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O. D. MUNN, S. H. WALES, A. E. BEACH.

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DEFECTS OF AMERICAN FLAX---CHOOSING SEED.

Linen is, perhaps, the most ancient and beautiful of all vegetable fabrics. One hundred years ago only, it was almost exclusively used in all civilized countries for shirting, sheeting and other domestic purposes, and cotton fabrics were then but little known. The rapid progress of the cotton manufacture and its extensive development during the present century are due to an almost unlimited supply, at a low cost, of this staple from the Southern States. Cotton is usually more expensive to cultivate than flax, but it can be prepared for carding and spinning at much less expense. Owing to its present very high price, however, and the prospect of a limited supply of it for the immediate future, much attention is now concentrated upon flax, to take its place in textile manufactures. We believe that flax may now be cultivated and prepared for carding at remunerative prices. Our opinions on this subject have been previously published, and need not now be elaborated. Our object at present is to urge the subject again upon the attention of our farmers, before sowing their seed and to point out some defects which have hitherto characterized American flax. In the records of the transactions of the Rhode Island Society for the Encouragement of Domestic Industry, for 1862 (just published) we find the following paragraph in the report of the committee on flax culture :—

"A noticeable fact relative to all samples of Western flax exhibited to the committee is the weakness of the staple ; that it wastes largely by manipulation, and when prepared, appears only suited for coarse fabrics. On the contrary, Canada flax is very strong, wastes much less in handling, and, when properly prepared, seems fitted for the finest purposes. The inferiority in Western flax appears to arise from the different mode of cultivation and after-care. They believe that any failure to work Western flax will be traceable to a want of knowledge on the part of the producer of the best modes of sowing, reaping and curing it, rather than to any other cause ; and that experiments to ascertain the best mode of cultivation and cure of it, with a view to its textile use, to be thorough, should begin with the planting of the seed."

This extract deserves the attention of all our farmers who design to cultivate flax. Our American Western flax is described as being defective in three very important features—it is weak, wastes largely in tow and is fit only for coarse fabrics. Nothing worse could really be said against it. And these defects are not due to climate or soil, but to a want of knowledge or carelessness in its modes of cultivation and after-care. We cannot agree with the last clause of the above extract, that further experiments are required in either the cultivation or cure of American flax. In Canada West, which has a climate similar to that of Michigan, we are told that flax of a superior quality is raised. Let our farmers, then, adopt the practice which has obtained in Canada, and without further experiments they will raise flax equally as good. In Canada West there are a large number of Scotch-Irish farmers who were acquainted with the cultivation of flax in Ulster, Ireland, and who have carried their knowledge and practice with them to America. One great defect in American flax is due to the inferior seed that has been used. No farmer expects to raise good wheat, oats or corn from bad seed, and flax in this respect should form no exception to the general rule. But hitherto our farmers have cultivated flax chiefly for its seed, to extract its oil, hence they have paid little attention to it for the purpose of obtaining its fiber. They must now abandon this idea, if they wish to secure good fiber. Russian—not American—seed is the best for this purpose, and the Dutch is next in quality. In the event of not being able to secure these European seeds, flax seed from Canada should be chosen, or very carefully-selected American seed.

THE BEST METAL FOR GREAT GUNS---OUR NEGLECTED WROUGHT-IRON CANNON OF LARGE CALIBER.

In the early ages of gunnery cannon were fabricated of a caliber compared with which the largest modern guns are pigmies. They were mostly made of bronze, although some of them were composed of wrought-iron forged in bars and banded with hoops of the same metal. A number of ancient bronze guns varying in caliber from 16 to 30 inches are still mounted on the forts at the Dardanelles, but the largest cannon of this kind was one cast at Moscow, Russia, in 1586. It is 18 feet long, the bore is 36 inches in diameter ; its chamber is sufficiently large to hold 500 pounds of powder, and the stone ball which was intended to be fired from it weighed 2,500 pounds ; a solid iron shot to fit it would weigh 6,000 pounds. The total weight of this cannon is 97,500 pounds, but like the great bell of Moscow, it has been simply a gigantic curiosity. As the powder used in olden times possessed much less expansive force than that which is now manufactured, and as stone balls were much lighter than those of iron, which are now used, of course these old guns were not subjected to such strains as modern artillery. From the old big guns of the Turks, Russians and others, there was a gradual descent, for two hundred years, to cannon of a smaller caliber. Half a century ago 32-pounders were the great guns on the largest war-ships, and in 1820, the heaviest cannon mounted on our American sea-coast defenses were 24-pounders. About thirty years ago gunnery took an upward tendency and we are still advancing in the construction of large cannon. Instead of 24-pounders for our coast batteries and 32-pounders for the navy, we have now guns ranging from calibers of 3 up to 15 inches—the largest being capable of throwing a shell of 420 pounds, and one of 20 inches caliber, capable of throwing a thousand-pound shot, has been proposed.

The best material of which guns of large caliber should be made is a question of much importance. At present there are four kinds used in the American army and navy. One class is made of bronze ; they are chiefly used for boat howitzers and light field-pieces. Another class consists of rifled guns, each formed with a cast-iron tube banded at the breech and the reinforce with wrought iron. Some of these are large ; they are used on vessels for long ranges and on land for siege and battery trains. A third class consists of rifled steel guns ; the fourth class are made entirely of cast iron. Most of our navy and fort guns belong to the latter class ; they are smooth-bores and range from 3 to 15 inches in caliber. As our largest guns are made of cast iron, the natural inference to be drawn from such a use of this metal is, that it is held to be the strongest and best metal for the purpose. This is a debatable question. No better evidence against it could be adduced than the admitted fact of its being unsafe for the manufacture of large rifled guns, which are subjected to greater strains than the smooth-bores. When used in rifled guns, these have to be banded with wrought-iron hoops. Why then should this metal be used at all for large guns? What would be thought of the proposition to use cast iron for musket barrels? It appears to be more unreasonable to employ this metal for large than small fire-arms, because guns formed of a stronger metal could be made lighter, and they would thus be more easily handled. The question naturally arises, why not use the best wrought iron—such as that employed for musket barrels—in the manufacture of heavy guns? This metal is much stronger than cast iron ; but it has been urged against its use that large sound forgings, such as are required for cannon, cannot be made; also, that it is more liable to take a permanent set than cast iron ; and lastly, that the use of hard cast-iron shot would soon wear them out. The latter difficulty can be overcome by coating the shot with a softer metal, as is now done with elongated rifled shot; the other two objections are not founded on perfectly reliable data ; although the greatest difficulty undoubtedly lies in securing good forgings.

We are glad to notice that the authorities of our Navy Ordnance Department have advertised for proposals for the construction of wrought-iron guns of as large a caliber as 100-pounders. We infer from this action that those who have charge of the Ordnance Department believe that superior heavy guns may be made of wrought iron, as our 15-inch cast-iron guns have, as yet, achieved no glory, and they cannot be used with large charges of powder. But we are not left in ignorance as to its fitness for such purposes ; we are only astonished that the Navy Department does not make use of the large wrought-iron gun which it has had in its possession for over twelve years. There is now in the Brooklyn navy yard a 12-inch wrought-iron gun which was made at the Mersey Steel Works, Liverpool, for the United States, under the direction of Commodore Stockton. It is as beautiful a piece of ordnance as can be seen anywhere, and it appears to be a very perfect piece of workmanship. It weighs 21 tuns, and is capable of throwing a solid shot of 280 pounds. Prior to the casting of our new 15-inch guns it was the largest cannon in the United States: It has driven a shot through several inches of iron plates bolted together, and why it has not been used and is not now mounted on one of the coast forts is inexplicable to us. We think it may be fired with a greater charge of powder and that it will send its shot with a far higher velocity than any of our cast-iron guns. The same parties who made this gun for our navy fabricated (in 1856) one of the same pattern and of similar material, of 13-inch caliber, for the British navy, and it has proved to be the most destructive battering piece of ordnance in the world. It has been fired repeatedly with 75-pound charges of powder and, at a distance of 800 yards it has sent its spherical shot through the "Warrior target" at Shoeburyness as easily almost as if the iron plates had been stoneware. No less than 8,000 pounds of powder have been used in firing with it, and it appears to be as sound in the bore as when its first shot was discharged, as stated on page 360, Vol. VII. (new series) of the SCIENTIFIC AMERICAN. It seems that the British Admiralty were once as oblivious to the merits of that great gun as our authorities have been to the one in *their* possession. The former gun lay rusting for three years on the sea-shore at Portsmouth, but it is now mounted and its merits appreciated ; the latter and older gun we saw last week lying like rubbish in the navy yard, and Col. Mordecai states that "it has never been tried." This statement does no credit to those who have the charge of it. We hope this gun will soon be rescued from its ignoble position, mounted and brought into use. There is not a gun on the harbor defenses of New York that can equal it for smashing and penetrating iron-plated frigates at short ranges.

ARMOR FOR SHIPS OF WAR.

Ever since iron-clad ships were invented there has been a conflict of opinions upon the subject of their armor. The proper thickness, the mode of fastening it, whether single plates or a number of thin ones are the best, with wood backing or without—these are only a few of the questions bearing upon the subject which have received attention. That some one plan has not been universally adopted is owing to obvious natural causes. Each person or Government thinks himself or itself best qualified to judge where his or its immediate interest is at stake.

In this country we have more generally adopted the series of thin plates in preference to heavy single ones ; although there are some exceptions to this statement. Abroad, the reverse is true. Thus far we have had more practical experience with iron-clad ships than any other people. The last to adopt these engines of war, we have been the first to put them into actual service, and our success has been wholly with the combinations of thin plating. The gunboats on the Western rivers—*Conestoga* and *Lexington*—were plated with solid iron $2\frac{1}{2}$ inches in thickness, yet they were completely riddled in the attack on Fort Henry by the ordinary guns at that point; so also was the *Essex* before her re-construction. The Ericsson batteries are all armored on the principle of many layers of thin plates, and they have proved themselves impregnable, so far, to every assault. The arguments in favor of thin plates may be summed up in the following list:—It is claimed that they are stronger for a given weight of metal than thicker forged armor, by reason of the "scale" or cuticle being preserved intact, as well as by the intimate relations of the fibers which occur when small quantities of the metal are subjected to intense pressure; for this reason it is apparent that the structure of thin plates must be, *ceteris paribus*, more reliable than forged ones. By the same reasoning, however, some may assert, that if the requisite machinery existed in this country for giving the same proportionate tenacity and tensile strength to heavy single plates, as good results would be produced. This sequence, although a natural one, is not, it seems by experience, a correct one. A combination of thin plates is said to be more effective in resisting the impact of a heavy shot than a single plate of the same thickness, by reason of their elasticity or re-action after the instant of percussion. All experience goes to prove this assertion; where heavy plates have been shattered to fragments, the thin ones have been displaced and bent but not destroyed, and the injuries to them rarely extend through a whole section of armor. The heavy plates when smashed require much time and expense for their renewal, and are at best a poor substitute for thinner coats in many layers.

Recent improvements have rendered the thin plates still more effectual. The gunboat *Essex* after her misadventure at Fort Henry, on the Cumberland river, was taken to St. Louis and there re-clad on the forward casemate with iron plates only one inch thick; under these were placed india-rubber sheets one inch thick, the whole being inclined at an angle of 45° upon a wooden backing of oak 16 inches through. Thus defended the ship went into service.

"In the action between this gunboat, commanded (at that time) by Commodore W. D. Porter, and the batteries at Vicksburg, Port Hudson and other points on the lower Mississippi river, the forward casemates were struck repeatedly by solid shots, varying from 32 to 128 pounds, some of which were fired from rifled guns at short range. None of those shots penetrated the forward casemate, but some of the larger ones indented the armor plates, started the wood-work and broke in pieces, showing that the force of the shot was entirely spent. The after-casemates, covered with iron of the same thickness, and made by the same manufacturers, but without india-rubber, were penetrated in several places by shots fired from the same batteries and similar guns; in all, over 125 shots struck this vessel at about the same range, proving that this thickness of iron affords no protection when placed immediately upon a solid timber support. In fact, the same may be said of 2½ and 3 inches of iron, if we may form a correct judgment from the results of the actions between the gunboat *Galena* and the batteries at Fort Darling, on James river, Va., and the gunboat *Carondolet* and the rebel ram *Arkansas*, on the morning of the 15th of July, 1862; also the engagement between the gunboat *Benton* (commanded by the late Captain Gwin) and the batteries at Haynes' Bluff on the Yazoo river. This vessel was struck twenty-nine times in this engagement. The first-named vessel's armor plates that were penetrated were 3 inches thick; the latter two vessels, belonging to the Mississippi squadron, were protected with armor plates 2½ inches thick. These plates were penetrated by 8-inch shot, the range being about the same as that when the *Essex* passed the batteries at Port Hudson, on Sept 7, 1862.

"Now, if 1 inch of iron and 1 inch of india-rubber between the armor plates and the timber (on the *Essex*) effectually resisted the penetration of the before-mentioned shots at short range (of which fact there can be no possibility of doubt), when we take into consideration the width of the river, position of the vessel and the locality of the batteries from which these shots were fired, as well as other evidences of the facts, what may be expected of a casemate composed of from three to four sheets of iron, of 1 inch in thickness and the same number of vulcanized india-rubber plates interposed between them, so as to afford a mutual support and to act as one continuous sheet? The probability is that the power of resistance to penetration, of this combination, would only be limited by the ability of the casemate to resist the momentum of the shot and sustain the plates.

"The ability of the armor just-mentioned to prevent a vessel from being swamped, going to pieces or springing leaks during a heavy sea, will depend only upon the depth of hold, width of beam and the manner in which the work is put together, and not merely upon bolts and rivets, as has heretofore been the case."

If all these assertions are correct (and we have good reason to think that they are), attention should be given to the subject immediately. If thin plates and rubber backing are as effective as they are claimed to be, all doubts as to the possibility of making iron-clad ships sea-worthy are set at rest forever.

TAXIDERMY—STUFFING BIRDS.

As the season is at hand when objects of natural history may be collected with facility, we will present some useful information relating to the modes of preserving them. Taxidermy is comparatively a modern art. Reâmur, the distinguished French *savant*, was the first writer, we believe, who published a memoir on the method of preserving birds. The skin was first to be steeped in alcohol, iron wires were passed through the legs and body, it was fastened to a board, two black beads placed in the head for eyes, and this was called a "preserved" bird. In 1786 the Abbe Manese published a memoir on the subject, and described the method which is now pretty generally practiced for stuffing, but the substances which he recommended for preservatives were not suited to the purpose. The following composition for treating the skins is used in the museum at Paris and is held to be the best:—White arsenic 2 lbs., hard soap 2 lbs., salts of tartar 2 ounces, and camphor 5 ounces. These substances are beat together under gentle heat in water, until they form a solution capable of being applied with a brush. The instruments used by the taxidermist consist of soft wires, a quantity of tow, several scalpels, scissors, pincers, forceps, files, a hammer, and a collection of beads resembling birds' eyes.

In hunting for birds as specimens, a double-bareled fowling-piece should be used, one barrel loaded with small, and the other with large shot, for shooting birds of different sizes. When a bird is shot, some dry saw-dust (carried in a wallet) should be sprinkled in the wound, and some tow placed in the beak to prevent the blood soiling the feathers. It should then be suffered to become cold, placed carefully in a wallet, and the feathers disturbed as little as possible until it is conveyed to the place where it is to be stuffed. If taken alive it should be killed by introducing a sharp probe between the skull and the first vertebra, to divide the spinal marrow. The bird should be skinned soon after it is shot if the day is hot, but in cold weather this may be deferred for several days. In skinning birds the ruffling and soiling of the feathers must be avoided as much as possible. The body is first separated at the knee joints, an incision made under the wing, and the two wings separated at the first joint; an incision is also made along the breast, and the head separated at the atlas, and the entire skin, with head, wings, tail, and lower joints of legs gently taken off. The brain is next removed from the skull, and the tongue and the eyes taken out. All the flesh must be carefully removed by the scalpel from the neck, wings and legs. The skin thus treated is now smeared inside with the arsenious compound described. The skin is now to be stuffed. Two wires are required for supporting the bird; one of these is first introduced up the leg, and pushed through the body to the head, and into a hole drilled in the skull. The other wire is passed through the other leg between the bone and the skin, but is not carried to the skull; it is merely twisted round the first wire. All the vacuities are then filled up—stuffed—with tow or cotton, and the incision sewed up. The bird is now properly fixed with the wires to support it on a board; the feathers are adjusted and the proper shape and position given, aided by pins and bandages, which are removed as the specimen becomes dry.

Such directions will not enable any person to stuff and mount birds perfectly, because a mere description of any method only serves to assist in commencing operations. By perseverance, however, combined with taste and mechanical skill, a good degree of perfection will soon be attained. Many birds will be spoiled before satisfactory success is achieved. The most common faults of a badly-stuffed bird are a disproportionate fulness of the body to the neck, and *vice versa*. A person who mounts a bird for the first time, usually commits the fault of placing the thighs behind the rump, by setting the body too much forward. Skins of birds may be preserved in alcohol, sent to any distance, and kept for a considerable period of time before being stuffed. A solution of corrosive sublimate and alcohol has been recommended for treating skins by the English naturalist, Warburton; another compound, of corrosive sublimate, rock salt and alum, by Swainson, with a powder of burnt alum and nutgalls to be dusted upon the interior of the skin. Arsenic, however, is the best preservative against both the attacks of insects and putrefaction. The habits of birds must be studied by the naturalist in order to give them the proper form and position in stuffing, in order to illustrate their habits. In another article we will describe the mode of treating other objects.

(To be continued.)

LITERARY NOTICE.

THE NEW AMERICAN CYCLOPÆDIA—A POPULAR DICTIONARY OF GENERAL KNOWLEDGE. Edited by George Ripley and Charles A. Dana. Published by D. Appleton & Co., 443 and 445 Broadway, New York.

That standard work of reference, the *New American Cyclopædia*, is now completed; Volume XVI. having just been laid on our table. We have had occasion to consult the *Cyclopædia* frequently and have found in it a great deal of valuable information on diverse subjects. The extent and amount of labor expended on this work are remarkable, and some details concerning it are here appended:—

The present work of Messrs. Ripley and Dana is the first original general cyclopædia completed in this country. The work was begun in February, 1857. A staff of twenty-five writers was engaged, most of whom had desks in a large office provided with a formidable library of books-of-reference printed in various languages. The Astor Library (New York) was, however, an additional and valuable place-of-reference. Besides the regular staff, a number of "outside" gentlemen contributed articles on subjects upon which they were especially competent to treat; and it has been the rule to entrust all papers upon the various sciences and arts to the most eminent professors and experts.

The publishers, Messrs. D. Appleton & Co., have invested $415,000 in this great literary venture. The amount paid to contributors and for the stereotype plates, up to December 12, 1862, was $143,700. The other expenses, on 217,550 volumes printed, of the first fifteen volumes, were—for paper, $111,500; printing, $17,500; binding, 110,000; advertising, circulars, &c., $20,000. Add to this the cost of paper, printing, and binding 10,000 copies of Vol. XVI. = $12,200, and an item denominated "sundries," $100, and we have a grand total of $415,000. Of the literary execution of the work, we, who have occasion to refer to it daily, can speak with satisfaction. The *New American Cyclopædia* is correct, full in its information and conveniently arranged for ready reference; the articles are concise, yet complete; and the work, continued and finished in the midst of a civil war, is an honorable example of American thoroughness and enterprise. We believe it is the intention of the editors and publishers to issue a supplementary volume, in which any subjects which have claimed treatment since the commencement of the work may have justice done to them; and the issue of an annual volume—a register of important events—which was begun by Messrs. Appleton last year, will hereafter answer the purpose of a supplement for those who want it.

SEVERAL mills in Ashaway, R. I., are now running day and night, manufacturing army flannels. One mill with only thirty-six looms is manufacturing 20,000 yards weekly by running night and day.