like, and acceptable as possible; and yet it is quite possible that it may convey the elements of truth as really as many a dry and laborious philosophical dissertation. By the quaint and grotesque points of view in which it presents the subject, it tends to bring out new features and aspects of it which might be overlooked in the ordinary light of scientific treatment.

And there is another point of view in which some might be disposed to regard it favorably. If not in accordance with the most recent views in theology, it is at least in harmony with the older and orthodox idea of the personality of God. It strikes the same key-note of impersonation, and is in accordance with the style of language employed in the Bible, and with the way in which an old Hebrew prophet might have declaimed "Sed eheu quam magno intervallo" on such a subject. Nor is it out of harmony with the mode of expression still made use of, and still most readily understood, by the great mass of mankind regarding God's operations in the world.

[THE ASCLEPIAD.]

THE FIRST ELECTRICIAN—WILLIAM GILBERT, M.D.

By BENJAMIN WARD RICHARDSON, M.D.

IF there be one old town in England more interesting than another to the historical scholar, it is Colchester. Every class of scholar may find some interest there, and we of medicine need not be behind the rest. In Colchester we shall find the birthplace and the final resting-place of the illustrious pioneer in science who gave us the word electricity, and the first true idea of the power. The pioneer in question was William Gilbert, M.D., friend and favorite physician of Queen Elizabeth.

The best account of this man is supplied in "The History and Antiquities of the Most Ancient Town and Borough of Colchester," by Philip Morant, M.A. MDCCXLVIII.

Gilbert wrote his own name Gilberd. He was the son of Hieron (Jerome) Gylberd, gentleman, a native of Hintlesham in Suffolk, but afterward a Burgess of Colchester; made so in 1528. William was born in the year 1540. He studied both in Oxford and Cambridge, and afterward traveled on the Continent, where (according to Morant) he had conferred upon him the degree of Doctor of Physic. Dr. Munk, however, has gathered from Mr. Cooper, the learned author of the "Athenæ Cantabrigienses," that he was of St. John's College, Cambridge; that he proceeded B.A. 1560; was elected fellow of St. John's, 21st March, 1560-61; M.A. 1564; M.D. 1569; and senior fellow of his college 21st December, 1569.

Gilbert settled in London when he was thirty-three years of age, and commenced practice as a physician. He became a Fellow of the Royal College of Physicians, passed through the office of Censor and Elect, and in the year 1600 was made President.

That he practiced his profession with great success is clear from the evidence of all who have written concerning him. He was received, says Morant, with the highest favor by Queen Elizabeth, whom he served as chief physician, and from whom he received a legacy, the only legacy she left to any one. He also, for the short period between the Queen's death and his own, acted as physician-in-chief to James I. By his will he left all his books, globes, and cabinet of minerals to the College of Physicians.

Morant states that there was a portrait of Gilbert in the Schools Gallery at Oxford in his time, which portrait showed him to have been tall of stature and of cheerful countenance. It is from this portrait that the engraving on this page was probably taken, although we have now no direct evidence of the fact. The plate has been kindly lent to me for autotype copy by permission of the Treasurer of the Royal College of Physicians.

From this plate as the center of the subject, Mr. Arthur Ackland Hunt produced, a few years ago, a very fine historical painting, representing Gilbert making an experimental demonstration in electricity, before Queen Elizabeth. In the picture Sir Walter Raleigh, Drake, and Burleigh contrast admirably with the ladies of the Court, who, if I remember rightly, are more interested in a young courtier than in the experiment.

Gilbert's house in Colchester was anciently called "Tymperley's" or Tymponnell's. In Morant's time it "was the same as Serjeant Price, late Recorder, lived in, and still possessed by his widow and relict, Bridget Price."

Where Gilbert resided while in London we have no record; but that he had every facility for his own line of research there cannot be reasonable doubt. To that research, so remarkable for its originality, and so important in its future bearings, I now direct, briefly, the attention of the reader.

The peculiarity of the work which first strikes us lies in a word. Gilbert is the man who gave us the word *electricity*. It had been known, long before his time, that the rubbing of amber (electron) caused amber to attract some light bodies. Gilbert, whose great line of investigation was on the magnet, differentiated between the attraction exerted by the magnet and that exerted by the excited amber. He connected also the kind of attraction evidenced through amber with that produced by exciting glass, wax, jet, and other substances since known as electrics. His great work "De Magnete," published in 1600, becomes thus the basis of all our electrical science from that date. Galileo, Bacon, Thomson the historian of the Royal Society, Priestley, and in our later time Hallam, all bear witness to the solid quality and originality of the De Magnete.

For preparing this short memoir I have, with the kind assistance of my friend Mr. James Menzies, made a study of this book, some portions of which are sure to be of interest to all scientific and medical readers.

De Magnete opens with a preface to the candid reader and student of magnetic philosophy, a preface so good that it admits, scarcely, of curtailment. In it Gilbert pours forth the spirit of true philosophy. In it he shows that he was well acquainted with and a master of the experimental method of research in natural science. In it he demonstrates that he was actually carrying out, in practice, that which the author of the *Novum Organon*—who, upon natural things, wrote, as Harvey said, "like a Lord Chancellor"—was putting on paper as a series of speculative disquisitions and projects.

Thus in the strictest sense of the term Gilbert might be called the father of modern experimental science.

With Mr. Menzies' kind and learned aid I give this remarkable preface in full, for the first time, I believe, in English dress.

PREFACE TO THE CANDID READER AND STUDENT OF MAGNETIC PHILOSOPHY.

"Since in the discovery of the secrets, and in the inquiry

into the hidden causes of things, stronger proofs can be obtained from reliable experiments and demonstrated arguments than from the probable conjectures and opinions of the ordinary professors of philosophy; since, therefore, the famous substance of that great magnet, our common mother the earth, hitherto wholly unknown, and the conspicuous and eminent forces of this globe of ours, may be the better understood, I propose to begin from the common magnetic, earthy, and iron bodies, those substances of our globe which we can grasp with our hands and perceive with our senses, and then proceed to demonstrable magnetic experiments, and so penetrate, for the first time, into the innermost parts and secrets of the earth. For after very many of those things which have been obtained from the heights of mountains, the depths of seas, the profoundest caverns and buried mines have been seen and understood, then at last we shall have learnt the true substance of the earth. To the investigation of magnetic force (such, indeed, are the wonderful and surpassing qualities of the bodies known to us) have I given a great and prolonged attention. Nor have I found this labor idle and unfruitful, inasmuch as during the progress of my daily experiments, new and unexpected properties have revealed themselves, and my love of knowledge hath so much increased from the diligent survey of things, that I have essayed to show forth the very interior of the terrene globe and its true substance on magnetic principles; to reveal unto men the earth (our common mother), and to point it out as with the finger, by true demonstrations, and by experiments manifest to the senses.

"And as geometry ascends from sundry very simple and easy principles to very high and difficult conceptions, by which the wit of man climbs above the firmament, so our teaching of magnetic science first sets forth in convenient order certain obvious facts; out of these more remarkable ones come to light; and at last, in sure order, the concealed and greatest secrets of our globe are opened, and the causes of those things known which, either through the ignorance of ancient, or the neglect of recent, times, have been over-

chance, at first sight seem very hard to be received, yet I doubt not but that at length they will obtain authority from the clear proofs given. Wherefore, in magnetic science, they who advance furthest, trust most in, and receive most profit from, the arguments adduced; nor in this science will anything easily become clear to any one in which all or nearly all points are not known. Almost the whole of this department of natural science is new and unheard of, except what a few writers have delivered concerning certain familiar properties of the magnet. Wherefore, I but little approve of the aid obtained from the ancient Greek writers, because neither the poor Greek arguments nor the Greek words avail to demonstrate or cast any light upon the truth. For our magnetic teaching is at variance with most of their principles and received opinions.

"Neither have I brought to this work any craft of eloquence or adornment of words, but this only have I done that things difficult and unknown may be so handled by me and set forth in that style of writing and in those words absolutely necessary, that they may be clearly understood. I sometimes, therefore, use certain new and unusual words, not that by means of the childish veil of words, shades and darkness should be cast upon facts (as the alchemists are wont to do), but that hidden things, which have no name, and which have never before been understood, may be plainly and clearly delivered by me.

"After describing our magnetic experiments, and making known the like elements of the earth, I proceed to the general nature of the whole globe itself, wherein it is allowed us to philosophize freely and with the same liberty which the Egyptians, Greeks, and Romans formerly used in publishing their opinions; whereof very many errors have been handed down to later authors, and in which smatterers still persist, and so wander, as it were, in perpetual darkness. To each of these ancient and earliest fathers of philosophy, Aristotle, Theophrastus, Ptolemæus, Hippocrates, and Galen, let due honor be paid; such are the writers who have diffused knowledge to subsequent ages; but our time hath

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looked and unknown. But why should I, in so vast an ocean of books, by which the minds of ingenious men are troubled and fatigued, through which very silly productions the herd of unreasoning men are intoxicated, rave, are puffed up, and create literary broils, and while declaring themselves to be philosophers, physicians, mathematicians, and astrologers, neglect and despise men of learning; why should I, I say, add anything new to this republic of letters, and expose this philosophy, glorious, seemingly new and incredible, on account of so many things hitherto unrevealed, to be condemned and torn to pieces by the ill words of such persons as are pledged to the opinions of other men, or are the foolish corrupters of good arts, bookish laymen, grammarians, sophists, wranglers, and froward individuals of the meanest kind? But unto you almost alone, you honest students of philosophy, who seek knowledge not from books only, but from things themselves, I commend these principles of magnetism, set forth in a new mode of philosophizing.

"And should it not seem fit to some to assent to sundry opinions and incredible statements, they may nevertheless contemplate a great array of experiments and discoveries (such as all philosophy ever flourisheth in), which have been searched out and demonstrated by me with much care, watchfulness, and cost. In them rejoice, and to good purpose enjoy them, if ye be able. I know how difficult it is to give freshness to old things, brilliancy to the antiquated, light to the dark, grace to the despised, credibility to the doubtful; how much more difficult is it to obtain and establish some authority for things new and unheard of, and which are opposed to all the beliefs of men! Nor for that, however, do I care; since I think it is to few that the philosophic spirit hath been vouchsafed. Whoever desires to make trial of the same experiments, let him handle the substances not unskillfully and carelessly, but wisely, aptly, and in a business-like way; and let him not (when he fails of success) begin to find fault with my inventions, for nothing hath been set forth in this book which hath not been examined and many times tried and repeated by me.

"Many things in the reasonings and hypotheses will, per-

disclosed and brought to light very many facts which they also, had they been alive, would doubtless have accepted. Wherefore we hesitate not to deliver, in an argument founded on truth, those things which have been discovered by us after prolonged experiment."

THE BOOK.

Such is the preface to this wonderful book. Its first chapter supplies a description of the magnet and of magnetic virtues. In its second chapter it introduces us to the word and the power electricity. It explains that not only will the magnet attract some bodies brought near to it, but some other things will do the same, after they have been excited by friction. Amber (*electron*) is one of the substances which can be thus excited; jet is another of the same kind; but amber came first into knowledge as evincing this remarkable property.

"Amber," Gilbert says, "holds flies, ants, and other small creatures shining in eternal sepulchers"—*aternis sepulchris relucentes*. There was a touch of poetry in William Gilbert.

The bodies of this nature may, then, be called electrics, and the property they present may be called the electric, or electrical. There are many bodies which act as electrics, besides amber and jet. The diamond, the sapphire, and some other precious stones, glass, sulphur, mastic, sealing-wax, and resin are electrics.

Gilbert seems to have discovered that glass, sulphur, and wax are electrics, his mode of discovery being as simple as it was effective. Small strips of metal suspended from their centers were the best objects. To them the excited electric was presented, and the attraction was the proof of the electrical action.

He was very exact in noting the conditions under which electrical action could be best observed. He found that it is always most active when the air is dry and when the wind is north or northeasterly. Moisture destroys the effect, and even the presence of the breath is sufficient to impair it. He made an attempt to electrify water, and by presenting

an electrified body to drops of water, produced a conical shape in the round drop. He discovered that if an electrified rod were brought near to the dense smoke rising from a burning substance, the smoke was attracted. He suggested that electrical attraction was due to the electrical fluid or effluvia rushing from one substance to another of similar kind, and cohering, as two drops of water cohere and run into one. He suggested also, on this matter, a distinction between magnetism and electricity.

"The difference between magnetic and electric force is, that all magnetic bodies attract by their mutual strength, while in electric bodies the electric attracts only; the body attracted is not changed by its natural force, but is drawn spontaneously by the nature of the material of which it is composed. Bodies are drawn toward electric bodies in a straight line toward the center of electricity; but the magnet attracts the magnet only at the poles directly, at other points obliquely and transversely, even as they adhere and hang together. Electric motion is the motion of an accumulation of matter; magnetism, of arrangement and order. The globe of the earth is collected, and coheres by electricity. The globe of the earth is directed and moves by magnetism, and at the same time it also coheres and is welded together in its inmost parts, so that it becomes solid."

Fig. 1.

To these remarkable indications must be added, however, others as remarkable in respect to the magnet. There is something startling in certain of the chapters relating to the electrical properties of the earth and the attraction of the planet for substances upon its surface. He gives a drawing (Fig. 1), of which I present a copy, in which he depicts a magnetic globe or orb, and indicates how magnetic poles or bars arrange themselves in respect to the axis of the globe.

One of the most interesting chapters on this matter of terrestrial magnetism is chapter xvii. in book i., "*Quod globusterrasit magneticus*": "The globe of the earth magnetic; the magnet; and how the magnetic stone has all the primary forces of the earth; and that the earth through the same forces maintains its fixed position in the universe."

This chapter begins:

"Before the cause of magnetic motions, the demonstration of facts concealed during so many ages, and experiments (those true foundations of human philosophy) are brought to light by us, that new and unheard of opinion of ours must be stated and laid before the eyes of the learned; which, when it has been debated and supported by certain probable reasons, it will indeed be established as firmly as anything which hath ever been seen or proved in philosophy by ingenious arguments or mathematical demonstrations."

Gilbert's opinion, thus prefaced, is, that the earth with its masses of rock and water, and all its parts, whether seen or

Fig. 2.

hidden from human sight, is a magnet, and is possessed of all the qualities known as magnetic. "I consider," says he, "the earth to be a solid substance, firmly cohering in its primary form, and (as in the other globes of the universe) endowed with a well knit form, which maintains its position and fixed polarity, and revolves with a determinate motion from an implanted power of movement, even as the magnet, beyond all bodies seen by us, possesses a true and genuine character, little injured and deformed by external evils, which is a homogeneous and true part of, and which has been separated from, the body and volume of the earth."

"Such is our earth in its interior parts, a body possessing a homogeneous magnetic nature; and on such a perfect foundation stands the whole nature of terrestrial things,

which under our diligent scrutiny everywhere shows itself, such as in all the magnetic metals of the earth, in veins of iron, in all kinds of clay, and in most varieties of earth and stone; whereas the pure element of Aristotle, and the main terrestrial phantasm of the peripatetic philosophers (that simple substratum of all things) is rude, inert, cold, dry, dead, of no vigor, hath never appeared to any one except in dreams, and is of no effect in the nature of things. To speak plainly, all the solid earth, wherever it is seen; even that earthy matter which has not been purified from coarse and humid elements, such as clay, mire, and material gathered from putrid substances; whether they have been injured by the imperfection of various mixtures, or fallen to pieces through their grossness like marl, all these, whether they have been prepared by fire alone, or are freed from their superfluous moisture, are attracted by the magnet, and as by the magnet so also are other bodies magnetically attracted and set in order by the earth itself; and through their implanted force do they arrange themselves according to the method and order of the world. So also every fragment of the earth, by true experiment, shows all the force of the magnetic nature, and obeys the globe and universal principle of our earth throughout its various motions."

In another part of his work he gives the preceding diagram to show how a needle, floated by means of a cork in a goblet of water, exhibits both variation and declination if it be rendered magnetic (Fig. 2).

In chapter xii., book i., he compares magnetic force to vital force. Magnetic force is life or resembles life, and surpasses human life in many respects, while it is bound in the organic body.

"The magnet is wonderful in innumerable experiments, and is, at it were, a living force. This is the one remarkable virtue of those which the ancients considered to be life in the heavens, in globes and stars, in the sun and moon. For they considered that such varied motions could not be maintained without a divine and living force; or that without it, vast bodies could revolve in fixed terms, or that wonderful powers could be infused into other bodies through this primary form of the globes themselves. The ancients, the whole Platonic school, the Egyptians, and Chaldeans, affirm that the universe is endowed with life. On the other hand, Aristotle thinks that the elements are inanimate, the stars animate. I myself think that the whole creation, all globes, all stars, and the glorious earth itself, are governed from the beginning by a proper and determinate life, and have their movements of self-preservation. Although there

GILBERT'S HOUSE AT COLCHESTER.

are not in the stars, the sun, or the planets any organs which can be recognized by us, yet they live. If there be anything of which man can boast, assuredly it is life; and God Himself (by whose will all things are ruled) is intelligence, is mind. Who is he, then, that will demand organs in the divine mind, which overpasses all the framework of organs, and is not restrained by material organs? But in the different bodies of the stars, the implanted force acts otherwise than in those divine things which are supernaturally ordained; and in the stars the force acts otherwise than in animals; in animals otherwise than in plants. Certes, it were a miserable condition of the stars, a base lot of the earth, if that glorious dignity of life were denied them which hath been granted to the worm, the ant, the moth, the plant, and the toadstool."

LAST DAYS AND WORKS.

Morant is careful to tell us that Gilbert left behind him another work, "*De Mundo Sublunari Philosophia Nova*," which work, still in manuscript, was retained in the library of Sir William Boswell, Knight. Nearly fifty years after the death of its author it was published from Amsterdam, by his brother William Gilbert, Junior, a proctor in the Court of Arches, with a dedication to the unhappy Prince Henry of Wales, friend of Walter Raleigh, and son of James the First.

According to the same biographer, Gilbert invented two ingenious instruments for seamen to find out the latitude without the help of sun, moon, or stars. The instruments were made public by Thomas Blondville, in a quarto work published in London in 1602.

The annual pension left by Queen Elizabeth to our philosopher physician was not long enjoyed by him. The queen died on March 24, the philosopher on November 30, 1603. He was never married.

In many respect Gilbert resembled Harvey, particularly in having been much beloved and honored by his brothers, of whom he had four—Ambrose, William, Jerome, and George. Over his tomb in the church of the Holy Trinity, Colchester, the brothers Ambrose and William placed a Latin inscription, which my learned brother Munk has copied into his Roll of the Royal College of Physicians, and which I supplement in English:

AMBROSE AND WILLIAM GILBERT HAVE PLACED THIS TOMB, IN MEMORY OF BROTHERLY PIETY, TO WILLIAM GILBERT, SENIOR, GENTLEMAN, AND DOCTOR OF MEDICINE. THIS THE ELDEST SON OF JEROME GILBERT, GENTLEMAN, WAS BORN IN THE TOWN OF COLCHESTER, STUDIED THE ART OF MEDICINE AT CAMBRIDGE, PRACTICED THE SAME FOR MORE THAN THIRTY YEARS AT LONDON, WITH SINGULAR CREDIT AND SUCCESS, HENCE, CALLED TO COURT, HE WAS RECEIVED WITH HIGHEST FAVOR BY QUEEN ELIZABETH, TO WHOM, AND TO HER SUCCESSOR JAMES, HE SERVED AS CHIEF PHYSICIAN. HE COMPOSED A BOOK CELEBRATED AMONG FOREIGNERS CONCERNING THE MAGNET, FOR NAUTICAL SCIENCE. HE DIED IN THE YEAR OF HUMAN REDEMPTION 1603, THE LAST DAY OF NOVEMBER, IN THE 63D YEAR OF HIS AGE.

The monument bearing the above epitaph remains in fair preservation in the old church of the Holy Trinity; and hard by still stands Gilbert's house, once the Tymperleys'. Friend Henry Laver, of Colchester, surgeon there, and excellent antiquarian scholar, to whom I am much indebted, has taken a photographic view of the residence as it now is, which view Bertram Richardson has transferred to paper, as a fitting conclusion to this short history of First Electrician.

DETECTION AND DETERMINATION OF PICRIC ACID.

By G. CHRISTEL.

This compound forms yellowish white leaflets which take up ammonia on exposure to the air and assume a deep yellow color. The solutions of trinitrophenol in dilute acids, in chloroform, and carbon disulphide are colorless. If the solution in chloroform is evaporated to dryness, there remains a colorless residue which is colored deep yellow by a drop of water. If a yellow (ammoniacal) picric acid is dissolved in a little water, mixed with two or three volumes of ether, and shaken up, a portion of the acid is taken up by the ether, and further additions of ether dissolve scarcely any coloring matter. The addition of acetic acid does not alter this behavior, but after adding a little sulphuric acid the entire picric acid may be extracted with ether. Ammonia withdraws the dissolved picric acid from ether; and the golden-yellow ammonium picrate is insoluble in ether. Chloroform removes only a part of picric acid from its pure watery solution or from one which has been acidulated with sulphuric acid. In searching for picric acid it is therefore best to acidulate with sulphuric acid and exhaust by shaking up with ether.

If to a solution of picric acid or ammonium picrate in water we add neutral lead acetate or copper sulphate, there is no precipitate, but on further adding a little alkali (ammonia) there is formed with lead acetate a reddish yellow precipitate, and with copper sulphate a greenish precipitate. On the other hand, $\frac{1}{10}$ milligramme picric acid dissolved in 5 c. c. water with a few drops of basic lead acetate becomes strongly opalescent, and gives subsequently a slight but distinct yellow precipitate. This precipitate is decomposed by dilute sulphuric acid. If the same precipitate is submitted to prolonged treatment with water, a part of the picric acid is dissolved, while there remain an apparently more basic compound of a deep orange-yellow.

The yellow coloring-matters of *Quercus tinctoria* (quercitron bark) and of *Broussonetia tinctoria* (fustic) behave in a similar manner with the salts of lead. These and analogous coloring matters are distinguished from picric acid thus: they are neither changed by potassium cyanide nor reduced by potassium stannite. Their precipitates are never so pale yellow as that of picric acid. The soluble aniline yellow of commerce dissolves to a reddish yellow liquid, which if much diluted appears of a pure yellow. It is very imperfectly precipitated by basic lead acetate, not changed by potassium cyanide, but turned at once to a purple by hydrochloric acid.

If a solution of trinitrophenol, not too dilute, is mixed with an aqueous solution of methyl green, there appears a green precipitate which in excess of water dissolves to a bluish green liquid. It is soluble also in acetic acid and in other acids. With organic bases (alkaloids) picric acid gives precipitates, as is well known, but they are not suitable for its separation. On boiling solutions of picric acid with permanganate, considerable quantities of the latter are reduced. If to an aqueous solution of picric acid there is added stannous chloride, a yellowish brown precipitate falls down, but if a little ammonia be added, or if potassium stannite is used, the liquid becomes red from the formation of picramic acid. If to a solution of barium chloride there are added a few crystals of caustic baryta and a solution of picric acid, not too dilute, there is formed a red precipitate. Sulphureted hydrogen reddens an alcoholic solution of picric acid. The same effect is rapidly produced by ammonium sulphide. By the action of zinc and dilute sulphuric acid upon picric acid there is formed a yellowish red turbid liquid. If this is decanted off from the zinc, mixed with an excess of alcohol (ethylic), allowed to stand for some time, and filtered, the liquid becomes greenish, and changes first to a violet blue and then to a reddish violet. If even a very small quantity of picric acid (much less than 1 milligramme) or of an alkaline picrate is heated with hydrochloric acid and stannous chloride, allowed to cool, a trace of potassium chlorate added to the mixture slightly heated, the liquid becomes first greenish yellow and then a fine blue, but an exceedingly trifling excess of potassium chlorate destroys the color. In presence of organic matter this reaction is not distinct. One of the most sensitive and trustworthy reactions is the well-known transformation of picric acid into red phenylpurpuric acid on heating with potassium cyanide. Trinitroresol, in like manner, forms cresylpurpuric acid on treatment with potassium cyanide. If an aqueous solution of picric acid, not quite saturated, is mixed with potassium sulphocyanide and the mixture heated, there appear in the liquid (which at first remained clear) numerous yellow crystalline needles, which reflect incident light with splendid green and red colors. If the crystals are separated from the liquid, dried, and touched with an incandescent body, they explode with extreme violence. Nitrogenous tissues (wool, silk) take a permanent yellow in an aqueous solution of picric acid; absolute alcohol, hydrochloric acid, dilute caustic alkalies, and aqueous ammonia withdraw the picric acid, partially or entirely, from such tissues. The residue from the evaporation of the ammoniacal solution thus obtained is particularly fitted for the basic acetate of lead reaction and for that with potassium cyanide. Animal charcoal, if added in small quantities to a solution of picric acid, does not decolorize it, but larger quantities entirely withdraw picric acid from its solutions.

To detect picric acid in beer Christel evaporates 200 c. c. to the consistence of a sirup; introduces the residue into a small flask, adds 50 c. c. of alcohol at 90 per cent., lets it stand for twenty-four hours, during which the whole is re-