

observatory. She has charge of about a dozen women computers who are studying the spectra of stars, which forms the memorial to the late Dr. Draper. Mrs. Fleming has herself examined and measured the 27,000 spectra of stars involved in the preparation of the Draper catalogue; she has discovered twenty-one new variable stars, the only variable stars discovered by a woman, and a larger number than have been found by a man. Twenty-five of the newly-discovered forty-five stars, whose spectra consists of bright lines, have been discovered by her, and a large part of the annals of the observatory have been prepared under her direction.—New York Sun.

The painting and decorating of the vast interiors of the great exhibition halls at Chicago, is an enormous undertaking. Frank Millet is the artist in charge. A recent estimate of the area to be covered with paint developed the fact that it would be impossible to set enough men at work with brushes to complete the task in time for the opening of the fair. Mr. Millet thereupon contrived a machine for doing the work. It consists of a piece of gas-pipe flattened at one end to make a "spray." From this a rubber hose connects with an air pump driven by an electric motor, and beyond this is a barrel of paint. The pump sucks paint from the barrel and the air jet sprays the paint with force upon the surface to be coated. Four workmen with this mechanism can accomplish more in a day than a small army of painters could in a week.—Scientific American.

The Swiss telephone system is claimed to be the best and cheapest in Europe. It is now under government control. The first telephone was used at Zurich, in 1880, when a private company started with 144 telephones. In 1886 the government undertook the working of the system, and the number of subscribers increased to 1,000. In this year the net profits were over 130,000 francs. In 1890 the subscribers numbered 8,000. On an average there were 546 calls a year to each telephone. The government allows 800 calls to each subscriber without extra charge, and all calls beyond that number are charged for at one cent each. The usual charge to subscribers is \$24 the first year, \$20 for the second year and less than \$16 per year from then on. Telegrams are received at the telephone office and delivered to the telegraph department at two cents each.—Electrical Review.

We learn from the annual report by the Director of the Veterinary Department for 1891, recently issued by the Board of Agriculture, that "both forms of this disease (glanders and farcy) have been much more prevalent in Great Britain during 1891 than for some years past." The number of horses attacked with glanders increased from 947 in 1890 to 1,260 in 1891; the animals attacked with farcy, from 861 in 1890 to 1,175 in 1891. In fact, the cases of glanders have only been once more numerous, and the cases of farcy are more numerous now than they have been at any time within fourteen years. Glanders is a contagious disease due to specific poison in the system. The smallest quantity of this poison is sufficient to infect another horse. The poison may enter the stomach, with food or with water, through a mucous membrane, or even through the skin. It is a bacillus. A horse may remain stabled with glandered horses for months, and breathe the same air: but he will not take the disease if he does not touch the poison. The disease never arises spontaneously. Glanders and farcy are practically the same disease. The same virus, or poison, is present in both cases. When the bacilli infest the blood vessels and glands are the seat of bacilli in active development, we have farcy. The living organisms peculiar to farcy are transmissible, not only from horse to horse, but to human beings, guinea-pigs. They are not transmissible to cattle or to pigs. Both glanders and farcy are said to be incurable. If we take the average value of the 2,435 animals attacked with glanders and farcy in 1891 to be £20 each, we have a total loss in the year of £48,700. If Mr. Hunting

is correct in stating that five times as many horses die of those diseases as are reported to die of them, we have a loss of £243,500. That human beings die in consequence of the poison having entered the system is a fact beyond dispute. Mr. C. S. Sherrington, superintendent of the Brown's Animal Institute, Wandsworth Road, in a letter to the editor of The Times, dated August 28, 1892, says that "this bacillus, since its discovery in 1882, has proved fatal to six of its investigators." Professor Axe, in a paper read before the meeting of the Southern Counties V. M. A., states that, in the course of seven years, twenty-eight patients died of glanders in a single Russian hospital.—Colonel Colville, in The National Review for December.

The first paper of which mention is made was manufactured from papyrus in Alexandria, and was used by the nations living upon the shores of the Mediterranean. The art of making paper from fibrous matter reduced to a pulp in water is supposed to have been discovered by the Chinese about eighteen hundred years ago. The Saracens, it is thought, acquired the art of making cotton paper about the year 704. The oldest manuscript written upon paper of this kind is in the Bodleian collection of the British Museum, and bears date 1049. In 1085 paper was made of rags instead of raw cotton. A specimen of linen paper is found bearing date 1100. In 1390 a paper mill was established at Nuremberg by Ulman Stromer, operated by two rollers which set eighteen stampers in motion. The first paper mill in America was established by William Rittinghuysen and William Bradford on a small stream called Paper Mill Run near Philadelphia. The second in 1710 at Germantown, Pa. In 1729 a paper mill was built upon Chester Creek, Pa. The first paper mill in Massachusetts was built at Milton in 1730. At the beginning of the Revolution there were three small mills in Massachusetts and one in Rhode Island. Now large quantities of paper are made in this country and exported to England, Ireland, Australia, Mexico and the West Indies.—New York Public Opinion.

For a long time Nature's hints were neglected or disregarded, but in 1888 patents were taken out in England and France by different individuals for the preparation of nickel steel. Tests of this alloy have been made by competent authorities, and the effect of the addition of small percentages of nickel to steel is seen in greatly reduced tendency to oxidation and increased strength. As an example of the superiority of this nickel steel, the following results of one of the tests may be given: A steel containing 4.7 per cent. of nickel "showed an ultimate strength of thirty per cent. and elastic limit of sixty to seventy per cent. higher than those of mild steel, with a nearly equal ductility, and the valuable quality added of less liability to corrosion." The authority who obtained these remarkable results adds: "Think for a moment of this in connection with the erection of the Forth Bridge or of the Eiffel Tower. If the engineers of those stupendous structures had had at their disposal a metal of forty tons strength and twenty-eight tons elastic limit, instead of thirty tons strength and seventeen tons elastic limit, in the one case, and, say, twenty-two tons strength and fourteen to sixteen tons elastic limit in the other, how many difficulties would have been reduced in magnitude as the weight of materials was reduced! The Forth Bridge would have become even more light and airy, and the Tower more netlike and graceful, than they are at present." And Sir Frederick Abel, in his presidential address at the Leeds meeting of the British Association, remarked, "It has been shown by Riley that a particular variety of nickel steel presents to the engineer the means of nearly doubling boiler pressures without increasing weight or dimensions."—From Nickel and Its Uses, by J. T. Donald, in The Popular Science Monthly for December.

At the instance of Lord Onslow the New Zealand Government have taken measures to preserve the native fauna from the destruction which has been going on, especially amongst birds, ever since white men settled there. Many of the wild birds of New Zealand are amongst the most remarkable in the world, and certain kinds are to be specially protected in future. Two islands have been set apart as menageries where trapping and shooting will be strictly prohibited.—English Mechanic.

A great feat in telephoning and one which marks very important progress in this field was accomplished a few days ago when the new line between New York and Chicago was formally opened. This is not only the longest distance yet attempted, but it is twice as great as that of any other telephone line in use. Some idea of the magnitude of the undertaking is had from the fact that nearly a million pounds of copper wire are used in the line, and that the tariff is \$9 for five minutes' conversation, which for, say, twenty hours a day represents an income of over \$2,000 a day. It proved to work very successfully, even a whisper being distinctly audible.—The Electrical World.

Dr. Sanermann publishes, in the Gazette de Francfort, some interesting remarks about artificial colouration of birds. Canaries, he says, when fed with cayenne pepper, gradually change their color, passing from yellow to red. Cayenne pepper contains a tinctorial substance, an irritative principle, and an oil. When the last two substances are extracted by steeping in alcohol, pepper loses its colouring properties, but an addition of olive oil restores them. From this fact the conclusion is drawn that the oily principle of pepper is the necessary vehicle of colour. Experiments made with white hens gave similar results. These hens have also the quality of being able to indicate changes of temperature by a marked change of plumage. The yolk of their eggs is bright red.



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