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LISTER CENTENARY
CELEBRATION
AMERICAN COLLEGE OF SURGEONS
DETROIT
1927

COLLECTION FROM
WELLCOME HISTORICAL
MEDICAL MUSEUM
LONDON


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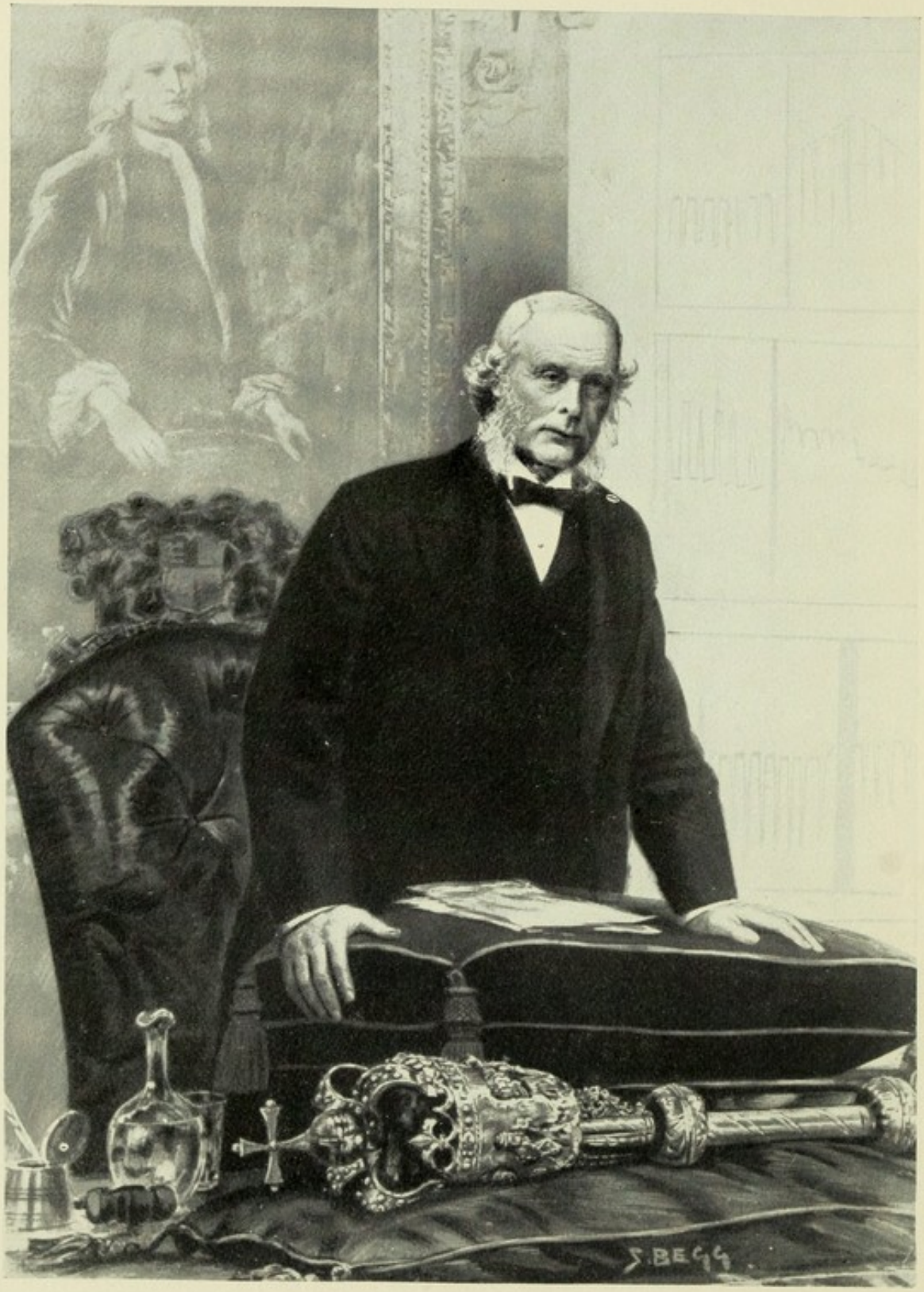
CATALOGUE AND HANDBOOK

LISTER COLLECTION

LISTER CENTENARY CELEBRATION
AMERICAN COLLEGE OF SURGEONS
DETROIT, MICHIGAN

OCTOBER, 1927



LORD LISTER
as President of the Royal Society

LISTER CENTENARY CELEBRATION

AMERICAN COLLEGE OF SURGEONS

DETROIT, MICHIGAN

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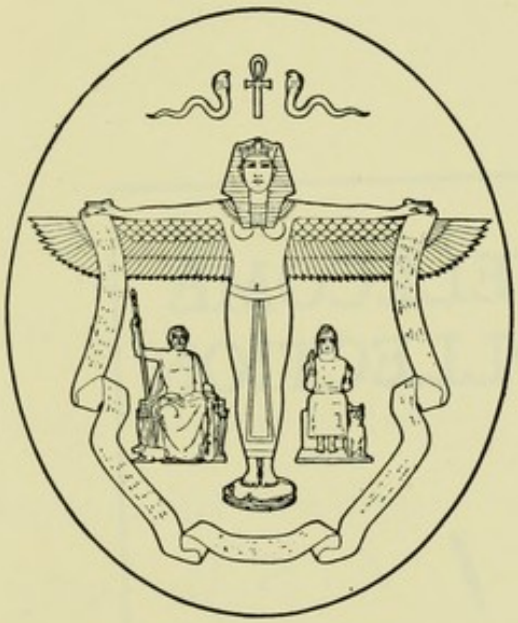

DESCRIPTIVE CATALOGUE

LISTER COLLECTION

PRESENTED BY

THE WELLCOME HISTORICAL MEDICAL MUSEUM

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Sectional Index

FOREWORD

THIS Catalogue is prepared for the Official Exhibition at the Lister Centenary Celebration to be held under the auspices of the AMERICAN COLLEGE OF SURGEONS at Detroit, Michigan, October, 1927, in connection with the centenary of the birth of

The Right Honourable
SIR JOSEPH LISTER, BARON LISTER OF LYME REGIS
Privy Councillor, Member of the Order of Merit.

Doctor of Civil Law of the University of Oxford ;

Doctor of Laws of the Universities of Cambridge, Glasgow, Edinburgh, Montreal and Toronto ;

Doctor of Science of the Universities of Dublin, Würzburg, Bologna, Vienna and Budapest ;

Fellow of the Royal Colleges of Surgeons of England, Edinburgh and Ireland ;

Fellow, and sometime President, of the Royal Society, London ;

Serjeant Surgeon in Ordinary to His Majesty the King ;

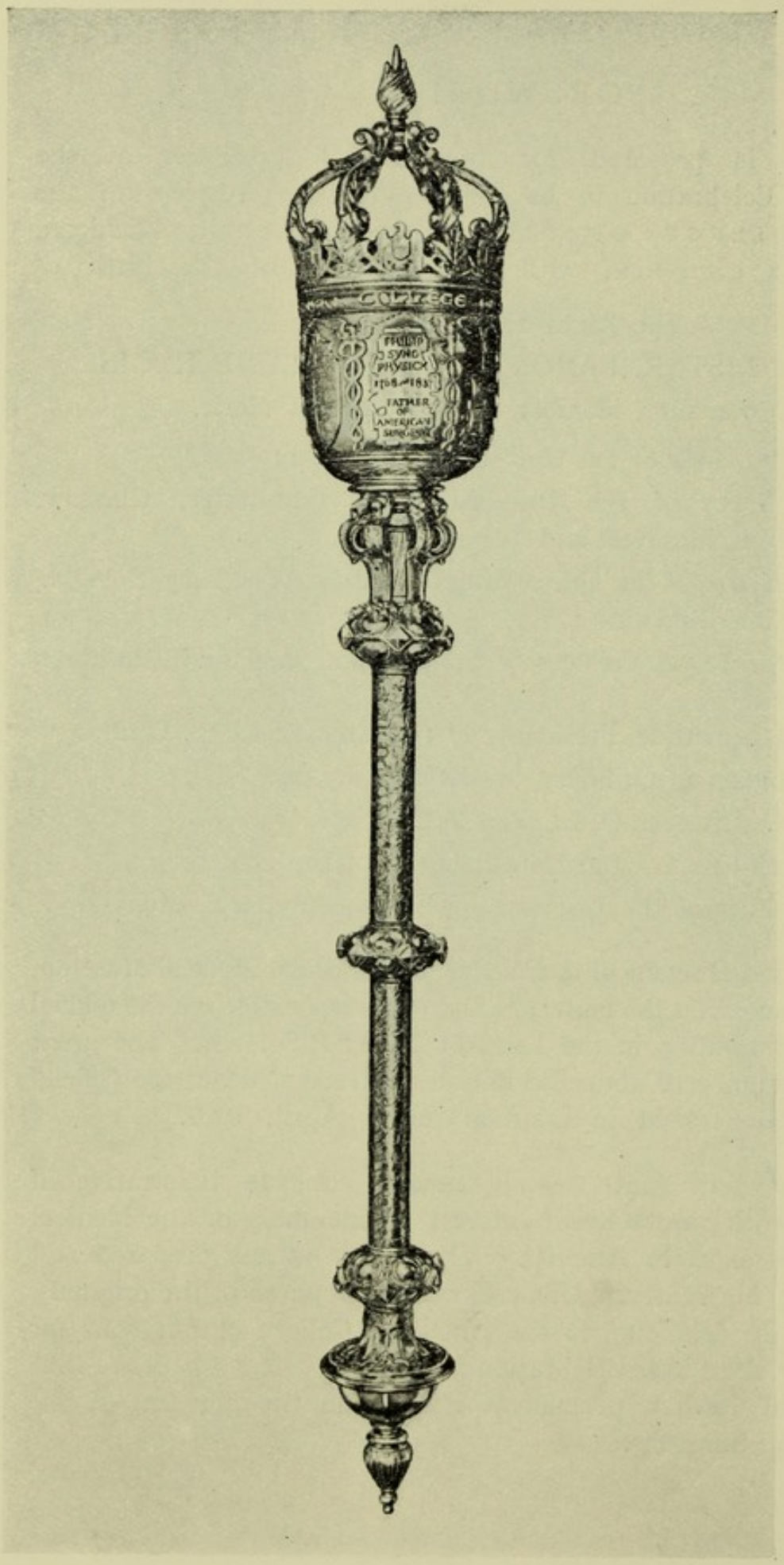
Knight of the Prussian Ordre pour le Mérite ;

Knight Grand Cross of the Danish Order of the Danebrog ;

Foreign Member of the Institute of France, etc., etc., etc.

The Founder and Director of the Wellcome Historical Medical Museum, London, England, acquired the materials and was responsible for the official Lister Centenary Exhibition in the Land of LISTER'S birth. The great interest and importance of that Exhibition was recognised at the Official Centenary Celebrations held in London during April, 1927.

Mr. Wellcome felt that a collection of objects illustrative of Lord Lister's life-work would be of interest to members of the Medical and Surgical Professions in America. Therefore, he has prepared and presented, through his Museum, this collection of replicas of the originals, including pictures, models, etc., to the American College of Surgeons for their Exhibition at the Lister Celebration at Detroit. It is his desire that this collection shall form a permanent Exhibit in the Museum of the American College of Surgeons.



The Gold Mace of the American College of Surgeons

This illustration is reproduced from the replica, wrought for the Wellcome Historical Medical Museum at the request of leading British Surgeons by the Sculptor of the original Mace.

The inscription on the Mace reads:—

"From the Consulting Surgeons of the British Armies to the American College of Surgeons in memory of mutual work and good-fellowship in the Great War, 1914–1918.

October 11*th*, 1920"

THE GREAT MACE

PRESENTED TO THE AMERICAN COLLEGE OF SURGEONS BY THE CONSULTING SURGEONS OF THE BRITISH ARMIES

THIS Mace has been designed so as to tell in a symbolic way of the close union between British and American Surgery, and of the ties which unite Great Britain to Canada and to the United States of America. It retains the traditional shape and proportions of the Civic Mace of the Seventeenth Century, and is of hand-wrought, chiseled and repoussé silver gilt. It was made by Omar Ramsden, who embodied in his design some suggestions of the donors.

THE CROWN-SHAPED FINIAL is formed of six rich scroll buttresses upholding the "Sacred Flame of Science" issuing from a mortar of antique pattern, the model of which was recently found on the field of battle near Salonika. These buttresses spring from a cresting composed of alternating Maple leaves and American Eagles intertwined with the Serpents of Æsculapius, while the position usually occupied by a band of jewels in a monarchical crown is filled with the words "The American College of Surgeons."

THE BODY OR HEAD is divided into six panels by the Winged Caduceus, being an ornamental rendering of the badge of the United States Army Medical Corps. The panels set forth the following "Achievements at Arms" in delicate and finely detailed repoussé work:

1. The full Blazon of the United States of America.
2. The Dominion of Canada.
3. The Royal College of Surgeons of England.
4. The Badge of the Royal Army Medical Corps.
5. The Shields of Arms of John Hunter and Lord Lister.
6. A Cartouche bearing the words "Philip Syng Physick 1768–1837, Father of American Surgery."

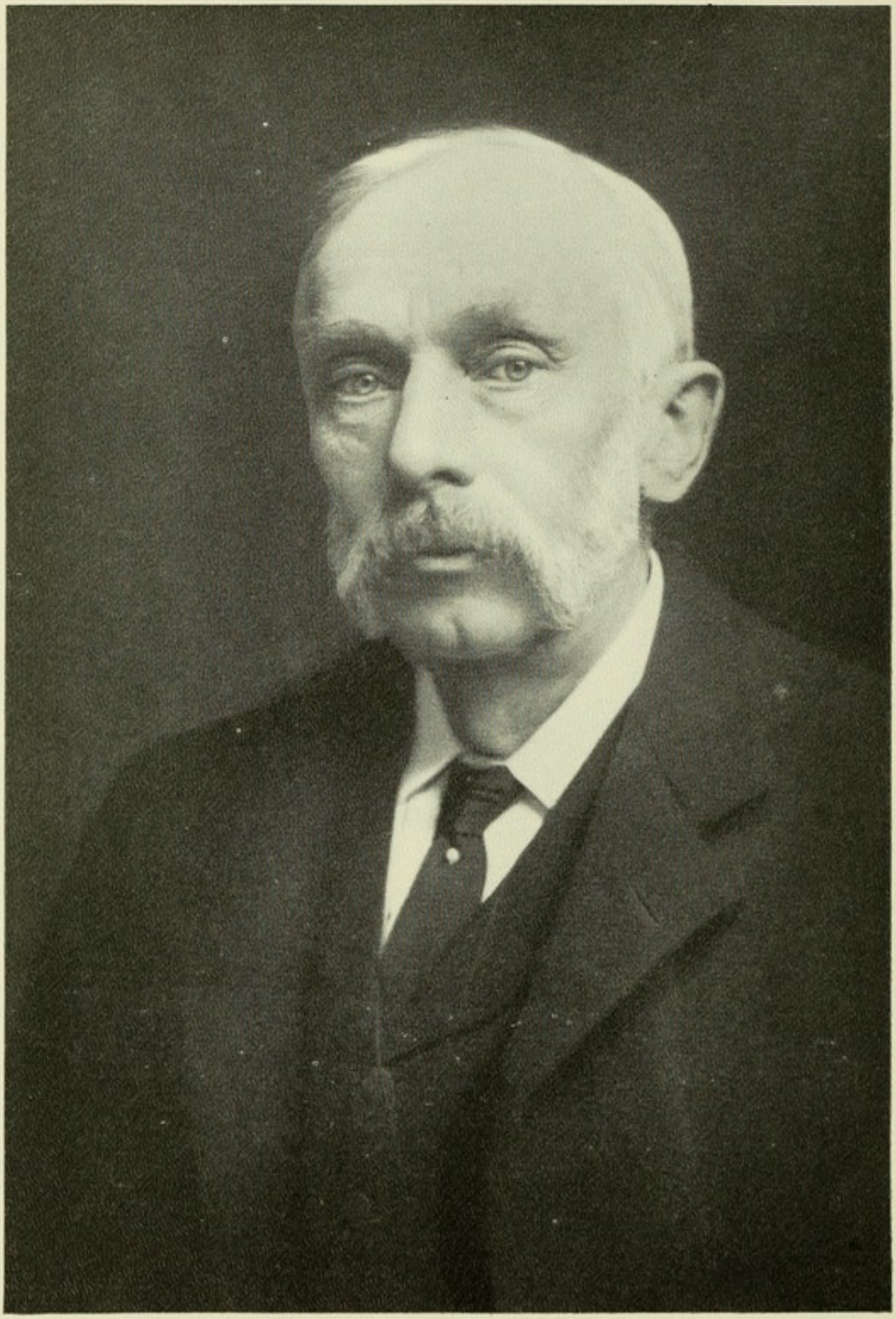
The lower portion of the Head is decorated with a symbolic band of water indicating the ocean which both unites and separates America and the Mother Country. The latter is symbolized by the British Lion Brackets of highly chiseled work which support the head and terminate the upper part of the staff. The talons of the lion's feet grip the hammered decoration of the upper knop, which consists of a design of American and Canadian Maple seed-pods and heart-shaped spaces. This hammered work is protected by boldly projecting, solid, jewel-like bosses of chiseled work.

THE STAFF is decorated with a free design of the national floral emblems of the United Kingdom—The Rose, the Thistle, the Shamrock, and the Leek. Intertwined among these are a number of ribbon scrolls, each one of which bears the name of one of the donors.

THE FOOT bears, as decoration, the root form from which the above spring and a series of six small shields which may be used for possible future arms of inscriptions. The extreme bottom knop is fluted with leaves of *Isatis tinctoria*.

The various parts are held together, in the traditional manner, by a rod of British Oak cut from a tree grown at Wytham, Berks. The extreme length is 3 feet 11¼ inches, and the weight of silver is 140 ounces troy.

THE DEDICATORY INSCRIPTION engraved on the plate under the Crown sets forth that the Mace is a gift "From the Consulting Surgeons of the British Armies to the American College of Surgeons, in memory of mutual work and good-fellowship in the Great War, 1914–1918."



Sir Rickman Godlee, Bt., K.C.V.O. M.S., F.R.C.S.

PREFACE

BY THE

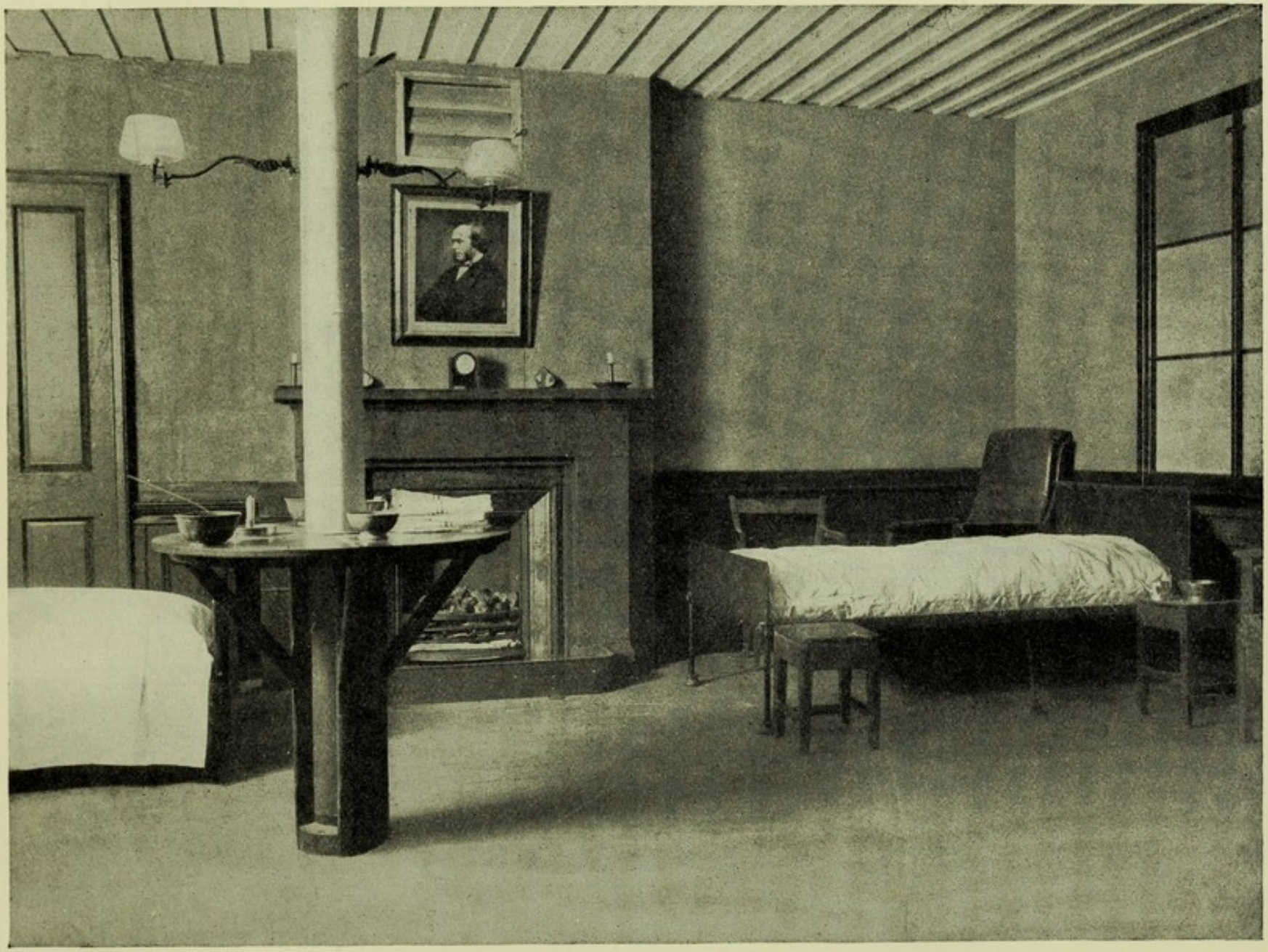
AMERICAN COLLEGE OF SURGEONS

THE American College of Surgeons has been chosen as the permanent home in North America of replicas of the apparatus, instruments and other material used by Lord Lister, the originals of which are on exhibit in the Wellcome Historical Medical Museum, London, England.

The American College was organised in 1913, with the interested co-operation of a nephew of Lord Lister, Sir Rickman J. Godlee, Bt., who was, at that time, President of the Royal College of Surgeons of England. In the same year he visited America to act as godfather at the organisation meeting of the College. He delivered the first Convocation Address, and presented greetings on behalf of the Royal College of Surgeons of England, as follows :—

> " We, the Council of the Royal College of Surgeons of England, have heard with much interest of the approaching inauguration of the American College of Surgeons. We hereby convey to it our hearty good wishes, and express the hope that it may have a successful career and fill a position beneficial alike to the profession and to the community.
>
> " We cannot forget the important advances in the Science and Art of Surgery achieved by many distinguished surgeons in the Continent of America during the past, and are proud to have enrolled upon our list of Honorary Fellows the names of some of the most active workers in these fields at the present day.
>
> " In accepting the invitation for our President to take part in the opening ceremony, we desire to show how we appreciate the intention of the American College to strengthen the bonds that already unite the medical profession amongst English-speaking peoples. It is a sentiment which always meets with a cordial response in this country, and it is one which this College will endeavour to support by all means in its power.
>
> " In witness whereof we have caused the Common Seal of the College to be hereunto affixed this 9th day of October, 1913."
>
> *President,* Rickman J. Godlee.
>
> *Vice-Presidents* { G. H. Makins. Frederic Eve.

The American College is housed in dignified headquarters in Chicago, with every facility both for safeguarding this Lister Collection and, at the same time, exhibiting it adequately ; and since Chicago is practically the central location with reference both to Canada and the United States, it is an especially suitable home for a collection of such general interest to the medical profession.



SECTION OF THE LISTER WARD, WELLCOME HISTORICAL MEDICAL MUSEUM
From the Glasgow Royal Infirmary

Catalogue of Exhibits

Lister's Life, Work and Honours

PARENTAGE, CHILDHOOD AND EDUCATION, 1827–1853

Photographs.

Joseph Jackson Lister, F.R.S., Lister's father, seated at a table, with a microscope.

Joseph Jackson Lister, F.R.S., Lister's father, seated at a table, without a microscope.

Isabella Lister, Lister's mother, 1839.

Lister's grandfather.

Copy of silhouette of Isabella Harris, junior. Born 1792. Portrait taken in 1818. Married Joseph Jackson Lister, July, 1818. Died September, 1864.

Copy of silhouette of Arthur Lister, Lister's brother. Born April, 1830. Portrait taken in 1837. Died July, 1908.

Copy of silhouette of Joseph Lister (Lord Lister). Born 1827. Portrait taken in 1840. Died February 10th, 1912.

Lister as a young man.

Upton House, West Ham, Lister's birthplace.

Upton House, Upton, Essex, taken in 1914.

Professor T. Graham, one of Lister's instructors at University College, London.

Group of Medical men, including Lister, about 1850.

FIRST EDINBURGH PERIOD, 1853–1860

Photograph of Lecture Notice, Edinburgh, 1855.

Joseph Lister, 1857.

GLASGOW (1860–1869) AND SECOND EDINBURGH (1869–1877) PERIODS

Testimonial to Professor Joseph Lister, F.R.S., signed by the Students of Surgery, University of Glasgow, and drawn up at the end of Lister's first session.

Class Examination List, made out in Lister's writing.

Joseph Lister, about 1862.

Agnes Lister, Lister's wife, about 1862.

The Old College, Glasgow.

The Block of the Glasgow Royal Infirmary.

Model of the Lister Ward, Glasgow Royal Infirmary.

Two wooden night commodes from the Lister Ward, Glasgow Royal Infirmary.

WARD STOOL.

Chair from Lister's room.

Wooden chamber closet from the Lister Ward, Glasgow Royal Infirmary.

Ward solution pan; Patients' bedside card holder; Patients' foot-warming pan; Surgeons' instrument tray; Soiled dressings pan; Ward solution kettle; Bleeding cup, 8 oz.; Patients' porridge bowl; Patients' spoon; Patients' drinking cup; Operation candlestick; Patients' milk jug; Patients' spittoon.

PHOTOGRAPHS.

Section of the original Lister Ward in the Wellcome Historical Medical Museum.

Lister Ward, Glasgow Royal Infirmary, *circa* 1865.

Antiseptics, Dressings and other Materials as used by Lister in Surgical Operations

Carbolic Dressings.

"I will now proceed to speak of the mode of dressing. Carbolic acid, as I have already remarked, is soluble in liquids of very different kinds, so different, for example, as water and one of the fixed oils; and each solution has its own special value. Water, having little affinity for the acid, dissolves but a small quantity, only one-twentieth part of the pure crystals, and holds that small quantity very loosely, so as to permit it to act with energy on any substance for which it has stronger attractions, and also to become soon dissipated on exposure. Hence, the watery solution is a pretty potent but transient application. Now this is exactly what we want when we apply carbolic acid to the interior of a wound for the purpose of destroying any germs which may have been introduced into it. We require something that will act with energy for the moment; but which, as soon as it has extinguished the vitality of the septic particles, may disappear from the wound, in order that the tissues may be left free from all unnecessary irritation. The fixed oils, on the other hand, have so strong an affinity for the acid that they will mix in any proportions with it, and hold it so firmly as not to permit it to act with much energy on the tissues or to become soon dissipated into the atmosphere. Hence an oily solution is comparatively bland but permanent in its operation. These are just the properties which are desirable for an external application. We wish it to serve as a reservoir of the acid, retaining it for twenty-four hours at least, so that it may remain constantly exerting its antiseptic influence upon the discharges that flow out beneath it. At the same time, it is most important that it should be mild in its action on the surface to which it is applied, in order to avoid irritation and excoriation. It appears clear, therefore, that a watery solution is best adapted

for the treatment of the interior of a wound in the first instance, while an oily preparation is suited for an external dressing." —*Collected Papers*, vol. II., pp. 67-68.

" I applied undiluted carbolic acid freely to the injured part, in order to destroy the septic microbes already present in it ; regarding the caustic action which I knew must occur as a matter of small moment compared with the tremendous evil which it was sought to avoid. But when this had once been done, no further direct action of the antiseptic upon the tissues occurred. The carbolic acid formed with the blood a dense chemical compound which, together with some layers of lint steeped in the acid, produced a crust that adhered firmly to the wound and the adjacent part of the skin. This crust was left in place till all danger was over, its surface being painted from time to time with the acid, to guard against the penetration of septic change into its substance. Meanwhile, in the undisturbed wound the beautiful result occurred that the material of the crust within it, and the portions of tissue which had been destroyed by the caustic, were replaced by living tissue formed at their expense.

" That dead tissue, when protected from external influence, was so disposed of, was a most important truth new to pathology ; and it afterwards suggested the idea of catgut ligature."—*Collected Papers*, vol. II., p. 365.

" I therefore resolved to open it and apply a dressing which should imitate, as much as circumstance permitted, that which we used in compound fractures. The pus which escaped on incision was as thick as any I ever saw. Mixing some of it with undiluted carbolic acid, I applied some layers of lint soaked with the mixture to the wound and surrounding skin, and covered them with a piece of thin block-tin moulded to proper shape, such as we used for covering the crust in compound fracture. This metal covering, which prevented loss of carbolic acid by evaporation and soaking into surrounding dressings, was fixed by strapping, and a folded towel was bandaged over it to absorb discharge.

"Next day, on changing the dressing, I was greatly astonished to see nothing escape from the incision except a drop or two of clear serum. What was now to be done? I had no longer any pus to mix with the carbolic acid. But it occurred to me that I might make a satisfactory crust by mixing carbolic acid with glazier's putty. Accordingly, I sent to the dispensary for some whiting and boiled linseed oil, and, making a solution of one part of carbolic in four of the oil, rubbed it up with whiting in a mortar, thus making a carbolic putty. This I spread on a piece of block-tin, and applied it as I had done the first dressing. There never was any further discharge of pus; the serous oozing diminished rapidly, and before long healing was complete."—*Collected Papers*, vol. II., p. 366.

WATERY SOLUTIONS.

"The crude carbolic acid which, under the name of German creosote, was supplied to me by my colleague, Dr. Anderson, Professor of Chemistry in the University of Glasgow, was a brown liquid which had been adulterated with water, and this lay on the top as a clear layer, destitute of any flavour of carbolic acid. This led me, in my first paper on compound fracture, to speak of carbolic acid as absolutely insoluble in water. But when it was afterwards produced in a comparatively pure condition in colourless crystals, it proved to be capable of being taken up by water, though twenty parts were required for the purpose. The watery solution, however, though weak numerically, showed itself to be exceedingly potent as an antiseptic. Having applied it to a foul sore in the palm of the hand, I found, on changing the dressing next day, that all putrefactive odour had disappeared.

"This enabled me to use carbolic acid for washing wounds after operation, and so to extend the application of the antiseptic principle to surgery in general. In the state of knowledge at that early period it seemed imperative to apply a powerful germicide to the wound before closing it. To use undiluted carbolic acid for operation-wounds, as I had done in compound fracture, was out of the question; and carbolic oil, though I did indeed try it, was

ill adapted for the purpose. But the watery solution could be satisfactorily used not only for washing the wound, but also for purifying the surrounding skin, the hands of the operator, and the instruments."—*Collected Papers*, vol. II., pp. 362-368.

Oily Solutions.

" The entire absence of carbolic acid in the layer of water on the ' German creosote,' with which I made my first attempts with compound fractures, indicates that there were present in the crude product substances for which the acid had incomparably greater attraction than it had for water. When purified from these substances, it is indeed soluble in water, but only in small amount ; and, being so feebly held by water, it is free, when in watery solution, to act upon other matters for which it has stronger attraction. Thus was explained the remarkable germicidal energy of a lotion containing only a twentieth part of carbolic acid, as illustrated by the foul sore in the hand before referred to.

" With linseed oil, on the other hand, the acid could be mixed in any proportion, and, being firmly held by the oil, it was mild in action, though present in the large proportion of 1 to 4, as used in the carbolic putty. The 1 to 4 carbolic oil is bland when applied to the tip of the tongue, whereas the 1 to 20 watery solution is intolerably pungent."—*Collected Papers*, vol. II., p. 368.

Carbolic Putty.

" The acid in the watery solution, while potent in action when applied, is soon dissipated, whereas it is slow in leaving the oil. Hence the watery solution, powerful but transient in operation, was admirably adapted for application to a cut surface as a detergent, while the carbolic putty, bland in action and serving long as a store of the antiseptic, could be used with good effect, not only for abscesses, but also as an external dressing for operation wounds ; and for that purpose I long employed it. The putty was used in a layer spread on calico, freely overlapping the skin around the wound, and covered with a folded cloth to absorb the serum that flowed from beneath its edges. Although this mode

of dressing gave place in time to others which were more convenient, the change effected under its use at that early period was of the most striking character; healing without suppuration, pain, or fever, instead of being the rare exception, became the rule, and operations were safely performed which had previously been utterly prohibited on account of the danger that attended them; while pyæmia and hospital gangrene, which had before been disastrously rife, were banished from my wards."—*Collected Papers*, vol. II., p. 368.

"After numerous disappointments, I have succeeded with the following, which may be relied upon as absolutely trustworthy. About six teaspoonfuls of the above-mentioned solution of carbolic acid in linseed oil are mixed up with common whitening (carbonate of lime) to the consistence of a firm paste, which is in fact glazier's putty with the addition of a little carbolic acid. This is spread upon a piece of sheet block-tin about six inches square; or common tinfoil will answer equally well if strengthened with adhesive plaster to prevent it from tearing, and in some situations it is preferable, from its adapting itself more readily to the shape of the part affected. The putty forms a layer about a quarter of an inch thick; it may be spread with a table-knife, or pressed out with the hand, a towel being temporarily interposed to prevent the putty from sticking to the hand or soiling the coat-sleeve. The tin thus spread with putty is placed upon the skin so that the middle of it corresponds to the position of the incision, the antiseptic rag used in opening the abscess being removed the instant before. The tin is then fixed securely by adhesive plaster, the lowest edge being left free for the escape of the discharge into a folded towel placed over it and secured by a bandage. This dressing has the following advantages: The tin prevents the evaporation of the carbolic acid, which escapes readily through any organic tissue such as oiled silk or gutta-percha. The putty contains the carbolic acid just sufficiently diluted to prevent its excoriating the skin, while its substance serves as a reservoir of the acid during the intervals between the dressings. Its oily

nature and tenacity prevent it from being washed away by the discharge, which all oozes out beneath it as fast as it escapes from the incision ; while the extent of the surface of the putty renders it securely antiseptic."—*Collected Papers*, vol. II., p. 33.

LEAD PLASTER.

" Of late we have been using what seems to answer admirably, namely, *Emplastrum plumbi*, mixed with one-fourth part of bees-wax to give it sufficient consistence, the carbolic acid being in proportion of about one-tenth of the whole. This is used as a plaster spread on calico in a layer about one-twentieth of an inch thick, and I can recommend it as thoroughly reliable."—*Collected Papers*, vol. II., p. 71.

Catgut treated with tannin, chromic acid, chromic acid with sublimate and bichromate of potash.

LISTER'S POCKET CATGUT-HOLDER.

" For everyday use a small oil-tight capsule may be carried in the pocket-case, and this can be replenished from a larger stock as may be necessary. I have had a small silver bottle, with well-fitting screwed top, adapted to my caustic case, and this contains two little rods of wood, with gut of two sizes wound upon them, with a few drops of the antiseptic oil ; and now that torsion has almost entirely superseded the ligature in ordinary wounds, this small supply will probably last me for months."—*Collected Papers*, vol. II., p. 85.

CATGUT STITCH.

" The catgut stitch becomes a new engine in surgery, enabling us to attach deeply-seated parts to each other, leaving the connecting medium to be removed by absorption."—*British Medical Journal*, 1871, II., p. 231, August 26th, 1871.

HORSE-HAIR SUTURES.

" In operations of this kind, silver wire for the deeper stitches, and horse-hair for the superficial ones, answer extremely well ;

the rigidity of the wire enabling it to give valuable support, while both these kinds of material are mechanically antiseptic, since they afford no nidus for putrefactive fermentation in their substance, and both are so smooth in surface as to be in that respect quite unirritating. For microscopic examination of horse-hair shows that its external epithelium, unlike the imbricated arrangement which prevails in many hairs, such as those of the mouse or of the human head, is so arranged as to produce perfect smoothness, a circumstance which is probably further valuable from the facility with which adhering dust can be removed."—*Lancet*, 1875, I., p. 788.

CHROMIC CATGUT, STERILE.

SURGICAL CATGUT IN ALCOHOL.

STERILISED CATGUT.

CATGUT, No. 2.

SURGEON'S CATGUT.

CATGUT IN STERILE FLUID, No. 345.

QUANTITY OF DRY CATGUT.

LINT DRAINS.

" It is only during the first twenty-four hours that a special provision for its discharge escape is needed, and for this purpose I have found it convenient to lay in the wound a strip of lint soaked with an oily solution of carbolic acid (one to ten), one end being left hanging out at the most dependent part, to serve as a drain for blood and serum."—*Holme's System of Surgery*, 1871, vol. V., p. 625.

INDIA-RUBBER DRAINAGE TUBES.

" I continued to use a strip of lint as a drain for about five years with perfectly satisfactory results. But in 1871, having opened a very deeply-seated acute abscess in the axilla, I found to my surprise, on changing the dressing next day, that the withdrawal of the lint was followed by escape of thick pus like the original contents.

"It occurred to me that in that deep and narrow incision, the lint, instead of serving as a drain, might have acted like a plug, and so reproduced the conditions present before evacuation. Taking a piece of the india-rubber tubing of a Richardson's spray producer that I had used for local anæsthesia at the operation, I cut holes in it and attached knotted silk threads to one end, so improvising a drainage tube. This I put to steep for the night in a strong watery solution of carbolic acid, and introduced it in place of the lint on changing the dressing next morning. The withdrawal of the lint had been followed by discharge of thick pus as before; but next morning I was rejoiced to find nothing escape unless it were a drop or so of clear serum. This rapidly diminished, and within a week of the opening of the abscess I was able to take leave of my patient, the discharge from the abscess cavity having entirely ceased."—*Collected Papers*, vol. II., p. 367.

"Drainage is provided for by the caoutchouc tubes of Chassaignac. In order to prevent the tube from being pushed in too far, we have two loops of carbolised silk attached to the orifice, each of them knotted at its extremity. The orifice of the tube is placed on a level with the skin, and when the dressing is bound down it gets the purchase on these knotted pieces of silk stretched upon the skin, and so the tube cannot leave its position. If the direction of the tube has to be oblique, we cut the orifice obliquely in proportion, so as to have it perfectly level with the surface. If the tube projects it gets bent and fails to convey the discharge properly." —*Dublin Journal of Medical Science*, 1879, vol. LXVIII., p. 104.

CATGUT DRAINS.

"Mr. Chiene, of Edinburgh, suggested some time ago the employment of catgut as a substitute for the caoutchouc tube. He hoped by this means to provide adequate drainage through capillary attraction, and, at the same time, by virtue of the proneness of catgut to absorption, to do away with the necessity for the withdrawal of the drain from time to time, which there is when the caoutchouc tube is used, whether for the purpose of shortening the tube or substituting a small one for a large.

Mr. Chiene's anticipations were to a considerable extent realised."—*Lancet*, 1878, I., p. 6.

BORACIC OINTMENT.

"Take of boracic acid, finely levigated, one part; white wax, one part; paraffin, two parts; almond oil, two parts. Melt the wax and paraffin by heating them with the oil, and stir the mixture briskly along with the boracic acid powder in a warm mortar till the mass thickens. Then set it aside to cool, after which it will be found to be a pretty firm solid mass, which is to be reduced to the proper consistence of a uniform ointment by rubbing down successive portions of about an ounce each in a cold mortar. This ointment, when used, is spread very thin upon fine muslin or linen rag, which absorbs more or less of the almond oil, and leaves a layer of blended wax and paraffin, flexible at the temperature of the body, and separable from the skin with the utmost ease by the discharge, which is thus not at all confined by it, but diffuses itself and flows out beneath it, receiving as it goes an abundant supply of the acid to prevent putrefaction, while cicatrisation is not materially interfered with by the mild antiseptic, and still less by the perfectly bland wax and paraffin."—*Lancet*, 1875, I., p. 787.

BORACIC LINT.

"In order that the dressing may be trustworthy, it was necessary that the boracic acid should be in some way stored up in it, as carbolic acid is in the resin of the gauze, so that it could not be at once washed out from it by the discharge. A ready means of attaining this object was presented by the fact that the acid, though sparingly soluble in water at ordinary temperatures, is pretty freely dissolved at the boiling-point. Thus, at 60° Fahr., water takes up only about a twenty-sixth part of its weight, and at 100° less than a sixteenth, but at 212° more than a third. Hence, if a piece of lint is dipped in a saturated solution near the boiling-point, it absorbs a great deal of the acid, and, after being allowed to dry, it is found to weigh about twice as much as it

originally did, the weight of the crystals disseminated through it being nearly equal to that of the lint itself. If, therefore, this 'boracic lint' is used as a dressing, the discharge may soak through it repeatedly without dissolving out all the acid, although it takes up in its passage a sufficient amount to render it antiseptic. It is further a fortunate circumstance that the crystals of boracic acid, instead of being hard and harsh, like most crystals, are soft and unctuous, and, therefore, occasion no mechanical irritation of the skin."—*Lancet*, 1875, I., p. 604.

SALICYLIC ACID.

"Now it is very desirable that, if such an occurrence should show itself, we should be prepared with means of an alternative character. I have alluded to the boracic acid dressing. This is very good with superficial wounds or sores. But we should not like to trust this mild boracic acid for deep-seated affections like empyema. What substitute, then, have we in case of the rare occurrence of carbolic acid poisoning? I believe the best at present known is salicylic acid. It may be used in the form of salicylic jute, which is a pretty cheap material."—*Lancet*, 1879, II., p. 902.

CHLORIDE OF ZINC.

"Chloride of zinc, I may remind the reader, has this remarkable peculiarity among all antiseptics that I have tried, that a single application of it to a recent wound, in a solution of the strength above mentioned, though it produces no visible slough, yet prevents the occurrence of putrefaction in the cut surface for days together, in spite of the access of septic material; and, if the discharges have opportunity to flow freely away, as after the removal of a tumour of one of the jaws, or a portion of the tongue, there may be absolutely no odour from first to last, the divided textures being thus guarded from the effects of putrefaction during the dangerous period before they have been covered by the protecting layer of granulations."—*Lancet*, 1875, I., p. 401.

IODOFORM.

"Iodoform, while volatile, is very slowly volatile, and, at the same time, so little soluble in the discharges, that in these points of view it seems an admirable antiseptic; but iodoform is by no means a potent agent in its action on micro-organisms. I ascertained, some years ago, for example, that, taking a 10 per cent. iodoform wool, the strongest used, and soaking this with milk, the lactic fermentation was only a short time retarded, and in the course of a few days not only the *Bacterium lactis*, but multitudes of other kinds of bacteria, were seen in abundance in the milk. Again, uncontaminated urine being made to soak such a piece of wool, and then inoculated with putrefying urine, I found that the ammoniacal fermentation was only a short time retarded by the iodoform. Hence, I was not surprised to learn that in the practice of Schede, of Hamburg, and others, it had been found that erysipelas occurred under the iodoform dressings. It is remarkable that iodoform has such an effect as it has in preventing putrefaction, but it is by no means a powerful germicide."—*Collected Papers*, vol. I., p. 295.

EUCALYPTUS OIL.

"Eucalyptus oil is undoubtedly a powerful antiseptic, and I have been using it in the form of gauze for a considerable time past. One difficulty with it is its great volatility. In the first instance, I employed gum dammar, instead of common resin, in the manufacture of the gauze, because I found that gum dammar held the eucalyptus more securely than the resin does; but gum dammar is an expensive gum, and, after some trials with common resin, I thought I was justified in substituting the cheaper material, and for a while we seemed to get good results with this arrangement. But, as I have already said, more recently the results were not satisfactory. I mean that, now and again, a case occurred which was unsatisfactory. On making enquiry of the manufacturer of our eucalyptus gauze, I found that he had deviated from the instructions which he had received as to the manufacture; that he often left the gauze, for a considerable time after it had been

charged, exposed to the air before folding it up, thus affording opportunity for the escape of the volatile constituent in large amount; and in hot weather this was more especially apt to occur. We found, as a matter of fact, that the eucalyptus gauze supplied to us had not the softness which it ought to have, caused by the adequate amount of eucalyptus oil. I was thus led to attribute our disasters to imperfection in the manufacture of the eucalyptus gauze."—*Collected Papers*, vol. I., p. 294.

THYMOL.

COTTON WOOL diffused with chlorine gas, sulphurous-acid gas, carbolic acid vapour and benzene vapour.

The introduction of cotton wool was suggested to Lister by one of Tyndall's experiments with the condensed luminous beam. Lister referred to the use of cotton wool as an antiseptic dressing in distinction to sterilised wool not containing an antiseptic.

SALICYLIC WOOL.

OAKUM DRESSING.

" Oakum not only proved efficient antiseptically, but presented several advantages over lac-plaster. When the latter is left as a dressing for several days together, the discharge, even though small in amount, soaking into the absorbing cloths, loses the carbolic acid it had received from the plaster, and, putrefying from day to day, assumes an acrid character, and sometimes produces most troublesome irritation of the skin. This is, of course, avoided by the oakum. Again, the lac-plaster being quite impermeable to watery fluid, keeps the skin beneath it moist, and, in fact, covered with a weak watery solution of carbolic acid, which, I suspect, insinuated itself more or less beneath the protective, and maintains a slight stimulating influence upon the parts beneath into it. But oakum, draining away the discharge as fast as it is effused, avoids this source of disturbance. The result is that, if a granulating sore is thoroughly washed with an antiseptic lotion and covered with ' protective ' and a well-overlapping mass of oakum secured

with a bandage, a dressing is provided which nearly approaches the ideal I have long had in view."—*Collected Papers*, vol. II., p. 168.

SERO-SUBLIMATE GAUZE.

SAL ALEMBROTH.

CORROSIVE SUBLIMATE.

"Corrosive sublimate has been used extensively already by our German brethren, chiefly in the form of sublimate wood-wool, as it is called, in which one-half per cent. of corrosive sublimate, with an equal part of glycerine, is mixed with what is termed 'wood-wool,' namely, pine-wood reduced almost to a state of powder by suitable machinery. This is highly absorbent. It is employed in large masses, and, so used, has given many excellent results. At the same time, it is somewhat unwieldy in its application. Under certain circumstances, it is not convenient to have so large a mass as is essential for its safety, and we have also varying reports as to its efficacy; and I may remark that we find some surgeons satisfied with what others would regard as a very mediocre kind of success with antiseptic treatment."—*Collected Papers*, vol. II., p. 297.

CYANIDE OF MERCURY.

". . . The inhibitory property of cyanide of mercury was a most important point if in other respects the salt were not disadvantageous; but, unfortunately, it proved to be so highly irritating that the greater irritating property of the cyanide of mercury more than counterbalances its superior inhibitory power. It naturally occurred to me that the cyanide of mercury might perhaps combine with some other cyanide and form a double salt, having advantages corresponding with those presented by sal alembroth as compared with bichloride of mercury. I tried the soluble double cyanide of mercury and potassium, but found it quite too irritating."—*Collected Papers*, vol. II., p. 313.

ABSORBENT GAUZE.

"There are different ways in which absorbent gauze such as this may be charged. One is to pass it folded in about sixteen layers through a trough, such as the one before me, which I have myself used, having a bar near the bottom to ensure the gauze being kept well under the liquid. It is then, as soon as you please, squeezed to press out superfluous liquid, and then, if wanted for immediate use, a simple way is to place the masses of gauze—say six-yard pieces—in a folded sheet, turn the folded sheet over them, and roll it up. The folded sheet then absorbs the still redundant liquid, and you have moist gauze ready for use in five minutes. For the use of the ordinary surgeon it will probably be best to have the gauze dried, on the understanding that it is again moistened with 1 to 4000 sublimate solution before being used."—*Collected Papers*, vol. II., p. 319.

LISTER'S CARBOLISED GAUZE.

ANTISEPTIC GAUZE.

"For preventing the access of putrefactive fermentation, the agent which we now commonly use is what we have termed the antiseptic gauze—being a loose cotton fabric, the fibres of which are impregnated with carbolic acid securely lodged in insoluble resin, which holds the carbolic acid with remarkable tenacity, while at the same time a little paraffin is added to prevent the adhesiveness which the mixture of carbolic acid and resin would otherwise possess. The interstices between the fibres are kept free from these ingredients, so that the fabric, being porous, may be fitted for absorbing discharges. The carbolic acid is in considerable quantity in the gauze; but it is held so tenaciously by the resin that, on the one hand, when first applied, it is unirritating to the human skin, and, on the other hand, unless discharge be very copious, it will retain its virtues for upwards of a week at the temperature of the human body. Now, supposing I were going to use this gauze for dressing any case in which a copious discharge was expected—as,

for example, a large psoas abscess immediately after it had been opened—I should take considerable quantity of gauze (about as much as one could conveniently hold between the extended hands) and fold it three times so as to make it eight layers."—*Collected Papers*, vol. II., p. 179.

CYANIDE GAUZE.

" The dyed salt, having been drained and dried at a moderate heat, is levigated, and may then be kept for any length of time fit for use. When employed for charging a dressing, it is diffused by means of pestle and mortar in solution of bichloride of mercury (1 to 4000) in sufficient abundance to drench the fabric thoroughly, for which four imperial pints to 100 grs. of the salt will be found adequate. This will give a percentage of between two and three of the cyanide to the dry gauze. For reasons which I have stated elsewhere, the gauze should always be used moist ; and if it be prepared for immediate use, as by the dispenser of a hospital, the process of drying may be omitted, the gauze, after being hung up for a while to drain, being deprived further of superfluous moisture by placing it for a while in a folded sheet. It may afterwards be conveniently kept moist by wrapping it in a piece of mackintosh cloth. When obtained dry from the manufacturer, it should be moistened again with the weak corrosive sublimate solution before it is used."—*Collected Papers*, vol. II., pp. 327 *and* 328.

MACKINTOSH OR JACONET.

" It is essential, if you expect much discharge, that the dressing should be large—that there should be a considerable space between the wound or source of the discharge, and the edge of the gauze dressing, otherwise you will not have material enough to ensure the absence of putrefaction. If I were to put it on as it is—gauze and nothing more—the discharge would come directly through the porous material, and, passing over and over through one limited portion, would probably, in spite of the retentive property of the resin, wash out all the carbolic acid from that part before twenty-

four hours had expired; and as soon as the antiseptic had thus been removed from that portion of the gauze, putrefaction would spread in. I therefore interpose under the outermost layer some impermeable tissue *to prevent the discharge from traversing the gauze directly, and compel it to travel through its entire breadth.*"—*Dublin Journal of Medical Science*, 1879, vol. LXVIII., p. 101.

OILED SILK PROTECTIVE.

"There is yet one other point to which I must allude, which is, that carbolic acid interferes with the cicatrisation of a wound if it acts directly on it. This agent operates with special energy on the epidermis. Sometimes this is a convenience; for example, if we dip the forefinger into a carbolic acid lotion, and hold it there for a second or two, we may be certain that the epidermis is so imbued with the carbolic acid that it is for the time antiseptic, and therefore may be introduced into the cavity of an abscess or any other part which we wish to explore. But this action of the acid on the epidermis makes it interfere with cicatrisation; and, even the gauze, though generally free from irritative influence upon the sound skin or an old scar, will frequently, if applied directly to a wound, entirely arrest new epidermic formation and sometimes excoriate a tender young cicatrix. Something, therefore, must be interposed to protect the wound from this effect of the antiseptic. What we have generally used hitherto for this purpose is what we have called the '*oiled skin protective*,' consisting of oiled silk varnished with copal varnish, which makes it much less permeable to the carbolic acid. But, unfortunately, this is not a perfect protective. It acts admirably until it becomes moistened; but afterwards, the water that penetrates the substance conveys the carbolic acid inwards. I have striven in various ways to get something perfect in that way; and I have lately been engaged in a manner which, though not yet completely successful, may be mentioned on account of its interest otherwise. Some time since, I tried the effect of an oil-paint on oiled silk, in the hope that the particles of pigment, closely packed, might serve considerably to intercept the carbolic acid,

though the oily material that cements the particles is permeable to it. The result was such as I had hoped, except that the material proved too stiff for convenient use."—*British Medical Journal*, 1871, II., p. 229.

ADHESIVE STRAPPING.

" If strapping is required, common adhesive plaster may be rendered antiseptic by dipping it for a second or two in a watery solution of the acid, and it is most convenient to have the lotion hot (say one part of one to twenty with two parts of boiling water), so that the strap is warmed at the same time by its immersion. It can then be applied effectively under the spray, which should always be used in changing the dressings of a stump till the wound has become superficial."—*Holme's System of Surgery*, 1871, vol. V., p. 624.

SPONGES.

" The sponges, after being used for an operation, are put into a vessel of water, and left there till the fibrine in their pores has been converted by putrefaction into a slimy liquid which can be readily washed out. They are then squeezed in successive portions of water till they cease to discolour it, and, after having been well wrung, they are thoroughly moistened with the 1–20 watery solution of carbolic acid. The sponges, after being so treated, have, very likely, a decided putrefactive odour clinging to them, but this is a matter of small moment. The presence of a little of the *products* of putrefaction will do no harm if the *causes* of the fermentation have been destroyed."—*Lancet*, 1875, I., p. 469.

REPRODUCTIONS OF VARIOUS EXPERIMENTS PERFORMED BY LISTER

OBSERVATIONS ON THE EFFECTS OF IRRITANTS UPON PIGMENTS AND VESSELS OF FROG'S FOOT. *Plate* 1.—Shows (LEFT) congested vessels and stellate pigment cells in part of web acted upon by mustard ; an intermediate zone with pigment fully diffused ; and (RIGHT) part of web not

acted upon by mustard, and having normal blood vessels and small patches of pigment. During the experiment the animal's body became much paler in the parts to which the mustard had not been applied. *Plate* 2.—Shows (BOTTOM) inflammatory congestion produced by pinching the web. The animal grew much paler owing to contraction of pigmentary tissue in uninjured part (TOP). "On the early Stages of Inflammation." *Philosophical Transactions*, Vol. CXLVIII., part II. for 1858, p. 545.

EXPERIMENTS ON THE COAGULATION OF THE BLOOD.

(i.) One of the earliest of Lister's experiments was made with a view to the corroboration of the theory that blood outside the body coagulated by reason of the escape of ammonia.

A rubber tube was inserted into the jugular vein of a sheep in such a manner that the blood flowed through the tube and then continued its natural course. While the blood was circulating the tube was tied into a number of airtight receptacles containing blood. The blood in these receptacles was examined after various intervals of time.

(ii.) "It has long been known that if blood is stirred with a rod the process of coagulation is promoted. It seemed desirable to ascertain distinctly whether the cause of this was the contact of the foreign solid, or the opportunity given for the escape of ammonia."

A bent glass tube was tied into the carotid artery of a calf and the apparatus shown was filled with blood. It was then divided by clamps. The orifice of the upper portion was, of course, exposed to the air; the lower portion was sealed.

The blood in the lower portion was churned by means of the wooden handle and wire cross-pieces.

(iii.) In his experiments on the coagulation of the blood, Lister constructed an apparatus consisting of a spiral of silver wire inside a small glass tube.

The carotid artery of a horse having been opened, the tube was thrust in as far as the common carotid. It thus had a full current of arterial blood flowing through it.

The period it took arterial blood to show first appearance of coagulation in a watch-glass being known, the apparatus was removed soon after, and,

on taking out the coil of silver wire, Lister found that it was already crusted over with coagulum. "On the Coagulation of the Blood." Croonian Lecture, *Proc. Roy. Soc.*, 1863.

EXPERIMENTS ON THE GERM THEORY.

Quantities of the same specimen of urine were introduced into four glass flasks, so as to make each about one-third full. The necks were washed and were then drawn out in a spirit lamp into tubes less than a line in diameter. Three of these fine tubes were bent at various acute angles, while the fourth was left short and vertical, though equally narrow. Each flask was boiled for five minutes, after which they were all left exposed to the air. *British Medical Journal*, 1871, vol. II., p. 225.

EXPERIMENTS REPRODUCED TO ILLUSTRATE THE GERM THEORY OF PUTREFACTION AND OTHER FERMENTATIVE CHANGES AND THE NATURAL HISTORY OF TORULÆ AND BACTERIA.

(i.) *November* 16*th*, 1871.

Urine was passed direct from a urethra treated with 1 in 40 carbolic into six purified wine glasses. A minim of tap-water was introduced into glasses Nos. 1 and 2, and a much smaller quantity into glass No. 3. All the glasses, with the exception of glass No. 6, which was left exposed to the air for twelve hours, were immediately put under a glass plate.

(ii.) *November* 21*st*, 1871.

Urine was passed into a purified flask with cap. Four purified wine glasses were charged from this flask, Nos. 1 and 2 having separate square glass covers, Nos. 3 and 4 having inverted porcelain evaporating dishes as covers. The residual urine in flask was boiled for nine minutes and purified glasses Nos. 5 and 6 were charged with boiled urine, No. 5 having a drop of tap-water added. Glass No. 1 was exposed to air for forty minutes, and glass No. 2 exposed for 9½ hours. The two with porcelain covers were not exposed at all. Glasses Nos. 1 to 5 were all covered with a glass shade, glass No. 6 remaining outside, there being no room for it.

(iii.) *December* 13*th*, 1871.

Lister took a purified wine glass with cover into the street in the evening during a drizzling rain : he allowed a few drops to fall into the

glass, and, replacing the cover, brought it in and charged it with unboiled urine from a purified flask.

LISTER'S "GLASS GARDEN."

In order that he could watch the growth of the special cells of torula which appeared in the scum of uncontaminated urine, and his experience having shown him that the thin layer of atmosphere between two glass plates was exhausted in a few hours, Lister devised what he termed a "glass garden."

A small drop of organism and medium was placed on the central island, and in order to ensure a moist atmosphere in the air chamber, a drop of boiled water was introduced into the surrounding "ditch." The whole was covered by a piece of thin covering glass, the margins being luted down with paraffin. Lister says: "In these conditions I have watched one and the same organism continuing to grow unmixed for several weeks together." "A Contribution to the Germ Theory of Putrefaction and other Fermentative Changes and the Natural History of Torulæ and Bacteria." *Trans. Roy. Soc., Edin.*, 1875, vol. XXVII., pp. 313-344.

EXPERIMENTS ON THE NATURE OF FERMENTATION.

(i.) Blood from the jugular vein of an ox was allowed to flow into a purified flask. A purified liqueur glass was charged from this flask and covered with a pure glass cap and shade.

(ii.) A liqueur glass of unputrefied blood was mixed with some water which had been boiled and cooled in a flask under the protection of a cotton cap.

(iii.) A flask of boiled milk was prepared on August 27th, 1877. Professor Lister showed it on October 1st, 1877. There was no fermentation and the milk was quite sweet. A liqueur glass was charged from this flask and covered with a cap and shade.

(iv.) One set of liqueur glasses was charged with boiled milk, and into each glass half a minim of unboiled water was introduced.

A second set of glasses was also charged with boiled milk, the shades were taken off at different times and the contents exposed to air for half-an-hour.

(v.) Experiments with Milk in little Glass Tubes.

The objects of the experiments with the little glasses was the proof that unboiled milk coming from a healthy cow really contains no material capable of giving rise to any fermentative change or the development of any kind of organisms which we have the means of discovering.

(i.) Milk received from cow in cowhouse to purified flask. Twelve small test tubes were then charged with purified pipette.

(ii.) The same experiment performed again with 24 tubes in the open air on a fine day.

(iii.) Milk was drawn from the cow, after the dairywoman's hands and the cow's teat had been washed, into the large end of two glass tubes connected by a piece of rubber tubing, which was compressed. Experiment performed in the open air on a drizzling morning. Twelve test tubes were filled from this glass tube by relieved pressure on rubber tube. "On the Nature of Fermentation." *Quarterly Journal Microscopical Science,* 1878, vol. LXX., p. 177.

Experiments on the Lactic Fermentation and its bearing on Pathology.

In order to find absolute evidence whether the bacterium lactis was or was not the cause of lactic fermentation, Lister set out to determine the number of bacteria in a given quantity of souring milk. He succeeded in doing this by means of an ingenious glass syringe which he had made. "On Lactic Fermentation and its Bearings on Pathology." *Trans. Path. Soc.*, London, 1878, vol. XXIX., p. 19.

Experiments on the Nature of Fermentation.

(i.) Having obtained an average, what he estimated at about rather less than one *B. lactis* to one drop from the syringe, Lister inoculated five liqueur glasses of boiled milk with one drop each.

(ii.) Having presumably got the Bacterium lactis in its pure form, the following tubes were inoculated as follows :—

A. Five covered test tubes with a drop each estimated as containing two *B. lactis.*

B. Five covered test tubes with a drop each estimated as containing one *B. lactis.*

C. Five liqueur glasses with a drop each estimated as containing one *B. lactis.*

D. One liqueur glass with a drop each estimated as containing four *B. lactis*.

From these experiments with the little tubes we have "absolute evidence that the *Bacterium lactis* is the cause of lactic-acid fermentation, and thus I venture to believe that we have taken one sure step in the way of removing this important but most difficult question from the region of vague speculation and loose statement into the domain of precise and definite knowledge." "On the Nature of Fermentation." *Quarterly Journal Microscopical Science*, 1878, vol. LXX., p. 177.

London Period, 1877-1912.

Photographs.

Lister's Patent of Baronetcy. Created Baronet in 1883.

Lister and his assistants in the Victoria Ward, King's College Hospital, Male Surgical Ward, 1890.

Lister and Pasteur embracing at Pasteur's Jubilee at the Sorbonne, 1892.

Photograph signed "Joseph Lister" (side view).

Lister's Patent of Barony. Raised to the Peerage in 1897.

Lister's Patent of Arms of Peerage of the Realm. Granted in 1897.

Lister's Coat-of-Arms.

Arms.—*Ermine, on a fess invected sable, three mullets of six points argent, in chief a staff erect entwined by a serpent proper.*

Crest.—*On a wreath of the colours (argent and sable). In front of a stag's head erased proper three mullets of six points argent.*

Supporters.—*On either side a stag proper, gorged with a chain or pendant, therefrom an escutcheon ermine charged with a cubit, arm erect holding a staff entwined by a serpent, both proper.*

Motto—"Malo Mori Quam Foedari."—*The shield contains also the baronet's hand of Ulster, which is on a canton argent, a sinister hand erect gules.* Lord Lister was entitled to use this canton with a red hand as a baronet.

Group beside the train, taken during Lord Lister's visit to Canada in 1897.

The guests at the Banquet to Lord Lister, May 26th, 1897, given by his former House-Surgeons, Clerks and Dressers.

Lord Lister as President of the Royal Society.

Lord Lister.

Address from the Royal Faculty of Physicians and Surgeons, Glasgow, to Lord Lister, on the Completion of his Eightieth Year, April, 1907.

Address from the Managers of the Royal Infirmary, Glasgow, to Lord Lister, on the Completion of his Eightieth Year, April, 1907.

Address from the President and Fellows of the Royal College of Physicians of London, to Lord Lister, on the Completion of his Eightieth Year, April, 1907.

Address from the Members of the Eastern Suburbs Medical Association of Sydney, New South Wales, to Lord Lister, on his elevation to the Peerage, March 9th, 1897.

Address from the Members of the British Guiana Branch of the British Medical Association, to Lord Lister, on his elevation to the Peerage. Dated April 29th, 1897.

Address from the Royal College of Physicians of Edinburgh to Lister congratulating him on reaching his eightieth year.

Royal intimation, signed by Leopold II., King of the Belgians, informing Lister of his nomination as Honorary Member of the Académie Royale de Médecine de Belgique.

Wreath sent by the Pasteur Institute, Paris, at Lord Lister's funeral.

Copies of Diplomas, Certificates, etc.

Austria-Hungary.

Kaiserliche Akademie der Wissenschaften, Wien.
Honorary Membership: July 20th, 1897.

University of Budapest.
Honorary Degree of Doctor of Medicine: May 13th, 1896.

Belgium.

Académie Royale de Médecine de Belgique.
Honorary Membership: May 16th, 1879.

Canada.

McGill University.
Honorary LL.D.: September 1st, 1897.

University of Toronto.
Honorary Degree of Doctor of Civil Law: August 24th, 1897.

FINLAND.

Finnish Medical Society.
Honorary Membership: March 5th, 1881.

FRANCE.

Société de Chirurgie de Paris.
Foreign Membership: January 7th, 1880.

GERMANY.

Ärtztliche Verein zu München.
Honorary Membership: June 15th, 1875.

Deutsche Gesellschaft für Chirurgie.
Honorary Membership: April 8th, 1885.

Society of the Friends of Science of Posen.
Honorary Membership: February 2nd, 1891.

(*Bavaria.*)

University of Würzburg.
Honorary Degree of Doctor of Medicine: August 2nd, 1882.

GREAT BRITAIN.

Edinburgh Medico-Chirurgical Society.
Honorary Membership: April 9th, 1884.

Hunterian Society, London Institution.
Honorary Fellowship: November 28th, 1888.

London Medico-Chirurgical Society.
Honorary Membership: July 15th, 1905.

Royal College of Surgeons of Edinburgh.
Honorary Fellowship: July 15th, 1905.

Royal College of Surgeons in Ireland.
Honorary Fellowship: April 28th, 1886.

Royal University of Ireland.
Honorary Degree of Master of Surgery: October 27th, 1887.

University of London.
Honorary D.Sc.: June 24th, 1903.

GREECE.

Constantinople Hellenic Society of Literature.
Honorary Membership: (1881).

HOLLAND.

Society for the Advancement of the Natural Sciences, Medicine and Surgery of Amsterdam.
Honorary Membership: November 5th, 1879.

ITALY.
Accademia delle Scienze dell' Istituto di Bologna.
Corresponding Membership: December 21st, 1890.
Reale Società Italiana d'Igiene.
Corresponding Membership: July 20th, 1891.
Regia Universita degli Studi di Bologna.
Honorary Degree of Doctor of Medicine and Surgery: July 13th, 1888.

MEXICO.
National University of Mexico.
Honorary Doctorate: September 22nd, 1910.

NORWAY.
Norwegian Medical Society.
Foreign Membership: November 3rd, 1869.

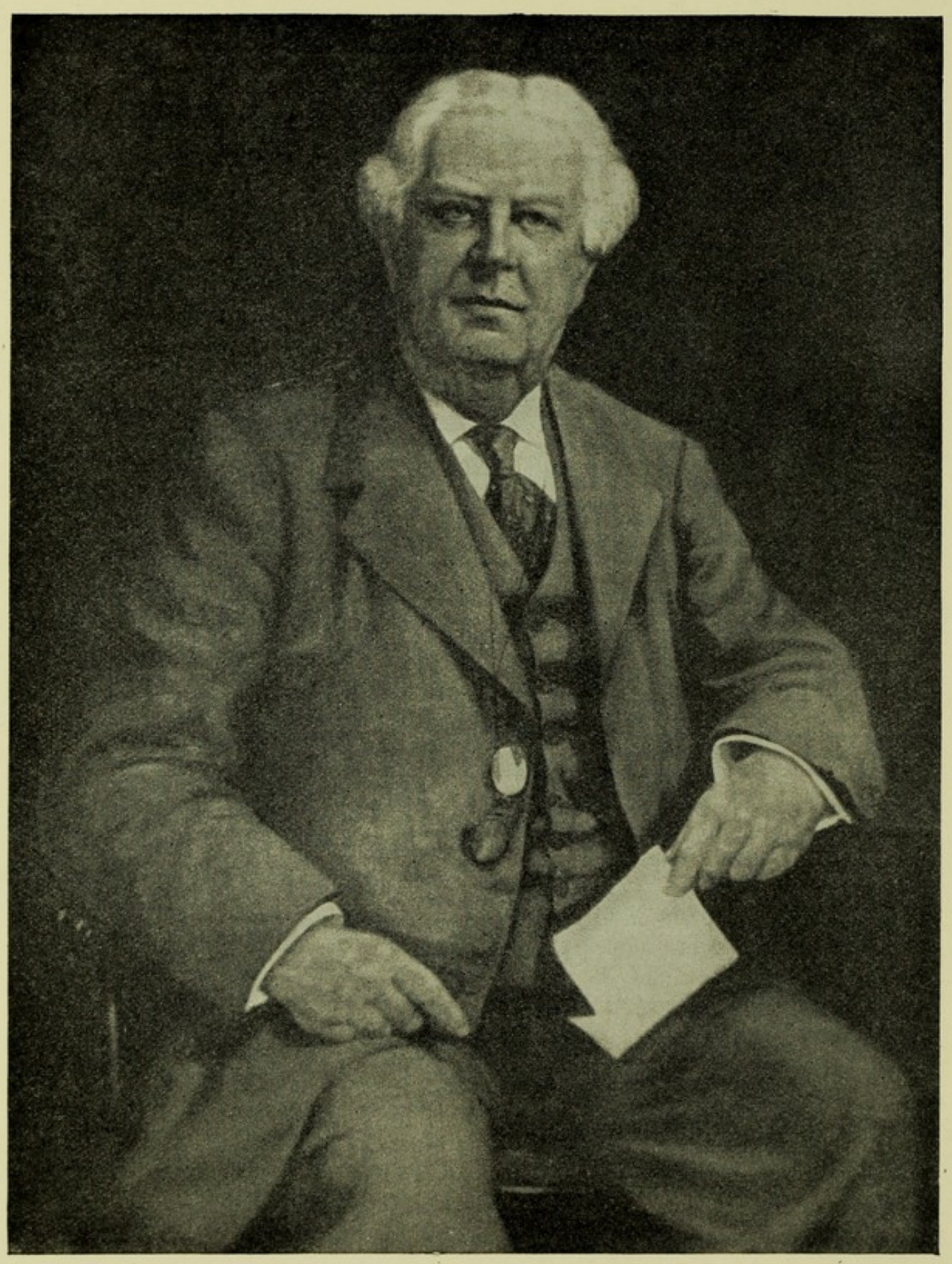
RUSSIA.
Imperial Caucasian Medical Society.
Honorary Membership: March 25th (O.S.), 1887.
Imperial Military Academy of Medicine of St. Petersburg.
Honorary Membership (and translation of Diploma into French): March 12th (O.S.), 1899.
Imperial University of St. Vladimir, Kiev.
Honorary Membership: September 8th (O.S.), 1884.
University of Moscow.
Honorary Membership: April 16th (O.S.), 1884.

SWEDEN.
Royal Swedish Academy of Sciences.
Foreign Membership: February 13th, 1889.

SWITZERLAND.
Société Vaudoise de Médecine.
Honorary Membership: January 23rd, 1882.
Université de Genève.
Honorary Degree of Doctor of Medicine: July 9th, 1909.

TURKEY.
Société Impériale de Médecine de Constantinople.
Honorary Membership: July 29th, 1889.

UNITED STATES OF AMERICA.
American Surgical Society.
Honorary Membership: April 25th, 1905.
National Academy of Sciences of the United States of America.
Diploma of Foreign Associate: April 20th, 1898.
New York Academy of Medicine.
Honorary Fellowship: February 4th, 1904.



SIR HECTOR C. CAMERON, C.B.E., M.D., LL.D.

From a Portrait in the Wellcome Historical Medical Museum

A Short Account of the Evolution of Lister's System of Antiseptic Surgery

BY

Sir Hector C. Cameron, C.B.E., M.D., LL.D.

Emeritus Professor of Clinical Surgery, and Dean of Faculties,
University of Glasgow.

The part which the Wellcome Historical Medical Museum is about to play in the celebration of the centenary of the birth of Lord Lister, will, I am sure, prove a very striking one.

The extraordinary and industrious enterprise of its officials has collected an immense amount of material connected with his life and life's work, and these memorials will all be on exhibition on the third evening of the celebration in the main hall of the Museum. A handbook will be published in connection with it, and I have been asked to write a few general introductory remarks. I feel that I cannot do better than describe the steps by which Lister gradually evolved his treatment, working with enormous industry and patience, in the face of much difficulty, opposition and discouragement.

Someone may well ask why this unique honour should be offered to Lister; what is there in his life work or its subsequent consequences which entitle them to so great and unusual recognition? The reply is, I think, that he devised a method of making and of treating all wounds on a plan which has been productive of results such as no wound treatment had achieved through all the centuries.

Before he came to Glasgow as Professor of Surgery, he had already made a prolonged study of the causes of inflammation and suppuration of wounds. He was satisfied that they were due to decomposition of the blood and serum of the wound, brought about in some way by the influence of the atmosphere. Further than this it seemed difficult to make any

progress in the elucidation of the subject, and it was generally believed that Liebig's teaching that this decomposition, and that of all other organic fluids exposed to the air, was due to the oxygen which the air contained.

About this time Dr. Thomas Anderson, his colleague, the Professor of Chemistry, with whom he often conversed on such subjects, drew his attention to certain communications of the French chemist, Pasteur, published in the *Comptes Rendus*, dealing with the causes of fermentation and putrefaction. No sooner had he read these than he was convinced of their truth. He repeated with his own hands those which seemed the most convincing of these experiments, and at once became a convert to the views which Pasteur held. Soon afterwards he wrote: "We find that a flood of light has been thrown on this most important subject by the philosophic writings of M. Pasteur, who has demonstrated, by thoroughly convincing evidence, that it is not to its oxygen, or to any of its gaseous constituents, that the air owes this property, but to minute particles suspended in it, which are the germs of various low forms of life, long since revealed by the microscope, and regarded as merely accidental concomitants of putrescence; but now shown by Pasteur to be its essential cause resolving the complex organic compounds into substances of simpler chemical constitution, just as the yeast plant converts sugar into alcohol and carbonic acid."

Thus Lister became a convert from this time onwards to what, in the language of that day, was known as "the germ theory of putrefaction." From that day forward, also, he was always conscious of the very great debt he owed to Pasteur in enabling him to do the work that he afterwards did. For upon this knowledge he built up entirely his new procedures. These altered and revolutionised the whole of surgery, producing a change such as the progress of centuries had not been able to achieve. He so wedded Science and Surgery that the union is now indissoluble. He also, at this early stage, himself engaged in the study of infinitesimal organisms of various kinds and their differentiation by experiments, as Pasteur had done. In this connection, I remember being present, I think in 1873, at a large meeting of the Royal Society of Edinburgh, presided over by the President, Sir William Thomson, afterwards Lord Kelvin, when Lister

read an important and interesting paper on "The Germ Theory of Putrefaction," full of the most ingenious experiments, for the satisfactory performance of which he had devised the appropriate apparatus. The President, after making very complimentary remarks on the communication, used words like these: "I believe we are at the beginning of a new science which, for want of a better name, I may refer to as *microscopical horticulture*. How far it will go it may be difficult to say." No one at that stage could have predicted its rapid and enormous advance, or foreseen that professorships and lectureships of the subject should now be established, and laboratories built for its pursuit, in almost every school of scientific learning in the world.

It is universally recognised that a great truth does not influence most the generation that gave it birth, and holding, as Lister did, that a knowledge and belief in the germ theory was essential to the successful practice of Surgery, he always took care that the students were made conversant with its facts as far as then known. He realised that a belief in these matters, and the evolution of a treatment to obviate sepsis in wounds, was not to be accomplished in a day. As a matter of fact, it has taken at least a generation to reach its present condition of efficiency. The older practitioners were so confirmed in their habits and forms of treatment, that, while perfectly willing to try the effects of a new dressing, they declined to submit themselves to the discipline of the germ doctrine. But Lister had great faith in youth, and it was to his students that he looked for the future success in Surgery of the principles which he was endeavouring to promote.

In his earliest efforts in antiseptic treatment he directed his attention to compound fractures. They were at that time the most fatal of all surgical injuries and were responsible for a great many of the cases of pyæmia which were of such frequent occurrence in all hospitals. The method adopted for applying this newly-conceived principle of treatment was as follows: A small piece of calico or lint, thoroughly saturated with undiluted carbolic acid, and held in a pair of dressing forceps, was introduced into the wound, and all its accessible interstices were thoroughly and freely swabbed with it. Two layers of lint, also saturated with the undiluted acid,

were laid over the wound, overlapping it in all directions for about half-an-inch. This was covered by a piece of thin block tin, moulded in a concave form and fixed in position by strips of adhesive plaster, the limb being placed in suitable splints, padded with some soft and absorbent material, which received the bloody discharge oozing from the wound during the first day or two. The carbolic acid and blood formed a thick paste with which the small piece of lint was thoroughly saturated, making it into a sort of crust or scab which adhered to the wound with great tenacity. Once a day the tin cap was removed and the crust of blood was painted over lightly with carbolic acid. What was aimed at was to prevent this crust from becoming septic, while the surface of it in contact with the wound gradually lost the carbolic acid which it had first contained, and so, being unirritating in itself, permitted of healing beneath it. In this respect, the early treatment was an imitation of those few but fortunate cases, often referred to in the surgical writings of the day, in which a small wound communicating with a fracture became covered by a dry clot of blood or a dry piece of bloody lint. This adhered, and under it healing took place without suppuration. It was this "healing by scabbing" that Lister tried to imitate.

The first advance after this crude form of treatment was dressing with an antiseptic putty. This was made by mixing ordinary whiting (carbonate of lime) with a solution of carbolic acid, in boiled linseed oil. It was spread upon calico to the thickness of about a quarter-of-an-inch. Between the wound and the putty there was a piece of lint soaked in carbolic oil, which soon became saturated with blood. The dressing of putty was changed daily, but the piece of oiled lint, harbouring under it a crust of blood, of greater or less amount, was not interfered with. It became fairly dry, and when the time arrived for discontinuing the splints, either a firm cicatrix or a superficial granulating sore was exposed to view.

The same dressing was now used in all cases, whether incised wound, compound fracture, or abscess.

In the treatment of these fractures, Lister had the opportunity of making observations on the absorption of blood clot, dead bone, and sloughs of the soft parts, which gave rise to so much criticism at the time

of their publication, and which suggested to him a valuable practice, subsequently introduced, when he employed for the first time antiseptic absorbable ligatures. In the course of his report on one of these early observations, he wrote :—

" I was detaching a portion of the adherent crust from the surface of the vascular structure, into which the extravasated blood beneath had been converted by the process of organisation, when I exposed a little spherical cavity about as big as a pea, containing brown serum, forming a sort of pocket in the living tissues, which, when scraped with a knife, bled even at the very margin of the cavity. This appearance showed that the deeper portions of the crust itself had been converted into living tissue. For cavities formed during the process of aggregation, like those with clear liquid contents in a Gruyère cheese, occur in the grumous mass which results from the action of carbolic acid upon blood ; and that which I had exposed had evidently been one of them, though its walls were now alive and vascular. Thus the blood that had been acted upon by carbolic acid, though greatly altered in physical characters, and doubtless chemically also, had not been rendered unsuitable for serving as pabulum for the growing elements of new tissue in the vicinity."

In like manner he reported an observation, quite novel at the time, of the absorption of some dead bone on the end of a fragment which lay exposed in the wound of a compound fracture. This knowledge of the absorbability of blood-clot, sloughs and dead bone gave him confidence that ligatures of organic material properly prepared might be used for tying cut blood vessels and left in the wound. Before putting the matter to the test in actual practice, he tried both silk and catgut for this purpose, on the carotid arteries respectively of the horse and calf. The ultimate result was that he fixed upon catgut for the purpose, rendered sterile by different chemical methods. By this means the old practice of leaving ligatures hanging from the ends of the wound was entirely got rid of. In pre-antiseptic days they acted as putrid setons ; and when the slough produced by their knot had to separate, it was too often the cause of severe hæmorrhage.

After the lapse of some time, it was felt that although the antiseptic putty had yielded striking results, it was attended with various

inconveniences. Lister expended an enormous amount of time and patience in finding a satisfactory substitute. This he ultimately found in his antiseptic lac plaster. A mixture of one part of carbolic acid in four parts of shellac was spread in thin layers on calico and painted over with a solution of india-rubber in benzine. When the benzine evaporated, the thin layer of india-rubber was left, preventing all adhesion of the plaster to the skin, but in no way interfering with the action of the antiseptic. This dressing proved more satisfactory in every way than the putty.

No one has ever recognised more fully than did Lister the necessity of limiting the irritating effects of the chemical substances employed in the treatment. It has been proved that the acid passed freely through gutta-percha tissue and thin sheets of india-rubber, but, on the other hand, the common oiled silk, used for covering water dressings, was much less penetrable by it. Taking oiled silk as a basis, he covered it with gum copal, which offers even stronger opposition to the passage of carbolic acid than oiled silk itself, and lastly, painted over both a solution of dextrine. This ensured that, when dipped in a solution of carbolic acid, the plaster was uniformly wetted. The acid was soon dissipated, and the plaster became an unstimulating covering of the wound, defending and protecting it from the direct action of the superimposed and widely overlapping antiseptic dressing. Lister, for distinction's sake, called it the protective plaster.

I have now described shortly the means which he used for ensuring asepsis in wounds up to the time when he left Glasgow for Edinburgh. One characteristic of these early methods, soon to be changed, was that the dressings were purposely made unabsorbent and impervious to the discharges. The putty and the lac plaster alike shed the fluids from the wound, only acting upon them as they flowed beneath, and preserving, by the volatility of the antiseptic they contained, an antiseptic atmosphere in the interval between themselves and the skin.

It had now become the practice in some quarters to dress wounds with oakum, carefully selected and teased, and good reports were given of its virtues as an antiseptic dressing. It was the use of this substance which suggested to Lister the employment of gauze in surgical practice.

In the *British Medical Journal* of January 14th, 1871, he wrote: "Hitherto I have been opposed to porous antiseptic dressings, having observed that, when in the form of lint steeped in an oily solution of carbolic acid, the discharge, if at all free, washed out the antiseptic liquid from the neutral fibres and opened a way for the penetration of putrefaction; but, having heard reports from various quarters of the efficacy of oakum, I have lately put it to the test with granulating sores, where, if it should happen to fail, no mischief would result, and I have found it more than answer my expectations. The reason for its superiority over oily cloths is readily intelligible; each fibre of the oakum is imbued with an insoluble vehicle of the antiseptic; so that the discharge, in passing among the fibres, cannot wash out the agent any more than it can when flowing beneath the lac plaster, to a narrow strip of which an individual oakum fibre is fairly comparable. I may remark, as worthy of notice by those who still cling to the idea that carbolic acid has some unknown virtue distinct from its antiseptic property, that oakum contains none of that substance, but creosote, and probably other antiseptic hydro-carbons, the effects of which, in preserving smoked meat, are familiar."

The material selected by Lister and still used all over the world, either impregnated with some antiseptic agent or sterilised by heat, was a cheap muslin of open texture known in trade as "book muslin." This was charged with resin, paraffin and carbolic acid. Eight plies of this gauze were placed over the wound, overlapping it widely in all directions. But in order to prevent fluids from going straight through the eight plies of gauze, and possibly exhausting its antiseptic ingredient, a piece of very thin Mackintosh or Jaconet, previously washed in the antiseptic lotion, was incorporated with the mass of gauze by being slipped under its top layer, thus leaving seven layers of the gauze next the wound, and compelling the discharges to make their way to the margins of the dressing, instead of coming straight through. Two novel additions were made to the treatment about the same time as gauze was first used, namely, the antiseptic spray and the employment of drainage tubes.

At this time Lister believed very strongly in the power of the atmosphere to infect the wound, although he always taught us that to a

certain extent the tissues of the body were capable of defending themselves against sepsis. Otherwise, he said, in the old forms of treatment such a thing as union by first intention could never have occurred. He, therefore, conceived the idea of rendering the ordinary atmosphere with its dust innocuous, by a finely-divided spray of carbolic acid. From this time until 1890, therefore, all wounds were made and all dressings changed under its protection. At first a hand-spray was used, but very soon a spray worked by foot took its place, leaving both hands free. Afterwards a spray machine, placed on a tripod, and worked by a long handle, was introduced, but, being cumbrous, received the nickname of " the donkey engine," and was superseded by the steam spray. Lister expended much thought, time and money in perfecting this instrument, but at last he got the manufacturers to achieve a most satisfactory result.

Of the discontinuance of the spray as a part of the treatment, Lister made the following remarks in his presidential address to the British Association in 1896. After a reference to some experiments which he had made, he said: " Hence I was led to conclude that it was the grosser forms of septic mischief, rather than microbes in the attenuated form in which they exist in the atmosphere, that we have to dread in surgical practice; and at the London International Medical Congress in 1881, I hinted, when describing the experiments to which I have alluded, that it might turn out possible to disregard altogether the atmospheric dust. But greatly as I should have rejoiced at such a simplification of our procedure, if justifiable, I did not then venture to test it in practice. I knew that with the safeguards which we then employed, I could ensure the safety of my patients, and I did not dare to imperil it by relaxing them. Nine years later, however, at the Berlin Congress of 1890, I was able to bring forward what was, I believe, absolute demonstration of the harmlessness of the atmospheric dust in surgical operations. This conclusion has been justified by subsequent experience; the irritation of the wound by antiseptic irrigation and washing may therefore now be avoided, and Nature left quite undisturbed to carry out her best methods of repair."

So completely did he disavow the practice that at the International Medical Congress in Berlin in 1890, he said: " I feel ashamed that I

should ever have recommended it for the purpose of destroying the microbes of the air." This was a striking example of a rule of conduct which he professed, and which, in a letter to Pasteur on another subject, he expressed as follows: "Next to the promulgation of new truth, the best thing that I can see that a man can do, is the recantation of a published error."

In the early 'eighties, Koch's researches had drawn attention to the value of solutions of corrosive sublimate as a germicide, and very soon in many places it became extensively substituted for carbolic acid in wound treatment. Lister himself experimented with the new antiseptic, and sought to find some mercurial preparation which might be substituted for the mixture of carbolic acid, resin and paraffin in the gauze. For, if satisfactory otherwise, a mercurial compound would have this great advantage over carbolic acid, that not being volatile, it would remain for an indefinite period in a dressing which need not therefore be changed so frequently.

At the suggestion of Mr. Martindale, Lister tried the double cyanide of mercury and zinc. This salt is a white powder, which, though absolutely insoluble in water, proved capable of being dissolved in small amount in blood-serum, and, small as that amount is, it is sufficient to inhibit absolutely the development of septic microbes, while its very slight solubility in serum enables the dressing charged with it to retain its antiseptic virtues in spite of a very copious flow of serum through it. It is, at the same time, perfectly unirritating to the skin or a healing wound.

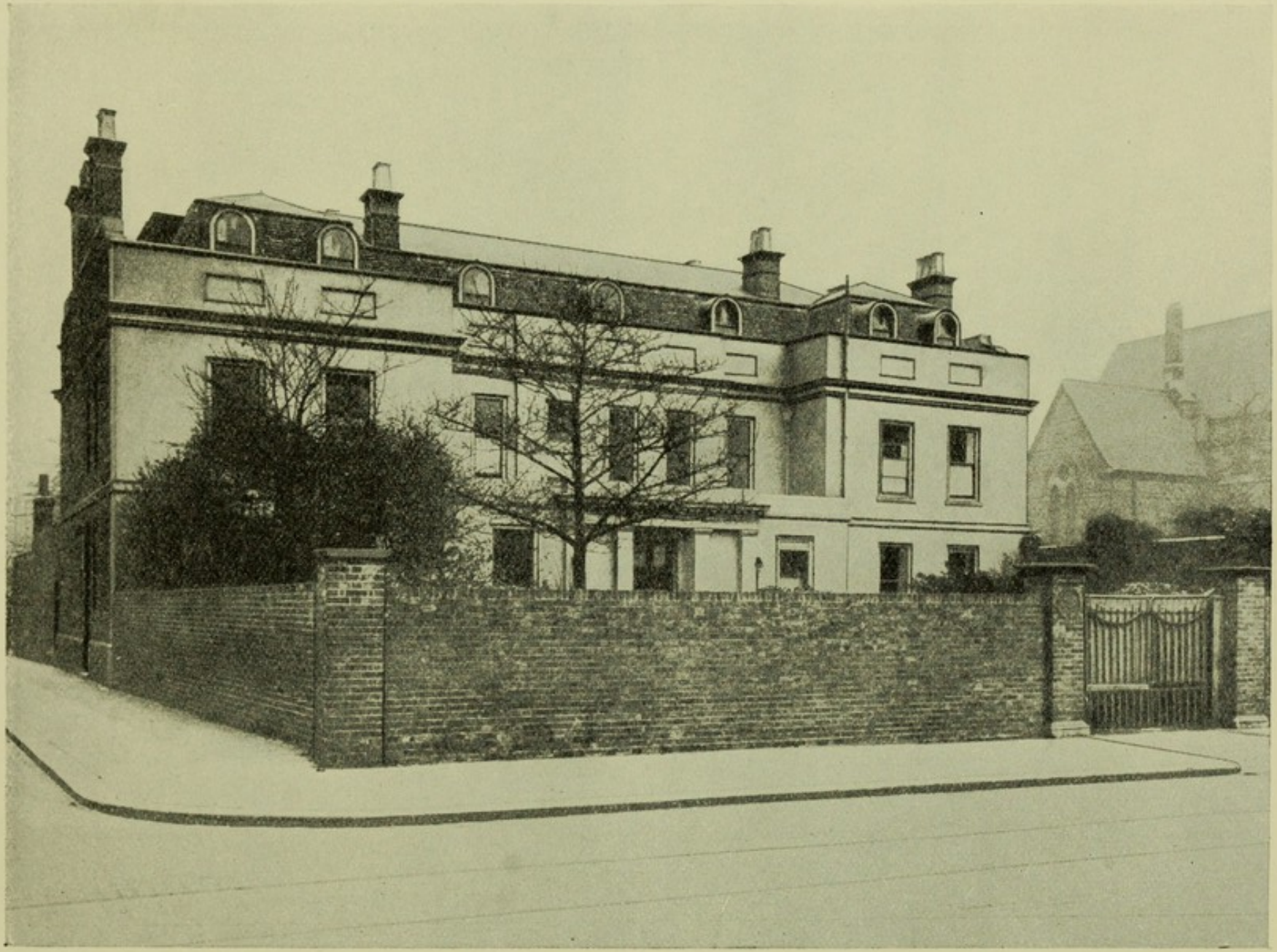
But when gauze was charged with the double cyanide by drawing it through water in which the salt was diffused, the gauze, when dried, had the great inconvenience that the powder dusted out with the greatest facility. This difficulty was at last got over by dissolving a small quantity of one of the aniline dyes in the water. This had the remarkable effect of attaching itself in a uniform manner to large quantities of the salt and at the same time fixing them securely to the fabric. All dusting out was thus prevented, while there was the further advantage that the colourless salt being dyed, the depth of tint of the gauze indicated the uniformity or otherwise of the distribution of the salt through it. A further advance was made by having the salt itself stained with the aniline dye by the manufacturing chemist,

whence its mauve colour in its present form. Though the double cyanide, when dissolved in serum, is perfectly effectual as an inhibitor of microbic growth, it has little, if any, germicidal power. Hence, any septic impurities originally attached to the gauze would have their contained microbes alive, after the mode of charging hitherto described. In order to guard against possible risk from this cause, a five per cent. solution of carbolic acid was used instead of water in the process of charging. There was still the chance of septic matter having become attached to the gauze after the preparation. Lister therefore advised that at least the portion of gauze next the wound should be moistened with a five per cent. solution of carbolic acid. Corrosive sublimate solution should not be used for the purpose, since the latter forms, with the double cyanide of mercury and zinc, a triple salt which Lister has told us is an extremely irritating substance. It was a further advantage from the use of cyanide gauze that it becomes in a very short time a dry dressing. This was the form of gauze which Lister used as long as he practised surgery.

Others have now entered into his labours, and, since his death, they have largely increased the scope of surgical procedure ; but most, indeed, one might almost say all, surgeons now have discontinued the use of gauze impregnated with chemical antiseptics, and use, for the dressing of wounds, exactly the same form of gauze sterilised by heat in specially-constructed sterilisers. They all, however, continue to use chemicals in the treatment of their hands and the patient's skin. These include, besides carbolic acid, preparations of iodine, and alcohol ; but the great end has been accomplished of abolishing sepsis and its consequences from all operations, because the principles which Lister always insisted upon have been fully accepted.

As Sir Berkeley Moynihan so well observes in the Hunterian Oration which he recently delivered : " In these days, when a patient dies, it is not because the operation leads to septic complications which he cannot withstand. We fear for him chiefly, if not only, when the extent of the operation is formidable, or when the most sensitive regions of the body, sometimes remote and almost inaccessible, are attacked by methods which, half a century ago, were beyond the wildest dreams of the most adventurous mind."

LISTER'S LONDON RESIDENCE
12, Park Crescent, Regent's Park



UPTON HOUSE, WEST HAM
Where Lord Lister was born, April, 1827

THE LIFE OF LORD LISTER

THE family of which Lord Lister was the most illustrious member lived for many generations near Bingley, in Yorkshire. Early in the eighteenth century, one Joseph Lister, great-grandfather of his renowned namesake, came to London, and there set up as a tobacconist in Aldersgate Street. His son, John Lister, having been apprenticed to watchmaking, followed that occupation for some years before taking over a wine business belonging to his father-in-law. Joseph Jackson Lister, John Lister's only son, was apprenticed on leaving school to his father's wine business, now a prosperous concern, and in due time proved himself to be a competent manager.

Although his schooling had finished when he was but fourteen years of age, Joseph Jackson Lister was a man of remarkable attainments. He was an excellent Latin scholar, and was well versed in modern languages, besides being an artist of more than ordinary skill.

Applying himself to the study of optics, Joseph Jackson Lister pursued his researches to such good purpose that in papers describing his experiments, published many years after his death, he was found to have anticipated discoveries subsequently made by Abbé and others. To his investigations into the optical properties of different kinds of glass and their combinations, we owe the production of the achromatic lens and the perfection of the modern microscope. These researches earned him, in 1832, no less a reward than a Fellowship of the Royal Society. This bent for original research, coupled with his lucidity of thought and mathematical accuracy, could not have been without effect on the early education of his children, and especially his son Joseph.

Joseph Lister, who was to be universally acknowledged as one of the greatest of mankind's benefactors, was born on April 5th, 1827. He was the fourth child and second son. His birthplace was Upton House, a delightful old Queen Anne house in pleasant grounds that had been purchased by his father at Upton, in Essex. Lister's mother, whose maiden name was Isabella Harris, had been a schoolmistress at Ackworth School, near Pontefract, and there is no doubt that from her Joseph received much valuable instruction during childhood.

Since early in the eighteenth century the Listers had been members of the Society of Friends, and it was in the tranquil, unpretentious and thrifty atmosphere of a Quaker household that Joseph Lister was brought up. A circle of Friends met at Plaistow, near Upton, and among them young Lister came into contact with several men and women of outstanding character and varied accomplishments. It may be that their abstention from more worldly amusements provided the incentive to literary and scientific study with which many Friends occupied their leisure.

Joseph Lister was educated at two private schools, the first being at Hitchin and the second at Tottenham. He was a bright boy at his work, especially at classics; but he showed no sign of precocity, having the interest and amusements of a normal lad of his age. His schoolmaster reported him to be "full of high spirits." At Tottenham, Lister received a good grounding in mathematics, natural science and modern languages.

When quite a child he began dissecting fish and small animals, and soon, to the surprise of his family, announced that when he grew up he was going to be a surgeon. In this ambition he at first received little encouragement from his father, who was a believer in the *vis medicatrix naturæ*. No obstacles were, however, placed in his way, and it became recognised that Joseph was destined for the medical profession.

At the age of seventeen he began his studies at University College, London, to which was attached a hospital that in those days was looked upon as being unusually well-equipped and up to date. He applied himself diligently to his work, and took his B.A. degree in 1847. Shortly after, a nervous breakdown, following upon an attack of smallpox, compelled him to take several months' holiday.

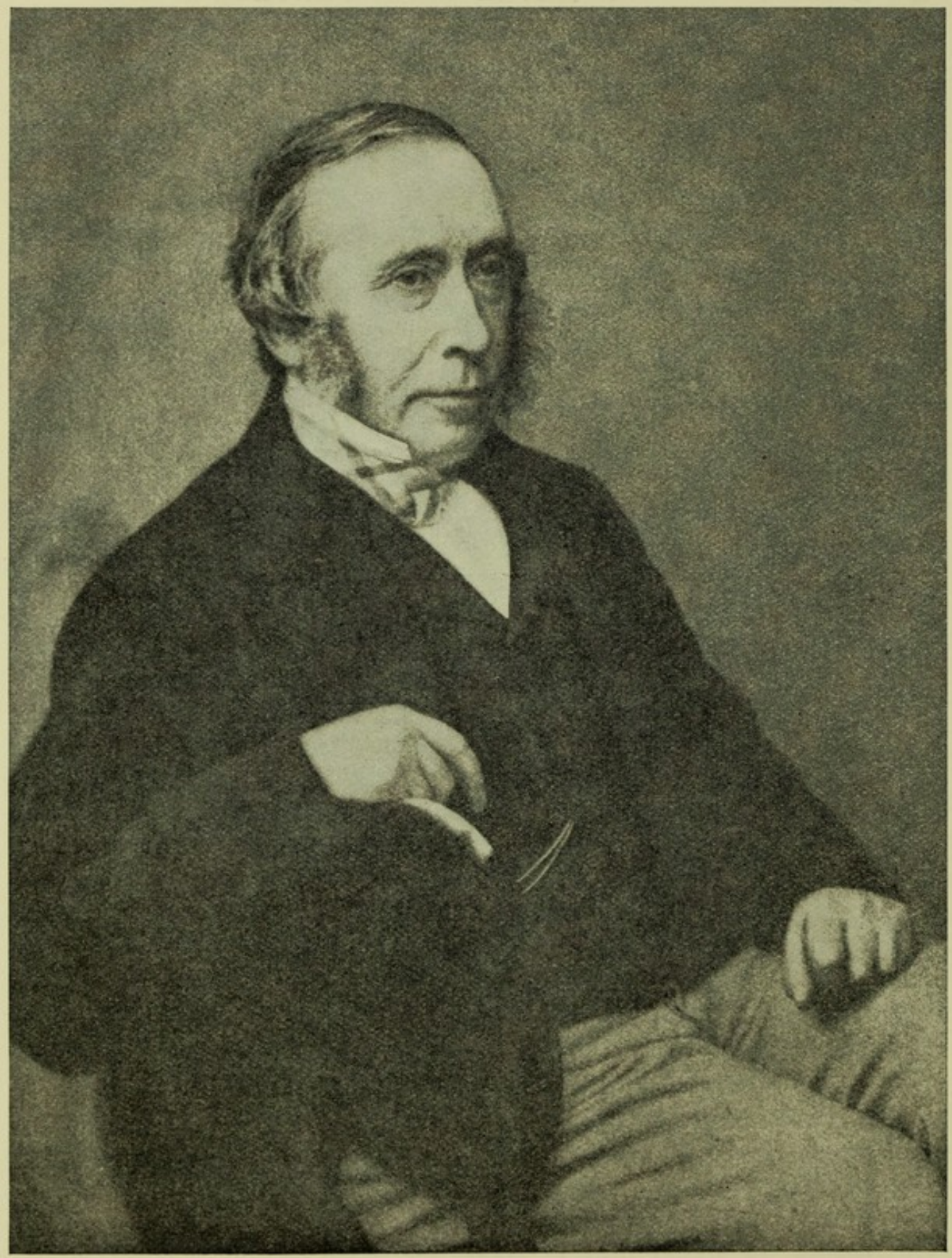
His medical studies commenced in earnest in 1848. At University College he met Wharton Jones, the Professor of Ophthalmic Medicine and Surgery, who exercised a beneficent influence over his early years as a medical student, as did also William Sharpey, Professor of Physiology. Lister came also into contact with Jenner, Walshe and Erichsen, under the last of whom he served as house surgeon.

At the period when Lister began to study surgery, anæsthetics had recently been discovered ; but although anæsthesia had eliminated one of the most shocking features of surgery—the pain inflicted upon the conscious patient—Lister was appalled at the sequelæ of surgery when he came to follow up the various cases. Suppuration, erysipelas and gangrene were dread visitants to every ward, and, indeed, to almost every patient who had been operated upon, so that too often the skill of the surgeon was nullified by their appearance. This state of affairs must have made an indelible impression on young Lister's mind.

In 1852, Lister took the degree of Bachelor of Medicine and became a Fellow of the Royal College of Surgeons, London. Obtaining his first residential appointment, he entered with zest into the social life of the hospital ; he spoke frequently at the Debating Society, and became an active member of the hospital Medical Society.

In 1853, Professor Sharpey advised a short visit to Edinburgh, and a longer period to be spent in seeing something of the methods practised in Continental schools. Accordingly, in September of the same year, Lister took lodgings in South Frederick Street, Edinburgh, and at once made the acquaintance of James Syme. His first meeting with Syme, who at this time was 54 years of age and at the height of his reputation as a surgeon, was cordial in the extreme. Syme forthwith offered Lister the work of assisting him both at his private operations and those he performed at the Infirmary.

Lister, surprised to find Edinburgh so far ahead of London in surgery, had, by the end of 1853, made up his mind to spend at least the winter there. He became a welcome guest at Syme's house, Millbank, and there met many eminent men, including Dr. John Brown, author of " Rab and his Friends." Soon Syme appointed him his " supernumerary clerk " and, later, resident house surgeon, though the elder man was good enough to make it understood that their relation would be rather that of surgeon and consulting surgeon. During the ensuing months, Lister had the opportunity of performing many operations, yet, despite his pre-occupation with surgery, he found time to report Syme's Lectures to *The Lancet*.



PROFESSOR JAMES SYME

The friendship grew apace, and Lister wrote that his work for Syme had the effect of making him " more than ever on free and comfortable terms with him."

About this time, Lister's work suffered from a rather serious distraction, for an attachment had sprung up between him and Agnes, Syme's eldest daughter, and this subject refused to be banished from his thoughts. However, his suit was accepted, and he at once set to work with renewed energy. Since Agnes Syme was not a member of the Society of Friends, Lister, after much heart-searching, resigned his membership of that body, and joined the Episcopalian Church.

In November, 1855, it was announced that Lister would commence an extra-mural course of lectures on " The Principles and Practice of Surgery," and soon, with his lectures, private researches and contributions to journals, added to his surgical work, his output of energy was enormous. Of his daily routine at this period he wrote : " The way I manage to work is by getting up early. I go to bed about ten and get up by alarum about 5.30, light my fire (laid the evening before), and my coffee boils while I dress. I take it and a bit of bread ; work for three or four hours, and off to my 10 o'clock lecture while my brain is brim full of it." His father approved this strenuous existence, but dryly expressed the hope that Joseph's *bed* hour would enable him to keep to the early rising.

Lister's marriage took place in the drawing-room of Syme's house on April 23rd, 1856. After a month spent among the English Lakes and at his native Upton, a three months' tour of the Continent was made. The famous medical schools were visited in Belgium, Germany, Switzerland, Italy and Austria. Lister and his wife returned to Edinburgh in October, 1856, and took up their abode in their newly-furnished home at No. 11, Rutland Street. Shortly afterwards he was elected to the Assistant-Surgeoncy at the Infirmary. His researches into the causes and exact nature of inflammation were continued, and we find him constantly reporting the results of his experiments to his father, who, on this subject, as on many others, was ever ready with helpful criticism.

In February, 1857, he performed his first public operation at the Infirmary. His serious and pious attitude of mind towards his calling

MRS. J. LISTER, 1856

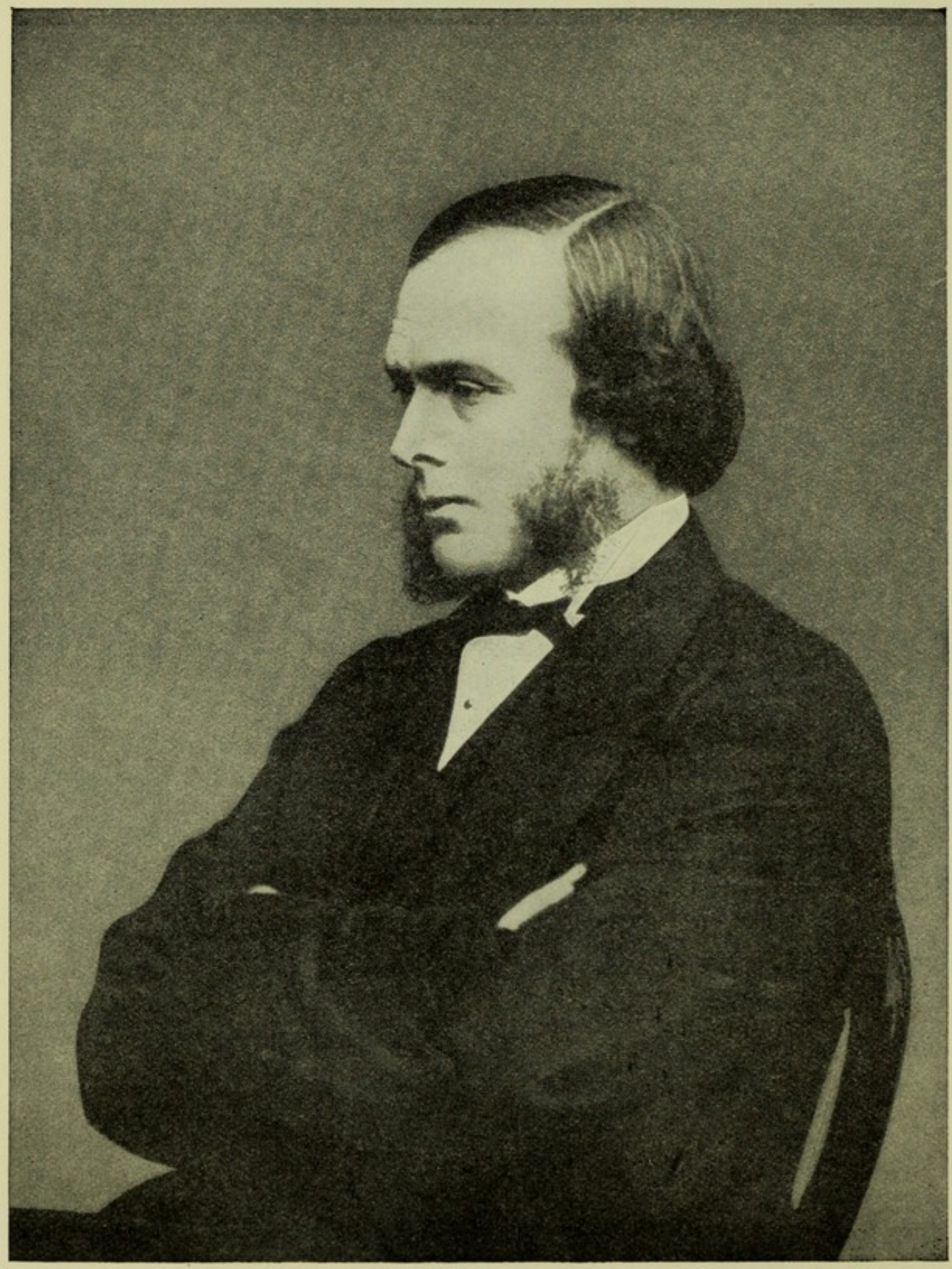
is illustrated in a letter to his sister concerning this same operation. In this he mentions that although the theatre was well filled with spectators, he subdued his nervousness by bearing in mind only the one Spectator who is ever present in public theatre and private room alike.

By this time Agnes Lister was helping her husband in many ways, such as by writing down notes to his dictation, checking his instruments before his operations, and generally assisting him in his experiments. By 1858, chiefly through Syme's influence, Lister had a fair private practice, and when, in 1859, there occurred a vacancy for the Professorship of Surgery in the University of Glasgow, it was under the advice of Syme that Lister became a candidate for the post. After a long period of suspense, Lister was appointed in January, 1860, and his stay in Edinburgh was brought to a close by a complimentary dinner and the presentation of a silver flagon.

Lister, who was at this time in the prime of his mental and physical vigour, settled at 17, Woodside Place, and was delighted to find that the Glasgow professorship offered full scope for his abilities. He soon had a considerable private practice, and within a short time obtained a Surgeoncy at the Infirmary. As his duties now involved lectures and examinations, in addition to his surgical work and private researches, his life at this time was a full one.

Thus he continued until, in 1864, the death occurred of James Miller, Professor of Systematic Surgery at Edinburgh. Lister's friends suggested that he should become a candidate for the post. Since, in Glasgow, his time was much taken up with routine work, the Edinburgh appointment appealed to him as being particularly desirable because it would give him more time for research. In addition, the post was regarded as the most important of its kind in Scotland. Local influences in Edinburgh, however, prevailed in the favour of his opponent, Spence, who was duly appointed.

Lister's mother died in September, 1864, leaving Joseph Jackson Lister a lonely old man at Upton. Joseph, always a dutiful son, now carried on a regular correspondence with his father, writing to him at least once a week. With the close of the year 1865, which was uneventful, Lister's career as a surgeon of the orthodox school ends.



PROFESSOR LISTER
Photograph taken during his first Edinburgh period, 1853-1860

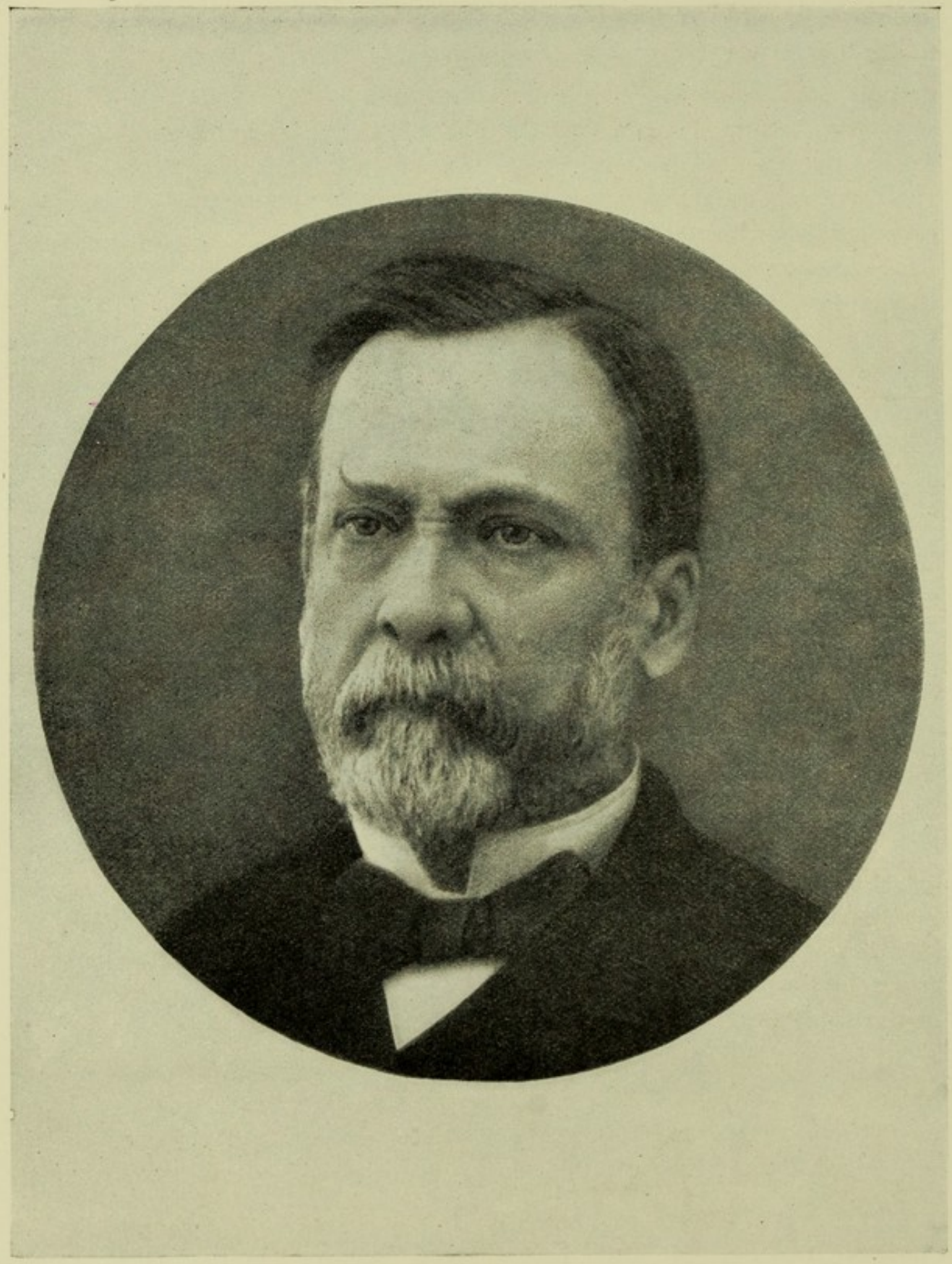
A letter to his father in 1866 contains a brief reference to the use of carbolic acid on healing sores and wounds, and during this and the following years the labour of perfecting the antiseptic treatment proceeded apace. It was not long before antagonism was aroused. Sir James Y. Simpson, the inventor of acupressure, a rival treatment for preventing suppuration, attacked Lister's method with virulence, the ensuing controversy appearing to afford him as much gratification as it did his opponent pain. Lister, though he courageously defended his treatment as he felt bound to do in the interests of both his profession and suffering humanity, took part in the battle unwillingly, for his gentle and reserved nature made anything of this sort repugnant to him.

In 1866, Lister met his first serious disappointment when he failed to secure a vacancy on the staff of University College, London. He had looked forward to his appointment with confidence, and was for a short space much cast down by his failure to obtain the post ; but perhaps Lister's loss was humanity's gain, for it is to be doubted whether the cause of antiseptic surgery would have been forwarded by his coming to London at that period. Soon he had dismissed the matter from his mind and become immersed once more in his Glasgow work.

Between the years 1866 and 1869 his researches were concerned largely with the preparation of various kinds of ligatures, and he spent much time in perfecting the earlier form of carbolised catgut. In the latter year his father-in-law, James Syme, had a paralytic stroke that warned him that his strenuous life must soon come to an end. Accordingly he resigned his Chair, and Lister decided to enter his name for the post, the Edinburgh students sending him an address with over a hundred signatures begging him to become a candidate. He was elected to the Edinburgh professorship in the same year.

Immediately after the return to Edinburgh, Lister's father, now over eighty years of age, fell ill and shortly afterwards died. His death led to the dispersal of the old family home at Upton, and removed a wise counsellor and devoted parent to whom his son had always been deeply attached.

In Edinburgh, Lister lived first in Abercromby Place and then in Charlotte Square. He soon had a larger private practice than at any



Louis Pasteur

time during his life, and before long was recognised as the leading Scottish surgeon. When, in 1870, death removed both Syme and Simpson from their labours, Lister was left in a position of unrivalled eminence.

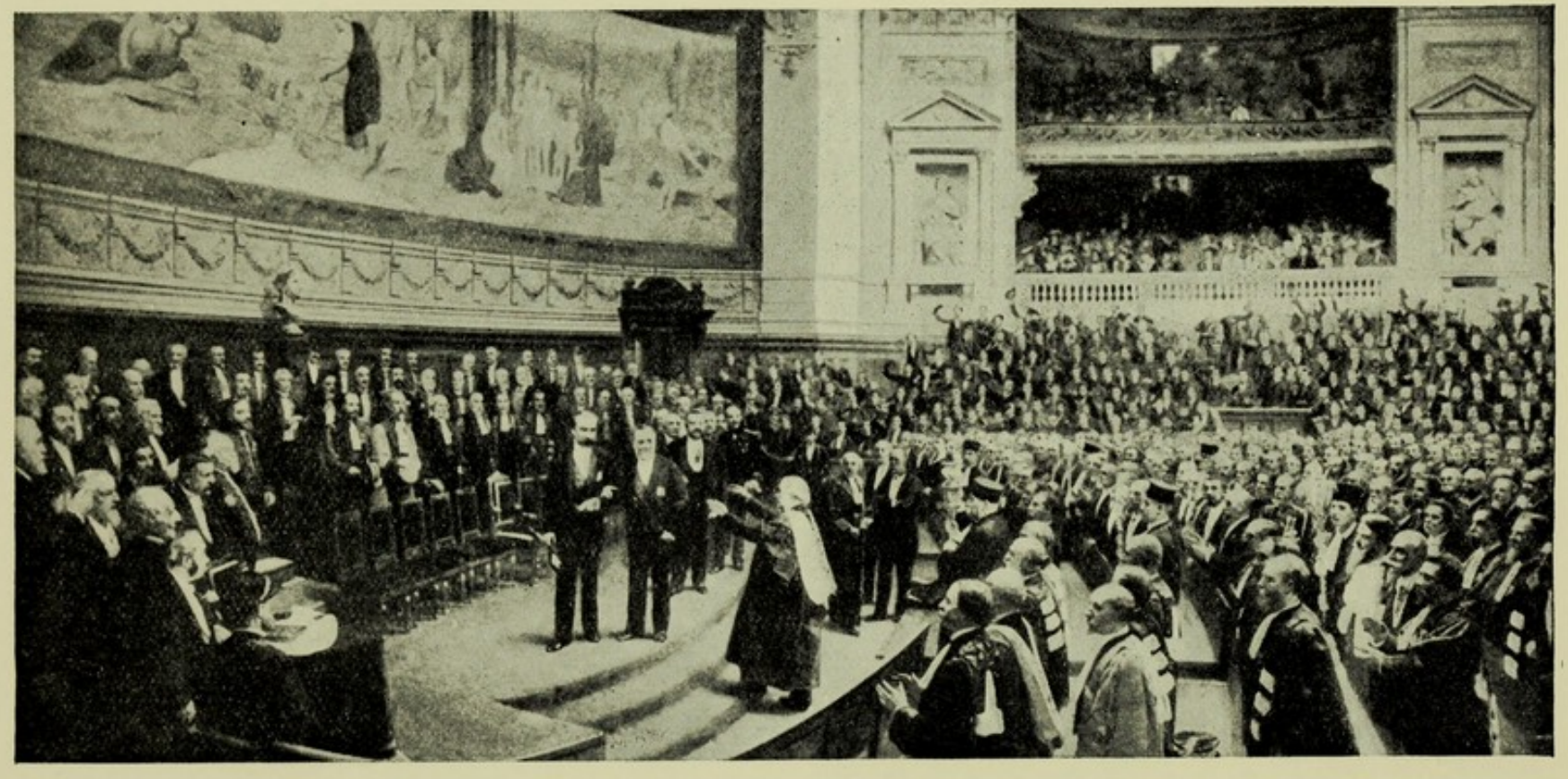
Life in Edinburgh was strenuous, but, on the whole, not so exacting as it had been in Glasgow. Purely academic duties took up less of his time, though his classes were largely attended ; and he was thus able to devote his nights—which were often prolonged far into the morning—to his private researches.

For the next few years he turned his attention more and more to the study of bacteriology, particularly to the problem of lactic fermentation and the nature and action of various yeasts. In February, 1874, having worked at a subject in which Pasteur had been the outstanding pioneer, Lister addressed to the French savant a letter in which he expressed a generous appreciation of the importance of Pasteur's researches, thus laying the foundation of a long and cordial friendship.

In 1875, Lister's attitude towards the agitation against vivisection showed the true nature of the man. He swept aside the arguments of the sentimentalists, and, even when appealed to by Queen Victoria to utter some condemnation of the practice, firmly refused to say otherwise than that he thought that vivisection, carried out humanely, was wholly for the good of humanity at large.

The Chair of Clinical Surgery at King's College, London, fell vacant in 1877, and despite Lister's pre-eminent position at Edinburgh, his many friends in England were eager to persuade him that he would be welcomed in London, where the antiseptic doctrine had made comparatively little headway. There was, however, much friction between rival factions over the possibility of Lister being appointed to the post, and at last an additional Chair of Clinical Surgery was created for him, and he was elected to this on June 18th.

On moving to London, Lister took up his abode at No. 12, Park Crescent, then by no means a fashionable quarter for ambitious medical men. Lister's practice grew steadily, though it was not so large as that of many other surgeons of the first rank.



LISTER AT PASTEUR'S JUBILEE, PARIS, 1892

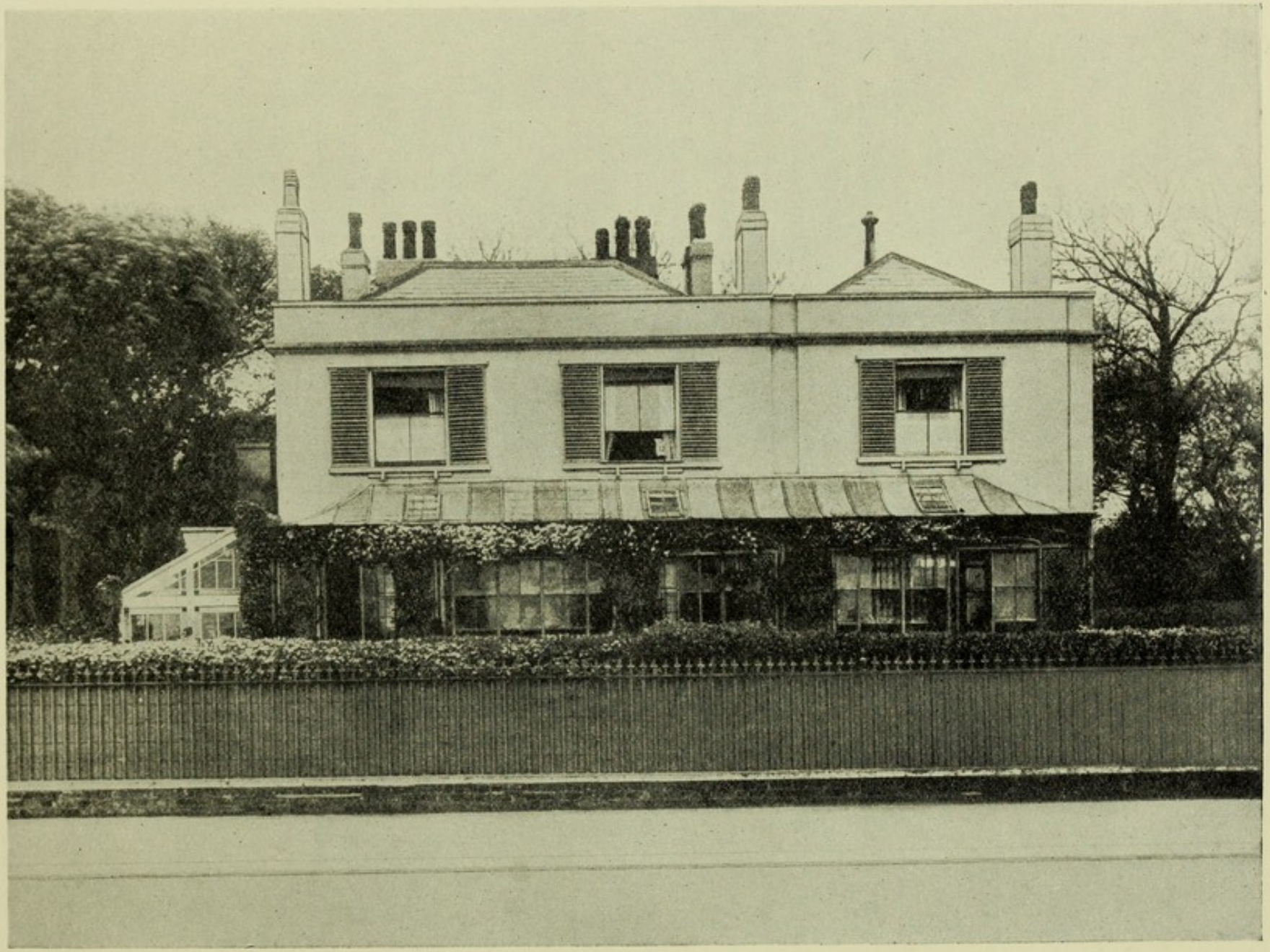
At King's College Hospital he was fully occupied with such matters as the reforming of the system, then in force, under which the nursing was in charge of a religious sisterhood, members of which ruled patients and even medical attendants with a rod of iron. To effect the changes he thought necessary, he had to fight much apathy and opposition ; but he did this in such a fashion that even his most bitter opponents were disarmed by his absolute unselfishness and sincerity.

Lister had long enjoyed a very high reputation abroad, and at the Sixth International Medical Congress, held in 1897, at Amsterdam, he was received with tremendous enthusiasm. For a number of years he had corresponded frequently and cordially with Pasteur and many other famous medical and scientific men in foreign countries. Honours began to fall thick upon him, various foreign distinctions being added to those bestowed upon him in his own country. In 1883 he was made a baronet.

As Lister approached and passed his sixtieth year, he allowed himself more relaxation, and as he had a wide range of hobbies, his time was always congenially occupied. He spent much of his leisure time in the study of bird life and the collection of botanical specimens, and, travelling frequently abroad, took longer and more leisurely holidays.

In 1892, when he was sixty-five, Lister had reached the age at which retirement was compulsory from his professorship at King's College, but he was asked to continue his charge of the wards for another year. In the same year he visited Paris to attend the great ceremony held at the Sorbonne to do honour to Pasteur, and here took place the historic meeting and embrace of these two great men of science, which has been imperishably recorded in Rixens' well-known picture of the scene. At this ceremony Lister delivered a fine eulogy of Pasteur, on whose researches, as he always freely acknowledged, his own antiseptic method of surgery had been based. Shortly afterwards, he was elected an Associate of the Académie des Sciences.

The year 1893 was darkened by the death of Lady Lister at Rapallo, whither they had gone for a holiday. The loss was a grievous one, for she had been his companion for thirty-seven years, sharing his amusements and hobbies, his love of birds and flowers, and his interest in foreign



PARK HOUSE, WALMER, KENT
Where Lord Lister died, February 10th, 1912

languages. Lister did not allow his great sorrow to interfere with his public or his private duties. He lived on at Park Crescent with his sister-in-law, Miss Syme, but his experimental work dropped off and social activities came to an end.

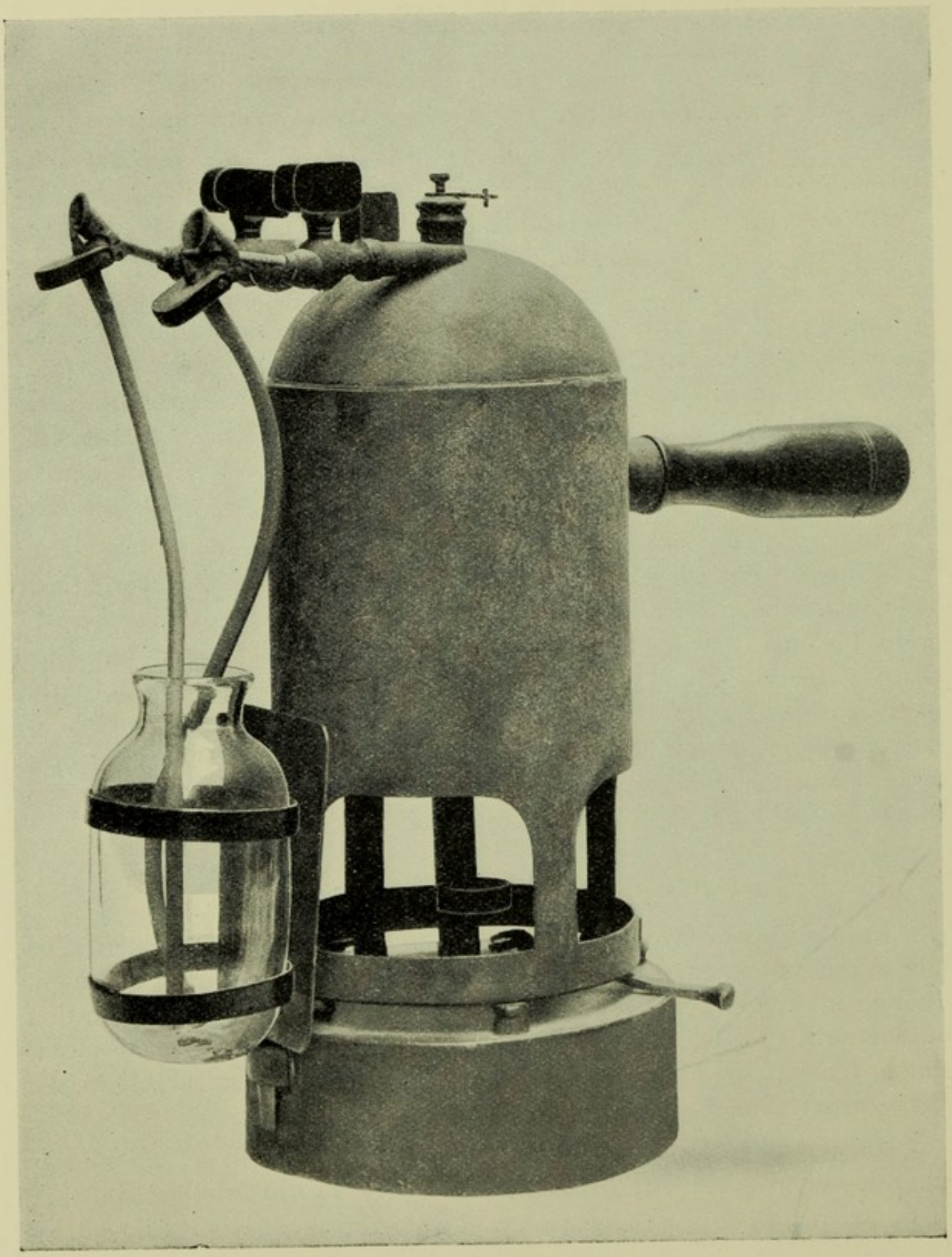
A welcome distraction for his thoughts was afforded by his being made Foreign Secretary of the Royal Society, the duties of which position gave him once more a definite and congenial occupation. In 1895, he became President of the Royal Society, holding this position for the customary five years. It was during his tenure of this high office that, on the occasion of Queen Victoria's second jubilee, he was created a peer. Edinburgh bestowed its freedom on him, and when King Edward VII, at the time of his coronation instituted the Order of Merit, limited to twenty-four members, Lister was one of the first twelve. Shortly after, he was sworn a member of the Privy Council.

Lister's eightieth birthday was celebrated all over the world, and he was overwhelmed with addresses and letters, but the long and supremely useful life was drawing to its close, and in 1908, after London and then Glasgow had bestowed their freedom upon him, Lister retired to the small seaside town of Walmer, in Kent. The remaining years went by uneventfully, and on February 10th, 1912, Lister passed peacefully away. After a public service in Westminster Abbey, he was laid to rest by the side of his wife in West Hampstead Cemetery.

* * * * *

In physical stature Lister was well-built and broad of shoulder. His face in repose was grave and thoughtful ; his eye penetrating, yet benign. Though his manner was courtly and dignified, it lacked any suggestion of aloofness. He had a keen sense of humour, and was a lover of clean, simple fun—a characteristic which allowed him to join with zest in the amusements of those much younger than himself.

His unfailing courtesy and graciousness to patients of no matter what degree, coupled with his gentleness and ability to inspire confidence in minds racked by apprehension and despair, made him beloved by all who had the inestimable privilege of coming under his care.



LARGE STEAM SPRAY USED BY LISTER

PIONEER WORK IN ANTISEPTIC SURGERY

IT WAS characteristic of Lister's pioneer thoroughness that all operations carried out according to the antiseptic technique with which his name will ever be associated began with the purification of the patient's skin around the site of the incision. Thus epidermis, hair follicles and gland ducts were cleansed from potentially septic matter. Others, notably Jules Lemaire, had washed wounds with antiseptics, including carbolic acid, but it seems not to have occurred to them to use this means to prevent the germs from entering the wound.

For the purpose of preparing the skin, a 1 in 20 solution of carbolic acid was used, a lotion of the same strength being employed also for cleansing the surgeon's hands and the instruments required during the operation. From first to last, Lister considered carbolic acid superior to corrosive sublimate or any similar antiseptic for this purpose. "While carbolic acid is more trustworthy as a germicide for surgical purposes than corrosive sublimate," he wrote, so late as 1893, " it is in other respects also greatly to be preferred. Carbolic acid has a powerful affinity for the epidermis, penetrating deeply into its substance ; and it mingles with fatty materials in any proportion."

In cleansing the skin before an operation, Lister dispensed even with a preliminary washing with soap and water, relying solely upon " the penetrating power and great affinity for organic substances " of carbolic acid.

For almost twenty years considerable importance was attached to the use of the carbolic spray, which was arranged to direct on to the field of operation a fine mist of antiseptic solution.

The first form of spray to be used was of the type designed by Richardson for applying ether to produce local anæsthesia. Despite the small capacity of this spray, and the limited cloud of vapour it produced, it was fairly satisfactory. Improvements in its construction were made by Lister and others from time to time, the chief of these being the

introduction first of a double hand bellows and then of a bellows operated by the foot. A spray, known as "the donkey-engine," was used for a brief period.

A change of even more importance was made in the winter of 1872–1873, when Lister first exhibited one of Siegle's steam sprays. Here again the design was modified as time went on, and various types of spraying apparatus were manufactured in Edinburgh and London.

In a paper contributed to the *British Medical Journal*, in 1871, Lister expressed his conviction that the spray enabled the surgeon to operate "in an antiseptic atmosphere, and effectually prevent putrefactive organisms from ever entering the wound alive." At this period he held that the use of the spray dispensed with the necessity for washing the wound with an antiseptic lotion, thus avoiding undue irritation of the tissues.

Much later, in 1890, we find Lister, having passed through an intermediate period of doubt with regard to the efficacy of the spray, confessing to a feeling of shame that he should ever have recommended it as a means of destroying microbes in the air. Nevertheless, the carbolic spray was conspicuous amongst the apparatus of antiseptic surgery until, in 1887, it was altogether abandoned.

As an operation progressed, Lister took every precaution to exclude from the wound any putrefactive microbes that might be present either in the air or on articles near at hand. Towels, wetted with a 1 in 20 carbolic solution, were spread over the blankets and other absorbent material in order that the instruments in use might not be placed on a surface that harboured septic particles. If the spray by accident ceased to work, the wound was at once covered with a "guard" consisting of a rag soaked in carbolic lotion.

Sponges used during the operation were wrung out of carbolic lotion before application, having been put to steep in this solution after a somewhat rough-and-ready purification from the last occasion on which they were used.

Lister's faith in the antiseptic power of carbolic acid is shown in the following passage: "In my Edinburgh practice I used to proceed in a bolder way. Taking the sponges out of the putrid tank, I washed

them in water, and sometimes, if I was in a hurry, even before the water which came from them was completely freed from red colour, I dipped them into the 1 in 20 carbolic solution, and took them at once to my operations.

"I have before now applied a sponge so treated immediately to a wound for the purpose of exercising elastic pressure and absorbing blood and serum from it, and then put on my external antiseptic dressing over it without any bad result."

Lister's researches on materials for ligatures were productive of results of first-class importance. In the earliest days he used silk dipped in melted wax to which a proportion of carbolic acid had been added; but, finding silk unsatisfactory, he set about preparing a catgut ligature that should be at once sterile, absorbable and of adequate tensile strength and pliability. Soon it became a matter of routine to ligature bleeding vessels with carbolised catgut—an innovation that marked Lister's first important contribution to the treatment of wounds.

He was doubtless led to the preparation of the carbolised catgut by the discovery that a ligature of animal substance applied upon an artery became organised and soon disappeared by absorption, thus surrounding the vessel with a ring of living tissue. The method used to render the gut antiseptic was to steep it in a mixture of five parts of a fixed oil, either olive or linseed, to which had been added one part of carbolic acid liquefied by the addition of five per cent. of water to the crystals. This emulsion, besides disinfecting the gut, made it tough and transparent, and no longer liable to soften under the action of watery discharges. Later, Lister prepared his catgut by steeping it in a solution of chromium sulphate (a solution of which he prepared by the action of sulphurous acid on chromic acid) and corrosive sublimate.

Efficient drainage of the wound was realised by Lister to be of the greatest importance in keeping the tissues free from sepsis, and to the subject of materials for drains he devoted his customary patience and inventiveness.

He used two chief methods of drainage—the first by means of tubes, and the second by means of capillarity. He devised tubes of sulphur-free

rubber having round holes cut in them at intervals, each hole being equal to about a third of the circumference of the tube.

These drainage tubes were stored in a 1 in 20 solution of carbolic acid until required for use. Lister's practice was to shorten the drainage tubes at each successive dressing until they became no longer necessary. For drainage by capillarity, a method introduced by Chiene was often used, the drain in this case consisting of a skein of fine catgut, containing, perhaps, twenty threads tied together at the middle. Lister, however, preferred the horsehair drain introduced by White, of the Nottingham General Infirmary.

The accurate stitching of the edges of the wounds was another commendable feature of the technique of antiseptic surgery. Lister's inventive mind soon devised what he termed " button stitches." These, to quote his own description, consisted of " two oval pieces of sheet lead, about one-twentieth of an inch thick, with a central perforation to receive a moderately thick silver wire. The silver wire is first passed as an ordinary suture, except that it is carried at an unusually great distance from the edge of the wound, both as regards surface and depth ; each end of the wire is then passed through the hole in the corresponding lead button, and secured by being wound once round the shorter diameter . . . . The two buttons thus take the place of the tips of two fingers of the two hands in giving support to the deeper parts of the wound, while leaving the cutaneous margins entirely free. . . . By their means the lips of a wound which otherwise could not be got to meet without considerable tension will often lie in contact of their own accord . . . . ."

In the closing of wounds three kinds of stitches were in common use : the " button stitches " described above ; silver wire stitches, placed at intervals to act as stitches of relaxation ; and numerous stitches consisting of gut, carbolised silk or horsehair, these last being termed by Lister " stitches of apposition."

The exact nature of the dressings that were applied over the incision underwent a series of changes, as Lister, by observation and experiment, sought perpetually for the ideal protective. It will be remembered that

the first carbolic dressing was used not for a surgical incision but for a compound fracture, and consisted simply of a piece of lint soaked in carbolic acid and placed so as to overlap the wound in every direction by half-an-inch. This dressing was then protected with a rather larger piece of block tin or sheet lead in order to retard the evaporation of the acid.

The first sample of carbolic acid with which Lister worked was a pungent-smelling, tarry liquid bearing no resemblance to the crystalline phenol of present-day laboratories. This impure substance, nevertheless, had the desired effect of preventing putrefaction of the damaged tissues, and the mixture of blood and carbolic acid formed a crust which sealed up the wound. The deeper portions of this clot did not liquefy and decompose, but remained firm and adherent, and eventually became organised.

A purer sample of carbolic acid coming to hand, Lister experimented and found that it was much more freely soluble in oil than in water. Hence he concluded that an oily carbolic dressing would hold its charge of antiseptic more tenaciously while bathed with watery discharges than one composed of the crude acid.

The first operation performed by Lister according to the antiseptic technique was the opening of a psoas abscess, and the dressing he applied to the incision was a paste composed of pus evacuated from the abscess mixed with carbolic acid. Owing to the healthy state of the wound, however, the supply of pus quickly ceased, and the next dressing was composed of carbolic putty made from ordinary whitening and a 1 in 4 solution of carbolic acid in linseed oil.

This putty was spread on a sheet of tin in a layer about a quarter-of-an-inch thick, and the dressing secured by means of adhesive plaster. Lister thus enumerates the advantages of the carbolic putty: "The tin prevents the evaporation of the carbolic acid, which escapes readily through any organic tissue such as oiled silk or gutta-percha.

"The putty contains the carbolic acid just sufficiently diluted to prevent its excoriating the skin, while its substance serves as a reservoir of

the acid during the intervals between the dressings. Its oily nature and tenacity prevent it from being washed away by the discharge, which all oozes out beneath it as fast as it escapes from the incision ; while the extent of the surface of the putty renders it securely antiseptic."

The carbolic putty dressing was subsequently modified by employing the paste rolled out between two pieces of calico to form a sort of plaster which was applied over a rag dipped in carbolic oil.

Later, in order that the advantages of the putty might be utilised without its bulk, various kinds of *emplastra* were employed, but these were given up on account of their adhesiveness, which the carbolic acid increased.

After a paraffin and wax mixture had been tried but found too apt to crumble, Lister was induced to try a modified form of *emplastrum plumbi,* to which about ten per cent. of carbolic acid had been added. This was spread on calico in a thin layer, and for a time appealed to him as being " thoroughly reliable."

It seems, however, that surgeons found that the substance of the *emplastrum* became softened by the carbolic acid with which the calico was kept moist, thus allowing the irritant acid to come into contact with the raw surface below. " With the view of getting over these difficulties," says Lister, " I sought to obtain some kind of antiseptic cement, by which a portion of dressing might be glued down firmly upon the skin. Among other materials I tried shellac, and, in so doing, I accidentally hit upon a substance which appears preferable to the plaster for almost every purpose. I found that this resin could be mixed with carbolic acid in any amount by aid of heat, the result, when cooled, varying, according to the quantity of the acid, from brittleness to fluidity, the intermediate proportions giving a firm but flexible solid with a certain degree of elasticity, approaching to some extent the characters of caoutchouc."

Lac thus prepared retained the carbolic acid so tenaciously that a thin layer spread on calico was found to keep its antiseptic virtues unimpaired for several days at the temperature of the body ; further, it had no irritant action on the skin. An improvement was made by spreading the carbolised

lac upon gutta-percha tissue, thus providing a dressing devoid of any objectionable stickiness.

At a later date, muslin cloth, of open texture, impregnated with a mixture of paraffin, resin and carbolic acid, was used instead of the lac-plaster. This antiseptic gauze was intended to combine the functions of the lac-plaster and the absorbent dressing. Oakum also was found to be an efficient antiseptic dressing, and was considered by Lister to present several advantages over lac-plaster, despite its strong, tarry smell.

With most of these dressings, however, it was found that the carbolic acid contained in them interfered with the cicatrisation of the wound if allowed to act directly on it. Even the gauze, though generally free from irritating influence upon sound skin, showed a tendency to excoriate a new cicatrix. Consequently, Lister employed a "protective," consisting of oiled silk coated with copal varnish, to protect the wound from the damaging propensity of the antiseptic, but this material showed an inconvenient degree of permeability to carbolic acid as soon as it became moistened. Oil-paint on oiled silk was tried, but this in turn proved to be too stiff.

One day, when paying a visit to an india-rubber factory, Lister conceived that caoutchouc mixed with some pigment might furnish a perfect protective. He accordingly tested a coloured rubber that had been vulcanised, and the experiment afforded a curious and instructive result: "The sulphur in the vulcanised india-rubber acting chemically on the discharge, the result was a stench like rotten eggs, presenting an excellent example of decomposition without putrefaction; for there was no putrefactive fermentation—no spread of the decomposition into the interior of the wound or abscess."

Since vulcanised rubber was thus ruled out, owing to its property of developing sulphuretted hydrogen, the problem was to find some other means of eliminating the softness and adhesiveness of the caoutchouc. Magnesia was tried for this purpose; but, although the resulting mixture was perfectly satisfactory so far as its physical properties went, it produced redness and intense itching when applied to the skin. "At length (related Lister, in an address before the British Medical Association) it occurred to

me that perhaps shellac, which seems quite unirritating, might be mixed with the caoutchouc, and that this might answer the purpose. For though shellac, when once mixed with carbolic acid, holds it very tenaciously, as is seen in the lac-plaster with which some of you are familiar, yet the acid does not readily penetrate into unmixed lac. When I suggested this to the managers of the india-rubber works, they told me that they had previously ascertained that shellac could be blended perfectly with caoutchouc; the product being the beautiful article you now see, sufficiently tough, yet pliant, transparent, and with no unpleasant odour, and, as I ascertained by experiment, practically impermeable to carbolic acid . . . . I had never before witnessed the healing of ulcers proceed so rapidly as I have seen it under this protective, covered with overlapping gauze . . . . "

In special cases Lister used other antiseptics than carbolic acid. In dressing the wound resulting from an operation for the removal of carious bones of the foot, he employed a solution of zinc chloride, an antiseptic introduced by Campbell De Morgan, of the Middlesex Hospital. He realised the antiseptic value of boric acid, which in those days was little more than a chemical curiosity, and from it prepared " boracic lint " by steeping lint in a saturated solution of the acid near the boiling-point. Boracic lint found useful application as a moist dressing after operations for phimosis.

By the year 1884, Lister had increased his armamentarium of antiseptics till it included eucalyptus oil, iodoform, salicylic acid and corrosive sublimate. With this last compound he conducted many experiments in order to produce a substance having the bactericidal properties of corrosive sublimate without its irritant effects. To this end he impregnated gauze with horse serum in which had been dissolved about one-and-a-half per cent. of the sublimate, and used this dressing with great success for many operations.

In " An Address on a New Antiseptic Dressing," which Lister delivered before the Medical Society of London towards the end of 1889, we find him describing the properties of a solution of sal alembroth (the double chloride

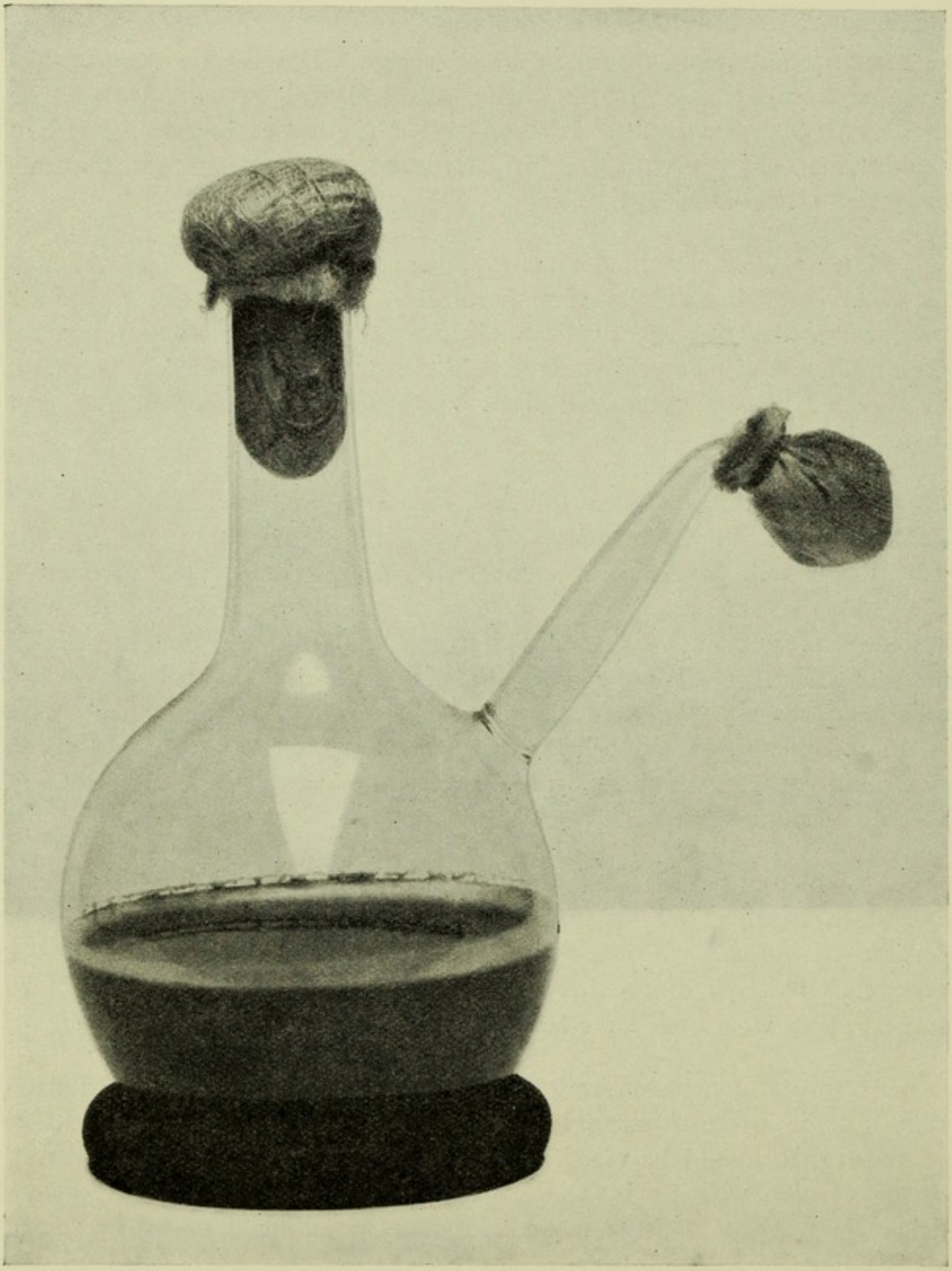
of mercury and ammonium) in blood serum. Despite its comparative freedom from irritation of the tissue, sal alembroth was not without its disadvantages. Its ready solubility caused it soon to be washed out of the dressings charged with it, and Lister was moved once more to continue his quest of the ideal antiseptic.

He next examined the double cyanide of zinc and mercury, and, though in many cases the results were admirable, the trials of this antiseptic produced a plentiful crop of disappointments. After much experimenting with biniodide of mercury, which left him dissatisfied with this compound, he directed his attention once more to the double cyanide of zinc and mercury.

He found that when a solution of starch was stirred up with the double cyanide in the proportion of one part of starch to two of the salt, the starch was almost completely precipitated. This precipitate could be made to adhere to gauze satisfactorily after treatment with sulphate of potash. Eventually it was found that the double cyanide could be fixed most tenaciously in the gauze by the use of certain aniline dyes, notably mauveine hydrochloride. In this form, with slight modifications, double cyanide gauze has survived to the present day, and still serves its purpose excellently when used according to Lister's recommendations.

Present-day practice favours the use of plain gauze or wool rendered aseptic by heating, but the antiseptic dressing is not without its value in certain circumstances. Boric lint is still widely used, and if Lister's researches had led to no more than the production of this adjunct to surgery, they would not have been in vain.

By way of conclusion, and having regard to the sharp differentiation that is made in some quarters between the antiseptic and aseptic systems of surgery, it should be recognised that Lister aimed always at securing *aseptic* results, whether by the use of antiseptics (which with him were never a substitute for the most scrupulous cleanliness) or by means of sterilisation by heat.



ORIGINAL URINE FLASK USED IN LISTER'S EXPERIMENTAL WORK

VARIOUS EXPERIMENTAL RESEARCHES

> " The philosophical investigations of Pasteur long since made me a convert to the Germ Theory, and it was on the basis of that theory that I founded the antiseptic treatment of wounds in surgery."
>
> JOSEPH LISTER, *in a communication made orally to the Royal Society of Edinburgh on April 7th,* 1873.

PRIOR to his knowledge of Pasteur's work, Lister had investigated the subject of inflammation from a purely physiological point of view. The importance of its nature and causation was ever present in his mind, for inflammation was apparently the precursor of suppuration, ulceration and gangrene.

As an example of his work in what may be called the pre-Pasteur period, his paper entitled " On the Early Stages of Inflammation " deserves attention. It was read in June, 1857, and described the now famous experiments he conducted on the web of a frog's foot, which he treated with mustard and mechanical irritants to produce inflammation. He found that inflammation thus produced was accompanied by a concentration of red corpuscles in the vessels of the affected part, and changes in the pigmentary tissue.

It was in 1865 that his colleague, Dr. Thomas Anderson, Professor of Chemistry, drew Lister's attention to the work and writings of Louis Pasteur. The revelation that there existed in the air and in dust micro-organisms that were capable of producing fermentation and decomposition in certain liquids seemed to provide a clue to the causation of the dread diseases, collectively known as " hospitalism," which in those times haunted the surgical wards of every hospital.

Lister's bacteriological work included many experiments on the natural fluids of the body, such as milk and urine, and he convinced himself that these liquids contained no organisms until they came into contact with the external air.

One of Lister's earliest experiments was performed with a view to corroborating the theory that blood outside the body coagulates by reason of the escape of ammonia. He inserted a rubber tube into the jugular vein of a sheep in such a manner that the blood flowed through the tube and then continued its natural course. While the blood was circulating the tube was tied into a number of air-tight compartments

containing blood, which was examined after various intervals of time. Lister found that the blood in these compartments coagulated readily, although no opportunity was afforded for the escape of ammonia ; thus proving that the evolution of ammonia plays no part in bringing about coagulation of the blood.

The purpose of another experiment which he performed is explained in the following words : " It has long been known that if blood is stirred with a rod, the process of coagulation is promoted. It seemed desirable to ascertain distinctly whether the cause of this was the contact of the foreign solid, or the opportunity given for the escape of ammonia."

To elucidate this problem, a bent glass tube was tied into the carotid artery of a calf and the apparatus was filled with blood. It was then divided by clamps. The orifice of the upper portion was, of course, exposed to the air, the lower portion being sealed. The blood in the lower portion was churned by means of a wooden handle and wire cross-pieces.

At the end of thirty-seven minutes the wire was found enveloped in a mass of clot, but at the end of an hour and a quarter the blood in the upper portion was still fluid and coagulable. Thus the blood in the churn, although it had no opportunity of parting with its ammonia, coagulated much more rapidly than that in the open vessel.

In his further researches on this subject, Lister constructed an apparatus consisting of a spiral of silver wire inside a small glass tube. Having opened the carotid artery of a horse, he thrust the tube in as far as the common carotid. It thus had flowing through it a full current of arterial blood. The time taken for arterial blood to show the first appearance of coagulation in a watch-glass being known, the apparatus was removed from the carotid and inspected. Lister found that the silver wire was already crusted over with coagulum. From this experiment, in which there had assuredly been no opportunity for the escape of ammonia, Lister concluded that it was obvious that there was a very great difference between ordinary solid matter and the living vessels in their relation to the blood.

In 1871, Lister contributed to the *British Medical Journal* an account of his first recorded experiment with urine—an experiment that was really

a modification of one previously carried out by Chevreul and Pasteur. Quantities of the same specimen of urine were introduced into four glass flasks, so as to make each about one-third full. The necks were washed and then drawn out in a spirit lamp into tubes less than a line in diameter. Three of these fine tubes were bent at various acute angles, while the fourth was left short and vertical, though equally narrow. The flasks were boiled for five minutes, after which they were all left exposed to the air.

In the flask with the short upright neck fungi soon made their appearance, and the urine deepened in colour, while in the flasks with bent necks the urine remained unchanged for years. These results led Lister to the conclusion that putrefactive changes taking place in urine are occasioned by particles of dust suspended in the atmosphere, but not by the atmospheric gases, which had access equally to each flask.

In a paper read before the Royal Society of Edinburgh on April 7th, 1873, he described further researches that he had carried out with urine. The urethra having been cleansed with 1 in 40 carbolic lotion, urine was passed direct into six purified wine glasses. A minim of tap-water was introduced into glasses Nos. 1 and 2, and a much smaller quantity into glass No. 3. All the glasses, with the exception of No. 6, which was left exposed to the air for twelve hours, were immediately put under a glass plate.

The results obtained were instructive. Forty-eight hours afterwards the contents of glasses Nos. 1 and 2 were turbid from the development of large and active bacteria ; the urine in glass No. 3 was similarly affected, but to a lesser degree ; while in the remainder there was no change. Fifty hours afterwards, the contents of glass No. 6 presented spots of opacity in the cloud of deposited mucus and contained bacteria in full activity. The urine in glasses Nos. 4 and 5 still remained perfectly clear, though in the course of the next few days these also showed signs of contamination.

From this comparatively crude experiment Lister deduced that exposure to the air might lead to the development of bacteria in the urine, assuming that the urine was free from contamination at the start. The slow development of bacteria in the two glasses that were neither treated

with tap-water nor exposed to the air led him to believe that, under more rigorous conditions, the urine would have remained sterile indefinitely.

Accordingly, he repeated the experiment some days later with stricter precautions to exclude accidental contamination. Urine was passed into a sterile flask fitted with a porcelain cap, which had previously been purified. Four purified wine glasses were charged from this flask with as little exposure as possible. Flasks Nos. 1 and 2 were fitted with square pieces of plate-glass overlapping well in all directions, while Nos. 3 and 4 were covered with porcelain evaporating dishes. The urine remaining in the flask was boiled for nine minutes and the purified glasses Nos. 5 and 6 were charged with this, No. 5 having a drop of tap-water added to it. Glass No. 1 was exposed to the air for forty minutes, and glass No. 2 exposed for nine and a half hours. The two with porcelain covers were not exposed at all. Glasses Nos. 1 to 5 were all covered with a glass shade, glass No. 6 remaining outside owing to the smallness of the shade.

The results showed that in four days the contents of glass No. 2 developed plants of filamentous fungi and opaque spots, and the following day became turbid with abundant bacteria. The contents of glass No. 1 showed no bacteria, but only three plants of filamentous fungi, and did not become turbid for two-and-a-half months. In the remaining glasses, Nos. 3 and 4, the urine showed no sign of change for thirteen days until further experimented upon ; that in No. 5 showed bacteria in five days, while that in No. 6, which had not been sheltered beneath the glass shade, remained unchanged for three weeks and then became turbid.

This experiment convinced Lister that urine free from organisms might be obtained direct from the body if simple antiseptic rules were observed. In addition, it demonstrated clearly that organic liquids so obtained and properly protected are secure against the introduction of organisms from without so long as the arrangement is left undisturbed. Thirdly, it showed that the various organisms that float in the atmosphere constitute a very small proportion of the abounding dust.

Continuing his experiments with urine, Lister took a purified wine glass into the street one evening in a drizzling rain ; he allowed a few

drops to fall into the glass, and placing over it a cover, brought it in and charged it with unboiled urine from a purified flask.

" In the course of a day or two," he reports, " I noticed a tiny opaque streak proceeding vertically downwards from a point on the inside of the glass ; and on the following day the streak had increased, and the cloud of mucus was speckled with numerous white points. On the fourth day, while the speckling of the cloud had increased, and the streak had become coarsely granular, two little plants of filamentous fungi were also seen floating in the clear liquid." He goes on to relate that on the fifth day the specks in the mucus deposit had the appearance of coarse white sand, and, on microscopically examining one of these granules, Lister discovered " a very beautiful torula," which, on account of the oval form of its cells, he termed *Torula ovalis*.

He experimented with the torula from this specimen of urine throughout a long period and in different media under varying conditions, and thus sums up his conclusions : " Without entering here on all the bearings of this observation, it may be remarked that for an organism so humble as the torula, though modified by various circumstances, to retain its specific morphological and physiological characters unimpaired for two years together is a fact fraught with the deepest instruction."

As an example of Lister's inventiveness, we may here notice the cellular slide that he devised in order that he might watch the growth of the torula. His experience having shown him that the thin layer of air between two glass plates was exhausted in a few hours, Lister had prepared what he termed a " glass garden." The organism and a small drop of medium are placed on the central island of the under plate, and a drop of boiled water is introduced into the surrounding " ditch " in order to ensure a moist atmosphere. The whole is covered with a strip of thin glass, the margins being luted with paraffin. Lister says : " In these conditions I have watched one and the same organism continuing to grow unmixed for several weeks together."

For his Introductory Address, delivered before the students of King's College, on October 1st, 1877, Lister chose fermentation as his subject.

After emphasising the bearing of fermentative decomposition upon the causation of disease, he described the various experiments he had carried out on the putrefactive fermentation of blood.

He exhibited to the class a vessel (a liqueur glass) into which blood had been poured, with special precautions, from a purified glass flask charged with blood from the jugular vein of an ox. The liqueur glass had then been covered with a purified glass cap and shade. Although the blood had been six weeks in the glass, with free access of the gases of the atmosphere, the cap and shade not being close fitting, it had not putrefied and the air in the glass shade was perfectly sweet. From this result Lister concluded that blood has no inherent tendency to putrefaction; and that the atmospheric oxygen is not able to cause the blood to putrefy, as was formerly supposed.

His next experiment had been to mix a liqueur glass of unputrefied blood with some water that had been boiled and cooled in a flask under the protection of a cotton cap. Here, again, no change had taken place, thus proving that although blood and water constitute a highly putrescible mixture, mere water is as inadequate as are the gases of the air to produce putrefactive fermentation.

The fermentative process that especially engaged Lister's attention was the souring of milk " through conversion of the sugar of milk into lactic acid." The Introductory Address delivered before King's College in 1877 contained also a description of the experiment with a flask of boiled milk. This had been prepared on August 27th of the same year, and when it was exhibited on October 1st, there was no sign of fermentation, and the milk was found to be quite sweet. A liqueur glass charged from this flask and covered with a cap and shade showed no change in its contents after four weeks had elapsed. Hence, Lister concluded that boiled milk is not prone to fermentation of its own accord ; it requires something to be introduced from without.

As a variant of this experiment, one set of sterile liqueur glasses was charged with boiled milk, and into each glass half a minim of unboiled water was introduced. A second set of glasses also was charged with the same boiled milk ; the shades of these were taken off at different

times, and the contents exposed to air for half an hour. As a result, fungi and various bacteria made their appearance, but no *Bacterium lactis* was present, nor was there lactic fermentation. From this, Lister deduced that the ferment that brings about lactic fermentation is a rare ferment.

He next described experiments that he carried out to prove that the unboiled milk coming from a healthy cow contains no materials capable of giving rise to any organisms or fermentative change. Milk was taken from a cow in the cowhouse and passed into a purified flask. From this, twelve small test-tubes were then charged with a purified pipette. The result was that all the tubes fermented ; every one contained organisms, some as many as three. Most of the tubes showed orange specks, which, on examination, Lister found to be organisms to which he gave the name of *Granuligera ;* but there was no *Bacterium lactis* and no lactic fermentation.

The experiment was repeated with twenty-four tubes in the open air on a fine day. Again, every tube developed organisms, but, at the same time, every glass had a different appearance. A large proportion showed scarlet specks. Lister's deduction was that no *Bacterium lactis* was present, or it would have taken precedence over the other bacteria, and would have rendered the milk quite an unfit soil for these and numerous other species.

A third experiment was made in the open air on a drizzling morning, but on this occasion the milk was drawn from the cow after the dairy-woman's hands and the cow's teat had been washed, and was passed through glass tubes connected by purified rubber tubing into twelve test-tubes. The result was that only two tubes out of the dozen remained quite fresh, and perfectly fluid and sweet. In these two tubes no organisms were discoverable under the microscope. The remainder of the tubes were to all purposes fresh, though all contained organisms. This experiment was held to prove beyond doubt that in unboiled milk, as in boiled milk, there did not exist any substance capable of giving rise to organisms or producing lactic or any other fermentative change.

In order to secure absolute evidence as to whether the *Bacterium lactis* was or was not the cause of lactic fermentation, Lister set out to determine

the number of bacteria in a given quantity of souring milk. To do this he employed an ingenious glass syringe of his own invention. Having by dilution obtained an average, which he estimated at rather less than one *Bacterium lactis* to one drop from the syringe, Lister inoculated five liqueur glasses of boiled milk with one drop each. Only one glass curdled and soured, and that had *Bacteria lactis* in abundance.

Using this culture of *Bacteria lactis*, which presumably was pure, the following tubes were inoculated as follows :—

A. Five covered test-tubes with one drop each estimated as containing two of the *Bacteria lactis*.
B. Five covered test-tubes with one drop each estimated as containing one *Bacterium lactis*.
C. Five liqueur glasses with one drop each estimated as containing one *Bacterium lactis*.
D. Five liqueur glasses with one drop each estimated as containing four *Bacteria lactis*.

The result was that A and D soured and curdled in a few days ; the milk became quite solid owing to the lactic fermentation, but was otherwise unchanged. Three of the glasses belonging to Class B remained fluid, and two of those belonging to Class C remained fluid also. Thus, out of the ten inoculated, five remained fluid and five developed lactic fermentation. Lister found that in each vessel in which souring had taken place *Bacterium lactis* was present in abundance, but in none of the remainder were bacteria of any sort discovered. While giving this address, Lister removed the cap of one of these liqueur glasses and proceeded to drink the milk it contained. It was quite sweet except for a slight flavour of suet, which Pasteur attributed to the oxidation of the oleaginous material of the milk.

The conclusion that Lister drew from these experiments was summed up by him in the following words :—

> " . . . . we have absolute evidence that the *Bacterium lactis* is the cause of the lactic acid fermentation. And thus I venture to believe that we have taken one sure step in the way of removing this important but most difficult question from the region of vague speculation and loose statement into the domain of precise and definite knowledge."

ORIGINAL SURGICAL WORK

ALTHOUGH the veneration in which Lord Lister's name is held to-day rests chiefly upon the sweeping changes that his researches wrought in the conditions under which surgery in general was carried out, his skill as an operative surgeon alone would have sufficed to place him high on the roll of the great Masters of Healing. He brought to bear the same patience and ingenuity upon the actual practice of surgery as upon the prevention of suppuration and sepsis in wounds.

Shortly after he had begun to use carbolic acid for compound fractures, he adapted the antiseptic method to the treatment of psoas abscesses, the evacuation of one of these constituting the first surgical operation carried out under the new system. Whereas, to have opened one of these huge abscesses without antiseptic precautions would have been almost certainly productive of a fatal result, Lister's patients did well almost without exception.

Comparatively early in his career he evolved a new method for amputation of the thigh, which, with characteristic modesty, he claimed to be but a modification of Carden's amputation. Lister divided the femur, while the knee was flexed, immediately above the articular cartilage of the patella, performing a circular amputation with a small posterior flap, thus securing a neat scar. This method produced a sound and serviceable stump to which a comfortable artificial limb could easily be adapted.

Lister was a pioneer in conservative surgery of the wrist joint, and the somewhat elaborate technique that he perfected for this purpose was amply justified by the number of hands he saved from amputation.

His method of amputating at the hip joint greatly diminished the dangers of this formidable operation. Instead of making an incision through the hip and thus producing a wound of very large area, he amputated the soft parts high up on the thigh and then dissected out the head of the bone—a course which involved a much smaller loss of blood for the patient and diminished the risk of sepsis.

Long before the majority of surgeons had realised the desirability of bloodless operating, and some years previous to the introduction of Esmarch's bandage, Lister had practised the method of emptying the limb of blood by holding it upright for some minutes before applying the tourniquet. All vessels were secured before the tourniquet was loosened, with the result that the quantity of blood lost was negligible.

Before Lister's time, operations for the removal of carcinoma of the breast were often of an incomplete character, even the cancerous glands of the armpit being usually left *in situ* after excision of the main growth. Not unnaturally, recurrence was common, and surgical interference was looked upon as a useless addition to the agony of the disease.

Lister's operations were radical and extensive ; the axillary contents were thoroughly cleared out and, where necessary, the pectoral muscles were divided and the region explored and cleaned. Lister's procedure was the precursor of the even more extensive operations for mammary carcinoma practised to-day.

Lister introduced many improvements in connection with the surgery of the urethra and bladder. He was instrumental in reviving the practice of suprapubic cystotomy, which he held to have distinct advantages over the usual method of approaching the bladder through the perineum. It was not till some years had elapsed that this procedure received full recognition as one of the best operations for such purposes as removing a stone from the bladder. In dealing with urethral stricture, he designed new forms of bougies, and anticipated that method of external urethrotomy now known as Wheelhouse's operation.

An adept in the surgery of bones and joints, Lister found that his antiseptic treatment enabled him safely to perform open operations for resetting badly-united fractures or for wiring fractures to secure union—a step that even the boldest surgeon would have shrunk from taking in pre-Listerian days. Lister's reputation in this branch of surgery brought to his wards from all parts of the kingdom a constant stream of patients desirous of having all manner of deformities corrected. Most of these operations involved the opening of healthy joints, and, despite the eminently

satisfactory results obtained, this procedure was condemned wholeheartedly by the timorous opponents of antiseptic surgery.

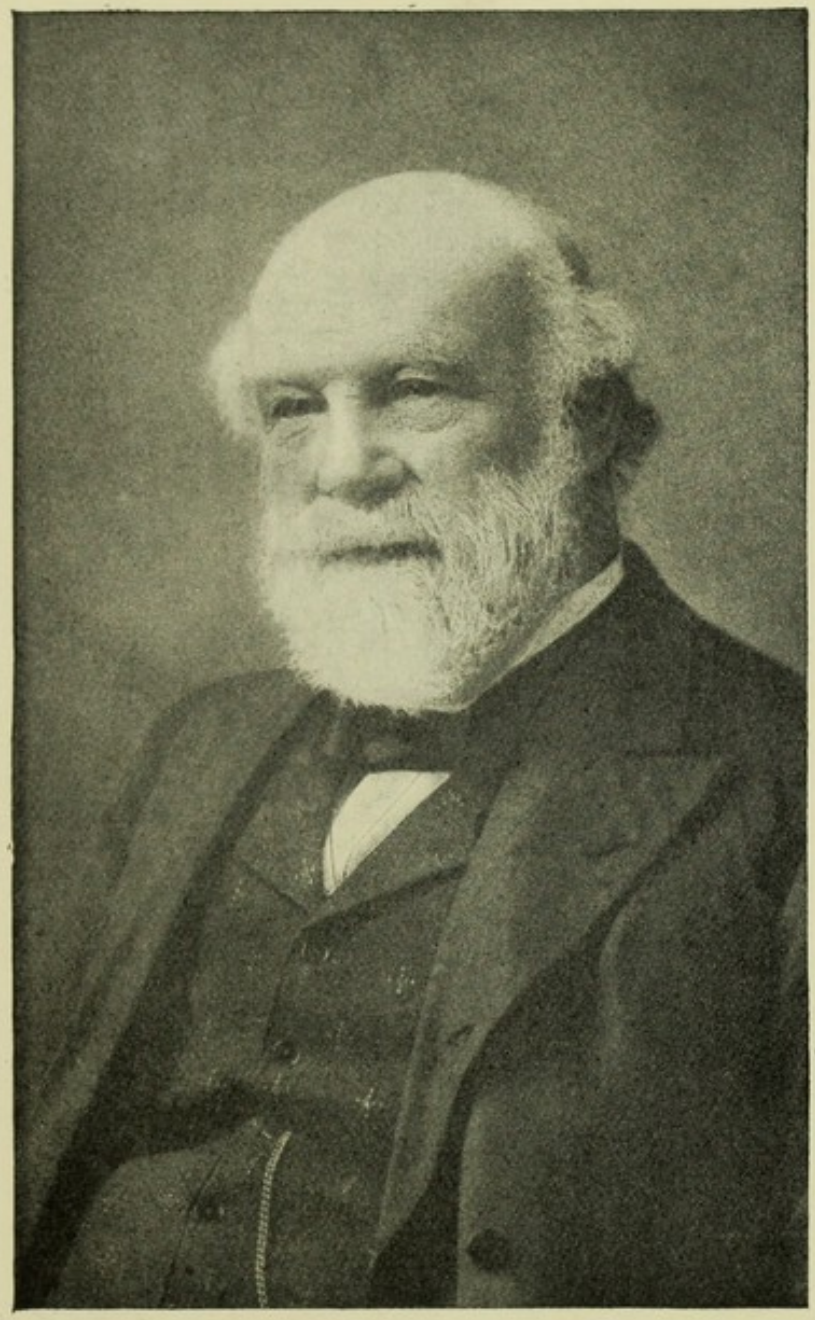
In the surgery of the blood vessels, Lister employed carbolic acid injected in its undiluted state for the treatment of varicose veins, varicocele and other forms of vascular tumours, though he did not, apparently, follow this practice for long. His treatment of internal piles on somewhat similar lines still finds favour, with certain modifications, at the present day.

Shortly after the outbreak of the Franco-Prussian war in 1870, Lister was called upon to advise with regard to the application of the antiseptic treatment to wounds received on the battle-field. He described a simple method for the use of antiseptics under war conditions, but the results were disappointing. It was probably found then, even more than during the late war, that the use of antiseptics at the stage when they would be most useful was severely limited by circumstances. Nevertheless, it may be justly claimed that Lister's influence on military surgery led to an enormously diminished mortality after amputations and minor operations, such as those for the extraction of bullets and shell fragments.

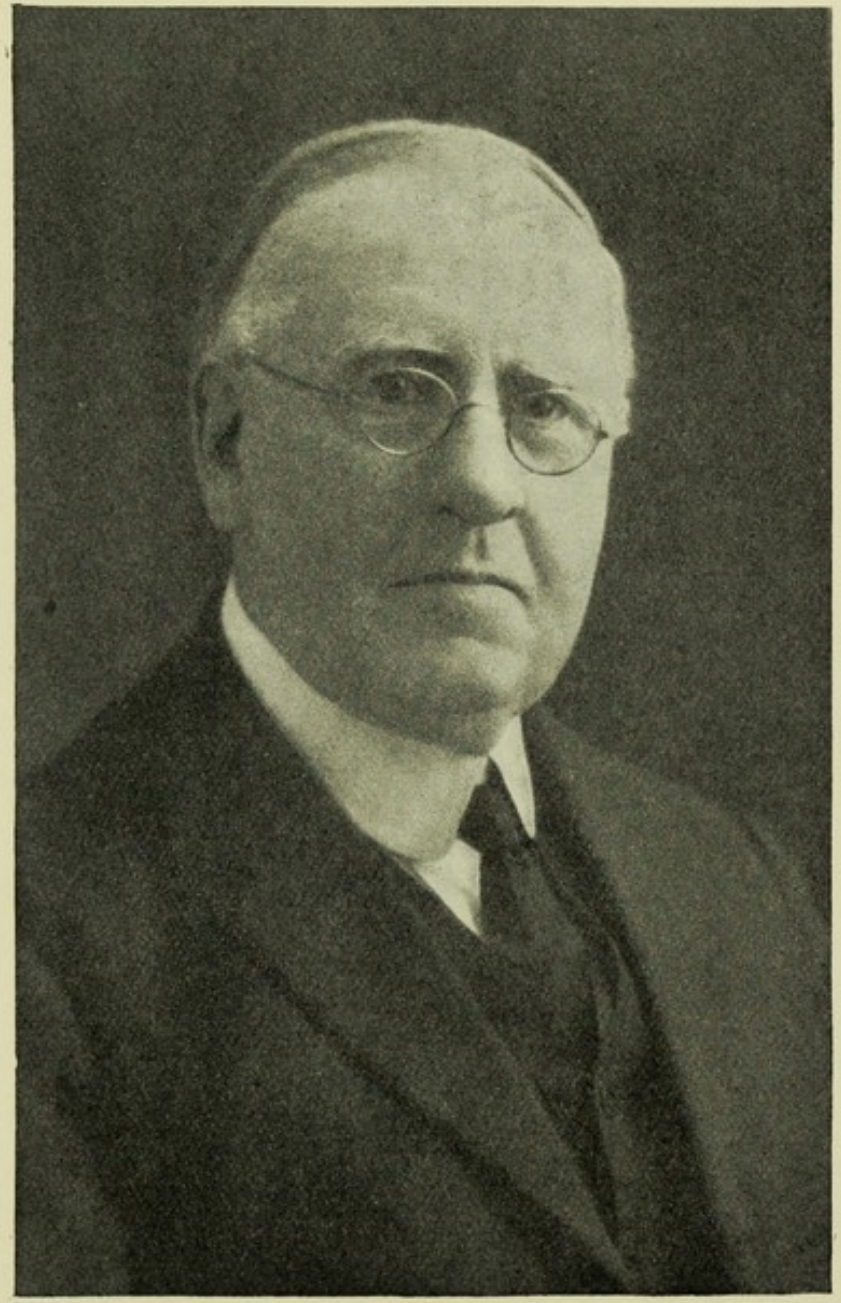
Throughout his long career as a surgeon, Lister's inventive mind devised numerous instruments, including a hook for extracting foreign bodies from the ear, an aortic tourniquet, the sinus forceps, the wire needle, and many forms of dressings, ligatures and drains for wounds.

* * * * *

As an operator, Lister was cautious, deliberate and thorough. To those accustomed to the spectacular performances of the pre-anæsthetic period Lister's painstaking methods may indeed have seemed to be, in the words of his detractors, "fit only for the dissecting room"; but those who were in a position to follow up the incomparable results achieved were not slow to testify to Lister's real worth as a surgeon. From start to finish he had every step in an operation clear in his mind, though when called upon he never failed to show great resource in an emergency. Steady of hand and alert of mind, he performed the most delicate manipulations with unfaltering certainty.



Sir William Turner, K.C.B., LL.D., F.R.S.

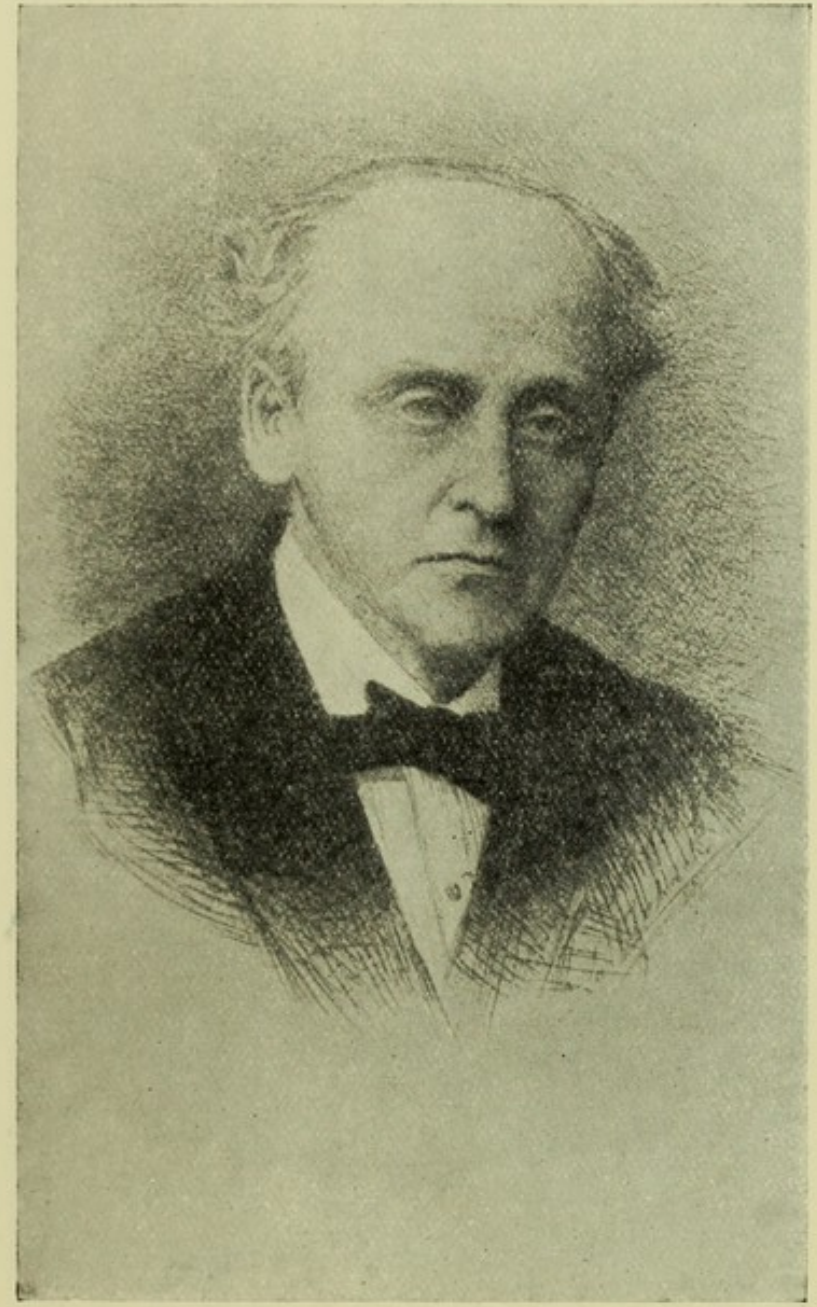


Sir William Watson Cheyne, Bt., K.C.M.G., D.Sc. LL.D., M.B., C.M., F.R.C.S., F.R.S.

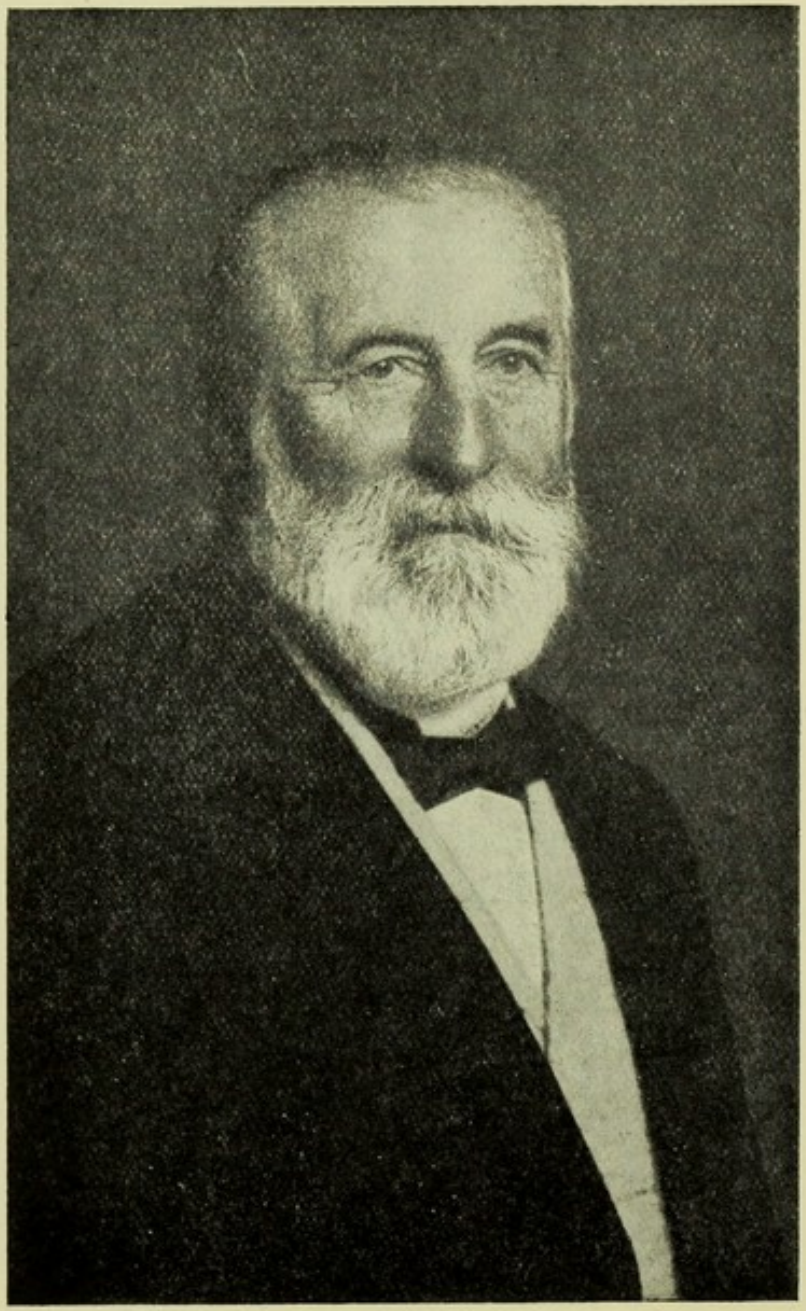
LISTER'S ASSOCIATES

ONE of the outstanding traits of Lister's personality was that he always inspired more than mere respect in his house-surgeons, dressers and students; he won their devotion and kindled their enthusiasm. Those who served under or worked with him were, naturally, men of widely varying temperaments, yet all felt towards him an affectionate admiration that he repaid by making them feel that the work they did was important, and that he had need of their co-operation. He had a long memory for those who, even many years before, had been his students or his assistants.

In the list subjoined, of those who acted as Lister's house-surgeons, clerks and dressers, will be observed many well-known and distinguished names, the owners of not a few of them being, happily, still with us. Among Lister's more intimate friendships must be mentioned that with Sir Hector Cameron, who was one of his most trusted counsellors. Sir William Watson Cheyne became Lister's house-surgeon late in the second Edinburgh period, and was his first surgeon in London, where he shared with his chief the treatment not uncommonly meted out to pioneers. Another friend, Robert Hamilton Ramsay, entered the medical profession rather later in life than usual, attracted chiefly, it is said, by the fascination of Lister's teaching. The friends whom Lister may have been said to have known from his youth included Sir William Roberts, the well-known Manchester physician, who was a dresser at University College Hospital when Lister was house-surgeon, and Matthews Duncan, who was a year older than Lister and was already established in Edinburgh when Lister went there the first time. With William Turner (afterwards Sir William) Lister often collaborated in working out problems that interested them both in the early Edinburgh days. His nephew, the late Sir Rickman John Godlee, to whom we owe much of our knowledge of Lister's private life, was intimately associated with him for many years, and assisted him during the entire period of his active practice in London.



Professor J. N. von Nussbaum
Munich



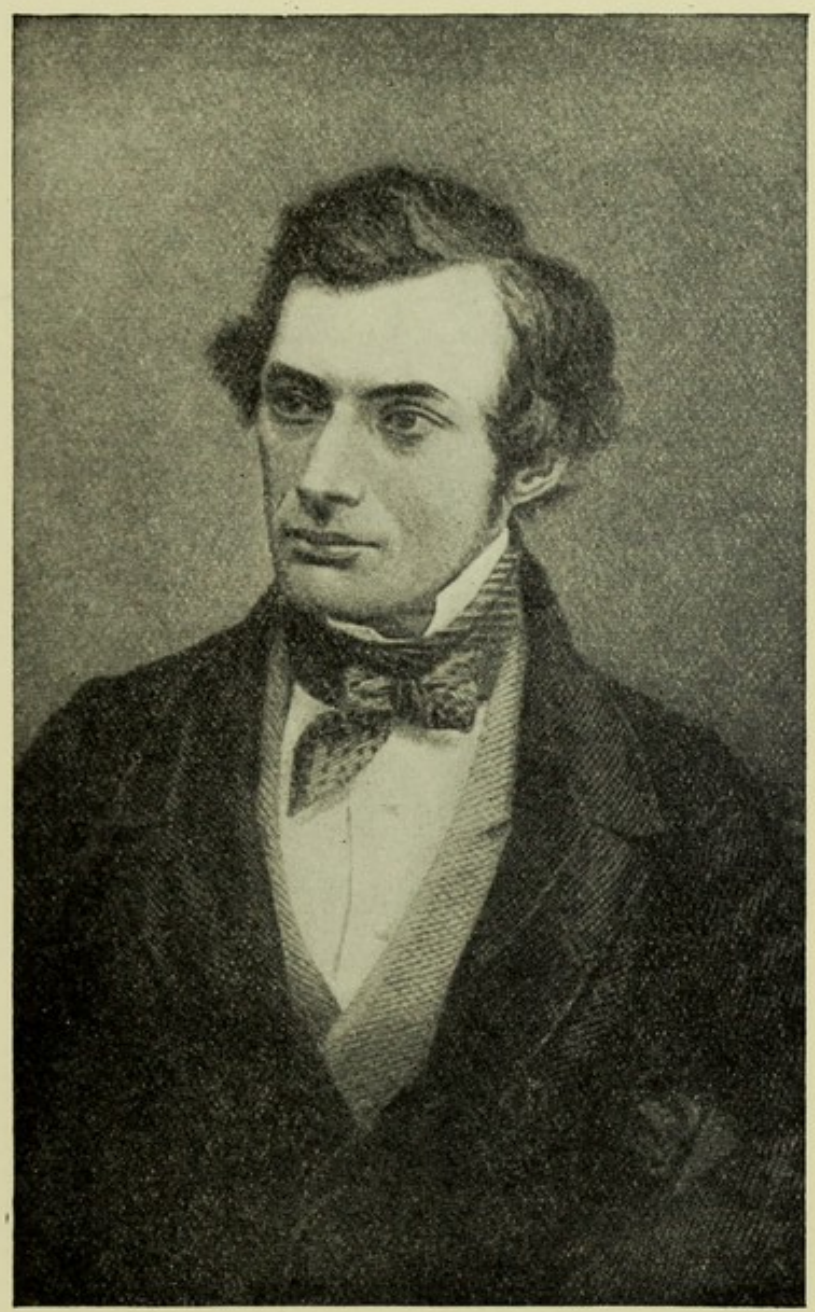
Professor E. von Bergmann

The Influence of Lister's Work

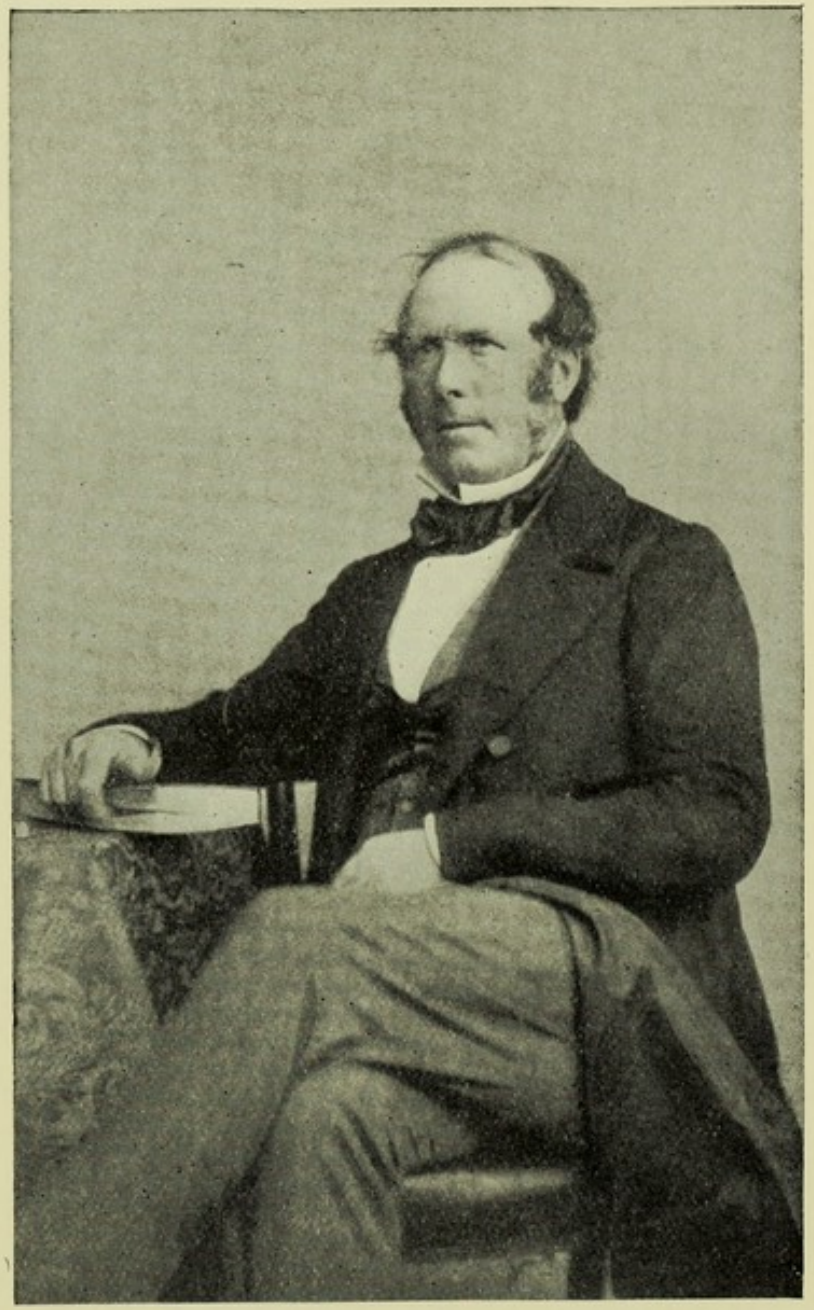
Since the day when Lister applied his first antiseptic dressing of mixed pus and carbolic acid to the incision made in evacuating a psoas abscess, the surgeon's methods of guarding against sepsis have undergone a process of slow evolution until they have been wholly transformed. To-day we have refinements that Lister may never have dreamed of ; sterilisation by heat is the order of the day, and carbolic acid is in small evidence. Lister himself was an indefatigable researcher, and, as we have seen, his repeated trials of different kinds of dressings, some of which are in use at the present day, were aimed at removing certain drawbacks attending the use of chemical antiseptics, if not at abolishing such antiseptics altogether.

Lister was no stranger to the idea of an aseptic dressing. As early as 1870, in an address to the British Medical Association, we find him, with the prevision of genius, foreshadowing the development of aseptic surgery in the following words : " . . . . the idea suggested itself that cotton wool might be used with advantage as an antiseptic dressing. Of course it would be useless to apply ordinary cotton without special precautions, for, according to the germ theory, putrefactive particles must exist among the fibres and lie scattered over the wool. But if the cotton were impregnated with some volatile material capable of destroying the vitality of septic organisms, and then placed upon the wound after washing it with a lotion containing the same substance in solution, the result ought to be, supposing the theory true, that, after the volatile antiseptic had become dissipated by diffusion from the dressing and from the wound, the cotton wool, though destitute of any chemically-antiseptic properties, should effectively prevent, by its filtering property, the access of any putrefactive agents, and keep the wound sweet, while in itself a perfectly bland and unstimulating application."

It will be noted that in his papers and addresses, Lister sometimes used the words " aseptic " and " antiseptic " as if he considered them interchangeable. His object, after all, was to prevent sepsis, and, though he worked always with a view to simplification, he found that chemical



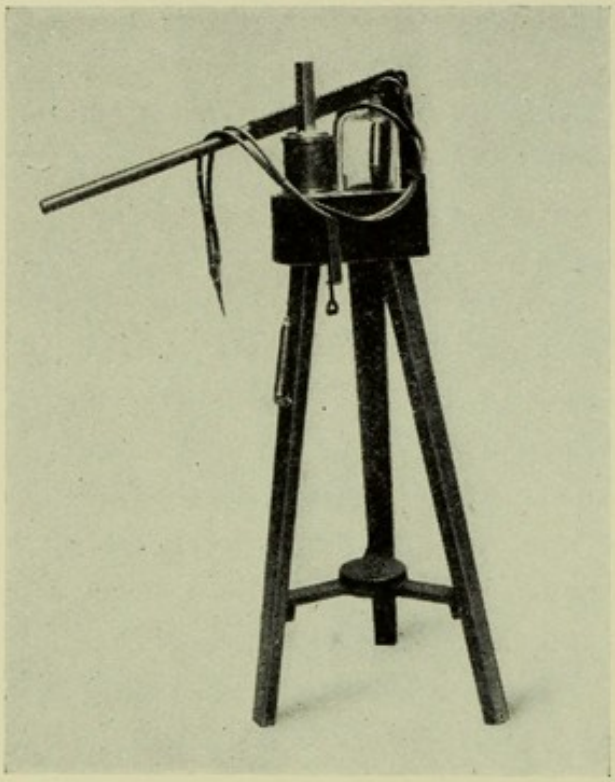
PROFESSOR T. GRAHAM, F.R.S.



PROFESSOR W. SHARPEY, M.D., F.R.S.

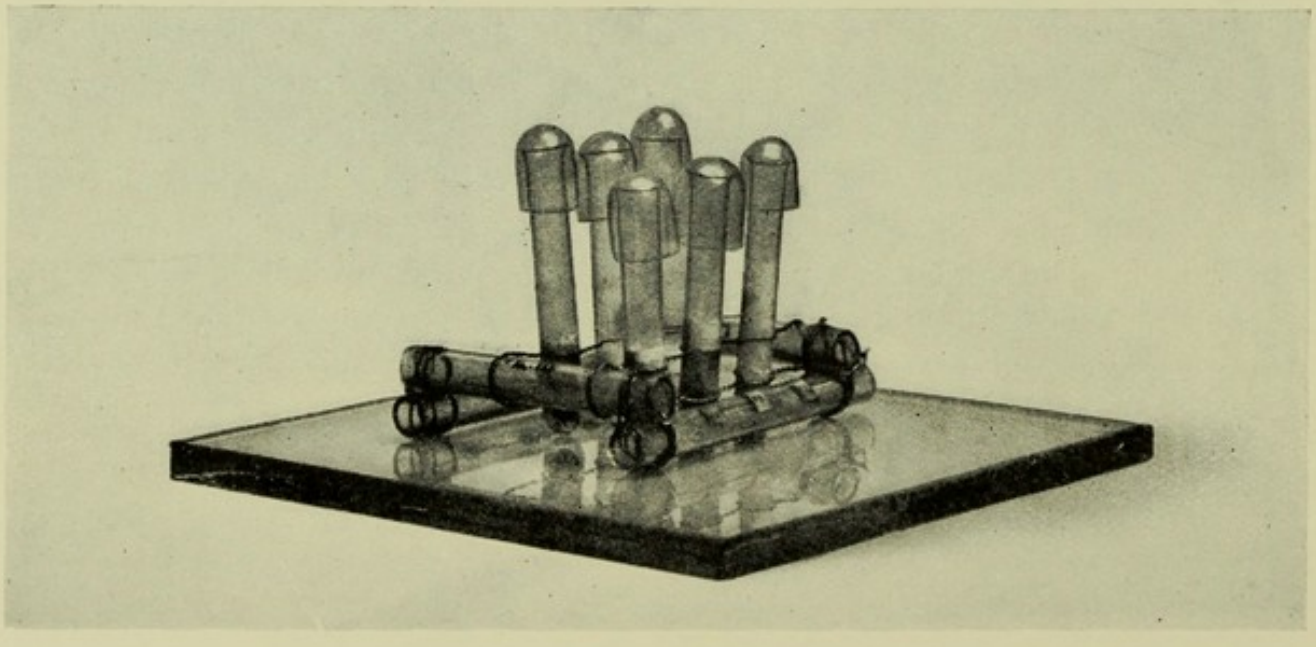
antiseptics placed in his hands a weapon so trustworthy that he was loth to discard them. In a passage following on that quoted above, Lister tells us that he prepared four specimens of cotton wool with different volatile antiseptics, and used the wool thus made as a dressing. He found that each sample of cotton wool answered its purpose satisfactorily until it became thoroughly moistened from a very copious discharge. When this happened, putrefaction occurred through the entire mass of the moistened part and reached the wound within twenty-four hours. Evidently, the risk attending the use of aseptic dressings seemed to be of far more serious account than the irritation of the tissues caused by chemical antiseptics. That difficulties of the same nature sometimes confront the surgeon of to-day is evidenced by the fact that during the last year of the late war the use of chemical antiseptics was revived by Carrel, who obtained excellent results from irrigating wounds with a solution containing sodium hypochlorite, sodium polyborate and small quantities of hypochlorous and boric acids.

Lister's pioneer work in the preparation of ligatures has been noticed in a previous section, as have also his contributions to general surgery ; but his name chiefly deserves perennial remembrance on account of the valiant battle he waged against things unclean in the bacteriological sense. In this sphere, his influence on present-day surgery has been incalculably great. He was thorough; and the rigorous aseptic routine of the modern operating theatre is but a logical extension of the minute care that Lister employed in excluding from wounds the pathogenic microbes that more than decimated surgical wards so late as the 'sixties of the last century. Our aims are the same as were his, and there has been no lack of continuity in method since Lister's earliest experiments. His were the labours of tilling the soil and sowing the seed ; we but reap the harvest.



DONKEY ENGINE
As used by Lister

CATGUT IN CARBOLISED OIL
Prepared by Lister



TEST-TUBES USED BY LISTER IN HIS EXPERIMENT
ON LACTIC FERMENTATION

LISTER'S HONOURS

DURING the latter half of his life, Lister was the recipient of honours and distinctions from almost every civilised country in the world.

A baronetcy was bestowed upon him by Queen Victoria in 1884, and he was raised to the peerage in 1897, taking the title of Baron Lister of Lyme Regis. He was a Privy Councillor, and a Member of the Order of Merit; a Fellow, and sometime President, of the Royal Society of London; Fellow of the Royal Society of Edinburgh; and a Fellow of the Royal Colleges of Surgeons of England, Edinburgh and Ireland. Edinburgh, Glasgow and London presented him with their Freedoms. He was a Knight of the Prussian Order of Merit, a Knight Grand Cross of the Danebrog Order, and an Officier de l'Instruction Publique of France.

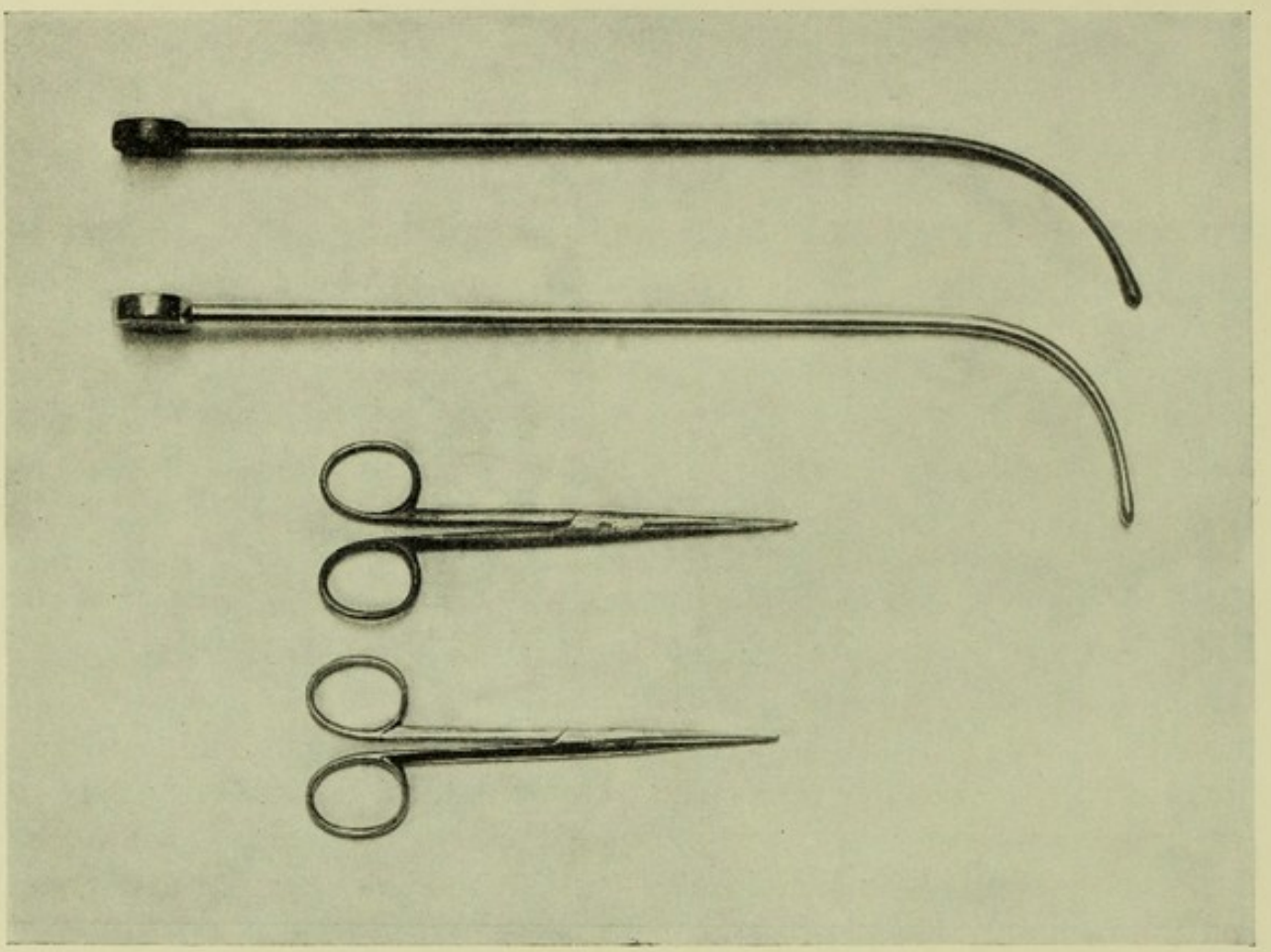
The medals awarded to Lister include the following: The Gold and Silver Medals of the Royal Society; the Albert Medal of the Society of Arts; the Copley Medal of the Royal Society; the Cothenius Medal of the Kaiserlich Leopoldinisch-Carolinisch Deutsche Akademie der Naturforscher; and the Honorary Medal of the Royal College of Surgeons of England.

Universities at home and abroad were liberal in their honours; Lister was a Doctor of Medicine of the Universities of Bologna, Budapest, Cracow, Dublin, Geneva and Würzburg; a Doctor of Science of the Universities of London and Victoria; a Doctor of Laws of the Universities of Cambridge, Edinburgh, Glasgow and McGill; and a Doctor of Civil Law of Oxford and Toronto. The National University of Mexico bestowed on him a Doctorate, and the Royal University of Ireland the degree of Master of Surgery.

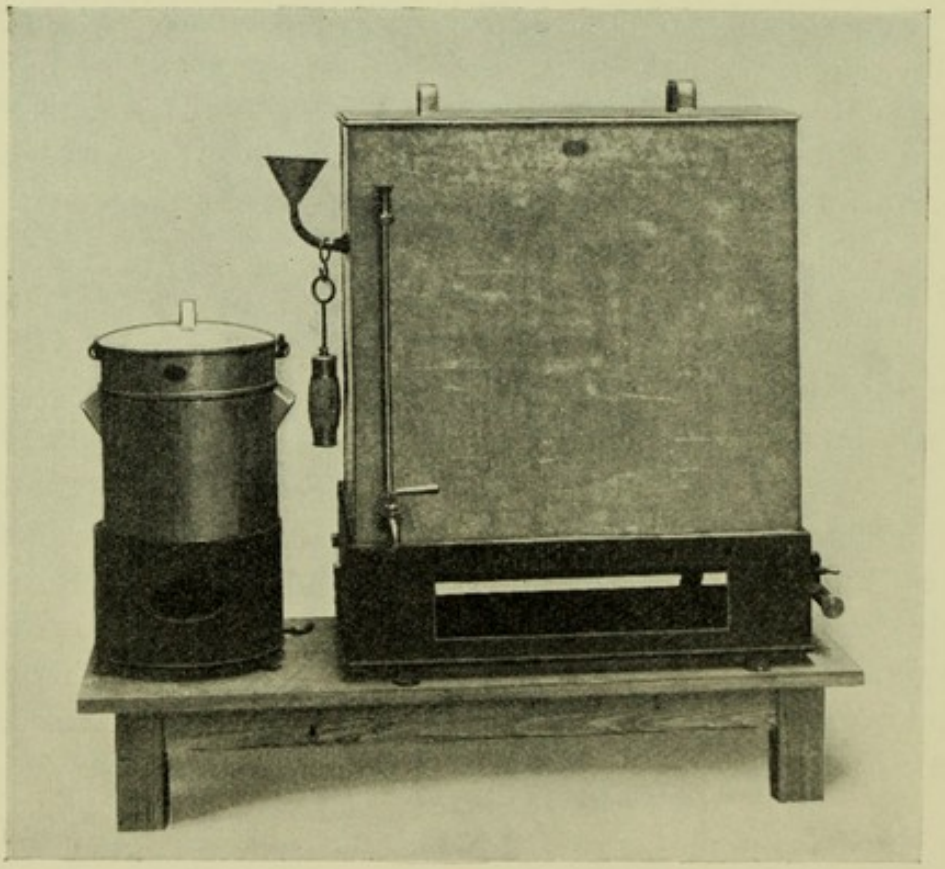
Lister was an Honorary Fellow of the American Surgical Association, the Academy of Medicine of Ireland, the Botanical Society of Edinburgh, the College of Physicians of Philadelphia, the Faculty of Physicians and Surgeons, Glasgow, the Hunterian Society, the Medical Society of London, the Royal Institute of Public Health, and the Royal Microscopical Society.

He was a Foreign Member of the American Academy of Arts and Sciences, Boston, Mass.; the Institut de France, and the Société de Chirurgie de Paris; the Museum of Comparative Zoology, Cambridge, Mass.; the Norwegian Medical Society; the Royal Swedish Academy of Sciences.

The following bodies made him Corresponding Member: the Accademia delle Scienze dell' Istituto di Bologna; the Société Royale de Médecine



LISTER'S URETHRAL SOUNDS AND SINUS FORCEPS



LISTER'S CARBOLISED GAUZE-MAKING APPARATUS

Publique, Belgium ; the Société Royale des Sciences Médicales et Naturelles de Bruxelles ; and the Reale Società Italiana d'Igiene.

Lister was an Honorary Member of the following Societies and Institutions : The Académie Royale de Médecine de Belgique ; the American Surgical Society ; the Arztliche Verein zu München ; the Berliner Medizinische Gesellschaft ; the Clinical Society of London ; the Constantinople Hellenic Society of Literature ; the Deutsche Gesellschaft für Chirurgie ; the Edinburgh Medical-Chirurgical Society ; the Finnish Medical Society ; the Gesellschaft für Geburtshülfe zu Leipzig ; the Gesellschaft für Natur und Heilkunde in Dresden ; the Hufelandische Gesellschaft zu Berlin ; the Imperial Caucasian Medical Society ; the Imperial Military Academy of Medicine of St. Petersburg ; the Imperial University of St. Vladimir, Kiev ; the Institution of Civil Engineers ; the Kaiserliche Akademie der Wissenschaften, Wien ; the K. K. Gesellschaft der Aerzte in Wien ; the Kaiserlich Leopoldinisch-Carolinisch Deutsche Akademie der Naturforscher ; the Kharkov Medical Society ; the London Medico-Chirurgical Society ; the Medizinische Gesellschaft zu Leipzig ; the Pathological Society of London ; the Pharmaceutical Society of Great Britain ; the Philosophical Society of Glasgow ; the Physicalisch-Medizinische Societät zu Erlangen ; the Physiological Society ; the Reale Accademia di Medicina di Torino ; the Reale Società Italiana d'Igiene ; the Royal Irish Academy ; the Royal Medical Society of Edinburgh ; the Royal Society of New South Wales ; the Royal Society of Physicians in Budapest ; the Royal Society of Sciences and Arts of Gothenburg ; the Royal Zoological Society of Ireland ; the Russian Medical Society of St. Petersburg ; the Russian Surgical Society ; the St. Petersburg Medical Society ; the Schlesische Gesellschaft für Vaterländische Kultur ; the Société de Biologie ; the Société de Médecine de Gand ; the Société des Sciences Médicales de Bucarest ; the Société Impériale de Médecine de Constantinople ; the Société Protectrice des Aveugles ; the Société Royale des Sciences Médicales et Naturelles de Bruxelles ; the Société Vaudoise de Médecine ; the Society for the Advancement of the Natural Sciences, Medicine and Surgery of Amsterdam ; the Society of Physicians and Apothecaries of the County of Zempten ; the Society of the Friends of Science of Posen ; the Swedish Medical Society ; and the University of Moscow.

HALL OF STATUARY, WELLCOME HISTORICAL MEDICAL MUSEUM,
AS ARRANGED FOR THE LISTER CENTENARY EXHIBITION

APPENDIX

Opening Ceremony

of

The Wellcome Historical Medical Museum

Tuesday, June 24th, 1913

Address by

The Chairman, Sir Norman Moore, Bt.

M. A., LL. D., M. D., F. R. C. P.

THEN PRESIDENT OF THE SECTION OF HISTORY OF MEDICINE
XVIIITH INTERNATIONAL CONGRESS OF MEDICINE

Mr. Wellcome, Ladies and Gentlemen, I have been asked to declare this Museum open because I chance to be President of the Section of the History of Medicine in the International Medical Congress, which is to be held in London in the month of August. I am glad to have the opportunity of speaking on this occasion, because I feel that this Museum will be a most important aid to the Section of the Congress over which I preside; and that it will be of interest not only to that particular section, but probably to nearly the whole of the seven thousand people who, from all the ends of the earth, are coming to London to attend the Congress.

Museums are so familiar to all of us at the present day, that we are, perhaps, inclined to think that they have existed from the beginning of time; but that is not the case. They are comparatively modern aids to study. Dr. John Dee, some of whose books we have in the library of the Royal College of Physicians, collected, in connection with his library, a small museum in the reign of Queen Elizabeth. It consisted chiefly of mathematical and astronomical instruments, and various other curiosities.

It was not a very important collection, and most of it was destroyed by a mob who thought that Dr. John Dee was a malignant necromancer.

The first important museum which was founded in England was that of John Tradescant, and of his son, John Tradescant, at Lambeth. The two Tradescants were primarily gardeners. They brought to England many of the shrubs which you see in the gardens all round London at the present day. They also collected herbs in relation to medicine ; and they formed this first general museum. The catalogue of their museum was published by the younger Tradescant in the year 1656. It contains no less than fifteen separate sections of curiosities ; birds, beasts, fishes, plants, insects, warlike instruments, coins, medals, and so on ; concluding with a list of the benefactors of the museum.

Many of us here present have seen one specimen from that museum. It is in two parts ; and consists of the head and foot of the extinct dodo, now preserved in the Ashmolean Museum at Oxford. In the darker times of that University—you know all universities, even the greatest, occasionally have periods in which their knowledge is clouded by indolence—in one of those dark periods, the University of Oxford destroyed the body of this unique bird ; but fortunately its head and foot are still preserved.

The museum of the Tradescants went to Elias Ashmole—the younger Tradescant left it to him—and so it became the basis of the Ashmolean Museum at Oxford.

Soon after their time, a very important museum was founded in London by James Petiver. James Petiver was a man educated at Rugby School, and must be regarded as one of the glories of that celebrated foundation. He came up to London and was apprenticed to Mr. Feltham, the apothecary to St. Bartholomew's Hospital. He throve in his occupation and became apothecary to the Charterhouse. While there, in addition to performing the duties of that station, and carrying on an extensive medical practice, he made entomological and botanical collections from all parts of the world ; and, in course of doing so, he came to know a great number of sea captains ; and those captains brought him other things than plants and insects, and in that way his museum came to contain

every description of natural object. Petiver had also a very considerable library; and it is worth remembering that all these early museums were associated with libraries.

Petiver died in 1718; and Sir Hans Sloane, President of the College of Physicians and of the Royal Society, bought all his collections. He had previously bought the museum which was kept in the rooms of a Mr. Curten, or Charlton—because he called himself both—in the Temple; and Sloane added many more specimens to these collections; and so formed a great library and a museum in almost every part of science. That museum, as you all, I am sure, know, he presented to the nation under certain conditions. It was the beginning of the British Museum. It was, therefore, primarily a library surrounded by collections of the specimens which illustrated everything that was recorded in the books of that library. That was the original view, in the first times of their formation, of museums. There is a very interesting catalogue of one such museum, that of Francis Calceolari in Verona, which appeared in the year 1622. It covers 800 pages folio, and gives an idea of the eagerness of collectors at that time, and also of the wide scope of interest which they felt. There is a picture of the museum at the beginning of the catalogue. It was an oblong room, with a floor of variegated marbles, and round the walls were dressers with drawers in which were specimens, while on the shelves of the dressers there were specimens in bottles, and isolated dry ones, and on the top several stuffed birds. On one side of the museum was a statue of Atlas bearing the world, as if to show that the specimens came from every part of it; on the other side, one of Minerva, as if to indicate that every kind of learning might obtain aid from it. From the roof there hung numerous dried reptiles and fishes. There were books at one end. Such was the first idea of a museum. "Whatever the earth possesses, whatever has been hidden in the depths of the sea, the toil and skill of Francis Calceolari has collected," says a Latin poem affixed to the catalogue.

The gift of Dr. William Hunter to the University of Glasgow was another museum of this type. It contains pathological, anatomical and natural history specimens, manuscripts, books, pictures and coins.

Such a museum we have at the present day exactly upon the original plan, a great library surrounded by illustrative collections, in the British Museum. Long may it continue so. It is enormously to the public advantage to have at least one such universal collection in our midst. A few years later a more limited kind of museum began to be formed. The celebrated Sir Thomas Browne, of Norwich, had an eldest son, Dr. Edward Browne, who, after taking his Bachelor of Medicine degree at Cambridge, in 1664, came up to London. He has left a very interesting journal of what he did on this visit, and in it he mentions going to see Edmund King, who lived in Little Britain and was surgeon to St. Bartholomew's. Edmund King showed him his collection of anatomical preparations, all of them of intense interest to this young bachelor of medicine.

That was an example of a collection relating to one subject only. Woodward, the geologist, soon after made that collection of fossils in small cabinets, which is to be seen to this day at Cambridge, where he founded the Professorship of Geology.

Many other special collections were made; but the greatest of them all was that of John Hunter. He, in his own house, collected a vast series of specimens, not by chance, but as illustrating the principles which he had in his mind, and the truths which he was endeavouring to seek out; a collection mainly concerned with comparative anatomy and pathology, and normal anatomy, and containing some other specimens as well. That collection, as you all know, is at present under the charge of Sir Rickman Godlee and his colleagues of the Royal College of Surgeons, who have proved themselves admirable custodians and improvers of the collection, and have added specimens in every direction, so that they have produced one of the greatest special museums in Europe.

Of special museums, the one which I have been asked to declare open to-day is a fresh example. A museum illustrating the history of medicine has never before been attempted in England.

The history of medicine is a subject which may be pursued in a great many ways. It divides itself into two great branches, and those two branches I think are very well typified by two of the figures which I can see before me on the ground floor.

The first is a curious creature with a black mask, with feathers in its head, with a necklace of the teeth of the Spermaceti whale, and with a curious instrument of incantation in its right hand and pointing out with its left, so that I can imagine the creature uttering a strange ejaculation. This is Ixtlilton, the god of medicine of the ancient Mexicans. He may be taken to represent that part of the origin of medicine which has to do with local superstitions, with charms and amulets and incantations.

The other aspect of the history of medicine is typified by the cast of the statue of the Apollo Belvedere, that statue which is perhaps the grandest representation in sculpture of manly intelligence, manly strength and manly beauty. Apollo, the god who in the Greek mythology was associated with medicine, in several ways with the control of diseases and, as their thoughts curiously ran, with the causation of disease. Apollo and his son Asklepios, whose statue is here also, seem thoughtful men, capable of observation, and full of the power of reasoning from observation. They thus present another view of the history of medicine. We can easily feel that they represent men who were the true ancestors, the true observing predecessors, of Hippocrates and Galen and Avicenna.

When we read Hippocrates and Galen, and when we search through the vast pages of Avicenna, all of us who do it carefully must feel that the path from them to Harvey and Glisson and Sydenham and Matthew Baillie and Lister, long though it be, is nevertheless a continuous track, and that those men of the past, Hippocrates, Galen and Avicenna, were the true predecessors, and were men of the same turn of mind, the same kind of thought, the same hope of enlarging medicine by observation, that Harvey, Glisson, Sydenham, Matthew Baillie and Lister were.

The two directions, in one of which most students of the history of medicine are inclined to tread, are towards folk-lore or towards the aspect of medicine as part of the history of the already cultivated human mind. For my part I am inclined to prefer the latter, without in the least wishing to belittle the former.

Those who like the line of study which is typified by Ixtlilton will find in the entrance hall plenty to engage their attention. There they may see very many fetishes and the curious dresses of the medicine men of West and Central Africa; numerous charms in use there among the pagan tribes; and the great god of medicine of New Zealand. Such are very appropriately placed near the entrance of this Museum.

You come on into the room in which we are at present, in which, besides the Cheiron, Apollo, Hygieia and Ixtlilton, are placed models of the gods that presided over medicine among the Chaldeans, the Egyptians and other ancient nations; and in the cases are numbers of instruments showing their variation from remote times. I am merely trying to give you a general idea of what are the contents of the Museum through which you will shortly walk.

Then you come to the staircase, and there are the three Saints who are connected in Christian theology with the study of medicine—Saint Luke, Saint Cosmas and Saint Damian; and as you come up the staircase you find on the walls many paintings. These are enlargements of illuminations occurring in manuscripts, and are a most instructive series illustrating illnesses and operations and the care of the sick.

Then in the cases round the gallery you will see numbers of charms and amulets. Now do not think that these charms and amulets are all matters of the Middle Ages. Many of these have been collected in the East End of London or in various parts of the countryside in England in our own day.

I remember very well the first occasion on which I became aware of the fact that charms and amulets are part of the living belief of educated people, in many cases, in this country. I was staying at a house in the Highlands where a lady, who was also a guest, one day produced from her pocket what seemed to be a small hard stone and showed it to me and asked me if I knew what it was. I said that I thought it was a stone, perhaps picked up on the seashore. "No," she said, "it is a potato. It has obtained this hardness by being carried in

my pocket. I carry it as a remedy for chronic rheumatism, from which I have long suffered." I asked where it came from. "Well," she said, "I am not ashamed to tell where it came from. I was staying at Dunrobin when I heard of this remedy, but I was in this difficulty: I was told that the potato would do my rheumatism no good unless it was stolen. I could not bear to strain my conscience even to purchase my health, so I told the Duchess of Sutherland of my difficulty, and she said: 'Oh, there is no difficulty; steal a potato out of the garden, it is the Duke's potato, he will not know of it, it will be effectually stolen for your purpose.'"

So accordingly the lady stole the potato and carried it in her pocket, and, according to her account, was cured of rheumatism. Well, I came back to London and told this to Sir James Paget, who was then flourishing. "Oh," he said, "when, some years back, I had to attend a lady of very high rank in this country, who had some affection of her knee-joint, I constantly received letters begging me to introduce freshly-peeled potatoes or new potatoes into her bed, or to put them in a basket under the bed, assuring me that if I did so she would at once get well."

Now that, which was the first definite superstition in relation to an amulet which I ever came across in life, is most interesting, because you will observe that, as the potato was only introduced into this country in the reign of King James I., the superstition cannot have had its origin in the Middle Ages, or the Dark Ages, or classical times; it is a modern thing.

Now that is one value of the history of medicine; that it opens one's eyes to the fact that so little changed, in spite of education, in spite of civilisation, is the human mind, that a superstition of that sort with regard to an amulet may grow up at the present day. Many more such are illustrated by the specimens here.

In the next room you will find a series of pictures, busts and medals, illustrating the career of physicians and surgeons and men concerned in the sciences relating to medicine. It would take me too long if I were to try to dwell upon many of them, or any of them, in fact.

At the far end you will see the largest series which I believe has ever been collected of portraits of the celebrated Harvey, and amongst them a bust of him, which very few people have seen because the original is upon his tomb in the remote village of Hempstead, in Essex. When the late Sir George Paget, the brother of Sir James, had taken his degree, having studied at St. Bartholomew's, he was so filled with enthusiasm for Harvey that he went on a pilgrimage to Hempstead and there saw the original of this bust, and had several copies of it made, of which that is one. Sir George Paget also gave one to St. Bartholomew's, and one to Caius College. It is a very remarkable bust, obviously taken from Harvey during his lifetime. On the walls you will find the portrait of almost every physician you have heard of in England.

Sir Thomas Barlow will recognise a large number of his predecessors in the illustrious office which he discharges with so much distinction—that of President of the Royal College of Physicians.

The next room contains a very fine series of early printed books referring to medicine and surgery. In the time of Queen Elizabeth there were large numbers of books relating to medicine and to surgery—more to surgery, by far, than to medicine—published in London. Physicians at that time did not think that it was consistent with propriety to write in any language except Latin, but surgeons held a different view. They were chiefly concerned with operative proceedings and lived among the people. One of them at that time, I remember, says: "Some people say that we ought to know Latin; for my part I care nothing whether a surgeon know Latin or not so he be a good artist," meaning so that he is able to operate well.

I do not think that writers on English literature have done these surgeons sufficient justice; they have not observed how admirably, in the little anecdotes which they give in relation to their cases, they have brought out the life of the time in the everyday language of the time. Many of their books are in this Museum.

There are also a number of diplomas for degrees. In the Italian Universities the diplomas for degrees were beautifully illuminated, and

they contain very quaint forms of inauguration which have long been forgotten in our Universities. A ring was put upon the finger of each doctor; he was in some cases given a kiss on admission to the faculty; he was crowned with laurel.

There are also some manuscripts—Latin, Arabic and Persian—on medicine; and there is one specimen of that very interesting document, an "album amicorum." When people studied at several Universities, as they often did in the 17th century, they used to have a blank book in which they got each professor whose lectures they attended, and each friend whom they made, to write a little inscription, and some of these inscriptions are most charming. The professors wrote showing their knowledge of the particular man, or their wishes for his prosperity in the future. The students at the University, instead of writing sometimes drew a little picture, not always having any particular reference to medicine. I remember one in which there is a young lady, very gorgeously dressed, a white horse prancing, and a peacock spreading its tail, and underneath is written:

"Ein Pfau, eine Frau und ein Pferd
Sind die drei stolzeste Thiere auf Erd."

I suppose the young lady was perhaps the object of the affections of the student, and that his friend wrote thus as a sort of warning to him.

Now, following those rooms, you go downstairs, and there you come into a vast area containing very many specimens; along one wall there is a series of pictures of Florence Nightingale—in many of the cases there are all kinds of what one would call instruments of nursing rather than of medicine or surgery.

There is a model of the operating table of Ambroise Paré. You will remember that he was the French surgeon who first hit upon the great idea, almost by chance, that it was better not to pour oil and wine into wounds, but to do them up without those additions. Then you come to a series of models illustrating the medical life of other times.

Some great teachers of history have urged that you ought to begin with what you can know perfectly in your own time, and so gradually go back to the times of less knowledge ; and Mr. Wellcome has followed this plan.

The first thing that strikes your eye is a pharmacist's shop which many of us can remember in Oxford Street, which was built in the last decade of the 18th century. There it is, with its window of small panes, containing a great variety of pharmacist's jugs and jars within it. Then, as you go on, if you look at the ceiling you will perceive printed upon it the prescription for Theriaca. Theriaca was the preparation known to mediæval and even to classical (because it is mentioned by Galen) medicine which contained almost the largest number of ingredients of any compound drug ; I say " almost " because at one time there were some that contained more, but Theriaca had plenty. In that formula there are 75 ingredients. It was thought a good remedy for the plague. An attempt was made to remove it from the Pharmacopœia in the year 1746 ; but the English are a very conservative nation, and it was not possible to do so. It was not removed from the London Pharmacopœia till the year 1788.

Just beyond this wonderful prescription there are a great many beautiful Italian apothecary's jars ; and then you come to an apothecary's shop in the Old Bailey in the year 1662.

There is the apothecary, reading a herbal in his shop, a crocodile and lizard hanging from the ceiling, and the blue pots which are proper to an apothecary are round him on the shelves. When you are looking at him, do not think of him as an illiterate or an ignorant man. Do not think of him as a charlatan. He was not anything of that kind.

We had at St. Bartholomew's at that very period an apothecary named Francis Bernard, who stayed in London throughout the plague. Later in life he was given a degree at Cambridge; and he became Physician to the Hospital and a Fellow of the Royal College of Physicians. He had one of the most splendid libraries of his time. I have often read

the pages of his catalogue and wondered where the astonishing riches which he had have gone.

Well, Francis Bernard—as the Master of the Society of Apothecaries, himself a learned man, who is here to-day, will tell you—was no exception in his profession. There were many apothecaries of that time who lived in shops like the one in this Museum, who were men of extensive reading, and who made valuable additions in many directions in science, and particularly in botany.

Next to this apothecary's shop is the workroom of an alchemist; and exactly opposite it is a series of pictures of the plague; so that one's mind is immediately turned to Ben Jonson's famous play. You will remember in it how a citizen goes out of town owing to the plague; and how an alchemist, through his servants, gets possession of the house, and carries on all sorts of incantations in it. He was such an alchemist as is modelled here.

The next room illustrating the subject is an early Italian pharmacy, with all its beautiful jars perfectly arranged, unbroken, on a series of shelves. Of course, since your mind has been turned to the theatre, and you have thought of Ben Jonson's alchemist, when you see this shop you cannot help thinking at once of Romeo and Juliet; but you will see that the pharmacist of the Italian pharmacy of Mr. Wellcome's Museum had thriven much more in his business than the poor apothecary in Mantua who sold Romeo the poison.

Next to these illustrations is a model of a barber-surgeon at work upon the injured skull of a patient. Shaving bowls hang round, and other implements of his occupation. Do not think of him as an ignorant mechanical person. He was not that. The circumstances of the time made him, as William Clowes, one of the barber-surgeons, said, not the least ashamed of being able to shave a man or cut his hair well; but he really had the scientific turn, the intelligence to search after the truth, the desire to cause his patients the minimum of pain, and to cure them with the greatest rapidity of the modern surgeon.

Such a barber-surgeon was this William Clowes, who was surgeon to St. Bartholomew's in the reign of Queen Elizabeth. He began his life by serving as a surgeon in the army; and he was present at that famous field of Zutphen, made illustrious by the death of Sir Philip Sidney. He came back to London and practised his profession; and he resigned his post upon the hospital staff in order that he might serve in the fleet against the Spanish Armada. He wrote several books, all of them fine examples of vernacular English and containing very many illustrations of life in the Shakespearean period.

There is just one more of these representations of past medical life. It is the house of a surgeon of the Empire at Pompeii. There he sits, a man of obviously thoughtful mind, with some few instruments beside him. When one tries to decide whether he was competent, and how far he was competent in his profession, you have to look into the general literature of the time.

In Petronius Arbiter, an author who is supposed to give a good idea of life in a small provincial town outside Rome, near Naples, in fact just where this surgeon is supposed to have lived, it is mentioned that a man had a silver skeleton, with all the joints so made that the limbs could be turned in any direction, and all the vertebræ of the spinal column could be moved so that the spine could be bent in anyway. Where such a skeleton was an ornament of a wealthy man's house, it is easy to imagine that the practising surgeon must have had considerable knowledge of anatomy and of the other parts of his profession.

Now there are, of course, innumerable other things which I might mention to you in this unique Museum. I will not detain you with any of them, because you will now have the opportunity of going to look at them; but I should like to point out one thing before I sit down, and it is this: That it is a just subject of pride that in our country so many splendid museums—those of the Tradescants, of Petiver, of Curten, of Sir Hans Sloane, the Geological Museum of Woodward, the Museum of William Hunter which is at Glasgow, the Museum of John Hunter which is at the Royal College of Surgeons—have all been formed by the exertions and at the cost of private individuals.

This Museum is no exception: it has been formed entirely at the expense and by the exertions of Mr. Wellcome, who has followed these good precedents. A lectureship in the history of medicine was founded by a private benefactor at the Royal College of Physicians in 1901, and is at present the only one in England. Mr. Wellcome's Museum will be a most important addition to the means of studying the History of Medicine. I now declare it open.

SIR THOMAS BARLOW, BT., K.C.V.O., M.D., F.R.C.P., F.R.S., etc., *President of the Royal College of Physicians: President of the XVIIth International Congress of Medicine:* Mr. Wellcome, Ladies and Gentlemen, you will all be most anxious to join in thanking Dr. Norman Moore for his most illuminating and most fascinating address. I should like, if it is not quite unseemly, to add one name to the glorious roll of the cultivators of museums, and that is one who has just been taken from us—I mean Sir Jonathan Hutchinson. This is no place and no time to make any appreciation of that great man; but it is fitting that we should remember that he was one of those who consistently maintained the obligation of developing museums, not only for the advance of medicine but for the general advancement of culture throughout the length and breadth of the land. He had made great sacrifices not only for his collection of pathological specimens, but likewise for those educational museums which he founded at Haslemere and the place of his birth, at which he attempted to show the value of the chronological study of human affairs throughout the centuries. At this time I think it is fitting to remember with gratitude Sir Jonathan Hutchinson, who did so much in this direction.

Ladies and Gentlemen, I am sure that everybody present in this Museum at some time or other has had to face the problem—the ever-recurring problem—of what is justifiable luxury and what is not justifiable luxury. I am sure that not only is that so in great affairs, but it has been the lot of many of those who are around me to stand before an etching, or a water-colour, or an old Greek coin, or some charming specimen, whatever it may be, and ask himself how far it was right for him to spend money on something of this kind, and how far it was justifiable for him to do it.

I will affirm, without fear of being contradicted, that Mr. Wellcome himself, during the long period in which he has spent so much time and so much energy in getting together this magnificent collection, must have had now and again the same question occur to his conscience; but, Ladies and Gentlemen, I think we may all of us assure him to-day, when we walk round, and when we think of the amount of intellectual enjoyment that will be given, when we think of the impetus to men and women of our own profession in the art of studying the evolution of medicine as we can see it here, and when we think of the enormous profit which will be given to cultured men and women of thought and reading, not only of our profession, but who follow the old Roman adage : that nothing is foreign to us that is human —I say, when we think of all these things we may, I think, rightly tell Mr. Wellcome that he may take comfort to his soul, and that he may feel that this Museum has been a case of justifiable luxury.

I think the years will come when, as he reflects and considers what happiness and what instruction this Museum has given to this generation and will give to generations to come, it will be a pleasure to him to remember that it was inaugurated by one who is without doubt one of the ablest scholars in the study of the history of medicine.

Sir FREDERICK TREVES, Bt., G.C.V.O., C.B., F.R.C.S., etc., *Vice-President of the International Congress of Medicine:* Ladies and Gentlemen, I have very great pleasure in seconding the vote of thanks that Sir Thomas Barlow has proposed to Dr. Norman Moore for his most learned and most interesting address. It tempts me to take the opportunity of expressing to Dr. Norman Moore what the medical profession owes to him for his contributions to the history of medicine, and the immense service he has done in observing and recording the lives of those who have been distinguished in the history of medicine and surgery in the past. It is an obligation impossible to discharge, and one I am quite sure that the whole of the profession very heartily appreciates.

I will not detain you with any comments on this Museum beyond saying this : it would be hard to exaggerate the importance and service of it. The progress of medicine has been so rapid as to be astounding

and bewildering; and a Museum of this kind, established and laid out as Mr. Wellcome has laid it out, enables one to pause for a moment and look back on the route that we have traversed. We have reached a height, possibly a great height, and it is well to look down into the plain that we have crossed, and to see by what steps we have reached the position that we now occupy.

I take it that progress in a matter like medicine and surgery proceeds on lines that, although they appear to us to be exceedingly diverse, have yet beneath them one or two common principles; and one cannot help noticing in this Museum, so far as the art and science of surgery are concerned, in what narrow lines that progress has been made; and, knowing that and studying it, one can forecast to some extent in what direction progress in the future will move.

It is curious in this collection of surgical instruments to see that, although one supposes there is really no limit to human ingenuity, there is no limit to adaptation and to enterprise in the matter of adapting means to an end; it is curious to see, having that impression, upon what very simple lines progress has been made in connection with surgical instruments.

Invariably they begin as complicated instruments and gradually become simpler and simpler until they resolve themselves into some of those very commonplace instruments that we are so familiar with at the present time. I will say no more except to very heartily second the vote of thanks which has been proposed to Dr. Norman Moore.

DR. NORMAN MOORE: Ladies and Gentlemen, I thank you very much for your kind vote of thanks. I am glad to have interested you; but there is a person here to whom your thanks are much more due, and I will ask Sir Rickman Godlee to propose a vote of thanks to him.

SIR RICKMAN GODLEE, BT., M.S., M.B., B.A., F.R.C.S., etc., *President of the Royal College of Surgeons:* Ladies and Gentlemen, I have the pleasure and great honour of rising to propose a vote of thanks to Mr. Wellcome, the patron of this wonderful feast which is laid before us—

I almost feel that I ought to propose his health, when one thinks of the dangerous regions to which he goes.

I had the pleasure, yesterday afternoon, of being taken round by Mr. Wellcome for a short time to some parts of this glorious Museum; and I was very much struck with the interesting way, and the very modest way, in which he showed me some of his magnificent treasures.

But there is another side to Mr. Wellcome's character, or to his occupation, which few of us know; and that is one which is carried on very far away, in some of the most distant parts of the King's dominions.

I think Mr. Wellcome is a very fortunate man, in the first place, to be here this afternoon, to see all the treasures he has collected looked at by an admiring crowd; and in the next place because he has a hobby which at the same time is extremely fascinating and also intensely useful.

Mr. Wellcome has, as we know, laboratories in Africa. We know that he has not only a laboratory on land, but he also has that wonderful floating laboratory of which you will see a model in the front of this Museum, with which he carries the war, it may be said, right into the enemy's camp, for he and the laboratory staff, protected by a wire gauze screen, can attack the mysteries of the mosquito by day, and sleep secure from them by night.

From time to time there are issued from those laboratories most beautiful reports, written by the Director and his collaborators, which show us not only the country in which they move, but the ghosts of the inhabitants who dwell there, and the flies which kill them.

This brings home to us very vividly the sort of work which Mr. Wellcome is doing. It shows us not only that he is greatly interested in the study of tropical diseases, but also that he is interested in the study of anthropology; and all these things are combined in this marvellous Museum. I think, however, that the point which we particularly wish to thank Mr. Wellcome for this afternoon is the great public spirit he has shown in expending his time and his wealth in forming this valuable Museum.

I am very glad to see in the foreword which is put at the commencement of the catalogue, that it is his intention that ultimately this Museum shall be a permanent asset to the nation. I wish, Ladies and Gentlemen, from all these points of view, to tender our sincere thanks to Mr. Wellcome for the collection that he has made, and for inviting us here this afternoon to its opening.

SIR FRANCIS CHAMPNEYS, BT., M.D., M.A., F.R.C.P., etc., *President of the Royal Society of Medicine:* Ladies and Gentlemen, I rise with very great pleasure to second the vote of thanks to Mr. Wellcome for this magnificent addition to the Museums of this Metropolis.

I think the feeling that strikes my mind most at the present time is that of envy of my juniors. One is just ending one's career, and one only wonders what one would have been if one had had the opportunity of starting with all the knowledge that now opens before one's juniors. It is harking back to the old that is so very exciting, I think, in the present day.

Those who have the opportunity of studying a collection of this sort, and going back to see what their ancestors did and thought, and what the inhabitants of distant lands have thought and are thinking about this great study of disease, cannot fail to have their imagination excited in a way which surely must bear fruit.

This seems to me to be the most fruitful part of such a study as that of the history of medicine. I know that it is recognised in the Universities to a great extent, where Professors of Medicine, and no doubt other subjects, show those who are beginning their studies some of the finest things that have been attained in the past.

Now I do not think that anything that has been recently done in London is more likely to excite the imagination of the medical student than a collection of this kind. I shall certainly, as far as my influence goes, beg those young men over whom I may have any influence, who are beginning the study of medicine, to come here and to study carefully all the fine things which they may

see here, so as to begin with their minds set in the right direction. I will not do more than cordially second the vote of thanks to Mr. Wellcome, and trust that his great enterprise and generosity will bear fruit which he himself will live to see.

MR. HENRY S. WELLCOME : Mr. Chairman, Ladies and Gentlemen, I am deeply grateful for the generous expressions which have fallen from Sir Rickman Godlee, Sir Francis Champneys and the other speakers. Our special thanks are due to Sir William Osler, Dr. Norman Moore, Mr. D'Arcy Power, Dr. Raymond Crawfurd, Dr. A. J. Chalmers, and many other eminent men throughout the world who have so liberally assisted me in many ways with kind advice, valuable suggestions and the utmost co-operation, which have contributed immensely to the success of this undertaking.

Many have manifested their keen interest by lending, and, in numerous instances, generously presenting, objects of the highest historical importance. I may also say that many of the great Institutions have been equally liberal in their co-operation and assistance. Also our thanks are due to members of my staff who have taken part in the work of classifying and arranging these exhibits. Their task has been, as you will appreciate, very great.

The official connection of this Museum with the International Medical Congress shortly to be held in London, of which Sir Thomas Barlow is the President, and our Chairman to-day is the President of the Section of the History of Medicine, greatly encourages me in this undertaking. The co-operation of the Section of History of Medicine will greatly enhance the value and usefulness of the Museum.

This Museum I regard as at its very beginning, though the collection and organisation have occupied many years. It is my intention to found in London a Bureau of Scientific Research (applause), and to appoint as the Director-in-Chief Dr. Andrew Balfour, who for nearly 12 years has rendered such distinguished and fruitful service as Director of the Tropical Research Laboratories at Khartoum. I am gratified to see Dr. Balfour present with us to-day. The tribute Sir Rickman Godlee paid to me with

regard to the work of those laboratories should be paid mainly to Dr. Andrew Balfour. This Historical Museum might well form a fitting and permanent adjunct to the Bureau of Scientific Research.

It is my idea and my intention that this Museum shall be a permanent institution. The value of history to research workers is beyond estimation. Reviewing the failures as well as the successes in the great past is not only informative but is often inspiring. In the course of my long researches into the history of medicine, I have come to the conclusion that we can gain a great deal of useful information from primitive peoples in the art of healing, and particularly in surgery.

In my own personal experiences amongst primitive races, I have sometimes found traces of the origin of what are usually regarded as entirely modern discoveries. Some things have been discovered in remote ages and lost, or forgotten, and rediscovered. Some ancient discoveries have continued in use through all the ages.

Dr. Reisner, in the course of his archæological excavations in Nubia, found some well-made bamboo splints, dating, I think, some 2000 or 3000 years B.C. Captain Anderson found similar splints in use in the Southern Sudan some years ago, and I myself have seen them in use in the Upper Blue Nile region. A few days ago in Morocco City, Southern Morocco, I saw exactly similar splints being used, and secured them for this Museum. The perpetuity and the rediscovery of ancient devices are exceedingly interesting subjects for investigation.

In organising this Museum, my purpose has not been simply to bring together a lot of "curios" for amusement. This collection is intended to be useful to students and useful to all those engaged in research. I have found that the study of the roots and foundations of things greatly assists research, and facilitates discovery and invention.

I thank you all for honouring me by your presence.

Reprinted from "British Medical Journal," September 13th, 1913.

THE WELLCOME
HISTORICAL MEDICAL MUSEUM

THE great interest aroused by the Historical Medical Museum during the recent meeting of the International Congress of Medicine has not abated, and we learn that the daily attendance at the Museum is still large. We recommend all doctors interested in the evolution of their art to visit it before September 30th, when it will be closed, to reopen, we believe, in the Spring. Short accounts of the Museum appeared in the JOURNAL of May 10th, p. 1035, and June 28th, p. 1379. Since then considerable additions have been made to the collection; but it is Mr. Wellcome's wish to make it as complete as possible. Many families have relics such as MSS., early printed books, diplomas, prescription books, autograph letters and other documents and objects associated with, or collected by, their ancestors who were engaged in medicine, surgery, pharmacy and the allied sciences. Often, on the death of those who cherish such relics, the things are relegated to the garrets, or sent to auction rooms where they are scattered amongst strangers who buy them for a trifle as curios, and so the history and record of associations with the original inventor or user are lost for ever. We venture to suggest that it would be well if these things could be sent to take their place in the Historical Medical Museum, which has now been established in London on a permanent basis by Mr. Wellcome, where they would be preserved, and at the same time form a permanent tribute to the work and memory of those from whom they have been handed down. Many things which are insignificant and of little historical value in themselves if isolated in small private collections become important when brought into association with a series of others arranged chronologically; they often supply the missing links in the chain showing the evolution of such objects. An isolated historical object may be aptly compared to a single mosaic tessera which in itself alone signifies nothing, but when put in its place with others becomes part of a picture, and thus may help to complete a lasting record of a famous deed or a great event.

Re-Opening Ceremony

of the

Wellcome Historical Medical Museum

Thursday, October 14th, 1926

Introductory Speech by The Chairman, Sir HUMPHRY ROLLESTON, Bt., K.C.B., M.A., M.D., F.R.C.P., *Regius Professor of Physic, University of Cambridge,* who with Dr. JOHN D. COMRIE, M.A., F.R.C.P., F.S.A.. *Lecturer on the History of Medicine and Clinical Medicine, University of Edinburgh,* received the guests, in the unavoidable, and deeply regretted absence of the Founder (Mr. Henry S. Wellcome).

Ladies and Gentlemen, the study of medical history is somewhat paradoxically a modern development, and its expansion in this country has been largely due to Dr. J. F. Payne, Sir W. Osler, Sir Clifford Allbutt, and especially to Sir N. Moore, who, as President of the Section of the History of Medicine of the International Congress of Medicine in London, opened for the first time this Museum on June 24th, 1913. Since then it has grown from strength to strength, and, after a complete re-organisation, which necessitated its closure for eleven months, is virtually a new Museum. This research Museum is intended to be continually progressive; not to remain as the last word in 1926, but to keep up with the advance of medicine. In the various groups, such as anatomy, physiology, chemistry, pharmacology, orthopædics, obstetrics, psychiatry, massage and antiseptic surgery, it will show at a glance the evolution of ideas, discoveries and inventions in a really scientific manner. Thus, in addition to advances, it will elucidate the retrogressive changes which took place in some ancient eastern countries and in Europe during the dark ages.

Familiarity with what " famous men and our fathers who begat us " have done to build up our present state of knowledge has a great educational value. Further, it exerts a wholesome influence in making us feel modest from the realisation of what our professional ancestors did in so much less favourable circumstances; we may indeed even find that discoveries made, or largely anticipated, by them years ago and long forgotten have independently again been brought to the light of modern eyes. It is salutary to look back and occasionally, as has been done with much advantage

in the past, to act on the dictum " back to Hippocrates." The Great War carried the practice of surgery " back to Lister," the centenary of whose birth will be celebrated next year. Antiseptic surgery and anæsthetics are the two greatest milestones in the advance of surgery, and here is presented a collection of Listerian relics—unrivalled for its completeness ; it includes part of Lister's Ward in the Royal Infirmary, Glasgow, where he did his immortal work, which, had it not been for Mr. Wellcome's prompt action, would have been for ever lost when the building was demolished two years ago.

London is fortunate indeed in this unique Museum, and the whole medical profession are under a deep debt to Mr. H. S. Wellcome for his unbounded generosity and enterprise in making and throwing open to us all this wealth of historical lore. It is indeed difficult to say what this Museum, with its contents and a library of more than 100,000 books, manuscripts and incunabula so quietly amassed, will mean to medicine in the future. Its resources have always been most freely at the call of those interested and working at the subject, as the Members of the Section of the History of Medicine know to their continual advantage.

Mr. Wellcome is greatly disappointed that, being unavoidably detained in America in connection with an important humanitarian mission of which he is in charge, he cannot be here to-night. He sends you his warmest greetings and wishes to bring to your notice the devoted labours of his staff in re-arranging the contents of the Museum, especially the great skill and enthusiastic devotion of Mr. L. W. G. Malcolm, who was trained in the evolution of scientific thought by the late Dr. W. H. R. Rivers, and he asks me to do the impossible, namely, to take his place as host.

WHAT SHOULD MUSEUMS DO FOR US?

HISTORICAL ADDRESS BY SIR ARTHUR KEITH, M.D., F.R.C.S., F.R.S.,
Conservator of the Museum, Royal College of Surgeons, England.

Often there comes back to me, when I think of what was happening in this great city in the middle of last century, a vision of the wan and studious face of Henry Thomas Buckle as it was bent over the manuscript of his " History of Civilisation in England." As he wrote in his study, a long,

lofty gaunt room with northern roof light, he was surrounded by thousands of manuscripts, deeds, documents and books—the material of history. Buckle thought, and there are many to-day who still share in his belief, that history could be written only in this way. Even when Buckle tells of the discoveries made by William Smith in the opening years of the nineteenth century—of how the crust of the earth was arranged in strata and that the order and age of the strata could be told by the fossils contained in them—he did not perceive that geologists had discovered a new way of writing history by deciphering things and not words. In this new way the history of the world on which we live is now being written ; when geologists began to arrange their fossils in an orderly way on the shelves of a museum, that museum thereby became not only a history of the earth but of all the living things that had appeared on it during past times. Presently it was discovered that the early history of man himself could be written in the new way. In Buckle's boyhood —he was born in 1821 and died in 1862—the archæologists of Denmark discovered that it was possible still to write the early history of their own country. They searched ancient tombs and peat-mosses for all things which showed traces of man's handiwork and gathered them—each labelled and documented—on the shelves of a museum, and presently that museum became a history of Denmark. The archæologists perceived that Denmark had passed through three epochs—one, in which only stone or bone had been used for weapons or tools ; another, when stone and bone were being replaced by bronze ; and a third, in which iron began to be used instead of bronze. Hence the division of the prehistoric time into three periods—stone, bronze and iron. History begins when a chronological table has been established, and we see this method of writing prehistory reaching a climax in the hands of Sir Arthur Evans ; the history of Crete has been deciphered by the spade and written on the shelves of the Museum at Knossus. It is in this way that the beginnings of our modern manner of living are being deciphered in Mesopotamia and Egypt. Museum making and history writing are the same thing.

England has a way of throwing up sporadic crops of great men ; she had a bumper crop in the 19th century : Darwin, Galton, Taylor and Pitt-Rivers came along almost in a bunch—Darwin leading. It was

Pitt-Rivers who demonstrated how reliable human history could be built up, bit by bit, in the shelves and show-cases of a museum ; it was he who made the spade an instrument of exact history in the hands of a trained observer ; it was he who pressed home the study of living primitive peoples as a clue to the customs, myths and beliefs of our long dead ancestors. What Pitt-Rivers did for human culture in general Mr. Wellcome has sought to do for a great branch of human knowledge—all that pertains to the art and science of healing. He has ransacked the world and brought together under one roof a rich, rare and vast assortment of materials for the history of Medicine such as has never before been seen or studied in any country. It would be dangerous in these times, when we dispute so keenly how far men simply imbibe ideas and how far they beget them for themselves, to speculate as to the influence which the example of Pitt-Rivers may have had on Mr. Wellcome. I believe, in this case, we have an instance of independent origin. Be that as it may, I am convinced that we who have to do with the administration of museums will do well to adopt Pitt-Rivers as our Patron Saint.

Now the evolution of history of medicine is more difficult than any other branch of knowledge to illustrate by museum methods. The trend of evolution is nearly always towards complication ; if we trace the history of a man's fighting weapons, we begin with a few types of a simple kind and we end in these modern days with the innumerable and highly differentiated engines of war. But in Medicine it is otherwise ; even amongst the most primitive races of mankind, we find that the practice of medicine is founded on an elaborate code of beliefs ; these beliefs are the fine-drawn gossamer of savage fancy—altogether too delicate threads for the clumsy fingers of museum curators to touch. If our task were merely to illustrate how the Medicine Man, whose image you will see to-night in his hut in New Guinea, seated amidst the simple and uncouth emblems of his art, becomes the fashionable physician of Harley Street with the artillery of modern science at his disposal, there would be no technical difficulty, for from the countries which lie between New Guinea and Harley Street we could cull a perfect series of ascending forms—an intermediate series of the kind which is so dear to the hearts of museum curators. Our difficulties begin when we seek to portray how the native practitioner looks upon the

human body when it is well and when it is ill. Until we have surmounted this difficulty we cannot appreciate the riches which are shown in Mr. Wellcome's "Hall of Primitive Medicine."

To give a concrete representation of the beliefs in which Medicine begins is particularly hard for men like myself. We have been trained to accept only what we can see and prove, to suppress all our childish notions. We find it almost impossible to take the mentality of primitive medicine seriously. It would have been otherwise with Lewis Carroll, the immortal creator of "Alice in Wonderland"; he understood how children reasoned, and, therefore, could have entered the hearts of primitive men without effort. There can be no doubt that in the play of his fancy, early man, like the primitive races of to-day, was a child and had a childish way of reasoning. The late and gifted Dr. W. H. R. Rivers, in his enquiries into the theory and art of Medicine among the natives of Melanesia, was able to lay aside the scientific armature of his mind and to adopt the point of view of the practitioners he encountered in primitive communities. He found that the rudest native practitioner had, like his counterpart of Harley Street, a definite theory of disease and that the means he adopted for its cure were a logical outcome of this theory. Had Lewis Carroll told a New Guinea medical man that after the material Cheshire cat had vanished its smile remained behind, the statement would have been accepted without the raising of an eyebrow. It must be a very long time ago since primitive man began to look on the human body as a mere husk and the spirit within it as the real person, for this way of interpreting the living body is almost universal among native peoples. On this belief the native physician bases his treatment of disease. If a man is to be free from illness his spirit must remain free, intact, uninjured. Illness, the native holds, springs from the spirit—not, as we believe, from the flesh. If the spirit be driven out of the body and forsakes it permanently, then death occurs. This is how the Melanesian explains death to himself and to his patients. Hence, a native practitioner's business is to discover in what way injury or damage has fallen on his patient's spirit, and, as these injuries are usually caused by other spirits or baneful influences, it is clear that a native, to practise successfully, must have studied and mastered the ways and wiles of these immaterial beings and things. The expert native practitioner is

he who can best cajole the cloud of spirits which permeate the air of primitive communities.

As we dig into the beginnings of Medicine we find that its foundations are laid on leechcraft, witchcraft and priestcraft. The early physician was also magician and priest. Unless you have grasped this truth you will altogether fail to understand Mr. Wellcome's " Hall of Primitive Medicine " ; for in that Hall you will find a wealth of amulets, charms, talismans, mascots, phylacteries, totems, fetishes, divination bowls, effigies, idols, masks and ceremonial dresses. When you examine the contents of that room you are really surveying a massed field of therapeutic artillery—the batteries by which ancient physicians sought to banish illness and disease from their patients, thus staving off death. The counterparts of the native artillery in Harley Street are the stethoscope, the bismuth meal, note-book for prescription, and a certain professional air.

I have drawn your attention to this part of Mr. Wellcome's collection for a special reason. When we seek to represent in a museum the theories and beliefs which guided the practice of Medicine in olden times, we encounter a grave difficulty. Let me explain the nature of this difficulty. If we dress a lay figure in a policeman's uniform, place a helmet on the head, a baton in one hand and handcuffs in the other, and lay open the policeman's note-book at the page he made his last entry, we bring before our visitors such a representation of law and order as enters their understanding without any further explanation. But suppose we have merely the arm badge of a special constable at our disposal ; how are we to make our visitors understand its full significance if they have never encountered a policeman in their life ? That is just the difficulty we have to face in representing early stages in the evolution of Medicine ; the divination bowl, fetish, amulet, charm, mascot and effigy are but the symbols of the ancient practitioner's art ; each is pregnant with significance ; it needs a world of knowledge to interpret that significance. It is otherwise in all the modern departures of Medicine. You will have an opportunity to-night of examining in this Museum all the stages in the evolution of utensils, apparatus and instruments employed in modern Medicine and Surgery ; never before has the story of surgical instruments been told with such a wealth of

illustration as will fall under your eyes here. The microscope is the main instrument of medical progress; this Museum contains its full history in the great collection shown in the Gallery. Never before have such pains been taken and so much wealth lavished to secure exact reproductions of the conditions amidst which druggist, chemist and apothecary carried out their respective callings in past times. You will see the actual ward from the old Infirmary of Glasgow in which Lord Lister banished from the world for ever some of the most dreaded of human sufferings. If you are inclined to think that the value of this exhibit is sentimental rather than useful, a glance at its bare ugly walls and its sordid equipment will alter your opinion. I was trained in just such a ward and know that the picture here preserved is true to its time. The men and women of a younger generation, who have grown up in clean bright wards with modern equipment can only realise the blessings which progress has brought them when they view the ward in which Lord Lister's patients lay as he and his nurses ministered to their needs.

You will turn away from Lord Lister's ward devoutly thankful that it is now only a historical record; it depicts a state of matters which we have left behind us. It is possible, as you walk through the Hall of Primitive Medicine and your eye catches again the weird and uncouth equipments of native witch doctors which cover its walls and fill its cases, that you will view these exhibits as mere flotsam and jetsam from the Dead Sea of Medicine —one which enlightened England has long since swept away. I should like to think this is so, but when I see, as I sometimes do, mascots on the motor cars of the wealthy, charms and amulets treasured by many people —both rich and poor—ignorant and educated; when I see, as I occasionally do, the quack preferred to the man who has given his life to the study of rational Medicine; and when I see learned men call in spirits to explain unusual physical phenomena; then I am not quite so certain that this part of Mr. Wellcome's Museum does represent altogether a past stage of things. In all of us there still remains more than a trace of the primitive man.

Now I come to what is the main matter of my discourse. What is the service that such a Museum as this should render to Medicine? Let

me put the question on a wider basis. What should museums do for us? You will pardon my immodesty if I refer for a moment to the services which museums have rendered to myself. Thirty-five years ago I returned from a sojourn in the East, where I had accumulated a great many facts relating to anatomy, and in my pocket just enough money to secure food and lodging for a year or two. My little cargo of anatomical facts was of no use in the world of learning until it had been compared with and added to cargoes brought home by previous voyagers into the realms of Anatomy. It was my first duty to assimilate the publications of other workers and to study kindred material which had been gathered in our great Museums. The British Museum was thrown open to me; in its Reading Room attendants brought and laid before me books and manuscripts of all times and of all countries. The treasures in the Natural History Museum, South Kensington, were placed freely at my disposal. The Museum which I have now the honour to be closely connected with, served me as a study and as a research room. All of these institutions were provided for me gratis, free and for nothing. I never enquired into the cost of running these great institutions during the years I was using them, but I can tell you what all three cost last year. The British Museum, Bloomsbury, required £221,000; the Natural History Museum, South Kensington, £100,000; the Museum of the Royal College of Surgeons, the most economical and best Museum of its kind in the world, £6000. Now that is a great sum of money; Museums, as Mr. Wellcome knows well, are very costly machines to run, to say nothing of the initial cost of bricks and mortar, and also outfit. To produce an income of £327,000, the sum now spent annually on these three institutions, needs a capital of about 6½ millions. You can see, then, that in those early days of study and research in London I was, although I did not realise it, terribly wealthy. I have the privileges of a Crœsus—a multi-millionaire. At least I had at my disposal that which had cost millions. It is plain that museums as instruments of research are very costly, and you may ask if the country is getting an adequate return for its great outlay. Well, if I had been the only student who then enjoyed museum benefits, our country would have had an altogether unsatisfactory return for its expenditure, but I was only one of many of that generation. The generation which was young thirty years ago is now

providing their country with leaders and teachers, and England is reaping to-day the harvest she sowed in museums a generation ago. You see that I do not hesitate in regarding the increase of knowledge—the fostering of research—as the first duty of a museum. Unless a museum is permeated with a spirit of enquiry it is dead. It is not enough to furnish a museum with the materials needed by students; no conservator can understand what a student needs unless he is also a student. The staff of a museum must be permeated with the love of knowledge and know how it can be extended if their institution is to thrive; and no man can continue to be a student unless you give him an exit for his knowledge. Unless he is encouraged to coin his gold and pass it into circulation, his mint becomes choked. One knows that a museum is prospering when the members of its staff are participating in the proceedings of learned societies and contributing to their publications. One knows that a museum is fulfilling its primary function when its rooms and closets are frequented by research students from homelands, colonies and foreign countries, and one knows that its contents are being rightly used by the frequency of grateful acknowledgments in learned publications. The literature which issues from a museum determines its status, and in this literature I include catalogues.

If the first duty of a museum, such as this of Mr. Wellcome, is to serve the needs of students and through students the public weal, there is a second duty no less important. There is its immediate duty to the public—the duty of direct education. It is this double duty of a museum that taxes the ingenuity of us conservators. To expose the whole of our resources to the gaze of visitors would be to satiate—not to whet—their curiosity. We produce in them not only headache but mental dyspepsia. We have to select from our great stores on which special students regale themselves, just those prime pieces of instruction which, when set in a right order, tell their story with emphasis and without words. Such an art needs a special genius, just as "window-dressing" does in the world of commerce, but I have noticed that the best elementary treatises are usually written by the most learned of our masters, and I am therefore hopeful that the most learned of our curators will also prove the greatest craftsmen in the art of "case-dressing." It is an art which makes a special appeal to Mr. Wellcome,

and he has surrounded himself with a staff of learned and expert men. He has chosen, as his Conservator, Mr. L. W. G. Malcolm, one who is already known by his important contributions to anthropology, and we all wish him and his colleagues the utmost success in fulfilling the aims which the founder of this Museum has in view.

All of us who regard museums not only as repositories of valuable things but as engines for the advancement of knowledge owe a debt to Mr. Wellcome. Students of history are usually poor men, and this is particularly true of those who seek to unravel and write the true history of Medicine. The materials needed for our studies are far beyond the resources of our purses. There are those men who, setting out in their careers to banish care by obtaining a sufficiency to carry them and theirs to the end of life's journey, awake to find that wealth accumulates on them so fast that affluence becomes more burdensome than the cares of poverty. Well ! we who benefit from museums are not in this group of men. If a poor man has to seek comfort in philosophy, a rich man, if he is to retain his soul, has to seek it as a necessity. The other day it was my good fortune to read a book written by a man who has become both a millionaire and a philosopher. " I have long felt and believed," he tells us, " that every man who has attained material success should look upon himself as an investment, so to speak, which the community has made. In return for the opportunities given to him and for the financial results they have brought, it is up to him to yield dividends in service and in other things of value to the community." Long before this philosophy for wealthy men had been formulated, Mr. Henry S. Wellcome, in his own quiet but efficient way, had begun to put it into practice. He had come to the rescue of us poor students and put at our disposal, and for the ultimate good of mankind, this Museum with its rich and rare stores of knowledge culled from all the countries of the world and from all periods of time. He has lifted our poverty above all dreams of avarice and has thereby earned the lasting gratitude of all who believe that the safety of our civilisation lies in the progress and dissemination of knowledge.

SIR FREDERICK KENYON, K.C.B., G.B.E., M.A., D.LITT., LL.D., *Director of the British Museum* :—

Sir Humphry Rolleston, Ladies and Gentlemen, it is my pleasant privilege to propose a vote of thanks to the two speakers to whom we have just listened. That is very easy: you have already in your own minds passed such a vote. No two better or more distinguished representatives could have been chosen of the two aspects of this Museum. Sir Humphry Rolleston has spoken for Medicine, Sir Arthur Keith for the History of Science. I will not presume to thank them for having come here to-night. They have come here, not to please us, but to do honour to the great benefactor to whom we owe this Museum. But we who have had the pleasure of listening to them would like to tell them how much we have enjoyed their addresses, and that we have taken to heart the wise words which they have spoken to us.

But there is another expression of thanks which we all have in our minds—our gratitude to and admiration for the founder of this Museum, Mr. Wellcome. It is a great grief to us that he is not himself present to-night. For years he has spent not only his money, but his personal labour to promote the cause of research in the history of medicine. He has personally conducted excavations in the Sudan; he has gathered materials from every part of the globe; he has lavished money in the purchase of specimens, and in the manufacture of facsimiles when originals were not to be had; and this great Museum is but one among a number of institutions for the promotion of research which he has founded, notably the Research Laboratories at Khartoum, the Bureau of Scientific Research, and the Chemical and Physiological Research Laboratories in London. And yet he has kept himself and his great work out of the limelight.

I presume that I owe the honour of being invited to address you to-night to the fact that I am connected with a great Museum. But on this score there is no occasion for me to say much to you, because Sir Arthur Keith has said all that need be said on this topic. He has laid down, clearly and emphatically, the two great functions of a museum—its duty to the student and its duty to the public, or, in other words, its services to research and its services to education. Now I believe I am right in saying that of these

two functions, both of which must be constantly in the mind of the Director of a great public Museum such as that for which I am responsible, it is the first that is the prime object in Mr. Wellcome's mind. This Museum is before all things a museum for the student, an instrument of research. And here let me most emphatically endorse what Sir Arthur Keith has said as to the part played in such a museum by its staff. Where a museum contains, as this does, the materials for original research, it is essential that it should possess a staff capable, both in quantity and quality, of conducting research themselves and of assisting the researches of others. The two duties go together. It is only the man who knows what research is, and is acquainted with his subject, who can effectively help the researches of others. No one is better aware of this truth than Mr. Wellcome. Already there is a series of Research Studies in Medical History, issued under the auspices and imprint of the Wellcome Historical Medical Museum (to which Sir D'Arcy Power, who is to follow me, has himself contributed) ; and I feel sure that things will be so arranged that this Museum will become, not merely a storehouse of materials (invaluable though it will be in that respect), but also a College of Research, from which will proceed a succession of monographs which will promote the advancement of scientific knowledge.

There are two great men in the history of Medicine whom, above all others, I wish we could have seen present to-night ; two men, separated by more than two hundred years in time, but akin in their wide knowledge and in their tastes and interests ; two men, of whom the later had a peculiar devotion for the earlier, and both of whom would have taken the liveliest interest in this Museum. I mean Sir Thomas Browne and Sir William Osler. Can we not imagine what curious and illuminating reflections this wonderful collection would have stimulated in the mind of Sir Thomas Browne, and in what quaint and beautiful English he would have expressed them ? And Sir William Osler, the beloved friend of many of us here to-night, the devotee of Sir Thomas Browne, with his eager interest in the history of science, his alert and well-informed mind, his readiness to help every good work and to encourage every real student, would not he, of all men, have been at home in this Museum, and would not he, of all men, have appreciated its possibilities

for good? I can think of no two more appropriate patron saints for a Historical Medical Museum.

As an official representative of Museums, I welcome this addition to our fraternity, and am sure that it will reach the highest standard of service to the community, which is the ideal of every Museum that is worthy of the name. And as a member of this gathering, and on your behalf, I offer to Sir Humphry Rolleston and Sir Arthur Keith our most sincere thanks for the pleasure and profit which we have received in listening to them.

SIR D'ARCY POWER, K.B.E., M.A., M.B., F.R.C.S.: Sir Humphry Rolleston, Ladies and Gentlemen, I gladly second this vote of thanks to Sir Humphry Rolleston for presiding over us this evening and to Sir Arthur Keith for giving us one of those charming lectures which we always expect from him and are never disappointed. It gives me an opportunity, too, of adding my tribute of praise to the value of the Wellcome Historical Museum on this occasion of its re-opening after the thorough cleaning and re-arrangement to which it has been subjected. I was present when the Museum was formally opened by Sir Norman Moore in 1913, and I may claim perhaps to be the one who has profited most largely by Mr. Wellcome's liberality in throwing open the collection to every student of the history of medicine. The Museum is unique, for no other nation has yet gathered together the remains of former practices in every branch of medicine from the earliest days in man's history to the present time.

There is still more than a lifetime's work to be done in arranging and describing the present collection, and it is being added to daily. I hope, however, that Mr. Wellcome will not wait until it is complete—for that will never be—but will continue the plan he has already begun of making parts of the Museum known to the world at large by individual publications bearing the stamp of the Wellcome Historical Museum. The Wellcome series of books has been well received by the medical press of all countries. More would be acceptable, for there is an increasing number of highly educated medical men in Great Britain, the United States, France and

Germany who are now taking an interest in the older literature of their profession. The Library attached to the Museum contains many rare books and some manuscripts which could be printed with advantage.

Ladies and Gentlemen, I will say no more but just remind you that I rose to second a vote of thanks proposed by Sir Frederick Kenyon, and I do so most heartily.

THE CHAIRMAN: Sir Frederick Kenyon and Sir D'Arcy Power, I shall be very brief in replying, because I think it is entirely obvious that I am only a kind of St. John the Baptist, who should leave Sir Arthur Keith to make the speech; as he made the speech of the evening, it is up to him to reply. I thank you very much.

SIR ARTHUR KEITH: Sir Humphry Rolleston, Sir Frederick Kenyon, Ladies and Gentlemen, I thank you most sincerely for the attentive way in which you listened to me as I tried to read my paper, which I am afraid I gabbled, for I feared you would not like it.

MR. W. G. SPENCER, O.B.E., M.S., M.B., F.R.C.S., *President of Section of History of the Royal Society of Medicine*: Sir Humphry Rolleston, Ladies and Gentlemen, I have the honour, as President of the History Section of the Royal Society of Medicine, to invite you to express our high appreciation and our warmest feelings of congratulation to Mr. Henry Wellcome upon the re-opening of his Historical Medical Museum. The memory of the Seventeenth International Congress of Medicine in 1913, attended by 7000 people, it is said, from all parts of the earth, has been dulled by the events in following years; but there is one outstanding remembrance of that Congress; for the first time a special section was allotted to the history of medicine, the importance of which was greatly enhanced by the simultaneous opening of this Museum by Mr. Wellcome, the founder. At that opening, Mr. Norman Moore, later Sir Norman Moore, delivered an address which gave prominence to various parts of the Collection, accompanied by numerous references to Medical Museums and Collections in the past. The Royal Society of Medicine in general, and its History Section in parti-

cular, look upon this Museum as its essential and indispensable ally in the propagation and study of the history of medicine in London. Moreover, there are here manuscripts and incunabula which under all proper safeguards it is hoped may become available for study by scholars in that subject. It is certain that the subject which this Museum illustrates must, year by year, become of increasing importance, for one reason because the enormous growth and extent of medical literature, which includes huge amounts of reduplication, will necessitate abbreviation, the presentation of all parts of medicine by historical methods or on the lines of evolution will be called for; and, for a second reason, that there must come reforms in the way that medical students are instructed. At the moment there is far too much of that which was common to the teaching of schoolboys in days gone by. The medical student has too often to plunge into the middle of things without preliminary explanations, to memorise quantities of disconnected particulars, and for the first time to observe, it may be, a disease in an individual. Anyone who looks at the questions in examination papers, or at text-books, will recognise the need for giving the student a preliminary general view of the several parts of medicine he is about to enter upon. When such a reform comes about, this Museum will be enormously appreciated. (Hear, hear.) Exhibits, for instance, to take one thing: at the present moment there are exhibits in the Central Hall of the Natural History Museum which furnish examples of what can be done in the way of evolutionary exposition. I am asking you not only to recognise the munificence of Mr. Wellcome, but to join in the hopeful assurance that the Museum may now be set upon a permanent basis which for the future will connect it with the study of the history of medicine in London. Sir Humphry Rolleston, Ladies and Gentlemen, I beg to ask you to pass a hearty vote of thanks to Mr. Wellcome for the founding of this wonderful Museum, for its continuity and for its re-opening, with the hope that, whatever happens, it will be established on a permanent basis for all time to come.

DR. JOHN D. COMRIE, M.A., F.R.C.P., F.S.A., *Lecturer on History of Medicine and Clinical Medicine, University of Edinburgh:* Sir Humphry Rolleston, Ladies and Gentlemen, I feel it is a great pleasure and honour

to second this vote of thanks to Mr. Wellcome, the Founder of the Museum, and I will try to do so briefly. Mr. Wellcome is fortunate in having possessed a delightful hobby in the History of Medicine, and he is still more fortunate in having been able to gratify that hobby; he has been most generous in his desire to make us all participators in that hobby, and for that we owe him a very great debt of gratitude, and just as Lorenzo the Magnificent made the Laurentian Library a sort of Mecca for scholars who wished to study the half-forgotten civilisation of Greece and Rome, so Mr. Wellcome has been very largely responsible for another revival of learning, the revival of an interest in ancient medical lore, which has in recent years become so conspicuous a success on both sides of the Atlantic.

There is still another special reason for which I should like to take this opportunity of expressing thanks to Mr. Wellcome. Not only has he instituted this splendid Museum in the Capital, but his generosity has also extended to that remote and barbarous region, still inhabited by primitive men, North of the River Tweed. There, some good many years ago, Mr. Wellcome was good enough to establish certain medals and prizes in connection with the History of Medicine Lectureship at Edinburgh University. Stimulated largely by those medals and prizes (I am sure Mr. Wellcome would be very glad to know this), a purely voluntary course of the History of Medicine has been attended, in the 18 years or so since it was founded, by considerably over 1000 students. Now, I am sure we all regret Mr. Wellcome's absence to-night, and I am sure we trust that he will have a safe and happy return at an early date, and I know that we hope that he will be preserved for many years of life and full energy for continuing his beneficent activities.

THE CHAIRMAN: Ladies and Gentlemen, I hope you will command me to communicate to Mr. Wellcome your very high appreciation of the value of the Wellcome Museum, your gratitude to a great benefactor to the study of medical history, and your thanks for his gracious and graceful hospitality which he has provided us with to-day. May I suggest that you should signify the same by standing up for a moment? (*The entire audience rose.*)

DR. C. M. WENYON, C.M.G., C.B.E., M.B., B.Sc., *Director-in-Chief Wellcome Bureau of Scientific Research :* Mr. Chairman, Ladies and Gentlemen, I hope you will forgive me if I speak rather huskily, but I have rather a bad cold. Owing to the regrettable, but nevertheless unavoidable, absence of Mr. Wellcome this evening, it has fallen to my lot as Director-in-Chief of the Wellcome Bureau of Scientific Research, to reply on Mr. Wellcome's behalf to the very cordial vote of thanks which has been proposed by Mr. Spencer and seconded by Dr. Comrie, and which you have carried with such enthusiastic unanimity. I think you, Sir, read to us the telegram which Mr. Wellcome sent, in which he regretted his absence this evening. I myself received a letter from Mr. Wellcome the other day in which he said he was more disappointed than he could express at being deprived of the pleasure of being with us this evening. I am sure we all feel that Mr. Wellcome is thinking of us very earnestly to-night, and that he is hoping every success will attend this ceremony of re-opening the Historical Medical Museum : the Historical Medical Museum which has resulted from Mr. Wellcome's most remarkable foresight, and which has always been the object of very special personal care and attention on his part. I am sure if Mr. Wellcome were here this evening, and were thanking you for the very kind and complimentary remarks which have been made, he would remember, as he did in 1913, the assistance which he has received from many eminent men, not only in this country but all parts of the world, in the shape of advice and support, in the establishment and support of this Historical Medical Museum. He would also remember the past and present staffs of the Historical Medical Museum, who have assisted him very greatly in the construction and building up of the Museum. The Chairman has already referred to the part that the indefatigable Conservator, Mr. Malcolm, has played in this reorganisation work. In that work the Chief Librarian, Mr. Charles R. Hewitt, who has charge of the wonderful library of 100,000 volumes, has also taken part, as also has the Secretary, Captain P. Johnston-Saint. If it had not been for the whole-hearted enthusiasm of these people, it is very doubtful if the Museum at the present time would have been in the perfect condition you will find it by and by when you inspect it. But, as the Chairman said, the Museum, as you will see it presently, is not a finished article : it is just a commencement, and it

is hoped that it will form a starting-point for developments which will be continued along truly scientific lines. If Mr. Wellcome were here this evening, he would probably tell us of some of his wishes regarding the future of the Museum, and the functions which he hopes it will fulfil. I am sure I am right in saying—in fact I know I am right in saying—that it is Mr. Wellcome's wish that this Museum shall form a centre for study and research in matters connected with the history of medicine, and that it will lead to a definite advancement of science in various directions. When Mr. Wellcome was speaking in 1913 at the previous opening of this Museum, he said that it was his intention to found in London a Bureau of Scientific Research, and that the Historical Medical Museum might very fitly form an adjunct to that Bureau. I think Sir Frederick Kenyon has already referred to the Bureau of Scientific Research, which you will have realised is now an accomplished fact. The Bureau of Scientific Research includes laboratories at Endsleigh Gardens, and a Museum of Medical Science, including tropical medicine, in which the diseases of all climates are illustrated in graphic form from the point of view of their history, etiology, symptomatology, therapeutics and prophylactics. That Museum is to be the object of an opening ceremony at a not very distant date. Affiliated to the Bureau are its very extensive Research Laboratories at Beckenham and the Entomological Laboratory; so the Historical Medical Museum, as you will see, is only one of the many institutions which Mr. Wellcome's unbounded generosity has founded. I think there is very little more that I need say, but I should like very much on Mr. Wellcome's behalf to thank you, because in spite of the inclemency of the weather this evening, so many of you have been able to be present. Many letters have been received from people in this country and various parts of the Continent, expressing very sincere regret that they have been unable to be present. Finally, I must thank you formally for the very cordial thanks which you have passed to Mr. Wellcome, and which you have carried so unanimously.

THE CHAIRMAN: It only remains for me now to declare, on behalf of the generous founder, the Museum re-opened, and we will follow Dr. Wenyon and the Conservator through the Museum.