Scientific American

MUNN & COMPANY, Editors and Proprietors.

PUBLISHED WEEKLY

At No. 37 Park-row (Park Building), New York

O. D. MUNN, S. H. WA ES, A. E. BEACH.

TERMS—Two Dollars per annum—One Dollar in advance, and the emainder in six months.

Single copies of the paper are on sale at the office of publication, and at all periodical stores in the United States and Canada.

Sampson Low, Son & Co., the American Booksellers, No. 47 Ludgate Hill, London, England, are the British Agents to receive subscriptions for the SCIENTIFIC AMERICAN.

☞ See Prospectus on last page. No traveling agents employed.

VOL. VI. NO. 7.....[NEW SERIES.].....*Eighteenth Year.*

NEW YORK, SATURDAY, FEBRUARY 15, 1862.

CULPABLE LOSSES OF ARMY HORSES.

A mistaken notion prevails in the community respecting the losses sustained by the great number of horses which have died of disease in Washington, and those which have been sold, as diseased, for a fewdollars after high prices had been paid for them by government. Many indifferent horses were undoubtedly purchased, but most of those which have died of disease, and those which have been sold as being useless for the army, were in good condition when purchased, and the loss which government has sustained by them can be traced to bad treatment.

The horse is an animal of fine organization and he requires to be nearly as well treated as his rider. In all nations where large standing armies are maintained, the governments support veterinary schools, from which competent surgeons are obtained for cavalry regiments. The horses of such armies are as well cared for as the soldiers. They have hospitals, good stables, and they are well fed and kept scrupulously clean. As the mounted troops hitherto required by our government have been few in number, no extended system, embracing the care of large numbers of horses was adopted; and under the altered circumstances of the present momentous war crisis, no proper head seems to have been selected to systematize and carry out measures for the organization of a large and efficient cavalry department. Many thousands of horses were purchased in the Northern and Western States and sent to Washington, where they were exposed for a long time to very inclement weather without stables, blankets or sufficient food of a proper quality.

Horses, like human beings, are very liable to become sick by a change ofclimate and water for drinking. This sickness will only last for a few days if the animals are properly treated, after which they will become acclimated and remain healthy with ordinary care. If they are not properly treated when first taken sick the disease is liable to become chronic and ultimately fatal. This was the case, we have been assured, with great numbers of the army horses sent to Washington.

It requires a mind of no ordinary grasp and experience of no common kind to superintend the army department relating to the horses of the cavalry, artillery and baggage trains. With respect to details, it appears that the right man has not yet been put into the right place, as it is reported by the newspapers that the horses of the army on the Potomac are now dying off daily in scores for want of proper care and provender.

Judging from the appearance and conduct of the majority of persons who are employed to take careof horses, it appears to us that a woful delusion is prevalent respecting the qualifications necessary for the performance of such dutles. Any man capable of measuring out a peck of oats, carrying a pailful of water, or tumbling in a bundle of hay and throwing out a heap of manure from a stable seems to be held competent to take care of a horse, whereas it requires a man of good judgment, much patience, firmness, intrepidity, kindness and careful habits to take this charge. There is a sad deficiency of such characters connected with our cavalry departments.

The most gross negligence and incompetence have also been displayed in shipping numbers of valuable horses by sea, on expeditions down the Southern coast. Of 130 excellent horses sent from Boston to Ship Island, 68 were lost during the voyage, owing to the improper method of packing them on board. Their flimsy stalls broke down when the ship labored in the sea, and the animals were dashed from side to side kicking and trampling one another to death. During the Crimean war the steamer *Himalaya* transported from the 1st of June to the middle of October, 1856, 3,000 horses, out of which only 3 were lost. In fitting up this vessel the platforms of the stalls were raised two inches off the deck, to admit of cleaning, draining and washing. Each horse had a separate stall, the sides and ends of which were of plank, and padded with cowhide stuffed with straw. The horses wore canvas head-stalls, and sling eyebolts were fastened to the deck, over the center of each stall, by which the horse was supported with a wide band of canvas under his belly whenever his situation required it. No such precautions were provided for the shipping of our horses; hence the great loss which has been sustained.

PROFESSOR AGASSIZ IN BROOKLYN.

The late Augustus Graham, of Brooklyn, in addition to other charitable bequests, left in the hands of trustees a fund of $12,000, with directions that the interest should be expended for popular lectures of a character somewhat similar to the Bridgewater treatises. The will prescribes that the lectures shall be "On the Power, Wisdom and Goodness of God as manifested in his Works," that they shall be delivered in Brooklyn on Sunday evenings by the most eminent masters of science that can be procured, and that they shall be free to all. The course delivered winter before last was by the Rev. Dr. Huntington; the course last winter by J. P. Cooke, Professor of Chemistry in Harvard University, and for the course this winter the trustees have been so fortunate as to enlist Professor Louis Agassiz.

It is well known that heretofore Prof. Agassiz has refused to deliver popular lectures, saying that his life was devoted to enlarging the boundaries of knowledge, and that he should leave to others the labor of its dissemination. But from his writing popular articles for the *Atlantic Monthly*, and consenting to deliver this course of lectures, it seems that he has changed his determination. It is with the highest satisfaction that we welcome the entrance of the greatest master of science in the world upon the field of that labor to which the SCIENTIFIC AMERICAN is devoted—the diffu sion of a knowledge of science among the great mass of the people.

The first two lectures of Agassiz's course were delivered in the small hall of the Brooklyn Institute, but so many who went were unable to procure admission, that a successful effort was made to obtain the Academy of Music for the remaining four lectures. The third lecture of the course was delivered on Sunday evening, Feb. 2, and the spacious building was crowded from parquette to ceiling with as respectable and intelligent an audience as is gathered there on opera night. In the natural order of the course the theme happened to be one in which Professor Agassiz is especially interested, and he treated it in a manner so methodical and clear as to charm the attention and command the comprehension of every person in the house. A report of the lecture will bo found on another page.

HISTORY OF HELIOGRAPHY.—On another page will be found the first of a series of articles we intend to publish on the above-named very interesting art, from the pen of M. A. Root, whose brief biography appeared in our last issue, under the title of "Fortunes and Misfortunes of an Artist." Mr. Root is about to publish a very useful and interesting treatise on the heliographic art, and the articles which will appear in these columns are extracts from the forthcoming work.

CHOOSING COTTON SEED.—A correspondent of the *Prairie Farmer* exhorts the farmers in Southern Illinois who intend to go into cotton planting next season to be very careful in the selection of seed. Sea-island cotton requires nine months of hot weather to mature to a full crop. The seed of this quality must not be used, but only that which is grown in the most northerly parts of Tennessee.

THE EXPLOSION OF GUNPOWDER.

On another page will be found a very interesting discussion on gunpowder by some of the best chemists in the city, and as they allude to the usual explanation of the matter we will give the explanation as we understand it.

Gunpowder is composed of five elements, all in the solid state, but by fire they are combined in new forms, by which about six-tenths of the mass is converted into gas; the chemical changes generating an intense heat. This change into the gaseous form causes an enormous increase in the volume, which is still further augmented by the rise in the temperature, and the ball is thus driven out of the gun.

Gunpowder is made by the combination of three substances, niter, sulphur and charcoal. Two of these, sulphur and charcoal, are simple elements, while the third is a compound substance. Saltpeter is the nitrate of potash and is composed of one equivalent of nitric acid, and one equivalent of potash. Potash, or potassa, is composed of one equivalent of the metal, potassium, and one equivalent of oxygen. Nitric acid is composed of one equivalent of nitrogen and five of oxygen, NO_5. The symbol of potassium is K, from the German name of the metal, Kalium. So the formula for the nitrate of potassa is KO, NO_5, and it will be seen that it is composed of three elements, nitrogen, oxygen and potassium.

The best gunpowder contains to the 100 pounds of niter, 17.76 pounds of sulphur, and 15.86 of charcoal, or carbon. This is precisely one atom of nitrate of potassa to three atoms of carbon and one atom of sulphur. And this, by being decomposed at the high heat which is generated when the powder is burned in a gun, is converted into one atom of sulphide of potassium, one atom of nitrogen and three atoms of carbonic acid,

$$KO, NO_5 + C_3 + S$$

becoming

$$KS + N + 3CO_2$$

It will be remembered that the atomic weight of potassium is 39, of sulphur 16, of nitrogen 14, and of oxygen 8. In this case 100 parts by weight yield 59 parts of gas; and one volume yields 300 volumes; the sulphide of potassium being a solid, and nitrogen and carbonic acid being gases.

MALLEABLEIZING CAST IRON.

Malleable iron is more generally understood to be cast iron, which has been subjected to a roasting deoxydizing process, without being fused, by which it becomes soft and tough. Formerly, wrought iron was called malleable, because the art of softening and toughening cast iron was then unknown, but wrought is now understood to be purified iron, capable of being rolled, forged and welded under the hammer.

The great genuine improvement, in the treatment of cast iron to render it malleable, was made by Samuel Lucas, of Sheffield, England, who obtained a patent in 1804, and his process is the one which is in general use at the present day for the same purpose. The articles of cast iron to be malleableized are placed in a suitable furnace with a layer of sand between them to prevent them from adhering, then they are covered with a pulverized oxide of iron, and subjected constantly to a high but not fusing heat for about six days and nights, then allowed to cool very slowly. The theory of the process is that the excess of carbon in the cast iron which renders it so hard and brittle unites with the oxygen of the pulverized iron ore in the furnace and passes off as carbonic acid gas, leaving the iron soft and malleable without changing its form. This was one of the most valuable discoveries ever made in metallurgy. It is now extensively practiced as an especial branch of art in every civilized country. Most cast iron articles intended for bridges, carriages, or for any purpose where they are to be subjected to vibrations are malleableized. Cast iron nails can be rendered so soft and tough by thus treating them, that they may be clinched almost as easily as those made of wrought iron. In 1838 Charles Burjot obtained a patent in England for treating raw pig iron with a mixture of the oxyde of manganese and charcoal in powder, in a furnace whereby he obtained malleable iron. The pigs were laid in alternate layers in a furnace with the mixture of manganese and charcoal between them, then they