A compend of electricity and its medical and surgical uses. By Charles F. Mason ... With an introduction by Charles H. May ...

Mason, Charles Field, 1864-1922.
Philadelphia : P. Blakiston, son & co., 1887.

MEDICAL ELECTRICITY

MASON

MEDICAL BRIEFS No3

ew Series of Manuals.

FOR MEDICAL STUDENTS.

ORM IN SIZE, PRICE AND BINDING.

rice of Each Book, Cloth, $3.00; Leather, $3.50.

RGERY. **Third Edition.** Manual of the Practice of Surgery. By WM. J. WALSHAM, M.D., Assistant Surgeon to, and Lecturer on Anatomy at, St. Bartholomew's Hospital, London, etc. 318 Illustrations.

Presents the introductory facts in Surgery in clear, precise language, and contains all the latest advances in Pathology, Antiseptics, etc.

"It aims to occupy a position midway between the pretentious manual and the cumbersome System of Surgery, and its general character may be summed up in one word—practical."—*The Medical Bulletin.*

"Walsham, besides being an excellent surgeon, is a teacher in its best sense, and having had very great experience in the preparation of candidates for examination, and their subsequent professional career, may be relied upon to have carried out his work successfully. Without following out in detail his arrangement, which is excellent, we can at once say that his book is an embodiment of modern ideas neatly strung together, with an amount of careful organization well suited to the candidate, and, indeed, to the practitioner."—*British Medical Journal.*

No. 2. DISEASES OF WOMEN. Second Edition. By Dr. F. WINCKEL, Professor of Gynæcology, etc., Royal University of Munich. The Translation Edited by **Theophilus Parvin,** M.D., Professor of Obstetrics and Diseases of Women and Children, Jefferson Medical College, Philadelphia. 150 Engravings, most of which are original.

This work has no superior as a text-book of Diseases of Women in regard to clearness and completeness, and in its presentation of the latest scientific knowledge, and of the best practical rules and methods of treatment.

"The book will be a valuable one to physicians, and a safe and satisfactory one to put into the hands of students. It is issued in a neat and attractive form, and at a very reasonable price."—*Boston Medical and Surgical Journal.*

No. 3. MIDWIFERY. By ALFRED LEWIS GALABIN, M.A., M.D., Obstetric Physician to, and Lecturer on Midwifery and the Diseases of Women at, Guy's Hospital, London, etc. 227 fine Engravings.

"The illustrations are mostly new and well executed, and we heartily commend this book as far superior to any manual upon this subject."—*Archives of Gynæcology, New York.*

"Sensible, practical and complete."—*Medical Brief.*

"I have carefully read it over, and, as a teacher of midwifery, I consider the book ought to become one of the recognized text-books; the treatment and pathology of the various subjects treated are clear and concise."—*J. Algernon Temple,* M.D., *Prof. of Midwifery, and Gynæcology, Trinity Medical School, Toronto.*

No. 4. PHYSIOLOGY. Fifth Edition. By GERALD F. YEO, M.D., F.R.C.S., Professor of Physiology in King's College, London. Fifth American from Second English Edition. 321 carefully printed Illustrations.

"The work will take a high rank among the smaller text-books of Physiology."—*Prof. H. P. Bowditch, Harvard Medical School.*

"By his excellent manual, Prof. Yeo has supplied a want which must have been felt by every teacher of Physiology."—*The Dublin Journal of Medical Science.*

☞ SEE NEXT PAGE.

P. BLAKISTON, SON & CO., Publishers and Booksellers,
1012 WALNUT STREET, PHILADELPHIA.

The New Series of Manuals—*Continued.*

No. 5. CHILDREN. Second Edition. Illustrated. By J. F. GOODHART, M.D., Physician to the Evelina Hospital for Children; Assistant Physician to Guy's Hospital, London. American Edition. Revised and Edited by LOUIS STARR, M.D., Clinical Professor of Diseases of Children in the Hospital of the University of Pennsylvania; Physician to the Children's Hospital of Philadelphia. With Illustrations, 50 Formulæ, and Directions for preparing Artificial Human Milk, for the Artificial Digestion of Milk, etc.

"As it is said of some men, so it might be said of some books, that they are 'born to greatness.' This new volume has, we believe, a mission, particularly in the hands of the younger members of the profession. In these days of prolixity in medical literature, it is refreshing to meet with an author who knows both what to say and when he has said it."—*New York Medical Record.*

"Thoroughly individual, original and earnest, the work evidently of a close observer and an independent thinker, this book, though small, as a handbook or compendium is by no means made up of bare outlines or standard facts."—*The Therapeutic Gazette.*

"The author has avoided the not uncommon error of writing a book on general medicine and labeling it 'Diseases of Children,' but has steadily kept in view the diseases which seemed to be incidental to childhood, or such points in disease as appear to be so peculiar to or pronounced in children as to justify insistence upon them. * * * A safe and reliable guide."—*American Journal of Medical Science.*

"Nothing that concerns disease as found in childhood seems to have escaped the author's attention. From introduction to the end it is replete with valuable information, and one reads it with the feeling that Dr. Goodhart is writing of what he has seen at the bedside. It need scarcely be added that the revisions and additions by the American editor are of much value, neither too full nor too spare, and very judicious."—*Journal of the American Medical Association.*

No. 6. PRACTICAL THERAPEUTICS. Fourth Edition. With an Index of Diseases. By ED. JOHN WARING, M.D., F.R.C.P. Rewritten and Revised. Edited by DUDLEY W. BUXTON, Assistant to the Professor of Medicine, University College Hospital, London.

"Our admiration, not only for the immense industry of the author, but also of the great practical value of the volume, increases with every reading or consultation of it. We wish a copy could be put in the hands of every Student or Practitioner in the country. In our estimation, it is the best book of the kind ever written."—*N. Y. Medical Journal.*

"It is, indeed, one of the most practical works that has ever attracted our attention. Combining the merits of Wood, Beck, Stillé, and the U. S. Dispensatory, it forms a volume which no young physician can afford to be without."—*Chicago Medical Journal.*

"This work is a monument of industry and perseverance. It is invaluable both to the Practitioner and Student."—*Canada Medical Journal.*

No. 7. MEDICAL JURISPRUDENCE AND TOXICOLOGY. Third Edition. By JOHN J. REESE, M.D., Professor of Medical Jurisprudence and Toxicology, University of Pennsylvania, etc. Third Edition. Enlarged.

"The production of this admirable text-book by one of the two or three leading teachers of medical jurisprudence in America, will, we hope, give a new impetus to the study of forensic medicine, which, inviting and important as it is, has heretofore been strangely neglected in both legal and medical schools."—*American Journal of the Medical Sciences.*

"We heartily second the author's hope that this treatise may encourage an increasing interest in the students for that most important, but too much neglected, subject, forensic medicine."—*Boston Medical and Surgical Journal.*

"We lay this volume aside, after a careful perusal of its pages, with a profound impression that it should be in the hands of every doctor and lawyer. It fully meets the wants of all students. . . . . He has succeeded in admirably condensing into a handy volume all the essential points."—*Cincinnati Lancet and Clinic.*

*** Other Volumes in Preparation. A complete illustrated circular, with sample pages, sent free, upon application.

Price of Each Book, Cloth, $3.00; Leather, $3.50.

P. BLAKISTON, SON & CO., Publishers and Booksellers,
1012 WALNUT STREET, PHILADELPHIA.

FROM PROF. J. M. DACOSTA.—"*I find it an excellent work, doing credit to the learning and discrimination of the author.*"

A NEW MEDICAL DICTIONARY.

Compact and concise, including all the Words and Phrases used in medicine, with Pronunciation and Definitions.

BASED ON RECENT MEDICAL LITERATURE.

BY

GEORGE M. GOULD, A.B., M.D.,

Ophthalmic Surgeon to the Philadelphia Hospital, Clinical Chief Ophthalmological Dept., German Hospital, Philadelphia.

SEVERAL THOUSAND NEW WORDS NOT CONTAINED IN ANY SIMILAR WORK.

Small, Square 8vo, Half Morocco, as above, with Thumb Index, . . . $4.25
Plain Dark Leather, without Thumb Index, 3.25

Among others IT CONTAINS TABLES of the ARTERIES, of the BACILLI, giving the Name, Habitat, etc.; of GANGLIA, LEUCOMAÏNES, MICROCOCCI, MUSCLES, NERVES, PLEXUSES, PTOMAÏNES, with the Name, Formula, Physiological Action, etc.; COMPARISON OF THERMOMETERS; WEIGHTS AND MEASURES, of VITAL STATISTICS, etc.

OPINIONS OF PROMINENT MEDICAL TEACHERS.

"The compact size of this dictionary, its clear type, and its accuracy are unfailing pointers to its coming popularity."—*John B. Hamilton, Supervising Surgeon-General U. S. Marine Hospital Service, Washington.*

"It is certainly as convenient and as useful a volume as can be found, regarding contents as well as arrangement."—*Julius Pohlman, Prof. of Physiology, University of Buffalo.*

"I have examined it with considerable care, and am very much pleased with it. It is a handy book for reference, and so far as I have examined it, it is accurate in every particular."—*E. H. Bartley, Prof. of Chemistry, Long Island College Hospital, Brooklyn.*

"I consider this *the* dictionary of all others for the medical student, and shall see that it is placed on our list of text-books.—*A. R. Thomas, M.D., Dean Hahnemann Medical College, Philadelphia.*

"It will be recommended among our text-books in our new catalogue."—*S. E. Chaillé, M.D., Dean Medical Dept., Tulane University, New Orleans.*

"Compact, exact, up to date, and the tables are most excellent and instructive. I prefer it to the larger and older books."—*Prof. C. B. Parker, Medical Dept., Western Reserve University, Cleveland.*

"I have given your 'New Medical Dictionary' a critical examination. Its size has made it convenient to the study table and handy for frequent use. At the same time it is comprehensive as to the number of words, including those of the latest coinage, and concise in its definitions. The etymology and accentuation materially enhance its value, and help to make it worthy a place with the classical books of reference for medical students."—*J. W. Holland, M.D., Dean Jefferson Medical College, Philadelphia.*

☞ **Students will find this an extremely useful book of reference. The anatomical tables will be of great use in memorizing the arteries, muscles, etc.**

A COMPEND

OF

ELECTRICITY.

MASON.

MEDICAL BRIEFS.

A new series of short, concise compends for the Medical Student and Practitioner.

12mo. Cloth. Price of Each Book, $1.00.

No. 1. POST-MORTEM EXAMINATIONS. With Especial Reference to Medico-Legal Practice. By Prof. RUDOLPH VIRCHOW, of Berlin Charité Hospital, author of Cellular Pathology; Translated by T. P. SMITH, M.D., Member of the Royal College of Surgeons of England. 2d American, from the 4th German Edition. With new Plates. Illustrated by Four Lithographs.

"We are informed in precise and exact terms how a post-mortem examination should be made, both with regard to the plan to be pursued, and the manner of making the several cuts into the various organs and tissues. The method of recording the results of the investigation is clearly indicated by the addition of the detailed account of the examination of four cases; and the value of the objective evidence is accurately stated in the form of the inferences drawn concerning the manner and cause of death."—*American Journal of Medical Sciences.*

No. 2. MANUAL OF VENEREAL DISEASES. A Concise Description of those Affections and of their Treatment, including a list of SIXTY-SEVEN PRESCRIPTIONS for Vapor Bath, Gargles, Injections, Lotions, Mixtures, Ointments, Paste, Pills, Powders, Solutions and Suppositories. By BERKELEY HILL, M.D., Professor of Clinical Surgery in University College; Surgeon to University College and Lock Hospitals; and ARTHUR COOPER, M.D., formerly House Surgeon, Lock Hospital, London. 4th Edition, Revised and Enlarged.

"I have examined it with care, and find it to be a practical and useful compendium of knowledge on the subjects discussed, well adapted to the use of medical students and those physicians in general practice who have occasional need to consult a work of this kind."—*James Neven Hyde, M.D., Professor of Skin and Venereal Diseases, Rush Medical College, Chicago.*

No. 3. MEDICAL ELECTRICITY. A Compend of Electricity and its Medical and Surgical Uses. By CHAS. F. MASON, M.D., Ass't Surg. U. S. Army; with an introduction by CHARLES H. MAY, M. D., Instructor in Ophthalmology, New York Polyclinic. Illustrated. *Just Ready.*

OTHER VOLUMES IN PREPARATION.

Price of Each Book, bound in Cloth, $1.00.

P. BLAKISTON, SON & CO., 1012 Walnut St., Phila.

MEDICAL BRIEFS, No. 3.

A

COMPEND

OF

ELECTRICITY,

AND ITS

MEDICAL AND SURGICAL USES.

BY

CHARLES F. MASON, M.D.,
ASSISTANT SURGEON U. S. ARMY.

WITH AN INTRODUCTION

By CHARLES H. MAY, M.D.,
INSTRUCTOR IN OPHTHALMOLOGY, NEW YORK POLYCLINIC.

PHILADELPHIA:
P. BLAKISTON, SON & CO.,
1012 WALNUT STREET.
1887.

TO

EDWARD G. JANEWAY, M. D.,

AS A TOKEN OF RESPECT FOR HIS GREAT LEARNING

AND

IN ADMIRATION OF HIS SUPERIOR SKILL

AS A DIAGNOSTICIAN,

THIS SMALL VOLUME IS DEDICATED

BY THE AUTHOR.

PREFACE.

FROM the large amount of literature upon the subject of medical electricity, the author has endeavored to select and classify such facts and principles as would present to the student and general practitioner a clear, short, and yet comprehensive view of this important and so illy-understood branch of therapeutics. He believes that a work having the scope thus laid out, will prove of value to the undergraduate and to the physician who have neither the time nor patience to wade through some of the larger treatises on the same subject.

U. S. Army, December, 1886.

CONTENTS.

CHAPTER I.

PRINCIPLES OF ELECTRO-PHYSICS.

	PAGE
Magnetism	23
Natural Magnets	23
Artificial Magnets	23
Armatures	24
Magnetic Curves	24
Electricity	24
Static Electricity	25
Conductors	25
Insulators	25
Induction	26
Potential	27
Electrical Machines	28
Leyden Jar	30
Dynamic Electricity	31
Galvanism	31
Galvanic Couplet	32

PAGE

Electricity—Electro-motive Force 33
Electrical Units 33
Ohm's Law 34
Arrangement of Elements 35
Effects of Galvanism 36
Faradism 37
Magneto-electrical Apparatus 37
Electro-magnetic Apparatus 37
Primary Current 39
Secondary Current 39

CHAPTER II.

FORMS OF ELECTRICAL APPARATUS FOR MEDICAL AND SURGICAL USE.

Constant Elements 41
Grenet Elements 41
Daniell Elements 42
Storage Cells 42
Accessory Apparatus 43
Galvanometer 43
Rheostat 43
Cell Enumerator 43
Commutator 43
Interrupter 44
Rheophore 44

CHAPTER III.

ELECTRO-PHYSIOLOGY.

PAGE

Electric Bath..... 49
Electrization by Sparks..... 49
by Shocks..... 50
Galvanic Excitation of Motor, Sensory, and Mixed Nerves.. 50
Normal Polar Formula..... 51
Voltaic Alternatives..... 51
Anelectrotonos..... 51
Katelectrotonos..... 51
Faradic Excitation of Motor, Sensory, and Mixed Nerves.. 52
Motor Points..... 53
Excitation of Striated Muscle..... 53
of Non-striated Muscle..... 53
of Heart Muscle..... 53
of Spinal Cord..... 53
of Cervical Sympathetic..... 53
of Pneumogastric Nerve..... 54
of Organs of Special Sense..... 54

CHAPTER IV.

ELECTRO-DIAGNOSIS.

Normal Reactions..... 55
Quantitative Changes..... 56
and Qualitative Changes..... 56

PAGE
Degeneration Reaction..... 56
Changes in Sensation..... 59
in Special Senses..... 59
Practice of Electro-diagnosis..... 60

CHAPTER V.

ELECTRO-THERAPEUTICS.

Magnetism..... 62
Static Electricity..... 62
Dynamic Electricity..... 64
General Remarks..... 64
Polar Method..... 64
Directional Method..... 64
Methods of Electrization..... 67
Special Therapeutics..... 70
Paralysis..... 70
Spasm and Cramp..... 71
Anæsthesia..... 72
Hyperæsthesia, Pain, Neuralgia..... 72
Diseases of the Brain..... 74
Spinal Cord..... 77
Functional Cerebro-spinal Diseases..... 79
Diseases of the Peripheral Nerves..... 82
Toxic Paralyses..... 84
Diseases of the Organs of Special Sense..... 84
of Muscles and Joints..... 85

PAGE
Diseases of Heart and Lungs..... 86
of the Abdominal Organs..... 87
of the Genito-urinary Organs..... 88
of the Skin..... 90
General Diseases..... 91

CHAPTER VI.

ELECTRICITY IN SURGERY.

Electrolysis..... 95
Aneurism..... 95
Nævi..... 96
Tumors..... 96
Extra-uterine Pregnancy..... 97
Stricture of Urethra..... 97
Galvano-causty..... 97
The Electric Light..... 98
AUTHORITIES CONSULTED..... 99

A COMPEND

OF

ELECTRICITY.

INTRODUCTION.

WITHIN the last ten years, Electricity has extended its usefulness with great rapidity. Immense strides have been made in its application to modern improvements in every-day life; so great has been this advance, that this branch of physical science now furnishes occupation for many hundreds of trained minds, and the profession of electrician has many followers. And though in the application of this power to medicine no such phenomenal discoveries have been made as the telephone and the various forms of electric lights and motors, still, the development of the science as applied to medicine and surgery has by no means remained at a standstill;

new uses have been proposed and established by continued observation, and the knowledge and application of this very potent therapeutic measure have very extensively increased of late years.

Notwithstanding the undoubted and great utility of Electricity in medicine and surgery, it is surprising that there still remains a large class of practitioners who rarely employ it, and are apparently content to remain in almost complete ignorance of the subject. This may be explained by the fact, that the busy practitioner is frightened at the prospect of having to wade through large and exhaustive treatises on the subject, and is thus dismayed by the mass of scientific information and of technical terms which he is expected to understand.

The undergraduate also is disheartened upon attempting the study of Electricity from full and lengthy treatises; and though this should not be a reason for completely ignoring the subject, yet as a matter of fact it often forms his excuse for so doing. Hence the necessity arises for concise and short treatises upon this therapeutic resource.

In all the better medical colleges in the country, a knowledge of the subject is required for graduation,

and rightly so. What student of medicine would profess to have a good knowledge of Materia Medica, and have omitted studying an important drug, such as belladonna or opium? And yet Electricity cannot be said to occupy a position in Therapeutics secondary to that accorded the drugs just mentioned. Some of its achievements in medicine and surgery stand unrivaled! Its relief of pain, of which Bartholow says, "there is no effect more certain than the power of galvanism to relieve pain," its allaying spasm, and its action in causing a favorable termination in cases of tubal pregnancy—these will serve as examples of brilliant results accomplished by the use of this great physical agent.

Then again, we have not many agents which are credited so often with saving life in failure of the heart and respiration from various causes. Many other examples of the inestimable advantages from the use of Electricity might be cited. Not only in general medicine, but in every specialty it has its frequent applications; and certainly no physician's office can be considered satisfactorily equipped without at least a faradic and a galvanic battery.

It is interesting also to consider the variation in

the estimation in which this agent is held by different practitioners, and to solve the causes of the discrepancy in the favor with which it is received by them. There will be found a large portion of the profession who are most enthusiastic in its use, praise it highly and apply it often. Another portion are almost absolute disbelievers; they look with suspicion upon anything with which Electricity is mentioned, and give it no more credit of valuable effects than that of being a good and powerful *placebo*.

The explanation of this difference of opinion will become plain, when it is known that the number of the first grows larger while that of the second class diminishes as the knowledge of the subject increases; in other words, that the lack of confidence in the remedy is usually the result of an absence or insufficient knowledge of the subject. It is no exaggeration to say that a not insignificant number of practitioners make use of the different kinds of electrical currents indiscriminately and without sufficient regard for the laws of Electro-therapeutics which should govern their employment; these are naturally disappointed in the results, and it is not surprising that they look upon the agent with suspicion.

That it is used not infrequently merely to act upon the patient's mind when other therapeutic resources have been exhausted, cannot be denied ; but such use, whether legitimate or not, does not undervalue its status when scientifically employed for well-established indications. To accomplish good results, it must be used according to fixed laws which are simple and easily understood ; and with increased knowledge comes a higher opinion of the value of the remedy, and the disbeliever often changes to an enthusiast.

With a daily enlarging knowledge and a constantly widening field of applicability, no physician can expect to compete with his brethren in therapeutic skill, who fails to secure at least an average acquaintance with the science.

The undergraduate also will find that he cannot afford to be without an understanding of the subject ; for he will become aware that the building of his practical learning upon the largely-theoretical foundation laid during his college years will be very seriously handicapped by the omission to give this subject a fair share of his time. He cannot be expected to read exhaustive works, but a very good

idea of the rudiments is to be expected; and since an understanding of medical and surgical Electricity would be difficult, if not impossible, without a knowledge of at least the elements of physical science, so much of the latter as is necessary for the proper assimilation of the text has been inserted.

The use of technical terms employed in expressing the units of force, quantity, etc., has become so common, that an acquaintance with their significance may be considered indispensable; hence their use in the following pages is an advantage, and, being explained in a simple manner, does not give rise to any difficulty in comprehensibility.

CHARLES H. MAY, M. D.

202 East 58th Street,
New York, Jan. 3d, 1887.

CHAPTER I.

PRINCIPLES OF ELECTRO-PHYSICS.

I. **MAGNETISM.**—Magnetism is the property certain bodies have of attracting iron; substances possessing this power being known as *magnets*.

The *natural magnet* is the magnetic oxide of iron or lodestone, a not uncommon ore.

The *artificial magnet* is made by rubbing a piece of soft iron or steel with a natural magnet, or by the action of galvanism, the piece of metal being placed within a helix of insulated wire, through which the current is made to pass.

Soft iron magnets soon lose their power and are hence known as *temporary magnets*, but steel magnets are *permanent*.

Magnetic substances are such metals as iron, steel, nickel, etc., which are attracted by and are capable of being made magnets. *Diamagnetic substances* are such as are repelled by a magnet.

If a magnet be suspended so as to move freely,

it will be found that one end always points to the north, while the other points to the south; hence the terms *north* and *south pole of the magnet.* Bring a second magnet into the neighborhood of the first, and we see that "*like poles repel, unlike poles attract.*"

Armatures are pieces of soft iron used to connect the poles of a magnet; the iron becomes temporarily magnetized, and reacting on the magnet prevents any loss of its power.

Magnetic curves are the imaginary concentric lines radiating from each pole of the magnet, through which experiment has shown the magnetic force to be exerted; the space embraced by these curves is known as the *magnetic field.*

Magnets are of various shapes; that of a bar, or of a horseshoe is usually employed.

A *magnetic battery* consists of a number of magnets bound together with their like poles in the same direction.

II. **ELECTRICITY.**—"Electricity is a powerful physical agent, the existence of which is made known chiefly by attraction and repulsion, but also by luminous and heating effects, and various other

phenomena. Its action is excited by friction, pressure, chemical operations, heat and magnetism."

1. **Static or Frictional Electricity** is that form which is excited by friction; it is called static in contradistinction to dynamic or current electricity, because it is not in motion, but is restrained in a state of high tension.

It is supposed that there are two kinds of electricity pervading all bodies, *positive* or *vitreous*, and *negative* or *resinous;* in the unelectrified condition these fluids just neutralize each other, but may be separated by chemical action, friction, etc.

If a glass rod be rubbed with a piece of silk it will attract a pith ball, charge it with positive electricity and at once repel it; if the positively charged pith ball be now brought near a negatively electrified substance, the ball will be attracted, negatively charged by conduction, and again repelled; hence the law, "unlike electricities attract, like electricities repel."

Conductors are substances which offer very little resistance to the passage of a current of electricity through them; those bodies offering considerable resistance are known as *non-conductors* or *insulators*.

The terms are, however, only relative, there being no absolute conductors or insulators. A list of the more important members of each class is here given:—

CONDUCTORS.	INSULATORS.
Water,	India rubber,
Saline solution,	Dry air,
Acid solution,	Dry paper,
Charcoal,	Silk,
Graphite,	Glass,
Metals, etc.	Shellac, etc.

Induction is the influence which an electrified substance exerts over a body placed near but not in contact with it, in decomposing its neutral electricity, attracting the unlike kind to the proximal end, and repelling the like kind to the distal end. The following tables will render clear the differences between induction and conduction.

INDUCTION.	CONDUCTION.
(*a*) Manifested in insulators and conductors.	(*a*) Manifested in conductors only.
(*b*) The inducing body loses no part of its electricity.	(*b*) The conducting body loses part of its electricity.
(*c*) The imparted electricity is of opposite kind.	(*c*) The imparted electricity is of same kind.
(*a*) The body to be electrified must be in connection with the earth.	(*d*) The body to be electrified must be completely insulated.

Dielectrics are insulators through which electricity may act inductively.

Electricity does not penetrate into the interior of bodies; hence the amount of electricity in any given body depends not upon its mass, but upon the amount of surface it affords.

Another peculiarity to be always borne in mind is the marked tendency for electricity to accumulate at and discharge itself from acute points.

Potential is the electrical level of a body above or below that of the earth, which is taken as the standard of comparison and assumed to be zero.

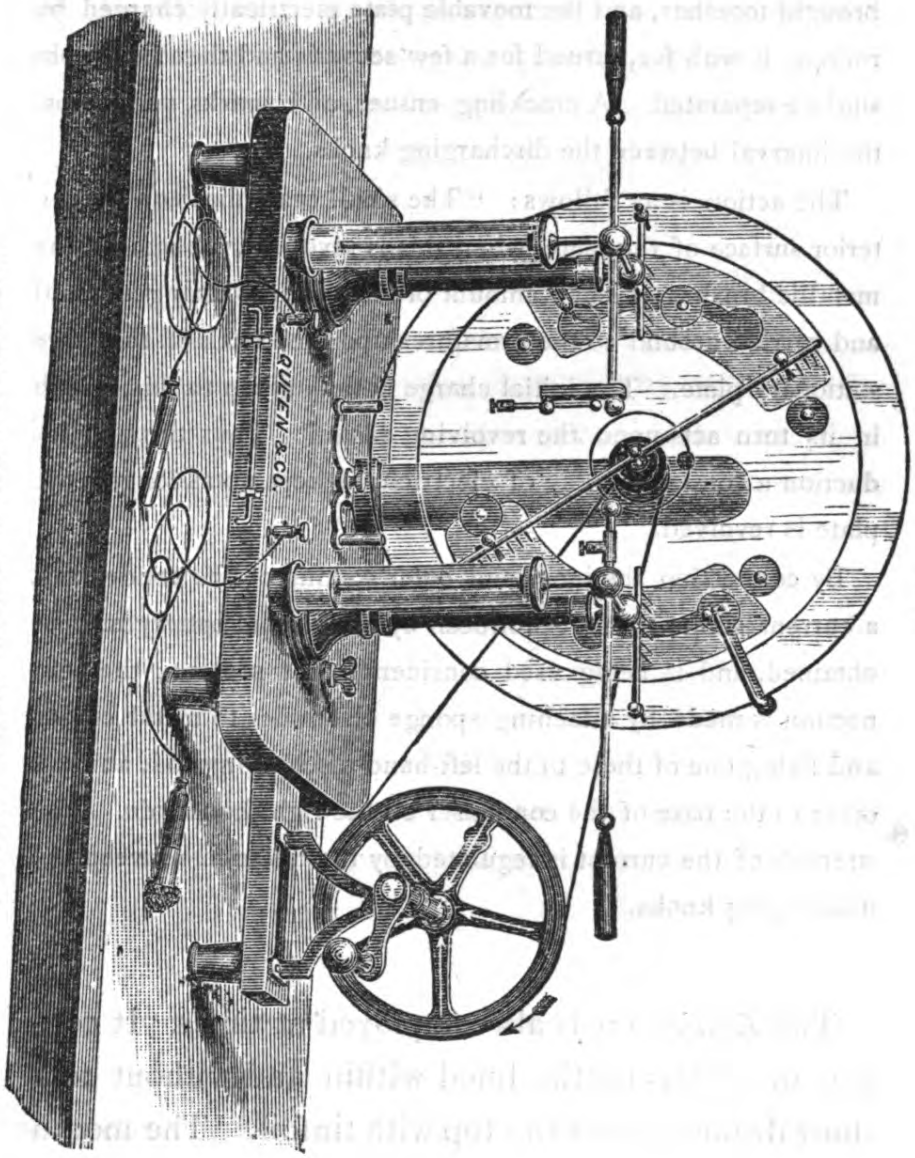
Just as when we place two buckets full of water at different levels above the earth's surface the water readily flows from the higher to the lower, and from the lower to the earth, so electricity flows from the higher level, or potential, to the lower. If the electrical level of an object is above that of the earth, it is said to have *positive potential;* if it is below that of the earth it has *negative potential*, and electricity flows from the earth to the object. Two substances, both positive or both negative, but having different degrees of potential, are positive and negative in

relation to each other. This is what is known as *relative potential.*

In order to produce large quantities of electricity for medical purposes various *electrical machines* are employed; some of these act by friction and induction, while the more modern forms, as the Tœpler-Holtz, depend upon induction alone.

One of the latest forms of the Tœpler-Holtz machine is shown in Fig. 1. It consists of two thin circular plates of glass, a short distance apart; the larger one is properly supported and fixed; the other, smaller in diameter, turns on a horixontal axle by means of the multiplying wheel and band seen to the right in the figure. The larger or fixed plate is provided with armatures, *i. e.*, gilt paper glued upon the posterior surface, and these as well as the plates are varnished. In front of the movable plate, at the level of the armatures, are two brass combs attached to two brass conductors, supported in front upon condensers, and terminating in large brass knobs through which pass brass rods—dischargers; the latter terminate centrally in small metal knobs, and laterally they are provided with vulcanite handles. Upon the front of the revolving plate are a number of small brass buttons which, when the plate revolves, are touched by the teeth of a brush, arranged so as to connect this surface with the armatures.

To work the machine, the knobs of the discharger are



THE NEW UNIVERSAL TOEPLER-HOLTZ MACHINE.

FIG. 1.

brought together, and the movable plate electrically charged by rubbing it with fur, turned for a few seconds and then the knobs slightly separated. A crackling ensues, and sparks pass across the interval between the discharging knobs.

The action is as follows: "The small brass disks on the anterior surface of the plate, when this is revolved, rub against the metallic brushes; a small amount of electricity is thus generated and carried around to the armatures upon the back of the large stationary plate. The initial charge is thus given to this, which in its turn acts upon the revolving plate." Thus through induction a constant supply of electricity is kept up as long as the plate is revolved.

By connecting the inner and outer coating of the condensers, a current similar to that produced by the faradic battery may be obtained, and is being used considerably at present; the connection is made by attaching sponge electrodes to metal chains and fixing one of these to the left-hand discharging rod, and the other to the base of the condenser on the right-hand side. The strength of the current is regulated by the distance between the discharging knobs.

The *Leyden jar* is also employed at times. It consists of a glass bottle, lined within and without to a short distance from the top with tinfoil. The mouth is closed by a cork, through which passes a brass rod, one end being in contact with the inner coating of

the jar, the other terminating externally in a knob. Through the knob the interior receives positive electricity from the prime conductor of an electrical machine, and by induction charges the exterior negatively. The jar is discharged by connecting the inner and outer coatings by means of a discharging rod.

A *battery of Leyden jars* is made by connecting their outer coatings with each other and with the earth, their inner coatings being also mutually connected.

2. Current or Dynamic Electricity.

(*a*) **Galvanism.**—Other names for this form of current are *voltaism*, *contact electricity*, *chemical current*, *constant current*, *primary current*, etc.

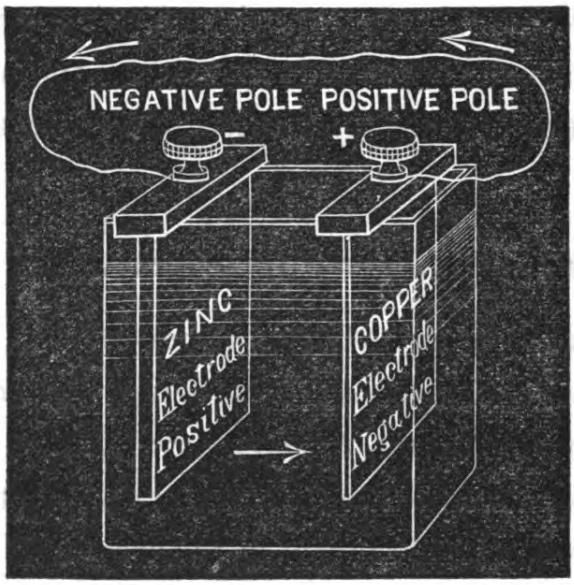
"The galvanic current is generated by the contact of dissimilar substances in the presence of chemical action, or of heat (*thermo-electricity*)."

When two metals (or carbon and a metal) are placed in a liquid which acts more strongly upon one than upon the other, a difference in their electrical potential results. If, now, they be connected by metallic wires, the electricity flows from the higher to

the lower potential, and the equilibrium is restored; but chemical action continuing, the constant current is the result. Such an arrangement constitutes a *galvanic couplet or cell*, and is shown in Fig. 2.

The electricity flows from the plate most acted on

FIG. 2.



(*zinc*) through the liquid to the conducting plate (*carbon*), thence through the connecting wires to the zinc again. Thus, as will be seen, the zinc constitutes the positive plate but negative pole, the carbon forming the negative plate and positive pole. The

circuit is said to be "open" when the wires are separated, "closed" when they are in contact.

The property of creating difference of potential, upon which the electrical current depends, is known as *electro-motive force*.

Electric force moves matter. *Electro-motive force* is an imaginary force moving an imaginary fluid electricity; its amount depends entirely upon the nature of a cell, and not at all upon its size.

To secure accuracy of admeasurement "electrical units" are employed; the more important of these are as follows:—

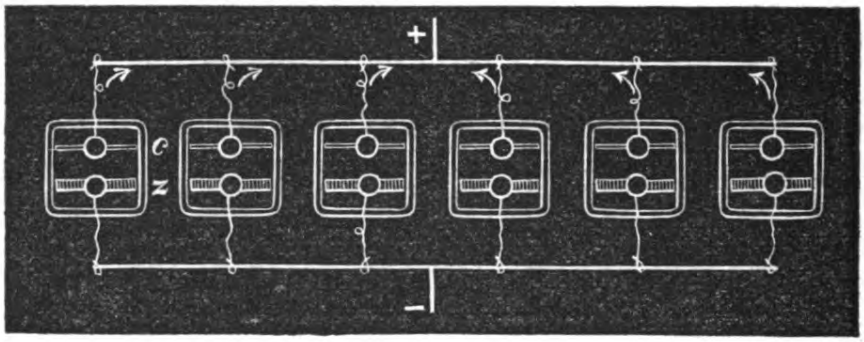
UNIT	SYMBOL.	NAME.
of Quantity,	Q.	Weber.
of Current strength,	C.	Ampere.
of Electro-motive force,	E.	Volt.
of Resistance,	R.	Ohm.

"The use of the term Weber is restricted to the unit of quantity; the Ampere denotes the same quantity, but includes the twin factor implied in the word current."

"The *Volt* is a little less than the electro-motive force of a freshly-charged Daniell's cell."

All the parts in a galvanic circuit offering more or less resistance to the passage of a current, obviously the current strength (C), will be equal to the electro-motive force (E) divided by the resistance (R), or $C = \frac{E}{R}$ (Ohm's law).

FIG. 3.



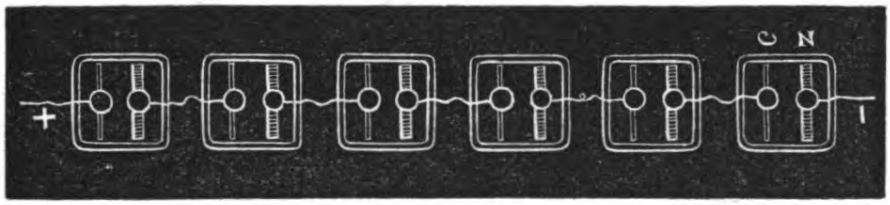
The resistance offered by the wires is inversely proportional to their sectional area and directly to their length; it also varies with the specific conducting power of the metal of which they are composed.

The resistance of the human body, practically that of the epidermis, is very great; it may be diminished

by increase in the size of the electrodes, of the amount of pressure made by them, and of the duration of their application; also by increase in the moisture and vascularity of the skin.

By *electric density* is meant the proportion existing between the sectional area of a conductor and the quantity of electricity conveyed by it; the greater the sectional area, the quantity remaining the same, the less the density.

FIG. 4.



Arrangement of Elements.—In the *simple circuit* or *arrangement in surface* all the zinc plates are connected, forming the negative pole, all the carbon plates forming the positive pole. See Fig. 3.

When the carbon of the first cell is connected with the zinc of the second, and so on throughout the series, the first zinc forming the negative and the

last carbon the positive pole, we have a *compound circuit* or *arrangement in series.* See Fig. 4.

The cells may also be variously grouped. The arrangement in any particular case will depend upon the amount of resistance to be overcome, and upon the object to be attained. As a general rule, the grouping should be such as to make the internal resistance as nearly as possible equal to the external. For ordinary galvanic application to the human body, whose resistance is very great, the cells are connected in series; whereas, for electrolytic and heating purposes, the arrangement in surface is adopted.

When the current is passed through a portion of the body, a flow of the interstitial fluids occurs from the anode to the kathode; this is known as the *cataphoric action* of galvanism.

Luminous and heating effects may be obtained by causing a strong current to pass through a platinum wire.

Chemical Effects.—Electrolysis is the decomposition of a body,—oxygen and acids collecting at the anode; hydrogen, alkalies, and bases at the kathode.

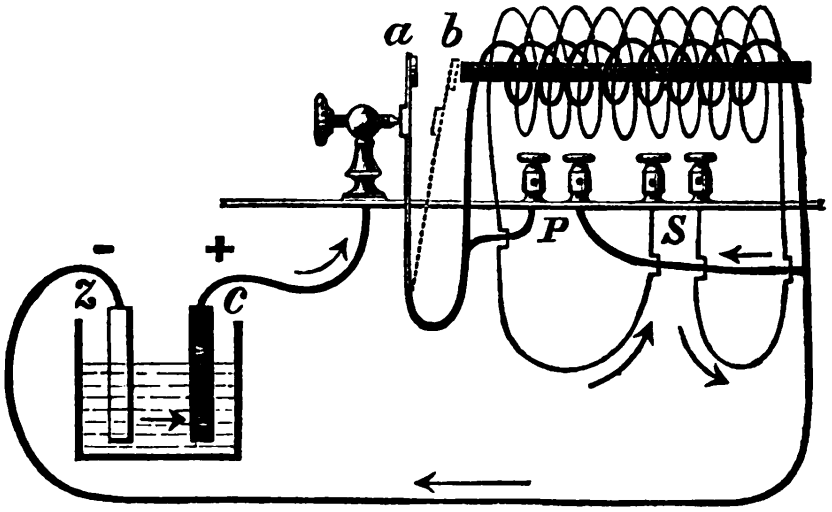
(*b*) Faradism, or Induced Electricity.

"The faradic current is generated by the inductive influence of galvanism or magnetism, in presence of variation in intensity of this influence." An electrical current is developed in a closed coil of wire when a magnet is brought near, and another, but in the opposite direction when it is withdrawn. Upon this principle depends the construction of the old *magneto-electrical apparatus*, which the recent discovery of a commutator, by which the currents may be collected and sent in the same direction, will probably again bring into use. A galvanic current induces a current in a neighboring wire, at the moment of closure in the opposite direction, at the moment of opening in the same direction.

When the current traverses an insulated helix within which is placed a soft iron bar, the bar becomes a magnet on closure of the circuit, to be instantly demagnetized when it is broken. These are the principles involved in the construction of the *electro-magnetic*, the common *faradic battery*. Their application can be clearly understood from Fig. 5.

Z, zinc element; *C*, carbon element; *P*, binding-posts for the primary coil; *S*, binding-posts of the secondary coil; *a*, the interrupter when the circuit is passing to the helix; *b*, the interrupter when the circuit is broken. The screw (shown in contact with *a*) allows of the adjustment of the interrupter to the bundle

FIG. 5.



(*From Ranney.**)

of soft-iron wires within the primary helix, thus making the interruptions fast or slow at the will of the operator. The patient is connected with the battery in action by means of cords attached to the binding-posts at *P* or *S*. These cords are not

---

* "Practical Suggestions respecting the Varieties of Electric Currents and the Uses of Electricity in Medicine," by Ambrose L. Ranney, M.D.: D. Appleton & Co., 1885.

shown in the diagram, but are shown in Fig. 1. The arrows show the direction of the currents. The zinc is marked as the negative element (—), and the carbon as the positive (+) element of the battery. Note that the wire of the primary coil is represented as coarser than that of the secondary; that the secondary coil has no connection with the elements of the cell; that the current going to the primary binding-posts is generated by the iron core, and is not that which originates in the galvanic cell; and that the interrupter has a small piece of platinum soldered upon it where it comes in contact with the screw, so as to prevent oxidation at that point. Patients feel the current made by the "break" more than that from the "make" of the circuit; hence one electrode apparently gives a stronger current.

The *primary current* is that which results from the inductive action of the coils of the inner helix upon each other, strengthened by the inducing influence of the magnet.

The *secondary current* is that which passes *to and fro* in the outer helix; each electrode is alternately anode and kathode, but the direct current is so much the stronger that it may be alone considered, and this current being understood, we may properly speak of anode and kathode in reference to faradism.

The strength of the induced current is in direct proportion to the number of coils in the outer helix,

and to the strength of the exciting galvanic current. It may be increased by withdrawing the metallic cylinder which surrounds the helix, and thus lessens the inductive influence.

The faradic current has no marked chemical nor heating effects; it has not the penetrating power possessed by galvanism.

CHAPTER II.

FORMS OF ELECTRICAL APPARATUS FOR MEDICAL AND SURGICAL USE.

Constant Elements.—In the simple "one-fluid cell" already described, it is found that, practically, the current is not *constant.* The zinc is rapidly dissolved, the fluid becomes saturated with salts, and the hydrogen from the electrolytic decomposition of the water accumulates on the carbon plate, polarizing it, and so preventing the passage of electricity to and through it. All these influences aid in rapidly reducing the current to a minimum.

The destruction of the zinc and the weakening of the current by the formation of numerous small couplets between particles of zinc and the impurities they contain is prevented by amalgamation. Polarization is prevented by having *two fluids* so arranged as to chemically utilize the liberated hydrogen. Cells so constructed are said to be *constant.*

Of single fluid cells, the *Grenet* may be taken as the type; the elements are zinc and carbon im-

mersed in a dilute solution of sulphuric acid, bichromate of potassium being added as a partial depolarizer. This form is often used in faradic batteries.

The *Daniell* is a good example of the "two-fluid element." A glass vessel contains solution of sulphate of copper and a perforated copper cylinder with a rim above; on the rim rest crystals of copper sulphate, which keep the solution saturated. Inside of the copper cylinder is a porous earthenware vessel containing a zinc plate immersed in solution of dilute sulphuric acid. The hydrogen set free by electrolysis decomposes the copper sulphate, forming copper and sulphuric acid, the former being deposited on the copper cylinder, the latter going to reinforce the sulphuric acid already present. Good cells of this type are those of *Siemens* and *Halski*, *Leclanche*, *the chloride of silver*, etc.

For electrolysis, Stöhrer's elements are specially commended by Bartholow.

For luminous and heating effects, we use either large cells or small elements connected in surface. Among the best are *Piffard's* and *Byrnes's*. *Polarization* or *storage cells* are also used for these purposes. "When two plates of platinum are dipped

into water and attached to the poles of a battery, they become polarized; that is, the anodic plate becomes covered with bubbles of oxygen, the kathodic with bubbles of hydrogen. If now the plates are connected with the terminals of a galvanometer, it is found that a polarization current is set up from the hydrogen through the liquid to the oxygen (*i. e.*, in the opposite direction to the battery current), and that this polarization current may last a long time if the plates are large enough. This property has been made use of in the construction of Plante's storage cell and Trouvé's Electrical Polyscope.

Accessory Apparatus.—The *Galvanometer* is an instrument used to show the presence, strength and direction of a current of electricity.

The *Rheostat* is so constructed as to allow an accurate gradation of current resistance when it is placed in the circuit.

The *Selector* or *Cell-enumerator* is an arrangement by which any desired number of cells may be at once brought into circuit.

The *Polarity Changer* or *Commutator* affords a

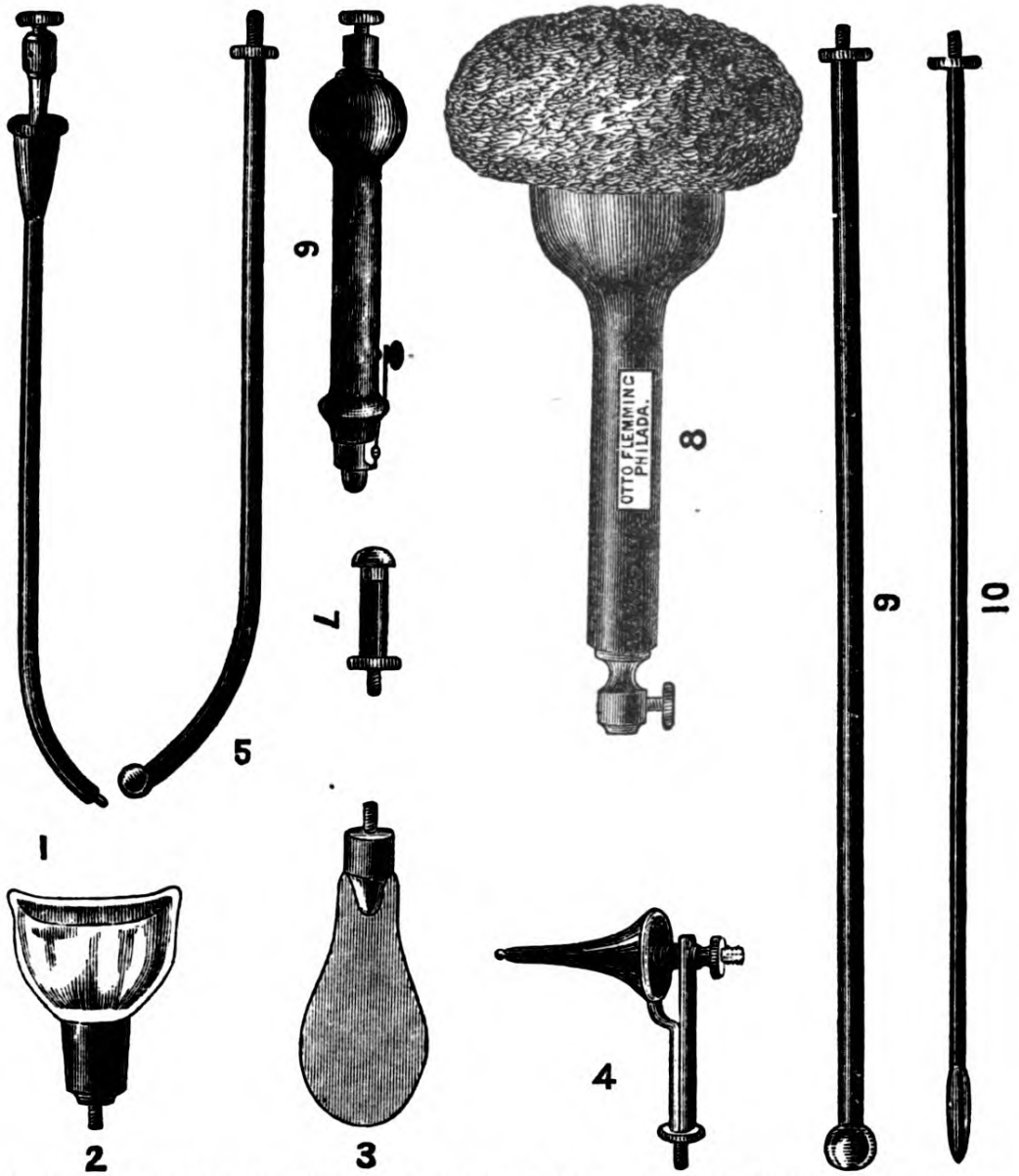
means of instantly changing the direction of the current and then reversing the poles.

The *Interrupter* (for the galvanic current) is usually contained in the handle of the electrode; a button is pressed upon, and this by means of a spring makes and breaks the contact.

Electrodes are the direct means of applying electricity to the body; they are of very various forms, as shown on pages 45 and 47.

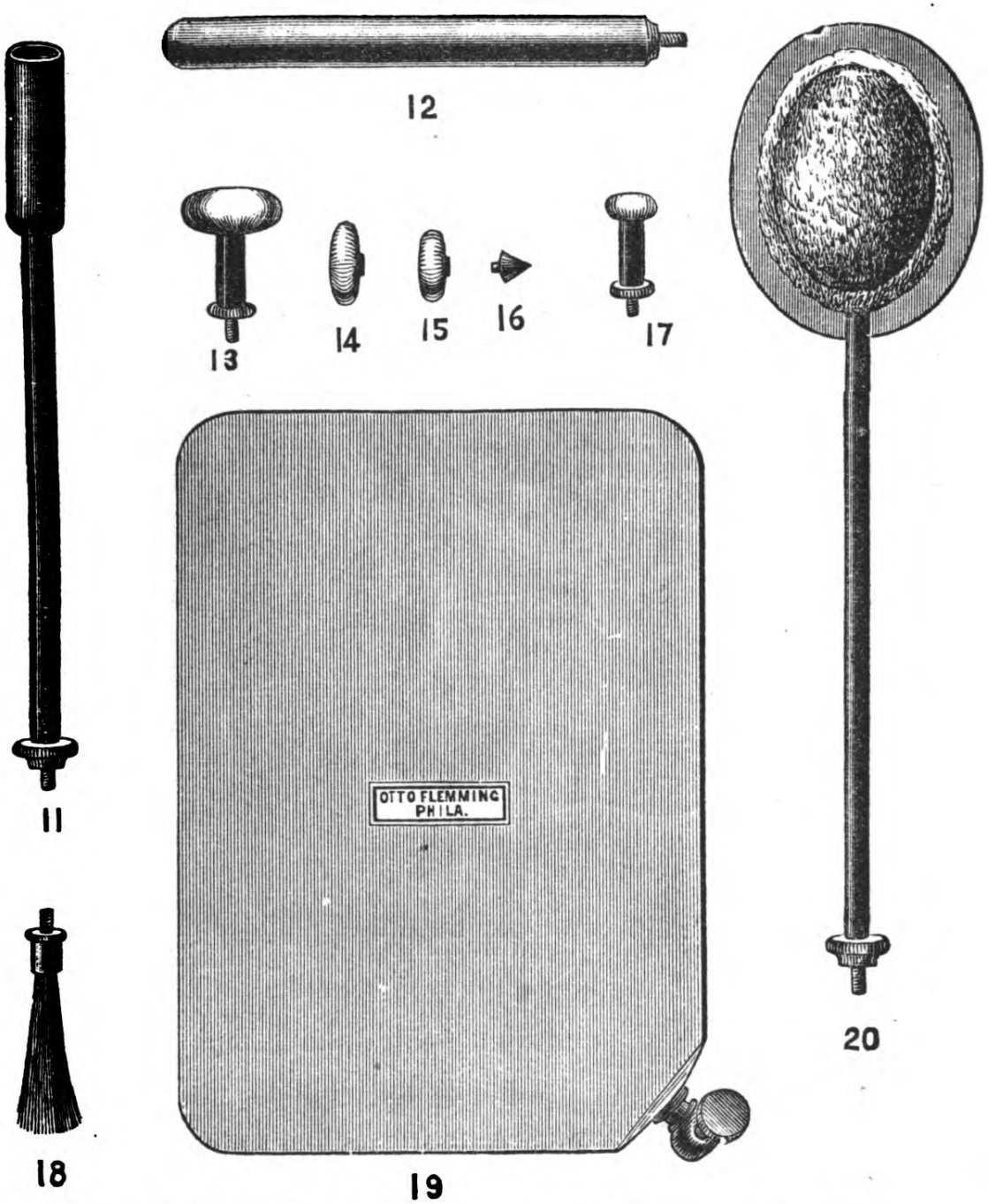
Disks of carbon covered with waste leather are preferable to those of metal covered with sponge.

Rheophores are the wires connecting the electrodes with the battery; they should be of ordinary telegraph wire insulated by a rubber coating.



FORMS OF ELECTRODES USED IN THE VARIOUS KINDS OF ELECTRICAL APPLICATIONS.

1. Laryngeal (Dr. Strawbridge's Eustachian Tube) Electrode.
2. Eye "
3. Tongue "
4. Ear "
5. Nasal "
6. Interrupting Handle Electrode.
7. For Special Nerves "
8. Large Sponge "
9. Uterine and Rectal "
10. Urethral "



11. Cup-shaped, for Mouth of Womb.
12. Vaginal Electrode.
13. Sympathetic Nerve "
14, 15 and 16. Disks, Olives, Points, etc.
17. Carbon Electrode.
18. Wire-brush "
19. Foot-plate "
20. Spinal "

CHAPTER III.

ELECTRO-PHYSIOLOGY.

I. **MAGNETISM.**—Of the physiological effects of magnetism little is definitely known; the north pole seems to cause irritation, the south pole sedation.

II. **STATIC ELECTRICITY.**—1. In the *electric bath* the patient is placed on an insulated stool, is connected with the prime conductor by means of a chain, and is charged, positively or negatively, as desired. The electricity enters and leaves the body painlessly, slight tingling of the surface is experienced, face becomes flushed, hair erect, action of heart accelerated, and in a few moments a general perspiration breaks out.

2. *Electrization by sparks.*—When the body is charged as above, if we bring near a conductor (metallic knob usually), sparks can be withdrawn through the clothes; these are accompanied with burning sensations and the production of wheals.

3. In *electrization by shock*, the part to be acted on is placed in the circuit between the inner and outer coatings of a Leyden jar, when a severe shock is felt.

4. *Motor Effects.*—By a special arrangement of the static machine a so-called "static induction current" is produced; this current has the motor effects of faradism, with the advantage that it is painless.

III. CURRENT ELECTRICITY.

1. *Galvanic excitation of motor, sensory and mixed nerves.*—When a galvanic current of average strength traverses a *motor nerve*, a muscular contraction results only at the moment of making and breaking the circuit, and upon variations in the current strength; the amplitude of the contraction will depend upon the rapidity of the changes, and upon the pole that is placed over the nerve.

Place a large electrode over the sternum or some other indifferent point; then with a small one over a motor nerve or muscle ascertain the minimum current strength necessary to produce a contraction upon closing (C) and opening (O) the circuit, first with the kathode (K), then with the anode (A).

The increase of current strength necessary will be

found to occur in a regular order known as the *normal polar formula*, and is as follows:—

1. Weak current.....KCC
2. Medium current .....ACC AOC
3. Strong current.....KOC

The contractions resulting from sudden reversals of polarity by means of the commutator are known as *voltaic alternatives*, and are much more powerful than those resulting from simple makes and breaks.

During closure the excitability of the nerve is diminished at the point of contact with the anode, (*anelectrotonos*), increased at the kathode (*katelectrotonos*), so that excitation of the nerve results from AO., *i.e.*, the return to normal from anelectrotonos, and from KC., *i.e.*, the production of katelectrotonos.

Excitation upon closure really only occurs at the kathode; upon opening only at the anode, KOC and ACC being accounted for on the theory of *virtual electrodes*, which cannot be discussed here. (See De Watteville.)

Nothing is gained by placing both poles over the nerve, for the current proceeds in all directions from

the electrode, and at a short distance the nerve is practically devoid of current. This diffusion of the current gives rise to "induced contractions" in neighboring muscles.

Pain results from excitation of a *sensitive nerve*, even when the current flows continuously, and is felt both at the point of application and in its peripheral distribution. In *mixed nerves* the effects are pain and muscular contractions.

2. *Faradic excitation of motor, sensory and mixed nerves.*—When a slowly interrupted faradic current traverses a motor nerve, a muscular contraction occurs at each break, but if the interrupter vibrates rapidly the contraction becomes tetanic. Similar stimulation of a *sensitive nerve* causes pain, and of a *mixed nerve* pain and motion.

The effect of galvanism when applied directly to *muscle* is the same as that resulting from stimulation of its motor nerve, but the short duration currents of faradism do not so readily affect it; indeed, the contractions from faradism are probably due to stimulation of the intra-muscular nerve elements. The reactions to both currents are more powerful by *direct stimulation*, in which the electrode is placed over the

point of entrance of the motor nerve into the muscle (*motor point*);* but in the case of large muscles with several motor points the whole muscle is best thrown into contraction by *indirect stimulation*—the electrode being over the nerve itself. A healthy muscular contraction is abrupt and sudden in its rise and fall.

Non-striated muscle reacts to both currents in its normal vermicular manner. The *heart muscle* does not react to the direct application of faradism, but does to galvanism; its rhythm may be increased or diminished by corresponding interruptions of the galvanic current. Percutaneous electrization of the *brain*, from before backward, causes a sickly sensation of cerebral disturbance; from side to side induces nausea and vertigo. Faradic currents do not affect the brain.

Although it is established that the *spinal cord* is penetrated by electrical currents, yet the effects produced are confounded with those resulting from the inevitable stimulation of the nerve roots, and cannot be distinguished.

It is still a disputed point whether the *cervical sym-*

---

* See pages 92, 93.

pathetic can be influenced by electrical currents in the living subject.

A strong current passed through the *pneumogastric nerve* arrests the heart in diastole, and the respiratory movements during inspiration; a weak current increases the frequency of the heart's action.

Faradization of the pneumogastric causes vomiting and arrest of intestinal peristalsis; quiescence of the stomach is induced by galvanism.

Galvanization of the *eye* causes flashes of light upon current opening and closure, KC and AO producing one set of colors, and KO and AC another different set.

Subjective noises from electrization of the *ear* occur only on KC and AO. A current passing through the *tongue* causes the "galvanic taste;" through the *nose*, subjective odors.

All the abdominal organs containing muscular fibre may be acted on by percutaneous electrization.

CHAPTER IV.

ELECTRO-DIAGNOSIS.

In certain diseases of the nervous system the neuro-muscular apparatus does not respond in the usual manner; the normal polar formula is altered. Upon examination we may find:—

I. **Normal Reactions.**—These indicate a healthy condition of the anterior spinal cornua and of the nerves arising from them, notwithstanding the part affected may be the seat of spasm or paralysis.

They occur 1. In all cerebral diseases unaccompanied by secondary changes in the cord.

2. In spinal diseases of the white matter only, at least in the early stages.

3. In circumscribed transverse spinal lesions in parts below, though degenerative reaction (De R) will be present in organs supplied directly by the seat of lesion.

4. In mild affections of peripheral nerves from cold or pressure.

II. Quantitative Changes.

1. *Excitability augmented.* — In early stages of cerebral hemorrhages, locomotor ataxia, facial paralysis, etc., and in tetanilla. Also occur in first stage of De R.

2. *Diminished excitability* accompanies De R in some of its phases; occurs, also, in old cerebral paralyses with secondary degeneration, old leuco-myelitic diseases, certain cases of progressive muscular atrophy and pseudo-hypertrophy, in simple muscular atrophy from disuse, wasting diseases, and joint affections. Its occurrence excludes poliomyelitis, hysteria, purely cerebral disturbances, and shamming.

III. Quantitative and Qualitative (Serial and Modal) Changes : Reaction of Degeneration.

1. *Alterations in nerve reactions.*—A more or less rapid diminution, ending usually in loss of reaction equally to both currents. The duration of this period varies, but excitability usually reappears about the time that the nerve becomes capable of transmitting motor impulses.

Qualitative changes are rare.

2. *Alterations in muscle reactions.*—The changes in the reactions to faradism pursue exactly the same course as in the nerves, and are due to the degeneration of the intra-muscular nerve elements.

The galvanic reactions are characteristic :—

(*a*) QUANTITATIVE CHANGES.—A temporary diminution is followed by a rapid increase of excitability, reaching its maximum in the second week, and then gradually falling to or below normal.

(*b*) QUALITATIVE CHANGES.—A modal alteration consisting of increased sluggishness of muscular contraction with tendency to become tetanic.

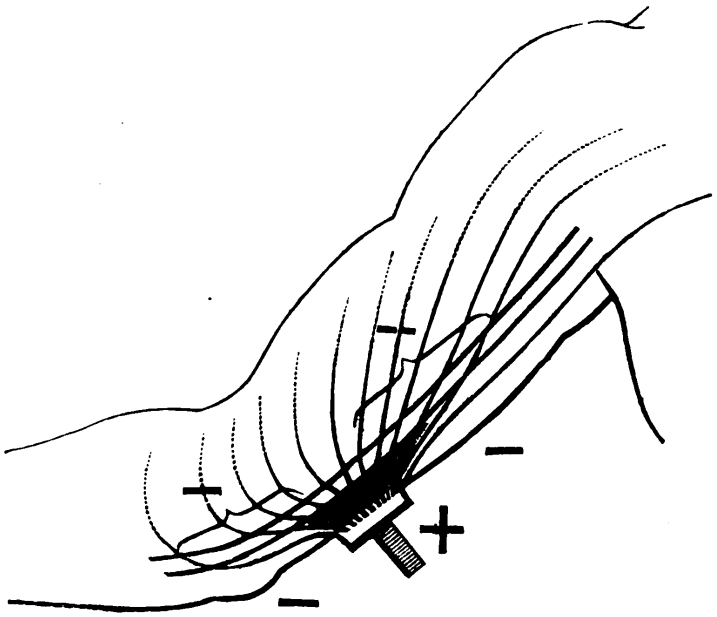
SERIAL CHANGES.—These consist in reversal of the normal polar formulas, ACC occurring with a constantly diminishing current strength until it finally overtakes KCC; and in the same manner KOC overtakes AOC, but the opening contractions soon disappear.

De R may still be present after months have elapsed, and may persist after motility is restored, if this has been lost.

The presence of De R means a specific "degeneration atrophy" of the neuro-muscular apparatus, due to a cutting off of the trophic influence of the

anterior spinal cornua, from disease of these cornuas, or of the nerves proceeding from them. It is not inconsistent with the preservation of motility; is present in anterior poliomyelitis, lead paralysis and severe cases of paralysis from peripheral nerve lesions.

FIG. 6.



This diagram represents the points of entrance and exit of the current in a nerve submitted to percutaneous excitation with one electrode, and the consequent formation in it of two zones of opposite electrical character; anodic and kathodic. The anode is supposed to lie over the ulnar nerve, whilst the kathode rests on the trunk. The polar anodic zone is shaded. The two

brackets show that, owing to the diffusion of current, the unipolar excitation of the imbedded nerve sets up in it a descending as well as an ascending current. The signs — indicate that under such circumstances the electrotonic condition of the nerve in the neighborhood of the electrode may be found the opposite of that set up immediately under the electrode.

In partial De R the galvano-muscular reactions are the same as in the complete form, but the farado-muscular and the galvano-nervous and farado-nervous reactions are normal or slightly diminished ; here the trophic influence is in some unknown manner cut off from the muscles, but not from the nerves. It occurs in amyotrophic lateral sclerosis (not always), progressive muscular atrophy (of central origin), bulbar paralysis, mild acute poliomyelitis, and in mild forms of peripheral paralysis.

IV. **Changes in sensation.**—Electro-diagnosis only enables us to ascertain the presence, location, and degree of hyperæsthesia and anæsthesia.

V. **Special senses.**—We have as yet no certain data in the diagnosis of the diseases of the *organs of vision.*

Of *taste*, we can only judge whether it be present or absent.

The presence of galvanic hyperexcitability of the *acoustic sense* affords an indication for treatment in certain cases where the hyperexcitability is accompanied by subjective noises; upon KC these noises often disappear at once and completely.

PRACTICE OF ELECTRO-DIAGNOSIS.

The patient is so placed that symmetrical parts are in the same position and equally relaxed. A large, well-moistened electrode is fixed over the sternum, and a smaller one with interrupting handle used as the exciting electrode. Comparison of symmetrical parts is best, but if the disease be bilateral, some other part, the condition of whose reactions is known, must be selected. First, with a current of ten cells, having a galvanometer in circuit, ascertain the amount of deflection when the electrode is placed over each point to be tested; by this means we may eliminate the error arising from difference in tissue resistance. Mark the points tested so that the electrode may be placed exactly over them, and see that the duration of closure and opening is exactly the same on the two sides. Now, with a slowly interrupted faradic current, note the amount of withdrawal

of the cylinder at which the first contraction occurs, and also the maximal contraction with very strong currents.

Next, with the galvanic current, ascertain the minimum number of cells with which a contraction occurs upon KC, AC, AO and KO, in the order given; also note the manner of the contraction.

A bifurcated rheophore may be usefully employed in these experiments, enabling us to compare reactions on different sides of the body at the same time and with the same current.

In testing *sensation*, the skin should be dry and dusted with some drying powder; the wire brush or Erb's electrode may be employed.

In examination of the *eye*, the active electrode is placed over that organ; of the *ear*, in front of the tragus or introduced into the ear, which has previously been filled with water. The *sense of taste* is tested by placing a small kathode over tongue, etc. Various electrical explorers have been invented for the purpose of detecting the presence of metallic foreign bodies in the body, but so far they have not been satisfactory.

CHAPTER V.

ELECTRO-THERAPEUTICS.

I. **Magnetism.**—There is much difference of opinion both as to the curative power of magnetism and as to the manner in which it should be applied. The most remarkable cures have been obtained in those cases where the symptoms were subjective, and the influence of psychical impressions could not be eliminated,—viz., in the various manifestations of *hysteria*, in *neuralgia*, *anæsthesia*, and *chorea*. In neuralgia the south pole is stroked over the seat of pain or held upon it; in the other affections named, a variable number of horseshoe magnets are bound upon the parts for a variable length of time.

Both permanent and electro-magnets are also successfully used for the *extraction of bits of metal from the interior of the eye*, a magnetized needle being passed into the neighborhood of the foreign body.

II. **Static Electricity.**—The static induced current may be advantageously substituted for the faradic

in case of *paralysis;* also in muscular contraction, such as occurs in *torticollis*, *histrionic spasm*, etc.; here a weak, rapidly interrupted current often affords great relief.

Remarkable cures are effected in *anæsthesia*, *hyperæsthesia* and *neuralgia* by insulation and the withdrawal of sparks from the affected parts.

Hysteria is particularly amenable to Franklinism. Cases of *hystero-epilepsy* are reported as cured by it.

Good results are obtained in *chorea* by insulation and sparks.

In *muscular rheumatism*, and in *stiff joints* from *chronic rheumatism and gout*, sparks are withdrawn from the affected parts, with marked relief in many cases.

By withdrawal of sparks from the various organs of the body, tonic and invigorating effects are obtained in cases of *neurasthenia*, *exhaustion*, and *debility* from various causes.

Torpid liver, *gastralgia*, *dyspepsia*, and *constipation* have been relieved by drawing sparks from over the affected organs, the action being reflex, or, as asserted by some, directly upon the organ.

III. **Dynamic Electricity.**—1. *General remarks.* The only accurate knowledge we possess of the physiological effects of electricity concerns its stimulating and modifying action on nerve and muscle; obviously these are insufficient to account for therapeutic results, but another very powerful factor is its so-called "*catalytic action*" embracing:—

(*a*) Electrolytic and cataphoric effects. (*b*) Stimulation of the flow of blood and lymph, directly by excitation of the vessels, indirectly by excitation of the vaso-motor nerves. (*c*) Stimulation of the trophic tracts and centres.

These effects are those of galvanism; the faradic current is markedly stimulating, slightly modifying, and its catalytic action, if it exist at all, is very slight. You will be guided in the selection of the proper current in individual cases by these considerations. As a general rule, the faradic current is best for stimulation and the galvanic for sedation, but to excite contraction in degenerating muscle the galvanic current is vastly superior.

There are two chief modes of applying electricity therapeutically—the *polar* and *directional* methods. For a discussion of the merits of each, the reader is

referred to De Watteville, whose conclusions are adopted here, viz., that no peculiar effects result from the direction *per se*, but that this method may sometimes be employed as a matter of convenience on purely physical grounds. For the production of electrotonic effects the polar method only can be used, the anode being the sedative and the kathode the stimulant pole. The polar method is usually employed in other cases also, because it affords the best means of reaching the affected part with a current of maximum density.

This consideration will also guide us in the choice of size and position of electrodes. No matter where the points of application, the current diffuses itself throughout the entire body, but it will be strongest where it has greatest density, *i. e.*, under the smaller electrode.

For a small point not deeply placed, *e. g.*, a motor point or an individual nerve, place a small electrode over the spot and a larger one at a considerable distance. For a large part (*e. g.*, deltoid muscle) similarly placed, use moderate-sized electrodes closely approximated; for a large joint or a deeply-seated part, as the brain or bladder, large electrodes placed

on opposite sides, so that the part to be affected is in the straight line between them; for an elongated organ like the spinal cord, large electrodes over the part, but as widely separated as possible.

In dosage we must take into consideration the part to be affected, the size of the electrodes, the resistance of the part, and the absolute current strength as indicated by the galvanometer.

Always first try the effect of the current upon yourself, on the cheek, or, in case of weak currents, upon the tongue.

Avoid unnecessary pain by a gradual increase of strength, and by firm and uniform pressure on the electrodes. In nervous affections, applications should be made to the seat of disease as well as to the seat of symptoms; the peripheral treatment, besides its local action, often reflexly affects favorably the central lesion.

In central applications we desire catalytic effects chiefly, and hence employ galvanism only.

In conditions of generally impaired nutrition, and in constitutional disease, one of the methods of *general electrization* is employed.

Electrization of one part should not continue longer

than two (2) minutes, and an entire sitting not more than ten (10) to fifteen (15) minutes. Sittings should occur not oftener than once daily, and in chronic cases two or three times a week will suffice. We should be guided, however, by the duration of the effects produced.

2. Methods of Electrization.

(*a*) *Localized galvanization.*—To obtain the sedative effect alone, the electrode should be stationary (*stabile*), and the current uniform or gradually increasing; by sponging over the part with an electrode, without, however, breaking the contact (*labile method*), we get catalysis combined with muscular contraction. For purposes of stimulation, the current should be interrupted.

(*b*) *Localized faradization.*—If a whole limb has to be faradized, the labile method may be resorted to, the motor points being sought for when individual muscles are to be treated, the motor nerve where the muscles cannot be reached directly.

In faradization of the skin, when employed for its reflex effects, the current should not be strong enough to excite muscular contraction.

(*c*) *General faradization.*—In this method the entire body is subjected to the influence of faradism. The patient is seated in a chair, with the feet resting on a metallic plate, which constitutes the kathode; the operator, taking the anode in his left hand, passes his well-moistened right hand with firm pressure from the forehead over the head to the occiput, and then over the anterior portion of the neck; now, the hand being substituted by the electrode, this is sponged over the trunk and limbs, the entire sitting lasting 15–20 minutes. This method seems to be very serviceable in the treatment of constitutional diseases, the neuroses, and all affections in which general debility, muscular or nervous, forms a prominent feature.

(*d*) *General galvanization* is too powerful ever to be required, except in a few rare cases which prove insusceptible to the preceding method.

(*e*) *Central galvanization.*—According to Rockwell, this method is most useful in those neuroses, such as hysteria, chorea, etc., when muscular and nutritive changes are not well marked. The kathode is held over the epigastrium and the anode passed over the head from vertex to occiput, thence along

the anterior edge of the sterno-mastoid muscle to the clavicle, and again from the occiput along the whole length of the spine, thus bringing the entire nervous system, cerebro-spinal and sympathetic, under the influence of the current.

(*f*) *Electric bath* (*galvanic or faradic*).—The electrodes are placed in the water contained in a tub of some non-conducting material, or one electrode is placed in the water and the other is connected with a large sponge, with which the patient sponges his entire body. This method is only useful in general diseases.

(*g*) *Subaural galvanization.*—This term has been applied by De Watteville to a method of treatment in which the kathode is placed just beneath the ear, and the anode over the lower cervical and upper dorsal vertebræ, a current of 5–10 cells being passed for 3–4 minutes on one or both sides. Good results have been obtained from this practice in very various affections. The effects produced were formerly supposed to be due to stimulation of the cervical sympathetic; but though this may be a factor, the simultaneous excitation of the spinal cord, medulla, pneumogastric, etc., must be taken into consideration.

(*h*) *Galvano faradization.*—In this method the batteries are so arranged that the two currents may be utilized at the same time and through the same electrodes. It economizes time when both currents are indicated, prevents the fatigue which may result from the ordinary faradic stimulation of muscle, and may prove useful in other ways.

3. Special Therapeutics.

(*a*) **Paralysis.**—The modifying, stimulating and catalytic effects of the current being exerted directly upon the part to which it is applied, and its stimulant influence by reflex action upon the centre presiding over this part, it is evident that, to obtain the best results, the treatment must be "in loco morbi" as well as "in loco symptomatis." The seat of lesion should be galvanized by a weak current, stabile if central, stabile or labile if peripheral. The obstacle to conduction is best overcome by interrupted kathodic galvanization above the seat of lesion, or, if this be not possible, by faradization of the sensory end of the reflex arc containing the lesion. Faradization and interrupted kathodic galvanization are to be used upon the nerves and muscles, the seat of symp-

toms; finally, faradization of the skin is to be employed for its reflex nervous and vaso-motor effects on the centre.

(*b*) **Spasm and Cramp.**—This class of affections is not so much benefited by electrization as are the paralyses. The indications are to obtain the sedative effects of the current by anodic galvanization of the seat of lesion, and of the peripheral motor nerve; to induce exhaustion of the neuro-muscular apparatus by over-excitation, by means of powerful interrupted kathodic galvanization, or faradic currents of increasing strength ("swelling faradic currents"); to act upon painful and pressure points by weak anodic galvanization; to stimulate the antagonist muscles. These various means to be tried successively in individual cases.

Facial spasm, when recent, may often be relieved by galvanization. De Watteville employs for this purpose a large anode placed over the lower part of the ascending frontal and parietal convolutions on the opposite side, a weak stabile current being passed for 5 minutes; failing in this, the various methods described for spasm in general should be tried. The more localized affections, *blepharospasm* and *nys-*

tagmus, are treated on the same principles. *Trismus*, when of peripheral origin, may be relieved by weak stabile anodic galvanization. When rheumatic in character, *torticollis* often yields readily to swelling faradic currents or to stabile galvanization of the affected muscles; but in old cases, and in those of central origin, all methods of electrization fail.

Cutaneous faradization of the epigastrium is recommended by Erb in *singultus*, *sneezing*, and other *respiratory neuroses*.

(*c*) **Anæsthesia.**—The principles of treatment are much the same as in the paralyses. Our chief objects will be to overcome the obstacles to sensory conduction, and to increase the excitability of the sensory receptive organs, central and peripheral, employing for these purposes peripheral cutaneous faradization, and labile kathodic galvanization, the anode resting on the point of origin of the nerves. It has been found that faradization of a small part of the anæsthetic area will often effect a cure of the whole, and may even relieve special sense anæsthesia.

(*d*) **Hyperæsthesia.** *Pain. Neuralgia.*—Electrization effects remarkable cures in cases of local-

ized pain, especially in that form known as neuralgia. It is in idiopathic neuralgia, and in the gouty, rheumatic and neurotic forms that the best results are obtained. First, we fulfill, if possible, the causal indication by treating the disease of the brain, cord or nerves, or the constitutional condition, by the methods to be described later on; next we treat the finer nutrititive change, the so-called neuralgic change upon which the pain directly depends. A weak galvanic current is passed through the nerve, the anode being over the seat of pain, or both poles may be over the nerve. Faradic currents, employed in the same manner, are sometimes successful, and counter-irritation with the faradic brush is often useful. Painful and pressure points must be treated in the manner already indicated.

Trigeminal neuralgia being often due to deep-seated organic changes, the results of treatment are usually only palliative. A galvanic current (5–10 cells) is employed; anode being over point of emergence of nerve from the skull, kathode over nape of neck; this may be repeated two or three times daily. To affect the deeper parts of the nerve, trans-

verse conduction through the mastoid processes may be used.

Galvanism, the anode being over points of emergence, is efficient in the treatment of *cervico-occipital neuralgia*.

The *cervico-brachial* form usually yields readily to stabile, or, when associated with paralytic symptoms, to labile galvanization, anode above the clavicle, kathode over the periphery.

Intercostal neuralgia, especially that form associated with herpes zoster, is very rebellious to treatment. Strong currents (30–40 cells) are to be employed, anode near spine, kathode over periphery.

Mastodynia requires the same treatment. Excellent results are usually obtained from electrization in *sciatica*. Strong currents (30–40 cells), a large anode over sciatic foramen; kathode being moved over periphery; or one electrode may be placed in rectum; or electro-puncture may be employed. *Neuralgia* of the *lumbar plexus* is treated on the same principle.

(*e*) **Diseases of the Brain.**—The forms of brain disease which we can hope to affect favorably by electrical treatment are *functional disorders*, by re-

moving the finer nutritive changes upon which they depend; *disorders of circulation*, by the vaso-motor effects of the current; *cerebral hemorrhage* and *softening from thrombosis and embolism*, by removal of circulatory disturbances, restoration of the function of neighboring parts lost from inhibition or sympathy, and improved nutrition of the affected and surrounding parts; *inflammatory and degenerative* changes by improving nutrition and circulation.

We treat the brain directly by cerebral galvanization; indirectly by subaural galvanization; reflexly by faradization of the skin. In applications to the brain use large, well-fitting electrodes, weak currents (2–10 cells) gradually increased and diminished and without breaks, sittings of from one to three minutes. Longitudinal galvanization — anode over occiput, kathode over forehead—is said to increase the cerebral circulation and the reverse position of the electrodes to diminish it.

Electrical treatment of *hemiplegia* from *cerebral hemorrhage*, and from *thrombosis or embolism*, should not be begun until about four weeks after the date of attack. Galvanization of the brain so as to include the seat of lesion should then be cautiously used,

the paralytic symptoms, at the same time, being treated in the manner already indicated. If, after a week or ten days, no improvement is manifest, farther treatment is useless; and the same may be said when improvement has begun, but ceases after a few days. The supervention of "late rigidity" also renders the prognosis of improvement unfavorable.

Aphasia is treated on the same principles.

In *monoplegia* and *monospasm* of cortical origin, the affected convolutions are subjected to galvanism, appropriate treatment being instituted for the symptom.

Headache and *insomnia*, when due to *cerebral anæmia*, are relieved by mild, unipolar galvanization, the electrode (anode or kathode, according to individual susceptibility), being slowly passed over all parts of the head; also by general faradization. The same affections, when a symptom of *cerebral hyperæmia*, are to be treated by longitudinal galvanization, kathode on occiput, anode on forehead; and by general cutaneous faradization.

In the *impaired memory*, *confusion of mind*, *vertigo*, *hypochondriasis*, etc., the result of *imperfect nutrition* from *atheroma of the cerebral vessels*, Bartholow has

obtained excellent results from a transverse transmission of the current through the brain.

In *bulbar paralysis*, besides central treatment, applications should be made to lips, palate and tongue, and to the side of the neck, in order to stimulate movements of deglutition.

In the treatment of the various *psychoses* some good results have been obtained, especially in the incipient stages, and in cases not due to organic change. In these mild cases longitudinal conduction through the brain is employed, together with general faradization if anæmia and impaired nutrition be coexistent. In cases with *torpor* and *apathy*, cutaneous faradization is useful. General hyperæsthesia, and especially psychical hyperæsthesia, is a contraindication to the use of electricity in these disorders.

(*f*) **Diseases of the Spinal Cord.**—Improvement is to be looked for in the same class of cases as in diseases of the brain; we have here, however, no physiological data upon which to base our treatment; this may be: 1st, direct, if the disease be localized, one electrode over the seat of lesion, the other at an opposite point; if it involves the whole length of the cord, one electrode stationary over

either end, the other slowly moved up and down over the spine.

2d. Indirect. General faradization, and cutaneous faradization over the cord or over distant parts. Anodal galvanization of pressure points. Very large electrodes; sittings, three to five minutes, weak currents (8–10 cells) gradually increased to 40–50 cells in some cases.

Excellent results have been obtained in *chronic myelitis* and in *acute myelitis* after the subsidence of the active symptoms. The "direct treatment" described above is to be used, and the paralyses treated on general principles. If there be *paralysis of the bladder* or *rectum*, faradization is to be employed,—one pole over the sacrum, the other in the shape of a special electrode introduced into the affected organ.

In *multiple sclerosis*, *lateral sclerosis* and *posterior spinal sclerosis* (*locomotor ataxia*), galvanization of the cord, and in the case of the first-named affection galvanization of the brain, is to be employed. The treatment must be long continued. Excellent results in locomotor ataxia have recently been claimed for cutaneous faradization over spine and limbs for several minutes daily.

In *acute anterior poliomyelitis* electrical treatment is to be instituted as soon as the fever subsides, galvanization stabile with anode over seat of lesion, and labile to the affected muscles.

This method of treatment proves still more efficient in *subacute and chronic anterior poliomyelitis*. In *pseudo-hypertrophic paralysis* and in *progressive muscular atrophy* the same methods are to be employed, though in these instances with very little hopes of improvement.

Electricity exerts a very favorable influence in *acute ascending paralysis* during the stage of convalescence.

Hemorrhage into the spinal cord and meningeal apoplexy, after the symptoms have become chronic, are to be treated in the same manner as the corresponding affections of the brain.

Chronic meningitis is benefited by stabile galvanization of the entire length of the cord.

(*g*) **Functional Cerebro-spinal Diseases.**—These affections are not so amenable to treatment as at first sight they would seem to be; being of a general character, the more general methods of treatment are specially indicated. In *neurasthenia*, *spinal irritation* and *railway spine*, very mild ascending

galvanic currents are to be applied to the cord, together with galvanization of the brain in cases with cerebral symptoms. Cutaneous faradization over spine, and general faradization are also very useful. Tender points are to be treated in the usual manner.

Hypochondriasis is often improved by general faradization combined with galvano-faradization of the abdomen.

The cures in *hysteria* are not so large as might à priori have been expected. Begin with weak currents very cautiously applied; central and peripheral applications.

In *essential epilepsy*, *chorea minor*, and *chorea major*, good results have been obtained from galvanization of the brain, in conjunction with subaural galvanization and general faradization.

Writers' cramp, and a similar affection in pianists, telegraphists, etc., may in its earlier stages be relieved by electrical treatment, aided by rest and massage. In the spastic cases stabile or labile galvanic applications to the affected parts, anode being over brachial plexus; in the paretic form faradization proves more useful. Cases of *tetanus* have been reported as cured by electrization. Mild stabile galvanic currents with polar

applications of anode over spine, and over sensory nerves and skin of extremities; stabile descending currents to cord.

Tetany is treated in the same manner with favorable results; faradization of the spine and peripheral motor nerves may also be employed in this affection. The faradic brush is used in *catalepsy* to arouse the patient from his trance.

Not much good is accomplished by the electrical treatment of *tremor*, per se; the stimulant and invigorating applications of the current are those indicated.

The electric bath is sometimes useful in *mercurial and lead tremors*. *Paralysis agitans* is not benefited by electricity.

Marked improvement and even cures have been reported from the use of galvanism in *Basedow's disease;* galvanization of the pneumogastric and brain, and subaural galvanization are the methods employed.

In cases of *migraine* the galvanic current should be passed daily during the interval from nape of neck to epigastrium, and through the head; during the attack applications to the head of the "faradic hand" are extremely useful.

Diabetes, insipidus and *mellitus* are treated by cen-

tral galvanization; in the first, cures have been reported, but in the last the results have been chiefly negative.

(*h*) **Diseases of the Peripheral Nerves.**—The results of treatment will necessarily depend upon the form of disease—traumatism, neuritis, degenerative changes, etc. The catalytic, modifying and stimulating effects of the current are those desired, and to obtain them galvanism is chiefly employed; applications above, below and at the site of lesion.

In paralyses of the *oculomotor*, *trochlear* and *abducens*, the affected muscles are to be galvanized, anode being over nape of neck, and kathode gently stroked over closed eyelid; 6–12 cells. Also stabile galvanization of seat of lesion.

The presence of De R in affections of the *facial nerve* indicates a severe lesion, and recovery, if it occurs at all, will be only after several months. The mild cases usually get well in a few weeks. Labile kathodic galvanization of the affected nerve, and muscles supplied by it, anode being over auriculo-maxillary fossa. Faradization in the same manner is also useful.

Paralyses of *laryngeal nerves* are treated by percu-

taneous galvanization, anode over nape of neck, kathode stroked over sides of larynx and trachea; also by direct applications to laryngeal muscles.

Phrenic nerves—Artificial respiration.—To induce artificial respiration a strong faradic current is made for one or two seconds, and broken for same length of time. A bifurcated rheophore is employed; the kathode being placed just behind the edge of the sterno-mastoid muscle on both sides, a large anode over lower end of sternum. During passage of the current the arms and trunk are fixed, and during the interval expiration is assisted by pressure on the chest.

Nerves of the upper extremity.—In many cases applications may be made above the seat of lesion by placing one electrode in the supra-clavicular fossa, over the lower cervical vertebræ, or in the axilla. The treatment of the muscular paralysis presents no unusual features. Currents of 15–25 cells should be employed.

Nerves of lower extremity.—Here proximal excitation is not so readily attained; current must be strong and electrodes large; one placed over lumbar region or introduced into rectum; in other respects treatment is the same as for the upper extremity.

(*i*) **Toxic Paralyses.**—In *drop wrist* the most frequent form of *lead paralysis*, labile kathodic galvanization of the affected muscles is employed, anode being over lower cervical vertebræ. The various forms of *diphtheritic paralysis* are treated on general principles.

(*j*) **Diseases of the Organs of Special Sense.**—*Eye.*—In applications to the eye a small concave electrode should be employed; weak currents, 4–8 cells, for five to ten minutes daily. Stabile galvanization with anode, or, in more chronic cases, kathode over the closed eyelid, the indifferent electrode being over cervical vertebræ. Subaural galvanization is also useful. Some good results from these methods have been obtained in *retinitis pigmentosa*, and to a still more marked degree in *inflammatory atrophy of the optic nerve*, but in the primary form of optic atrophy improvement is exceptional. Faradization of the affected part, with or without the brush, is sometimes useful in *chronic conjunctivitis and keratitis.*

It is chiefly nervous affections of the *ear* that are benefited by electricity. In cases of *tinnitus*, that electrode (usually the anode) under whose influence

the noises diminish, is placed in front of the tragus, the other being at an indifferent point; the strength of the current should be great enough to check the tinnitus without producing too much dizziness; should last about ten minutes, and should be very gradually diminished to zero, this gradual diminution being very important.

In cases of *deafness*, the electrodes are employed in the same way, but interruptions and voltaic alternatives are made.

(*k*) **Diseases of Muscles and Joints.**—*Simple muscular atrophy* from disuse, joint diseases, etc., is relieved by daily galvanic and faradic stimulation; care being taken not to induce exhaustion. *Weakness and stiffness of joints and muscles from injury* may be removed by the same treatment.

Sprains in the acute stage are much benefited by weak currents through the affected joint; when more chronic, by stronger galvanic and faradic currents, as well to the surrounding muscles as to the joint.

Excellent results are attained in the treatment of *muscular rheumatism*, especially in that form known as *lumbago*. The methods of treatment are the faradic brush, faradization of the muscles with strong

currents, and stabile galvanization, with a few voltaic alternatives toward the close of the sitting.

Acute inflammations of the joints are benefited by passing a stabile galvanic current through the affected part, together with labile galvanization of the neighboring muscles. Faradization may be used in the same manner. Authorities are not agreed as to the utility of electricity in the rheumatic form of acute inflammation.

Chronic articular rheumatism is treated in the same manner as muscular rheumatism, with the addition of the use of the galvanic brush, so as to produce small eschars over the affected joint. Arthritis deformans is treated in the same manner, but the results are at best only palliative. Subaural galvanization should also be tried in this affection.

In *chronic gout* temporary relief of the pain may be obtained from local galvanization or faradization.

(*l*) **Diseases of the Heart and Lungs.**—Various methods of electrical treatment are employed with benefit in *nervous asthma.* De Watteville uses galvano-faradization, one electrode over occiput, the other moved on each side from the subaural position to the sternum; sittings, five to ten minutes.

Good results have been attained in *Angina pectoris* during the attack by strong cutaneous faradization of the præcordial region; also by galvanization, anode over præcordia, kathode moved from subaural position over cervical and upper dorsal region. This latter method, the position of the electrodes being reversed, is also useful in *nervous palpitation.* Weak currents and short sittings.

(*m*) **Diseases of the Abdominal Organs.**— Here, in accordance with physical principles, we must employ very large electrodes and strong currents. To reach the stomach a wire may be introduced through the stomach-tube, but usually the percutaneous application will suffice.

In *nervous vomiting* benefit is obtained from galvanization of the pneumogastrics and stomach; a large electrode being over epigastrium and the other applied successively to occiput and sides of neck, two to three minutes in each position.

Dyspepsia is treated by faradization of the stomach from before backward, and from side to side, and by galvanization, from before backward.

Gastralgia, enteralgia, hepatalgia, etc., are bene-

fited by the stabile galvanic current passed from before backward.

In *gastrectasia* the anode is held over dorsal vertebræ, while the kathode is moved over epigastrium; frequent interruptions and voltaic alteratives.

Flatulence is treated on the same principle.

Chronic constipation may often be cured by galvanization or galvano-faradization of the abdomen; one pole over lumbar region, the other moved over course of colon and in a circle around umbilicus; strong currents, frequent interruptions, daily sittings. Faradization may be employed alone, but if so, one electrode should be introduced into rectum. The same plan of treatment is sometimes successful in *intestinal obstruction;* in this case applications may be made several times daily.

In *congestion of the portal circulation* galvano-faradization of the abdomen is useful; it also promotes the absorption of fluid in cases of *ascites;* rapid diminution and even disappearance of the effusion sometimes occurs under its use.

(*n*) **Diseases of the Genito-urinary Organs.**—In affections of the bladder applications may be external, one electrode pressed down over symphysis,

the other over sacrum for the detrusor muscle, over perineum for sphincter; or they may be internal, one electrode above symphysis, the other, a urethral electrode, introduced into the bladder, previously partially filled with water.

External stabile applications suffice in *spasm of the bladder;* anode over seat of spasm. *Paralysis of the bladder* should be treated by both internal and external applications; faradization and interrupted galvanization, the latter current being weak, and of short duration. This plan of treatment is also very efficient in *enuresis nocturna.*

In *functional spermatorrhœa and impotence* a large plate electrode is fixed over lumbar region, while the kathode is stroked over perineum, groins and genitals. Galvanization or galvano-faradization with strong currents and voltaic alternatives; if the symptoms be irritative, weaker stabile currents should be used. The vesiculæ seminales may be reached through the rectum, and the orifices of their ducts by a urethral electrode.

Electrization often proves very useful in *amenorrhœa;* a large electrode being fixed over the lumbar region, the kathode is introduced into uterus or

pressed down above pubis; weak galvanic currents. The same method is useful in *dysmenorrhœa*, the anode being near the intra-uterine electrode.

In *menorrhagia and metrorrhagia*, in *chronic metritis* and in *displacements*, faradism so employed as to act on the uterine muscular tissue has been claimed to be advantageous.

Inertia uteri during labor and *hemorrhage* occurring at this time may be overcome by the same method; kathode being against cervix, anode over lumbar region.

Recently several cases of *tubal pregnancy* have been reported, in which a transference to the uterus was secured by the action of a galvanic or a faradic current.

The various *pelvic neuralgiæ* are benefited by galvanism, kathode over hypogastrium, anode labile over lumbar region; weak currents gradually increased; a few voltaic alternatives.

The secretion of milk may be much stimulated by faradization of the breasts with strong currents; sittings, ten to fifteen minutes, and frequently repeated.

(*o*) **Diseases of the Skin.**—As the neurotic origin of many skin diseases is being recognized,

their treatment by electricity is coming into vogue, and even many forms not neurotic are benefited. Labile galvanization of the affected part is usually employed, the poles being alternately active so as to secure to the greatest extent the catalytic effects of the current. Central treatment should not be neglected. In regard to *acne*, Bartholow says that "a cure can usually be effected by persevering treatment in the worst cases."

Chronic eczema, psoriasis and *prurigo* are other affections benefited by electricity. De Watteville has employed the same agent successfully in *local asphyxia, scleroderma* and *chilblains*.

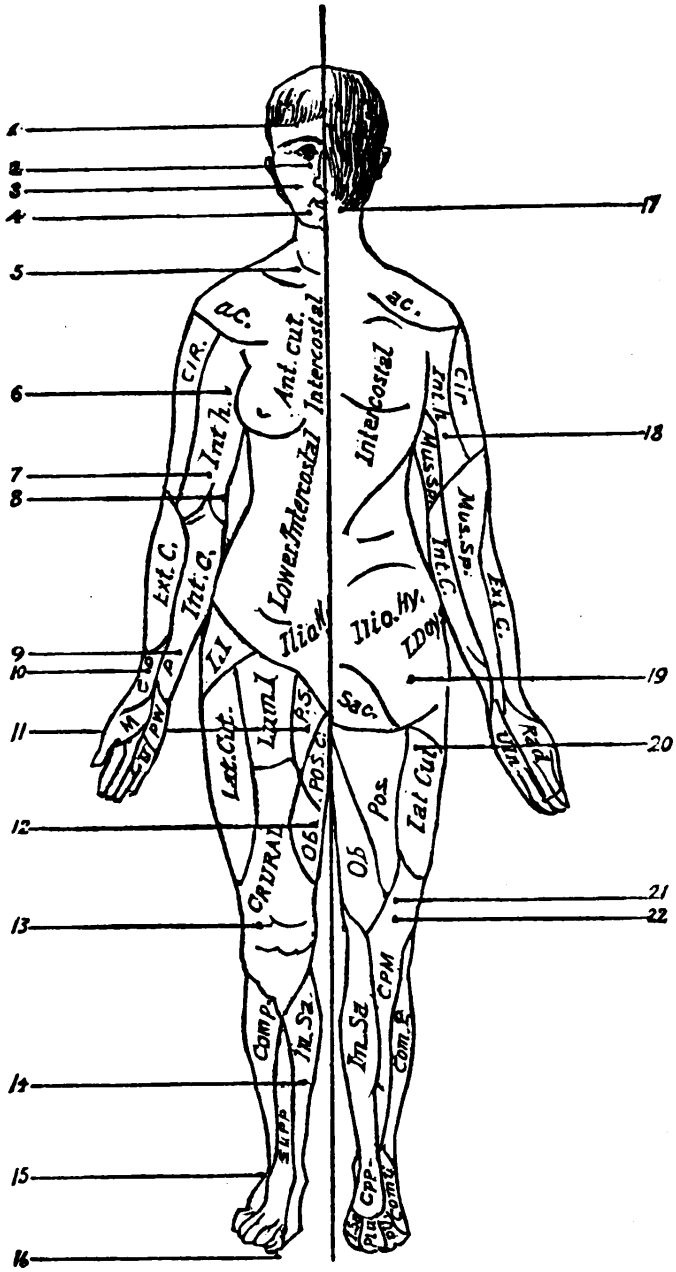
Alopecia is much benefited by galvanism, both poles being placed close together on the skin. The same treatment is useful in *bed-sores and ulcers*.

(*p*) **General Diseases.**—*Anæmia and chlorosis* are much benefited by the general methods of electrization, special attention being paid to subaural galvanization in chlorosis.

EXPLANATION OF FIG. 7.

1. Seventh or facial nerve supplying the frontal muscle.
2. " " " " levator labii superioris alæque nasi.
3. " " " " zygomaticus minor.
4. " " " " orbicularis oris and quadratur menti.
5. Phrenic nerve supplying the diaphragm.
6. Musculo-cutaneous nerve supplying biceps, brachialis, etc.
7. " " " " brachialis anticus.
8. Ulnar nerve supplying muscles of forearm and hand.
9. Radial " " flexors of thumb and fingers.
10. Ulnar " " palmaris brevis, abductor min. digit., opponens min. digit., etc.
11. Obturator nerve supplying sartorius, adductor longus, etc.
12. Crural " " adductor longus, vastus internus, etc.
13. " " " vastus externus.
14. Anterior tibial nerve supplying flexor com. digit.
15. Musculo-cutaneous nerve.
16. Internal saphenous nerve.
17. Occipital nerve supplying posterior neck muscles.
18. Musculo-spiral nerve supplying triceps, etc.
19. Intercostalis " " lumbar muscles.
20. Gluteus " " adductor magnus, etc.
21. Popliteal " " gastrocnemius externus.
22. " " " soleus.

FIG. 7.



MOTOR POINTS, AND DISTRIBUTION OF CUTANEOUS NERVES.

CHAPTER VI.

ELECTRICITY IN SURGERY.

For purposes of **electrolysis**, the external resistance being small, the internal resistance should not be great. Stöhrer's or Grenet's cells are employed, and the current should be accurately measured. The needles should be well insulated for two-thirds of their length, the remaining one-third being gilded to prevent its solution.

In the treatment of *aneurism*, our object is to secure, not decomposition, but coagulation of the blood. The clot formed about the anode being firmer, the needles are usually connected with this pole; their uninsulated portion is introduced completely into the sac in order to prevent diffusion of the current into the surrounding tissues, and the inflammation and sloughing which might result from such an accident. The kathode is placed at an indifferent point. The current strength should be sufficient to coagulate egg albumen in twenty to thirty minutes. Duration of sitting about thirty minutes, repeated according

to results obtained. Great caution must be used in withdrawing the needles.

In the treatment of *nævi*, our object is to induce coagulation to such an extent as will facilitate absorption without causing sloughing. Usually one needle (kathode) will suffice. Begin with a few cells and gradually increase, if necessary. In *port-wine stain* we destroy the skin by introducing a number of needles superficially; the new skin is pale, but the cicatrix from a galvanic eschar does not contract.

Warts, moles, and single hair follicles may readily be destroyed by the kathodic needle.

Malignant tumors are treated by introducing a number of needles through the base; sloughing occurs, and the resulting ulcer heals by granulation. *Enlarged glands* and *small superficial tumors* are often successfully destroyed by electrolysis. In *cystic tumors* both needles are introduced, with the object of acting on the lining membrane, so as to facilitate absorption. Successful results have been thus obtained in *ovarian cysts, hydrocele, cystic goitre, hydatids of the liver*, etc.

By electrolysis, at least the growth of *fibroids of the uterus* can be arrested. The same means is very suc-

cessful in causing the death of the fœtus and arrest of the growth of the cyst in *extra-uterine pregnancy*.

Excellent results have been obtained from electrolysis in the treatment of *stricture of the urethra*. A large bougie with a metallic point connected with the kathode is carried down to the stricture, while the other electrode is placed over the abdomen or perineum. Begin with 5–6 cells and gradually increase; repeat after a few days' interval, if necessary.

Galvano-causty.—For galvano-caustic purposes, a special electrode handle is employed, to which may be attached the loop, the cautery dome, or the knife. Its advantages are that it can be used in localities where other means would not be applicable; that it causes no hemorrhage, and that it is followed by less pain than cutting operations. The loop is of great service in the removal of *polypi of the larynx, nose, ear, uterus, and rectum*, also in removal of *hemorrhoids*, and in *amputation of tongue, penis, and cervix uteri*. It should be placed in position, then brought to a dull red heat, and gradually tightened as it cuts its way through.

The knife has been successfully employed for *tra-*

cheotomy, and for cutting through the vaginal wall into the cyst of a *tubal pregnancy*.

The cautery dome is applicable for all the purposes of an ordinary cautery, *to control hemorrhage*, *destroy hypertrophies*, *stimulate ulcers*, etc.

The Electric Light.—The incandescent wire is now being used in a variety of forms for the illumination of the various cavities of the body, for the purpose of examination as well as operation.

AUTHORITIES CONSULTED.

(A) BOOKS.

La Pile Electrique (M. Alfred Niandet).

Medical Electricity (G. D. Powell).

Lectures on Electricity (Rockwell).

Lectures on Electricity in Medicine (Ranney).

Handbook of Electro-therapeutics (Erb).

Medical Electricity (Bartholow).

Medical Electricity (De Watteville).

Elementary Principles of Electro-therapeutics (Haynes).

Medical and Surgical Electricity (Beard and Rockwell).

Text Book of Physics (Kiddle).

Medical Physics (Draper).

Therapeutics, Materia Medica and Toxicology (Wood).

Manual of Electro-therapeutics (Amidon).

Text Book of Electricity in Medicine and Surgery (Poon).

Medical Electricity (Althaus).

Clinical Electro-therapeutics (Hamilton).
Clinical Uses of Electricity (Reynolds).
Galvano-therapeutics (Nigtel).
Handbook of Medical Electricity (Tibbits).
A Treatise on Electricity (De la Rive).
Electro-physiology and Therapeutics (Morgan).
A Treatise on Localized Electrization (Duchenne).
Electricity and Magnetism (Gordon).

(B) JOURNAL ARTICLES, MONOGRAPHS, ETC.

Onimus.	Noyer.
Seiler.	Apostoli.
Blackwood.	Morton.
Hutchinson.	Bland.
Schweig.	McKendrick.
Garrigues.	Bennet.
Night.	Stevenson.
Newman.	Fox, and others.

INDEX.

	PAGE
ALOPECIA	91
Alternatives, voltaic	51
Amenorrhœa	89
Ampere	33
Anæmia	76
Anæsthesia	72
Anelectrotonos	51
Aneurism	95
Angina pectoris	87
Aphasia	76
Apoplexy, meningeal	79
Apparatus, accessory	43
electro-magnetic	37
magneto-electric	37
Armature	24
Asthma	86
BATH, electric	69
Battery, Faradic	37
Leyden jars	31
magnetic	24
Bladder, paralysis of	78
spasm of	89
Blepharospasm	71

PAGE

CATALEPSY 81
Catalysis 64
Cataphoric action 36
Cell, constant 41
Daniell 42
enumerator 43
galvanic 32
Grenet 41
single fluid 41
storage 42
two-fluid 41
Cells, arrangement of 32
Cerebrum, softening of 75
Chlorosis 91
Chorea 63
Circuit, compound 36
simple 35
Commutator 43
Conduction 26
Conjunctivitis 84
Constipation 63
Contraction, induced 52
Cord, spinal, action of current on 53
Cramp, writers' 80
Current, primary 39
secondary 39
static 50
Curves, magnetic 24

DEAFNESS 85
Degeneration, partial 59
reaction 56

PAGE

Diabetes, insipidus 81
mellitus 81
Dielectrics 27
Dysmenorrhœa 90
Dyspepsia 63

EAR, diagnosis of 61
tinnitus 84
Eczema 91
Effects, cataphoric 36
chemical 36
luminous and heating 36
Electric light 98
Electricity, dynamic 31
static 25
Electrization by shock 50
sparks 49
Electrodes, virtual 51
Electro-diagnosis 55
Electrolysis 36
in aneurism 95
cystic tumors 96
extra-uterine pregnancy 97
fibroids 96
malignant tumors 96
nævi 96
removal of superfluous hair 96
stricture 96
warts 96
Embolism 75
Enteralgia 87
Enuresis nocturna 89

PAGE
Epilepsy 80
Exophthalmic goitre 96
Eye, diagnosis of 61
action of electricity on 84

FARADISM 37
Faradization, general 68
local 67
Field, magnetic 24
Flatulence 88
Force, electric 33
electro-motive 33
Foreign bodies, removal from eye 62
search for 61
Formula, normal polar 51

GALVANISM 31
Galvanization 89
central 68
general 68
local 67
sustained by 91
Galvano-causty 97
for amputations 97
hemorrhage 98
hemorrhoids 97
polypi 97
Galvano-faradization 70
Galvanometer 43
Gastralgia 63
Gout 63

PAGE

HEADACHE 76
Heart, palpitation of 87
Hemiplegia 75
Hemorrhage 75
cerebral 75
of uterus 90
Hemorrhoids 96
Hyperæmia, cerebral 76
Hypochondriasis 76
Hysteria 63
Hystero-epilepsy 63

IMPOTENCE 89
Induction 26
Insomnia 76
Interrupter 44

JAR, Leyden 30

KATELECTROTONOS 51
Keratitis 84

LAW, Ohm's 34
Locomotor ataxia 78
Lumbago 85

MACHINE, Holtz 29
Magnet, artificial 23
natural 23
permanent 23
temporary 23
Magnetism 23

PAGE

Meningitis 79
Menorrhagia 90
Method, directional 64
polar 64
Metritis 90
Metrorrhagia 90
Migraine 81
Muscle, atrophy of 79
non-striated, action of current on 53
of heart, action of current on 53
striated, action of current on 53
rheumatism of 63
Myelitis 78

NÆVI 96
Nerve, motor, action of current on 52
optic, atrophy of 84
pneumogastric, action of current on 54
sensitive, action of current on 52
sympathetic, action of current on 53
Neuralgia 63
cervico-brachial 74
occipital 74
of heart 87
of lumbar plexus 74
intercostal 74
pelvic 90
trigeminal 73
Neurasthenia 63
Nystagmus 71

OHM 33

PAGE

PARALYSIS 70
agitans 81
of bladder 78
diphtheritic 84
facial 82
infantile 82
laryngeal 82
pseudo-hypertrophic 79
of rectum 78
toxic 84
Points, motor 93
Poliomyelitis, anterior 79
Polypi 97
Potential 27
negative 27
positive 27
relative 28
Progressive muscular atrophy 79
Prurigo 91
Psoriasis 91
Psychoses 77

RECTUM, paralysis of 78
Respiration, artificial 83
Retinitis pigmentosa 84
Rheophore 44
Rheostat 43
Rheumatism, articular 86
muscular 63
Rheumatoid arthritis 86

SCLERODERMA 91
Selector 43

PAGE

Sensation, diagnosis of..... 59
Spasm, facial..... 71
Spermatorrhœa..... 89
Spinal cord..... 53
inflammation of..... 79
irritation of..... 79
lateral sclerosis of..... 78
multiple sclerosis of..... 78
posterior sclerosis of..... 78
Stimulation, direct..... 52
indirect..... 53
Stricture..... 97
Substances, diamagnetic..... 23
magnetic..... 23
Sympathetic nerve, action of current on..... 53

TETANUS..... 80
Tetany..... 81
Thrombosis..... 75
Torticollis..... 63
Tremor..... 81
lead..... 81
mercurial..... 81
Trismus..... 72
Tumors, cystic..... 96
fibroid..... 96
malignant..... 96
ovarian..... 96

VOLT..... 33
Vomiting..... 87

WEBER..... 33

HOLDEN'S ANATOMY.

Octavo. 208 Illustrations. Cloth, $5.00; Leather, $6.00.

IN OIL-CLOTH BINDING, $4.50.

A Manual of Dissection of the Human Body. By LUTHER HOLDEN, M.D., F.R.C.S., Eng. Fifth Edition, revised and enlarged, and with new illustrations. Edited by JOHN LANGTON, M.D., Surgeon to, and Lecturer on Anatomy at, St. Bartholomew's Hospital, London, etc.; with 208 Illustrations. 8vo. Oil-cloth binding, $4.50; Cloth, $5.00; Leather, $6.00.

***This edition of Holden's Anatomy is *eminently a Student's book,* without as well as within. As a text-book it has become so well known that it is unnecessary to speak of its contents. The printing and binding of this new edition, however, should be explained. It has been printed on very handsome paper, so that the minutiæ of each wood-cut is clearly brought out; and the student will meet with no difficulty in tracing each muscle, nerve, artery, vein or organ in the illustrations. Many of the cuts have the explanations printed on them; a very great advantage, enabling the reference to be made quickly, and fixing the fact more surely. Marginal references have been inserted throughout the text, to catch the eye, at each important paragraph. The binding has been put on so that the book will LAY OPEN AT ANY PAGE. It being used so largely in the dissection room suggested to the publishers the binding of it in OIL-CLOTH. The advantages of this binding are, that it will not retain the odors of the dissecting table, does not soil easily, it may be washed without damage, and while quite as durable, allows of our making a LOWER PRICE for the book than in either cloth or leather binding. It is, therefore, particularly well suited for the dissecting room, operating table or students' use generally.

SUPPLIED BY ALL BOOKSELLERS.

Potter's Materia Medica, Pharmacy and Therapeutics.

A Handbook of Materia Medica, Pharmacy and Therapeutics,—including the Physiological Action of Drugs, Special Therapeutics of Diseases, Official and Extemporaneous Pharmacy, etc., etc. By SAM'L O. L. POTTER, M.A., M.D., late A. A. Surgeon U. S. Army, Author of "An Index of Comparative Therapeutics," "Quiz-Compends" of Anatomy, Visceral Anatomy and Materia Medica, "Speech and its Defects," etc.

About 700 Pages. Cloth, $3.00; Leather, $3.50.

This book contains many unique features of style and arrangement; no time or trouble has been spared to make it most complete and yet concise in all its parts. It contains many prescriptions of practical worth, a great mass of facts conveniently and concisely put together, also many tables, dose lists, diagnostic hints, etc., all rendering it the most complete physician's companion ever published. **As a practical working book for every-day use** it is unsurpassed, as the author has had unusual experience and advantages in preparing concise, comprehensive handbooks.

The favor with which Dr. Potter's Compends have been received by students and practitioners in America and England, has stimulated him to produce a treatise which he aims at making **the most useful for the practical worker to be obtained.** This book, like few extant, treats of established facts, discards arguments, and entirely ignores obsolete experiments; giving marked prominence to all practical points, and leaving mere theories in the comparative obscurity where they belong.

The Appendix contains numerous *Tables* comprising doses, diagnostics, Latin terms, formulæ for hypodermics, metric equivalents, specific gravities and volumes, and obstetric memoranda—together with *Notes* on temperature and the clinical thermometer, poisons, urinary examinations and patent medicines.

The Index will be a special feature. Extreme care will be taken to include in it every title, synonym and reference of importance; while each article of the materia medica will be indexed with at least two entries.

SUPPLIED BY ALL BOOKSELLERS.

Waring's Practical Therapeutics.

Fourth Edition. Rewritten and Revised.

WITH AN INDEX OF DISEASES.

A Manual of Practical Therapeutics, considered with reference to Articles of the Materia Medica. Containing, also, an Index of Diseases, with a list of the Medicines applicable as Remedies, and a full Index of Medicines and Preparations noticed in the work. By EDWARD JOHN WARING, M.D., F.R.C.P., F.L.S., etc., etc. Fourth Edition. Rewritten and Revised. Edited by DUDLEY W. BUXTON, M.D., Assistant to the Professor of Medicine at University College Hospital; Member of the Royal College of Physicians of London.

744 Pages. Cloth, $3.00; Leather, $3.50.

This edition has been thoroughly revised and, in a great part, rewritten; much care has been exercised to include all the vast array of new remedies, and to retain, in every respect, the eminently practical character of the manual. There are many features of arrangement and contents not found in similar books, that have made the former editions successful and render it especially valuable.

"Mr. Waring has produced a volume which entitles him to the thanks of Students as well as of all who need a work on Therapeutics. We commend it to the attention of the Profession."—*American Medical Journal.*

"Dr. Waring's Therapeutics has long been known as one of the most thorough and valuable of medical works. The amount of actual intellectual labor it represents is immense. . . . An Index of Diseases, with the remedies appropriate for their treatment, closes the volume."—*Boston Medical and Surgical Journal.*

"The plan of this work is an admirable one, and one well calculated to meet the wants of busy practitioners. There is a remarkable amount of information, accompanied with judicious comments, imparted in a concise yet agreeable style."—*Medical Record.*

SUPPLIED BY ALL BOOKSELLERS.

CATALOGUE No. 7. MARCH, 1892.

A CATALOGUE

OF

BOOKS FOR STUDENTS.

INCLUDING THE

? QUIZ-COMPENDS ?

CONTENTS.

	PAGE		PAGE
New Series of Manuals,	2,3,4,5	Obstetrics.	10
Anatomy,	6	Pathology, Histology,	11
Biology,	11	Pharmacy,	12
Chemistry,	6	Physical Diagnosis,	11
Children's Diseases,	7	Physiology,	11
Dentistry,	8	Practice of Medicine,	11, 12
Dictionaries,	8, 16	Prescription Books,	12
Eye Diseases,	9	? Quiz-Compends ?	14, 15
Electricity,	9	Skin Diseases,	12
Gynæcology,	10	Surgery and Bandaging,	13
Hygiene,	9	Therapeutics,	9
Materia Medica,	9	Urine and Urinary Organs,	13
Medical Jurisprudence,	10	Venereal Diseases,	13

PUBLISHED BY

P. BLAKISTON, SON & CO.,

Medical Booksellers, Importers and Publishers.

LARGE STOCK OF ALL STUDENTS' BOOKS, AT

THE LOWEST PRICES.

1012 Walnut Street, Philadelphia.

*** For sale by all Booksellers, or any book will be sent by mail, postpaid, upon receipt of price. Catalogues of books on all branches of Medicine, Dentistry, Pharmacy, etc., supplied upon application.

Just Ready
Price 10 cents } 3000 Questions on Medical Subjects.

"An excellent Series of Manuals."—*Archives of Gynæcology.*

A NEW SERIES OF
STUDENTS' MANUALS

On the various Branches of Medicine and Surgery.

Can be used by Students of any College.

Price of each, Handsome Cloth, $3.00. Full Leather, $3.50.

The object of this series is to furnish good manuals for the medical student, that will strike the medium between the compend on one hand and the prolix text-book on the other—to contain all that is necessary for the student, without embarrassing him with a flood of theory and involved statements. They have been prepared by well-known men, who have had large experience as teachers and writers, and who are, therefore, well informed as to the needs of the student.

Their mechanical execution is of the best—good type and paper, handsomely illustrated whenever illustrations are of use, and strongly bound in uniform style.

Each book is sold separately at a remarkably low price, and the immediate success of several of the volumes shows that the series has met with popular favor.

No. 1. SURGERY. 318 Illustrations.
Third Edition.

A Manual of the Practice of Surgery. By WM. J. WALSHAM, M.D., Asst. Surg. to, and Demonstrator of Surg. in, St. Bartholomew's Hospital, London, etc. 318 Illustrations.

Presents the introductory facts in Surgery in clear, precise language, and contains all the latest advances in Pathology, Antiseptics, etc.

"It aims to occupy a position midway between the pretentious manual and the cumbersome System of Surgery, and its general character may be summed up in one word—practical."—*The Medical Bulletin.*

"Walsham, besides being an excellent surgeon, is a teacher in its best sense, and having had very great experience in the preparation of candidates for examination, and their subsequent professional career, may be relied upon to have carried out his work successfully. Without following out in detail his arrangement, which is excellent, we can at once say that his book is an embodiment of modern ideas neatly strung together, with an amount of careful organization well suited to the candidate, and, indeed, to the practitioner."—*British Medical Journal.*

Price of each Book, Cloth, $3.00; Leather, $3.50.

No. 2. DISEASES OF WOMEN. 150 Illus.

NEW EDITION.

The Diseases of Women. Including Diseases of the Bladder and Urethra. By DR. F. WINCKEL, Professor of Gynæcology and Director of the Royal University Clinic for Women, in Munich. Second Edition. Revised and Edited by **Theophilus Parvin**, M.D., Professor of Obstetrics and Diseases of Women and Children in Jefferson Medical College. 150 Engravings, most of which are original.

"The book will be a valuable one to physicians, and a safe and satisfactory one to put into the hands of students. It is issued in a neat and attractive form, and at a very reasonable price."—*Boston Medical and Surgical Journal.*

No. 3. OBSTETRICS. 227 Illustrations.

A Manual of Midwifery. By ALFRED LEWIS GALABIN, M.A., M.D., Obstetric Physician and Lecturer on Midwifery and the Diseases of Women at Guy's Hospital, London; Examiner in Midwifery to the Conjoint Examining Board of England, etc. With 227 Illus.

"This manual is one we can strongly recommend to all who desire to study the science as well as the practice of midwifery. Students at the present time not only are expected to know the principles of diagnosis, and the treatment of the various emergencies and complications that occur in the practice of midwifery, but find that the tendency is for examiners to ask more questions relating to the science of the subject than was the custom a few years ago. * * * The general standard of the manual is high; and wherever the science and practice of midwifery are well taught it will be regarded as one of the most important text-books on the subject."—*London Practitioner.*

No. 4. PHYSIOLOGY. Fifth Edition.

321 ILLUSTRATIONS AND A GLOSSARY.

A Manual of Physiology. By GERALD F. YEO, M.D., F.R.C.S., Professor of Physiology in King's College, London. 321 Illustrations and a Glossary of Terms. Fifth American from last English Edition, revised and improved. 758 pages.

This volume was specially prepared to furnish students with a new text-book of Physiology, elementary so far as to avoid theories which have not borne the test of time and such details of methods as are unnecessary for students in our medical colleges.

"The brief examination I have given it was so favorable that I placed it in the list of text-books recommended in the circular of the University Medical College."—*Prof. Lewis A. Stimson*, M.D., *37 East 33d Street, New York.*

Price of each Book, Cloth, $3.00; Leather, $3.50.

No. 5. DISEASES OF CHILDREN.

SECOND EDITION.

A Manual. By J. F. GOODHART, M.D., Phys. to the Evelina Hospital for Children; Asst. Phys. to Guy's Hospital, London. Second American Edition. Edited and Rearranged by LOUIS STARR, M.D., Clinical Prof. of Dis. of Children in the Hospital of the Univ. of Pennsylvania, and Physician to the Children's Hospital, Phila. Containing many new Prescriptions, a list of over 50 Formulæ, conforming to the U. S. Pharmacopœia, and Directions for making Artificial Human Milk, for the Artificial Digestion of Milk, etc. Illus.

"The merits of the book are many. Aside from the praiseworthy work of the printer and binder, which gives us a print and page that delights the eye, there is the added charm of a style of writing that is not wearisome, that makes its statements clearly and forcibly, and that knows when to stop when it has said enough. The insertion of typical temperature charts certainly enhances the value of the book. It is rare, too, to find in any text-book so many topics treated of. All the rarer and out-of-the-way diseases are given consideration. This we commend. It makes the work valuable."—*Archives of Pedriatics, July, 1890.*

"The author has avoided the not uncommon error of writing a book on general medicine and labeling it 'Diseases of Children,' but has steadily kept in view the diseases which seemed to be incidental to childhood, or such points in disease as appear to be so peculiar to or pronounced in children as to justify insistence upon them. * * * A safe and reliable guide, and in many ways admirably adapted to the wants of the student and practitioner."—*American Journal of Meaical Science.*

"Thoroughly individual, original and earnest, the work evidently of a close observer and an independent thinker, this book, though small, as a handbook or compendium is by no means made up of bare outlines or standard facts."—*The Therapeutic Gazette.*

"As it is said of some men, so it might be said of some books, that they are 'born to greatness.' This new volume has, we believe, a mission, particularly in the hands of the younger members of the profession. In these days of prolixity in medical literature, it is refreshing to meet with an author who knows both what to say and when he has said it. The work of Dr. Goodhart (admirably conformed, by Dr. Starr, to meet American requirements) is the nearest approach to clinical teaching without the actual presence of clinical material that we have yet seen."—*New York Medical Record.*

Price of each Book, Cloth, $3.00; Leather, $3.50.

No. 6. PRACTICAL THERAPEUTICS.

FOURTH EDITION, WITH AN INDEX OF DISEASES.

Practical Therapeutics, considered with reference to Articles of the Materia Medica. Containing, also, an Index of Diseases, with a list of the Medicines applicable as Remedies. By EDWARD JOHN WARING, M.D., F.R.C.P. Fourth Edition. Rewritten and Revised by DUDLEY W. BUXTON, M.D., Asst. to the Prof. of Medicine at University College Hospital.

"We wish a copy could be put in the hands of every Student or Practitioner in the country. In our estimation, it is the best book of the kind ever written."—*N. Y. Medical Journal.*

"Dr. Waring's Therapeutics has long been known as one of the most thorough and valuable of medical works. The amount of actual intellectual labor it represents is immense. . . . An index of diseases, with the remedies appropriate for their treatment, closes the volume."—*Boston Medical and Surgical Reporter.*

"The plan of this work is an admirable one, and one well calculated to meet the wants of busy practitioners. There is a remarkable amount of information, accompanied with judicious comments, imparted in a concise yet agreeable style."—*Medical Record.*

No. 7. MEDICAL JURISPRUDENCE AND TOXICOLOGY.

THIRD REVISED EDITION.

By JOHN J. REESE, M.D., Professor of Medical Jurisprudence and Toxicology in the University of Pennsylvania; President of the Medical Jurisprudence Society of Phila.; Third Edition, Revised and Enlarged.

"This admirable text-book."—*Amer. Jour. of Med. Sciences.*

"We lay this volume aside, after a careful perusal of its pages, with the profound impression that it should be in the hands of every doctor and lawyer. It fully meets the wants of all students. . . . . He has succeeded in admirably condensing into a handy volume all the essential points."—*Cincinnati Lancet and Clinic.*

"The book before us will, we think, be found to answer the expectations of the student or practitioner seeking a manual of jurisprudence, and the call for a second edition is a flattering testimony to the value of the author's present effort. The medical portion of this volume seems to be uniformly excellent, leaving little for adverse criticism. The information on the subject matter treated has been carefully compiled, in accordance with recent knowledge. The toxicological portion appears specially excellent. Of that portion of the work treating of the legal relations of the practitioner and medical witness, we can express a generally favorable verdict."—*Physician and Surgeon, Ann Arbor, Mich.*

Price of each Book, Cloth, $3,00; Leather, $3.50.

ANATOMY.

Macalister's Human Anatomy. 816 Illustrations. A new Text-book for Students and Practitioners, Systematic and Topographical, including the Embryology, Histology and Morphology of Man. With special reference to **the requirements of Practical Surgery and Medicine.** With 816 Illustrations, 400 of which are original. Octavo. Cloth, 7.50; Leather, 8.50

Ballou's Veterinary Anatomy and Physiology. Illustrated. By Wm. R. Ballou, M.D., Professor of Equine Anatomy at New York College of Veterinary Surgeons. 29 graphic Illustrations. 12mo. Cloth, 1.00; Interleaved for notes, 1.25

Holden's Anatomy. A manual of Dissection of the Human Body. Fifth Edition. Enlarged, with Marginal References and over 200 Illustrations. Octavo.

Bound in Oilcloth, for the Dissecting Room, $4.50.

"No student of Anatomy can take up this book without being pleased and instructed. Its Diagrams are original, striking and suggestive, giving more at a glance than pages of text description. * * * The text matches the illustrations in directness of practical application and clearness of detail."—*New York Medical Record.*

Holden's Human Osteology. Comprising a Description of the Bones, with Colored Delineations of the Attachments of the Muscles. The General and Microscopical Structure of Bone and its Development. With Lithographic Plates and Numerous Illustrations. Seventh Edition. 8vo. Cloth, 6.00

Holden's Landmarks, Medical and Surgical. 4th ed. Clo., 1.25

Heath's Practical Anatomy. Sixth London Edition. 24 Colored Plates, and nearly 300 other Illustrations. Cloth, 5.00

Potter's Compend of Anatomy. Fifth Edition. Enlarged. 16 Lithographic Plates. 117 Illustrations. *See Page 14.*
Cloth, 1.00; Interleaved for Notes, 1.25

CHEMISTRY.

Bartley's Medical Chemistry. Second Edition. A text-book prepared specially for Medical, Pharmaceutical and Dental Students. With 50 Illustrations, Plate of Absorption Spectra and Glossary of Chemical Terms. Revised and Enlarged. Cloth, 2.50

Trimble. Practical and Analytical Chemistry. A Course in Chemical Analysis, by Henry Trimble, Prof. of Analytical Chemistry in the Phila. College of Pharmacy. Illustrated. Fourth Edition, Enlarged. 8vo. Cloth, 1.50

☞ *See pages 2 to 5 for list of Students' Manuals.*

Chemistry:—Continued.

Bloxam's Chemistry, Inorganic and Organic, with Experiments. Seventh Edition. Enlarged and Rewritten. 281 Illustrations. Cloth, 4.50; Leather, 5.50

Richter's Inorganic Chemistry. A text-book for Students. Third American, from Fifth German Edition. Translated by Prof. Edgar F. Smith, PH.D. 89 Wood Engravings and Colored Plate of Spectra. Cloth, 2.00

Richter's Organic Chemistry, or Chemistry of the Carbon Compounds. Illustrated. Second Edition. Cloth, 4.50

Symonds. Manual of Chemistry, for the special use of Medical Students. By BRANDRETH SYMONDS, A.M., M.D., Asst. Physician Roosevelt Hospital, Out-Patient Department; Attending Physician Northwestern Dispensary, New York. 12mo. Cloth, 2.00

Leffmann's Compend of Chemistry. Inorganic and Organic. Including Urinary Analysis. Third Edition. Revised. Cloth, 1.00; Interleaved for Notes, 1.25

Leffmann and Beam. Progressive Exercises in Practical Chemistry. 12mo. Illustrated. Cloth, 1.00

Müter. Practical and Analytical Chemistry. Fourth Edition. Revised, to meet the requirements of American Medical Colleges, by Prof. C. C. Hamilton. Illustrated. Cloth, 2.00

Holland. The Urine, Common Poisons, and Milk Analysis, Chemical and Microscopical. For Laboratory Use. Fourth Edition, Enlarged. Illustrated. Cloth, 1.00

Van Nüys. Urine Analysis. Illus. Cloth, 2.00

Wolff's Applied Medical Chemistry. By Lawrence Wolff, M.D., Dem. of Chemistry in Jefferson Medical College. Clo., 1.00

CHILDREN.

Goodhart and Starr. The Diseases of Children. Second Edition. By J. F. Goodhart, M.D., Physician to the Evelina Hospital for Children; Assistant Physician to Guy's Hospital, London. Revised and Edited by Louis Starr, M.D., Clinical Professor of Diseases of Children in the Hospital of the University of Pennsylvania; Physician to the Children's Hospital, Philadelphia. Containing many Prescriptions and Formulæ, conforming to the U. S. Pharmacopœia, Directions for making Artificial Human Milk, for the Artificial Digestion of Milk, etc. Illustrated. Cloth, 3.00; Leather, 3.50

Hatfield. Diseases of Children. By M. P. Hatfield, M.D., Professor of Diseases of Children, Chicago Medical College. Colored Plate. 12mo. Cloth, 1.00; Interleaved, 1.25

☞ *See pages 14 and 15 for list of "Quiz-Compends"*

Children:—Continued.

Starr. Diseases of the Digestive Organs in Infancy and Childhood. With chapters on the Investigation of Disease, and on the General Management of Children. By Louis Starr, M.D., Clinical Professor of Diseases of Children in the University of Pennsylvania. Illus. Second Edition. Cloth, 2.25

DENTISTRY.

Fillebrown. Operative Dentistry. 330 Illus. Cloth, 2.50

Flagg's Plastics and Plastic Filling. 4th Ed. Cloth, 4.00

Gorgas. Dental Medicine. A Manual of Materia Medica and Therapeutics. Fourth Edition. Cloth, 3.50

Harris. Principles and Practice of Dentistry. Including Anatomy, Physiology, Pathology, Therapeutics, Dental Surgery and Mechanism. Twelfth Edition. Revised and enlarged by Professor Gorgas. 1028 Illustrations. Cloth, 7.00; Leather, 8.00

Richardson's Mechanical Dentistry. Fifth Edition. 569 Illustrations. 8vo. Cloth, 4.50; Leather, 5.50

Sewill. Dental Surgery. 200 Illustrations. 3d Ed. Clo., 3.00

Taft's Operative Dentistry. Dental Students and Practitioners. Fourth Edition. 100 Illustrations. Cloth, 4.25; Leather, 5.00

Talbot. Irregularities of the Teeth, and their Treatment. Illustrated. 8vo. Second Edition. Cloth, 3.00

Tomes' Dental Anatomy. Third Ed. 191 Illus. Cloth, 4.00

Tomes' Dental Surgery. 3d Edition. Revised. 292 Illus. 772 Pages. Cloth, 5.00

Warren. Compend of Dental Pathology and Dental Medicine. Illustrated. Cloth, 1.00; Interleaved, 1.25

DICTIONARIES.

Gould's New Medical Dictionary. Containing the Definition and Pronunciation of all words in Medicine, with many useful Tables etc. ½ Dark Leather, 3.25; ½ Mor., Thumb Index 4.25

Harris' Dictionary of Dentistry. Fifth Edition. Completely revised and brought up to date by Prof. Gorgas. Cloth, 5.00; Leather, 6.00

Cleaveland's Pronouncing Pocket Medical Lexicon. 31st Edition. Giving correct Pronunciation and Definition. Very small pocket size. Cloth, red edges .75; pocket-book style, 1.00

Longley's Pocket Dictionary. The Student's Medical Lexicon, giving Definition and Pronunciation of all Terms used in Medicine, with an Appendix giving Poisons and Their Antidotes, Abbreviations used in Prescriptions, Metric Scale of Doses, etc. 24mo. Cloth, 1.00; pocket-book style, 1.25

☞ *See pages 2 to 5 for list of Students' Manuals.*

EYE.

Hartridge on Refraction. 5th Edition. Illus. Cloth, 2.00

Hartridge on the Ophthalmoscope. Illustrated. Cloth, 1.50

Meyer. Diseases of the Eye. A complete Manual for Students and Physicians. 270 Illustrations and two Colored Plates. 8vo. Cloth, 4.50; Leather, 5.50

Swanzy. Diseases of the Eye and their Treatment. 158 Illustrations. Fourth Edition. Cloth, 3 00

Fox and Gould. Compend of Diseases of the Eye and Refraction. 2d Ed. Enlarged. 71 Illus. 39 Formulæ. Cloth, 1.00; Interleaved for Notes, 1.25

ELECTRICITY.

Bigelow. Plain Talks on Medical Electricity and Batteries. Illustrated. With a Glossary of Electrical Terms. Cloth, 1.00

Mason's Compend of Medical and Surgical Electricity. With numerous Illustrations. 12mo. Cloth, 1.00

HYGIENE.

Parkes' (Ed. A.) Practical Hygiene. Seventh Edition, enlarged. Illustrated. 8vo. Cloth, 4.50

Parkes' (L. C.) Manual of Hygiene and Public Health. Second Edition. 12mo. Cloth, 2.50

Wilson's Handbook of Hygiene and Sanitary Science. Seventh Edition. Revised and Illustrated. *In Press.*

MATERIA MEDICA AND THERAPEUTICS.

Potter's Compend of Materia Medica, Therapeutics and Prescription Writing. Fifth Edition, revised and improved. *See Page 15.* Cloth, 1.00; Interleaved for Notes, 1.25

Biddle's Materia Medica. Eleventh Edition. By the late John B. Biddle, M.D., Prof. of Materia Medica in Jefferson College, Philadelphia. Revised by Clement Biddle, M.D., and Henry Morris, M.D. 8vo., illustrated. Cloth, 4.25; Leather, 5.00

Potter. Handbook of Materia Medica, Pharmacy and Therapeutics. Including Action of Medicines, Special Therapeutics, Pharmacology, etc. By Saml. O. L. Potter, M.D., M.R.C.P. (Lond.), Professor of the Practice of Medicine in Cooper Medical College, San Francisco. Third Revised and Enlarged Edition. 8vo. Cloth, 4.00; Leather, 5.00

Waring. Therapeutics. With an Index of Diseases and Remedies. 4th Edition. Revised. Cloth, 3.00; Leather, 3.50

☞ *See pages 14 and 15 for list of ? Quiz-Compends ?*

MEDICAL JURISPRUDENCE.

Reese. A Text-book of Medical Jurisprudence and Toxicology. By John J. Reese, M.D., Professor of Medical Jurisprudence and Toxicology in the Medical Department of the University of Pennsylvania; President of the Medical Jurisprudence Society of Philadelphia; Physician to St. Joseph's Hospital; Corresponding Member of The New York Medico-legal Society. Third Edition. Cloth, 3.00; Leather, 3.50

OBSTETRICS AND GYNÆCOLOGY.

Davis. A Manual of Obstetrics. By Edw. P. Davis, Demonstrator of Obstetrics, Jefferson Medical College, Philadelphia. Colored Plates, and 130 other Illustrations. 12mo. Cloth, 2.00

Byford. Diseases of Women. The Practice of Medicine and Surgery, as applied to the Diseases and Accidents Incident to Women. By W. H. Byford, A.M., M.D., Professor of Gynæcology in Rush Medical College and of Obstetrics in the Woman's Medical College, etc., and Henry T. Byford, M.D., Surgeon to the Woman's Hospital of Chicago. Fourth Edition. Revised and Enlarged. 306 Illustrations, over 100 of which are original. Octavo. 832 pages. Cloth, 5.00; Leather, 6.00

Cazeaux and Tarnier's Midwifery. With Appendix, by Mundé. The Theory and Practice of Obstetrics; including the Diseases of Pregnancy and Parturition, Obstetrical Operations, etc. Eighth American, from the Eighth French and First Italian Edition. Edited by Robert J. Hess, M.D., Physician to the Northern Dispensary, Philadelphia, with an appendix by Paul F. Mundé, M.D., Professor of Gynæcology at the N. Y. Polyclinic. Illustrated by Chromo-Lithographs, and other Full-page Plates, seven of which are beautifully colored, and numerous Wood Engravings. One Vol., 8vo. Cloth, 5.00; Leather, 6.00

Lewers' Diseases of Women. A Practical Text-Book. 139 Illustrations. Second Edition. Cloth, 2.50

Parvin's Winckel's Diseases of Women. Second Edition. Including a Section on Diseases of the Bladder and Urethra. 150 Illus. Revised. *See page 3.* Cloth, 3.00; Leather, 3.50

Morris. Compend of Gynæcology. Illustrated. Cloth, 1.00

Winckel's Obstetrics. A Text-book on Midwifery, including the Diseases of Childbed. By Dr. F. Winckel, Professor of Gynæcology, and Director of the Royal University Clinic for Women, in Munich. Authorized Translation, by J. Clifton Edgar, M.D., Lecturer on Obstetrics, University Medical College, New York, with nearly 200 handsome illustrations, the majority of which are original. 8vo. Cloth, 6.00; Leather, 7.00

Landis' Compend of Obstetrics. Illustrated. 4th edition, enlarged. Cloth, 1.00; Interleaved for Notes, 1.25

Galabin's Midwifery. By A. Lewis Galabin, M.D., F.R.C.P. 227 Illustrations. *See page 3.* Cloth, 3.00; Leather, 3.50

☞ *See pages 2 to 5 for list of New Manuals.*

PATHOLOGY. HISTOLOGY. BIOLOGY.

Bowlby. Surgical Pathology and Morbid Anatomy, for Students. 135 Illustrations. 12mo. Cloth, 2.00

Davis' Elementary Biology. Illustrated. Cloth, 4.00

Gilliam's Essentials of Pathology. A Handbook for Students. 47 Illustrations. 12mo. Cloth, 2.00

*** The object of this book is to unfold to the beginner the fundamentals of pathology in a plain, practical way, and by bringing them within easy comprehension to increase his interest in the study of the subject.

Gibbes' Practical Histology and Pathology. Third Edition. Enlarged. 12mo. Cloth, 1.75

Virchow's Post-Mortem Examinations. 3d Ed. Cloth, 1.00

PHYSICAL DIAGNOSIS.

Fenwick. Student's Guide to Physical Diagnosis. 7th Edition. 117 Illustrations. 12mo. Cloth, 2.25

Tyson's Student's Handbook of Physical Diagnosis. Illustrated. 12mo. Cloth, 1.25

PHYSIOLOGY.

Yeo's Physiology. Fifth Edition. The most Popular Students' Book. By Gerald F. Yeo, M.D., F.R.C.S., Professor of Physiology in King's College, London. Small Octavo. 758 pages. 321 carefully printed Illustrations. With a Full Glossary and Index. *See Page 3.* Cloth, 3.00; Leather, 3.50

Brubaker's Compend of Physiology. Illustrated. Sixth Edition. Cloth, 1.00; Interleaved for Notes, 1.25

Stirling. Practical Physiology, including Chemical and Experimental Physiology. 142 Illustrations. Cloth, 2.25

Kirke's Physiology. New 12th Ed. Thoroughly Revised and Enlarged. 502 Illustrations. Cloth, 4.00; Leather, 5.00

Landois' Human Physiology. Including Histology and Microscopical Anatomy, and with special reference to Practical Medicine. Fourth Edition. Translated and Edited by Prof. Stirling. 845 Illustrations. Cloth, 7.00; Leather, 8.00

"With this Text-book at his command, no student could fail in his examination."—*Lancet.*

Sanderson's Physiological Laboratory. Being Practical Exercises for the Student. 350 Illustrations. 8vo. Cloth, 5.00

PRACTICE.

Taylor. Practice of Medicine. A Manual. By Frederick Taylor, M.D., Physician to, and Lecturer on Medicine at, Guy's Hospital, London; Physician to Evelina Hospital for Sick Children, and Examiner in Materia Medica and Pharmaceutical Chemistry, University of London. Cloth, 4.00; Leather, 5.00

☞ *See pages 14 and 15 for list of ? Quiz-Compends ?*

A UNIQUE BOOK.

POTTER'S MATERIA MEDICA, PHARMACY AND THERAPEUTICS. Second Edition. Revised and Enlarged. A Handbook; including the Physiological Action of Drugs, Special Therapeutics of Diseases, Official and Extemporaneous Pharmacy, etc. By S. O. L. POTTER, M.A., M.D., Professor of the Practice of Medicine in Cooper Medical College, San Francisco; Late A. A. Surgeon, U. S. Army, etc. A new Edition in larger type. Octavo. Cloth, $4.00; Leather, $5.00.

DR. POTTER has become well known as an able compiler, by his Compends of Anatomy, and of Materia Medica, both of which have reached four editions. In this book, more elaborate in its design, he has shown his literary abilities to much better advantage, and all who examine or use it will agree that he has produced a work containing more correct information in a practical, concise form than any other publication of the kind. The plan of the work is new, and its contents have been combined and arranged in such a way that it offers a compact statement of the subject in hand.

PART I.—MATERIA MEDICA and THERAPEUTICS, the drugs being arranged in alphabetical order, with the synonym of each first; then the description of the plant, its preparations, physiological action, and lastly its *Therapeutics*. This part is preceded by a section on the classification of medicines as follows: Agents acting on the Nervous System, Organs of Sense, Respiration, Circulation, Digestive System, on Metabolism (including Restoratives, Alteratives, Astringents, Antipyretics, Antiphlogistics and Antiperiodics, etc.). Agents acting upon Excretion, the Generative System, the Cutaneous Surfaces, Microbes and Ferments, and upon each other.

PART II.—PHARMACY AND PRESCRIPTION WRITING. Written for the use of physicians who put up their own prescriptions. It includes—Weights and Measures, English and the Metric Systems. Specific Gravity and Volume. Prescriptions.—Their principles and combinations; proper methods of writing them; abbreviations used, etc. Stock solutions and preparations, such as a doctor should have to compound his own prescriptions. Incompatibility, Pharmaceutical and Therapeutical. Liquid, Solid and Gaseous Extemporaneous Prescriptions.

PART III.—SPECIAL THERAPEUTICS, an alphabetical List of Diseases—a real INDEX OF DISEASES—giving the drugs that have been found serviceable in each disease, and the authority recommending the use of each; a very important feature, as it gives an authoritative character to the book that is unusual in works on Therapeutics, and displays an immense amount of research on the part of the author. 600 prescriptions are given in this part, many being over the names of eminent men.

THE APPENDIX contains lists of Latin words, phrases and abbreviations, with their English equivalents, used in medicine, Genitive Case Endings, etc. 36 Formulæ for Hypodermic Injections; a comparison of 10 Formulæ of Chlorodyne; Formulæ of prominent patent medicines; Poisons and their Antidotes; Differential Diagnosis; Notes on Temperature in Disease; Obstetrical Memoranda; Clinical Examination of Urine; Medical Ethics; Table of Specific Gravities and Volumes; Table showing the number of drops in a fluidrachm of various liquids and the weight of one fluidrachm in grains, and a table for converting apothecaries' weights and measures into grams.

A MINE OF WEALTH FOR THE STUDENT.

Standard Text-Books.

LANDOIS' HUMAN PHYSIOLOGY. A Text-Book of Human Physiology, including Histology and Microscopical Anatomy, **with special reference to the requirements of Practical Medicine.** By Dr. L. LANDOIS, Professor of Physiology and Director of the Physiological Institute, University of Greifswald. Translated from the Fifth German Edition, with additions by WM. STIRLING, M.D., Sc.D., Brackenburg, Professor of Physiology and Histology in Owen's College and Victoria University, Manchester; Examiner in the Honors' School of Science, University of Oxford, England. Third Edition, revised and enlarged. 692 Illustrations. One Volume. Royal Octavo. Cloth, $6.50; Leather, $7.50.

"With this Text-book at command, NO STUDENT COULD FAIL IN HIS EXAMINATION."—*The Lancet.*

"One of the MOST PRACTICAL WORKS on Physiology ever written, forming a 'bridge' between Physiology and Practical Medicine. . . . Its chief merits are its completeness and conciseness. . . . EXCELLENTLY CLEAR, ATTRACTIVE AND SUCCINCT."—*British Medical Journal.*

"Unquestionably the most admirable exposition of the relations of Human Physiology to Practical Medicine ever laid before English readers."—*Students' Journal.*

"Landois' Physiology is, without question, the best text-book on the subject that has ever been written."—*New York Medical Record.*

CAZEAUX AND TARNIER'S MIDWIFERY. Eighth Revised and Enlarged Edition. With Appendix, by Mundé. The Theory and Practice of Obstetrics; including the Diseases of Pregnancy and Parturition, Obstetrical Operations, etc. By P. CAZEAUX, Member of the Imperial Academy of Medicine. Remodeled and rearranged, with revisions and additions, by S. TARNIER, M.D., Prof. of Obstetrics and Diseases of Women and Children in the Faculty of Medicine of Paris. Eighth American, from the Eighth French and First Italian Editions. Edited and Enlarged by ROBERT J. HESS, M.D., Physician to the Northern Dispensary, Phila., etc., with an Appendix by PAUL F. MUNDÉ, M.D., Professor of Gynæcology at the New York Polyclinic, Vice-President American Gynæcological Society, etc. With Chromo-Lithographs, Lithographs, and other Full-page Plates, seven of which are beautifully colored, and numerous Wood Engravings. One Volume, octavo.

Cloth, $5.00; Full Leather, $6.00.

MEYER ON DISEASES OF THE EYE. A Manual of Ophthalmology. By Dr. EDOUARD MEYER, Prof. à l'École Pratique de la Faculté Médecine de Paris; Chevalier of the Legion of Honor, etc. Translated from the Third French Edition, with the assistance of the author, by Dr. FREELAND FERGUS, Assistant Surgeon, Glasgow Eye Infirmary. With 267 Illustrations and three Colored Plates. Prepared under the direction of Dr. R. Liebreich. 8vo. Cloth, $4.50; Leather, $5.50.

The first chapter is an explanation of the best means for examining the eyes, externally and internally, with a view to diagnosis, the various ophthalmoscopes, general considerations on the treatment of ophthalmia, etc. Each disease is then taken up in its proper order; the anatomy of the part being presented first, followed by the diagnosis, causes, progress, prognosis, etiology and treatment. The arrangement of the work will thus be seen to be systematic, commending itself to all physicians and students for the logical and concise way in which the facts are given. This English edition makes the eighth language into which Meyer's book has been translated.

P. BLAKISTON, SON & CO., Publishers and Booksellers,
1012 WALNUT STREET, PHILADELPHIA.

Standard Text-Books.

HOLDEN'S ANATOMY. A Manual of the Dissections of the Human Body. By LUTHER HOLDEN, F.R.C.S. Fifth Edition. Carefully Revised and Enlarged, specially concerning the Anatomy of the Nervous System Organs of Special Sense, etc. By JOHN LANGTON, F.R.C.S., Surgeon to, and Lecturer on Anatomy at, St. Bartholomew's Hospital. 208 Illustrations. 8vo.

Oil-cloth Covers, for the Dissecting Room, $4.50.

The popularity of this work has steadily increased during the past few years. It is probably used more extensively than any other dissector. The Oil-cloth binding allows of washing, and does not retain the dirt and odor of the dissecting table. This edition has been carefully printed and bound, and lays open flat at any page.

"No student of anatomy can take up this book without being pleased and instructed. Its diagrams are original, striking and suggestive, giving more at a glance than pages of text description. All this is known to those who are already acquainted with this admirable work; but it is simpe justice to its value, as a work for careful study and reference, that these points be emphasized to such as are commencing their studies. The text matches the illustrations in directness of practical application and clearness of detail."—*New York Medical Record.*

ANDERSON ON SKIN DISEASES. A complete Treatise on Skin Diseases. By MCCALL ANDERSON, M.D., Professor of Clinical Medicine, University of Glasgow. With numerous wood engravings and several colored and steel plates. Octavo. Cloth, $4.50. Leather, $5.50. *Just Ready.*

This aims to be a complete text-book. It will be found to contain all the latest methods of treatment. The subject is dealt with in a systematic, practical manner, and is based on an extensive experience of nearly twenty-five years.

GOWERS' MANUAL OF DISEASES OF THE NERVOUS SYSTEM. A Complete Text-book. By WILLIAM R. GOWERS, M.D., Professor Clinical Medicine, University College, London. Physician to National Hospital for the Paralyzed and Epileptic. Comprising over 400 Illustrations. Second Edition; in two Vols. *In Press.*

BYFORD. DISEASES OF WOMEN. The Practice of Medicine and Surgery, as applied to the Diseases and Accidents Incident to Women. By W. H. BYFORD, A.M., M.D., Professor of Gynæcology in Rush Medical College and of Obstetrics in the Woman's Medical College; Surgeon to the Woman's Hospital; Ex-President American Gynæcological Society, etc.; and HENRY T. BYFORD, M.D., Surgeon to the Woman's Hospital of Chicago; Gynæcologist to St. Luke's Hospital; President Chicago Gynæcological Society, etc. Fourth Edition, Revised, Rewritten and Enlarged. With 306 Illustrations, over 100 of which are original. Octavo. 832 pages. Cloth, $5.00; Leather, $6.00.

"In short, the book is brought up to the standard of to-day, and in most respects may be considered a reliable, practical text-book, written by an earnest worker and practical man."—*American Journal of Medical Sciences.*

ROBERTS. PRACTICE OF MEDICINE. The Theory and Practice of Medicine. By FREDERICK ROBERTS, M.D., Professor of Therapeutics at University College, London. Eighth American Edition, thoroughly revised and enlarged, with new Illustrations. 8vo. Cloth, $5.50; Leather, $6.50.

"If there is a book in the whole of medical literature in which so much is said in so few words, it has never come within our reach."—*Chicago Medical Journal.*

"The best text-book for students. We know of no work in the English language, or of any other, which competes with this one."—*Edinburgh Medical Journal.*

P. BLAKISTON, SON & CO., Publishers and Booksellers,
1012 WALNUT STREET, PHILADELPHIA.