A tabular view of the section work for the ensuing year can be printed at any time before the school year begins and distributed among the students after they have received their section numbers. In this way all confusion will be avoided and the students will present themselves at the various hospitals at the hours assigned, without further notice. The absence of one or more students from a section will not interfere with the instruction of the remaining students.

By adopting a system of rotation each section meets a different instructor each time until the rotation has been completed and Section No. 1 has returned to its first instructor. In arranging such a system it is necessary so to arrange the instruction that at the end of rotation each section shall have had the same number of exercises in each subject. This may be accomplished by arranging the subjects in such a way that the same subject shall not be assigned to more than one section in succession, that is, two sections should not be taught clinical medicine in succession. If this arrangement is not adhered to, it will be found at the end of several exercises that one section will have had more instruction in surgery, and another, more in clinical medicine, etc. A study of Table II will explain this.

To avoid interfering with the rotation and at the same time to give less instruction in clinical pathology and in pediatrics, these two subjects are arranged to alternate with each other. It will be seen that during the *first* rotation the odd numbers are assigned to clinical pathology and the even numbers to pediatrics. To enable the sections that had pediatrics to have clinical pathology and *vice versa*, it is necessary in the *next rotation* to assign the even numbers to clinical pathology and the odd numbers to pediatrics. This alternation must be arranged in the tabular view. After receiving their section numbers at the beginning of the term, the students have only to consult the tabular view to find out which hospital to go to and what the exercise will be on any day in the school year.

There is one important objection to the method of teaching, namely, the number of instructors that are needed. This objection applies chiefly to clinical medicine. If the method were adopted in the Harvard Medical School, *without any alteration* in Table II, it would require eight additional assistants in clinical medicine, because the time of the present instructors is fully occupied in teaching auscultation and percussion. It should be borne in mind that the apportionment of sections can be altered to any extent. Two of the sections assigned to clinical medicine could receive instruction in neurology, a third and fourth section could be assigned to dermatology and to pediatrics respectively. By this arrangement only four additional instructors would be needed in clinical medicine. As a preliminary arrangement for the first year or two, the number of exercises could be reduced to two or three times a week instead of four times.

The purpose of this paper, as I stated at first, is to show the practicability of section teaching, but I should like to add a few words about didactic lectures and to offer a few suggestions about conducting a course in section teaching. I believe that didactic lectures are needed by the students to supplement section teaching. Most of the time at a clinical exercise should be spent in correcting errors in observation and in deduc-

tion and in permitting the students to examine the abnormalities which have been detected. The time which remains, if this be done thoroughly, will be found to be so short that the instructor will be forced to omit much useful information about the disease under discussion, information that is often of the greatest value in the management and treatment of cases in practice and much that is essential in order to obtain a clear conception of the nature of the disease. To obtain such information from text-books alone is usually beyond the powers of the student because his reading-time is very limited and because he lacks the experience which is necessary to enable him to separate the essential from the non-essential.

SUGGESTIONS.

(1) The section teaching should be under the control of the professor. This would not require a great expenditure of time if the clerical details were performed for him by an assistant or by a secretary.

(2) A list of the diseases which the professor wished to have shown to the students could be prepared, and the instructors could arrange to show these diseases during the year.

(3) The instructors could keep a record of the diseases which had been shown and the sections that had seen them. These reports could be sent to the professor every week and would enable him to arrange the teaching so that all of the students could see the same diseases in the course of the year.

(4) An effort should be made to show the students different stages and complications of the same disease.

(5) The professor could arrange a series of lectures to supplement the section teaching. These lectures would be delivered before the entire class in the amphitheatre of the hospital and the students would be expected to take careful notes for future study. In a large hospital it would often be possible to find a number of cases in different stages of a given disease. These cases would serve as illustrations and would help to impress a distinct picture of the disease upon the students' minds.

(6) Patients with chronic diseases often remain in a hospital for several weeks. If a given case were shown to each section in turn it would be possible for the entire class to see the same patient in the course of one rotation.

(7) I believe that the students should be required to pass both a practical and a written examination in auscultation and percussion at the end of the second year in order to show that they are competent to begin section work.

THE CASE OF A MAN WHO SWALLOWED HIS SUSPENDERS; REMOVAL BY EXTERNAL ESOPHAGOTOMY; RECOVERY.—OTHER SIMILAR CASES.

BY MAURICE H. RICHARDSON, M.D., BOSTON.

WILLIAM H., shoemaker, aged twenty-nine, entered the Massachusetts General Hospital on April 13, 1899. He had been discharged a few days before from the Worcester Insane Asylum, of which he had been an inmate for thirteen months. He said that two weeks before entrance, while despondent, he attempted to swallow his suspenders. He succeeded in getting down certain portions of the suspenders and some broken glass, but just how much was uncertain.

I questioned the patient repeatedly, but could get little information as to what or how much he had succeeded in getting by the fauces. He was not unwilling to tell, but he was dazed and stupid and somewhat silly. He complained of no pain, but rather of a discomfort under the sternum while eating. The food at times passed easily into the stomach; at times it was immediately regurgitated. There had been no blood in the regurgitated material.

The history given by this mentally unbalanced patient would seem extraordinary, except that the insane do the most incredible things. I had had some experience with foreign bodies in the melancholy and suicidal, and in every case operation had demonstrated the truthfulness of the patient's statements, even when it was hard to believe them. I therefore was inclined to accept as a fact that somewhere in the alimentary tract would be found portions, at least, of the man's suspenders, and perhaps other things. The precordial discomfort and the occasional regurgitation suggested impaction in the esophagus. The man was physically strong and well developed; mentally, he was slow and stupid. Nothing could be seen or felt in the fauces. With the olive-tipped probang an obstruction of some kind was perceptible in the esophagus at or about the level of the transverse portion of the aortic arch. Nothing metallic could be detected. An x-ray negative showed unmistakably a suspender buckle at the level of the arch, and possibly another higher up.

The safest route of removal — whether by mouth, by external esophagotomy, or by gastrotomy — was the most important question in this case. The chief danger in esophageal impaction is from ulceration into the great vessels, especially when the impacted body is a flattened one with sharp edges — a coin, a tooth plate, for example. Moreover, the usual time for a fatal erosion is two weeks or less. In this case, therefore, the erosion, if any was taking place, must have been sufficiently advanced to make even the most refined manipulations dangerous. Indeed, it would be by no means surprising if attempts at extraction, by whatever route, would end in a deluge of blood from the aorta. The selection of route would depend, not upon the facility with which a hemorrhage might be checked — for such a hemorrhage could not, of course, be checked — but rather upon the feasibility of detachment and removal without causing that hemorrhage.

The instruments usually selected for removing foreign bodies from the esophagus through the mouth cannot with intelligence be either directed, applied to the foreign body, or withdrawn. Some of them, once fast to a foreign body, cannot be made to let go. Some years ago the coin catcher got fast to a tooth plate impacted at the lower end of the esophagus, and in attempts to detach it enough force was applied to it to break off the metal end of the coin catcher. No harm was done in this case, but it is easy to imagine what might have happened — what, in fact, often has happened in trying to dislodge foreign bodies. On the other hand, I removed with great ease, by means of a coin catcher, a tooth plate which had been for eleven months impacted in the esophagus behind the sternoclavicular joint. I had fully decided to operate through the neck and was using the coin catcher to determine the firmness of the impaction, when the plate became detached and was drawn up.

In the present case the impaction was considerably above the aortic arch. Though we could not make out exactly the kind of buckle, it was evidently a flattened metallic thing, with sharp edges, and it was caught in most dangerous proximity to the aorta and its great branches.

From these considerations I decided to take no chances by instrumentation through the mouth. Gastrotomy was not seriously considered, because the foreign bodies were high up. By external esophagotomy the esophagus could be inspected, felt of, the foreign bodies could be accurately localized, instruments could be directed, applied and withdrawn with precision.

External esophagotomy was performed April 15th. As soon as the esophagus was opened, a thin, brownish, foul-smelling fluid escaped. The finger detected at once that the esophagus below the incision was plugged with something soft. By means of curved, long-bladed hemostatic forceps there were first removed a ball and string attached to a brass ring; then half a suspender web with two buckles; then a third buckle — all covered with a dark, foul-smelling slime. The olive probang, the coin catcher, the bristle probang were successively passed into the stomach without meeting further obstruction. With the finger an ulcerated area could be felt just above the aortic arch. The esophageal wound was closed in two layers with fine, interrupted silk sutures. The external wound was closed except for a gauze strand, leading from the esophageal sutures.

The wisdom of provisional gauze wicking was shown, I think, by this case, for at the end of twenty-four hours there was a fully-developed wound infection, with a temperature of 104°. Thorough irrigation of the wound was followed by rapid subsidence of the infection, the wound rapidly healed, deglutition became normal. The patient was discharged on the 29th of April, physically well, but mentally as unsound as ever. Seven months later, I received the report that the patient was very well, both physically and mentally; that there was no trouble in deglutition and that the wound was in good condition.

The things that an unbalanced patient may do are certainly extraordinary. That he may do them should be borne in mind in obscure symptoms connected with the alimentary tract. My experience has not been large, but it has been enough to guide me to the lesion in several curious cases, some of which I have already published in detail.

One of the most extraordinary was that of a strong young woman who swallowed successfully a gold pencil. She then got an open safety pin stuck in her gullet and detached it with a steel crochet needle, which she then successfully swallowed. This was followed by a lot of common pins. For gastric symptoms, I opened the pylorus, through which I found sticking the open safety pin. I left the other articles in the alimentary canal, whence in due time they all emerged, except the crochet needle, which never has been found.

My first dissecting-room subject had her stomach full of straw. The specimen is now in the Warren Museum. Recently, Dr. Brewster removed for me a ball of hair from the small intestine of a girl of ten years old. This hair ball had completely obstructed the lumen.

An insane woman, after her cup of tea, swallowed the sharp-edged silver teaspoon. It lodged in the

esophagus bowl downward. I succeeded in removing it by external esophagotomy, without hemorrhage. She died, however, in a few days from some unknown cause. There was no wound infection to account for her death.

In another case, that of a hysterical girl, I opened the epigastrium for a tumor supposed to have been caused by the habitual swallowing of rubber gum. Though no gum was found, there was an abscess about the pylorus which I have always thought was caused by the gum. This girl recovered.

Perhaps a little remote, anatomically at least, are the cases of foreign bodies introduced into the rectum. They illustrate, however, the freaks of the insane, the hysterical and the perverted. The most extraordinary instance I have known was the man who lost a ketchup bottle in his rectum, whence Dr. Warren successfully removed it.

Dr. Warren's case recalls that of a general paralytic, in close confinement, whose silver-plated dinner knife disappeared. It was a brilliant exemplification of the possibilities of eliminative diagnosis, for a careful search eliminated every possible place of concealment except his rectum, where, in fact, he had concealed it. He had thrust the knife through the rectal wall into the abdominal cavity, where it was lying free when I explored. A general peritonitis was under full headway, and he died.

Another case deserves mention, though it is not quite analogous to those described. A hysterical and neurasthenic woman declared that she had accidentally swallowed a plum stone, and suffered, she said, extreme torture from its pressure in the stomach. A surgeon, thinking (as I believe rightly) that her troubles were imaginary, passed an instrument into the stomach, withdrew it and showed the patient a plum stone. Unfortunately, the patient immediately declared that it was not that kind of a plum! I finally opened the stomach in this case, but found nothing. The woman died later from an acute inflammation of the alimentary tract caused by drinking, with suicidal intent, corrosive-sublimate solution.

THE CLINICAL VALUE OF OLIVER'S HEMOCYTOMETER.¹

BY DAVID D. SCANNELL, A.B., HARVARD MEDICAL SCHOOL, BOSTON.

DURING the course of a series of lectures on the physiology of the blood delivered before the Royal College of Physicians, of London, in 1896, George Oliver, an English physiologist, described a new and ingenious method of red corpuscle estimation, at once time-saving and accurate as compared with the Thoma-Zeiss procedure. The invention of this new device was prompted by the same desire for physiological exactness and investigation that led to the production of his tintometric hemoglobinometer, the observations of which are fully as accurate, reliable and definite as the hemoglobinometers of von Fleischl and Gowers.

In his argument for the need of an apparatus more exact and consistent than the Thoma-Zeiss counter, Oliver says: "The present methods for determining the red corpuscles are, (1) the examination by the microscope, and (2) the percentage estimation by the centrifugal machine. The former enumerative method is

¹ From Dr. Richard C. Cabot's clinic at the Massachusetts General Hospital.

perhaps on some grounds preferable, especially for clinical work, for it enables any alterations in the individual corpuscles to be observed at the same time. But repeated observations have shown that this same method as ordinarily applied does not possess that degree of accuracy with which it is usually credited. Even though all the necessary precautions have been taken, a series of trials derived from the same mixture of a sample of blood may yield the wide variation of *ten per cent.* The possibility of such a large margin of difference must render the method totally unreliable for any physiological inquiry, however immaterial it may be for clinical purposes. Extended enumeration will, of course, average the discrepancies, but it necessarily involves the expenditure of more time, labor and eyesight than are at the disposal of most observers, especially, too, as physiological work demands the largest possible collection of data and much repetition. It was therefore necessary to search for a simple and time-saving method of hemocytometric observation which, founded on extended enumeration in the first instance and attaining to the accuracy of it, might be substituted for it."

Oliver's hemocytometer is based on the following principle: In the process of drawing out a glass tube, the sides of the tube become minutely corrugated in the direction of its axis. When a candle or small gas flame is looked at through this tube containing water, a transverse line of light is seen, consisting of closely packed minute images of the flame produced by the above-mentioned corrugations of the glass. The parallel furrows and ridges are demonstrable with the aid of a small magnifying glass. Each ridge acts as a lens, hence the horizontal line made up of an aggregation of the images of the flame.

Oliver discovered that if, instead of the water as a refracting medium, he used normal blood diluted with some fixing fluid (such as Hayem's, ferrocyanide of potash, or sodium chloride), the resulting mixture presented a degree of opacity varying according to the amount that the blood was diluted by the fixing fluid.

The opacity so produced completely shuts off all view of the transverse line of light until, on still further diluting, a definite point is attained when it can be seen faintly as a delicate thread of light running transversely across the tube, "the dawn, as it were, of the bright minute images of the flame seen when the opacity is absent or still further reduced." Repeated observations by Oliver have shown that the development of this delicate horizontal line by dilution of the blood with either of the fixing fluids mentioned is an extremely sensitive index of the number of red corpuscles present in any individual blood. This was determined in many ways; for example, by the observation that the amount of fixing fluid required to bring the horizontal line into view was always in proportion to the different quantities of the same blood experimented with, and therefore in proportion to the number of the blood corpuscles present at each observation.

The apparatus required for such observation is extremely simple and should be relatively inexpensive. It consists of (1) a flattened graduated tube; (2) a capillary pipette having a capacity of 10 cubic millimetres of blood; (3) a mixing pipette for which an ordinary medicine dropper is a perfect substitute; (4) a candle or gas flame, and (5) a fixing solution, preferably Hayem's.