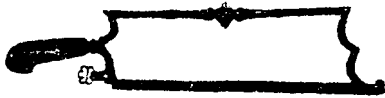


MEDICAL



COLLECTORS



ASSOCIATION

March 1985

Dear Colleagues:

The Medical Collectors Association is a success beyond my expectations. I had anticipated perhaps thirty or forty members and yet the Association keeps growing each day and is approaching one hundred members. Virtually all of last year's members have renewed, although we have not heard from about a dozen. One reminder notice was sent and we will not be sending any others. So if any of you have any friends who have neglected to renew their membership, please give them a nudge.

There are several news items which relate to the group and which are worth mentioning at this time. Dr. Audrey Davis of the Smithsonian is considering the possibility of hosting a meeting sometime in the fall or winter of 1985. This would be an ideal setting and hopefully Dr. Davis will find the time to make this possible. At the present time this is only a tentative plan. Another possibility of a meeting which has come forth has been suggested by Dr. Nicholas Dewey of London, England. Dr. Dewey has been hosting meetings on the history of medicine for several years now and has raised the possibility of a Medical Collectors Association meeting which would be devoted towards medical collecting. We will keep you posted as plans proceed for this get-together, which would be held some place in England in the fall of 1986.

Also in the category of meetings, Miss Susan Cronenwett is organizing an ophthalmic fair at the American Ophthalmic Museum in Southbridge, Massachusetts. By this time all of you should have received invitations from Miss Cronenwett to the fair. She has agreed to invite all of the members of the Medical Collectors Association.

Dr. Barry Wiedenkiller has written suggesting that we maintain a "hot line" for stolen items. A number of items have been stolen from the University of Nevada School of Medicine and he has sent me a list. I would be willing to publish descriptions of items which any of you may have lost or believe stolen. However, these would have to be items which could be identified readily. Those things which are relatively common and easily available would be virtually impossible to relocate.

This issue of the Newsletter contains an original article by Dr. Audrey Davis, reviewing some important aspects of the history of dentistry in the United States. In keeping with the dental theme, I have included two patent model descriptions which were kindly supplied by Dr. Davis with photographs provided by Miss Brenda Gilmore.

Also in this issue, we have begun the description of medical museums which Professor Pengelley has been kind enough to supply. This will be a rather lengthy section and will probably take several Newsletters to publish. The first section

Founder: M. Donald Blaufox, M.D., Ph.D.

devotes itself to some of the medical museums in England. The amount which we publish with each issue will depend upon the available space.

The identification column has received several contributions and I would be happy to receive contributions from any of you who have things to identify. This month's identification column contains some beautiful drawings by Dr. C. Keith Wilbur of Northampton, Massachusetts, who raises the question whether these items are indeed medical or of other use. Dr. Wilbur states that he has seen several of these knives in surgical kits and has seen one with the initial USN on the handle. In a Sears Roebuck catalogue of 1906 he has seen them listed as steel ink erasers, while in Dr. Damman's book they are listed as venesection knives. Although I have indicated in the identification page that there are no maker's markings, since the majority of them are seen without any markings, the ones that Dr. Wilbur has provided to us had markings which included Rogers, Cutlers to her Majesty; Clauss, U.S.A.; and Miller Brothers, U.S.A. I have also indicated in the column that they are of wood and steel which is their usual configuration, but Dr. Wilbur indicates that those which he has drawn are made of rosewood, ebony, or ivory handles, and one has a brass collar. We welcome your opinions as to whether or not these are indeed medical items. I have one which was in a medical bag from a 19th century New England physician and which I assumed to simply be an ink eraser. Dr. Wilbur also writes to inform the membership that W.B. Saunders is producing a new publication, "Medical Heritage", with Sharon Romm as the Editor. Dr. Romm's address is Department of Surgery, Albert B. Chandler Medical Center, University of Kentucky, Lexington, Kentucky 40536-0084. This issue will contain a number of items of interest to medical collectors.

Also in the identification column, several collectors identified the instrument which we had pictured as a Lister Carbolic Acid Spray or Steam Spray producer. Several sent me pictures of a variety of versions of this machine and I am including in the Newsletter two photocopies of pages from a Maw and Thompson Catalogue of 1882, which was sent to me by Dr. Anne Young. I am also including a copy of a lecture by Dr. Lister at which he described the use of his machine in sterilization. Among the collectors and dealers who identified the instrument were Dr. Campbell, Mr. Middleton, Dr. Young, Dr. J. William Rosenthal and Jean and Jacqueline Pawlowski. If I have left anybody out who called and wrote, please forgive me. Also, Dr. Ronald Berger has informed us that he has another example of the "Rich Man Poor Man" knives which were described. He is among the fortunate few who have the "Rich Man" version.

I hope you will all enjoy this latest issue of the Newsletter. Please continue to send me any contributions or news items that you think would be appropriate for inclusion. Also I would appreciate comments on format and other kinds of suggestions.

All of you who have received this letter and therefore renewed your membership, should have received membership certificates. If any of you have not received membership certificates, please let my office know.

Sincerely,
M. Donald Blaufox, M.D., Ph.D.

**REMEMBER OUR SUCCESS DEPEND ON CONTRIBUTIONS AND SUGGESTIONS TO THE
NEWSLETTERS FROM THE MEMBERS**

DENTISTRY AND ITS IMAGE IN THE NINETEENTH CENTURY

From an unorganized mechanical art prior to 1840 to a professionally applied science by the end of the century, American dentistry rose to world acclaim. Before 1840 most dentists produced their own drugs, instruments and supplies, as well as developed their own methods for saving, extracting and replacing teeth. The average American dentist's trademark instrument was the pellican ("pulliken") for extracting painful and decayed teeth. Artificial teeth were made from animal teeth such as hippopotamus, those removed from the deceased, others carved from bone, mother of pearl, ivory, wood or wax and a few molded in porcelain.

PATENTS IN AMERICAN DENTISTRY

Patents were mandated by U.S. law in 1793. When the law was recodified in 1836, a unique feature was introduced, a requirement to submit a model with the patent specification. Models of all types and qualities were submitted including a functioning miniature of a larger mechanism, a detail of the working part of a complex mechanism, a manufactured piece adapted according to the new patent or a mock-up of the mechanism made of paper, wood, or other substitute material. Although the law requiring patent models was repealed in 1870, the patent office continued to request them until 1880, and some inventors submitted models for several decades after 1880.

The requirement for a patent model stipulated that they be "not more than twelve inches square...neatly made, the name of the inventor should be printed or engraved upon, or affixed to it, in a durable manner".

An uneasy relationship between inventors, mechanics, dentists and patent holders permeates the development of dentistry in the 19th century. Professionals were discouraged from holding patents, especially medical practitioners, who among the three major professions law, divinity and medicine, had the most opportunity to use and seek patents for mechanical devices, tools and instruments.

Of all medical and scientific practitioners in the nineteenth century, dentists employed the patent system most effectively to develop inventions they required while condemning ownership of patents by dentists.

Some of the most inventive dental practitioners established instrument and appliance manufacturing companies and supplied their colleagues with much needed equipment in this period. Samuel Stockton White (founded S.S. White Co. in 1844) and the four men who organized the Buffalo Dental Company in 1867, two of the oldest American dental manufacturers, began their careers as dentists. Lee S. Smith and Son was founded in 1866. In all instances, they realized that many American practitioners could not obtain reliable teeth and instruments to carry out their daily dental routines. Thus inspired and determined to provide some of the materials which were needed by all dentists, they left their careers as dentists and began their businesses, one in Philadelphia and the others in Buffalo, New York. Their histories reveal the necessity of the patent system to the dental manufacturers and the insistence which both companies placed on obtaining patents related to dental instruments, supplies and artificial teeth before they were produced. S.S. White obtained and bought more dental patents than any other dental manufacturing company in the nineteenth century.

These major American dental manufacturers relied on patents to produce their most popular instruments and devices. The S.S. White Dental Manufacturing Company listed the patents it owned by 1885 in the following categories: dental engines,

hand pieces, flexible shafts, operating tools and polishing attachments--111; dental brackets--9; dental pluggers--29; dental chairs and head rests--37; and vulcanizers and flasks--14. The Buffalo Dental Manufacturing Company owned thirty-three patents in all categories by 1872. A later listing contained twenty-three patents obtained between 1866 and 1906, most of them awarded to the dentist Theodore Lewis, one of the company's founders.

SAMUEL STOCKTON WHITE

Samuel Stockton White was born at Hulmeville, Bucks County, PA, June 19, 1822. His father died in 1830 and White at the age of 14 was indentured to his uncle Samuel W. Stockton, a dentist in Philadelphia "...whose manufacturer of porcelain teeth was the first in the U.S. to attain any commercial importance". Paul Goddard in his beautifully illustrated text published in 1844 referred to "better teeth of this kind (porcelain) are made in this country than in any other..." These teeth could also have been made by Nathan Cooley Keep, M.D. and D.M.D. (December 23, 1800-March 11, 1875). Keep was another pioneering American dentist who had selected jewelry making as his first career. When the jewelry business floundered, Keep began to manufacture porcelain teeth. Keep brought "the art to a high degree of perfection". "He spent many evenings in his cellar testing in a baking furnace new enamels and bodies he had compounded. In a competitive exposition he received the first premium for the excellence of his imitation of the natural teeth and was considered unequalled in all that pertained to the niceties of their manufacture. His signal ability in this direction made him master of his art; he had the artist's eye and the delicate touch so rare in any profession."

Samuel S. White was expected to and did learn "the art and mystery of dentistry and the manufacture of incorruptible teeth." At 21 in 1843, he began to practice dentistry in his uncle's office and to superintend the manufacturing department. The next year he set up his own tooth factory in the attic of a house and practiced dentistry in the same building. From this one person business began what would become within the decade the largest dental manufacturing company in the world. In 1868 as a monument to the success of his business and the foremost reputation among American dental manufacturers, White erected a new building in Philadelphia which measured 44 ft by 235 ft by 90 ft high. Perhaps, symbolically, but indeed with sound economic principles, the first floor of the building was leased to the jewelers Bailey and Company. On the second floor was located the dental business with a sales-room, private offices and the publication office for The Dental Cosmos. Displayed on this floor were all the items manufactured from the "smallest hand implement to the costliest plush-lined chair". The third, fourth and fifth floors were used to manufacture teeth, instruments and supplies, and prepare them for shipment. Between 200 and 300 people were employed in supplying from this plant "four-fifths of the dental materials consumed in the world". White's comprehensive dental supplies are typified in his patent of January 4, 1876 (#171,750) for an improved dental engine mounted on a chair to a water motor and belt drive and suspended by a flexible shaft or cable.

White's manufacturing business consumed enough of his time so that by 1846 he gave up the practice of dentistry to concentrate on the manufacture of porcelain teeth. Branch houses were established in New York in 1846; in Boston in 1850 and in Chicago in 1858. By the end of his career the improvements in mineral or porcelain teeth claimed by SSW are varied and significant. These are: "The translucency gained without the sacrifice of strength; the increased capability of resisting changes in temperature; the added strength with lessened bulk and weight; the modifications with special reference to the comfort of the wearer; the distinctions in shape in accor-

dance with anatomical types; adaptability to varying conformations of maxillae, the recognition of the artistic demands in replacement--the distinctive needs of differing sex, age, complexion, nationality, and general physical peculiarities; the faithful reproduction of the manifold deviations from absolute uniformity, including the minor as well as the more noticeable features, effects to disarm suspicion of artificiality, and forms to overcome the results of irregular or excessive absorption without violating aesthetic requirements; improvements also in the mechanics of substitution,--the means of attachment to the various bases--the bell-shaped, the double-headed, and the foot-shaped pins, and modifications of form specially applicable to the different materials used as bases."

By the time of White's death in 1880 his firm, which had stamped its products with a trademark since 1867 of two S's superimposed on a W, had earned eighty medals for excellence in tooth manufacture from the great industrial institutes in the U.S. and all the international exhibitions. White also built up the dental instrument part of his business until by the end of his life SSW instruments were as esteemed in Europe as they were in the U.S. White stimulated inventors and encouraged dentists to improve their practices which created a market for the tools and supplies he manufactured and sold. The company's journal The Dental Cosmos assumed a major role in educating dentists.

ELI THOMPSON STARR

The dentist whose mechanical and inventive talents contributed the most to the excellence of the S.S. White Dental Company was Eli Thompson Starr (Jan. 7, 1834-Dec. 11, 1904). Over the last four decades of the nineteenth century beginning with his employment in 1862 by S.S. White, Starr received almost one hundred patents and contributed to many more which were awarded to others and generally, assigned to or bought by the S.S. White Dental Manufacturing Company. Most of Starr's own patents were assigned to the S.S. White Dental Company.

His patents were obtained for improvements in every aspect of dentistry including dental chairs, head rests for dental chairs, hand pieces, dental engines, spittoons, artificial teeth, gas regulators for a vulcanizer, flasks, molds, impression trays, electrical devices for use by dentists such as mouth illuminators and faradic batteries.

Starr began his dental career as a result of encouragement from his father-in-law, Emmor Jefferis, a leading dental practitioner in Wilmington, Delaware, after Starr's business as a manufacturer of sheet-iron for tin plates failed in 1857. After an apprenticeship with Jefferis during which he learned to carve porcelain blocks and to fuse porcelain, he assisted J. DeHaven White of Philadelphia. In August 1862 he joined the S.S. White Company.

Starr understood the shortcomings of the dental supplies and instruments then available and soon developed a genius for inventing devices to provide the needed equipment to his dental colleagues and customers. One of his early inventions was the reversible flask for vulcanizing rubber plates for artificial teeth, which after forty years remained a popular device. Starr possessed unparalleled knowledge of porcelain teeth through all the stages of their manufacture from preparation of the crude materials, the mold-making and through the finishing processes to the completed product.

ARTIFICIAL TEETH

Designing and shaping models to produce artificial teeth in porcelain and other substances led some dentists and manufacturers to study the forms of natural teeth in extensive detail. The prolific inventor and designer of the S.S. White Dental Mfg. Co., Eli T. Starr, by the last decade of the century, had improved upon the anatomical study of the Carabelli, which was considered the classic publication on the anatomy of the teeth since 1844. Starr's work carried out over many years included discovering the "relative height, breadth and thickness of each crown and root". One basic fact emerged from Starr's study that "...however much the crown of teeth of a given class may differ, their necks, possess typical forms, from which there are comparatively slight variation". Starr's aim in publishing his article was to describe with diagrams the anatomy of each tooth. He believed "Dentists will know how to apply the knowledge to the benefit of their patients".

Eli Starr applied his own data and received a patent for an artificial tooth crown on May 18, 1866 (#342,771). The purpose of Starr's patent was to bind a porcelain cap to a natural tooth root. Starr's conclusion that the necks of a bicuspid and molar teeth were very similar was used in this patent. The metal band, usually gold, encircled the neck of the tooth and was extended to raise the porcelain or equivalent crown-cap placed with it and locked in place with filling material, rather than extending the porcelain crown. The purpose of providing a porcelain surface instead of a complete tooth crown was to strengthen the grinding surface, which was worn down by the opposing tooth.

Starr's tooth crown was an improvement on C.M. Richmond's widely used "pivot crown". The pivot crown contained a pin or post-baked into the base or neck of the porcelain portion of the crown. The strength of the pin was directly related to its diameter which, however, had to be small to enable it to fit into the root of the tooth. Starr strengthened the root of the pin by forming a depression in its circumference, which enlarged the surface to be exposed to the filling cement and created a stronger bond for the pin. Starr claimed this arrangement of the root would not loosen as easily as the flat surface pin used in Richmond's tooth.

In a third patent, Starr described a porcelain veneer for a tooth which was not completely destroyed and, therefore, warrant the use of a pin, and yet, not sufficiently intact to be patched up with a porcelain filling or stopping. To apply Starr's "improved veneer or facing the decayed or improved portion of the crown is removed and an opening made into the nerve canal or canals of the tooth or enlargements thereof, or into the solid denture of the root, for the reception of an anchoring post or posts, or a screw or screws, in well-known ways" (#276,920, May 1, 1883).

Forming air chambers in upper dental plates so that they would remain in the mouth could be done by a variety of methods. One method was patented by Mary Ann Boughton, one of the few women who received a dental patent in this period. Her patent, granted on January 31, 1871 (#111,429), suggested that an air chamber be created by placing a block of wax over the spot in the cast corresponding with the roof of the mouth where the air chamber was desired, and then, inserting the plaster of Paris material into the mouth to make the cast. The space left after the wax melted would be sufficient to form an air space, and there was no need to gouge out some of the plaster to create the space as was customarily done before her invention.

Plates were also held in the mouth by an attached atmospheric disc. When it became necessary to clean the disc, the wearer had to return to the dentist until Quincy A. Scott of Pittsburgh, Pennsylvania, discovered a method of attaching the disc with a screw and nut, so that it could be removed and cleaned by the owner

himself (#170,776, December 7, 1875).

Inventors were not always dentists who were inspired to help other patients. William Ballard of Brooklyn, New York found a remedy for his own problem in retaining an upper plate in his mouth. On November 21, 1865 (#51,001) he patented a method of puncturing the upper surface facing the roof of the mouth of a dental plate with small depressions extending from the periphery near the teeth to the central air chamber space. After two years and the trial of many sets of teeth made by the most eminent American dentists, Ballard concluded that a central air chamber commonly used to hold up artificial teeth was not sufficient to retain the plate in the mouth under normal conditions of use. Thus he introduced the numerous auxilliary spaces in the plate to create a stronger suction for retaining the plate during speech and while eating.

The association between patents and advances in the technology of dentistry has not been adequately assessed in the history of dentistry. The unfortunate publicity growing out of the rubber patent and a few others, and the attempt to sell a license to every dentist who used the vulcanizing process in his practice, has detracted from the usefulness of many other patents which were developed by manufacturers who produced the patented inventions to a high standard. Standardization and dependability in the manufactured tools and supplies were vital to the success of dental craftsmen. Without the establishment of the major suppliers S.S. White, Buffalo Dental Manufacturing Company, and Lee S. Smith and Son in the U.S., and in England Claudius Ash, to name a few of the major manufacturers, the American dental craft would have remained localized and dominated by regional differences. Professionalization in dentistry on a national level required large nationwide suppliers of acceptable equipment. The nation's patent system protected the manufacturer so that he could compete in all regions of the U.S. and in foreign countries by maintaining a monopoly on an implement or apparatus for a period long enough to profit from his investment in its production.

Evolving from a host of craftsmen--jewelry makers, plaster molders and sculptors, wood workers, smiths, ivory turners, clockmakers, etc., the nineteenth century dentist brought a tradition of mechanical skills to his profession which directed and shaped its development. Mechanical skills executed with a plethora of implements highlight the daily routine of the nineteenth century dentist. Acclaimed as among the best medical professionals, dentists had forged a favorable reputation, developed a specialized craft, created an industry to supply their tools and materials and won their patient's respect by the end of the century. American dentists would have taken longer to perfect techniques, especially preserving teeth and installing artificial teeth, without the establishment of appropriate institutions to guide and regulate their activities. The dental school taught the future dentist the sciences of anatomy and preventing dental diseases--the dental manufacturer supplied the dentist throughout his career with the essential tools to practice the profession he had learned in dental college. During his career in the nineteenth century many tools changed from what they were when he first began to practice after graduating from dental school and, therefore, dental clinics sponsored by manufacturers, inventors and schools, brought the graduate up to date.

SMITHSONIAN DENTAL COLLECTIONS

The Smithsonian Institution United States National Museum of American History, Division of Medical Sciences' collection of dental instruments, teeth appliances and supplies began to be assembled in 1925. By 1957, fifteen different donors had con-

tributed an assortment of dental instruments, furniture, teeth and patent models. Among these gifts were fifty hand instruments, three sets of dental instruments, three sets of teeth including a plaster cast of President Theodore Roosevelt's lower jaw marked "1909 The President", two dental chairs and accessories and 135 patent models.

The Smithsonian Institution collection of patent models obtained from the patent office is composed of 71 models produced between 1838 and 1869, 47 models during the 1870's and 17 models from 1880-1902, when models were no longer required by the patent office. A Second collection of patent models donated by Columbia University Dental School in 1967 contains 274 models of which 55 were produced through 1869, 144 from 1870 to 1879 and 75 from 1800 to 1900. These models represent devices employed to facilitate almost all the techniques and procedures used by the dentist to remove, repair and replace teeth. They testify to the dentist's mechanical skills and to a growing awareness of patient safety and comfort. The Division of Medical Sciences hold the most extensive collection of dental patent models--401. Twenty-five of them were made by Eli T. Starr and five by S.S. White.

Within the next decade and a half, over 4,500 dental items of all types were added to the collection. The major donors of these items were the Columbia University School of Dental Medicine (2,034 items) including 274 patent models and the Charles Land Collection of fifty-five items; the University of Pennsylvania School of Dentistry (1,282 items); the Edward H. Angle Collection from the University of Illinois (176 items); and the Edmund Kells Collection from Tulane University (100 items). The S.S. White Company donated 156 items in 1960 and 1981, as well as a good sampling of the company's nineteenth and twentieth century trade literature. However, the bulk of the S.S. White Company records and papers were deposited in the University of Pennsylvania Dental Library and the Eleuterian Mills Library in Wilmington, Delaware.

Donations of American dental items from all periods are welcome. Please consult the Division of Medical Sciences to learn if an item you wish to donate is not already included in the Smithsonian Institution's collection.

UNITED STATES PATENT OFFICE.

WILLIAM P. TISDALE, OF PASS CHRISTIAN, MISSISSIPPI.

DENTAL FORCEPS.

SPECIFICATION forming part of Letters Patent No. 233,817, dated October 26, 1880.

Application filed March 18, 1880. (Model.)

To all whom it may concern:

Be it known that I, W. P. TISDALE, of Pass Christian, Harrison county, Mississippi, have invented an Improvement in Dental Forceps, of which the following is a specification.

The invention consists in a rod bifurcated at one end and a rod that has a head embracing the elastic prongs or bifurcations, so as to open and close the jaws which form a part of the prongs, the slide-rod being operated by a hand-screw, all as hereinafter described.

Figure 1 of the drawings is a side elevation, and Fig. 2 a plan view.

In the drawings, A represents a rod having a bend, through which works a screw, *g*, which is swiveled at the end in a slide-rod, *e*, which has a head at its front end. This head embraces the prongs or bifurcations *i i* and presses them together, so as to bring the jaws *b* against opposite sides of the tooth or roots thereof.

The instrument is particularly adapted to the extraction of the lower front teeth, and, when the jaws are made sharp, for extracting the roots of such teeth.

Having thus described all that is necessary to a full understanding thereof, what I claim as new and of my invention is—

A dental forceps consisting of the rod A, having the elastic front prongs, *i i*, of which the jaws *b* form a part, the slide-rod *e*, having a head that forces the prongs together, and a screw, *g*, working through a bend of rod A and swiveled to the end of rod *e*, as shown and described.

WILLIAM P. TISDALE.

Witnesses:

JOHN W. BAY,
N. BUTCHERT.

(Model.)

W. P. TISDALE.
Dental Forceps.

No. 233,817.

Patented Oct. 26, 1880.

Fig. 1

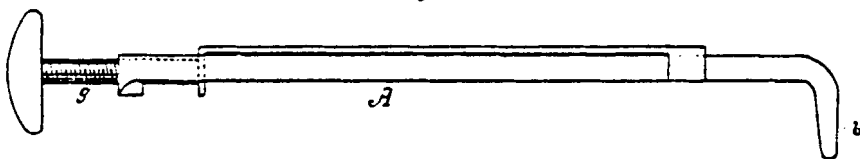
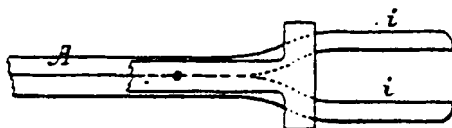


Fig. 2



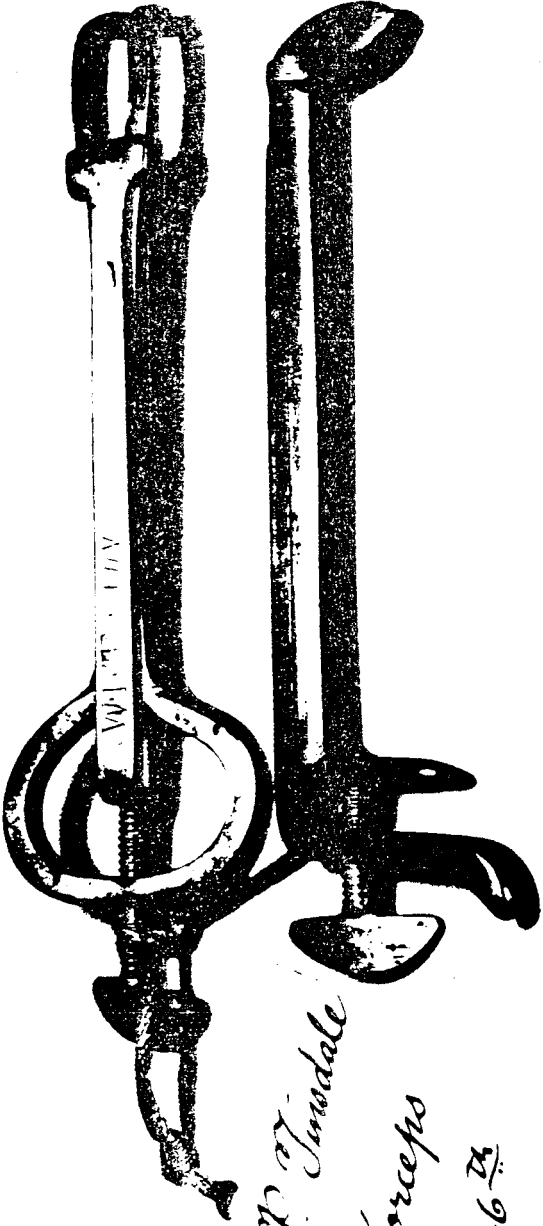
WITNESSES:

H. R. Brown
H. H. Hollingsworth

INVENTOR:

W. P. Tisdale
BY *Wm. L.*

ATTORNEYS.



No. 233,817

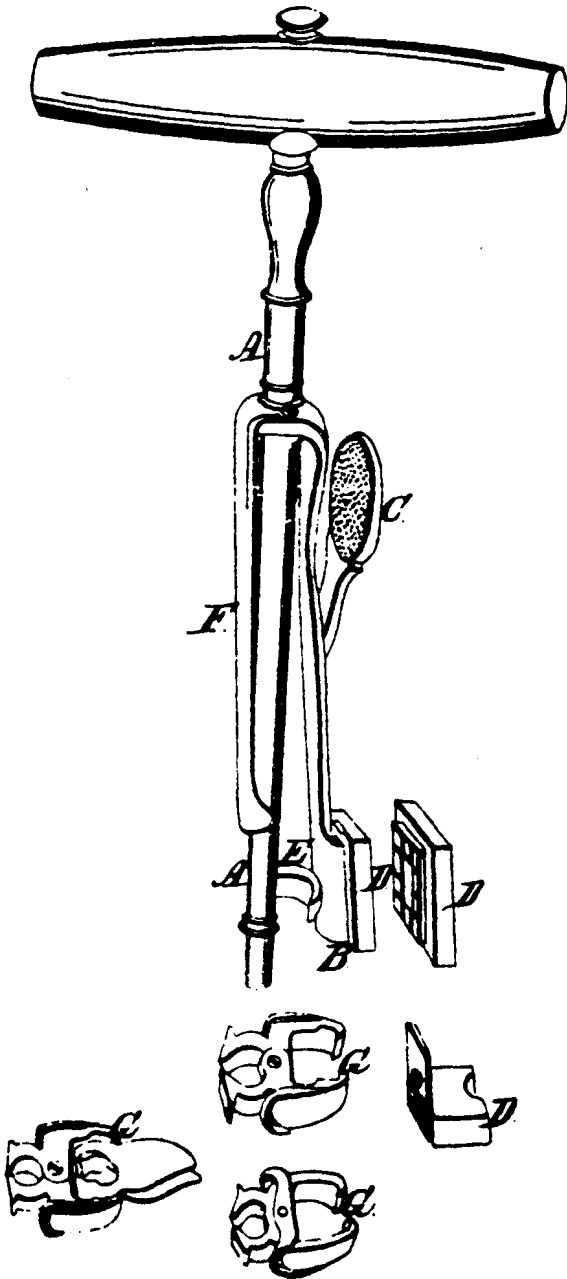
William F. J. M. J. M. J. M.

Dental Forceps

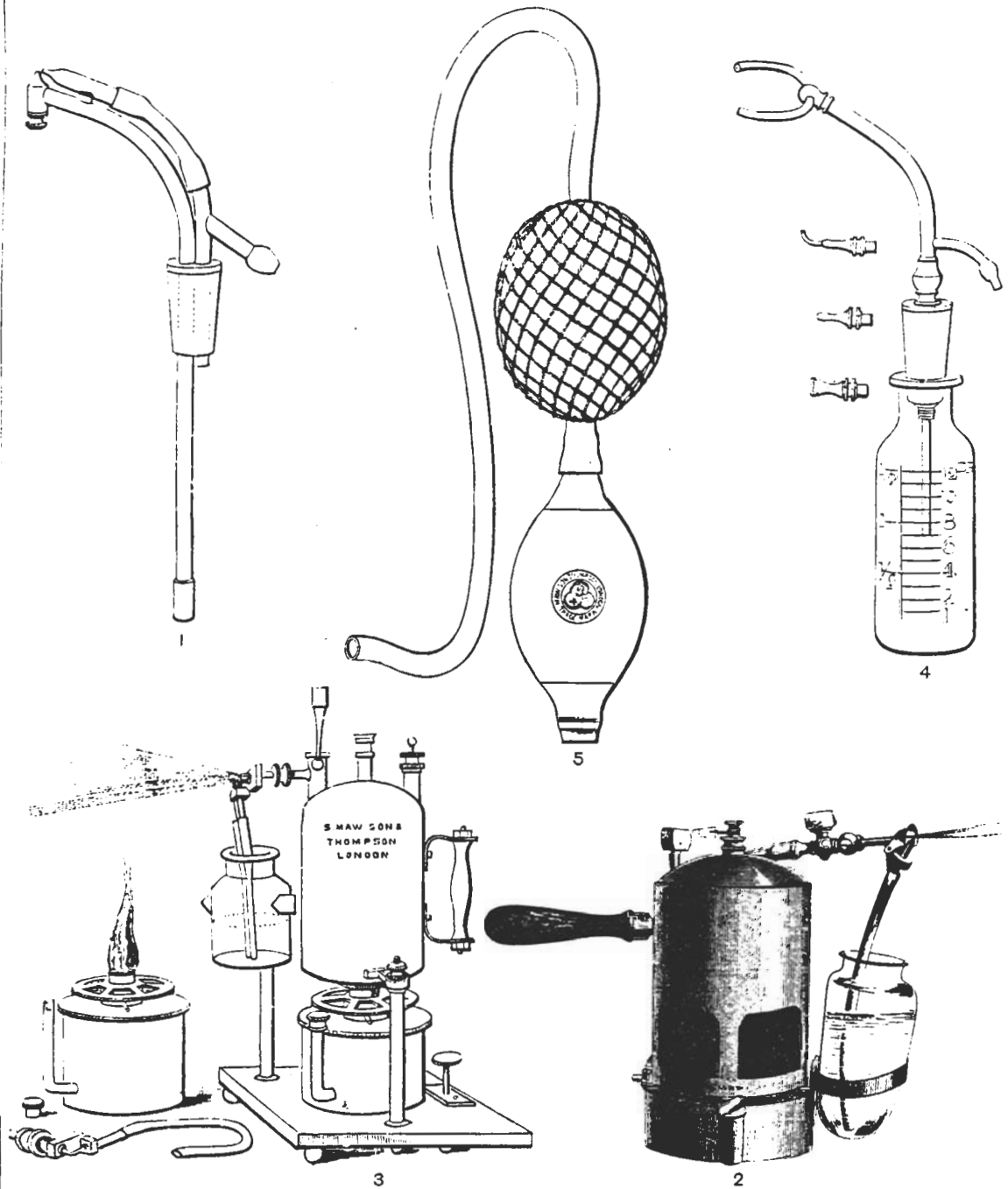
Patented Oct. 26th
1880.

T. BRUFF, Sr.
TOOTH EXTRACTOR.

Patented June 28, 1797.



MISCELLANEOUS APPARATUS, INSTRUMENTS, ETC. (Continued).

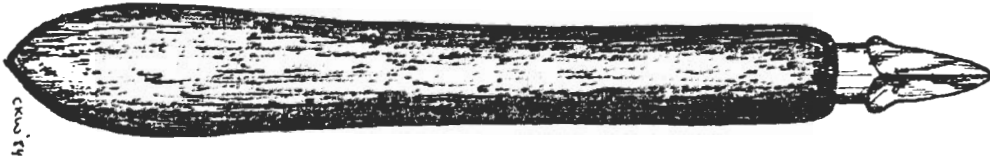
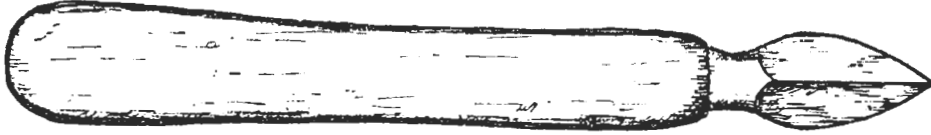


HAND BELLOWS AND STEAM SPRAY PRODUCERS.

- Fig. 1. LISTER'S, FOR CARBOLIC ACID, WITH BELLOWS (FIG. 5).
 Fig. 2. LISTER'S, STEAM, FOR CARBOLIC ACID, SINGLE JET.
 Fig. 3. MAW'S, STEAM, FOR CARBOLIC ACID, DOUBLE JETS.
 Fig. 4. RICHARDSON'S, FOR THE LOCAL APPLICATION OF ETHER, WITH BELLOWS (FIG. 5).

CAN YOU IDENTIFY THESE?

Material: Wood and Steel
Maker: Unknown
Presumed Use: Surgical Knives or Ink Erasers
Date: 19th Century

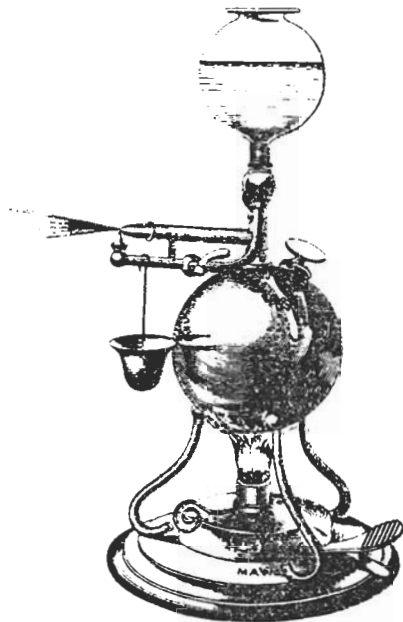


I think these are:

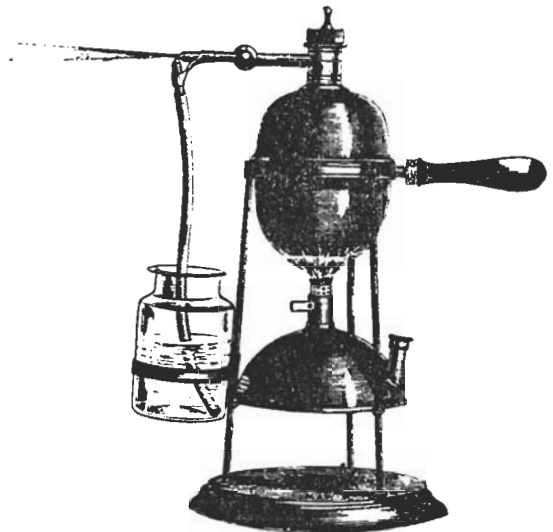
From:

Please return to M. Donald Blaufox, M.D., Ph.D.

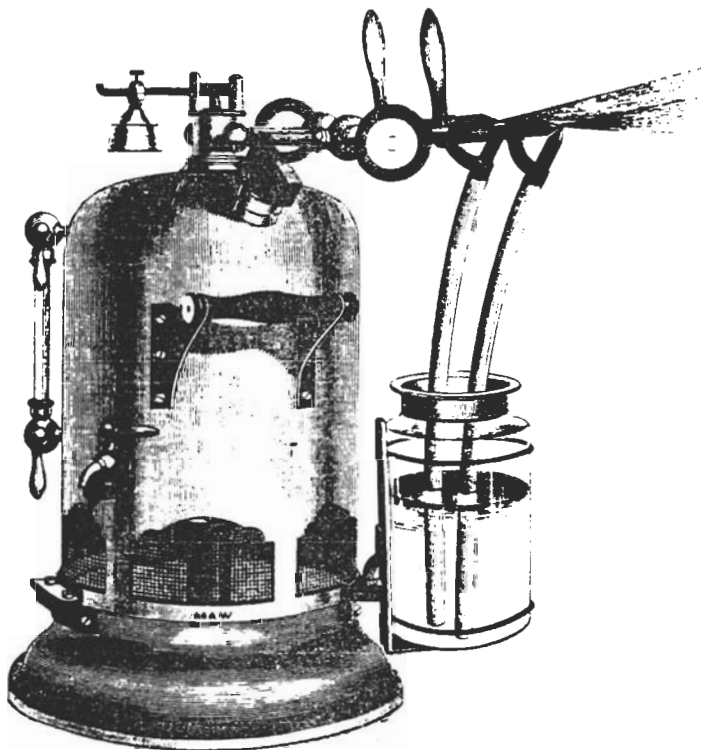
MISCELLANEOUS APPARATUS, INSTRUMENTS, ETC. (Continued).



6



8



9



7

STEAM SPRAY PRODUCERS.

Fig. 6. COLIN'S.
Fig. 7. LEI'S.

Fig. 8. MAW'S.
Fig. 9. MAW'S, WITH DOUBLE JETS.

DEMONSTRATIONS OF ANTISEPTIC SURGERY BEFORE MEMBERS OF THE BRITISH MEDICAL ASSOCIATION

[*Edinburgh Medical Journal*, vol. xxi, 1875-6, pp. 193, 481.]

DEMONSTRATION I

GENTLEMEN.—I propose this morning and to-morrow morning to avail myself of such opportunities as happen to be at my disposal to illustrate before the British Medical Association the methods and the value of antiseptic treatment. The first case which I shall bring before you will show this treatment in its simplest form, and in one of its most striking instances—a case in which I propose to lay open the knee-joint. The patient (a man fifty-four years of age) was under my care some years ago, with a very large effusion under the deltoid, in an acute form, attended with much fever. I opened it antiseptically, and the patient made a rapid recovery without suppuration. He has thus already had experience of the value of antiseptic treatment, and therefore trusts it implicitly for the management of what he at present suffers from, namely, painful effusion into the knee-joint. It is of twelve months' duration, and has resisted repeated blistering (about a dozen have been applied in all), and from the peculiar prominence that exists over parts of the articulation, I suspect suppuration is imminent. Now, if blistering failed in a case of this kind, without antiseptic management the surgeon would be at a loss what to do. Dieulafoy's aspirator might sometimes prove serviceable, but those who have tried it must confess that they are often disappointed in consequence of the fine tube becoming blocked by portions of lymph. But by antiseptic means we are able to obtain, by incision and drainage-tube, a perfectly free exit for the fluid, and thus relieving the joint altogether from the tension due to effusion, permit the natural tendency to recovery to come into operation. I need hardly remark, that to do this without antiseptic treatment would be madness—would be a thing which no surgeon would be justified in doing; to make a free incision into the knee-joint and to keep the wound open with a drainage-tube, would be an altogether unwarrantable procedure. We all know that the knee-joint has often been opened by free incision for the extraction of loose cartilages, and that in some such cases, the wound having healed by first intention, all has gone on well without any antiseptic treatment at all; though we know also that this

is a very uncertain and dangerous practice. But though it is true that wounds of joints, whether accidental or intentional, may heal without disturbance under ordinary treatment, yet it is certain, that if such wounds were kept open without antiseptic means, disastrous consequences would be inevitable ; by keeping the wound open we should take away the only chance there would be, without antiseptic treatment, of the case ending without disaster. But, Gentlemen, paradoxical as it may at first appear, with antiseptic treatment the more free the wound, and the more widely it gapes, the more certain you are to avoid inflammatory disturbance in the joint ; simply for this reason, that you are the more certain of a free discharge of the plasma effused into the interior. And if you avoid all tension from this cause, and at the same time exclude putrefactive mischief, you have the joint left absolutely free from irritation. Before we bring the patient in, I may say that I shall make the incision pretty free as regards the skin, and carry it gradually down to the joint, so as to be able to see and secure any small artery that may be divided. For if you simply plunge the knife into the joint, and put in a drainage-tube, bleeding may take place into the articulation from some deep vessel, and lead to considerable inconvenience. Just as in Professor Andrew Buchanan's well-known experiment, hydrocele fluid is made to coagulate by the addition of a little serum from a blood-clot, so if a very little blood finds its way into the knee-joint, the liquor sanguinis effused from the synovial surface mixing with the globulin of the red corpuscles forms a coagulable fluid and undergoes coagulation, and you have the knee-joint filled with solid matter, which interferes with the rapidity of recovery, although in due time the accumulation disappears by absorption.

[The patient being now brought in, Mr. Lister proceeded]—Here, then, we have before us the distended knee-joint. You observe this peculiar limited special bulging, which, together with the history, makes me suspect that the joint is on the eve of suppuration.

I have said that this case will be an example of the antiseptic treatment in its simplest form. The antiseptic will not be introduced into the joint ; it will not be applied to the affected part at all. It will be merely employed externally to prevent the access of septic mischief while we provide exit for fluid from the interior. We shall first purify the skin with a strong (1 to 20) watery solution of carbolic acid, which is best for detergent purposes ; water holding carbolic acid but slightly, and very readily giving it up to act upon anything else. Carbolic acid has a remarkable penetrating property. It blends with oily substances and animal matters, and penetrates the hair and hair-follicles, and therefore such a washing as I am now giving will render the skin absolutely pure, surgically speaking. This is a very great point.

In the next place, we shall have an antiseptic atmosphere provided by means of this spray-producer, which acts on the principle of Siegle's steam inhaler. High-pressure steam, issuing by a minute orifice from a boiler heated by spirit-lamp or gas, sucks up a strong solution of carbolic acid by a tube that dips into a vessel containing it, and, blending with it in about equal quantity, forms a 1 to 40 spray. We have lately very much improved our spray by a slight alteration of the apparatus. We used to have the tube which conveys the carbolic solution perpendicular to that for the steam, just as the air-tube is at right angles with the water-tube in the common atmospheric odorator; and the result was a coarse spray with scattering drops, consuming a needless quantity of the solution, and causing needless irritation of the surgeon's hands and wetting of his sleeves; and, what was of more moment, inducing unnecessary irritation of the wound, and making around the trustworthy spray an area of uncertain extent completely valueless, because the solution in it was in the form of comparatively large drops with intervals of unaltered air. But, by placing the tube for the solution at an angle of 45° with that for the steam, and with its point ground off obliquely so as to be exactly in the axis of the steam-tube, we get a spray destitute of scattering drops, perfectly trustworthy throughout its visible extent, though little coarser than a London fog.

The slate on which I am now directing the spray is in an antiseptic atmosphere; yet so fine is the spray, that it scarcely moistens the surface. The face of one of my dressers is now enveloped by the cloud, which, as you observe, is capable of being inhaled without serious inconvenience. That we should be able to provide a respirable, yet reliably antiseptic atmosphere, is what I confess I never anticipated. The boiler has a safety-valve to prevent explosion, and a window to enable you to see when the water is becoming exhausted. A large spray-producer like this will go on working, with one supply of water in the boiler, for a couple of hours.

The part to be operated upon, then, being in an antiseptic atmosphere, if the finger is to be introduced into the wound (and I shall very likely have to pass my finger into the joint) you must take special care that it is an aseptic finger; and this is done by cleansing it with an antiseptic solution, making sure that it passes well into the folds of skin about the nail. And if I should have to introduce an instrument into the articulation, I must see that it is always pure when inserted. In order, Gentlemen, that you may get satisfactory results with this sort of treatment, you must be able to see with your mental eye the septic ferments as distinctly as we see flies or other insects with the corporeal eye. If you can really see them in this distinct way with your intellectual eye, you can be properly on your guard against them; if you do not so see them,

you will be constantly liable to relax in your precautions. I have seen, for instance, a gentleman, anxious to carry out the antiseptic treatment completely, take out a large loose cartilage from the knee-joint under the spray, using at the outset instruments which had been purified by lying in a solution of carbolic acid; but in the course of the operation, I observed him take a pair of forceps which seemed better adapted for his purpose than any which he had so prepared, and simply dip them for an instant into the antiseptic lotion, and then plunge them into the interior of the joint. Now, Gentlemen, was that doing the treatment justice? Between the teeth of those forceps there were probably portions of dirt. Give the carbolic acid lotion time, and it would penetrate this dirt, greasy though it might be; but it cannot do so in a moment; and nothing was more likely than that some portion of this dirt would come off from the forceps and remain in the joint, and induce putrefaction there. I have known of a gentleman with every anxiety to carry out antiseptic treatment, exploring the wound in a case of fracture of the skull, and, the probe happening to fall to the ground, it was taken up from the dusty floor, and immediately passed into the depths of the wound. Now, Gentlemen, that was but courting failure. What more likely than that some of the septic dust, which certainly was brought up adhering to the bloody probe, should pass into the wound without having been sufficiently acted on by the spray in the moment of transit, and, mingling with the blood in the interior, be there protected for the future by the blood-clots from the antiseptic influence of the dressings, and induce putrefaction? If we could see the septic material upon the instrument as distinctly as we could see green paint in contrast with the red blood, then of course we should say, We must wash off this green poison; but because we cannot see it with the physical eye, we are always liable to make mistakes through neglect of using proper precautions; and I am more and more persuaded, the longer I practise antiseptic surgery, that the chief essential to success is a thorough conviction of the reality of the presence of the septic matter on all objects in the world around us. Through the kindness of the President of the Physiological Section, I hope to have the opportunity of demonstrating some facts which I believe will tend to convince you that the septic ferments are, like those of the alcoholic fermentation, living organisms—that they are analogous to the yeast plant. But whether you believe or do not believe that they are living, it is as certainly demonstrated scientifically as it is certain we are here, that these ferments do exist. If we do not bear that in lively remembrance, we shall be constantly making mistakes.

[Mr. Lister then proceeded to perform the operation. Some small arteries, which bled in the incision, were secured with fine prepared catgut, and the

joint having been opened, two drainage-tubes, each about $\frac{1}{4}$ -inch in diameter, were inserted side by side; an obstructing band within the articulation being divided by a probe-pointed knife guided by the finger so as to permit them to be introduced fairly into the cavity. He commented on the various steps as he proceeded, urging again the absolute necessity of having all the instruments thoroughly aseptic, and went on to say]—One learns after a while to do these little purifications instinctively, but at first it requires thought, intelligence, and constant care, particularly to any one who has been in the habit of operating without having to attend to these minutiae. Would that we could get rid of all complications in the system! If we could dispense with the spray, no one would rejoice more than myself; but until somebody wiser than I am can supply some better means, we must continue to use it. There is, I find, considerable thickening of the textures in the vicinity of the joint, and this is the cause of the swelling which is still apparent, though the synovial capsule is now empty. The outer orifices of the drainage-tubes are made transverse or oblique, as required, in order that they may lie flush with the surface of the skin, and when retained in this position by means of the threads which you see attached to their margins, they discharge their functions perfectly.

The operation having now been performed, the next point is so to dress the wound as to make sure that nothing septic will get in before next dressing; this must be not a matter of hope but of certainty. The material which we have used for some time past is an open cotton cloth, with the fibres impregnated with a mixture of carbolic acid and common resin.¹ Common resin holds carbolic acid with extreme tenacity, and in consequence of this gives it off so slowly as to be unirritating to the skin; yet at the temperature of the human body it furnishes a sufficient supply of the acid for a trustworthy antiseptic dressing. But at the ordinary temperature of the air in this country, the antiseptic is evolved so slowly from the gauze that the fermentative energy of septic dust is not at once extinguished by falling upon it, as it is by mingling with a strong watery solution; and if the gauze were applied dry, some active septic particle adhering to its surface might enter the blood or serum at the outlet of the wound, and propagate putrefaction to the interior. There was a time when I used to have occasionally in my practice putrefaction which I could not explain, but which I afterwards saw must be due to this cause, and the difficulty was then at once overcome by dipping the lowest piece of gauze in a watery solution of carbolic acid. This solution which I am now using, having been mixed with blood from the wound, has a very dirty appearance. A surgeon, who went

¹ For details regarding the composition and mode of preparation of the antiseptic gauze, see *Lancet*, March 13, 1875 (p. 210 of this volume).

round my wards some time since, expressed astonishment that I should use dirty lotion to wash a wound, and to purify what I was placing upon it; but, Gentlemen, the wound, although aesthetically dirty, was surgically pure, and the lotion had not been made impure by being used for washing it. Even if it had been otherwise, we might have trusted the carbolic acid to purify it. Why then should we waste good lotion? I dip, therefore, in the lotion this piece of gauze that I place next to the wound, and thus make perfectly sure that nothing septic is applied to it.

It is most important that the spray be properly directed during the dressing. I have seen a surgeon expose a serious wound, involving injury to the brain, while the spray was only playing on the opposite side of the head. It were far better that the antiseptic method should not be employed at all than that it should be used imperfectly. For such attempts not only end in disappointment, but throw discredit on the system. Some people seem to say, 'I have tried the thing and failed, and therefore, of course, the system is all nonsense.' I have seen it fail in my own practice, but under such circumstances I have always thought there must have been some mistake on my part, and I have endeavoured to discover where my mistake lay. But that does not seem to be the way in which the matter is viewed by some of our professional brethren.

A small piece of gauze dipped in the lotion having been placed next the wound, the dressing on which we rely for excluding putrefaction is applied in the form of eight layers of the gauze, sufficiently broad, as you see, to cover the surrounding skin for several inches in every direction; and beneath the outermost layer is placed this piece of thin macintosh cloth to prevent the discharge from going directly through the dressing; because, if a considerable quantity went through, strongly as the resin holds carbolic acid, it might be all washed out before twenty-four hours had elapsed, and then putrefaction would spread inwards to the wound. The dressing is secured by a bandage, for which strips of the antiseptic gauze prove very convenient. Now, Gentlemen, we are perfectly sure that, if we have left nothing septic in the wound, we shall find no putrefaction when the dressing is changed to-morrow.

[The subsequent progress of this case has illustrated well the remarks made at the demonstration, with regard to the effects of a free opening, or the contrary, under antiseptic management. When I saw the patient on the following day, I learned that he suffered unusual pain in the afternoon after the operation, which became very severe during the night, and though somewhat less in degree at the time of my visit, was still very considerable. The temperature had risen on the previous evening to 102.4° Fahr., and was now 101.8°. Such a state of things would at one time have alarmed me, and would have made

me fear that putrefaction had occurred. This, however, I felt confident could not have been the case, and another probable explanation suggested itself. The peculiar bulging above alluded to, situated over one of the pouches of the synovial capsule beside the ligamentum patellae, had tempted me to make the opening in that situation; but the bulging part collapsing on escape of the fluid, the only way in which I could ensure complete introduction of the drainage-tubes into the joint was by passing their ends under the ligamentum patellae; and I thought it not unlikely that they might have been compressed, and their function so interfered with. Accordingly, on changing the dressing, I found that the gauze presented a bloody stain, which appeared sufficiently accounted for by oozing from the surface of the wound, while the joint was fully distended. And it appeared that the disturbance to which the articulation had been subjected had led to unusually rapid effusion from the synovial surface, and this being unable to escape, had produced great tension, attended with pain and fever. I at once placed him under chloroform, and made a fresh incision at the outer side of the limb into the pouch above the patella, and introduced a drainage-tube larger in diameter than the little finger, after pressing out the clear serous and fibrinous contents of the capsule. This was of course done with antiseptic precautions, and a dressing like that employed the day before was applied. The result was that almost immediately after awaking from the chloroform sleep, he felt himself entirely relieved of his pain; and not only has that which was induced by the first operation left him, but he has entirely lost that which had annoyed him for so long a period previously. The temperature in the evening was found to have fallen to 99° Fahr., and has since remained normal, and the discharge, which has continued to be merely serous, has so diminished in quantity, that when I last saw him (August 15) I substituted a drainage-tube of medium size for the large one, and was able to direct that an interval of three days should be allowed to pass before the next dressing. I must add that he has tested the limb, contrary to orders, by getting out of bed and resting his weight upon it, but without any of the pain which he formerly experienced on so doing. In all other respects he is in perfect health.

It happens, by a curious coincidence, that another patient requiring the same operation has since been admitted under my care in the infirmary; a man twenty-six years of age, who, six days before admission, observed a painful swelling in the left knee, without assignable cause, and both pain and swelling had since steadily increased. The skin, however, was free from redness, and, subacute as the case was, I hoped that entire rest, with efficient fomentation, would relieve him. On the contrary, pain continued to increase during the next five days, while the temperature rose above 100° Fahr.; and on the 11th

inst. I introduced a large-sized drainage-tube into the joint by incision above the patella, at the outer side of the limb. With the serous fluid that escaped were mixed considerable portions of lymph, opaque, and in some parts of yellowish-white colour; and these portions proved on microscopic examination to be masses of pus corpuscles; so that it was clear that the case was just passing into one of that justly dreaded disease under ordinary treatment, suppurative synovitis. The result, as in the former case, was immediate and permanent relief from pain. His temperature next day was normal, and has remained so. The discharge, purely serous in quality, is quickly diminishing in quantity, and the patient eats and sleeps as in perfect health.]

The next patient I wish to bring before you is one who came under my care six weeks ago with an affection of the inner side of the ankle, which he attributed to a sprain two months previously, after which he had constant pain in the part, and increasing thickening of the textures. The outer side of the foot and ankle looked perfectly sound. We put up the limb in a side splint of poroplastic material, and used repeated blistering, but without any advantage; pain continued to increase, and it was evident that, if left to run its course, it would end in caries of the tarsus. I therefore, fifteen days ago, made an antiseptic incision, expecting to open a joint, but hoping that I should not find pus. To make an opening into an articulation without the presence of pus would have been, without antiseptic means, an unjustifiable proceeding; but here, as I have said, I hoped not to find suppuration, because I knew that, if the procedure were antiseptically conducted, the opening into the joint would do no harm whatever, while I should be able in all probability to get great benefit through relief of tension by free incision; and if I should find that no pus had been formed, this would make the case much more hopeful, because it would show that the disease was not so far advanced as if suppuration had already occurred. I was gratified, therefore, to find, on cutting into the soft substance, which gave very much the same sense of fluctuation, before the incision was made, as if fluid had been present, that there was no pus—nothing but inflammatory degeneration of the soft parts, the lateral ligament between the astragalus and the navicular bone being entirely disorganized, so that when the finger-nail was applied the softened textures gave way with the utmost readiness, and the joint lay freely open before us, the cartilages happily appearing to be sound. I will now change the dressing, so that you may see the appearance of the part. While the bandage is being cut or removed, the patient, or an assistant, keeps his hand over the site of the wound, to prevent the dressing from rising *en masse*, and pumping in septic air. As I raise the folded gauze (exactly similar to that which I applied in the last case), I take care that the

spray passes into the angle between it and the skin. And now, Gentlemen, I venture to say here is a novelty for such of you as have not practised antiseptic surgery. There is the blood-clot still lying in the widely gaping wound, purposely kept open by this drainage-tube, which I introduced down to the open joint when I made the incision fifteen days ago, and which has never yet been taken out.

I have not seen this wound myself since I made it. I am sometimes accused of taking a deal of unnecessary pains with my cases, and it is also said that any good results which I may get are due to my own personal care. If such were the case, Gentlemen, if I obtained better results than other surgeons by the more careful use of the same means, that would indeed be something to be proud of. But it is not so. It is simply that we are working on a new principle. Mr. Rice, my house surgeon, who was trained first as a dresser and afterwards as a clerk under me, does these things exactly as I do them myself. If I were to go away for a week, a fortnight, or a month, as far as the antiseptic element is concerned, I should feel I had left my patients in perfectly safe hands. In this particular instance, Mr. Rice has had sole charge of the dressing after the first day, and here is the result. I am very glad to see, looking at the foot now for the first time for a fortnight, that the inflammatory thickening has almost entirely gone. I had of course made inquiry as to the patient's progress, and I had learned from his lips that the pain was greatly diminished, as the immediate result of the incision. I used to have a great horror of opening into the tarsal articulations in cases of this sort in consequence of the disastrous results which I have known to occur, through the spreading of suppuration among them. But if the skin is unbroken, so that the antiseptic system can be brought fairly into operation, there is no such danger. Here there has not only been no disturbance whatever from the operation, but we have obtained the benefit that we anticipated from free incision. The inflammation which previously existed has almost, if not entirely, disappeared.

And now let me direct your attention again to this remarkable appearance of the blood-clot lying in the open wound fifteen days old. If we had not used antiseptic means, that would have been impossible. Some people say, We can show you good results without antiseptic treatment. Of course, good results can be got by good surgery without antiseptic treatment; but I say this is an instance of something that could not possibly happen without it. When a blood-clot existed in an open wound under a moist dressing which was not antiseptic, it was absolutely certain to putrefy and disappear long before the lapse of fifteen days. Let us now see what change may have taken place in this clot. I see, when I raise the upper layer of it from the edge of the wound,

that there is about an eighth of an inch of cicatricial margin ; yet there is no pus—there is not even any granulation. How the tissue which is thus formed in an organizing blood-clot differs histologically from that of granulations, I have not had time to investigate. But that it differs from granulations functionally is certain, and that in two ways. First, it has not nearly the same tendency to contract that granulations have ; and, secondly, instead of forming pus under the influence of the very slightest stimulus, as granulations do, this tissue resembles normal textures in requiring protracted stimulation to induce it to granulate and suppurate. Now, cicatrization in an open wound without granulation is something new ; it never happened in the world's history without antiseptic means.

We may now dispense with the drainage-tube in this case ; and having removed it from the tubular cavity in the coagulum in which it lay, I will cut out with scissors a piece of the tube of blood-clot. You observe blood oozes freely from it. What was once blood-clot bleeds when wounded. It has become organized and vascularized up to the surface.

If there had been a dressing of carbolic gauze applied next the wound, and changed daily, we should have had a very different appearance. It seems to be a difficult thing for me to write the English language so as to make my meaning intelligible. I find the opinion still often attributed to me, that carbolic acid stops suppuration by some sort of specific agency. On the contrary, I have pointed out, from my earliest experience in the subject, that antiseptic treatment threw remarkable light upon the subject of suppuration, by showing that an antiseptic itself, while it prevented putrefaction, stimulated to suppuration ; so that you have what I have termed 'antiseptic suppuration',¹ if the antiseptic continues to act upon the tissues for a certain length of time. If we had not interposed this layer of prepared oiled silk to protect the wound from the stimulating action of the carbolic acid in the gauze, we should have had a granulating and suppurating sore long ago. The blood-clot itself in its superficial layers serves as an additional protection to that which lies beneath ; but if the blood-clot, which must be regarded as a kind of tissue, is stimulated by an antiseptic, its superficial parts are converted in time into granulations which suppurate. The interposition of the oiled silk 'protective' shields the clot more or less completely from this stimulating agency, and, provided that you can allow a considerable period to elapse between the times of changing the dressing, so as to avoid the frequent washing of the clot with the stimulating antiseptic lotion, you may often see cicatrization proceed to its completion without any granulation occurring. In the present case, it is five days since the dressing was last changed, and it might have been left longer without risk

¹ See p. 152.

of putrefaction, the serous oozing being so extremely trifling. [The case had been dressed four times in all during the sixteen days that had passed since the incision was made, viz. on the day immediately following the operation (which, as a rule, should always be the case), and afterwards at increasing intervals, as the serous oozing diminished. But the deepest part of the dressing, consisting of the protective and the small piece of gauze immediately over it, had been left in place from first to last, to avoid as much as possible the stimulation of the clot. I may add, in preparing this paper for the press, that the case has continued to progress well. The patient told me yesterday (August 16), that the last trace of the jerking pain which he used to feel left him on the evening of the day of demonstration; and Mr. Rice informs me, that, on changing the dressing on the 14th, after an interval of six days, he found cicatrization almost complete. We may therefore say, without much risk of mistake, that this foot has been saved from amputation by antiseptic treatment.]

The next case is one of ununited fracture in the lower part of the femur of a year's standing, in a man thirty-six years of age. Twelve days ago, I cut down on the outer side of the limb, a very long incision being required. Finding the fragments overlapping about an inch, I removed portions with the gouge and hammer from the posterior surface of the upper fragment and the opposing part on the anterior surface of the lower one, so as to leave two fresh osseous surfaces in apposition. Without antiseptic treatment, this would have been a very dangerous operation. The risk of pyaemia would have been so great, that, in common with most surgeons, I should have regarded such interference as unjustifiable; but I think we may venture to say that, with antiseptic treatment in its present form, all such risk may be certainly avoided. It is now twelve days since the operation. For the first few days blood and serum were effused very copiously, and we had an arrangement by means of which a large mass of gauze could be applied in considerable extent under the limb. But the time has come when it might be put up in a more permanent form. This plaster-of-Paris arrangement was applied yesterday, while the limb was kept well extended by the pulleys, the patient being under chloroform. I have here a limited space for the dressing, and therefore use a correspondingly thick mass of gauze. This you will find often a matter of importance, as in operating for strangulated hernia, where you have not much space between the wound and sources of putrefaction in the perineum. And so in the present case, the window left in the plaster-of-Paris is occupied by a very substantial mass of gauze. The discharge of the last twenty-four hours has caused, you see, merely a small brownish stain upon the gauze, the result of a slight amount of serum, tinged with the colouring matter of the blood. The ends of the wound were stitched

up for about three inches at each side ; those parts united by first intention, and are completely healed. The central part of the wound was left open for the orifices of three large drainage-tubes. And here again we see the persistent blood-clot. Two days ago, I took out for the first time the drainage-tubes, and they were, just as in the case you last saw, lying in tubular moulds in the coagulum. One of them was permanently removed ; the other two were re-introduced after being considerably shortened by cutting portions off from the deeper ends. In taking out drainage-tubes you must be particularly careful to have the spray properly directed. For as the drainage-tube comes out, air must enter to take its place, and this air will be septic or not as the spray is or is not over the wound. Here we see the orifices of the two drainage-tubes, one of which may probably now be dispensed with altogether. As I remove them, you observe the tubular beds in which they lay. And here, as in the last case, we have as yet no suppuration whatever from the open wound.

The protective must never extend beyond the gauze ; if it did so, by excluding the action of the carbolic acid it would allow putrefaction to spread in under it.

I should have liked very much to have shown you one other case, but as time does not permit this, I shall mention in brief the main points of it. The case was one of chronic inflammation of the lower part of the tibia, which had induced great thickening of the bone, attended with severe and constant pain, in a girl eighteen years of age. There was a small sinus present, but scarcely any discharge. Introducing the probe, I found it pass deeply into the substance of the bone. Supposing that there might be some small exfoliation present, I proceeded to explore the bone, detaching the periosteum from the surface, and making an excavation with a gouge and hammer. I found a peculiar state of things pathologically. The chronic inflammation, instead of producing merely a softened state of the bone, had led to a conversion of the osseous texture into granulations. We operated by the bloodless method, and found these granulations almost perfectly white. I proceeded to dig these out, and got into cavity after cavity. At one time I thought the probe had gone through the posterior surface of the tibia, but it proved to have passed into another cavity in the extremely thickened bone. At last I found that the soft material at the lower part of the excavation moved when the foot was moved ; or, in other words, I had opened into the ankle-joint. The result of the whole procedure was a very large and complicated cavity, and it is to the mode in which this cavity has been filled up that I wish to direct your attention. Now, I desired that this should be done by means of organizing blood-clot. If this is done it saves a great deal of time as compared with granulation and healing from the bottom, and produces a more smooth and level scar. As for a long

time past I have done, I systematically placed the protective right across from one lip of the wound to the other, and then stretched the small piece of moistened gauze over, so as to keep the protective flat, in order that the blood-clot might accumulate under the protective, and so fill the wound. But we forgot to arrange the limb in proper position. It was allowed to lie resting on its posterior surface, and on changing the dressing next day I found that a large portion of the blood had drained out of the cavity. The deepest recesses of the excavation in the bone were indeed filled with clot, but a great cavity still remained. Well, there was an observation made by my colleague Mr. Chiene not long since that gave me a hint as to how to do in this case. He observed that, having systematically arranged for the formation of blood-clot in a hollow wound, a portion of the blood in his case, as in mine, trickled out, and the blood-clot only partially filled the wound. After the lapse of sixteen days, Mr. Chiene proceeded to ascertain by scratching with the point of a knife whether the blood-clot was organized. He found it was, for blood was effused from the vessels of the tissue into which it had become converted. Dressing was applied as before ; and the remarkable thing is, that this secondary blood-clot, formed on the top of the first, became also organized like the first, producing living vascularized tissue level with the surface of the skin.¹ That observation gave me the hint how to deal with this case ; for it showed that if the blood-clot is insufficient in the first instance, we may supplement it by letting fresh blood into it at a later period ; and if the secondary clot became organized in Mr. Chiene's case, though formed so late as sixteen days after the operation, still more might such an occurrence be expected if the second bleeding took place at an earlier period. Accordingly, three days after this operation had been performed, I took a sharp knife and made a few slight incisions in the sides of the wound. A considerable quantity of blood poured out, and the limb being kept on its side, to prevent it from escaping, the result is that, twenty-two days after the operation, and nineteen days after this secondary procedure, I could show you still a portion of the secondary blood-clot visible, while the greater part of it has given place to granulations. [It may be added, that the patient has lost all her pain from the time of the operation, and that here, as in the case of disease of the foot and in the ununited fracture, there has never been the faintest inflammatory blush around the open wound.]

MEDICAL MUSEUMS

Introduction

It gives me much pleasure to respond to the request of Professor M. Donald Blaufox to supply a list of medical museums and other places of interest in the history of medicine--together with my comments.

For 10 years my wife and I have been visiting such places, whenever time and money (two things hard to come by!) were available, and while our task will never be complete we have seen a great deal in many countries, and we are happy to pass this on to other interested people.

I wish to make three brief acknowledgments. Firstly to my wife, Daphne, who has accompanied me on all my travels and was an enormous help in everything, not the least of which was reading maps, navigating and seeing things I would have missed. I could not possibly have done it without her. Secondly I thank the University of California for granting me various leaves of absence to pursue the project. Thirdly I thank the many people, historians, doctors, biologists, librarians, curators and others, all of whom (with one exception!) were more than helpful and cooperative. Some even tolerated my very scanty French, German and Italian with good grace. All in all the whole thing has been a superb educational experience for me, and I hope some others will follow in my footsteps--they will not be disappointed.

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ENGLAND - LONDON

The Science Museum
 Exhibition Road
 South Kensington
 London, SW7 2DD

Phone 01-589-3456

Opening Hours

Weekdays 10.00 - 18.00

Sundays 14.30 - 18.00

Closed on some national holidays.

There is no admission charge.

Underground - South Kensington

The Science Museum (which incorporates The Wellcome Museum of the History of Medicine), is one of a large complex of museums clustered around the intersection of Cromwell Road and Exhibition Road. It is primarily a museum of the physical sciences and technology and contains a superb collection of optical instruments, including microscopes, so important in the history of biology and medicine. One of the microscopes (c. 1675) is said to have belonged to Robert Hooke (1635-1703), a pioneer in microscopy, and the first person to describe a plant cell. There are doubts about this, however, but if it is not one of Hooke's, it is certainly a replica of one, and came from the royal collection of George III. George III was a prolific collector, and most of his collections have in due course found their way into various British museums.

However, just as important, there was added in 1981 The Wellcome Museum of the History of Medicine. It was always somewhat amazing to me that a country like Britain, with such a long tradition of excellence in medicine and also so historically oriented, did not have a good medical museum. But this is fortunately no longer the case. I hesitate to say this medical museum is the best in the world, because they are all different, but it is certainly the largest, and second to none. The Wellcome Museum occupies the fourth and fifth floors of the Science Museum, and consists of 43 huge dioramas and reconstructions on the fourth floor, depicting the history of medicine from neolithic times to the present, while on the fifth floor are over 500 display cases, all in chronological order, on virtually every aspect of the history of medicine. They are beautifully displayed and explained. Almost all this vast collection comes from Sir Henry Wellcome F.R.S. (1853-1936), one of the founders of the pharmaceutical house of Burrows and Wellcome. Sir Henry was born in the United States, but as a young man he took out British citizenship and in due course became a very wealthy man and devoted 40 years of his life to collecting. In addition to his collections in the science museum, he also founded the Wellcome Institute of the History of Medicine (see later). Certainly no one has ever done more for the history of medicine.

I simply cannot imagine anyone, with an interest in the history of medicine, going to London and not taking time to see The Wellcome Museum of

the History of Medicine. I suggest you allow yourself a minimum of two hours, or perhaps you might prefer to spend two hours in the morning, then have lunch and go back again in the afternoon. If this should be the case, please let me recommend an excellent little restaurant within easy walking distance from the museum.

The Piccola Venezia
39 Thurloe Place
South Kensington
01-589-3883 (reserve if possible)

Not cheap, but a nice place to relax and give thanks to Sir Henry Wellcome!

The British Museum of Natural History
Cromwell Road
South Kensington
London SW7

Phone 01-589-6323

Opening Hours

Weekdays 10.00 - 18.00
Sundays 14.30 - 18.00
Closed on some national holidays.
There is no admission charge.

Underground - South Kensington

This is not strictly a medical museum, but it is one of the very best natural history museums in the world, and since it is just around the corner from the Science Museum, it is well worth a visit at the same time.

The Royal College of Surgeons of England
Lincoln's Inn Fields
London

Phone 01-405-3474

Opening Hours

Normal business hours.
There is no admission charge.

Underground - Holborn

The Royal College of Surgeons was established in its modern form in 1800, and was based then, as now, on the humanitarianism, educational concepts and professionalism which John Hunter (1728-1793) established as the blueprint for medical training, which became the subsequent pattern followed by medical schools in both Britain and the United States. The major function of the Royal College of Surgeons can be summed up by saying that it is to maintain and improve the standards of surgery in all their varied aspects and

it has played an enormous and world wide role in these respects. It is an entirely autonomous body, all of their funds coming from their fellows and public subscription, but none from the government.

It is important to note that the college, including its magnificent Hunterian Museum, is an active working organization, and is not open to the general public. However, it is open to members of the medical and allied professions, medical students and members of scientific societies. Other individuals and groups must make application to the curator of the Hunterian Museum, Miss Elizabeth Allen. The Hunterian Museum is neither a natural history museum, nor a museum of medical history. Visitors require some basic knowledge of history to appreciate it. It is not suitable for young people, and children under the age of 16 are not allowed. Having said all this, I will add that Miss Allen and the porter in charge at the front desk are generally cooperative, but they have responsibilities to the institution they serve, and the public must respect these.

John Hunter (see also under East Kilbride) can figuratively be described as the "Patron-Saint" of the Royal College of Surgeons. Just as his famous brother William Hunter (see under East Kilbride) established obstetrics as a medical science, so also did John put surgery into a scientific category rather than a "butchery procedure" practiced largely by barbers and other untrained people. He eventually became surgeon-extraordinary to King George III and in 1783 established his own medical school in what is now Leicester Square. Here the student had to undergo rigorous training, study animal and human specimens, attend lectures and practical classes, and do research: All the things we now take for granted in medical training. Honors poured in upon him, and over 1000 of his students spread his ideas and methods throughout the modern world. He died in 1793, probably from syphilis, with which he inoculated himself in order to distinguish it from gonorrhoea. Dedication!--but unfortunately the experiment failed into the bargain! He is buried in Westminster Abbey.

By far the most important exhibit at the Royal College of Surgeons is the Hunterian Museum. Originally, Hunter's collection comprised about 14,000 specimens, but time, and above all the World War II bombing of the college have reduced the number considerably. Nevertheless, there are still many thousands left, and they are magnificently displayed in this lovely and fascinating museum. All the more remarkable when one realizes that most of it is the work of one man and the specimens are 200 years old! Within the displays are dissections illustrating all the main basic structures and functions of the animal form. These include the endoskeleton, joints, muscular systems, nervous system, organs of special sense, integumentary system, organs of locomotion, the digestive, circulatory, respiratory, excretory and reproductive systems, as well as ductless glands. One is immediately struck by the incredible skill of the dissections. Guide books to the museum are available, and there are also many other interesting publications on sale, and the staff is dedicated, enthusiastic and helpful. All in all, a visit to the Hunterian Museum is a thrilling experience.

The Royal College of Surgeons also has a superb collection of the medical instruments of Joseph Lord Lister (see under Glasgow), many of which are on display in the lobby and can easily be seen. There is also a large

statue of John Hunter which dominates the lobby, and there are lovely original portraits by Sir Joshua Reynolds and others. The library of the college (which can only be seen by special permission) is one of the great medical libraries of the world, with priceless holdings, including all Hunter's publications, and most of his case books. Regrettably, his manuscripts are mostly lost.

Finally, let me point out that in the central part of Lincoln's Inn Fields, on the Kingsway side near where Sardinia Street enters, there is a new and lovely mounted bust of John Hunter.

St. Thomas' Hospital
Lambeth Place Road
London SE1

Phone 01-928-9292

Opening Hours

Normal business hours.
There is no admission charge.

Underground - Waterloo

St. Thomas' Hospital is one of many major hospitals in London, but from my point of view it has the distinction of being indelibly associated with Florence Nightingale (1820-1910) (see also under Middle Claydon, East Wellow and Aldershot) who did so much to found the modern profession of nursing.

The origins of St. Thomas' go back to the 13th century, but it has only been in its present location since 1871, and is now a vast and ever expanding hospital. With all its varied history and contributions, no aspect has proven more far reaching than the founding in 1860 at St. Thomas' of the Nightingale Training School for Nurses. With its foundation, modern nursing may be said to have begun. It is difficult for us today to realize that right down to the middle of the 19th century, to be a nurse was a social disgrace. It was in fact tantamount to being a prostitute, and many women combined the two professions. However, a new course was set by Florence Nightingale. Most of the early probationers (called "Nightingales" then as now!) scattered to all parts of the earth and spread their knowledge, expertise and dedication. Thus modern nursing was born, and is today a totally vital and indispensable part of medicine--something rather easily overlooked by many people, including doctors themselves.

The background of Florence Nightingale is not only of interest, but has great historical importance from which we can all learn. She was born in Florence, Italy (hence her name) in 1820. Her English parents, both wealthy and upper class, were at the time of her birth, living in Italy. However, at the age of one she accompanied her parents back to England to live at the family home of Embley Park (see under East Wellow), and it was there she spent most of her childhood. By all accounts she was a highly intelligent and motivated child, and loved to learn. She received the education thought suitable for an upper class woman of her day, designed to make her a wife and

mother, but very little else. As she grew up her family expected her to lead a glittering social life, but she was in great conflict with this. Her early inclinations were clear when she was only 20. At that time there was a famine in the area where she lived, and she immediately plunged herself into social work. Her happiness at doing something constructive was obvious to all, and at the same time she announced her intention of becoming a nurse. Her parents were horrified, and ordered her to give up the whole idea, but their remonstrations proved useless. However, it was to be another 13 years before she actually broke the parental bonds and left home. In later life she came to have nothing but contempt for her mother and sister. "They have nothing to do" she said "but tell each other not to get tired putting flowers into water!" In the meantime, she travelled to Rome, and there she met Sydney Herbert, who was destined to become a very influential British politician, and was responsible for getting a lot of Florence Nightingale's ideas put into practice. On returning to England she had a love affair with a certain Richard Monckton Milnes but it did not last, and in fact she never married. She also visited the Institute of Lutheran Deaconesses at Kaiserswerth, Germany (see under Germany). Here she spent six months studying their methods of nursing. She was impressed with the organization of the hospital, but thought little of their sanitation and nursing care. From Kaiserswerth she went to Paris, and studied in the hospitals under the authority of the Sisters of St. Vincent de Paul. On her return to England again, her parents were more adamant than ever against her desire for a career in nursing, but finally in 1853 at the age of 33 she left home and started to work at the Governesses' Sanatorium on Harley Street, London. This did not last long, as events simply overtook her.

In 1853 the Crimea War started. Britain and France supposedly went to protect Turkey against Russian attack. Things went badly for Britain from a military point of view, and the London Times reporter on the spot dispatched home articles criticizing the incompetencies and indifference of the generals and other authorities to the suffering of soldiers, particularly those sick or wounded in the hospital. This had a profound and far reaching effect in England. Sydney Herbert was by this time Minister at War, and in due course Florence Nightingale and about 20 nurses were sent out to Scutari in Turkey, where the main hospital was located. The authorities were hostile! But by her patience, high standards, organizational ability and leadership, she eventually reconciled the army to nurses. In a short time there were heavy casualties, and the doctors and generals in desperation turned to her for help, and her moment of triumph had arrived. Her degree of dedication and leadership soon spread far and wide. She never asked her nurses to do anything she didn't do herself. For example, during one winter at the Scutari Hospital, she personally was present at the death of over 2000 soldiers.

In 1855 the situation got even worse, and at one point there were more soldiers in the hospital (12,000) than in the trenches (11,000). The death rate was appalling, and eventually a sanitary commission was sent out from London. Florence Nightingale became personally responsible for implementing their reports, and in a short time the death rate dropped from 40% to 2%! Somewhat inevitably, however, she got ill herself, but did not return to England until 1857 after the end of the war. England had prepared a great welcome for her, but she would accept no personal acclaim, and immediately

started a campaign of reform in sanitation, health care, hospital care and nursing, which included the founding of the Nightingale Training School at St. Thomas'. The rest of her long life was devoted to these ends. During these later years of her life, she also wrote a great deal on nursing, hospital design and sanitation. Her "Notes on Nursing" published in 1859 (the same year as Darwin's "Origin of Species"!) is considered a classic on the subject, and there were many more.

All biographers of Florence Nightingale agree that "she was not an easy person to get on with": reformers seldom are! However, her influence was enormous. Basically she brought about three revolutions. The first of these was in the profession of nursing itself, which she raised from a very low status to one of high social (if not monetary) regard. Secondly, she brought about a revolution in hospital administration and design. But thirdly, and perhaps the most important of all, was her social revolution. She, more than anyone else, broke the Victorian tradition that the only thing young, well-educated women could do was to become homemakers and have children. Thus, she was a great social liberator, whose impact is still with us today. She died at her London home on South Street in 1910 at the age of ninety. Prior to her death, and true to her nature, she refused a national funeral and burial in Westminster Abbey. Instead she was buried in the family grave within the churchyard of East Wellow, Hampshire (see under East Wellow).

At the present time there is no central place in St. Thomas' (or anywhere else), where the belongings of Florence Nightingale are assembled. However, as part of a current extension to one of their buildings it is hoped that there will be a "Florence Nightingale Museum," where most of her surviving things will be properly displayed (a drive for funds is already underway). In the meantime we must recognize that her former possessions are scattered and if we wish to see them we will have to rely on cooperation and courtesy of those responsible for their preservation. First of all, there is a very impressive statue of Florence Nightingale on the east balcony of the main entrance rotunda off Lambeth Palace Road. Unfortunately, this is not the original cast, because the latter was stolen some years ago and has never been traced. However, the firm who did the casting in the 19th century was traced, and by good fortune they still had the original mold! So the present statue is as near to the original as possible. It may be seen by any interested visitor.

In the office complex of the District Nursing Officer, there is a variety of furniture which formerly belonged to Florence Nightingale. These include her piano, desk and several chairs. There are also other small items, prints and even clothes. Similarly in the office complex of the Nursing Personnel Officer there are such items as Florence Nightingale's medicine and needlework chests, another desk, books, etc. There is also a lamp of the type used by nurses in the Crimea, but it probably did not belong to Florence Nightingale. All these things can only be seen by the permission of the appropriate Nursing Officer. They are busy people, but one can ask, and they are helpful.

The Nightingale Training School for Nurses adjoins St. Thomas' Hospital on the east side. It is a modern building, but of particular interest to us is the fact that in their library are many of the books from Miss

Nightingale's own library, including her bible--she was incidentally a devoutly religious woman, and like St. Joan of Arc, believed she had had a mystical experience as a young woman. The library also has copies of all the books she wrote. However, her private papers are held by the Archives Department of the Greater London Council, which is right next door to St. Thomas'. The library holdings of the Nightingale Training School may be seen with the permission of the librarian. In addition to all these interesting aspects of St. Thomas', it is convenient to note here that during the years Florence Nightingale was associated with the hospital, she lived in a house on South Street. The house itself no longer survives, but there is a ceramic plaque put up by the London County Council to commemorate this. To reach the site, take the underground to Green Park and then walk up Park Lane beyond the Dorchester Hotel to South Street and turn right. Her house was at what is now 8-10 South Street, and the plaque reads:

in a house
on this site
Florence Nightingale (1820-1910)
lived and died

A simple tribute to this great human benefactor.

Old St. Thomas' Hospital Operating Theatre
c/o The Chapter House, Guy's Hospital
St. Thomas Street
London

Phone 01-407-7600

Opening Hours

Variable - phone for information.
There is a small charge for admission.

Underground - London Bridge

This is the second oldest surviving operating theater in the world. It dates from 1822, and was originally the women's operating theater of St. Thomas' Hospital, but is now part of Guy's Hospital and is maintained as a museum. It is a remarkable, though somewhat "grim" place, but at the same time a historical "gem," and I cannot recommend too highly a visit here to see what the "realities" of surgery were only 150 years ago. When I was last there (1982) the responsible officer in charge was Mr. M. Fellows-Freeman (ext. 3149) and the curator was Mrs. Jean Miller. Literature is available at the entrance desk.

The origins of this operating theater go back to the 18th century, when the loft of the church was used by the apothecary of St. Thomas' Hospital, for drying, storing and preparing the medicinal plants used by the hospital. For this reason it was actually called "the herb garret." In 1822, a new women's operating theater was built in the garret, as part of the space occupied by the apothecary and his herbs. The theater was in use for 40 years until 1862, when St. Thomas' Hospital sold its property to the railway

company using nearby London Bridge Station, and in 1865 the hospital moved from the area altogether. The Operating Theatre, although abandoned, was fortunately bricked-up and this no doubt saved it from complete decay. It remained that way until 1956 when, in the course of renovations, it was discovered and fortunately its value recognized. It took many years of careful work to restore it to its original condition, but with funds provided mainly by St. Thomas' and Guy's Hospitals and the Wolfson and Wellcome Foundations, the work was completed, and it and the adjoining herb garret were opened to the public in 1962.

On entering the theater, one is struck by the fact that virtually everything is made of wood, in contrast to the stainless steel in a modern operating theater. But to me at least, the most striking thing of all is to realize that "these walls must have seen and heard some terrible things." When it opened in 1822 anaesthesia was unknown, and it was not until 1847 that anaesthesia was first used here. Secondly, throughout its entire 40 years of use, no techniques of antisepsis were in use. It was entirely pre-Listerian (see under Glasgow). This is attested to by the fact that in one corner of the room is a china basin and jug used by the surgeon to wash up after the operation! In fact, the contents and whole atmosphere remind one dramatically of three necessary preliminaries before modern surgery became possible. These are the placing of surgery on a scientific basis, mainly by John Hunter (see under the Royal College of Surgeons) in the late 18th century, the introduction of anaesthesia in the late eighteen forties, and finally the introduction of antisepsis in the late eighteen sixties. Thus, this Old Operating Theatre is a vivid and very educational reminder of the history of this part of medicine. The herb garret adjoining the theater is now a historical medical museum, thanks largely to the work of the late Mr. R. J. Scott, who for many years lovingly cared for everything as curator. There are very interesting displays in the herb garret, including some of the original poppy seed used to supply opium.

In concluding this section on the Old St. Thomas' Hospital Operating Theatre and Herb Garret, I feel obliged to say that a visit to them should be "a must" for anyone interested in medical or human history.

The British Dental Association
63/64 Wimpole Street
London W1

Phone 01-935-0875

Opening Hours

Monday-Friday 10.00 - 16.00
There is no admission charge.

Underground - Oxford Circus

The British Dental Association is the main professional society of British Dentistry, having as its main function the general advancement of dentistry in the United Kingdom. Founded in 1880, it is over 100 years old, and has played a huge role in the progress of modern dentistry.

The offices and facilities of the British Dental Association on Wimpole Street are really for the benefit and use of professionals in the field. However, there are two things there that the biologically-oriented visitor will find of great interest. The first of these is the Dental Museum and it is certainly one of the best dental museums in the world. It displays graphically the advance of dentistry from the earliest times to the present day, and it is especially good in that it is being kept up-to-date on a year-to-year basis. In addition to the superb collections of dental instruments (some of them grim!) throughout the last three centuries, they have displayed dental chairs, cabinets, anaesthetic equipment, etc., and a great collection of old dental cartoons, many with a merciless humor! I have nothing but praise for this museum, which the visitor will find fascinating. Secondly, and in the same building, is their superb dental library. This is not open, as such, to the public, but you may ask to see it, and I found the librarians obliging and cooperative. This is certainly one of the great dental libraries in the world. It is both working and historical, and from a historical point of view it is probably the best and most complete.

The Royal College of Physicians of London
11 St. Andrews Place
London NW1

Phone 01-935-1174

Opening Hours

Monday-Friday 10.00 - 17.00
There is no admission charge.

Underground - Great Portland Street

The Royal College of Physicians is over 400 years old. It has engaged in a whole variety of activities in its long history, and as such has had, and continues to have, an enormous influence on British medicine.

The Royal College of Physicians of London was founded in 1518 by charter of King Henry VIII. At this time it became obvious that the medical standards of physicians in England were well below those on the continent, particularly those of Italy, and Henry VIII's charter was an attempt to remedy this situation. Since that time the college has played a major role in British medicine, which has spread to much of the rest of the world. One of its early Fellows was no less a person than William Harvey (see under Folkestone and Hempstead) who added enormous prestige to the college. Today the Royal College of Physicians of London is chiefly responsible for the maintenance and improvement of the standards of physicians in Britain.

Of main interest to the visitor is their historical medical library (regrettably I found the librarian very uncooperative), which while not open to the public nevertheless has a "main reading room," and this is open to the public. From time to time in this room there are magnificent displays of early medical works. In the college also are a series of fine portraits of their famous Fellows, including one of William Harvey.

St. Mary's Hospital Medical School
Praed Street (corner of Norfolk Place)
Paddington
London, W.2

Phone 01-262-1280

Opening Hours

Normal business hours.
There is no admission charge.

Underground - Paddington

St. Mary's Hospital is relatively new in comparison to other London hospitals, having only opened its doors in 1851, and the Medical School attached to it was founded in 1854. However its fame has rapidly become second to none, because it was here in 1928 that Alexander Fleming (1881-1955) first observed the antibacterial properties of the mold, Penicillium notatum, though it was many years after this before the active agent "penicillin" was extracted, purified and became clinically available. Nevertheless, we may correctly say that with Fleming's discovery the "antibiotic age" was born, and it is no exaggeration to say that it has proved to be the greatest therapeutic advance in all the history of medicine. It is safe to say also that without penicillin and subsequent antibiotics, one third of the people in the world today would not be alive.

Alexander Fleming was a Scotsman, having been born in Lockfield, Ayrshire in 1881. He was brought up on the family farm receiving an average education for a rural community, and by the time he was 13 he was already in London where he worked at a variety of jobs. An important turning point in his life came when at the age of 20 he inherited a small amount of money and decided to use it to study medicine. Accordingly, he entered St. Mary's Hospital Medical School, and apart from a stint in the Army in the first World War, he remained with St. Mary's for the rest of his working life.

Early in his career, Fleming became interested in the study of the antibacterial mechanisms of the body, and also antibacterial agents, but he never attempted any massive survey of potential antibacterial agents as did Paul Ehrlich (1854-1915). In fact, it was really a chance event which led him to what is now called penicillin therapy. In 1928 while working in his laboratory at St. Mary's he noticed that some colonies of staphylococci on a culture plate had been destroyed by an accidental contamination of a mold which had literally floated in through the window of his laboratory! Fortunately, Fleming had "a prepared mind" and recognized the significance of this event. The mold, subsequently identified as Penicillium notatum, was found to inhibit the growth of many other species of pathogenic bacteria. In the following year, 1929, he reported his findings to the London Medical Society, and also published a short paper entitled "On the Antibacterial Action of Cultures of a Penicillium," and suggested its use for antibacterial therapy. However, at that time chemical techniques were very inadequate, and extracts of the active substance (penicillin) were impure and their effects unpredictable. Despite his efforts, and those he enlisted for help, the

problem could not be solved, but Fleming never lost hope that sometime in the future the problem of extracting a pure sample of penicillin would become a reality. This indeed occurred in Oxford in 1940 when Ernst Chain (1906-1979) and Howard Florey (1898-1968) (see under Oxford) accomplished this. The following year, 1941, the first clinical trial was made on an Oxford policeman, who was dying of a severe bone disease due to an infection. The infection was immediately arrested and the patient started to improve at once. Unfortunately, there was only enough penicillin available for five days of treatment, and after this the infection took over again and the patient died. This was an unhappy beginning, but subsequent trials confirmed that the results of penicillin therapy could be almost miraculous. Fleming himself was overjoyed at this turn of events. In 1941 England had long been at war, and was shortly to be joined by the United States. Fortunately, the authorities in both countries were persuaded of the importance of this discovery, and the highest priority was given to the difficult task of the extraction of penicillin in meaningful amounts. Spurred on by ever increasing war casualties, the problem was in fact solved in a remarkably short period of time, thus a new era of medical therapy was ushered in. At first penicillin was only available to the allied armed services, but with the coming of peace in 1945 its use quickly spread throughout the world, and its originator, Alexander Fleming, was hailed far and wide as a hero. Honors poured in upon him from all over the earth. He was knighted by King George VI in 1944 (as were Florey and Chain), and he, Florey and Chain all received the Nobel Prize in 1945.

Fleming's first wife, Sarah Marion McElroy, died in 1949 leaving him a lonely man. In 1953 he was married for the second time to Dr. Amalia Coutsouris-Voureka, a Greek scientist who was working at St. Mary's. Tragically, they were only to have two years of married life, for Sir Alexander died suddenly in 1955. His body was cremated, but his ashes are preserved in St. Paul's Cathedral. In concluding this short biography of Sir Alexander Fleming, it is perhaps in the interest of accuracy to say that many scientists and historians of medicine find fault with Fleming for "not doing the right experiments" after his first observations in 1928, and also for lack of perseverance. Be that as it may, and remembering the old saying that "hindsight is easy," the fact remains that it was Fleming's careful observations and deductions that were instrumental in bringing about this enormous advance in medicine.

Unfortunately, the authorities at St. Mary's Hospital Medical School have not seen fit to preserve much of the associations of Sir Alexander Fleming. His laboratory has been so altered and put to new uses, that for practical purposes it no longer exists and is now an office complex. In spite of this, there are two things worthwhile seeing. The first of these is a very nice plaque on the side of the Medical School building just to the left of the main entrance on Praed Street. It reads as follows:

Sir
Alexander Fleming
1881-1955
Discovered Penicillin
in the second story
room above this plaque.

It is an interesting experience to look up at the second story window above the plaque, and realize it was here that antibiotic therapy, which is such a major aspect of medicine today, had its beginnings. Secondly there is the library and conference room on the third floor of the Wright-Fleming Institute (part of the Medical School). This is not open to the public; the visitor may ask to see it, by permission of the librarian of the Medical School. Some of Fleming's personal library is in this room, and it was the library he used in his day. In this room also is a nice portrait of him and a bust. Most of Fleming's library, his notes and records, laboratory equipment, etc. are scattered and generally inaccessible except to professionals, and even then it is difficult!

The house in Chelsea in which Sir Alexander Fleming lived for many years still stands. It is at 20 Danvers Street. To reach it take the underground to Sloane Square, and then walk down Kings Road to Paultons Square (it is quite a step!), and turn left. This then leads into Danvers Street. The house is privately occupied, and is not marked in any way. Finally, Fleming's ashes are preserved in St. Paul's Cathedral (see later).

I find it a pity that more of the materials and associations of this great human benefactor are not preserved and available for viewing by the public. Perhaps in the future there may be a "Fleming Museum"--I hope so.

Hampstead Cemetery
Fortune Green Road
London

Opening Hours

Everyday 9.00 - dusk
There is no admission charge.

Underground - West Hampstead

This is the cemetery where Joseph Lord Lister (see under Glasgow and Edinburgh) is buried. It is sometimes referred to as the West Hampstead Cemetery, simply because it is located in West Hampstead, but there is in fact only one cemetery in Hampstead. The cemetery is about a 15 minute walk from the underground station (alternately one can take a taxi). The grave of Lord Lister and his wife is in section WA, and the number is 432. If you enter the cemetery at the main gate, the grave is located at the bottom of the cemetery to the left of the chapel, and is on the left side of a minor walkway. You do not have to go off the walkway to find it, it borders the walkway. It is a simple grave for this great man and his wife.

Sigmund Freud Museum
20 Maresfield Gardens
Hampstead
London

Underground - Finchley Road

As I write (March 1985), I am not absolutely certain of the status of this museum, as to whether it is even open yet. However, this was the home of Sigmund Freud (see under Vienna) from 1938 until his death one year later, after he had to leave his native Austria because of Nazi persecution. After he died the house became the property of his daughter Dr. Anna Freud, who lived there until her death in 1982. My wife and I were received there by Dr. Anna Freud in 1979 and she showed us all the priceless collections, anthropological and antiquarian of Sigmund Freud, as well as his library which contained all his works in both the German and English editions, also his furniture and other artifacts. Dr. Anna Freud told us that upon her death the house would become a museum, but I do not know whether this has been completed. I will be in England later this year and will determine the present status. On the outside of the house however, is a plaque erected by the London County Council, which reads:

Sigmund Freud
1856-1939
Founder of Psychoanalysis
Lived here in
1938-1939.

Also in Hampstead (underground Swiss Cottage) on the grounds at the back of the new Public Library (88 Avenue Road) is a very fine statue of Sigmund Freud which was sculptured by Oscar Nemon.

The Royal Society of London
6 Carlton House Terrace
London SW1

Phone 01-839-5561

Opening Hours

Normal business hours.
There is no admission charge.

Underground - Charing Cross or Piccadilly Circus

The Royal Society is one of the oldest scientific institutions in the world, with origins as far back as 1645, but in 1662, King Charles II, who had previously become a member, granted the first charter. Thus, it has been in existence for well over three centuries, and has played an enormous role in the advancement of science. In its original charter granted by Charles II, the purpose of the society is stated to be "the promotion of natural knowledge." Using modern English we would describe this today as the promotion of the natural sciences, and throughout its history the society has remained true to this end. Today it accomplishes this by a variety of means. These include the maintenance of the highest scientific standards in the electing of its fellows, the awarding of medals, lectureships, and research grants, the publishing of newly discovered knowledge, promoting cooperative scientific research throughout the world, the giving of scientific advice to the government and other bodies, and finally maintaining a historical

scientific library. The society also maintains a remarkable collection of paintings and busts of its former fellows, whose names include Robert Boyle, William Harvey, Sir Isaac Newton, Sir Joseph Banks, John Hunter, Charles Darwin, Sir Joseph Dalton Hooker, Joseph Lord Lister, and many more. In fact, virtually every truly great British scientist has been a fellow of the society since the latter part of the seventeenth century.

The Royal Society is of course an active working organization, and is not generally open to the public. However, they are remarkably cooperative with really interested people, and will show them around if an appropriate guide is available. It is not suitable for children. In addition, their scientific meetings are held on Thursdays from November to June, and these are open to the public.

If a visitor is fortunate enough to get a tour of the premises, they should, in my opinion, ask particularly to see three things: the library, the portraits and busts of the fellows and the Council Room. The library, which is such a major part of the Royal Society, has a historical collection of scientific books almost beyond praise! The preservation of such works by the Society is considered a vital part of our culture. The library also preserves their own publications and those of their fellows. Their collection of portraits and busts are scattered in various rooms and hallways of the premises, but most can be seen with the help of a guide. Finally of special interest is the Council Room, where they not only have portraits of their distinguished fellows, but some huge and magnificent tapestries woven by the Zulu Tribes of Africa.

The Royal Society of London is a remarkable institution, and its influence on the development of all science has been, and continues to be, enormous. If visitors are lucky enough to be shown over the premises, it will be an event they will cherish.

Westminster Abbey
Parliament Square
Westminster
London SW1

Phone 01-222-5152

Opening Hours

Open to the public most days, so long as there is no service or special event in progress. Photography in the Abbey is forbidden except by special permission. There is no admission charge.

Underground - Westminster

Westminster Abbey is more to Britain than simply a church. It is in fact a national shrine where, throughout the ages, many of her great sons and daughters have been buried or commemorated, and these include biologists and doctors.

There are many things in Westminster Abbey of great historical interest and beauty, but I strongly recommend some knowledge of British history before a visit there, as well as the use of the official guide book. I will confine myself here to memorials of the great scientists. There is a booklet available entitled "The Abbey Scientists," which I recommend. On entering the Abbey, by the West Door, the Nave is straight ahead, and almost immediately in the center of this is the memorial to Sir Winston Churchill and the tomb of Britain's Unknown Soldier. To the left of this is the North Aisle, and within the floor of this aisle are the tombs of John Hunter and Charles Darwin. Nearby are the tombs of Sir Charles Lyell (1797-1875), the geologist and close friend of Charles Darwin, Sir Isaac Newton (1642-1727), the physicist and mathematician, and Lord Ernest Rutherford (1871-1937), the chemist and physicist. Nearby are also memorials to Alfred Russel Wallace, Sir Joseph Dalton Hooker, Charles Darwin, Joseph Lord Lister, and the great physicist Michael Faraday (1791-1867) and others. Further on in the North Transept is the memorial to Sir James Young Simpson, and in the South Transept, as part of "poet's corner," is the memorial to Stephen Hales. Westminster Abbey is a fascinating place, where the visitor can spend many enjoyable hours, but none of them better than seeing the memorials to famous British scientists.

St. Paul's Cathedral
Ludgate Hill
London EC4

Phone 01-248-2705

Opening Hours

Open to the public most days, so long as there is no service or special event in progress. There is no admission charge.

Underground - St. Paul's

St. Paul's Cathedral, like Westminster Abbey, is somewhat of a national shrine, and it is here that the ashes of Sir Alexander Fleming are interred. They are in the crypt underneath the main floor, and are located in a wall not far from the tomb of the Duke of Wellington. There is a plaque on the wall indicating the location of his ashes. It is worth a visit by those interested in the contribution of this great man to medicine and human welfare.

The British Library
The British Museum
Great Russell Street
London WC1

Phone 01-636-1544

Opening Hours

Weekdays 10.00 - 17.00
Sundays 14.30 - 18.00

Underground - Tottenham Court Road

The British Library is one of the truly great libraries of the world, and has played an incalculable role in the development of all human knowledge. It was founded by Act of Parliament in 1973, and can now be described as the National Library of Britain. At the present time it is in a state of transition, with three main operating divisions. These are the Reference Division, the Lending Division, and Bibliographic Services. It is the Reference Division with which I will be concerned here, because it comprises the former library departments of the British Museum, including the Science Reference Library, which are still housed there.

The origins of the British Museum are of great interest. It was founded by Act of Parliament in 1753, with the object of bringing together the enormous collections of Sir Robert Colton, as well as those of the First and Second Earls of Oxford and those of Sir Hans Sloane. Included in the Act were specific provisions for a library, and the money to buy these collections was raised by a government-sponsored lottery! Fortunately, it worked well. Just four years later in 1757 the library was greatly enhanced by the presentation of the entire Royal Library of King George II (1683-1760), which contained the collections of every British King since Edward IV (1442-1483). It was certainly then, and fortunatley still is, one of the most priceless collections to survive the ravages of time. The collections were enhanced again in 1823, when King George IV (1762-1830) presented to the Museum the library of his father King George III (1738-1820). Thus in its early years the library was greatly helped by gifts from Royalty. At its foundation the British Museum Library was established as a "copyright library," which under the law (going back to the Press Licensing Act of 1662) entitles it to a free copy of every book published in the United Kingdom. Its holdings are now well over 10,000,000 and include historically important manuscripts, documents, maps, letters, etc.

The Reference Division of the British Library (formerly the British Museum Library) is not a library for the general public or for casual use. Nevertheless, qualified scholars may obtain permission from the librarian to use it, if their need is considered justified. However, any visitor may see the famous "Reading Room" and I can assure you it is worth a visit. This magnificent and huge domed room, with its surrounding bookstacks, was designed by the architect Sydney Smirke and opened in 1857. It has been in continuous use ever since, and its value to the advancement of scientific knowledge incalculable. The dome of the building was damaged by a bomb in the early days of World War II, but fortunately no serious or permanent damage resulted.

To visit the Reading Room, it is only necessary to ask permission at the main entrance desk. However, visitors are only admitted every hour, on the hour, from 10.00-16.00. They cannot accommodate anyone between hours. In addition to the Reading Room, there is of course the rest of the museum with its magnificent heritage of cultural exhibits.

The Wellcome Institute of the History of Medicine
Wellcome House
183 Euston Road
London NW1

Phone 01-387-4688

Opening Hours

Normal business hours.
There is no admission charge.

Underground - Euston Square

The Wellcome Institute of the History of Medicine has probably done more to preserve our medical heritage than any other organization. Its origins go back to the pharmaceutical company of Burroughs and Wellcome, which in 1895 became the sole property of Henry Wellcome (1853-1936). Henry Wellcome, a very wealthy man, had wide interests in such things as archaeology, medical education, medical research and most important for us the history of medicine. He made enormous collections in the latter area during his lifetime, and these are now housed in the Science Museum (see previously).

When Sir Henry Wellcome died in 1936, his will set up the Wellcome Trust, a part of which is the Wellcome Institute of the History of Medicine. This is centered at 183 Euston Road, and comprises an Academic Unit which is associated with the University of London, a superb historical library, and a museum of various aspects of the history of medicine. Still at Wellcome House (and there are no plans to move it), is the Museum of Medical Science. It is a technical medical museum, with heavy emphasis on tropical medicine. In the building also are old Apothecary Shops, reassembled intact, and a fine art collection. These may be seen upon request at the director's office.

In addition to all this, the academic staff of the Wellcome Institute of the History of Medicine is an active research unit, whose function is to promote the history of medicine in a whole variety of ways.

The John Snow Public House
39 Broadwick Street (corner of Lexington Street)
London W1

Phone 01-437-1344

Opening Hours

Normal Pub hours.
There is no admission charge.

Underground - Piccadilly Circus

There is no more pleasant place in London for the medical historian than The John Snow Pub! Why is the John Snow Pub of historical significance? The answer is that a great medical discovery took place near where the pub now stands, and it was a Dr. John Snow who was responsible for it. John Snow

(1813-1858) should, in my opinion, have greater status in the history of medicine than is normally accorded to him, because he made major contributions in both anesthesiology and epidemiology.

Born in York, the son of a farmer, he is said to have been a good student, and at the age of fourteen was apprenticed to a surgeon. In his teenage years he became a temperance advocate and for the rest of his life he practiced this himself. It is perhaps ironic that he should be commemorated by a pub! Also, very early in life he had to cope with cholera epidemics, on which he became very knowledgeable. In 1836 he migrated to London, and in 1844 he received a medical degree from the University of London. When the anesthetic, ether, was introduced from the United States in 1846, Snow at once recognized its potential, and within one year he had invented a reliable apparatus for its administration, and published a book on it entitled "On Ether." In the same year, 1847, James Young Simpson (see under Edinburgh) introduced chloroform, and Snow quickly embraced this also, but recognized the differences between this and ether. He quickly became the leading authority on anesthesia, so much so, that he was chosen to administer chloroform to Queen Victoria in 1853 at the birth of Prince Leopold. He later (1858) published another book entitled "On Chloroform."

However, in the meantime he had not lost interest in cholera and its means of spreading. This was of course long before the theory of the microbial origins of disease, as put forth by Pasteur (see under France). As early as 1849 Snow believed, and publicly said so, that cholera was "water borne" but, it was not until 1854 that he was able to prove this. In that year there was a terrible outbreak of cholera in Soho, which was the area in which Snow himself lived. So severe was the outbreak, that over 200 people died within 3 days. Suspecting that the disease was "water borne," Snow did a study of the incidence of disease in relation to a public well on Broadwick Street, and noticed that the closer people lived to the well the greater the incidence of cholera. He also noticed that a sewer pipe passed within a few feet of the well, and believed that this was the source of contamination of the well water. Accordingly, Snow advised the authorities to "remove the handle from the pump!" Despite much protest, this was in due course done, and the cholera stopped at once. While the microbial origin of the disease was not understood for many years to come, the "water borne" nature of it was, and with the sanitation reforms which quickly followed, cholera virtually disappeared from the British scene. Furthermore, the understanding of the value of clean water in general gave rise to enormous improvements in health.

Dr. John Snow never married and died at the early age of 45. Nevertheless, his contributions to medicine and human welfare remain secure for all time.

After Snow's death in 1858, London expanded rapidly. In due course a Public House was built on or near the site of the former well. Some 15 years ago, a group of historically-minded London doctors asked the brewing company (Watneys), who owned the pub, if they could put up a plaque on the pub commemorating Dr. John Snow and his great discovery. Watneys was delighted, and at the same time renamed the pub the "John Snow," and there it stands today as a reminder of this great man. Inside the pub are a variety of

framed photographs and documents commemorating Snow's great discovery. It is popular with the local people and a nice "cosy place" to have a drink (or a "Pub lunch"), and to toast Dr. John Snow!

Brompton Cemetery
Fulham Road
London, SW10

Phone 01-352-1201

Opening Hours

Daily 9.00 - dusk
There is no admission charge.

Underground - West Brompton

Here in this cemetery Dr. John Snow (see above) is buried. To find the grave, go through the entrance off Old Brompton Road. Turn left at the first cross walkway inside the cemetery, and the grave is about 30 yards along on the right. It is easily seen. The burial register number is 18588, and it is officially described as being on North Walk, Compartment E, Location 52. It is inscribed:

To
John Snow, M.D.
Born at York
March 15th, 1813
Died in London
June 16th 1858

In remembrance of his great labours
in science and of the excellence of
his private life and character, this
monument with the assent of Dr.
William Snow has been erected over
his grave by his professional
brethren and friends.

Restored in 1895 by Sir Benjamin W. Richardson F.R.S.
and a few surviving friends.

The grave has been restored three times: 1st in 1895 by Sir Benjamin W. Richardson. 2nd in 1938 by anaesthetists from Britain and the United States. It was destroyed by a German bomb in April 1941--but restored for the 3rd time in 1951 by the Association of Anaesthetists of Great Britain and Ireland, who now maintain it.

This completes my section on London. The next section will be on the rest of Britain.