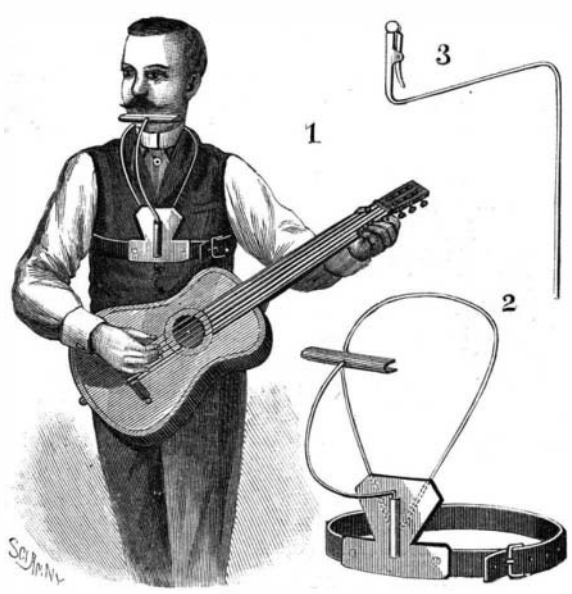
The Congressional Vacuum Balloon.

The committee of the House of Representatives on acoustics and ventilation has actually reported favorably a bill appropriating $75,000 to subsidize a man who thinks he can construct a steel "vacuum" balloon of great power. He is to be allowed to use the facilities of one of the navy yards for the building of his machine, and is to have the money as soon as he has expended $75,000 of private capital upon his air ship. One of the mathematical physicists of Washington was asked by a member of Congress whether such a balloon could be successfully floated. He set to work upon the problem, and here are some of his results, which are rather curious: A common balloon is filled with hydrogen gas, which, being lighter than air, causes the balloon to rise and take up a load with it. But, as the pressure of the gas within is equal to the pressure of the atmosphere without, no provision other than a moderately strong silk bag is required to prevent collapse. The inventor of the proposed steel balloon hopes to gain greater lifting power by using a vacuum instead of gas, the absence of substance of any kind being lighter than even hydrogen gas. But he has to contend with the tendency of the shell to collapse from the enormous pressure of the atmosphere on the outside, which would not be counterbalanced by anything inside of it. The first question which presented itself was, How thick could the metal of the shell be made, so that the buoyancy of the sphere, which would be the most economical and the strongest form in which it could be constructed, would just float it without lifting any load? The computations showed that the thickness of the metal might be 0·000055 of the radius of the shell. For example: if the spherical shell was 100 feet in diameter, the thickness of the metal composing it could not be more than one-thirtieth of an inch, provided it had no braces. If it was thicker, it would be too heavy to float. Now, if it had no tendency to buckle, which of course it would, the strength of the steel would have to be equivalent to a resistance of more than 130,000 pounds to the square inch to resist absolute crushing from the pressure of the air on a cross section of the metal. Steel of such high crushing strength is not ductile, and cannot be made into such a shell. If the balloon is to be braced inside, as the inventor suggests, just as much metal as would be used in constructing the braces would have to be subtracted from the thickness of that composing the shell. Of course, such a shell would buckle long before the thickness of the metal of which it was composed was reduced to 0·000055 of its radius. In other words, it is mathematically demonstrated that no steel vacuum balloon could be constructed which could raise even its own weight. This is an illustration of how intelligently Congress would be likely to legislate on scientific matters unguided by intelligent scientific advice.—*Science*.

AN IMPROVED HARMONICA HOLDER.

A holder in which a clamp or catch for a harmonica or similar instrument is mounted on a support, with means for attaching it to the body of the musician, is

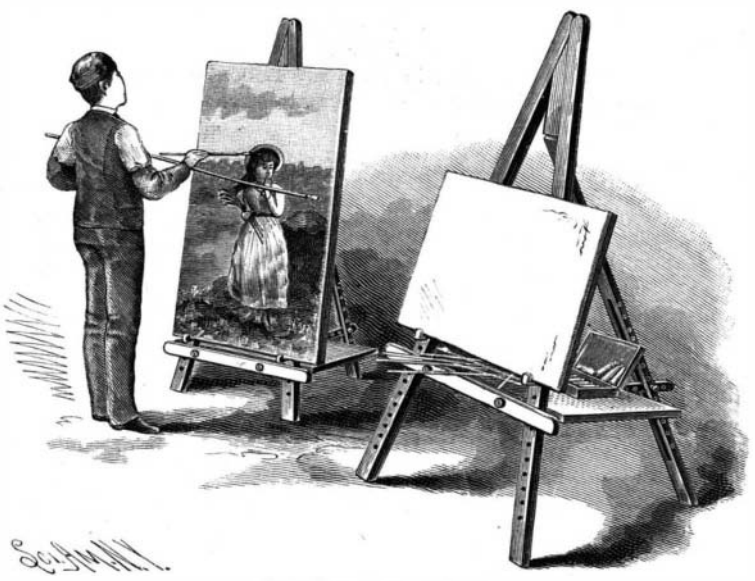


MULHOLLAN'S HARMONICA HOLDER.

illustrated herewith, and has been patented by Mr. William E. Mulhollan, of Portland, Oregon. The body of the holder consists of a nearly flat plate, adapted to rest against the person, with a bottom cross strip to which is attached a strap or retaining band for holding the plate against the body. An attached pear-shaped loop, as more fully shown in Fig. 2, is also adapted to be placed around the neck to sustain the plate, which has a projecting socket in front for the reception of a detachable bent shank, carrying on its outer end a catch or clamp for removably holding a harmonica or other mouth instrument, which is thus supported in convenient position for playing, leaving the hands free for another instrument. In Fig. 3 is shown another form of bent shank adapted to be placed in the socket for holding music in convenient position for reading when performing on a flute or similar instrument.

AN EASEL WITH ADJUSTABLE SHELF.

An easel having a detachable and adjustable shelf, adapted to receive colors, pallette, etc., or articles of bric-a-brac or other ornaments when the easel is employed to display a picture, is illustrated herewith, and has been patented by Mr. William H. Van Wart, of Stonington, Conn. The front legs of the easel are provided



VAN WART'S EASEL.

with a series of apertures, in which are entered suitable pins for the support of a canvas or picture to be exhibited, or these pins may hold a suitable narrow table for such purpose. A shelf which is more or less rectangular, and of a size adapted to that of the easel near its base, is supported in front by a clamp-like cross-piece, attached to the shelf by screws or thumbscrews, the rear leg of the easel supporting the shelf at the other side by means of a bar attached to the under side of the shelf, passing through a slot in the rear leg of the easel, the shelf being held at any desired height by a pin passed through one of a series of apertures. Such a shelf, while useful for holding artists' materials or articles for display, acts also as a brace, imparting both strength and steadiness to the easel. The shelf may be made in sections hinged together to be folded, for convenience in transportation or out-of-door work, with a stud to engage an aperture in the rear leg of the easel, and the forward corners of the shelf recessed where they engage and are supported in position upon the forward legs, by pins placed in apertures provided therefor.

Sugar Machinery.

The British Vice-Consul at St. Iago de Cuba, in a Foreign Office report, states that the sugar estate machinery in use in Cuba is obtained from England, the United States, and France. He says the English sugar mills are found to be the strongest and best, but the French evaporating apparatus is preferred to and found to work better than the English. The general class of machinery made in the United States for export is, in his opinion, unreliable, being simply made to sell, though that used in the American refineries is unrivaled. Small machinery is often ordered from the United States instead of from Europe, on account of the greater promptness with which delivery can be obtained. At present there are two appliances for use on sugar estates for which there should be a good future, viz., cane shredders and furnaces for burning green bagasse. Though there are several in the market, none has so far given universal satisfaction, and the report states that there is a field for really good articles of this kind.

A Great Globe.

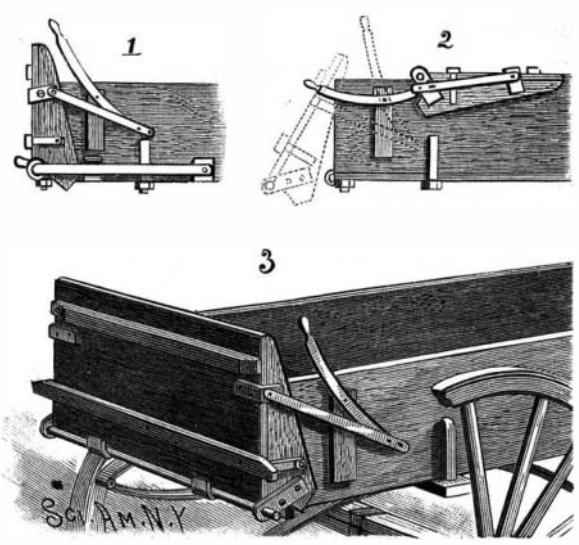
According to *La Nature*, an immense terrestrial globe, constructed on the scale of one millionth, will be shown at the Paris exhibition of 1889. A place will be set apart for it at the center of the Champ de Mars. The globe will measure nearly 13 meters in diameter, and will give some idea of real dimensions, since the conception of the meaning of a million is not beyond the powers of the human mind. Visitors to the exhibition will see for the first time on this globe the place really occupied by certain known spaces, such as those of great towns. Paris, for instance, will barely cover a square centimeter. The globe will turn on its axis, and thus represent the movement of rotation of the earth. The scheme was originated by MM. T. Villard and C. Cotard, and *La Nature* says that it has been placed under the patronage of several eminent French men of science.

Buckthorn in Toothache.

Dr. Gretchinsky has called attention to a practice which obtains among the peasantry in some parts of Southern Russia of treating toothache with a gargle of decoction of buckthorn—*Rhamnus catharticus* (*Lond. Medical Recorder*, June 20, p. 241). He states that, in order to test the ground of this practice, he made a series of control experiments upon a number of inmates of the local prison who were suffering from toothache. The patients were ordered to gargle their mouths with the cooled decoction every three or five minutes until the pain disappeared, and in every case the suffering ceased in about half an hour, though there still remained a vague aching or kind of itching about the teeth. A prolonged anodyne effect was produced by inserting a cotton wool plug steeped in the decoction in the cavity of a hollow tooth. Dr. Gretchinsky considers his experiments proved decoction of buckthorn to be a reliable means for mitigating such dental pain as depends upon inflammation of the pulp. He recommends the decoction to be made by boiling 100 parts of the bark in water sufficient to yield 200 parts of the strained liquid and adding 10 parts of brandy. Another writer attributes the anodyne action to the powerfully astringent properties of the decoction.

AN IMPROVED END GATE FOR WAGONS.

An end gate removably pivoted at its lower edge to a wagon body, and provided with levers, whereby it is moved in and out of position by a person in the wagon, has been patented by Mr. Emil L. Burklund, of Wahoo, Neb., and is illustrated herewith. It is formed with side parts braced by metallic strips, and overlapping the body, and is pivoted at the bottom by means of a rod passing through sleeves or loops on the wagon body, the lower ends of the side parts being curved, and resting upon strips secured to the rear edge of the body, whereby the gate may rock on its lower edge independent of the pivotal connection. The gate is operated and held in closed position by means of handled levers, each pivoted to a strip secured on the wagon body, the outer ends of these levers being each pivoted to one end of a bar, which at its other end is pivoted to a bracket projecting from the side edges of the end gate. The joint between the outer end of the handled lever and the bar is made adjustable, there being different holes in which the pivot pin may be placed, to secure greater range of movement of the end gate. When it is desired to use the end gate for dumping or unloading, the pivotal rod at the bottom is slipped out of the sleeves, when the gate may be thrown out at its lower end, as shown in dotted lines in Fig. 2, or it may be moved entirely out of the way, by means of the levers, and brought down upon the top of the wagon body, in position to serve as a seat, as also shown in the same figure. In Fig. 1 is shown another form of pivotal connection at the bottom of the end gate, for use where the location of the wheels would interfere with the ready removal of the pivotal rod. In the latter case, the end gate has a tubular rod secured by metallic eyes or bent strips to its lower edge, the ends of this rod being held by a catch block on the end of a metallic strip, secured along the



BURKLUND'S WAGON END GATE.

lower edge of the wagon body, there being a handle whereby, with this hinge connection, the lower edge of the end gate may be easily detached or engaged in hinged position.

A MAN who has tried it says that wooden posts treated as follows, at a cost of two cents apiece, will last so long that the party adopting it will not live to see his posts decay. Take boiled linseed oil, and stir in pulverized charcoal to the consistency of paint, and put a coat over the timber.

Development of Public Lighting in France.

At the recent annual congress of the Society Technique du Gaz, at Boulogne, M. Ellissen delivered an interesting address, from which we take the following, as given in the *Journal of Gas Lighting:*

Referring to the growing demand for increased illumination, which is a characteristic of the social life of the present day, M. Ellissen quoted some figures recently laid before the Physical Society by M. Mascart. About a century ago, a grand *fete* was given in the Salle des Glaces, in the Palace of Versailles—one of the finest rooms in the world—and about 1,800 wax candles were employed in the lighting. In 1873, on the occasion of another *fete* in the same place, 4,000 wax candles were used, while three years later, 8,000 candles were necessary. So that in 1878 just twice the amount of illumination, for the same superficial area, was required, in comparison with what was regarded as sufficient five years previously, and more than quadruple that employed a century ago.

Turning to public lighting, the president remarked that the setting up of a few electric arc lamps called the attention of municipalities to the necessity for increasing the lighting of the public thoroughfares, and the result has been the employment of high power gas burners.

M. Ellissen thinks we may hope to see in the future the streets and open spaces lighted in such a manner that drivers of vehicles will be able to dispense with lamps for finding their way and avoiding collision, the existing necessity for these lights causing, he considers, the mind to revert to the time when pedestrians carried lanterns with them as they traversed the streets at night.

On this subject he quoted the following interesting particulars as to the origin and development of public lighting in France, as contained in the work of M. Edmond Thery: We have to go back to the year 1558 before the first traces of public lighting in Paris are met with. By a decree of Parliament, made in the month of November in that year, it was ordered that a lighted lantern (*une lanterne ardente et allumante*) should be placed at the corner of each street from ten o'clock at night till four o'clock in the morning, and where the streets were so long that the lantern was unequal to lighting them from end to end, other lamps were to be placed at suitable intervals. This first attempt at public lighting was attended with but small success, and during the troubles of the League, the decree was disregarded. In 1662—that is, more than a century later—a fresh attempt at lighting the streets was made. By letters patent granted by Louis XIV., and registered by Parliament on August 26, 1662, the privilege of public lighting was accorded to one Laudati Caraffe, who, however, was to enjoy it for a period of five years only. The system proposed by Caraffe was the establishment of stations where the services of lantern and torch bearers could be secured for a few sous, to conduct pedestrians to their destinations. The lantern bearers made use of yellow wax tapers, about 1½ pounds in weight, marked with the arms of the city, and divided into ten equal parts. Pedestrians who desired to be conducted and lighted paid 5 sons for each part. The lantern men also lighted carriages and sedan chairs at a charge of 5 sous for every quarter of an hour they were engaged. In order to check the time, each man had suspended from his belt a sand glass (also marked with the city arms), arranged to run 15 minutes, and this he reversed when starting on his journey. The lantern bearers were posted at distances of 800 paces one from another. The central bureau, situated in the Rue St. Honore, was opened to the public on October 14, 1662, but, notwithstanding the originality of the system, the hopes of the inventor for its success were far from being realized, and he ruined himself in the undertaking.

The real originator of the public lighting of Paris was the Lieutenant-General of Police, La Reynie. At his suggestion, a royal edict was issued in 1667, prescribing the establishment of lanterns, containing lighted candles, suspended from ropes at the height of the first floors of the houses. This experiment was thoroughly successful, and at the end of the seventeenth century, Paris had 6,500 public lanterns, in which were consumed nightly about 1,625 pounds of candles. The Parisians, as well as the foreigners resident in the city, were enraptured with this method of lighting, which they regarded as a *chef d'œuvre*. One of the latter, writing on the subject at the time, went so far as to say that the spectacle of the illumination of Paris at night by means of an infinite number of lamps was so beautiful and so complete that "Archimedes himself, had he been living, would have been incapable of adding anything more useful and agreeable." The street lamps in which oil was consumed, and which were furnished with reflectors, did not make their appearance until a century later. They were the invention of Bourgeois de Chateaublanc, who was intrusted for a period of twenty years with the lighting of Paris. This was assuredly great progress, and the song writers of the day did not fail to direct their good humored railleries against the poor old candle lanterns. It was quite seriously believed that the perfection of public lighting had been attained, and M. De Sartines, in the course of a memorial addressed to the King in 1770 on the subject of the police administration in France, said, in reference to the new street lamps, that the large amount of light afforded by them justified the belief that it would never be possible to find anything better. "It is probable," remarked M. Ellissen, alluding to the ridicule cast upon the old candle lamps, "that our children also will laugh at the methods of lighting by gas, and even by electricity, such as we know them to-day."

In 1787, Aime Argand, a Genevese, invented a lamp with a glass chimney, which was unjustly called Quinquet, after a great lamp seller of the period. This lamp was improved upon by a tinsmith and lamp maker of the name of Vivien. It was this lamp that the marvelous invention of Philippe Lebon had so much difficulty in dethroning in France. Lebon was born in Champagne in 1767, the year of the invention of street lamps, and was discharging his duties as professor of mechanics at the Ecole des Ponts et Chaussees in Paris when he conceived the idea of employing combustible gas, obtained by the distillation of wood, for the lighting of houses and the public thoroughfares. He took out his first patent on September 28, 1799. Since that time, what progress has been made by the invention of Philippe Lebon! It was not, however, until 1820 that the first gas company was constituted in Paris. During the ten years from 1844 to 1853, the six gas companies then existing distributed 246 million cubic meters, being, on an average, 24 million cubic meters per annum. But it is chiefly from the formation of the Paris Gas Company by MM. Emile and Isaac Pereire that dates the real development of gas consumption in Paris. The volume of gas sent out from this company's works in 1856 was about 10 million cubic meters, whereas in 1866 it had reached 122 millions, in 1876 had further advanced to 189 millions, and in 1887 was 291 millions.

The Commercial Aspect of Electric Lighting.

The record of litigation in connection with important patents relating to electric lighting has been, so far as this country is concerned, a singularly disastrous one for their owners. The attempt of Siemens to obtain a patent, which, if successful, would virtually have controlled the manufacture of the modern type of dynamo machines, was frustrated by his delay in making application until one of the machines had been two years in use in the United States. The Gramme syndicate were defeated in their efforts to place themselves in a similar position, by reason of the expiration of a prior foreign patent for the invention. The Brush company brought a suit to enforce its patent on the arc lamp, and after a protracted and expensive legal contest, was defeated by the production of evidence of an actual, though limited, prior public use. And now the Edison incandescent lamp patents appear to be doomed to share the fate of their unfortunate predecessors.

As a result of this state of affairs, the public has enjoyed what has been practically an era of unrestricted competition in both arc and incandescent lighting, for some ten years. But contrary to the general opinion, indications are by no means wanting that the present condition of things is likely to undergo a material change at no distant day. A combination or consolidation of electric lighting interests has often been discussed, and sundry attempts have been made in the past to realize it. But the combined resistance of the innumerable personal interests which would be affected by such a move has been far too great to permit much real progress in the desired direction to be made. Meantime the stockholders of the electric light companies, as well as the public, have gradually become more and more disgusted with the present outlook. Only a very small proportion of the vast sums of money embarked in electric lighting enterprises has yielded any return whatever, and it is becoming painfully evident that the bulk of the investment must sooner or later be charged to the account of "profit and loss." On the other hand, the public is badly served; many plants are becoming dilapidated, and the catalogue of disasters to life and property is lengthening with ominous rapidity. There exists, in fact, an exact reproduction of the state of affairs which existed in the telegraphic service thirty years ago, and as surely as history repeats itself, so surely the same remedy will be applied—consolidation or union of interests. Such a consolidation will not come voluntarily. It can only be brought about, like the welding of metal, by the combined effects of internal heat and external pressure. Many considerations, some of which are of a commercial and others of a legal nature, indicate that the beginning of the end is not far distant. However well founded the public antipathy to monopolies may be, it must at least be affirmed of an electric light monopoly that it is so closely hemmed in by its great rival, gas, that no fear of extortionate charges need agitate the mind of the prospective consumer. But the history of the consolidation of the telegraph interests clearly shows that the real source of future profit lies in the reduction of expenditure and in the increase of the business. Every one knows that the money received in the electric lighting business to-day would yield a very large profit, if all unnecessary expenses were abolished. That the force of circumstances must ultimately bring about the result we have pointed out, in spite of all opposition on the part of persons interested in preventing it, seems to us as certain as any future event can be.—*Electrical Engineer.*

Fire Discipline with the Magazine Rifle.

At the Royal United Service Institution, recently, Major-General E. H. Clive, Commandant of Sandhurst Staff College, presiding, Captain Walter H. James, late Royal Engineers, gave a lecture on "Fire Discipline and the Supply of Ammunition in the Field as Provided for by Foreign Powers." The lecture was regarded as supplementary to one by Captain James two years ago on magazine rifles. The lecturer commenced by quoting the oft-repeated remark that modern war was less deadly than ancient—that the loss of life which a nation suffered in the fighting of to-day was more moderate than that which occurred in olden times. This might be true, he said, as regarded the general result; but certainly the improvements in modern arms had rendered the losses at the points where collision actually took place far more deadly than they were with the old weapons.

He proceeded to describe the Prussian, French, and Austrian regulations in regard to fire discipline, and showed, in regard to the Prussian, that the magazine fire, as a rule, was only used at close ranges; but that a rapid fire was employed at artillery at over 900 yards, three fires being recognized, "volley," "independent," and "magazine," and the signaling of orders was by whistle. The firing in the French and Austrian services was much the same. The Prussian and Austrian soldiers carried each 100 rounds, and provision was made to add 98 by wagon to each Prussian soldier's supply, and 83 to the Austrian, while the French soldiers carried 78, and his supply by wagon was made up to 177. The lecturer gave other details of regulations in these armies, and pointed out the stress which was laid by these nations on the preparation of the men for the difficult *role* of modern fighting. Italy and Belgium both had systems directed to the same end—the control over the fighting line by its division into units capable of being influenced by one man. All the work meant careful training, and, in conclusion, he drew attention to the increased ammunition supply which both Prussia and Austria had already given to their men. These supplies would be considerably augmented when the new small-bore rifles were introduced. But the new departure should present nothing difficult to the British army if it would but remain true to the old guiding lines. It was superiority of fire which gained the reputation of English bowmen, it was superiority of fire by which Wellington beat the French at the beginning of this century.

If the natural aptitude for shooting was carefully trained, we could hold our own under any conditions. But it must be trained, and training was not to be got on the barrack square, but by careful practicing in peace the tasks that fell to the soldier in war, under conditions which represented in everything but loss of life the actual realities of modern fighting.

Narrow Escape of a Physician from Poisoning by a Cobra.

Dr. Vincent Richards, of Calcutta, an enthusiastic investigator in many different lines of medical research, had a narrow escape recently from poisoning by a cobra bite. He was holding a vigorous cobra in his right hand for the purpose of obtaining its venom. In pointing with his left forefinger to where some watch glasses lay, he brought the part close to the animal's head. The snake made a sudden dart, and fastened its fangs just below the second joint. Retaining his presence of mind, Dr. Richards tore the reptile away and killed it. A tight ligature was at once placed on the proximal aspect of the wounds, which were sucked, enlarged by knife, allowed to bleed freely, and thoroughly mopped with a five per cent solution of permanganate of potash; an India rubber cord was bound around the wrist. A medical friend subsequently further enlarged the wounds, and applied strong nitric acid to them. The ligatures were cautiously removed after a time. No symptom of poisoning resulted except a slight tightness of breathing.

Absinthe.

It appears from recent researches made by Mr. G. Varenne that absinthe is of itself not by any means so poisonous as it is usually supposed to be. This investigator finds that its toxicity is due to the use in its manufacture of the tailing of the spirit stills, *i. e.*, the residua which contain all the impurities of the alcohol. It is said that absinthe made with pure rectified spirit produces none of the effects ordinarily known as absinthism. The amount of oil of absinthe used in making the drink is very small, and the temptation to use the worst kinds of alcohol in its manufacture is of course large, because the bad flavors are easily disguised in so aromatic a drink.—*Dr. Bulletin.*