NINETEENTH CENTURY SURGICAL INSTRUMENTS

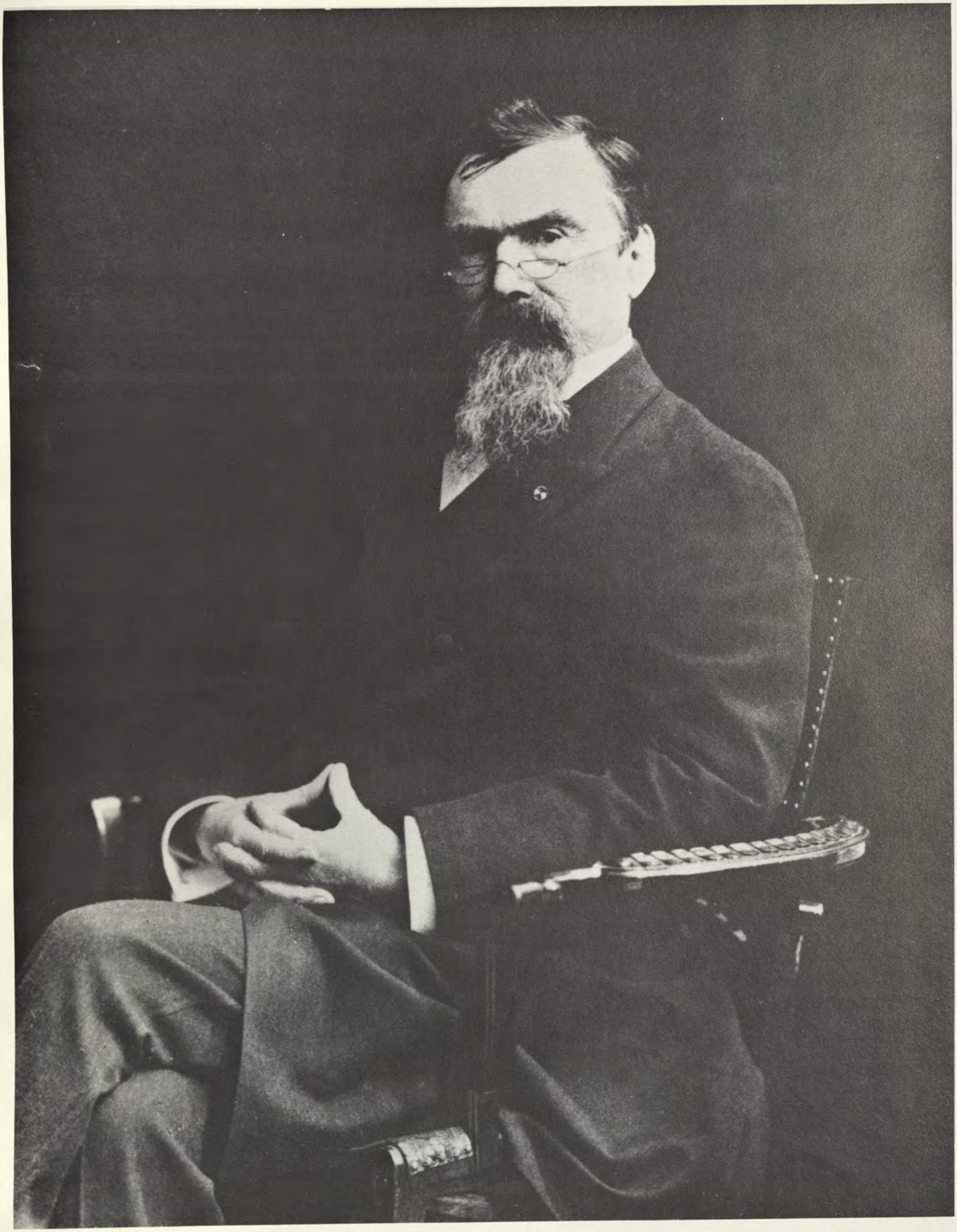
A CATALOGUE OF THE
GUSTAV WEBER COLLECTION
AT THE HOWARD DITTRICK MUSEUM
OF HISTORICAL MEDICINE

JAMES M. EDMONSON

OCCASIONAL CONTRIBUTIONS
TO THE HISTORY OF
THE HEALTH SCIENCES
FROM THE
HISTORICAL DIVISION OF THE
CLEVELAND HEALTH SCIENCES
LIBRARY

NUMBER 3 JUNE 1986

NINETEENTH CENTURY
SURGICAL INSTRUMENTS



Gustav Carl Eduard Weber (1828-1912)

NINETEENTH CENTURY
SURGICAL INSTRUMENTS

A CATALOGUE OF THE GUSTAV WEBER COLLECTION AT THE HOWARD DITTRICK MUSEUM OF HISTORICAL MEDICINE

ilton
JAMES M. EDMONSON, PH.D.
CURATOR, HOWARD DITTRICK MUSEUM
OF HISTORICAL MEDICINE

HISTORICAL DIVISION
THE CLEVELAND HEALTH SCIENCES LIBRARY
CLEVELAND, OHIO
1986

The HISTORICAL DIVISION of THE CLEVELAND HEALTH SCIENCES LIBRARY includes the Howard Dittrick Museum of Historical Medicine, a rare book collection, and archives documenting the history of the health sciences in Northern Ohio.

Printed in the United States of America by Lutz Printing Co., Cleveland.

This work is dedicated to
Michael W. L. Gauderer, M.D.

CONTENTS

ACKNOWLEDGEMENTS

I wish to acknowledge my indebtedness to several persons who made this work possible. Christine, my wife, graciously admitted the intrusion of Gustav Weber into our lives and came to share those small delights of discovery that emerged from careful scrutiny of his surgical instruments. From the outset Patsy A. Gerstner, Chief Curator of the Historical Division of the Cleveland Health Sciences Library, encouraged the preparation of a catalogue that would bring the collections of the Dittrick Museum to a broader audience. To this end she suggested that the *Occasional Contributions* would be an appropriate venue and granted the time necessary to conduct a careful examination of the Weber collection. Glen P. Jenkins, Rare Book Librarian, provided invaluable bibliographic assistance, while Ingrid D. Ebner, Historical Division Assistant, offered welcome help in making sense of German language sources. Judy M. Chelnick, Assistant Curator, sorted out problems of miscatalogued objects and thus established the full range of Weber's armamentarium which had been scattered indiscriminantly throughout the recesses of storage areas in the Dittrick Museum. Laurena L. Hyslop, who saw the manuscript through its concluding phases, including final text editing and citation verification, deserves special thanks for taking time from her responsibilities as Collections Manager. Jan Sobota, Conservator, devoted his remarkable talents to restoring Weber's instruments to their original pristine condition for purposes of exhibition. Lastly, Michael W. Sands brought his special touch to the task of photographing the objects illustrated in the text that follows.

James M. Edmonson
June, 1986

I. INTRODUCTION

The artifact collection of the Howard Dittrick Museum comprises over thirty thousand objects, making it one of the larger repositories of medical artifacts in the United States. A small but particularly interesting part of that collection is the late nineteenth century armamentarium of a Cleveland surgeon, Gustav (or Gustave) C. E. Weber (1828-1912).

The Weber collection actually predates the creation of the Howard Dittrick Museum of Historical Medicine. Gustav Weber donated a first lot of books, instruments, and mementos to the Cleveland Medical Library Association in 1897[1] when he retired from a long and active career to become United States Consul in Nuremberg, Germany. The Association received a second lot, composed mostly of surgical instruments, in 1902 upon Weber's return to Cleveland. While the books were integrated into the holdings of the Cleveland Medical Library, the instruments and mementos remained in storage for several years.

In 1926 the Cleveland Medical Library Association moved its collections to its present home, the Allen Memorial Medical Library. In the new building a gallery for the "Museum of Historical and Cultural Medicine" was set aside, and Howard Dittrick began the task of organizing the assemblage of medical objects that had accumulated in the Association's library facility over the preceding three decades. Weber's donation was among the first to be formally accessioned, along with artifacts given by Dudley Peter Allen and other historically-minded physicians of Cleveland. Their gifts thus constitute the seed that later blossomed, through the untiring efforts of Howard Dittrick, into the present extensive holdings of the museum.

The fact that Weber's gift to the Cleveland Medical Library Association was an important early accession does not provide, in itself, sufficient incentive to carry out the task of preparing a special catalogue. Other features of the Weber collection, however, recommend it as a subject meriting close study. The professional stature of the donor, Gustav Weber, is of particular interest, and his prominence on the local scene suggests that the collection may serve to help us understand the character of surgical and medical practice in Cleveland in the nineteenth century.

Gustav Weber was, without contest, the single most powerful figure in Cleveland medicine from 1860 through 1890. An obscure instructor of clinical surgery at the commencement of his career, Weber went on to become editor of the first medical journal in Cleveland (*The Cleveland Medical Gazette*), to serve as Surgeon General of Ohio during the Civil War, to found St. Vincent de Paul (Charity) Hospital and its associated medical college, and, subsequently, to hold the posts of professor and, later, dean both at the Medical Department of the University of Wooster and at the Medical Department of Western Reserve University. During these decades of service to medicine Weber was frequently at the center of controversies (from which he usually emerged triumphant) that pitted rival faculties of Cleveland medical schools against each other in competition for students, hospital privileges, and financial support.

Although medical politics may have kept Weber in the public eye and guaranteed his place in local histories of medicine, it was his surgical talent that most impressed colleagues and students. Documenting that aspect of Weber's career from written sources is, however, a problematic task.

While he exhorted students at commencement exercises to make their names known through publications in medical journals, he contributed little to the medical literature of his day and left no personal papers that would give latter day historians a more precise knowledge of his surgical practices.[2] We must turn, therefore, to the objects he donated to the Cleveland Medical Library Association; from these we may derive not only an understanding of the breadth of Weber's surgical practice and his openness to innovative, even daring, new procedures and instruments, but also a sense of what constituted "best practice" in Cleveland surgery during the latter half of the nineteenth century.

When viewing the entire compass of Weber's armamentarium, one is immediately struck by its great diversity and range. Weber's practice of surgery was not confined to any recognized speciality, although he did show a preference for the challenges of reconstructive or plastic surgery. In the course of his career Weber acquired instrument sets appropriate for the emerging specialties of ophthalmic and laryngeal surgery, as well as more general-purpose sets for such traditional surgical procedures as amputation and removal of bladder stones (lithotomy and lithotrity). Weber also experimented with new therapeutic techniques, e.g. electro-cautery, that required expensive and fragile instruments. Non-surgical instruments as well, notably for diagnostic purposes, comprise an important part of the Weber Collection. The composition of this collection thus indicates that Gustav Weber practiced at a time when specialization was the exception, and not the rule, particularly at the outset of his career in Cleveland in the 1850s.

A closer look at the instruments reveals that Weber had a cosmopolitan, even international orientation. Virtually all the instrument sets and apparatus came from suppliers other than the two Cleveland instrument makers, J. Fenton and E. M. Hessler, who conducted business in the second half of the nineteenth century. The majority of Weber's instruments came from George Tiemann and Company of New York, which, by 1870, was the leading firm making and importing surgical instruments into the United States. In addition, several sets came from European makers, principally Krämer of Bonn, Germany, Josef Leiter of Vienna, Austria, and A. Lutter of Berlin, Germany. This preference for instruments made in German-speaking countries did not stem from their technical superiority; in fact, at least until the 1880s, English and French surgical instrument makers were quite the equals of their counterparts in Germany and Austria. The reason for Weber's preference must be sought instead in the ties he maintained with medical colleagues on the Continent, especially in his native Germany. Weber returned to Europe as many as five times while still in practice and sent his only son, Carl, to the University of Bonn for undergraduate study. While residing in Cleveland Weber subscribed to several European medical and surgical journals and, thereby, kept himself well-informed of novel procedures involving special-purpose instruments. He apparently ordered the requisite instruments through Tiemann or addressed his orders directly to a European supplier. In this manner Weber's armamentarium came to contain a greater preponderance of instrument sets and medical devices made in Germany and Austria than one would normally expect to find in America at that date.

If we put aside the matter of provenance and consider the Weber instruments from the standpoint of materials and construction, some ambiguous insights emerge. Although his surgical career in

Cleveland spanned almost four decades (1856-1896), the style and form of his instruments changed little. Most were purchased before 1875, thereby antedating the widespread impact of Louis Pasteur's Germ Theory (*ca.* 1861-63) which fostered substantial alteration of the design and materials of surgical instruments. But Weber's surgical practice continued for another two decades, and he persisted in using traditionally made instruments with handles of ivory, ebony, and hard rubber. Was he resistant, even hostile to change dictated by a new understanding of what causes infection? The answer is "no," with some qualifications.

The Germ Theory enunciated by Louis Pasteur was most significantly applied to surgical practice by Joseph Lister, beginning in 1867.[3] Lister adopted the principle of antisepsis, or the eradication of infectious bacteria by chemical means, and devised elaborate measures to render surgery germ-free. Chief among these was the use of carbolic acid spray to envelop both patient and operators in a mist of germ-killing chemicals, followed by wound dressings soaked in the same solution. Other surgeons soon followed suit, including Weber, who read about and duplicated Lister's procedures. These attempts were later recalled by Weber's friend, Martin Stamm:

> When I first met Doctor Weber in 1876 antiseptic surgery was just dawning upon the profession, and Lister had the same experience that prophets have had in all ages and countries. In England, its birthplace, it found very little favor until Volkmann sent staff surgeon, W. A. Schultze, to Lister's clinic to study the method under the latter's guidance. We read Schultze's report in Volkmann's *Klinische Vortraege*, and shortly afterwards the brilliant results from Volkmann's and Nussbaum's clinic, and had lengthy conversations about the new procedure. The message was almost overpowering for the Doctor, who had witnessed at the bedside so many sad scenes from the ravages of sepsis and hospital gangrene. It was like the reawakening of Spring, a new fire seemed to course through his veins and he was eager to give this new method a thorough practical trial. With boyish delight he witnessed its magic results; it gave him new zest for work. The ferment theory had been in vogue; Bergmann had chemically produced sepsin, which for some time was considered the pathogenic agent. The theory of air infection also took hold of the surgical mind and the carbol[ic acid] spray was its natural offspring. A special assistant was entrusted with the apparatus and I thought he had a inner delight in wrapping us in a tropical vapor. It was soon abandoned when Nussbaum called "Away with the spray!" The germ theory was in the air, but had not yet received the proper scientific basis, so that we who were believers in it and also ardent advocates were classified as "bug cranks."[4]

Despite his apparent enthusiasm for antisepsis and, later, asepsis, Weber was, evidently, using instruments that could not have remained intact if subjected to thorough sterilization by heat or chemical action. Close scrutiny of his instruments reveals that none suffered any evident damage from boiling, prolonged soaking in antiseptic solutions, or steam sterilization. Therefore, we may conclude that, while many of his contemporaries adopted all metal "antiseptic" instruments in the 1880s, Weber continued to employ his older-style instruments made of traditional materials. However, he was neither ignorant of nor entirely opposed to the need for fundamental change in the surgeons' armamentarium. In 1889 he presented an all metal set for minor surgery to George Upson, the outstanding surgical student at the University of Wooster. By this act Weber demonstrated an unreserved willingness to direct the next generation along the right path. But for his own needs, Weber felt more at home with the same instruments that had served so well for many years.

The Weber collection represents the close of an era in that surgeons of following generations seldom acquired such a complete array of instruments and equipment. Instead, they relied more and more upon institutions, including the hospital, clinic, and infirmary, to provide standard surgical instruments. It might be necessary to furnish a private office with diagnostic aids and instruments for minor surgical procedures, but major surgery became the province of hospitals. There, the numerous special instruments would be delivered to the operating room in sterile condition and be laid out carefully by assistants and nurses prior to surgery. In Weber's day it was completely different; from the outset of his career he was compelled, by necessity, to acquire all the instruments for surgical practice and teaching responsibilities. In Cleveland no separate operating room built for that purpose existed until 1872 when St. Vincent (Charity) Hospital erected a surgical amphitheatre. Only after that date did any Cleveland hospital begin to build up a store of surgical instruments for in-house use.

As a consequence, the Weber collection embodies the choices, made carefully and deliberately, of what instruments would serve best to deal with any medical or surgical eventuality. The Weber collection gives us, in tangible form, evidence of what one individual considered to be the most useful and practical instruments available in his day. This is not to say that Weber always made the "right" choice, or that he always had ready access to the "best" instruments. Nevertheless, when one compares Weber's selections either to the offerings of instrument makers' catalogues, to other accessions of personal collections in the Dittrick Museum, or to the few available histories[5] of medical technology and surgical instruments, it is readily apparent that Gustav Weber had an almost unerring eye for quality.

---

[1]For documentation of this donation, see the *Minutes of the Cleveland Medical Library Association* (Minutes of the Council) 27 September 1897 (volume 1, p. 104-5) and (Meeting of the Council) 11 September 1902 (volume 1, p. 304). Evidence that Gustav Weber hoped that his collection would stimulate interest in the historical study of surgical instruments is found in his letter to the CMLA in 1903: "I proposed to obtain from friends an endowment large enough to furnish about $250.00 a year which would enable the Association to have every year a lecture on the progress of surgery and surgical instruments to be delivered by a members of the profession of Cleveland, not by outsiders, at the selection of the members of the Association. This fund I trust will be large enough to keep the surgical armamentarium, which may be gradually increased I hope, in good order." (volume 1, p. 321-22).

[2]Aside from occasional clinical notes published in the *Cleveland Medical Gazette* and printed commencement addresses at Western Reserve University and the University of Wooster, Weber did not publish extensively. His chief contributions to the medical literature of his day include "Remarks on the various operations for removing Calculi from the Bladder of the Female, with a new Method," *New York Journal of Medicine* 1 (1856):42-52, "A new method of arresting hemorrhage," *Medical Record* 10 (1875):305-10, and "Elephantiasis Arabum cured by ligature of the femoral artery," *American Journal of Medical Sciences* 87 (1884):164-70.

[3]For more information on the Germ Theory and its acceptance into medical and surgical practice, see Gert H. Brieger, "American Surgery and the Germ Theory of Disease," *Bulletin of the History of Medicine* 40 (March-April 1966):135-45 and F. F. Cartwright, "Antiseptic Surgery," in F. N. L. Poynter, ed. *Medicine and Science in the 1860s: Proceedings at the Sixth British Congress on the History of Medicine, University of Sussex, 6-9 September, 1967* (London: Wellcome Institute of the History of Medicine, 1968), pp. 77-103.

[4]Martin Stamm, "Gustave C. E. Weber as I Knew Him" *Cleveland Medical Journal* 11 (June 1912):412-13.

[5]See *BIBLIOGRAPHY, Instrument Collections and Catalogues, p. 61.*

II. BIOGRAPHICAL NOTE

In place of a full biographical sketch of Gustav Weber, which is precluded by the dearth of manuscript and printed materials documenting his career, we offer the reminiscences of his friend and colleague, John H. Lowman (1849-1919). The two men served together as faculty at the Medical Department of the University of Wooster (1870-1896), held visiting privileges at St. Vincent and Lakeside Hospitals in Cleveland, were active in the city's medical societies, and were early members of the Cleveland Medical Library Association. This "Appreciation" was read at a special meeting of the Association, held to eulogize Weber following his death in 1912, and was published in the *Cleveland Medical Journal* in 1912.

For further information about the career of John H. Lowman, see Chapter XLII, pp. 355-59 of Adolphus S. Knopf, *A History of the National Tuberculosis Association* (New York: National Tuberculosis Association, 1922).

An Appreciation of Doctor Gustav C. E. Weber.

By JOHN H. LOWMAN, M. D., Cleveland.

In the early days of the Civil War an officer was in Kentucky, eagerly commandeering medical supplies to take to the front. Arriving on the field of a recent battle he saw much miscellaneous operating by excited young surgeons; one of them he ordered to desist, as the limb did not require amputation. "By what right do you interfere?" replied the surgeon. "By the authority of the State of Ohio," came the answer. The officer was Weber, the most picturesque figure in the annals of medicine in Northern Ohio. By the study and practice of the old methods he had become a keen and rapid operator in times when there was safety in speed. Thence on, by gradually and cautiously adopting new methods he became a finished surgeon of the modern type. He was thus a master in two eras. He grew with science, and most interestingly could he unfold the developments of certain operative procedures. He passed through all the stages of laparotomy and vesical fistula, and was almost mobbed on account of one of his earliest hysterectomies because of the unreasoning bitterness of some of the medical instransigents. We depend on records for history, which becomes not only narrative but critical and philosophical because of its limitations, but the surgeons in the seventies lived history. Books were old before bound; no one but the most diligent knew whether he followed the latest methods. The last operation was already history, the next involved new discoveries. The men who came to that decade ripe, mature and ready were indeed fortunate. They were present at the birth of great events and that is what made many of them great. Drink at the source of the spring if you want the water pure. It was not only in the seventies that Weber got inspiration, but in the fifties as well, when, as a student, he roamed the capitals of Europe. Paris at that time was the center of almost everything. The Vienna faculty was at its glorious apogee and Holland still reflected the brilliancy of her old masters. Most charming was it to while the time away with Doctor Weber and listen to his *schwärmerei*[1] and anecdote, for he was an idealist as well, and loved to dream and recollect. Princely in hospitality, winning in manner, generous in thought and impulse when the mood was on, for he had his moods, he was a most delightful companion.

Born in Germany he came to Cleveland in the year 1856, in his twenty-eighth year, as Professor of Surgery.[2] At that early age he was master of his profession, and so rapidly did he gain general recognition that in five years he was appointed by Governor Tod Surgeon General of Ohio and given special privileges by Stanton, the then Secretary of War.[3] This early success was, however, preceded by a long preparation, for his was by no means the ordinary superficial student experience of the middle of the last century. Far from being superficial it was long, rich and arduous. His associates and teachers were men of high attainment and his opportunities manifold and unusual. His boyhood home at Bonn was an intellectual center, where Jean Paul Richter occasionally came. His mother was a von Podowilz, a woman of decided literary attainments and strong womanly qualities. His father was M. I. Weber, Professor of Anatomy, the author of several books and atlases.[4] He was called to Bonn from Landshut, before the latter university was incorporated with Munich, because of his distinguished ability and together with other great lights formed the first faculty there. Professor M. I. Weber was known for his vivacity of temperament, as well as for his learning, and every summer was a favorite figure at Baden Baden in the days of its greatest gaiety, always giving his winnings to the boys at the casino and hotels when he left. Much of his natural charm reappeared in his son. Gustav's time as a boy was passed in roaming up and down the banks of the Rhine, every spot of which in the neighborhood of Bonn he knew well, but study had not many charms for him. An old gymnasium teacher, returning after an absence of a few years, said on meeting him, "Oh! you grinning youngster when do you intend to work?" He continued to intersperse his desultory studies at the gymnasium with long pleasant rambles until he entered the university as a *mediciner*. Even then his brother Edward, who had a much more serious turn of mind, vowed that they could not make much out of him.

Early in his first year at the university a suspicion by the government that he was interested in the revolution of '48 and a hint to his mother of this fact led to his leaving Bonn one night suddenly for Munich, where he remained a short time with his uncle von Walther, an ophthalmologist. Thence he went to America, to St. Louis, where he continued his medical studies and graduated.[5] There the taste for anatomy was awakened in him and he made among other things an extensive dissection of the superficial veins of the human body as a museum specimen.

Dissatisfied with his opportunities in Missouri he returned a year after his graduation to Europe and went to Vienna, where he found a generous protector in Karl Braun, an old friend of his father. He practically lived in the hospital with Braun for a year. This was the era of Skoda, Opholzer, Hyrtle, Hebra, Rokitansky, and Arndt, the men who made the Vienna faculty so distinguished at that time.[6] One day, on going to begin work with Arndt, the latter remarked of a young man who was leaving the house, "You will hear great things from that young man some day." It was of von Graefe he spoke. Graefe was just leaving for Germany, where he was to have so illustrious a career. The life in Vienna was Weber's first great inspiration and there his fixed purpose was formed.

As the boy Gustav was amusing himself on the hills about Bonn he met a prominent Hollander who was there on account of the health of his daughter. The boy showed them many of his pleasant haunts, and when they parted the distinguished stranger gave him a ring and invited him to Amsterdam where he was sure he could do something for his young friend. So when the time came to leave Vienna, Weber went to Amsterdam, especially as Germany was not open to him; here he found his old friend, and by his assistance became interne in the great Out-of-town hospital there. This was a general hospital with a strong medical service. The surgical department was less important, but the treatment of lues[7] received particular attention, as Holland was one of the few places where careful inspection and restriction of the disease were enforced. Weber always recognized the great value of the life there for him, for it was there where he obtained his especial training as an internist. The Dutch physicians were highly esteemed and articles translated from the Dutch were received by the German periodicals with great satisfaction. The editor of a Marburg journal was particularly enthusiastic over their work. Preis von der Hofen was the inspiring genius in the low countries at that time and was often at the hospital. One hardly need comment how the experiences young Weber was daily having in Vienna and Amsterdam would affect any young man. And these were to be repeated the next year in Paris.[8]

There, through the maneuvers of young Heyfelder, a son of a former physician to the court, he was introduced with some temerity and without the professor's knowledge to Roux's clinic.[9] The old man quickly recognized the new face and instantly demanded explanations, and when he found the newcomer to be the son of Weber of Bonn he welcomed him, introduced him to his class as the son of the most distinguished anatomist of the day, invited him to his wards and to his home. From that time on Weber followed Roux and was often at his house. Roux had married the daughter of Baron Larry, Napoleon's great surgeon; Danyeau, the obstetrician, had married Roux's daughter; thus the Roux house was a distinguished center. Roux was legitimist in politics and a life senator, and was frequently courted by Napoleon. He held the first service at the Hotel Dieu and to be daily with him was a stroke of fortune. It was in Paris that Weber first knew that he was to be a surgeon. These were the days of fierce conflicts between the lithotritists and lithotomists.[10] Roux hurled sarcasms on the crushers and tried to prove his position by exhibiting bushel baskets full of calculi[11] whenever he had a stone case to operate. The air was electrical with rapid movements and counter movements. Every one expected something new, interesting or startling in the state, on the stage, or in the small whirlpools of smaller groups. Jobert de Lamballe had fallen and been relieved of his function as physician to the Empress, had suicided in consequence, and been substituted by the young, brilliant surgeon, Nelaton, who detected the bullet in Garibaldi's ankle.[12] The life in the *Quartier Latin* Weber never forgot. Indeed, who that has lived there even for a short time can forget it? Weber now was studying English, as was also Roux's granddaughter; and old Roux, fierce, grizzly, impetuous, used to tease them unceasingly over their pronunciation. In fact, Roux must have been a great rogue. At his receptions, to which every one went, he would say to the new nobility as he stroked a new coat, "What wonderful velvet, what gold lace; never was such velvet seen in France until the second Empire." Napoleon occasionally visited the Hotel Dieu and would go with Roux, but to the old man the Emperor was to the last a *mauvais sujet*.

From this atmosphere, from these associates, from these masters, from the very aristocracy of medicine, Weber went to New York. His brother Edward had preceded, had become a pronounced success and was then surgeon to the emigrant hospital. He was the first man to remove the superior maxillary bone in America and had done much good work, but the familial disease, tuberculosis, claimed him. Weber took his place, married there,[13] and practiced there for three or four years until his friends, Leidy and Stephen Smith, induced him to leave, lest his brother's fate overtake him. Going west, he heard in Detroit of the position in Cleveland just made vacant by the resignation of Ackley,[14] and, through the mediacy of Leidy, secured it. The Webers were most kindly rceeived and soon had a warm place in the hearts of the citizens; a place which they never lost.

The surgical clinic had declined, but Weber, having secured a place in the infirmary, brought 'bus loads of patients to the college every Wednesday and operated in the general amphitheatre. He could not, however, rest without a hospital, and after the war had ceased and his health, which had been seriously threatened by his service during the war, had returned, he inspired the building of the first great hospital here. His wife directed a fair for it that yielded some thousands of dollars; all classes of citizens united in pushing the project, and Charity Hospital arose and will always remain a monument to him. In 1864 he left the Cleveland Medical College and organized a new one.[15] His prestige as Surgeon General drew numerous students; classes were large from the beginning and the school continued to be an independent, successful educational institution until it united with the older college in 1880. It was through Weber's intimacy with Mr. J. L. Woods that the first great contribution was made to medical science in Cleveland.[16] The donor said to the writer that his thought had been turned in that direction through his affection for his physician. Thus two monuments will endure to crown the memory of Doctor Weber. Only a few can equal that service.

Doctor Weber came to his full development in the latter sixties, when he was about forty years old, but his ripest period was from his forty-fifth to his fiftieth year. It seemed as if no critical illness in Cleveland was allowed to pass at that time without his inspection. He was called in serious obstetrical complications, in grave medical cases, in ophthalmological operations as well as in his own immediate department of surgery. His judgment was good in all departments of medical science. He was, moreover, a generous, helpful and resourceful consultant. As an operator he was well equipped, his armamentarium was very extensive, his preparation of the patient careful, and his survey of the general situation wide and searching. On his first coming to New York he was an ardent lithotitrist. He had brought a full complement of Segalas' instruments and wanted to use them. Stephen Smith invited him to operate before his class in the old New York hospital on Broadway. Weber took his position by the patient but failed to find the stone. After manipulating as long as he thought safe for the patient he desisted and, turning to Smith, said he must give it up. Smith complimented him heartily on his judgment and immediately gave a talk to his students on knowing when to stop. The recollection of this occasion was always a sweet morsel. Weber's judgment was evidently good from the beginning. Up to the days of bloodless operations and asepsis, judgment had to be swift and unerring. Not every one could be a surgeon then, the pitfalls were too numerous and the responsibilities too great. Weber's dissection was clean and rapid. He made no blunders. He operated with a wide field and constantly enjoined having plenty of room. He was rapid and painstaking and complete. He had a mechanical eye and was singularly accurate in his plastic work. Harelip, rhinoplasty, chiloplasty were favorite operations with him. He always had good flaps and rarely left much surface for granulations. In the twenty-five years of his great activity he performed almost every operation known to surgery. The mortality of his early laparotomies was fully twenty-five per cent. This was indeed the case in many hospitals and did not improve much until antisepsis was introduced. His other work would compare very well with that of today in its results. His subsequent attention and supervision was most careful, due probably to his wide medical training and resourcefulness.

Weber was an intensive surgeon. His whole thought was concentrated on his work. Very seldom was he led away from it. He was the artist that Billroth said every physician and surgeon should be. He could see in imagination his work as he approached it. Yet with all his skill—he was ambidextrous as well—with all his experience and learning, his work was not easy. He not infrequently approached an operation with solicitude, and did not hesitate to admit this fact to his students. His scientific ideals were very high and he thought no one should seriously undertake the extensive practice of surgery unless prepared by character and training. As a teacher he did not realize the value of the essentially mechanical parts of the science. Perhaps he did not recognize the importance of the place of the plodding surgeon. There are very many things that a young man who has studied and worked under the eye of an experienced operator can do well; judgment will come with increased experience, and increased usefulness with better judgment. Many good surgeons have begun with systematic anatomical studies and minor surgery. Weber, in his lectures, dwelt on the wider problems, on the development of surgery, on its historical aspects, rather than on the commonplace details. He should have had an understudy for the preliminaries; he had neither the time nor the temperament for them, nor the school organization for carrying them out. His students in consequence lacked the courage that comes from prolonged technical training. They were not sufficiently automatic in nonessentials. At the same time they acquired an ultraconscientiousness that was inspired by the word of the master; two things that were fatal to daring and restrained a rapid progress. Weber had no *sang froid,* he was never reckless. His feeling, warmth and almost feminine tenderness were against it. He had not the brilliancy of incompleteness, which is really a slight lack of balance, but rather the perfection of completeness. While he enjoyed some particularly brilliant turn of an operation, his was an artistic rather than a vain appreciation. He always avoided dash and meretricious methods, and would tell the story of Blackman's amputating the shoulder joint with two strokes of a knife on the battlefield of Pittsburg Landing. Weber examined the amputated arm and found that there has been a resection of the joint at some previous time. He claimed that brilliancy had to have some such luck behind it to be safe.

He started the first medical journal in Cleveland, but he never contributed much to medical literature. Had he done so he would have had a more enduring fame. He used to make the above statement of Delamater, whom he regarded as the greatest diagnostician he had known. He had a distinctive professional manner and believed somewhat in the oracular methods. This was the late surviving relic of the sixteenth century, when physicians wore red robes and wigs, carried canes with scent bottles in the heads to counteract malevolent humors, and talked mysteriously in guildic Latin. He thought the physician should be the physician at all times and in all places. He believed the doctor should never lay down his aegis. He had a bit of the occult in him and had experienced many very odd coincidences. There was in him a subtilty, a perfect commingling of affability and reserve that produced an indefinable manner which with his evident consciousness of power gave him great strength. His method in the sick-room was admirable, and his respect for the individual rights of the patient very notable. His conclusions were couched in clear and simple terms and, although he retained a little of his German accent, he had an extraordinary facility in selecting the right word to express his thought. His methods, manner, bearing and reflections were built up around his medical ideals; thus he was lost in the transitional movements of the last two decades. He remained individualistic and felt that in personal development lay the most secure benefits. Some of the later deviations from altruism would seem to point to his idea as the true one. His faith was in democracy but his personality was aristocratic.

In 1898 he retired from the active practice of surgery, which he had gradually been relinquishing, and became consul in Nuremberg, where he remained four years. On his return in 1903 he was tendered a banquet by the Cleveland Medical Library Association, to which he gave his books and instruments. It was on that occasion that he had a stroke of apoplexy that paralyzed his right side. From then on he spent his declining years at Cosey Bank, his home in Willoughby. The chance visitor would always find him in his favorite corner looking out over the veranda into the trees, many of which he and his wife had planted. There he sat a decade long, growing in sweetness with no repining, with no complaints, quietly contented with his home, with occasional friends and pleasant thoughts. His old charm and manner never left, and with all his infirmities and with all his years he never seemed old. He often said he was only waiting, but waiting did not seem to make him weary. His end came in his eighty-fifth year after an attack of influenza and was simply a quiet slipping away into eternity.

1807 *Prospect Avenue, S. E.*

---

[1]Schwarmerie—(Ger.) enthusiasm, almost a romantic, idealistic exuberance.

[2]Weber was born 26 May 1828 in Bonn, Germany.

[3]dates of military service, January-October, 1862 (F. C. Waite, *Centennial History of Western Reserve University School of Medicine*). (Cleveland: Western Reserve University Press, 1946), p. 474.

[4]Moritz Ignaz Weber (1795-1875)—for biographical information, see August Hirsch, *Biographisches Lexikon der Hervorragenden Aerzte Aller Zeiten und Völker* (Wien und Leipzig: Urban & Schwarzenberg, 1888), pp. 209-10. Following the entry on his father, there is also an entry on Gustav Weber.

[5]Weber attended the University of St. Louis (Beaumont Hospital Medical College) from 1849-51. His diploma for the degree of Doctor of Medicine is in the collections of the Howard Dittrick Museum of Historical Medicine. The diploma is dated 28 February 1851.

[6]Erna Lesky, *The Vienna Medical School in the Nineteenth Century* (Baltimore: Johns Hopkins University Press, 1976), pp. 96-260.

[7]Lues—a plague or pestilence; specifically, syphilis.

[8]On the role of Paris as a medical mecca, see Erwin H. Ackerknecht, *Medicine at the Paris Hospital 1794-1848* (Baltimore: The Johns Hopkins University Press, 1967), pp. 191-94.

[9]Philibert Joseph Roux (1780-1854) was, among French surgeons of the early 19th century, second only to Guillaume Dupuytren. His contributions to surgical technique included staphylorraphy (cleft palate surgery), resection of bone, and suture of the ruptured female perineum.

[10]The instruments used for lithotomy (cutting for stone) and lithotrity (stone crushing) are discussed on pp. 48-49.

[11]Calculi—stone; concretion formed in any part of the body, most commonly in the passages of the biliary and urinary tracts; usually composed of salts of inorganic or organic acid or of other material such as cholesterol.

[12]Lowman is referring to the Nelaton's bullet probe. See p. 26.

[13]Weber married Ruth Elizabeth Cheney of New York City. They had a daughter, Ida (Mrs. L. Harrison Dudley), and a son, Carl G. Weber. The latter followed into his father's career, studying first at the University of Bonn and then at the Medical Department of Western Reserve University. Carl Weber graduated with the degree of Doctor of Medicine in 1886 and then entered medical practice. His health was never good, however, and he died in May 1888 "after a lingering illness [possibly pulmonary tuberculosis] of years." *Cleveland Medical Gazette* 3 (1888):242.

[14]Lowman here refers to Joseph Leidy (1823-91) and Stephen Smith (1823-1922). Leidy, a veritable polymath who made notable contributions to anatomy, botany, paleontology, and zoology, probably welcomed Weber on the bases of his father's renown in anatomy. Smith, a noted New York surgeon, knew Weber on more intimate terms and invited him to surgical clinics at Bellevue Hospital Medical College, where Smith held the post of Professor of Principles of Surgery. For biographical notes on these men see "Joseph Leidy" in Howard A. Kelly, *A Cyclopedia of American Medical Biography* (Philadelphia: W. B. Saunders and Company, 1912) volume 2, pp. 92-94 and "Stephen Smith" in B. French Stone, ed., *Biography of Eminent American Physicians and Surgeons* (Indianapolis: Carlon & Hollenbeck, 1894), p. 476.

Horace Ackley was one of the four founders of the Medical Department of Western Reserve College, see Frederick Clayton Waite, *Western Reserve University Centennial History of the School of Medicine* (Cleveland: Western Reserve University Press, 1946), pp. 87-92.

[15]For more information on St. Vincent de Paul (Charity) Hospital and Charity Hospital Medical College see Waite, pp. 235-39. During the School's existence, it graduated 193 students of the 298 who enrolled, see Frederick C. Waite, *Alumni Catalogue of the School of Medicine of Western Reserve University* (Cleveland: Western Reserve University, 1930), pp. 102-6.

[16]John L. Woods was a wealthy businessman with interests in the lumber trade in Wisconsin and in Cleveland, Ohio. His philanthropic contributions were instrumental in the construction of a new building for the Medical Department of Western Reserve University (1884) and the endowment of five professorships at the same institution (1892). Gustav Weber served as Mr. Woods' personal physician, accompanying him on several visits to health spas and attending Woods during his final illness in Augusta, Georgia in 1893. See *Cleveland Medical Gazette* 8 (1892-93):106-7, 355-57.

III. THE WEBER COLLECTION

Diagnostic Instruments: Introduction

Before the nineteenth century the process of diagnosing illness involved little, if any, use of technology or instruments. Diagnosis consisted principally of interviewing the patient, who provided a personal and necessarily subjective description of the signs characterizing their malady. The information that the physicians derived from this essentially social encounter constituted the basis for treatment, along with the inferences the physician might make drawing upon his past experience. This time-honored way of practicing medicine remained intact until the early nineteenth century. Then, with the advent of diagnostic technologies, medicine underwent a profound change. The stethoscope, the ophthalmoscope, and the thermometer, soon followed by a bewildering panoply of diagnostic devices, enhanced the ability to hear, see, and measure the signs of disease and injury. Diagnostic technology, therefore, imparted to medicine and surgery a greater degree of precision and objectivity than was possible before. It also compelled physicians and surgeons to become adept in the use of new technical devices if they were to remain at the forefront of their profession.

Although Gustav Weber practiced surgery, he nevertheless acquired a full complement of diagnostic aids. These included a stethoscope, two ophthalmoscopes, an otoscope, a thermometer, a sphygmograph, a sphygmomanometer, and a microscope for study of pathological specimens. With the exception of the stethoscope, which is now lamentably lost, all are in the collections of the Howard Dittrick Museum.

OPTHALMOSCOPES.

The ophthalmoscope, invented by German physiologist Hermann von Helmholtz *ca.* 1850-51, enabled physicians to see the interior of the eye for the first time. Helmholtz's ophthalmoscope was a deceptively simple instrument based upon the inventor's mastery of physiological optics. It consisted of a mirrored surface, placed on an angle to reflect light through the pupil, and and opening or fenestration in the center of the mirror through which the viewer obtained a direct line of sight into the eye. The resulting image of the fundus, or interior portions of the eye, could be made quite clear by using a bi-convex lens to correct for nearsightedness or farsightedness of both viewer and subject.

Physicians recognized immediately the substantial clinical value of von Helmholtz's ophthalmoscope. With it they could view and describe both normal eye structures and pathological disorders. Very soon several refinements of von Helmholtz's instrument appeared, each intended to enhance the ease of use and versatility of the ophthalmoscope. Gustav Weber acquired two such "improved" ophthalmoscopes: an early version of Coccius' ophthalmoscope, first introduced in 1853, and a binocular ophthalmoscope, designed by Giraud-Teulon from 1861-63, that gave the viewer depth perception.

One might reasonably suppose that the introduction of the ophthalmoscope promoted professional specialization in the field of ophthalmology. While this was true in a general sense, it must be remembered that the ophthalmoscope sometimes helped to identify disorders that were not diseases treated solely by the eye specialist. Manifestations of systemic disorders, such as diabetes, hypertension, and kidney disease, could also be revealed. In making such a diagnosis the ophthalmologist would be in a position to refer the patient to another physician for treatment. The incorporation of the ophthalmoscope into medical practice aided all physicians, not merely those in the emerging specialty of ophthalmology.

HDM 212. Ophthalmoscope (Coccius'), *ca.* 1855-65. Fig 1.
Case of walnut with brass latches and hinges; case lined with rose-colored velvet. Ophthalmoscope consists of fenestrated flat mirror in brass frame; brass shank below mirror fits into ivory handle; cross bar mounted at base of shank supports holder for concave lenses (used to focus light from a lamp onto the mirror that reflected light into the patient's eye). Set originally contained three lenses; one is now missing.
Dimensions of case: 20.9 cm. L x 8.9 cm. W x 6.8 cm. H

HDM 213. Ophthalmoscope, binocular (Giraud-Teulon's), *ca.* 1865. Not illustrated.
Case covered in black leatherette; brass catch and hinges; lid lined with deep red watered silk; base lined with mauve velvet. Ophthalmoscope consists of japanned brass housing for prisms that facilitate binocular viewing; concave fenestrated mirror mounted on side facing subject or patient; detachable wood handle screws into brass fitting on base of prism housing; marked on housing: "Nachet/ A Paris."
Dimensions of case: 10.8 cm. L x 7.8 cm. W x 3.7 cm. H

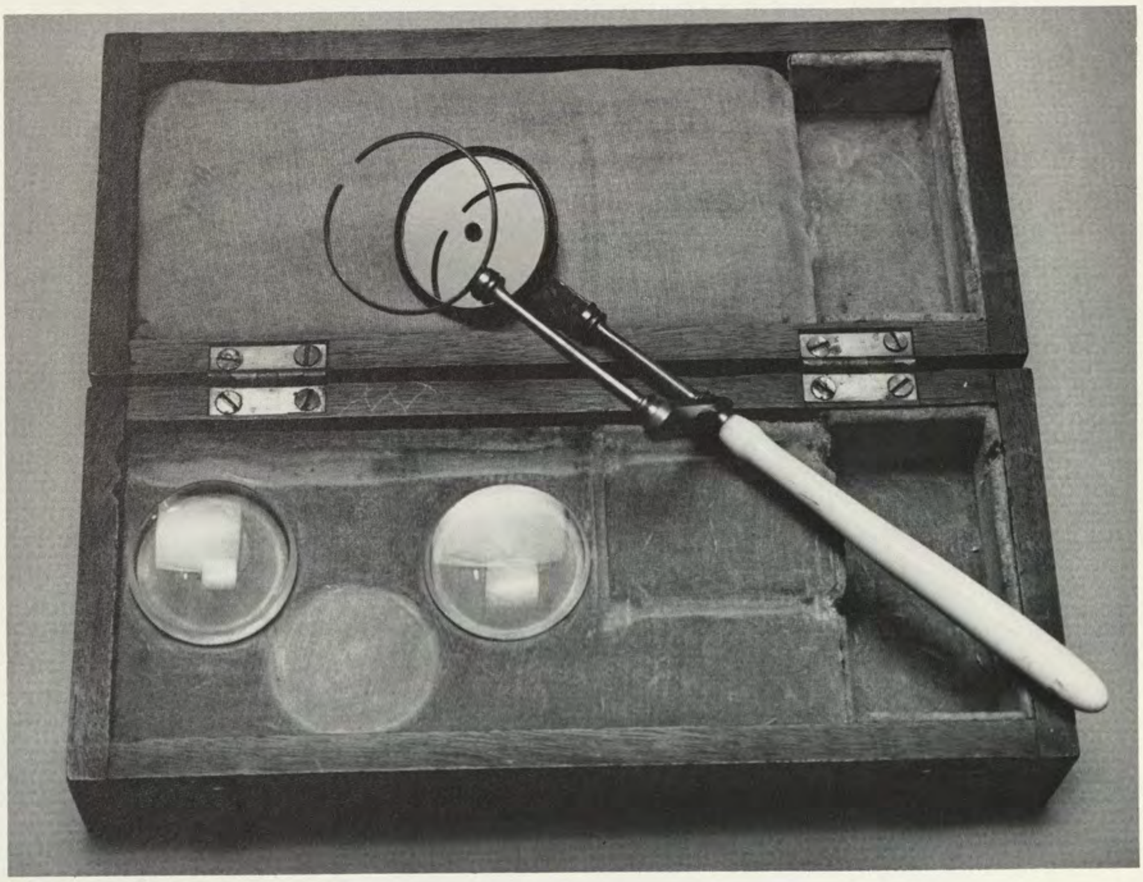


Fig. 1

OTOSCOPES.

The otoscope, used to examine the ear, combined an aural speculum with a source of natural or artificial light to provide illumination. In 1857 H. Henry Clark, a New Jersey phy$ician, devised an otoscope incorporating conical ear specula designed by British otologists Joseph Toynbee and William R. Wile. Clark claimed to have hit upon the means of illumination by chance, as he described in 1857:

> One day last winter I observed in front of my residence a man taking from his pocket a small mirror, and, turning it obliquely, throw the rays of light down a hole in the edge of the sidewalk that conducted to the faucet, by means of which the supply of water to my house was controlled. Stepping out, I observed that this small hole, about three feet deep and but a few inches square, was perfectly illuminated. It at once occurred to my mind that an instrument might be constructed in the same manner to shed light in upon the drum of the ear, affording the same kind of aid that the ophthalmoscope does in the examination of the eye. (J. Henry Clark, "The Reflecting Otoscope and Artificial Drum," *Medical and Surgical Reporter* 10 (October 1857):488-89.)

Clark took his concept and some rough drawings to George Tiemann, the leading instrument maker in New York. Tiemann and his workmen transformed Clark's idea into physical reality, thus producing one of the first otoscopes made in America.

The Clark otoscope, as illustrated in the 1879 Tiemann catalogue, consisted of a conical ear speculum mounted on one end of a brass cylinder. At mid-point of the cylinder was a funnel, placed at a right angle to the main section of the otoscope. The silver-plated interior of the funnel served to collect available light and concentrate it upon a mirror fitted at a 45° angle within the instrument body. A viewing tube passed through the center of the mirror, permitting a clear, illuminated line of sight from the eyepiece at one end to the speculum at the other.

HDM 201. Otoscope (Clark's), *ca.* 1857-60. Fig. 2
Case covered with black leatherette, brass hook and eye clasp; case lined throughout with deep red velvet, label on interior of case lid, black on white: "Geo. Tiemann & Co./ Manufacturers of/ Surgical Instruments/ & every description of/ Cutlery/ No. 63 Chatham St./ New York." Label on base of case, red on white, with ink script legend: "Clarks/ Otoscope/ 9.00." Case contains: otoscope, silver-plated copper and brass body, with reflecting mirror on interior and hard rubber and brass eye piece; two conical ear specula, silver-plate on brass.
Dimensions of case: 8.6 cm. L x 8 cm. W x 6 cm. H
Tiemann (1879) Pt. II, p. 35, fig. 160*

***Note.** Instrument makers' catalogues constitute indispensible reference sources for collectors and curators seeking to identify and date surgical instruments. While American-made instruments were described and illustrated in pharmaceutical supplies catalogues as early as the 1850s, instrument-making firms did not prepare their own catalogues until after 1870. The most prominent of these firms was George Tiemann and Co. of New York, which issued illustrated price lists for particular instrument groups in the early 1870s and then collected these in its first comprehensive catalogue, *The American Armamentarium Chirurgicum*, in 1879. The 1879 edition and its successor in 1889 were perhaps the most widely distributed instrument catalogues of their day as well as the most comprehensive in scope; today they are found in medical libraries more frequenty than those of any other American firm. For this reason, descriptive entries of the Weber collection include, where appropriate, references to the 1879 and 1889 Tiemann catalogues. In this way students of medical technology may more readily find illustrations of surgical instruments described in the text.

Fig. 2

THERMOMETRY AND THE THERMOSCOPE.

The widespread clinical application of the fever thermometer began only in the 1870s, even though its invention dates to the early seventeenth century. In the interval scientists established standard thermometric scales (Celsius and Fahrenheit), including the normal temperature of the human body, while instrument makers labored to perfect their materials and designs so as to yield uniform, reliable thermometric readings.

It remained for Carl Reinhold Wunderlich, a professor of medicine at Leipzig, to validate the clinical use of the thermometer. Wunderlich compiled thermometric readings for several diseases over the course of sixteen years and correlated changes in body temperature with the successive stages of each disease. With this information in hand, physicians believed that they had a new means to identify illness in its early phases and thus take action in time to ameliorate the patient's condition.

In America the leading proponent of Wunderlich's views was Edward Seguin, an emigrant French physician residing first in Cleveland and then in New York City. Seguin employed the thermometer to pinpoint thermal abnormalities in a specific region of the human body and thereby locate the site of disease or injury. His efforts were, at first, hampered by imperfectly calibrated instruments; existing manufacturing processes and materials made it difficult, if not impossible, to produce clinical fever thermometers that gave uniform results. To overcome this deficiency Seguin devised a self-calibrating thermometer, or "thermoscope."

The thermoscope consisted of a glass tube, open at one end and terminating in a spherical bulb at the other. Calibrating or indexing began by heating the bulb briefly and then immersing the open end of the tube into a bowl of water. As the bulb cooled water was drawn up the inverted tube, which was then withdrawn from the water. With practice one could fill the tube without flooding the bulb. A sliding metal scale, marked from 0 to 10 cm. was then adjusted to align the 0 index with the base of the water column. The thermoscope was now ready for use.

Weber probably used the thermoscope to locate the precise seat of infection or injury, as indicated by thermal abnormalities, and thus guide medication or surgical intervention.

HDM 211. Thermoscope (Seguin's), *ca.* 1875. Not illustrated.
Case covered with dark green leather, brass hinges and copper catch; interior lined with beige velvet, edged in gold trim; label on interior of case lid, gold on black: "Dr. Seguin's Thermoscope." Thermoscope consists of glass tube (19.3 cm. long), with flared lip at open end and spherical bulb at opposite end; sliding metal scale, indexed 0-10 cm., marked on reverse; "W. F. Ford NY" and "Caswell Hazard & Co."
Dimensions of case: 20.5 cm. L x 3.6 cm. W x 2.5 cm. H

SPHYGMOGRAPH AND SPHYGMOMANOMETER.

In the mid-nineteenth century physicians and surgeons turned to their colleagues in experimental physiology to borrow new apparatus for clinical diagnosis. Chief among these were the sphygmograph, to record the arterial pulse, and the sphygmomanometer, to measure blood pressure. These two devices respectively provided graphic and numerical representations of physiologic functions. Diagnosticians hoped that this information could help pinpoint specific disorders, but this expectation was not fulfilled in practice. They proved difficult to operate, often gave inconsistent results, and even when working properly, provided information of quite limited value to the surgeon and physician.

The sphygmograph, introduced in 1860 by the French physiologist Etienne Jules Marey, was a sensitive instrument for recording the pulse wave as measured at the radial artery, near the base of the thumb. Physicians traditionally monitored the pulse at this point, applying their thumb to sense its strengths and frequency. The sphygmograph supplanted the subjective judgement of the physician, however, by furnishing a tracing or graphic depiction of the pulse.

In operation, the physician strapped the Marey sphygmograph to the wrist, situating an ivory button directly over the artery. Each arterial pulse wave was transmitted from the button by a sensitive spring to a stylus that rose and fell in concert with the pulse. The stylus recorded its action on a strip of smoked paper that moved forward by means of a clockwork mechanism a distance of approximately four inches in about ten seconds. The resulting visual record resembled, in a rough sense, the graphic reading of a modern EKG machine. A fundamental difference separates the two apparatus, however. While an EKG reading replicates distinct heart functions, the Marey sphygmograph simply recorded the pulse wave, indicating its frequency, degree of regularity, and equality of the heart beats. The difficulty of interpreting the significance of these measures was compounded by the variance in results between two different sphygmographs. In its original form, as used by Weber, there was no way to calibrate the Marey sphygmograph; apparently similar, even identical, instruments could exert quite different pressures upon the radial artery. Thus, the same individual's pulse might give quite variant readings when recorded by two different sphygmographs.

All these shortcomings served to limit the clinical usefulness of Marey's sphygmograph. Initial enthusiasm soon gave way to disenchantment and clinicians awaited the introduction of a more practical apparatus to help them in the diagnosis of cardiac disease and disfunction. The sphygmomanometer, unlike Marey's sphymograph, recorded actual arterial blood pressure. Early nineteenth-century versions involved inserting a canula directly into the artery, so that the blood exerted pressure directly upon a column of mercury to register arterial pressure (as measured in millimeters of mercury in a capillary tube). This method of direct measurement remained a laboratory procedure with little prospect for clinical application.

Indirect sphygmomanometry, eliminating the need for arterial canulation, became a practical reality in the 1880s. In that decade Samuel Siegried Ritter von Basch, a Czech physician teaching physiology in Vienna, introduced a sphygmomanometer that could be utilized by clinicians. Von Basch substituted an aneroid manometer for the mercury column in his device and, more importantly, replaced the direct arterial cannula with a water-filled bulb or pelotte. In practice, the physician positioned the pelotte over the radial artery and increased water pressure upon it until the pulse sound, monitored by stethoscope, disappeared. The manometer reading at this point gave a measure of systolic pressure.

The von Basch sphygmomanometer constituted a diagnostic tool of distinct value, but its use was still much more common among specialists than the ordinary physician. The version found in the Weber collection incorporated several improvements covered under von Basch's German patent of 1886 and, therefore, must have been acquired by Gustav Weber very close to the end of his active career.

HDM 206. Sphygmograph (Marey's), *ca.* 1875. Fig. 3.
Sphygmograph consists of brass frame with rectangular housing for coil spring mechanism (to propel smoked paper recording strip left to right a distance of three and one half inches) and support for steel leaf spring ending in ivory button (to be placed over radial artery); vertical adjusting screw controls spring tension. Sphygmograph used in conjunction with arm rest, which is covered in deep red leather with brass posts on each side (for tying the sphygmograph in place over the patient's arm).
Dimensions of sphygmograph: 19 cm. L x 3.2 cm. W x 5.5 cm. H
Dimensions of arm rest: 23.2 cm. L x 12.6 cm. W x 4.5 cm. H
Tiemann (1879) Pt. I, p. 87, fig. 279

HDM 209. Sphygmomanometer (von Basch's), *ca.* 1886-90. Fig. 4.
Case covered with black leatherette, brass hinge and clasp; interior of base lined with deep purple velvet; interior of lid lined with gray silk. Case contains: anaeroid manometer (or Vidie capsule), in cylindrical nickel-plated case with clear crystal cover over dial gauge face, metal housing for "pelotte" or rubber bulb to be placed over radial artery ("pelotte" and connecting rubber tube now missing). Face of dial gauge marked: "Basch's Sphygmo-manometer No. 886/ D. R. P. No 38529" and scale graduated from 0 to 22[0] mm. Hg.
Dimensions of case: 10.7 cm. L x 6.8 cm. W x 4 cm. H

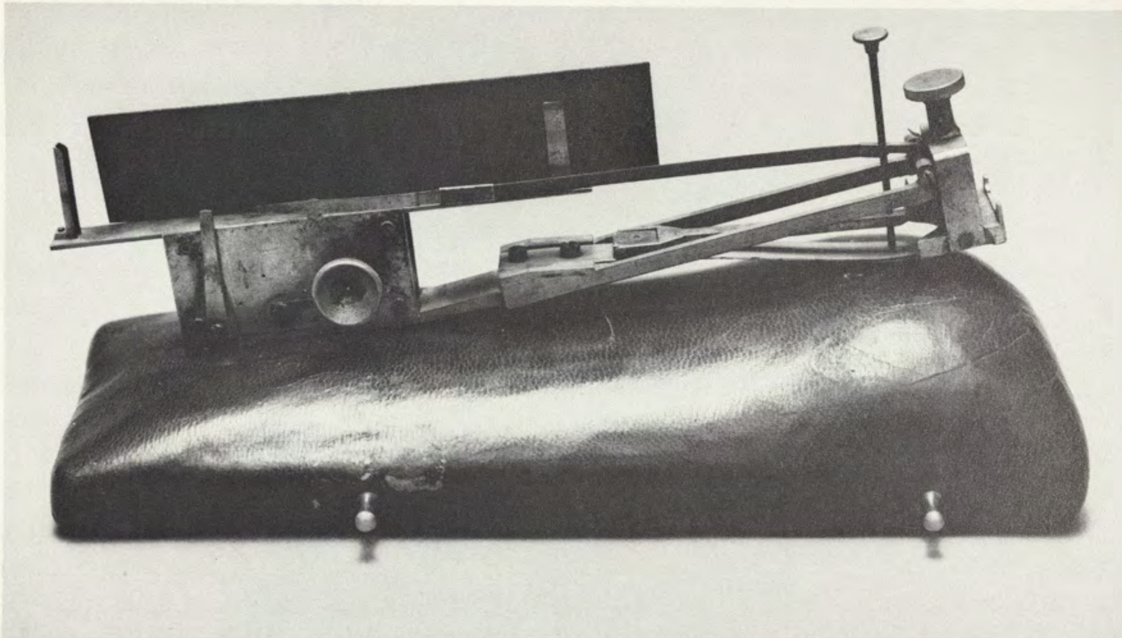


Fig. 3

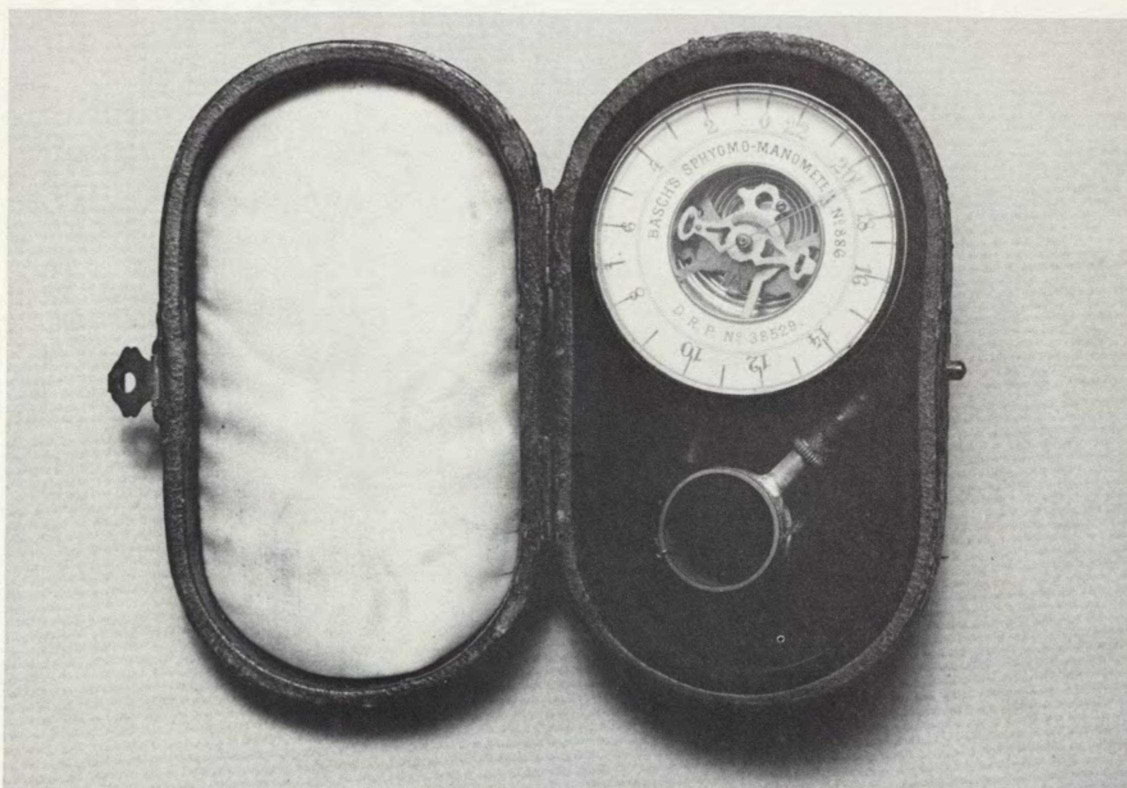


Fig. 4

MICROSCOPE.

Although the microscope dates to the seventeenth century, it did not become an essential tool for medical and biological investigation until the development of the achromatic lens in the nineteenth century. In the 1820s European and British optics workers introduced achromatic lenses that minimized aberration problems in compound microscopes. A decade later American scientists and physicians began to appreciate the importance of this technical improvement and sought out European and British-made instruments for their own research work. English microscopes were admired for their quality of workmanship and powerful lenses, but many American buyers turned to cheaper and simpler French-made microscopes that proved sufficient for most routine microscopic examinations.

It was not until 1847 that an American instrument maker, Charles A. Spencer, began to offer achromatic microscopes that rivaled European models. Americans, however, continued to rely upon imported microscopes since Spencer and other American instrument makers could not meet the rising demand for middling quality, inexpensive microscopes.

Gustav Weber, like many Americans studying medicine abroad, acquired a microscope before returning to the United States in 1853. Upon the recommendation of Jacob L. C. Schroeder Van Der Kolk, a Dutch colleague, Weber selected a modified "drum" type compound achromatic microscope. The drum pattern was made popular by Paris instrument maker Georges Oberhauser *ca.* 1830 and remained a favorite style produced by his firm and by other French makers, including Camille Nachet and Charles Chevalier. Weber's microscope is unsigned but most closely resembles those made by or attributed to Nachet.

How extensively Weber used a microscope in his regular practice of medicine and surgery is difficult to say. The few microscope slides found in his elegant walnut slide cabinet give some clue. Of the fifty-three slides that remain, twenty-three are pathological, showing the tissue sections from patients that Weber treated. Another twenty-six slides show tissue sections from other species, mainly vertebrates, that would have been useful for purposes of comparative anatomy or histology. Four slides remain unidentified. The only dated slide is a human pathology specimen, prepared commercially by Gehring of Cleveland. The label reads: "Epithelioma/ from lower jaw/ Dr. Weber July '84."

HDM 207. Microscope, modified "drum" type, *ca.* 1855. Fig. 5.

Mahogany case, fitted with wood supports and compartments to hold microscope and accessories; brass hinges and lock. Lacquered brass modified "drum" type microscope; cylindrical lead-filled base with open front contains concave mirror and diaphragm (adjusting ring at rear of base exterior); surmounted by black lacquered rectangular stage, fine adjustment controlled by knurled screw on left side of stage; cylindrical pillar mounted at rear of stage supports sliding tubular body of microscope; two objectives and two eyepieces; separate convex glass condenser with brass frame. Compartment lid in case marked, in script: "Ocul 1 mit Obj 1 = 48 a 50 m./ Ocul 2 mit Obj 1 = 90 m./ Ocul 1 mit Obj 2 = 200 m./ Ocul 2 mit Obj 2 — 400 m."

Dimensions of case: 10.2 cm. H x 31 cm. L x 13.3 cm. W

[Note: Paper label on exterior of microscope case says "microscope selected by/ Shoeder [*sic*] Van Der Kolk . . ." Jacob L. C. Schroeder Van Der Kolk (1797-1862) carried out microscopical studies of brain tissue that confirmed the medula as being the seat of epilepsy (1859).

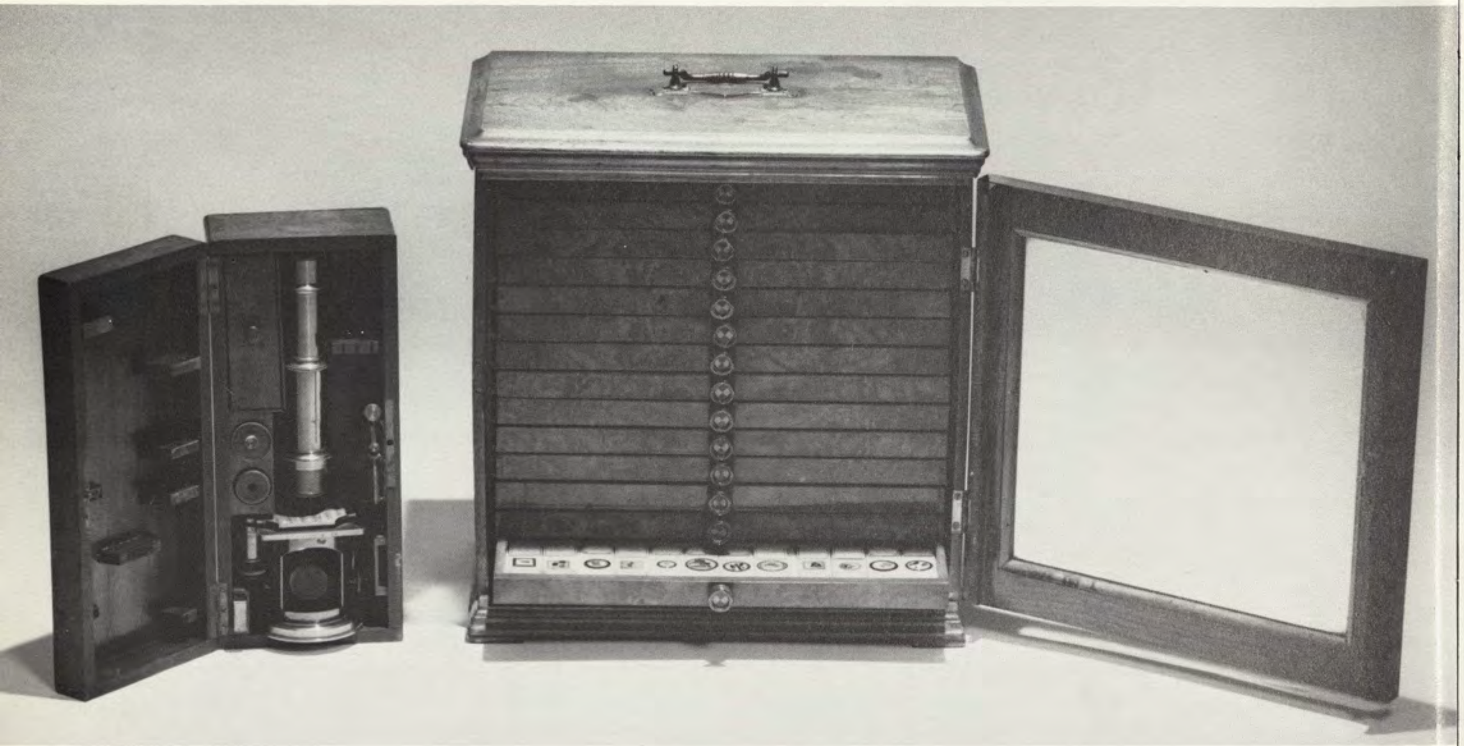


Fig. 5

HDM 293. Microscope slide cabinet, *c.* 1875. Fig. 5.
Walnut microscope slide case with glass front door, brass hinges and handle on case top; case contains fourteen slide drawers, each with walnut burl veneer face and single inlaid ivory and walnut pull knob.
Dimensions of case: 36.5 cm. L x 23 cm. W x 38 cm. H

POST-MORTEM INSTRUMENT SETS.

Post-mortem examination is the process of identifying the cause and circumstances of death, often for legal purposes. It was a central part of medical education since it enabled students to see first-hand the pathological disorders that they were taught to diagnose in living persons. Correlating pathological findings in deceased persons with symptoms observed in patients aided surgical students to assess more confidently when it was appropriate to recommend surgery and when it was not. To gain the experience necessary to make this judgement, students at Cleveland medical colleges in the 1870s had to attend eight hours of dissection each week (out of a total of forty-five class hours).

The post-mortem examination sets of Gustav Weber included several instruments that might be used in minor or major surgery, such as the scalpel and amputating saw. They also contained special-purpose instruments almost never called for in surgery. These include instruments to sever the spinal cord (rachitome and costotome), to open the intestines (enterotome), and to remove the calvarium, or skull-cap (T-handle chisel). The two post-mortem sets shown here differ only in size, not selection, of instruments. Examples of the smaller set, sold by George Tiemann and Co. of New York, could be found in dissecting rooms at medical colleges across the country by the 1860s. The other set is unusually large and could be easily mistaken for an amputation set until closer inspection reveals the presence of such dissection aids as a double-ended dissecting hook, an enterotome, a blowpipe, and a folding measuring stick ruled in millimeters and centimeters.

HDM 230. Post-mortem set, *ca.* 1860-70. Fig. 6.
Post-mortem instrument set in mahogany case with lock; plain brass plate in center of case top. Case interior lined with dark green velvet is divided into two compartments (base and lid) separated by velvet-covered partition; label on partition marked gold on black reads: "G. Tiemann and Co./ Manufacturers/ of/ Surgical Instruments/ 63 Chatham St. N.Y." Lid of case contains (front to rear): amputating knife blade: raspatory; costotome (chisel); hammer with calvarium hook; scalpel; dissecting hook; scalpel; director; aneurism needle with eye; chain hook; scalpel; and needle. Most instruments marked "Tiemann & Co." but case also contains instruments with marks of Lüer (Paris) and Fenton (Cleveland, Ohio).
Dimensions of case: 5.8 cm. H x 26 cm. L x 12.5 cm. W
Tiemann (1879) Pt. I, pp. 94-96.

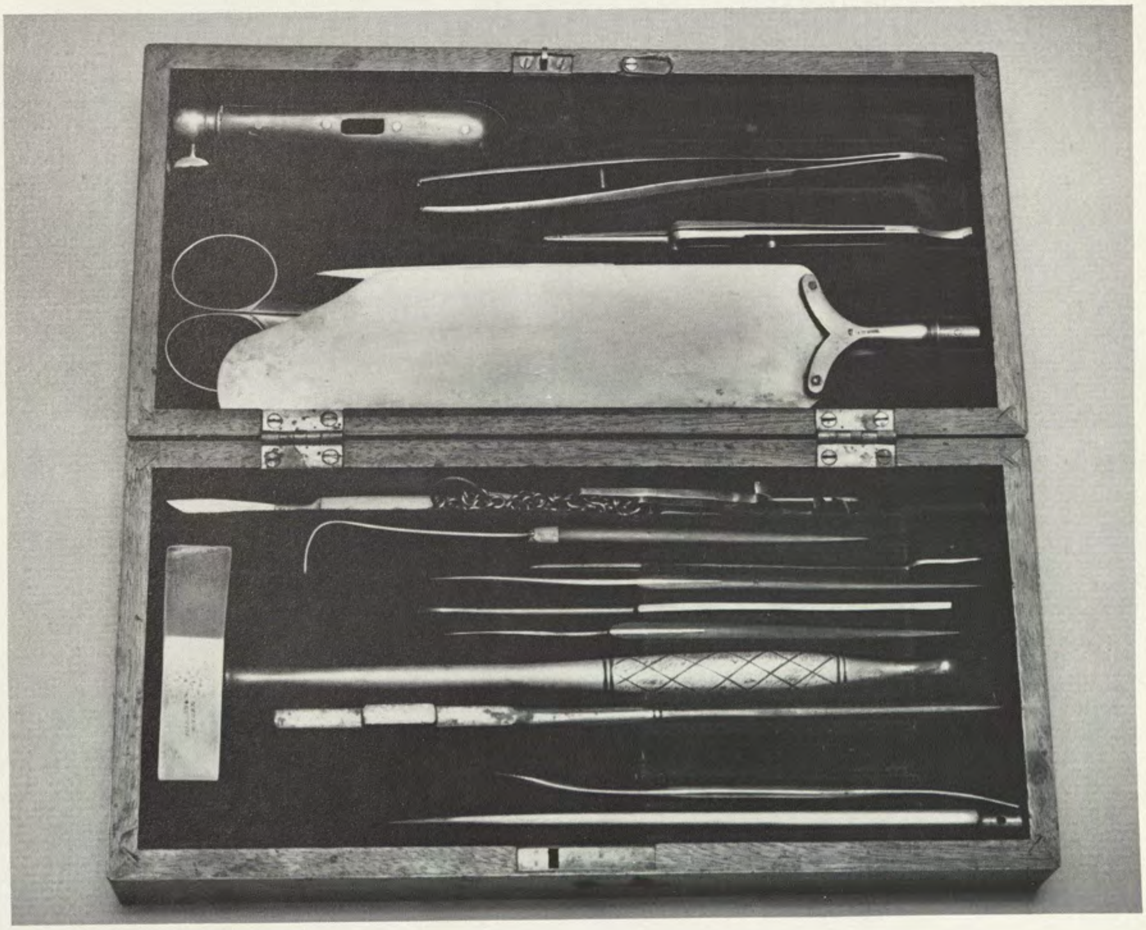


Fig. 6

HDM 252. Post-mortem set, *ca.* 1875. Fig. 7.

Post-mortem instrument in black, leather-covered case with brass lock plate and latches. Case interior lined with purple felt; separate felt-lined instrument tray fits into base of case; label on interior of case lid, gold on black, reads; "Josef/ Leiter/ Wien/ Fabrik Chir. Instrumente U. Bandagen." Base of case contains (front to rear): amputation saw; bone chisel; mallet; bone gouge; double-ended dissecting hook, wood folding meter stick, ruled in millimeters and centimeters; and four large, curved needles. Instrument tray contains (front to back): large amputating knife; six scalpels, graduated in size; T-handle bone chisel; two dissection hooks; enterotome; two dissecting forceps; and blowpipe. Instruments marked "Leiter/ Wien."

Dimensions of case: 40.3 cm. L x 6.8 cm. W x 14.2 cm. H

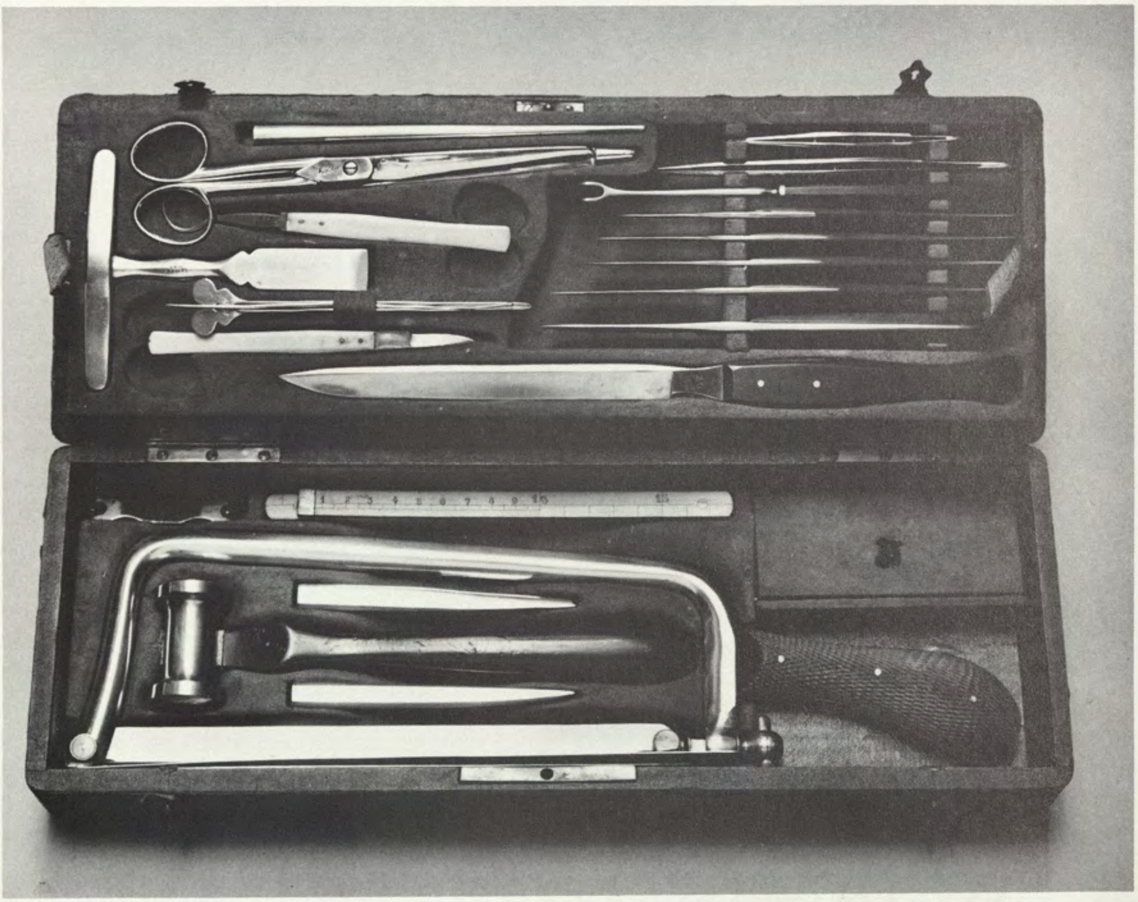


Fig. 7

General Surgery Instruments

AMPUTATION INSTRUMENTS AND MILITARY MEDICINE.

Does war stimulate progress in medicine and surgery? This question must have arisen in the mind of Gustav Weber, while Surgeon-General of Ohio forces, and he probably would have responded ambivalently, "no and yes." The War of the Rebellion, or the American Civil War, fostered no great revolution in therapeutics. Most casualties still succumbed far from the battlefront, in camps and military hospitals where staff physicians were left to contend ineffectually with rampant infection and disease, including typhoid, diarrhea, and dysentery. For surgeons, the war was a virtual schooling period during which they gained extensive experience in capital surgery, or amputation of limbs shattered by Minié balls and case shrapnel.

In the field of medical instrumentation, the Civil War inadvertently broadened the range of surgical sets offered by instrument makers. These firms, led by George Tiemann and Co. and Wade & Ford, began to prepare sets comprising a selection of instruments recommended by a renowned surgeon. Thus, one encounters in the Tiemann line a set listed as "Dr. Hamilton's Field Case." This refers to the military surgery set recommended by Frank Hastings Hamilton, "Professor of Military Surgery in Bellevue Medical College." In *A Practical Treatise on Military Surgery* (New York: Baillière Brothers, 1861, p. 112), Hamilton explained that he designed the case specifically for battlefield use:

> Our object has been to comprise within a single case all the instruments which are likely to be needed in an emergency, and which case may be sufficiently compact and light to be easily carried from one point to another. It is not intended to supply all the wants of a hospital, or to complete the armamentarium of the regimental surgeon, but only to obviate the necessity of carrying several cases where only a few instruments are needed.

The case sets of amputation and surgical instruments that grew out of this military necessity later became a regular feature of the equipment acquired by physicians and surgeons in the last half of the nineteenth century. Most medical men received them as gifts presented upon graduation by family, friends, and medical college professors.

HDM 242. Amputation instrument set *ca.* 1861-65. Fig. 8
Mahogany case; brass corner straps, slide catches; recessed brass plate on case top, engraved: "U.S.A./ Hospl. Dept."; interior of case lined with olive velvet throughout; removable partition in case lid covered with olive velvet, with oval label in center, gold on black, reads: "G. Tiemann & Co./ Manufacturers/ of/ Surgical Instruments/ 63 Chatham St. N.Y." Lid of case, partitioned, contains (front to rear): capital saw (Satterlee's); bone forceps (Satterlee's); rectum trocar and cannula; and two pairs dressing forceps. Missing: bullet forceps and metacarpal saw. Base of case, partitioned, contains (front to rear): aneurism needle; tenaculum; four bistouries (two pointed, two blunt); one scalpel; one catlin (double-edged); two amputating knives (single-edged); director; chisel; four suture needles. Missing: two scalpels; one amputating knife; one tourniquet; and possibly three unidentified instruments. Instruments marked: "Tiemann", "Hofman", and "Reynders". It is interesting to note the absence of a key lock mechanism on this case, in contrast to non-military cases, which almost invariably incorporated a lock and key to keep curious hands out of a case full of extremely sharp instruments.
Dimensions of case: 41 cm. L x 26 cm. W x 6 cm. H

HDM 256. Amputation instrument set, *ca.* 1861-65.. Figs. 9 and 10.

Mahogany case, covered with rosewood veneer; brass corner straps and lock; recessed brass plate (unengraved) on case top; interior of case lined with deep blue velvet; removable partition in case lid covered with blue velvet, with oval label in center, gold on red: "G. Tiemann & Co./ Manufacturers/ of/ Surgical Instruments/ 67 Chatham St. N.Y." Lid of case, lined in blue velvet, contains (front to rear): artery forceps; bone forceps; capital bow saw with extra blade; metacarpal bow saw; two tenacula. Base of case, lined in blue velvet, contains: three catlins (double-edged knives), graduated in size, three amputation knives (single-edged), graduated in size, one scalpel, and one suture needle. Instruments marked: "Krämer" and "Tiemann." Instrument case accompanied by pouch or carrying case of heavy saddler's leather, separate compartment for rolled bandages; brass buckles for leather closure straps.

Dimensions of case: 42 cm. L x 14.8 cm. W x 9 cm. H

Dimensions of pouch: 43.5 cm. L x 16 cm. W x 15 cm. H

Fig. 8

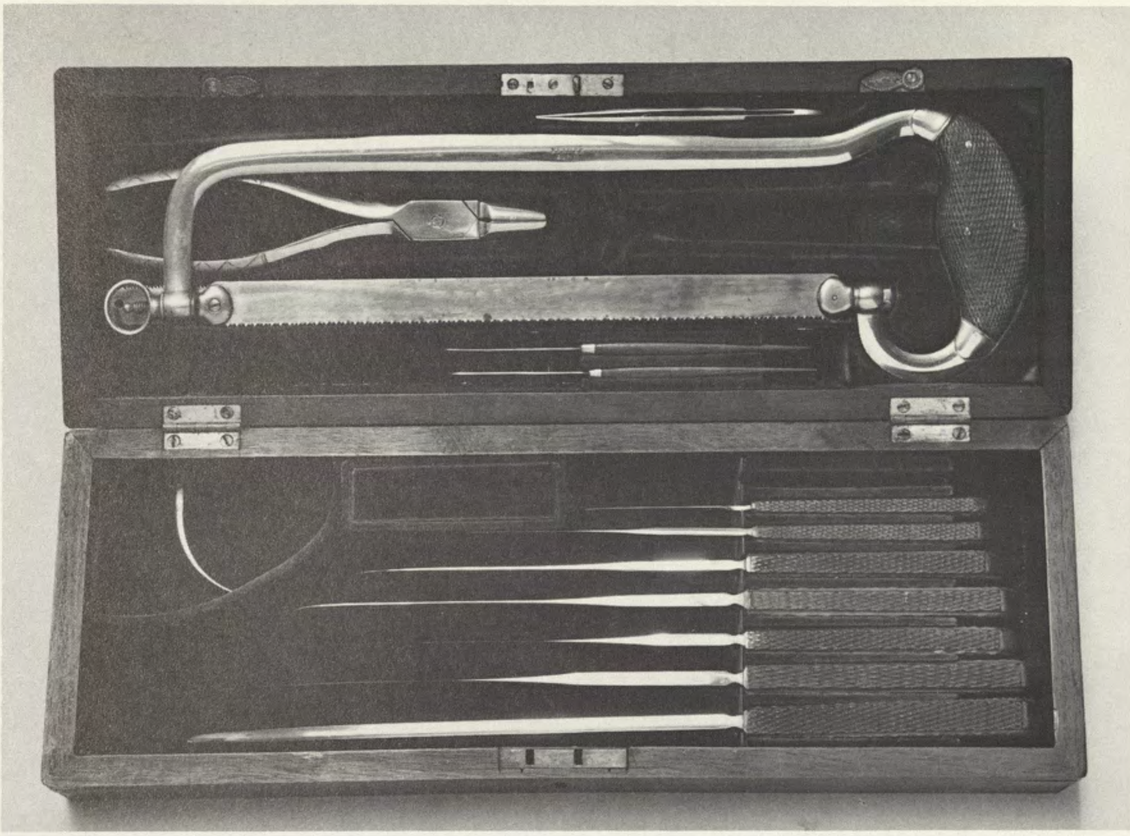


Fig. 9

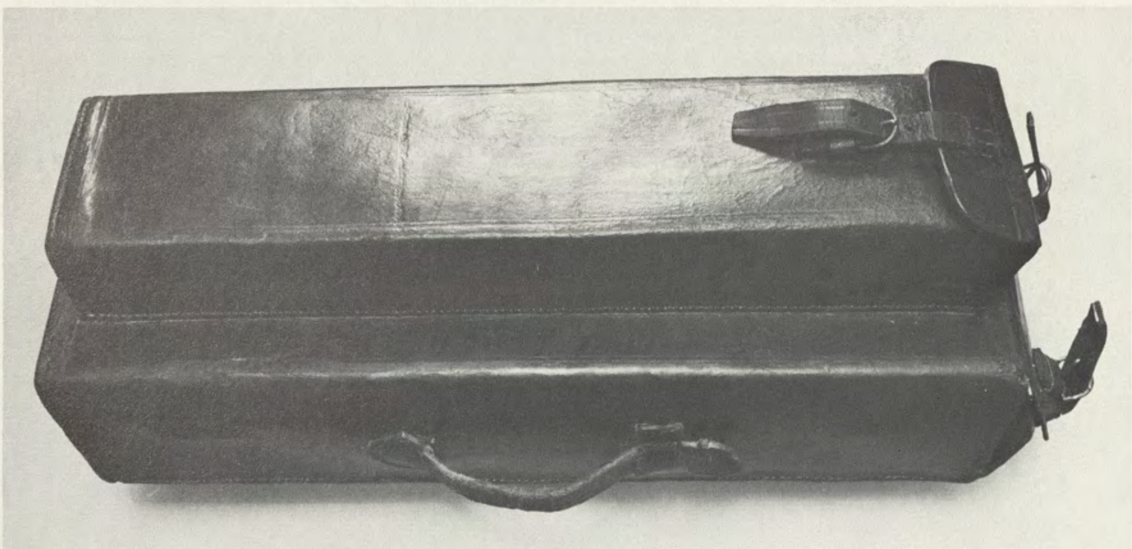


Fig. 10

HDM 346. Bullet Probe (Nelaton's), *ca.* 1865. Not illustrated.
Curved steel shaft, with wood handle, tipped with porcelain ball.
Dimensions: 25 cm. L x 2 cm. diameter (of porcelain tip)
Tiemann (1879) Pt. I, p. 40, fig. 120
[Note: This Nelaton probe is heavier than other examples, and the probe end is orb-shaped rather than hemispherical.]

The Nelaton probe enabled military surgeons to confirm the presence of a bullet lodged deep in tissue. The probe consisted of a metal shaft tipped with a white porcelain bulb, which was marked or discolored by contact with a lead projectile. It was devised in 1862 by Auguste Nelaton, personal surgeon to Napoleon III of France, to locate the bullet embedded in the ankle wound of Guiseppi Garibaldi, renowned Italian patriot and military leader. From that date until the advent of radiology in 1896, the Nelaton probe remained an essential tool for surgeons treating gunshot wounds.

MINOR SURGERY.

Minor surgery is a term that aptly describes most surgery, with the exception of limb amputation, before the advent of general anesthesia in the 1840s and antiseptic procedures introduced in the late 1860s. Prior to these revolutionary advances in operative technique, surgeons usually hesitated to open the abdomen or chest out of fear of surgical shock and post-operative infections commonly grouped under the rubric of "hospital fever." For these reasons much surgery was limited to excising surface tumors, lancing abscesses, removing fingers or toes, and extracting foreign bodies from wounds. Instrument makers regularly assembled leather pocket cases and small wood cases containing instruments appropriate for these procedures, such as scalpels, bistouries, forceps, and small saws. Weber acquired at least three minor surgery sets put up in walnut or mahogany cases, but his armamentarium included no leather pocket cases commonly carried by general practitioners.

HDM 240. Minor surgery instrument set, *ca.* 1870. Not illustrated.
Mahogany case, with nickel-plated reinforcing straps and hook and eye clasps (now missing escutcheon and recessed plate on case top); interior of case lined throughout with purple velvet; removable partition in case lid covered with purple velvet, with oval label, gold on black: "G. Tiemann & Co./ Manufacturers/ of/ Surgical Instruments/ 67 Chatham St. N.Y." Lid of case contains (front to rear): one pair fenestrated spring-catch hemostatic forceps (Lüer's), one pair curved tissue forceps, and one metacarpal saw. Several instruments (scissors and forceps) missing. Base of case contains (front to rear): one blunt curved bistoury, one sharp curved bistoury, three double-edged scalpels, eight scalpels, one arterial clamp or serrefine (Langenbeck's), two double prong retractors, one aneurism needle, and one sharp-pointed director.
Dimensions of case: 24.5 cm. L x 11.8 cm. W x 5.8 cm. H

HDM 235. Tenotomy knives, *ca.* 1875. Not illustrated.
Brown leather case, tooled border with C-scroll design, metal latches. Interior lined with maroon velvet and satin. Compartments in base contain three tenotomy knives, graduated in size, with ivory handles. Marked: "Eschbaum."
Dimensions of case: 15 cm. L x 4 cm. W x 1.7 cm. H

HDM 268a. Minor surgery instrument set, *ca.* 1860. Figs. 12 and 13.

Mahogany case, brass corner straps, lock, and escutcheon plate; recessed brass plate (unengraved) on case top. Interior of case lined with maroon velvet. Removable velvet impressed with C-scroll border and eagle with banners: "H. Hernstein/ 393 B'way/ New York." Ivory pull. Lid contains (front to rear): two pairs of operating scissors, metacarpal saw, bone forceps, and artery forceps. Base contains (left, front to rear): tourniquet, wire, and aneurism needles; and pointed bistoury; curved pointed bistoury; short scalpel; tenaculum; straight pointed bistoury; curved blunt bistoury; two scalpels; narrow metacarpal saw; straight pointed bistoury; long straight bistoury; double-edged scalpel; aneurism needle and holder; and one key (for needle holder). Instruments marked: "Hernstein."

Dimensions of case: 29 cm. L x 11.8 cm. W x 5 cm. H

HDM 268b. Minor surgery instrument set, *ca.* 1865. Fig. 11.

Rosewood case, brass hook and eye latches and German silver hinges; recessed brass plate (unengraved) on case lid; interior lined with purple velvet; removable partition in case lid covered with purple velvet, with oval label in center, gold on black: "G. Tiemann & Co./ Manufacturers/ of/ Surgical Instruments/ 67 Chatham St. N.Y." Lid of case, partitioned, contains (front to rear): bone chisel and lifting back metacarpal saw (Conant's) that fit interchangeably into separate handle; bone forceps; slide catch artery forceps. Several instruments, principally artery forceps and scissors, are missing. Base of case contains (front to rear): double hook; amputation knife blade and separate handle; two tenotomes; four bistouries, two blunt and two sharp; six scalpels, graduated in size. All instrument handles are of ivory and marked either "G. Tiemann" or "Otto & Reynders."

Dimensions of case: 22.5 cm. L x 12.5 cm. W x 13.3 cm. H

Tiemann (1879) Pt. I, pp. 33-37

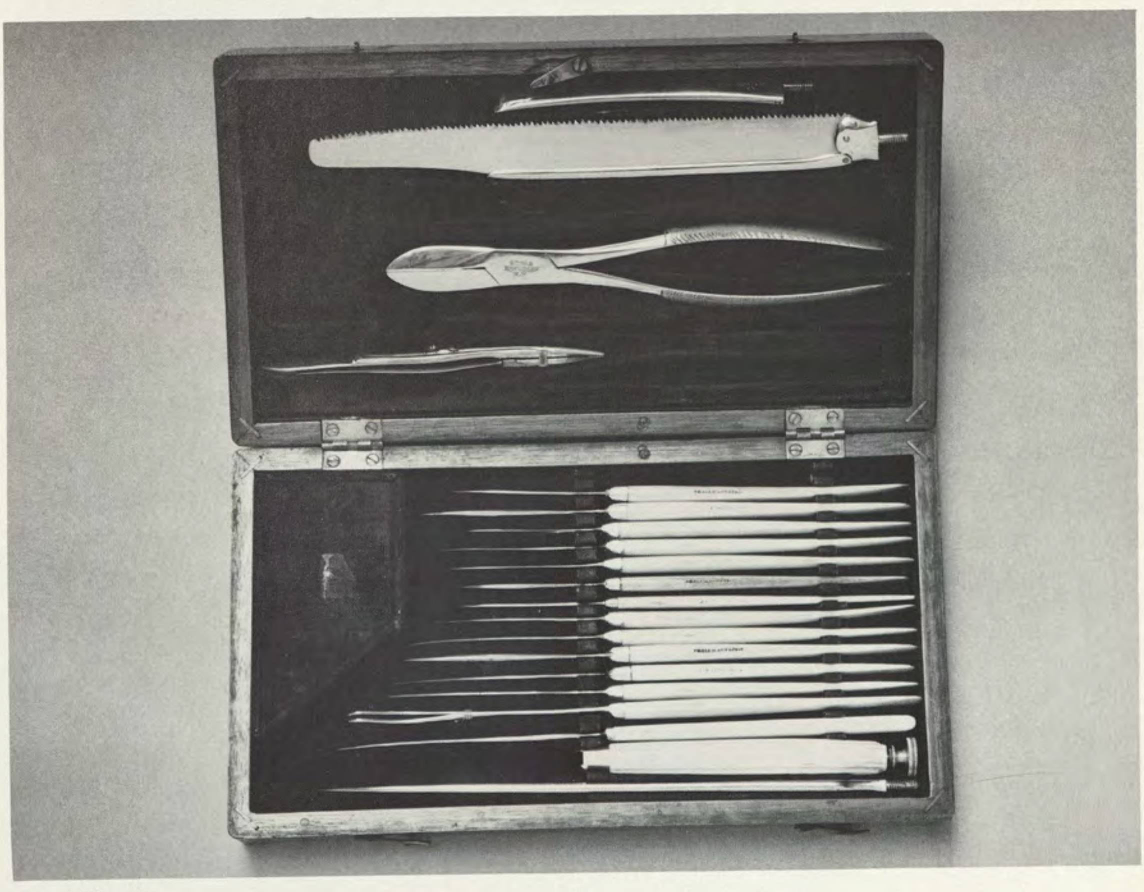


Fig. 11

Fig. 12

Fig. 13

OSTEOTOME.

In the late eighteenth century surgeons sometimes excised, or cut out, sections of soft bone damaged by severe compound fracture or bone disease of the limbs. They then reunited intact bone segments hoping that subsequent healing would eliminate the need for amputation. Excising and resecting bones was difficult to perform, however, with conventional saws found in the surgeon's operating case. The chain saw, introduced by John Aitken in 1784, proved to be a valuable substitute since it could be used in tighter confines and damaged surrounding tissue less than the stiff-bladed amputation saw. The back-and-forth cutting motion of the chain saw remained a problem, though, since it produced ragged bone surfaces that did not reunite readily. To correct these defects Bernhard Heine, a German instrument maker, introduced a novel form of the saw, the osteotome, in 1830.

Heine's osteotome consisted of a chain saw that ran in a groove along the edge of a rigid blade. A hand crank drove the chain providing a continuous motion that cut bone smoothly. Although intended for limb resection, surgeons also employed it in place of the trephine and the bone chisel and gouge, especially in operations of the skull. The osteotome soon won acclaim throughout Europe; by 1835, the Académie des Sciences in Paris honored its designer with the award of the coveted Monthyon Prize.

The osteotome, despite its apparent advantages, never became a standard surgical tool. This complex mechanism was simply too costly to manufacture. In 1879 the osteotome was the single most expensive instrument offered by G. Tiemann & Co. of New York; it cost $300.00 at a time when the best complete surgical set in the Tiemann catalogue sold for only $200.00. A decade later it would be supplanted by electrically powered surgical saws with small rotary blades.

HDM 229. Osteotome (Heine's), *ca.* 1855. Figs. 14 and 15.
Case covered with black leather, with embossed gold floral decoration on edges of lid and surrounding recessed keyhole on front of base; interior lined throughout with deep red velvet; shipping label on bottom of case, black on orange: "Forwarded By/ Hagadorn & Heron's/ Staten Island & New York/ Express/ F. L. Hagadorn, Stapleton, S. I./ William Heron, Jr., New York/ Office in New York at the Ferry, foot of Whitehall St." Case contains: osteotome, three brass hooks (to hold bone in place while being cut by osteotome), small brass finger grip (for manipulating depth gauge), combination steel screwdriver and spanner, combination steel screwdriver and pick, steel pincers, bundle of fine brass wire, and steel key for case lock. Osteotome consists of polished steel frame and smooth ebony handle grips; chain saw runs along groove of rigid blade and toothed chain sprocket positioned within steel frame; hand crank (to drive chain sprocket) with ebony handle on right side, or obverse, of osteotome; sliding rod, brass, ebony and steel (serves as gauge to determine depth of cut) mounted on left side, or reverse, of osteotome; steel adjusting screw on left side of osteotome adjusts tension of chain by means of worm gear within frame. Marked on right side of steel frame: "Herrmann/ In/ Würzburg."
Dimensions of case: 34.5 cm. L x 9 cm. W x 7.3 cm. H
Dimensions of osteotome: 31 cm. L x 6 cm. W x 5.2 cm. H
Tiemann (1889) p. 105, fig. 1607

HDM 226. Bone drill set (Brainard's), *ca.* 1885. Not illustrated.
Black imitation leather case, with metal lock and escutcheon plate; interior of case lined with beige chamois. Base contains: nickel-plated aseptible eight-sided handle with thumb screw (to secure tools in handle), three drill bits, one shaft, and one burr.
Dimensions of case: 13.5 cm. L x 9 cm. W x 3 cm. H
Tiemann (1889) p. 109, fig. 1625

HDM 236. Bone surgery set, *ca.* 1875. Not illustrated.

Brown reptile skin (alligator?) case with metal slide catches; interior of lid lined in gathered wine satin with leather label, gold on beige: "E. M. Hessler/ Cleveland, O." Base lined in deep wine velvet with compartments containing: (left, front to rear) scalpel and resection knife with ebony handles, five nickel-plated bone chisels, various shapes with ridged bases; (right, front to rear) scoop with ebony handle and four nickel-plated gouges, various shapes with ridged bases. Instruments marked: "E. M. Hessler."

Dimensions of case: 24 cm. L x 7.5 cm. W x 2 cm. H

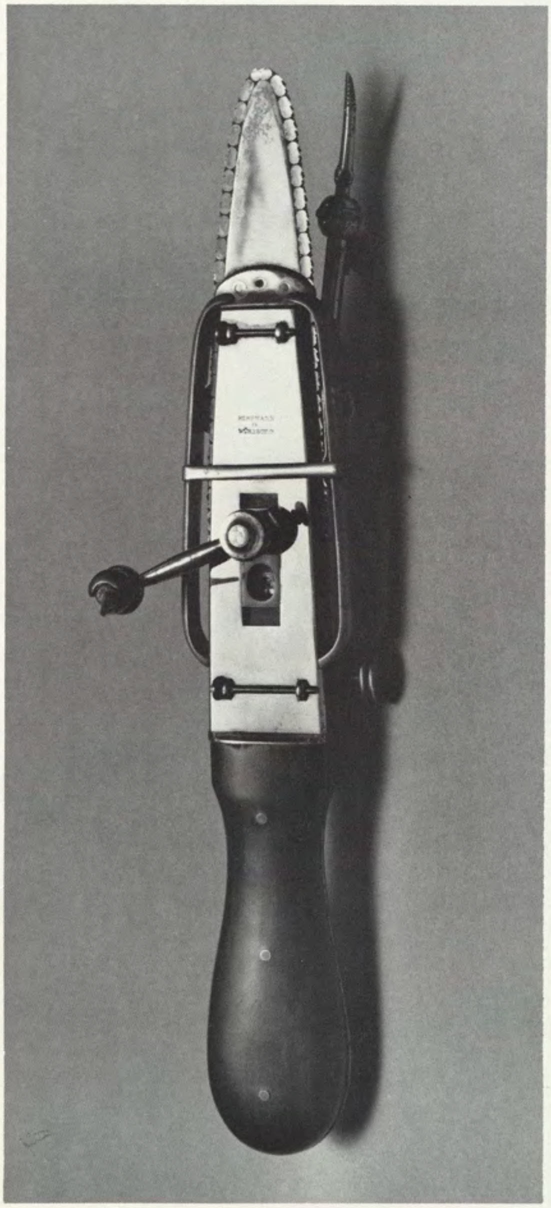


Fig. 14

Fig. 15

TREPHINING INSTRUMENTS.

Trephining, or trepanning, consisted of removing bone sections from the skull. It was an ancient surgical procedure customarily performed in conjunction with religious rites to facilitate the release of "evil spirits." Trephining was also practiced in medical circumstances devoid of ceremonial ritual, including cases of skull fracture inflicted by a blow to the head or reducing pressure associated with brain tumors.

To perform a trephination the surgeon first exposed the skull by opening a flap of the scalp and pushed back the periosteum with a raspatory, or scraping instrument. The surgeon then employed either the cylindrical crown trephine or a Hey's saw to cut a disc or square-shaped section of bone. In using a crown trephine the surgeon began by using a perforator or a *Tire-fond* (bone screw) to make a pilot hole. In this he placed the center pin of the trephine and rotated it until the teeth of the instrument cut into the skull a bit. The surgeon then withdrew the center pin and completed the cylindrical incision, taking periodic rests to clear debris with a bristle brush. When the bone section became free, the surgeon removed it with either the *Tire-fond* or Sharp's forceps. In cases of depressed skull fracture the surgeon employed lenticulars and elevators to raise sections of bone.

The trephining set owned by Gustav Weber, dating from 1860-75, differs little from instruments available almost a century earlier. Its use by Weber was probably limited to critical cases, since the mortality level of trephining often exceeded fifty percent, even under the best of conditions.

Fig. 16

HDM 218. Trephining set, *ca.* 1860-78. Fig. 16.
Brown leather case with German silver hardware and leather-covered carrying handle; interior of base lined with tan leather; removable partition in lid faced with tan leather, backed with red felt; interior of lid covered with red felt. Base of case contains (front to rear): brush with short boar bristles in cylindrical ebony handle (to clean teeth of trephine and saw); bi-ped support for elevator; trepan brace, brass frame and ebony handle; three crown trephines, steel and brass; "T"-shaped handle for trephine; steel raspatory with wood handle; brush with long boar bristles, in rectangular mahogany handle with checked sides. Lid of case contains (front to rear): perforator; head saw (Hey's), steel with checked ebony handle; elevator (Petit's), steel with checked ebony handle; raspatory, steel with checked ebony handle; steel forceps (Sharp's), for removing bone disc cut by crown trephine; perforator; two small *tire-fonds*, steel with ebony handles. Instruments marked: "Krämer."
Dimensions of case: 29.5 cm. L x 15.7 cm. W x 7 cm. H

CLEFT PALATE SURGERY.

Cleft palate, as a congenital defect, may involve either the hard palate (the forward section of the roof of the mouth) or the soft palate (the rear section composed of muscle fibers and glands). Modern surgical treatment of soft palate fissure, a procedure known as staphylorraphy, dates to 1816-17, when Carl Ferdinand von Graefe first described a method for uniting the cleft segments of the palate membrane. Early attempts to correct clefts of the hard palate soon followed but met with less initial success. The underlying bone of the hard palate is protected by a thick, fibrous membrane, the periosteum, and this is in turn covered by mucous membrane. Surgeons first "peeled back" the outer layer of mucous membrane and then inserted sutures through both the periosteal layer and the palatal bone. Tightening the sutures brought together the opposing sides of the fissure, but this seldom resulted in a joining of the bone surfaces.

Working from 1859-61 Bernhard Von Langenbeck, a German surgeon, devised a successful technique for uranoplasty, or union of a cleft in the hard palate. Von Langenbeck achieved bone regeneration by separating the periosteum from underlying bone surfaces. The procedure began by severing muscles on each side of the rear of the hard palate with convex and concave bladed knives, or tenotomes. This freed each side of the soft palate for movement toward the center when drawn together by sutures. The next step involved careful lifting of both mucous membrane and periosteum from the bone surface with elevators, or raspatories. Von Langenbeck then inserted sutures through overlying mucous and periosteal membranes with a specially designed thread carrier. The ends of each suture, while still untied, were laid parallel in a holder, or "diadem," resting on the forehead of the patient. The surgeon then drew the sutures tight in succession, thus uniting the sides of both hard and soft palate with even tension front to back.

For over two decades the "von Langenbeck operation" remained the most widely practiced procedure for surgical treatment of cleft palate. In 1889 Julius Wolff proposed performing the operation in two stages and applying methodic wound compression, but these constituted only a modification, not abandonment, of von Langenbeck's original operative technique.

HDM 239. Cleft palate surgery set (von Langenbeck's), *ca.* 1865. Fig. 17.
Case covered in black leather, with brass fittings (hook clasps missing); case lined with mauve velvet. Interior of case lid marked, in gold: "Chr. Schmidt/ Fabrik Chirurg. Instrumente/ Berlin." Case contains

(front to rear): two seizing forceps; sharp hook, or tenaculum; two-edged pointed knife; concave-bladed knife, or tenotome; convex-bladed knife, or tenotome; double-edge knife with probe-point; double-edge knife with sharp point; straight elevator, with smooth, rounded point; curved elevator, or raspatory, with smooth, rounded point; needle holder (von Langenbeck's), with retractable spring hook (to grasp suture); and thread carrier. Separate semi-circular compartment on left side of case contains; suture holder, or "diadem," and cheek retractors, with black ribbon ties. Instruments marked: "Lutter."
Dimensions of case: 30 cm. L x 18.5 cm. W x 4.8 cm. H

HDM 271. Case of needles and suture holders for cleft palate surgery, *c.* 1870. Not illustrated.

[Note: This set contains a variety of needles, principally for cleft palate surgery, but also for repairing aneurisms, perineum closure, and so forth. It includes needles fixed to handles, as well as handles with threaded ends to accept a series of needles of varying form (curved, straight, and spiral).]

Mahogany case lined with deep red velvet; with removable partition in lid; label on partition, gold on red, marked "G. Tiemann & Co./ Manufacturers/ of Surgical Instruments;" German silver hinges and recessed brass plate (unengraved) on case lid. Base of case contains (front to rear): aneurism needle; two curved cleft palate needles (Sheene's); aneurism needle (Fletcher's).
Dimensions of case: 22.5 cm. L x 8 cm. W x 3.8 cm. H

Fig. 17

TRACHEOSTOMY INSTRUMENTS.

To perform a tracheotomy, or tracheostomy (as the procedure has been called for about two decades), the surgeon cuts open the trachea and inserts a cannula, or breathing tube. Traditionally, the surgeon did this only as a last resort when either swelling, blockage by foreign objects, or injury to the trachea threatened to suffocate the patient. The most frequent call for the procedure was in cases of diphtheria, the now-rare childhood disease that caused fatal obstruction of the larynx.

Pierre Bretonneau (1778-1862), a French physician, first identified diphtheria as a special disease entity in 1826. To relieve the asphyxia threatening the lives of his young patients Bretonneau performed tracheostomies. He was certainly not the first to do so, but Bretonneau succeeded where others failed—thanks to instruments he devised for tracheostomy. Bretonneau employed a simple curved tube, made of silver, to keep open the airway made by the tracheal incision.

Armand Trousseau (1801-1867), Bretonneau's student, made several modifications to the instrument and further popularized tracheostomy while head of the Hôpital des enfants in Paris (1849-58). By 1842 Trousseau adopted the double cannula, which permitted the removal and cleaning of the inner tube while the outer tube remained in the patient's trachea. Trousseau also devised a dilator to spread the tracheal incision during the insertion of the cannula, or tracheostomy tube. His dilator was subsequently modified by a colleague, Delaborde, who introduced a tri-valve dilator *ca.* 1861-62. Dislodging of the tracheostomy tube remained a serious shortcoming until the addition of a moveable collar at the mouth of the tube, where it emerged from the patient's neck. This improvement was made around 1859 by the Paris instrument maker Lüer at the suggestion of Roger, a protégé of Trousseau. It enabled the patient to move freely and comfortably while the tracheostomy tube remained tied firmly in place by a cloth strap knotted around the neck. These combined features comprise the form of tracheostomy tube referred to as "Trousseau's" which remained a favorite design into the present century.

Despite technical improvements of the apparatus, tracheostomy entailed grave risks. During the period 1825-75, only one patient in four survived; the rest succumbed to the original ailment, to complications arising from the tracheostomy itself, or to post-operative infections, especially pneumonia. In any event, a mortality rate of 75 percent discouraged the practice of tracheostomy in all but the most serious circumstances. Diphtheria remained the principal application until after 1885, when Joseph O'Dwyer announced his method and instruments for opening the larynx by inserting small tubes down the throat and into the swollen laryngeal passage. O'Dwyer's intubation instruments were rendered almost obsolete following diphtheria immunization programs using Emil Behring's antitoxin in the early twentieth century.

One special form of tracheostomy not related to diphtheria was to anesthetize and to facilitate normal breathing during surgery on the face and throat. Friedrich Trendelenburg (1844-1924), a Berlin surgeon, described this application in 1869. His apparatus consisted of a tracheostomy canula connected to two tubes. The first led to a cloth-topped cone for administration of chloroform or ether; the second served to inflate a rubber tampon, or cuff, fixed on the end of the canula inserted in the patient's trachea. By inflating the tampon with a rubber squeeze bulb, the patient breathed solely through the tracheostomy tube which halted the drainage of blood from above that might inhibit respiration.

HDM 220. Tracheostomy instrument set, *ca.* 1870. Fig. 18.

Case covered with black leatherette, brass hook and eye clasps; case interior lined throughout with purple velvet; label on interior of case lid, gold on black: "G. Tiemann & Co./ Manufacturers/ of/ Surgical Instruments/ 67 Chatham St. N.Y." Case contains (front to rear): tracheostomy bistoury, blunt point; tracheostomy scalpel; tracheostomy bistoury, sharp point; tracheostomy blunt hook; roll of white cotton of linen tape (to tie tracheostomy tubes in place); tri-valve tracheal dilator (Delaborde's); and four silver double-tube trachea cannula (Trousseau's), graduated in size. All instruments marked "Tiemann & Co."

Dimensions of case: 23.8 cm. L x 14.6 cm. W x 5 cm. H

Tiemann (1879) Pt. II, pp. 93-94

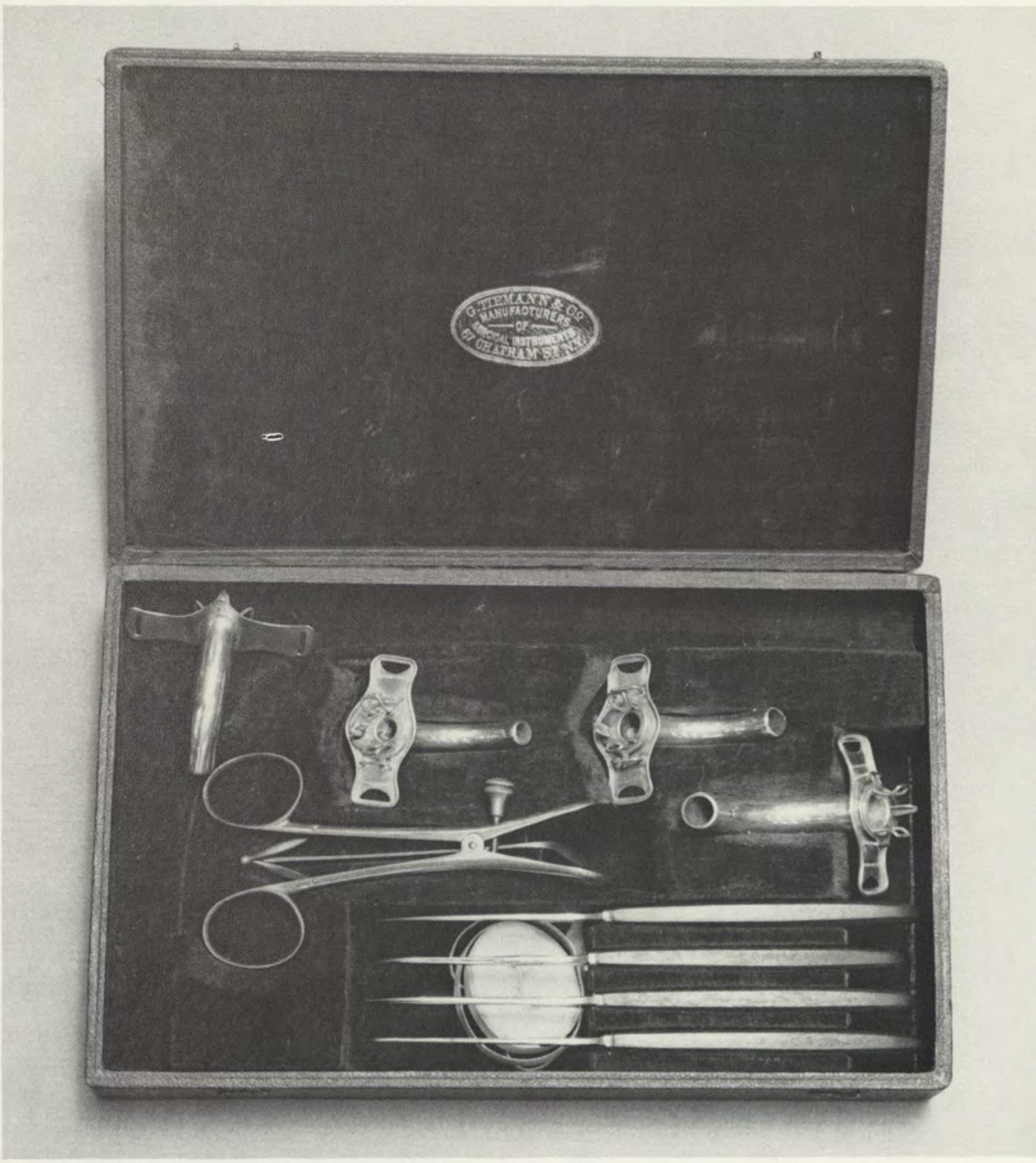


Fig. 18

HDM 224. Tracheal cannula (Trendelenburg's) and chloroform cone, *ca.* 1875. Fig. 19.

Case covered with black embossed paper, brass clasp; interior lined with purple velvet and paper. Case contains: silver trachea cannula connected by flexible tubing to cone-shaped anesthesia inhaler covered with cloth and small sphere-shaped rubber squeeze bulb attached to ivory nozzle. Anesthesia inhaler marked "C. Schmidt/ Vorm. A. Lutter/ Berlin."

> [Note: Trachea cannula was originally fitted with a small rubber cuff or tampon (now missing) that could be inflated with the rubber squeeze bulb.]

Dimensions of case: 16 cm. L x 9.5 cm. W x 8.7 cm. H

Tiemann (1879) Pt. II, p. 96, fig. 391

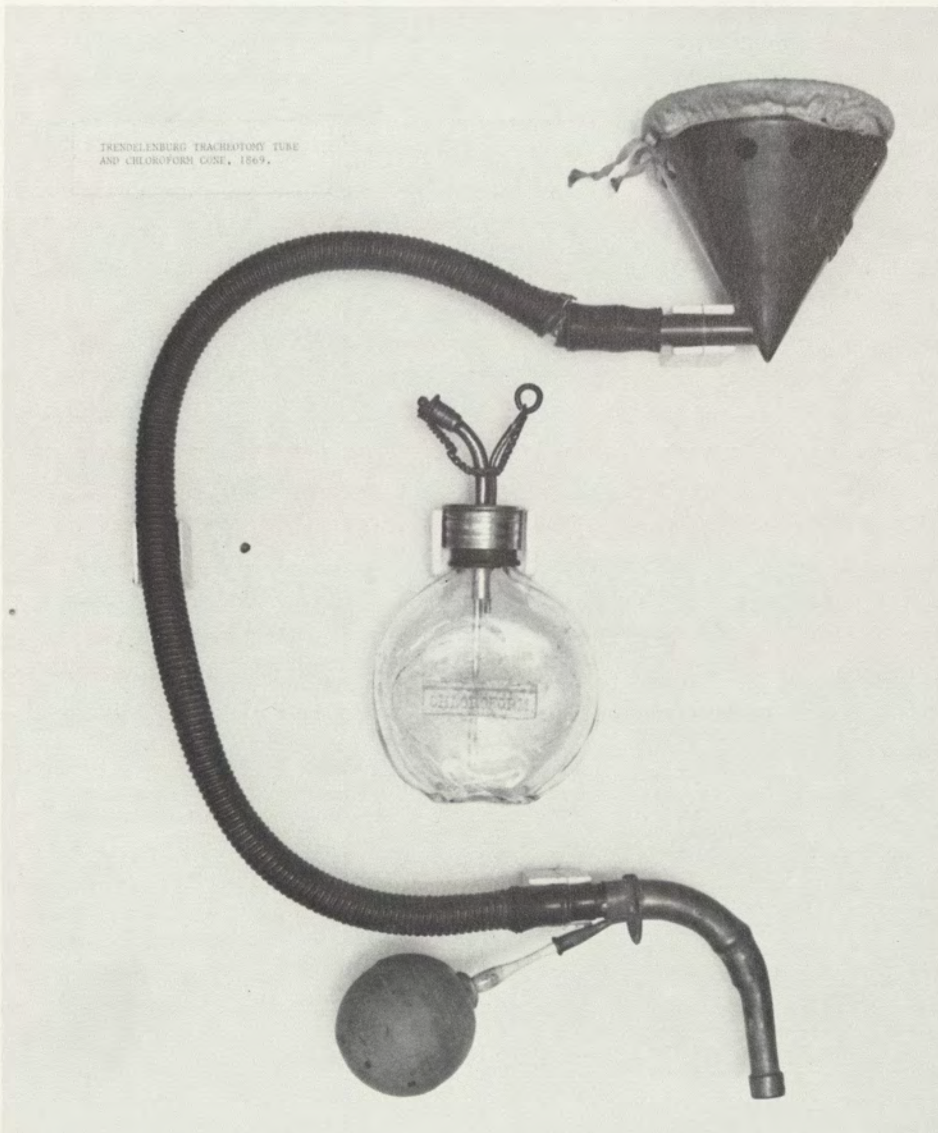


Fig. 19

LARYNGEAL INSTRUMENTS.

Laryngeal surgery did not become a practical reality until the introduction of the laryngoscope. This diagnostic instrument, which consisted of a simple, angled mirror on a long handle, was perfected in the 1850s by Ludwig Turck of Vienna and Johann Nepomuk Czermak of Budapest. Its use permitted visual examination of the larynx and by 1860 physicians employed it to assist surgical removal of polyps of the larynx.

Morell Mackenzie, a British physician, was a leader in the new field of surgery now made possible by the laryngoscope. Instructed in the use of the laryngoscope by Czermak in 1859, Mackenzie returned to London to start a practice in laryngology; by 1862 he opened the Throat Hospital that specialized in the laryngeal diseases. In 1865 Mackenzie published *The Use of the Laryngoscope in Diseases of the Throat*, which presented the diagnostic value of the laryngoscope and described instruments designed by Mackenzie for laryngeal surgery. These included the laryngeal lancet and a combination instrument that could be used, alternatively, as forceps, scissors, or ecraseur (cutting loop). Mackenzie's chief improvement consisted of altering the angle of laryngeal instruments; in place of the broad, sweeping curve from handle to cutting edge favored by German surgeons, he adopted a sharper, right-angle bend. This change permitted more direct access to the larynx when inserted in the patient's mouth, and it won rapid approval among laryngeal surgeons.

In America laryngeal surgery made its greatest strides in New York and Philadelphia, cosmopolitan centers where well-developed medical communities kept avidly abreast of British and Continental advances. By 1863 Louis Elsberg of New York, through personal correspondence with Czermak, mastered the use of the laryngoscope, taught it at New York University School of Medicine, and reported in medical journals on new instruments for laryngeal surgery. In Philadelphia, J. Solis Cohen published the first American text in the field, *Diseases of the Throat*, in 1872 and initiated regular instruction in laryngeal surgery at Jefferson Medical College. Instrument makers followed surgeons' interests closely, and by 1875 Codman and Shurtleff of Boston, Gemrig of Philadelphia, and George Tiemann and Co. of New York offered for sale laryngeal instruments imported from Europe or at least patterned after the best models available abroad. Gustav Weber's laryngeal instruments came from Tiemann's in New York and are identical to those first described by Mackenzie in 1865.

HDM 227. Laryngeal lancet (Mackenzie's), *ca.* 1870. Fig. 20.

Case covered with black leatherette, incised C-scroll decoration on lid; brass hook and eye latches; lined with deep red velvet; label on interior of lid, gold on red: "G. Tiemann & Co./ Manufacturers/ of/ Surgical Instruments/ 67 Chatham St. N.Y."; exterior of case bottom covered wtih marbled paper, green and red on cream. Case contains: laryngeal lancet, ebony handle with hollow steel shank and ferrule; shank bends at end ± 90 degrees, with bayonet joint for attachment of sheath to cover lancet blade; spring lever at mid section of handle actuates rod within hollow shank to project lancet point beyond protective sheath; case also contains extra lancet blade and sheath

Dimensions of case: 25.5 cm. L x 7.7 cm. W x 3.7 cm. H

Tiemann (1879) Pt. II, p. 81, fig. 322b

HDM 244. Laryngeal tube forceps and scissors (Mackenzie's), *ca.* 1870. Fig. 21.

Case covered with black leatherette, incised C-scroll decoration on lid; brass hook and eye latches; lined with purple velvet; label on interior of lid, gold on red: "G. Tiemann & Co./ Manufacturers/ of/ Surgical Instruments/ 67 Chatham St. N.Y."; exterior of case bottom covered wtih marbled paper, red and blue on grey. Case contains: laryngeal forceps, ebony handle with hollow steel shank and nickel-plated ferrule; shank bends at end ± 110, with tube sheath for forceps and scissors; spring lever at mid-section of handle withdraws rod within shank to actuate scissors or forceps; case contains scissors with hooks (to grasp severed tissue), forceps with perpendicular blades, forceps with horizontal blades, and extra tube sheath.

Dimensions of case: 29.2 cm. L x 7.3 cm. W x 4 cm. H

Tiemann (1879) Pt. II, p. 8, fig. 323

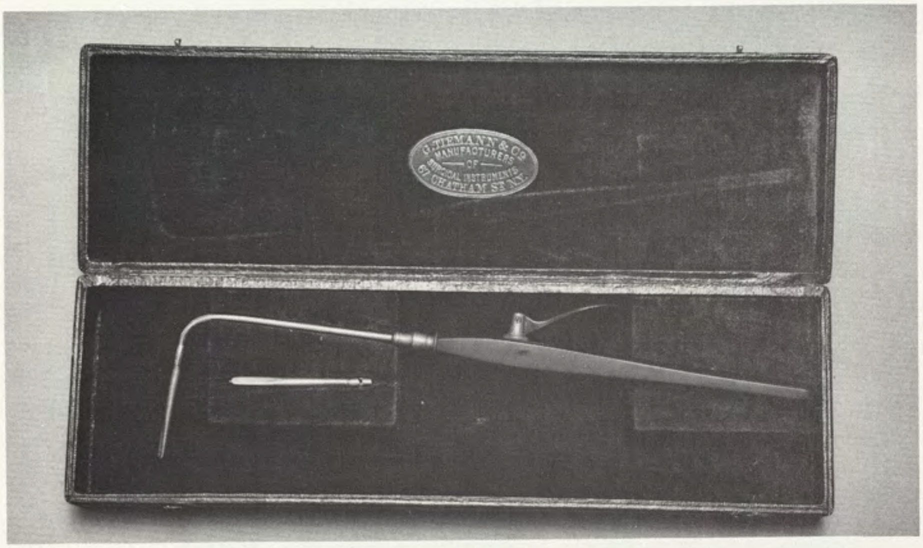


Fig. 20

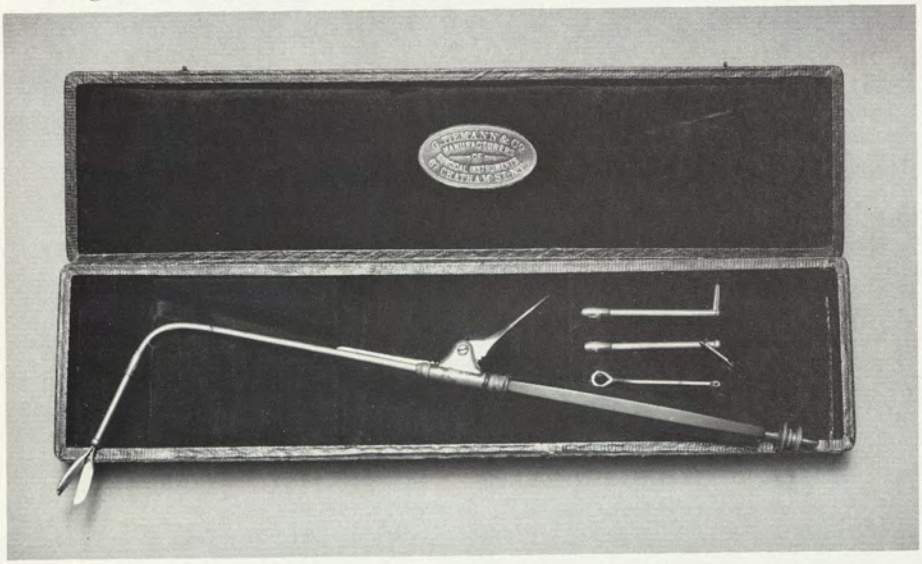


Fig. 21

GALVANO-CAUTERY.

Although the medical application of electricity began in the late eighteenth century, surgeons did not employ it extensively until the 1850s. In 1854 Albrecht Theodore von Middledorpf, a physician in Breslau, Germany, published *Die Galvanocautik*, describing the removal of tumors and abscesses by means of direct-current electricity. His work attracted notice in the United States and was presented to an American audience by Algernon Coolidge in 1855. Coolidge, in an address before the Boston Society for Medical Observation, recounted a brief history of cauterization by electricity and illustrated the apparatus employed by Middledorpf.

The essential components of Middledorpf's galvano-cautery consisted of a fine platinum wire, mounted on an insulated needle, connected to a galvanic battery. When actuated by direct current from the battery, the platinum wire became white-hot. At first, surgeons preferred the galvano-cautery since it caused less hemorrhage than the scalpel and was much less frightening than the hot iron traditionally used in cautery. They soon found, however, that the technical limitations of available apparatus discouraged general usage of galvano-cautery. For the most part, these problems stemmed from the galvanic battery and not the platinum electrodes. In the absence of controlling devices, the current could rise and fall, making the electrode either too hot or not hot enough. This difficulty was compounded by problems inherent in managing the galvanic batteries, which often required several gallons of harsh acid (nitric and sulphuric), that produced noxious fumes when in operation.

Electrodes similar to those in the Weber collection became available by the late 1850s. Instrument makers offered complete sets suitable for a variety of surgical applications, from cautery of uterine tumors to removal of laryngeal polyps. By 1860 Thomas Hall, an electrical instrument manufacturer in Boston, produced electrodes patterned after those of Middledorpf. His simple apparatus appears almost crude, however, when compared to the instruments sold by Continental and British instrument makers. Leaders in this field were Krohne and Sesemann of London and Joseph Leiter of Vienna. By the early 1870s, however, American-made instruments, particularly those made by the New York firms of Shepard & Dudley and George Tiemann and Co., compared quite favorably to the products of their European counterparts. The models available at that date, regardless of provenance, remained little changed through the 1890s.

HDM 223. Electrode set (Schrötter's) for galvano-cautery, *ca.* 1870. Fig. 22.
Case covered with red checked leather, brass hinges and hook and eye clasps; interior lined throughout with purple velvet, with label, gold on black, on interior of case lid: "Fabrik Chir. Instrumente U. Bandagen/ Josef/ Leiter/ Wien." Case contains: insulated ebony handle to hold electrodes, with brass, ebony, hard rubber, and nickel fittings, and six curved electrodes (four with fixed platinum wire tips and two for platinum wire loop or snare).
Dimensions of case: 28.2 cm. L x 13 cm. W x 3.5 cm. H
Tiemann (1879) Pt. I, p. 113, fig. 398

HDM 237. Electrode set (Leiter's) for galvano-cautery *ca.* 1860. Fig. 23.
Case covered with brown leather, brass hinges and clasps; interior of base and removable tray lined with deep red velvet; interior of case lid lined with mauve silk, with label, gold on black: "Fabrik Chir. Instrumente U. Bandagen/ Josef/ Leiter/ Wien." Base of case contains two plier-like clamps and insulated ebony handle to hold electrodes, with brass, nickel, and ivory fittings. Handle can be used with either a fixed platinum wire electrode (usually wrapped around a non-conducting porcelain tip) or a wire cutting loop or snare (wire loop is drawn closed by "sling," or screw mechanism, that attaches to handle). Removable tray holds five fixed-end electrodes, each mounted on brass, ivory, and porcelain shaft, and four wire-loop holders (one straight and three curved), each mounted on brass and ivory shaft.
Dimensions of case: 28 cm. L x 17.4 cm. W x 6.7 cm. H

Fig. 22

Fig. 23

ASPIRATOR.

Before 1850 physicians relieved the accumulation of fluids in body cavities by inserting a trocar. They would push the sharp, pointed end of the trocar into the cavity and withdraw the inner rod, leaving a metal tube or cannula in place. Fluids could then drain freely by gravity, but there was great risk of allowing air and bacteria to enter the body. Festering wounds around the hole opened by the trocar were not uncommon, thus adding further complications to ailments that first necessitated use of the trocar.

Dangers inherent in draining fluids by means of the trocar could be reduced by using an aspirating syringe. In 1850 Morrill Wyman of Boston applied this technique when confronted by a massive accumulation of fluids in the chest of a young woman. He introduced a very small diameter trocar and then attached a stomach pump to suction pleural fluids concentrated in the patient's thoracic cavity. Wyman's successful practice of aspiration was soon promoted by Henry Bowditch, a prominent Boston physician, and it won increasing acceptance as a therapeutic measure in America. By the early 1870s aspiration was a widely practiced technique and instrument makers in Britain, Europe, and the United States offered a variety of syringes or pumps designed for this purpose.

The Dieulafoy aspirator (1869), a model copied by many instrument makers, consisted of a glass-barreled syringe and metal piston. It incorporated two stopcocks, one to open and close the needle orifice, and the other to expel the syringe contents following aspiration. In operation, the physician closed both stopcocks and withdrew the piston rod, thus creating a vacuum of one atmosphere. With the aspirating needle in place, the physician opened one stopcock and allowed fluid to fill the vacuum. The physician then closed the first stopcock, opened the second exhausting stopcock, and forced the fluid out by compressing the piston rod to its original position. The chief weakness of this apparatus lay in the piston and stopcock packing; each relied upon oiled silk to maintain a good seal and this packing material often failed to achieve this purpose.

The Potain aspirator (1870-72) circumvented the problem of leaking valves by using an all-brass pump to exhaust a separate glass reservoir, which was in turn connected by tubing to an aspirating needle. Before aspiration the physician exhausted the reservoir by repeated piston strokes, much like using a hand bicycle pump. Opening the stopcock on the needle tubing then siphoned fluid from the body into the glass chamber. Despite the advantages of the Potain aspirator, namely the superior piston-cylinder seal achieved by using metal in place of glass, manipulating all the separate parts connected to each other by rubber tubing proved cumbersome.

To overcome these various technical shortcomings, James Coxeter and Sons of London introduced a new model aspirating syringe in 1874. The Coxeter syringe design incorporated a glass section at the needle end of its cylindrical body, so that aspirated fluids could be seen when the needle was still in place. Since the remainder of the apparatus was made of nickel-plated brass, the Coxeter syringe maintained an airtight seal that was much more difficult to achieve in cylinders made of glass. Perhaps impressed by these refinements and advantages, Gustav Weber acquired a Coxeter aspirator in the mid 1870s.

HDM 275. Aspirator (Coxeter's), *ca.* 1875. Fig. 24.

Wood case, covered in black imitation leather, with German silver and brass hardware; interior lined with purple velvet. Case lid contains compartment with hinged flap; compartment holds two sections of rubber tubing (section of tubing for aspirating tubing for siphoning fluids includes stopcock at end). Base of case houses nickel-plated aspirating syringe, with applied metal label that reads: "University College/ Coxeter· Maker./ 23 Grafton St. East/ London." Syringe consists of "T"-shaped piston rod handle at one end, cylindrical body of plated brass and clear glass, and three-way stopcock at other end. Two removable trays fit into base and serve as holders for two trocars and four aspirating needles.

Dimensions of case: 26.5 cm. L x 8.8 cm. W x 8 cm. H

HDM 210. Aspirator, *ca.* 1875. Not illustrated.

Black leatherette case, rectangular with rounded corners, brass lock and hinges; interior lined with purple velvet. Case contains glass barrelled aspirating syringe (similar to Dieulafoy's original model) in fenestrated nickel-plated housing; piston rod, calibrated "0-9", ends in ring handle; two stopcocks located at opposite end of syringe body; one aspirating needle (one missing) and flexible rubber tubing fit in case wtih syringe.

Dimensions of case: 18 cm. L x 7.5 cm. W x 2 cm. H

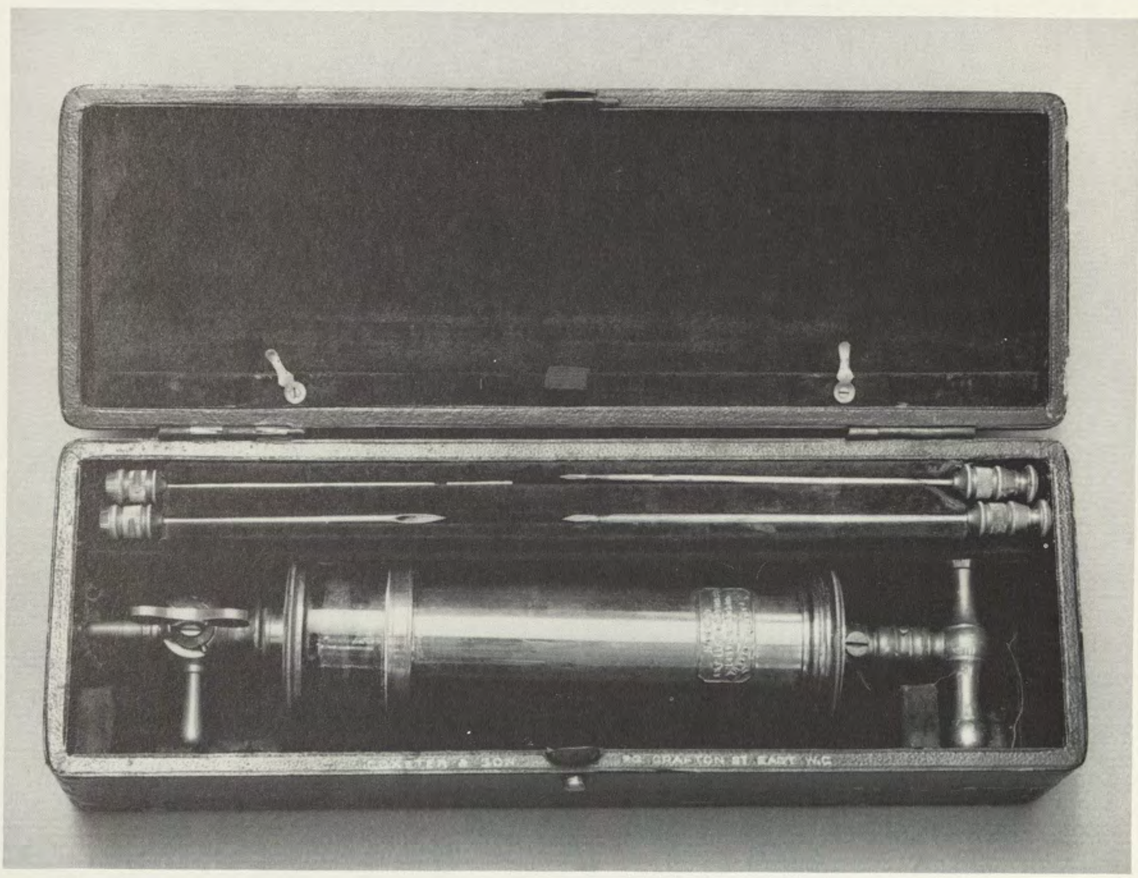


Fig. 24

STOMACH PUMP.

By the early nineteenth century physicians in Britain, France, and America employed pumps to introduce nutrients and draw out toxic substances from the stomach. To do so they adapted cylindrical enema pumps attached to long tubes made of leather or eel skin. Removal of poisons, the principal usage, involved washing the stomach with warm water injected by the pump, followed by suction of all fluids by means of the pump. This form of treatment was not widely practiced, however, until Adolf Kussmaul revived and popularized the use of the stomach pump in the late 1860s.

Kussmaul used the pump to empty fluids from the stomachs of patients suffering from gastric disorders and not merely to remove poisons ingested accidentally or, in cases of attempted suicide, intentionally. He recognized that the stomach pump served diagnostic purposes, too, since the fluids extracted could be analyzed to better identify and understand gastric diseases.

From a technical standpoint, Kussmaul's success depended upon an American innovation; he patterned his pump upon the aspirating syringe of Drs. Wyman and Bowditch of Boston. This syringe, in the form adopted by Kussmaul in 1869, incorporated a two-way valve for either injection of water or aspiration of fluids. With the aid of this valve, the stomach tube, changing from pumping action to suction, could remain in place. Soft, flexible rubber tubes, introduced in the early 1870s, made Kussmaul's pump still easier to use for the physician and less discomforting for the patient.

Instrument makers manufactured the pump adopted by Kussmaul for the next three decades with few design changes. They even offered identical pumps equipped with aspirating needles and enema attachments; however, the Kussmaul pump was used less and less for its intended purpose (the rapid evacuation of stomach contents). Physicians complained that it worked almost too well, that its strong suction caused detachment of the stomach mucous lining along with the gastric fluids. In its place they substituted a rubber squeeze bulb that aspirated gastric contents up the stomach tube more gently and drained them into a glass reservoir bottle.

HDM 208. Stomach pump, enema syringe, and aspirator, *ca.* 1875. Not illustrated.
Maple case, metal hinges, lock, escutcheon plate; interior lined in deep purple velvet; lid with diagonal red ribbon and oval label, gold on black: "E. M. Hessler/Manufacturer/ of/ Surgical Instruments/ Cleveland, O." Base with partitions contains nickel-plated lever stomach pump, with long rubber-coated stomach tube ending in black hard rubber tip. Enema attachments in case include flexible rubber tubing with metal tip, for rectal and colonic injection; flexible rubber tubing ending in metal foot, to siphon fluids into syringe from separate basin or reservoir. For aspiration, the case contains a separate metal automatic valve, one side for suction and the other for exhaust; rubber stopper with two stopcocks, to expel aspirated fluids into glass bottle; two sections of flexible rubber tubing; and three aspirating needles or trocars, graduated in size.
Dimensions of case: 31.5 cm. L x 15 cm. W x 5 cm. H

HDM 238. Stomach and enema pump (Kussmaul's), *ca.* 1867-75. Fig. 25.

Mahogany case with brass hardware and recessed brass plate on case lid (unengraved); interior of case lined with maroon velvet. Compartment in base contains: brass lever stomach pump with wood handle; long rubber-coated stomach tube ending in black hard rubber tip; brass foot, to siphon fluids into syringe from reservoir; two mouth gags to hold tubing and one simple screw-type wood mouth gag. Enema and vaginal douche attachments include one section of rubber-coated tubing with brass fittings; two ivory tips for rectal and vaginal injection of fluids.

Dimensions of case: 29.5 cm. L x 18 cm. W x 6 cm. H

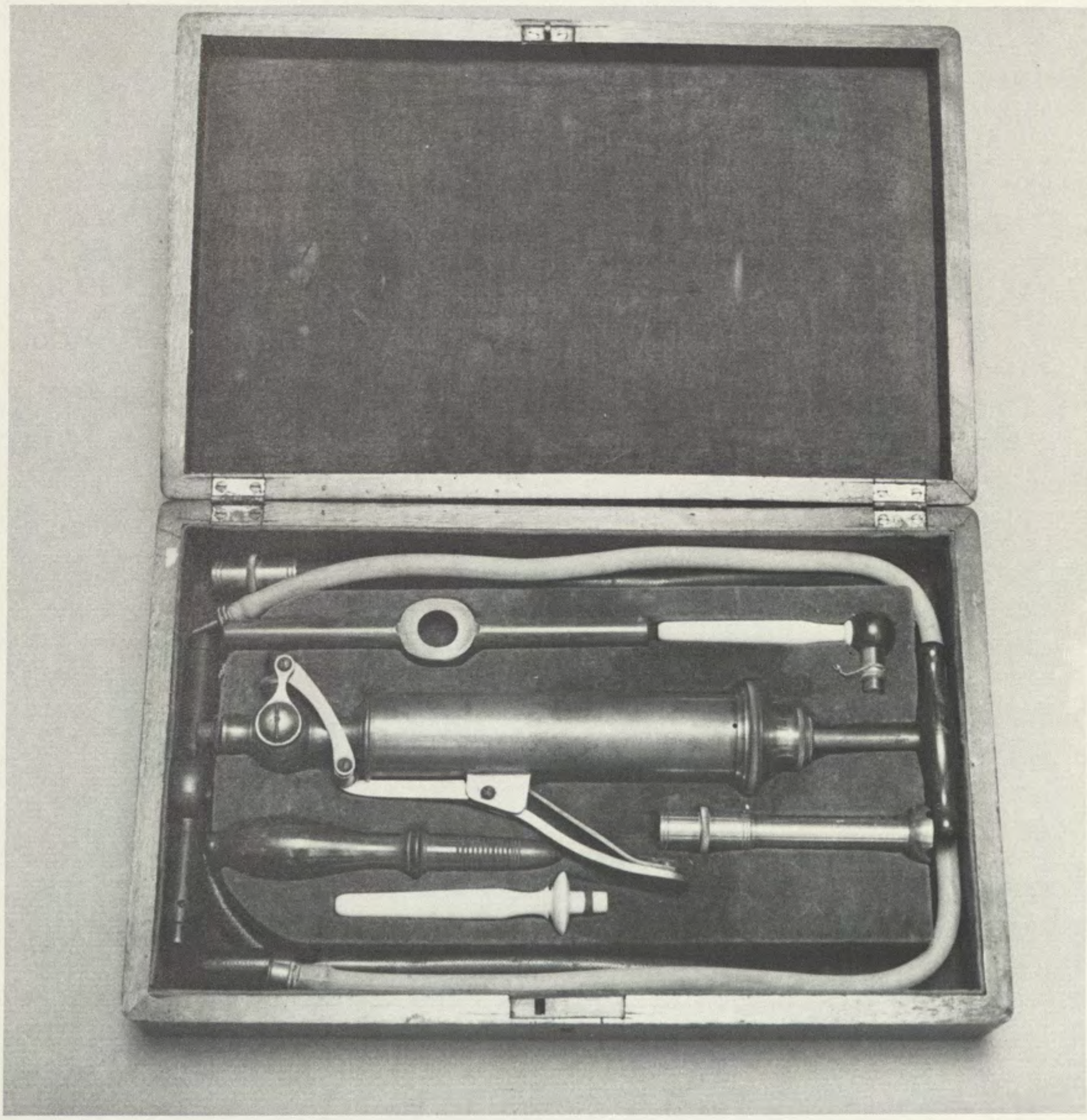


Fig. 25

LITHOTOMY AND LITHOTRITY INSTRUMENTS.

Removal of bladder stones, or vesical calculi, is one of the older surgical operations. Lithotomy, the traditional procedure often called "cutting for stone," took one of two principal forms: either perineal lithotomy or suprapubic lithotomy. Perineal lithotomy involved making an incision between the anus and the urethra with the aid of a grooved staff, passed through the urethra, to guide the lithotomy knife. The operator then opened the base of the bladder and extracted the stone with either a hook or a gorget (an elongated scoop, often with a sharp leading edge) and grasping forceps. Suprapubic lithotomy, or cutting through the abdominal wall to the bladder from above, was not practiced much before the advent of anesthesia in the 1840s and even then the surgeon risked rupturing the peritoneum and displacing the bowel. For these reasons, perineal lithotomy was the most widely adopted means to extract bladder stones from antiquity through the mid-nineteenth century.

In the second quarter of the nineteenth century physicians and surgeons in France and Britain turned their attention from lithotomy to lithotrity. Lithotrity, in contrast to lithotomy, required no surgical incisions. Instead, it consisted of crushing stones with an instrument passed through the urethra to the bladder. This instrument, the lithotrite, took various forms depending upon the mechanical ingenuity of lithotrists and instrument makers. In general, it resembled a urethral sound ending in a curved tip that incorporated a drill, jaws, or chain mechanism to reduce the stone into particles small enough to be passed by the patient. By the mid-nineteenth century lithotrites with crushing jaws superseded other forms and employed either a rack-and-pinion mechanism (Ferguson's lithotrite) or a screw mechanism that could be engaged once the stone had been seized (Thompson's lithotrite). After crushing a stone the lithotritist used a double-current catheter to flush stone fragments from the bladder. The "sitting," or duration of lithotrity, seldom exceeded three to five minutes and often had to be repeated on several occasions to completely remove stone fragments.

Henry J. Bigelow, a Boston surgeon, introduced litholapaxy *ca.* 1876-78, the last major refinement of lithotrity in the nineteenth century. Litholapaxy combined the use of a rubber bulb evacuating pump with large diameter catheters to remove crushed stone at one prolonged sitting (as long as three hours, if necessary.) Bigelow believed, unlike most of his predecessors and contemporaries, that the urethra could be dilated considerably without adverse consequences and that evacuating all fragments from the bladder at one sitting would eliminate the discomfort experienced by passing stones naturally following lithotrity. His litholapaxy technique and apparatus steadily won acceptance, even from Sir Henry Thompson, the leading lithotritist of the day and an early opponent of the practice.

The Weber lithotomy-lithotrity set, so complete in other respects, does not include Bigelow's evacuator and catheters and, therefore, probably dates from about 1875 or before. It comprises instruments from seven different makers, each fitting snugly into a special case made to order by Tiemann and Co. of New York.

HDM 251. Lithotomy and lithotrity instrument case, *ca.* 1875. Fig. 26.

Mahogany case, covered with American chestnut veneer; brass corner straps, slide catches, lock, and escutcheon plate; recessed brass plate (unengraved) on case top. Interior of case lined with deep purple velvet; removable partition in case lid covered with deep purple velvet, with oval label in center, gold on black: "G. Tiemann & Co./ Manufacturers/ of/ Surgical Instruments/ 67 Chatham St. N.Y." Lid of case, lined in deep purple velvet, contains (front to rear): lithotome, or lithotomy knife; two curved sounds; three grooved lithotomy staffs; handle for rack-and-pinion mechanism of lithotrite (lithotrite missing); lithotome *caché* (Frère Côme's); scoop and conductor; double current catheter, curved; single current catheter, curved; sound, curved; and two grooved lithotomy staffs, right-angle bend. Base of case contains (front to rear): lithotrite (Thompson's); lithotrite (Ferguson's), with separate handle for rack-and-pinion mechanism; blunt gorget; screw handle, three-spoked, for lithotrite (Jacobson's); sharp gorget; lithotrite (Ferguson's); and lithotrite (Jacobson's). Removable instrument tray fits into lower half of case; tray lined with deep purple velvet and framed in mahogany. Tray contains (front to rear): wire searcher; curved, grooved sound, or director; four curved sounds, graduated in size; lithotomy forceps; and sharp-pointed lithotomy scalpel. Most instruments marked "Krämer/ Bonn," but case also contains instruments with marks of George Tiemann and Co. (New York). J. Fenton (Cleveland, Ohio), Lüer (Paris), Hernstein (New York), Eschbaum (Bonn), and Association Imperiale de la Chirurgerie (Paris?). Center of base and tray have recess for an instrument, possibly a large urethral syringe, that is now missing.

Dimensions of case: 43.8 cm. L x 19.5 cm. W x 9.5 cm. H

Fig. 26

HDM 776. Vesical calculi. Not illustrated.

Cardboard box containing approximately 30 calculi (some in fragments) ranging in size, some as large as an egg. These were removed by Weber employing lithotomy instruments.

HDM 398. Urethrotome (Civiale's?), *ca.* 1870. Not illustrated.

Case covered with very dark green leatherette, with brass catch; base of interior lined with purple velvet; lid lined with purple silk; mark on inside of base, in gold: "J. Weiss & Son, 287 Oxford St. Long."
Urethrotome consists of German silver or nickel sheath, enclosing steel blade mounted in ebony handle; marked on sheath: "Weiss."
Dimensions of case: 31 cm. L x 3.2 cm. W x 2.8 cm. H

OPHTHALMIC SURGERY.

Although Gustav Weber considered himself a general surgeon, the number and range of ophthalmic instruments he owned suggests that he performed eye surgery extensively. This was not uncommon before the mid-nineteenth century, however. While eye surgery comprised an ancient practice, it did not become a distinct medical speciality in America until after 1850 and even then was largely restricted to major metropolitan centers. Evidence of increasing specializtion is found in the opening of eye infirmaries in the late 1820s in Philadelphia, New York, Baltimore, and Boston, some of which became nationally known eye hospitals (notably Wills Hospital which was established in 1834 in Philadelphia). The presence of a growing number of physicians and surgeons specializing in eye disorders in the United States led to the formation of the American Ophthalmological Society in 1864. These institutional efforts promoting specialization were supported by notable medical advances, particularly von Helmholtz's invention of the ophthalmoscope (1850-51) and Koller's introduction of cocaine (1884) for ocular anesthesia. These changes in surgical practice and professional organization had their impact after the 1850s. Gustav Weber's career, then, spanned the period during which ophthalmic surgery really came into its own as a modern surgical specialty.

The principal eye disorders that Weber treated surgically included cataracts, obstructed iris, lacrimal (tear duct) disorders, removal of tumors or cysts on the eyelid, and strabismus (squint or cross-eyed condition). For these operations surgeons employed numerous special-purpose instruments, each devised to make delicate incisions or remove disease tissue. For example, surgeons remedied cataracts (a condition where the lens of the eye is opaque) by opening the cornea with pointed needles or triangular-bladed cataract knives, enlarging the aperture and raising the cornea with blunt needles and spatula, and extracting the lens with a minute forceps. For lacrimal disorders, chiefly the fistula (a blockage of the passage from the lacrimal sac to the eye) surgeons used special probes and small aspirating syringes. Instruments for excising eyelid tumors differed little from those used to remove growths elsewhere on the body, but were, of course, correspondingly smaller in size.

The importance of lightweight materials and diminutive size in the construction of ophthalmic instruments was forcefully emphasized by the British author and surgeon H. Haynes Walton in

A Treatise of Operative Ophthalmic Surgery (1st American ed. Philadelphia: Lindsay & Blakiston, 1853; p. 24):

> With ophthalmic instruments, lightness is an element of the highest importance. The lighter they are, the greater is the delicacy with which they can be applied. With lighter instruments the resistance to be overcome is better appreciated, as well as the amount of the force required for that purpose. . . . the minimum of the dimensions compatible with the kind of instrument, should be made the rule. In successive years, as I have required to renew my instruments, I have gradually had their size reduced, and the effect has been to adapt them better to the several operations. Besides remedying the clumsiness and awkwardness which attach to those of greater bulk, in several instances positive evils arising from inordinate size have been avoided.

HDM 234. Ophthalmic surgery set (for cataract and iridectomy), *ca.* 1860-70. Fig. 27.
Case covered with black leatherette, embossed decoration on lid including legend "Eye Case," with brass hook and eye clasps; interior of base lined with deep blue velvet; interior of lid lined with blue silk, with label, gold on black: "Max Wocher/ Surgical Instruments/ Sixth Street/ Between Vine & Race/ Ohio Medical College Building/ Cincinnati." Case contains: two tractors (Graefe's), two hooked needles (Luzardi's), one concave lens scoop (Critehat's), one iris forceps (Liebrich's), two fixation forceps (Noyes'), and one angular iris forceps. Instruments marked "M. Wocher," "Eschbaum" and "Otto & Reynders."
Dimensions of case: 16.23 cm. L x 7.2 cm. W x 2.5 cm. H

HDM 273. Ophthalmic surgery set (for cataract, iridectomy, and strabismus), *ca.* 1860-70. Not illustrated.
Case covered with black leatherette, embossed decoration on lid and sides, with brass hook and eye clasps and hinges; interior of base and lid lined with blue watered silk. Case contains: four cataract knives (Beer's), three iridectomy knives, two cataract knives, one curved tenotomy knife, eight couching needles, one straight section knife, three hooked needles, two iris knives, one entropium forceps, one long forceps, one angular iris forceps, and one strabometer. Instruments marked "Eschbaum," "G. Tiemann," and "Heine."
Dimensions of case: 18.5 cm. L x 15.5 cm. W x 2.2 cm. H

HDM 274. Ophthalmic surgery set, *ca.* 1855-65. Not illustrated.
Case covered with brown morocco leather, embossed decoration on lid including legend "M. I. Schnetter, Iun./ In/ Muchen," with brass hook and eye clasps; interior of base lined with deep red velvet edged with embossed gold foil; interior of lid lined with silver silk edged with embossed gold foil. Case contains: eye speculum (Pellier's), eye lid retractor, one cataract knife (Beer's), three blunt hooks (Tyrell's), one hooked needle, and one straight needle without handle. Case is missing one forceps and one scissors. Maker's label on case bottom, mostly obliterated, reads: "Max Joseph Schnetter, Junior."
Dimensions of case: 15.5 cm. L x 11 cm. W x 2.5 cm H

HDM 272. Ophthalmic surgery set, *ca.* 1855-65. Not illustrated.
Case covered with green leather, edged with embossed gold gadrooning, brass hook and eye clasps; case lined throughout with deep red velvet. Case contains: two eye lid retractors, two small double hooks, one blunt hook, one curved strabismus hook, one spring forceps, one straight cross-spring forceps, one curved cross-spring forceps. Case is missing three unidentified instruments and two scissors.
Dimensions of case: 19 cm. L x 15 cm. W x 2.8 cm. H

> [Note: Earlier German-made sets in Weber's armamentarium (HDM 272 and HDM 274) contain instruments that are both larger and less specialized than those of sets acquired from American instrument makers Max Wocher of Cincinnati and George Tiemann of New York. In these latter sets one finds instruments from several different American, German, and French makers.]

HDM 83. Tissue removing forceps, *ca.* 1860-70. Not illustrated.

Spring forceps with fine mouse tooth ends, surmounted by scissor mechanism (to sever tissue once in the firm grasp of the forceps); marked "Tiemann."

Dimensions of case: 13 cm. L x 1.8 cm. W x 1.7 cm. H

[Note: This instrument is similar to skin grafting scissors in Tiemann (1879) Pt. V, p. 11, fig. 87.]

HDM 273. Entropium forceps (Desmarre's), *ca.* 1865-70. Not illustrated.

Spring forceps, steel, ending in oval ends (one solid and one fenestrated), with adjustable screw closure mechanism; marked: "Lüer/ A Paris."

Dimensions of case: 9 cm. L x 2.8 cm. W x 1.9 cm. H

Tiemann (1879) Pt. II, p. 1, fig. 5

HDM 294. Lacrimal syringe (Anel's or Bartholow's), *ca.* 1869. Fig. 28 (top).

Case covered wtih deep green leatherette, with brass catch; case interior lined with purple velvet; label on interior of lid, red on gold; "G. Tiemann & Co./ Manufacturers/ of/ Surgical Instruments/ 67 Chatham St. NY." Case contains: silver syringe with finger loops on each side of syringe barrel and thumb loop on end of syringe piston, and three silver lacrimal needles or canulas.

Dimensions of case: 12 cm. L x 6 cm. W x 3 cm. H

HDM 73. Ophthalmic surgery set (for lacrimal fistula), *ca.* 1870-75. Fig. 28 (bottom).

Case covered with black morocco leather, interior lined with deep red velvet; label, gold on black, on interior of lid: G. Tiemann & Co./ Manufacturers/ of/ Surgical Instruments/ 67 Chatham St. N.Y." Case contains: one short canalicula knife (Bowman's), one long canalicula knife (Weber's), one lacrimal catheter (Speir's), one director (Bowman's), two silver lacrimal probes (Bowman's, Nos. 5-6 and 7-8), four silver lacrimal probes (William's, Nos. 1-2, 3-4, 5-6, and 7-8), four hard rubber, or whale-bone lacrimal probes (Nos. 1-2, 3-4, 5-6, and 7-8), one German silver probe, and one pair fixation forceps (Dudley's).

Dimensions of case: 15.3 cm. L x 5.2 cm. W x 2.5 cm. H

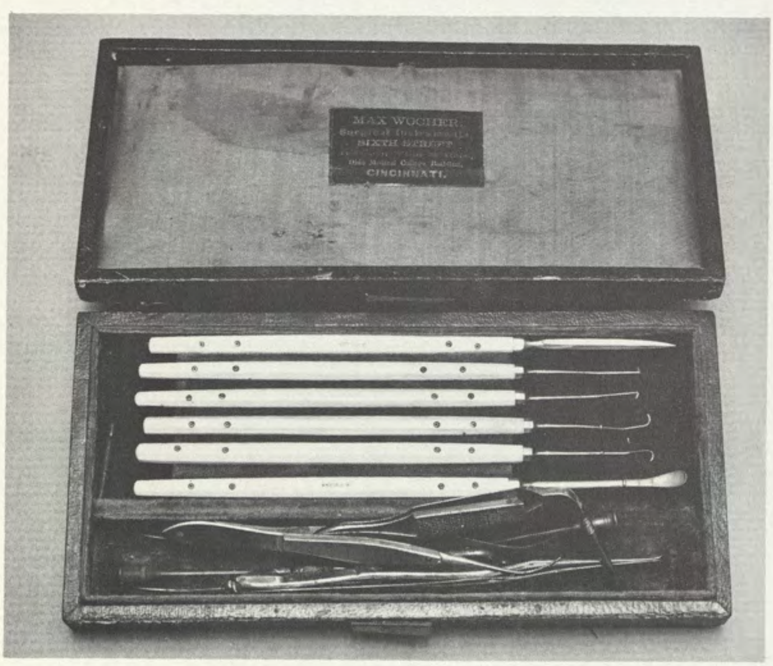


Fig. 27

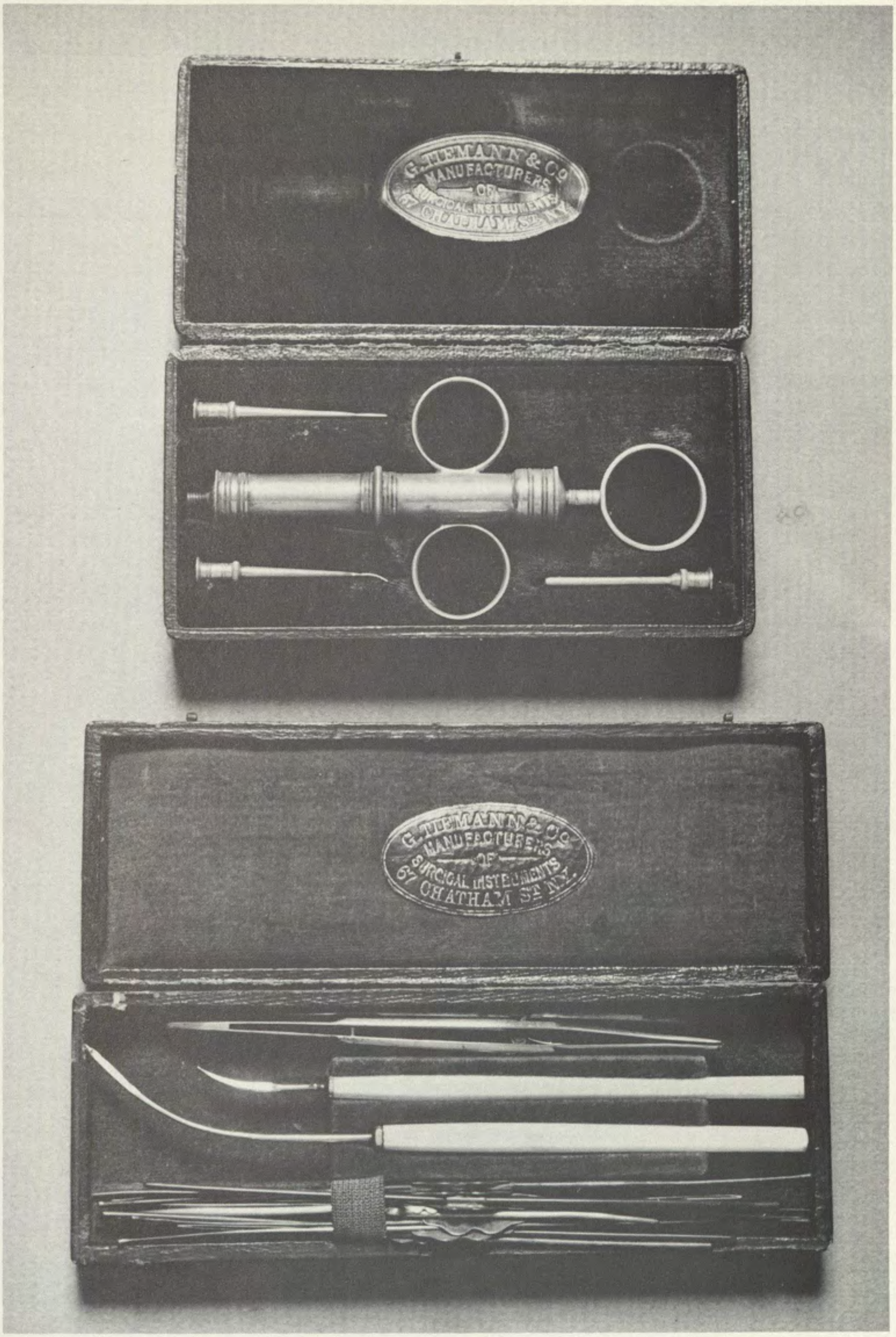

G. TIEMANN & CO
MANUFACTURERS
OF
SURGICAL INSTRUMENTS
67 CHATHAM ST. N.Y.

Fig. 28

HYPODERMIC SYRINGES.

In the late 1850s physicians began administering drugs, particularly anesthetic agents, with the hypodermic syringe. This therapeutic technique, now so universally familiar, was, in fact, quite novel at the time. Fledgling attempts at hypodermic medication, as practiced by Irish physician Francis Rynd in 1844-45, involved making an incision with a lancet, inserting a fine tube or cannula in the skin, and then allowing medications to flow through the cannula by gravity. By 1853 Alexander Wood, from Edinburgh, Scotland, improved upon this method by employing a small glass syringe and silver needle to inject medicines beneath the skin. Wood published accounts describing his technique, but credit for popularizing hypodermic medication belongs to Charles Hunter, a London surgeon. Hunter, who introduced the term "hypodermic" to describe the method, asserted that subcutaneous injection of anesthetics (morphine or other alkaloids) could have a general therapeutic effect even when injected quite far from the seat of pain.

In America, hypodermic syringes were made and used as early as 1856. That year Fordyce Barker of New York returned from Edinburgh, bringing a syringe similar to that of Alexander Wood. Barker gave this syringe to instrument maker George Tiemann who began producing syringes modeled on this pattern.

Over the next decade Tiemann and other instrument makers introduced various types of syringes, each new model calculated to correct defects of design, materials, and construction of its predecessors. Syringes with glass barrels, for example, allowed the physician to view the syringe contents, but often leaked around the piston packing and could break under hard usage. Cheaper models featured vulcanized rubber fittings to protect the glass barrel, while more expensive syringes incorporated silver or German-silver (nickel, copper, and zinc alloy) frames to house the barrel. In either case, however, the sealing wax and other cements used to hold the fittings in place could come loose, especially when weakened by chemical reactions with the medications being administered. Despite these problems, the glass-barreled syringe gained increasing favor. By 1866 Reynders of New York introduced "Lüer's improved hypodermic syringe" which remained a standard model for the next two decades.

The all-metal syringe, as proposed by Cincinnati physician Roberts Bartholow, eliminated most of the weaknesses inherent in glass syringes. Bartholow, in *Manual of Hypodermic Medication* (1869), claimed that a silver syringe was the best sort. The metal could be machined to attain an almost-perfect fit between the piston and cylindrical barrel while regular oiling of the leather piston packing prevented any leakage of medicines. Careful washing and drying after each usage was necessary, according to Bartholow, to remove any undissolved medicine and to halt corrosion of the silver.

By the early 1870s instrument makers offered reliable, easy-to-use hypodermic syringes that combined the best features of glass and metal designs. Physicians used these syringes to administer sedatives and analgesics (morphine, atropine, and, later, cocaine) or tonics and stimulants (strychnine and caffeine). Administering these medicines remained a problem, however, since many had to be injected almost immediately after being mixed in solution. In 1881 H. Augustus Wilson of Philadelphia eliminated this nuisance by introducing compressed tablets, each constituting a precise dosage when dissolved in a specified amount of water. Henceforth, as Wilson observed, any syringe could ". . . be armed and ready for use hypodermically or otherwise."

HDM 611. Syringe (Lüer's) for spray and hypodermic injection, *ca.* 1875. Fig. 29 (top).
Case covered with black leatherette, brass catch; lid interior lined with purple watered silk, with printed marking in gold: "Instruments de Chirurgerie/ A. Lüer/ Place de l'Ecole de Médecine 13."; base interior lined with purple velvet. Case contains brass syringe, nickel-plated with markings "0-50" on piston shaft and "A. Lüer/ Brevete" and "A Paris/ S.G.D.G." on finger pieces; one long laryngeal spray nozzle; three short spray nozzles; and two hypodermic needles, gold plated. Set is missing one long laryngeal spray nozzle and three short spray nozzles.
Dimensions of case: 17.5 cm. L x 7.8 cm. W x 2.7 cm. H

HDM 269. Hypodermic syringe (Tiemann's), 1878. Fig. 29 (bottom).
Case covered with red leather, brass catch; lid interior lined with deep blue silk; base interior lined with maroon velvet; base exterior faced with blue paper marked, in script: "2/ May 7 1878". Case contains: syringe, glass barrel in fenestrated nickel-plated frame, with markings "0-25" on piston shaft; steel hypodermic needle, with brass screw fitting; tubular glass bottle (for solution to be injected) with mouth at right angle to body of bottle, with etched marking on side; "G. Tiemann & Co./ Pat. Oct. 9 1877."; hard rubber stopper in mouth of bottle.

[Note: This patented medication bottle enabled the physician to fill the syringe more easily: "You merely turn the neck upward, remove the stopper, insert the syringe into the fluid, and draw upon the piston until the desired quantity of medicine has entered the barrel." Tiemann (1879) Pt. 1, p. 73]

Fig. 29

TRANSFUSION APPARATUS.

Loss of blood from hemorrhage has always concerned surgeons. One possible remedy is blood transfusion, or the transfer of blood from the circulation of one person to that of another. This has been performed at least since the mid-seventeenth century when various physicians replenished the human blood supply with blood taken from sheep, calves, and dogs. However, this ostensibly life-saving measure killed patients if they received a sufficient amount of animal blood, which contains proteins incompatible with those found in human blood. Physicians, therefore, steadily abandoned transfusion from animals in favor of human donors exclusively. This, too, met with infrequent success, however, and medical science offered no certain reason for its failure. By the mid-nineteenth century blood transfusion was practiced mainly in obstetrics for post-partum hemorrhage.

In 1874, at the annual meeting of the American Medical Association, Theophilus Parvin addressed an assembly of obstetricians on the subject of uterine hemorrhage. In his presentation Dr. Parvin recounted the recent history of transfusion crediting the English physician James Blundell with the revival of interest in blood transfusion in the 1820s. Parvin then detailed the frustrations encountered by his predecessors and contemporaries, particularly the difficulties caused by coagulation. Clotting blood, which blocked the flow of blood from donor to recipient, hampered virtually all transfusion devices. To reduce, if not eliminate, this problem, Parvin recommended the use of either the Aveling or the Leiter transfusion apparatus.

J. H. Aveling, an English obstetrician, introduced his transfusion device in 1864. It consisted of two silver tubes or canula, connected by rubber tubing, for insertion in the veins of donor and recipient. The flow of blood from one to the other was initiated and sustained with the aid of a small rubber squeeze bulb placed mid-way in the tubing between the two. Aveling later (1872) added small stopcocks to open and close each canula and thus control the flow of blood more precisely. With this improvement, the Aveling apparatus became one of the most popular instruments for transfusion, particularly since it was so simple and easy to operate.

The other transfusion device that Parvin recommended was designed by Josef Leiter of Vienna and sold by Otto and Reynders, a prominent New York instrument maker. The Leiter apparatus consisted of a cylindrical suction pump of hard rubber, a built-in lancet, and a cannula connected to the pump by rubber tubing. In use the physician strapped the open end of the pump over the arm of the donor and then opened the desired vein by depressing the lancet. The pump handle served to alternately withdraw blood from the donor and to force it through the tubing and cannula into the recipient's blood system.

Physicians examining the Leiter device shown by Parvin acknowledged that it was "very ingenious and complete" but also concluded that in practice it might prove too complicated and awkward. One observed that

> Venesection is so simple an operation that you can hold the vein with one hand, and regulate the cut of the lancet with the other. But with the instrument before us (Leiter's) it is a sort of mechanical process, which I consider to be a radical defect. Possibly Dr. Parvin may be able to say something in favor of the instrument, but the feature I have pointed out seems decidedly objectionable. (Theophilus Parvin, "Minutes of the Section on Obstetrics and Diseases of Women and Children," *Transactions of the American Medical Association* 25 (1874): 191.)

The Leiter apparatus, regardless of its merits or defects, was probably used by Gustav Weber only as a desperate last resort. This was so because transfusion of incompatible blood types could have fatal results. Only with the identification in 1907 of the four blood groups (O, A, B, and AB) did transfusion become a safe form of therapy for surgical patients.

HDM 1. Blood transfusion apparatus (Leiter's), *ca.* 1875. Fig. 30.
Hard rubber syringe, green-brown in color, open at end opposite piston plunger, with two side-mounted orifices (one for built-in lancet, fixed at 45°; the other for attaching rubber tubing connected to recipient cannula); purple cloth strap on wire frame at open end of syringe served to hold apparatus securely over vein in donor's arm; cannula of glass and hard rubber.
Dimensions of case: 22 cm. L x 10 cm. W x 4.5 cm. Diameter

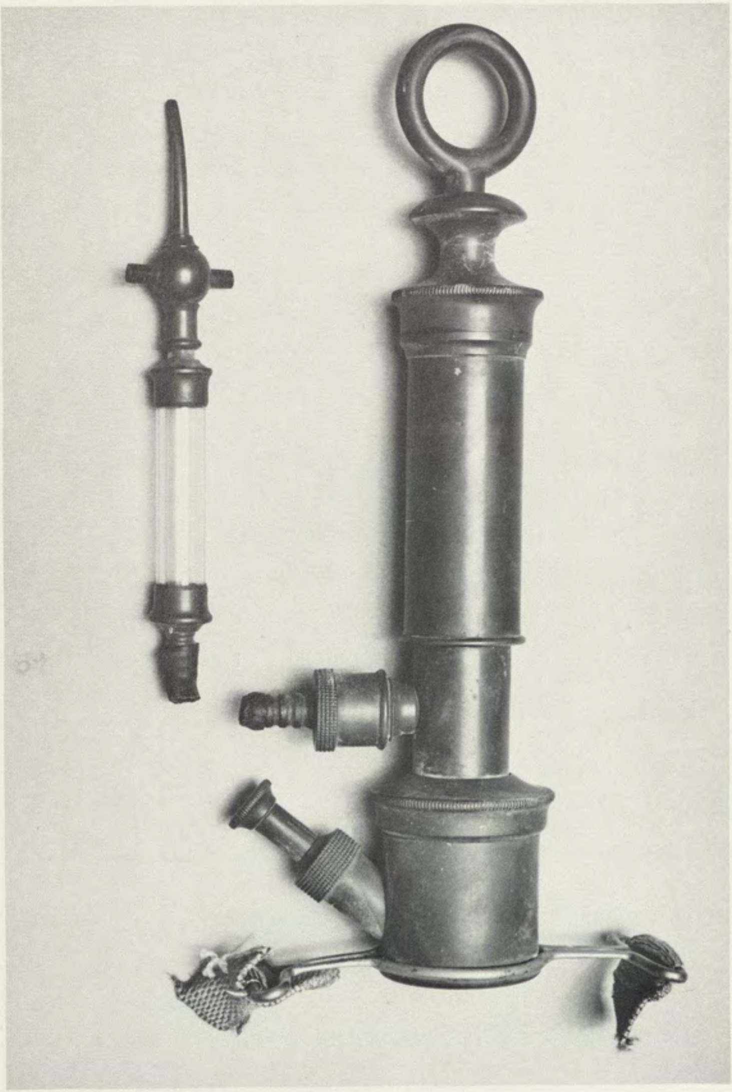


Fig. 30

GYNECOLOGICAL AND OBSTETRICAL INSTRUMENTS.

In the second half of the nineteenth century obstetrics and gynecology were emerging as distinct and separate specialties in American medicine. The field of obstetrics, long the province of female midwives who attended home deliveries, was coming to be dominated by male physicians. Among the reasons for this shift was the divergent attitudes of midwives and doctors toward the process of childbirth. Midwives (in Cleveland most were foreign trained) generally saw childbirth as a natural event requiring little or no medical intervention; physicians, on the other hand, were more inclined to hasten parturition with the aid of obstetric instruments, notably the obstetric forceps. Instrumentation, which presumably guaranteed a shorter and safer delivery, thus separated the obstetrician from the midwife.

Gynecology, like obstetrics, became increasingly reliant upon instrumentation for both diagnosis and treatment. Traditionally, physicians carried out gynecological examinations by palpation of the abdomen and discreet digital exploration of the vagina; visual examination with the vaginal speculum offended the sense of moral propriety that guided the conduct of the physician-patient relationships in antebellum America. However, the barriers of human dignity fell before medicine's new emphasis upon the anatomical location and specificity of disease entities by the mid-nineteenth century. The investigative imperative to see and thus identify lesions, fistula, and other gynecological disorders compelled physicians to make greater use of the speculum disregarding the prevailing sensibilities. Now insights obtained with aid of the speculum prompted more frequent and ambitious surgical treatment of gynecological disorders, as evidenced in the increased incidence of ovariotomies, hysterectomies, and clitoridectomies.

Gustav Weber, as a general surgeon, was not customarily involved in either of these nascent specialties. Nevertheless, Weber acquired the two essential instruments for treating obstetrical and gynecological cases that he encountered: a pair of obstetric forceps and a vaginal speculum. The forceps are of a pattern often referred to as "Busch's" forceps (introduced by Johann David Bush *ca.* 1798) and incorporate such features as finger rests, bulbous end, and a so-called "English" lock. The speculum, a bi-valve design (which became popular after *ca.* 1825), is pictured in the 1879 Tiemann and Co. catalogue and there is called "Weber's" speculum; catalogue records at the Dittrick Museum credit Gustav Weber with its design but offer no documentation to support this attribution. The other instruments Weber employed, principally in gynecological surgery, were a uterine dilator and a uterine knife.

HDM 56. Obstetrical forceps, *ca.* 1865. Not illustrated.
Long German-style forceps, polished steel shanks and blades, ebony handles with curved finger rests and bulbous base; elongated shanks meet at "English" (Elliot's) lock and crossover junction; fenestrated blades have deep cephalic and narrow pelvic curves; forceps marked on shank: "Eschbaum/ Bonn/ Markt 171."
Dimensions: 39.5 cm. L x 6.5 cm. W x 11.5 cm. H

HDM 66. Vaginal speculum (Weber's), *ca.* 1870. Fig. 31.

Bi-valve speculum, nickel-plated with two concave blades; hinged blades joined by screw lock mechanism which determines blade opening; stationary blade forms a shank with hard rubber handle, with cross-hatch gripping surface; marked on shank: "Tiemann & Co."

Dimensions: 15.5 cm. L x 9 cm. W x 6 cm. H

Tiemann (1879) Pt. III, p. 51, fig. 187A

HDM 72. Intrauterine knife, *ca.* 1860. Not illustrated.

Case covered in embossed leatherette, brass latches; interior of case lined with deep purple velvet and green paper; label on interior of case lid, black on white: "Geo. Tiemann & Co./ Manufacturers of/ Surgical Instruments,/ & every description of/ Cutlery,/ No. 63 Chatham St./ New York." Case contains knife holder, steel shank and hard rubber handle, with cross-hatch gripping surface; three steel blades in case can be clamped singly in handle end marked on shank: "Tiemann."

Dimensions of case: 26 cm. L x 4 cm. W x 3 cm. H

HDM 231. Uterine dilator (Molesworth's Climax dilator), *ca.* 1875. Not illustrated.

Walnut case with brass hardware; lined with red velvet; bottom exterior of case covered by illustrated label with operating instructions. Nickel-plated syringe with stopcock and piston handle ending in ring; three rubber dilating tubes (to be inflated by water injected from syringe), graduated in diameter (⅛", ¼", ½", and ¾") and marked: "Pat'd Dec. 1, 1874."

Dimensions of case: 28.8 cm. L x 8.4 cm. W x 5.6 cm. H

Tiemann (1879) Pt. III, p. 78, fig. 323

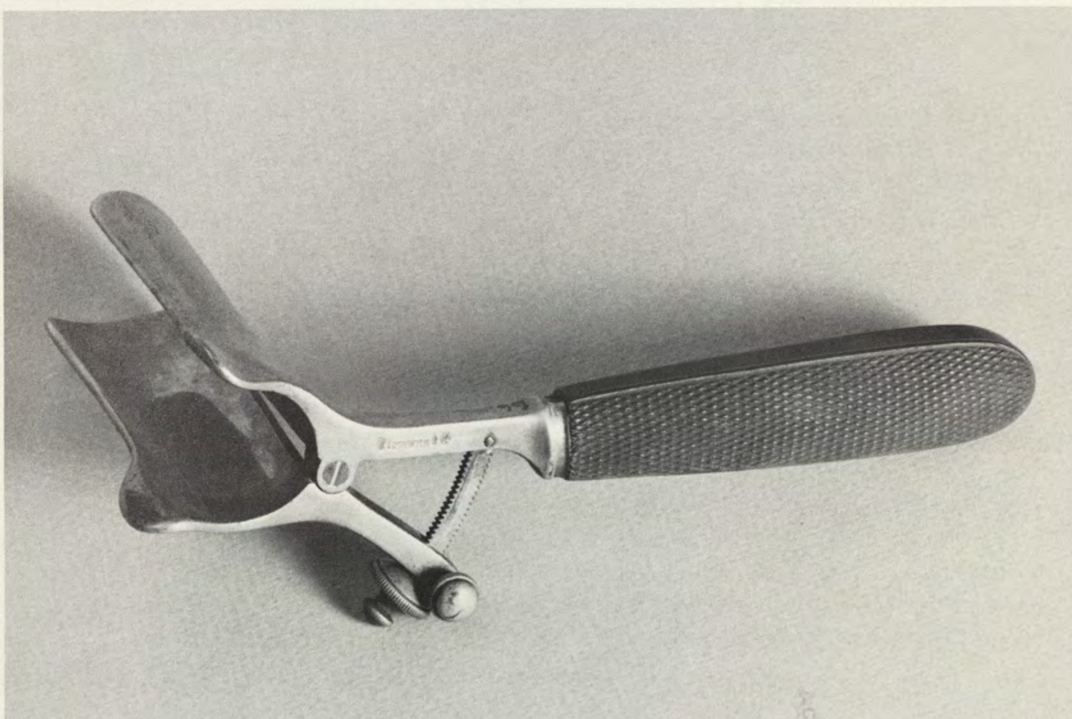


Fig. 31

BIBLIOGRAPHY

Instrument Collections and Catalogues

Davis, Audrey B. "Historical Studies of Medical Instruments." *History of Science* 16 (1978):107-33.

Ibid. *Medicine and Its Technology.* Westport, Conn.: Greenwood Press [*ca.* 1981].

Dittrick, Howard, *et al.* "Medical History Collections in the United States and Canada. II. Collections in Cleveland, Ohio." *Bulletin of the History of Medicine* 8 (October 1940):1214-45.

Edwards, J. J. and Edwards, M. J. "Early Medical Museums." Chapter 3 in *Medical Museum Technology.* London: Oxford University, 1959, pp. 33-60, 162-65 (references).

Gebhard, Bruno. "From Medicine Show to Health Museum." *CIBA Symposia* 8 (March 1947):566-600. "From Theatrum Anatomicum to Medical Museum" pp. 566-83. "The Origin of Hygiene and Health Museums" pp. 584-92. "Health and Hygiene at International Expositions" pp. 593-600.

George Tiemann & Co. *The American Armamentarium Chirurgicum.* New York: George Tiemann & Co., 1879 ed. and 1889 ed.

Hamarneh, Sami. "History of the Division of Medical Sciences." Paper 43, pp. 269-300 from *United States National Museum Bulletin 240: Contributions from the Museum of History and Technology.* Washington, D.C.: Smithsonian Institution, 1964.

Handbook to the Wellcome Historical Medical Museum. London: The Wellcome Museum, 1920.

Kirkup, J. R. "The History and Evolution of Surgical Instruments. I. Introduction." *Annals of the Royal College of Surgeons* 63 (1981):279-85 and "The History and Evolution of Surgical Instruments. II. Origins: function: carriage: manufacture." *Annals of the Royal College of Surgeons* 64 (1982):125-32.

Lister Centenary Celebration, American College of Surgeons, Detroit, Michigan, October, 1927, Descriptive Catalogue, Lister Collection. London: The Wellcome Historical Medical Museum, [1927].

Meyerson, Akê. *Studier I Serafimerlasarettets instrumentasamiling: Utgivna med anledning av lasarettets 200-årsjubileum.* Stockholm: Karolinska Institutets Kirurgiska Klinik vid Serafimerlasarettet, 1952.

Describes and illustrates surgical instruments used in Sweden by Olor Acrell, "the father of Swedish surgery," at the Serafimerlasarettet [Hospital], the Karlinska Institutet, and the Stockholm College of Medical Instruction.

Snyder, Geerto. *Instrumentum Medici.* Ingelheim am Rhein: C. H. Boehringer Sohn, 1972.

Thompson, C. J. S. *Guide to the Surgical Instruments and Objects in the Historical Series with their History and Development.* London: Museum, Royal College of Surgeons of England, 1929.

Thompson, W. E. "Historical Surgical Instruments in the Museum of the Royal College of Surgeons of England (2)." *Journal of Bone and Joint Surgery* (London) 351 (August 1953):474-49.

Van Lieburg, M. J. "The Instrument-collection of Peter Vink: a Chapter in the Development of the Surgical Profession in the Netherlands during the 18th Century." *Janus* 67 (1980):207-19.

Van Lieburg indicates that the guild of barber-surgeons of Rotterdam, under the leadership of Paris-trained Peter Vink, created an "Instrumenten-Kasse" in 1757; this guild-owned instrument collection was available for use by subscribing members and operated much as a lending library of instruments even after the guild's dissolution (1798) effected in 1806.

Wade, Ella N. "A Curator's Story of the Mütter Museum and College Collections." *Transactions and Studies of the College of Physicians of Philadelphia* 42 (October 1974):121-81.

The Wellcome Historical Medical Museum. London: The Wellcome Foundation, Ltd., 1927.

Zanobio, Bruno. "The Restoration of Pavia Version of Giovanni Allessandro Brambilla's Surgical Armamentarium." In *Wien und die Weltmedizin,* edited by the International Academy of the History of Medicine, pp. 49-54. Vienna: Verlag Hermann Böhlaus Nachf., 1974.

Diagnostic Instruments—General

Keele, Kenneth D. *The Evolution of Clinical Methods in Medicine.* Springfield, Illinois: Charles C. Thomas Publisher, 1963.

Mitchell, S. Weir. "The Early History of Instrumental Precision in Medicine." The President's Address. *Transactions of the Congress of American Physicians & Surgeons, 2nd Triennial Session.* Washington, 1891. New Haven, 1892. pp. 159-98.

The Reichert Collection Illustrative of the Evolution and Development of Diagnostic Instruments and Techniques in Medicine. New York: Burroughs Wellcome & Co., 1942.

Reiser, Stanley Joel. *Medicine and the Reign of Technology.* Cambridge, England: Cambridge University Press, 1978.

The most influential and scholarly historical treatment of medical technology, with particular emphasis upon how diagnostic technologies have transformed the physician-patient relationship. Excellent bibliography organized by subject matter, including particular diagnostic procedures and their instrumentation.

The Ophthalmoscope

Carter, Robert B. "On a New Form of the Ophthalmoscope." *Lancet* 1 (7 March 1863):264-65.

Describes the binocular ophthalmoscope of Giraud-Teulon.

Rucker, C. Wilbur. *A History of the Ophthalmoscope.* Rochester, Minn.: Whiting Printers and Stationers, 1971.

The Otoscope

Brunton, John. "A New Otoscope or Speculum Auris." *Lancet* 2 (1865):617-18.

Brunton conceived the design for his otoscope as early as 1861 and commissioned Mr. White, of Renfield Street, Glasgow (an optical and mathematical instrument maker for the University) to produce it.

Clark, J. Henry. "The Reflecting Otoscope and Artificial Drum." *Medical and Surgical Reporter* (Burlington, New Jersey) 10 (October 1857):488-92.

Clark describes his invention of the "Clark" otoscope by crediting George Tiemann & Co. with a considerable role in the process. Contains no illustrations.

Grant, G. "On the Physical Exploration of the Ear by Means of the Auriscope." *Medical and Surgical Reporter* (Burlington, New Jersey) 10 (September 1867):449-52.

Describes and illustrates an otoscope that is identical to the "Clark" otoscope illustrated in trade catalogues of George Tiemann and Co. (1879); Grant implies, but does not categorically claim to have invented this instrument (both he and J. Henry Clark practiced in Newark, New Jersey).

Grant, G. "Physical Exploration of the Ear, by Means of the Auriscope." *New York Journal of Medicine* 4 (1858):122-24.

This later version reworks the article from *Medical and Surgical Reporter* for a wider audience.

Key-Åberg, Hans. *Historical Review of Instruments Used in Otoscopy, Together with a Description of a Method for Photographing the Membrana Tympani.* Stockholm: P. A. Norstedt and Soner, 1919.

The Clark otoscope (1857), which resembles the Brunton (1865) shown in figure xiv, is not mentioned.

"Obituaries. J. Henry Clark, M.D." *Transactions of the Medical Society of New Jersey* (1869):107-8.

The obituary makes no mention of Clark's role in the development of the otoscope.

The Thermoscope

Seguin, Edward. "The Clinical Thermoscope." *Medical Record* 10 (1875):204-5.

Seguin, Edward. *Family Thermometry; a Manual of Thermometry for Mothers, Nurses, Hospitalers, etc., and All Who Have Charge of the Sick and of the Young.* New York: G. P. Putnam & Sons, 1873.

Seguin, E. *Medical Thermometry and Human Temperature.* New York: William Wood & Company, 1876.

Wunderlich, C. A. and Seguin, Edward. *Medical Thermometry and Human Temperature.* New York: William Wood & Company, 1871.

The Sphygmograph and Sphbygmomanometer

Lawrence, Christopher. "Physiological Apparatus in the Wellcome Museum. 1. The Marey Sphygmograph." *Medical History* 22 (1978):196-200.

Lawrence, Christopher. "Physiological Apparatus in the Wellcome Museum. 3. Early Sphygmomanometers." *Medical History* 23 (1979):474-78.

"New Instruments. The Sphygmograph." *Medical Record* 1 (15 February 1867):580-81.

The Marey sphygmograph is described and illustrated reproducing woodcuts from a notice in the *Dublin Quarterly Journal of Medical Sciences.*

Ward, Samuel B. "The Sphygmograph, and Some of Its Uses." Medical Record 3 (15 October 1868):385-89.

The Microscope

The Billings Microscope Collection of the Medical Museum, Armed Forces Institute of Pathology. 2nd ed. Washington, D.C.: Armed Forces Institute Pathology, 1974

Describes the over 650 microscopes that make up the

Billings Collection and is illustrated extensively throughout.

Cassedy, James H. "The Microscope in American Medical Science, 1840-1860." *ISIS* 67 (1976):76-97.

Nuttall, R. H. *Microscopes from the Frank Collection, 1800-1860.* Jersey, Channel Islands: A. Frank, 1979.

Discusses the development of the "drum" microscope and illustrates examples. Over 400 titles are included in its extensive bibliography.

Padgitt, Donald L. *A Short History of the Early American Microscopes.* London: Microscope Publications Ltd., 1975.

Warner, John Harley. "Exploring the Inner Labyrinths of Creation: Popular Microscopy in Nineteenth-Century America." *Journal of the History of Medicine and Allied Sciences* 37 (1982):7-33.

Post-Mortem Instrument Sets

Thomas A. R. *A Practical Guide for Making Post-Mortem Examinations, and for the Study of Morbid Anatomy, with Directions for Embalming the Dead, and for the Preservation of Specimens of Morbid Anatomy.* New York: Beoricke and Tafel, 1873.

Provides illustrations of common post-mortem instruments.

Vocke, Franz. *Die Leichen-operationem. Ein Leitfaden für das Operationsstudium an der Leiche.* Berlin: Gustav Hempel, 1854.

This is the text Weber acquired as a guide for post-mortem examinations; it includes eight plates showing the range of instruments employed in an autopsy or dissection.

Wadsworth, William S. *Post-Mortem Examinations.* Philadelphia: W. B. Saunders Company, 1915.

Although postdating Weber's period, this is remarkable for its description and illustration of the tools and instruments useful in making post-mortem examinations.

General Surgery Instruments

Bennion, Elisabeth. *Antique Medical Instruments.* Berkeley: University of California Press, 1979.

Perhaps the most widely consulted work on the subject. Is of only minor help to American collectors, however, since most items illustrated are British or Continental and date from before 1870.

Boschung, Urs. "Le Fabricant D'instruments et L'histoire de la Chirurgie: Joseph-*Frédéric-Benoit Charriere (1803-1876)." Bracegirdle, Brian, ed. Proceedings of the Second Symposium of the European Association of Museums of History of Medical Sciences.* Collection Foundation Marcel Merieux, [September 1984], pp. 121-29.

Bray, Walter A. "The Surgeon and His Knife." *Archives of Surgery* 82 (1961):613-24.

Dammann, Gordon. *Pictorial Encyclopedia of Civil War Medical Instruments and Equipment.* Missoula, Montana: Pictorial Histories Publishing Company, 1983.

A welcome contribution to the literature on Civil War vintage instruments. Some mistaken identificaitons creep into the text (e.g. an auto-clyster is described as an embalming pump on p. 42-3) and quality of photography is uneven, but it is a useful source nevertheless.

Hamilton, Frank Hastings. *A Practical Treatise of Military Surgery.* New York: Baillière Brothers, 1861.

Weber's personal copy of this work is part of the collection of the Cleveland Medical Library Association.

Hart, A. G. "The Army Surgeon in the Last War." *Cleveland Medical Gazette* 13 (1898):335-46.

Describes the medical service during the period when Gustav Weber was Surgeon General of Ohio forces.

Kirk, Norman T. "The Development of Amputation." *Bulletin of the Medical Library Association* 32 (January-October 1944):132-63.

Moller-Christensen, Vilhelm. *The History of the Forceps: An Investigation on the Occurrence, Evolution, and Use of the Forceps from Prehistoric Times to the Present Day.* Copenhagen: Levin & Munksgaard, Ejner Munksgaard, 1938.

Smith, Stephen. *Hand-Book of Surgical Operations.* New York: Baillière Brothers, 1863.

Prepared as a pocket companion "at the sugestion of several professional friends, who early entered the medical staff of the Volunteer Army." Describes the most popular operating cases in use, as well as the official cases provided by the U.S. Army and Navy.

Thompson, C. J. S. *The History and Evolution of Surgical Instruments.* New York: Schuman's, 1942.

Tripler, Charles S. and Blackman, George C. *Hand-Book for the Military Surgeon.* Cincinnati: Robert Clarke and Company, 1861.

Appendix lists "Supply for Medical Officer," enumerating the surgical instruments furnished to each Medical Officer for his personal use during his period of military service.

Truax, Charles. "*The Mechanics of Surgery.*" Chicago: Hammond Press, 1899.

The single most useful guide to medical instrumentation of the late nineteenth century.

Wangensteen, Owen H. and Sarah D. *the Rise of Surgery from Empiric Craft to Scientific Discipline.* Minneapolis; University of Minnesota Press, 1978.

Warren, J. Collins. *The Nelaton Probe.* Reprinted from *Boston Medical and Surgical Journal* (21 August 1919).

The Osteotome

"New Instrument, Called the Osteotome, Designed for the Partial Ablation of Bones. Invented and Exhibited to the Academy of Sciences, Paris, by Dr. Heine." *Lancet* (18 October 1834):127-33.

The osteotome is described in detail and varied uses in which it proved a valuable addition to the surgeon's armamentarium are cited.

Roberts, Milton Josiah. "The Electro-Osteotome: A New Instrument for the Performance of the Operation of Osteotomy." *Medical Record* 24 (27 October 1883):472-75.

Roberts felt that the electro-osteotome and other powered saws, although far from foolproof, would soon displace other bone cutting instruments, including Heine's osteotome.

v. Walther, Ph. "Das Knochenbistourie, ein von Herrn Bernhard Heine neu erfundenes Werkzeug." *Journal der Chirurgie und Augen-Heilkunde* 18 (1832):39-55.

Describes Heine's osteotome, as well as that of H. Demme of Warsaw.

Vriend-Vermeer, Door W. "Het osteotoom van Bernhard Heine." *Overgedrukt uit het Nederlands Tidjsdhrift voor Geneeskunde* 107 (19 Oktober 1963):1930-32.

A brief history of the osteotome, with photographs of two osteotomes in the collections of the Rijksmuseum voor de Geshiedenis der Natuurwetenschappen in Leiden.

Cleft Palate Surgery Instruments

Dorrance, George Morris. *The Operative Story of Cleft Palate.* Philadelphia: W. B. Saunders Company, 1933.

Without a doubt, the most comprehensive work on any single surgical operation; provides a close narrative of the technical developments in cleft palate surgery and features profuse illustrations of the instruments and their mode of use.

Goldwyn, Robert M. "Bernhard von Langenbeck." *Plastic and Reconstructive Surgery* 44 (1968):248-54.

Langenbeck, B. "Die Uranoplastik mittelst Ablösung des mucösperiostalen Gaumenüberzuges." *Archiv fur Klinische Chirurgie* 2 (1861):205-87.

The essential, special purpose instruments first devised by von Langenbeck are described and shown: 1) elevators to separate the mucoperiosteum from the bone and 2) needle holder and guiding staff for suture.

Langenbeck, B. "Weiter Erfahrungen im Gebiete der Uranoplastik mittelst Ablosung des mucoperiostalen Gaumenuberzuges." *Archiv fur Klinische Chirurgie* 5 (1863):1-17.

Includes illustrations of instruments (curved or convex knife for lateral incisions, raspatory or periosteotome for detaching muco-periosteal membrane, double-edged pointed and blunt end knives, and concave tenotome).

Tracheostomy Instruments

Applebaum, Edward L. and Bruce, David L. *Tracheal Intubation.* Philadelphia: W. B. Saunders Company, 1976.

"A Short History of Tracheal Intubation" is included on pp. 1-5 and operative technique and instruments used today are also described. The tube, though now made of plastic material, closely resembles the form made popular by Trousseau.

Bouvier. "Rapport sur des canules et des dialatateurs pour la trachéotomie, adressés à l'Académie par MM. Robert et Collin, Matheiu, Charrière, Lüer, fabricants d'instruments de chirurgie, et par M. Laborde, interne des hôpitaux." *Bulletin de l'Académie de médecine* 27 (1861-62):6-7, 1218-37, [discussion] 1237-40.

Goodall, E. W. "The Story of Tracheotomy." *British Journal of Children's Diseases* 31 (1934):167-76, 253-72.

Two French surgeons, Bretonneau (1778-1862) and Trousseau (1801-1867), are credited for bringing the operation into use for laryngeal diphtheria and for naming it tracheotomy (pp. 171-72); these two were responsible for refining the design of tracheotomy tube and giving it the form and features that it retains to the present (pp. 266-68).

Guthrie, D. "Early Records of Tracheotomy." *Bulletin of the History of Medicine* 15 (1944):59-64.

Junker, F. "On the Use of the Tracheal Tampon." *Medical Times and Gazette* (4 May 1872):510-11; (25 May 1872): 595-97.

Junker notes that von Langenbeck first used Trendeleberg's tracheal tampon on 23 November 1871 for removal of a tumor involving the superior maxillary bone; he then

declared that "in the future he would not perform any operation on the face, in which inspiration or deglutition of blood may be apprehended, without using Dr. Trendelenberg's instrument." (p. 510)

Also notes that Trendelenberg's apparatus is available from "Messr. Krohne and Sesemann, 8,Duke street, Manchester-square, W." (p. 595) Additional uses of the tampon-cannula are suggested, including use while operating for cleft palate and for the local treatment of diphtheria and croup (pp. 596-97).

For information on Junker see K. Bryn Thomas, *The Development of Anaesthesia Apparatus* (London: Blackwell Scientific Publications, 1975), pp. 68-71; for information on Trendelenberg pp. 78, 81-84.

Mackenzie, Morell. *Diphtheria; its Nature and Treatment, Varieties and Local Expressions.* Philadelphia: Lindsay and Blakiston, 1879.

This work describes indications for and success rate of tracheotomy in cases of croup, or laryngo-tracheal diphtheria, especially in the period from 1825-1875; figures presented range from a cure rate of 20 percent to 70 percent with the average figure being somewhere around 25-30 percent.

Sanné, A. *A Treatise of Diphtheria, Historically and Practically Considered; Including Croup, Tracheotomy and Intubation.* Translated and annotated by Henry Z. Gill. St. Louis, M.: J. H. Chambers & Co., 1887.

Contains a history of tracheotomy (pp. 458-86), a description of instruments in use at that time (pp. 506-18), and notice on the recent (i.e. 1885) introduction of O'Dwyer's intubation tube as a substitute for tracheotomy. Sanné notes that the success rate of tracheotomy did not improve much until after Trousseau introduced the double cannula for the tracheotomy tube (*ca.* 1849-58, while head of the Hospital des Enfants, see p. 462) and use of Laborde's tri-valve dilator (p. 509-10).

The double cannula is dated to *ca.* 1842, devised by General Barthez (father of a patient with laryngitis) and constructed by Luër of Paris (p. 511). According to Wangensteen, this construction should be credited to George Martine of St. Andrews (Scotland) *ca.* 1730.

Trendelenburg, Friedrich. "Beitrage zu den Operationen an den Luftwegen." *Archiv fur Klinische Chirurgie* 12 (1870):112-33.

See especially "Tamponnade der Trachea," pp. 121-33 and plate 3, which describe the inflatable cuff around a Trousseau-type tracheal tube (to pack trachea during operations of the larynx and pharynx); the patient would be anesthetized by air inhaled through rubber tubing connecting a chloroform cone and tracheal cannula.

Laryngeal Instruments

Deleven, D. Bryson. "The Influence of New York upon the Development of Laryngology." *Transactions of the American Laryngology Association* 40 (1918):151-63.

Donelan, James. "Morell Mackenzie, the Father of British Laryngology, Founder of the 'Journal of Laryngology'." *Journal of Laryngology, Rhinology, and Otology* 34 (1919):181-89.

Elsberg, Louis. "Laryngoscopal Therapy, of the Medication of the Larynx under Sight." *Transactions of the American Medical Association* 14 (1864):305-11.

Shows generally German-style laryngeal instruments made by G. Tiemann & Company, but are more sharply angled, like Mackenzie's:

"The laryngeal instruments which I have enumerated and exhibited resemble each other in their general characteristics. Their most essential peculiarity is their size and exact bend, the latter being one and one-quarter right angle; the length of the handle three and a half inches; thence to the bend the same distance, and to the straightened end nearly five and a half inches. All their dimensions have been adopted as the result of numerous and careful measurements and experiments in both living and dead." p. 308.

Gibbs, G. D. *The Laryngoscope.* London, 1861.

A Guide to the Historical Exhibit of Instruments Shown at the Fiftieth Anniversary Meeting of the American Laryngological Association. Washington, D. C., 1928.

Hawais, H. R. *Sir Morell Mackenzie: Physician and Operator.* London, 1893.

Mackenzie, Morell. *Diseases of the Pharynx, Larynx, and Trachea.* New York: William Wood & Company, 1880.

This work contains excellent histories and descriptions, with illustrations, of pharyngeal instruments (pp. 8-12), the laryngoscope (pp. 158-76), laryngeal instruments (pp. 178-95), and tracheal instruments (pp. 370-79).

Mackenzie dates the use of galvano cautery for laryngeal surgery to the period 1864-67 and it was best popularized by Rudolph Voltolini (see pp. 370-71).

Mackenzie, Morell. *Essay on Growths in the Larynx.* Philadelphia: Lindsay & Blakiston, 1871.

See especially "The Removal of Growths by Internal or Laryngoscopic Treatment," pp. 62-84, for description of HDM 244 laryngeal forceps, scissors, and ecraseur (pp. 71-72) and HDM 227 laryngeal lancet (pp. 74-75).

Mackenzie, Morell. "On the Application of Remedies to the Larynx with the Aid of the Laryngoscope." *Lancet* 2 (20 December 1862):673-74.

That the precise angle of the instrument is 108° is indicated. This was settled upon only after experimenting with cadavers, taking measurements, and determining the optimum angle from the statistics compiled.

Mackenzie, Morell. *The Use of the Laryngoscope in Diseases of the Throat, with an Appendix on Rhinoscopy.* Philadelphia: Lindsay and Blakiston, 1865.

Mackenzie describes HDM 227 laryngeal lancet (pp. 114-17) and HDM 244 laryngeal forceps, scissors, and ecraseur (pp. 199-28).

Solis Cohen, J. *Diseases of the Throat: a Guide to the Diagnosis and Treatment of Affections of the Pharynx, Oesophagus, Trachea, Larynx and Nares.*

Surgical instruments are described in "Treatment of Growths in the Larynx," pp. 417-52; Mackenzie's instruments are featured.

Solis Cohen, J. "Intra-laryngeal Surgery, and Topical Medication of the Upper Air-passages." *Medical Record* 2 (1867-68):294-6, 313-6, and 385-7.

This article shows instruments manufactured by Gemrig of Philadelphia.

Solis Cohen, J. "Laryngoscope." *Medical Record* 1 (1866-67):228-30, 275-77, 347-50, 393-95, 443-46, 538-40 and 2 (1867-68):4-7, 29-32.

Solis Cohen, J. Da Silva. "Early Days of Laryngology." *Transactions of the American Laryngological Association* 40 (1918):127-35.

Stevenson, Robert Scott. *Morell Mackenzie: the Story of a Victorian Tragedy.* New York: Henry Schuman, 1947.

Galvano-cautery Instruments

Althaus, Julius. *A Treatise on Medical Electricity, Theoretical and Practical and Its Use in the Treatment of Paralysis, Neuralgia, and Other Diseases.* 3rd ed. London: Longmans, Green, and Co., 1873.

Describes apparatus (galvaic ecraseur) identical to HDM 237 (see pp. 350-53), fig. 91) offered for sale in London by Krohne and Sesemann. This same instrument was absent from the 2nd edition (Philadelphia; Lindsay and Blakiston, 1870) that was the personal copy of Weber (which had uncut signatures except for the surgery section).

Beard, George M. and Rockwell, A. D. *A Practical Treatise on the Medical and Surgical Uses of Electricity Including Localized and General Electrization.* New York: William Wood & Co., 1871.

Byrne, J. "Clinical Notes on the Electric Cautery in Uterine Surgery." *American Journal of Obstetrics and Diseases of Women and Children* 5 (1873):522-40, 727-36 and 6 (1874):112-43.

Byrne provides an excellent discussion of the apparatus used in galvano-cautery, noting the problems that plagued the use of batteries available at the time; features instruments (electrodes) made by Shepard and Dudley of New York.

Cambridge, N. A. "Electrical Apparatus Used in Medicine Before 1900." *Proceedings of the Royal Medical Society* 70 (1977):635-41.

Cambridge discusses electrocautery (pp. 639-40) and shows (fig. 12) instruments devised by Middeldorpf.

Coolidge, Algernon. "On Cauterization by Galvanism." *Boston Medical and Surgical Journal* 53 (November 1855):342-49.

This brought to the attention of American readers the work of A. T. Middeldorpf, citing his book *Die Galvanocaustik, ein Beitrag zur Operativen Medicin* [*sic*] and providing illustrations of the platinum wire loop favored by Middeldorpf [as noted in Weber's own copy of Alfred C. Garratt, *Electro-physiology and Electrotherapeutics; showing the best methods for the medical uses of electricity* (Boston: Ticknor and Fields, 1860), pp. 660-61.].

Cutter, Irving Samuel. "History of Physical Therapy and its Relation to Medicine." in *Principles and Practice of Physical Therapy*, eds. H. E. Mock, Ralph Pemberton, and John S. Coulter, pp. 1-115. Hagerstown, Maryland: W. F. Prior Co., 1932.

Section 1: "Electricity as a therapeutic agent," pp. 1-84 and Section 2: "Applications of light to disease," pp. 84-115.

See pp. 65-72 for "respectable" electrotherapy in mid-nineteenth century America.

Garratt, Alfred C. *Electro-Physiology and Electro-Therapeutics; Showing the Best Methods for the Medical Uses of Electricity.* Boston: Ticknow and Fields, 1860.

The Dittrick Museum has Weber's own copy of this work; the principal galvano-cautery apparatus illustrated and described is that made by Thomas Hall, an instrument maker of Boston [see pp. 119-20, 155 ("Electrical instruments," figs. 44-47), 659-64].

Leiter, Jos. "Neu modificirter galvanokaustischer Apparat." *Wiener medizinische Wochenschrift* 10 (1860):328-31.

Leiter describes, with complete illustrations, a galvano-cautery battery and set of electrodes that are identical to HDM 237.

Middeldorpf, A. Th. "De La Galvanocaustiques." *Archives*

Générales de Médecine Seried 5 (August 1855):145-59.
Ibid. Series 5 (October 1855):444-64.

Piffard, Henry G. "The Proper Construction, Care, and Uses of the Galvano-Cautery Apparatus." *New York Medical Journal* 23 (1876):364-426.

Rowbottom, Margaret and Susskind, Charles. *Electricity and Medicine: a history of their interaction.* San Francisco: San Francisco Press, 1984.

See especially Chapter 9, "Electricity in Surgery (Late 19th Century)," including discussion of galvano cautery apparatus pp.144-52.

Walker, Thomas James. "The Galvano-caustic Apparatus: Its Applications in Surgery." *British Medical Journal* 1 (20 April 1861):409-11, 437-40.

Describes and illustrates apparatus used in Vienna by Adolf Zsigmondy; it indicates that Leiter of Vienna (p. 438) is a chief manufacturer of galvano-cautery apparatus; includes the cost of apparatus ". . . The most useful instruments, properly fitted for a surgeon's use, cannot be obtained, even in Vienna, at a much lower cost than ten pounds, . . ." (p. 439), difficulty of managing the acid batteries and ". . . the smell and smoke caused by the burning, and occasionally blazing tissues, . . ." all worked to discourage the use of galvano-cautery.

The Aspirator

Atwater, Edward C. "Morrill Wyman and the Aspiration of Acute Pleural Effusions, 1850. A Letter from New England." *Bulletin of the History of Medicine* 46 (1972):235-56.

Bowditch, Henry I. "On Pleuritic Effusions, and the Necessity of Paracentesis for their Removal." *American Journal of the Meidcal Sciences* 23 (April 1852):320-50.

The illustrations of p. 350 show the instrument for aspiration used by Bowditch, following the lead of Wyman.

Dieulafoy, Georges, *A Treatise on the Pneumatic Aspiration of Morbid Fluids.* Philadelphia: J. B. Lippincott & Co., 1873.

"New Inventions. Coxeter and Son;s Aspirator." *Lancet* 1 (14 February 1874):234-35.

Gives brief mention of the Coxeter aspirator, with illustrations. Some two weeks later, Coxeter acknowledges the priority of John Weiss, leaidng medical instrument house in London, for design of a syringe with Glass viewing section (see p. 319, 28 February 1874).

"New Inventions. Coxeter and Son's Aspirator." *Medical Times and Gazette* 2 (21 November 1874):591-92.

Provides a description and illustration of Coxeter's aspirator with a good explanation of how it works.

The Stomach Pump

Friedenwald, Julius and Morrison, Samuel. "The History of the Development of the Stomach Tube with Some Notes on the Duodenal Tube." *Bulletin of the History of Medicine* 4 (June 1936):425-54.

So far, the best work on the subject, with good illustrations to point out the differences among the various pumps devised since the late eighteenth century.

Major, Ralph H. "History of the Stomach Tube." *Annals of Medical History* n.s. 6 (November 1934):500-509.

Paine, John R. "The History of the Invention and Development of the Stomach and Duodenal Tubes." *Annals of Internal Medicine* 8 (December 1934):752-61.

Lithotomy and Lithotrity Instruments

Agnew, D. Hayes. *The Principles and Practice of Surgery, Being a Treatise on Surgical Diseases and Injuries.* 2 vols. Philaeslphia: J. B. Lippincott & Co., 1881.

Pp. 651-696 provide excellent descriptions and illustrations of lithotomy and lithotrity procedures in vogue (including Bigelow's litholapaxy) during Gustav Weber's surgical career.

Bigelow, Henry J. *Litholapaxy or Rapid Lithotrity with Evacuation.* Boston: A. Williams and Company, 1878.

Ellis, Harold. *A History of Bladder Stone.* Oxford: Blackwell Scientific Publications, 1969.

Herman, John R. *Urology: A View Through the Retrospectroscope.* Hagerstown, Maryland; Harper & Row, Publishers (Medical Department), 1973.

A Memoir of Henry Jacob Bigelow. Boston: Little, Brown, and Company, 1900.

Murphy, Leonard J. T. *The History of Urology.* Springfield, Illinois: Charles C. Thomas, Publisher, 1972.

In two parts: Part I. Ernest Desnos. The History of Urology to the Latter Part of the Nineteenth Century. Translated and edited by Leonard J. T. Murphy. Originally *L'Histoire de l'Urologie*, an extract from the *Encyclopedie française d'Urologie.* Paris: Octave Doin et Fils, 1914.

Part II. Murphy, Leonard J. T. The Development of Modern Urology.

Ophthalmic Surgery Instruments

Hubbell, Alvin A. *The Development of Ophthalmology in America: 1800 to 1870.* Chicago: W. T. Keener & Company, 1908.

The only recent work of its kind on the subject.

Macfarlan, E. "Lachrymal Probe Syringe." *American Medical Times* 9 (9 July 1864):15-16.

Mackenzie, William. *A Practical Treatise on the Diseases of the Eye.* Philadelphia: Blanchard and Lea, 1855.

A classic text providing a good "state of the art" overview of ophthalmic surgery at the mid-century point. Very good woodcuts of instruments.

Walton, H. Haynes. *A Treatise on Operative Ophthalmic Surgery.* Philadelphia: Lindsay & Blakiston, 1853.

Provides excellent illustrations and descriptions of ophthalmic surgery instruments, especially in Chapter II, "Ophthalmic Instruments in General," pp. 23-31.

Hypodermic Syringes

Bartholow, Roberts. *Manual of Hypodermic Medication.* Philadelphia: J. B. Lippincott & Co., 1969.

Notes that the modified Pravaz syringe is the most popular in the United States, but he prefers a silver, not glass, syringe described (pp. 24-25) and illustrated (frontispiece). This one is identical to the HDM 294.

Elliot, George T. Jr. "Obstetrical and Medical Cases [at Bellevue Hospital, New York City]." *New York Journal of Medicine.* Volume V. Third Series (November 1858):332-345.

Elliot notes on p. 340: "My colleague, Dr. Barker, brought back with him from Edinburgh one of Andrew Wood's instruments for injecting living tissue with various medicated solutions. It consists of a small graduated glass syringe with canulae so slender as to be inserted deeply without drawing blood. Tiemann has made them for me since, using an India-rubber syringe of the smallest size."

This may be among the earliest citations of the use of the hypodermic syringe in American medical literature. See also Elliot's "On the hypodermic injection of sedatives," *American Medical Times* 9, 10 (3) September 1864):123-24. Here Elliot dates his first trial of the hypodermic syringe to August 1857.

Howard-Jones, Norman. "A Critical Study of the Origins and Early Development of Hypodermic Medication." *Journal of the History of Medicine and Allied Sciences* 2 (1947):201-49.

An exhaustive, if not completely definitive, study of the development of hypodermic syringes and their use; written from the British perspective, it demolishes the notion that Pravaz "invented" the hypodermic syringe *ca.* 1852; provides only passing comments on acceptance and diffusion of hypodermic technique in America.

"Improvements in Instruments. Lüer's Improved Hypodermic Syringe." *Medical Record* 1 (1866-67):23-24.

Provides illustration and brief description of the Lüer syringe made by Reynders of New York.

Pfender, Charles A. "Historical Synopsis of the Development of Hypodermic Medication." *Washington Medical Annals* 10 (1912):346-358.

Although a good succinct treatment, it is superseded in most respects by Howard-Jones (1947).

Ruppaner, Antoine. *Hypodermic Injections in the Treatment of Neuralgia, Rheumatism, Gout, and Other Diseases.* Boston: T. O. H. P. Burnham, 1865.

This follow-up work was initially published in "Researches upon the Treatment of Neuralgia by Subcutaneous Injection, With Cases," *Boston Medical and Surgical Journal* 62 (1860):193-99, 216-22, 241-47, and 280-89.

The Travoy [Praviz?] syringe and that of Tiemann are recommended; the use of lancet and glass syringes are discouraged (see especially "The instrument, operation, and point of injection," pp. 32-44).

White, Robert. "Hypodermic Injection of Medicines, with a Case." *Boston Medical and Surgical Journal* 61 (1859):289-92.

In this work Wood is credited with the development of the syringe, but it is noted that he (the author) uses "a vaccinating lancet and small glass syringe, with the piston well packed, and have found them to answer admirably every desired object in the operation."

Transfusion Apparatus

Aveling, J. H. "On Immediate Transfusion." *Transactions of the Obstetrical Society of London* 6 (1865):126-36.

Baffes, Thomas G. "History of Blood Transfusion." *New Orleans Medical and Surgical Journal* 98 (1945):159-77.

Ficarra, Bernard J. "The Evolution of Blood Transfusion." *Annals of Medical History* (3rd ser.) 4 (1942):302-23.

Keynes, Geoffrey, ed. *Blood Transfusion.* Baltimore: Williams and Wilkins Co., 1949.

See especially the chapter "The History of Blood Transfusion," pp. 1-40.

Kilduffe, Robert A. and DeBakey, Michael. *The Blood Bank and the Technique and Therapeutics of Transfusions.* St. Louis: C. V. Mosby Co., 1942.

A good introduction to the history and methods of blood transfusion.

"Leiter's Transfusion Apparatus." *Transactions of the American Medical Association* 25 (1874):168.

A short description of the Leiter apparatus, complete with woodcut illustration. See also the discussion of the Leiter and Aveling apparatus by Theophilus Parvin, pp. 189-93.

"New Instruments. Aveling's Apparatus for Immediate Transfusion." *Medical Record* 9 (1874):190-91.

The description and illustration for this article were furnished by George Tiemann and Company of New York.

Parvin, Theophilus. "Address in Obstetrics, Disease of Women and Children." *Transactions of the American Medical Association* 25 (1874):203-220.

Discusses the history of transfusion in cases of uterine hemorrhage and recent advances in this field of therapy.

Schmidt, Paul J. "Transfusion in America in the Eighteenth and Nineteenth Centuries." *New England Journal of Medicine* 279 (1968):1319-20.

Zimmerman, Leo. M. and Howell, Katherine M. "History of Blood Transfusion." *Annals of Medical History* new series 4 (1932):415-33.

Provides good illustrations of apparatus used in the late nineteenth and early twentieth centuries; it does not show or mention the Leiter transfusion device.

Gynecological and Obstetrical Instruments

Cianfrani, Theodore. *A Short History of Obstetrics and Gynecology.* Springfield, Illinois: Charles C. Thomas, 1960.

Das, Kedarnath. *Obstetric Forceps: Its History and Evolution.* Calcutta: The Art Press, 1929.

The definitive work on the subject documenting almost six hundred different forms of the obstetric forceps; completely illustrated.

De Lee, Joseph B. *Principles and Practice of Obstetrics.* Philadelphia; W. B. Saunders Co., 1913.

In this work De Lee illustrates and gives a short history of the development of balloon dialators similar to those of Molesworth; he dates the first colpeurynter, or rubber balloon to be distended with water after being placed in the vagina, to the invention of Carl Braun in 1851 (see pp. 911-12).

Lente, Frederick D. "The Comparative Value of the Molesworth's Dilator." *Medical Record* 9 (1874):244.

"Reviews." *American Medical Times* 9 (3 September 1864):122.

Review of Hugh L. Hodge, *The Principles and Practice of Obstetrics* (Philadelphia: Blanchard and Lea, 1864).

Ricci, James V. "The Vaginal Speculum and Modifications Throughout the Ages." *Contributions from the department of Gynaecology of the City Hospital, New York, 1948-49.* New York: New York Medical College, City Hospital Division, 1949.

By far, the most comprehensive review of the subject, with a chronological list of vaginal specula introduced 79 A.D. to 1940 and illustrations of over 560 models.

Hist. WO 162 E24n 1986

Edmonson, James Milton

Nineteenth century surgical instruments. 101239

CLEVELAND HEALTH SCIENCES LIBRARY
Allan Memorial Library

Back cover illustration:

This *carte de visite*-style photograph shows Gustav Weber, saw in hand, instructing four University of Wooster students. The figures are, left to right, George Sherman Peck (M.D.,1876), Gustav Weber, Guy B. Case (M.D.,1873), Charles B. Parker (M.D.,1873), and Theodore A. Weed (M.D.,1877).