TUESDAY—*Afternoon Session.*

The meeting was called to order Tuesday afternoon at 2 o'clock by the president, Dr. Brown.

The first order of business was a lecture by Dr. W. A. PRICE, D.D.S., Cleveland, Ohio, on "Some Advantages of the Stone Model Method in Making Gold and Porcelain Restorations," as follows:

SOME ADVANTAGES OF THE STONE MODEL METHOD IN MAKING GOLD AND PORCELAIN RESTORATIONS.

Without spending much time on a preamble, I would ask the privilege of having an informal heart-to-heart talk with you, and wish you to ask any questions you desire, as that will help me to cover more accurately the consecutive points necessary for a general understanding of the work.

CONDITIONS CONTROLLING FILLING OPERATIONS.

I would ask you to consider first the general conditions that control our operations. We are living in the twentieth century; the dentists of the past decades have set a standard for us that forces us to strain every nerve and effort to maintain that standard, even without introducing new methods. Let us consider first these standards that we have received from the profession of the past as ideals for dental operations. When we attempt the restoration of cavities by gold inlays, we must uphold as standards the margins and contours that we have seen in probably hundreds of magnificent gold fillings malleted into place, ten, twenty, thirty, and forty years ago, and we must insist on margins as perfect as these for our gold inlays.

INTERPROXIMAL SPACES AND CONTOURS.

We have studied the interproximal spaces and have learned to recognize that a thorough restoration depends almost as much on the relationship of the teeth as on the way in which a filling fits the cavity. We must therefore emphasize contours, and must have as our ideals anatomical interproximal spaces. For that we have again to consider those beautiful malleted fillings, for they have set the highest ideal of any we have had, and in judging any specimens of inlay work, I am going to insist for myself that it comes up to those standards of margins and contours that have been furnished by the best samples of malleted gold fillings.

OBSTACLES IN THE FIELD OF OPERATION.

Another fixed condition that we want to study for a moment is the field of operation. You will all agree with me that fillings that stand as monuments to the skill of our splendid operating of the past have not always been monuments to the professional judgment of the men who inserted them, considering the strength of the patients who had to endure the insertion of such fillings. That is another standard for ideals, and we will insist on an operation that will be more comfortable for the patient, and as much more comfortable as possible than was the insertion of those large contour malleted gold fillings. I believe one of the very worthy considerations in judging the merits of any operation will be the patient's actual suffering, and also the strain on the operator, or even the inconvenience to both during the time of the insertion of a filling.

The field of operation presents very serious limitations to us. We have

learned to work in that very constricted territory, the oral cavity, with the cheek and tongue in the way, with the saliva around—and perhaps bloody saliva—so that we cannot see very well unless we put the rubber dam in position. So that is another fixed condition which we will try to modify, by removing as much of our operation as possible to a more desirable field to work in, which will be in our hands, on the table, in the laboratory, or at the bench, so as to perform, if possible, a part of the operation under more ideal conditions, always provided that the final efficiency of the operation be not sacrificed.

CONTRACTION AND EXPANSION OF METALS.

There are other fixed conditions that control very largely the success of our work, one of these being the law that controls the behavior of the metals we are working with. The profession as a whole has uncritically been taking for granted the physical processes governing the melting and cooling of gold; they are making no allowance or very little for the normal contraction that invariably takes place in gold.

There have been three distinct teachings with regard to the contraction of gold. One has been that gold does not contract if properly treated; and if it does, the contraction is so little that we may ignore it. Another is that we can prevent the contraction by a certain manipulation, which would be the chilling of the gold very quickly after casting; in other words, casting into an almost cool investment. Another has been that gold does contract a definite amount no matter when, how, or by whom it is manipulated, and that this total contraction will take place under all conditions, though its exact position may be changed in part; that is, as the mass of gold making up an inlay and sprue is cooling, the gold may be moved from the sprue to take up some of the total of the contracted gold in the inlay. In other words, it is entirely a question of position or location of the contraction that has been changed, not the total contraction, but the location of the contraction. It is very necessary for us to have something definite in our minds relative to that contraction. If, for example, gold does contract, and if we can and do not control it, making our inlays to fit a definite cavity without making allowance for that contraction, we cannot make such margins as we have taken for our ideals. It therefore becomes imperative for us to decide whether or not gold does contract, and if it does, then to make plans to provide in some way for the correction and control of that contraction. In my mind it is a fixed law and as definite a fact that gold does contract about one-fiftieth of its diameter from the crystallizing point, as is the law of gravity. No information has been published yet as to the behavior of gold as it changes its state from the liquid to the solid, though from experiments which I have made and am making, the indications are that considerable change in volume occurs then. If we cast into a piece of fused quartz, which is a substance with only about one-fortieth of the expansion and contraction of gold, the fused gold will contract normally by the simple weight of its own mass, and there will be a total contraction of over one-fiftieth of its length. The hydrostatic pressure would be sufficient to control the spheroidal tendency of the gold, for it would be at the base about 3/14 of a pound. If we were casting a bridge one inch long under these conditions, it would be over one-fiftieth of an inch shorter than the mold into which the gold was run. If, however, we will repeat that cast and have a definite and sufficient pressure on the gold at the time of cooling, we will in a measure control, not the total contraction, but the location of the contraction by forcing gold down through the sprue. We thus make our contraction take place in the sprue as much as possible, instead of having it normally distributed in the inlay and sprue. For this the investment must be hot, and the sprue gate large.

METHODS OF CONTROLLING THE CONTRACTION OF GOLD.

I do not think it necessary for me to give scientific reasons at this time for the contraction of gold, and we shall take it for granted that gold does contract. I shall now discuss the methods of controlling that contraction. It seems to be a fixed fact that the location of contraction can be controlled up to a certain point nearly in proportion to the pressure that is applied on the sprue. To be exact, if we apply a pressure of twenty-four ounces on a cross section of a sprue one-eighth of an inch square or of any globule of molten gold, it will move the gold for nearly two hundred degrees below the melting-point, which would be equivalent to an air-pressure in a casting machine of approximately one hundred and twenty pounds per square inch. If we use only two ounces, the actual pressure on that globule of gold would only move the gold for some thirty degrees below the melting-point, which would be equivalent to something like sixteen pounds per square inch—which means that the gold is contracting from the time it commences to crystallize, contracting all the time down to normal temperature at the rate of about one one-thousandth of an inch for every one hundred degrees F. in temperature. Or if in any piece contracting about one one-thousandth of its diameter for every hundred degrees F. that it cools, we only control it for two or three hundred degrees below that point, then we have nearly twenty thousandths uncontrolled. Therefore, if we are to control the contraction to a considerable degree by pressure, we must use higher pressures than are obtained in any of the small casting machines. It is possible with such a machine as I use to obtain an equivalent of as much as from three to six hundred pounds of air-pressure in casting, which, however, ordinary investments will not stand.

There are three other ways of preventing a gold inlay from being too small, viz, to prevent the contraction of the metal itself (as yet not possible), or to expand the form into which it is cast by either enlarging the pattern or the mold made from it. If we take an investing material of any of the standard formulæ and heat it, it will expand at a maximum six to eight thousandths of its dimension at a temperature of 1000° F. Therefore, if we carry out the proper manipulation, we can only hope that an ordinary investment will expand from six to eight thousandths of its diameter, leaving with ordinary low-pressure machines an uncontrolled contraction of the gold of from twelve to fourteen thousandths. The wax of which patterns or impressions are made is subject to great changes, due to treatment and temperature. If we are undertaking to make butt margins around the inlay, we will find a space even of hundredths of an inch, which is wide enough to permit perhaps twenty teams of bacteria to go in abreast. If we undertake to make a joint with that procedure, we will have a joint to be filled with cement, which, after the cement has been washed out, will provide an inviting place for bacteria.

It is not possible for us to control entirely the contraction that will take place in the gold, but we can control it in a large measure. If we use high pressure on ordinary investment materials, what happens? We find that twenty pounds of pressure from the air-machine will distort very considerably a plaster and silica mixture of one to three or one to four, so that the inlay will not go to place in the cavity. This is due to the yielding of the investing material under the pressure.

INVESTMENT MATERIALS.

This suggests another ideal, viz, to have an investment which is hard enough to withstand any pressure you desire to use, without yielding at the cavity surfaces. One of the first requisites and one of the greatest advantages of a hard model, whether it be stone or whatever you may have to cast into, is that the

surfaces reproducing the cavity will not yield under any pressure that we may apply in casting.

CAVITY PREPARATION.

Another very important phase in this work is the preparation of the cavities so as to allow us to take care of the other fixed conditions—or our inability to do two things: To control the contraction of the gold, and to put into position a block that will fit within a thousandth of an inch at all margins, if it were possible for us to make it within that proximity. It is mechanically impossible to withdraw and insert in position anything that fits as tightly as that block would, because of the necessary roughness that would occur on the surfaces. Take, for example, a glass-stoppered bottle not tapered, and try to pull that stopper from the bottle if it fits as tightly as we would want an inlay to fit if we depended on the mechanical reproduction of the margins by so exact a casting. We could not unseat an inlay if it were once in place, and we could not remove the impression, if we had the cavity so prepared, without a distortion of a few thousandths of an inch.

I believe it to be a physical impossibility to make margins with butt joints that would compare with the gold fillings that we have taken for our standard. Therefore the only way left for us to overcome this difficulty is by the preparation of the cavities. It is an axiom with me—and I believe it will be as fixed an axiom in the preparation of cavities for inlay work as is extension for prevention in the preparation for gold malleted fillings—that every margin of every surface of every cavity must be beveled, the reason being that by the burnishing of a bevel of pure gold we overcome or correct the marginal errors. It is not possible for us to spin or burnish gold up to a flat, square, open butt joint without making a depression in the surface. If, then, we have made our joint by burnishing a flap, so to speak, we must have our cavity so prepared that the burnishing will not interfere with the contours of the bevel when the operation is completed. The cervical margin should always be prepared with a bevel. A thin feather-edge margin, as we have learned, has no strength, and offers an inviting place for bacteria when opened up. The margin must invariably be chisel-shaped. With these precautions of cavity preparation and a hard model to cast directly into, and with an inlay material that can be burnished to allow of the closure of the margins, it is possible to make a restoration that in every particular will fulfil our standards, namely, margins as perfectly finished and adapted to the tooth, without a visible cement line at the edge, as our best malleted gold fillings, and contours that will not only be as good but will be very much better, because of the better conditions under which they are made, and which allow us to produce an ideal anatomical interproximal space.

THE MAKING OF AN INLAY FOR AN OCCLUSAL CAVITY IN MOLARS.

The simplest kind of cavity that we have to fill is an occlusal cavity in the molars, where there is no contour to restore, and where the contact points and both buccal and lingual walls are in position. The simplest form of tray that can be used for taking an impression of such a cavity is the finger. An impression material should be used that will reproduce the tooth perfectly. The impression material is shaped into a cone, the base of which is heated slightly so that it will stick to the finger. The tip of the cone is then heated, and the cone is put into the mouth and pressed to place in the prepared occlusal cavity. The cavity surfaces and the tooth surface beyond the cavity surface—which are required in order that in making contours we may carry out the lines of the tooth—are thus readily reproduced. This is the simplest form of restoration, and in so simple a cavity, if the point of contact with the approximating tooth is normal, the whole operation can be made readily in ten minutes by fusing the pure gold directly into the stone model. (I

will show in my clinic that this restoration can be made easily in that time, even with the inconveniences involved in a clinic.) The embarrassing part in practice will be that the operator can present to his patient the finished inlay too quickly to be able to charge a proper fee. In practice, therefore, I take the impression of the tooth, and perhaps that of one or two others, dismiss the patient, and make the inlays in the meantime, and I find that patients will pay a good fee without thinking that I am being overpaid. Still another advantage is that an assistant can make the inlay as well, perhaps, as can the operator. The filling is polished on the stone model, except the finishing of the margins, which is done after burnishing-in the soft cement in the cavity.

DIRECT VS. INDIRECT METHODS.

I should probably at this time speak more in detail of the stone model and how it is made. I am speaking this afternoon for model methods in general, and I would rather have dentists use fusible metal, sulfur, or amalgam for their models, and make the extra two steps in taking the impression and making the pattern in order to obtain more perfect contours and margins, than to have them work by the direct method, because I believe that they will get better results. By using the hard model, into which one can cast directly, two of these steps are saved, besides other advantages. The mixing of the stone is very simple. Any dentist has had practice enough in making silicate fillings to know how to manipulate that material. The stone is essentially a silicate cement, and has the additional properties that it will tolerate high temperatures without contraction and that it becomes very hard on being heated.

It would perhaps be well to trace for just a moment the steps taken and the errors introduced in the different methods. If the direct method is used, when the pattern is made directly in the cavity with wax and removed, the cavity surfaces are removed one step from the cavity. When the pattern is invested and the wax is melted out, the cavity surfaces have been removed two steps; by casting directly into the investment the cavity surfaces have been removed three steps from the original; when the fusible metal, sulfur, or amalgam model methods are used, when the impression is taken, one step is made; when that impression is placed into the modeling material, two steps are made; when an impression is made from that by making a wax pattern in the cavity, three steps; when the wax pattern is invested in the plaster and silica, four steps; and when the pattern is reproduced in gold, five steps. Yet it is better to take these five steps, if a better result can be obtained by so doing, especially in complicated cavities.

THE ARTIFICIAL STONE METHOD.

With the hard model or artificial stone method, the impression is removed from the cavity by one step; the stone model made of that impression, two steps, and the direct casting into that model, three steps, just the same as with the direct wax method. The advantages are, then, not that the steps are shortened as compared with the direct method, but that all the cavity surfaces and also the tooth surface are carried beyond the field of operation, so that, in finishing, the contours can be shaped up normally according to the ideal, the gold is being held in a solid body while the margins are being polished, and the hard surfaces of the cavity in the stone model make it possible to use as high pressure as desired.

All adjoining parts can be removed or replaced at will. Take, for example, a distal cavity in a lower second molar, where the saliva interferes and where one margin lies below the gingival line. By taking the impression the gingival tissue can be pushed down temporarily, and the margin exposed and reproduced very accurately. The third molar, after it has been reproduced on the model, can then be removed by fracturing the model, the reproduced gingival tissue can

be cut down and the cavity exposed perfectly. By putting the third molar back on the model the required contact point can be clearly noted, and no gingival tissue hinders the operator in making the contours.

TAKING IMPRESSIONS.

There have probably been few drawbacks to the inlay method that have been greater than the distortions caused from taking impressions of surfaces that are lying below an overhanging contact point. When the impression material is withdrawn from the space, the impression immediately below the contact point changes shape and is distorted at this point. If we use a tray with a septum passing down between the teeth and beyond the contact point, slowly pressing down the tissue, we not only carry the tissue down out of the way, but when the impression is withdrawn we shall have the contact point required, and the septum prevents distortion of the cervical margin of the cavity.

The first requisite for taking an impression for any method is a wax that will spread out thoroughly over the point. Another will be to have the cavity margins all beveled, so that a record of that bevel is carried away with the impression. If the cavity is prepared in that manner, and a tray of the kind referred to is employed in taking the impression, on withdrawal the cervical margin will be found undistorted. In restorations of approximal cavities, it is frequently found that at the cervical margin the butt joint is an open joint, and the inlay will not go down to place, partly owing to the contraction of the gold, partly to the distortion of the investment under the pressure used for casting. We are not able to close such cervical margins, and of all margins of a cavity none is so important. The thin vulco-carbon separating disks are very convenient for preparing the approximal and cervical margins. If the cavity is prepared with a chisel-shaped bevel at the gingival margin, the inlay can be burnished and finished and that joint closed as beautifully as in the most perfect malleted filling, provided the margin is pure gold.

One danger must be emphasized just at this point. If in making the restoration the contour has carelessly been carried too far below the gingival floor, a most embarrassing overhanging margin will result, extending into the tissue, which is possibly worse than an open butt joint. To avoid this, we make a record at the time when the impression is taken as to how far the bevel goes below that point.

THE INTERPROXIMAL SPACES.

Returning to the question of interproximal spaces, two or three important points demand consideration in reproducing an anatomically exact interproximal space. When a cavity is present in the distal surface of the second molar, the third molar is generally found tipping forward into the cavity, as the contact point is lost from the second molar, and it is almost invariably necessary, if the interproximal space is to be reproduced, to procure a little separation so as to hold the third molar in a more perfect relation. Some operators reproduce the contact point by the direct method of flowing a little extra gold at that point, and polishing this off to fit, but that is simply guesswork. A more exact method is to remove a definite amount from the reproduced contact point of the adjoining tooth and carve the wax so as to reproduce a correct interproximal space. The teeth are separated with temporary stopping.

The requisite next in importance in producing such ideals as we have set as our standards is that the material of which the inlay is made be pliable, in order that we may burnish and close the margins perfectly. Second, we must close the margin with a slow-setting cement while the cement is soft. I cannot conceive of our ideal being attained unless these two points be observed. Therefore pure gold for margins will be found very much superior to alloys, which are harder and cannot be burnished closely. A slow-setting cement will

prove to be of greater value for setting inlays than the more quickly setting cements, which harden too quickly to allow of finishing completely all margins close to the tooth before the cement is too hard.

The next class of cavities that we will consider is that in teeth in which two adjoining contact points are gone. That involves a new difficulty, because we cannot polish off a portion of the adjoining contact point. We accomplish our result as follows: We may break the model apart and put the fractured pieces together again with exactness, and make the wax patterns touch each other in that position. We have not yet allowed for any additional wax for the separation we are to get in the case. We can do this by adding wax and trying the models together. It will be found of very great advantage in such cavities to use an instrument that makes it possible to carry the two pieces of the model, after it has been fractured, directly away from each other in a parallel position, thus procuring any desired amount of separation. We accomplish that with this instrument, which is called the micrometer articulator. [The essayist here demonstrated and described the use of the instrument.]

If a series of three, four, five, or even six contact points are to be restored at once, it is done by means of that instrument so exactly that when the inlays are put into position, probably only one or two of the contact points will have to be polished off, and the occlusion is so exact that when the patient bites into the wax it will prove to be almost normal. I have no hesitation in restoring several points at once, as it can be done with exactness, provided always that the position of the teeth permits.

The next class of cavity we shall discuss is that involving two contact points on the same tooth, which will require a double tray, or one having two septa. A tray with septa of suitable length is selected, and with this an impression can be taken with great exactness of a root to be crowned or of a bicuspid or molar in which the occlusal and both the mesial and distal surfaces are to be restored by an inlay. The third molar, for example, will be taken with a box tray. The hard model holds the gold, preventing any mesio-distal shortening from contraction, which is a point of exceedingly great value.

STEPS IN CAVITY PREPARATION.

The weakest point in most of our gold inlays, if we use pure gold, lies in the step form of cavity preparation in bicuspids and molars. I wish to say in this relation that the inlay method involves no more and probably less destruction of tooth structure than does the insertion of malleted fillings, provided the malleted fillings are made with the idea of extension for prevention, for the reason that the gold can be applied in a thinner mass than in the malleted gold, and yet have strength. For the reinforcement of the step it is of great advantage to use an iridio-platinum bar, which tends to make the attachment of the gold very strong. This bar is laid into the stone model cavity before waxing up, and then the gold is cast directly around that bar, which allows a support analogous to that of reinforced concrete. The end of the iridio-platinum bar is allowed to extend beyond the tooth into the investing material.

INVESTING THE STONE MODEL.

It has just occurred to me that possibly I have not made it clear that the stone model becomes a part of the investment. After waxing up the cavity in the stone model, the sprue is attached firmly to it, and the stone model, wax filling, and all are put into the investing material, and after melting out the wax the inlay is cast in the usual way. Distortions on the occlusal surfaces may be produced by the pressure on the investing material, just as with the old methods, but no distortions of the cavity surfaces, which are the essential surfaces, will occur, these being in stone. The little tip of iridio-platinum bar extends into the investing material, which holds

it in position while the wax is being melted out.

INLAYS IN BICUSPIDS.

The preparation of cavities in bicuspids involving a contact point on the mesial or distal surface often makes it necessary to encroach upon the attachment of a good filling already in place, in order to secure a strong attachment. The ideal attachment would be to take both fillings out and make the cavity continuous from mesial to distal, but that is not necessary. If a groove and post-hole are cut, and a bent iridio-platinum bar, which comes away with the impression and is transferred to the model, is put in, waxed, and cast around, an attachment is obtained that strengthens both fillings. This is well illustrated in making an anchorage for a lower canine in which a large portion of the wall is gone. By this method of using the bar an anchorage can be secured without encroaching upon tissue that is of great value.

INLAYS IN CANINES AND INCISORS.

Probably no cavity makes greater esthetic demands upon the operator or presents greater difficulties in taking impressions than cavities in incisors and canines. There is no operation that to me is so satisfactory as a gold inlay in an anterior tooth inserted from the lingual surface. This is a very difficult operation, but it becomes relatively easy by the following procedure: The tooth is prepared from the lingual surface, and the impression is taken by the use of a septum tray, which is allowed to pass between the teeth. The impression material is put on the tray and the tray is inserted from the lingual surface. A sharp lancet or knife is used to scrape off the wax from the septum as it passes between the teeth, and also to expose very carefully the labial margins of the cavity, so that they will be reproduced in the second part of the impression. After chilling with cold water, a second mass of wax is placed against the teeth and the protruding septum from the labial surface, giving a record of the labial surface and the labial margin of the cavity. After chilling, the labial piece is removed first, then the lingual, then the two are put together, and a compound impression is obtained, so exact that when the model is made, the fillings will delight the operator if he has prepared the cavity so that the impression can be withdrawn properly. The greatest difficulty is the proper preparation of the gingival margin, the bevel of which must be carried far enough labially for the impression material to be withdrawn without distortion from the entire approximal gingival margin.

One may well ask how it is possible to make a bevel on the labial surface margin, and have it extend in such a way as to lock the filling. A filling made for that cavity according to this method will not go into place with the bevel on the labial margin as cast, until with some instrument the labial bevel is bent back sufficiently for it to pass through. When that is done, one can pass it through and by burnishing the joint can be closed. With that simple procedure, that bevel of pure gold can be turned away from the margin so as to allow the inlay to go into position, and while the cement is soft the inlay may be burnished to the cavity surfaces, and the joint be closed very perfectly, and polished like a malleted filling.

METHOD OF MODIFYING THE CONTRACTION OF GOLD.

I would say a few words on the modification of the contraction of the gold. The ideal filling material for casting would be one that would be as pliable as gold, and even stronger, and one that would not contract as much as gold. If we could modify the gold formula so as to control the contraction, it would be more valuable to us as a filling material. I do not mention this because I have succeeded, but because I want you to succeed in finding such a material. We have in Invar a metal which does

not contract or expand at the low ranges of temperature, but this is not a material which we can use for inlays. If, by adding some other metals to gold, we can produce a material that will have neither expansion nor contraction, this new alloy will be that much more valuable to us than gold. I have only to report in this connection that the addition of a little aluminum, two-tenths of one per cent., will increase the range through which the alloy will be moved by pressure several fold. This has an advantage in those cavities which are compound from mesial to distal through the occlusal. The great difficulty in filling that class of cavity consists in that the staple or horse-shoe will not go down over the tooth, and after the inlay is made it is found that it will not go to place without forcing, and the inlay on forcing simply spreads out in a V shape at the bottom. If two-tenths of one per cent. of aluminum be added, with high pressure, the total contraction can be controlled in a large measure, and if cast into a hard investment material the gold will be held so that it cannot contract. I have in my hand two rings which were cast at the same time and with the same pressure. They are reproductions of wax models that were rings of wax that passed over a tapered column of brass, and of as nearly the same size as could be made, yet one will drop over the column and the other will not go within half an inch of the bottom. One ring was cast with stone for the center, which kept it from contracting, and for the other ordinary investing material was used, the contraction of the gold compressing the investing material, therefore making the ring smaller. In inlays for the class of compound cavities referred to, the hard material will hold the gold so that it will not contract to so great an extent, if at all. In casting a base for a crown, a great advantage is also offered by using such a hard investment for the base. Many operators have cast a base for a crown, with a solid band cast for the root, and have found that it would not fit, because the contraction is so great that it will crush the investing material. If gold and platinum are used for a very heavy base, the contracting strain will be so great that even the stone is crushed, which is also true of eighteen-karat gold. A moderately sized mass of pure gold cast around that stone will not crush it, which fact suggests that we use as soft a gold as will be strong enough for casting the bases for our crowns, in order that our stone may hold it.

The effect of adding a little more aluminum to the gold is interesting and perhaps surprising. It is not desirable to use in dental work more than two-tenths of one per cent. of aluminum. If, however, ten parts of aluminum are added to ninety parts of gold, the melting-point of this alloy is lower than that of pure aluminum, also lower than that of an alloy of five parts of gold in ninety-five parts of aluminum. If two parts of aluminum and one part of gold are heated together for a long time, they will form an alloy which, though brittle and very untractable and unmoldable, has a melting-point higher than that of gold. I would not say that any union takes place between these metals, but the resultant alloy seems to represent both a chemical and a physical union, and has properties and a melting-point entirely out of proportion to the physical properties of the metals individually. It is a difficult alloy to form, and seems to have the formula $AuAl_2$.

RESTORATION OF INCISAL ANGLES.

I have not spoken of the details of making a restoration of incisal angles with compound fillings of gold and porcelain. Few operations can be so successfully accomplished as the restoration of these angles by casting a window-faced gold and platinum inlay and fusing porcelain into that, or better, cementing the porcelain, giving the esthetic effect of an all-porcelain inlay and the strength of a gold and platinum inlay.

I wish to thank you for your attention. I have been as brief as was possible in the presentation of this subject.

Discussion.

Dr. G. B. PALMER, New York. I am very glad of the opportunity to say a word of this method of Dr. Price's, for I have been using it now since November and have been very successful with it. I saw him in Brooklyn last fall, when I extended to him an invitation to present his work before this meeting of our society. I had some trouble at first in working that method, but Dr. Price kindly helped me over my difficulties, and since that time I have given up the idea of the direct method, and have had only two failures since. I have made a great many inlays after his plan, and find it of great advantage in very many cases, notably when we wish to anchor a base. There are very many cases in which we have occasion to put a band over the occlusal surface, with a post in the root-canal. By this method the post is fitted into the cavity, an impression in wax is taken and withdrawn and the stone model is made. The band and pin remain on the model in the exact position in which they are removed from the cavity, and the gold is cast directly around that. This process is always successful—the inlay will readily go into the cavity, and the post will take its proper position.

Another very important feature is the restoring of contact points. The model can be broken; if, for instance, a cavity involves the mesial, distal, and occlusal surfaces, the inlay can be waxed directly to the model and cast so accurately that it fits within a thousandth of an inch every time. The inlay can be finished and polished so that when it is set into the cavity, no further work on it will be needed. The adoption of this method will surely be found very satisfactory.

Dr. JAMES MCMANUS, on behalf of the members of the society, presented the president, Dr. Brown, with a gavel to be used in the conduct of the society proceedings, and as a memento of his tenure of office as president.

The meeting then adjourned until the evening session at 8 o'clock.

TUESDAY—*Evening Session.*

The session was called to order Tuesday evening at 8 o'clock by the president, Dr. Brown.

The first order of business for the evening session was the reading of a paper by Dr. THOMAS E. WEEKS, Philadelphia, Pa., entitled "The Care of the Teeth of Children: Our Duty to the Men and Women of the Future."

[This paper is printed in full at page 738 of the July issue of the COSMOS.]

Discussion.

Dr. A. J. FLANAGAN, Springfield, Mass. It seems like the old times of the years gone by to have a man journey from the Philadelphia Dental College and come to New England and address us. If we go back in the history of dentistry it will be interesting and entertaining to find that way back in 1865 we had Garretson, we had Flagg, and later we had Stellwagen and Guilford come to New England and visit the various dental societies. In those days it was rather a rare occasion when we did not have a yearly visit from some representative of the old Philadelphia Dental College to give us the advanced, the new in dentistry. It is rather pleasing to record the fact that we have tonight a dental teacher from the middle west, who now makes his home in Philadelphia, and comes to us under the flag of the old Philadelphia Dental College to address us. May he have success in the East, as he has had in the West.

I was rather pleased when our friend Dr. Weeks said that God willed that people should owe us something. I did not have to go to the Bible to discover that, because I have been in practice now for twenty years.

Dr. Weeks has taken a broad stand on the question of the treatment of the teeth of children, and especially on the question of charitable work. Perhaps I had better confess than brag that for seven years I was attending dentist at a charitable institution in Springfield; for more than twelve years I have been den-

tal surgeon on a hospital staff, so that I have had what might be termed, perhaps not a scientific education, but practical experience, along these lines. This question of the charitable work of dentists as judged in comparison with that of physicians needs a little new understanding. Take, for instance, this city or any city, where medical men are doing charitable work—what does that work usually consist of? I am going to advance an opinion, after twelve years of experience, and that is this: The average physician, if he is in attendance at a medical hospital or in charitable institutions—what sort of work does he do, and how much time does he devote to it? That is what we must consider when we compare the charitable work of the dentist with that of the medical man. The medical man, after his regular office hours, which are usually from eight to nine in the morning, two to four in the afternoon, and sometimes from seven to eight in the evening, has his driver come to the door and is carried to the hospital where he may have in charge a dozen patients as medical adviser—and what does that really mean? He goes to the various wards—there is a house surgeon, there are assistants and nurses —and visits the twelve patients, which often does not take an hour. He leaves directions, if a wound needs cleansing or if the patient needs new medicine; he does not stop to do that himself, for his assistants can attend to all that. This has not taken one hour of his time, and yet we find the medical men rising up in their might and demanding that we dentists do something along similar lines.

Suppose a dentist spends an hour in charitable work, what does he accomplish? His work is entirely different; it does not consist in giving nurses and assistants directions to do so-and-so; the dentist must do the work himself, and by an hour of charitable work in dentistry but little can be accomplished. Yet, if a dental practitioner gives one-half day in a month for thorough dental service, he is doing more work and giving more in real service than the average medical man is during an attendance of one month in the average hospital.

Take the surgeon; what does his work consist of? If his patient is a public patient and comes into the public ward, he does not prepare the patient for the operation, give the anesthetic, or attend to the requirements after the operation; his assistant or assistants can do all that. He may take from a quarter to a half-hour to perform his operation—indeed, in a month many a prominent surgeon in New York city does not give six hours of actual service; and yet unfair comparisons are made. If a dentist gives an hour's time, nothing is thought of it, and no recognition is given for his work. On the other hand, patients are sent to the hospitals as charitable patients at a minimum charge of seven to ten dollars a week, but at times a surgeon who has charged no fee for the operation because he was on service at the time, receives a recompense on the quiet afterward because of special attention, while the hospital receives only its regular weekly rate. How about those medical and surgical cases in which the physician is called to the home of the sick and recommends the hospital because the patient has not the means to pay him for home treatment? There is an unwritten history of philanthropic and charitable work in so-called hospitals and dispensaries which the public in general, and the dental profession in particular, need to peruse.

There is a condition, gentlemen, which should be explained more fully than it has been. If a dental dispensary is expected to do its best work, there must be at least one dentist there in regular daily attendance, similar to the service of an interne. Very little truly practical work can be accomplished without plenty of time and much brain work, backed by all that finger ability means, for in dentistry you can accomplish little by writing prescriptions.

In regard to the treatment of children's teeth, I was hoping that Dr. Weeks would speak of the use of silver nitrate, especially in the treatment of

superficial caries in deciduous teeth, also of the use of gutta-percha. To be sure he mentioned base-plate gutta-percha, but not as I wished him to. I was brought up under the care and tuition of Dr. Flagg, and perhaps I am a gutta-percha enthusiast. I consider it of prime importance to educate parents to the fact that the eight molars of the deciduous set should be saved. The reason should be explained to them why these teeth are so important in the period of from eight to ten years of age, and why they, above all others, should be preserved. If a child of poor parentage at the age of four or five has an anterior tooth decaying, which we know is going to be lost at the age of six or seven, why torture the child by putting in cement fillings, when we can use silver nitrate; and why not do as the physician does, charge for the advice as well as the service? It is astonishing to find good dentists giving hours of service in advice, and applying treatments, and getting not one cent for it. Would the physician render these services gratis?—yet we claim to be a branch of the healing art.

If the proper education had been given to the public by the dental profession in the past relative to dental advice, the general thought would not prevail at the present time that a dentist can charge a fee only for material service. We are to blame for these conditions.

The essayist speaks of the question of cement, and I am willing to admit that there is not much sense in using cement oxyphosphates in children's teeth. We frequently find, if there is a cavity in the first deciduous molar, that there is one in the second also, and what is to prevent us from making of these two cavities one simple cavity? The S. S. White Co. has had for years what they call a space-guard, to be used in making one simple cavity of these approximal cavities in deciduous molars. It consists of a little piece of tin covered with base-plate gutta-percha, one side of which is warmed; then the piece is forced to the bottom of the cavity, thus making a bridge over the septum of the gum between the deciduous molars. On this bridge of tin and gutta-percha you can build a filling of gutta-percha, cement, or amalgam. No one greater aid has been given to us in recent years than this space-guard in the saving of deciduous teeth with comfort to the patient and satisfaction to the dentist.

I agree with the essayist in his conception of the use of metals in deciduous teeth because of conditions we cannot control. The main object is to give service free of pain, and which will give comfort for the longest time. I have found nothing that exceeds in good qualities ordinary base-plate gutta-percha. Someone may say that it wears out from attrition. True, but what is to prevent us from covering the gutta-percha with a small piece of gold, or some baser metal, to which a small headed pin has been soldered. This cover can be slightly warmed and pressed into the body of gutta-percha, thus constituting a metal covering or inlay over the gutta-percha. There is far too much neglect of children's teeth, because the average dental practitioner has not educated the parents to a proper and just estimate of the deciduous teeth. This education means also a proper recompense for prevention and treatment, rather than for operative work. Parents usually understand that a physician charges the same fee for relief of suffering in a child as in an adult. Why should dentists charge less, or dismiss the little patient with makeshift temporary relief? After our little patient has gone from the office we expect the Almighty to be kind to that child, but in any event another dentist will be.

I find that the greatest help in handling children consists in having the armamentarium ready. I doubt if anyone who treats children can retain a successful practice if he uses the rubber dam indiscriminately on children's teeth. We have any number of napkins and cotton rolls to be used in place of the dam, also special clamps and matrices, saliva ejectors and compressed air, all of which are helps in treating children that we did not have years ago.

The essayist spoke of calling in the unethical and unrecognized dental prac-

titioners to fill positions in dispensaries and institutions. Does the essayist believe it to be proper to fill positions with the unethical? Again, can a dental practitioner be truly ethical who holds no membership or interest in any dental or medical society? One of the things that boom medical societies today is the fact that practically no medical practitioner can hope for preferment or appointment without membership in at least his local or state society. I doubt if it would be possible in New England today to have a medical inspector or examiner appointed to any position of trust or preferment of a public or private nature, unless he were a member in good standing of his state or district society. If a practitioner is appointed to a position in a hospital, the first requirement is that he must be a member in good standing, and if he is not, he cannot get on the staff. It behooves us to remember these facts, and the principles that build up a profession are as necessary in dentistry as they are in medicine or in any other profession.

In closing, I wish to say that in discussing the question of comparison of the worth and appreciation of the medical and dental professions, we should assume a just and intelligent standpoint. By knowing general conditions, and informing the public of the relative value of medicine and dentistry under these conditions, we will soon have a standing in the minds of the public on a level equal to that accorded to medicine at the present time.

Dr. L. C. TAYLOR, Hartford. This subject is very dear to my heart. That we have listened to a most excellent paper this evening no one can deny. I agree with the essayist in every point but one in the matter of education. The spirit and intent of the paper is most excellent, and I wish to congratulate the essayist especially in that he has not spoken altogether, as most men do, about wanting to examine the "teeth" of the children in the public schools. That term used alone casts a suspicion upon the man who makes it. When you say you wish to examine the mouth—instead of merely the teeth—of a patient with a view to seeing what exists there, you show that you comprehend something, for that the jaws and the soft tissues and the alveolar borders are of as much importance as the teeth themselves, no one can deny, because they help to make up the character and quality of the child. We have lived too long in the land of tooth-carpenters; there is still too much extracting. A few days ago the Stomatological Society of New York passed resolutions condemning almost *in toto* the extraction of teeth in children under sixteen years of age. The practitioner who extracts a tooth simply because it is easier to do so than to care for it, is injuring the child, and not doing justice to his patient.

Our essayist speaks of the majority. The majority are the poor children whom he wishes to have cared for. That is a great work, a work we should all be interested in, because in time to come we can stamp out the teachings of the past forty years, when extracting teeth was the main feature of professional work. It is time to wake up, time to progress.

The essayist speaks of how he handles children and how he declines to allow the mother to be present with the child. I would take exception to that. If he will allow the mother to come with the child and will give her a lecture while he is working for it, he will get the finest control of the child possible to obtain. Moreover, when he has finished, he has probably converted the mother to recognize the necessity of caring for the mouth, and she will probably bring the child again.

Dr. Weeks speaks of the care of the teeth of children as the discharge of our duty to the men and women of the future. Our duty, of course, is to care for them as best we can, but let us teach so that we can obtain control and carry them along when they become men and women. I want control of the children, but I also want the mothers who stand behind them.

Next the essayist spoke of disease of the mouth and teeth and its importance. This is a great field, because diseases

that pertain to the mouth are most prevalent, and may be treated with the greatest benefit to the patient. I can name no less than twelve or fourteen patients who have told me frankly that I have cured their rheumatism, because it was oral conditions that had caused the disease. The toxic products in the mouth become so abnormal that the organs of the body decline to take care of them, and they are left to circulate in the system, making the patient believe that he has rheumatism. I explain to the patients that after the cause has been removed, the stomach tones up, the skin becomes normal, the poisons are eliminated, and the rheumatism is cured. That is only one of the phases of the importance of dental care, as the number of diseases and dangers that come from unhygienic mouth conditions is very great. I therefore claim that our principal duty consists in caring for the diseases of the mouth, which is paramount to the filling of teeth.

The essayist speaks of teaching and preaching. That is a right and proper statement. We should do something besides looking for simple cavities, which seems to be the principal object of many practitioners. There is more dental work being neglected today than is being done, which is a point that many have paid very little attention to.

With regard to the question of necessary instruction in the public schools, I would say that the children should in school learn something besides studying music, or this or that art; they must be taught to appreciate clean mouths. Some say that they cannot understand this. Children understand more than they are credited with, and sometimes they grasp these points to a fuller extent and much more quickly than older persons.

The essayist speaks of the use of copper oxyphosphate as a filling material. I do not believe that copper oxyphosphate should be introduced into the mouth of a child, because equally as good results can be obtained by simply painting over the cavity with resin. By making a film of resin over the bottom of the cavity to protect the pulp from irritation and subsequent trouble, oxyphosphate can be inserted, and a gold or an amalgam filling built into it while it is still soft, yielding a good permanent filling for the child at eight years of age that will be of long duration if it is fairly well done, this method being applicable in almost all cases.

Dr. W. A. PRICE, Cleveland, Ohio. Someone asked me this afternoon if I would not say something of the work we have been doing in Cleveland for the care of children's teeth. I want to say to Dr. Taylor that in Cleveland all children have to go to school, so that in order to reach the children we have to go to the schools, but we do not simply examine but repair their teeth.

Dr. TAYLOR. Do you examine their mouths well?

Dr. PRICE. We examine them well, and the gum tissues and the oral conditions are noted as carefully as the cavity conditions. Our plan of work is based on the following considerations: We take it for granted that every child's teeth and oral conditions should be taken care of. We have some eighty or ninety dentists in Cleveland, all members of our city society, who have agreed to give a week of their time or thirty-three dollars in money for the care of the teeth of the children of people who cannot afford to pay for the work. While we incidentally examine their mouths in the schools, we send the examination card to their parents with the statement that if they cannot afford to have their children's mouths put in good condition, we will do it. We have in conjunction with that work twenty lecturers, divided into four groups of five men, each group giving a lecture on one branch, making four separate lectures. Each lecture is given with the aid of a lantern, and each one takes fifteen minutes. In this way we put before an audience in an hour enough to make them think for some time, and I wish to say that the results of our work have been very gratifying indeed. No phase of our work is more important than the care of the children's teeth, which Dr. Weeks has so strongly emphasized.

How many realize that of the children growing up today probably fifty per cent. of the boys would not be accepted in the United States army, because they have not teeth good enough for such service. When a nation like Germany has seized the opportunity of rendering more men capable of military service by the establishment of fifty clinics, and by making it compulsory for the people to have their teeth taken care of, it is an object lesson to us.

There is another matter that I wish to speak of in this connection. If you go to the museum at Colorado Springs, you will find that in all the cliff-dwellers' skulls on exhibition there none of the deciduous teeth exhibit any caries. You may find a tooth broken off from a blow, but you will not find any caries. If you visit communities of Italy, where the people are largely engaged in out-of-door work and live on coarse foods, you find the deciduous teeth of the children beautifully developed, with strong enamel. Why is this? If you examine in a community such as your city or mine the teeth of children of parents of modern civilization, you will find that their deciduous teeth are chalky. I want to say from what study I have given to this subject that a great deal of damage is done in this direction by the teaching of "tocology," which has for its basic idea the regulation of the mother's diet during the period of pregnancy, with a view of developing a small osseous frame in the child for the comfort of the mother at the birth of the child. In the effort to produce small bones the child is starved of the calcium salts that make good teeth. We can trace defective teeth directly to the lack of nourishment of the child during its early life, the food being such as not to induce the proper formation of the teeth. I wish to ask how many mothers know of the necessity of feeding a child such food as will produce good teeth. To my mind this is one of the most important duties that we have for the future, *i.e.* to combat this fearful doctrine of tocology, and establish an understanding among people of all grades of society that they cannot afford to starve children before birth, for they are taking away from them that which is most necessary for their service in life as citizens; and we must of necessity go into the schools and teach what foods children should have during the first four years of their lives. I have models of a number of cases; in one of these there are three children in the family, and the teeth of the first two were so poor that it seemed impossible to keep the deciduous set in the mouth for the normal length of time. The mother is an acknowledged student and advocate of the doctrine of tocology. The third child, however, was brought up under different conditions. After the third month of pregnancy the mother started the diet for the formation of splendid teeth for the baby, with the result that the deciduous teeth erupted as though they belonged to one of those cliff-dwellers, so perfectly were they formed, and such hard enamel they had. A correct system of feeding was carried on just as assiduously during the first four or five years, and the child's permanent teeth are now erupting with no cavities and with the enamel beautifully formed. There was no other reason for this child's having better teeth than the others than the better treatment which it received in the matter of diet. Is that not a sufficient warrant, if we wish to do our duty to the men and women of the future, to go before our communities and implore them, if not demand, that they take more care of the diet of the mother before the birth of children, and of the food of the children after birth?

Dr. F. T. MURLLESS, Jr., Hartford. This is a matter concerning which I feel a great deal of enthusiasm. I have had occasion to take some special interest in it of late, and I am thoroughly impressed with the pathetic need of active efforts. In fact the need is so stupendous and the difficulties are so great that the situation is almost depressing. You will share my feelings when I tell you that one of the commissioners of public health of Chicago reported recently that in the public schools of that city, not-

withstanding a rigid process of isolation, disinfection, and inspection of scarlatina cases, the readmission of these patients was almost uniformly followed by a fresh outbreak of scarlatina in the schoolroom to which they returned. This fact attracted so much attention that medical inspectors went over the cases again to see why this occurred, but were inclined to regard the recurrence of the disease as merely a matter of coincidence. When cultures were made from cavities in the teeth of these children it was discovered that for a considerable period after the child had returned to school there were germs of scarlatina in these cavities, and that fellow scholars were being infected through the common use of drinking-cups, lead pencils, and books. Therefore since we know the remedy, it is for us to apply it. Without doubt this terrible scourge could be stamped out but for oral incubation of the bacillus. To do this every child must have not *post facto* but prophylactic dental attention. There are many details that we shall have to work out in regard to administration before much alteration can be made in the situation. It is a question in my mind whether here in the East, in most communities, we can at present have oral examinations enforced as they have in Cleveland. The people in our staid conservative New England states are a little averse to examination of their children's teeth in schools. I believe a beginning may be made by limiting our attentions at first to the teeth of the children of the deserving poor. In speaking with one of the principals of a public school in one of our large cities, I found that in a city of eighty thousand people it was estimated that they had fourteen thousand school children. According to the statistics which are furnished by the examination of millions of children, it is safe to say that ninety per cent. of them are in need of immediate oral attention. I asked how many in this city were children of the deserving poor, and my informant said, "Well, you can say that ten per cent. of this ninety per cent. especially deserve consideration." Among these fourteen thousand then we have fourteen hundred who cannot pay for necessary dental service. That is comparatively few, but when we think of the aggregate amount of hours of work required to give even these fourteen hundred children comfort and protection, we have a stupendous proposition before us.

A way to get at these deserving children, I might suggest, would be by means of a blank to be filled out by the school principal or the mother superior, recommending the child and giving enough of the facts in regard to the family so that the case could be traced, which would seem to me to be quite essential. There is another feature of this work that is going to be very difficult to handle at first, namely, its financial aspect. Until, through active work, the people of a community are able to appreciate how directly dental attention affects the health of the child, appropriations of public money will be difficult to secure, but if started with private contributions and voluntary dental attendance, this movement will soon secure recognition, and become a part of the municipal machinery of every city and town.

Dr. WEEKS (closing the discussion). I would like to ask every man present to read the paper when it is published thoughtfully and carefully, and try to see what was in my mind when I wrote it.

When we are called upon to go to war, we do not stop to ask what religion, cult, or grade of society a man belongs to before we allow him to go into the army and fight. Let us get over this narrowness and give every fellow, no matter whether he is in our association or not, a chance to do his duty. That is all I ask you to do. It will broaden you; it will broaden him, and it will bring him into the society in spite of everything.

I brought out one method of treating children's teeth for two reasons. First, I have used that method over twenty years, and I have seen the teeth of children improve under it. I have had experience in treating the mouths of young girls of seventeen or eighteen years of age, in whom the teeth of one side were

kept filled with copper oxyphosphate from an early age, while those of the other side presented fresh cavities in which the difference in the character of the teeth of the two sides was very marked. Moreover, I am sure that the majority of men within hearing distance of me have not had so much experience with this material.

In regard to Dr. Flanagan's remarks on the question of medical societies, let me say that you must keep in mind the fact that nearly every young man entering that profession thinks it is his duty to join a society. Do the dental graduates think so? Not at all.

Dr. FLANAGAN. Who is to blame?

Dr. WEEKS. We are. My suggestion was offered not in the spirit of blame, but was meant to help you to bring about that which you wish.

Regarding the choice of material for teeth of children, do not overlook the antiseptic and therapeutic properties of the materials that go into a cavity. I agree most heartily with Dr. Taylor that cavities are only an incident in mouth conditions, and it is the condition of the whole mouth that we as dental physicians should look after.

It has been said by Dr. Flanagan that we are limited in the amount of service. Like him, I am going to confess and not brag. Our good friend, Dr. Tracy, with some others, has charge of a dental clinic in New York connected with one of the hospitals, and while I was in New York one winter I volunteered to help out a little. There was a trained nurse in attendance who assisted the operators and kept the records. She reported that the average for each one of the several afternoons that I served was fourteen children treated and twenty-six fillings made. I am no smarter than a great many others, but that is a lot of work to do in an afternoon. Yet it can be easily done if you have a trained assistant and follow the methods and use the materials suggested.

In closing, I wish to say that there are wonderful possibilities in this line of work, if you will all become as enthusiastic as many are. If you will, the ways and means will work out naturally.

The meeting then adjourned until Wednesday morning at 10 o'clock.

(To be continued.)