THE ARCHER FISH.

The archer fish (*Toxotes jaculator*) belongs to a group or sub-family of the scale-finned fishes (*Squamipinnes*), so called because the "vertical fins are more or less densely covered with small scales." The principal characteristic of this fish is the elongated lower jaw. The inhabitants of Java, its native island, keep these fish in their houses as pets. They are sometimes twenty centimeters in length. The coloring of the upper part of the fish is greenish-gray, the under part silvery; there are four short, wide bands across the back, dark brown, with a shade of green.

With few exceptions, all of the scale-finned fishes are found in the upper stratum of the water and near the shore; some of them descend into the ocean, and others occasionally wander out into the sea, following ships for their refuse, or chasing other prey. Most of them, especially the beautifully colored species, belonging to this family, are found, as a rule, in the vicinity of reefs, or above shallow places, playing in the sunshine. Their beauty is very much heightened by motion.

Heuglin says that in the Red Sea they are commonly observed in the deep chasms or well-like depressions between the coral reefs, where the water is always clear and quiet, although there may be a high sea outside.

When a ship anchors in a dark night between the reefs, the presence of these fish may be perceived by their phosphorescence.

They may be observed, often at a considerable depth, faintly glowing spots; suddenly they disperse like scattering sparks, move slowly to and fro, gather together in groups, and separate again.

Nearly all the fishes of this family are carnivorous, feeding upon small medusæ, coral insects, etc. These fish, Heuglin says, play around the coral branches in the same manner as birds hover around trees upon the land.

In crowds they stand still for a few minutes before a branch of a coral, suddenly dart forward, bite at the coral insects on the branches, and hasten as if inspired by a spirit to another place, to go through the same play, and begin again the same chase.

As soon as the archer fish sees a fly or any other insect sitting upon a plant hanging over the water, it approaches to within about one or one and a half meters, and spurts from its mouth a drop of water, so violently and with such accuracy that it seldom misses its prey.

It has this habit even in captivity, and the Japanese make a household pet of it. They keep the fish in water basins, and place in the middle of the vessel a stick, sometimes reaching out over the water sixty centimeters. In the stick wooden pins are fixed, and insects are fastened upon them. Soon after this is done, the fish swims around the stick, comes up to the surface of the water, raises its eyes toward the surprised insect, suddenly spurts a drop of water upon it, throws it down, and swallows it if its shot is successful; if not, it swims around the stick and tries again. The certainty with which they throw this jet of water upon their victims is wonderful.

In order to observe this, Hommel thrust a needle through a fly and fastened it to the stick. Without intermission, rapidly, and in regular order, all of his fish attempted to throw the fly down, without once missing their aim as they shot the drops of water upon it.

THE ARCHER FISH.

Insects appear to be the most natural food for this species, and seem to be preferred to every other kind of food.
—*From Thierleben, by A. E. Brehm.*

Wisdom of Plants.

As an example of the curious property of plants in selecting from a soil only those materials proper for their nourishment, the ice plant, which is found abundantly on the Mediterranean coasts, is one of the most striking. It has lately formed the subject of some experiments by M. Mangon, who has cultivated it for many years. Its popular name is derived from the little vesicles filled with water which cover its stem, and have much the appearance of frozen dew-drops.

Analysis shows that it sucks up from the soil a large quantity of soda, potash, and other alkaline salts; indeed, it may be said that the plant represents a solution of alkaline salts held together by a vegetable tissue only, weighing two per cent of its mass. M. Mangon believes that the plant might be useful if planted on unproductive soils where such salts are in excess, thereby rendering the ground suitable for ordinary cultivation.

Carbonic Oxide in Common Furnaces.

According to Mr. J. Lowthian Bell, every furnace wherein a high temperature is attained is virtually a carbonic oxide gas furnace. He shows that carbonic acid, the product of the perfect combination of carbon and oxygen, cannot exist at a high temperature, in consequence of dissociation taking place. Therefore, if a great heat is desired from solid fuel, it is impossible to avoid the waste represented by the formation of carbonic oxide at some region above the fuel, and where there is usually no provision for using it. It has long been known that carbonic acid breaks up at high temperatures; but Mr. Bell has shown that the same effect is produced at comparatively moderate temperatures—a view in which he is supported by M. Berthelot. He mentions the well known phenomenon of the carbonic oxide flame just above an ordinary open coke fire; and says that this is not merely due to the fact that the gas can only inflame in contact with fresh air, but also that it could not burn in the hot fire below. Thus every furnace is a carbonic oxide generator; the only difference between those which avowedly produce gas and those in which the work is done by the primary burning of solid fuel being that the former turn to good account what the latter produce to waste. The lesson to be drawn from these observations is that the only way to burn coal or coke to advantage is to first convert it into carbonic oxide, and afterward burn every atom thereof in the right place. Unless this sequence of operations is followed by design, it will assuredly be observed by nature. According to this view, the gas furnace is less revolutionary in principle than has been supposed; it is simply a method of regulating and rendering profitable a natural and otherwise wasteful process.

A FRENCH surgeon says, that on chloroforming some mice and lifting them by their tails, they tried to bite, but on laying them again in a horizontal position, they resumed insensibility. Acting on this hint, when a patient showed signs of collapse under a dose of chloroform, he dropped the patient's head over the bedside and raised the feet quite high. The patient at once became conscious; when laid straight on the bed he became insensible again, and a return to lowering the head and raising the feet for ten minutes was required to counteract the chloroform. It is thought that by this treatment anæsthetics may be used with great safety.

Indigestion and Disease.

Dr. Henry Reynolds has an article in the *Phrenological Journal* on indigestion which seems to define the nature and symptoms of the complaint very closely.

Many suffering from dyspepsia will find their own feelings described in the following extracts, taken from Dr. Reynolds' paper, and we hope some will derive benefit from his hints:

The important relation of indigestion to many diseases which people suffer is not sufficiently realized. Difficulty in breathing, occurring spontaneously, or on slight exertion, may be caused by indigestion.

Indigestion causes alterations in the general nutrition of the body, which are manifested in various ways, among which are the following: Anæmia, or a depraved state of the blood, involving a deficiency of the red globules of the blood, and causing persons thus affected to be unnaturally pale, especially about the lips; decay of the teeth; grayness of the hair; excessive liability to inflammation, from slight causes, of the mucous membranes, especially the eyes and throat; to which may be added, in cases of those predisposed to such affections, liability to gout and rheumatism, and affections of the lungs or kidneys. Consumption has frequently been regarded as due in many cases to long continued derangement of the digestion, whereby the general nutrition of the system has become impaired.

The inflammation of the mucous membrane of the throat, known as "clergyman's sore throat," is a product of indigestion, and the removal of the cause by the adoption of a suitable dietary, exercise in the open air, and observance of the laws of health generally will be the best treatment for it.

Indigestion is the cause of various alterations in the skin manifested by general coldness or chilliness, especially of the extremities, by changes in its color or texture, which may be earthy or sallow in tint, or dry and coarse, and by various eruptions, among which are the well known eczema, acne, impetigo, and nettle rash. Most of the cases of skin disease affecting children are best treated by attention to the diet, making the diet easily digestible, and sufficiently limited to insure complete digestion.

The causes of indigestion may be due to the food or condition of the stomach. The food may be defective in quality. There may be excess or deficiency of the normal ingredients, saccharine, starchy, albuminous, or fatty, or some of the naturally indigestible materials which form a part of all food. The food may be introduced in an indigestible form on account of defects in the cooking of it, or imperfect mastication, or from its having undergone putrefaction or fermentation, which arrests the functions of the stomach. Imperfect mastication of food is a very common cause of indigestion among Americans.

Eating too much is probably the most common of all causes of indigestion. The secretion of the gastric juice in the stomach seems to be proportioned to the amount of material required for the nourishment of the system. Food taken in excess of this amount acts as a foreign substance undergoing fermentation and putrefaction, and occasioning much disturbance in the system.

Much may be done for the cure of indigestion by eating very abstemiously of suitable food, thoroughly masticated, taking exercise in the open air, breathing pure air, and observing the laws of health generally. The amount of food should be reduced until the quantity is reached which the stomach can digest without evincing any symptoms of indigestion.

The Marseilles Tea Trade.

Within the last few years there has been a singular development of the tea trade at the port of Marseilles. In 1850 the arrivals did not exceed 12,000 kilogrammes, most of which came from the warehouses of the Hanseatic towns and from London. Ten years later the direct relations with the East caused a great movement of tea to Marseilles, the annual imports being 229,114 kilogrammes, of which 223,813 came directly from China. Since then the trade has been very greatly on the increase, the quantity for 1881 being 3,198,430 kilogrammes, of which 2,878,675 were from China. Of this quantity 52,593 kilogrammes were for home consumption, the duty upon which amounted to 111,471 f. The imports of tea for the whole of the French ports were 3,572,268 kilogrammes.

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Steam Plowing in Scotland and the United States.

At the recent session in Chicago of the National Agricultural Convention, a variety of other interesting topics were discussed, includiug that of steam plowing. Among those present was Mr. George Greig, of Scotland, whose long experience with steam plows enabled him to give some very practical and useful information. He gave a description of the great farm of the Duke of Sutherland, in the counties of Ross and Sutherland, comprising one million four hundred thousand acres, and of the efforts of the Duke to accomplish the reclamation of this land, heretofore, a vast waste, by the use of steam power.

The land is laid out in forty acre fields, with roads for the cultivating engines at each side. The steam cultivator consists of two engines and the plow, which is intended to travel between them. The engines are constructed very much in the same way as the ordinary steam cultivating engines of this class. Each engine is fitted with a drum upon which the rope which hauls the implement is coiled, and they work alternately, pulling the plow backward and forward. The plow here is the great object of interest. It if entirely of a novel character, and has cost, in its development to its preseut perfection, not less than £10,000 in experiments. The result of its action in the soil is very much like that of ordinary trenching by manual labor. It is provided to take two furrows about twenty inches broad. The first one cuts off the vegetable matter and throws it into the bottom of the trench, while the second one takes up the subsoil from below and places it upon the top of the vegetable matter, the depth of the two furrows being from two and one-half to three feet. The first plow is provided with a discolter, which is set to work at a lower level than the share, and thus carries the first plow over any bowlder with which it might otherwise get engaged. The second plow is hung on the end of a strong lever, which is held down with a given tension from the rope, so as to engage the stones passed over by the first plow and drag them out. Small stones are thrown to the surface, and large ones are dragged up and left to be hauled out by the wire rope on its return journey. The cost of trenching land by this system to a depth of two and one-half to three feet has been found, with the latest improvements, not to exceed £4 per imperial acre, and this includes the payment of men in the trench throwing up the stones, which fall back into the furrow after the plow has passed. To do this trenching entirely by manual labor, to leave it in a condition as efficient as the steam operation, would cost at the present time not less than £25 to £30 an acre.

The next operation in connection with the reclamation is the clearing of the stones, fifty tons to the acre. The device was a steam sledge which carries from four to five tons of stone. This sledge has been so constructed that when it reaches the end of a field with its load, and the motion is reversed, it turns a somersault of its own accord and leaves the load behind it, returning to be refilled. This sledge was not only found to be a very economical way of carting off the stones, but a great benefit in consolidating and leveling the surface of the land on its passage.

The next operation is the liming of the land, at the rate of from four to five tons an acre. The lime is brought from England, a distance by sea of five hundred miles, then carried by railway twenty miles. A small engine of four horse power and of three tons weight answers the purposes of carting, reaping, rolling, and driving. With it the lime is taken from the railway station to the fields and deposited at the end of each field in large heaps, to be again drawn into lines through the fields with the wire rope and larger engines, using the stone sledge as the carting machine. The sledge has a capacity for six tons, and when it arrives at the part of the field where the lime is required, it tips it out in the same manner as has been described with the stones.

The fencing is made in the usual way with stones taken from the land, and where there are no stones iron fencing of a novel description has been devised in order that it may be folded down on the ground when necessary, so as to allow the steam plow ropes or cartages to pass over it at any point. The standards, which are fixed in stone, are hinged at the bottom, so that when the holt which fastens the stay is taken out the fence falls over. This fence has been found to be great economy where large snow storms occur; through being laid down all winter and lifted up in spring, the snow in this way cannot injure it.

The execution of the under drainage on the reclaimed lands has given rise to greater difficulty than the other operations, in as far as no direct effort was made to accomplish this by steam power. Until lately there was no known implement that would have coped successfully with the bowlders which are to be met with in a drain four feet and a half deep. I feel sure, however, that in the future the plow which I have described for trenching, with very slight modification, will successfully cut out drainage to a depth not exceeding five feet, and at a price not exceeding one-tenth part the cost of manual labor.

In the view of putting it under crops, the surface cultivation of the land has also been undertaken by steam, and for this purpose a novel implement was produced in the shape of a machine which works very much on the principle of the American disk harrow. This implement runs over the land at a rate of six miles an hour, and pulverizes it to an extent to make a seed bed for the smallest and finest seeds.

The primary object of the reclamations has been fully realized, in as far as the farms that have been operated upon are now self-sustaining. Referring to the possibility of making tanks upon land for the purpose of retaining water for the use of stock, I will mention a very interesting incident. The engines which have been introduced by the Duke of Sutherland have been used in New Zealand for the purpose of making tanks for storing water. A machine has been constructed with something of the character of a scoop. This scoop is arranged upon wheels under the engine and controlled by the man who sits upon it. The engine is placed upon that end of the ground intended to be excavated, and this machine runs down and fills itself, and is run up again and is emptied by the action of one man. The success of the first machine taken to New Zealand was such that a large demand sprang up for them, and great tracts of country in Australia, which formerly could not be grazed, are now being stocked with sheep.

The cost of the entire set of machinery for ditching by steam, including two engines of fourteen horse power, with a ditcher, would come to abont $10,000.

The steam cultivating engines are from six to twenty horse power. These small engines are in use in many portions of Scotland, where the fields do not exceed ten acres in extent.

The expense of plowing an acre of ordinary land in Scotland with horses, common plow, and common attendants I estimate at $3 per acre.

Mr. Grinnell (of Iowa): Since we have got these broad Clydesdale horses and the French horses—"necks clothed with thunder," and all that sort of thing—and our farmer boys to ride the plow, we plow for seventy-five cents an acre, and there are plenty of people who want the job at that rate. That being the case, do you think we can be seduced into introducing steam plows when we have Clydesdale horses?

Mr. Greig: I am not prepared to recommend the application of steam plowing when land can be plowed for less than one dollar an acre.

For ordinary surface cultivation I am not prepared to tell you that steam plows have supplanted horses or mules; but when you want very deep cultivation, such as is required for grading roads, sugar cane crops, and that sort of thing, I am quite satisfied that steam cultivation will compete with horses very successfully. And one of the advantages of steam cultivation is, that you get a much better kind of cultivation than you can with horses; you plow deeper and it gives you a mixture of soils, and you get much better results than could be gained by simply turning a furrow. We can run a cultivator at the rate of six miles an hour, but we don't profess to run a plow at a high speed. I will mention a very interesting thing that has only now come to light. Heretofore we have been restricted in the breadth of the implement. We found we could only cut a certain number of furrows. Our plowing machine has always been under the power of the engine. If we could cut the number of furrows the engine could plow, we would be able to double the work and reduce the cost one-half. We have now hit upon a plan by which we can work more than one implement on the same road; and I have no doubt that in the course of two or three years you will find that steam plows will be coming into use in America. With a couple of engines and a steam plow you can turn from twenty to thirty acres of prairie land in a day, and you would consider that a good day's work. I am quite satisfied, from what I have heard of the prairie land and the manner in which you plow, that thirty or forty acres will be within the power of the engine under this new system.

Mr. Grinnell: The preparation of the soil costs $16, and liming $5. That makes about $21 or $22 an acre. The question is, then, how in the world you can induce anybody to stay in Scotland, where it costs for the preparation of the soil $21 or $22 an acre—what persuasion is used, what forcible argument or entreaty, to keep them from leaving the country? I don't understand it.

Mr. Greig: I must tell the gentleman, in answer to his question, that I have been standing in Scotland as if on a hot brick. It was only circumstances I could not overcome which prevented my being in America years ago.

Mr. Charles H. Wood (of Chicago): This subject of steam ditching is one with which I am, so to speak, loaded to the muzzle, and I am going to answer some of the questions the gentleman from Iowa suggests. He was comparing the cost of plowing in Scotland with the cost of plowing here in America, which he places at 75 cents an acre. It is only fair to remark that the work required to do the plowing that is done in England and Scotland would cost, with our implements and our experience, and the same expense of feeding and wages, probably $1.50 to $2.00 an acre. They do it more thoroughly, and the soil is more difficult to work. In regard to the applicability of the English steam plow to American uses, there are parties who have faith in its success here. Some have been introduced in the Red River region, and one or two in other places. Several years ago—fifteen or twenty—one or two sets of English plowing tackle were brought into Illinois, and, I think, all of them have been abandoned, except one which has been operated on a sugar plantation south of New Orleans by Mr. Lawrence. It has been demonstrated in that region, by actual results, that the yield of sugar per acre has been increased from ten to fifteen hundred pounds under steam plowing where the ordinary crop without it was about 1,000 or 1,200, which makes an increase of forty or fifty per cent. That is not a fair gauge of what it would be worth in our prairie country, because down there the great advantage is that they can do the work more thoroughly and plow deeper than they can with horses and they find that deep plowing greatly enhances the quantity produced per acre. Another thing, the climate there is such that they cannot get the same power out of horses practically that we can, and it costs more to feed their horses. I have given this matter a good deal of study, and have endeavored to learn all I could in regard to what has been done in England and Scotland, and I have learned something further from the gentleman's remarks this afternoon. But what I have learned convinces me that the English plowing apparatus, the cable system, a wire rope steam plow, where the engine is stationed at each side of the field, never can be a practical success in a general way in this country; but a steam plow for this country must be a traveling locomotive engine—that has been moderately successful. There have been experiments in that direction which show that it is possible to do it, but it has not yet been found practical to do it. The steam plow was tried here in Chicago, and it worked pretty well on dry, hard ground, plowing at the rate of three acres an hour. I think there were eight plows; they made a track six feet in diameter, and everybody was convinced then that it was the coming way for plowing. The next year, I think it was, it was tried at the agricultural exposition at Freeport, and there they found some soft, wet ground, and when they got into that field there was no friction to hold the drum against the ground, and the drum gave way, and the result was the plow stopped. They put on more steam and turned the plow faster, but it wouldn't work. At Decatur, about the same results followed, and one or two more experiments have been made to bring out a locomotive steam plow.

It is hardly worth while to go into details in regard to them all; but it is evident, from the experiments and failures of the past, that the direction in which further efforts should be made is by some means of putting snow shoes on the engine. I will further illustrate what I mean in this way: I suppose most every farmer here has heard of, if not tried, the experiment of wooden clogs upon horses' feet, for the purpose of hauling a load of hay on soft meadow ground. It is a matter of common practice with some farmers, where they have soft meadow, in order to haul hay off of it, to put on the horses' feet wooden clogs, and they found where a team could hardly get over the ground without the clogs they could do so without any trouble and haul a load with the clogs. I suppose, in connection with that, they had broad tires on the wheels. If a man wants to travel over snow, after a snowstorm, he puts on snow shoes. This distributes his weight over a larger surface, and he succeeds in walking on top of the snow, where otherwise he would sink before getting out of sight of his starting point. There are a great many men working at the problem of a traveling steam plow; some are wasting their efforts trying to get something very light—something that don't weigh anything. Now, it is evident that an engine, to have force, must have weight; it is evident that a pony never can pull the load that a heavy Clydesdale horse can; it is evident that a heavy Clydesdale horse must have greater width to support him on soft ground than a pony. If you want to have a good engine of twenty tons weight, you must have broad feet for it to rest on. Now, if some practical means can be brought out to distribute that heavy weight over a broad surface and a flat surface of ground, it will be practical to make a traveling locomotive steam plow with the capacity of going over soft ground without miring, and you will have something that can be used wherever desired. You can use heavier implements than you do now; you can use a kind of implement that would not be safe for a moment now, or at all practicable. I believe, Mr. President, that the subject of steam tillage is one of the most important, and will soon claim as much attention as any other subject which can be brought before this convention; and I think, in connection with your proposed exhibition next year, it would be a very desirable thing, and of great importance to the general interests of the agricultural classes, that encouragement be offered in the way of a premium for something of this kind.

We may add as a postscript to the foregoing that the steam plow has, within the past few weeks, been set to work in California, with much success. A recent number of the Stockton *Independent* gives this report:

"I saw the steam plow work yesterday. Engines, 2; distance apart, 460 yards; width of land plowed at each passage, 4 feet; number of plows used, 8; 4 used at a time; there should be 5, making 10 in all, but 2 are being tempered; time of cutting a furrow, from 4 to 5 minutes; power of engines each, 40 horse; character of land, tough, black sod, salt grass growing; depth of furrow, 6 inches; every part of the machinery working well; cost of fuel, $5 per day for both engines; capacity, from 40 to 60 acres per day in sandy soil. The writer is of the opinion that, with very few alterations on the plows, the machines will prove an immense success, and will supply a long needed want for plowing land in California. Land plowed by this machine will produce at least one-fourth more crop for a period of six or seven years than by the ordinary plowing in use in this State."

ACCORDING to the *Milling World*, sackcloth or canvas can be made perfectly impervious to moisture equal to leather by steeping it in a decoction of one pound of oak bark with fourteen pounds of boiling water. The cloth has to soak twenty-four hours, when it is taken out, passed through running water, and hung up to dry. This quantity is sufficient for eight yards of stuff. The flax and hemp fibers, in absorbing the tannin, are at the same time better fitted to resist wear. This recipe is useful to millers who sack flour.

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