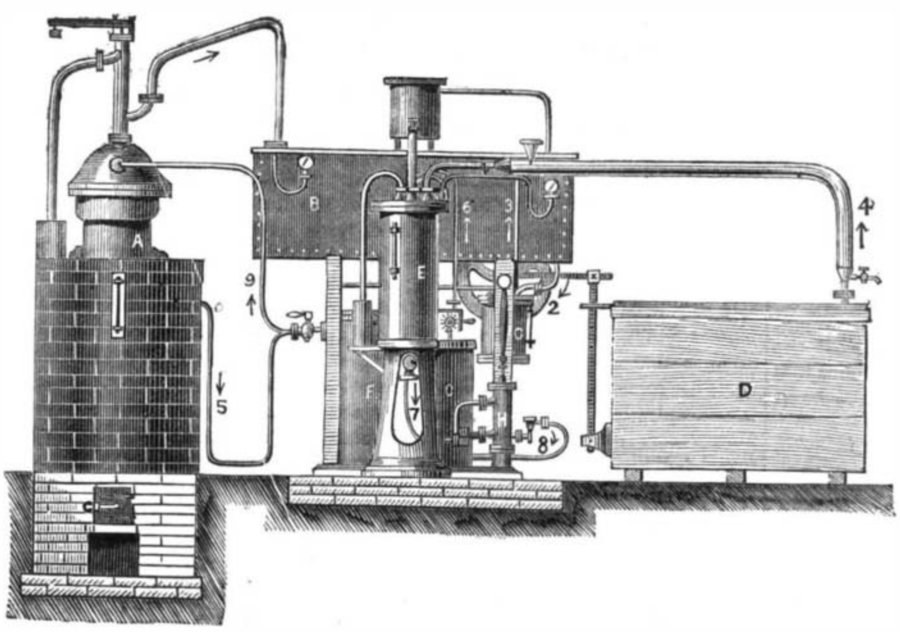
THE AMMONIA ICE-MAKING PROCESS.

We present herewith an engraving of an apparatus for making ice and producing cold, exhibited by Messrs. Vaas and Littmann at the Vienna Exposition, in which, as in the well known system of Carré, the vapor of ammonia is the congealing agent. The normal volatility of ammonia, in both machines, is increased by removing the vapor as quickly as it forms. The apparatus consists of the boiler, *a*, condenser, *b*, gasholder, *c*, ice box, *d*, the absorption cylinder, *e*, the temperature exchanger, *f*, the cooler, *g*, and the pump, *h*. The boiler, *a*, is first half filled with solution of ammonia, which is caused to evaporate by the application of heat, and the gas thus formed is forced through the pipe, *i*, into the worm pipe of the condenser, *b*, and from there through the pipe, 2, into the gasholder, *c*. From the gasholder the gas is conducted by the pipe, 3, to the valve on the top of the ice box, *d*, which is in connection with the worm pipe inside the ice box.

At the commencement of the operation this valve is kept shut; but as soon as the gas has attained a pressure of eight to ten atmospheres, it is slightly opened. The gas, on its passage through the worm pipes of the condenser (which are always surrounded by cold water), is condensed, and the liquid passes through the valve to the worm pipes in the ice box, where it again commences to evaporate, taking up at the same time heat from the solution of chloride of calcium, in which the worm pipes in the ice box are submerged. This absorption of heat so lowers the temperature of the solution of chloride of calcium as to render it capable of turning the fresh water contained in the ice cases to ice.

The ammonia, which has been volatilized again in the pipes of the ice box, passes through the pipes, 4, to the absorption cylinder, E, and, at the same time, the weak solution of ammonia, which has lost the gas by heat, passes out of the boiler by the pipe, 5, into the exchanger, *f*, through the cooler, *g*, into the absorption cylinder, *e*, where it absorbs the gas which comes from the ice box, and from these it is pumped back by the pump, 7, into the boiler to be again heated. When the machine is working the valve on the ice box must be opened just sufficiently far to allow the gas to escape, but not to allow the pressure to fall, and the valve between the cooler and the absorption cylinder must be so regulated as to admit the proper quantity of the weak solution from the boiler as will absorb the gas from the ice box. A machine for making 200 lbs. of ice per hour requires a two horse engine to drive it.—*Iron.*



IMPROVED AMMONIA ICE-MAKING MACHINE.

IMPROVED STEAM PUMP.

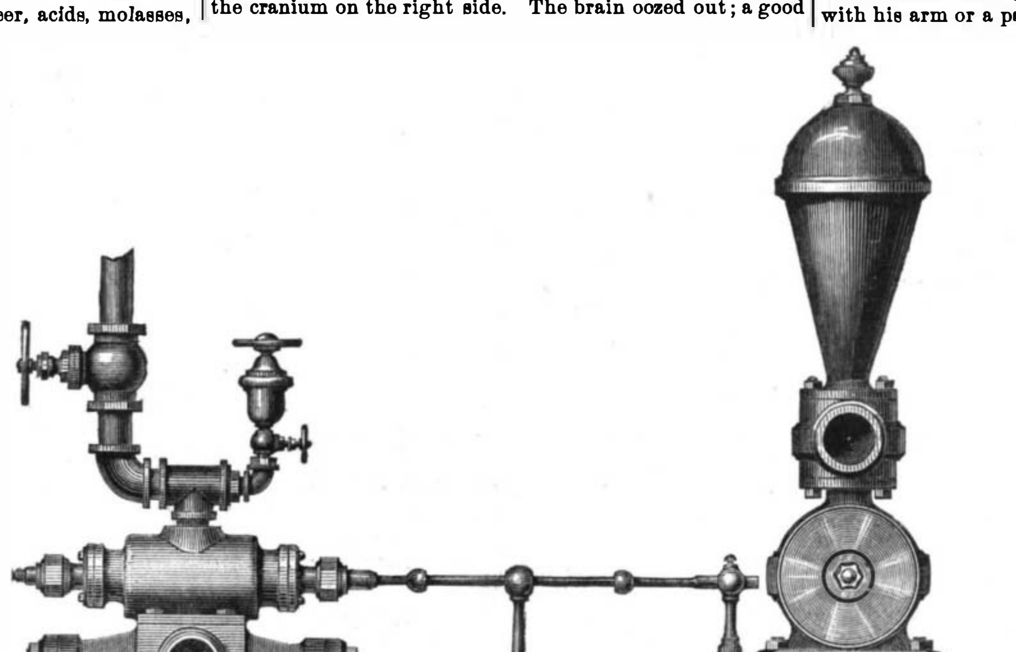
The many and diversified uses of the Niagara pump are so well known that is hardly necessary to allude to them in any detail. Briefly, the machine will pump water—hot, cold, fresh, salt, clean, or muddy—sirups, beer, acids, molasses, or other heavy fluid. It is especially adapted to the feeding of steam boilers and supplying of tanks, and is useful in sugar refineries, tanneries, oil works, and manufactories generally. Finally, it is well suited for the drainage of mines, quarries, low lands, and for wrecking purposes.

The main feature of the improved form of the machine, as represented in our engraving, is the simple steam valve. This appliance, as formerly used in the pump, consisted of an auxiliary slide valve and steam cylinder, and a slide valve operated by the latter. At present this has been simplified so that only one circular balanced valve is employed, working on centers packed with rings, and operated directly from a tappet on the main piston rod. The apparatus can be run so slow that the motion of the piston rod will be hardly perceptible, and then again as swift as desired, without fear of having the piston strike the heads of the cylinder.

By a simple device, the steam operates the valve when running slow; and when working fast, the momentum of the piston opens and closes the valve; so that at any speed there will be invariably a full port of steam for the return stroke before the piston arrives at the end of its course, the connection between piston and valve being direct.

The parts are cast separate to provide for the replacing of breakages, which may occur by accident or frost, at small expense, and the makers add that the fewness of the various portions enables them to furnish a machine of excellent material and the best possible workmanship at a low figure.

For further particulars address Messrs. Hubbard & Aller, 93 to 97 Pearl street, Brooklyn, N. Y.



THE JOHN HARDICK NIAGARA STEAM PUMP.

DR. BROWN SEQUARD ON NERVE FORCE.

Dr. Brown Séquard has recently concluded the admirable series of lectures which he has been delivering in Boston. Some weeks since we gave a *resume* of the initiatory discourses, on the subject of nerve force; and we continue our abstracts, with reference to the very curious and instructive topic of

NERVE DERANGEMENTS.

A great many disorders in our system, says Dr. Séquard, may result from the stoppage or arrest of the activity of certain cells of gray matter. Tetanus or lock jaw is a convulsive affection which can be checked immediately by certain influences coming from certain parts of the system. When produced by strychnin, insufflating air into the lungs stops the convulsions; a similar result is caused by carbonic acid or a current of galvanism. In brief the mechanism of the arrest of convulsions in tetanus is just the same as the mechanism of the arrest of the heart in the case of galvanization of the *par vagum* of the neck. Similarly an irritation of almost any part of the skin may prevent epilepsy. In the case of anaura starting from a limb, a ligature around the latter (by irritating the nerves of the skin and sending a current toward the brain, changing the state of the cells there) serves to prevent an attack. There are many cases of epilepsy that have been cured by accidental injury.

Another kind of stoppage or arrest of the activity of cells consists in the arrest of the morbid activity of the brain. In cases of insanity, a large number of patients have been cured suddenly by means of irritation of the skin, that was either accidental or employed by a physician. A patient in a lunatic asylum met another one who struck his head and broke the cranium on the right side. The brain oozed out; a good deal of it was lost, and the patient was cured of his insanity and epilepsy. Other affections of the brain, such as amaurosis or paralysis, may be cured suddenly, sometimes without any cause that we can find, but with good ground certainly to believe that an irritation has acted which has produced a change in the cells of the brain and dismissed their morbid activity. For there are clear cases in which those affections have been cured by such irritation. Those alterations of cells that were producing an arrest of the power of sight or paralysis have been submitted to an irritation of parts of the skin or of some viscus, and the irritation, going to the morbid part and producing a change in the activity of those cells, has cured the disease.

Referring to paralysis, the lecturer said that the malady is considered to result from a cessation of activity of a part of the brain from disease, destroying some particular portion. According to this view the destruction of the part of the *crura cerebri* or *pons varolii* necessarily should produce a paralysis in some muscles of one half of the body: but such is not the case, for the paralysis may exist in the same side of the body where the disease is or on the opposite side, or the *pons varolii* may be destroyed without any paralysis at all supervening. Paralysis really appears only from an irritation which starts from a place where the disease is and acts upon parts at a distance so as to modify them.

THE DOUBLE BRAIN.

One half of the brain is sufficient for all the functions of the two halves of the organ. There is no question that it is our habit of making use of only one side of the body that consigns to one half of the brain—the right side—the faculty of expressing ideas by speech. If we develope both sides of our body equally, not only would there be the benefit that we could write or work with the left hand as well as with the right, but we should have two brains instead of one, and would not be deprived of the power of speech through disease of one side of the brain.

The nervous system is not essential to the existence of muscular contraction or irritability. Professor Bernard, of Paris, has found that woorari poison affects the motor nerves in muscles so that the conductors which unite the brain with the muscles become paralyzed while the muscles remain active. Dr. Séquard, however, doubts that the woorari acts upon the parts within the sheath of the muscular fibers, and hence nerve power may possibly remain therein.

SEPARATION OF A NERVE.

It is well known that, if a nerve has been divided, after four days it loses its power. The muscles, however, remain perfectly active, and we can produce contraction in them. Unfortunately, here, also, there is an element of nerve tissue which is inside of the nerve sheath, and it is not known whether it has lost its power or not. In the case of two decapitated men, the lecturer said that he had made an experiment of cutting off the arms. He found, after thirteen and a half hours in one case and fourteen hours in the other case, that all signs of life in the limbs had disappeared. Up to that time, either galvanism or a shock produced by a blow with his arm or a paper cutter caused the muscles to respond to the irritation. He then injected the blood of a man into one of those arms, and the blood of a dog into another. In both cases local life was restored in those arms. The muscles became irritable again, and the strength of contraction was extremely powerful. Indeed, in the arm in which the blood of the man had been injected, the power was immense. It was greater certainly than during life. There was therefore a return of muscular irritability after it had disappeared and nervous excitability had not come. The nerves remained quite dead. Therefore it seemed quite clear that the muscular irritability depended upon nutrition by blood and the oxygen in it. The blood injected was richly charged with oxygen and that was the reason why the muscular irritation became so great.

Long ago, said the speaker, I had discovered that light can affect the iris of the eye, even when it has been removed from the body. The eye of an eel had been removed from the body for sixteen days and kept at a temperature of about 36° to 40° Fah. But he found that, although the eye was in almost complete putrefaction, the light still acted as an irritant of muscular fibers. There it was impossible to admit that there was nervous action. The muscular fibers themselves were considerably altered. Still they acted.

THE HEART AND THE NERVOUS SYSTEM.

It has been questioned whether the thermical movements, such as that of the heart, depend upon the nervous system. It has been found that, 48 hours after the heart has been separated from the chest of a dog, it continued to beat. There is recorded the case of a man at Rouen in whom the heart was found to beat for thirty-six hours after the death of the body by decapitation. There is therefore a possibility of long persistence of life in those organs. And the great cause why we see those organs stop at death so quickly is that the phenomena of arrest of their activity have taken place at the time of death.

MOTION WITHOUT NERVE FORCE.

A very singular fact is that movements, voluntary in appearance, can exist without nerve force, and Dr. Séquard related the following remarkable case:

"I was called," he says, "to see a patient who was indeed no more a patient; he had died before I reached him. I was told that he was making certain movements, and his family and friends all thought him alive. I examined him and found that he was certainly dead without any chance of returning to life, at least according to our very limited knowledge. I found that he was performing slowly movements that he had been performing with great vigor before I came. He would lift up his two arms at full length above his face, knit the fingers together as in the attitude of prayer, then drop the arms again and separate them. The movements were repeated a good many times with less and less force, until at last they ceased. There was no trace of sensibility anywhere, no reaction to the operation of galvanism or burning anywhere, as I had to make use of these means to satisfy the family. A needle was pushed into the heart as there was no danger from this experiment, a certain physiologist having, for the mere sake of showing what the Japanese had done that way, introduced one many times into his heart. The needle introduced showed that the heart of my cholera patient did not beat."

Dr. Dowler of New Orleans has amputated limbs from cholera patients after death, and has found that the members amputated continued to move after having been separated from the nervous centers; so that, if there were nerve force acting, then it was nerve force existing in trunks or nerves and not the nerve force that comes from the will.

The lecturer then proceeded to give several curious instances of movements apparently voluntary but really without the control of the person. One case was of a young lady in Paris who every Sunday at ten o'clock ascended a bed, and, putting her back on the top of the edge or border of the bed, took an attitude of prayer and began to address prayers to the Virgin Mary. She continued in that attitude, fixed like a statue, except that her chest continued to move and her heart to beat; her lips were giving utterance to sounds All the other parts of the body were absolutely motionless. This was a feat that you could not perform on level ground. Standing rigidly on tiptoe, even without shoes, is an utter impossibility, beyond a short time. Sometimes a movement forward is made, sometimes backward, and often rotary motions take place. Two cases of the last mentioned class happened in persons who exhibited their strange contortions standing on their heads. A girl who had received a severe blow on the head had a rotary movement on that account. She knew well what was the matter with her, and had come to be able to prevent any bad effect of it. If she wanted to go in a contrary direction, she turned herself in a direction almost at right angles to it, and the irregularity of hermovement brought her to the right place.

Passing to another branch of his subject, Dr. Séquard proceeded to show that the

CENTRAL NERVOUS SYSTEM

has power to act on all regions of the body through the medium of the vaso-motor system, which is capable of diminishing the size of blood vessels and thus regulating circulation; also, that a suspension of the activity of the vaso motor nerves produces a passive dilatation of the blood vessels with increased afflux of blood. Increased circulation in any part of the body may be due to chemical processes,going on in the tissues, which attract the blood into the vessels supplying the tissues in question. Professor Draper of New York has shown that these chemical changes do cause an increase in the rapidity and amount of circulation. And such chemical force the lecturer believes to arise from a direct transmutation of nervous force. The circulation depends more on the general tissues of the body, and much less on the heart, than is commonly supposed. Indeed it may be said that the heart is formed by the circulation instead of *vice versa*. The curious rapidity with which an engrafted organ will not only grow to its stock,but will show evidence of partaking in its circulation, should be remembered in estimating the causes of the latter. The lecturer told an anecdote of his engrafting a cat's tail on a cock's comb.

Another influence belongs to the nervous system, which is that it regulates the nutrition, secretion, and other functions. It is not essential to nutrition, though it is of great use.

THE POWER OF THE MIND OVER THE BODY

through the nerve force is infinitely greater than most of us can imagine, in extent and variety. Mesmerism, animal magnetism, the Od force, Perkins's tractors,—all these have some ground in Nature, that ground being simply the immense power of the imagination on the body. John Hunter made some curious experiments in willing pain into a part; he failed, however, to will the attacks of his gout into his great toe, though he tried to do it. Swedenborg,though subject to illusions and hallucinations, had an equally clear view of the way in which the brain can convey various kinds of sensation, etc , into any part of the body. Bennett of Edinburgh tells of a man whose sleeve was caught in a hook; the man, thinking his arm was pierced, suffered excruciating pain until he was extricated. As for mesmerism, the senses are exquisitely exalted; but the feat of reading a watch placed out of sight may be (perhaps) explained by the obscure faculty we possess of estimating the lapse of time,even in sleep. The *convulsionnaires* of St. Médard suffered themselves to be trampled under foot in the most shocking way without feeling pain; this is one instance of the suppression of feeling by mental influence, of which the mesmeric anæsthesia is another example.

The secretions are arrested or made active by nerve influence. Nursing mothers who give way to anger or other emotions poison their own milk, whereby the infant's health is often injured for life, if he be not killed outright. The bowels are purged by bread pill (as was once proved on a large scale by the Emperor Nicholas) provided people are told they are to be purged; eighty out of one hundred hospital patients have been vomited by a neutral remedy, when told "there had been a mistake made and they had all taken emetics." Much sea sickness would be avoided if people could be made to believe they were not going to have it. The stigmata, or marks of the nails on the Saviour's hands and feet,have been plainly seen to appear on the corresponding portions of the bodies of certain of his more devout followers, among whom St. Francis of Assisi must be specially named. Yet ought we not to lose from our sight the possibility that these occurrences, however unquestionable they be, are yet simply owing to an action of the imagination, whereof a notable instance is related upon authority of great weight: A mother saw a window sash descend with violence upon her little child's fingers, whereupon she herself was instantly seized with extreme pains in her own fingers which did afterwards swell and inflame in such a manner that she was long in being cured. The fakirs of India are sometimes able to divest themselves of the signs of life—respiration and circulation being stopped and bodily temperature lowered—for months continually. This well attested fact becomes less strange in view of the fact, once observed by the lecturer in his own laboratory, where a dog remained several months after death in a temperature from 40° to 60° without undergoing putrefaction; here is evidence of a power to arrest metamorphosis, even when the voluntary, and indeed all, the motions are at an end. The pain of toothache vanishes at sight of a dentist's chair; neuralgia once disappeared as the lecturer was about to enter on an operation for its relief; most functional, and even some organic, affections (as dropsy) may be cured by giving a patient the idea that he is to be cured! and the well attested list of modern miracles is in the same category of facts.

Nervous force is generated through the blood; it results in this case from a transmutation of chemical force. It is accumulated by rest, but too prolonged rest stops its production, and an anæmic condition, with degeneration,occurs. Too prolonged action of a part or organ does the reverse, in producing congestion and the diseases incident to congestion. The principal rule of hygiene is deducible from these principles: It is,not to draw blood by exertion to one part of the nervous system alone, exclusive of the rest.

We may not despise the doctors, but must attend to certain cautions, which are summed up in one, as follows: We ought not to spend more than our means allow. We ought also to use all of our organs pretty equally. Regularity in the time of meals, sleep and exercise must be acquired; if it is not natural to us, it must be gained by habit.

IN THE LABORATORY WITH AGASSIZ.

BY A FORMER PUPIL.

It was more than fifteen years ago that I entered the laboratory of Professor Agassiz, and told him I had enrolled my name in the scientific school as a student of natural history. He asked me a few questions about my object in coming, my antecedents generally, the mode in which I afterwards proposed to use the knowledge I might acquire, and finally, whether I wished to study any special branch. To the latter I replied that, while I wished to be well grounded in all departments of zöology, I purposed to devote myself specially to insects.

"When do you wish to begin?" he asked.

"Now," I replied.

This seemed to please him, and with an energetic 'very well," he reached from a shelf a huge jar of specimens in yellow alcohol.

"Take this fish," said he, "and look at it; we call it a hæmulon; by and by I will ask what you have seen."

With that he left me, but in a moment returned with explicit instructions as to the care of the object entrusted to me.

"No man is fit to be a naturalist," said he, "who does not know how to take care of specimens."

I was to keep the fish before me in a tin tray, and occasionally moisten the surface with alcohol from the jar,always taking care to replace the stopper tightly. Those were not the days of ground glass stoppers and elegantly shaped exhibition jars; all the old students will recall the huge neckless glass bottles with their leaky, wax-besmeared corks,half eaten by insects and begrimed with cellar dust. Entomology was a cleaner science than ichthyology, but the example of the Professor, who had unhesitatingly plunged to the bottom of the jar to produce the fish, was infectious; and though this alcohol had "a very ancient and fishlike smell," I really dared not show any aversion within these sacred precincts, and treated the alcohol as though it were pure water. Still I was conscious of a passing feeling of disappointment, for gazing at a fish did not commend itself to an ardent entomologist. My friends at home, too, were annoyed, when they discovered that no amount of *eau de Cologne* would drown the perfume which haunted me like a shadow.

In ten minutes I had seen all that could be seen in that fish, and started in search of the Professor, who had however left the museum; and when I returned, after lingering over some of the odd animals stored in the upper apartment, my specimen was dry all over. I dashed the fluid over the fish as if to resuscitate the beast from a fainting fit, and looked with anxiety for a return of the normal sloppy appearance. This little excitement over, nothing was to be done but to return to a steadfast gaze at my mute companion. Half an hour passed,—an hour,—another hour; the fish began to look loathsome. I turned it over and around; looked it in the face,—ghastly; from behind, beneath above, sideways, at a three quarters' view, just as ghastly. I was in despair; at an early hour I concluded that lunch was necessary; so, with infinite relief, the fish was carefully replaced in the jar, and for an hour I was free.

On my return, I learned that Professor Agassiz had been at the museum, but had gone and would not return for several hours. My fellow students were too busy to be disturbed by continued conversation. Slowly I drew forth that hideous fish, and with a feeling of desperation again looked at it. I might not use a magnifying glass; instruments of all kinds were interdicted. My two hands, my two eyes, and the fish: it seemed a most limited field. I pushed my finger down its throat to feel how sharp the teeth were. I began to count the scales in the different rows, until I was convinced that that was nonsense. At last a happy thought struck me—I would draw the fish; and now with surprise I began to discover new features in the creature. Just then the Professor returned.

"That is right," said he "a pencil is one of the best of eyes. I am glad to notice, too, that you keep your specimen wet and your bottle corked."

With these encouraging words, he added:

"Well, what is it like?"

He listened attentively to my brief rehearsal of the structure of parts whose names were still unknown to me: the fringed gill arches and movable operculum; the pores of the head, fleshy lips and lidless eyes; the lateral line, the spinous fins and forked tail; the compressed and arched body. When I had finished, he waited as if expecting more, and then, with an air of disappointment:

"You have not looked very carefully; why," he continued more earnestly, "you haven't even seen one of the most conspicuous features of the animal, which is as plainly before your eyes as the fish itself; look again, look again!" and he left me to my misery.

I was piqued; I was mortified. Still more of that wretched fish! But now I set myself to my task with a will, and discovered one new thing after another, until I saw how just the Professor's criticism had been. The afternoon passed quickly; and when towards its close, the professor inquired:

"Do you see it yet?"

"No," I replied, "I am certain I do not, but I see how little I saw before."

"That is next best," said he, earnestly, "but I won't hear you now; put away your fish and go home; perhaps you will be ready with a better answer in the morning. I will examine you before you look at the fish."

This was disconcerting; not only must I think of my fish all night, studying, without the object before me, what this unknown but most visible feature might be: but also, without reviewing my new discoveries, I must give an exact account of them the next day. I had a bad memory; so I walked home by Charles River in a distracted state, with my two perplexities.

The cordial greeting from the Professor the next morning was reassuring; here was a man who seemed to be quite as anxious as I, that I should see for myself what he saw.

"Do you perhaps mean," I asked, "that the fish has symmetrical sides with paired organs?"

His thoroughly pleased "of course! of course!" repaid the wakeful hours of the previous night. After he had discoursed most happily and enthusiastically—as he always did—upon the importance of this point, I ventured to ask what I should do next.

"Oh, look at your fish!" he said, and left me again to my own devices. In a little more than an hour he returned and heard my new catalogue.

"That is good, that is good!" he repeated; "but that is not all; go on;" and so for three long days he placed that fish before my eyes, forbidding me to look at anything else, or to use any artificial aid. "Look, look, look," was his repeated injunction.

This was the best entomological lesson I ever had,—a lesson whose influence has extended to the details of every subsequent study; a legacy the Professor has left to me, as he has left it to many others, of inestimable value, which we could not buy, with which we cannot part.

A year afterward, some of us were amusing ourselves with chalking outlandish beasts on the museum blackboard. We drew prancing starfishes; frogs in mortal combat; hydra-headed worms, stately crawfishes, standing on their tails, bearing aloft umbrellas; and grotesque fishes with gaping mouths and staring eyes. The Professor came in shortly after, and was as amused as any at our experiments. He looked at the fishes.

"Hæmulons, every one of them," he said; "Mr. —— drew them."

True; and to this day, if I attempt a fish, I can draw nothing but hæmulons.

The fourth day, a second fish of the same group was placed beside the first, and I was bidden to point out the resemblances and differences between the two; another and another followed, until the entire family lay before me, and a whole legion of jars covered the table and surrounding shelves; the odor had become a pleasant perfume; and even