GALVANI.

The accompanying portrait of Galvani is taken from the beautiful work by Amédée Guillemin, entitled "L'Electricité et le Magnétisme."

Luigi Galvani was born at Bologna, September 9, 1737. Although it was his own wish in early life to enter the church, his parents educated him for a medical career. In 1762 he was appointed lecturer on anatomy in the University of Bologna, the city in which he practiced. He soon gained repute as a skillful teacher, and, chiefly from his researches on the organs of hearing and genito-urinary tracts of birds, as a comparative anatomist.

His celebrated theory of animal electricity he enunciated in a treatise, "De Viribus Electricitatis in Motu Musculari Commentarius," published in the memoirs of the Institute of Science of Bologna, in 1791, and subsequently in separate form at Modena.

The statement has often been made that Galvani, in 1786, had skinned some frogs to make a broth for his wife, who was in delicate health; that the leg of one of these, on being accidentally touched by a scalpel which had lain near an electrical machine, was thrown into violent convulsions; and that it was thus that his attention was first directed to the relations of animal functions to electricity. From documents in the possession of the Institute of Bologna, however, it appears that Galvani was already engaged in investigating the action of electricity upon the legs of frogs twenty years previous to the publication of his "Commentary." It is in this work that he describes the invention of his metallic arc, which was constructed of two different metals, one of which, when placed in contact with a nerve and the other with the muscle of a frog, caused contraction of the latter. In his view, the motions of the muscle were the result of the union, by means of the arc, of its exterior or negative electrical charge with positive electricity which proceeded along the nerve from its inner substance. Volta, on the other hand, attributed them solely to the effect of electricity having its source in the junction of the two dissimilar metals of the arc, and regarded the muscle and nerve simply as conductors.

After the death of Galvani very little was heard of animal electricity till 1827, when the study of the subject was resumed by Nobili.

On Galvani's refusal, from religious scruples, to take the oath of allegiance to the Cisalpine Republic, on its establishment, he was removed from his professorship. Deprived thus of a means of livelihood, he retired to the house of his brother, where he soon fell into a decline. The government, in consideration of his great scientific fame, eventually, but too late, determined to reinstate him in his chair at the university. He died December 4, 1798.

We should add to the above note that Galvani studied with very great care the electricity of the torpedo, and that it was principally in that study that he found a confirmation of the theoretic ideas that he had conceived from the convulsions of the frog. He believed in the identity of the electric fluid produced by the organs of the torpedo with the fluid secreted by the muscular system of animals. He took much pains to ascertain that the nerves of the electric organs begin in the same manner as those of ordinary muscles. In his opinion, the electric organ of the torpedo was only a muscle enjoying to a high degree properties that are common to all others.

GALVANI.

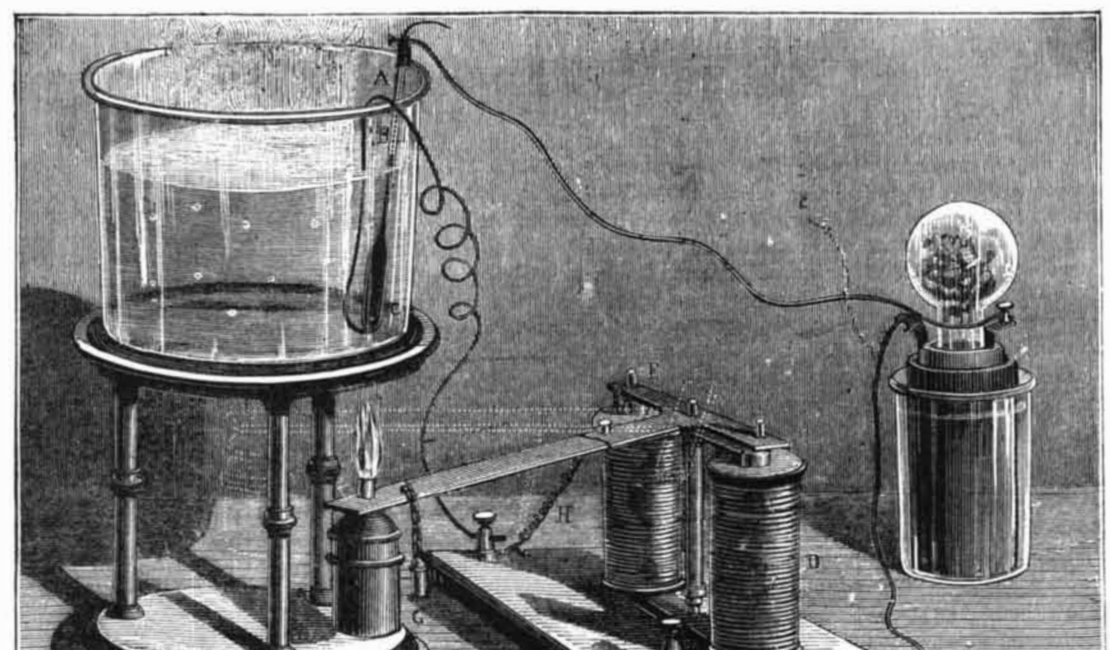
REGNARD'S TEMPERATURE REGULATOR.

Those persons who are obliged by the nature of their labors to work in the country, at the seaside, or, in a word, far from towns where there are gas works, experience great difficulty in keeping stoves at a constant temperature. All regulators of any precision that are used in laboratories require the use of illuminating gas, which some mechanism or other lights or puts out at the desired moment.

At one of the recent sessions of the Société de Biologie, Mr. D'Arsonval presented a stove which was capable of operating without gas by utilizing the boiling points of volatile liquids. This leads me to describe a stove that I have made use of for some time past, and which operates very regularly, and with extreme sensitiveness.

Into a water bath there dips an electric thermometer, B, that is to say, a thermometer open at the top, into whose tube runs a very fine platinum wire, A, that may be raised or lowered, or fixed definitely before any degree whatever of the scale. The mercury in the thermometer bulb communicates, through a wire soldered into the glass, with a Leclanché or Daniell pile. Since the upper platinum wire is in connection with the other pole, as soon as the mercury, by dilatation, touches the latter the current will be closed. Interposed in this current there is an electro-magnet, D, whose armature, E, provided with a long lever, carries a benzine lamp, G. When no current is passing the lamp is placed under the stove; but, as soon as the current begins, the armature of the electro-magnet is attracted and the lamp is removed to a distance. The thermometer, becoming cool almost instantly, causes the mercurial column to leave the platinum wire. As soon as the current is broken the electro-magnet becomes inactive, and a spring, H, draws the lamp back beneath the stove, and so on. The accompanying cut sufficiently explains the mechanism.

It will be seen that the temperature of the stove cannot vary, since, as soon as it rises, the source of heat is removed; and as soon as it lowers the source of heat is replaced. This stove, like another that we have already made known, has the further advantage of being instantly regulated at any desired temperature; to effect which it is only necessary to fix the platinum wire opposite the degree that it is desired to have. After that it will be always at such degree that the current will be closed and the lamp removed from beneath the stove.—*Dr. P. Regnard, in La Nature.*



REGNARD'S TEMPERATURE REGULATOR.

Sand for Glassware.

The sand from which the finest glassware, crown glass, French plate, and the like, is made, is seldom found in large deposits, in accessible places, and in strata free from impurities. Quartz in California, which yields $5 of gold to the ton, is called in miners' language "pay-rock," and yet the sand itself out of which French plate glass is made is worth $5 a ton delivered in the city market. A vein of glass sand was discovered over ten years ago near McVeytown, Mifflin Co., Penn., and is now being extensively worked. The sand rock occurs, for the most part, in irregular formation, with an occasional approach toward a stratified condition. The rock is hard and dry, yielding with difficulty to the drill, except where water penetrates it, forming crevices. These soft veins, made by the water, are much dreaded by the miners. A mass of this soft rock may fall at any moment and crush or bury the hapless workman.

The sand rock is mined by what is called "drifting," or excavating in a horizontal direction. The drift is made sixteen feet high and twenty feet wide, and extends about 500 feet in different directions from the mouth of the mine. With a force of sixty men, only about fifty feet of rock can be excavated in a year. An analysis of the sand shows almost pure silica, with slight impurities of cobalt, shale, and slate. Under the microscope, beautiful crystals in the sand are seen. The rock in the mine is of a marble white color, with a few tints of yellow and green. The air in the drift is cold and damp, and is kept pure by ventilators running up to the top of the ground. A temperature of about 40° prevails in the mine winter and summer.

The sand is taken out of the mine in small hand-cars by steam power and then dumped into the crusher. The crusher is something like a large coffee-mill, and breaks the sand rock up into coarse pieces, ready for the pulverizer. This consists of two large cast iron wheels, four feet in diameter and over a ton in weight, which roll around, like wagon wheels, in a circular pan. Water is kept constantly pouring into the pan, to help on the process of grinding and to carry the sand along to a sieve, which takes all coarse lumps that have escaped from the ponderous weight of the pulverizing wheels. The sieve is made of brass wire, in the shape of a cylinder, about three feet in length and a foot and a half in diameter, and revolves like a flour-bolting machine. After passing through the sieve, the sand is carried along a trough by the water into the washer. At the lower end of this the sand is forced up a trough by means of spiral conveyers, which act on the principle of the Archimedes screw. Thence the sand is washed down another trough filled with water, at the end of which there is an escape for the impurities. This operation is repeated three times, when the sand passes into another spiral conveyer, and is carried to a large room called the "drainer," where it is distributed over a large surface for draining off the water. The floor of the room is perforated with large holes. From the drainer the sand is carried to the drier, a large receiving chest containing a network of iron pipes through which steam passes. As the sand dries it drops into a funnel-shaped trough, and from that passes into a conveyer, and thence to an elevator. The sand comes from the drier fine and almost as white as flour. The elevator carries it up into a tower to facilitate the work of loading.

The sand is now ready for the market, as much of it as is to be made into fine glassware. That which is intended for ironstone chinaware, however, must go through another process before it is ready for the market. After leaving the drier the sand is put into a large drum made of wrought iron, about six feet in length and three feet in diameter, for the purpose of being repulverized. One ton of the sand and a ton and a half of what are here called "black diamonds," or "Russian pebbles," are put into the drum. Some of these pebbles come from Greenland, and resemble in luster Iceland spar. They are about as large as a hen's egg. Being harder than the sand, they pulverize it by constant friction. A portion of the black diamond is worn off in the process, but when the sand is made into chinaware and burned, it is of the same color throughout. Other pebbles could be used in pulverizing, but the dust that they give off in the process discolors the ware when burnt. The time required for reducing one ton of sand to this fine powder is generally ten hours.

A novelty of the McVeytown sand works is the way in which the water-power is communicated to the machinery at the mine. Steam is used for drying only, and the water of the old Pennsylvania canal, which is over one thousand feet from the works, is used for driving the machinery by a system of wire cables and band wheels. The wheels are set up in three small towers, thus preventing too much slack in the wire cables. Two turbine water-wheels are used at the canals. The sand shipped from this mine amounts to about 25,000 tons a year. Pittsburg, Wheeling, and Ohio cities are the principal markets. — *Glassware Reporter.*

Earthquakes in Panama.

The recent earthquake in Mexico has been followed by several less serious yet quite destructive disturbances in the Isthmus of Panama. The more notable occurred September 7 and 8. Traffic on the Panama railroad was suspended owing to damage to the sinking of the track in places and the damage to bridges. A freight building of stone at Aspinwall is reported to be destroyed. One man was killed and several injured there. No lives were lost at Panama.

Liability to disturbances of this character, or worse, is one of the difficulties which the canal enterprise has to encounter but cannot overcome.

SEVENTY-SIX courses of stone, making 152 vertical feet, have been laid since work recommenced in earnest upon the Washington Monument. Its height is now 302 feet.