Correspondence.

The Ambulance Bicycle.

To the Editor of the Scientific American:

Under the caption of "A New Use for the Bicycle," in your issue of 25 ult., credit is given for its introduction and invention as an ambulance to a Dr. Honig, of Berlin. This seems to be an error, for the first ambulance bicycle, with litter, splints, and medical outfit, was designed and invented nearly two years ago by the Medical Director of the Naval Hospital at Chelsea, Mass., and application was made to the Pope Manufacturing Company, of Boston, to introduce it into that city. G.

Chime Whistles on Passenger Engines.

To the Editor of the Scientific American:

In your issue of May 18, 1895, appears a short article on this subject. In this article the principal reason for urging the use of gong whistles on passenger locomotives has been entirely overlooked. To the traveler it is a very common sight to see the waiting passengers come pouring from the waiting room on hearing the whistle of a coming locomotive, which, to their discomfort, is only an incoming freight. The passengers may repeat this a few times before hearing the proper whistle, which must also be inquired after or investigated.

I have learned to distinguish the whistle of the passenger locomotives which concern me most, and although I may be several blocks from the depot I know just how much to quicken my pace if I desire to meet them. It is to be hoped that other roads will lose no time in profiting by the good example set by the Pennsylvania Railroad. L. C. Mann.

Electricity in the Bleaching of Textile Fibers.

BY LOUIS J. MATOS, CHEMICAL ENGINEER.

Of all the many and varied uses to which the electric current is put, there is none of more interest to the textile chemist than its application to bleaching. It should be explained at the outset that electricity per se is totally devoid of any bleaching properties, and that the textile chemist simply avails himself of the property of the electric current to effect certain chemical decompositions, which he is able to utilize advantageously in his art.

The earliest attempts to use electricity for this purpose are somewhat clouded in obscurity, but it is certain that the credit for the first commercially available resultsare due to Mr. Eugene Hermite, the inventor of the process I am about to describe in detail.

The bleaching liquor employed in this process is produced by the action of the electric current upon an aqueous solution of a metallic chloride. The one found to be most desirable, owing to its greater econo mical value, is that of magnesium, although the chloride of calcium or of aluminum may be used with the same result. As will be readily understood, upon pass ing a current through such a liquid, there occurs a simultaneous decomposition of the chloride present and the water. The result of this electrolytic action is the simultaneous liberation, at the positive pole, of chlorine and oxygen. These two gases—in the nascent state—unite at the positive pole, with the production of an unstable compound possessing, to a very great degree, effective decolorizing properties. Simultaneously also, at the negative pole, the action of the current liberates magnesium, and as the magnesium instantly decomposes an equivalent of water, we obtain, as products of this reaction, hydrogen and oxide of magnesium.

Now, if we add to the electrolyzed solution, or bleach bath, some vegetable fiber—for example, digested and washed wood pulp—the natural coloring matter of the fiber is destroyed by the highly oxidizing power of the chlorine-oxygen compound previously mentioned, and the chlorine, which is now set free, immediately unites with the hydrogen, forming hydrochloric acid, and this, in turn, in the presence of the magnesium oxide, dissolves that substance, re-forming the original salt in solution. After the pulp has become sufficiently bleached, the liquor is drained off, run back into the decomposing or electrolyzing vat, and, after the addition of a small quantity of fresh magnesic chloride, it is ready for another operation, on passing the current. The pulp only requires to be washed, as is ordinarily done at the present time in the common bleaching powder process, and then ready for conversion into paper.

Thus we see that but two elements are consumed in the operation—electricity and the coloring matter of the substance to be bleached.

The electrolyzer, which is the most important piece of apparatus in the plant, consists of a vat or tank, of galvanized iron, provided with a tube of zinc, perforated with holes, in order to facilitate the circulation of the liquors. The negative electrodes are made of zinc in the shape of disks, and are secured to horizontal shafts, which, by proper gearing, are caused slowly to revolve. Between each pair of these disks are placed the positive electrodes, each of which consists of an ebonite frame, holding, with the necessary firmness, a net or perforated strip of platinum. Each of these pieces of platinum is soldered by its upper edge to a piece of lead and is completely isolated. Every frame of the positive poles communicates by means of a piece of lead to a bar of copper which traverses the electrolyzer.

The bar of copper to which the positive electrodes are attached is in communication with the positive pole of the dynamo. The current is distributed through all the electrodes of platinum, and passes through the liquid to the disks of zinc forming the negative electrodes, which are connected by means of the tank or vat with the negative pole of the dynamo.

In order to maintain the negative electrodes at the proper distance apart, ebonite blades are fastened to the positive electrodes. At the lower portion of the box or tank is a gate or door, which permits of access to the apparatus for cleaning; a valve is also provided for drawing off the liquor, should this become necessary.

When several electrolyzers are employed in a battery, the negative pole of one is connected to the positive pole of the next in the series, and so on to the last one.

The current strength ordinarily employed in the electrolyzer is from 1 to 1·2 amperes, and with a corresponding electro-motive force of 5 volts. Instruments for measuring the strength of the current are placed in the circuit, and give at any moment a record of the force utilized.

The electrolyzers require no special attention. About once in every month the apparatus is thoroughly cleansed with water applied by means of a rubber hose through the door previously mentioned; it is not necessary to dismantle it for the purpose. The wear of the electrodes, in consequence, is very slight.

The conductors, which join the electrolyzers and which bring the current from the dynamo, are made of bars of commercially pure copper; the cross sectional area of these bars varies with the distance between the dynamo and the electrolyzer.

It is always advisable to locate the dynamo and the electrolyzer as close to each other as possible.

The Dynamo.—For this work a very strong type of machine is required, and it should be so constructed as to be capable of yielding its maximum duty—running day and night.

The Bleaching.—Bearing in mind the remark previously made respecting the peculiar action of chlorine upon animal fibers, it will be understood that the electrolytic process is inapplicable to them. We will confine our remarks, in consequence, to the bleaching of vegetable fibers, in connection with which much has already been accomplished with the process, and where there is still room for important improvements.

The fiber of most importance is, of course, cotton, and of this I shall speak first.

Cotton occurs in the form of a silky hair, which, when examined under the microscope, is revealed to us as a flattened tube, more or less twisted, and of a pearly white color. It consists almost wholly of cellulose, with certain admixtures natural to it, such as moisture, several coloring matters—collectively termed "endochrome" oils—and a certain amount of inorganic salts. The quantities of these admixed substances peculiar to cotton are small, but, in the processes of converting the crude fiber into a manufactured product, certain other substances are added, such as oils, fats, starches, sizes, mineral matters, etc., all of which must be removed before the goods can be properly bleached. To do this it is necessary to subject the goods to a preliminary boiling or scouring.

Electrolytic Bleaching of Slubbing.—In this state, cotton is difficult to bleach, owing to the mechanical obstacles, nevertheless it is done, and with remarkable success. Preliminary scouring is out of the question, and the electrolyzed solution is allowed to act directly on the material. The contained waxy matters, and those which are insoluble, are not acted upon by the solution, but the latter causes a decomposition of the coloring matter, which is converted into carbonic acid. The pectic acid is changed into a soluble pectate of magnesia, and the remaining mineral matters are dissolved. The greatest difficulty encountered is in causing the liquid to penetrate evenly into every part of the slubbing, but this is overcome by the use of pressure.

The length of time required for the immersion varies according to the color of the cotton treated, to the degree of white desired, and also to the amount of chlorine and oxygen contained in the solution. Compared with the old method of immersion in the chloride of lime solution, the time can be very greatly prolonged without injury to the fibers. After bleaching, the cotton is removed, and carefully washed with water slightly acidulated with sulphuric acid; this is followed with a rinse, the excess of water is removed, and the stuff is finally dried in the ordinary way.

Electrolytic Bleaching of Cotton on Cops and Bobbins.—Some difficulty is experienced in successfully bleaching yarn that is wound upon tubes or spools, wing to the resistance offered by the threads when superposed, but, by employing the conditions advised for the bleaching of slubbing, the difficulty is overcome. The cotton is acted upon by the bleach liquor of suitable strength, and, owing to the rapid action of the solution, the fibers are bleached during the ingress of the liquid.

Electrolytic Bleaching of Yarn and Cloth.—These offer the fewest obstacles. Yarn is bleached in a series of tanks supplied with the solution of constant strength from the electrolyzer. Cloth is similarly treated, except that it can be passed through the bath in a continuous form.

Electrolytic Bleaching of Linen and Hemp.—These fibers differ very much from cotton in the amount and nature of the extraneous matters which they contain. Linen is made from the fibrous part of the flax plant. The flax fibers are bound together by a cement like substance, which must be removed in order to isolate the individual fibers. The removal of this substance constitutes the very important process of "retting," of which several methods are carried on. The oldest and perhaps the best known is the retting by fermentation, which is a kind of rotting of the ligneous matter. After this is removed, the subsequent operations of bleaching and dyeing are in order. It has been found that if these fibers are subjected to the action of the electric current in the bleach tank, the oxygen, which is given up very readily, oxidizes the constituents of the vegetable cement, converting them into resinous bodies, and thereupon at once proceeds to exercise its bleaching powers. When the fibers have assumed a yellowish or reddish color, the oxidation is finished, further treatment in the electrolytic bath is stopped, the material is removed and subjected to the action of boiling caustic or carbonated alkalies, either with or without pressure. This boiling operation effects the more or less complete removal of these resinous bodies, and leaves the fiber in a very clean and free condition, ready for further treatment. To bleach, all that is now necessary is to subject the fibers to a simple passage through the electrolytic solution, when a white of extreme brilliancy is obtained, and a silky feel is imparted to the fibers, which can be obtained by no other process, if the fibers have been retted in the ordinary manner.

Electrolytic Bleaching of Linen Threads.—Threads made of electrically retted fibers are of great purity, containing, besides cellulose, the natural coloring matter, and the residues of the vegatable cement, and, from what has preceded, it is easily seen that the bleaching of yarns is devoid of any difficulty. In comparison with the ordinary bleaching powder process, that of Hermite has the decided advantage that the liberated gases, which do the bleaching, do not, as is the case in the old method, act injuriously upon the fibers. A modification of cellulose—termed "oxy-cellulose"—is formed in the old process, which is responsible for a considerable loss of fiber.

Electrolytic Bleaching of Jute.—This fibrous substance is one of a group closely allied to linen, but it has been quite impossible to bleach it on account of its feeble resistance to oxidizing agents. By way of comparison, I will describe the method generally in use, at the present time, for bleaching this substance:

The goods are scoured in a bath containing half of one per cent of silicate of soda, and kept at a fair heat; next they are washed and passed through a bath of sodium hypochlorite, containing about one per cent of available chlorine; then well washed, passed through a weak bath of hydrochloric acid, and washed again. The bleaching by the Hermite process, which resembles that for linen, consists in the preliminary removal of the cutose and vasculose (vegetable cement) by conversion into resinous bodies, and the extraction of these by treatment with soda or other alkali. The actual bleaching is done by means of the electrolyzed solution, worked in a tank, in the same manner as with the ordinary chloride of lime process.—Textile Industries.

The Pottery Tree.

One of the most peculiar vegetable products of Brazil is the Moquilea utilis, or pottery tree. This tree attains a height of 100 feet, and has a very slender trunk, which seldom much exceeds a foot in diameter at the base. The wood is exceedingly hard, and contains a very large amount of silica, but not so much as does the bark, which is largely employed as a source of silica for the manufacture of pottery. In preparing the bark for the potter's use, it is first burned, and the residue is then pulverized and mixed with clay in the proper proportion. With an equal quantity of the two ingredients, a superior quality of earthenware is produced. This is very durable, and is capable of withstanding any amount of heat. The natives employ it for all kinds of culinary purposes. When fresh the bark cuts like soft sandstone, and the presence of the silex may be readily ascertained by grinding a piece of the bark between the teeth. When dry it is generally brittle, though sometimes difficult to break. After being burned it cannot, if of good quality, be broken up between the fingers, a mortar and pestle being required to crush it.

Our Country's Progress as Seen by a Foreigner.

The English statistician, Michael G. Mulhall, publishes, in the June number of the North American Review, an article on "The Power and Wealth of the United States." Mr. Mulhall's conclusion is that:

"If we take a survey of mankind in ancient or modern times as regards the physical, mechanical, and intellectual force of nations, we find nothing to compare with the United States in this present year of 1895, and that the United States possess by far the greatest productive power in the world."

Mr. Mulhall shows that the absolute effective force of the American people is now more than three times what it was in 1860, and that the United States possess almost as much energy as Great Britain, Germany and France collectively, and that the ratio falling to each American is more than what two Englishmen or Germans have at their disposal. He points out, by a careful comparison between the conditions in these different countries, that an ordinary farm hand in the United States raises as much grain as three in England, four in France, five in Germany, or six in Austria. One man in America can produce as much flour as will feed 250, whereas in Europe one man feeds only thirty persons.

Mr. Mulhall calls special attention to the fact that the intellectual power of the great republic is in harmony with the industrial and mechanical, eighty-seven per cent of the total population over ten years of age being able to read and write.

"It may be fearlessly asserted," says he, "that in the history of the human race no nation ever before possessed 41,000,000 instructed citizens."

The post office returns are appealed to by Mr. Mulhall in support of this part of his statement, these showing that, in the number of letters per inhabitant yearly, the United States are much ahead of all other nations.

According to the figures of Mr. Mulhall the average annual increment of the United States from 1821 to 1890 was nine hundred and one millions of dollars, and he adds that "the new wealth added during a single generation—that is, in the period of thirty years between 1860 and 1890—was no less than forty-nine milliards of dollars, which is one milliard more than the total wealth of Great Britain."

Classifying the whole wealth of the Union under the two heads, urban and rural, Mr. Mulhall finds that rural or agricultural wealth has only quadrupled in forty years, while urban wealth has multiplied sixteen-fold. Before 1860 the accumulation of wealth for each rural worker was greater than that corresponding to persons of the urban classes; but the farming interests suffered severely by reason of the civil war, and since then the accumulation of wealth among urban workers has been greatly more than that among rural workers, a fact which Mr. Mulhall thinks explains the influx of population into towns and cities.

In a series of figures Mr. Mulhall shows that the "rise in wealth and increase in wages came almost hand in hand." In dealing with the development of farm values, he makes the following statement:

"If the United States had no urban population or industries whatever, the advance of agricultural interests would be enough to claim the admiration of mankind, for it has no parallel in history."

The Almaden Quicksilver Mines in Spain.

The complete statement of the work done at the Almaden quicksilver mine for the year 1894, as given by the Revista Minera, is important and of much interest. During the year there was excavated at Almaden 6,680 cubic meters of ore, and only 561 cubic meters of barren rock had to be taken out. Most of the mineral was obtained in the crosscuts and galleries on the 12th level, and it was on this level that most of the stoping has been done during the year. The permanent work required the construction of 8,309 cubic meters of masonry in the various galleries and chambers. In weight the extraction for the year amounted to 19,428 metric tons of ore and 1,828 tons of barren rock.

In the furnaces of the Almaden during the year 1894 there were 18,744 tons of ore treated, which produced altogether 44,521 flasks of quicksilver, representing a total weight of 1,535,988 kilos. of quicksilver, the average yield of the mineral treated having been 8·19 per cent. This shows an improvement over the preceding year, when the yield was only 7·82 per cent. The furnaces were run for seven months of the year, having been shut down through the hot season, from May to September inclusive. The highest yield reported was 8,059 flasks, in December, and the lowest 2,912 flasks, in October.

A NAUTICAL BICYCLE.

La Ilustracion Española y Americana describes a new boat invented by Don Ramon Barea, of Madrid, which is said to pass over the water with ease and rapidity. This machine is composed of two cases of steel, which serve as floats and are connected by cross bars. In the space between the two, and near the stern, is a paddle wheel operated by pedals something like a bicycle.

This nautical bicycle weighs about 100 pounds. Its construction will be readily understood by a glance at our engraving. The machine was lately tried with much success. Mr. Barea demonstrated the facility with which he was able to pass over the water on his machine. The vessel is steered by a small rudder at the stern. The speed which can be obtained is about six miles per hour. The apparatus is well spoken of in Paris. It may be used upon lakes and rivers with success.

Examples of aquatic contrivances, something like the above, have heretofore been published in the SCIENTIFIC AMERICAN. In our numbers for November 8, 1890, and February 14, 1885, illustrations will be found.

A NAUTICAL BICYCLE.

Egyptological.

The tomb of Senmut, the famous architect of the temple of Queen Hatasu, has just been discovered by Mr. Newberry, of the Fund, and Professor Steindorff at Gurneh, consisting of three chambers elaborately decorated.

Professor Petrie announces that he has discovered the graves and remains of a hitherto unknown race on the soil of Egypt, and that his work the past season produces results "filling the greatest blank in Egyptian history." He claims for them a period between the fourth and twelfth dynasties. This, if true, dispels the notion, at first conveyed, that he had found evidences of a prehistoric race. He thinks the race a cross between the Libyans and the Amorites. They used metal and flint, and the variety of fineness of their pottery is surprising. Further and established evidences of this remarkable discovery, between Ballas and Negada, will be welcomed by the anthropological world.

Professor Adolf Erman, Ph.D., has just accepted the position of vice-president of the Egypt Exploration Fund for Germany.

The Ashmolean Museum, at Oxford, has been enriched by the chief results of the excavations last year at Coptos by Mr. Petrie, which he considers to have yielded prehistoric fragments of archaic sculpture and terra cotta. Among the sculptures are the colossal head of a bird, a lion's head, and the head of the god Minz, the rest of whose statue is en route. We cannot assert these remains to be prehistoric, but may indulge the fond belief that they belong to Egypt's mythic era.

Captain H. G. Lyons, R.E., of the Fund, has presented the same museum with stelæ of the twelfth dynasty, found on the site of the temple at Wady Halfa, and with two hieratic stelæ from the village of Mut in the Dakhla oasis, which refer to the artesian wells in that district and the water supply.

The value of the Archæological Survey department of the Egypt Exploration Fund, whose chief mission is the recording of important inscriptions, which are being constantly obliterated, is well illustrated in a letter from Professor Sayce. At El-Kab, near an ancient well and under the cliff, he found a platform of rock which had been cut for the foundations of a chapel of some size. Here he discovered many texts relating to the Old Empire, including one of special value, as it gave the names of two temples built on the spot in the period of Pepi of the sixth dynasty. One of them was named Kenb-set (Corner of the Mountain). The texts are so numerous that weeks of labor would be required to transcribe them.

At Esneh, the recently found paintings in two subterranean Coptic churches, Dr. Sayce says, are already nearly destroyed by the fanatical Arabs. Of the few still untouched paintings, he writes that "one representing the Virgin and Child is especially good, though it will probably have been destroyed by the Mohammedan iconoclasts before this letter reaches England."—W. C. W., Boston Commonwealth.

Ampere's Induction Experiment.

At a recent meeting of the Physical Society, Prof. S. P. Thompson read a note on "A Neglected Experiment of Ampere."

Ampere, in 1822, made an experiment which, if it had been properly followed up, must have led to the discovery of the induction of electric currents nearly ten years before the publication of Faraday's results. While attempting to discover the presence of an electric current in a conductor placed in the neighborhood of another conductor in which an electric current was flowing, Ampere made the following experiment: A coil of insulated copper strip was fixed with its plane vertical, and a copper ring was suspended by a fine metal wire so as to be concentric with the coil and to lie in the same plane. A bar magnet was so placed that if an electric current was induced in the suspended ring, a deflection would be produced. No such deflection, however, was observed.

In 1822, in conjunction with De la Rive, Ampere repeated this experiment, using, in place of the bar magnet, a powerful horse shoe magnet. He describes the result in the following words: "The closed circuit under the influence of the current in the coil, but without any connection with this latter, was attracted and repelled alternately by the magnet, and this experiment would, consequently, leave no doubt as to the production of currents of electricity by induction if one had not suspected the presence of a small quantity of iron in the copper of which the ring was formed." This closing remark shows that they were looking for a permanent deflection. When, however, Faraday's results were published in 1831, Ampere, after again describing the experiment made in 1822 by himself and De la Rive, says: "As soon as we connected a battery to the terminals of the conductor, the ring was attracted or repelled by the magnet, according to the pole that was within the ring, which showed the existence of an electric current produced by the influence of the current in the conducting wire."

The Spider's Web.

The spider is so well supplied with the silky thread with which it makes its web that an experimenter once drew out of the body of a single specimen 3,480 yards of the thread—a length but little short of two miles. A fabric woven of spider's thread is more glossy than that from the silkworm's product, and is of a beautiful golden color.