THE ÆOLIAN HARP.

The Æolian harp is a musical instrument which is set in action by the wind. The instrument, which is not very well known, is yet very curious, and at the request of some of our readers we shall herewith give a description of it.

According to a generally credited opinion, it is to Father Kircher, who devised so many ingenious machines in the seventeenth century, that we owe the first systematically constructed model of an Æolian harp. We must add, however, that the fact of the spontaneous resonance of certain musical instruments when exposed to a current of air had struck the observers of nature in times of remotest antiquity.

Without dwelling upon the history of the Æolian harp, we may say that in modern times this instrument has been especially constructed in England, Scotland, Germany, and Alsace. The Æolian harp of the Castle of Baden Baden, and those of the four turrets of Strassburg Cathedral are celebrated.

We shall first describe Kircher's harp, which this Jesuit savant constructed according to an observation made by Porta in 1558. The instrument consists of a rectangular box (Fig. 1), the sounding board of which, containing rose-shaped apertures, is provided with a certain number of strings stretched over two bridges and fastened to pegs at the extremities. This box carries a ring that serves for suspending it. Kircher recommends that the box be made of very sonorous fir wood, like that employed in the construction of stringed instruments. He would have it 1·085 meters in length, 0·434 meter in width, and 0·217 meter in height, and would provide it with fifteen catgut strings, tuned, not like those of other instruments to the third, fourth, or fifth, but all in unison or to the octave, in order, says he, that its sound shall be very harmonious. The experiments of Kircher showed him the necessity of employing a sort of concentrator in order to increase the force of the wind, and to obtain all the advantage possible from the current of air that was directed against the strings. The place where the instrument is located should not, according to him, be exposed to the open air, but must be a closed one. The air, nevertheless, must have free access to it on both sides of the harp. The force of the wind may be concentrated upon such a point in different ways; either, for example, by means of conical channels, or spiral ones like those used for causing sounds to reach the interior of a house from a more elevated place, or by means of a sort of doors. These latter, two in number, are adapted to a kind of receptacle made of boards and presenting the appearance of a small closet. In the back part of this receptacle there is a slit, and in front of this the harp is hung in a slightly oblique position. The whole posterior portion of the apparatus must be situated in the apartment, while the doors must remain outside the window (Fig. 1). In later times the Æolian harp has been improved by Messrs. Frost & Kastner, whose apparatus is represented in Fig. 2. It consists of a rectangular box with two sounding boards, each provided with eight catgut strings. In order to limit the current of air and to bring it with more force against the strings, two wings are adapted near the thin surfaces opposed to the wind, so that the current may reach each group of cords on passing through the narrow aperture between the obliquely inclined wing and the body of the instrument. The dimensions of the resonant box are as follows: height, 1·28 meters; width, 0·27 meter; and thickness, 0·075 meter. Distance between the two bridges, or length of the sonorous portion of the cords, about 1 meter; width of the wings, 0·14 meter. Distance between the sounding board and the wings, 0·42 meter. Inclination of the wings, 50 degrees.

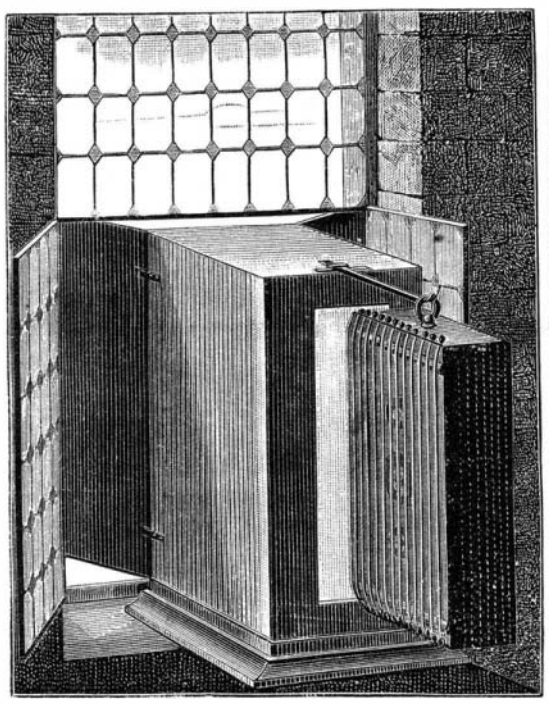

Fig. 1.—KIRCHER'S ÆOLIAN HARP.

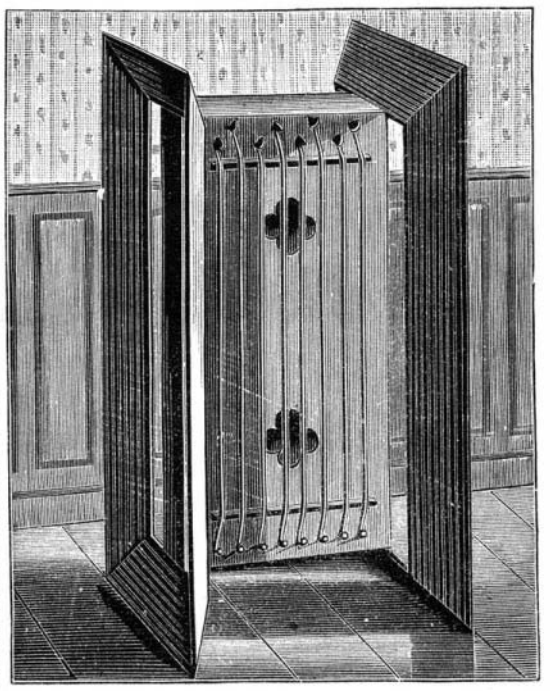

Fig 2.—FROST & KASTNER'S IMPROVED ÆOLIAN HARP.

The celebrated Æolian harps of the old castle of Baden Baden are entirely different, and merit description. One of them (Fig. 3) is formed of a resonant box, the construction of which differs from that of Æolian harps with a rectangular box, in that it is prolonged beyond the place occupied by the strings, and is rounded off behind. In the opposite side there are two long and narrow apertures. To prevent the apparatus from being injured by the weather, it is inclosed in a sort of case occupying the recess of the window in the old ruined castle in which it is exposed. Behind the harp there is a wire lattice door, the purpose of which seems to be to protect the instrument against the attempts of robbers or the indiscreet contact of tourists. We annex to the general view of the instrument a front and profile plan (Fig. 4). The Æolian harp has often inspired both writers of prose and poetry. Chateaubriand, in *Les Natchez*, compares its sounds to the magic concerts that the celestial vaults resound. Without attributing such effects to the instrument, it must be admitted that it possesses remarkable properties, which act upon the nervous system and cause very different impressions, according to the temperament of those who listen to its accords.

Hector Berlioz, in his *Voyage Musicale en Italie*, has given as follows the curious effects that an Æolian harp produced upon his lively and impassioned imagination: "On one of those gloomy days that sadden the end of the year, listen, while reading Ossian, to the fantastic harmony of an Æolian harp swinging at the top of a tree deprived of verdure, and I defy you not to experience a profound feeling of sadness and of *abandon*, and a vague and infinite desire for another existence."

An English physician, Dr. J. M. Cox, in his practical *Observations* upon dementia, asserts that unfortunate lunatics have been seen whose sensitiveness was such that ordinary means of cure had to be given up with them, but who were instantly calmed by the sweet and varied accords of an Æolian harp. Other observers narrate that they have heard the efficacy of Æolian sounds spoken of in Scotland for producing sleep.

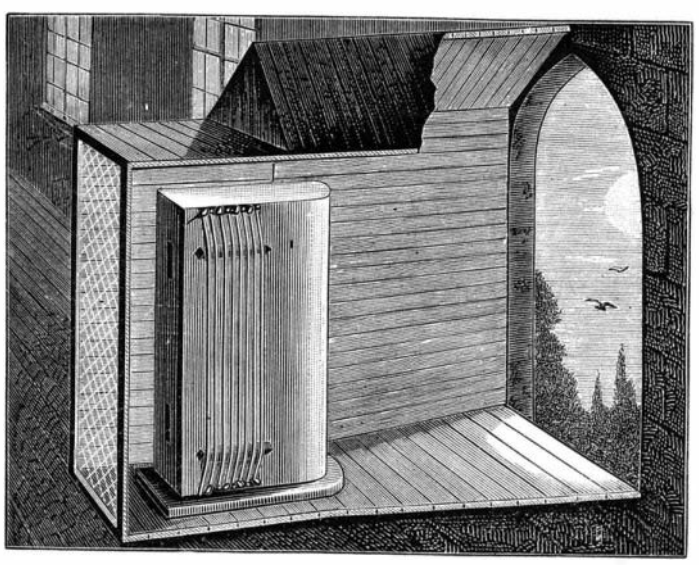

Fig. 3.—ÆOLIAN HARP IN THE OLD CASTLE OF BADEN BADEN.

Telegraph wires are often, under the influence of the winds, submitted to vibrations which reproduce the phenomena of the Æolian harp. The electric telegraph, which, before the construction of the Kehl bridge, directly traversed the Rhine, very frequently resounded, and the observer who placed his ear against the poles on the bank of the river was enabled to hear something like a far-off sound of bells.—*La Nature.*

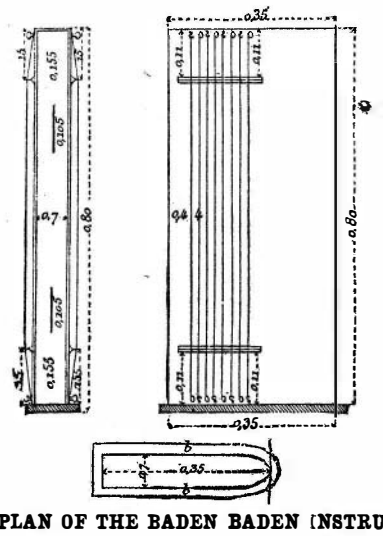

Fig. 4.—PLAN OF THE BADEN BADEN INSTRUMENT.

The Disinfection of Tubercle.

From current theories of the infective nature of tubercle, it naturally becomes exceedingly important to ascertain by what agents its virulence may be most effectually neutralized. A series of experiments on this subject have been communicated to the Academie de Medecine by M. Vallin. Fragments of tubercular pulmonary tissue removed from the body of a man who had died of phthisis were well mixed with distilled water, and fifty centigrammes of the filtered liquid were injected into the peritoneal cavity of a guinea pig. No inflammation was produced, but at the end of a few weeks the animal began to lose flesh, and died at the end of the fourth month. The liver, spleen, and lungs were full of granulations and gray masses, transmissible by inoculation. It was this secondary tubercular substance which supplied the material for the inoculation experiments. With distilled water, an infusion of caseous fragments of the organs was made, and a sheet of filtering paper was saturated with the liquid and then allowed to dry. It was then cut up in strips of the same width, each of which would yield, to a small quantity of water, a similar dose of the virus. Preliminary experiments showed that the inoculation of this produced tubercle with certainty. Some strips of the paper were exposed to the action of various disinfectants. In a chamber fifty cubic meters in area, strips were exposed to the fumes of sulphur for twenty-four hours. The results showed that it was necessary to burn twenty grammes of sulphur in this chamber to render the virus innocuous. When the quantity burned was less than twenty grammes, the animals usually died tuberculous. Boiling water was found invariably to secure immunity, and so also did corrosive sublimate in a solution of one per thousand. The conclusion M. Vallin draws from the experiments is that it would be well every year to purify by sulphurous fumigation all prisons, barracks, hospitals, and schools.—*Lancet.*

Improved Papier Mache Process.

A durable and inexpensive method of employing papier mache as a substitute for mattings, carpets, oil cloths, and other floor coverings has been introduced, says the *Providence Journal*, the simplicity of the process being also an additional advantage in its favor. After the floor has been thoroughly cleaned, the holes and cracks are then filled with paper putty, made by soaking newspaper in a paste made of wheat flour, water, and ground alum, that is, to one pound of such flour are added three quarts of water and a tablespoonful of ground alum, these being thoroughly mixed. With this paste the floor is uniformly coated, and upon this a thickness of Manila or hardware paper is placed, or if two layers are desired, a second covering of paste is spread on the first layer of Manila paper, and then the second thickness of paper is put on, and the whole allowed to become perfectly dry; on this being accomplished another surface of paste is added, succeeded by a layer of wall paper of any style or pattern desired. On the work becoming entirely dry, it is covered with two or more coats of sizing, made by dissolving one-half pound of white glue in two quarts of hot water, and when this has dried, a coat of "hard oil finish varnish," nothing more being required after the latter has had time to become thoroughly dry in every part.

The Niagara Ice Bridge.

An unusually extensive and interesting ice bridge was formed early this winter across the Niagara River below the falls.

The architect of this stupendous structure, says an intelligent observer, is the south wind. A steady blow from this quarter causes the ice in Lake Erie, twenty-five miles away, to break up into gigantic fragments, which float down the current of the Niagara until they shoot the rapids and plunge over the cataract—a sight worth a long journey to see. Below the falls some of these enormous cakes lodge, here against a rock, there upon the beach at the foot of a cliff. Others follow, and, tossed by the seething billows against their predecessors, find lodgment also. They are welded by the frost and dashing foam, and this process goes on until the river is covered from shore to shore. The accumulation increases, the cakes of ice being forced under the mass by the pressure of the waters, until, as now, the bridge extends from shore to shore, and from the foot of the great cataract away down nearly to the railway suspension bridge, three miles, and of a thickness often equal to the tallest of city business blocks.

Substances Used in Amalgamating.

The application and modification of the amalgamation process, as practiced on the Comstock, has occasioned among experienced millmen great doubt as to the beneficial results derived from the use of any chemical agents at present mixed with the ore. This doubt is occasioned, or at least strengthened, by the custom of late years of decreasing the quantity of salt and sulphate of copper added to the charge, without apparently diminishing the product of bullion. Many amalgamators now abstain from the use of both reagents; others add a small quantity of sulphate of copper, but no salt; in a few instances the custom is to throw in only a little of the latter, while in many mills the rule is to employ a small amount of both substances, owing to a slight prejudice against the abandonment of "chemicals" altogether.

The action exerted by these two reagents in the pan would appear clearly to indicate that the benefits derived from their use are partly to aid in converting the sulphide into chloride of silver, as in the patio, and partly to decompose such minerals as are but slightly attacked by the mercury. In the Comstock process, however, the large quantity of iron present must tend greatly to produce subchloride of copper almost as soon as the chemical agents are thrown into the pulp.

Notwithstanding the importance of common salt and sulphate of copper in the patio, and, under certain conditions, in the pan, their value must be considered as only secondary in the decomposition of a large proportion of the Comstock ores. The advantages derived from their use are shown to be exerted chiefly upon such minerals as blende and galena, which are but slightly attacked by the mercury. But the amounts employed are in most cases too small to effect any favorable results. On the other hand, if a sufficiently large proportion of the reagents are consumed in the pulp, in order to produce the beneficial returns, it is always at the expense of preserving the necessary purity of the mercury. The quantity of salt deemed necessary by millmen varies from one-quarter of a pound up to seven or eight pounds per ton; scarcely any two establishments have the same rule.

The consumption of sulphate of copper also depends upon the ideas of the amalgamators, but the amounts do not differ so widely as in the case of the salt. It ranges from one-quarter of a pound to three pounds per ton.

The addition of the sulphate without salt is of late years a common practice. The opinion among those who work their ore in this way is that it gives a little better yield than when mercury alone is employed, particularly where the ore indicates the presence of galena in any considerable amount, in which case it is said to "quicken" the mercury and render it more energetic.

Continued experience appears to determine this fact with a considerable degree of certainty. In working ores containing only a small percentage of lead, the quicksilver very soon becomes dull and inactive, or, as it is technically termed, it "sickens," and the yield from the pan is consequently low. Lead is one of the most deleterious metals in destroying the amalgamating energy of mercury, and at the same time is very rapidly absorbed when the two metals are brought into contact. Sulphate of copper possesses to a certain extent the property of expelling lead from the mercury, copper being amalgamated and sulphate of lead formed at the expense of the sulphuric acid of the copper salt.

If a concentrated solution of sulphate of copper be allowed to stand upon the lead amalgam, the action takes place quite rapidly, mercury containing lead acting much more energetically upon the copper solution than when perfectly pure.

This salt, however, dees not appear, under any circumstances, to possess the power of completely driving out the lead.

Another advantage derived from the addition of a small quantity of the sulphate of copper is that mercury, under certain conditions, when exposed to the solution, forms a minute amount of copper amalgam, which causes the metal to act with a somewhat greater intensity in the decomposition of the silver sulphide than when perfectly pure. Iron, as a reducing agent in the pan process, probably plays an important part in bringing about the favorable results obtained. This may occur, according to Mr. Hague, in three ways:

First.—It aids in a great measure the decomposition of the chloride of silver.

Secondly.—It reduces the calomel formed during the operation; the chlorine combining with the iron, goes into solution, and the heavy metal is liberated. In this way it not only prevents a chemical loss of mercury, but also serves to keep the surface of that metal bright and clean, which otherwise might be coated with a thin film of subchloride, which would greatly destroy its activity.

Thirdly.—It undoubtedly assists directly in the amalgamation where the two metals are brought into close contact with the easily reducible sulphurets. The successful and continued operations on the Comstock without the aid of any other chemical agents sufficiently prove this statement. The experiments in treating argentite and iron filings with mercury confirm the fact.

Humboldt, in speaking of the amalgamation problem in Mexico, draws attention to this point, and remarks upon the rapidity with which amalgamation was secured when the two metals were triturated together with argentite. This action of iron is obtained not only from the constant agitation maintained, which brings the pulp and metal in contact with the sides and bottom of the pan, but also from the amount of iron disseminated in a fine condition through the ore, produced by the wear of the stamps, shoes, and dies.—*Mining and Scientific Press.*

Consumption of Wood.

It would seem from the following statistics that the inventors of wood sawing and splitting machines have an extraordinarily large field for the use and sale of improved devices.

The Census Bureau has presented its figures respecting the consumption of wood as fuel for the census year 1880. The number of persons using wood for domestic purposes is given at 32,375,074, and the record of the various States and Territories, in amount and value, is shown in the following table:

FOR DOMESTIC USE.

	CORDS.	VALUE.
Alabama	6,076,754	$8,727,377
Arizona	170,017	724,572
Arkansas	3,922,400	5,095,821
California	1,748,062	7,693,731
Colorado	426,719	1,638,783
Connecticut	525,639	2,371,532
Dakota	422,948	3,028,300
Delaware	177,306	751,311
District of Columbia	26,902	80,706
Florida	609,046	1,230,412
Georgia	5,910,045	8,279,245
Idaho	99,910	383,689
Illinois	5,200,104	14.136 662
Indiana	7,059,874	13,334,729
Iowa	4,090,649	14,611,280
Kansas	2.095,438	7,328,723
Kentucky	7,994,813	13,313,220
Lonisiana	1,944,858	4,607,415
Maine	1,215,881	4,078,137
Maryland	1,152,910	3,170,941
Massachusetts	890,041	4,613,263
Michigan	7,838,904	13,197,240
Minnesota	1,669,568	5,873,421
Mississippi	5,090,758	7,145,116
Missouri	4,016,373	8,633,465
Montana	119,947	460,638
Nebraska	908,188	3,859,843
Nevada	155,276	972,712
New Hampshire	567.719	1,964,669
New Jersey	642,598	2,787 216
New Mexico	169,946	1,063,360
New York	11,290,975	37,539,364
North Carolina	7.434,690	9,019,569
Ohio	8,191,543	16,492.574
Oregon	482,254	1,254,511
Pennsylvania	7,361,962	15,067,651
Rhode Island	154,953	706.011
South Carolina	3,670.959	11.505,997
Tennessee	8,084,611	10,674,722
Texas	4,883,852	10,177,311
Utah	171,923	418,289
Vermont	782,338	2,509,189
Virginia	5,416,112	10,404,134
Washington	184,226	499,904
West Virginia	2,241,069	3,374,701
Wisconsin	7,206,126	11,863,739
Wyoming	40,218	224,848
Total	140,537,439	$306,950,040

Other lines of consumption as a total for the United States are represented by the following figures:

	CORDS.	VALUE.
Railroads	1,971,813	$5,126,714
Steamboats	787,862	1,872,083
In mining and amalgamating precious metal	358,074	2,874,593
Other mining operations	266,771	673,692
Manufacture of brick and tile	1,157.522	3,978,331
Manufacture of salt	540,448	121.681
Manufacture of wool	158,208	425 239
Grand total	145,778,137	$321,962,273

The consumption of charcoal in the twenty largest cities in the United States, in the manufacture of iron and in the production of the precious metals, is placed at 74,008,972 bushels, valued at $5,276,736. Maine and Massachusetts imported some wood from Canada.

Car for Transporting Live Fish.

One of the fish cars of the United States Fish Commission was recently dispatched from Washington for California with a cargo of live fish—some 18,000 in number—for stocking Western waters. As described by the Washington *Star*, these cars resemble in external appearance, and to a large extent in internal arrangements, a modern sleeping car. There are compartments at each end, one for the superintendent, the other for a kitchen. Through the middle portion of the car an aisle runs between wide ledges, on each side, for supporting the tin tanks in which the fish are carried. There are two ice boxes next the superintendent's room, for cooling the air of the compartment in which the fish are carried. Delicate fish are transported in pails holding a gallon of water, and accommodating about twenty fish each. These pails are then placed in the water tanks.

By this plan the young fish are protected from being dashed to death by the motion of the cars. In transporting carp the pails are sufficient. The motion of the water due to the motion of the cars helps to keep the water well aerated. Care is taken, however, to renew the water every eight hours, and to remove promptly any fish that may die. The loss by this method of carriage is very small.

The Ice Plant.

This annual plant, the botanical name of which is *Mesembrianthemum crystallinum*, and which is remarkable for the transparent vesicles filled with water, and resembling frozen dewdrops, that cover its fleshy stem and large, thick leaves, is also a striking instance of the elective power of roots, whereby plants can take up from a complex soil the materials proper to them.

M. Mangon has cultivated it for seven or eight years, in La Manche, on the same ground with cabbage, celery, etc., and while these latter had their normal composition, the ice plant dried and burnt, furnished an ash with so much of chlorine and alkalies that at first he was inclined to think that some mistake had been made in weighing. Taking six specimens, he finds the average percentage composition in 100 kilogrammes to be: water, 96·810; combustible matter, 1·800; ash (comprising chlorine, potash, soda, and other mineral matters), 1·390. The plant, then, is formed of a weak solution of alkaline salts, held by a vegetable tissue whose weight reaches less than 2 per cent of the total mass. The ashes formed of salts of soda and potash form nearly half (43 per cent) of the dried plant. This composition recalls that of seaweed. From one hectare (2·47 acres) of ice plants M. Mangon obtained 1,820 kilogrammes of ashes containing 335 kilogrammes of chlorine, as much soda, and 588 kilogrammes of potash, the latter capable of furnishing 863 kilogrammes of carbonate of soda, or nearly as much as is got from incineration of one hectare's yield of the saltwort at Alicante. M. Mangon asks whether the cultivation of the ice plant as a potash plant might not be lucrative under certain conditions; in any case, it would probably be useful, he thinks, in removing from the salt ground on the Mediterranean coasts (its place of origin) the excess of alkaline salts which render it unproductive.

Novel Gas Burner.

The latest novelty in the way of gas burners is now to be seen in action at the Crystal Palace, London, so says the *Lancet*, and all who see it will confess that the inventor has succeeded in getting a most powerful light by the consumption of a very moderate amount of gas. The light is evolved from a cage of platinum wire, which is kept at a white heat. An ordinary gas pipe is fitted with a Bunsen burner of rather special construction, and the flame is further supplied with a jet of air under pressure, so that practically the Lewis light consists of a platinum gauze cage kept at a white heat by means of an automatic blowpipe. It is needless to say that special arrangements are necessary for supplying the air jet to the flame; but the arrangements are comparatively simple, and will not, we think, militate against the introduction of the Lewis light. It need not be said that the light gives off no smoke, and that the combustion of the carbon is perfect. Further, it is not influenced by any amount of draught, and cannot be extinguished or sensibly affected by blowing upon it, so that the light requires no protection in the shape of chimney or globe. The light given off is equal to that of five candles for every cubic foot of gas consumed per hour, and an ordinary Lewis light consumes twelve and a half feet per hour, and gives off the light of fifty candles. The light can easily be made to ventilate. The heat given off is necessarily considerable, and we think the light will prove more generally useful for street lighting than for inside lighting. Unless provided with means of ventilation, the Lewis light would certainly be too hot for use in ordinary sitting rooms.

Photographing Speech.

The *Photo. News* says: The new system of teaching the deaf and dumb by directing them to look at a person speaking, and to note the position of his lips in giving utterance to different sounds, has now been in practice for several years on the Continent; and, as our readers are probably aware, has also been adopted in this country with some success. A Continental teacher has now hit upon a plan of furthering the instruction by having recourse to photography. A model has been chosen whose lips are particularly expressive in their action, and a series of photographs taken of him while pronouncing the different sounds that go to make up a language. Such a "speaking likeness" has been obtained, that, in many cases, even an untrained observer has little difficulty in guessing the letter on the lips of the model, as the photographs are displayed one after another. Mr. Warnerke exhibited several of the pictures at the last meeting of the Photographic Society.

Stopping Engines by Electricity.

We lately described an electric apparatus for closing the valve of an engine and thereby stopping it. This apparatus is now at work in some of the large mills at Dundee, in Scotland. In describing the apparatus at work, the *Dundee Advertiser* says: "The huge engine in Manhattan Works (Colonel Sandeman's), working at from six hundred to seven hundred horse-power, and driving a fly-wheel of about thirty-five tons weight, formerly took two minutes to come to rest after the steam had been taken off. This apparatus has been fitted to it, and the ponderous engine is now brought up in thirty seconds. To see this powerful, majestic piece of machinery, the developer of power for a large range of works, almost immediately brought to a standstill by the mere touching of a button at the far end of the building is an impressive illustration of the easy control of enormous force by wisely ordered arrangements. To mill-owners the utility of the apparatus will be evident."