Correspondence.

Preservation of Hard Wood Handles.

To the Editor of the Scientific American:

I handle a great many hard wood handles for hammers, axes, etc., and I find that I lose a great many annually from the ravages of a little insect or wood borer, which thoroughly honeycombs a handle in a very short space of time, leaving the handle a mere shell with innumerable small holes on the outside, and grinding the inside into a powder as fine as flour. I have found it a very difficult matter to find specimens of this insect. The few that we have examined with a magnifying glass are smaller than a flea and of a milk white color, with long antennæ, although one was discovered considerably larger, about the size of a flea, and dark colored, but was the only one. I would like to ask you, 1st, the scientific name and common name of the insect; 2d, a remedy, if there is any, to prevent the destructive work of this little pest.

Los Angeles, Sept. 7, 1892. C. DUCOMMUN.

Dr. C. V. Riley, to whom we referred our correspondent's letter for reply, writes as follows:

1. There are several coleopterous insects of the family *Ptinidæ* known to infest dry hard wood that is used for handles of various implements. Since Mr. Ducommun does not send any specimens, it is impossible to name the particular species which does the damage. It is, however, in all probability, one of the powder post beetles, genus *Lyctus*, of which *L. striatulus* and *L. parallelopipedus* have been observed under conditions similar to those described by Mr. Ducommun. They are small, elongate brownish beetles, and their larvæ small, six-legged yellowish white grubs, with their bodies always curved near the tail end.

2. The beetles and their larvæ may be destroyed by immersing the infested handles in kerosene for a short time. It is quite important, however, to thoroughly disinfect in this manner all handles which show the least trace of the presence of the beetle. The entire stock of handles kept in the store should be carefully inspected from time to time. The presence of the beetles may be easily detected from the small circular holes through which the beetles have entered the wood, or from the little heaps of fine sawdust which accumulate beneath the infested handles.

The Electric Cars in Boston.

To the Editor of the Scientific American:

I have been a constant reader of your paper for over thirty years, and have never yet discovered what I thought to be an article published with a view to promote any unworthy scheme, or misrepresenting facts for the benefit of any individual or corporation.

There appears, however, in your issue of September 17 an article headed "The Trolley Electric Car," which was copied from an electrical paper, and in which the trolley system of Boston is very highly spoken of. The article speaks of the "great success" and the "enormous profits" realized by the system in Boston, and refers to the sale of the company's stock as proof of the fact. The facts in the case are that electric cars have been the greatest nuisance that was ever put into the streets of Boston. So far as improving the surface travel of the city, it has impeded it very much, and the accommodations are not as good as the former horse car service, except to parties who are riding to the suburbs or country. In the center and more immediate circles of business and travel it has blockaded our streets, with great hazard to life and property. It is impossible to calculate with any degree of accuracy when you can reach a certain point; something happens, the trolley is out of order, the fuse is burned out, or the car is off the track; so that we often find a mile of heavy cars in line, with not enough power on a single trolley wire to move but a few at a time.

Horses and men have been killed and injured by falling trolley wires, and one of the worst fires in Boston, where three or four million dollars' worth of property and several lives were lost, was set by an electric wire, which was supposed to have come in contact with the trolley system.

The telephone system has been greatly impaired by the trolley wires, and accidents have been fearful. From the last official report of the railroad commissioners, for one year, it appears there were 281 accidents, resulting in 20 deaths. The amount of damages paid by the railroad company for the last fiscal year was $149,592.42, with, perhaps, full as many more unsettled claims—an average of $407 for each day in the year. It is believed by those most familiar with the receipts and expenditures of this company, with their accident account, cost of repairs, increased capitalization, etc., that they can never earn a dividend.

The capital stock, etc., of this company has been increased from $6,400,000 to $16,400,000, with debts and liabilities amounting to $20,000,000, in four years. Although they have paid eight and ten per cent dividends on their common and preferred stock, which, of course, has carried their stock somewhat above par, yet, when you consider that in Massachusetts dividends can be paid out of capital stock or borrowed money, it is easy to see how stocks can be sold above par.

Outside of those who live a long distance from the center of the city, and get cheap fares and extra speed in the suburbs, and those who have personal interest at stake, I think the electric road would be voted out of Boston. I have no personal or private interest in this or any other company, but am simply a careful observer, with some knowledge of the cost and profits of street railway traffic. J. V. M.

Boston, September, 1892.

High Speed Photography.

Professor C. V. Boys recently gave a British Association lecture to artisans at the Synod Hall, Edinburgh, at which Lord McLaren presided.

Professor Boys explained that in the observation of moving things a so-called instantaneous view is necessary, but that, according to the nature of the subject, different degrees of instantaneity are sufficient or necessary. Thus for portraiture the magnesium flash is so sudden that an eye with the pupil wide open, as it is in the dark, has not time to contract during the time that the light lasts: while, on the other hand, a large clock face made to rotate so fast that the outside of it was traveling at forty miles an hour appeared a mere blur by this light.

In contrast to this the same rotating clock face was illuminated by a brilliant electric spark, and appeared absolutely at rest, the finest marks being clear and sharp. Therefore, in dealing with such slow speeds as forty or one hundred miles an hour, the particular electric spark made use of would last a sufficiently short time. In illustration of the application of an ordinary electric spark to the photography of bodies moving at speeds less than sixty miles an hour, Mr. F. J. Smith's experiments with intermittent sparks were referred to, and one of Lord Rayleigh's photographs of a breaking bubble was exhibited.

In illustration of the perfection to which mechanical methods may be brought, a very perfect photograph of a broad gauge express train, which passed Mr. F. J. Smith at one hundred miles an hour, was exhibited. The camera was in a train traveling at forty miles an hour, and the other train was meeting it at sixty miles an hour. The lecturer had to deal with speeds which were very much greater, so that it was by no means evident that the spark, which to such tests seemed perfectly instantaneous, lasted in reality so short a time that a bullet, for instance, would not move a visible amount before the light had ceased.

In order to investigate the duration of sparks made under different circumstances, the revolving mirror had been employed, and the method of using it was shown. It was placed about twenty feet from the screen, where a beam of light from an electric lamp was focused. If the mirror were made to turn once a second, the image was shown to travel at the rate of 240 feet a second on the screen. The electro-magnetic driving apparatus was then allowed to rotate until the mirror was turning 1,000 times a second, when the image traveled on the screen 240,000 feet a second, or about 160,000 miles an hour—nearly 200 times as fast as the bullet from a Martini-Henry rifle, the bullet traveling only thirteen times as fast as an express train.

It was thus possible to observe easily to the 1-100,000,000th of a second how long any spark actually lasted. Photographs of three sparks taken with the apparatus were exhibited, showing that such a spark as that which had just seemed to be instantaneous really lasted as much as the 1-100,000th of a second, which was far too long for the purpose of photographing rifle bullets; whereas a spark made with other apparatus was practically extinct in 1-10,000,000th of a second, and the last light died away in less than 1-1,000,000th of a second. The third spark lasted less than half of this. The second spark is the one which the lecturer had employed in his experiments.

Professor Boys then referred to the experiments of Professor Mach, of Prague, who was the first to photograph bullets successfully, and showed a diagram of his apparatus and one of the photographs which Professor Mach had sent him. He then showed and explained a diagram of his own apparatus, and a photograph of it in position in the laboratory. The apparatus itself, to the uninitiated, seeming to be of the rudest construction, consisted in the main of a rough packing case, but it was in reality more carefully designed than was apparent.

This had been brought and set up in a position as for taking a photograph, but, as was explained, owing to the moisture-saturated state of the air in the room, the glass plate could not be properly electrified. However, a bullet was sent through it from a magazine rifle on the chance that the spark would pass, and if it had, the plate would have been developed and shown in the lantern. A series of photographs of bullets, shot, and so on, taken in the last few weeks, were then exhibited, and their features explained.

A pistol bullet (750 feet a second) was the first one shown. This and the wad were clear and sharp, but no atmospheric waves were visible. A Martini-Henry rifle bullet (1,295 feet a second) was perfectly defined, and waves similar to those seen on water through the still surface of which a point is dragged were clearly defined. A magazine rifle bullet (2,000 feet a second) left a conspicuous trail like that behind a steamer, and the head and tail waves were more conspicuous than those last seen, and were more inclined to the perpendicular. The connection between the speed and the inclination of the waves, both in the case of water waves and air waves, was shortly explained, and it was shown that when the body is moving at a speed which is less than a particular speed, in each case none are found.

In illustration of this point, an aluminum bullet of 3,000 feet a second showed still more inclined waves, while the inclination was greater still in another photograph when the bullet had been fired through a mixture of carbonic acid gas and ether vapors, in which sound—that is waves—can only travel at about half the speed that it does in air.

Mr. Scott Russell's experiments on the reflection of water waves, published in the journal of the British Association of 1844, were then referred to, and it was shown that air waves may behave in precisely the same manner, being either perfectly reflected or wholly unreflected, in which case they gather strength and form a breaker, and that this depended on the inclination. Thus at a grazing incidence there is no reflection. This is the case of the whispering gallery. The lecturer also showed that the deflection of bullets near walls was likely to be less in the case of high speeds, for then the air wave, being more inclined, would be reflected instead of running ahead and increasing the resistance on one side of the bullet, as photographs showed was the case.

Three photographs of shot, fired from an ordinary fowling piece were next shown, the first from a chokebore, the second from a cylindrical barrel, and the third from the same barrel, but with a few drops of oil among the shot. These were of interest in connection with the discussion as to the longitudinal and the lateral spreading of the shot. The last series of slides showed what happened when a bullet pierced a glass plate. A series of views were taken as it gradually went through and escaped from the cloud of glass it had created. It was shown that here again the air waves about the glass plate gave information as to what the glass had been doing from the moment of the first collision to the time—in one case, 1-100th second later—when the photograph was taken. The lecturer concluded by expressing his obligation to those who had helped him in the experiments.

Cobalt Toning.

M. Alexis Redares, in a communication to *La Photographie*, relates his experience in regard to cobalt toning. He says, in place of cobalt depositing itself on albumenized paper in a metallic state, it deposits brown oxide of cobalt, and the proofs obtained are of a reddish color, and leave much to be desired. He used the following solutions:

A.

Water	1,000 cm. 3
Chloride of cobalt	10 gr.

B.

Water	1,000 cm. 3
Acetate of lime	40 gr.

100 cm. 3 of A mixed with 130 cm. 3 of B, leaving this mixture three or four days before filtering. Test by sunflower paper to find if solution is acid or basic. If acid, add drops of a 10 per cent solution of bicarbonate of lime. If basic, saturate with a 10 per cent solution of hydrochloric acid. The bath should be absolutely neuter, otherwise it will not tone. From two to three days are required to tone by this process on ordinary paper. Fix with hyposulphite as usual.

M. Redares has used in the bath acetate of lime in place of acetate of soda, which he finds has no reducing power on the salts of cobalt. He expresses hopes of perfecting the cobalt toning, and regrets he cannot yet give a formula which will tone in a couple of hours.

Apyrite, a New Smokeless Powder.

Although full information of the composition of this powder is not obtainable, it is known that nitro-cellulose enters largely into it. It is claimed that this powders burns without flame or smoke, that it can be handled and transported without danger, and that it is not affected by moisture or heat. According to the *Revue Scientifique* experiments recently made at Stockholm showed that twenty shots with apyrite did not heat the gun as much as fifteen shots with ordinary Swedish powder, or ten shots of nitro-glycerine powder. Neither does it foul the gun, 800 shots with it leaving the gun clean. The same authority states that with the new magazine gun used in Sweden, 3·5 grammes, or about one-eighth of an ounce, will give an initial velocity of 640 meters, or 2,080 feet, with a pressure of 2,260 atmospheres. The manufacture of this powder requires, it is said, neither special appliances nor buildings.

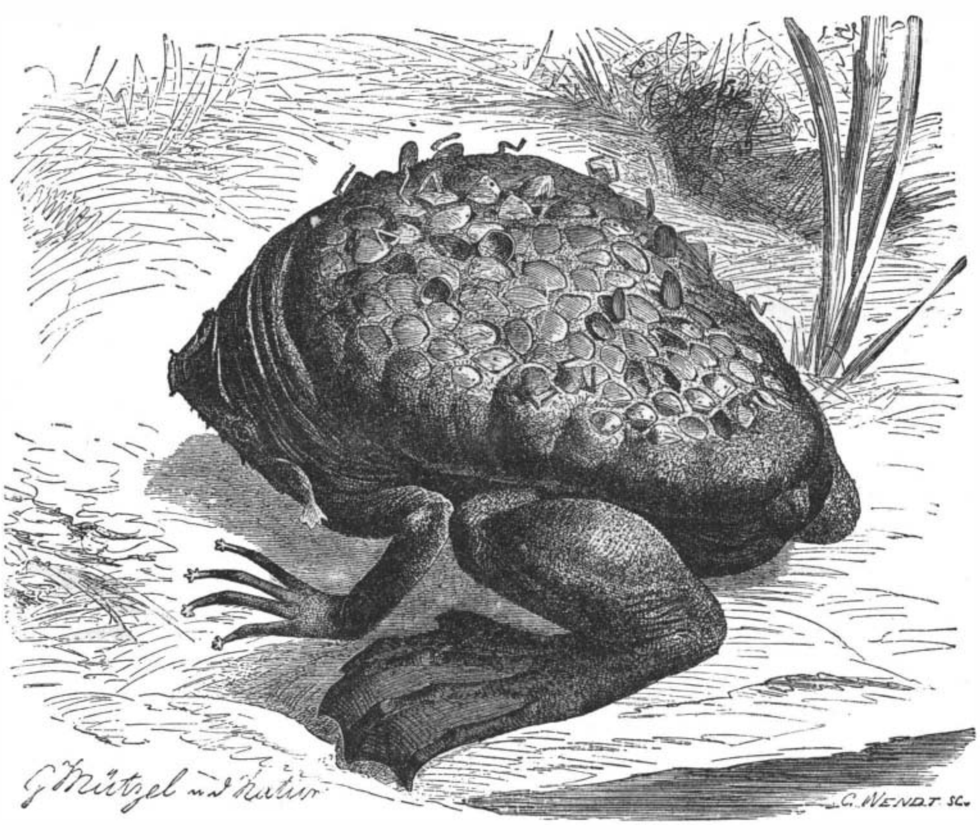
Electrolytic Process for Antimony.

According to the *Moniteur Scientifique*, Koepp, of Rheingau, Austria, has invented the following process for obtaining antimony from its ores. It consists in treating sulphide of antimony with certain salts of oxide of iron alone or in connection with haloid salts in an apparatus from which the antimony is deposited electrolytically. The trisulphide of antimony is decomposed in contact with ferric salts, sulphur is liberated, and the ferric oxide passes to the state of ferrous oxide, and at the same time antimonious oxide passes into solution. The reaction is rapid, and is complete when it takes place in the presence of free hydrochloric acid, or, better, in the presence of a haloid salt, such as common salt. The following reaction is explanatory: $2Fe_2Cl_6 + Sb_2S_3 = 2Fe_2Cl_4 + Sb_2Cl_4 + S_3$. The antimonial solution freed from the sulphur by filtration is submitted to electrolytic action, and the antimony is precipitated at the negative pole, the iron being oxidized at the positive pole, giving a solution of ferric chloride which can be used for the treatment of fresh quantities of sulphides of antimony. The anode and cathode are composed of lead plate. The bath is heated to about 50° and maintained in constant movement. In order to obtain a compact deposit of antimony, it is necessary to employ a current of 40 amperes or thereabout for each square meter of surface of the cathode.

THE PIPA AMERICANA.

This animal raises its young in a very peculiar manner. The male pipa places the eggs on the back of the female, where they are held by a secretion from the skin until each one is inclosed in a little hexagonal case shaped like the cells of the honeycomb, and developed in the skin of the mother frog. Each casing is closed by a little cover. In these little cases the sixty or seventy young of every pipa pass the eighty-two days which constitute their period of development.

The engraving is copied by the *Illustrirte Zeitung* from the seventh volume of Brehm's "Thierleben," which has lately been completely revised by Dr. Böttger.



THE PIPA AMERICANA. (ONE HALF NATURAL SIZE.)

The Washington and Georgetown New Cable Plant.

The Washington and Georgetown Street Railway Company has just equipped the Pennsylvania avenue and Fourteenth street branches of its road with a new cable plant at a cost of $3,000,000. This, together with the Seventh street road owned by this company, and already using the cable system, makes the most complete and one of the largest cable systems in the country. The company's tracks cross the entire length of the city, from east to west, over Pennsylvania avenue, and across the width of town, north and south, by double tracks on Seventh and Fourteenth streets. The entire system contains twenty-two miles of single track, all Johnson's girder rail, eighty pounds to the yard. The track gauge is 4 feet 8½ inches, and the maximum grade is 6 per cent, occurring on a stretch of about 1,000 feet, on what is known as Capitol Hill. The entire system has a capacity of four hundred cars, but only two hundred and ten in regular daily use.

The power house of the new plant is at Fourteenth and D streets, N. W. It is in the center of the business section of town, and the site, which is 141×241 feet in extent, cost alone $556,000. The ground, however, was insecure, which necessitated the sinking of two thousand one hundred piles, from 25 to 30 feet long, on which the masonry foundation was laid. The building, while plain in outline, is a handsome structure of selected red pressed brick, with red Seneca sandstone trimmings. It covers the whole of the square of ground bought by the company. It has a height of 98 feet in three stories. The ground floor and a part of the second floor will be occupied by the company for the cable plant and offices, and the remainder will be let for offices and manufacturing purposes.

The engines of the new plant are of the Reynolds-Corliss type, and are furnished by the Edward P. Allis Company, of Milwaukee. They are 36×72 inches cylinders, and 750 nominal horse power. The fly wheel is 30 feet in diameter, and weighs 100,000 pounds, and has a normal speed of fifty revolutions per minute. The 15 inch line shaft is 66 feet between the engines. Steam is furnished to the engines from a battery of eight Babcock & Wilcox boilers, of 184 horse power each. The fuel is fed to the furnace by the Rooney mechanical stokers, and the ashes are disposed of in the same way. The Berryman feed water heater is used, and all the steam connections of the building are by Blake & Williams, of New York. The driving plant was furnished by Robert Poole & Son Company, Baltimore.

Three cables are operated from the house, one known as the West avenue section, containing 23,760 feet, the Fourteenth street section, containing 27,900 feet, and the East avenue section of 31,660 feet. An auxiliary cable of 4,000 feet carries a line of cars from the main line of the road, at the foot of the Capitol, to the Baltimore and Ohio depot, by an ingenious device, the design of Mr. Upton, chief engineer of the road, and it is as simple as it is ingenious. It is practically a small driving plant on the plan of those at the power house, but minus the engine. The East avenue cable, on its way to the navy yard, is passed by a turn round the drum of this secondary driving plant, which is sunk in a vault 14 feet deep, beneath the pavement, and in this way the 4,000 feet of auxiliary cable is kept going at a rate of six miles per hour, without interfering with the rest of the line.

Besides the power house, in the center of the city, there are two new car barns, one at Mount Pleasant, the terminus of the Fourteenth street road, J. L. Parsons, Washington, D. C., contractor, and the other at the navy yard, the eastern terminus of the Pennsylvania avenue line, S. H. & J. F. Adams, Baltimore, contractors. Both these buildings are of pressed brick, with red sandstone trimmings, and are quite an ornament to the neighborhood.

The road was designed by W. B. Upton, chief engineer of the road, in consultation with Daniel Bontecou, of Kansas City, consulting engineer, and the construction was carried out under the supervision of D. S. Carll, erecting engineer.

The driving plants for the three cables at the power house are entirely independent, and by means of friction clutches any cable may be operated by either of the engines without regard to the others. The total length of the 15 inch drum shafting is 95 feet. The cable drums are 14 feet in diameter, fitted with Walker differential rims, which, in the Seventh street power house, have given wonderful service, and after two years' wear were measured but a short time ago, and failed to show a wear of $\frac{1}{16}$ of an inch. The cable drums are of six grooves each, and are both operated by a rope drive, an entirely new departure in cable construction. The pulleys on the line shaft are 9 feet 8¼ inches and those on the drum shaft are 26. On the West avenue and Fourteenth street sections the line shaft drums have seven and nine grooves in each set, but on the East avenue section, which is 3,760 feet longer than any of the others, the pulleys have twelve and fourteen grooves. The power is transmitted from the line shaft drum by "stevedore" manila ropes, to the 26 feet pulleys on the cable drum shaft. The cable is 1¼ inches, Lang lay, six pieces of nineteen strands each over a hemp core, and was made by the John A. Roebling Company.

The cable tension device is one of the most interesting features of the whole plant. It is the design of W. B. Upton, chief engineer of the road, and was designed especially with a view to remedy the surging of the cars by means of an automatic variation of the tension. It was tried on the Seventh street road for several months with entire success, and all three of the cables in the new power house are fitted with it. The tension carriage is also Mr. Upton's design.

The principle of the device is a weight, suspended between lever arms, in such a way as to bring the tension heavier or lighter on the levers, as the tension is heavier or lighter on the cable.

The cable speed will be nine miles per hour.

Work on the road was begun in May of 1891, and finished in July, 1892, but the construction was not pushed during the whole time.

The cars are operated with a grip and single trailer, or with two trailers in the crowded hours of the day. The seventy grip cars were manufactured by the John Stephenson Company. They are 14 feet long, and have a seating capacity of twenty. The one hundred and eighty passenger cars are from the American Car Company, St. Louis. The closed cars have a seating capacity of thirty-two, and the open cars will carry forty. Cars are switched at the ends of the line, no turntables being used.

The power house was designed by W. C. Root, of Kansas City, and was placed in the hands of J. E. & A. L. Pennock, contractors, of Philadelphia. All of the architectural iron work was furnished by the Champion Iron Company, of Ohio. The work was greatly delayed by the insecure ground, which necessitated the sinking of piles for the masonry foundation, and by bad weather during the winter, which hindered the brick workers.

The Washington and Georgetown Street Railway Company was organized in May of 1862, using a very poor quality of horse power on bob-tailed cars. It has grown constantly with the growth of the city, its improvements keeping well abreast of the times, in spite of occasional adverse Congressional criticisms to the contrary. The Congressional provision for the change in motive power was made just two years ago from the 6th of the present month, and was a very short time for the accomplishment of such an undertaking; but, by constant, steady work, the change was made and the first car was run over the line on the last day of the two years time limit allowed by Congress. The present officers of the road are Henry Hurt, president; C. M. Koomes, secretary and treasurer; and C. C. Sailer, superintendent.—*Street Railway Review.*

California Beer Seed.

A correspondent sends a small package containing some "California beer seed." He says: "It is used with sugar and water for making domestic beer. This sample was dried the present summer. When in its best condition it causes a brisk alcoholic fermentation, about the same as common yeast. This may not be as active as the best, but it is the freshest I can procure now, and is enough for a pint of water, with 1½ ounces of sugar dissolved in it and kept at a proper temperature for alcoholic fermentation. The beer that this came from was made with sorghum molasses, from which it derived its dark color. In its normal purity and wet it is perfectly white. It is self-propagating, that is, it increases in quantity while fermenting sweetened water."

Answer by Dr. C. V. Riley.—I have had this substance before and have watched the interesting fermentation of water and sugar under its influence. The action is due to a bacterium and a fungus the species of which in our American substance have not, as Prof. Galloway, the micologist of the department, informs me, been settled definitely. It is similar, if not identical, to the so-called "ginger beer plant" of Europe, and in this case Marshall Ward, in the Proceedings of the Royal Society, Volume L., No. 304, London, 1891, determines the organisms involved as *Bacterium vermiforme* and *Saccharomyces pyriformis.* Mr. Charles L. Mix, in the Proceedings of the American Academy of Arts and Sciences, Volume XXVI., speaks of this subject under the following title: "On a Kephir-like Yeast found in the United States." He summarizes the European literature concerning the milk ferment of the Caucasus, and concludes that the American ferment is almost if not quite identical with the European kephir, in which the bacterium is *Dispora caucasica*, and the fungus is *Saccharomyces cerevisiae.* Beyerinck, in the "Centralblatt fur Bakteriologie," Volume VI., p. 44, describes the *Saccharomyces* as a new species, making it distinct from *cerevisiae* and giving it the name of *kefyr.* This name Mix adopts for the American fungus, although this adoption seems to be provisional. For the present we can do no better than to accept Mix's conclusions.