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TESTING THE PARTS OF A MODERN BICYCLE.

The American bicyclist has become a most exacting judge of the qualities of a wheel. He insists on perfect finish, silent running, and lightness, and at the same time, on good roads and bad, gives the wheel the most severe trials imaginable. In England and on the Continent riders are perfectly satisfied with wheels weighing from 30 to 50 lb.; here bicycles must weigh from 18 to 26 lb. The consequence is that American wheels must be of the highest standard, or they will be accounted low grade by the rider.

To meet this condition of things, the Pope Manufacturing Company, the makers of the world-famous "Columbia," have established a system absolutely unique in the bicycle world; namely, a testing department, where every article which enters into the construction of a bicycle can be tested with the highest degree of accuracy. Samples of the tubing are subjected to direct and vibratory strains to see if it possesses the desired mechanical qualities, and analysis of the same sample shows how far those qualities are determined by, and can be predicated upon, chemical composition. Steel balls are broken to test what they will stand; cranks, sprockets and chains are experimented with to ascertain the best shape and material for each. Spoke wire is fractured and its data are fixed.

The greatest difficulty encountered in bicycle building is in maintaining the model originally designed in unvarying exactness of strength and material through hundreds and thousands of machines. It requires the highest engineering skill and the widest mechanical knowledge to design a bicycle that will run with smooth accuracy under all sorts of varying conditions, but, when this is done, what assurance has the buyer that the machine he receives is an exact duplicate of the original so carefully designed? Only the most rigid testing of materials and sample parts through all the processes of manufacture can prevent the substitution of inferior material or variations from prescribed pattern. Of course no such test will be satisfactory which does not destroy the piece tested, and so samples picked at random are used for the purpose.

With the heavy wheels of a few years ago, such painstaking tests as are now deemed essential to determine the exact material and construction of every part were not required, but with the modern wheel the pleasure of the rider, and his safety, depend upon it.

The accompanying illustrations clearly show the de-

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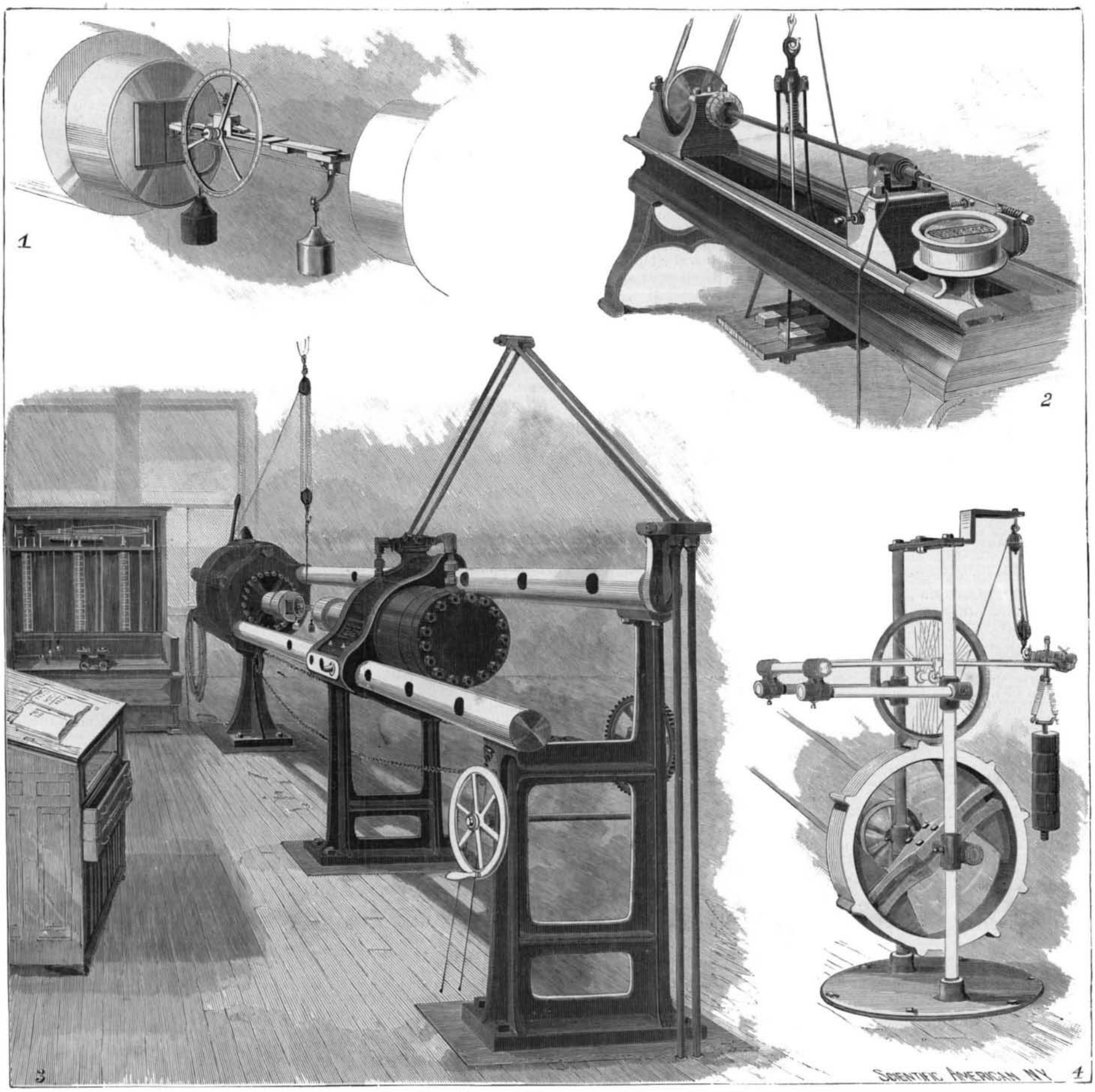

TESTING THE PARTS OF A MODERN BICYCLE.

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(Continued from first page.)

tails of the machines used for effecting these tests, and we believe they will be of interest to our readers.

The bridge engineer, weight not having to be measured by ounces, allows an ample margin for safety in his work, yet prescribes for his steel the most rigid requirements. With the excessively small factor of safety of a bicycle, the Pope Manufacturing Company have felt that such exactitude of requirement was more than ever essential. Accordingly the steel used in the construction of their wheel is ordered by certain data that years of testing have shown to be proper, and specimens have to be supplied for examination. It is analyzed in the laboratory, its percentage of carbon, phosphorus, sulphur and nickel being determined, and none is accepted that does not come within a very rigid limit of toleration. The records of this testing department must be valuable beyond price.

Testing the crude material for acceptance is a small part of the work of the testing department. Every portion of the wheel is constantly being tried under all sorts of conditions as a guide to manufacture and design. To apply direct tensile, compressive and transverse strains, the great testing machine, an Emery hydraulic machine, built by the William Sellers Company, is used.

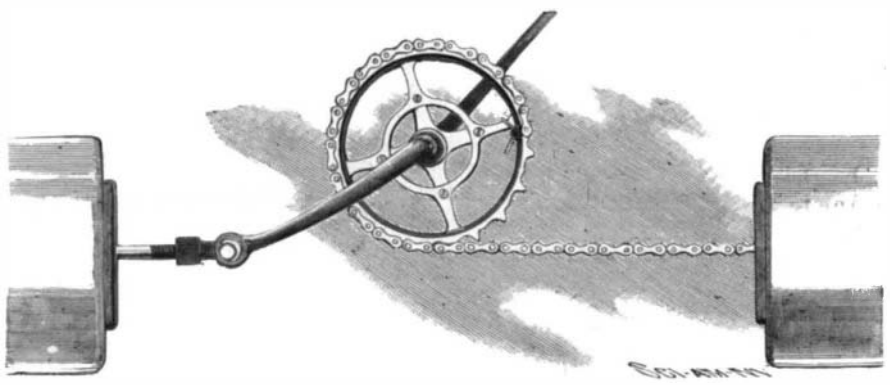
This machine has a capacity of 100,000 pounds strain and attains an accuracy of an ounce or less. The machine is a model on a small scale of the great Watertown Arsenal machine, already described in our columns, and represents the highest order of testing mechanism that has ever been devised. In the large illustration we show the great engine with its elaborate system of weight mechanism in the case ready for work, and another cut shows a very ingenious piece of apparatus used to measure the elongation of a specimen before fracture. An accurate steel roller is held between two planes of steel. These planes can move over each other, the roller rolling in one or in the other direction. At the outer ends of the planes of steel are V-shaped knife edges and points used to afford a fixed bearing upon the sample. The roller carries an aluminum wheel with graduated periphery. As the bearing points are pulled apart, the roller turns, the wheel rotates and the amount of its rotation measures the elongation or separation of the points to one ten-thousandth of an inch. Spoke wire is all carefully tested, cranks, sprockets and all parts of the wheel and chain are here subjected to various classes of strains. One of the cuts shows the test of the combined crank, sprocket and chain, the test being, of course, always pushed to destruction. Another illustration shows the tubing test on the vibratory strain testing machine. The piece of tubing is rotated in a lathe, a counting indicator being attached to its end to show the number of revolutions which it makes. A weight, varying from 25 pounds to 225 pounds, rests so as to produce a deflection of 0·09 to 0·30 inch. The tube rotates by the hour, the line of deflection constantly varying and passing through the 360 degrees of a full circle at every rotation, and after millions of turns it succumbs. The number of turns indicates the quality. This machine has been in constant operation for four years, and has demonstrated that high carbon steel is superior to all other materials, except nickel steel, for the tubing for bicycle frames. The latter, which works in the drawing mill with the greatest difficulty, seems to surpass everything yet tried in its power to resist strains, and is used for the most critical portions of the Columbia bicycle. Ordinary tubing, such as is purchased in the open market, yields long before the high carbon Columbia tubing.

The wheel test, shown in another cut, speaks for itself. Here a regularly mounted wheel is pressed by a weight of 180 pounds against a rotating wheel on whose perimeter are secured blocks so as to represent as it rotates the roughest kind of road. Making 106 revolutions per minute, a speed equivalent to 13½ miles is given to the wheel, and the test, if carried on for a long enough period, infallibly reveals any weakness in the specimen, and locates it.

The laboratory, with enameled brick walls, Becker balance, evaporation chambers and the most modern appliances, is a model for chemists. The whole department was organized under consultation with leading experts and investigators at home and abroad. Its operations are in charge of Mr. Henry Souther, formerly of the Pennsylvania Steel Company.

In addition to the testing department, the uniformity of workmanship is maintained by means of an elaborate inspection of each part of the bicycle after every operation through which the work passes. Experts in each process are employed for the purpose, and there are at present 584 different inspections required upon a Columbia and its component parts, not including the final inspection and examination of the finished bicycle before shipment.

All of this work, and the design and preparation of improvements and new models, is in charge of a council of expert engineers and mechanics, who hold regular meetings and to whom is left the decision of every detail of design and the processes of manufacture. One man alone is not deemed to be fitted to deal with so complicated a problem as the modern bicycle, and, therefore, safety is sought in a multitude of counselors.



TESTING CRANK, SPROCKET AND CHAIN.

Vitality of the Diphtheritic Bacillus Out of the Body.

Flugge, in his Grundriss der Hygiene, published in 1889, stated that the microbes of diphtheria retained their virulence for ten days in the form of dust and from four to six weeks if dried in dense layers; but in a paper on the means by which the disease is spread, which appeared in the Archiv fur Hygiene in 1894, he expresses his incredulity as to aerial diffusion of diphtheria beyond the range of personal intercourse, on the ground that the degree of desiccation required for the floating and conveyance of the bacilli in currents of air would be fatal to them.

Roux and Yersin and Pernice and Scagliosi had carried out some experiments with portions of the membrane, but Carlo Reyes, deeming these unsatisfactory, since it was not by such means but rather by the saliva, mucous discharges, and similar fluids that the infection took place, undertook an inquiry into the subject, using pieces of linen or cotton, silk, paper, sand, and finely pulverized and sifted earth, which he saturated with emulsions in water of pure cultures of great virulence. These materials were allowed to dry spontaneously and were then exposed to light or were kept in darkness in air of the normal humidity at ordinary temperatures, or maintained in a state of saturation; and in atmospheres artificially dried by H_2SO_4 or kept at a constant temperature of 37° C. His results, which appear in the Annali d'Igiene Sperimentale, show that in chemically and absolutely dried air Loffler's bacilli died in all cases within a few hours, forty-eight at the most; that light had, as a rule, but little influence; that under other conditions they retained their vitality on silk and paper for a few days only in dry, and for about a week in moist air.—Lancet.

Should One Sleep After Eating?

We would not now revert to this oft-discussed question to give any one's theoretical views or personal beliefs in the matter, or to bring forward the familiar argument that because animals sleep just after they have eaten, hence the human animal should do the same says the Medical Record. Dr. Schule, of Fribourg (La Med. Mod., January 15, 1896), has, however, approached the subject from the chemico-experimental side, and his results are worthy of record. Having analyzed the stomach's contents in two normal subjects a few hours after meals, some of which were followed by sleep and others not, he finds that sleep has for its constant effect the weakening of the stomach's motility and at the same time there is an increase in the acidity of the gastric juice. On the other hand, simple repose in the horizontal position stimulates the motive function of the stomach, but does not increase the acidity of gastric juice. The conclusion is hence reached that, while one should stretch himself out for a rest in the horizontal decubitus after a hearty meal, he should resist the tempting Morpheus, especially if there be present a dilated state of the stomach or if its juices be hyperacid.

Swedish Exhibition.

Kuhlow's German Trade Review states that the arrangements for the Stockholm Exhibition have been completed. It will take place in 1897, and everything is now being done to make it as representative and comprehensive as possible. Matters are being pushed ahead with much vigor, and all parts of the country appear to take the keenest and most active interest in the success of the undertaking. The exhibition will contain sections devoted to engineering, machinery, shipbuilding, electricity, scientific appliances, etc. It is added that the site of the exhibition, about which there was at one time much disagreement, has now been decided in a satisfactory manner.

Glass Blowing—Offhand Work.

The art of glass blowing before the lamp is now being carried on in the Royal Prussian Museum of Mechanical Arts in the same manner in which it was practiced by the old Venetians during the most flourishing period of their glass industry. The famous glass artist, Fr. Zitzmann, of Wiesbaden, occupies a room in the museum, in which he produces from his stock of glass tubes of different strength and color by blowing those fine and delicate drinking vessels, carafes, vases, etc., as are seen in the numerous collections of old Venetian glass. Similar products of more recent date are being manufactured again in Venice and Murano since 1860, when the industry was revived by Salviati, and by the Rhenish Glass Co. of Cologne—Ehrenfeld. These factories are operating on a large scale, and with the assistance of all the appliances that modern technology can furnish. Zitzmann, on the other hand, works without any moulds or patterns, using nothing but a few absolutely necessary tools. Otherwise he relies entirely on his sense of form, which is developed to extraordinary keenness. It is extremely interesting to watch him at his work, and observe how fast and sure the numerous articles, so different in shape, size and decoration, are created by him. A large number of his products are on exhibition in the museum. While the drinking glasses destined for use show forms just and delicate and elegant as pure, the artist has been tempted by his great virtuosity in overcoming all technical difficulties to overload some of the larger ornamental vessels exhibited with too much by-work. This ought to be avoided, if the article shall not lose its practical value. The demand for such fancy glassware in Europe is very fair at present.

Conversion of a Tree into a Newspaper in One Hundred and Forty-five Minutes.

We take from the Centralblatt fur Oesterreich-ungarische Papier-industrie the following account of a curious experiment:

A very interesting experiment was made on April 17 last at Messrs. Menzel & Company's paper and wood pulp manufactory, at Elsenthal, in order to ascertain what was the shortest space of time in which it was possible to convert the wood of a standing tree into paper, and the latter into a journal ready for delivery. This experiment is of extreme importance, because it shows what rapidity can be attained by the concurrence of practical machines and favorable conditions.

Three trees were felled in a forest near the establishment at thirty-five minutes past seven in the presence of two of the owners of the manufactory and a notary whom they had called upon to certify as to the authenticity of the experiment. These trees were carried to the manufactory, where they were cut into pieces 12 inches in length, which were then decorticated and split. The wood thus prepared was afterward raised by an elevator to the five defibrators of the works. The wood pulp produced by these machines was then put into a vat, where it was mixed with the necessary materials. This process finished, the liquid pulp was sent to the paper machine. At thirty-four minutes past nine in the morning, the first sheet of paper was finished. The entire manufacture had thus consumed but one hour and fifty-nine minutes.

The owners of the manufactory, accompanied by the notary, then took a few of the sheets to a printing office situated at a distance of about two and a half miles from the works. At ten o'clock, a copy of the printed journal was in the hands of the party; so that it had taken two hours and twenty-five minutes to convert the wood of a standing tree into a journal ready for delivery.

It must be added that, during the course of the manufacture, there occurred a few interruptions which might be avoided at another time, and that, in the opinion of the two manufacturers, had it not been for this, twenty minutes might have been gained.—Moniteur de la Papeterie.

A Costly Epidemic.

The ravages of the rinderpest in South Africa are said to be more appalling than any cattle plague which has affected the region within living memory. As an instance of the devastation wrought in Bechuanaland, it is reported that Khama, the paramount chief, who, with Bathoen and Sebele, recently visited England, has lost from his private herds alone, 8,000 head of cattle. At Pitsani, at last advices, the cattle were dying by the hundred daily, and Dr. Hutcheon, who has just concluded a tour of inspection, is reported to have declared that unless something occurs to stay the infection—which seems very unlikely—not a single cow will, within a few weeks, be left in the Bechuanaland Protectorate. It is estimated that the cost of the plague will be over £5,000,000. To the South African native cattle are a medium of exchange and staple diet.—London Daily News.

An Inscription on the Parthenon.

Consul Horton, of Athens, writes to the consular department, March 5, 1896: I have to report an archæological discovery of extreme interest recently made by a student in the American School of Classical Studies, of this city. I refer to the deciphering of an inscription on the architrave at the east end of the Parthenon. The face of the eastern architrave is thickly dotted with small holes, and for many years scholars have been under the impression that these holes were the traces of nails which had once held fast the letters of an inscription. It had also been suggested from time to time that a study of the nail holes might give some clew as to the letters themselves, which long ago were torn down, doubtless for the sake of the metal which they contained.

The difficulty of such a task, which has defied the archæologists until now, is evident. The architrave is about 100 feet long, and the holes extend over 90 feet of its length. They dot thickly spaces from 3 to 4 feet in length, between which are circular blanks, where shields about 4 feet in diameter hung at intervals. Various attempts have been made, chiefly by German archæologists, to "read the nail holes." The most notable of the methods employed have been photography and transcribing with the aid of magnifying glasses.

No attempt met with any success until Mr. Eugene Plumb Andrews, of the American School, hit upon a practical method. He threw a rope over the eastern end of the ruined building, and pulled up a rope ladder. Then he suspended a swing in front of the architrave 37 feet from the marble step below, and took what is known as a "squeeze" of the holes. His method was ingenious. Damp "squeeze" paper was first applied to the surface of the stone, and patted well down with a brush. The paper broke through over the holes. Mr. Andrews then forced extra strips into each of the openings and lapped their ends down on the large sheet. When he had thus treated all the holes, he laid another sheet over the first to hold the ends of the strips in place, and pounded all together into one solid sheet, on which the exact position of the nail holes was represented by protuberances.

Mr. Andrews was about one and a half months making his squeezes, twelve in all, representing the twelve spaces between the shields. Then he arranged them in order and began studying them. His greatest difficulty occurred at the start. He did not know whether the inscription ran straight across all the squeezes or whether the squeezes were to be read separately, as the pages of a book.

Moreover, the ancient workman who had nailed up the letters had made numerous mistakes, so that many of the holes were treacherous and confusing.

Mr. Andrews, however, persisted, and light began to dawn. He found, for instance, that three holes placed thus ∴ indicated either a △ or a Λ, the metal letter having been nailed at its three corners, and that three holes placed thus ⁘ showed where an O had been nailed.

He made a transcript of the squeezes on a long strip of paper, marking the locality of the protuberances with dots, and then attempted to form the ancient letters by drawing lines from dot to dot. Finally, he deciphered the word "Autokratora," which proved that the inscription had been Roman, and not, as formerly supposed, of an earlier date. The word "Nerona" threw further light on the matter.

Here was evidently the dedication of a statue to the Emperor Nero, and the reading was simplified by a study of other similar inscriptions, as the same phraseology is used in all. The inscription, as Mr. Andrews reads it, is translated substantially as follows:

"The council of the Areopagus and the council of the six hundred and the people of the Athenians erect this statue of the Very Great Emperor Nero Cæsar Claudius Sevastos Germanicus, the Son of God, during the generalship over the hoplites for the eighth time of Claudius Novius, the overseer and lawgiver, son of Philinos, during the priestess-ship of . . . daughter of . . . ."

It appears, therefore, that the inscription recorded the erection of a statue to Nero, probably in the Parthenon.

As it is known from another inscription that Claudius Novius was general for the eighth time in the year A. D. 61, we have the exact date of this inscription.

Mr. Andrews graduated at Cornell in 1895, and holds the university fellowship for one year. There are at present twelve students in the American School.

RECENTLY DISCOVERED BUST OF LOUIS XVII.

BY HENRI MORAND.

During the "Reign of Terror," it will be remembered that Louis XVI and Marie Antoinette, as well as their son, the Dauphin, were held prisoners in the Temple. On the 21st of January, 1793, the King was beheaded, and the Queen met with the same fate shortly afterward. The Dauphin was intrusted to the care of the cruel shoemaker jailer, Simon, who made the child the

BOURBON WAX DOLL OF THE LAST CENTURY IN NANTUCKET MUSEUM.

subject of his ill treatment, and, it is said, caused his death on the 8th of June, 1795.

Many, however, believed that the body of a poor boy was substituted for that of the Dauphin, and that, with enormous sums, the Emperor of Austria, his grandfather, succeeded in bribing Simon, who allowed the child to escape to that country, where he was brought up by a village watchmaker, of the name of Neuendorf, who taught him his trade. At the age of twenty, having obtained cognizance of his high birth, he tried to have himself recognized by the court of Austria, but was ignored.

CONTEMPORANEOUS PORTRAIT OF LOUIS XVII.

BUST OF LOUIS XVII RECENTLY DISCOVERED.

He then returned to the village of his youth, married, and later removed to Holland, where he and his family were protected by a secret hand. The sons of Neuendorf entered the Hollandish army and became officers. In the cemetery of Maestrecht his tomb bears, it is said, the following inscription: "Ici repose Louis XVII, roi de France, né à Versailles le 1785, mort à Maestrecht. Priez pour lui."

A book was published, years ago, by Harper & Company, the title of which was: "Have we a King Among Us?" The story tells us that the Dauphin was taken to Florida and brought up by an Indian family. One day, as the Dauphin was taking a bath, he struck his head against a rock. This accident made him forget his past history. Later he was adopted by a missioner among the Indians, followed the same profession, and was known as Rev. Mr. Williams.

Nantucket, Mass., has also its "Dauphin" in the "History Rooms," which is supposed to be a facsimile of Louis XVII when a baby. It is a wax doll, natural size, brought back from France by Captain Coffin, to his daughter, in 1789. There seems to be no doubt that the features are those of the Bourbon family.

A few months ago, as some workmen were making room for some improvements in the palace of Versailles, they discovered the defaced bust of a child. The nose, mouth, and chin broken, undoubtedly by the vandals of the French revolution. After many researches by scientific people, Monsieur de Nolhac, the custodian of the Musée de Versailles and author of "La reine Marie Antoinette," discovered, beyond doubt, that it was no less than the Dauphin of France, or Louis XVII, and the work of one of the most distinguished French sculptors of the time, Deseine.

The French government had the mutilated parts restored and it is now in the above named museum.

Recovery of Silver and Gold from Photographic Residues.

The American Druggist translates from the Neueste Erfindungen und Erfahrungen an original contribution by Weidert as follows:

Analysis of finished photographs shows that only a very small portion of the gold and silver used in their preparation remain in the finished print, by far the greater portion of the metals being retained in the baths.

The methods of recovery of silver residues vary with their character. The silver from old fixing baths can be recovered in the simplest manner. By hanging strips of copper or zinc in the baths the silver will be deposited on the strips in a grayish black powder or in small leaflets of a metallic luster. This method, however, is tedious and extravagant, since a large portion of the silver remains in this solution. A somewhat better method is to agitate the bath after the addition of zinc dust, and then filter off the precipitate, wash, and then treat with diluted sulphuric or hydrochloric acid in order to dissolve out the valueless zinc. This process also is not particularly to be commended.

It is generally customary to precipitate the silver with an aqueous solution of potassium sulphide, and drain the brownish black sulphide of silver on a muslin filter and dry it. In order to reduce this to silver, it is fused with calcined soda in a porcelain or graphite crucible and poured upon an iron or marble slab.

The sulphide of silver can also be roasted in the atmosphere, then mixed with three or four parts of potassium nitrate and introduced carefully in small portions into a glowing crucible.

In order to recover the silver from the paper clippings, etc., which have not been "fixed," the paper residue should be cut into small pieces and put for two hours into a bottle where the old fixing bath is kept. This bath is then filtered and treated as above directed.

Since all photographic silver paper contains, in addition to the silver chloride, easibly soluble silver nitrate, the first wash water from the toning in particular should be collected and the silver precipitated by the addition of hydrochloric acid and sodium chloride. After drying, this should be reduced in the same manner as the silver sulphide, by the means of potassium or sodium nitrate. One may also pour over this precipitate a five per cent solution of hydrochloric or sulphuric acid, and then hang in the solution a piece of zinc, whereupon the silver is thrown down in the metallic form.

Gold is generally precipitated from the baths by addition of hydrochloric acid and a solution of ferrous sulphate. The gold is thrown down as a brownish red powder, which should be washed well and fused. Occasionally ammonium chloride is added in excess to the toning bath with some hydrochloric acid. The gold then precipitates out after a short time (if in a warm place and particularly in light) in the form of metallic glistening scales.

A CRUSADE against hokey-pokey has been going on in London for some years past, shocking accounts of the millions of microbes found in the mixture being published from time to time. A member of the health board, however, analyzed a strawberry ice cream bought of one of the most fashionable West End caterers recently, and found that it contained from eight to fourteen million bacteria to the cubic centimeter, among them the bacillus coli, which is a worse record than that of the Italian street venders.