

advantage. The corporation is paying into the State treasury \$150,000 a year in the way of taxes.

We ask you to retain this corporation in Massachusetts, that its headquarters shall be here, that its employment of a clerical force and of operatives shall be here, so that Massachusetts shall get the benefit of having its citizens employed, its supplies furnished from Massachusetts sources.

The Brilliance of a Candle Flame.

That the luminosity of a candle can be calculated direct from the dimensions of its flame is the rather striking theorem of Herr P. Glan, who gives the results of his measurements in the current number of *Wiedemann's Annalen*. The volumes of the bright portions of various candle flames were measured by taking the length by means of a scale placed behind the flame, and the breadth at various points by gauging it with calipers or compasses. These bright portions have approximately the shape of cones, each of these cones being penetrated from below by a truncated cone, consisting of the dark central portion. The difference between the volumes of the two cones gave the volume of the brilliant portion. Stearine and paraffin candles of various thicknesses, and provided with different wicks, were compared by means of a rod photometer. It was soon found that the height of the flame was not the only factor determining the brightness. A stearine candle of 5.88 cm. circumference had, on the other hand, a higher luminosity than another 6.49 cm. in circumference. But a determination of the ratio of the volume to the illuminating power showed that this ratio is very nearly constant, the difference between the actual luminosity and that calculated from its volume never exceeding 3 per cent. In other words, equal volumes of the bright flame of any two candles give out the same amount of light.

Soap Suds for Calming Waves.

The remarkable action of oil upon waves is well known. This phenomenon led the officers of the steamship *Scandia*, of Hamburg, to make an experiment upon the same principle that was very successful, and that appears to us worthy of mention. During its last trip to the United States the vessel, while in mid-ocean, was attacked by a very heavy storm. It then occurred to the officers to dissolve a large quantity of soap in tubs of water. Having thus obtained several hundred gallons of soap suds in a very short time, they threw it overboard in front of the ship. The effect was almost instantaneous, and the vessel soon began to navigate without difficulty. Her officers at once addressed a long report to the Hydrographic Bureau of the United States, giving an account of their voyage, the storm, and the means that they employed to still the waves. They conclude by saying that although soap suds does not produce absolutely all the effects upon water that oil does, it at least suffices to break the force of waves in most cases. Besides, this method recommends itself to transportation companies careful of their interests. Soap suds is much cheaper than oil, and a relatively large quantity of soap can be carried without encroaching too much upon the space set apart for passengers and merchandise.—*La Nature*.

EOLIAN HARPS.

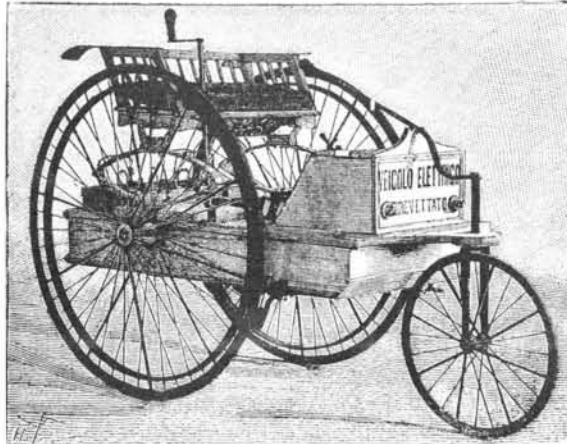
The following experiment, although performed as long ago as 1855 by Mr. Wheatstone at the Polytechnic Institution, is of sufficient interest to reproduce. Upon the center of the stage were arranged, in a semicircle, four Erard harps, which, at the pleasure of the experimenter, vibrated as if they were made to resound by invisible hands. To this effect, there had been fixed to the sounding boards of each of them four vertical rods of firwood, which descended perpendicularly, passed through the floor of the stage and the ceilings beneath, and in the deep cellar of the Institution were fixed, one of them upon the sounding board of a piano, another upon the sounding board of a violoncello, and the two others upon the sounding board of violins. In order to render it possible to interrupt the vibrations between these instruments and the harps, the rods supporting the latter had been divided at a few centimeters above the floor. A revolving motion of the harps caused either their juxtaposition with or their separation from the rod.

This thoroughly scientific experiment was taken up under the name of Eolian harps by Robert Houdin, who introduced several scenic modifications into it. A stage elevated in the very midst of the spectators was traversed by two firwood rods, which, after passing through the floor, rested upon harps placed in the hands of instrumentalists. At the command of the skillful prestidigitator, two other instruments, supported by the upper extremity of the rods, executed a concert whose success was immense, thanks to the careful and very elegant *mise en scene*. Certain operators further surprised their spectators through the pretended intervention of mediumistic spirits very much in fashion at the time.—*La Nature*.

CARLI'S ELECTRIC CARRIAGE.

The question of small automobile vehicles for streets and highways is at present the preoccupation of the manufacturers and inventors of all countries. The competition instituted by the *Petit Journal* will certainly bring to Paris all the systems that have been devised for the solution of the problem—steam, gas, petroleum, and electricity produced by batteries or stored up in accumulators. This latter solution, which to us appears to offer the brightest future for an application in large cities that are provided with central stations of distributions of electric energy, is, nevertheless, the one that answers the least to the programme drawn up by our daily contemporary, and too hasty and too absolute conclusions must not be deduced from the check that electricity will necessarily suffer.

We do not generally take a vehicle upon roadways for

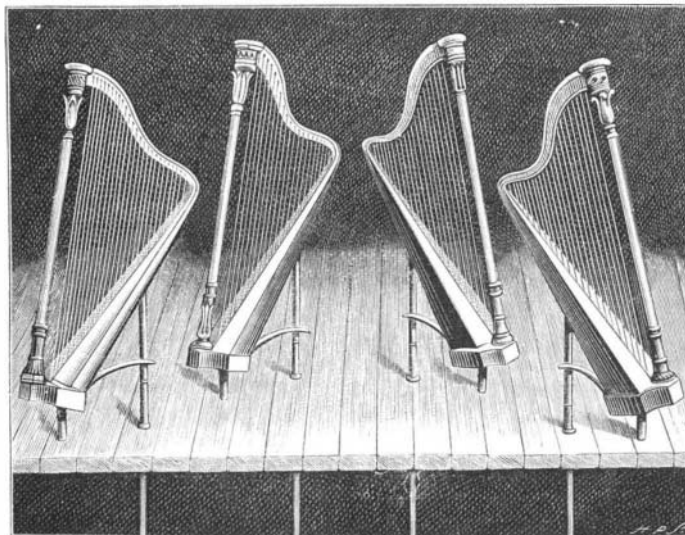


CARLI'S ELECTRIC CARRIAGE.

trips of 60 miles. For such journeys the railway is the proper mode of conveyance. But we do take a coach for making excursions, and visits and doing business for a few hours, in returning sensibly to the starting point, and it is for such applications, which are the most numerous, that the use of energy stored up in accumulators comes in.

However this may be, researches in this direction continue, and we shall now make known to our readers a new electric carriage, of which a description has been kindly communicated to us by Prof. G. Milani, of the University of Pisa. The essential part of the description that he sends is as follows:

This carriage was constructed at Castelnuovo (Garfagnana) in the power loom weaving establishment of Count Joseph Carli, deputy to the Italian parliament. The Carli electric carriage is actuated by accumulators of the Verdi type, this having been selected because it possesses a great specific capacity and can best resist the shocks always inevitable in a vehicle designed to run upon all sorts of roads. The battery consists of 10 elements each having a capacity of 100 amperes-hour, say 200 watts-hour. There is thus at one's disposal 2 kilowatts-hour. The model employed weighs 11 pounds and contains five plates. Under conditions of normal discharge, the battery furnishes a current of 5 amperes, say about a half ampere per pound. The plates are arranged horizontally in a wooden cage, are held in place by small bars of ebonite and are separated from each other by a fabric of paraffined jute. The whole is inclosed in small ebonite boxes hermetically closed by an ebonite cover, in order that the liquid may not slop over through the effect of jolting. The inventors have found it of a certain advantage to have recourse



EOLIAN HARP EXPERIMENT.

to a system of very slow charging. To this effect, they employ very feeble currents of a duration of from twenty-five to thirty hours, and this permits of using primary batteries. This circumstance is favorable to the best rendering and to the best rate of discharge of these accumulators, even when the external resistances

vary in a large measure. Experiments have proved that the rapid discharge presents no inconvenience and leads to no alteration of the positive surfaces. The rendering alone drops from 97 to 63 per cent, if we pass from a half to one ampere per pound of plates. The battery of 10 accumulators of the type described above confines an energy equal to 2 kilowatts-hour. The vehicle weighs but 350 pounds in running order.

The motor actuates the hind wheels directly by means of gears. It absorbs about 550 watts and the battery is capable of supplying it for a four or five hours' trip. The excitation is in derivation. The motor is capable of serving for the recharging of the accumulators, by virtue of the well known principle of reversibility. It is only necessary to apply a winch or a belt. There is a train of gears between the axis of the motor and that of the wheels. By means of this gearing, it is possible, by turning a winch, to reduce the angular velocity of the motor from 1,000 revolutions per minute to 100 or to 30. On another side, a rheostat permits of varying the angular velocity of the motor from 1,000 to 300 revolutions per minute. It is thus possible to develop the greatest power corresponding to every speed, to run at slow speed upon ascending roads, at high speed upon declivities, etc.

For starting and for unforeseen obstacles on the way, recourse is had to an impulsion box that is held in reserve. This consists of a system of rubber tension springs that are stretched by revolving a small wheel, even during the running of the carriage. When an energetic impulsion is necessary, the springs are relaxed by means of the foot, and produce upon the axle an impetus equal to double the power of the motor itself, and sufficient for a run of at least 160 feet.

The Carli establishment, under the able superintendency of Mr. F. Boggio, is constructing two types of this carriage, one of them simple and cheap and the other more elegant and more elaborate in detail. It is the second type that is represented in our figure.

We have cared to publish this note in order to well show that the electric coach, such as we conceive it, is not a utopia. The electric carriage of Mr. Pouchain and that of Mr. Carli are already realizing the majority of the conditions necessary to this kind of exploitation. The questions of form will soon be solved by the art of the coach builder and that of the electrician.

A few more improvements in accumulators, and central stations will, in the charging of coach accumulators during the day and a part of the night, have an important market that will improve their annual rendering as well as their present conditions of exploitation.—*La Nature*.

American Fire Arms.

Sometime ago we published the statement that the German Mauser rifle was an American invention, and we are now asked as to our authority for that statement. Those familiar with the facts are aware that Mr. Mauser, at the time the weapon having his name was invented, was a skilled mechanic in the employ of the E. Remington & Sons, Iliou, N. Y., and that the first Mauser gun was constructed at the expense of the Remingtons, and under the supervision of their master mechanic. The Remingtons had an interest of one half or more in the invention, but Samuel Remington, who for many years represented the company in Europe, had such an unfortunate experience of the German government's illiberality to inventors that he sold his interest in the gun to Mr. Mauser for \$500. These facts fully justify our statement, referred to, that the Mauser is an American invention. The Lee rifle was also invented and constructed originally at Iliou, and it furnishes the essential idea of most if not all of the rifles now in use in European arms, with the exception of the improved Chassepot or Gros. It certainly excites surprise in the mind of any one who is familiar with the history of small arm invention to find our government going abroad for its service weapon. The kingdom of Sweden and Norway, from one of whose subjects we obtain our new army rifle, was the first foreign government to adopt and purchase an American breech-loader, the Remington. With proper encouragement from the government our small arms manufacturer might hold the field against the world. The design and essential idea of the breech-loader and magazine gun, wherever it is found, is American. The machinery used in the manufacture of modern arms in all foreign countries manufacturing their own arms is of American invention and in large measure of American manufacture. The machinery in the armories of Germany was manufactured by the Pratt & Whitney Co., of Hartford, Conn., and the German workmen were instructed in its use by Yankee mechanics, sent out by that company and remaining in Germany for one or more years.—*Army and Navy Journal*.

THE farmer in Japan who has ten acres of land is looked upon as a monopolist.