of the shape of the abdomen, it is difficult to prevent the occurrence of congestion of the kidney. This occurs because of compression of the renal vein between the aorta and the kidney. It could be prevented by putting the new kidney exactly at the place of the extirpated one.

This operation is not dangerous. Of seven animals operated on, six remained in good health. The seventh died of intestinal intussusception four days after the operation.

29 (172)

Secondary peristalsis of the esophagus — a demonstration on a dog with a permanent esophageal fistula.

By **S. J. MELTZER.**

[*From the Rockefeller Institute for Medical Research.*]

The peristalsis of the esophagus with which every one is familiar is that which follows an act of deglutition. About a year ago I reported to this society that experiments which I had made on rabbits demonstrated that the esophagus is capable of peristaltic movements not initiated by deglutitions. Injections of indifferent solutions or of air directly into the esophagus cause there a regular peristaltic movement. This latter form of peristaltic movement, which for the sake of brevity I shall henceforth term *secondary peristalsis*, differs from the *primary peristalsis*, the one which follows deglutition, essentially through the nervous mechanism by which it is controlled. All the movements of the complicated act of deglutition are managed by a reflex mechanism, with only one sensory stimulus for its initiation and a series of consecutive motor impulses going to every part of the long path of deglutition; it is practically a single reflex. The reflex mechanism of the secondary peristalsis, on the other hand, consists of a chain of reflexes; each part of the esophagus sends up to the center a sensory impulse started by the presence of the bolus in that part and receives in turn a motor impulse. The secondary peristalsis therefore requires the presence of some sort of a bolus within the esophagus and presupposes the integrity of the latter; whereas the primary peristalsis requires neither a bolus nor the integrity of the esophagus;

even if a large section of the latter is removed, the peristalsis appears in the lower segment in due time after each deglutition as long as the vagus nerves remain intact.

Recently secondary peristalsis was studied in the esophagus of dogs, in which animals it appeared promptly and was easily demonstrable. The bolus consisted mostly of a piece of absorbent cotton attached to the middle of a long thread, one end of which ran through an opening in the floor of the mouth and the other through an opening in the stomach. The animal was of course narcotized but anesthesia interferes greatly with both forms of peristalsis. The observations however were made when the animal recovered from the anesthesia. It was found that the bolus went down to the stomach from any part of the esophagus without being started by a preceding deglutition. The bolus had to be of a certain size; if too small it was either without effect or the effect set in late and the movement was slow and irregular. When the bolus was kept by force in one place for a long time that place lost the promptness of its irritability. It recovered this again, however, a few minutes after the removal of the bolus. I shall not enter upon further particulars except to mention the observation made by Dr. Auer and myself that section of one vagus will remove the secondary peristalsis, while the primary peristalsis is but very little affected.

The chief object of the present communication was a demonstration of both forms of peristalsis in a dog with a permanent fistula in the upper half of the cervical esophagus. I introduced into the fistula an olive-shaped body of hard rubber to which a long thread was attached. The thread ran over a rod and had a paper fan at the opposite end. When the olive-shaped body traveled down into the stomach the fan was observed to move upwards. When the olive-shaped body was placed into the lower half of the cervical esophagus it remained in that place without moving downwards. A deglutition, on the other hand, carried it down into the stomach. But when the olive-shaped body was placed into any part of the thoracic esophagus it was promptly carried down into the stomach without the aid of a preceding deglutition. When the olive-shaped body was held back by force for some time, it was not carried down spontaneously — a deglutition, how-

ever, carried it down promptly. These facts mean that the thoracic esophagus, which remained normally innervated, manifested secondary and primary peristalsis. Retention of the olive-shaped body in one place for some time fatigued the sensory nerve fibers and thus impaired the mechanism of the secondary peristalsis, but the primary peristalsis which required only intact motor nerves remained unaffected. In the cervical part, however, the innervation of the left side of the esophagus was greatly impaired or perhaps even abolished by the operation and the abnormal adhesions.

We see from the last mentioned results, therefore, that the secondary peristalsis is completely abolished, while the primary peristalsis is practically intact, which is in harmony with the above mentioned observations of Dr. Auer and myself of the effect of section of one vagus upon the secondary peristalsis of the esophagus.

30 (173)

Peristaltic movements of the rabbit's cecum and their inhibition, with demonstration.

By **S. J. MELTZER** and **JOHN AUER.**

[*From the Rockefeller Institute for Medical Research.*]

The rabbit's cecum fills nearly one half of the abdominal cavity and is full of food, which has to get into it and leave it again by some moving force. Nevertheless we find in the literature practically no statement on the movements of that organ. There is good reason for it. When the abdominal cavity of a rabbit is opened the cecum as a rule shows no motion. We wish to report that according to our observations, that organ exhibits well marked and quite regular peristaltic movements; but these can be seen only in the normal animal. When a well fed rabbit is fastened on its back on a holder and the hair of the abdomen is removed, as a rule movements of the cecum can be seen sooner or later. The movements are well marked and characteristic in their appearance, and leave no doubt as to the organ in which they take place. We shall mention only a few details in this communication. As a rule, especially in well fed rabbits, the movements begin in the colon and travel towards the small gut, that is, they are antiperistaltic in