PONT-Y-PRIDD BRIDGE, SOUTH WALES.

BY LLEWELYN WILLIAMS, ARCHITECT.

The ancient bridge shown in the accompanying illustration spans the river Taff at Pont-y-Pridd, about 12 miles northwest from Cardiff, S.W.

It was built in the year 1755, and was used continually for a period of about 100 years, when, from the increase in traffic, and the steep inclinations to the center, a new bridge was deemed necessary, which was built alongside the old one.

The old bridge has an interesting history, being the third one built in a period of about eight years. The first, a structure of three arches, was washed away by a great flood two years after its completion; the second was similar to the one illustrated, one arch, which, however, collapsed shortly after the false work was removed, owing to imperfect design.

Its builder, Mr. William Edwards, was not daunted by two failures, although compelled to replace each one at his own expense.

The third one, now standing, has a clear span of 140 feet, and is 75 feet high in the clear above low water, built of a hard, close-grained sandstone found abundant in the neighborhood.

For beauty of outline and general grace of design, this bridge was considered a wonder in its day. There was perhaps no other of so great a span in Great Britain, exceeding even the Rialto, at Venice, by 42 feet.

Mr. Edwards was a self-taught man, of great natural genius, never having received any education except the little gained from a country school. His technical knowledge and engineering skill was all acquired without the aid of books or teacher, in the positive school, although costly, of daily experience.

While but comparatively young, he was his own draughtsman, engineer, constructor and superintendent, and besides found time to fulfill the duties of minister to a church for a period of forty years.

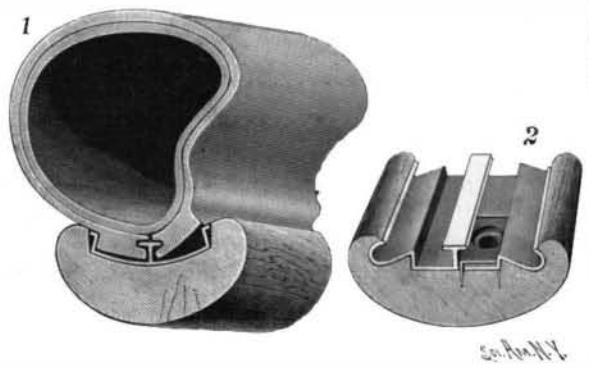
He soon discovered the cause which caused the collapse of his second bridge. It had too great a weight on the quarters near the abutments, causing the central portion of the arch to lift, thus letting down the whole structure.

To avoid this in this third bridge, he conceived the idea of perforating the solid haunches with three cylindrical arches, on each side, each being 9, 6, and 3 feet in diameter respectively, reaching clear across under the width of the roadway, thus relieving the excessive weight, fatal to his last bridge, and crowning his labors after eight years of misfortune with complete success, a monument of his indefatigable perseverance.

Mr. Edwards built many other bridges of nearly equal span in England and Wales, in all of which, when a long span was found necessary, he utilized the same principle of perforating the haunches, to lighten the load. His work still stands solid, and unsettled, by the storms and floods of about 150 years, examples of masonry worthy the emulation of our modern mechanics.

AN IMPROVED BICYCLE RIM AND TIRE.

The rim and tire shown in the illustration are of strong and simple construction, and designed to facilitate mechanically uniting the pneumatic tire with the rim, while the arrangement is such that the wheel may be used whether the tire is inflated or not. The improvement affords the subject of a patent granted to Mr. Lewis A. Erickson, Stromsburg, Neb., Fig. 1 illustrating the application of the invention and Fig. 2 representing a different form of wood rim with metallic band inserted and with the socket for spoke nipple, through which the air is forced into the tire. The wheel has the usual separate air tube surrounded



ERICKSON'S BICYCLE RIM AND TIRE.

by a strip of canvas attached to the exterior rubber tube, the ends of the canvas folding around cushioning projections on the bottom of the tire. These projections may also consist of wire springs, around which the loose ends of the canvas are folded, and they fit into recesses in a metallic band or casing in the top of the rim. This band has in its middle an annular T-shaped rib securely holding and mechanically fastening the tire to the rim, in such way that it is not liable to become detached should the tire become accidentally deflated.

The Water Supply of Rome.

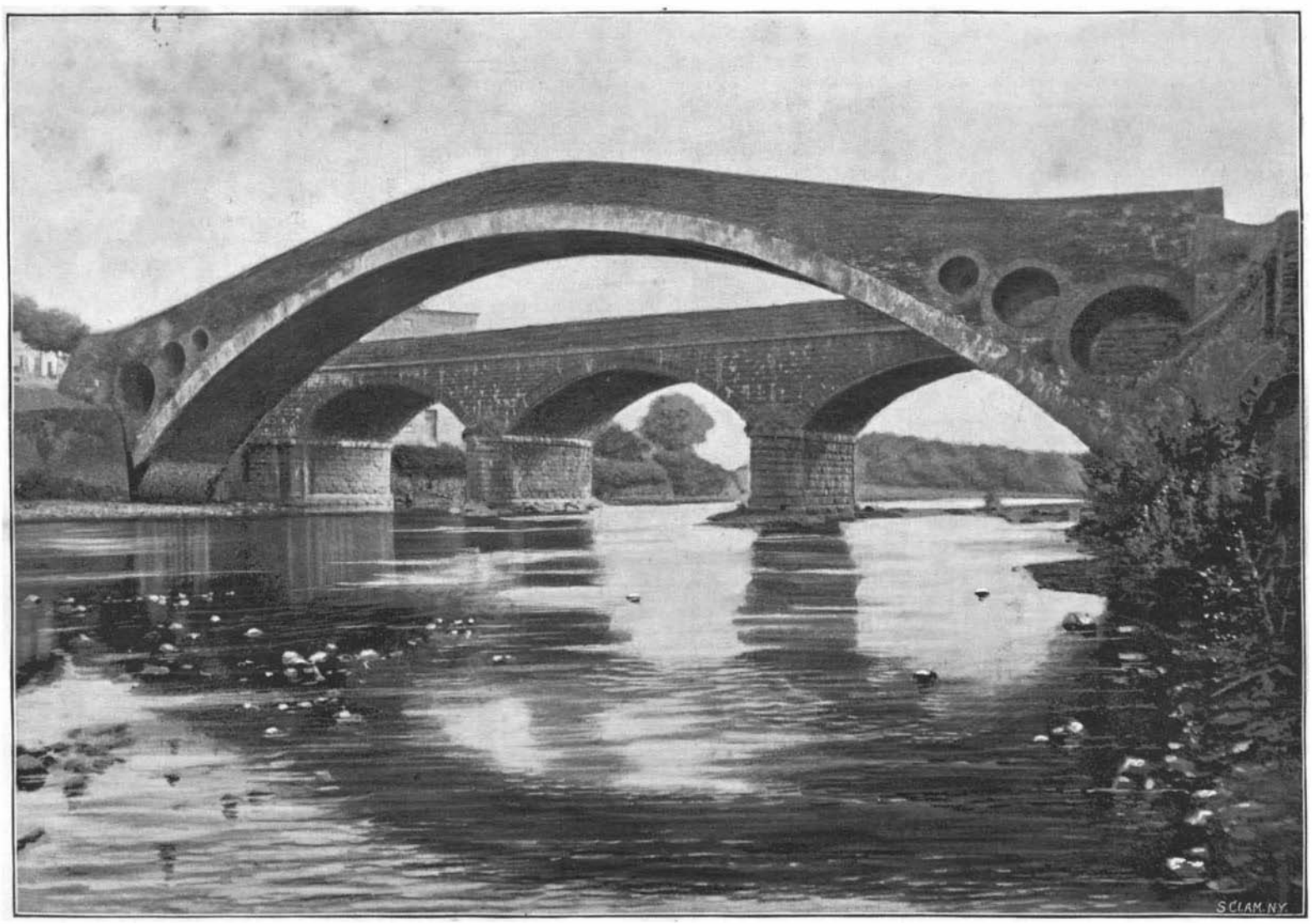
Modern Rome is supplied by four aqueducts yielding the plentiful daily supply of 600 liters a head. A good deal of this water goes to supply fountains—the amount going to one alone, the Fontana Trevi, being sufficient to supply a respectable community. Though it is delightful and refreshing to see the numerous fountains playing, the idea strikes one that perhaps it would be better if a little less water played in the fountains and a little more were used in the households and on the persons of the people. How far behind the ancient Roman cities are in this respect our modern ones all over the world! What is Rome of to-day with its four aqueducts and occasional fountains to the Rome of the year 330, which could boast of 19 great aqueducts, 11 thermae, 856 baths, and 1,352 fountains? The thermae of Caracalla alone were capable of accommodating at one time 1,600 bathers, and we need but to see the magnificent ruins that remain of a few of these baths, or of the great aqueduct running in various directions over the broad surrounding campagna, to realize how the Romans loved pure water and plenty of it. The water supply of to-day is plentiful enough to keep the sewers well washed out. Three main sewers or collectors have been built of late years along the banks of the Tiber, two on one side and one on the other. These sewers empty into the Tiber some kilometers below the city. The banks of that stream, once in picturesque disorder, are being altered by extensive embankments, averaging 14 meters in height and built of fine large quadrangular blocks of travertine. The cost of the embankment wall is paid for at a certain rate a square meter. The sum of one hundred million francs was voted by the government to defray the expenses of the great alterations made along the course of the Tiber. The ancient Cloaca Maxima has not been condemned—it will go on as of old emptying its contents into the golden Tiber—modern experiment having proved that its relatively small contributions are rapidly rendered harmless by dilution in the stream.—Geo. H. F. Nuthall, M.D.

A Curious Case of Combustion.

Dr. Lindsay Johnson writes to the British Medical Journal regarding a patient for whom he ordered ordinary chlorate of potash lozenges (B. P.) which were kept loose in the waistcoat pocket for convenience. Without thinking what he was doing, he put an unopened Swedish safety box of matches into the same pocket. While bending down to pick up something on the floor the lozenges rubbed against the friction paper on the outside of the box. This set the entire box alight, and the heat kindled all the matches in the box. The lozenges added fuel to the flames. The result was that the gentleman was instantly in flames, the combustion being of explosive violence. He was severely burned. Dr. Johnson thinks that it might be well if a caution were to be printed on the bottle or box in which the lozenges are sold to the effect that they should in no case be carried loose. With this recommendation we entirely agree. This is not the first occasion we have recorded accidents like the above, and Mr. Alden's alarming story about the disappearance of two men who used chlorate of potash lozenges is enough to make all druggists regard these apparently harmless and nasty sweets with greater caution than they do.

Postal Rates—A Correction.

In our issue of January 26 it was stated by mistake that under the new foreign postal rates the charge for printed matter would be but 1 cent per pound. The rate for the United States, including those for Canada and Mexico, on second class matter, is 1 cent per pound; but for foreign countries, the rate on second class matter, under the new postal rates, is 1 cent per 2 ounces.



PONT-Y-PRIDD BRIDGE, SOUTH WALES.

A Large Alternator.

A large alternator, the great size of which has been rendered necessary by the conditions under which the machine is to be worked, and particularly the low speed, is now being constructed by the General Electric Company at Schenectady. This alternator, which is to be installed in the station of the Edison Electric Illuminating Company at St. Louis, Mo., will supply current for incandescent and arc lighting and for motive power purposes. With a view to secure efficient results for these various uses, the generator is being constructed on the "monocyclic" system, which we recently described. This system employs a comparatively low frequency of alternations, and the armatures of the generators have special windings adapting them for use on circuits with self-starting current motors. The alternator in question is of 800 kilowatts capacity, has 80 poles, and is to be driven at 90 revolutions per minute. On account of the great size of the frame, difficulties were expected in producing the castings, but owing to the facilities of the Schenectady works, no trouble was experienced in pouring even the large frame casting. This single piece, made up in part of wrought iron embedded in the castings, weighs 35 tons, and measures 24 ft. over all. The amature is ironclad and is 16 ft. in diameter, weighing nearly 45 tons. The armature will be supported on a 22 in. shaft. The generator will be able to supply, at full load, 667 amperes at 1,200 volts, or the equivalent of 16,000 16 c.p. lamps.

Life Saving Balloons.

The Utica, N. Y., Observer states that Professor Carl Myers has completed at the balloon farm at Frankfort, N. Y., the first of a series of balloon outfits to be supplied to some sixty vessels belonging to New York parties for life saving purposes in case of shipwreck. Each outfit consists of an automatic apparatus generating hydrogen gas under pressure, so controlled by a stop cock that the closing of this immediately stops the generation or flow of gas and retains it still under pressure. This is used to rapidly inflate a balloon of sufficient size to carry a life line ashore from a wrecked vessel, by means of which a heavier cable may be drawn for communication or passage of crew or goods, as now practiced by the governmental life saving crews where stations exist for throwing a line by use of a mortar. The defects of the mortar system are that the stations are infrequent on the coast, the difficulty great in throwing a line against the wind at so small a mark as a ship, and the distance, which frequently makes such efforts futile. The balloon system has the advantage of requiring no special apparatus on shore, while the balloon simply is drifted toward a line of coast by the same wind which blows the ship ashore, and drops its line when the shore is reached.

A REVOLVING ICE CAKE.

To the Editor of the SCIENTIFIC AMERICAN:

There is a curious ice formation on the Mianus River, near the village of Bedford, Westchester County, New York. The Mianus at that place is a small stream, averaging about ten feet in width. At a place locally known as the "ten foot hole" the stream widens out into a pool forty or fifty feet wide. In this pool there has formed a cake of ice about twenty-five or thirty feet in diameter and perfectly circular in shape.

This circular cake of ice is slowly revolving and is surrounded for about two-thirds of its circumference by stationary ice. There is a space of about three inches between the revolving cake and the stationary ice, except at the "up stream" side of the revolving cake, where the water is open and the current quite swift. Each revolution takes about six minutes.

I inclose a rough drawing, which will give an idea of this curious formation. J. M. BATES.

Street Car Fenders.

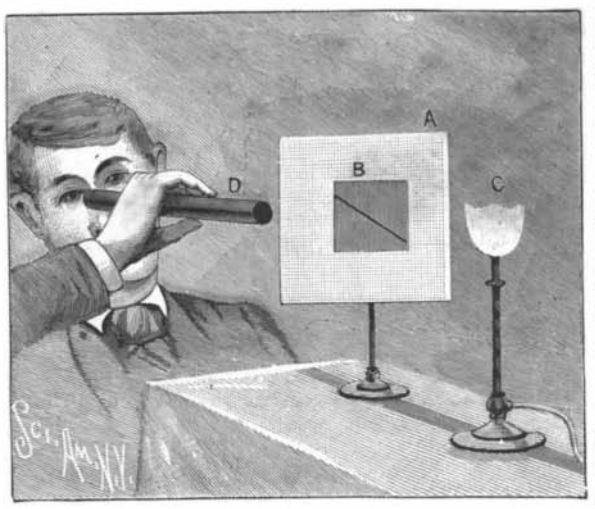
On October 6, 1894, the City Council of Baltimore passed an ordinance compelling the various street railroads of that place to equip all of their cars with fenders before January 8, 1895, or pay a fine of $5 a day for each car not so protected. The ordinance requires that the railroad companies "shall provide for each car or train of cars a car fender or fenders, with both front and wheel guards, of a design which the mayor and city commissioner shall have certified to in writing, which in their judgment comply with the requirements set forth in the report made to the commission appointed under the provisions of the resolution of the mayor and city council, approved April 28, 1894, by Mendes Cohen, engineer to the commission." On the expiration of the time allowed only one company had fully complied with the law, which resulted in the arrest of the superintendents of three lines. They were each released in $500 bail. It is not likely that the trials will result in a conviction, as the railroads involved have proved that they are equipping their cars as fast as fenders can be made.

The commissioners of the District of Columbia are preparing regulations in regard to fenders which require that every cable and electric railroad company in the District shall equip its cars in a satisfactory manner with fenders within forty-five days from the promulgation of the regulations. No special fender is made official, but all fenders used must be subject to the approval of the commissioners.

ON THE MEASUREMENT OF IMAGINATIONS.

BY E. W. SCRIPTURE, YALE UNIVERSITY.

Somewhat over a year ago, I announced the discovery of a method for measuring the intensity of hallucinations. A research on this subject has reached a successful completion, and will soon be made public. In the course of these investigations it occurred to me



MEASUREMENT OF IMAGINATIONS.

that it might be possible to measure the intensity of an imagination also. The experiment was successful. The method is not difficult and is readily intelligible. In order to explain the method, it will be sufficient to describe the first simple experiment made.

The apparatus used is shown in the figure. The screen, A, serves as a frame for a piece of fine tissue paper, B. The tissue paper is illuminated by daylight in front and by a gas flame at the back. When the gas flame is turned down, the eye looking through the tube, D, sees a plain white circle illuminated by daylight.

The first experiment made was on a student accustomed to using the telescope. He was told to imagine hair lines on the white surface, like the hair lines seen in the telescope. This was successfully done. He was asked to describe them and compare their blackness. There is, he said, a horizontal line, which is the blackest of them, and three vertical lines of about equal blackness. He was told that the field of view was to be made gradually lighter by turning on a flame behind, and he was to tell how the lines behaved. As the gas was slowly turned on he described various changes in the lines. Finally he said he saw a slant line that he had not imagined before. It appeared just about as black as the horizontal line and blacker than any of the others. Thereupon the experiment was ended.

The slant line was a real line. This he did not and still to-day does not know. On the back of the tissue paper a slant line had been drawn, and as the gas was turned up, of course it showed through. Thus we have a direct unsuspecting comparison of intensity between a real line and an imaginary one.

The photometric determination of the intensity of the real line is not a difficult matter. A phantasimeter has been devised in which the graduation is done beforehand, but the simple arrangement just described serves to indicate the method of experiment.

A REVOLVING ICE CAKE.

An Electrical "Nickel-in-the-slot" Gas Meter.

An electrical contrivance has been invented which makes it possible to control the supply of gas from an ordinary gas meter by merely dropping a coin in a slot in the mechanism. The attachment is so arranged that a number of coins may be inserted in a slot, and as one coin's equivalent in gas is consumed, that coin drops into a receiver inside the meter and the next coin in the slot takes its place. In this way the meter can be made to supply gas for an indefinite time by keeping the slot filled with coins. The electrical attachment makes it possible to do away with any complicated arrangement of wheels and levers. The movement is controlled by a simple electro-magnet. When a coin is dropped into the slot the circuit is closed, this excites a magnet, which in turn attracts an armature, and the movement of the armature opens the valve of the meter. It will be seen that as long as the stream of coins is kept up, the meter will continue to supply gas. When the last coin has dropped into the meter the circuit is opened, and this, of course, causes the magnet to release the armature and close the valve. The especial advantage of the electrical over the ordinary mechanical attachment consists in the diminished probability of the machines getting out of order. The contrivance, it is thought, if generally used, would save all the bad debts of gas companies.

Progress of the Diphtheria Cure in France.

The Paris correspondent of the Lancet reports that arrangements have been made at the Pasteur Institute for the immediate dispatch of tubes of anti-toxic serum to any part of France. It will thus be seen that M. Roux and his assistants have not been idle. Indeed, both the institute authorities and the public have worked with a will; the latter having, through the Figaro, and by means of gifts made directly to the institute, contributed up to December 31, 1894, no less a sum than 611,000 francs ($122.200). This does not include 100,000 francs ($20,000) just voted by the Chambers, and which will doubtless become an annual subsidy. The institute now possesses, for immunizing purposes, a stud of 136 horses, a total that will probably be ultimately increased to the maximum of 150. Of these, 20 are kept by the Municipal Council of Paris at a cost of 20,000 francs ($4,000) a year, for the benefit of the Paris hospitals and poor. At Villeneuve d'Etang —a property ceded by the state to M. Pasteur in 1886— there are 79 horses cared for by a capable veterinary surgeon and his staff. That the animals flourish under the regime of good feeding and periodical bleedings adopted is proved by the presence in good health at Alfort of a sturdy Brittany pony which has hitherto supplied no less that 420 quarts of blood.

Photographing Frost Flowers.

At this time of the year, when Jack Frost draws his beautiful ferns and flowers on the window pane, who has not often wished that this beautiful work could be made permanent?

It will be interesting to the professional as well as the amateur photographer to know that it can be made permanent and far more distinct than Jack Frost ever painted them, yet with all the beauty of every line and curve that is found in the original. But one must enter into copartnership with the frost king himself to attain the desired end. It is accomplished by the old wet-plate process. Here is the secret:

The glass plate is flowed with collodion and immersed in the sensitizing nitrate of silver bath in the usual manner. When removed from the bath it is put in the light-tight plate holder and placed where it will freeze. While frozen it is placed in the camera, focused on a white screen and developed in the usual wet-plate way. The plate should be kept frozen till the developer is poured on. Beautiful border negatives can be made in this manner, and no two pictures quite alike. To produce different effects, the holder, when laid out to freeze, should be placed sometimes on end, sometimes on the side, and at other times on the face, flat down. The plate does not require very thorough draining when removed from the bath. Time of exposure in the camera will be governed to suit the artist's taste. Of course, a long exposure gives flat pictures. We have made negatives in one or two seconds that gave prints as distinct as a pen and ink sketch on white paper. We tried it without the use of the camera by a slot admitting a streak of white light into the dark room. The frozen sensitized plate was passed across the beam of light and developed as usual, but the result was not so good as in the camera.—Henry W. Brown, in Min. and Sci. Press.

GERMAN RAILROADS.—The report of the German Railroad Union for the past year shows that the aggregate length of railroads in the union was 45,880 miles. There is a reported increase of 561 miles during the year. Of the entire mileage 11,453 miles or about 23 per cent are double track roads.