that is the right way to start. I thank Dr. Ferrier very much, and also Dr. McGeehee for his discussion.

DR. JOHN M. TEMPLES, Tulsa, Oklahoma: I rise to express my appreciation of the essayist's effort. I certainly was impressed with one point he makes, and that is the putting on of a rubber dam—the time saved by doing this. I am quite sure the average practitioner does not use the rubber dam as often as he should, but to me the saving of one-third of my time by using the rubber dam is certainly worthy of consideration. I had not counted up how much time I saved, but I am sure he must be correct.

I appreciate the paper very much, but not being a college man I am not prepared at this time to take issue on anything, and I am sure I cannot add to what the doctor has said. I take this opportunity to thank both the gentlemen for their valuable contributions.

DR. CLARENCE O. SIMPSON, St. Louis: I came here this morning in the capacity of a student rather than a critic. Knowing the two gentlemen who were to open the discussion—Dr. Volland and Dr. McGeehee—I felt sure there would be full discussion, and believe that the time would be so well occupied that the discussion would probably only be stopped by the chairman or by the physical exhaustion of the stenographer. But as Dr. Volland is not here the discussion has been reduced fifty to seventy-five per cent.

Knowing the efficiency of the two gentlemen as equestrians in riding their favorite hobby of cavity preparation, I

did not take notes and did not expect to take part in the discussion. However, I cannot pass a paper so valuable as Dr. Ferrier has given us this morning, on a subject so much needed by the profession at large. There seems to be no one thing—among the many things—in which the profession is so negligent and short-sighted, possibly dishonest, as the preparation of cavities. Dr. Ferrier has repeated many points which are not new, and he has emphasized, as it is necessary to continually emphasize, many points and details in scientific cavity preparation. I am glad to see that Dr. Ferrier has the courage to suggest some improvements on cavity preparation as usually taught, particularly in the conforming to a degree the gingival outline to the outline of the gum. That is a thing I have been considering for years, and insist that it is only proper since we have recognized this anatomical feature in other work. For example, we conform the band of a shell crown to the outline of the gum, we do not make these bands on a straight plane. The student as one of the first steps in making crowns is taught to outline this crown band to the gingiva. Why should we not follow this in cavity preparation? I do not believe that a flat gingival seat bucco-lingually is correct, because it will do one of two things—it will either come from under the gum margin at a very susceptible location, or it will at its deepest point be entirely too far under the gum septum, endangering the gum septum in the placing and finishing of the filling. So it seems entirely correct to conform to a degree the outline of the gingival margin to the outline of the gum itself. I have followed this plan, not only in cavities of the third and fourth classes, but also of the second class. The outline of the normal gum curves occlusally from the labial to the proximal on the anterior teeth about three millimeters. The extremes of this curve averages about three millimeters in the anterior teeth and shades back to about one millimeter in the poste-

rior teeth. That is with normal gum tissue. But how often do we find normal gum tissue? We have absorption of gum tissue, but I do not hesitate to conform the gingival outline to an absorbed area. I make a flat seat and extend that margin gingivally to conform to the outline of the gum, making not a straight line, not a convex line toward the cavity, but sometimes a concave line. With the flat seat mesio-distally we have ample resistance form to take care of the stress that Dr. McGeehee has mentioned in connection with the striking of foreign substances, and as stones in the "seedless" cherry pie.

Another point is the depth of the cavity. I believe in following the Black methods, but error has often been made in cutting the cavities too deep. I believe that a gingival seat of two millimeters mesio-distally, sometimes less, is sufficient for most any cavity. Deeper than that encroaches too closely upon the pulp, which should be avoided.

Another point I wish to suggest is the one mentioned by Dr. Ferrier in regard to beveling the gingival cavo-surface angle for inlay preparation. I believe we can secure better fitting inlays with a bevel there, because it carries out the idea that we have always considered necessary, in inlay fitting, that is, improving the margins by polishing to a thin edge, and burnishing them to the cavity margin; and a butt joint at that point in my hands cannot be adopted as readily as one where there has been some bevel made. This is not for protection to the enamel rods, but for the purpose of fitting the inlay.

There is so much to be said on this subject of cavity preparation that it is hard to choose the essential points and attempt to discuss them in so short a time. I wish to thank Dr. Ferrier for his able presentation, and for having the courage to vary slightly from what we may call the "old line" cavity preparation.

The toilet is a very important point.

There should be careful examination made in regard to the removal of superficial decay, not only the deep areas but superficial decay. Often the decay has extended laterally much farther than we would anticipate if we did not apply some dehydrating medium and make careful examination, even to the extent of staining it to determine whether there is superficial decay beyond the outlines.

Another point of cavity toilet which should not go unnoticed is the protection of those cavities which have been prepared for inlays and the patient dismissed for subsequent sittings. I believe the common practice is to stick in a little temporary stopping. This is not perfectly sealed and is often dislodged when the patient returns. These cavities should be protected, and I have been able to do it with temporary cement. You might hesitate to do that, but I assure you it can be done by flowing temporary cement into these cavities, then removing it by drilling into the center of the cement and fracturing it. You can feel sure then that the cavity has been sealed during the interval that the patient has been absent.

I thank you.

DR. WALDEN I. FERRIER (closing): I think the subject has been pretty thoroughly covered by those who have preceded me.

I would like to refer to the last gentlemen's statement in regard to the butt joint in an inlay. He misunderstood me. I agree with him that the gingival margin should be beveled in inlay preparations but in the step portion of the cavity the cavo-surface angle should not be beveled because the enamel rods incline towards the sulcus of the tooth. When you make the walls parallel you have taken care of the short rods. I mean the occlusal portion of the cavity, not the proximal portion. The doctor misunderstood me.

He has answered as well, probably better, than I could, Dr. McGeehee's criti-

cism of the convexity of the gingival wall in cavities of the proximal surfaces of incisors and cuspids. As he says, if you make the gingival wall flat, I mean at right angles to the long axis of the tooth, it will not be covered by the gum tissue in susceptible areas; but if you curve it, follow the gum line, it will be placed in an immune area its entire extent; the resistance to displacement will be increased instead of diminished as this curvature offers more surface for resistance than a straight line would. However, there is usually enough resistance obtained for mastication in the ordinary cavity preparation. The principal reason I use this form of preparation is for extension for prevention. Many of these operations that are otherwise good are not extended enough at the linguo-gingival angle to be covered with gum tissue, and there they fail. Seventy-five per cent. of these operations fail at that point, and that is why I so extend it.

As to the use of rubber dam, I am radical about the use of rubber dam I suppose, but I cannot work well without it any more. Dr. McGeehee has taken issue with me in that it is impossible to prepare a cavity without a rubber dam. Possibly I should not have made that statement. If you keep the tooth absolutely dry thruout the operation you can probably prepare the cavity correctly but you are consuming enough time in keeping the tooth dry to place three rubber dams, because it is a simple procedure, so it is really a time saver.

I said that in preparing the buccal and lingual wall of bicuspid and molars, I did not make them parallel when I desired to use gold foil. Dr. McGeehee's criticism is well taken; the paralleling of these walls is the Black method and is a good preparation, but I save some tooth structure, and if you notice I said the paralleling of these walls would be an added but not a necessary convenience, that is all.

The contact point. That is a good point to bring up, but you cannot cover

everything in a paper like this. I could have consumed the whole time in the discussion of almost any one phase of cavity preparation. Where the crowns are bell-shaped if you make the incisal excavation too near the incisal angle you will place it in such a position that there will be danger of fracturing the angle, and to make a new contact point is the best way around this difficulty.

As to the Wedelstaedt step, I do not think that Dr. McGeehee understood my reason for using it. It is for convenience only, nothing else. We remove the angle because we cannot place the foil in the incisal angle, using the correct line of force in these distal surface cavities in the upper left cuspid. It cannot be done. At least, I have never seen it done, and many men agree with me. But by removing that angle and preparing an incisal step it makes the placing of the foil just as simple as in the incisal step of the central incisor, and that is very easy of execution. It makes a strong, substantial operation, and one that does not display too much gold.

Dr. Steele brought forward some objection to my grinding the pulpal surface of the inlay. I have done that and made a better fit at the gingival wall. He said if

the inlay does not fit you had better make a new one. That is right in a majority of cases, but I want to say that no inlay fits. You have a two per cent. error in the shrinkage of the gold that you cannot get away from any way you fix it. I have repeatedly ground the pulpal surface, and having the walls parallel, or almost so, have secured a better joint at the gingival wall. If we could make these inlays absolutely tight at the gingival wall so that there would be no gum irritation we would not be making any gold foil operations. We get fairly good margins all right, but not so good as with foil. But I am not condemning the inlays; I use them in many cases.

Now as to the scientific features of dentistry. Dr. Steele said there is nothing in dentistry that is scientific. I do not think he meant that dentistry is not at all scientific, because I am sure the doctrine of extension for prevention as advocated by Dr. Black is absolutely scientific. I may not know what the definition of science is, but it seems to me that if you call the prescribing of drugs for an ailing patient a scientific procedure, then surely the cutting of a cavity in a tooth so that it will remain immune to future decay is a truly scientific procedure. I thank you.