sewage-polluted water-supplies cost many thousands of human lives; the scientific experiments which, with infinitely more exactitude, justified a presumption of dangerousness cost the lives of fourteen mice."

We see then in one way or another experiment must form the basis on which medical science is to be built up. The question for us to decide is, "Shall these experiments be few, carefully planned, conclusive, economical of animal life, or shall they be numerous, accidental, vague and wasteful of human life?" I think in settling this question we may safely take for our guide the words of Him who said, "Ye are of more value than many sparrows."

Original Articles.

PHOTOGRAPHY OF THE HUMAN STOMACH BY THE RÖNTGEN METHOD, A SUGGESTION.

BY JOHN C. HEMMETER, M.D., PH.D., BALTIMORE, MD.

In the *Deutsche Medizinische Wochenschrift*, No. 13, March 26, 1896, Dr. Wolf Becker, of Berlin, describes a method for photographing the hollow organs of the animal body by the Röntgen process. In his work on "A New Kind of Rays," Röntgen, after stating that the various metals are permeable to the rays to different degrees, says that the salts of the metals, in a solid form or in solutions, can be arranged in a similar manner to the metals, with regard to their permeability.

This property of solutions not to allow the Röntgen rays to penetrate, he utilized to photograph the stomach and a loop of intestine of a guinea-pig by distending both with liquor plumbi subacetici of the German pharmacopœia. To fill the organs mentioned Becker did a laparotomy, tied the stomach both at the cardia and pylorus and the intestinal loop at both ends, and then injected the solution of subacetate of lead by means of a Pravaz syringe. In doing so he tore the gastric walls, which had to be sewed up again, but could not be repaired so tightly as to prevent leakage. The possibility of injecting the subacetate through the mouth and œsophagus did not suggest itself to him, it seems. A Rumkorff inductor producing a spark fifteen centimetres long was used, and the distance of the lowest pole of the Hittorf (Geissler) tube from the highest point of the object was twenty-three centimetres. The time of exposure was thirty-five minutes.

In the photograph, the only parts of the abdominal contents that are visible are the parts that contain the lead-acetate solution. It cannot be claimed, however, that the outlines of the stomach and intestinal loop are at all well defined, which is explained, perhaps, by the circumstance that the solution leaked out into the abdominal cavity.

To obtain a photograph of the human stomach a solution is necessary having two properties: (1) it must not injure the stomach of the subject to be photographed; (2) it must be impenetrable to the Röntgen rays. Then it will be important to observe in what dilution these solutions may yet refuse penetration to these rays of light.

In No. 18, April 30, 1896, of the same journal, Dr. Carl Wegele, of Königsborn, Westphalia, in commenting upon Becker's experiment, suggests the introduction of his spiral electrode into the stomach in such a manner that it should come to lie along the greater curvature of the stomach. A small coin is suggested to be placed over the umbilicus. Both the metal of the electrode and the coin would show in the photograph and thus some idea of the location of the stomach might be obtained. This would, however, give no impression of the size of the organ as the metal of the electrode would in favorable experiments map out the greater curvature only. Although the duration of exposure for the Röntgen method has been much shortened by the improved technique of the physical laboratory of the University of Jena, the plan to determine the location and size of the stomach by the Röntgen photography can hardly be considered anything but circuitous.

A rapid and most reliable method of determining the location of the stomach is by Einhorn's electrodiaphany; and its capacity and also its location can be readily ascertained by the use of my intra-gastric, deglutable, elastic-rubber bag.[1]

The liquor plumbi subacetatis used by Dr. W. Becker is not a solution of simple plumbic acetate, but contains also oxide of lead in the proportion of three of the former to one of the latter; besides being poisonous, it acts upon mucous membranes like a corrosive. I do not consider the use of the Röntgen method, on account of its complexity and long duration of exposure, as practical for determining the size and location of the stomach; if, however, one wishes to experiment with it to ascertain whether there is any value in it, I would suggest that the solution of plumbic acetate be injected into my intra-gastric, stomach-shaped rubber bag. These bags as made by Tieman & Co., of New York, for me, can be made strong enough to hold sufficient of the solution to distend the adult stomach, and at the same time can be swallowed easily or pushed down, after they are folded over a thin esophageal tube. When the bag which has exactly the shape of the stomach, has reached the cavity of the organ, the plumbic acetate solution can be slowly filled in through the mouth by means of the esophageal tube until the bag is distended far enough to closely apply itself to the gastric walls. The umbilicus might be marked by a coin as suggested by Wegele. A photograph taken in this manner would give, not only a part of the stomach, but the entire organ and show its location and size. After the exposure the solution of plumbic acetate would have to be removed by aspiration, for which a stomach-pump would be useful for speedy evacuation.

Recently a method for intubating the duodenum has been described by the author,[2] which makes it conceivable that elastic bags may be introduced into and distended in the duodenum for diagnostic purposes and also for similar experiments as those suggested in this report. (See also article on "Intubation des Duodenum," in Boas's Archiv für verdauungs Krankheiten, Band ii, Heft 1, by the author.)

ADDENDUM.

Plumbic acetate precipitates albumins, proteids, albuminoids. It is essential, therefore, to have the India-rubber, intra-gastric bag made of pure gutta-percha. Recently I made a number of experiments in the biological laboratory of the Johns Hopkins

[1] Hemmeter: Motor-functions of the Human Stomach, etc., New York Medical Journal, June 22, 1895, p. 771.

[2] Hemmeter: Intubation of the Duodenum, Johns Hopkins Hospital Bulletin, April, 1896.

University on the resistance of gutta-percha bags to acetate-of-lead solutions. It was found that in very thin bags of this material, tiny spots of some proteid substance occur at times, which are corroded by the plumbic acetate, producing pin-point holes. This, however, resulted only when concentrated solutions of the salt were used. Still it is very important to assure one's self that the intra-gastric bag is intact, by pouring the solution into it outside of the body first. Also by using as weak a solution as will suffice to cut off the Röntgen rays. As it is a well-established fact that bone tissue is particularly impervious to this form of light, an emulsion of bone powder suggests itself as a proper substance with which to distend the intra-gastric bag.

GYMNASTICS IN HEART DISEASES.[1]

BY DR. CLAES J. ENEBUSKE.

THE term "gymnastics" has not acquired a generally accepted definition in the English language, so far as I have been able to learn. A reasonably clear presentation of the subject, the discussion of which, by your courteous invitation, I shall have the honor to open here to-night, depends in no small degree upon an agreement at the outset of the actual meaning of the term gymnastics, inasmuch as it must be one of the fundamental technical terms in my paper. Therefore, I solicit your generous patience with a few general introductory remarks about gymnastics from my present standpoint, before I pass over to my particular subject.

For my present purpose, I wish to define gymnastics from its theoretical aspect as, the attempt to understand the activity of the human body, which expresses itself in its movements and postures, as far as it can be understood by the aid of present biological knowledge, and especially the attempt to understand, as far as possible, their effects upon the body. The results, gathered from these attempts, form the contents of the "theory of gymnastics," if that term may be spoken at present.

I wish to define gymnastics from its practical aspect as, the attempts to utilize the theoretical knowledge of the movements and postures in such a way, that they may become means to serve the purpose of ameliorating the body.

It is, therefore, the definition of the postures and movements, with regard to form and degree of activity for the said purpose, which determines them as gymnastic in contradistinction to others.

Moreover, the selection of such defined postures and movements and combining them in such a way that they together shall yield the best possible results in the desired direction, that is, combining them to what is called in the gymnasium a "gymnastic day's order,"[2] and in the "gymnastic clinic,"[2] a "gymnastic prescription,"[2] is what constitutes a gymnastic lesson or a gymnastic treatment in contradistinction to other forms of physical exercises.

Finally, the substitution at proper time of a given gymnastic day's order or gymnastic prescription by another of modified composition, so as to meet the change in condition of the individual engaged in the gymnastic lessons or receiving the gymnastic treatment, causing a rational progression of the postures and movements to take place parallel with the change in the condition of the individual, is what constitutes a course in rational gymnastics or in gymnastic treatment in contradistinction to other courses of exercises.

I said that the amelioration of the body is the purpose. The amelioration may be understood as the amelioration of the healthy individual, so that he may actualize in his body the most of his possible physical beauty, strength and efficiency. Gymnastics for this purpose have been called "pedagogical gymnastics," and, through the pedagogical profession, they serve, in the first place, the schools and higher educational institutions. The gymnastic pedagogy, by its near relation to the subject of school hygiene, is related to the physician's interest. On the other hand, the amelioration of the body may be understood as the amelioration of the diseased body, that is, the postures and movements may be defined to serve the purpose of alleviation and cure of disease. Gymnastics for this purpose, as far as they actually adapt themselves for this purpose, serve medicine and demand a place in materia medica. They have been called "medical gymnastics," and by the inner order of the things they have the same relation to the business of the medical profession as the pedagogical gymnastics have to the business of the pedagogical profession.

The postures and movements needed for the purpose of pedagogical gymnastics have generally a different character, are more active than those generally needed for medical purposes, which sometimes are entirely passive. However, in the preparatory training under pedagogical gymnastics of weaker, yet healthy individuals, postures and movements are often needed, which resemble or are identically the same as those used in medical gymnastics. On the other hand, in the treatment of patients by medical gymnastics, particularly in the after-treatment, postures and movements of the same character as those used in pedagogical gymnastics are often employed. The boundary-line between pedagogical and medical gymnastics cannot be clearly drawn by stating that such or such movements and postures are pedagogical gymnastics and such others are medical gymnastics. The movements and postures are common, belonging to both branches. The distinction lies in the purpose to which they are adapted. They are pedagogical gymnastics when they serve education and are administered by persons qualified to serve education; they are medical gymnastics when they serve medicine and are administered by persons qualified to serve medicine.

The title of my paper, "Gymnastics in Heart Diseases," may perhaps at first impress with an accent of novelty. I feel confident, however, that if, by your courtesy, gentlemen, the definitions of the terms gymnastics and medical gymnastics, which I have suggested, are adopted by you during the discussion of my subject to-night, a few words only may suffice at the outset to divest the title of my paper of all trace of novelty. When, ages ago, a physician advised a sufferer from heart disease to go to bed and by the reclining posture the embarrassment of his insufficient heart-action abated, a gymnastic remedy was successfully employed. When you advise your heart patient to go to bed, or to sit up, or stand up, or begin to walk, to walk about more, to begin to walk downstairs and upstairs and so forth, you deal with gymnastic measures from the standpoint of my definition. In

[1] Read, by invitation, before the Boston Society for Medical Improvement, February 24, 1896.
[2] Translations of Swedish terms.