cient time has elapsed only the spectrum of α will be seen. But since, in reality, the phenomena of dissociation are not so sharply defined, the strong lines of each spectrum will be represented by weak lines in the other spectra, especially if the temperature of the furnace, α , be lower than that of the complete dissociation of β . Unfortunately our means are still too limited to enable us to decompose an element in our laboratories. Lockyer has tried to solve the problem by studying the spectra of the stars. The spectrum of the brightest and hottest stars, Bellatrix in the constellation of Orion is simple enough; besides a few hydrogen lines, there are only a few very fine lines which represent metals and which characterize elements of very small specific gravity, such as magnesium. The spectrum of the colder stars, on the other hand, such as the sun, or Deneb (α Cygni) show many more metals, but no metalloids; and the spectra of the coldest of

THE DOCTOR OUTSIDE OF MEDICINE.*

By WILLIAM L. STOWELL, M.D.

IN 1626, Peter Minuit bartered articles worth twenty-four dollars for Manhattan Island. It is now assessed for more than two billion dollars. Then there was no physician on the island; now there are three thousand dividing the medical honors and striving to divide the dollars. "Each man in his time plays many parts," and the parts played by our profession may well occupy us for a little time.

Perhaps the earliest genuine doctor to arrive was Peter Van der Linde, who came in 1638. When physic was slow he inspected tobacco, and gave part of his time to school teaching. He was also clerk of the church. He could not have all the obstetric work, because during his time Lysbert Direksen was town midwife and lived in a house built at public expense.

FIG. 8.—LOCKYER'S APPARATUS FOR THE SPECTROSCOPIC COMPARISON OF SOLAR AND TERRESTRIAL ELEMENTS.

stars, Betelgeuse (α Orionis), shows the characteristic band spectrum of metalloids and their compounds. In burning stars the temperatures of which vary from that of α Orionis to that of Bellatrix, the hydrogen lines are plainly visible; while the lines of the cleveite gases (helium and its associates) are not visible below the temperature of α Cygni. Sharply defined calcium lines are seen in the spectrum of stars having the temperature of Bellatrix. Iron lines are not obtained below the temperature of Cygni and are not visible at the temperature of Bellatrix. The strong lines of magnesium are seen at the temperature of Cygni and are still slightly visible at the temperature of Bellatrix. Upon these facts Lockyer has based his hypothesis of celestial dissociation according to which hypothesis the compounds in the different stellar types, with temperatures varying from those obtainable in our laboratories to those far greater than we can imagine, are first split up into their constituent elements, and these elements in turn dissociated into elements of smaller atomic weights, until everything is resolved into the universal primeval matter in the hottest sun. A few elements widely distributed in the universe are arranged by Lockyer in the order of their resistability to the effect of

Her successor was voted one hundred guilders (thirty-eight dollars) annually to attend the poor.

About this time (1638-1647) there was in the council of Governor-General Kieft, Dr. John de la Montagne, "a man of intelligence and decision of character," a Protestant refugee from France, who had gone to Holland, and thence here. We find the colonists waging war against the Indians under "command of the indefatigable Montagne," and he later signs the peace treaty with them. There were at this time only a hundred white men on the island. One of them was Surgeon Hans Kierstede, from Saxony, who married Sara, daughter of Annetje Janse, "the famous midwife." This worthy pair had ten children, and so did what they could for the white population. More than that, Surgeon Kierstede was a director for the new church and got up a sort of festival where the guests became very full of good brew. When they were in good spirits he started a subscription for the new church, and the liberal pledges seem to have been all paid when the men were sobered. The property of this same Annetje Janse was the beginning of the great wealth of Trinity Church.

Surgeon Paulus Van der Beeck (1643) becomes rich

FIG. 9.—SPECTRA OF BURNING STARS.

rising temperature as follows: Gas X (the unknown member of the group of cleveite gases) helium, hydrogen, calcium, magnesium, iron. From the disappearance of the iron lines in the hottest stars and the simultaneous intensification of the hydrogen and helium lines and of the line representing gas X, the English astrophysicist concludes that iron is a compound which is formed in part by one of these gases.

The composite nature of the elements seems to be a well-founded theory, which investigators are justified in taking as the starting point of future researches. The first step has been taken in the attainment of new knowledge, when the dogma of impossibility has been set aside. We are not too sanguine in hoping that science will soon solve this old riddle of the nature of the elements.

THE dust from blast furnaces has been used on certain lands in France as a fertilizer and the results have been proved quite successful.

by farming in Breuckeln, is tax collector and ferry master, and makes people wait for the boat "half a day and night."

Surgeon Jacob Varanger (1654) grows tired of being his own importer and consumer, so petitions the council to pay "for the use of his medicament," and to raise his salary as physician to the trading company. Varanga is claimed as one of the founders of the first hospital, yet his name is not in the list of twenty "great citizens," but among the two hundred and four "small citizens."

A little later on (1657) another composite doctor arrives—Samuel Megapolensis, son of Reverend Megapolensis. He is a Harvard graduate, who studied theology in Utrecht, and upon his return was appointed pastor of the church. He continued the rare art of both preaching and practising, and also did his part in

* Read before the Society of the Alumni of the City (Charity) Hospital, February 8, 1899.—From the New York Medical Journal.

politics, as appears from his being one of the commissioners at the English capitulation (1664).

In those days the palisade was along the present Wall Street. The only remaining relic of these early Dutch times is a portion of the foundation walls of 71 and 73 Pearl Street.

Those who died were buried just north of Bowling Green.

In 1666, Peter Harris, both physician and surgeon, was authorized to "exercise his art."

The term surgeon had been applied to ships' barbers, and had not the honor we now give it.

Gaudineau (1686), a Huguenot, also signs himself chirurgo-physician. He appears as lieutenant under Dongan in the French and Indian War (1708). There may be no significance in names, but it is curious to note that the first autopsy was held (1691) upon the body of Governor Slaughter, whose sudden death was thought to be due to poisoning. Dr. Johannes Kerfbyle, of Leyden, officiated.

The doctors did some fighting, not with Indians, as appears from the duel between Governor Dongan's nephew, Thomas, and Dr. John Livingston. The latter was killed and Dongan convicted of manslaughter.

In 1705, law and medicine combined in the person of Dr. Bridges, for a brief time chief justice.

In early days, slavery flourished here, and a slave market was established in 1709 at the foot of Wall Street. Dr. Dupay was a slave owner, for we find that he wants £55 for a negro wench nineteen years old whom he had brought up from infancy. She did not like being sold on approval, and a few years later is again offered for sale, "as she has a great itch for running away."

Quarantine was hastily established, in 1710, on Governor's Island, then Mutton Island. Three thousand German Lutherans had left Plymouth to come here to make tar, cut masts, etc. Four hundred and seventy of them were buried at sea. The council was dismayed when the large remainder arrived, and, "fearing distempers," appointed Dr. Garran, Dr. Law, and Dr. Moore to inspect the immigrants. Carpenters were also sent to build huts for them.

In 1725, Bedloe's Island was used as a quarantine for smallpox patients from Madeira.

About 1735, an almshouse, "publick workhouse and house of correction," was built in the fields or park. It was on the site of the present City Hall. Here slaves were kept for correction and the poor sheltered. Besides a salary, the keeper received fees from all who entered or were discharged, and 1s. 6d. for whipping. In 1764, the keeper was allowed £20 extra, as there had been no whipper for some time.

The second floor room on the Broadway side was the hospital ward, containing six beds. Dr. John Van Beuren was in charge on a salary of £100 a year.

It was here that Dr. Beekman Van Beuren introduced vaccination in the face of much opposition.

Dr. Gerardus Beekman, as president of the council, filled the executive chair in 1710 until the new governor arrived. He was a wealthy landowner, lieutenant-colonel of militia, etc. He was "the great gunner who shot a deer in city common, the antlers of which are still preserved in the family." He was one of the eight men condemned with Leisler when the latter was executed for treason in refusing to give up the fort. The doctor wrote to the governor that he wished to visit some patients on Long Island that were "very dangerous." Having leave to go, he neglected to come back to be executed.

Upon the arrival of Governor Clinton, in 1743, George Clarke returned to England said to be worth £100,000, "so profitable was it to rule New York." Ten years later Sir Danvers was governor. He had been deranged by grief at the loss of his wife, and two days after arriving here hanged himself from the fence in Mr. Murray's garden. Dr. Magraw, "the best physician in town," had ordered him sack and whey the day before, but he had refused it, telling the servant to prepare broth. Mr. Murray seemed to think this a sure evidence of madness. In 1743, Dr. McGrath introduced free cold bathing for the cure of fevers. He was an unrefined, capacious man who was himself often "in hot water." These were troublous days in the colony. Smallpox and yellow fever prevailed (1737 and 1739), the Jews were disfranchised (1738), and thirty-four negroes and whites were executed for a plot to burn the city (1741).

About this time (1745) Dr. John Nichol died. He was an active practitioner and useful man, a member of the governor's council. In the same year Mr. John Dupuy, M.D., the man midwife, died, of whom the paper stated, "in which loss it may be truly said, as of Goliath's sword, 'there was none like unto him.'"

The most conspicuous physician of the last century was probably Cadwallader Colden (1688-1776). He was a Scotchman by birth. Wilson calls him "one of the ablest men in the province," and well he may. He graduated from the University of Edinburgh, studied medicine in London, and practiced the same in Philadelphia for several years. Governor Hunter induced him to come to New York and made him first surveyor general in the colonies. The governor suffered much from sciatica, and finally returned home. In a letter he says: "I have no hope of ease on this side, having try'd all remedies, Christian and Pagan, Polemical, Chymical, and Whimsical, to no purpose. Aix-la-Chapelle is all my present comfort." Colden's favorite study was botany, and he sent to Linnæus three or four hundred American plants. His pen was ever busy. He wrote on yellow fever a "History of the Five Indian Nations of Canada," and numerous scientific articles. He was for fifty years in his majesty's council, and for twelve years lieutenant-governor. On account of the stamp act in 1765 a procession of citizens burned in effigy Colden and the devil; however, at another time, fifty-six merchants congratulated him on his administration. At one time he had a country seat near Newburg, and again a large farm on Long Island. His intellectual capacity and attainments were great and various, one biographer saying that he was "known in the scientific and literary world as a physician, botanist, astronomer, and historian." He was the first to suggest the formation of the American Philosophical Society. He was loyal to the crown all his life, and died at the ripe age of eighty-eight years, in 1776, just after the English occupied New York.

The revolutionary period supplies medical anecdotes as well as war history. Dr. James Beekman erected a

house in 1764 upon the bluff above East River at what is now Fifty-second Street. It stood there until 1874. This is a familiar spot to us of Charity Hospital. This historic house was at times occupied by such notables as General Howe, Sir Henry Clinton, and Madame de Riedesel. In the greenhouse there Nathan Hale was tried as a spy on September 21, 1776. He was then taken to City Hall Park and executed, not far from where his statue now stands.

The most important day this country ever saw was July 4, 1776, when the delegates from the thirteen colonies assembled in congress and declared American independence. All the fifty-six delegates present signed, and five of them were physicians. They were as follows:

Lyman Hall, from Georgia, a successful practitioner, afterward governor.

Benjamin Rush, graduate of Princeton when fifteen years old, who became professor of chemistry in the College of Philadelphia when twenty-four years old. He was surgeon-general of the hospitals during the war, and for the last fourteen years of his life treasurer of the United States Mint.

Oliver Wolcott, of Connecticut, was major-general in the army and held many high public offices, including that of governor. He and Hall were classmates in Yale in 1747.

Josiah Bartlett, of New Hampshire, was a "noble patriot"; for ten years in legislature and congress, governor of his State, justice of the supreme court, and first president of the State Medical Society.

The last signer was Dr. Mathew Thornton, from Londonderry, New Hampshire. He was a practitioner and "most ardent patriot," whose monument bears the simple inscription, "An honest man."

New York sent few doctors to the war, but among these zealous patriots are mentioned James Brewer, Moses Younglove, Ebenezer White, and Daniel Menema. She had seventeen original members in the Society of Cincinnati.

In 1790, congress removed from City Hall, New York, to Philadelphia. On October 14 of that year the medical society was allowed to use the council chamber for its meeting. There Dr. Nicholas Romaine gave medical lectures a year or two later.

At that time the medical society numbered twenty-eight members. Among the noteworthy men were Dr. John Bard and his son, Dr. Samuel Bard, who operated upon the carbuncle that afflicted George Washington.

Dr. John Bard (1716-1799) was a very eminent man, noted for his urbanity of manner as well as great learning. He established the first quarantine at Bedloe's Island, and was first president of the New York Medical Society organized in 1788. He was usually dressed in a red coat and cocked hat and carried a gold-headed cane. He drove in a low phaeton and was accompanied by a colored servant.

Samuel Bard (1742-1821), son of John, graduated at Columbia, and took his M.D. in Edinburgh. He organized the first medical school with Columbia, then King's College, and in 1769 took the chair of physic. He was dean of the faculty.

Dr. John Cochrane was evidently a man of wealth, as he lived on Broadway and entertained the generals of the army in a royal manner (Lamb).

No one enjoyed a higher social position and influence at this time than Mrs. John Jay. On one date, her only guests at dinner were Dr. and Mrs. John Charlton. Charlton was an English surgeon from the court of George III., who came with the army. He married Mary de Peyster. He usually rode on horseback, but practiced little. In 1795, yellow fever again raged. The cabin boy and surgeon of a West Indian ship were the first to die. The disease spread, only to be checked by the frosts of November. Governor Jay then set Thursday, November 26, as Thanksgiving Day, as had previously been done in Massachusetts. More than fifteen hundred persons had died of the population of fifty thousand. This scourge resulted in underground sewers being begun. At this time there were one hundred students in Columbia and fifty more studying medicine.

Prof. McMaster, writing on yellow fever, gives this interesting picture: "If the purchaser of the vinegar (for prevention) were a nervous man and tormented with hourly fear of being stricken with the fever, the spectacle he presented as he sallied forth to buy was most pitiable. As he shut his house door he was careful to have a piece of tarred rope in either hand, a sponge wet with camphor at the nose, and in his pocket a handkerchief well soaked in the last preventive of which he had heard. . . . If he were so unhappy as to meet a friend on the way, neither shook hands, but exchanging a few words at a distance, each sought, bowing and scraping, to get to the windward of the other as he passed. When at last the shop was reached, nothing could induce him to enter while another stood at the counter, or was seen approaching on the street" (Wilson).

April 13, 1788, was the date of the "Doctors' Riot." This was caused by some inquisitive boys discovering the hospital doctors dissecting. They spread ghastly tales and soon had an angry mob after the young medics. The doctors sought safety in the jail, but barely escaped being removed from there. Dr. Hicks was hiding behind the chimney of his preceptor's house (Dr. Cochrane) while the mob were below, looking for him and evidences of his dissecting. The trouble lasted part of two or three days and was only quelled by the militia. Baron Steuben and Secretary Jay were endeavoring to quiet the mob by speeches when both were injured by flying missiles. Steuben was just praying that the soldiers should not be allowed to shoot when he was hit upon the head with a brick. As he fell he cried out, "Fire, Governor, Fire!" and it was done.

Nicholas Romaine was a native New Yorker, 1765-1817. His weight of three hundred pounds did not affect his activity. He was "vested with almost all the honors the medical profession can bestow." He could upon invitation "lecture on the aphorisms of Hippocrates, unfold the structure of the brain, expound the philosophy of paludal diseases, or discourse on the plant which Clausius cherished." He was "at all times assiduous in civic pursuits and closet studies," a type of what a physician should be to a community.

Dr. Hugh Williamson (1735-1819) was another man of many gifts. He was ordained to preach, but gave up because of his health. He studied medicine in Edinburgh and Utrecht and practiced successfully in Phila-

delphia. He was surgeon in the army, member of the North Carolina House of Commons, delegate to the convention to frame the Constitution, and was elected as a federalist to the first congress.

In Philadelphia he was professor of mathematics and one of a commission to observe the transit of Venus and Mercury.

Seventeen hundred and ninety-eight was marked by the invention of the steamboat. In March of that year Dr. Samuel L. Mitchell, then a representative in the legislature, introduced an act granting the exclusive right to navigate the New York waters by fire or steam for twenty years. The bill was passed very much as a joke. In April, 1807, Fulton actually made the trip from New York to Albany in the "Clermont" at the rate of five miles an hour. Dr. Mitchell was one of the passengers, and, as Colden was backing the scheme, he was probably there also.

The most remarkable man of his time was Samuel Latham Mitchell, M.D., LL.D. (1764-1831). He graduated in medicine in Edinburgh, and returning here studied law with Chief Justice Yates.

For twenty years he was visiting physician to New York Hospital. As a teacher, he was professor of chemistry and natural history in Columbia, professor of botany and materia medica in the College of Physicians and Surgeons, and one of the faculty of the Rutgers Medical School. His analysis of the Saratoga mineral waters helped their fame.

In 1796, he made a geological and mineralogical tour of the State, the published results of which laid the basis of his European reputation.

In 1797, together with Dr. Edward Miller and Dr. Elisha H. Smith, he founded (and for sixteen years edited) *The Medical Repository*, the first medical journal in this country.

His knowledge of the Indians was thorough. When they gave exhibitions at the Elgin Gardens he would translate their war songs; and because of his legal knowledge he was sent to make a treaty with them.

In politics he was in the State legislature working hard with Cadwallader Colden and Governor De Witt Clinton for the Erie Canal. In 1825 it was opened with the greatest naval fête the city had ever witnessed. Dr. Mitchell had procured bottles of water from the thirteen largest rivers in the world—Ganges, Nile, Mississippi, Amazon, etc.—and united them all in this artificial waterway. The doctor counted it the proudest day of his life when the inland lakes and ocean were united in "indissoluble marriage." It cost \$7,602,000 then. We heard more about its cost last autumn. With Williams we find him working for the furtherance of West Point Military Academy. As United States senator he puts his energies into improved quarantine laws. With the ever-active Colden and others he established the Deaf and Dumb Institute. When State aid was wanted for the Botanical Gardens at Fifth Street, he talked for hours to the legislature, and that without special preparation. Naturally, he was among the incorporators of the Society for the Establishment of Free Schools in 1805.

Socially he was a delightful companion, not an abstract philosopher. He was Sachem of Tammany Society, was an active member of nearly all the learned societies of the world, and yet found time to preside over the "Krout Club," or discuss conchology with Dr. Samuel Akerly, his brother-in-law.

His writings include "Theory of the Earth and Solar System Phosphorescence of the Ocean," "Anatomy and Physiology of the Shark," a description of the fishes about New York (one hundred and sixty-six varieties), and "The Ethnology of the Indian."

It is little wonder that Dr. Francis called him "the Nestor of American science."

In St. Paul's churchyard at Vesey Street, on the Broadway side, there stands near the fence a large monument which you have probably all seen, but perhaps not stopped to observe. It is that of the Irish patriot who made this his adopted home. Dr. William James Macnevin (1768-1841) was educated in Vienna, practiced in Dublin, traveled in and wrote of Switzerland, and spent four years in an Irish jail. "He had no prison house; worth, freedom, Wisdom still can walk at large, though bolts and bars, and walls of adamant may intervene." He translated from the original Gaelic, and compiled a French grammar for the children of Thomas Addis Emmet, his fellow prisoner.

On July 4, 1804, he landed here, and at once began practice. He gave clinics in the almshouse (1807), and was professor of midwifery in the College of Physicians and Surgeons, and professor of materia medica in Rutgers Medical School. He was also professor of chemistry. Dr. Francis says that "the stores of ancient and modern science were equally accessible to him, and he was ever ready to communicate." When he died, "all felt that learning had lost a distinguished ornament, . . . the charities of life an ardent friend, and patriotism one who had sustained martyrdom in her glorious cause."

Another man in the faculty with Dr. Mott, Dr. Macnevin, and Dr. Francis, was Dr. David Hosack, "distinguished beyond all his competitors in the healing art" (1769-1835). Beginning with materia medica, he became professor in all the branches except anatomy and surgery. In 1804, he had to do with a tragedy which a part of our history. When Alexander Hamilton was shot by Vice-President Burr on that early July morning at the Weehawken dueling ground, Hosack was waiting for him in a boat below the cliff. This was the untimely end of the great Hamilton, and the end of dueling in this country.

Dr. Hosack's favorite study was botany, and in 1801 he succeeded in establishing the State Botanical Garden upon twenty acres bounded by Forty-seventh and Fifty-first Streets, between Fifth and Sixth Avenues. This was for the "conservation of our indigenous botany, or as a repository of the most precious exotics." It was a curious and valuable place in many ways, but not very useful, so the property was turned over to Columbia College. You all know how valuable the ground has proved to it. Dr. Hosack was one of the originators of the New York Historical Society, and twelve years its president.

In 1824, when Lafayette revisited America after half a century of absence, he was shown all possible honors, and Dr. Hosack, conducting him to the chair that once belonged to Louis XVI., "in a graceful speech tendered him his election as an honorary member of the Historical Society."

His name is connected with most wise and great affairs of his day. It was he who established the library of New York Hospital, which has now been (1898) transferred to the Academy of Medicine.

"It was not infrequently remarked that Clinton, Hosack, and Hobart were a tripod on which our city stood."

Another botanical M.D. was James E. De Kay (1792-1851), an all-round naturalist. His travels took him to Turkey, where he became superintendent of the naval yards. He returned to Oyster Bay, near his intimate friend, the poet Bryant. Though he cared little for practice, he came here at once to help care for the cholera patients, and wrote chiefly for the New York press.

John W. Draper, M.D. (1811-1882), chemist and physiologist, was a many-sided man. After practicing a few years in Virginia he came here, and with Mott and others founded the New York University Medical College. He did much in the early days for photography. It was he who first photographed from high-power microscope lenses. He wrote with equal ease upon chemistry, "Intellectual Development of Europe," "The Future Policy of America," and the "Conflict between Religion and Science."

Contemporaneous with Dr. Draper, though older, was another M.D. who did not practice—Peter Irving (1771-1838), M.D., from Columbia. Peter was brother of Washington Irving, and helped the latter with the immortal "Knickerbocker's History of New York." He found the pen mightier than the bistoury, and after traveling widely abroad led a literary life, being noted for his "classical acquisition and belles-letters knowledge."

Medicine combined with art in the anatomical lectures given by Dr. T. G. King before the National Academy of Design. The academy originated with S. F. B. Morse, of telegraphic fame, who was its president for many years. He was a great painter, especially of portraits. One of Lafayette by him is still in the City Hall. Morse and King continued the anatomical lectures many years.

In January, 1831, chemists, physicians, and others began to agitate the subject of pure water. Dr. De Kay prepared a report including a quotation from Devoe in 1798, to wit: "The collect behind the tea-water pump is a shocking hole, where all impure things center together and engender the worst of unwholesome productions." All this is now completely changed; the shocking hole has been filled up, and in or on its place stands the Criminal Court Building, where the New York Health Department resides and engenders hygienic laws and antitoxines instead of "unwholesome productions." The Croton water supply was brought to the city with a great celebration in 1842, having cost twelve million dollars.

In the medical history of New York no one took so great an interest as John W. Francis, M.D., LL.D. (1789-1861). In 1809, Dr. Francis was the first man to receive the degree of M.D. from the College of Physicians and Surgeons. He later was professor of materia medica, of medical jurisprudence, and of obstetrics there. He was greatly interested in all the hospitals, asylums, and benevolent institutions of his time. He said "you might as well create a practical navigator by residence in a sylvan retreat as furnish a physician without hospital experience."

Dr. Francis was the medical friend of the leading actors from Cooke to Macready. Kean went with him to Vauxhall Garden (where Astor Library now is) and turned somersaults there. They then went to Bloomingdale, as Kean was anxious to see if our insane were like those in England. He nearly ended his own life on this trip. Dr. Francis wrote various medical papers, but is now best remembered by his "Old New York, or Reminiscences of Sixty Years." Though a busy practitioner, he had time for the meetings of the famous "Bread and Cheese Club," where he met the naturalist, Dr. De Kay, and Charles King, later president of Columbia.

Dr. Kane, the Arctic explorer, was born in Philadelphia in 1820, and entered the navy as surgeon. He was a great traveler, and visited all parts of the world while on duty or during furloughs. During the Mexican War (1846) he was with the military staff. Being a naturalist as well as a sailor, he went with the first Grinnell Expedition from here in 1850. In 1853, he commanded the "Advance," and first definitely determined the existence of an open polar sea. His expedition accomplished more than any preceding one, and brought him honor and fame. His health failed, and he sought relief in Havana, where he died in February, 1857.

Another man to whom we New Yorkers are especially indebted is Rufus H. Gilbert, M.D. (1832-1885), who invented the elevated railroad. He was a student of Willard Parker, and graduate of the College of Physicians and Surgeons. In 1862, he was surgeon to the Duryea Zouaves, and performed the first surgical operation under fire at Big Bethel. Later he was director of the army hospitals. After the war his health failed, and he became assistant superintendent of the Jersey Central Railroad. He was greatly interested in the overcrowding of the poor districts, and so labored to find a way of relief. The original elevated railroad, from Battery Place through Greenwich Street to Thirtieth Street, was begun in 1867. Dr. Gilbert at first held a large amount of the stock, but he lost most of it, and his death was really hastened by anxiety and disappointment.

In these days of interchanging war and peace we are reminded of Richard J. Gatling, M.D. (1818), who is still living in our city. His inventions so filled his mind that he never practiced medicine. When a boy he perfected a cotton-seed sower and a wheat drill. (How he might have helped the gynecologists with cases of sterility!) In 1861, he invented the revolving gun which was tried by General Butler and later adopted by the United States service. It is, as you know, virtually ten breech-loading rifle barrels together, and can now deliver twelve hundred shots a minute. Its efficiency may be learned by reference to the Manila battles of recent dates.

Of all medical men and patriots there is none whose history is so romantic or whose deeds are so daring and magnificent as those of Marcus Whitman. His name is inseparable from that rich territory

"Where rolls the Oregon, and hears no sound
Save his own dashings."

In 1836, he left this State with his young wife for a

bridal tour of thirty-five hundred miles. When the party reached Fort Laramie the garrison tried to prevent his going beyond with his old "wagon." The great forests were then occupied only by Indians and traders of United States origin or belonging to the Hudson Bay Company. There this little band meant to go and did go. In 1842, six years later, Whitman was visiting a patient at Walla Walla and attended a dinner of traders and others where an express rider announced that a quantity of immigrants were two hundred and three hundred miles above, coming down there. An enthusiastic priest jumped up, shouting shouting, "Hurrah for Oregon! America is too late!" Whitman grasped the situation, and left for home. In twenty-four hours he had started, in spite of all entreaties not to do so, to ride to Washington to see Webster before the Ashburton treaty should be signed, and Oregon lost to the United States. It was a rich possession, of thirty-two times the size of Massachusetts, and Whitman's residence there six years showed him its value. The experiences of four months of winter spent in the saddle, pushing on constantly over mountain passes, through forests, swimming rivers frozen half over, at times eating dog meat and mule meat, and once being wholly lost—what history it is, and what an indomitable will the man had! Mr. Lovejoy and the guides were his companions, yet he may be said to have made the trip alone.

After five months' travel he reached Webster at Washington, and set aside all the arguments against the worthless and inaccessible land. When told that wagons never could be taken over the mountains, his sufficient reply was, "My wagon is there now." He returned on September 4, 1843, with two hundred wagons and nearly a thousand persons (eight hundred and seventy-five) and thirteen hundred head of cattle.

Daniel Webster said, "It is safe to assert that our country owes it to Dr. Whitman and his associate missionaries that all the territory west of the Rocky Mountains and south as far as the Columbia River is not now owned by England." The rides of Paul Revere and Sheridan were momentous, but Whitman outdistanced them and saved us six thousand miles of Pacific coast and inestimable wealth yet to be secured. Poor Whitman and his family were massacred in November, 1847. Compare his journey with a trip by the Northern Pacific or Sunset Limited. Since his day our western horizon has been pushed seventy-five hundred miles farther.

I cannot well refrain from reference to one eminent doctor now living and very active—Dr. Leonard Wood, now brigadier-general and military governor of Santiago. Governor Roosevelt, his long-time friend, counts him one of our most superior public men. He received his medical diploma from Harvard in 1882, and for a short time practiced in Boston. His adventurous spirit led him into the army, and shortly we find him with General Miles fighting the Apaches. His great power of endurance, his kindly manner, and unusually sound judgment soon made him the natural leader of some of the detachments sent out. He soon won the medal of honor. It was the most natural thing in the world that he should command that unique regiment, the Rough Riders, and his evident executive ability and justice made him the natural selection as governor of the province. He is a man whom we may proudly claim as one of us, though he has grown out of medicine.

There is one doctor who belonged to all English-speaking people—Oliver Wendell Holmes, M.D., LL.D. (1809-1894), the "autocrat," "professor," and "poet." A student of law, then of medicine; professor of anatomy and physiology for forty-four years in Dartmouth and Harvard; a poet from his college days to the end of his long life. The dry subject of anatomy he enlivened by comparing the sweat glands to a fairy's intestine, and the mesentery to shirt ruffles of a former generation. He wrote "Lectures on Homoeopathy and Kindred Delusions," and many other medical topics, yet found time to write fourteen volumes not medical.

Dr. Holmes was pre-eminently the poet for occasions

"When the tongue has grown loose
And the waistband grown tight."

He frequently came to New York (where else can a Boston man go?), in 1853, to attend the meeting of the American Medical Association, and later the semi-centennial of the New England Society. When the new Fifth Avenue Theater was opened, "they were something more perplexed for poets than for port and sherry," and Dr. Holmes was the poet guest. His most notable visit here was in 1883, when the New York medical profession honored itself in honoring him with a dinner at Delmonico's. Two hundred and fifty most eminent physicians and guests united in paying tribute to the genius, wit, and learning of the doctor-poet, who could

"... show with demonstrator's art
The complex chambers of the heart,
Or, armed with diviner skill,
To made it pulsate at his will."

Among the speakers were Dr. Barker, Dr. A. H. Smith, and Dr. T. G. Thomas, the Hon. William M. Evarts, George William Curtis, Whitelaw Reid, and, best of all, the doctor himself in a poem.

This paper must have an end, and perhaps it had better be here. We have found that the knowledge of medicine adds to the efficiency of those possessing it; that it is compatible with many things else—law, preaching, literature, painting, poetry, natural history, exploration, astronomy, invention both in the arts of war and peace, and adds dignity, honor, and usefulness to a man in any profession.

Tooth Powders.—The Zahntechnische Reform publishes the following recipes:

I. Menthol, 1 gramme; betanaphthol, 0.5 grammes; saccharine, 0.25 gramme; lime carbonate, 500 grammes; II. Myrrh, 10 grammes; sodium chloride, 10 grammes; soot, 5 grammes; soap, 5 grammes; lime carbonate, 500 grammes.

III. Camphor, 5 grammes; soap, 10 grammes; saccharine, 0.25 gramme; thymol, 0.5 gramme; lime carbonate 500 grammes. Scent, as desired, with rose oil, sassafras oil, wintergreen oil, or peppermint oil.

NEW BOOKS

Accumulators. How Made and Used. An Elementary Handbook for the use of Amateurs and Students. Edited by Percival Marshall. 12mo, cloth, 80 pages, 40 illustrations. New York, 1899. \$0 50

Agriculture. Principles of Agriculture. A Textbook for Schools and Rural Societies. By L. H. Bailey. 16mo, cloth, 300 pages, illustrated. New York, 1899. \$1 25

Air-Brake Catechism. For Firemen, Engineers, Air-brake Constructors, Shop Men, and all branches of Railroad Men. By Robert H. Blackall. 12mo, cloth, 240 pages, illustrated. New York, 1899. \$1 50

Alaska and the Klondike. A Journey to the New Eldorado, with Hints to the Traveler and Observations on the Physical History and Geology of the Gold Regions, the Conditions of and Methods of Working the Klondike Placers, and the Laws Governing and Regulating Mining in the Northwest Territory of Canada. By Angelo Heilprin. Fully illustrated from photographs and with a map of the gold regions. 12mo, cloth, 315 pages. New York, 1899. \$1 75

Astronomy. The Elements of Practical Astronomy. By W. W. Campbell. Second edition revised and enlarged, 8vo, cloth, 264 pages. New York, 1899. \$2 25

Birds. A Dictionary of Birds. By Alfred Newton, assisted by Hans Gadow, with contributions from Richard Lydecker, Charles S. Roy, and Robert W. Shufeldt. 8vo, cloth, illustrated, 1,088 pages. London. \$5 00

Birds. The First Book of Birds. By Mrs. Harriet Mann Miller. With 8 colored and 12 plain plates, and 20 figures in the text. 12mo, cloth, 149 pages. Boston, 1899. \$1 00

Botany for Beginners. By Ernest Evans. 16mo, cloth, 290 pages. New York, 1899. \$0 75

Building Construction and Superintendence. By F. E. Kidder. Part II, Carpenter's Work. Second edition, 8vo, cloth, 544 pages, 524 illustrations. New York, 1899. \$4 00

Cement. Portland Cement. Its Manufacture, Testing and Use. By D. B. Butler. 8vo, cloth, 360 pages, 85 illustrations. London, 1899. \$6 00

Chemistry. The Arithmetic of Chemistry. Being a simple treatment of the subject of Chemical Calculations. By J. Waddell. 12mo, cloth, 133 pages. New York, 1899. \$1 00

Chemistry. Descriptive General Chemistry. A Textbook for Short Course. By S. E. Tillman. 8vo, cloth, 429 pages. New York, 1899. \$3 00

Clay Modelling for Schools. A Progressive Course for Primary Schools and Grammar Grades. By Anna M. Holland. 8vo, cloth, illustrated, 21 pages, 19 plates. Boston, 1899. \$1 00

Cyanide Process. Practical Notes on the Cyanide Process. By F. L. Bosqui. 8vo, cloth, illustrated, 201 pages. New York, 1899. \$2 50

Decorative Designs of all Ages, for all Purposes. With numerous engravings and diagrams. Edited by Paul N. Hasluck. 16mo, cloth, 160 pages. London, 1899. \$0 50

Dams. The Design and Construction of Dams, including Masonry, Earth, Rock-Fill, and Timber Structures. Also the principal types of Movable Dams. By Edward Wegmann. Fourth edition, revised and enlarged. Quarto, cloth, 250 pages of text, 83 folding plates. New York, 1899. \$5 00

Electrotyping. A Practical Treatise on the Art of Electrotyping by the latest known methods. Containing historical review of the tools and machinery required, and complete instructions for operating an Electrotyping plant. By C. S. Partridge. 12mo, cloth, 149 pages, illustrated. Chicago, 1899. \$1 50

Engineer's Handy-Book. Containing Facts, Formulas, Tables and Questions on Power. Its Generation, Transmission and Measurement, Heat, Fuel and Steam, the Steam Boiler and accessories, Steam Engines and their parts, the Steam Engine Indicator, Gas and Gasoline Engines, etc., etc. By Stephen Roper. Fifteenth edition, revised and greatly enlarged by E. R. Keller and Clayton W. Pike. 12mo, 844 pages, leather pocketbook form. Philadelphia, 1899. \$3 50

Fertilizers. The Source, Character and Composition of Natural, Homemade and Manufactured Fertilizers, and suggestions as to their use for different crops and conditions. By E. B. Voorhees. 12mo, cloth, 335 pages. New York, 1899. \$1 00

Fields, Factories and Workshops; or, Two Sister Arts, Industry and Agriculture. By P. Kropotkin. 8vo, cloth. New York, 1899. \$3 00

Foundry Cupola. The Cupola Furnace; a Practical Treatise on the Construction and Management of Foundry Cupolas. By E. Kirtland. 12mo, cloth, 361 pages, illustrated. Philadelphia, 1899. \$3 50

Heat for Advanced Students. By Edwin Edser. 12mo, cloth, 470 pages, fully illustrated. London and New York, 1899. \$1 00

Hydraulic and Placer Mining. By E. B. Wilson. 12mo, cloth. New York, 1899. \$2 00

Plants. A Textbook of Plant Diseases Caused by Cryptogamic Parasites. By George Massee. 12mo, cloth, 458 pages, fully illustrated. London, 1899. \$1 75

Plant Relations. A First Book of Botany. By John M. Coulter. 12mo, cloth. New York, 1899. \$1 25

Prospecting, Locating, and Valuing Mines. By R. H. Stretch. 12mo, cloth, 374 pages. New York, 1899. \$2 00

Railways. Light Railways at Home and Abroad. By Wm. H. Cole. With plates and illustrations. 8vo, cloth. Philadelphia, 1899. \$5 00

Refrigeration. Compend of Mechanical Refrigeration. A Comprehensive Digest of Applied Energetics and Thermodynamics for the Practical Use of Ice Manufacturers, Cold Storage Men, Contractors, Engineers, Brewers, Packers, and others interested in the application of Refrigeration. Third edition. By J. E. Siebel. 12mo, cloth. 389 pages. Chicago, 1899. \$3 00

Science. Early Chapters in Science. A first book of knowledge of Natural History. Botany, Physics, and Chemistry for Young People. By Mrs. W. Audry. Edited by W. F. Barrett. 12mo, cloth. 348 pages. New York, 1899. \$3 00

Science. The Fairy Land of Science. By Arahella B. Buckley. New and revised edition. 12mo, cloth. Illustrated. New York, 1899. \$1 50

Sewer Design. A course of Lectures delivered at Cornell University, intended for those Students whose intentions to enter the field of Sanitary Engineering calls for more special and detailed work than is required of all Civil Engineering Students. By H. N. Ogden. Illustrated, and 5 folding plates. 12mo, cloth. New York, 1899. \$2 00

Slide Valve. The Slide Valve Simply Explained. By W. J. Tennant. Revised and much enlarged by J. H. Kinealy. Fully illustrated with original drawings and diagrams. 16mo, cloth. 83 pages. New York, 1899. \$1 00

Smith's Work. With 211 engravings and diagrams. Edited by Paul N. Hasluck. 16mo, cloth. 160 pages. London and New York, 1899. \$0 50

Soap Bubbles. Fun with Soap Bubbles, including Book and Complete Outfit for Fancy Bubbles and Films. For the Amusement of Young and Old. By Thomas N. St. John. 16mo, paper cover. \$0 35

Stable. The Private Stable. Its Establishment, Management, and Appointments. By "Jorrocks." With full page plates. Small quarto, cloth. 652 pages. Boston, 1899. \$3 00

Steam Boiler Practice. In its Relation to Fuels and their Combustion, and the Economic Results Obtained with Various Methods and Devices. By Walter B. Snow. 8vo, cloth. 297 pages. New York, 1899. \$3 00

Steam Engine. The Steam Engine and Gas and Oil Engines. A book for the use of students who have time to make experiments and calculations. By J. Perry. 8vo, cloth. 646 pages. Illustrated. New York, 1899. \$3 25

Technological Dictionary. By N. Ponce de Leon. English-Spanish and Spanish-English of Words and Terms employed in the Applied Sciences. Industrial Arts, Fine Arts, Mechanics, Machinery, Mines, Metallurgy, Agriculture, Commerce, Navigation, Manufactures, Architecture, Civil and Military Engineering, Marine, Military Art, Railroads, Telegraphs, etc., etc. Vol. I. Ingles-Espanol. 8vo, half leather. 873 pages, \$8.50. Vol. II. Spanish-English. 8vo, half leather. 782 pages, \$7.50. Complete in 2 volumes. \$16 00

Testing Materials. Handbook of Testing Materials for the Constructor. Part I, Methods, Machines, and Auxiliary Apparatus. (In two volumes: Vol. I. Text; Vol. II. Illustrations.) By Prof. Adolf Martens. Authorized translation and addition, by Gus. C. Henning. 8vo, cloth. 2 vols., 623 pages, 1,030 figures. New York, 1899. \$7 50

Volcanoes. Their Structure and Significance. By T. G. Bonney. 12mo, cloth. 317 pages. Illustrated. New York, 1899. \$2 00

Water Supply. The Elements of Water Supply Engineering. By E. Sherman Gould. 8vo, cloth. Illustrated. New York, 1899. \$2 00

Wiring. The Internal Wiring of Buildings. By H. M. Leaf. With many illustrations and diagrams. 12mo, cloth. 198 pages. London, 1899. \$1 50

MUNN & CO., Publishers,

SCIENTIFIC AMERICAN OFFICE,

361 Broadway, New York.

THE Scientific American Supplement.

PUBLISHED WEEKLY.

Terms of Subscription, \$5 a Year.

Sent by mail, postage prepaid, to subscribers in any part of the United States or Canada. Six dollars a year, sent, prepaid, to any foreign country.

All the back numbers of THE SUPPLEMENT, from the commencement, January 1, 1876, can be had. Price, 10 cents each.

All the back volumes of THE SUPPLEMENT can likewise be supplied. Two volumes are issued yearly. Price of each volume, \$2.50 stitched in paper, or \$3.50 bound in stiff covers.

COMBINED RATES.—One copy of SCIENTIFIC AMERICAN and one copy of SCIENTIFIC AMERICAN SUPPLEMENT, one year, postpaid, \$7.00.

A liberal discount to booksellers, news agents, and canvassers.

MUNN & CO., Publishers, 361 Broadway, New York.

TABLE OF CONTENTS.

	PAGE
I. CHEMISTRY.—Solubility of Copper in Gelatin Solution.....	20276
The Nature of the Elements.—By Dr. CURT SCHMIDT.—9 illustrations.....	20282
II. ELECTRICITY.—An Extraordinary Telephone Accident.—1 illustration.....	20275
The Cost of Electricity from Isolated Plants.	20275
III. EXPOSITIONS.—A Visit to the Exposition of 1900.—6 illustrations.....	20271
Plan of the Pan-American Exposition.—Electricity Building, etc.—2 illustrations.....	20274
IV. LITERATURE.—The Doctor Outside of Medicine.—By WILLIAM L. STOWELL, M.D.	20284
V. MARINE ARCHITECTURE.—Is the Steering of the Modern Screw-Propelled Vessel Defective?—By the late Capt. CORNELIUS W. MCKAY.—1 illustration.....	20280
VI. METALLURGY.—Bessemer Steel Production in 1899.....	20279
VII. MISCELLANEOUS: Selected Formulas.....	20276
Trade Notes and Receipts.....	20276
VIII. ORDINANCE.—Krupp Central-Pivot Gravity and Spring-Return Carriages for Naval Ordnance.—6 illustrations.....	20278
IX. PHOTOGRAPHY.—On Mounting Prints Without Cocking.....	20281
Porcelain and Watch Dial Pictures.	20281
X. TECHNOLOGY.—Sugar from Watermelons.....	20276
The Value of Para Rubber.....	20276

Automobiles

The SCIENTIFIC AMERICAN for May 13, 1899, is devoted mainly to illustrations and detailed descriptions of various types of horseless vehicles. This issue also contains an article on the mechanics of the bicycle and detailed drawings of an automobile tricycle. Price 10 cents.

The following copies of the SCIENTIFIC AMERICAN SUPPLEMENT give many details of Automobiles of different types, with many illustrations of the vehicles, motors, boilers, etc. The series make a very valuable treatise on the subject. The numbers are: 732, 979, 993, 1053, 1054, 1055, 1056, 1057, 1058, 1059, 1075, 1078, 1080, 1082, 1083, 1099, 1100, 1113, 1122, 1178, 1195, 1199, 1206, 1210. SUPPLEMENT No. 1229 contains a highly interesting article giving full data as to operating costs of horse and electric delivery wagons in New York city. Price 10 cents each, by mail. For sale by all newsdealers, or address

MUNN & CO., Publishers,

361 Broadway, - - - New York City.

BUILDING EDITION OF THE SCIENTIFIC AMERICAN.

Those who contemplate building should not fail to subscribe.

ONLY \$2.50 A YEAR.

Semi-annual bound volumes \$2.00 each, yearly bound volumes \$3.50 each, prepaid by mail. Each number contains elevations and plans of a variety of country houses; also a handsome

COLOR PLATE.

SINGLE COPIES - - - 25 CENTS EACH.

MUNN & CO., 361 Broadway, New York

PATENTS!

MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN, continue to examine improvements, and to act as Solicitors of Patents for Inventors. In this line of business they have had over fifty years' experience, and now have unequalled facilities for the preparation of Patent Drawings, Specifications, and the prosecution of Applications for Patents in the United States, Canada, and Foreign Countries. Messrs. Munn & Co. also attend to the preparation of Caveats, Copyrights for Books, Trade Marks, Reissues, Assignments, and Reports on Infringements of Patents. All business entrusted to them is done with special care and promptness on very reasonable terms.

A pamphlet sent free of charge on application containing full information about Patents and how to procure them; directions concerning Trade Marks, Copyrights, Designs, Patents, Appeals, Reissues, Infringements, Assignments, Rejected Cases, Hints on the Sale of Patents, etc. We also send, free of charge, a Synopsis of Foreign Patent Laws showing the cost and method of securing patents in all the principal countries of the world.

MUNN & CO., Solicitors of Patents,
361 Broadway, New York
BRANCH OFFICES.—No. 625 F Street, Washington, D. C.