THE RAWHIDE CANNON.

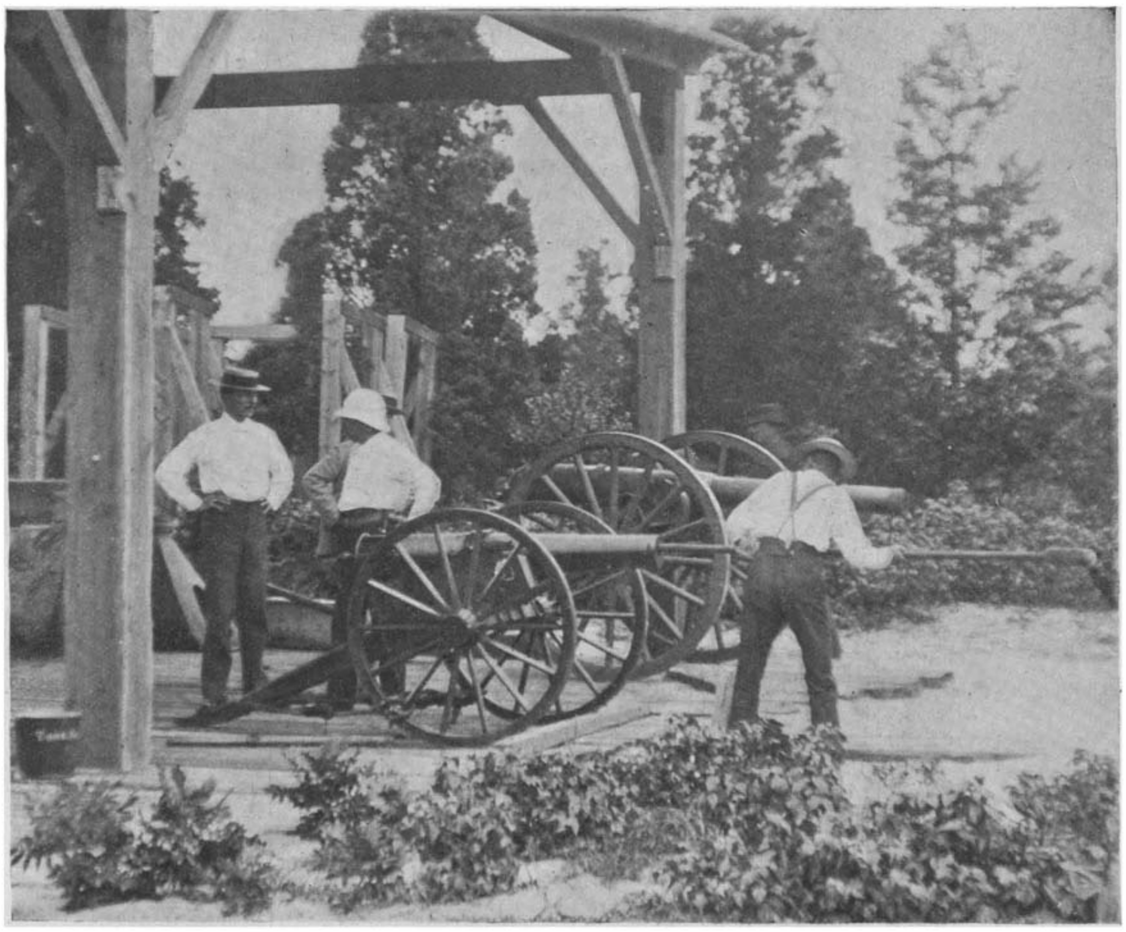
A curious weapon, nothing more nor less than a cannon chiefly made of rawhide, was subjected to official tests on July 23 by the Ordnance Board of the United States Army, at the proving grounds, Sandy Hook.

The gun consists of an inner tube of steel, around which is wound strips of rawhide to a combined thickness proportionate to the intended charge which the gun is to carry. The exterior of the raw hide is then inclosed in a shell of metal. The weapon when finished has the general appearance of an ordinary cannon, but is rather more bulky.

The inventor of this curious piece of artillery is Mr. Frederick Latulip, of Syracuse, N. Y., and he obtained a patent for the invention June 26, 1894, from which we take the following description:

"The principal objects of the invention are to cheapen and lighten the construction of guns and gun barrels, and, at the same time, to so strengthen the same that they will withstand the explosive strain of not only the usual charge, but an unusual one.

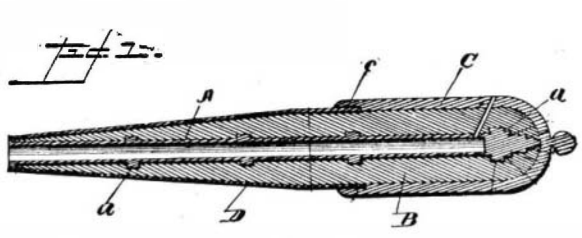
A indicates a core of steel or other suitable metal, properly bored, and provided with exterior collars or bands, a, arranged at intervals thereon. These collars or bands are cast integral with the core and serve to prevent endwise movement of the rawhide casing during firing. The breech portion of the core is provided with a series of step-like depressions, a.



LOADING THE RAWHIDE CANNON.

B indicates a casing of rawhide surrounding the core, and before being applied is treated as follows, viz.: I take the ordinary dried commercial rawhides and soak in water sufficiently to soften the hides and remove the lime therefrom. The hides are then well fleshed and split into thin layers in any well known manner. These layers are then soaked in a bath of liquid ammonia for from ten to fifteen minutes, after which they are thoroughly dried and cut into strips of the width desired for winding. The strips are then subjected to a bath consisting of a solution of sulphuric acid and water, in about the proportion of one part of acid to thirty-two of water, for about ten minutes. A bath of pure naphtha might be substituted for the sulphuric acid one above mentioned with equally good results. The effect of either of these baths is to cause a drawing or exudation of the oil or grease contained in the rawhide strips. The result of this treatment leaves the strips, when they are dried, hard and tough like horn, and possessing great strength.

In winding the strips around the core, cement is first applied to both surfaces to cause the successive overlapping layers to adhere, and this application of the cement also serves to soften the rawhide sufficiently to permit of easy and perfect winding; and in winding, the spaces or seats between the collars or bands are first filled. The strips are wound tightly around the core between said points in spiral overlapping layers until the spaces or seats are filled flush with the tops of the collars or bands, the cement, pressure and strain causing the layers to adhere firmly. After the spaces or seats have been filled with the rawhide layers, the breech is then wound in a like manner. In winding the breech I commence at the outer end and wind the strip around the core, filling the first step or depression, and, when filled even with the second step or depression, the winding is continued until both of said steps or depressions are filled flush with the third step or depression, and so the winding continues until the breech is incased flush with top of the first collar or band, a. After all of the spaces or seats and depressions are filled with the spirally wound overlapping layers of rawhide the winding is continued the entire length of the gun until the required thickness is obtained, after which the gun is placed in a suitable lathe and the rawhide casing is turned down to the desired shape. When turned down to the required shape a steel cap, C, having a groove or rabbet, c, is fitted tightly over the breech portion of the thus far constructed gun, and a steel shell, D, conforming to the



taper of the forward portion of the gun is forced over the rawhide until its inner end fits snugly within the groove or rabbet, c, of the cap, where they are secured together. The cap, C, is provided with the usual trunnions.

In place of the shell, D, I may provide the rawhide casing with a wire jacket, and instead of making the core breech solid, as shown, I may make it with a screw-threaded opening closed by screw-threaded breech block.

In constructing gun barrels I provide the core with the collars or bands as in the larger gun, and wind the rawhide strips around the said core in the same manner, filling the spaces or seats first, and then continuing the winding until the desired thickness is reached. After being turned down, a shell is forced over the rawhide casing until its inner end abuts against the abutment, to which it is brazed or soldered.

By constructing guns and gun barrels as hereinbefore described, the tendency to transverse and longitudinal rupture is reduced to a minimum, as the rawhide gives the necessary tension to withstand the explosive strain of the charge.

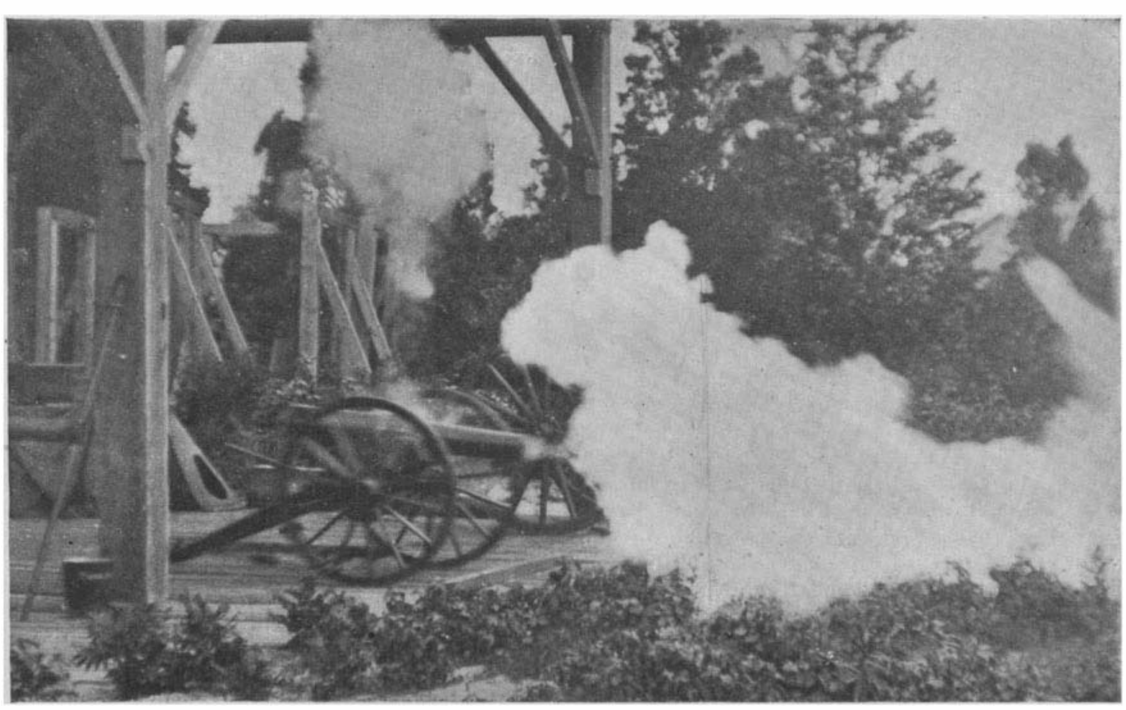
The principal claim is for a gun having a metallic core provided with retaining collars or bands, an intermediate casing of rawhide and a metallic covering for said casing."

We give herewith two photographic illustrations of the new gun specially taken for the SCIENTIFIC AMERICAN. One represents the loading of the gun, in the other its appearance at the moment of firing. The New York Sun gives an excellent account of the proceedings, from which we abstract the following:

The cannon held its own against very severe tests. It successfully withstood a pressure of 30,369 pounds to the square inch, but the recoil after this shot broke the trail of the gun carriage, and further tests were impossible, no other carriages being available at the time. The War Department ordered the Ordnance Board to test the cannon carefully. In Syracuse they have been firing the gun privately in an armory for a month past.

The principal claims made for the gun are that it is only about half the weight of an ordinary steel gun, that it is just as durable and much stronger than a steel gun, and that any number of shots can be fired from it in rapid succession without heating it.

The rawhide gun used July 23 was not a very formidable affair. It was 5 feet 8 inches long and was of 2½ inches caliber. It was mounted on a most elaborate gun carriage, which Mr. Link, the assignee, informed the board was made by the finest wagon maker in Syracuse. The gun weighs 456 pounds, and, according to the diagram, is made up of layers of steel, rawhide, and copper wire. The bore is of steel, ¾ of an inch thick at the muzzle and 1½ inches thick at the breech. The rawhide is 1 inch in thickness at the muzzle and 3 inches in thickness at the breech, and is cut in 4 inch strands. Around the whole is wrapped two layers of heavy copper wire. The gun looked strong enough to stand an ordinary charge, but not an officer present believed that there would be much more than a few bits of the carriage left after the first of the heavy tests had been made. Mr. Link thought otherwise. He walked proudly around his cannon, giving it affectionate pats every now and then, and inviting the officers to blaze away and "bust her if you can."



FIRING THE RAWHIDE CANNON.

The officers smiled significantly at each other, and Lieut. Ruggles was ordered to go ahead with the tests. Those who had attended gun tests at the proving ground before noticed that this test was not to be made at the usual place. The gun had been hauled some distance inland, where there is a large number of earth works, and had been placed about fifty yards in front of one of these huge piles of sand and earth, for reasons which became apparent later.

The workmen at the proving ground didn't seem to like the work of loading the gun, because, since it was built on the old-fashioned plan, they had to insert powder and balls in the muzzle and then drive them home with a ramrod. All the modern guns are breech loaders, and the men at the proving ground don't know much about any other kind of guns.

There was considerable discussion as to the amount of powder to be used in the first test. Some of the officers wanted a heavy test for a starter, their idea evidently being to settle matters quickly. It was finally decided to put a pound of ordinary powder in for a start, and when all was in readiness three lanyards were tied together so as to give the gunner plenty of opportunity to escape flying debris in the event of an accident. Then the whole force retreated behind the bank of sand so as to give the gun plenty of room.

The gunner concluded that he'd better get behind the hill, too, and so he secured another lanyard to the already long line and joined the rest of the company. At the word he fired, and although everything seemed to have gone all right, the officers didn't come out from behind the hill until the smoke had cleared.

They seemed surprised to see the gun intact. Mr. Link smiled while the Ordnance Board held a consultation with Lieut. Ruggles, after which a pound and a half of musket powder was placed in the gun. The gage showed after the first shot that the pressure had been 5,471 pounds to the square inch, while after the second shot it registered 16,840 pounds. The third shot, it was thought, would settle the cannon, and two pounds of powder were used, but it didn't, though the gage showed a pressure of 26,708 pounds to the square inch. The officers looked surprised, while Mr. Link in his joy got out his nerve tonic, took a drink, and then murmured to the Sun reporter:

"Ain't she a peach ?"

There was nothing for the board to do but to go on with the tests, and they ordered Lieut. Ruggles to go on up to a pressure of 35,000 pounds. In order to obtain this pressure it was decided to use two balls, and while preparations for the shot were going on the members of the Ordnance Board slowly withdrew from the scene. Capt. Crozier found that he had some business at headquarters, and Capt. Heath went up to give some instructions to a gang of men who were getting a 500 pounder ready for a test about half a mile away, while Major Phipps was suddenly overcome with thirst and started for the pump to get a drink. There was a rush for the sand bank when the gun was loaded, and when all hands were safely ensconced behind it, the charge was fired. It didn't phase the cannon a bit, and it was still intact when the officers crept out from behind the sand bank again. The gage showed that the pressure with two balls had been only 26,345 pounds, and so it was decided to use three balls and two pounds of quick rifle powder.

Mr. Link looked a little bit anxious when this was announced, but told the officers to go ahead. The pressure from this last shot was 30,360 pounds to the square inch, and, though the carriage gave way, the gun stood it nobly. Mr. Link went into ecstasies over it, while the officers looked a little disappointed. The members of the Ordnance Board came around after the last shot, and seemed very much surprised to find the cannon intact. They said there would have to be some more tests, and there were wicked gleams in their eyes as they said it, but all Mr. Link did was to chuckle and say: "Blaze away all you like. That's what she's here for."

The cannon was perfectly cool after every shot. The average recoil was about six feet. Major Phipps said after the test that the gun to be of any use would have to be a breech loader. Mr. Link said that he could build a breech loader just as easily as a muzzle loader, and that it would be just as good. The tests will be resumed in a few days.

The Encyclopedic Dictionary.

The cheapening of books and all kinds of reading matter is one of the most distinctive features of the age, and as a consequence of the vastly increased range of subjects brought to the attention of the general reader, the ordinary dictionary does not nearly as well meet the wants of the public as it did a generation or two ago. It seems to be demanded that the dictionary shall be also encyclopedic in its character, affording as concisely as possible a compendium of the world's knowledge, but without occupying as much space or costing as much as would a large library. A dictionary of this class, recently brought out by the Syndicate Publishing Company, of No. 237 South Eighth Street, Philadelphia, Pa., is more fully described in our advertising pages. The work is contained in four quarto volumes of 5,357 pages and over 3,000 illustrations, having over 250,000 words and treating of more than 50,000 subjects. It forms in itself a library for the busy man of affairs, the mechanic ambitious to advance himself in his line, or the student or apprentice just making a beginning; and, for the purpose of insuring for it a wide circulation among those of limited means, the publishers agree to send the whole four volumes to any subscriber on receipt of $2 and an agreement to pay $2 additional monthly until the sum of $16, the price of the work, is paid. The work is a valuable one, and by this method of sale it is placed within the reach of thousands of persons who would otherwise be unable to become its possessors.

Natural History Notes.

Feeding Habits of Certain Birds.—Some interesting observations have recently been made by the chief of the Division of Ornithology of the Agricultural Department concerning the habits of birds that are supposed to be enemies of the farmer. It is said to have been proved conclusively that 95 per cent of the food of hawks, owls, crows, and blackbirds consists of animals and insects that are far more dangerous to agriculture than are the birds themselves. The charge against crows is that they eat corn and destroy eggs, poultry and wild birds. Examination shows that they eat noxious insects and destructive animals, and that although 25 per cent of their food is corn, it is mostly waste corn picked up in the fall and winter. With regard to eggs, it was found that the shells were eaten to a very limited extent for the lime. Crows also eat ants, beetles, caterpillars, bugs, flies, and grubs, which do much damage. The cuckoos also are found to be very useful birds.

The Upas Tree.—During his recent stay in Java, Professor Wiesner ascertained some interesting particulars with reference to the celebrated Upas tree, Antiaris toxicaria. Contrary to the general impression that this tree is not uncommon in Java and the Sunda Islands, an impression manifested by the statements in the leading text books, Professor Wiesner learned that the original specimen described by Leschenhault has been felled, and in the whole of Java there were but three individual trees belonging to the genus and closely allied to A. toxicaria. Of these three trees one was found by Dr. Greshoff to be innocuous, and was therefore A. innoxia, Blume, a species supposed by many botanists to be only a variety of A. toxicaria. The second tree proved to be poisonous, one drop of the latex being sufficient to kill a dog; the third has not been examined.

The tree has, however, been cultivated in the botanical garden, and there are now in the plantation at Tjikomoh about seventy specimens. Neither in the botanical garden nor in the plantation could any ill effects be observed, even after a person having been for some time in the neighborhood of the trees; so the accounts of the poisonous nature of the exhalations from it are much exaggerated. Dr. Burck has shown that the plant gives off no injurious vapors, and that the latex is poisonous only when it passes through a wound into the blood.

Sensitive Movements of Plants.—Dr. J. M. Macfarlane publishes the results of a series of experiments on the effect of colored screens on the sensitive movements of leaves (Oxalis stricta and several species of Cassia). He finds the exciting agents of the movements to be certain of the light rays. When sensitive plants are placed behind colored screens, the leaflets fold up as in the nyctitropic state, most strongly under red, less so under yellow, only feebly or not at all under green light; while under blue screens the leaflets remain open as in ordinary daylight. In all cases nyctitropic movements are accelerated behind a red screen, not quite so strongly behind a yellow screen, while behind a green screen the movements practically coincide in time with those of exposed plants, and are beautifully regular in sequence; under blue light there is a distinct retardation of the normal nyctitropic period. Up to 38° C., or even 43° in some species, heat rays appear to fail in stimulating the tissues. The general result of these experiments is that the heat rays, the less refrangible rays, and the more refrangible rays, are all efficient up to a certain point in inciting nyctitropic movements. Orange, yellow, and green screens to the protoplasm, whether in the form of pigmented walls, pigmented cell sap, or chlorophyl, are of a protective character, and permit the normal functions to be carried on unimpeded by the injurious action of the more intense blue-violet rays.

Poisonous Property of the Shrew Mouse.—Both in England and in Germany, popular tradition in rural districts attributes poisonous effects to the bite of the common shrew mouse. Scientific naturalists have discredited this belief, but the recent observations of Remy St. Loup, published in the Revue des Sciences Naturelles, tend to show that this popular reputation for toxicity may not be groundless. He observed that cats were afraid of the animal, and having captured a specimen placed it in a cage with a common mouse. The latter, although twice the size of the shrew, fled from its companion in fright, but nevertheless was bitten in the leg by its fellow prisoner. The bitten mouse speedily developed abnormal symptoms, and on releasing it, its hind legs were found to be perfectly paralyzed. It was enveloped in cotton wool, but the next morning was found dead without having moved from where it was placed. Considering that the wound caused by the bite of the shrew was very small, it would appear that the old tradition as to the poisonous properties of its bite, at least as regards the domestic mouse, is well founded.

Fecundation of Flowers by Insects.—Mr. H. G. Hubbard describes in Insect Life a new case of fecundation of flowers by insects. It concerns a species of Philodendron, of the family of the Aroids, which is found in the Antilles. By its structure, the flower would seem especially adapted for direct fecundation were not the male organs tightly inclosed in the folds of the spathe. The fecundation is effected by coleoptera of the genus and species Macrostola lutea, which in pairs perforate the spathe, wherein the female deposits her eggs at the apex of the spadix. The young soon hatch, and detaching the spathe from the spadix, allow the pollen to fall upon the female organs situated beneath. The entire interior of the flower is very humid, so that all the young are soon covered with a paste of pollen which they carry to the neighboring flowers after the flower has opened. Such opening is due to the parent insects. The spores of fungi enter through the very small aperture made by the insects, and, developing, eat into the spathe, which is also soon attacked by the larva of a fly and by many other insects.

Amount of Light Favorable to Plants.—Herr J. Wiesner has come to the following conclusions on this subject: Those plants which, like Lemna, receive an unlimited amount of light on all sides, do not produce a maximum of organic substances. In by far the greater number of plants the amount of light absorbed is diminished by the form and position of the organs. In trees this amount is reduced, in the peripheral portion of the foliage, to one-half or one-third, in the central portion to as little as one-eightieth of the possible amount of light. All luxuriant vegetation is produced under conditions of comparatively feeble, and especially of diffused, daylight. Intense light is of no advantage to a plant growing in unfavorable conditions, especially in poor dry soil. Although the actual amount of light enjoyed by trees and shrubs is greater in tropical than in temperate regions, yet in the latter the leaves of deciduous woody plants receive a more intense light than those of the former at one particular period of the year, namely, at the commencement of the period of vegetation.

The Color of Flowers.—Schubler has found that, out of a thousand flowers, 284 are white, 226 are yellow, 220 are red, 141 are blue, 75 are violet, 36 are green, 12 are orange, 4 are brown, and 2 are black.

White flowers become proportionally more numerous in measure as one advances toward the north.

Distribution of Marine Fishes.—Mr. Browne Goode, in a paper recently read before the Society of Biology, shows that the ideas admitted in regard to the distribution of deep water fishes are erroneous. Contrary to the opinion usually held, no separation in the horizontal strata is possible. Nor is it any more accurate to say that the marine fauna of great depths is the same for all parts of the world.

The application of the method of percentages leads Mr. Goode to distinguish 11 characteristic regions and 2 subregions. These are as follows: (1) Northern Atlantic; (2) Eastern Atlantic with Mediterranean subregion; (3) Virginian Northwestern Atlantic with Mexican subregion; (4) Southwestern Atlantic or Brazilian region; (5) Northern Pacific; (6) Eastern Pacific; (7) Northwestern Pacific; (8) Polynesian; (9) Zelandian; (10) Antarctic region; (11) Indian region.

Royalties.

One of the incentives for inventors to secure patents on their inventions is the possibility that a handsome income may be derived therefrom in the shape of royalties. In the art of photography, where the manufacture of sensitized dry plates on a large scale has come to be an extensive industry, successful plate-coating machines command a good royalty. An item in the English journal Optician states that Mr. B. J. Edwards rents out on royalty twenty of his patented plate-coating machines at a yearly rent of $500 per machine. One company uses five of them. Mr. Edwards was a photographer, knew the needs, and applied his inventive ingenuity, finally accomplishing a successful result. How many thousands there must be, having inventive talent, who could improve the machinery in the lines of industry they are familiar with, to the betterment of mankind generally and themselves individually.

The example of Mr. Edwards is only one of many, where success is attained in the invention of practical and needful improvements, and should inspire others to make use of their inventive talents.

A New Anthracite Vein.

Anthracite coal in a vein four feet thick has been discovered on the Line Mountain, which bounds Schuylkill and Northumberland Counties. The vein is on the south side of the mountain, near Pitman, in the former county. This is a surprise to coal experts, for it is five miles south of the Shamokin coal basin, and was believed to be outside the coal district.