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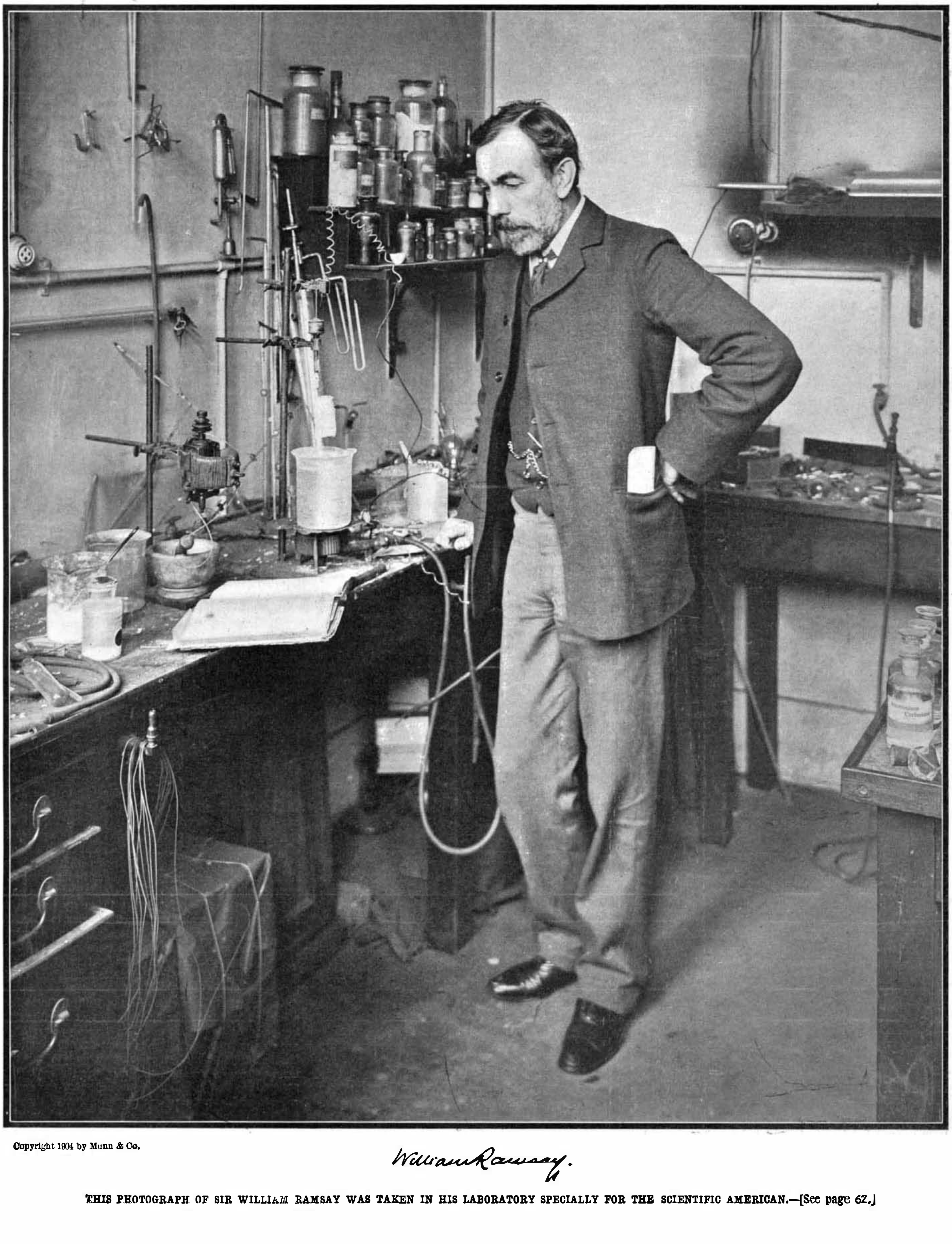

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William Ramsay.

THIS PHOTOGRAPH OF SIR WILLIAM RAMSAY WAS TAKEN IN HIS LABORATORY SPECIALLY FOR THE SCIENTIFIC AMERICAN.—[See page 62.]

The *modus operandi* is as follows: The observatory directors have to study the registering apparatus before and after the ascension, and see that the ascension is properly made. As soon as a telegram is received announcing the place where the balloon has fallen, the director proceeds thither, takes notes as to the descent, and removes the balloon and apparatus. Upon returning to the observatory, he fixes the diagram with gum-lac dissolved in alcohol, makes a detailed report upon the meteorological conditions previous to and during the ascent, and sends the whole to Prof. Hergasell, superintendent of the Meteorological Institute of Strasburg. At Strasburg the various diagrams obtained at the different aeronautic stations are studied and the results thereof coordinated. The material is afterward published in a special organ entitled "Veröffentlichungen der internationalen Kommission für wissenschaftliche Luftschiffahrt."

The balloons employed are double, i. e., they consist of an upper bag 6½ feet in diameter, inflated with hydrogen to a tension so calculated as to cause it to burst when it reaches an altitude of 12 or 18 miles. The lower bag, on the contrary, is much less inflated, and is simply designed to act as a parachute when the other bursts. It carries the car and the exploring instruments, viz.: a thermometer, a barometer, and a hydrometer. These apparatus, through a clockwork movement, register different lines upon a revolving drum coated with lampblack.

In Italy, the first experiments were made on March 3 and April 14, 1904, and were directed by Prof. Camillo Alessandri, superintendent of the Meteorological and Geodynamical Observatory of Paris. This place was selected as the Italian station for sending up registration balloons because it is situated in the immense plain of the Po, far from mountains and the sea.

On the 3d of March the weather was so bad that it was impossible to take any other photograph than the one representing the members of the commission. On the contrary, we are indebted to the courtesy of Prof. Alessandri for a series of views of the ascension of April 14, two of which represent different phases thereof. Another represents the car with the registering apparatus, and another still the psychrometer, the thermometer, and the barometer tracing curves upon a cylinder coated with lampblack, along with the diagram of April 14.

The ascension of the 14th gave a very good diagram of the pressure. The minimum ordinate corresponds to a pressure of 82 millimeters (3.228 inches) of mercury in ordinary weather. The curve of the humidity (the highest of the three) is also very characteristic. The pen of the thermograph unfortunately ceased to operate at about two-thirds of the altitude. It takes the cylinder one hour to make an entire revolution. It is therefore impossible to introduce into the barometric indications the desired correction of temperature, and, consequently, to say what was the maximum altitude reached by the balloon, and what was the lowest temperature. This, however, is of but relative importance.

The experiment of March 3, on the contrary, reveals a new fact, and that is that, contrary to what has hitherto been thought, the temperature above 12 miles altitude appears to remain constant. This first result, should it be confirmed, will well inaugurate the series of experiments directed by Prof. Alessandri, from whom there is much to be expected in this matter, since it is under his direction, also, that is being built, at 14,092 feet above sea level, the observatory of Monte Rosa, which will be the highest one in Europe, and perhaps in the world.

SIR WILLIAM RAMSAY.

BY THE ENGLISH CORRESPONDENT OF THE SCIENTIFIC AMERICAN.

The eminent English scientist, Sir William Ramsay, whose name is so intimately associated with the new element radium, is a born chemist. He has always lived and moved in a scientific atmosphere. His grandfather was a large manufacturing chemist; his father was also intimately connected with the science, though he practised as a civil engineer, while his mother's father and brothers were all physicians and chemists.

Sir William Ramsay is one of the world's youngest scientists, being only fifty-two years of age. He is a Scotsman by descent and was born in Glasgow in 1852. His uncle, who was a sugar planter, when he died left his library to young Ramsay's father. This library contained a selection of books on chemistry, one of which exercised a peculiar fascination for the youth. This was "Graham's Chemistry," which Sir William says he "read with great eagerness while he was a youngster," and which he describes as "clear and interesting as a novel." Curiously enough, some years later this scientist stepped into the shoes, as it were, of the master who had been his inspiration—professor of chemistry at London University College, an appointment formerly filled by Prof. Graham.

Sir William Ramsay received his primary education at the Glasgow Academy. From this he passed to the Glasgow University. When the time arrived for him to select his profession he decided to adopt medicine, and entered the laboratory of an analyst to gain his elementary knowledge. His spare time he devoted to attending lectures on chemistry at the University, and particularly patronized the lectures of Lord Kelvin, in whose class he secured the third prize.

At nineteen years of age he left Glasgow and went to Tübingen University, where he remained two and a half years and eventually secured his degree. He was twenty-one years old when he returned to England and became assistant to the technical chair of chemistry at the Andersonian University, which post he occupied for two years.

In 1874 he was appointed tutorial assistant in chemistry at the Glasgow University. This office he filled for six years, vacating it only to succeed to the professorship of University College at Bristol. At the time of his appointment Prof. Marshall, the eminent political economist, was principal of the college, but Sir William Ramsay had only been with him a year when he resigned, and the professor of chemistry became the principal of the college in his place.

This period was one of the most arduous in the life of Sir William Ramsay. He not only filled the principal's chair and carried out those official duties, but he continued his chemistry lectures as well, and filled the dual office for some six years. In 1887 the chair of chemistry at the University College, London, fell vacant, and Sir William Ramsay was appointed to the office, a position which he accepted, and forthwith resigned his Bristol appointments.

Sir William Ramsay may be said to have first brought himself to the public notice by his brilliant discoveries of unknown and unsuspected constituents of the atmosphere—discoveries made partly with the collaboration of Lord Rayleigh. As a reward for their labors these two scientists were awarded the Hodgkins prize of the Smithsonian Institution of $10,000.

Valuable though these discoveries were, they had merely brought Sir William Ramsay to the threshold of still greater possibilities. In the spring of 1895 his attention was drawn to the experiments of Dr. Hillebrand, an American chemist who had succeeded in deriving a new gas from certain minerals. The features of this gas caused the discoverer to advance the theory that the minerals from which he had prepared this gas were the constituents of argon.

Sir William Ramsay followed up Dr. Hillebrand's investigations and procured a quantity of these minerals. He heated them, and eclipsed his previous effort by obtaining helium. The characteristic line of this gas had been found in the solar spectrum by the French astronomer Janssen as far back as 1868, and had been designated helium by Profs. Frankland and Lockyer. Sir William Ramsay, however, was the first scientist to obtain it.

In 1897 in the course of an address before the chemical section of the British Association for the Advancement of Science at Toronto, Sir William Ramsay further stated that there were three other gases which had so far resisted discovery. Furthermore, he was so bold as to describe some of their most salient characteristics. This was a bold assertion to make, even for an expert chemist, and Sir William Ramsay must have been exceptionally confident of deriving them. Such a feat of prophesy has only once before been equaled. This was by Prof. Mendeljeff of St. Petersburg, the enunciator of the law of periodicity. The three gases which Sir William Ramsay so described before their actual discovery, were neon, krypton, and xenon.

In five years Sir William Ramsay had discovered no less than five new elements in the air—a remarkable achievement, the value of which may be more comprehensively gaged from the fact that from 1863 to 1875, a period of twelve years, only two elements had been discovered—indium in the former year and gallium in the latter.

At the present moment the scientific world is still busily occupied studying the results of Prof. Ramsay's experiments with radium, and the transmutation of metals. Prof. Rutherford and Mr. Soddy, of Montreal, suggested that it was not improbable that one of the products of decomposition of the emanation from radium salts would prove to be helium. Sir William Ramsay, in concert with these scientists, set to work to substantiate the theory, and undoubted spectroscopic evidence was obtained that helium is a product of the disintegration of the emanation.

This discovery was obtained in a peculiar manner. Mr. Soddy observed that the gas emanating from a compound of radium was not affected in any way by any chemical reagent, and that it is self-luminous. Prof. Rutherford and Mr. Soddy concluded from this fact that it was perpetually transforming, and that the luminosity was due to the parting of electrons in changing its condition. From this it was surmised that it changed into something, but the question was, What? Sir William Ramsay came to the rescue. He collected the gas of radium and subjected it to spectroscopic inspection. It was found to be peculiar. Two days later it was again examined and the spectrum of helium was observed, growing brighter and brighter as the spectrum of the gas decreased in distinctness. Ten days afterward the evolution was so far advanced that the material into which the luminous gas had changed was found. This discovery is momentous in its value; for does it not mark a new turning point in applied chemistry? At any rate, it must have been a source of peculiar satisfaction to Sir William Ramsay to discover that radium was emitting his own discovery, helium.

Sir William Ramsay is a most skillful mechanician. As he invariably works with such infinitesimal quantities, the experiments necessitate the employment of delicate and special apparatus. All this Sir William makes himself, as it would take too long to inculcate another workman as to his requisitions. He has even devised a new method of glass blowing in order to obtain the special minute vessels he requires for his researches. Some idea of the small quantities of material with which this distinguished scientist works may be gleaned from the fact that in some of his recent radium investigations, Sir William was using less than a cubic millimeter of gas, a quantity which could be placed in less space than a pin's head. This accumulation was the result of two months' work, from which one can estimate the rarity of radium.

Few men have received more decorations than Sir William Ramsay in recognition of their scientific achievements. That rare award, the Hoffman foundation gold medal, which is bestowed only once in five years upon a foreigner, was presented to him for "distinguished work in the field of general chemistry, particularly for the discovery of new ingredients in the air." This medal was instituted in 1888 and is called after the celebrated German chemist of whom, curiously enough, Sir William Ramsay was formerly a pupil. The English scientist was the first man to whom the medal was presented.

He is also an officer of the Legion of Honor, and a corresponding member of the Institute of France. He is furthermore an honorary member of all the leading scientific associations both in Europe and this country.

He has contributed numerous scientific papers dealing with his discoveries and their influence upon present scientific knowledge. The most important of these publications are those dealing with "The Molecular Surface-Energy of Liquids"; "Argon, a New Constituent of the Atmosphere," written in conjunction with his collaborator in this discovery, Lord Rayleigh; "Helium a Constituent of Certain Minerals"; "Neon, Krypton, and Xenon, Three New Atmospheric Gases"; and more recently several papers concerning the phenomena of radium. He is also the author of two text books on chemistry, as well as "The Discovery of the Constituents of the Air."

Although he is a busy worker, Sir William Ramsay yet finds time to indulge in his recreations, which comprise cycling, the study of languages, and mountaineering. He is also a great lover of music, and is an accomplished player upon the violin.

A New Satellite of Saturn.

In 1899 Prof. William H. Pickering, from an examination of photographs taken for the purpose with the 24-inch Bruce telescope, discovered a new and faint satellite of Saturn, having a period of about a year and a half. (See H. C. O. Circular No. 43.) A further discussion of a large number of photographs has served to determine the elements of its orbit. Eleven photographs taken by Mr. Frost at the Arequipa station, under the direction of Prof. Bailey, enable us to follow the satellite from April 16 to June 9, 1904, and to correct its ephemeris. A full discussion by Prof. Pickering will appear in a few weeks in a forthcoming volume of the Annals. Meanwhile, to enable astronomers elsewhere to observe it at once, its position, angle, and distance from Saturn may be stated to be on July 14, 77.4 deg. and 17.8 min.; on July 24, 79.8 deg. and 14.3 min.; and on August 3, 1904, 84.0 deg. and 10.5 min., respectively. EDWARD C. PICKERING.

The Current Supplement.

"Steel Making at Ensley, Alabama," is the title of the article which opens the current SUPPLEMENT, No. 1490. Excellent illustrations accompany the text. An article on the origin of radium explains in a popular way the elementary philosophy of radio-activity. Some interesting experiments in forcing plants by ether are described by the Belgian correspondent of the SCIENTIFIC AMERICAN. Messrs. C. E. Stromeyer and W. B. Baron conclude their discussion of water-softening apparatus. "Fertilizer from Fish Waste or Refuse" is the title of a most instructive article by C. H. Stevenson. Of archeological interest is an essay by Harlan I. Smith on a costumed human figure from Tampico, Washington. Many illustrations accompany this article. Emile Guarini, who has made a special study of the use of electricity in agriculture, was commissioned to deliver a course of lectures on electroculture by the Minister of Agriculture of Belgium. An abstract of his lecture is given. "The Recent Progress of Tanning as a Chemical Industry" is made the subject of an exhaustive paper by J. T. Wood. The first series of articles by the Paris correspondent of the SCIENTIFIC AMERICAN on the cars in the Gordon Bennett Cup Race is published. Some extracts from a paper by J. Campbell Morrison on peat as a fuel may be found of value to those who are at all interested in fuels. The usual science notes, electrical notes, and consular notes will also be found in the SUPPLEMENT.

Electrical Notes.

An amalgamation of the patents of the De Forest and Maskelyne wireless telegraph systems has been effected. The object of this combination is to employ wireless telegraphy as a feeder to cable telegraphic systems. Indisputably there are numerous opportunities for the operation of either communication in the capacity as a feeder to cables, and over short distances. In co-operation with the cable companies, it is proposed to link isolated islands with the nearest cable stations, and to develop wireless communication between ships and shore, and between vessels at sea. This combination will strengthen both systems. As is well known, the De Forest apparatus is a sound recorder, the messages being received on the principle of a telephone, while on the other hand the Maskelyne system is a tape recorder. By this amalgamation, therefore, either system will be available according to requirements

At a recent meeting of the Elektrotechnischer Verein, Berlin, Dr. Reichel, chief engineer to the Siemens-Schuckert Werke, read a paper on the Berlin-Zossen experiments. In connection with the difficulties attendant on the transmission of electric energy to large railway systems, Dr. Reichel referred to the work done by the Siemens & Halske Company and the Siemens & Schuckert Werke. Experiments with high-tension alternating current for the operation of electric railways were begun as far back as in 1897, on a suggestion by Mr. Wilhelm von Siemens, with a view to ascertaining the working conditions of high-speed electric railways. Provided a means be found to transmit amounts of energy as high as 2,000 to 3,000 kilowatts to rapidly-moving cars, the problem may be solved in any special case. The Gross-Lichterfelde experiments, undertaken with this view, afforded a basis for the well-known Marienfelde-Zossen experiments, commenced immediately afterward (in 1900). As a transmission of a high-tension current to the car did not offer any unsurmountable difficulties, endeavors were eventually made to use not only three-phase but also single-phase alternating current for the operation of railways. As regards the respective advantages of single-phase alternating and continuous currents, Dr. Reichel thinks the conditions of each special plant to be the only means of realizing these. He accordingly does not deem it advisable wholly to abandon continuous-current operation, the more so as material improvements, especially with respect to the increase of tension, are possible on these lines also, while many years' experience will, on the other hand, be necessary to fully realize the properties of single-phase alternating-current operation. The best means of securing this experience would be, according to Dr. Reichel, to install some electric railway systems using this novel kind of current.

The electric weld is becoming a more and more important factor in many industries. During recent years the extension of its application has been steady, and each year has witnessed its entrance into new fields. Sometimes, indeed, new manufactures, or new ways of obtaining results, have been based upon its use. The electric welds under consideration are the results of the operation of uniting two pieces of metal by what is known as the Thomson process, first brought out by the writer and rendered available in commercial practice a considerable number of years ago. The rapidity, flexibility, cleanliness, neatness, accuracy, and economy of the electric process has won for it such an important standing in the arts that many future extensions in its application are assured. The uniformity of the work, the control of the operation, the extreme localization of the heat to the particular parts to be united, and the fact that the process is not limited to iron and steel, but can deal equally well with other metals, such as copper, brass, bronzes, and even lead, are characteristics of the electric welding operation. In the wagon and carriage industry the process is applied in the production of tires of all sections, axles, hub, spoke and sand bands, fifth wheels, shifting rails, steps, shaft iron, etc., while it has found a large use in the welding into continuous strips or bands of the wires inclosed in rubber tires for holding them in place. The larger part of the dash-frames used in carriages in the United States are now probably made by electric welding, while iron and steel agricultural wheels are built up, or have their parts united, by electric welds. To enumerate the many applications to the bicycle industry would be almost to catalogue most of the metal parts of this useful machine. It must be borne in mind, too, that a welding machine, slightly modified, is equally applicable for locally heating parts in electric brazing or hard soldering, for upsetting, and for bending or shaping. In the wire industry the part played by electric welding is already quite important, and becomes steadily more so. Besides the mere simple joining of wires of iron, steel, or copper into long lengths, the welding of wire or strip into hoops for barrels, tubs, pails, etc., is supplanting the older forms. Numerous machines are in operation turning out electrically-welded wire fence, much as a loom turns out cloth.—Elihu Thomson, in Cassier's Magazine.

Rapid Coaling of Warships in Port.

The British Admiralty are endeavoring to expedite the coaling of warships while in port. It is imperative in case of hostilities, when a warship has to return to its naval base for fresh fuel supply, that such replenishment should be carried out as rapidly as possible, in order to permit the vessel to return to the scene of operations, or proceed on its journey. For this purpose the navy department is acquiring special floating coal depots of different types and dimensions, adaptable to various ranges of operations.

The latest type of this floating coal reservoir has been delivered to the dockyard at Portsmouth. It has been constructed by Messrs. Swan, Hunter & Co., of Wallsend-on-Tyne, and is of huge dimensions. The depot is constructed for carrying 12,000 tons of coal, and is sufficiently large to enable two first-class battleships or four smaller vessels to be berthed alongside and coaled simultaneously. The actual coaling operation is accomplished by means of Temperley transporters, three of which are erected upon each of four platforms with which the depot is provided. The depot will be moored at a suitable place in the harbor. Its advantage over projecting piers is that it can be towed to any desired position whenever required. With this type of coaling reservoir the fuel will be transported to the bunkers of the war vessels with much greater celerity and ease than is at present possible.

Another type of coaling device which has proved highly successful is what is known as the "haulabout." These haulabouts are plain steel hulls, similar to barges, with hatchways extending nearly across the vessel. Fitted to each haulabout are two self-contained Temperley traveling tower transporters, the beams of which have a very long over-reach on either side, and are sufficiently high to take coal from a large collier, and deliver it directly to the boat deck of the largest battleships or cruisers, if necessary. For the purposes of transshipping the coal from the colliers to the hold of the haulabout, the towers are made to travel the full length of the vessel. Thus they command the full extent of the hull of the barge both in filling and discharging. The capacity of a haulabout is 1,000 tons of coal.

Each tower of the transporter is fitted with a steam boiler and special engine for hoisting and conveying the load, for raising and lowering the overhanging parts of the beam, and for propelling the tower along the rails. This engine is also fitted with gearing and lifting tackle for removing and replacing the hatch covers, which are picked up and carried to the end of the vessel by traveling the towers along in the usual way.

These haulabouts have been specially designed to provide a coaling vessel of considerable storage capacity, capable of being hauled about from vessel to vessel, where it can either supply coal from its own hold, or be used for discharging coal direct from the collier to the vessel to be coaled. The vessels are capable of filling their own holds, either from colliers or from the shore, for which purpose they are supplied with automatic dumping buckets.

Pyro Rays Given Off by Incandescent Wires.

M. Tommasina has been making a series of researches upon the radio-activity which is produced by incandescent wires, and brings out some phenomena of a novel character. He finds that the wire gives off three different kinds of rays. The observations were made upon the loss of electric charge produced by a metallic wire heated to redness by a current and placed parallel to the metal disk of an electroscope or between the two plates of a condenser. In the latter case one plate is connected to ground, and the other to the electroscope. Under these conditions he observes various phenomena of loss of electric charge, and these can only be attributed to a radio-activity which is induced by the emanation from the incandescent wire. In observing the nature of these emanations he finds three kinds of rays which he designates as α, β, and γ, and calls the phenomenon "pyro-radio-activity." In the case of the α rays, the emission is stopped by even the thinnest screen of any kind of material. In free air it seems to diffuse, with a strongly-marked tendency to follow the lines of electric force. It transports a positive charge. The β rays will traverse a very thin screen of paper or aluminium (which absorbs the greater part, however) and they carry a negative charge. These forms of radiation, which he calls "pyro-rays," cause a strong ionization of the air. They produce the discharge of an electroscope no matter what may be the sign of its charge, and will traverse a hermetically-closed recipient of cardboard. In the latter case their action is diminished, however. They will also produce an induced fluorescence of a platinocyanide of barium screen, to a slight degree. The pyro-rays are given off in great quantity from an incandescent platinum wire and also by a disruptive discharge between any metallic wires.

Automobile Notes.

The report of the motorcycle endurance test held July 2 to 7, and consisting of a round trip run from New York to Albany and back, followed by a run to Cambridge, Md., has just been made. An average speed of 15 miles an hour was easily maintained. The miniature automobiles made an excellent showing. The five machines that scored the best in the complete test were 1¾-horse-power "Indians," which had respectively 1,317, 1,310, 1,309, 1,308, and 1,306 points to their credit. Their nearest competitors were a 1½-horse-power "Rambler" (1,296 points), and two 2¼-horse-power "Columbias" (1,295 and 1,292 points respectively). Besides the road endurance tests, a gasoline consumption test was held, in which a Yale-California machine covered 55 miles on one quart of fuel at a cost of about a mill a mile. The tests have thus thoroughly demonstrated the practicability, utility, and cheapness of the American motor bicycle.

The New York-St. Louis Automobile Run, under the auspices of the American Automobile Association, will start from this city Monday, July 25. The cars are expected to arrive at the World's Fair on August 10 and join in the parade which will be held the following day, which is to be "Automobile Day" at the fair. At least 100 machines will in all probability start from New York. These will be joined by others throughout the tour, and it is expected that fully 200 cars will enter St. Louis on the appointed day. A fee of $10 is charged for joining the run, and certificates will be given all cars that successfully complete it.

The greatest hill-climbing contest that has ever been held was that up Mount Washington, which took place Monday and Tuesday of last week. Some attempts at mountain climbing have been made abroad by following the roadbed of cogwheel railways, but no real mountain climbing contest over a road eight miles in length, with a continuous grade of from 5 to 20 per cent, has ever before been held. Some eighteen machines participated in the climb. The most sensational as well as the fastest performance was that of Harry Harkness on his 60-horse-power Mercedes, which conquered the mountain in 24 minutes, 37 3-5 seconds. F. E. Stanley, one of the pioneer inventors of the steam automobile in America, made the next best time in a 6-horse-power steamer. This was 28 minutes, 19 2-5 seconds. A 2-horse-power Metz motor bicycle covered the distance in the excellent time of 34 minutes, 11 3-5 seconds. The best performances in the class for vehicles weighing between 1,000 and 2,000 pounds were those of a 24-horse-power Peerless (26 minutes, 6 4-5 seconds, 2 minutes being allowed on account of a delay caused by another machine being in the way); a 10-horse-power White steamer (42 minutes, 19 4-5 seconds); and a 20-horse-power, 3-cylinder Phelps (47 minutes, 20 2-5 seconds). A 12-horse-power Columbia machine did the climb in 51 minutes, 50 2-5 seconds, while a 16-horse-power Rambler dropped out with a broken transmission. For vehicles under 1,000 pounds, a 6-horse-power Oldsmobile made the very good time of 1 hour, 20 minutes, 46 seconds. Two specially-built light steam cars were second and third in this class in 2 hours, 16 minutes, 55 seconds, and 2 hours, 25 minutes, 51 2-5 seconds respectively. In the free for all class, Mr. James L. Breeze, in a 40-horse-power Mercedes, climbed the mountain in 31 minutes, 22 4-5 seconds; and Otto Nestman, in a 7-horse-power Stevens-Duryea, in 40 minutes, 45 seconds. What made the test of particular value was that the machines were all stock cars. Besides the mountain-climbing contest, several 100-mile tours through the mountains were made during the remaining days of the week.

A new form of endurance test that has developed of late is the non-stop run. By this is meant a trip during which the engine of the automobile is never stopped. The longest run on record of this kind is one of 2,017 miles, made recently in England on a Talbot car. The run consumed 5 days and 4 hours, during all of which time the engine ran continuously. Several attempts of this sort have been made in this country, but so far they have not been successful.

A queer order has been placed with a firm of Sheffield (England) manufacturers by an Oriental potentate for the supply of a bedroom suite made throughout of solid silver. The designs are of Oriental character, and most elaborate. The suite comprises a bedstead, cabinet, dressing table, one dozen chairs, three footbaths, and three hot-water cans.