NOVEL AIR BRAKE.

It is well known among engineers and engine drivers that in reversing the valves of a locomotive in the usual way to check the speed of the engine the pistons draw in air and compress it in the steam chest and steam supply pipes, until, in some instances, the pressure is greater than the steam pressure in the boiler. Our engraving represents an invention for utilizing this action of the locomotive cylinders for the purpose of operating air brakes for checking or stopping the train, and it also avoids drawing cinders into the cylinders, a thing common to engines working in the ordinary way.

The engraving represents only such parts of the locomotive as are immediately related to the invention, Fig. 1 being a view of the front end of the smoke box with the cylinders left out; Fig. 2 a side view of the same parts; Fig. 3 a sectional view of the exhaust nozzle, and Fig. 4 is a detail view of the safety valve lever.

A and B are, respectively, the exhaust and supply pipes, connected with the cylinders in the usual way, and C is an exhaust nozzle of the ordinary pattern, except that it is provided with a sliding valve or cover, D, and a pipe or nozzle, E, which projects through the cap of the smoke box, and is provided with a flaring mouth. The pipe, E, is provided with a plug valve or cock whose spindle extends through the side of the smoke box and is provided with an arm connected with a rod extending to the cab of the locomotive; on the inner end of the same spindle there is an arm connected by a link with the valve, D, the cock and the valve, D, being arranged relatively to each other so that when the valve, D, is open the cock will be closed, and *vice versa*.

From the top of the steam pipe, B, a pipe extends upward through the top of the smoke box, and has at the top a safety valve, F. of ordinary construction, whose lever extends over the smoke box and is held down by a spring connected with a lever fulcrumed on the top of the boiler, and moved so as to bring more or less pressure on the valve by turning the cam on the shaft, G, by means of the lever attached. This lever is provided with a pawl arranged to engage the teeth of a fixed segment.

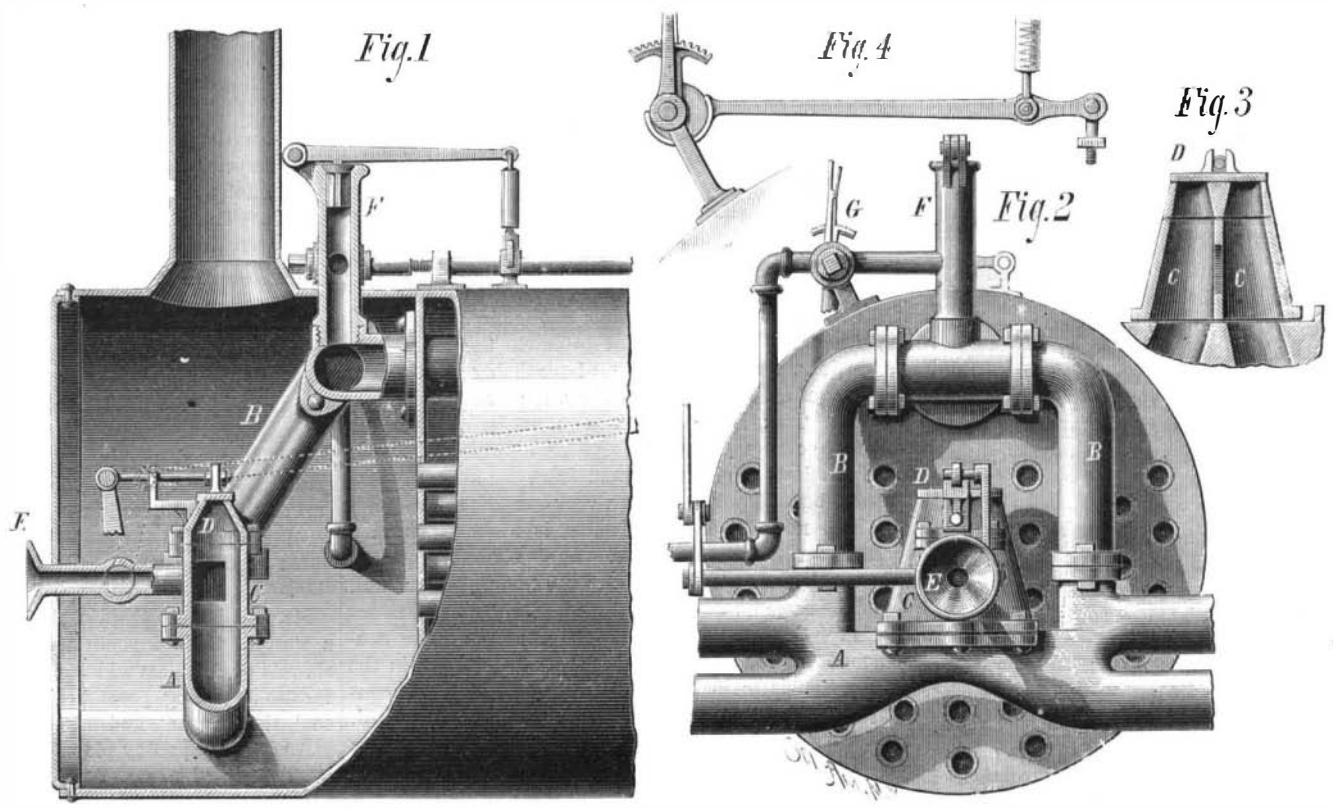
Below the valve, F, a pipe extends a short distance laterally from the vertical pipe, and then passes downward and is connected with the pipe or pipes leading to pneumatic brake cylinders of any approved form. This pipe is provided with a three-way cock, whose spindle extends through the shaft, G, which is tubular and reaches to the cab, where it may be conveniently operated.

On shutting off the steam from the cylinders and reversing the valves, the valve, D, is closed and the valve in the pipe, E, is opened; the cylinders then act as powerful pumps drawing in air through the pipe, E, and forcing it into the steam chest and steam pipe, B. The required pressure is quickly reached, and the surplus air escapes through the valve, F. Should this operation fail to check the engine sufficiently the three-way cock in the air discharge pipe is opened and air is allowed to escape from the steam supply pipe, B, to the pipes leading to the brake cylinders. An abundant supply of compressed air is always ready, and more or less of it may be used in operating the brakes.

When it is desired to let off the brakes the three-way cock is turned so as to shut off the air supply and liberate the air contained in the brake cylinders and pipes connected with them. The inventor proposes also to connect the three-way cock with an air reservoir so that a quantity of air may be stored if desired. After letting the air out of the brake cylinders, the valve, D, is opened, and the valve in the pipe, F, is opened when the engine is in its normal condition.

Another feature of the invention, and a very important one, is that engines commonly used for drawing freight trains can be utilized to stop this class of train without the brakemen getting upon the top of the cars, and it enables railway companies to place such engines on passenger trains and have the advantage of the air appliances on the cars as described.

This invention dispenses with all special pumps and utilizes the momentum of the moving train for braking purposes. To any one doubting the ability of the engine cylinders to act as air compressors we mention the fact that an engine has been made to compress sufficient air in its boiler, while being drawn forward by another engine, to propel itself forward at the usual rate of speed for several miles by compressed air alone, there being neither fire nor water in the boiler. This invention was recently patented by Mr. John Hall, of Hamilton, Ontario, Canada.



HALL'S AIR BRAKE.

NEW LINE-THROWING GUN.

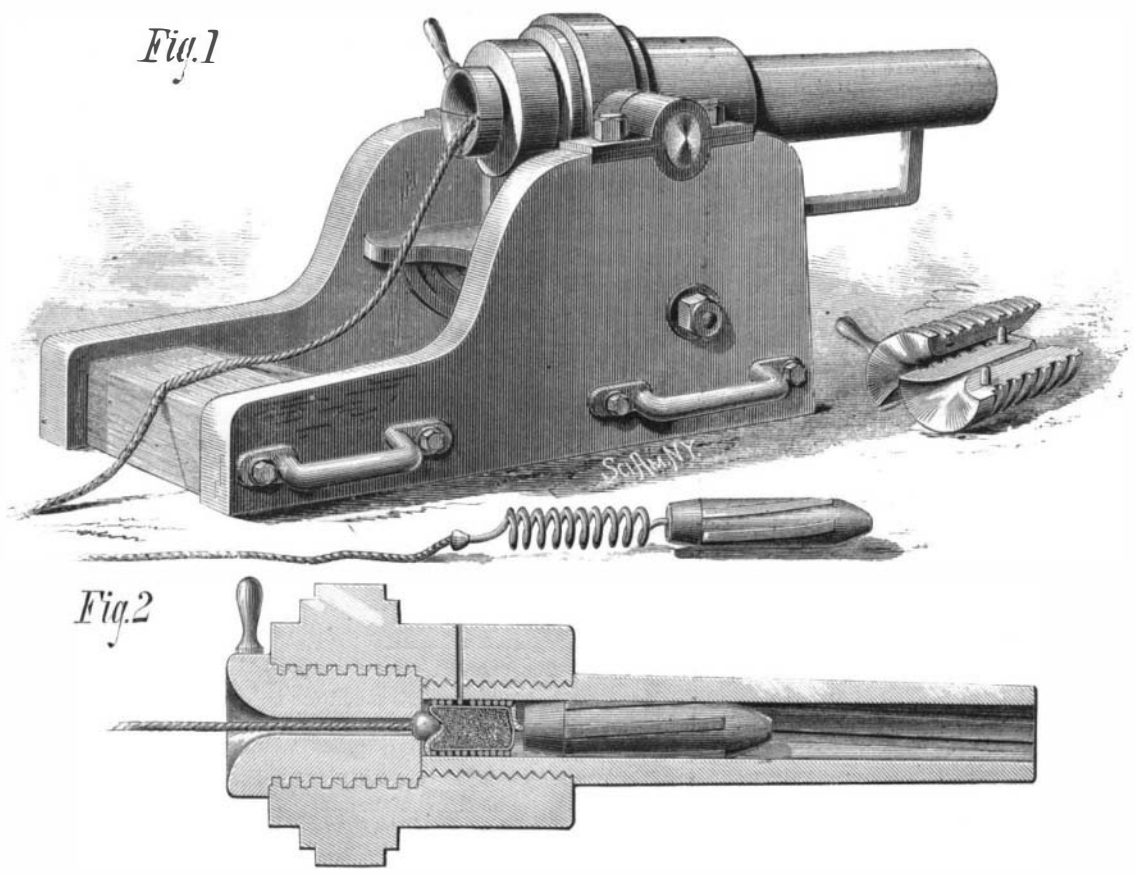
The engraving shows a breech-loading line-throwing gun lately patented by Mr. L. W. Spencer, of this city. In some respects this gun differs materially from others designed for the same purpose. It is rifled to insure accuracy and to increase the range. It is breech-loading, and the projectile carries the line through the center of the breech.

Fig. 1 shows the gun in perspective, a detail view of the split breech piece being shown on the ground under the muzzle of the gun. Fig. 2 is a longitudinal section of the gun, showing the position of the line and load, and the projectile is shown at the side of the gun

The gun is mounted on the carriage by means of trunnions in the usual way, and is secured in any desired position by the clamping screws at the sides of the carriage. The breech block is made in two parts, with a central longitudinal opening for the line, and it has a heavy screw thread which fits the threads in the chamber in the breech of the gun. The projectile has attached to it a tail piece of wire rope or other material that will resist the action of the exploding charge which is enveloped by it. The tail piece is attached to the life line, and carries a valve which closes the opening in the breech block through which the line passes and prevents the backward escape of gas.

When the gun is fired the shot passes straight out of the gun, the elastic tail uncoils, and the life line is drawn through the opening in the breech block, in a direct line, so that it does not in any way interfere with the course of the projectile.

With this gun the projectile is thrown out with no retardation except that caused by the weight of the life line. By the ordinary method, when the life line is fired out of the gun ahead of the projectile, the weight of the line compels the projectile to turn over, greatly retarding the speed of the projectile and line and affecting the accuracy of firing.



SPENCER'S LINE-THROWING GUN.

MECHANICAL INVENTIONS.

An improved wagon brake lever has been patented by Mr. Edward S. Plimpton, of Denison, Iowa. This invention consists in a novel arrangement of a double jointed lever, with a pawl and ratchet and a rod connecting with the brake shoe, whereby provision is made for locking the brake by the engagement of the pawl with the ratchet, and for disengaging the pawl to release the brake.

Mr. Israel Erickson, of Whitehall, Mich., has patented a simple and effective device for feeding sawdust, shavings, etc., to a fire and spreading them thereon. The invention consists of spreading bars or spreaders, having outwardly curved rear ends, and pivoted at about the center of their lengths to the under side of a reciprocating plate or frame supported on rollers, and works in a spout or conductor fixed in front of a fire door, the spreaders being opened or spread laterally by contact of their curved ends with fixed rollers, and being closed by a connecting spring.

An improvement in car couplings, invented by Mr. Philo B. Williams, of Edgerton, Ohio, relates to that class of couplers with which cars can be coupled without the brakeman going between the cars for that purpose; and it consists of a spear or dia-

mond-shaped pointed coupling bar, and of a draw head provided with an internal shoulder and a swinging metallic plate, which engage and hold the point of the coupling bar.

THE JAPANESE AND CHINESE SECTIONS OF THE BERLIN INTERNATIONAL FISHERIES EXHIBITION.

BY A. W. ROBERTS.

The fishes and marine animals in the Japanese and Chinese sections of the Berlin International Fisheries Exhibition were objects of the greatest interest. These specimens of the marine life of Eastern Asia were prepared by native taxidermists, and to obtain a more artistic and picturesque effect they were grouped (by Mr. K. Slemenroth) to represent Japanese and Chinese marine life.

No. 1 represents the polypus, or devil fish (*Megateuthus martensii*), the body measuring thirteen feet in length, the head being provided with eight arms, each being fourteen feet long, the ends of which are provided with powerful suckers.

short thick cylinder, the center of which can be raised so as to establish a vacuum between itself and the object to which it is attached. As the weight of a man in water is about five pounds, it would not be difficult for a medium sized devil fish to drag him under water. The food of the devil fish consists of crustaceans and bottom fishes.

In the illustration the devil fish is shown in the act of entangling a coral diver in his terrible embrace.

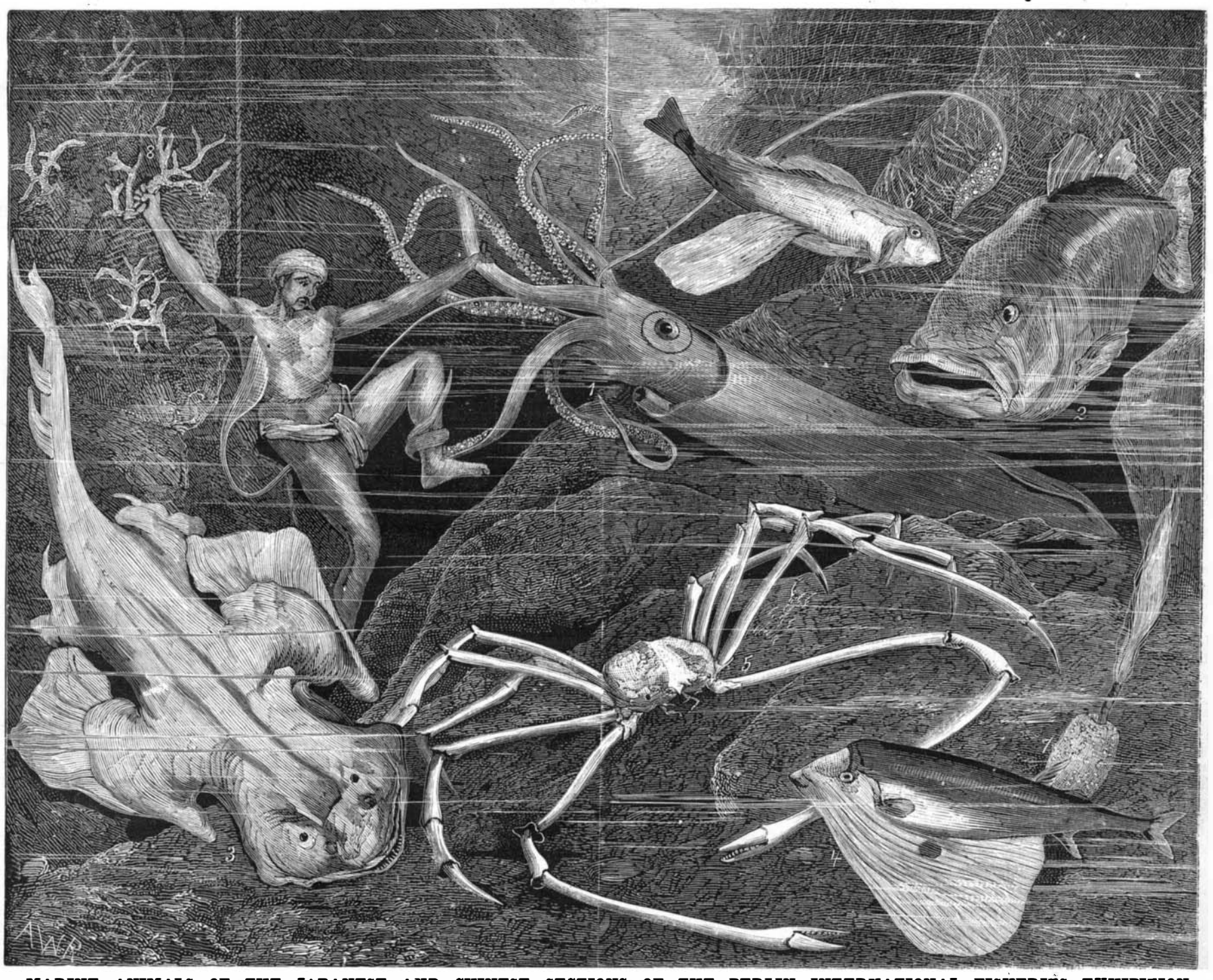
No. 2 is an example of Japanese perch, being only six feet in length, and is the largest known variety of the perch tribe.

At No. 3 we have the old-fashioned angel fish (not the exquisite angel fish (*Chætodon*) of the tropics). It got its name of angel fish from its supposed resemblance to a cherub, such as are to be seen at the present day on ancient headstones in Trinity churchyard. It is also known by the name of monk fish, exactly why I don't know, as it has anything but a holy look when fresh from the ocean. The most proper name it has received is the shark-ray, as it looks like an exact connecting link between the shark and ray or skate

I have had several living specimens of a variety closely resembling the one figured above, and known to fishermen as the flying sea robin. In coloring they were beyond describing, and for exquisite grace of motion were perfection itself. When resting on the bottom and with wings folded up close to their sides like a fan, they often gave forth a pleasant musical sound, from which is derived their tribe name, *volitans*. I lost several specimens of this gorgeous fish from their habit of leaving the aquarium at night, and their wings drying before they were able to return to the water. But one that I had kept for a long time had learned how to pass from one tank to another during the night, often making a run of six tanks. Their favorite food is the bait shrimp.

Some years ago great numbers of these fish, of a large size, visited our coast and were sold in the markets under the name "dolly vardens," on account of their brilliant colors.

The gigantic spider crab (Fig. 5), *Macrocheria*, or long-armed crab of Japan, is the largest crab known. In the cabinet at Rutgers College, N. J., is a specimen of this variety, which, when the claws are extended, measures eleven feet



MARINE ANIMALS OF THE JAPANESE AND CHINESE SECTIONS OF THE BERLIN INTERNATIONAL FISHERIES EXHIBITION.

1. Polypus. 2. Giant Perch. 3. Angel Fish. 4. Fan Fish. 5. Giant Crab. 6. Flying Fish. 7. Glass Sponge. 8. Coral.

The devil fish fisheries of Eastern Asia are of great importance, as the following figures will show: In 1873, 9,000 boats were engaged in capturing devil fish, each boat being manned by six fishers, the annual yield being over 14,520,080 pounds, valued at $375,000; 80,000 persons were also engaged in preparing and packing the flesh.

Through the establishment of public aquaria more correct information of the habits of these (the smaller varieties) wonderful fishes has been obtained.

We call them fishes, but they bear no resemblance to fish that have scales and swim by means of their fins and tail. Scientifically they are not fishes at all, but are very closely related to our oysters, clams, and other mollusks. Scientists classify the devil fish or octopus (meaning eight-armed) as belonging to the division of soft-bodied mollusca and of the class *Cephalopoda*, meaning feet projecting from the head.

They breathe by taking in water at the broad and open end of their bag-like body through two large gills, and ejecting it through a short and thick tube or funnel situated below the head in front. By this means they propel themselves backwards through the water.

One of the most curious features about a devil fish is that he has several hundreds of sharp and serrated sucking disks distributed in two rows along each arm. Each disk is a

tribes. It is a bottom fish and feeder, living on crustaceans, and is particularly partial to all the flat fish family. Its flesh, unlike the skate, is coarse and fibrous, and is seldom eaten, except by the very poorest classes. The only useful part of this fish is its skin, which, when dried, is used in place of sandpaper on woodwork, also for handles for swords, knives, etc.

In New York city this fish has been the means on several occasions of supplying our traveling shows with that class of circus natural history in the way of a mer-MAN. This wonderful production was the result of the artistic mind and delicate manipulation of a New York taxidermist (I use the term advisedly—stuffer would be better). I have seen white whales made out of sides of sole leather from the Swamp swim out of this same factory, and gorillas start up-town who, only a few days before, had been a living polar bear at Central Park.

Above the devil fish, at No. 6, is figured the flying fish (*Dactylopterus orientalis*). It derives its name from its ability to leave the water and skim over the surface, by means of its highly developed pectoral fins. It assumes this habit as a means of escape from its enemies.

No. 4 is the fan fish. Its beautiful pectoral fins are developed to an extent that enables it to rise out of the water and soar along its surface, after the manner of a bird.

and six inches. There was at Barnum's (old museum) a specimen of this crab, presented by Mr. Carsom Brevoort, Esq., of Brooklyn, which measured twenty feet. This specimen was lost at the burning of the museum. The long-armed spider crab common on our coast is a close relation to this Japanese variety.

At No. 7 is shown the *Hyalenema*, or glass sponge, the skeleton or spicula of which is shown in the illustration as looking like a long bunch of slightly twisted fibers. This spicula is transparent and consists of pure silica. The wonderful Venus horn is a close relation to this Japanese variety. Under a microscope the spicula of various sponges present the appearance of stars, spades, hooks, spears, etc. There is a variety of sponge that grows on our oysters called oyster beard. This sponge is so full of fine spicula that the fishers' wives use it for scouring and polishing their cooking utensils.

No. 8 is the well known red coral of commerce. In Persia, China, and Japan this red coral (or the "daughter of the sea") used to bear the same value as gold. In Johnson's dictionary is the following definition: "Coral—a plant of as great hardness and stony nature while growing in the water as it is after long exposure to the air." Peyssonel was the first to make known its animal origin, but it was many years after that the scientists of Europe had to acknowledge that after all Peyssonel was right.