exploded with oxygen insufficient for complete combustion, at a temperature at which no condensation of steam can take place during the reaction, and at a temperature greater than the critical pressure, an equilibrium between two opposite chemical changes is established, which is independent of the mass of oxygen taken, so long as this quantity is less than half the hydrogen. Within these limits the law of mass is completely verified for the gaseous system composed of carbonic oxide, carbonic acid, hydrogen, and steam at a high temperature.

HERBST'S METHOD OF FILLING.

Demonstrated by DR. G. C. CLUDIUS, Grenoble, France.*

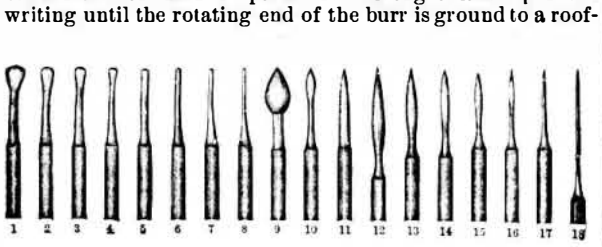
AT the July meeting of the Odontological Society of France, Dr. Cludius, from Grenoble, made the following demonstration of a new method of gold filling, saying:

We feel the necessity of making the operation of filling teeth with gold easier, if possible, especially in difficult cases, in order to lessen the fatigue of the operator, as well as to prevent the suffering of the patient, during hours without interruption, under the ceaseless blows of the mallet. The remedy has been sought in new forms of material, like sponge and crystal gold. These have not given any help in the performance of good operations, but have rather facilitated poor work. We are not in need of varieties in the forms of gold, but we ought to try and improve its manipulation, and this has recently be done in a novel manner by Dr. Herbst, whose rotation method has been mentioned in the dental journals within only a few months; and yet it seemed necessary that this great invention, made in Bremen, should take its way by America to come to us.

In the January meeting of the Odontological Society of New York, Dr. Bödecker mentioned it for the first time, describing the excellence of fillings made by Dr. Herbst in less than half the time that any mallet work would have required, and he expressed his intention of going to study the method with the inventor. Thinking that I was yet nearer to Bremen, I went thither, and found there Dr. W. D. Miller, who had come on the same errand. Mr. Brasseur had also written to Dr. Herbst, and it is by his (Mr. B.'s) invitation that I came to Paris to show you what I have learned in Bremen. To-morrow morning I shall show the method in the mouths of patients at the Dental College of France. Dr. Herbst did not patent his new method, to which may be given the name of "rotation gold filling." All he desires is that every one may try the system, and he feels himself already largely paid by the acknowledgments he is daily receiving.

He proves that by his way of rotation one is able to adapt the gold more perfectly to the walls of the cavity than by any other means hitherto employed. One can thus work gold in the very weakest teeth, because there is no force employed, yet the gold is as much condensed as by any mallet known.

The new instruments are very simple, and you may find them in the dental depots. One can easily prepare them for himself—at least the principal one, No. 5—by putting a broken burr in the hand-piece and holding it like a pen for writing until the rotating end of the burr is ground to a roof-



like shape, on a dry Arkansas stone. Nos. 1, 2, 3, and 4 are smooth burnishers, and help to fix the first layers of gold in large fillings. They are afterward used as finishers. Nos. 9 to 17 are finishing burnishers, and No. 18 is a needle-point finisher.

The cavity is to be prepared in the usual way, but retaining points are very much less needed than for other methods. Take, for instance, a central cavity in a molar—and, moreover, the fundamental idea of this system is to transform all cavities to be filled into central cavities. Now fix several cylinders, of a size proportioned to the cavity, with a common plugger, and then take No. 2, or 3, or 4, and by a slow rotation polish the gold against the walls. If the gold does not stick directly, put in more cylinders with the plugger, and recommence the condensation with the burnisher. On this first layer of gold a second one is to be made to adhere; but the polished surface prevents, and here No. 5 finds employment in quick rotation and interrupted touches until the polish is gone. (I may here remark that the gold is condensed by this rotation and without pressure in a very remarkable way.) For large fillings, No. 5 is to have proportionate points,† which, if too fine, will make holes in the gold, and the pressure is to be intermittent, in order to avoid the development of heat, which would be painful and irritating to the pulp.

All the instruments by use get gilded, and will not work longer without tearing out the gold; but this inconvenience may be prevented by occasionally rubbing them while in rotation upon a piece of tin.

The filling of the cavity is continued in the way above described.

Let us now take the case of two incisors with lateral cavities approximating one another. The two cavities, prepared as usual, are treated as if one, and the gold is at the same time introduced into both cavities, fixing some cylinders in the four corners by rotation of the proper burnishers, and condensation with No. 5, until they are filled, so that there appears to be a single mass of gold. No. 18 is then pushed with regular rotation between the teeth until the mass is quite separated, so that thin files, and disks, and tapes may be employed in finishing the fillings.

In filling similar cavities between the second bicuspid and first molar, after they are properly prepared, place a matrix and fill one cavity with shellac to retain the matrix, and distribute the resistance, and then fill the other like a central cavity, beginning at the cervical border, and pressing especially against the matrix at that point, work toward and finish at the middle of the crown. Having filled the first one, remove the shellac and fill the other in the same way.

The rotation and the pressure, *if intermittent*, do not produce heat—at least, not more than will render the gold cohesive.

Dr. Herbst filled for me two molars, carious to the cervical border, and very sensitive there, for which reason they had for years been filled with plastics, because I was afraid of perforation if retaining points were made, without which gold filling by malleting would not have been possible; and I was too nervous to sit three or four hours in the chair. Dr. Herbst filled both teeth by rotation, without retaining points, in a little more than one hour. Several gentlemen present have seen them and observed the severe tests to which Mr. Brasseur subjected them, and I may add that notwithstanding the great sensitiveness of the dentine and the proximity of the pulps, I felt not the least inconvenience from heat, and my own patients bear like testimony.

We will now split a crown filled in the hand, and you see that the gold is pressed into the smallest depressions of the interior surface, and is so uniformly condensed as to resemble an ingot, impossible to separate in pieces, yet you may note the different stages of the rotation.

I saw Dr. Herbst fill six cavities—some of them large ones—in front teeth, taking altogether at the same sitting about one hour.

It would be difficult to precisely describe the manipulation requisite for the great variety of cases presenting in practice, but I have explained to you in theory the typical ones in the hope of stimulating you to try this method of filling by rotation, which I look upon as one of the most ingenious modes yet given to our profession. The results are splendid, and the operator will thereby save much time and prevent great suffering on the part of the patient.

DR. KOCH'S BERLIN LECTURE ON CHOLERA AND THE COMMA BACILLUS.

AN important conference upon cholera was held in Berlin, at the Imperial Board of Health, on the evening of July 26. There were present Drs. Von Bergman, Coler, Eulenberg, B. Frankel, Gaffky, Hirsch, Koch, Leyden, S. Neumann, Pistor, Schubert, Skrezcka, Struck, Virchow, and Wollfhugel. The conference had been called at the instance of the Berlin Medical Society, whose President, Professor Virchow, explained that it was thought advisable Dr. Koch should in the first instance give a demonstration of his work before a smaller body than the whole Society, so that the proceedings might be fully reported in the medical press. He mentioned that Herr Director Lucanus and President Sydow had expressed their regret at being unable to be present, as well as many others, including Drs. Von Lauer, Von Frerichs, Mehlhausen, and Kersandt. Dr. Koch first showed various specimens of the bacilli and their method of preparation (see *Berliner Klinische Wochenschrift*, August 4). This resembles that for the tubercle bacillus, viz., drying on a cover glass and staining with fuchsin or methyl-olin. Koch then gave a history of his work while in Egypt and India. His post-mortem examinations led him to believe that the intestines were the nidus of the disease. At first his microscopical examinations were unsatisfactory, but finally he got fresh dejecta and acute cases, and then discovered the comma bacillus.

This, he said, is smaller than the tubercle bacillus, being only about half or at most two-thirds the size of the latter, but much more plump, thicker, and slightly curved. As a rule, the curve is no more than that of a comma (,), but sometimes it assumes a semicircular shape, and he has seen it forming a double curve like an S; these two variations from the normal being suggestive of the junction of two individual bacilli. In cultures there always appears a remarkably free development of comma-shaped bacilli.

These bacilli often grow out to form long threads, not in the manner of anthrax bacilli, nor with a simple undulating form, but assuming the shape of delicate long spirals—a corkscrew shape—reminding one very forcibly of the spirochæte of relapsing fever. Indeed, it would be difficult to distinguish the two if placed side by side. On account of this developmental change, he doubted if the cholera organism should be ranked with bacilli; it is rather a transitional form between the bacillus and the spirillum. Possibly it is true spirillum, portions of which appear in the comma shape, much as in other spirilla, *e. g.*, spirilla undula, which do not always form complete spirals, but consist only of more or less curved rods. The comma bacilli thrive well in meat infusion, growing in it with great rapidity. By examining microscopically a drop of this broth culture the bacilli are seen in active movement, swarming at the margins of the drop, interspersed with the spiral threads, which are also apparently mobile. They grow also in other fluids, *e. g.*, very abundantly in milk, without coagulating it or changing its appearance. Also in blood serum they grow very richly. Another good nutrient medium is gelatine, wherein the comma bacilli form colonies of a perfectly characteristic kind, different from those of any other form of bacteria. The colony when very young appears as a pale and small spot, not completely spherical as other bacterial colonies in gelatine are wont to be, but with a more or less irregular, protruding, or jagged contour. It also very soon takes on a somewhat granular appearance. As the colony increases the granular character becomes more marked, until it seems to be made up of highly refractile granules, like a mass of particles of glass. In its further growth the gelatine is liquefied in the vicinity of the colony, which at the same time sinks down deeper into the gelatine mass, and makes a small thread-like excavation in the gelatine, in the center of which the colony appears as a small white point. This again is peculiar; it is never seen, at least so marked, with any other bacterium. And a similar appearance is produced when gelatine is inoculated with a pure culture of this bacillus, the gelatine liquefying at the seat of inoculation, and the small colony continually enlarging; but above it there occurs the excavated spot, like a bubble of air floating over the bacillary colony. It gives the impression that the bacillus growth not only liquefies the gelatine, but causes a rapid evaporation of the fluid so formed. Many bacteria also have the power of so liquefying gelatine with which they are inoculated, but never do they produce such an excavation with the bladder like cavity on the surface. Another peculiarity was the slowness with which the gelatine liquefied, and the narrow limits of this liquefaction in the case of a gelatine disk. Cultures of the comma bacillus were also made in agar-agar jelly, which is not liquefied by them. On potato these bacilli grow like those of glanders, forming a grayish-brown layer on the surface. The comma bacilli thrive best at temperatures between 30° and 40° C., but they are not very sensitive to low temperatures, their growth not being prevented until 17° or 16° C. is reached. In this respect they agree with anthrax bacilli. Koch made an experiment to ascertain whether a very low temperature not merely checked development, but killed them, and subjected the comma bacilli to a temperature of —10° C. They were then completely frozen, but yet retained vitality, growing in gelatine afterward. Other experiments, by excluding air from the gelatine cultures, or placing them under an exhausted bell-jar, or in an atmosphere of carbonic acid, went to prove that they required air and oxygen for their growth; but the deprivation did not kill them, since on removing them from these conditions they again began to grow. The growth of these bacilli is exceptionally rapid, quickly attaining its height, and after a brief stationary period as quickly terminating. The dying bacilli lose their shape, sometimes appearing shriveled, sometimes swollen, and then staining very slightly or not at all. The special features of their vegetation are best seen when substances which also contain other forms of bacteria are taken, *e. g.*, the intestinal contents or choleraic evacuations mixed with moistened earth or linen and kept damp.

A most important statement was that the comma bacillus seems to be killed by the bacteria of putrefaction, and consequently agents that destroy the latter organisms without the former may really do injury, by removing from the cholera bacillus an impediment to its growth.

As for destructive agents to the bacillus, he found it killed by solutions in the following proportions: oil of peppermint, 1 in 2,000; sulphate of copper, 1 in 2,500 (a remedy much employed, but how much would really be needed merely to hinder the growth of the bacilli in the intestine!); quinine, 1 in 5,000; and sublimate, 1 in 100.000.

In contrast with the foregoing measure for preventing the growth of these bacilli is the striking fact that they are readily killed by drying. This fact is proved by merely drying a small drop of material containing the bacilli on a cover glass, and then placing this over some of the fluid on a glass slide. With anthrax bacilli vitality is retained for nearly a week; whereas, the comma bacillus appears to be killed in a very short time.

Dr. Koch having found and cultivated the comma bacillus and ascertained its distinctive character, next proceeded to investigate its relation to cholera. In all there were now about one hundred cases of cholera in which the bacillus had been found, while it was never found in connection with other diseases. Three different views, said the speaker, as to its relation to the cholera process are tenable:

1. That the disease favors the growth of these bacilli by affording them a suitable soil. If so, it would mean that the bacillus in question is most widely diffused, since it has been found in such different regions as Egypt, India, and France; whereas the contrary is the case, for the bacilli do not occur in other diseases, nor in the healthy, nor apart from human beings in localities most favorable to bacterial life. They only appear with the cholera.

2. It might be said that cholera produces conditions leading to a change in form and properties of the numerous intestinal bacteria, a pure hypothesis; the only instance of such a conversion refers to a change of physiological and pathogenic action, and not of form. Anthrax bacilli under certain conditions lose their pathogenic power, but undergo no change in shape; and that is an instance of a loss of pathogenic properties, while there is no analogy to support the view of the harmless intestinal bacteria becoming the deadly cholera bacilli. The more bacterial morphology is studied, the more certain it is that bacteria are constant in their form; moreover, the comma bacillus retains its special characters unchanged through many generations of culture.

3. Lastly, there is the view that the cholera process and the comma bacilli are intimately related, and there is no other conceivable relation but that the bacilli precede the disease and excite it. "For my own part," said Dr. Koch, "the matter is proved that the comma bacilli are the cause of cholera."

Dr. Koch then described his attempts to inoculate lower animals with the bacillus, and explained the cause of his failure in the natural immunity of the animals against the disease.

In advocating the local Indian origin of the disease he said: That the virus can be reproduced and multiplied outside the body is apparent, since the bacillus can be cultivated artificially, and its growth is not affected by comparatively low temperatures. Probably it does not grow in streams and rivers, where, owing to the current, a sufficient concentration of nutrient substance does not occur; but in stagnant water and at the mouths of drains, etc., vegetable and animal refuse may accumulate and afford the necessary nutriment. Thus is explained the propagation of cholera by the subsoil water, and the increase of epidemics with the sinking of its level, which lessens the flow and diminishes the amount of surface water. Admitting the dependence of cholera upon this micro-organism it is impossible to conceive the disease having an autochthonous origin in any particular place; for a bacillus must obey the laws of vegetable life, and have an antecedent; and since the comma bacillus does not belong to the widely diffused micro-organisms, it must have a limited habitat. Therefore, the occurrence of cholera on the delta of the Nile does not depend on its resemblance to the delta of the Ganges; but the disease must have been imported there as it is into Europe. It was once thought that an outbreak in Poland had a local origin until it was discovered to have been introduced from Russia. Again, about ten years ago, there was a sudden outbreak at Hamar (Syria), thought to be an instance of local origin, but erroneously, as shown by a statement of Lortet, who told Koch, when at Lyons, that the epidemic had been introduced into Hamar, where he was at the time, by Turkish soldiers from Djeddah. All great epidemics of cholera began in South Bengal, where the conditions for the development and growth of the bacillus are most perfect.—*Med. Record.*

LOCAL ANÆSTHESIA BY THE HYDROCHLORATE OF COCAINE.

By R. J. LEVIS, M.D., Surgeon to the Pennsylvania Hospital and to the Jefferson Medical College Hospital.

THE notes of a few cases of the use of the hydrochlorate of cocaine will illustrate its perfect efficiency in some and its apparent inertness in others, and may help toward its proper application and general appreciation.

In a double extraction of hard cataract there was no pain produced by the graspings of the conjunctiva in the fixation of the eyes, in the corneal incisions, and in the iridectomies.

A 4 per centum solution was freely brushed over the entire conjunctival surface three times, at intervals of ten minutes, and the operations were commenced in forty minutes after the first application. No irritation was produced, and the only sensation described was that of "numbness and hardness." The entire conjunctival surface seemed insensible to repeated pinching with the fixation forceps.

In a single extraction of hard cataract a 4 per centum solution was brushed over the ocular and palpebral conjunctiva, with the eyelids freely everted. Three applications

* Translated from the *Revue Odontologique*, for the *Dental Cosmos*.

† In the cuts, Nos. 6, 7, and 8 are proportionate modifications of No. 5.