
NATIONAL ACADEMY OF SCIENCES

OF THE UNITED STATES OF AMERICA
BIOGRAPHICAL MEMOIRS
VOLUME XVII—SEVENTH MEMOIR

BIOGRAPHICAL MEMOIR

OF

WILLIAM STEWART HALSTED

1852–1922

BY

W. G. MacCALLUM

PRESENTED TO THE ACADEMY AT THE AUTUMN MEETING, 1935



W. G. Balster

WILLIAM STEWART HALSTED

1852-1922

BY W. G. MAC CALLUM

William Stewart Halsted was born in New York on September 23rd, 1852. He came from a family of Halsteds in England who, in the 16th century, had an estate in Rowley Parish called High Halsted. They were closely connected by intermarriage with the Townley family and it was as son of William Miller Halsted and May Louisa Haines (daughter of Richard Townley Haines) that he was born. His family in New York was prominent financially and active in various philanthropic projects. He himself as a boy was sent to a private school at Monson, Mass., later to Andover in 1863, and graduated from there to go to Yale, which college he entered in 1870, graduating in 1874. At Yale he spent most of his time in athletics, especially in rowing, baseball and gymnastics. In his senior year he was captain of the football organization and made the winning goal in the celebrated game with Eton which Yale won 2 to 1.

After graduating from Yale he entered the College of Physicians and Surgeons in New York, with Dr. Henry B. Sands as preceptor. Later in his course he became assistant to Prof. John C. Dalton, the physiologist whose interest was especially in cerebral localization, but most of his time was spent in dissection. He had some association with Alonzo Clark, in whose office he made some chemical tests. Then, in 1876, before graduating in medicine, he was admitted as interne in the Fourth Surgical Division at Bellevue, where he followed the medical work of Janeway, Loomis and Jacobi, but was especially associated with the surgeon Hamilton, in whose service he invented various methods of treating fractures, and the use of continuous hot baths in infections. In 1877 he graduated with honors from the College of Physicians and Surgeons and was appointed House Physician at the New York Hospital where he saw much of Draper, Seguin, Hackley and Woolsey Johnson. There he

devised a new form for hospital temperature charts which is still in general use.

In 1878 he went for the first time to Europe and in Vienna attended courses with Chiari, Fuchs, Pollitzer, Kaposi and especially with Zuckerkandl in anatomy. He attended the clinics of Billroth and met Woelfler and Mikulicz of whom he saw much. Then, in 1879, he went to Würzburg to take a course in embryology with Kölliker, and histology with Stoehr and visited the clinics of von Bergmann. In 1880, he spent some time in Leipzig where he knew Weigert and attended the clinics of Thiersch and Wagner. Then to Halle, where he spent several profitable weeks with Volkmann, and after that to Schede in Hamburg and Esmarch in Kiel, returning to New York early in September, 1880. These two years, from the autumn of 1878 to that of 1880, were fortunate in that he watched the great progress in many branches of medicine and perhaps especially the development of Lister's antiseptic surgery by the German surgeons, and, also, in that he came in contact with the most able men of that day who were pioneers in their fields.

On his return he became the associate of Sands at the Roosevelt Hospital where he not only operated in the surgical clinic but inaugurated an outpatient department and, with Hall, Hartley and Markoe, studied especially the antiseptic treatment of gonococcal infections. Beside this he, with Munroe and later Tuttle and West Roosevelt, carried on a quiz for several years. This was very successful because of its practical character and many of the men now well known were students in the wards and at the recitations held in his house on Twenty-fifth Street, and were received by Dr. Welch in his demonstrations in pathology at Bellevue. At the same time he was demonstrator in anatomy under Sands in the College of Physicians and Surgeons, and there much associated with Thomas A. Sabine. He was visiting physician at the Charity Hospital on Blackwell's Island and next year Surgeon-in-Chief at the Emigrant Hospital on Ward's Island. How he ever managed to carry on so many and varied activities it is hard to understand. In 1883 he was appointed visiting physician to Bellevue. In the same year he was put on the visiting staff of the

Presbyterian Hospital and in the summer had the surgical service at the Chambers Street Hospital, when William T. Bull was away. There he devised a method of transfusion of blood in patients poisoned with illuminating gas.

Through these years from 1880 to 1885 he worked with superhuman energy and endurance, caring for the outpatient department of Roosevelt in the mornings, with five other hospitals demanding his services in wards and operating rooms at any time, with regular hours of teaching in the dissecting rooms at the College, and with his quiz of sixty-five or more students at his house. Despite this great burden, it was then that his best ideas were evolved and the germ of most of his later work began to appear. He, with Hall, did much to establish in New York the principles of antiseptic surgery and invented new dressings for wounds. He was impressed by the discovery of Koller that the cornea could be anaesthetised with cocaine, a method which was first made public at the Heidelberg Ophthalmic Congress in 1884, and they began experimenting with this substance. It was then he found that he could by injecting it into a sensory nerve, block all conduction through that nerve and so render the whole area from which its branches came, insensitive to pain. This was a most important discovery and has been utilized ever since. But, in thus experimenting upon themselves and students, they did not realize that cocaine is a demoralizing habit-forming drug and neither Dr. Halsted nor his co-worker, Hall, escaped, but through superhuman strength and determination Halsted at last overcame it. After an interval of more than a year he came back to a more thoughtful leisurely life with time for reflection and contemplation of his surgical problems, a life in the end far more fruitful than could ever have been the strenuous rush of his existence in New York, if he had kept on at that pace. After all, in his case it was probably no misfortune but rather the reverse.

It was in 1886 that at Dr. Welch's invitation he came to Baltimore and for a time they lived together. During the winter of 1886-87 he began work in Dr. Welch's laboratory supported and encouraged by him. There he found Councilman, Nuttall, Abbott, Herter and others, among whom Mall

especially impressed him. He and Dr. Halsted became close friends and worked together on experiments on the end-to-end suture of the intestine in which they recognized the importance of the submucosa in holding the suture. Later, Dr. Halsted turned his attention to the study of compensatory hypertrophy in the thyroid after partial removal. Both of these studies gave results of permanent value. From the beginning of his work in the laboratory, however, there remained his earlier interest in the treatment of wounds. He realized that Lister's work was throughout concerned with the prevention of the access of bacteria to the wound by methods which were of good intention but in general fallacious while ignoring the great importance of the delicate handling of tissues and their accurate adjustment for healing. It became clear to him that bacteria might survive the use of antiseptics and that it is especially important that no dead tissue which might form a medium for their growth should be left in the wound and that no vacant space should be left in which fluid might accumulate with the same result. Blood clots he recognized as slightly defensive, so that they were sometimes intentionally allowed to fill a space.

Such study engaged his attention throughout all his later years, even when his technique had, with the advent of the more strictly aseptic methods, become extraordinarily precise. But it was always the treatment of the tissues which seemed to him most important. If they were exactly brought together as nearly as possible in their normal relations with no dead space, perfect haemostasis and with good circulation in all the tissues, none of which had been roughly handled so as to cause the death of cells, then healing might progress uninterruptedly—even if a few bacteria were left. He had found that in the intact peritoneum of a dog bacteria were soon destroyed, whereas if any dead tissue were left there, perhaps by tying a ligature about a considerable mass of blood vessels and other tissue to stop bleeding, generalized infection would result. But he was equally careful about the introduction of any bacteria and invented the subcutaneous suture to avoid passing through the skin which could not be completely disinfected. Instead of

catgut he used silver wire which helped in the defense, the surgeon's hands and the patient's skin were disinfected with permanganate and then with bichloride of mercury and he introduced sterilized rubber gloves for the operator's hands. Some of this was of course of gradual development after the opening of the Johns Hopkins Hospital, in 1889, but most of it had been worked out experimentally on dogs during his years in the laboratory.

The hospital was formally opened in May of 1889 and Dr. Osler was appointed Professor of Medicine, Dr. Halsted Associate Professor of Surgery, Dr. Kelly Associate Professor of Gynaecology and Obstetrics. Dr. Welch had been made Professor of Pathology in 1884, with Dr. Councilman as Associate. Dr. Halsted was head of the Out-patient Department and Acting Surgeon to the Hospital. Shortly after this he was made Surgeon-in-Chief and in 1892, Professor of Surgery. Miss Caroline Hampton was head nurse for the Surgical Service and later Dr. Halsted had her appointed head nurse in the operating room. It was because of her suffering from the inflammation of her hands and arms, produced by the antiseptics, that he first devised the rubber gloves. She was a Southerner from North Carolina, and one of a distinguished family there, the daughter of Frank Hampton, who had married Sally Baxter in 1855, and niece of Wade Hampton. Their stately house at Millwood, near Columbia, had been destroyed by Sherman's soldiers and after the death of her parents, she and her sister were cared for by their aunts. She had gone to New York, in 1886, and graduated as a trained nurse at the New York Hospital in 1888.

Dr. Halsted and Miss Hampton were married in June 1890 at Millwood and went to the family hunting lodge at Cashiers in the mountains for their wedding trip. Later he bought this place from the aunts and called it High Hampton. Every summer they spent much time there and it became the real centre of Mrs. Halsted's life, rather than the house at 1201 Eutaw Place in Baltimore, because that country appealed to her so much more than the city.

From this time on Dr. Halsted's work in the hospital aimed

at three things—to perfect the technical methods of surgery, to study experimentally and otherwise the several topics which from the beginning had engaged his interest, and above all, to establish a school of surgery by training his assistants so thoroughly and through so long a time that they might leave him and transmit his teaching, undiminished, in other schools. In these three aims he was successful, as may be learned from a study of surgery as it exists in a great many hospitals throughout this country and even from observations of the results of his influence abroad.

With the beginning of his surgical service in the new hospital, his attention was more or less concentrated on his efforts to treat cancer of the breast, on the radical cure of hernia, and upon the healing of wounds, especially under a moist blood clot. The details of these studies cannot be repeated here but it may be reiterated that in all, the fundamental principles concerned in the protection of tissues from unnecessary injury and their readaptation to a nearly normal position with maintenance of an adequate blood supply, seemed to him of primary importance in securing healing and avoiding infection.

He was always experimenting with methods and materials and devised needles, glass spools, mosquito clamps, etc., that are now used everywhere. The equipment of his operating room was very simple and there was none of the marble and shining nickle that seems necessary in the modern operating room. There was only a wooden table which he invented and the glass vats of powerful antiseptics for hands and arms. But everything was sterilized and the technique of the antiseptic approach to asepsis was rigorous and even painful to the staff.

In 1893 the Johns Hopkins Medical School was opened with a small class and when these students came to him for the course in surgery they found his teaching not at all such as it was when he was a quiz-master in New York, but rather that of an investigator who discussed at length the subjects that especially interested him. In the operative clinics they found most impressive not his dexterity or brilliance in operating, but his intense interest in the pathological condition and in his concentration on a plan of operation which would most surely

relieve the situation and lead to the ultimate healing of the patient. His teaching was through example and not through dogmatic statement. It was first-hand knowledge that they gained from an eager inquirer who allowed them to see what had stirred his interests, what difficulties he had encountered and his best efforts to overcome them.

His summers he spent in long vacations at High Hampton although he made many trips to Europe. In Baltimore he saw much of a small group of friends at the Maryland Club where they gathered in the old club building on Franklin Street. They were Dr. Welch, Major Venable, Dr. Frank Donaldson, Dr. Lockwood and some others. But after his marriage, when the club moved to its new building on Eager Street, he was hardly ever there except when Mrs. Halsted had gone south to High Hampton. He never played cards or any of the other games that pass time in a club, but he had always been interested in boxing and often went to boxing matches or prize fights in a theatre far down in the town. At High Hampton he followed Mrs. Halsted's interests in the planting and harvesting of various crops, in her expert handling of horses, whether in driving or riding, and strove to fit himself to accompany her on her cross country gallops. They always had several dogs which interested him, and in an amateurish way he studied the stars through a large telescope which he had set up at their southern home. He delighted particularly in their garden where he concentrated his attention on dahlias, ordering the bulbs from foreign dealers. His success in growing these attracted dahlia lovers to High Hampton to see his wonderful display.

"The Professor," as he was always called, was a severe judge of young men and extremely exacting in his estimate of the abilities of those whom he was willing to retain as his assistants. His accuracy in such recognition of talent and worth is attested by the list of those whom he trained to a career in surgery. Unlike some surgeons who prefer to operate alone, he wanted all the assistants who could to take part in an operation but they must be silent and unobtrusive. He foresaw their capabilities and practically decided for them the future

character of their work, some to be general surgeons, others to concentrate upon some special field such as otology and laryngology or the surgery of the nervous system. Still others he chose to be his associates in carrying out his own experimental studies. Even a partial list of the men of his staff in former years will give an idea of the results, for they were Finney, Cushing, Bloodgood, Mitchell, Young, Crowe, Follis, Heuer, Dandy, Reid, Rienhoff, and many others. He always gave the most serious thought to the future of his assistants and counselled them as may be seen in the following extracts from a letter to one of them. "The next ten years of your life should naturally be the most fertile ones and there is probably nothing from which in later years you will derive so much satisfaction as from the contributions of yourself and your assistants to science. In the building up of a school you will have to sacrifice yourself to the interests of the school and of your assistants. The head of a department in a school should give his problems freely to his assistants, rather than to technicians and salaried students, the results of whose work would redound to his own glory."

During these years he was concerned with the operative treatment of gallstones and in 1896 described a device for the accurate suture of the common duct. Later papers dealt with acute pancreatitis caused by obstruction and backflow of bile into the pancreatic duct and with the effects of continued loss of bile through drainage. In 1903 he began once more to work on the surgery of the thyroid gland and especially upon the treatment of exophthalmic goitre which involved also the problem of tetany from accidental removal of the parathyroids. The nature of tetany having been cleared up about this time he studied especially the position and blood supply of the parathyroids and planned his operation for excision of a large part of the thyroid in such a way as to leave them uninjured. All of this is described in detail in his "Operative Story of Goitre." Later, he experimented with the transplantation of parathyroid glands which he seemed to find successful only when there was already a deficiency or need for this tissue. In a paper published in 1914 he reviews 650 cases of exophthalmic goitre upon which

already he had operated with good results, and this figure must have been greatly increased before his death. In his Harvey Lecture he spoke especially of the relation of the thymus to this disease, a question which still remains obscure.

With foreign surgeons his relations were friendly, almost intimate, and he made it his duty and pleasure to visit their clinics to watch and discuss their work. He was always an adherent of the German attitude toward surgery in principle although often critical of particular features. He admired Theodore Kocher especially but also maintained a correspondence with v. Mikulicz, v. Eiselsberg, Küttner, and others, and sent his assistants to work with such men. Leriche, of Strasbourg, visited him here and later wrote a most appreciative description of his methods and of his work, especially impressed as he was with the experimental attitude and with the course in experimental surgery which Dr. Halsted originated and then gave over to Cushing. He said, "In Baltimore the fusion of surgery and physiology is intimate and future surgeons are trained in a laboratory of experimental surgery in contact with living beings and not in a dissecting room." He goes on to describe the principal points in such surgical operations as he witnessed, the use of rubber gloves, the avoidance of catgut, the horror of mass ligatures, the anatomical reconstruction of the separated tissues, the suppression of drainage and the careful dressing with silver foil. "Halsted is the most exquisitely unaffected man one could find. It is because he is so simple and direct that he has been able to group around him and retain at his side assistants of whom most have for a long time been masters. It illustrates admirably the truth of the phrase 'the worth of a professor is measured by the personality of those whom he has trained.' "

Dr. Halsted visited Payr of Leipzig and Enderlen in Würzburg and Martel and Quenu in Paris. Later, in 1911 and in 1914, he attended the Congresses of the German Surgical Association of which he was made an honorary member, and spent much time in Berne visiting Kocher with whom he kept up the warmest friendship.

As long ago as 1892, he entered upon what he afterward

spoke of as a "vibrant domain of surgery," the operative removal of an aneurysm which involved the ligation of large arteries. This led him to a prolonged study of the immediate and more remote results of the closure of such a large artery as the subclavian or femoral, a study which with Reid, Holman, Reichert and others lasted for the rest of his life. He devised a metal band for the partial or complete occlusion of the artery and realized the danger of haemorrhage when the arterial wall was greatly diseased and of the necessity of allowing time by partial occlusion for the development of a collateral circulation—all details in a very complex problem whose complete solution seems questionable. His study of the "Ligation of the Left Subclavian Artery in its First Portion," seems to be the best of all his papers. It is largely a review of the history of the subject including that of arteriovenous aneurysms which throws much light on the physiological principles involved. Further work on the obstruction of the lymphatics, veins and arteries was carried on by his assistants in an effort to explain the swelling of the arm so often observed after an extensive operation for the removal of a cancer of the breast. It proved that such swelling cannot be due to mechanical obstruction alone but is the result of infection.

In August, 1919, Dr. Halsted returned from his house in the south with symptoms of gall-stone colic and underwent an operation by Dr. Follis who removed the gall-bladder. He recovered and carried on his work through 1920 and 1921, devising a new method of intestinal suture. He remained fairly well through the spring of 1922, and in April a great banquet was organized in his honor by the Maryland State Dental Association for the presentation of a gold medal by the National Dental Association in recognition of his discovery of local anaesthesia. This gave him great happiness, as he wrote to his friend, Dr. Matas, of New Orleans. In June, 1922, as he was walking near the Pathological Laboratory he was induced to come in and be photographed, despite his disinclination which was well known, and this is therefore the date of the accompanying portrait. In August of 1922 he returned hurriedly from the south and underwent another operation by Heuer and

Reid. But in spite of their watchful care, he sank and died on September 7th, 1922. It was found that the operation had been perfectly successful but that he had developed pneumonia and pleurisy.

It is difficult, if not impossible, to give an adequate impression of the man whose personality was so hidden in his habitual reserve and so hedged round with the formality of his manner toward those who did not know him well, although to a few he was on terms of complete intimacy and vivacious companionship. He was very shortsighted, not very tall, and his powerful shoulders were a little stooped. He walked with deliberate measured tread and his arms were held bowed out a little, which gave the impression of great muscular strength. He looked neither to right nor left and seemed surprised if someone spoke to him, and in any conversation which followed his formality and extreme politeness hampered the other person a good deal and the interview finally ended in the same key. But with Dr. Welch, or others of his intimate circle, he was all bright attention, eager to miss nothing of what might be said. Their talks in the little chess-room of the Maryland Club with Major Venable and Mr. Frank Hambleton were full of amusing and brilliant repartee in which no one equalled Dr. Halsted. His interests and consequently his reading were not widespread and he had nothing of Dr. Welch's omnivorous appetite for books on every topic. He was not interested in poetry or general literature, nor did he care for painting or sculpture, but he was really expert in the matter of antique furniture and old rugs and his home was full of wonderful examples. He seemed to know or care little for music but did enjoy the theatre. In business matters he was very naïve and had little or no ability to deal with such things as investments. His courage and self possession in the emergencies that arise in the course of operations or in any other situation were remarkable and he was never disturbed or unduly excited in any contretemps. His experimental studies were concerned with the several fundamental problems which in their manifold details always interested him and he had notebooks in which he had put down innumerable suggestions for future work. But

in general he persisted with experiments quite closely related to his major problems and this tenacity of purpose brought him his best results. He treasured the leisure from routine operating which was given him by the full-time system for his experimental studies, and drew some of his assistants into this work in such a way that he was later to be proud of their development and confirmed in his attitude of intense devotion to the training of his chosen staff.

In attempting to estimate the significance of Dr. Halsted's work it seems that his greatest service was not so much his surgical discoveries and inventions, many and important as these were, as his attitude in operating upon the human body which must forever be the proper attitude of the surgeon. It was simply the recognition of the normal or physiological condition of the tissues which one should attempt to restore, realizing their natural defense and the reasons for their vulnerability. It was not concentrated upon invading bacteria as were the antiseptic method of Lister and the aseptic method of von Bergmann and Schimmelbusch but rather on the maintenance of the normal defenses of the tissues although incidentally, of course, his operative technique was clean.

Dr. Halsted was never inclined to public appearance and shunned publicity. He was the recipient of some honorary degrees and corresponding memberships in foreign societies but they were comparatively few—a list of these is given below.

He was not inflated with self-esteem, he did not advertise and he was not a politician, the things which lead to present but not to permanent fame. But he made lasting contributions to the world's knowledge and his name will endure.

His most important single contributions may be briefly listed as follows:

- 1880—Gutta serena films for dressings and drainage.
- 1884—Cocaine in block anaesthesia by injection into nerves.
Centripetal transfusions of blood in illuminating-gas poisoning.
- 1886—Treatment of gonococcal urethritis by flushing with weak bichloride of mercury.
- 1887—Recognized importance of submucosa in intestinal sutures.
- 1888—Described compensatory hyperplasia in thyroid.
- 1889—Devised radical operation for cure of cancer of the breast.

WILLIAM STEWART HALSTED—MAC CALLUM

- 1890—Introduced use of rubber gloves in operations.
Devised operation for the cure of inguinal hernia.
- 1891—Ligated subclavian artery with the first excision of a subclavian aneurysm.
- 1893—Performed first choledochotomies in America.
- 1896—Introduced silver foil as dressing for closed wounds.
- 1905—Transplanted successfully parathyroid glands in dogs.
- 1912-1922—Improved operations on aneurysms and mammary cancer and devised new methods of draining the common bile duct, and performing intestinal anastomosis. Proved infectious origin of swelling of the arm after operation for cancer of the breast, and demonstrated with Reichert and Reid that whole limbs may be successfully transplanted without anastomosis of blood vessels.
Author of monographs on goitre and the surgery of the great arteries.

TITLES AND HONORS

- Honorary Fellow of the Royal College of Surgeons, England, 1900;
Edinburgh, 1905.
- Honorary L.L.D., Yale 1904; Edinburgh 1905.
- Honorary Sc. D., Columbia 1904.
- Foreign Corresponding Member, Harveian Society (Hon.).
- Membre Corresp. Etranger de la Société de Chirurgie, Paris, 1909.
- Honorary Fellow, American College of Surgeons, 1913.
- Ehrenmitglied d. Deutsche. Gesellschaft für Chirurgie, 1914.
- Membre titulaire de l'Assoc. française de Chirurgie, 1914.
- Honorary Member, American Society for Experimental Pathology, 1916.
- Foreign Member, Kungl. Svenska Vetenskaps Akademien, Stockholm, 1917.
- Honorary Member, Societas Medicorum Sverana, Stockholm, 1918.
- Membre honoraire étranger, Académie Royale de Médecine de Belgique, 1920.

MEMBERSHIPS

- Member, National Academy of Sciences, 1917.
- Associate Fellow, American Academy of Arts and Sciences.
- Fellow, American Surgical Association.
- Fellow, American Association for the Advancement of Science.
- Member, Society for Experimental Biology and Medicine.
- Member, American Association of Pathologists and Bacteriologists.
- Member, American Association of Anatomists.
- Member, American Medical Association.
- Awarded Gold Medal of American Dental Association, 1922.

BIBLIOGRAPHY

- Case of intestinal incarceration. N. Y. Med. Jour., 1883, XXXVII, 241.
- Sliding apparatus for extension in fracture of femur. Med. News, 1883, XLII, 284.

- Refusion in treatment of carbonic oxide poisoning. *N. Y. Med. Jour.*, 1883, XXXVIII, 625.
- Lower limit of the pleural cavity. *N. Y. Med. Jour.*, 1883, XXXVII, 100.
- Excision of one centimetre of the inferior dental nerve. *N. Y. Med. Jour.*, 1883, XXXVII, 386.
- Ligation of the lingual artery. *N. Y. Med. Jour.*, 1883, XXXVII, 637.
- Removal of foreign bodies. *N. Y. Med. Jour.*, 1883, XXXIX, 226.
- Adduction and abduction in fractures of the neck of the femur. *ibid.*, 1884, XXXIX, 251.
- Effects of adduction and abduction on the length of limb in fractures of the neck of the femur. *ibid.*, 317.
- Cases of partial resection of elbow and shoulder for tuberculosis and of the ankle for traumatism. *ibid.*, 1884, XI, 619.
- Relation of the infraorbital canal to reproduction of the superior maxilla. *ibid.*, 1884, XXXIX, 48.
- Hemiplegia following stab wound between occiput and atlas. *ibid.*, 1884, XXXIX, 103.
- Passage of emboli through the lungs. *ibid.*, 1884, XXXIX, 312.
- Aseptic surgery in New York in 1884. *ibid.*, 1884, XI, 497.
- Freedom from haemorrhage of intercostal arteries in thoracotomy. *ibid.*, 1884, XI, 498.
- Determination of length of limb in fracture of neck of femur. *ibid.*, 621.
- Abdominal interference to lumbar incision for removal of kidney neoplasm. *ibid.*, 734.
- A new needle holder. *ibid.*, 1885, XLI, 79.
- Practical comments on the use and abuse of cocaine in minor surgical operations. *ibid.*, 1885, XLII, 294.
- Water as local anaesthetic. *ibid.*, 327.
- Descent of femoral hernia. *ibid.*, 1885, XLI, 368.
- Circular suture of the intestine—an experimental study. *Am. Jour. Med. Sc.*, 1887, XCIV, 436.
- Treatment of cancer of the breast—discussion. *Maryland Med. Jour.*, 1888, XIX, 29.
- Radical cure of hernia. *Bull. Johns Hopkins Hosp.*, 1890, I, 12.
- Two cases of reflex nerve manifestations cured by operation. *ibid.*, 35.
- Healing of wounds under the moist blood scab. *ibid.*, 46.
- Epispadias: intestinal obstruction: appendicitis. *ibid.*, 59—title only.
- Amputation of breast, etc. *ibid.*, 59—title only.
- Un-united fracture of hip, etc. *ibid.*, 62—title only.
- Cicatricial jaw ankylosis. *ibid.*, 111.
- Crush of elbow. Organization of blood clot. *ibid.*, 112.
- Skin grafting. *ibid.*, 112.
- Radical cure of hernia. *ibid.*, 112, also, 1891, II, 63.
- Tumor of undescended testicle. *ibid.*, 113. Title only.
- Intestinal anastomosis. *ibid.*, 1891, II, 1.

- Treatment of wounds with especial reference to the value of blood clot in the management of dead spaces. *Johns Hopkins Hosp. Report* 1890-91, II, 255.
- Spurious ankylosis of the jaws. *Bull. Johns Hopkins Hosp.*, 1891, II, 62.
- Iodoform oil injections for tuberculosis of hip. *ibid*, 104.
- Osteoplastic operations for obliteration of involucral cavity. *ibid*, 160.
- Plastic operation for obliteration of cavity in lower end of femur. *ibid*, 160.
- Suppurating compound comminuted fracture into ankle joint. *ibid*, 160.
- Needle-holder for Hagedorn's needles. *ibid*, 63.
- Colles' fracture. *ibid*, 1892, III, 30.
- Excision of veins of the cord in radical cure of inguinal hernia. *ibid*, 76.
- Ligation of the first portion of the left subclavian artery and excision of a subclavio-axillary aneurysm. *ibid*, 93.
- Report in Surgery. *Johns Hopkins Hosp. Reports*, March, 1891.
- Review of Schimmelbusch. Anleitung zur Aseptischen Wundbehandlung. *Bull. Johns Hopkins Hosp.*, 1892, III, 63.
- Radical cure of inguinal hernia in the male. *ibid*, 1893, IV, 17.
- Laparotomy for intussusception. *ibid*, 43.
- Tuberculous knee joint. *ibid*, 97.
- Goitre. *ibid*, 97.
- Operative treatment of old dislocations of elbow. *ibid*, 97.
- Recurrent volvulus. *ibid*, 28.
- Bactericidal properties of the blood. The effect of strangulation of the tissue upon local infection. *Maryland Med. Jour.*, 1893, XXVIII, 404.
- Gastro-enterostomy and adhesions. *Bull. Johns Hopkins Hosp.*, 1893, IV, 54.
- Excision of knee joint in which Hansmann's plates were employed. *ibid*, 1894, V, 31.
- Diagnostic sign in appendicitis. *ibid*, 32, 113.
- Operative treatment of cancer of the breast. *Maryland Med. Jour.*, 1894, XXXI, 109.
- Radical cure of hernia. *Bull. Johns Hopkins Hosp.*, 1894, V, 98.
- Results of operations for cure of cancer of the breast. *Johns Hopkins Hosp. Reports*, 1894-5, IV, 297.
- Congestion of head and neck and protrusion of eyeballs upon abdominal pressure. *Bull. Johns Hopkins Hosp.*, 1894, V, 33.
- Operative treatment of hernia. *Am. Jour. Med. Sc.*, 1895, CX, 13.
- Glottis kept open by forward pressure on angle of jaw in anaesthesia. *Bull. Johns Hopkins Hosp.*, 1895, VI, 4.
- Concerning inflammation and suppuration. *Trans. Am. Surg. Assoc.*, 1895, XIII, 249.
- Concerning operative treatment of hernia. *ibid*, 343.
- Irrigations with bichloride solutions. *Bull. Johns Hopkins Hosp.*, 1895, VI, 164.
- Three cases of plastic surgery. *ibid*, 1896, VII, 25.

- An experimental study of the thyroid gland of dogs with especial consideration of hypertrophy of this gland. *Johns Hopkins Hosp. Reports*, 1896, I, 372.
- Operative treatment of gallstones. *Maryland Med. Jour.*, 1896, XXXV, 101.
- Rectal tuberculosis. *ibid*, 101
- Compensatory hypertrophy of the thyroid gland. *ibid*, 1897, XXXVII, 67.
- Remarks concerning gallstones and biliary surgery. *Bull. Johns Hopkins Hosp.*, 1897, VIII, 31.
- Inflated rubber cylinders for circular suture of the intestine. *ibid*, 1898, IX, 25.
- Miniature hammers and the suture of the bile ducts. *ibid*, 67.
- A clinical and histological study of certain adenocarcinomata of the breast. *Trans. Am. Surg. Assoc.*, 1898, XVI, 114.
- Bacteriology of cystitis. *ibid*, 50.
- Concerning drainage and drainage tubes. *ibid*, 103.
- The pancreatic ducts; action of pancreatic juice on the skin. *ibid*, 232.
- Gunshot injury of the spine. *Jour. Am. Med. Assoc.*, 1898, XXX, 1109.
- Contribution to the surgery of the bile passages. *Bull. Johns Hopkins Hosp.*, 1900, XI, 1.
- The forceps of Laplace and intestinal anastomosis. *ibid*, 1899, X, 114.
- Successful removal of a large foreign body from the head. *Phila. Med. Jour.*, 1900, V, 4.
- A contribution to the surgery of foreign bodies. *Johns Hopkins Hosp. Reports*, 1900, IX, 1047.
- Excision of upper portion of right femur for tuberculosis of hip joint. *Bull. Johns Hopkins Hosp.*, 1900, XI, 19.
- Retrojection of bile into the pancreas, a cause of acute haemorrhagic pancreatitis. *ibid*, 1901, XII, 179.
- Brief consideration of the cases of cancer of the breast treated at the Johns Hopkins Hospital since 1889. *Trans. Am. Surg. Assoc.*, 1901, XIX, 26.
- Bisection of large tumors as aid to enucleation. *Maryland Med. Jour.*, 1901, XLIV, 316.
- Local anaesthesia with weak solutions of cocaine. *Trans. Am. Surg. Assoc.*, 1901, XIX, 293.
- Remarks on 780 cases of hernia operated at the Johns Hopkins Hospital. *ibid*, 357.
- Egg-sized gallstone of common bile duct; liver abscess. *Bull. Johns Hopkins Hosp.*, 1902, XIII, 147.
- A case which may point out a new disease of the lymph glands. *Gaillard's Med. Jour.*, 1902, LXXVII, 217.
- Closure of cystic duct after excision of gall-bladder. *Bull. Johns Hopkins Hosp.*, 1902, XIII, 54.
- The cure of the more difficult as well as the simpler inguinal ruptures. *ibid*, 1903, XIV, 208.
- The X-Ray treatment of cancer. *Maryland Med. Jour.*, 1903, XLVI, 282.

- Pathology and treatment of benign tumors of bone with cyst formation.
 Bull. Johns Hopkins Hosp., 1904, XV, 262.
- The training of the surgeon. *ibid*, 267.
- Carcinoma preceded by a history of gastric ulcer. *ibid*, 347.
- Partial occlusion of the aorta. *ibid*, 1905, XVI, 202.
- Partial occlusion of blood vessels, especially of the abdominal aorta.
ibid, 346.
- The clinical features of thyroid hypertrophy. *ibid*, 288.
- Results of the open air treatment of surgical tuberculosis. *Amer. Med. Phila.*, 1905, X, 937.
- Results of occlusion of aorta by metal bands. *Trans. Sect. Surg. and Anat., Am. Med. Assoc.*, 1906, 587.
- Hansman's plate for fracture of the femur. *Maryland Med. Jour.*, 1906, XLIX, 280.
- Blood vessel surgery and manual dexterity. *Bull. Johns Hopkins Hosp.*, 1906, XVII, 237.
- Experimental partial occlusion of arteries. *Trans. South. Surg. and Gynaec. Assoc.*, 1906, XIX, 486.
- Hypoparathyreosis, status parathyreoprivus and transplantation of the parathyroid glands. *Am. Jour. Med. Sc.*, 1907, CXXXIV, 1.
- Results of radical operations for the cure of carcinoma of the breast. *Trans. Am. Surg. Assoc.*, 1907, XXV, 61.
- Relation of goitre and chronic rheumatism, etc. *Maryland Med. Jour.*, 1907, L, 72.
- Preservation of the parathyroids during thyroidectomy. *Trans. Am. Surg. Assoc.*, 1907, XXV, 60.
- Surgical tetany and the parathyroids. *Jour. Am. Med. Assoc.*, 1907, XLIX, 1243.
- The parathyroid glandules. Their blood supply and their preservation in operations on the thyroid gland (with H. M. Evans). *Ann. Surg.*, 1907, XLVI, 489.
- Transplantation of parathyroid glands in dogs. *Proc. Soc. Exp. Biol. and Med.*, 1908, V, 74.
- Some results of recent experimental work on the parathyroids. *Maryland Med. Jour.*, 1908, LI, 536.
- Surgical tuberculosis and tuberculin. *ibid*, 32.
- Auto and isotransplantation in dogs of the parathyroid glandules. *Jour. Exp. Med.*, 1909, XI, 175.
- Partial progressive and complete occlusion of aorta in dog by metal band. *ibid*, 373.
- Clinical and experimental contributions to the surgery of the thorax. *Trans. Am. Surg. Assoc.*, 1909, XXVII, 111.
- A general consideration of the treatment of aneurysms of the main arteries. *Bull. Med. and Chir. Faculty*, 1909, I, 182.
- The relation of the duration of goitre to changes in the thyroid. *Trans. Am. Surg. Assoc.*, 1909, XXVII, 69.

- The parathyroids and the operative treatment of the thyroid gland. *ibid*, 75.
 Centripetal arterial transfusion. *ibid*, 85.
 The isotransplantation of muscles in dogs. *ibid*, 308.
 End-to-end suture of the intestine by a bulkhead method. *ibid*, 1910, XXVIII, 256.
 Intratracheal insufflation, etc. *Med. Record*, 1910, LXXXVII, 511.
 Partial occlusion of large arteries by aluminum bands. *Trans. Am. Surg. Assoc.*, 1910, XXVIII, 49.
 Hepatico-duodenal anastomosis. *ibid*, 312.
 Epithelkörperchen. *Verh. Dtsch. Gesellsch. f. Chir.* Berlin, 1911, XL, Theil 1, 45.
 Non drainage of joints. *Trans. South. Surg. and Gynaec. Assoc.*, 1911, XXIV, 234.
 Report of a dog maintained in health by a parathyroid autograft. *Jour. Exp. Med.*, 1912, XV, 205.
 A bulkhead suture of the intestine. *ibid*, 216.
 The effect of ligation of the common iliac artery on the circulation and function of the lower extremity. *Bull. Johns Hopkins Hosp.*, 1912, XXIII, 191.
 Developments in the skin grafting operation for mammary cancer. *Trans. Am. Surg. Assoc.*, 1912, XXX, 287; also *Jour. Am. Med. Assoc.*, 1913, LX, 416.
 Hypertrophy of the thyroid gland; revision of experiments made 25 years ago. *Proc. Soc. Exp. Biol. and Med.*, 1912-13, X, 111.
 Partial occlusion of aorta by bands of fresh aorta and fascia lata. *Trans. Am. Surg. Assoc.*, 1913, XXXI, 218.
 Excision of both lobes of thyroid for the cure of Graves' disease. *ibid*, 319.
 Preliminary ligation of thyroid arteries. *ibid*, 312.
 Factors concerned in causing hypertrophy of the thyroid. *Trans. Assoc. Am. Phys.*, 1913, XXVIII, 127.
 Ligature and suture material. Also, an account of introduction of rubber gloves, gutta percha tissue and silver foil. *Jour. Am. Med. Assoc.*, 1913, LX, 1119.
 Significance of the thymus gland in Graves' disease. *Harvey Lecture*, 1913-14, Phila., 1915, IX, 224. Also, *Bull. Johns Hopkins Hosp.*, 1914, XXV, 223.
 Die Partielle Verschluss grosser arterien. *Archiv. f. kl. Chir.*, Berlin, 1914, CV, 580.
 A case of iliofemoral aneurysm. *Jour. Am. Med. Assoc.*, 1914, LXIII, 207.
 John Shaw Billings. *Bull. Johns Hopkins Hosp.*, 1914, XXV, 249.
 Dr. Tiffany's place in American Surgery. *Bull. Med. and Chir. Faculty Maryland*, 1913-14, VI, 131.
 Results of X-ray treatment of thymus gland in Graves' disease. *Bull. Johns Hopkins Hosp.*, 1915, XXVI, 55.
 Elusive mobility of the breast in a case of retromammary cyst. *ibid*, 350.

- A diagnostic sign of gelatinous carcinoma of the breast. *Jour. Am. Med. Assoc.*, 1915, LXIV, 1653.
- As to the cause of the dilatation of the subclavian artery in certain cases of cervical rib. *Proc. Soc. Exp. Biol. and Med.*, 1915, XIII, 1. Also, *Trans. Am. Surg. Assoc.*, 1916, XXXIV, 273.
- Surgical and medical cures of hyperthyroidism. *Bull. Johns Hopkins Hosp.*, 1915, XXVI, 59.
- An experimental study of circumscribed dilatation of an artery immediately distal to a partially occluding band. *Proc. Nat. Acad. Sc.*, 1918, IV, 204. Also, *Jour. Exper. Med.*, 1916, XXIV, 271.
- The ideal operation for aneurysm. *Bull. Johns Hopkins Hosp.*, 1916, XXVII, 94.
- Arterial dilation in arteriovenous fistula and in cases of cervical rib. *Bull. Med. and Chir. Faculty Maryland*, 1917, IX, 122.
- The operative approach and mortality in acoustic tumors. *Bull. Johns Hopkins Hosp.*, 1917, XXVIII, 239.
- History and development of surgery with special reference to the thyroid. *Bull. Med. and Chir. Faculty Maryland*, 1918, X, 85.
- Cylindrical dilatation of common carotid following partial occlusion of the innominate and ligation of the subclavian. *Trans. Am. Surg. Assoc.*, 1918, XXXVI, 501.
- The sinus-spud. *Bull. Johns Hopkins Hosp.*, 1918, XXIX, 195.
- Congenital arteriovenous and lymphatico-venous fistulae. *Trans. Am. Surg. Assoc.*, 1919, XXXVII, 262.
- The omission of drainage in common duct surgery. *Jour. Am. Med. Assoc.*, 1919, LXXIII, 1897.
- The operative story of goitre. *Johns Hopkins Hosp. Reports*, 1920, XIX, 71.
- Self evisceration of a large abdominal hygroma through a scalpel prick of the peritoneum. *Bull. Johns Hopkins Hosp.*, 1920, XXXI, 13.
- The upturned edge of the liver over an acutely distended, empyematous gall-bladder. *ibid*, 14.
- A striking elevation of the temperature of the hand and forearm following the excision of a subclavian aneurysm. *ibid*, 219.
- Ligation of the left subclavian artery. *Johns Hopkins Hosp. Reports*, 1921, XXI, 1.
- An end-to-end anastomosis of the large intestine. *Bull. Johns Hopkins Hosp.*, 1921, XXXII, 98.
- The swelling of the arm after operations for cancer of the breast. *ibid*, 309.
- Ablation d'un aneurysme de la premiere portion de l'artere sousclaviere, etc., *Lyon Chirurg.*, 1921, XVIII, 1.
- Blind end circular suture of the large intestine. *Ann. Surg.*, 1922, XXXVII, 356.
- The effect on the walls of blood vessels of partially and completely occluding bands. *Trans. Am. Surg. Assoc.*, 1922, XL, 201.

- Centripetal arterial transfusion. *ibid*, 218.
- Replantation of entire limbs without suture of vessels. *ibid*, 160. (With Reichert and Mont Reid.)
- Surgical papers of William Stewart Halsted. Edited in two volumes by Walter C. Burket. The Johns Hopkins Press, 1924.
- William Stewart Halsted, Surgeon. W. G. MacCallum, The Johns Hopkins Press, 1930.