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The Technics of Maunsell's Method of Intestinal Anastomosis,

WITH A RÉSUMÉ OF THE CASES OF OPERATION TO DATE.

BY

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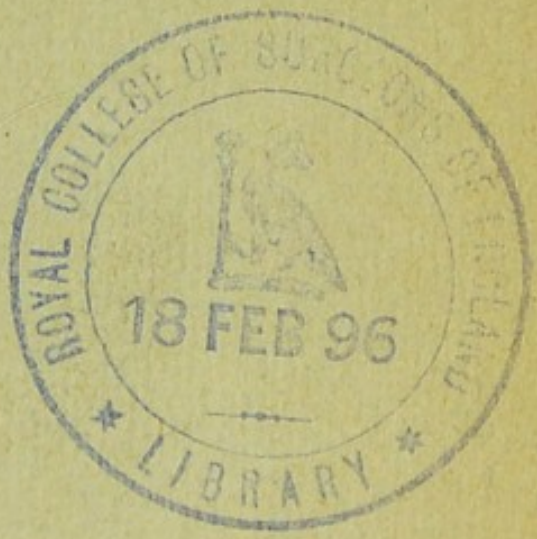

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THE TECHNICS OF MAUNSELL'S METHOD OF INTESTINAL ANASTOMOSIS,

WITH A RÉSUMÉ OF THE CASES OF OPERATION TO DATE.*

By FREDERICK HOLME WIGGIN, M. D.,
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Soon after the publication by the writer, in the *New York Medical Journal* of January 20, 1894, of the report of a successful case of intestinal anastomosis effected by Maunsell's method, a letter of congratulation was received from the late Professor H. Widenham Maunsell, who had recently removed from New Zealand to London. He stated that he was dissatisfied with the published description (*American Journal of the Medical Sciences* for March, 1892) of his method of intestinal suture. Last winter, after the publication by the writer in the *New York Medical Journal* of December 1, 1894, of an article entitled Intestinal Anastomosis, read before this association on October 11, 1894, in the course of which a comparison

* Read at the twelfth annual meeting of the New York State Medical Association, October 17, 1895.

was made between Maunsell's method and that of Murphy, of Chicago, so much interest was shown in regard to the former method, and so many inquiries were made for information as to various details of the technics, and as to where a description of the method could be found, that a letter was addressed to Dr. Maunsell, requesting him to revise and republish his article. Unfortunately, before this letter reached its destination, Professor Maunsell had died from an attack of the *grippe*. A friend, in announcing the unhappy event, said: "Science has lost a devoted and enthusiastic student." The same letter conveyed a request from Mrs. Maunsell that the writer should undertake the revision and publication of the article which he had requested Dr. Maunsell to rewrite. The task the writer now undertakes as a tribute to the genius which conceived and the courage which first executed this admirable surgical procedure, and as an acknowledgment of the debt which he is confident time will prove intestinal surgery owes to this distinguished surgeon.

Technics of Maunsell's Method of Intestinal Anastomosis.—The patient having been prepared in the usual manner for the performance of a laparotomy, and having been anæsthetized, the operation is begun by making a median incision in the abdominal wall below the navel, extending it upward if it prove to be necessary. This opening permits a quick and thorough search to be made for the diseased or injured portion of the bowel. For operations on the appendix vermiformis, the cæcum, or any part of the ascending or descending colon, the rule is to make an incision over the site of disease or injury, if it can be localized. In all doubtful cases the median incision is to be preferred. The abdomen having been opened, and the portion of the intestine to be excised located, it is brought outside of the cavity, accompanied by about six inches of

healthy intestine on either side. It is next emptied of its contents above and below the diseased part by passing it between the finger and thumb and gently compressed. The empty gut should be clamped on either side of the diseased portion of the bowel at points six inches distant, to prevent the escape of fæcal matter at the time of excision, or during the subsequent manipulations, either by the clamps devised by Dr. W. S. McLaren, of Litchfield,

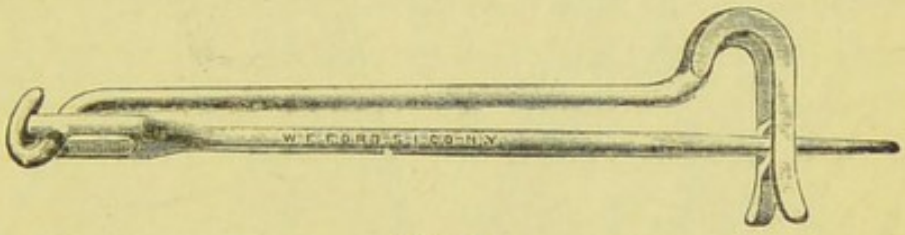

Fig. 1.

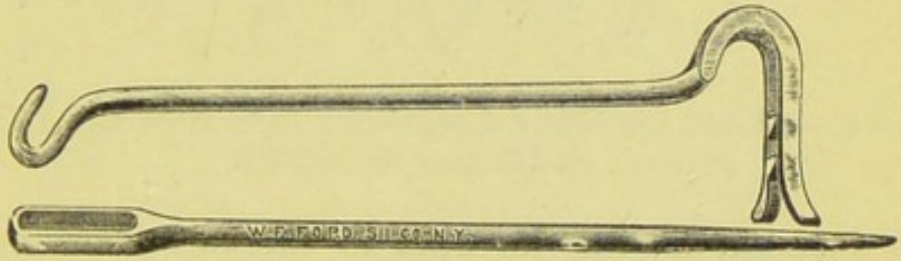

Fig. 2.
McLaren's clamps.

Conn., or by those improvised as suggested by Maunsell from a safety pin and a sponge, as shown in Fig. 3.

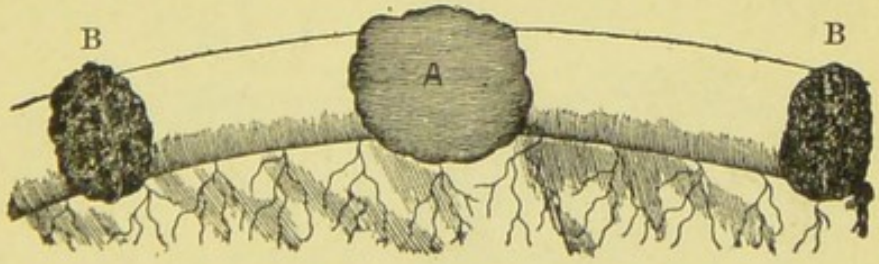

Fig. 3.—A, cancerous, gangrenous, or injured portion of intestine; B B, sponges with safety pins clamping the empty bowel on either side of the diseased or injured structure.

The general peritoneal cavity is shut off by flat sponges which have been rendered sterile and wrung out in hot saline solution, and the exposed portion of the bowel

should be protected by the same means. The portion of the intestine to be removed is excised by means of a V-

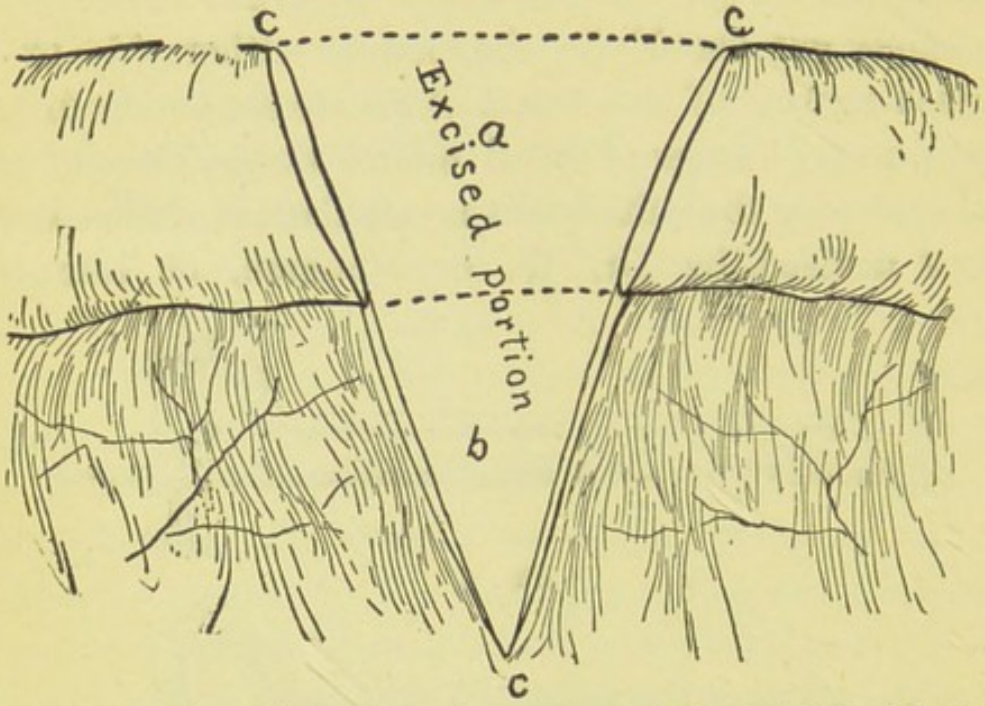

Fig. 4.—*a b*, portion of intestine and mesentery to be removed; *b b*, mesentery; *c c c*, lines of the incision.

shaped incision having its apex in the mesentery and its lateral borders on either side of the diseased point.

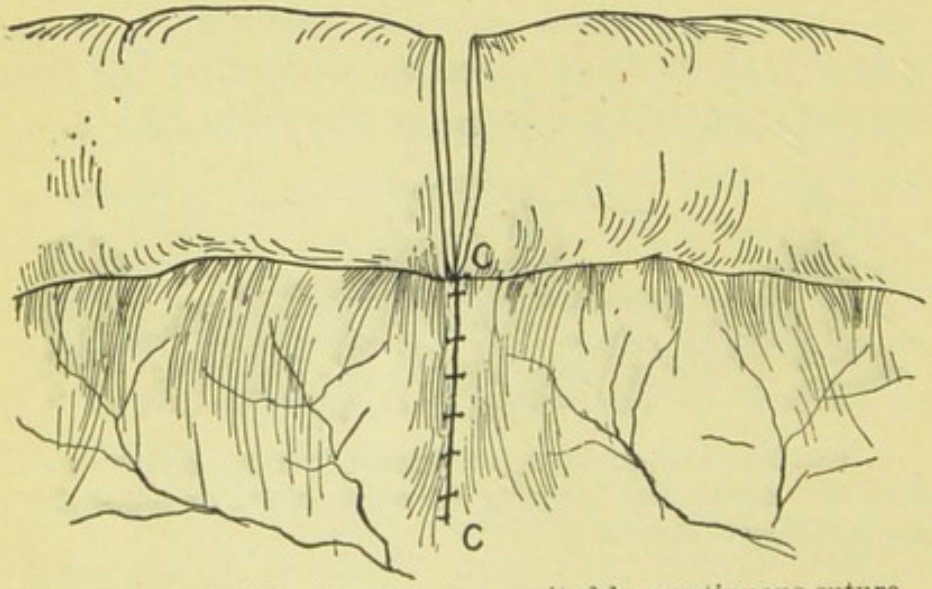

Fig. 5.—*c c*, incision in mesentery united by continuous suture.

The mesenteric vessels are ligated before being cut by passing a needle armed with catgut around them, and tying

it, as suggested by Halsted; or they can be picked up and ligated as they are divided. The wound in the mesentery is closed by means of a continuous or interrupted suture, as seen in Fig. 5.

After the divided ends of the intestine have been carefully washed with a hot saline solution, followed by a small quantity of a fifteen-volume solution of hydrogen dioxide, the proximal and distal ends are united primarily by means of two temporary sutures which are passed through all the intestinal coats, are tied, and the ends left long.

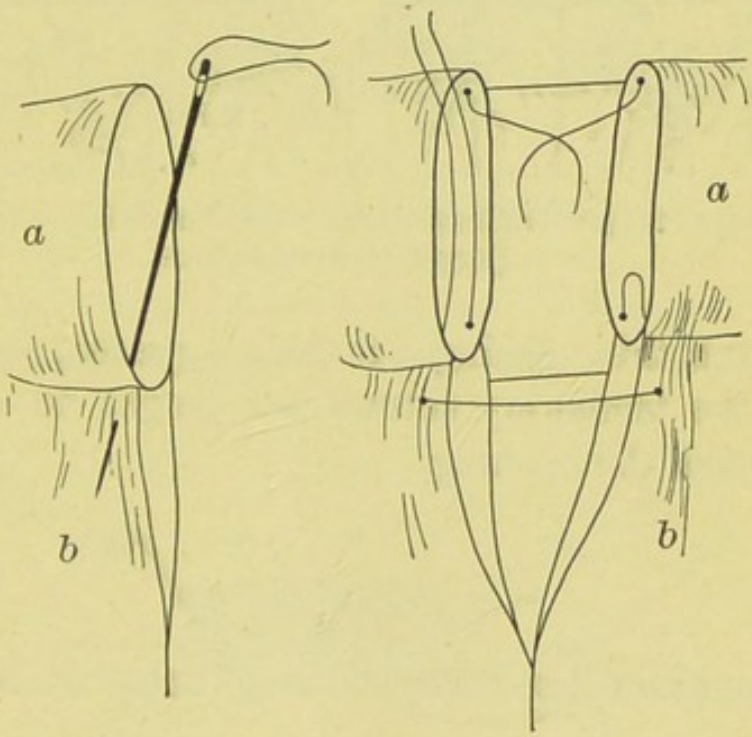

FIG. 6.—*a a*, segments of bowel; *b b*, segments of mesentery.

The first suture is placed at the inferior or mesenteric border, and is passed in such a manner as to include a portion of mesentery on both sides, as is shown in Fig. 6, and the second is placed directly opposite at the highest point of the superior border.

A longitudinal incision, an inch and a half long, is next made in the superior border of the larger intestinal segment, two inches from its severed end, by pinching up the

intestinal coats between the finger and thumb, and dividing them with a narrow-bladed knife (shown in Fig. 7).

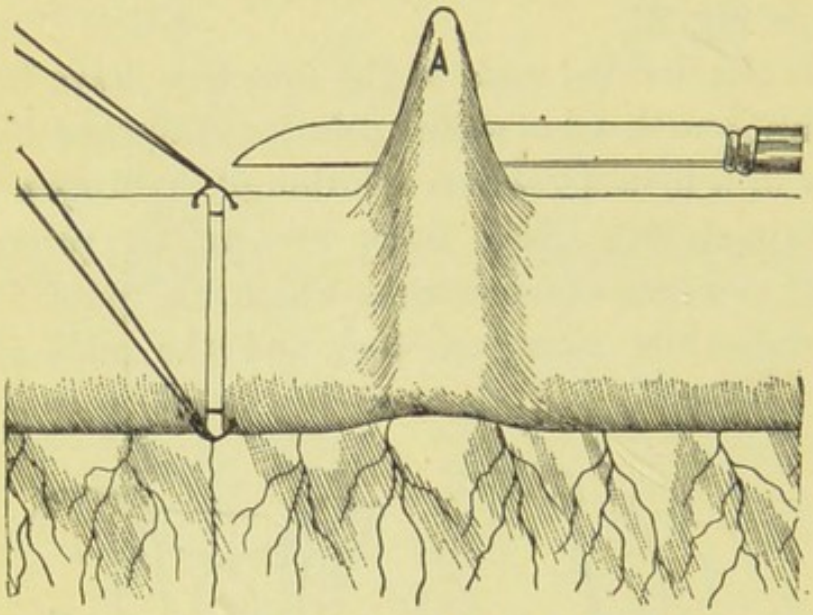

FIG. 7.—A shows the point of longitudinal incision made in the superior border of the larger intestinal segment.

Through this opening a forceps is passed, and the long ends of the temporary sutures are caught up and drawn back through the opening.

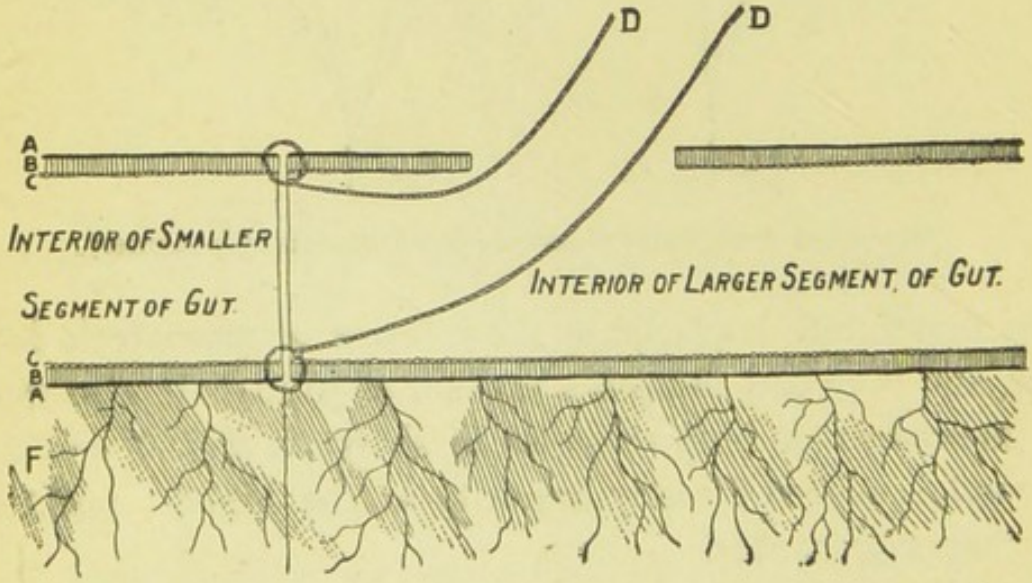

FIG. 8.—Longitudinal section of gut, showing A A, peritoneal coat; B B, muscular coat; *c c*, mucous coat; D D, temporary sutures passed into the bowel and out through the longitudinal slit made in the larger intestinal segment F, mesentery.

By now drawing on these sutures, the ends of both segments of the bowel are invaginated and made to appear through the longitudinal incision as concentric rings. Figs.

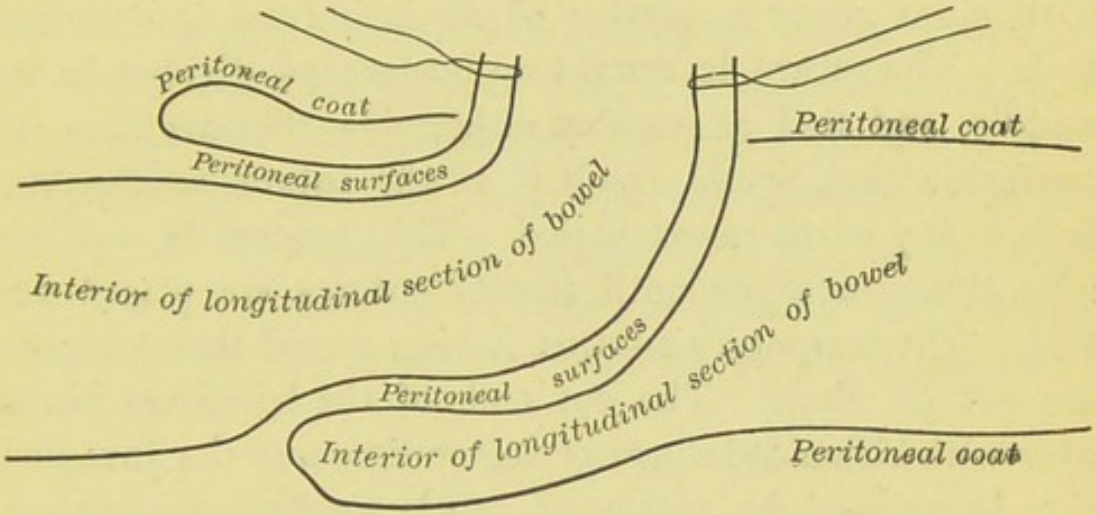

FIG. 9.—Longitudinal section of intestine, showing the relative position of the peritoneal coats of bowel invaginated at the longitudinal opening.

9 and 10 show this to have been accomplished, and the peritoneal surfaces are seen to be in contact on all sides.

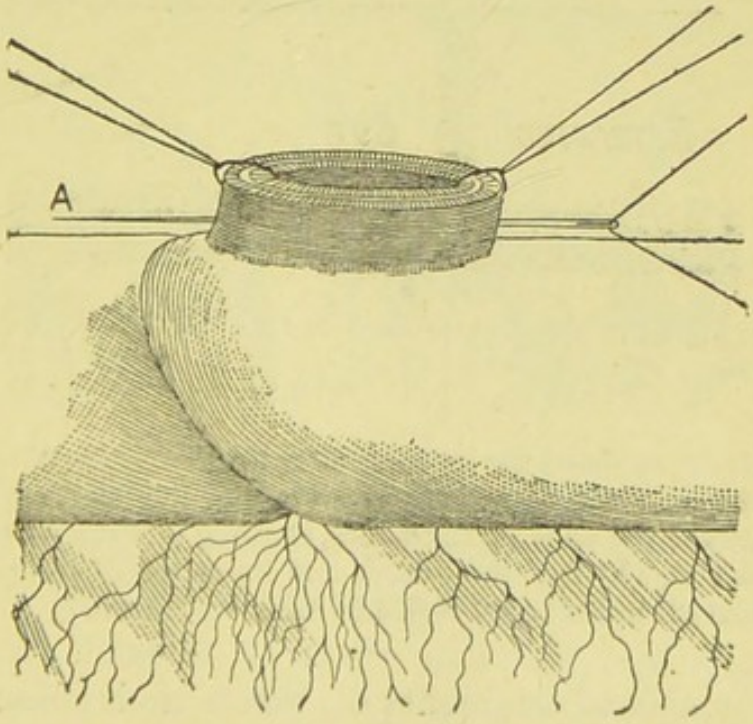

FIG. 10.—A shows the needle passed through both sides of the bowel and through all the intestinal coats, and shows that one passage of the needle places two sutures.

The ends of the long temporary sutures previously alluded to are held by an assistant while a fine, straight needle (milliner's No. 6), armed with a strand of horsehair, is passed through all the coats of the bowel and through both sides about a quarter of an inch from the divided ends. The suture is caught up by forceps, divided in the middle, and tied at once on either side, thus avoiding the confusion that would result if all the sutures were passed before any of them were tied. This process is repeated nine times more, or until twenty sutures are placed and tied. The temporary sutures, having served their purpose, are cut off short. The cut ends of the bowel are dusted over with either iodoform or acetanilide, and the invagination is reduced by means of gentle manipulation accompanied by slight traction. The edges of the longitudinal opening are turned in, and it is closed by Lembert sutures passed through the peritoneal, muscular, and submucous coats.

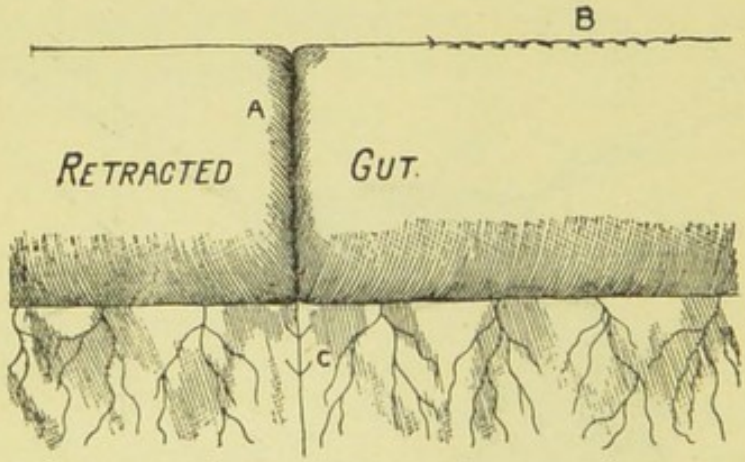

FIG. 11.—This figure shows the intestine after the completion of the anastomosis and the reduction of the invagination. A, line marking the point of union between the ends of the bowel, showing that the peritoneal coat is well turned in, and that the sutures and knots are all inside the gut; B, longitudinal slit in the bowel closed by Lembert sutures.

Anastomosis of segments of ileum and colon may be effected by this method in the following manner:

A temporary suture is passed through all the coats of

the greater and lesser intestinal segments at their mesenteric border, care being taken to adapt this border of either segment to the corresponding border of the other. This suture is tied and the ends left long. A second temporary suture is passed through the side of the larger segment at the point where the superior border of the smaller segment touches it, and through which the suture is also passed, tied, and the ends left long. A third suture is passed through all the coats of the highest free end of the larger segment. The location of these sutures and the accurate adaptation of the mesenteric borders of the segments is shown in Fig. 12.

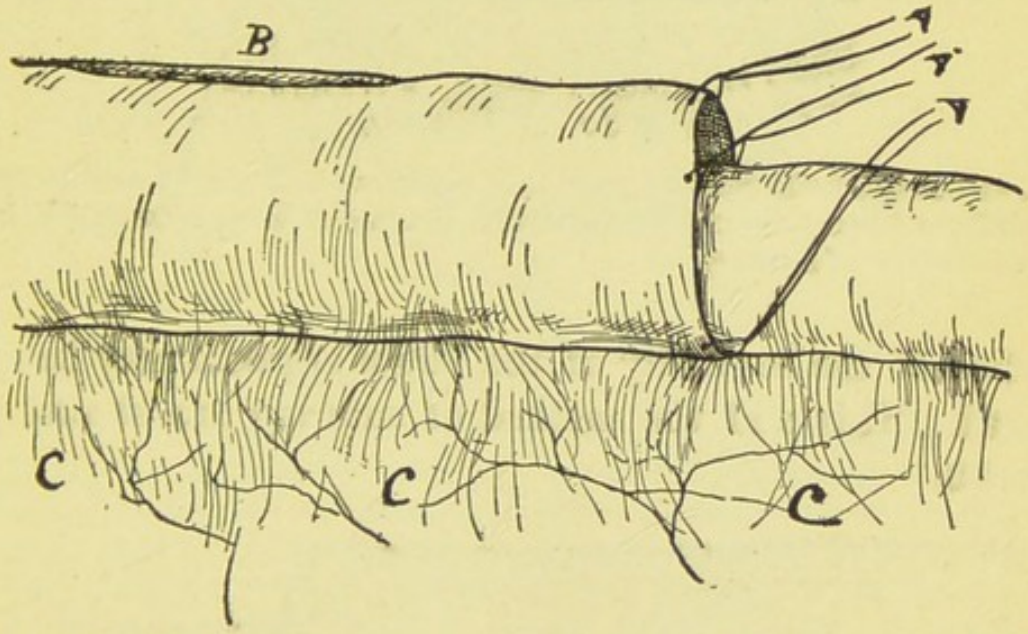

FIG. 12.—A A A, temporary sutures passed through all the coats of both segments; B, longitudinal slit made in the superior border of the larger bowel; C C C, mesentery.

A longitudinal incision is made in the superior border of the larger segment two inches from the divided gut. The ends of the temporary sutures are now drawn through this opening, traction is made, and the free edge of the larger segment is inverted and invaginated, being accompanied by the smaller segment which is only invaginated, and the free edges of the intestine now appear in the longi-

tudinal opening as concentric rings. If the difference of calibre between the two segments is great, a V-shaped

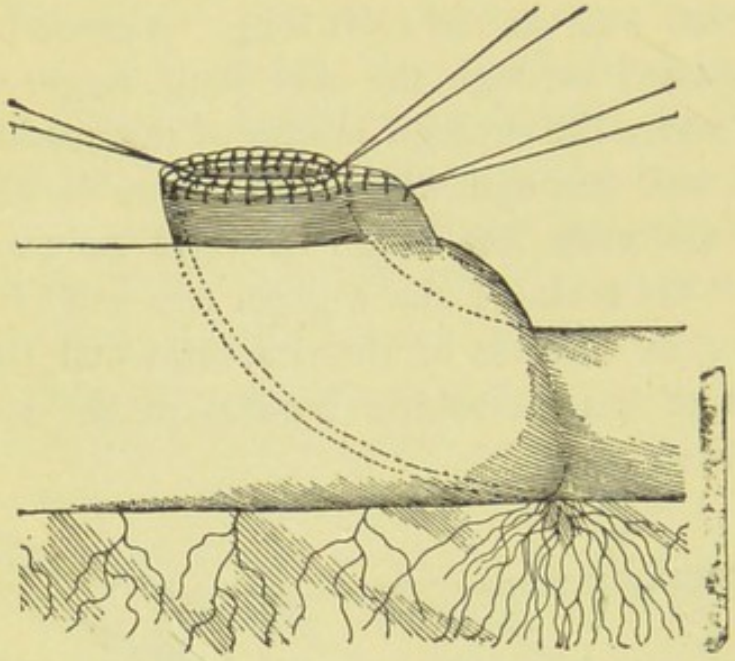

FIG. 13.—Diagram showing the union by invagination in a case where a decided difference in calibre exists between the segments of bowel to be united, and the method of suturing.

portion of the convexity of the larger segment may be removed. This and the method of suturing are shown in Fig. 13.

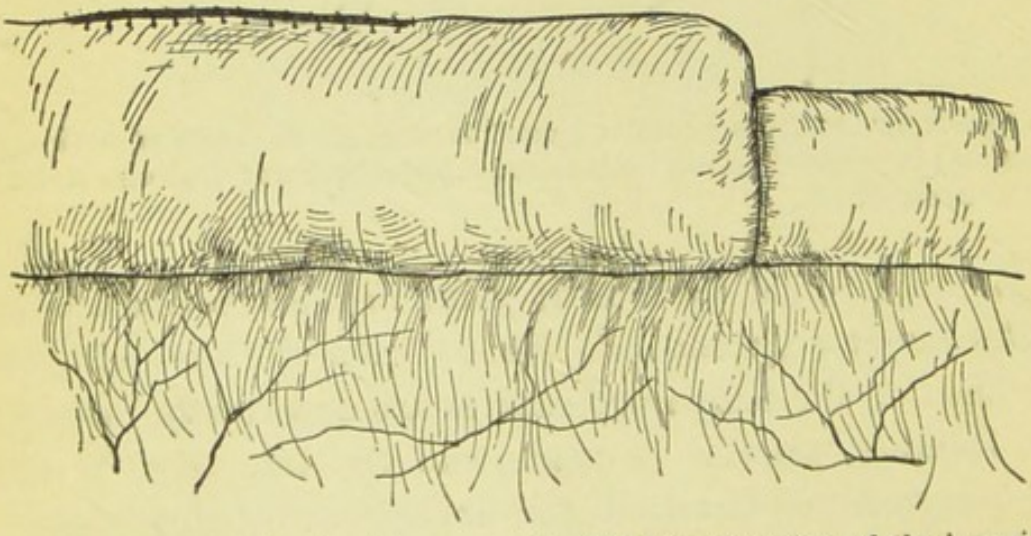

FIG. 14.—Diagram showing the segments after the reduction of the invagination, and the closure of the longitudinal incision in the superior border of the larger segment.

The intussusception is reduced and the longitudinal slit is closed, as previously described :

Gastro-duodenostomy or Gastro-enterostomy.—Prior to the performance of operations on the stomach, the patient is deprived of food for two days and the stomach is cleansed by several irrigations with an antiseptic solution during this interval. The patient having been anæsthetized and the abdomen opened by means of either a transverse or a longi-

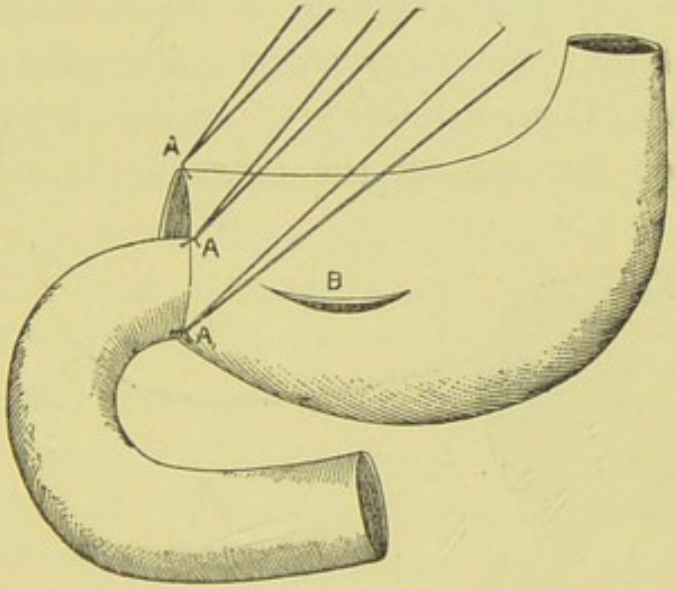

FIG. 15.—A A A, temporary sutures with the ends left long, uniting the cut surfaces of the stomach and duodenum ; B, longitudinal opening in the stomach. Through this slit the free ends of the temporary sutures are passed, and by making traction on them the invaginated cut ends of both the duodenum and the stomach are drawn through the opening and the sutures placed from the inner side, as has been previously described.

tudinal incision, Fig. 15 shows how, after pylorectomy, the duodenum may be united to the stomach by means of this method.

Owing, however, to the partial fixation of the duodenum, this method is only applicable to cases in which the growth is confined to the pylorus. When the disease is extensive, it is better to anastomose the jejunum to the stomach at a point on its greater curvature. Gastro-enterostomy is performed as follows :

A portion of the jejunum, as close to the duodenum as possible, is drawn out of the abdominal cavity, emptied of its contents, and clamped. A portion of the greater curvature of the stomach is also drawn into the wound, and the jejunum is brought into contact with and united to it by several Lembert sutures in such a way that there will be as little strain as possible on the usual permanent sutures after they are placed and tied. A longitudinal opening, an inch and a half long, is then made in the superior border of the gut. The corresponding opening in the stomach should be an inch above the greater curvature and parallel to it. The extreme ends of these wounds are now united by temporary sutures passed through all the coats of the stomach and

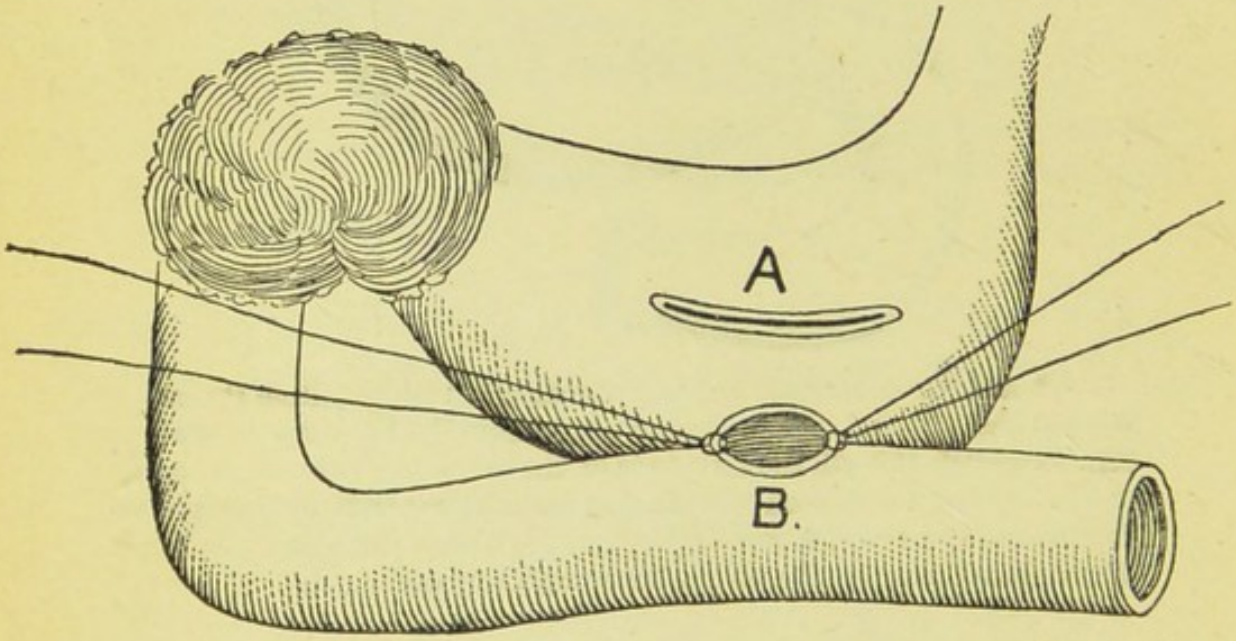

FIG. 16.—A, opening in the centre of the stomach (where the vessels are very small) through which the cut edges of the corresponding openings, B (united by temporary sutures), made in the longitudinal axis of the upper end of the jejunum and in the line of the greater curvature of the stomach, may be invaginated and sutured in the usual manner from the inside.

intestine, and the sutures are tied, the ends being left long. An opening is now made near the centre of the stomach sufficiently long to allow of the invagination of the openings already made in both bowel and stomach. This hav-

ing been accomplished, the openings are sutured in the manner already described, the needle passing through all the coats of the intestine and stomach. The invagination is reduced, and the slit in the centre of the stomach is closed by means of Lembert sutures.

When the disease is located in the cæcum or in the ileo-cæcal valve, ileo-colotomy may be performed as follows, instead of in the manner previously described:

The diseased cæcum having been completely excised, an opening is made in the side of the healthy colon two inches from its cut end; into this opening the free end of the ileum is inserted. The temporary sutures are applied, tied, and brought out through the cut end of the colon, and, traction being made on them, the cut edge of the colon and free end of the ileum are invaginated and drawn through the free end of the colon. The sutures being applied in the manner previously described, the invagination is reduced. The free end of the colon is turned in to the extent of an inch, and the opening is closed by a row of Lembert sutures, care being taken to pass the needle through a few shreds of the submucous, as well as the peritoneal and muscular, coats, as advised by Halsted.

When the diseased cæcum can not be excised, owing to the existence of firm and long standing adhesions formed between this portion of the bowel, the right ureter, and the iliac vessels, ileo-colostomy should be substituted for ileo-colotomy. The diseased cæcum and the ileo-cæcal end of the ileum having been emptied of their contents, clamps are applied four inches on either side of the diseased structure. The ileum is divided. The end of the ileum which is attached to the cæcum is invaginated, and the opening closed by means of Lembert sutures. An incision is made in the convex surface of the colon large enough to receive the free end of the ileum, which is attached to the

edges of the cut in the colon by the usual temporary sutures. An opening is now made in the colon two inches higher up, through which opening a forceps is passed and the ends of the temporary sutures are seized, and by their aid the free end of the ileum and the edges of the opening in the colon to which it has been attached are invaginated and drawn out through the upper slit in the colon. The permanent sutures are passed as usual, tied, and cut off short. The invagination is reduced, and the longitudiual opening in the colon closed.

An irreducible intussusception is treated in the manner shown in Fig. 17. A slit is made in the intussuscipiens and

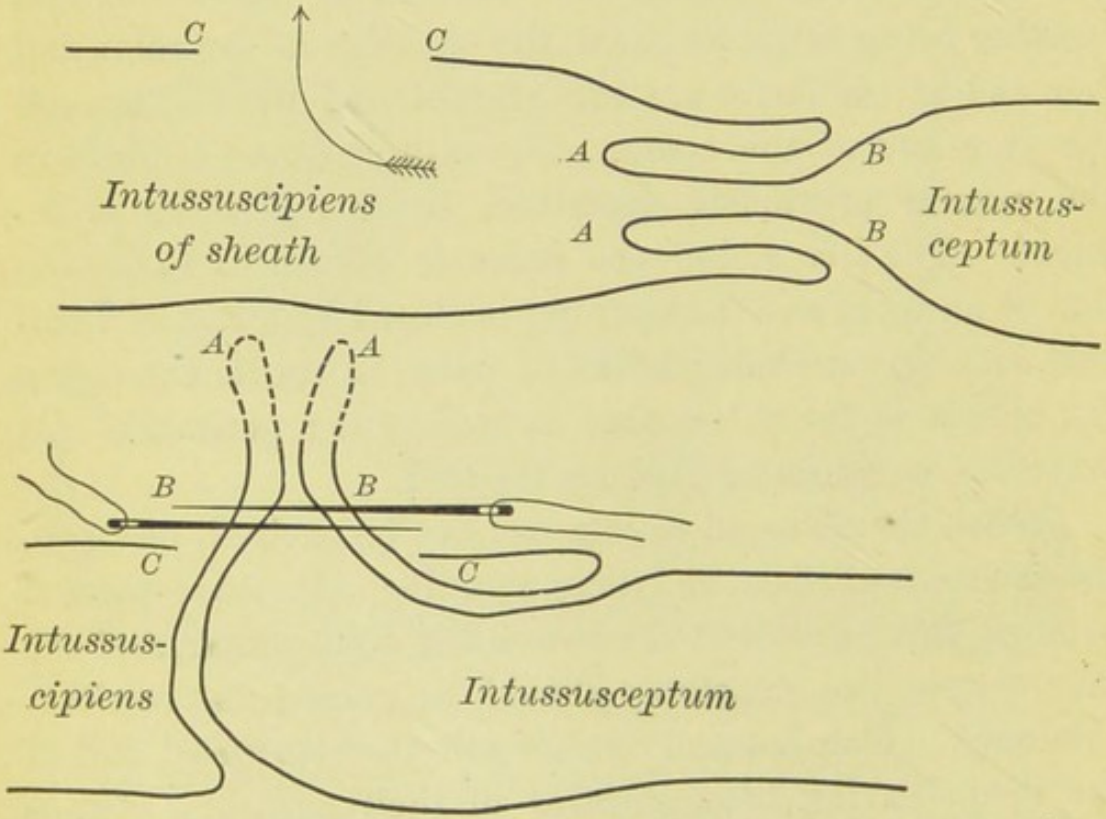

FIG. 17.—Diagram of longitudinal sections of intestine, showing an acute irreducible intussusception and the method of its treatment. C C, longitudinal opening made in the superior border of the intussuscipiens; A A, tip of the intussusceptum; B B, neck of intussusceptum.

gentle traction made on the intussusceptum until its neck appears outside the opening in the intussuscipiens. The base is then transfixed with two fine straight needles armed

with horsehair, and the intussusceptum is amputated a quarter of an inch above the needles, leaving a fair stump beyond them. The sutures are now passed through the invaginated bowel, caught up in the interior of the bowel, divided, and tied. The ends of these sutures are left long and used as retractors in place of the regular temporary sutures while the other sutures are being placed and tied. This having been done, they are cut off short, the invagination is reduced, and the longitudinal slit is closed. The object of transfixing the neck of the intussusceptum previous to its amputation is to prevent it from retracting, and it also insures the maintenance of the proper relative positions of the different layers.

The various experimental intestinal anastomoses which in the past few years the writer has performed in accordance with this method on dogs have proved the following points in the technics to be of consequence:

1. The longitudinal slit which is made in the segment of bowel having the greatest calibre (proximal or distal), and through which the invagination occurs, should be located at least two inches from the cut end of the bowel.

2. The mesentery of both segments must be included in the first temporary suture which is passed at this intestinal border; this prevents sloughing of the bowel at this point.

3. The sutures should be placed at least a quarter of an inch from the cut intestinal edge; they should be interrupted, about twenty in number, and should not be drawn too tightly when they are tied.

4. The best suture material for this work is carefully tested and prepared horsehair.

5. The needle best adapted to this work is a round, straight one (milliner's, Nos. 6 to 9).

6. The invagination after the sutures have been placed

must be carefully reduced, rather by manipulation than by traction, otherwise the sutures may cut out.

7. In closing the longitudinal slit too much of the intestinal edges should not be turned in or a contraction may result at this point.

The special claim of this method of intestinal suture to recognition and further practical trial rests upon the lack of special appliances needed for its performance; its adaptability to every portion of the intestinal tract; the ease, rapidity, and safety with which an intestinal anastomosis can be effected by its aid; and the fact that no time need be lost in determining the direction in which the invagination should be made.

The objections made to this operation, which experience has proved groundless, are: First, that the sutures pierce the mucous as well as the other intestinal coats. This point Professor Maunsell considered an advantage, for he said "firmly suturing all the coats gives great healing capacity to the ends of the bowel, and the stitches are not likely to tear out." That this objection is not a valid one is proved by the fact that no failure to secure a good result has occurred from this cause in any of the cases of which we have record where an intestinal anastomosis has been performed in accordance with this method, nor has there been the slightest evidence of leakage having taken place. The second and last objection that has been urged has been the possible danger of cicatricial contraction causing stenosis at the point of union. This fear has proved, in the writer's experience, to be without foundation, the patient upon whom the writer operated (performing enterectomy with removal of six inches of the ileum for a perforation following an abdominal contusion) on September 12, 1893, having remained in perfect health and free from bowel symptoms for more than two years. I now have

the pleasure of presenting this patient to you. Again, on October 9, 1894, an intestinal anastomosis according to this method was performed by the writer on a dog before the Litchfield County (Conn.) Medical Association. The dog made a good recovery and remained in good health till April 23, 1895, when he was killed and a necropsy performed before the same association. The intestinal scar at the point of union was barely visible, there was no ocular evidence of contraction, and there were no intestinal adhesions.

It has from time to time been suggested that after the sutures have been placed according to this method and the invagination has been reduced, it would be wise to place as an additional safeguard a row of Lembert sutures around the outer side of the bowel, uniting again the peritoneal coats of the segments. To this suggestion Professor Maunsell replied in a letter to the writer, dated London, February 25, 1894, as follows: "A double line of sutures should never be applied in intestinal surgery. It obstructs the circulation too much, interfering with firm plastic peritonitis, and in some cases causing gangrene of the inverted portion of the gut."

The writer has been able to collect the reports of eleven cases of intestinal anastomosis effected by this method of suture. Of these operations nine resulted in the recovery of the patient and two were followed by death, which could not in either instance be fairly attributed to the failure of the suture or the method of applying it.

The successful operations were performed by the following surgeons:

1. Frank Hartley, M. D., surgeon to the New York Hospital. Operation performed during March, 1892, and recorded in the *New York Medical Journal*, vol. lvi, pp. 302 and 464.

2. Mr. Stanley Boyd, F. R. C. S., surgeon to the Charing Cross Hospital, London. Operation performed November 26, 1892. Case recorded in the *Transactions of the Medico-Chirurgical Society*, London, vol. lxxvi, p. 345.

3. Frederick Holme Wiggin, M. D., surgeon to the New York City Hospital (Blackwell's Island). Operation performed September 12, 1893. Case recorded in the *New York Medical Journal*, January 20, 1894.

4. Mr. W. Harrison Cripps, F. R. C. S., surgeon to St. Bartholomew's Hospital, London. The case was reported and the patient shown to the London Medical Society at its meeting, November 12, 1894.

5. Mr. Keetley, F. R. C. S., surgeon to the West London Hospital. Case recorded in the *Lancet* for November 17, 1894, p. 1156.

6. Mr. L. A. Bidwell, F. R. C. S., surgeon to the West London Hospital. Case reported to the writer by Professor Maunsell in February, 1895, and to the London Medical Society by Mr. Bidwell, March 25, 1895.

This gentleman has recently informed the writer that the operation was performed upon a woman, twenty-seven years of age, for a rupture of the ileum which occurred in the course of an operation for the removal of an extra-uterine gestation sac of ten months' standing. In reply to the writer's question as to whether or not extra sutures had been employed to approximate the peritoneal coats after the reduction of the invagination, Mr. Bidwell writes: "The only modification which I employed was closing the longitudinal opening in the gut with Halsted's suture instead of Lembert's."

7. Dr. Emmerich Ullman, of Vienna. The operation was performed in December, 1894, only one row of silk sutures being employed. The patient made a good re-

covery. The case was recorded in the *Centralblatt für Chirurgie*, No. 2, 1895; also in the *Annals of Surgery* for August, 1895.

8. Mr. W. Watson Cheyne, F. R. C. S., surgeon to the Kings College Hospital, London. Case unrecorded. The operation was performed on April 9, 1895. The following history of the case has been kindly furnished to the writer by Mr. Cheyne: "Cancer of transverse colon; excision, Maunsell's method, and recovery. Female, married, aged seventy-two, admitted to King's College Hospital, March 27, 1895. Previous history unimportant. In July, 1893, had an operation performed for pain in the abdomen; nature of the operation not known; she says it was about the vagina. Previous to that she had suffered much pain in the right iliac fossa for about eighteen months. She says she was cured as the result of this operation, but of late pain has come back in the right iliac region and symptoms of partial obstruction have set in more than once. When she was admitted there was a condition of partial obstruction, but this improved somewhat before she was operated on. On her admission her abdomen was a good deal distended; nothing was felt *per rectum; per vaginam* the anterior wall of the vagina seemed scarred. On placing the hand on the right side of the abdomen the coils of the intestine are readily felt and great pain is at once felt as the result of the peristalsis set up under chloroform. A hard oval tumor is felt about the umbilicus, which moves freely in the interior of abdomen. On April 9th the abdomen was opened and a cancerous tumor of the transverse colon was found, together with enlarged glands in the mesocolon and in the neighboring omentum. The bowels were clamped by Maunsell's safety-pin method and the disease was removed. Repair by Maunsell's method. Uninter-

rupted recovery. Patient well when I last heard." To this Mr. Cheyne adds: "I found Maunsell's method very difficult in this case. The obstruction had evidently lasted a long time, and the longitudinal muscular bands of the intestine above were enormously hypertrophied and formed rigid bands, and the difficulty of invaginating that end of the gut was extremely great. In a case of old-standing obstruction I would not again use Maunsell's method."

9. Dr. Robert T. Morris, professor of clinical surgery in the New York Post-graduate Medical School and Hospital. The operation was performed in the writer's presence on September 19, 1895. On October 11, 1895, Dr. Morris reported the patient's convalescence to have been uneventful.

Unsuccessful Cases.—1. Professor H. Widenham Maunsell. The operation was performed during December, 1886, and was recorded in the *Lancet* of February 13, 1892. It was the first operation in which this method was employed, and was for the relief of intestinal obstruction due to a carcinoma. The patient died on the sixth day, from exhaustion. The necropsy revealed perfect union of the segments of the bowel. There was no sign of leakage.

2. Dr. Parker Syms, surgeon to the Lebanon Hospital, and assistant surgeon to the New York Cancer Hospital. The operation was performed on September 19, 1893. The patient died of septicæmia on September 22d. In explanation of the cause of this patient's death, it should be stated that on September 5, 1893, Dr. Outerbridge, gynæcologist to the hospital, performed abdominal section for the purpose of removing a malignant growth which was low down in the pelvis, involving the entire circumference of the sigmoid flexure. The tumor was so adherent to the surrounding structures that it could not be removed. Therefore, the ab-

dominal wound was closed; one layer of silkworm-gut sutures passed through all the layers. On September 15th an attempt was made to reach the tumor by means of Kraske's method of rectal excision, but after the posterior three quarters of the rectum had been freed from its attachments the operation was abandoned. On September 19th, Dr. Syms opened the abdominal cavity in the line of the cicatrix, which was found to be very firm. The abdominal walls could not be pulled apart, and the tissues had to be incised. The diseased portion of gut was with difficulty drawn into the wound, and three inches resected. The hæmorrhage was profuse, and controlled with difficulty on account of the friability of the tissues. The ends of the gut were invaginated, and the sutures placed and tied according to Maunsell's method. The latter procedure was difficult of accomplishment as the sutures tore out easily. The patient's condition was poor, and the abdominal cavity was filled with salt solution. Prior to the performance of this last operation the patient's temperature was 101° F. Following the operation, the temperature rose to 103·6° F. The sacral wound, Dr. Syms stated, had already shown signs of septic infection, and later it became gangrenous. The patient died on September 22, 1893. No record could be found of the results of the necropsy if one was made. Surely there was sufficient cause for the patient's death, aside from the possible failure of the intestinal anastomosis. Throwing out this doubtful case, we find that the method of intestinal suture devised by the late Professor Maunsell has in all the cases which the writer has been able to collect resulted in a satisfactory union of the intestinal segments.

The writer, in concluding this article, wishes to acknowledge his indebtedness to Mrs. Maunsell for Figs. 12

and 14 and some notes found among her husband's papers after his demise; to Mr. Boyd for Fig. 6; to Mr. Cheyne, Mr. Bidwell, Dr. Morris, and Dr. Syms for the notes of their case; and to the Messrs. Lea Brothers & Co. for electrotypes of several of the illustrations.

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