It is employed for several useful and ornamental purposes, such as the making of ear-rings, necklaces, brooches, snuff boxes, knife handles, etc. It is particularly worn as mourning jewelry; it requires, however, much care in working, being extremely brittle. It is ground on lead wheels with emery, and polished with rotten-stone. It is kept in favor by the jewelers, on account of its high polish; but its value is very indifferent, excepting that of the iridescent obsidian, which commands a high price, and is sometimes seen cut in cabochon, and set in rings.

There is no doubt but that obsidian is of volcanic origin, being mostly found in the neighborhood of volcanoes, and that it is a glass, produced by volcanic fire, as it is a combination of silex and alkaline substances. The Neptunian theorists have endeavored to prove that it is occasionally found with the remains of decomposed granite, gneiss, and porphyry, with which it even alternates in layers.

FISH CULTURE.

BY CHARLES J. ATKINS.

Nearly all of our common fishes are *oviparous* which term, as distinguished from *viviparous*, we may apply to those species of animals which are reproduced by eggs laid in an undeveloped state. In most cases not only are the eggs extruded from the female fish before their development, but also that contact of the male element which impregnates them, and without which no development is possible, is effected after extrusion.

The operation of spawning, or depositing and impregnating the eggs, as performed by the parent fishes, is essentially as follows. At the spawning season, mature fishes of both sexes repair to a suitable locality; and, having selected a place, a female extrudes her eggs, which sink to the bottom among the pebbles, or, if glutinous, adhere to sticks, weeds, and stones. At the same time, or immediately afterward, the male emits the milt, the fecundating element, which, diffused through the water, comes in contact with the eggs and impregnates them. In due time, nourished by the water in which they are deposited, and quickened by its heat, they develop and hatch into living fish.

Now a little examination into circumstances will make it evident that a great waste must here occur. A multitude of greedy creatures hover around, ready to devour the eggs as soon as they are left by the parent, or are swept within reach by the current; a portion fails to come in contact with the milt; others are destroyed by noxious sediment or parasitic fungi, or buried deep beneath the shifting sands which the floods may bring down upon them. Should a portion of the eggs escape these dangers, the newly-hatched and defenceless young are eagerly hunted out by all the carnivorous tribes of the water. In the end, comparatively few of the eggs laid result in mature fish; it is perhaps impossible to ascertain the proportion with precision, but one per cent, would be far more than sufficient to maintain and increase the numbers of any species, so enormously fecund are they. Indeed, a rough calculation shows that were one per cent of the eggs of a salmon to result in full grown fish, and were they and their progeny to continue to increase in the same ratio, they would in about sixty years amount in bulk, to many times the size of the earth. Nor is the salmon among the most prolific species. I have counted in a perch (*Perca flavescens*), weighing three and a half ounces, 9,943 eggs; and in a melt (*Osmerus viridescens*), ten inches in length, 25,141. Some of the larger fishes produce millions at each spawning.

Now if in some way the eggs can be protected from these various dangers that threaten them when abandoned by the parent fish to the ordinary course of nature, it will at once be seen that a great gain will be made in the number hatched from the spawn of each mother; and if, farther, the young fish can be protected from their enemies until they have acquired size, strength, and agility sufficient to care for themselves, another gain will be thus effected. These two problems are among the most important with which Pisciculture has to deal, but have, we think, been satisfactorily solved.

An interesting experiment was made in Sweden in 1761, by Charles Frederick Lund. He obtained some breams, perch, and mullets, with mature spawn, and placed them in large submerged or floating wooden boxes, in which he had placed quantities of pine boughs. In these boxes the fish were kept several days, until they had completed the process of spawning; they were then removed. The eggs had adhered to the boughs. These species hatch quickly, and in a short time multitudes of young fish emerged from the boughs. In this way he obtained from fifty female breams, 3,100,000 young; from one hundred female perch, 3,215,000 young; and from one hundred female mullets, 4,000,000 young. These are certainly wonderful results. They were placed in the Lake of Ræxen, and dismissed to care for themselves. In a similar way those species, like the trout, whose eggs fall free from each other to the bottom of the stream, may be made to spawn in places where it will be convenient to protect them by enclosures from marauders; and, with a suitable arrangement of small ponds and streams, the young fry of all species may be separated from the old ones that would devour them.

But the crowning discovery in Pisciculture was that of artificial fecundation. This discovery was made during the last century, but was turned to no practical account, and and was hardly practised except in laboratories, when it was re-discovered in France a few years ago, under circumstances that brought its economic bearing prominently before the attention of learned men.

Since the operation of extruding the eggs and milt is essentially mechanical, it can be as well performed by man as by the fish, and, once extruded, the milt performs its own office upon the eggs, and fertilizes them, with no other interference than suffices to bring them into contact. Nay, man can do better than the fish: he can express the eggs into a vessel where none of them will be swept out of reach of the milt, or into the maws of the expectant throng of bystanding fishes; he can then press the milt into the same vessel, and, by stirring them together, insure that the milt shall reach every egg. This is artificial fecundation. But let us examine the method employed.

The operations of Pisciculturists, who have practised artificial impregnation, have been mostly confined to a few species of the family of Salmonidæ. The processes pursued will therefore apply only in a limited extent to the members of other families.

Perhaps salmon and trout have received the most attention. Both these species always seek, running, shallow water, and spawn in the autumn or early winter. A female and male, both ripe and ready to spawn, seek a proper place, and on a gravelly bed, swept clean of sand for a small space, the female deposits her eggs, and the male his milt. The operation is described with great minuteness by European writers but I think that our brook trout (*Salmo fontinalis*) has not been observed sufficiently to ascertain whether its habits are precisely those of the European trout.

All fishes, when spawning, are so intently engaged upon it, that they take very little notice of anything else. Trout can be captured with the greatest ease at this time—not unfrequently they can be taken with the hand. The following is the artificial process as described by a practical breeder of the brook trout.

The trout, male and female, must be taken with a net, or in some manner that will not injure them, just at the time they are preparing to spawn, and placed in baskets standing in the water in some convenient place. A pan or pail with three or four inches of water in it is brought near the baskets containing the trout. All things being ready, a female trout is taken out of the basket with one hand, and with the other the abdomen is gently rubbed from the gills downward, whereupon the spawn flows in a continuous stream into the vessel. The rubbing is continued until the spawn is wholly extruded, and the trout is then quickly replaced in the water. This operation must not continue more than one minute if possible. On one side of the egg is a small white speck; this is where the impregnation takes place. This side of the egg being lightest, it always falls uppermost. A male trout is now taken, and in like manner the milt is expressed; it falls through the water and settles upon the eggs. All the trout in the baskets are served in the same manner. The spawn and milt are then placed in shallow vessels, and deposited in water, where they are allowed to remain an hour more. (Other operators find a few minutes sufficient to insure impregnation, and at the end of that time rinse the eggs thoroughly.)

The manner of proceeding with salmon and other species is essentially the same.

The eggs, being thus artificially impregnated, may be deposited in a natural stream, under circumstances as closely as possible resembling those chosen by the fish, and left to themselves; or, as is far better, they may be subjected to artificial hatching. By this they may be guarded from various mishaps, the supply of water can be so regulated that it will be uniform, and the eggs can be examined from time to time, and dead and diseased ones be removed before they can injure their neighbors.

It is essential that the incubation be conducted under circumstances like those under which it naturally takes place. The temperature, quality, and state of the water are the main conditions. Some species spawn in fresh water, and some in salt; some in rapid streams, and some in lakes and ponds; some in winter, and some in summer. The temperature required by trout is about forty one deg. Fahrenheit, ranging, however, from several degrees below this, to about fifty deg. while some species of summer-spawning fish require a temperature higher than sixty degrees. The time required for development varies with different species, and is much affected by temperature. Some species hatch in five days, while the trout is rarely less than fifty days, and at thirty-seven degrees of heat requires one hundred and thirty-six days.

The apparatus employed in artificial incubation is of various kinds. A metal box, with many holes to admit a free circulation of water, was one of the first employed; this is immersed in the water. Troughs of stone, vessels of earthenware, willow baskets, and wooden boxes have all been used in the incubation of salmon and trout.

A favorite form of hatching box for trout is a long wooden trough, its bottom inclined sufficiently to cause a gentle flow of water through it, and covered with a layer of gravel; the whole covered in by a lid. The eggs are deposited in the gravel or sand, and a stream of water, an inch or two deep, led through the trough.

At the French Piscicultural establishment at Huningue, and the Stormontfield salmon-breeding ponds, the hatching apparatus consists of a series of horizontal troughs, arranged side by side like the steps of a stairway, through which a stream of water falls in succession from the uppermost.

After the eggs are deposited in the hatching-boxes, a proper supply of pure water must be kept up until they hatch. They must be frequently examined to remove diseased eggs, and guard against the collection of sediment. It is better that they be kept in darkness, for light encourages the growth of a parasitic fungus.

When trout hatch they have still a large portion of the egg attached to the abdomen; that is gradually absorbed, and while it remains they require no food. It is the "yolk-sack." Upon its complete absorption the young trout begins to feed, and must be placed where he can find his own food, or must be regularly supplied with such as is adapted to his infantile condition, and will attract his attention, and tempt his appetite.

The whole process of producing fish, by artificial impregnation and incubation, is in practice remarkably successful. More than ninety per cent of the eggs become living fish. Mr. Ainsworth, the authority quoted above, has this year obtained twenty thousand trout from twenty-one thousand eggs, being more than ninety-five per cent.

In another point of view this process is of vast importance. It facilitates the transportation of species from one water to another. Salmon eggs, fecundated, were carried from Scotland to Australia in 1865; were successfully hatched in the River Plenty; and, having returned from their first migration to the sea, may now be considered as established there. In a similar manner the Merrimac River has been sown with salmon eggs brought from New Brunswick, and a harvest may be expected therefrom.

The rearing of fish in artificial ponds and reservoirs, and then bringing them into marketable and eatable condition by regular and systematic feeding, has been successfully carried out, and it is found to be quite practicable as an industrial occupation, bringing better returns, when trout are reared, than the growing of any other kind of animal food. Yet to determine with certainty what are the conditions of success in this branch of Pisciculture requires further experiment.

Pisciculture is not a new art. It was practised among the ancient Romans; yet not as an industrial pursuit, but as a source of amusement to men of wealth and leisure, or to supply with delicacies the tables of a gluttonous nobility. In Catholic countries, since the establishment of monasteries, fish preserves have been commonly attached to those institutions, to supply the devotees with food during their frequent religious fasts. There is no reason, however, to suppose that they had any knowledge of artificial impregnation. In China, it has long been an important branch of industry, and although we know very little of the process that they employ, it is certain that they succeed in making fish an abundant and cheap article of food.

Since the awakening of the public mind to this subject in Europe, government establishments have been put in operation in France and Germany, and private operations of great importance have been carried on in the British Isles. It is thought that primitive abundance may be restored to their now exhausted rivers, and not many years hence an acre of water shall be made to produce as much food for man as an acre of land. In America many persons have engaged in pisciculture as an experiment, and some attempts have been made to carry it farther; but as nothing has been done on a large scale, no great results have yet been attained.—*American Naturalist.*

Correspondence.

The Editors are not responsible for the opinions expressed by their correspondents.

What are the Comets?

MESSRS. EDITORS:—It seems that as yet no satisfactory explanation has been given about these mysterious heavenly bodies. After seeing the article in No. 6 of the present volume, I beg leave of presenting herewith my hypothesis, which I have developed during many years past, and by which all known phenomena can be explained in a more satisfactory manner than by any other hypothesis.

The comet consists of gaseous matter which by the force of gravitation is formed into a perfectly round sphere. This sphere is of much greater dimensions than is generally supposed. The tail of the comet represents only the radius of the whole sphere; it is the visible part of the gaseous matter, while the rest of the sphere is perfectly transparent and consequently invisible to our eyes.

On its solitary travel through the space of our stellar system, and in consequence of the loss of heat by radiation, this sphere of gaseous matter is in a state of condensation and has the appearance of a cloud or of a sphere of mist. But as soon as it approaches our planetary system and becomes visible to our eyes, it comes under the influence of the caloric rays of the sun, by which the misty or cloudy matter is reduced to a perfectly transparent gas, and thus becomes invisible. Only the more dense mass that is collected around the nucleus, withstands the action of the sun's rays and thus remains visible as the head of the comet. On the opposite side from the sun, that portion of the gaseous matter which is shaded or protected by the head against the caloric rays of the sun retains its cloudy or misty appearance by which it is visible to our eyes as the tail of the comet. This tail is in perfect equilibrium with the rest of the invisible gaseous matter that forms the sphere; it is in fact a cloud in the shape of a column within a large sphere of a perfectly transparent gas.

Based on this hypothesis I can explain all known phenomena in relation to comets in such manner that no scientific man could contradict me. But it would make a book to represent my hypothesis in full in all its details, and I could hardly expect that so much of the valuable space of this journal could be devoted to one single subject. I wish to add only a few words.

Against this hypothesis perhaps the objection might be raised, how could such a great sphere of gas pass our planetary system without a collision, or without causing some great catastrophe upon our planet, the earth? As an answer to this I would refer only to an article in No. 2 of Vol. XIV., new series, of the SCIENTIFIC AMERICAN, which contains a report of the passage of the earth through the tail of a comet. The earth has probably many times passed through the sphere of gaseous matter of a comet without any perceptible effect. This gaseous matter being so extremely rare and of such a nature as not to produce any essential change in our atmosphere.

The least satisfactory explanation has as yet been given about the transparency of the nucleus of a comet which allowed the light of a fixed star to pass through without any perceptible diminution of its brightness and without refraction. How is this possible? The gaseous mass that forms the comet is a mixture of different gases; some permanent gas or gases mixed with a condensible vapor, something similar to our atmosphere mixed with the vapor of water. Under the immense pressure of such a great sphere of gas, it is compressed at the center to such a degree of density, so as to float the liquid which results from the condensation of the vapor. This liquid forms an ocean floating upon a certain stratum of compressed air Thus it forms but a thin bubble, and is not only transparent but it will also not refract or change the straight line of the rays of light that are passing through it.

J. G. KONVALINKA.

Astoria, L. I.

Mills for Grinding Hydraulic Cements.

MESSRS. EDITORS :—I will briefly give a description of what I consider the best kind of mills and millstone dress for hydraulic cement. I will also give the titles, and names of the authors, of the best works in the English and French languages, on the art of lime burning, and general management of cement.

In these works the methods of preparing the lime prior to coming to the mill, and after going from it, seem to be exhaustively treated; but there is little or nothing as to how it should be crushed and ground—a most important part in the making of good cements. At present neither the build of the stone or the dress is suited to such work. Flour mills are brought to a very high state of perfection. A millstone built on the same style they are for grinding wheat is not at all fit for grinding cement. The eye of the stone should be at least sixteen inches diameter, or similar to Mullin's Ring Millstone. The balance-ryne should be semicircular (old style), with chambers in the lugs for the driver to work in. However good in theory, it may seem to drive a stone near its center, all millers of varied experience know that a stone driven near its center wears down rapidly around the verge, leaving the center high. Under the most favorable circumstances, a stone which grinds cement wears out of "face" very fast, and is much more difficult to be kept in proper order than a stone for grinding wheat. If the cement is not ground fine and even, it is not much better than sand, unless it is by itself. When not to be mixed, it should not be ground fine; when to be mixed with sand or other material, it should be as fine as possible. In all cases, but especially with some kinds of rock that cannot be evenly burnt, the cement should be bolted. A bolt ten feet long and thirty inches in diameter, covered with wire cloth, would in all cases make an even quality of cement. What would not pass through the wire could be returned to the stone again. It takes a greater quantity to fill a barrel when coarse than fine. It should always be ground while there is a *little* heat in it, as it takes less power and makes better cement.

As old stock French Burr is best for grinding wheat, so it is best for cement. It should be as hard and free from pores as possible, the hardest block or blocks around the eye of the stone. A stone four feet six inches diameter (the best for cement) should be divided into sixteen parts, with two furrows to the part. The lands should all be of equal width at the verge and tapering inward. The furrows should be an inch and a half wide and about three eighths deep at back; There should be a cast iron stand for the concave, with four legs obliquely set. It could be bolted to the floor. The concave need only bear in the stand at top and bottom. The crusher shaft should have an oil cup, set screws, and center lift, like a millstone spindle.

The best works on cement, etc., etc., are, "Observations on Limes, Calcareous Cements, etc.," by C. W. Pasley; "Practical Treatise on Limes, Cements, etc.," by Major General Q. A. Gillmore; "A Practical Treatise on Calcareous and Hydraulic Limes and Cements," by J. G. Austin; "Recherches sur la Chaux," par Vicat; "L'art de Calciner la Pierre Calcaire," par Hassenfraz; "Mémoires sur les Chaux et Ciments," par Treussart: "Recherches sur la Chaufournerie," par Petot.

JOHN O'CONNELL.

Louisville, Ky.

The "Dunderberg."

MESSRS. EDITORS :—Will you be so kind as to permit me to make a suggestion or two on the remarks of your correspondent in your issue of Aug. 10th on the *Dunderberg*.

The armor of this vessel is as follows: 4½ inches on casemate backed by 40 inches of wood, for the most part soft pine. Such a protection, as scores of experiments incontrovertibly prove, is easily penetrable by ordinary naval guns of medium weight and caliber. This armor inclines 30 degrees from the perpendicular; so small an inclination is not sufficient to materially increase its impregnability with respect to a shot striking it exactly horizontally—and shot never strike in that way—while at distances requiring a moderate elevation the inclination is just about sufficient to cause it to strike the armor perpendicularly. The side armor below casemate of the *Dunderberg* is composed of 3½-inch slabs laid on a backing composed almost wholly of soft white pine. This very thin iron is easily penetrable by shells, a shell passing through the iron, lodging well into the wood and there exploding, would make awful work. It would explode in every direction, inside as well as outside, and without doubt tear a hole in the vessel. My long experience with shells and their terribly destructive effects when they lodge and explode convinces me that the designer of this vessel has made a grave mistake in planning the armor. But then it should in justice be added that this was designed in 1862 before the now common powerful ordnance was fairly introduced, and when all naval officers, except a few who are always a little ahead of the times, regarded these heavy guns as delusions.

The gun deck of the *Dunderberg* was not constructed to carry fifteen-inch guns; it was originally intended to carry these guns in turrets on top of the casemate, when this plan was abandoned and it was decided to carry them on the gun deck, a gun carriage and compressor had to be invented to carry them. This was very successfully accomplished, but trials demonstrated the important fact that the gun deck was by far too weak to withstand the tremendous strain put upon it by the fifteen-inch guns. Those familiar with heavy ordnance will understand the reason when it is stated that this deck is composed of 4½-inch soft white pine planks laid on beams some 36 inches assunder. Doubtlessly a sufficiently strong deck can be put in.

Your correspondent makes a very grave mistake when he says the *Puritan's* armor is composed of 6 1-inch plates. This armor is made of 6 inch plates over 4½-inch solid slabs extending below the water line and laid on a backing of 48 inches of oak fastened to the iron hull fifteen-sixteenths of an inch thick. The armor is not so thick under water but it extends four feet below it, and accurate diagrams show that a shot fired in a direction at all horizontal must pass through from 18 to 20 feet of water before reaching the hull, a distance far more than sufficient to absorb its force.

The remarks of your correspondent on the jamming of turrets, etc., are evidently made without a proper knowledge of the facts. Service in front of Charleston in the iron-clads enable me to speak advisedly on this subject. The only case of jamming was when the iron-clads were fresh from the manufacturer's hands, when Dupont made his attack. This jamming was not only of a very temporary character indeed—it only occurred to one or two turrets—but it was speedily corrected and did not in my recollection occur again during the awful pounding these little vessels received for two years—a pounding to which that received in the first attack was as nothing

With respect to the 15-inch gun, your correspondent does not do wisely in seeking to underrate its capacity in view of the well-established facts in relation to its great power against armor, particularly the late trial with this gun in England.

AN OLD ARTILLERIST.

Boring Through Trees to Increase their Fruitfulness--How to Exterminate Thistles.

MESSRS. EDITORS :—In No. 3, current volume, I read an article under the caption, "Boring Through the Heart of Trees." Without doubting that the boring produced fruitfulness, I would say that it is a fact long established that whatever hinders growth promotes fruitfulness, (that is, anything that does not deaden the tree), and *vice versa*. The practice of dwarfing trees has been universal, or near enough so to have school children understand that it is the object to diminish growth to produce early fruitfulness. The tree alluded to as having a mortise 18 or 20 by 4 inches, through the tree, must have hindered the growth of the tree, and by so doing promoted fruitfulness. Sulphur placed in a hole bored in a tree, if it helps to check the growth of the tree, will increase its fruitfulness. If sulphur were needed as a constituent part of the tree, why not place it in the ground at the roots of the tree? If a physician were to cut a hole into a man's stomach to place medicine in it, what would be thought of him?

Many years ago I heard it said that the cutting of Canada thistles in the full of the moon in June and again in the full of the moon in August, the same season, would kill them. The idea carried was that the particular phase of the moon killed them. I cut them as aforesaid, and it killed them. I was not inclined to yield to whims or superstitions, and searched for the cause. I found that at certain times of the year, or at least that there were times of the year when the thistle was hollow, and the cutting of them at any time while hollow, would kill them, simply because the rain would fill them with water and cause their decay.

A. K. S.

Nebraska.

Views of a Scientific Englishman.

MESSRS. EDITORS:—In the SCIENTIFIC AMERICAN of July 13th I observe a description of "Rider's Geometrical Plow." For more than twenty years we have built plows on the principle which Mr. Rider now brings before the public as new. At page 31 of our trade catalogue, sent by this post, you will find the words, "The breasts [mold boards] are made upon exact geometrical principles." These words have appeared in our catalogue for upward of twenty years, and our plows have for a like period been constructed, not by "rule of thumb," but on principles well ascertained and defined.

I often observe in your valuable paper illustrations and descriptions of machines launched as new inventions, which are simply repetitions of what we in England have produced many years before. The world is undoubtedly indebted to America for a great variety of useful schemes, but I have often been surprised at the want of knowledge displayed by your machinists on the history of English inventions. When perfect free trade is established between the two countries, this will pass away, and the mechanical progress in both will be wonderfully accelerated. By her restrictive policy, America repels foreign inventors. English manufacturers have the world before them, and so far as the manufactures of machinery are concerned, they go to countries to introduce their productions where they are not hampered with heavy protective duties.

Notwithstanding the acknowledged fact that America is a "go-ahead country," political economy does not at present appear to take deep root. Remove the barriers to free intercourse in trade, and both countries would be immensely benefited.

In one of your articles of July 13th, on "Rights of Property," are the following words:—"The aim of law is to benefit the whole people. Laws which burden the masses but fatten the few, should never be perpetuated." No more apposite remarks could be penned upon the principle of taxing the public for the advantage of a few producers.

JAMES HOWARD.

Bedford, Eng.

[Mr. Howard is the senior partner of the celebrated firm of James & Frederick Howard, whose establishment at Bedford, Eng., for the manufacture of agricultural machinery, is one of the most perfectly organized and extensive of any in the world. Mr. Howard is vigorous, progressive, and liberal in all his ideas.—EDS.

The Emperor Napoleon's First Grand Prize to America.

MESSRS. EDITORS:—Your Paris correspondent of July 2d mentions, among the award of grand prizes at the Exposition, one to "the mills of Chapin, at Lawrence, Mass." As this statement of an important prize is incorrectly given, I would be pleased if you will give your readers the following explicit account. The Emperor Napoleon proposed a distinct award of grand prizes, ten in number, of ten thousand francs each, "in favor of persons, establishments, or localities which, by a special organization, or special institutions, have developed a spirit of harmony among all those coöperating in the same work, and have provided for the material, moral, and intellectual well-being of the workmen."

There were 500 candidates for these prizes; 200 from Great Britain alone. Of the 500, twenty received honorable mention, in addition to the ten who gained the prizes; the second prize in order of merit, and the first to the United States, was to "Mr. Chapin, of Lawrence, for a well-conducted factory." Mr Chapin represented the Pacific Mills corporation, of Lawrence, the largest of our New England manufactories, producing cotton, cotton and worsted, and worsted fabrics.

The Pacific Mills is well known throughout this country and abroad by its variety of popular fabrics, and in this department it confessedly holds a first rank. The Emperor's prize, however, was awarded it for its complete and successful system, in advancing the well-being of its operatives, by its library, lectures, and various benevolent societies connected therewith, and in promoting their physical condition by excellent sanitary regulations. It is gratifying to Americans, particularly, to know that one of our leading manufactories should obtain a grand prize of such value, when the factories of the world were competitors.

C. M. S.

New York city.

[The Pacific Mills, at Lawrence, Mass., is probably one of the most complete as well as most extensive in this or any country. It is, therefore, a matter of national as well as local pride that of the ten grand prizes, for the merits enumerated in our correspondent's communication, given, we believe, from the Emperor's private purse, one should be awarded to an American concern. No less than five hundred applications were made for one of the ten prizes of $2,000 in gold intended for this class, and one of the ten which were honored by success was a Yankee corporation.—EDS.

A Chance for Inventors.

MESSRS. EDITORS:—I have been struck with the great waste of valuable material that is permitted on the sugar plantations of Louisiana. I refer to the cane after the juice has been pressed out, and which is known as "bagasse." I do not know any reason why this material could not be used in the construction of paper; yet I am not aware that this substance has been experimented with in order to prove its utility. It can certainly be procured and prepared much cheaper than bamboo, and it has such a suitable fiber for the purposes above named that it is a wonder such vast quantities have either been burnt up or allowed to rot in heaps about the sugar houses. With the hope that this matter may attract the attention of enterprising men, I subscribe myself,

J. T. PAYNE.

New Orleans, La.

A Dental Improvement Wanted.

MESSRS. EDITORS:—I wish that you would suggest to inventors through the medium of your paper that they study on some way of affixing white enamel to the face of gold filling in teeth. I am confident that a fortune is awaiting somebody in that line. I will pay $100 to-day for a permanent enamel on my front teeth. They are filled on their face.

HOMELY TEETH.

A Small Invention Wanted.

MESSRS. EDITORS:—We mechanics who work in shops are much in need of a light paper hat or cap, neatly made of paper, pinked about the crown with holes conveniently cut for ventilation. A cheap article of this description is much needed and will sell well. There are over one hundred and fifty wanted in our shop.

JOHN A. FIELD.

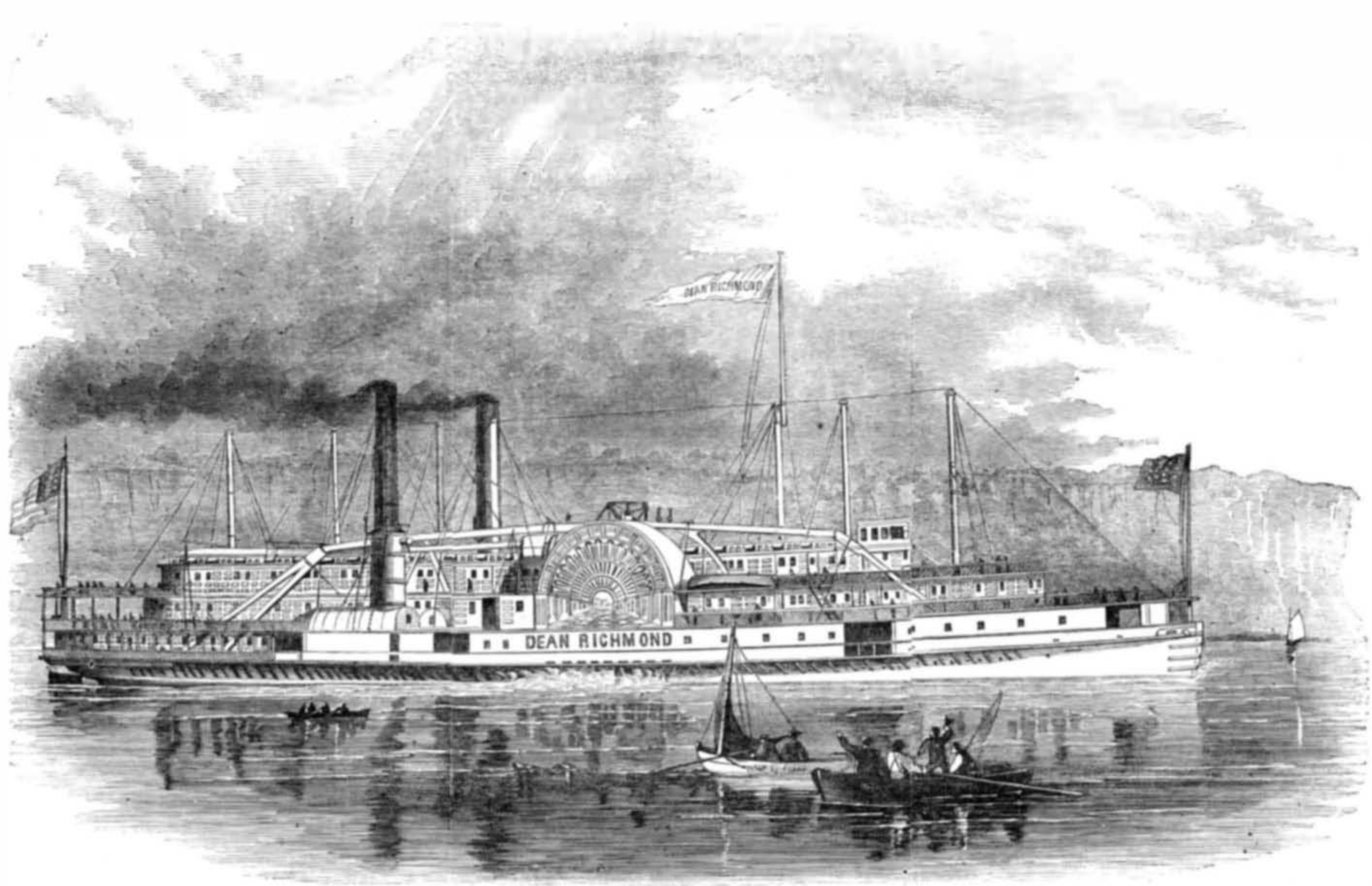
Racine, Wis.

MERCHANT FLEETS.—In her mercantile tunnage, Great Britain leads the world, with seven millions tuns. Germany far exceeds France on this score, being third on the list. In the year 1860 the United States had overtaken England, and stood as the first commercial power in the world. The four years of war sadly reduced her merchant fleet, and now she ranks second, with five millions registered tunnage.

The Hudson River Steamboats.

The Mississippi River has given its name to a class of boats well known on all the Western waters from Pittsburgh to New Orleans. They are simply a shallow boat or scow on which are erected successive stories of saloons. Many of them are magnificent in their fittings and appointments, and all of them are convenient and comfortable. So at the East we have a class of boats deriving their distinctive name from the Hudson or North River. They are stanch, elegant in decoration, and some of them immense in size. Among the finest may be mentioned the *Dean Richmond*, the subject of the engraving—which is from a drawing by the artist Bonwill—the *St. John*, and the *Drew*. Our engraving gives a very correct view of the *Richmond*, and will convey to our country readers an accurate idea of the appearance of one of these river palaces. This boat plies between New York and Albany. She belongs to the People's Line, and cost $700,000. She has accommodations for 900 first-class and 600 second-class passengers. Her internal arrangements are of the best possible style, neither labor nor money being spared in her fitting up.

By means of these boats the poorest can have an opportunity of experiencing the delights of a trip on the most beautiful river of the country, and at the some time of enjoying the luxuries of a first-class hotel. Such vessels have done much to familiarize our people with the elegancies of life and to make them cosmopolitan in ideas and refined in tastes.



THE STEAMER "DEAN RICHMOND."

Science Familiarly Illustrated.

Musketoes—What They Are and How They Live

It is unscientific to say that musketoes bite, for they have no teeth; and they have no need of teeth to seize upon or prepare their food, for they are dainty, and take food only in the liquid form—spoon victuals. They are a chivalric race, and attack their enemies with a sort of sword or lance; no doubt they consider biting and gouging quite vulgar. The lance of the musketo is a very beautiful and perfect piece of work; it is smoother than burnished steel, and its point is so fine and perfect that the most powerful microscope does not discover a flaw in it. As the most delicate cambric needle is to a crowbar, so is the musketo's lance to the best Damascus blade. The lance is worn in a scabbard or sheath, which in every respect is worthy of it; it is often ornamented with plumes. Man carries his sword at his side, and the musketo on his head. The latter arrangement has manifest and wonderful advantages—the weapon is always *en garde*, and does not impede locomotion by getting entangled with the legs.

The lance and its sheath being on the head and being somewhat flexible, is often called a proboscis. This view of the case is strengthened by the fact that the scabbard is a suction pipe through which the musketo drinks its food. As Moses struck the rock with his staff, so the musketo with a thrust of his lance pierces the fountain, and the nectar, gushing into the scabbard, finds its way to the more sensitive and vital parts. But is not this calling the lance and scabbard a proboscis, thus likening the delicate musketo to the monstrous elephant, a little far fetched?

The musketo is the most musical of all animals. There is no bird which sings so much. He never tires of his simple song. How happy must he be, cheerily singing even far into the night! What a volume of melody from so slight a creature! if man had a voice as loud proportionate to his weight, he might hold a conversation across the Atlantic, and there would be no need of the telegraph. Linnæus, out of compliment to the musical powers of the musketo, named him Culex Pipiens. But there are those who say that the musketo has no vocal organs, and that his notes are not music, but the sounds produced by the flapping of his wings, or by some other similar and purely mechanical movement. Have these detractors music in their souls?

The musketo might be classed among our domestic animals, may we not say among the household pets? They are the almost constant companions of man in town and country during the holiday season of the summer. No home without the musketo. What affection! How they stick to us, closer than brothers! They often come a great way—hundreds of miles—to be with us. Most of those which greet us in this city have left their distant homes in Jersey and have made the perilous journey across a wide river. They also love their own society and travel in companies which sometimes comprise millions of individuals—in swarms which obscure the sun. But the common-place detractors say that musketoes are bred in unwholesome swamps, and that it is only the wind which bears them, as it does feathers and malaria, wherever it listeth.

Let us inquire about the earliest beginning of the musketo; let us take him in the egg. The mother musketo has notions of naval architecture, and out of the eggs she lays she constructs a well-modeled boat, with elevated prow and stern and well proportioned midship. For the boat she employs 250 to 350 eggs, building it up piecemeal, somewhat after the manner of men, binding together the individual eggs by means of a powerful water-proof cement, into a substantial and complete structure. Unfortunately we are unable to give a recipe for the water-proof cement; there are many who would like to have it. The boat is built on the water, and when completed she is confidently abandoned to the mercy of the wind and the wave. Thanks to that water-proof cement, she can neither be broken, wetted, or sunk; she is safer than if she were copper bottomed. The little craft, it must be remembered, is freighted with life—each of its 250 or 350 little state rooms has its tenant. After a few days cruising the occupants of the shells come forth, and the ship is destroyed. But those little creatures are surely not musketoes! They appear more like fish or serpents, or little dragons. On closer examination they prove to be what every one knows under the name of "wigglers;" they are the larvæ of the musketo. They wiggle about in the well-known way for a week or two, and after changing their skins two or three times, they assume quite a new form and movement. They are now what the boys call "tumblers," and are the *pupæ* of the musketo. In about a week, if the weather, etc., be favorable, something of the form of the musketo may be seen through the transparent skin of the tumbler. Shortly the prisoner escapes from his confinement as a full-fledged and bold musketo, and soars away in search of food and pleasure.

HOW MARL IS MINED IN NEW JERSEY.

The Squankum Marl Company has located its machinery for digging and hauling marl on a little stream about a mile from Lower Squankum. The whole of the ground they operate upon is laid under water. They have a large steam dredging machine, which will float in two feet of water, and will excavate to a depth of twenty-six feet beneath the surface, and to a breadth of forty feet at the surface of the water, and will discharge the material excavated at a hight of twelve feet above the water. A branch railroad connects with the Raritan and Delaware Bay Railroad at Lower Squankum. The track from this branch is laid along the margin of the pond, and the cars are brought up to be loaded directly from the excavator. In this way the water is to be made useful instead of being a hindrance. The machine is floated to the place where it is required, it is then set to work removing the top dirt, in the present work six feet deep, which is deposited in a bank along the margin of the pond. The track can then be brought up and the marl dug and dumped in the cars to be carried away. The work is very rapid, a tun of marl can be dug in a minute, and so powerful is the excavator that it gouges out the marl and deposits it in the cars as solid and almost as dry as when in the marl bed. Should this plan in its workings equal the expectations of its projectors, it will be a great advance on other methods in use. The machine, which costs about $10,000, is driven by a sixteen-horse engine, is operated by four men, and burns a cord of wood a day. When all is arranged, it digs about a tun per miuute, and can probably do half of that for the day through, which would be three hundred tuns deposited in the cars in ten hours. An allowance must be made from this for the stripping, which may amount to from a quarter to a third as much as the extraction of the marl. The excavator is in successful operation, and can dig from six to eight thousand bushels (300 to 400 tuns) a day. Two locomotives and twenty cars are constantly employed in the delivery of marl, which is unloaded at any point on the line of the Raritan and Delaware Bay Railroad, or on boats at Port Monmouth, at 8 cents a bushel, or $1 60 a tun.

Tho following are analyses of the New Jersey marls from three principal beds:

Phosphoric Acid	1.12	2.65	3.73
Potash	5.80	6.81	4.98
Lime	11.67	1.04	4.15
Magnesia	1 97	1.81	.47
Oxide of Iron	16.93	19.80	18.70
Alumina	7.18	8.04	8.18
Silica	40.61	49.73	49.68
Sulphuric Acid	.70	.11	2.44
Water	8.10	8.34	7.37
Carbonic Acid and Loss	5.92	....	....
	100.00	98.33	99·70

We are indebted to Prof. George H. Cook, State Geologist of New Jersey for copies of his reports from which we take the above.