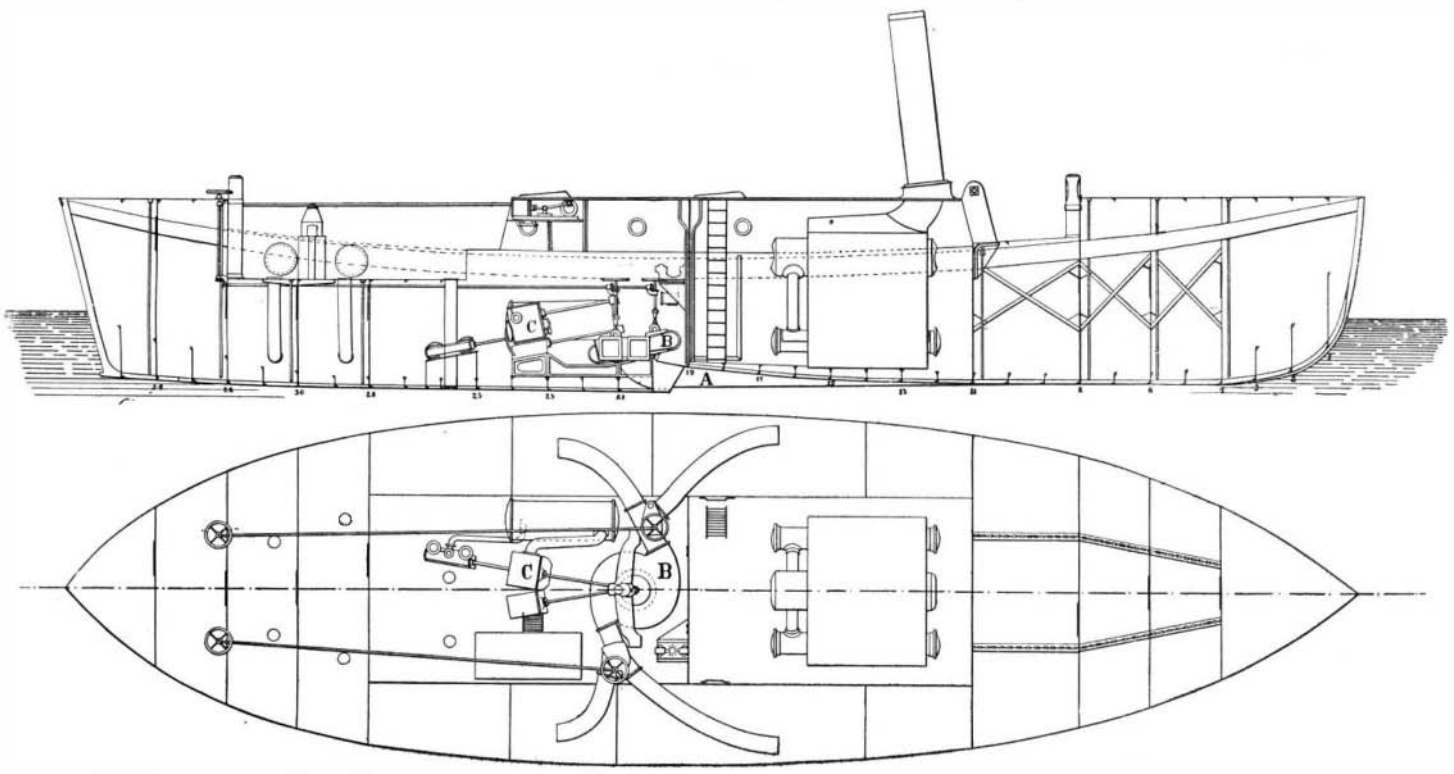
A HYDRAULIC LIFEBOAT.

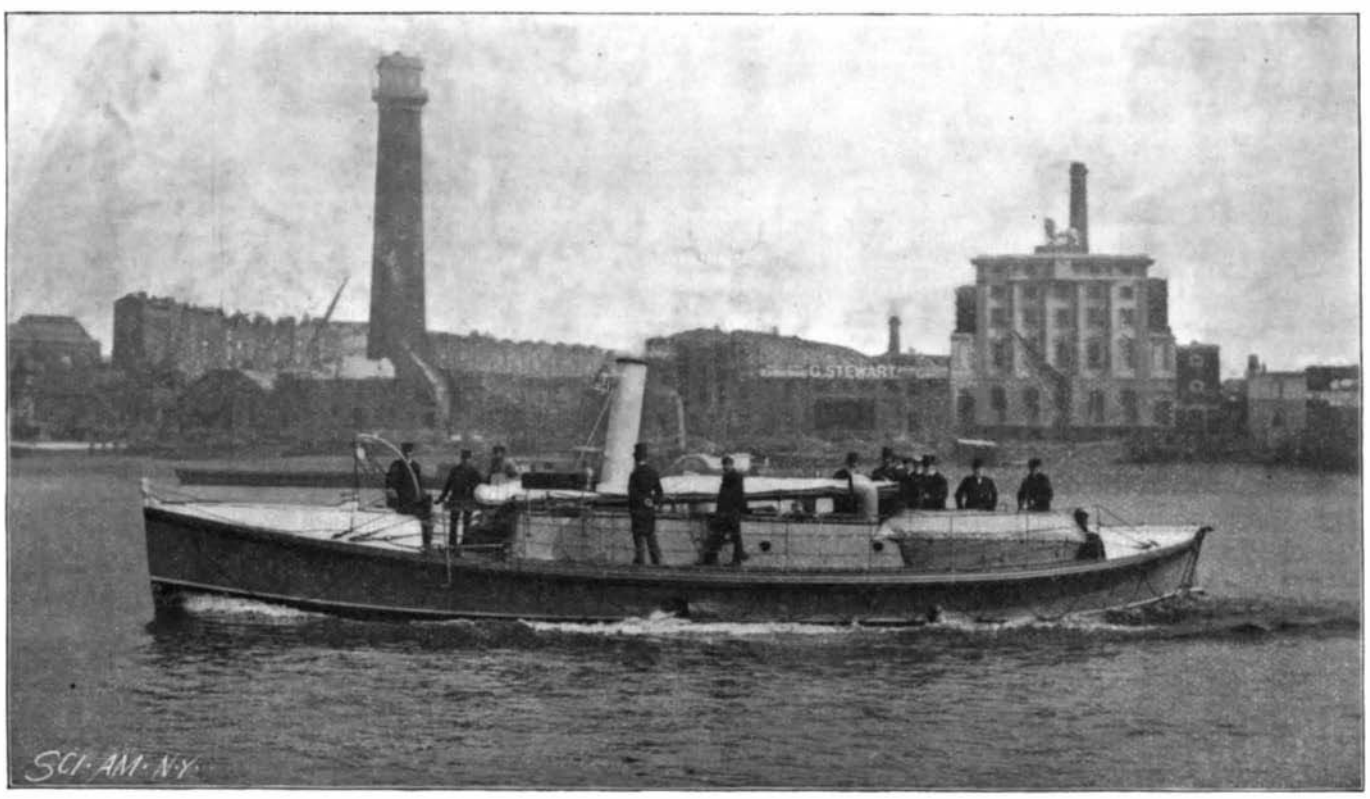
We present illustrations of one of the few successful hydraulically propelled boats which have been constructed in recent years. Most of our readers will remember the attempts which were made years ago at hydraulic propulsion by means of a jet of water driven at high pressure from a three-quarter inch nozzle at the stern of the boat. The attempt in question was not successful for obvious reasons. Since that time hydraulic propulsion has been successfully achieved by enlarging the area of the discharge and forcing through it a large volume of water at a moderate pressure. This system was applied some years ago to a hydraulic lifeboat named the "Duke of Northumberland," which was constructed by Messrs. Green, of Blackwall, the machinery being supplied by Messrs. Thornycroft, of Chiswick, the well known builders of torpedo boats. This system of propulsion was not applied with any idea of economy, but with the object of providing a steam-propelled boat which should not have any exposed propeller, which might be damaged by the wreckage of vessels. Since she was put actively to work, the "Duke of Northumberland" has rendered excellent service at Harwich and also at New Brighton, where she is at present stationed.



LONGITUDINAL SECTION AND PLAN OF "THE QUEEN" SHOWING ENGINES C, CENTRIFUGAL PUMP B, SUCTION A, AND THE DELIVERY PIPES FOR THE HYDRAULIC JETS.

"The Queen" is the second lifeboat of this type to be built and she takes her place as one of the fleet of the Royal National Lifeboat Institution. Her dimensions are as follows:

Length over all, 55 feet; width of hull, 13 feet 6 inches; breadth on deck, 16 feet; the deck being carried out considerably beyond the sides of the hull so as to form sponsons of the kind with which we are familiar in American river steamers. The sponson deck is very solidly constructed and acts as a fender for the hull when the boat is taken alongside a wreck. It also affords protection to the jet orifices in the sides of the boat.



HYDRAULIC LIFEBOAT "THE QUEEN" CONSTRUCTED FOR THE ROYAL NATIONAL LIFEBOAT INSTITUTION.

The hull was designed by Mr. G. L. Watson, best known in America as the designer of the "Thistle" and the "Valkyries," challengers for the America cup. It is built entirely of steel and is fully subdivided into watertight compartments. In the after part of the boat is a large open cockpit, from which the steering is done. The cockpit is made watertight with non-return relieving valves, which allow any water which may be shipped to flow out immediately. The rudder projects considerably below the bottom of the boat to enable it to take hold of the water in a choppy sea. The steering is greatly assisted by the method of hydraulic propulsion, as will be explained later in the article.

The boat is driven by engines, C, of 200 horse power, which are direct connected to a centrifugal pump, B, which is placed approximately horizontally near the bottom of the boat. The pump is 2 feet 6 inches in diameter, and, when running at full speed, it makes 450 revolutions per minute. The cylinders of the compound engine are 8½ inches and 14½ inches in diameter, with a common stroke of 12 inches. Steam is supplied by a Thornycroft water-tube boiler placed in a closed compartment forward of the engine. The pressure at the boiler is 140 pounds to the square inch. The water is drawn into the pump by means of an intake, A, formed by a break in the skin plating, which is formed in the shape of a scoop. The outlet and inlet passages are short, being made so with a view to carrying as small a quantity of water as possible. The go-ahead outlet is located just below the water level and the go-astern outlet just below the sponsons. In whatever direction the boat may be traveling, the centrifugal pump is always turning one way, and the reversing of the boat is accomplished by directing the flow of water either ahead or astern, as the case may be. After the water has passed through the pump it passes to either side of the boat, and each delivery pipe is divided into two branches, which enable the water to be directed either toward the bow or the stern by means of two sluice valves, which are located at the point of division of the outlet passage. These valves are operated by means of hand wheels, which are located conveniently within reach of the coxswain's hand in the afterpart of the cockpit. This gives the coxswain a remarkable control of the boat. If he wishes to make a sharp turn to port, he will direct the port race from the pump ahead, while the starboard jet will be kept going astern. The action is somewhat similar to that of a twin screw vessel, but more effective, owing to the fact that the jets emerging amidships give a greater turning moment than is afforded by screws located near the keel at the stern. Another curious feature is that the boat can be stopped without stopping the engines, by placing the valves so that they divide the water delivered from the pump between the go-ahead and the go-astern positions. On her trial trip the boat showed a speed of 8·85 knots per hour. As was to be expected, the boat runs with great steadiness and practically no vibration, and there is only a slight throbbing movement noticed, which is, of course, due to the momentum of the reciprocating parts acting in a fore and aft direction.

It will be noticed that, for the power developed by the engine, the speed is low; but, as we have already stated, the hydraulic propulsion is not adopted for motives of economy, but because of its fitness for the particular class of work which the lifeboat has to accomplish. The ordinary propeller would be simply out of the question, because of the certainty of its being fouled by the ropes and wreckage which is usually floating alongside a stranded ship. The intake of the hydraulic engine is built entirely within the hull and is protected by gratings; it is, therefore, well adapted for use where the sea is encumbered with wreckage and floating spars. Moreover, the short, steep seas which a lifeboat, in putting out, has to encounter, would cause screw propellers to race excessively; whereas the hydraulic propulsion is not affected by rough water.

The lifeboat is provided with a heavy steel wire hawser 100 fathoms in length. It is carried on a reel located in the cockpit. The boat also carries a steam capstan which will prove of inestimable value in the work of the boat. At the conclusion of the speed trials interesting experiments were carried out to determine the turning capacity. A life buoy was thrown overboard while the vessel was running at full speed, and the jets were at once delivered in the go-astern direction. It took just one minute to recover the buoy. For purpose of comparison, the time was taken in recovering the buoy with the jets going ahead and the rudder put hard over. It took exactly the same time to recover the buoy as in the first place. The draught of the lifeboat, when all gear, stores, fresh water and thirty-nine persons are on board, is about 3 feet 3 inches, and at this draught the displacement is about 30 tons. We are informed by Messrs. Thornycroft & Company, by whose courtesy we are enabled to present the illustration and particulars, that they are now contemplating a steam lifeboat driven by a screw turbine propeller, which will secure all the advantages of hydraulic propulsion, but which will give an equal speed for about fifty per cent as much power as is required to drive the centrifugal pump.

RECENTLY a bust of Michael Faraday was unveiled at the Michael Faraday Board School, at Walworth. The bust was presented by the managers of the Royal Institution, and is a copy of the original bust executed by Matthew Noble. Sir J. Crichton Browne, F.R.S., and other representatives of the Royal Institution, were in attendance.

Exhibition of Kodak Photographs.

The introduction ten years ago by the Eastman Kodak Company of a new system of roll holder or film photography, when the word "Kodak" was first applied to a camera and the phrase, "You press the button, we do the rest," became popular, is now fittingly celebrated by a singularly large and interesting exhibition of Kodak pictures, going on from January 4 to January 15 at the Academy of Design in this city, corner of Twenty-third Street and Fourth Avenue, and is well worthy of a visit.

The exhibition combines work sent in in answer to a number of competitive competitions gotten up by the Eastman Company last year, besides several loan exhibits sent upon invitation by a number of well known art photographers and also by members of the royal family of England. The pictures have been exhibited in London and are now put on view in New York as examples of the latest progress in film photography. The excellence of the display, the prominence of many of the contributors, make it very attractive to all interested in photography.

The south (largest) room is devoted mainly to enlargements on the Eastman bromide paper by notable photographers and the royal family, some of which, in tone and color, simulate etchings to a remarkable degree. The latest method of softening masses of light and shade in enlargements is to place over and in contact with the sensitive sheet an ordinary fine open meshed bolting cloth, such as is used in flour mills, during the exposure. While the dots and spaces produced by this method are observable on close inspection of the print, they disappear when viewed at a little distance.

The magnitude of several of the enlargements also demonstrates the freedom from grain in the special transparent film used as the basis for the sensitive emulsion, as well as the excellence of definition of the lenses employed.

The west hall is filled with large frames of prize Kodak and pocket miniature photographs, all of excellent uniform quality.

The north hall contains loan photographs and larger sized direct pictures, while the east gallery is devoted mainly to the industrial branch of film phototography and to lantern slides and transparencies. Here were to be seen specimen prints toned in several different ways, negatives and transparencies produced directly by the solarization or reversal of the image method, remarkably well executed X ray, large photographs, and specimens of the film as prepared prior to the coating of the sensitive emulsion.

There were also examples of the Eastman transfer bromide paper, by means of which the developed image can be transferred to porcelain, glass, linen, silk, and other articles.

The pictures were neatly framed and the several halls appropriately draped. As a whole the exhibition may be considered a success, not only as illustrating the art and scientific possibilities of film photography, but also the remarkably rapid growth and extension of a purely American industry devised by Americans keen enough to comprehend the popular demand for simple, inexpensive picture-taking apparatus and appliances.

Common Errors About Snakes.

BY NICOLAS PIKE.

Much has been written recently in relation to snakes, when in danger, receiving their young into the esophagus and retaining them until danger is over. This has been denied in strong language by many naturalists who seldom think it worth while to study the biology of this interesting class of animals. It appears strange that at this late day the wildest superstitions are still extant with regard to reptile life. There is one reason that may account partly for it. Nine out of ten persons who meet a snake either kill it or run from it. Now if a little trouble were taken to watch some of their habits, they would soon lay aside their erroneous ideas.

I intend to show in this article that not only one species of snakes, but many, have been known positively to care for their young in this manner. I shall also try and correct many errors concerning snakes. It is a very difficult matter to eradicate superstitious ideas and foolish errors, when universally engrafted upon the public mind. Many of these errors have become fixed among the ignorant, and even among some that are educated.

That snakes receive their young into the esophagus when they are in danger is a well known fact. More than forty years ago Sir John Richardson published an account of a rattlesnake that he saw take a brood of young ones she attracted by her rattles, and they darted into her mouth, which she held wide open. The moment the little ones heard the warning, they disappeared into her esophagus.

Prof. Brown Goode, Curator of the Smithsonian Institution, Washington, in a paper read by him before the American Association for the Advancement of Science, proved that the performance was not an uncommon one.

Col. F. W. Prince, of Hartford, Conn., says he saw a snake, probably an adder, about whose head and body her young brood were disporting themselves. Instantly the mother snake opened wide her mouth and down her throat ran the baby brood, one on the tail of the other. Dr. Edward Parker states that when in Paraguay he saw seven young rattlers run into the mouth of the old one. He secured them, and they are now in the collection of the National Museum, Washington.

Thomas Proctor, lawyer, naturalist, and gentleman, whose veracity is undoubted, informed me that he has seen the common garter snake take her young into the esophagus and, after retaining them for some minutes, has seen them come out again.

I have observed this habit in a number of species, including the rattlesnake, the common adder, Heterodon platyrhinos, two species of garter snakes, Eutania sirtalis and saurita. In the year 1842 I made a tour on foot round Long Island, in order to gain a knowledge of its fauna and flora. A naturalist of distinction accompanied me on the trip. At this early period snakes, including the rattler and copperhead, were there not uncommon. The striped pine snakes and sand adder were very numerous. One day while in camp I observed, very near my tent, a striped snake with a number of little ones around her. I called my companion, who was near, to come and see the pretty sight. As he came forward the snake became frightened and made a blowing noise, which the young understood, for they quickly gathered near the head of the mother, who opened her mouth wide, and they all disappeared into her esophagus. I quickly seized her by the neck and secured the whole family, seventeen in all. I kept them a week and then gave them their liberty. During the period of confinement I had the pleasure of seeing the mother protect her young several times in the manner above stated. Prof. Brown Goode has accounts like the above from more than one hundred different sources. Of these, sixty-seven observed the young dart into the old snakes' mouths. Twenty-two noted the means of communication that warned them of danger, which was either a blowing, a click, a rattle, or whistle. Five witnesses saw the young go in and come out again, and one observer saw the act repeated on several successive occasions. Why should we disbelieve that the snake take their young into the esophagus, when it is well known that fish do the same thing? The fish in Panama called the arius, according to Agassiz, carry their young in this way. While at the Seychelles group of islands, Southern Africa, it was my custom to bathe in the ocean every morning. On one occasion, in company with an officer of the English army, we observed a fish, which I thought to be "Laffe volant," lying quite motionless near the bottom, in shallow water. Numerous small fish, two inches in length, were swimming around the larger fish's head. When we disturbed what proved to be the mother, she opened her mouth wide and instantly the young disappeared down her throat. At first we thought she had devoured them, but in a few minutes they all appeared, swimming round the head of the mother as before. Again when disturbed she did the same thing. We tried the experiment with a number of individuals with same results. We thought at the time we had made a great discovery. In speaking of the circumstance to some friends, we found it was well known to those living in the island.

There is a fish in the Amazon River, South America, that has been observed to care for her young in the same manner. The fish is called the "studis." There are many animals that have a similar habit. Among the reptiles there is a lizard, native of South Africa, I have observed do this. I could add largely to the above, but space will not admit in this article.

The common error, which is almost universal, is that snakes bite. Snakes do not bite! Their jaws are connected only by a cartilage, are not hinged, and cannot be brought together with any force. The poisonous snake strikes from its coil, throws its head and body forward, and strikes or hooks its fangs into the object aimed at. The entire work is done with the upper jaw, the lower jaw having nothing to do with it. The serpent does not swallow its prey; but slowly draws itself over the creature it devours. It is enabled to do so by the elasticity of the skin and the extraordinarily loose condition of the teeth-bearing bones of its fangs. As for a snake depositing a thick slime all over its prey before swallowing it, it is a mistake. The tongue does not carry moisture enough to do this, but when once inside the animal there is an abundance of saliva. The tongue is looked upon as a sting, and the common expression is "Look out for its sting!"

The tongue is a mobile, extensile organ of both touch and taste. So far from being a sting, the delicate implement is of the greatest use, and expresses fear, anger, or pleasure; also when testing any objects of food. This we have often proved whenever a different kind of food was given. There is no doubt but that the tongue of a snake is very important to its owner, as the slightest injury even to its tips generally results in the snake's death.

That Snakes Fascinate Their Prey.—The notion formerly entertained that snakes fascinate their prey is superstitious and now exploded.

Shedding of the Skin.—The general opinion is that snakes shed their skin once a year. Snakes do not shed their skin or hide, only the cuticle. I have known this to take place four or five times in one year.

As snakes have no ears, they are supposed to be quite deaf. Snakes are very sensitive to sound when there is a vibration in objects in contact with their bodies. It is said that they have also an appreciation of sound through the delicate nerve of the tongue.

Many positively assert that snakes are not fond of music. As a rule, snakes are fond of music. I have had them wriggle about, erect their heads and bodies, to the sound of the piccolo and flute. Loud music, such as the cornet and bugle, frightens them. While living in the East, I was frequently invited by friends to accompany small hunting parties to the forest. On one occasion I had been out all day, and our bungalow was left in charge of a servant. On our return, we were informed that a large and dangerous serpent had been seen to ascend to the thatched roof and secrete himself there. A fakir was sent for and came immediately. Seating himself, with a companion, on the floor, in the center of the house, he commenced to play an instrument similar to a clarinet. Soon the snake made his appearance, first showing its head only; gaining confidence, he soon moved to a position directly over the head of the musician, letting himself down full length, holding on a minute by its tail, then dropping down to the floor and coiling up directly where the men were seated, elevating its head and body about twelve or fourteen inches, swaying backward and forward, keeping time to the music for some minutes, when the musician's assistant placed a basket over its head and secured it. Snakes are very timid creatures, and always try to avoid man when they can do so; but when cornered, and find that they cannot escape, will turn upon him. I have had small garter snakes do this, and have always given them their liberty for displaying so much courage. They are easily frightened, but if handled carefully, will soon become very tame and familiar. Although I have studied them for many years scientifically, I am always learning something new about them—some new disclosure in their life history. So it is in all branches of nature; therefore, it becomes very important to note down carefully observations for future reference and comparison. The proper way to study natural history is in the field. There are few works on natural history that are professionally treated, and many of these are unsatisfactory. Those who have been obliged to examine carefully, in the hope of collecting original observations, statements of facts worthy of repetition, or remarks properly illustrative to obtain the information desired, have been sadly disappointed. There is no doubt that many naturalists of the present day study natural history improperly. A collection of stuffed bird skins, sea shells, reptiles in alcohol, scientifically arranged, with Latin names, and locality, is all that is required. Biology is ignored! I am not much surprised at the superstition which many people entertain about snakes. Most people have great antipathy toward them, and the hand of man is almost universally raised against them. With the exception of the poisonous kinds, the snake should be protected as a friend to mankind. They destroy an immense amount of rats and mice, and are truly a friend to the agriculturist. Many people have erroneous ideas which were instilled into their minds in childhood, especially concerning the serpent, and it is a very difficult thing to eradicate such ideas of long standing. It seems incredible that such things exist, and are countenanced in this enlightened age, especially by those who profess to be educated. But such is a fact; and the object of this article is to correct some of the most glaring of these mistakes.

Alfred Nobel's Will Proved.

The will of the late Alfred Nobel, the Swedish chemist, an expert in high explosives, who died at San Remo, Italy, on December 9, 1896, has been proved. The personalty is valued at $2,170,465.

About half the estate goes to relatives and the remainder is invested, the interest to be divided annually into five prizes of about $10,000 each. Prizes one, two, and three are to be awarded to the persons making the most important discoveries in physics, chemistry, physiology or medicine.

Prize four is to be given to the person making the best literary contribution upon the subject of physiology or medicine, and prize five is to be awarded to any person who has achieved the most or done the best things looking to the promotion of the cause of peace throughout the world.

These prizes, which are all open to any persons anywhere in the world, will be awarded by the various Swedish academies, except the prize for the propagation of peace, which is left in the hands of a committee to be elected by the Norwegian Parliament.

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