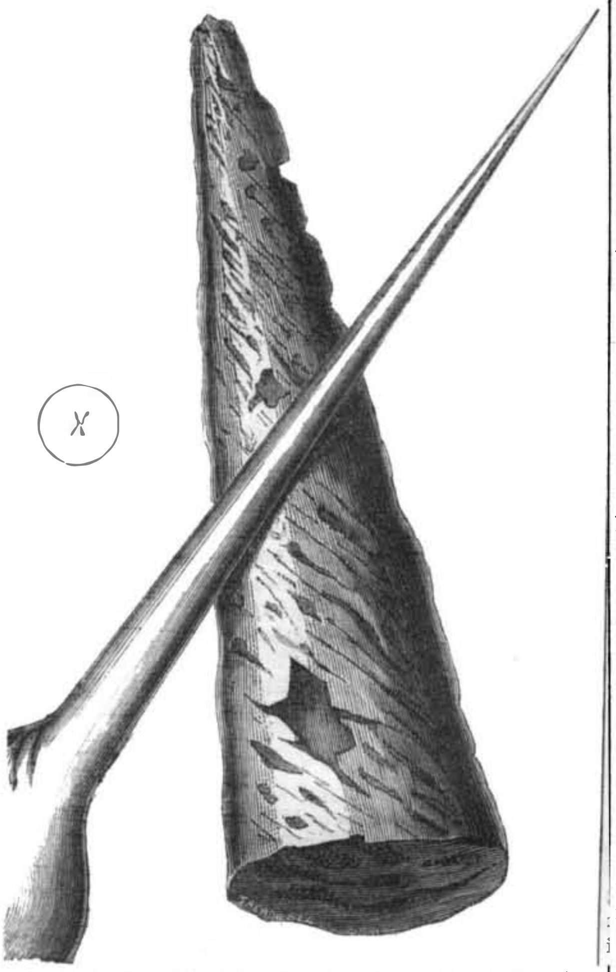
NATURE AND ART.

Conversing recently on the inborn genius of all true artists, and the futility of attempting to supply Divine gifts by a forced educational training, an eminent sculptor of our acquaintance remarked that he had really learned very little from his instructors, in fact, that he never had a master.



A fine cambric needle and the sting of a wasp, under a microscope.

We replied that we could name his master; and when he surprised, asked the name, we said: "Nature." He at once agreed and acknowledged that the artist is always learning in Nature's school. Painters give the same testimony, and admit that, for instance, the highest achievement of the greatest landscape painter falls far short of the reality. The strongest proof, however, of Nature's superiority is found in the accuracy of her handiwork. If we critically examine a human production, and compare it with the result of Nature's mysterious manipulation, we are amazed beyond conception. Take, for instance, the point of the finest cambric needle, and place it under the microscope with the sting of a bee or wasp: the apparently polished and pointed needle will then look like a rough, blunt bar, which, in fact, it really is; but the deficiency of our vision prevents us discovering this, while by help of the microscope we become able to perceive the truth. What, however, does this powerful aid to our vision reveal in regard to Nature's similarly shaped product, the sting of the wasp or bee? It shows us that it is smooth and uniform in its tapering dimensions, and has a point so fine that the highest power of the instrument does not cause it to appear blunt, as is the case with the needle. In fact, it is the most perfect apparatus for the purpose for which it is intended, while our needles are only attempts to produce a sharp point, which the microscope shows us we cannot do. We give here an engraving of the appearance, in the microscope, of the two objects named; the drawing is taken from an ancient work of Lieberkühn, published in Germany in 1760.

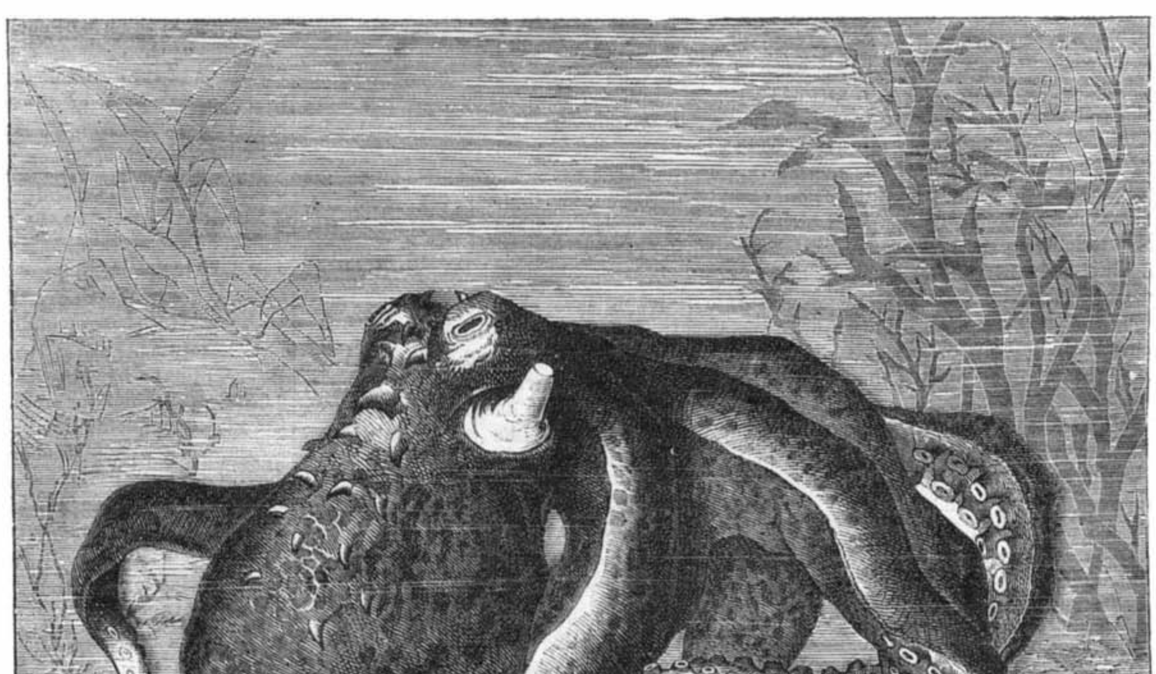
The comparison of these two objects is only a single illustration of a general fact, which the investigator of Nature observes everywhere. The anatomist is continually surprised and fascinated by the structure of the animal under investigation; he finds, not only that every part is exquisitely adapted to its purpose, but that this fitness is carried into the minutest details, which the human eye can only unravel when aided by the powerful modern microscope.

THE DEVIL FISH.

There has always been a certain fascination about the marine monsters of the old mythologies; but modern researches in natural history have played havoc with the authenticity of many of these legends, and the *See Polyp, octopus*, or devil fish, is almost the only survivor of the world of the prodigies who choked Laocoon and would have devoured Andromeda. Greek writers astounded their readers with accounts of *octopi* large enough to devour ships, and these and many other exaggerated stories have caused many persons to deny the existence of this animal, the rarity of which is a further excuse for incredulity. But the large aquaria erected lately at Hamburgh, Germany, and Brighton, England, have each obtained a specimen; and the habits and configuration of the creature can now be easily studied.

The illustration here presented to our readers was drawn from life from the specimen at Hamburgh, by Herr Karl Stelling, for the *Illustrirte Zeitung*, from which we produce it. The corporal economy of the creature is most peculiar. The body consists of two parts, one a bag, containing the stomach, etc., provided with two eyes, and the other a nucleus and eight arms, each tapering to a point. On the under side of these are seen orifices by which the fish can attach itself, by suction, to any living object, which would have little chance of escape. By rapidly extending and closing the arms, it can rise in the water with great force and even throw itself into a boat. In repose, it curls itself up and remains almost motionless in a corner; but its ferocity is to be seen in its incessant watchfulness and the constant state of nervous activity in its long sinuous appendages.

The species shown in our illustration exists in the Atlantic and Indian Oceans and the Mediterranean and Red Seas. The ordinary size measures two feet from tip to tip of the arms, and there is no reason to believe that any larger than five feet now exist; but historians, otherwise credible, report the capture of some which measured forty feet.



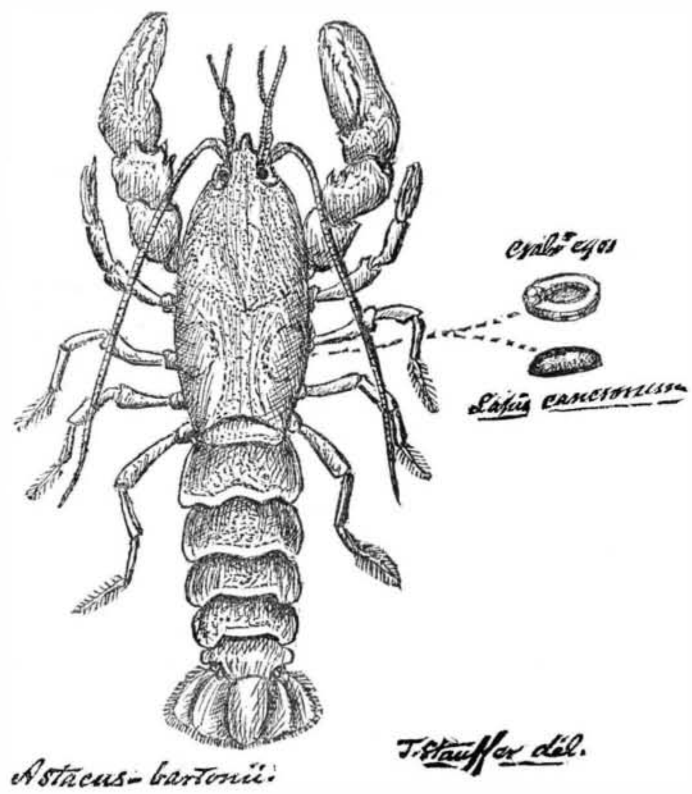
THE DEVIL FISH IN THE HAMBURGH AQUARIUM.

Correspondence.

[For the SCIENTIFIC AMERICAN.]

Fresh Water Crawfish or Crayfish.

I was surprised, on examination, to find no mention made of our common crayfish in the works on crustacea in my possession. I have known this creature from youth up, and of



later years as the *astacus Bartonii*—fresh water lobster. Sanborn Tenney, A. M., in his "Manual of Zoölogy for Schools, Scholars, and the General Reader," New York, 1865, page 463 (subject, *Macrurans*, the long-tailed decapods), simply mentions that the "*homarus* contains the American lobster, *h. Americanus* (De Kay), which is from one to two feet long." With this meager information, he passes to the *gastrurans* or stomapods.

The accompanying figure represents the full size of our common species found in the streams, and I have seen them in the bottom of springs, in Lancaster county, Pa., and I presume they are equally common elsewhere.

My attention was called to this species by Squire Wright, of the Lancaster *Intelligencer*, who gave me two beautiful pearl-white, hard substances, flat on one side, with a centrally depressed disk, the other side slightly convex, fully five sixteenths of an inch in diameter, of a circular form, smooth and hard as ivory or pearl, nearly one eighth of an inch in thickness. He informed me that he took these out of the body of a crayfish found crawling (and apparently sick) on the banks of the Conestoga, near Lancaster. Having been a druggist for over twenty years, I recognized these bodies, once in vogue as a medicine, and known to me as crabs' eyes, but why or wherefore, I knew not, as a druggist. However, as a naturalist of later years, I knew their source, so far as it regarded foreign species, but it was new to me to find they were so large and fully developed in our native species. Linnæus classified the crustaceans among the insects; Cuvier and others clearly showed that they were as distinct from insects as a whale is from a fish, properly speaking. The crabs' eyes, called *oculi cancrorum* or *lapides cancrorum*, were formerly used in medicine as a powerful alkali, or absorbent. Old authors supposed they were formed in the brain of the animal; Van Helmont first found them in the region of the stomach. M. Geoffroy the younger has observed the manner of their formation much more accurately: "While the shell of the crayfish, which is shed every year, is hardening, a white nutritious juice, secreted in two portions of the stomach, forms, by degrees, a soft calculous substance, of a crustaceous texture, from successive appositions of the juice. Before the casting of the shell, the animal is in a weak and sickly state; it takes no food for some days, and in this period the calculi seem to serve for its nourishment; and on this account the crabs' eyes are met with only while the fish are losing their shells, and for a few days afterwards."

The prevailing idea is that these pearl-like bodies are cast off with the stomach and the old shell, and the old stomach is the first food the new stomach receives to digest; and it dissolve the crustaceous deposit, which goes to reproduce and harden the new shell, provided as a reserved accumulation, to meet the emergency. Much of interest to the naturalist is related and known about these scavengers of the sea and fresh water, as they are by no means choice in the selection of their food.

Although crustaceans, directly, do not greatly add to the supplies of our food, yet they indirectly assist very materially in contributing to our wants. The molting of a crab seems a mysterious process to the novice in natural history, who finds that the shell, a coat of stony hardness, which requires great strength to open, cut, or break, can be cast off entire—the joint of every part of its thousand jointed body, *antennæ*, foot, jaws, claws, and tail. And not only does it cast off these hard external parts, but the very linings of its gills, of its stomach, of its eyes, and other parts are thrown off, and thus, when the creature has escaped, the shell seems as perfect nearly as the animal itself. You may often meet with cases from the Brazils of a gaudy *grapsus* (more delicate even than the new coated animal, seeing the parts are translucent); these are the cast-off skins. Mr. R. Q. Couch, a most able naturalist, says "that he could never understand how that broad flat surface inside each claw could be got rid of without injury to the new claw; however, by attentively watching the process in several instances," he continues, "I observed that, in the act of drawing out the new claw, the edge is cut through by these flat horny plates, the divided parts immediately closing again, and speedily becoming so adherent as to preclude their being re-opened." Crabs, when they lose a claw, are said to get a new one at the next casting of the shell. Mr. Couch says: "This can take place only in the joint which is nearest the body; if any other be injured, they bleed to death; but if the nearest joint be removed, there is little blood lost, and over the wound a thin film forms, in the middle of which is a tubercle. After the shell is cast, the tubercle suddenly enlarges, and under it may be discovered a small claw doubled on itself beneath the membrane of the scar. This remains in a soft state until the crab again casts its shell, when the new claw is set at liberty, is straightened out, and becomes hard and calcareous like other parts of the body; so that a claw, instead of being removed and perfected at once, or at the first casting of the shell, is not so in reality until the shell has been cast the second time." That, in their contests with each other, they often lose their claws, there is no question. This will recall the amusing article devoted to lobsters, in Dickens' *Household Words*, July 29, 1854, where he says: "They are a kind of marine Muscovites, bristling with rage against every one—fierce, hard, horny, and pugnacious, always tearing and rending something, and losing their limbs with as much indifference as if they belonged to some salt water Czar."

The tail or, rather, abdomen of a lobster, the joints of which fold so beautifully on each other, suggested to James Watt the idea of a flexible pipe, which he constructed for some water company. Nature has given many valuable hints, which are worthy of study, for she is truly prolific in devices and adaptations to ends, as wonderful as they are marvelous, filling him who duly contemplates the matter with awe and adoration. J. Stauffer.

The Patent Right Question.

To the Editor of the Scientific American:

A citizen has a right to claim from the State only such protection in the use and ownership of property as shall redound to the public good. The exclusive right to use an invention is not for the public good; but as inventors, without some remuneration more than the personal use of the thing invented or the honor of being the inventor, might allow their powers to lie dormant, or be tempted to keep their inventions secret, the authorities of the State require the public good to be ignored for a term of years, for the benefit of the inventor, to encourage study and experiment; which study and experiment the State would have as much right to compel by direct legislation, were the enforcement of such laws practicable, as it has to compel military service when the welfare of the State demands it.

As every person in a lawless country could and would defend the possession of ordinary property by force, the public good demands there should be laws to enable men to do peaceably what, without law, they would do by force, and these laws follow more naturally from the fact that a large majority of every people are property holders of some kind. But an inventor is not prevented from the use of his invention by its being used by others, nor could he by force prevent this use by others of an idea he can never actually take possession of; and inventors being greatly in the minority, their interest must conflict with the public good.

The possession of ordinary property is the origin of law, whereas the ownership of a monopoly is the creature of the law and could have no existence but for the law.

There is a wide difference between the two kinds of property, and the right to both cannot be claimed upon the same grounds. H. A. Walker.

Tarboro, N. C.

To the Editor of the Scientific American:

I cannot see that an inventor has any inherent right in his own discovery. Our own government has wisely seen fit to offer an inducement to inventors for the discovery or reproduction of any lost art which may be useful to the public. His reward is an exclusive property for a fixed term of years in the discovery or invention. It is only intended to grant this exclusive property to genius, and not to ordinary talent. Genius, being supremely greater than talent, originates and gives to the public that which was not before known; and still ordinary talent is better rewarded, pecuniarily, than genius. An inventor must of necessity be a genius; and he has a just and legal claim upon the public so far as the law enacts that he is to be protected in the ownership of his invention. So he directs his mind, occupies his time, and spends his money in order to receive the reward. Not, however, for the simple act of inventing, do the laws reward him. He must produce something that will enure to the public welfare; if he invents a device for burglarious purposes or for picking pockets or locks, or to aid in counterfeiting, the law does not allow him any property in his invention.

It is a prudential question as to how far a people should go in rewarding inventive talent. England has had a very costly experience in this direction. Millions of money have been spent in a contest of inventive ability between the Admiralty and the constructors of ordnance, between armor to resist and missiles to penetrate. This contest still goes on at the expense of the public. I cannot see that the inventor can set up any claim, except just so far as he benefits the public and the laws grant him a reward. But when it becomes a question of duty, every one is bound to exercise his talents for the good of mankind; and he is entitled to both a fair remunerative and appreciative reward, simply because such reward serves to stimulate like action in others, and not because he is entitled to reward; but because the public interest requires that he should be rewarded. J. E. E.

Beaver Falls, Pa.

Sailing Faster than the Wind.

To the Editor of the Scientific American:

You recently told a correspondent that a boat might sail faster than the wind, if carried across the river by the force of the downward current. To me, this answer was not entirely satisfactory, as I knew by observation that rafts, boats and barges, floated down the river with the current, always ran faster than the water, and I cited the case of oil barges being run out of Oil Creek by pond freshets, which outran the water so much that they had to stop and wait for it. I then asked: Why was this so? I will give you my reasons for it.

A raft of boards is comprised of about 300,000 feet, board measure, and each foot weighs about 4¾ pounds; so that a raft of 300,000 feet will weigh 1,425,000 pounds. Suppose that the fall in the river is at the rate of four feet to the mile, or one foot in 1,320 feet, an indirect plan is formed, upon which the inclination is 1 in 1,320; and the quantity putting force upon the raft would be $\frac{1}{1320}$ of 1,425,000 pounds, or something over 1079 pounds. A raft of boards running at the rate of five miles an hour does not meet with very much resistance from the air in a still day among the high hills of the Alleghany River. Would not this 1,079 pounds of constant gravity pull have tendency to make it sail faster than the water that carries it? I consider this to be a scientific question, and I would like to see something on the subject from men of science.

Cobham, Pa. Henry Baxter.

Car Ventilators.

To the Editor of the Scientific American:

I recently noticed in one of our papers a description of a railroad car ventilator, that was submitted to the Car Builders' Association at their last meeting in this city. I do not recollect the name of the inventor; but the idea was to make the front of the car double, with openings at the edges covered with wire netting. I am not interested in any ventilator whatever, except that I desire to see the one introduced that will give us pure air; and I fear we shall not see that very soon, if the matter is to be left in the hands of men who advocate introducing "air through an opening over the door of the car," as appears to be the case on the Harlem railroad. Every one who has ever ridden on a railroad car knows that the dirtiest place on the whole train is between the cars. There is no trouble in ventilating a car; it requires no intricate machinery; just open the doors and all the windows, and the thing is done. But ventilation is not all we want, nor is it the principal thing; we want pure air, air freed from not only cinders but from fine railroad dust and ashes, which, inhaled by the breath, are quite as detrimental to health as vitiated air. Now for a person to assert that a ventilator containing dry wire netting, however fine, will admit fresh air to a car, and at the same time arrest railroad dust that is fine enough to permeate the closest woolen clothing, is, to my mind, simply absurd. From the very nature of the case, it is impossible to separate air and railroad dust without moisture; with moisture the thing is perfectly feasible, and, if inventors are inclined to give us pure air, the only possible way they can do it is to use moisture or else give us air taken from forward of the engine tender. But do not give perspiring humanity a dust-laden air, making them believe that it is pure because it comes through wire gauze and double partitions with many intricate windings. We had better have the windows open and brush off the cinders which are the least of our troubles. The cars might be kept pretty free from impure air by giving us another employee on the train whose sole duty should be to see that all the windows on the leeward side of the cars were kept closed, and let what windows are to be opened be those on the windward side, and see that the doors are always kept closed except while the train is in motion. The great trouble is that passengers on the windward side close the windows because the air is too fresh and strong, while those on the leeward side open them and fill the car with smoke, dust and cinders, which are on that side only. If the windows were opened on both sides, the wind might perhaps blow through and keep the car clear. But perhaps the best way of all would be to cover the road bed with small stones to the depth of five or six inches, sow grass seed on the sloping sides of the cuts, and convey the smoke and ashes either above or below the cars and discharge them at the rear of the train. The speed of the train would give the draft required. F. S. C.

Boston, Mass.

The Million Dollar Telescope.

To the Editor of the Scientific American:

Mr. Alvan Clark, Jr., of Cambridge, Mass., informs the writer that, at the rate of compensation paid for the Washington telescope (26 inch objective, $50,000), the sum of one million dollars would pay for an equatorial telescope complete, of which the object glass would have a diameter of 5 feet 6½ inches in clear aperture and a focus of 75 feet.

When the air is very clear, a good achromatic will bear a power of one hundred for each inch of aperture. The aperture of the object glass being 66½ inches, the highest power will be 6,650 diameters. This will bring the moon within 34·58 miles, as the moon's mean distance = 230,000 miles which ÷ 6,650 = 34·58 miles.

If, however, the object glass were perfect, and the atmosphere were of uniform temperature, we could apply a microscopic eyepiece $\frac{1}{80}$ of an inch focus; then the magnifying power would be 72,000, and the moon would appear within 3·19 miles. The drawings of the Great Nebula in *Orion*, made with the Harvard fifteen inch glass, show more detail than those made with the Parsonstown six foot reflector. Our great telescope, therefore, will be at least equal in performance to a reflector twenty-six feet in diameter.

S. H. M., Jr.

To the Editor of the Scientific American:

F. H. R. says, in his letter on page 100: "Of course the field would be divided by dark bands into polygonal sections similar to the object glass." Such would not be the case. The field would be unobstructed, its shape and size depending wholly upon the eye piece. There would be a loss in definition, in the use of such an object glass as compared with one of the ordinary construction, arising both from the reduction of the available aperture, and also from the reflection and diffraction of the rays of light coming in contact with the interior frame work of the object glass.

Slatersville, R. I. A. F. Kelly.

To the Editor of the Scientific American:

I noticed recently on page 100 of your current volume, an article on the million dollar telescope, in which the writer says that, if the object glass be composed of seven pieces, one in the center and six around it, the field would be marked with dark lines corresponding to the joints. I can show it to be otherwise.

If you put an opaque disk in the place of the object glass, a screen in the field or in place of the eye piece, and pierce the disk, you get an image opposite the aperture on the screen. Another hole would form another image. With seven holes, one in the center and six around it, you would have seven images with dark bands between them. If you put a glass in the center, the corresponding image is only made more distinct; but one put at the side not only makes the image clearer, but also throws or deflects it towards the central one so that they correspond. Each one would be thus brought into the center and the shadow of the joints would not appear.

New York city. Convex.

"For Inventors and Mechanics."

Messrs. Munn & Co.:

Gentlemen:—Please accept my thanks for a copy of your inestimable little handbook for the current year, embodying a copy of the United States Patent laws, with many valuable hints and instructions to inventors. Its one hundred and forty illustrations of mechanical movements are well calculated to, and will undoubtedly, in many instances, save the young and old inventor many a weary hour of brain racking.

It is invaluable to inventors as a pocket companion. Let me know its price, including postage, as some friends who have seen it are desirous of getting a copy.

Houston, Texas. J. J. Martin.

To Restore Color.—When color on a fabric has been accidentally or otherwise destroyed by acid, ammonia is applied to neutralize the same, after which an application of chloroform will, in almost all cases, restore the original color. The application of ammonia is common, but that of chloroform is but little known.

The yellow pine, an invaluable building material for bridge and car work, is being rapidly thinned out in the South. No tree of this kind grows afterward where one is cut, but only a worthless scrub pine of another species. Those who now set out new plantations of these trees will in a few years find them very valuable.