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## HENRY DRAPER.

Professor Henry Draper, M.D., LL.D., died, after a brief illness, at his residence in this city, November 20. Although Professor Draper's scientific labors have been many and of great value, he was yet comparatively young, and there was every reason to anticipate for him great and brilliant successes in ripe life. He had inherited much of his illustrious father's ability and love for scientific investigation, and was able to carry on his chosen work under the most favorable of material conditions.

He was born in Virginia, in 1837, and was removed to this city three years later, when his father, Professor John W. Draper, accepted the chair of Chemistry in the University of the city of New York. He was graduated in the Medical Department of the University in 1858, and after spending some months in scientific observations and travel in Europe, he joined the medical staff of Bellevue Hospital. In 1860 he was elected to the chair of Physiology in the Academic Department of the University, which position he filled until last winter, when he succeeded his father in the chair of Chemistry.

While yet in school, he began to develop the possibilities of microphotography, and discovered the value of the protochloride of palladium in darkening collodion negatives. On his return from Europe he constructed a 15½-inch reflecting telescope, devising important improvements in methods of grinding, polishing, and testing reflectors. With this telescope he carried on the pioneer work of lunar photography. He subsequently constructed the telescope of 28-inch aperture, which he put to such successful use in photographing the spectra of stars. His beautiful diffraction spectrum, obtained in 1872, remains unexcelled. His admirable work as superintendent of the photographic department of the commission created in 1874 to observe the transit of Venus, was rewarded by a special gold medal, struck in his honor by order of Congress.

Among the later achievements of Professor Draper in the department of spectro-photography, are those leading to the discovery of oxygen in the sun, in 1877, and his studies of the great comet of 1851. Meantime he had added to his list of brilliant successes in celestial photography by photographing the great nebula in Orion.

His observatory at Hastings on the Hudson, and his laboratory in this city, are accounted the best equipped private scientific establishments in the country if not in the world. A fortunate marriage early placed at his command almost unbounded facilities for gratifying his taste for difficult and costly investigations, and the world has reaped the benefit.

Professor Draper's social relations were wide and exceedingly happy. A characteristic illustration of his method in social entertainment was shown on the evening preceding his fatal attack, when he gave a dinner to the members of the National Academy. It was a splendid exhibition of the possibilities of electric lighting artistically developed and applied.

## NATIONAL AND INTERNATIONAL EXHIBITIONS IN 1883.

The government of Spain has announced the conditions and regulations of a National Exhibition of Mineralogy and Metallurgy to be held in Madrid, between April 1 and June 30, 1883. Exhibits will be received up to February 15. Applications for space for machinery and special exhibits must be made before October 31, 1882. All other exhibitors, save those of machinery, are granted an additional month for filing applications for space in the main gallery. The exhibition is to include all machinery, utensils, and tools (Spanish or foreign) that are used in mining and metallurgy, in the manufacture of earthen and glass ware, and in the utilization of mineral waters; also all foreign manufactures from Spanish minerals. There is to be no charge for space, and water for hydraulic and steam engines will also be free for machines not exceeding five horse power. Liberal arrangements have been made for transporting and handling exhibits, and for the passage of goods in bond through the custom houses for exhibition purposes.

The increasing value of the markets of Spain and her colonies gives to this exhibition especial interest to a large class of American inventors and manufacturers. As an efficient though indirect mode of reacting on Spanish America, the exhibition may be worth considering.

The general agent for the United States for the international, colonial, and general export exhibition to be held in Amsterdam, Holland, from May 1 to October 31, 1883, has issued a circular, presenting the inducements which the exhibition holds out to American farmers, merchants, manufacturers, railway companies, and land and mine owners. This is the first international exhibition in the kingdom of the Netherlands, and is expected to draw many visitors from northern France, Belgium, Germany, and the Scandinavian countries.

The kingdom, with its colonies, embraces a population of nearly 40,000,000 people, and Amsterdam is one of the richest as well as most progressive commercial centers in Europe. Our trade with Holland and its dependencies has more than trebled during the past seven years, and the coming exhibition should be taken advantage of to greatly extend that trade.

At a meeting of bankers and merchants, held in this city November 21, the general agent, Mr. S. A. Wheelwright, reported favorable indications of State and national interest in favor of an abundant representation of American natural and artificial products at this exhibition.

Venezuela proposes to celebrate the centenary of the birth of Simon Bolivar, the South American liberator, by opening a national exhibition at Caracas, July 24, 1883. The Venezuelan Chargé d'Affaires in this city announces that he is authorized to extend a welcome to all authors, inventors, manufacturers, and artisans who may wish to make their productions known in Venezuela. He adds:

"Considering that Venezuela exports \$6,000,000 every year to the United States and only imports some \$2,000,000 from them, it will be readily perceived that the commerce of this enterprising nation with our country is far behind what is due to its gigantic production and inventive genius; or, in other words, that there is a market in South America for the products of this country not sought for by its commerce to the extent that it might advantageously do so. The exposition at Caracas offers a favorable opportunity to all who may desire to obtain a new and profitable outlet for their goods."

## ROMANCE AND REALITY OF ANIMAL MOTION.

Mr. E. Muybridge, whose success in catching and fixing by instantaneous photography the attitudes of animals in motion is so well known to our readers, gave an illustrated lecture upon the romance and reality of animal motion in this city, November 16. By means of a zoopraxiscope the instantaneous views were thrown upon a screen singly, in rapid succession, and in combinations, giving startlingly life like representations of the postures and movements of live animals.

Though the principal attention was given to the horse, the motions of other animals and men were also reproduced and described. After explaining the method by which series of instantaneous views of moving animals were obtained, Mr. Muybridge showed how greatly the reality of animal positions varied from the positions represented in sculpture and painting. Photographs of famous sculptures and paintings were thrown upon the screen, and the impossible attitudes represented were contrasted with views of live horses under the conditions which the artists intended to represent. When describing the walking motion of a horse, Egyptian, Assyrian, and Roman pictures were shown to demonstrate that an erroneous idea of this motion prevailed in the earliest attempts at art. It was perpetuated in the famous statue of Marcus Aurelius, which has been the model of almost all equestrian statues to the present day, and is as conspicuous in the equestrian statues of Washington in Boston and in Union Square as in any of the old Egyptian or Assyrian pictures. It is not possible for a horse to walk in the way there depicted. Meissonier had a correct idea of a horse's walk when he painted his great picture of Napoleon in 1814, but the critics ridiculed it and pronounced it incorrect. Now he has the satisfaction of knowing that he was right and they were all wrong. Miss Thompson also was correct, and the critics derided her for being so.

Later the lecturer showed photographs of Egyptian and Assyrian models of the running horse—models blindly followed by artists ever since—in which the animal is presented poising himself on both hind feet extended far behind, with his fore feet stretched far out ahead of him together. The North American Indians had a much more correct idea of the motion of a horse, as was demonstrated by their rude pictures upon a buffalo robe that Lafayette bought when in this country and took back with him to Paris.

When all the varied paces of horses had been described and illustrated, the jumping horse was shown in a series of brilliant and sometimes comical views. These were followed by illustrations of the gaits of oxen, a bull, a Newfoundland dog, a hound, deer, a goat, and the hog.

The goat runs like a horse and the deer like the hound, bounding rather than running. In one part of the deer's stride its attitude was very near to that which artists have so long inaccurately made as that of the running horse.

Views were given of the walking, running, and jumping attitudes of Hazeel, whose unrivaled ungracefulness proved a surprise even to the champion himself. Other athletes were shown boxing and tumbling.

The lecture closed with a beautiful series of pictures of pigeons and sea-gulls in flight. But two peoples—the Egyptians and the Japanese—ever represented birds as seen in some of the photographs with the wings down.

## "Vaccination" for Chicken Cholera.

Mr. W. H. Griffith, of Zanesville, O., says that during the past two years he has vaccinated 2,000 fowls in yards badly smitten with chicken cholera, and of this number only 11 died. Of fowls in the same yards not vaccinated all died. The proper procedure in such cases is as follows:

"Vaccinate a hen, and in eight days her system will be thoroughly inoculated; then cut off her head and catch all the blood in some vessel, then pour the blood on paper to dry; a half drop of this blood is sufficient to vaccinate a fowl, and the blood of one hen will vaccinate your whole flock. Catch the fowl you wish to vaccinate, and with a pin or knife make a little scratch on the thigh (just enough to draw blood), then moisten a little piece of the paper with the dried blood on it and stick it on the chicken's leg where you scratched it, then let the fowl run, and you need have no fear of chicken cholera."

In the course of his experiments Mr. Griffith has dried enough blood to vaccinate 10,000 fowls. He offers to send, free of charge, to such as wish to try the cure, enough blood to start with. All he asks is that application be made soon (as the blood loses its virtue by long keeping), and that experimenters report results.

**History and Cost of a Tunnel.**

The recent opening of the St. Gothard Railway through the Alps has moved Consul Byers, of Zurich, to write a sketch of the great tunnel. The pass of that name is over the highest mountain chain in Europe. The New York *Times* condenses from Mr. Byers' article the following interesting facts:

The old post road, commenced in 1820, 7,000 feet above the sea in places, was 18½ feet wide; it crossed gorges, clung dizzily to steep mountain sides, and was roofed over where most threatened by avalanches. When the first railway was opened, in 1846, from Baden to Zurich, it was proposed to ask concessions to enable the company to attack one of the high passes, and in 1863 a union or society for the purpose was effected, upon the basis of an estimated cost of \$37,403,000. In December, 1871, the St. Gothard Railway Company was organized, \$6,800,000 stock and \$13,600,000 of bonds were issued, a contract was made calling for completion in eight years, with a forfeit of \$1,000 for each additional day and a bonus of \$1,000 for each day gained upon the contract time. Work began in the summer of 1872, and it was soon discovered that the estimates were wrong, and that \$57,800,000 would be needed to carry out the plan; a crisis followed, and the enterprise seems to have been saved only by what had already been invested in it, leaving no way out but to push ahead. The railway proper extends 113 miles from Immensee, in Switzerland, to Chiasso, in Italy, and more than one fifth of the whole line is in tunnels—fifty-six in number; many of these are not straight, but actually spiral, accomplishing heavy ascents in short distances, and there are also many lofty viaducts, bridges, and complicated galleries. The total length of tunneling is 23 miles. The main or great tunnel is 9¼ miles long, although others, exceeding 6,000 feet, might be thought noticeable elsewhere. The great tunnel is 26 feet wide and 19 high. The modern boring machines were worked by air compressed by large turbine wheels driven by the rapid river Reuss. The air was carried from the compressors outside to the borers within the tunnel in iron pipes of six inches diameter, and the escaping air served an indispensable purpose in ventilation; 3,500,000 feet of compressed air were daily thus delivered and set free, pushing back and out of the tunnel the bad natural gases, with those set free by the dynamite and thrown off from animals and workmen. Fifty drills were worked; the usual daily advance was 21 feet, working from both ends, and the whole excavation was lined as fast as made with a circular tube of masonry, 18 to 30 inches thick. The workmen were principally Italians, who worked eight hours a day, receiving 60 cents to \$1.20 per day (mostly the former), boarding themselves, and living chiefly on meal porridge; yet most of them are reported to have saved and sent home to their families a part of this pittance. The tunnel cost 310 of their lives, and wounds were inflicted upon 877. The final actual cost of the tunnel and railway, exclusive of rolling stock, is now reported at something over \$40,000,000.

**Live Worm in a Horse's Eye.**

A case of parasitism somewhat rare in this country is attracting attention in Jersey City. About three months ago a driver in the employ of Dodge & Bliss noticed a worm in the eye of one of his horses. It was then about one inch long, and black. Now it is three inches long, and white.

Mr. W. H. Arrowsmith, of the American Veterinary College, tells the *Sun*:

"The disease is one seldom seen here. It is called in the books *filariæ oculi*, and is very prevalent in warm climates, in India, Australia, and in Arabia. It is supposed to be due to germs taken into the body when the animal is feeding upon grass in low, marshy ground. The germs or eggs of the parasite are developed into the active life of a worm, and that worm penetrates to different parts of the body, sometimes to the eye, sometimes to the brain, sometimes interior organs. But it has been so seldom seen either in Europe or here that comparatively little is known of its progress, development, or results. There have been, I believe, but four or five cases reported in both Europe and this country. When fully developed, as it is in the eye of the horse of Dodge & Bliss, it is a parasitic white worm, varying from one to three inches in length, and about as thick as an ordinary pin. While in the aqueous humors of the eye it is in continual motion. When I examined it this morning by means of the ophthalmoscope, I found it in the anterior or aqueous chamber of the eye. It was very active. The cornea of the eye was somewhat opaque, and the iris somewhat distended. By careful observation we could discern a granular surface upon the anterior face of the crystalline lens. The horse otherwise was in perfect health. He works, and does not show any apparent inconvenience, with the exception of a certain nervousness during examination of the eye. The activity of the parasite is such at present that it is impossible to say whether it has a head or tail, or what its internal construction may be. But, from microscopic observation, we will probably be able to discover head, tail, and alimentary canal. According to Percival's 'Hippo-pathology' and Williams' 'Veterinary Surgeon,' even the sex of these parasites is clearly discernible under the microscope. I do not believe that this parasite is ever found in human beings, but only in grass-eating animals that have grazed in low, marshy ground; and that it is in the eye is only a matter of accident in the course of its penetration of the body of the horse."

**An Electric Storm.**

The past ten days have been characterized by wide-spread electrical disturbances, which culminated in intensity November 17. On that day telegraphic communication was more or less interrupted over the northern half of the United States, and much damage was done to switch boards and other telegraphic apparatus. The disturbance extended across the sea, interfering seriously with the work of the cables, and made itself felt in many parts of the European continent.

The manager of the operating room of the Western Union telegraph building pronounced the disturbance the most serious he had ever encountered. The storm was the severest between 5 o'clock A.M. and noon. It seemed to be centered along the valley of the Mississippi, and at its greatest severity in those parts of the country north of the latitude of Washington. The only wires that could be used at all were those on the metallic circuits. All the cables and wires that touched the ground circuits were absolutely useless. Shortly after 1 o'clock the storm very suddenly disappeared, and work was resumed on all the wires.

It is said that various experiments were tried by telegraphers during the prevalence of the storm to work the wires and dispose of the great accumulation of business, but with little success, until it was discovered that by taking two wires from the ground between any two given points and joining their ends a metallic circuit was formed that could be operated. In this way eight wires between Buffalo and Chicago were made to do service as four. Electricians seem to agree that the disturbance was unlike any heretofore experienced, as it appeared in some cases to act upon the wires in strong waves, causing a constant changing of the polarity of the current.

In other places the sending of messages was possible, as in previous electric storms, without using a battery. A dispatch is said to have been transmitted from Bangor, Maine, to North Sydney, Cape Breton, a distance of 700 miles, in this way. Brilliant auroras were generally seen where the sky was clear on that and subsequent nights.

The appearance of exceptionally large sun spots is believed to have more than an accidental connection with these disturbances of the earth's electric equilibrium.

**The Laws of Breeding.**

In a note to John L. Hayes, LL.D., editor of the *Bulletin of the National Association of Wool Manufacturers*, Mr. William H. Brewer, an authority on the laws of breeding, says he knows of no case where a new breed has been made of two well-defined breeds, the new breed having the excellences of the others, or even the excellences of a first cross. It is a common experience, he continues, that while the first or earlier crosses are reasonably uniform, successive crosses vary greatly. On the other hand, numerous examples may be given of new breeds being formed from the crosses of several, and then, by long-continued selection of animals having the desired qualities, from three several breeds. Mr. Brewer further says:

"Again, it is a common experience, particularly in breeding for flesh (but it is true of all characters), that in cross-bred animals for one or two generations the cross breeds may be better as animals of use than either of the parent stocks. But this excellence cannot be maintained with a sufficient uniformity to insure profit. In truth, the whole and sole reason of the enormous prices which thoroughbred animals of various kinds bring, of a long proved pedigree, is not because of the superior excellences of those animals themselves as animals of use, but simply because their characters are transmitted, and those of equally good mongrels are not. The crossing of different breeds of sheep for mutton or for particular grades of wool will long be continued, and is very profitable in many directions; but it is only profitable, so far as I have been able to hear, where these rules are obeyed, and we frequently go back to the pure breed, on one side or the other, for keeping up the excellence."

**Beer Glasses in Berlin.**

The large breweries that surround Berlin sell a considerable quantity of beer on draught, each brewery being provided with a large garden or saloon, not unlike Lion Park, at One-hundred-and-tenth street and Ninth avenue, in this city. On Sundays and holidays, a great concourse of people, many of them whole families, assemble there to quaff the national beverage fresh from the rock cellars. Of course it requires a large number of beer glasses (Seidel) to supply them. The Moabit brewery uses 11,000 glasses; an export brewery there, 22,500; the Union, Friedrichshain, New World, and Spandauer Bock, each use 12,000, while 10,000 are used in the "Zelten." Beer is also sold at the zoological garden, where 25,000 Seidel are in use. About 75,000 more are in use at the large breweries on the south side of Berlin, where the Tivoli Society, Hasenhaide, and Bock breweries are situated. This total of nearly 200,000 glasses does not include smaller establishments like Belle Alliance, Walhalla, and hundreds of other gardens, hence the total number used annually is estimated, says the *Amerikanischer Bierbrauer*, at 5,000,000, or four glasses to each man, woman, and child. What may seem more surprising to our readers is that 10 per cent of the glasses used in Berlin are imported from this country, mostly from Wheeling, West Virginia. Many of the other glasses are "imitation American," and come from Schlesia, the rest from the Rhein. About one-third of the whole number pass through the hands of a single house in Berlin.

**Purification of Sulphuric Acid by Crystallization.**

In the *Zeitschrift für Analytische Chemie*, Tjaden Moddermann remarks that he has for some time been accustomed to prepare pure sulphuric acid by recrystallization of the hydrate ( $\text{H}_2\text{SO}_4 \cdot \text{H}_2\text{O}$ ), and finds this seldom adopted method of purification to be really an excellent one. The author has experimented in this way upon acids containing considerable quantities of lead and arsenious and nitric acids, etc., and by protracted recrystallization has in all cases obtained a pure acid from them. The method is very simple. The acid is mixed with sufficient water, and, in bottles two-thirds full, exposed to the cold in the open air on a frosty night. If the mixture has been properly made, it is generally frozen throughout the next morning. The chief thing then is to carefully separate the crystals from the mother liquor, and for this purpose the author employs a centrifugal apparatus, so constructed that the acid only comes in contact with glass. The separation is very easily effected, and, except in cases where an acid is strongly contaminated with the different oxides of nitrogen, one recrystallization is generally sufficient.

**A Town and the Cholera Blown Away by a Hurricane.**

The Captain-General of the Philippine Islands telegraphs from Manila, October 21, that a tremendous hurricane had almost entirely destroyed that town. In less than an hour from its commencement not a single native house and not a single wooden house was left standing. Almost all the stone buildings, even those having iron rafters, were unroofed and made uninhabitable. Comparatively few casualties had taken place among the population. In a later telegram the Captain-General says that the authorities of Balacan and the interior of the island report a similar destruction as caused by the hurricane, and fifteen thousand more persons are houseless. Singularly enough, on the first day after the hurricane not a single case of cholera occurred in Manila or the island. The tornado not only swept over the entire archipelago, but was felt many hundred miles out at sea, especially to the south and west. It is believed that more lives have been lost by shipwreck than on land.

**The Meat we Eat.**

According to statistics compiled by the Agricultural Bureau, the annual meat product of the United States is in round numbers:

	Number.	Pounds.
Dressed hogs.....	29,000,000	5,120,000,000
Beef.....	6,250,000	3,124,000,000
Veals.....	3,000,000	275,000,000
Muttons.....	7,000,000	350,000,000
Lambs.....	5,000,000	100,000,000

About one-fourth of the pork and one-twelfth of the beef are exported, leaving for home consumption about seven thousand six hundred and fifty million pounds of the above meats, mostly beef and pork; or an average of almost half a pound a day for every man, woman, and child in the country. We think this must be erroneous, and the above figures probably need correction.

**Preservation of Lemon Juice.**

A correspondent in *Mém. de Méd. et de Pharm. Milit.* says, after various experiments and the test of eight months' exposure to the sun and heat of summer, he has come to the following conclusion: "Heating the juice or adding alcohol to the same would appear to be superfluous, as it is only necessary to filter it and keep it in sealed bottles; however, since filtration proceeds so very slowly, the best way is perhaps to add 10 per cent of alcohol to the fresh juice, and bottle."

The *Pharmaceutical Journal* observes that it may be preserved without the addition of alcohol by heating it to 150° F., and then excluding it from the air by carefully closing the full bottles at this temperature. The operation should be carried out in winter.

**Consumption of Watch Glasses.**

According to the *Revue Chronométrique*, there are annually manufactured 2,500,000 watches, and during the last fifty years more than 70,000,000 have been put on the market; there remains yet for us to add a stock of not less than 50,000,000 of old watches, which makes a total of 86,000,000 to 87,000,000 watches requiring glasses. The new watches consume nearly 4,000,000, which makes an annual consumption of not less than 47,000,000 of glasses. But we must add that every watchmaker away from a town sees the necessity of always having on hand an assortment responding to the wants of his customers. Then if we take into account children's watches, lockets, compasses, etc., one finds one's self with astonishment in the face of an annual consumption which cannot be less than 100,000,000 of glasses.

**Subterranean Scenery.**

Mr. H. C. Hovey, perhaps the only man who has ever made a special study of all our great American caverns, lectured in the Hall of the Academy of Sciences, New York, Nov. 20, upon subterranean scenery. He gave descriptions of the Mammoth, Luray, and Wyandotte Caves, and the ice grottoes of Niagara, and illustrated the marvelous scenery found in them by means of lantern views. This is a new field for lecture enterprise, and one that cannot fail to be as popular as it is interesting.