

Novelties for the Paris Exposition.

If the management of the Paris Exposition fulfills its promises, no small number of technical marvels will be revealed to the public in 1900. First of all there will be Sczepanik's much heralded telectroscope, an instrument which, by the aid of selenium, is said to have solved the problem of electrical vision. The telectroscope will, however, find a rival in the telautograph invented by Anton Pollak, a Hungarian engineer. The telautograph, it is claimed, provides a means of receiving messages sent from one station to another, in exactly the same form in which they were transmitted. The idea in itself is old; but the inventor is said to have devised an apparatus which is entirely different from its predecessors. Pollak claims to have solved the problem by using selenium—a metal which is unique in possessing the property of conducting electricity with a resistance which varies with the intensity of the light that falls upon it. The varying illumination is produced by treating the written telegram in a peculiar manner, and the variations in resistance effected by the selenium are communicated to a conductor to produce an increase and decrease in the intensity of the current passing therethrough. According to Uhländ's *Wochenschrift*, the Vereinigte Elektrizitäts-Actiengesellschaft, of Budapest, has applied to the management of the Exposition for space in which to exhibit the apparatus. An imperfect model is said to be in tolerably successful operation, and to be able to transmit in one hour 144 telegrams, each four inches by two inches, upon which space any number of words or characters can be inscribed.

Houdin and the Arabs.

Probably the most interesting personality in the whole history of magic is Robert-Houdin. His interesting works on magic are classics, and are so regarded by all conjurers. Rarely has a more fascinating biography been written than his "Memoirs." The crowning event of Houdin's life was when he was sent to Algeria to counteract the influence of the marabout priests over ignorant Arabs. The marabouts are Mohammedan miracle workers and were continually fanning the flames of rebellion against French domination. The French government invited Robert-Houdin to go to Algeria and perform before the Arabs in order to show them that a French wizard was greater than a marabout fakir. This was pitting Greek against Greek. The marvels of optics, chemistry, electricity, and mechanics which Houdin had in his repertoire, coupled with his digital dexterity, were well calculated to evoke astonishment and awe. How well the French wizard succeeded in his mission is a matter of history. A full account of his adventures among the Arabs as contained in his "Memoirs" makes very interesting reading. The *Household World* recently published the following account of his early experiences in Algeria:

To witness Houdin's first performance in Algiers the neighboring tribes were invited. The theater was speedily filled with them and the French officials, who attended in all their pomp and glory. Interpreters were scattered through the house in order to repeat Houdin's remarks to the natives in their own language. With true Oriental dignity and gravity, the Arabs witnessed the first few tricks in stolid silence, but the taking of a huge cannon-ball from a borrowed hat aroused great excitement.

Then came the great tricks of the evening, especially prepared to astonish the Arabs.

"By a wonderful power which I possess," said Houdin, "I can deprive any man of his strength. I invite anyone to prove my words."

On this being interpreted to the Arabs, a tall, strong man stepped forward on the stage. Houdin held in his hand a little iron box, and, balancing it carelessly on his little finger, he asked the Arab,

"Are you strong?"

"Yes," replied the man carelessly.

"Are you sure of always remaining so?"

"Always."

"Lift that box."

The Arab did so, and asked contemptuously, "Is that all?"

"Wait!" said Houdin, making a solemn gesture. "Now you are weaker than a woman. Try to lift that box again."

The Arab seized the handle and tugged again. He could not raise the box an inch from the floor. After many attempts, he paused for a moment to brace himself for a final effort. He seized the handle again, but shrieked aloud with pain, dropped on his knees, then,

rising, threw his cloak round his face to conceal his shame, and rushed from the theater, leaving his compatriots stricken with fear. The trick was as simple as the result was startling. The box was placed on a powerful electro-magnet, and the current being complete, no man on earth could have lifted it. An electric shock, sent at a signal by Houdin from behind the stage, was what caused the Arab to shriek and hurriedly retreat.

Before the excitement caused by this trick had subsided, Houdin announced that he had a talisman which rendered him invulnerable, and he defied the best shot in Algiers to kill him. A marabout at once sprang on the stage, exclaiming, "I want to kill you!" Houdin handed him a pistol, which the Arab, examining, pronounced a good one. "It is a good pistol, and I will kill you."

"Very well," said Houdin. "To make sure, put in a double charge of powder. Here's a wad. Take a bullet from this tray, and mark it so you will know it again. Ram it into the pistol well."

"It is done."

"Now," said Houdin, "you say the pistol is a good one, and you've loaded it well, so kill me."

"Yes," replied the marabout; "I will do that."

Houdin took a pear, stuck it on a knife, and walked a few paces in front of the Arab, and told him to aim at his heart. He fired, and the marked bullet was seen on the pear. After the powder and wad were rammed home, and while the Arab was marking the bullet, Houdin slipped a little tube into the pistol. This tube was closed at the lower end, and into this the Arab dropped the bullet. As he thrust the wad down with the ramrod, the tube fitted snugly on to it, and was withdrawn with it, being polished to resemble it. Houdin thus got possession of the marked ball, and all was then plain sailing.

On one occasion during his visit to Algiers Houdin was placed in a very awkward position, from which he

showed the bullet between his teeth. "You could not kill me," he said, "and now you shall see what my shots can do." He fired at the marabout, and immediately a red splash was seen on the whitewashed wall before which he was standing. The Arab was untouched; stepping up to the wall, he dipped his finger in the red splash, tasted it, and realizing that it was blood, collapsed in amazement.

Though the trick was simple, only a Houdin could have devised and carried it out successfully. During the night he had melted some wax, blackened it to look like lead, and ran it into a bullet mould, thus obtaining a hollow globe of wax exactly resembling a bullet in appearance. It was with this bullet the marabout loaded his pistol, and in ramming it down crushed it to powder. A second bullet, similarly made, Houdin filled with blood obtained from his own body. This he dropped into his pistol, and rammed it down very gently, so as not to crush it. As it struck the wall it was broken, leaving a red splash of blood.

TELEPHOTOGRAPHY.

Every photographer has seen opportunities for making desirable photographs when distance interposed an insurmountable obstacle; for example, it may be desired to photograph a group of cattle in a field, which would be scattered on the approach of a human being, or a distant but inaccessible mountain which could only be seen to advantage from a neighboring hill, or a bit of scenery on the further side of a river or lake, and hundreds of other scenes which attract the eye of the photographer, but which are practically beyond the reach of his instrument without the device described in this article, by means of which the object may be brought into such close proximity as to make the work of the photographer very easy.

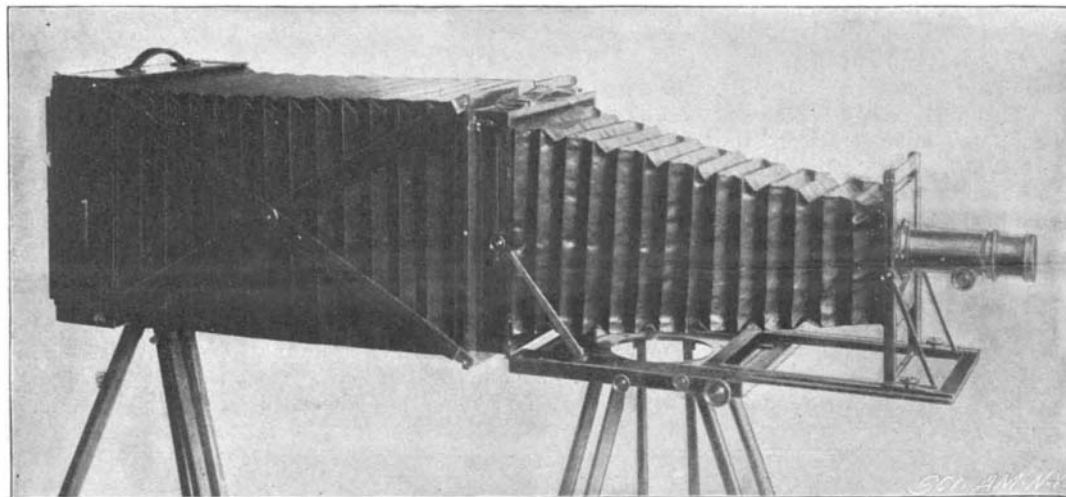
Given a distant and inaccessible object, the necessity for a photograph, and a photographer desirous of producing such a photograph, and we have all the conditions for the practical use

of the telephotographic attachment herewith illustrated. This is not a telephotographic objective, but an achromatic negative combination to be attached to an ordinary photographic lens to amplify the image produced by the lens from three to eight diameters, thereby representing the object at from one-third to one-eighth the distance shown by the lens without the attachment; in other words, it enables the operator with a photographic lens to obtain a photograph of an object on a much larger scale than can be obtained with the lens alone without the telephotographic attachment.

During the late war with Spain, the desirability of procuring photographic negatives with the aid of a telephotograph became very apparent. Mr. Dwight L. Elmendorf, of New York city, who has made a special study of this method of photography, followed the campaigns in Cuba, both on sea and land, and with the aid of the telephotographic camera obtained some remarkable photographs of troops in action. Many of these photographs were taken at a great distance from the scene of action, so that the photographer was in comparative safety while engaged in taking the views. The results obtained, however, do not justify this supposition, as, from all appearances, the men appear to be in close proximity to the camera, and one would judge that the intrepid photographer was having a hot time of it. There are immense possibilities of a very practical nature in the use to which this method of photography can be put, and it should prove of great value in warfare in determining the nature of the enemy's country, in making observations of special objects and fortifications, and in obtaining a record of the positions of troops while maneuvering or in action, while they are at a considerable distance.

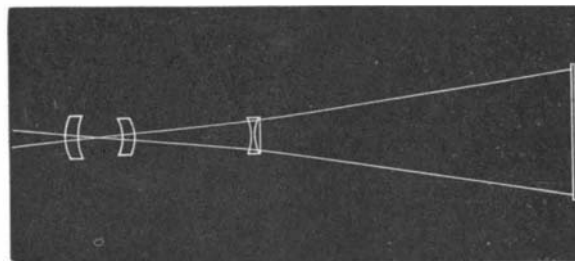
We give an example of the work that may be obtained by the use of the telephotographic attachment. The smaller picture is a view of a large summer hotel in Maine, which was taken on an 8 x 10 plate with a rectilinear lens. The small space inclosed by the parallelogram contains what appears on the larger plate magnified seven times. Both views were taken from the same point, one with the photographic lens alone, the other with the lens provided with the telephotographic attachment adjusted to magnify seven times. This attachment is of great utility in taking views with even much less magnification than that here shown. It is very useful in making pictures of buildings, especially high and inaccessible portions, as it permits the operator to take the view from a point far enough away to avoid the distortion common to pictures made with the lenses of wide and medium angles.

The attachment is shown as applied to a Zeiss anas-



CAMERA WITH TELEPHOTO ATTACHMENT, ADJUSTED TO MAGNIFY SEVEN TIMES.

only extricated himself by his quick-wittedness. He was the guest of an Arab chief, Abou Allem, and entertained his host and friends by a few tricks. One of the company was a marabout, who asserted that the spectators in Algiers had been merely duped by a vision. Houdin, however, produced the marabout's watch in his hand, and, on feeling his sash, the marabout found there a five-franc piece. Convinced by this and other feats that Houdin was really a sorcerer, he challenged him to repeat his performance in the theater and produced two pistols. "You need not fear," said the Arab, "since you know how to ward off bullets." Without losing his self-possession, Houdin



COURSE OF THE RAYS THROUGH THE TELEPHOTO.

explained that his invulnerability lay in a talisman which was with his possessions in Algiers. "By six hours' prayer, however, I can do without that talisman, and at eight o'clock to-morrow morning you can fire at me."

At the appointed time there was a large concourse of Arabs, which the news had attracted. The pistols were brought and carefully examined. The marabout dropped in the powder, Houdin handed him a bullet from the tray, and he rammed it down. Houdin then loaded his own pistol, and, walking about fifteen paces away, turned and faced the marabout. The shot was fired, and the Frenchman opened his mouth and

tigmat $6\frac{1}{2} \times 8\frac{1}{2}$ lens on an 8×10 box provided with an extension, to enable the parts to be adjusted for a magnification of eight times. This necessitates a camera box 42 inches long, requiring the use of two tripods. The extension on the back of the camera box is 22 inches in length, and is used fully extended only for magnifying six, seven or eight times. For making views with a magnification of three, four or five diameters the rear bellows is closed, and the apparatus is supported on a single tripod.

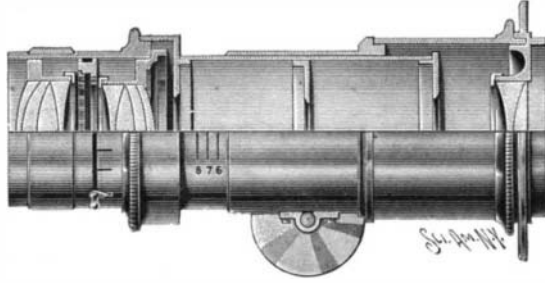
The telephotographic attachment represented in one of the engravings with a Zeiss objective inserted in the outer end is shown partly in section, to more clearly illustrate the construction. The rear or flanged end of the attachment contains an achromatic negative or concave lens which corresponds to an amplifying lens in a microscope or telescope. To the tube containing this lens is fitted a sliding tube, in the front end of which is placed the photographic lens proper. The sliding tube is adjusted by means of a rack and pinion, the latter being turned by the milled wheel.

As the amplifier magnifies any imperfections that may be in the lens to which it is applied, it follows that none but the finest lenses can be used in connection with the attachment. It has also been ascertained that it is necessary to have the negative lens fitted to and corrected for the photographic lens with which it is used.

After the rays cross in the photographic lens and diverge within the camera, the central ones are rendered still more divergent by the achromatic concave lens taking the course shown in the diagram. It will be seen that only a small portion of the rays received and transmitted by the photographic lens pass through the amplifying lens. The time of exposure is, of course, much longer with the telephotographic attachment than with the photographic lens alone: that is, it is approximately proportional to the square of the magnification. For example: If, with the photographic lens alone, the exposure would be $\frac{1}{8}$ of a second, with the telephotograph adjusted to magnify eight times, it would require an exposure of one second; but there is considerable latitude in exposure in a telephotograph, and it is well enough to give a little more time than the rule calls for.

The principles underlying the use of the camera for this kind of photography are so simple that there is no reason why any one having any taste for photography should not quickly become accustomed to its manipulation, with results that will be found most novel and gratifying. The expense is trifling, as the ordinary camera and lens may be used, the extra length being obtained by means of the box extension at the back of the ordinary camera. This box extension is clearly shown in the engraving. Of course, owing to the length of the complete apparatus when assembled for telephotographic work, two tripods are necessary. We present in one of the views a detail of the telephotographic attachment and a diagram showing the path of the rays before they reach the plate as

indicated above. The whole subject is teeming with interest for the amateur photographer, and the



PHOTOGRAPHIC LENS WITH TELEPHOTO ATTACHMENT.

most interesting and startling results are often obtained.

Breathing Valves of Fishes.

Fishes breathe, as is well known, says Ulric Dahlgren, in *The Princeton Bulletin*, by passing a stream of water through the oral cavity, in at the mouth and out by two lateral openings, the gill clefts. This is accomplished by a rhythmic motion, plainly visible, the nature of which, however, has never been accurately described, our best text-books of ichthyology

calling it "swallowing." "An act similar to swallowing," etc.

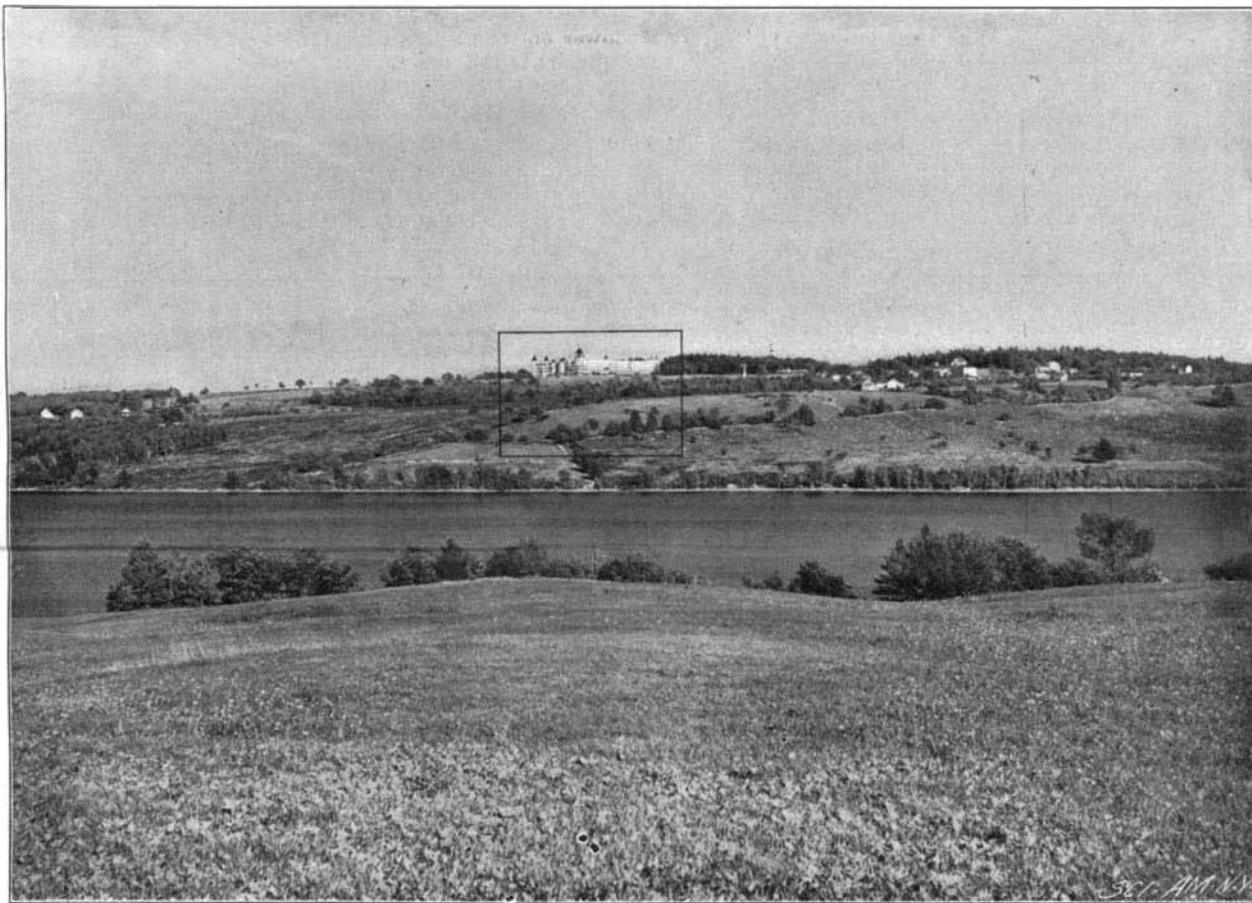
The writer's discovery of two membraneous valves just inside the teeth has made possible the following conception of the breathing of teleost fishes.

The construction and operation of the fish's apparatus is that of a perfect two-valve pump. In such a pump there must be a chamber which possesses two openings, each guarded by a valve. The forces necessary to operate such a structure are three (or six) in number: 1st, a force so applied as to alternately contract and expand the chamber; 2d, a force to alternately shut and open the posterior (exit) valve; 3d, a force to alternately shut and open the anterior valve. These valves must be operated in proper sequence to the expansion and contraction of the chamber. The valves may be operated either by separate mechanism or by the automatic action of a current passing through the chamber.

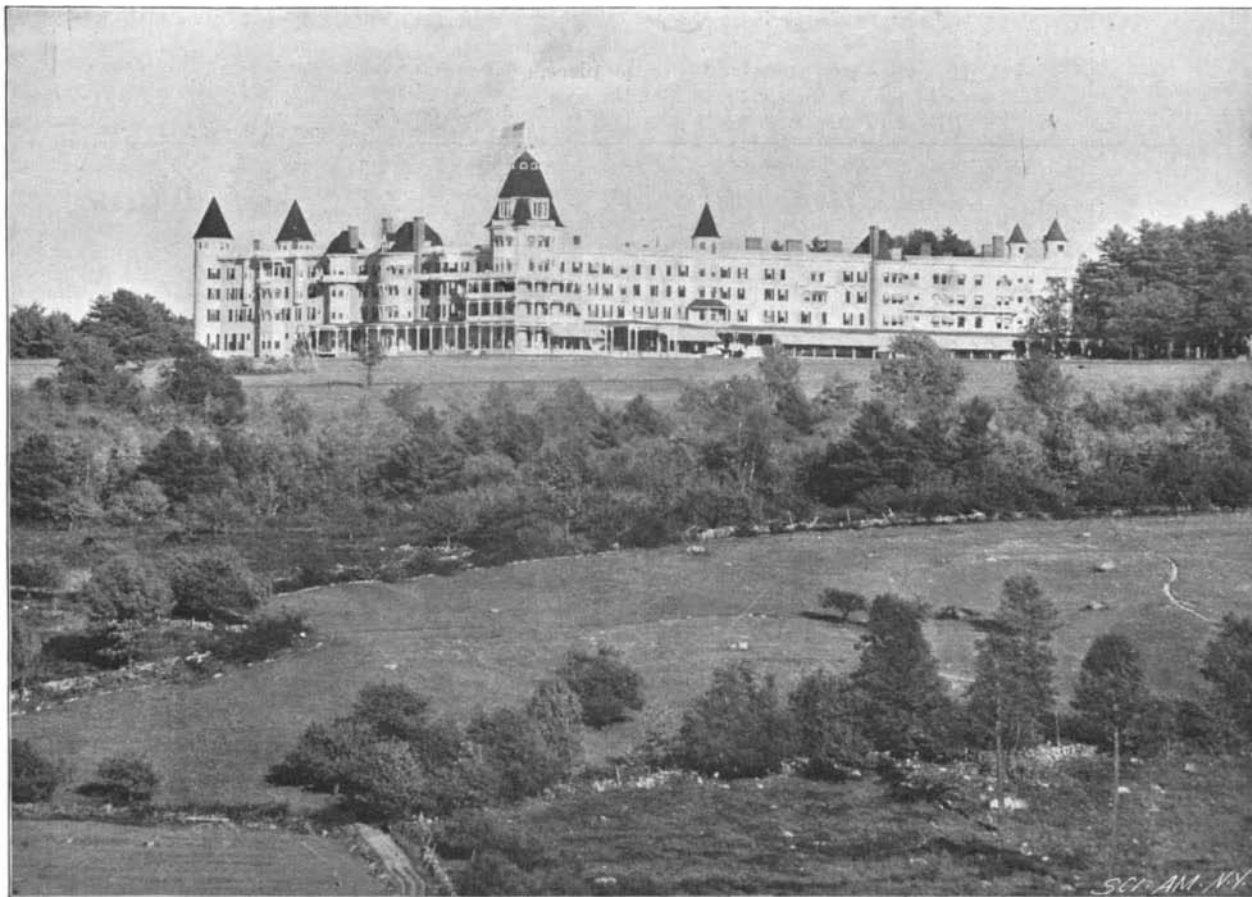
It is to this latter point that attention is called in the case of the fish. Here we find a chamber (the oral cavity) and two openings, the mouth (anterior opening) and the double gill opening (posterior opening). Muscular force is applied to expand and contract the oral cavity. But no such direct application of muscular force is needed to open and close the anterior and posterior openings. This is done automatically by the branchiostegal valves in the gill opening (or posterior opening), and by the maxillary and mandibular breathing valves in the mouth opening (or anterior opening). The fish is thus not required to use separate muscles to close and open the passages, but the loss of energy due to friction and retarded momentum on the valves must be added to that required to expand and contract the oral cavity. It is simply a mechanical economy such as is found in the heart.

Work on the Public Library.

At the recent meeting of the Board of Trustees of the New York Public Library it was announced that the Board of Estimate and Apportionment would probably be able to appropriate \$1,000,000 for the work on the New York Public Library during the present year, and \$500,000 thereof is now immediately available, by reason of an appropriation made March 17, for removing the reservoir and making the foundations. The work on the library has been delayed for a long time, owing to the real or supposed approach of the city to its debt limit. However, there has really been no time lost, for the interval since the adoption of the plans has been most valuable as giving an opportunity for their study and development. Since July, 1896, about 80,000 volumes and 80,000 pamphlets have been added to the collection of the library, and at the end of the present year the library will contain about 465,000 volumes and 180,000 pamphlets. To accommodate the great increase, nearly five linear miles of shelving have been built, of which nearly one-half has been placed in the Lenox Library building.



A HOTEL IN MAINE PHOTOGRAPHED WITH ORDINARY LENS.



PHOTOGRAPH OF SAME BUILDING FROM SAME POINT WITH TELEPHOTO ATTACHMENT, DISTANCE NEARLY TWO MILES.