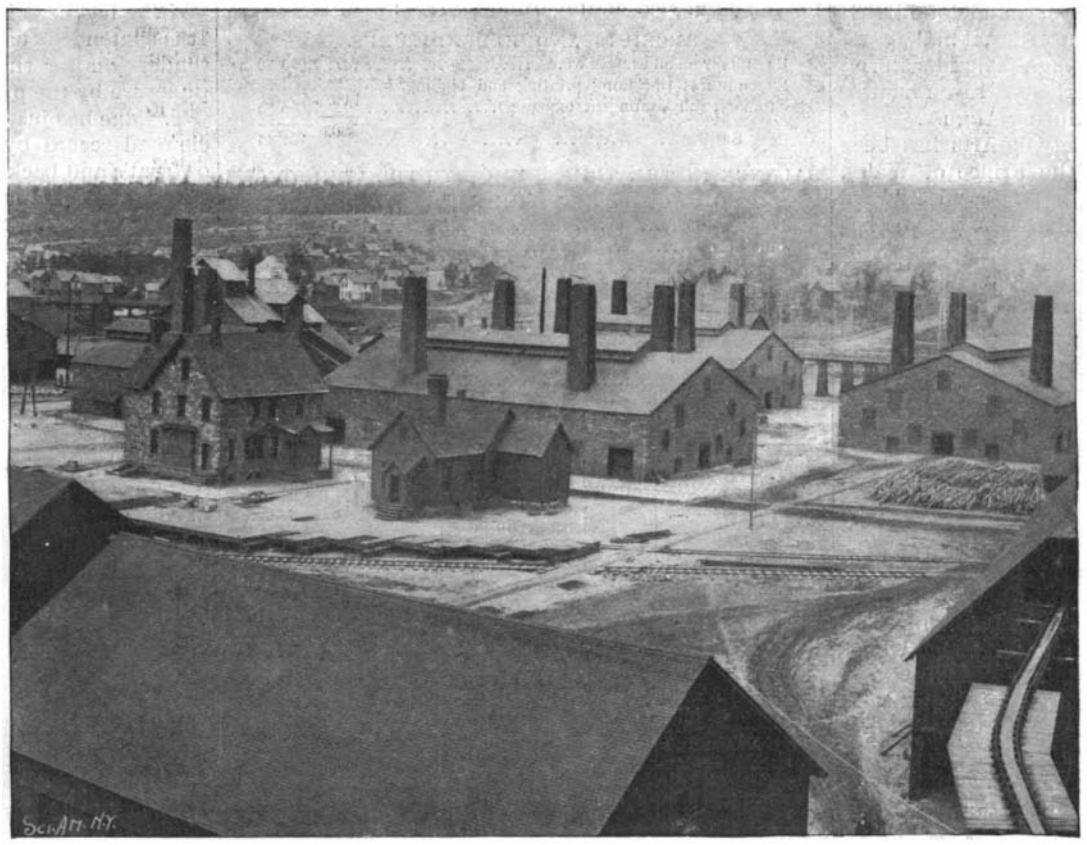
Refining Silver by Electrolysis.

The electrolytic method for refining silver, which was devised by Mobius some time ago, appears to be in successful operation now at the works of the Pennsylvania Lead Company and elsewhere. The process is distinctly interesting on account of the new features which it involves. The silver to be refined is first treated by ordinary well known metallurgical processes to reduce the quantity of other metals present (lead, copper, bismuth, etc.) to at most 2 per cent. It is then cast in sheets measuring 45 × 25 × 1·3 cm. and weighing 13—15 kilos. each. These serve as anodes. The cathodes are formed of thin, rolled sheets of pure silver, 33 × 55 × 2 cm. in size. The electrolyte is a solution of the nitrate of copper and silver, to which 0·5 —1 per cent of nitric acid is added to prevent the deposition of the copper. Four cathodes and three anodes are placed in each cell at distances apart severally of 43 mm. The anodes are inclosed in muslin bags for the purpose of intercepting the undissolved matters which fall from them as the action proceeds. These consist of gold, bismuth, the principal portion of the lead (in the form of dioxide), and a little silver and copper. A sheet of woolen cloth stretched on a frame near the bottom of each cell catches the silver as it is removed from the cathodes by a mechanically moved wooden scraper. The intensity of the current employed is 18 amperes per square foot of cathode surface. The silver is collected from each cell at intervals of two days, the gold once a week. The silver is washed with water and then melted in graphite retorts capable of holding 560 kilos. each, and is thus obtained of a fineness of 999—999·5. The residue of gold, etc., after being melted, granulated and treated with acid, gives gold of a fineness of 996—998. In the above process, care must be taken that the amount of copper in the electrolyte does not exceed 4-5 per cent, as otherwise the silver is not obtained in a pure state —The Electrical Review.



CALUMET AND HECLA SMELTING WORKS.

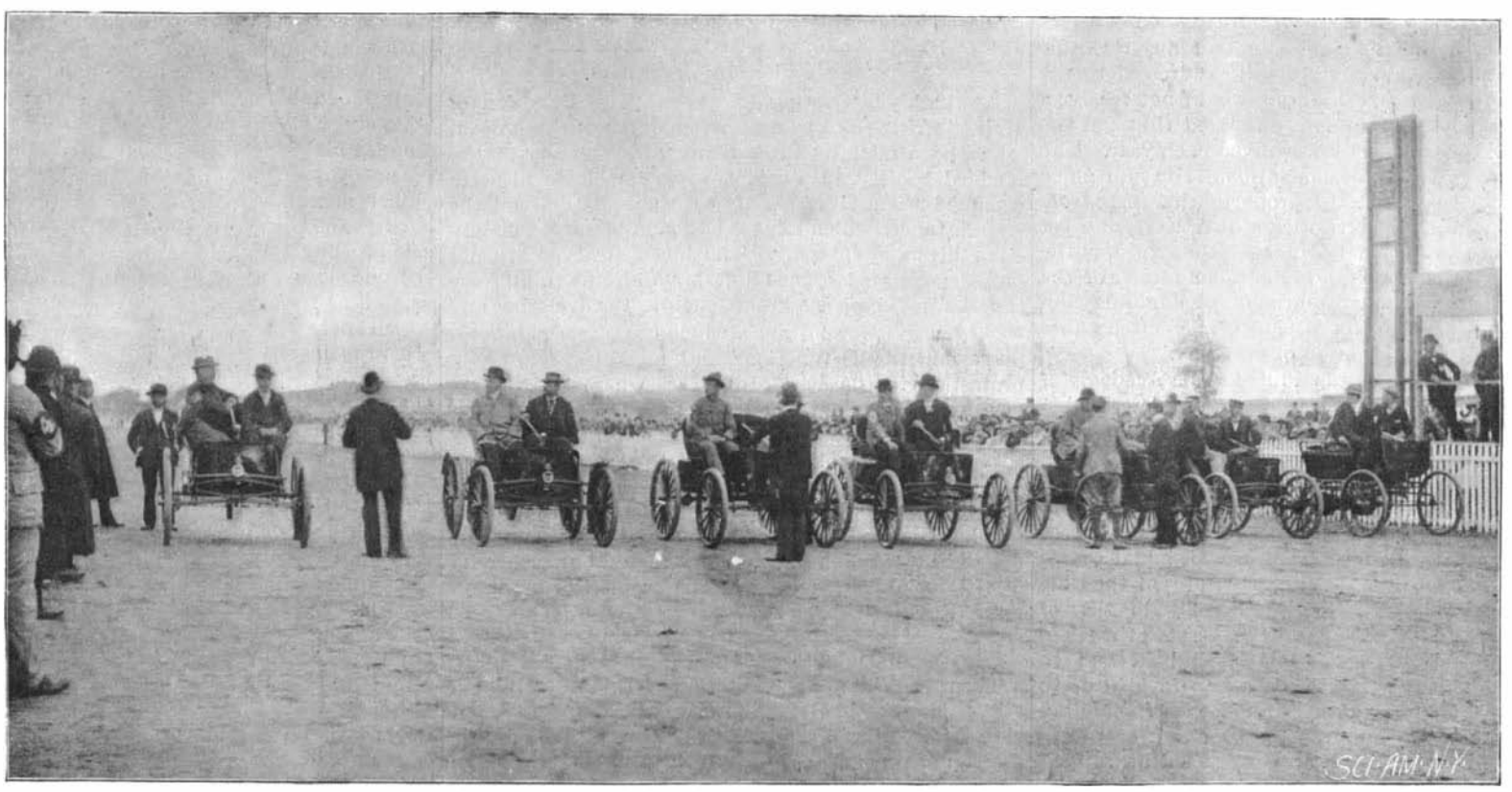
THE PROVIDENCE HORSELESS CARRIAGE RACE.

In the last issue of the SCIENTIFIC AMERICAN we gave an account of the first two heats run on the Narragansett Park track at Providence, R. I. Owing to a severe storm which swept New England during the race week, the plans of the managers were upset and only one more heat was run, the winners being Morris & Salom; the Riker carriage was only a few yards behind.

The fastest mile was made by the Riker electric carriage, the time being 2:13. The Morris & Salom electric carriage made the fastest five miles, covering the distance in 11:27. The prize money was reduced on account of the five heats not being run. The first prize, of $900, was adjudged to the Riker Electric Motor Company, of Brooklyn, N. Y.; the second prize, of $450, to Morris & Salom, of Philadelphia, Pa. The contestants were anxious to run the other heats, in spite of the weather, but the management declined. The announcement of the success of the electric carriages created some surprise, as it has been thought lately that motors using some form of petroleum were best adapted for horseless carriage use, and the electric motor has been somewhat discounted. The electric carriage has made a record for speed, and the great ease of control and the absence of noise and odor will commend it to those who are anxious to purchase horseless carriages, but whether they are adapted for long runs or not still remains to be proved.

The entries were as follows (but in one case several carriages of the same make were entered under different names): Duryea Motor Wagon Company, Springfield, Mass.; Morris & Salom, Philadelphia, Pa.; W. Lee Couch, New Brighton, Pa.; Lewis Brown, Sawkill, N. Y.; J. Frank Duryea, Springfield, Mass.; George H. Hewitt, Springfield, Mass.; C. Mayhew & Son, Saratoga Springs, N. Y.; Riker Electric Motor Company, Brooklyn, N. Y., P. F. Olds & Son, Lansing, Mich.; and Fiske Warren & Company.

Great interest was manifested in the races, which were witnessed by 5,000 spectators. Our engraving shows the carriages lined up for the start.



THE PROVIDENCE HORSELESS CARRIAGE RACE—THE START.

Electric Farming.

The agricultural department of the Cornell University recently published the results of some experiments extending over a period of six years, upon the effect of the light of the electric arc lamp upon the growth of plants. There were two houses, both of which were exposed to sunlight during the day, and one of which received in addition the light from an arc lamp during a part of the night. The arc lamps were inclosed in clear glass globes. It has been observed that the effects of the light of one inclosed in a glass globe are markedly different, the former in some cases proving injurious instead of beneficial to the plants. It was found as a result of these experiments that there was a decided beneficial influence on the growth of lettuce, and that there can no longer be any doubt as to its advantages in forcing this plant. With seed sown under ordinary conditions, and the young plants placed under the influence of the light after they are well established, will show marked improvements up to a distance of forty feet. One curious thing was noticed, that the effect of the shadow of a beam or rafter cast by the electric light showed plainly on the leaves. It is stated in this report that Mr. Rawson, a fancy truck farmer near Boston, now uses the electric light in the commercial forcing of lettuce. He has three lamps of 2,000 candle power each, which run all night. The hothouse covers nearly one-third of an acre. Mr. Rawson finds that he obtains a gain of five days per crop during the winter, which makes a gain of three weeks for the three crops during the winter. The gain from one crop, he estimates, is sufficient to pay the expenses of operating the electric lights during the whole season.

Prof. Bailey's experiments at Cornell confirm those of Mr. Rawson, as he states he finds many plants grow more rapidly when under the influence of the electric light at night. Among these are the daisy and the violet. He is convinced, he says, that the light can be used in forcing certain plants.

X Ray Experiments in Japan.

We have received from Y. Yamaguchi and T. Mizuno, professors of physics, Daïichi Kōtō Gakkō, Tokio, Japan, an interesting pamphlet containing numerous excellent half-tone reproductions of good X ray photographs. The text is entirely in Japanese, but the pictures speak for themselves, and indicate a high degree of skill of the Japanese investigators in this new branch of physics.

Science Notes.

At a recent meeting of the Royal Meteorological Society a paper was read on "Arctic Hail and Thunder Storms," in which the author, Mr. H. Harries, stated that the commonly accepted opinion that hail and thunder storms are unknown in the Arctic regions is entirely incorrect. He examined one hundred logs of vessels which have visited the Arctic regions, and found that out of this number seventy-three showed that hail was experienced some time during the voyage. Thunder storms were less frequent, but were experienced seven months of the year, being most frequent during August.

The Albert Medal of the Society of Arts has been awarded, with the approval of the Prince of Wales, the president of the society, to Prof. David Edward Hughes, F.R.S., "in recognition of the services he has rendered to arts, manufactures, and commerce by his numerous inventions in electricity and magnetism, especially the printing telegraph and the microphone." The council of the society have awarded silver medals to the following readers of mechanical and scientific papers during the session 1895-96: W. J. Dibdin, for his paper on "Standards of Light;" A. A. Campbell Swinton, for his paper on "Roentgen's Photography of the Invisible;" E. W. Moir, M.I.C.E., for his paper on "Tunneling by Compressed Air;" and George Simonds for his paper on "Bronze Casting in Europe."

"Observations have been made by Prof. Lloyd Morgan on instinct in young birds," says Appleton's Popular Science Monthly, "with a view to determine how far the activities involved in swimming, diving, running, flying, feeding, bathing, etc., are instinctive or congenital, and how far the definiteness of this and other activities is a matter of individual acquisition. Other observations were on congenital and acquired timidity. They indicated that while the performance of the activities in question has a congenital basis, they are perfected by individual acquisition, and that there is no instinctive avoidance of insects with warning colors, this seeming to be entirely the result of individual experience. No material support was afforded to the view that the instinctive activities result from the inheritance of what is individually acquired."

Huxley's table on the "Chemical composition of man of the average weight of 154 pounds" was for years the standard, but it has recently been superseded by a new one compiled by the Paris Academy of Sciences, says the Mining and Scientific Press. The table is appended:

Elements.	Pounds.	Ounces.	Grains.
Oxygen	111	8	0
Hydrogen	21	6	0
Carbon	21	0	0
Nitrogen	3	10	0
Phosphorus	1	2	88
Calcium	2	0	0
Sulphur	0	0	219
Chlorine	0	2	47
Sodium (salt)	0	2	116
Iron	0	0	100
Potassium	0	0	290
Magnesium	0	0	12
Silica	0	0	2

The late Dr. Brown Goode made the following comparison in a report of the United States National Museum: "There is not a department of the British government to which a citizen has a right to apply for information upon a scientific question. This seems hard to believe, for I cannot think of any scientific subject regarding which a letter, if addressed to the scientific bureaus in Washington, would not receive a full and practical reply. It is estimated that not less than 20,000 such letters are received each year. The Smithsonian Institution and National Museum alone receive about 6,000, and the proportion of these from the new States and Territories, which have not yet developed institutions of learning of their own, is the largest. An intelligent question from a farmer of the frontier receives as much attention as a communication from a royal academy of sciences, and often takes more time for the preparation of the reply."

At a recent meeting of the Philadelphia Academy of Natural Sciences, Dr. Charles S. Dolley described a centrifugal apparatus, which he called a planktonokrit, for the quantitative determination of the food supply of oysters and other aquatic animals. By means of its use he is enabled to make a large number of plankton estimates in a day, and thus judge of the characters of given areas of water in connection with fish and oyster culture at different times of the day, states of the tide, varying depths, etc. The method employed is that of the centrifuge, an apparatus which consists of a series of geared wheels driven by hand or belt, and so arranged as to cause an upright shaft to revolve up to a speed of 8,000 revolutions per minute, corresponding to 50 revolutions per minute of the crank or pulley wheel. To this upright shaft is fastened an attach ment by means of which two funnel-shaped receptacles of one liter capacity each may be secured and made to revolve with the shaft. The main portion of each of these receptacles is constructed of spun copper, tinned. When caused to revolve for one or two minutes, the entire contents of suspended matter in the contained water is thrown to the bottom of tubes properly placed, from which the amount may be read off by means of a graduated scale.

Annual Report of the Commissioner of Patents for the Fiscal Year 1895-96.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C., September 5, 1896.

SIR: I have the honor to submit the following report of the business of the United States Patent Office for the fiscal year ending June 30, 1896:

RECEIPTS AND EXPENDITURES.

Receipts from all sources were	$1,307,090 30
Expenditures (including printing and binding, stationery, and contingent expenses)	1,097,368 85
Surplus	$209,721 45

BALANCE IN THE TREASURY OF THE UNITED STATES ON ACCOUNT OF THE PATENT FUND.

June 30, 1895	$4,566,757 73
June 30, 1896	209,721 45
Total	$4,776,479 18
Number of applications awaiting action on the part of the office on July 1, 1896	8,943

COMPARATIVE STATEMENT.

Date.	Receipts.	Expenditures.
June 30, 1890	$1,347,203 21	$1,081,173 56
June 30, 1891	1,302,794 59	1,145,502 90
June 30, 1892	1,268,727 35	1,114,134 23
June 30, 1893	1,288,809 07	1,111,444 22
June 30, 1894	1,183,523 18	1,053,982 38
June 30, 1895	1,195,557 07	1,038,166 08
June 30, 1896	1,307,090 30	1,097,368 85

Date.	Applications for Patents, including Reissues, Designs, Trade Marks, Labels, and Prints.	Applications Awaiting Action on the Part of the Office.
June 30, 1890	43,810	6,585
June 30, 1891	43,616	8,911
June 30, 1892	43,544	9,447
June 30, 1893	43,589	8,283
June 30, 1894	39,206	7,076
June 30, 1895	41,014	4,927
June 30, 1896	45,645	8,943

Summarizing these tables, there were received in the fiscal year ending June 30, 1896, 41,660 applications for patents, 1,641 applications for designs, 84 applications for reissues, 2,460 caveats, 2,064 applications for trade marks, and 171 applications for labels. There were 22,791 patents granted, including reissues and designs; 1,782 trade marks registered, and 11 prints registered. The number of patents which expired was 11,466. The number of allowed applications which were by operation of law forfeited for nonpayment of the final fees was 4,014. The total receipts were $1,307,090.30; the receipts over expendituesr were $209,721.45; and the total receipts over expenditures to the credit of the Patent Office in the Treasury of the United States amount to $4,776,479.18.

CURRENT WORK.

On the 30th of June, 1896, all but four of the examiners had their work within one month of date, two were between one and two months, and the other two were between two and three months from date. At the close of the fiscal year there were 8,943 applications awaiting action on the part of the office. Very respectfully, your obedient servant. JOHN S. SEYMOUR,

The Secretary of the Interior. Commissioner.

The Function of Hair.

"A highly interesting paper on 'The Function of Hair,'" writes the Vienna correspondent of the Lancet, "has been read by Prof. Exner at a meeting of the Medical Society. He said that writers have hitherto occupied themselves mainly with speculations on the circumstances which have led to man becoming denuded of his hairy covering. The hairs, however, are not only degenerated organs, but have also to fulfill some functions. There is a group, such as the eyelashes and the eyebrows, for instance, which are sensorial organs, possessing tactile functions, and, moreover, serve as a protection to the eyes. In places where two integumentary surfaces are in contact . . . they act as rollers and facilitate the gliding of the integumentary surfaces on each other. A third function of the hairs consists in the equalization of surface temperature. There is no doubt that the hair of the scalp protects the head against external cold and also prevents the loss of heat through the very low thermal conductivity of the hair cylinders and of the cushion of air intermingled with them."

National Academy of Design.

The fifteenth annual exhibition of this veteran institution is to be held in this city on November 23, and closes December 19, next. Only the work of living artists not previously shown in New York or Brooklyn will be on exhibition.

In connection with the academy is the Department of Schools, beginning October 5, 1896, and ending May 15, 1897, where several branches of art are taught by some of the best artists. The president is Thomas W. Wood, and the secretary J. Carroll Beckwith. Of the artists on the council may be mentioned such names as Walter Shirlaw, J. G. Brown, Frederick Dielman and F. S. Church.

Cycle Notes.

Prof. Roentgen, the discoverer of the X rays, is a cyclist.

A French peasant has made a wooden bicycle in which even the nails are made of wood.

One of the largest bicycle concerns in the United States will adopt the chainless wheel for an 1897 model.

A tire has been invented in which feathers are used. It is contended that when a puncture occurs, the first tendency is for the down to be carried up into the puncture by the pressure of the air on the inside.

T. Edge has just broken the English 1,000 mile bicycle road record by traveling from Land's End to John o'Groat's and back to Forfar in four days nine hours and nineteen minutes. This is fourteen hours better than the previous record.

Part of the Paris horse market has been set aside for a public bicycle market, which will be held once a week. The track used to show off the horses will also be used for the trial of the machines. All bicycles sold in the market will pay a tax of ten cents to the city.

Consular Agent Mertens, at the port of Valencia, Spain, reports to the Department of State that the ladies of Spain are taking up bicycling, and he thinks this will help in removing that barrier which prevents them from going out unless attended by some responsible duenna. American wheels are unknown in Spain, though an inferior French machine called "L'Americaine" and bearing a spread eagle with the United States coat of arms is extensively advertised. There is said to be a good chance for our wheels in Spain, as Germany is barred out by tariff discriminations and the French and English wheels are unsatisfactory.

The bicycle track in Moscow is one of the best in Europe, says the Bicycling World. It is one of the most modern things about the old Russian capital, and is situated on the plain of Hodinsky, where the recent great loss of life occurred. The track is 600 meters, less than three laps to the mile, all of cement, with steep banking at the turns, and a system of electric timing which, indifferently successful at Paris, works like a charm in Moscow. There are more than 4,000 cyclists in the city and two large clubs. The development of cycling in Russia is wonderful, considering that the roads are horrible—rutty, stony, hilly, and frequently covered with the miserable pave, that despair of European wheelmen.

There is evidence to show that the ball bearing was invented at the works of Messrs. Boulton & Watt somewhere about the year 1760. Its inventor was John Wyatt, a native of Weeford, near Lichfield. Wyatt, it is said, tried hard to solve the problem of cutting files by machinery, but failed. He was more successful with a spinning machine, in which some claim he anticipated Arkwright and Hargreaves, and even more successful with a compound lever weighing machine. Lack of capital led to financial embarrassment, and drove him to Boulton & Watt's shops, which were then a kind of refuge for inventors in distress. It was there he devised the ball bearing. For more than a century the ball bearing was practically neglected. A short pamphlet narrating Wyatt's achievements was published by Hamilton, Adams & Company in 1885.

In the last British consular report from Venice it is said that cycling has spread through the province with wonderful rapidity. The wide and smooth roads which exist in North Italy and which are carefully maintained in a good condition at the expense of the state are covered with cyclists. Bicycles and tricycles of English make are considered the best, and would be naturally preferred, but for the lower prices of machines manufactured in Italy, or those coming from Austria and Germany. Most people prefer, for economy's sake, to buy the cheaper ones. There would be a field there for low, very light machines at a moderate price, as well as for practical cycle boats or water cycles, of which there are none in use so far. There are no cycles propelled by steam, oil, or electricity, and no horseless carriages in the district. The vice consul thinks that there will be an opening for the sale of machines, and also in establishing lines for the conveyance of parcels and passengers in horseless wagons and carriages.

The nuisance of the gongs which youthful wheelmen attach to their mounts has been referred to in the New York Tribune. A device which has been suggested, if it has not already been adopted by noise loving riders, is a chime of bells, of harmonious tones. If the thing goes much further, the board of health will have to take a hand to protect the nerves of a suffering community. A noise-producing arrangement which is common in some parts of Connecticut and elsewhere, although wholly or comparatively unknown in this city, consists of strips of rubber passed around the diamond frame of a bicycle. The ordinary bands can be used if the front wheel is removed so that they can be put on, or a long strip of rubber, wound around and around, will serve. The strips must be stretched as tight as possible. In a wind the rubber acts as an Æolian harp, giving forth a sound not entirely unmusical. Sometimes it resembles the buzzing of an approaching trolley car, and is a great mystery to those unfamiliar with it, especially if there are no street railway tracks in sight.