each side of the center line and connect the ends of the two front and back cross lines. These oblique lines form the two upper radial corner lines of the bellows.

Supposing the sides to measure 8½ inches wide on the back and 4¼ inches on the front or small end, we divide the distance at each end and locate the side center lines (see Fig. 6). From these we determine the location, by measurement, of the two lower radial corner lines of the bellows. The bottom of the bellows is then divided, and one-half added to each side of the

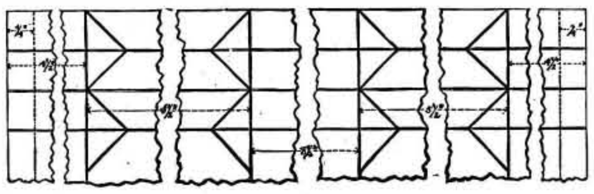

DIAGRAM A.—MEASUREMENTS FOR A 5×8 BELLOWS.

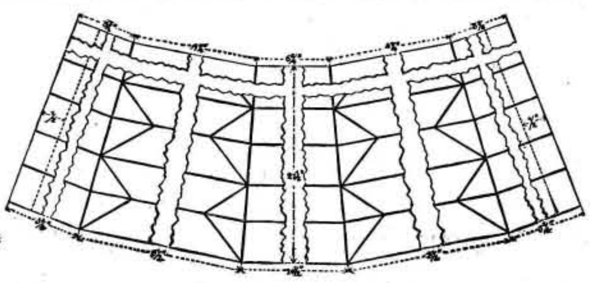

DIAGRAM B.—PLAN AND MEASUREMENTS FOR AN 8×10 BELLOWS.

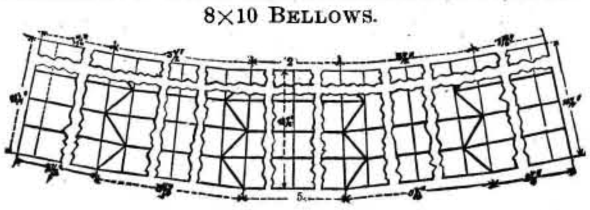

DIAGRAM C.—MEASUREMENTS FOR A 4×5 TRUNCATED CORNERED BELLOWS.

sides of the bellows, an extra length of ½ an inch being allowed for the lap or joint.

The crease lines for the cross folds are next determined, by first dividing off on the respective center lines in equal distances the width of a double fold, which may be about 1½ inches. The measurement should commence from the wide end and proceed toward the small end. Cross fold lines are then drawn between the four radial corner lines in each section, at right angles to their respective center lines, and will meet each other, producing a shape similar to a portion of an octagon. The next step is to locate the position of the intermediate fold. This is done by laying the base of a draughtsman triangle on the base line, or back of line, and drawing a line at 45 degrees inward from the intersection of the corner line with the back line, nearly across the fold, then by reversing the position of the triangle, so that its base is coincident with the next fold line, and drawing another diagonal line at 45 degrees inward from the intersection of the fold line with the radial corner line to where it will cross the other diagonal line. Where they meet will be the proper location of the intermediate fold line. This will be the same for all the intermediate folds. The points for these lines should then be located on the center line, and they should be drawn parallel with the other fold lines between the two center corner lines. Each side of the bellows is measured off in the same way. The corner folds are located precisely as in the case of the rectangular bellows, by drawing lines ¾ of an inch distant from the corner lines parallel with the latter, and crossing the squares so formed by diagonal lines, which represent the zigzag lines of the corner folds. Fig. 6 and Diagram B show positions of these lines. The double lines are to be creased from the inside.

One slight objection to this form of bellows is that it is liable to stick and not to freely expand. Hence Mr. Bierstadt has devised a simpler shape, in which the corners of the folds are truncated. This form is clearly shown in Figs. 7 and 8.

The bellows, by its peculiar construction, may be folded up more compact than any other, and at the same time is so elastic and springy that its folds do not in the least adhere or stick to each other. In Fig. 7 we see the conical shaped sheet after it is creased and cemented, in the process of being changed from the round to the square shape. After the flat sheet is creased, its ends are glued together, which forms a truncated cone. Then it is compressed at the creases into folds, as shown in Fig. 5.

Fig. 8 shows the peculiar corner fold of this bellows, the joint at the bottom, and its compact form when compressed.

Diagram C shows the plan and measurements of a bellows adapted for a 4 × 5 camera, as shown in Figs. 7 and 8.

The special difference in creasing from that shown in Fig. 6 and Diagram B is in the corner folds, which is explained more clearly by referring to Diagram D.

Supposing the inside measure at the back to be 5 in. and at the front 3 in., we locate a center line, C, and lay off the side corner line, D, as heretofore stated. We then divide the center line into inches, and draw lines parallel to A, extending them on each side as far as side line, D. We next determine the position of the intermediate line, I, by deducting from half the distance between E and A the amount of space between G and H, obtained by dropping a line from the intersection of fold line, E, with corner line, D, to the base line, A, the said line, E F, being parallel with the center line, C. Just here is an important difference. Instead of stopping the intermediate line, I, at the corner line, D, we extend it to point, J, or a distance beyond the perpendicular line, I F, equivalent to the space between I and F or between E and I. We then draw the line, J, parallel with corner line, D, and have a guide where to draw the zigzag line, since the intermediate lines like I extend to line, J, and the inner fold lines, like A and E, to line, D. By drawing a diagonal line from H to J across the square, K, and from J to E across the square, L, we have the proper location and angle for the corner crease lines. From the point H, we measure off half of the width of the inside of the intended side of the bellows. Draw a center line perpendicular to its base, and measure off on that the position of the fold lines as described for the top of the bellows. It will be seen that on the sides of the bellows the intermediate lines stop at line, J, while the other fold lines cross the line, J, and meet at E. By this method a curious skew shape of the cross lines, especially between lines, D and J, is observed, but is necessary in order that the folds may come out in unison.

A bellows constructed after the above plan presents a very neat and light appearance. It requires a little more paper, but is, by reason of its elastic qualities, almost self-acting. It should be remembered that the use of dividers must be avoided, since the slightest puncture in the paper will damage the bellows. Working plans of the different forms of bellows will shortly appear in the SCIENTIFIC AMERICAN SUPPLEMENT.

SARGENT'S PALM. (*Chamœphenix Sargentii.*)

For many years the royal palm held court as a small family of nobility on the southernmost extremity of southwestern Florida, at Cape Sable. These few examples were all that were known to belong to the United States, as a native growth. The small grove was a place of resort for lovers of the curious and interesting in nature, but the vandal hands of some of the too rapidly increasing bands of hunters and tramps long since carried off every vestige of the wood from these beautiful vegetable forms.

It was with great pleasure that we learned from Mr. Monroe, of Staten Island, that he had discovered several of the grand trees on a piece of timber which he had purchased near the Miami River. Mr. Monroe was an early purchaser in this region, and adds to his enterprise in planting the new lands near the Everglades considerable scientific and æsthetic skill. He

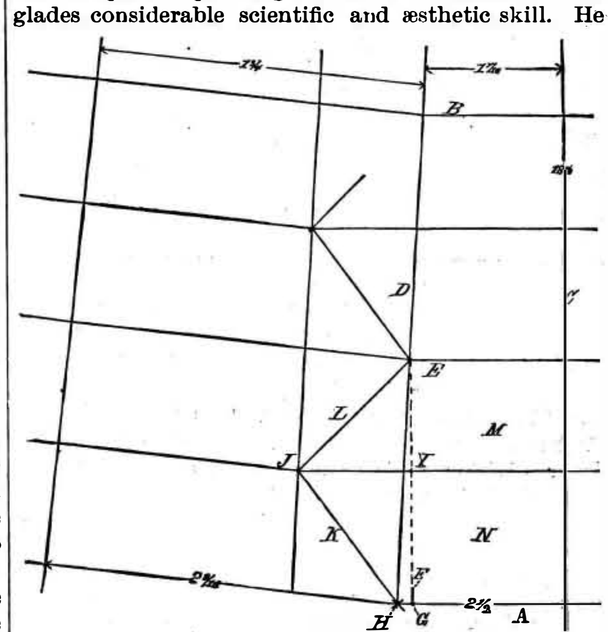

DIAGRAM D.—PLAN OF TRUNCATED CORNERS.

penetrated the thickets in all directions, and with photographic implements in hand he secured the pictures of all notable objects.

It was with surprise that he came upon several handsome palms, differing wholly from those which are familiar to the visitor there. He readily decided that they were royal palms, yet their low and outspreading foliage struck him as differing from those glorious trees.

The habitat of these palms is so difficult of access, it is scarcely strange that they have never before been seen. Elliot's Key is another and more recent locality of these palms, lying about eight miles off the southeastern coast of Florida, forming with Arsenicker Keys the southern boundary of Biscayne Bay. The island is about seven miles long and about a half mile wide. Here the very successful experiment of raising pineapples is being repeated with profit.

In 1886 Prof. Sargent, of Cambridge, was engaged in examining the botany of the region. Here the proprietor, Mr. Filor, led the party to what was considered a group of young royal palms. On observing the fruit, which was not fully matured at the time, it showed plainly that it was of a distinct species, and new to science. As there are about a thousand species of the palms, their identification is not always easily accomplished. Prof. Sargent sent a specimen of this tree, in the form of its fruit and some other essential parts, to Prof. Wendlandt, of Germany, who has great facilities for the study of such plants. It was found that the newly discovered tree was not only different in species, but in genus also. Hence the Professor has named it *Chamœphenix Sargentii.* The first or generic name denotes its resemblance to the date palm.

Prof. Sargent first visited these trees in April, when the fruit was not yet ripened. He thinks that the tree flowers in September, and that the fruit ripens in June—when it is about the size of children's marbles. The fruit is borne mostly in twos and threes, the thin, smooth pericarp incasing one, two, or three spherical nuts. The ber-

A NEW PALM—SARGENT'S PALM (CHAMŒPHENIX SARGENTII).

ries of the royal palm are scarcely larger than buckshot. This new tree reaches about twenty feet in height.

Mr. Monroe informs us that the Messrs. T. & E. A. Hine, of Woodside, N. J., owners of a large cocoanut grove in the western end of Long Key, while prospecting came across "quite a large grove of what they took to be the royal palm," rather stunted in growth, as they thought, by the winds. It seems that Mr. Monroe was suspicious that the tree was not a true royal palm, as he was familiar with both, having found on Little River several specimens of what now prove to be new. He transplanted several, and up to lately they were doing well. Should these new trees prove hardy and easily propagated, they will be a valuable addition to the semi-tropical flora of the United States.

That they stand quite low temperatures is seen by the fact that in the winter 1875-76 the mercury at the above localities stood at 36°—a point much lower than ever known there before.

We are indebted to A. H. Curtiss for some items of interest connected with the discovery of this new tree, he having accompanied Prof. Sargent as a botanical guide to the Florida flora.

A New Compass.

The *Alta California* gives an account of the test of a new compass invented by Leon Sirieix, a Frenchman by birth, and a graduate of the French Polytechnic. The compass as exhibited consists of a brass cylinder divided into two compartments. The lower compartment contains the corrector of the needle, while the upper division contains the compass card, which is swung on a pivot, as in the ordinary compass. On one side of the cylinder, close to the base, is a screw, and in the center of the base is another. These are the adjusting screws, the first, A, being used for correcting the permanent magnetism, and the other, B, for the correction of the induced magnetism. The inventor placed his compass on an imaginary ship, and laid her head due north, or in other words, made the "lubber line" form one with the pole on the wall. The needle then pointed due north. On the other courses the same result was attained. The needle never deviated one degree from the north. Iron was placed around the compass, and the needle was observed to deviate a degree west. The inventor moved screw, B, and adjusted the needle carefully. The imaginary vessel was swung again, and on every course the needle pointed due north. It was also shown that the compass had no "heeling error," which is caused by the rolling of the vessel. A most severe test was applied, but the card remained perfectly horizontal. The Sirieix compass was revolved at a great rate, much more than could ever be attained in swinging a ship, and directly the motion was stopped the compass card was seen to be still pointing north, and it had moved little more than half a degree on each side of the "lubber line." The compass card was spun round at a great rate. Left to itself, it became dead in about one minute's time. An ordinary compass would revolve probably five minutes or more. Mr. Sirieix has in his compass avoided the use of compensating magnets placed in the deck or binnacle, vertical bars, and other arrangements necessary to the compasses mentioned. He has, to use his own expression, "centralized and neutralized" the magnetism of the ship in a spot directly beneath the compass card, thus succeeding where others have failed. The *Alta* says: "Prof. Sladky, of the University of California, has testified in writing to the splendid performance of Mr. Sirieix's instrument, and it has also been examined by Lieutenants J. B. Milton, E. J. Dorn, and G. M. Stoney, of the U. S. Navy, all of whom agree as to the efficiency of the compass."

Spanish Naval Progress.

The United States government has at last screwed up its courage to the extent of ordering ships that shall make 19 knots an hour. This is equivalent to being about a quarter of a century behind old Spain. The Spanish navy is now in possession of a war vessel, the Reina Regente, that sails at the rate of 21 knots per hour. Probably by the time our 19 knot ships are ready, Spain and other nations will have vessels that can make 25 knots. It seems to be difficult for our Navy Department to keep posted as to what is being done by other naval powers. What is the use of building antiquated, slow boats, when better and more approved forms are already afloat that can sail around them and run them down.

The Reina Regente has a displacement of 5,000 tons, 12,000 horse power, burns 1·4 pounds of coal per hour per horse power, and has a very formidable armament. This wonderful vessel was built in 15 months' time. The fastest torpedo boat is also in the Spanish navy. It is named the Destructor, and runs at a speed of 22½ knots or over 26 miles per hour.

Spain is rapidly regaining her ancient prestige on the sea. Spanish steamship lines are fast being extended all over the world. Splendid Spanish steamers now ply between New York, the West Indies, and Mexico. On the Pacific the Spanish steamers are vigorously competing for the coast trade.

Gas Lighting.

The first really authentic record of experiment on the destructive distillation of coal for the production of illuminating gas occurs in a work by Dr. Stephen Hales, published in the year 1726. In it he says that from the distillation of 158 grains of Newcastle coal, 180 cubic inches of gas (or, as he says, "air") could be produced. In the year 1792, William Murdoch, of Redruth, in Cornwall—a Scotchman by birth—experimented on the gas produced by the destructive distillation of various animal and vegetable substances, though it does not appear that he used any other means of purifying the gas than water. Upon the occasion of the national illumination at the peace of Amiens, on March 28, 1802, he lighted up a portion of Messrs. Boulton & Watt's factory at Soho, near Birmingham, with a public display of gas lights; and this is probably the first practical attempt at gas lighting upon a tolerably large scale. He afterward extended the apparatus so as to give light to the principal shops in the neighborhood; and in 1805 he fitted up plant for lighting Messrs. Phillips & Lee's cotton mill.

But we, as a nation, are not to bear the whole honor of introducing gas as an illuminating agent, for in 1799 Lebon lighted up his house in Paris with coal gas, much to the astonishment of the people; and Mr. F. A. Winsor, happening to be at Brunswick at the time the experiments were made known, was much interested, and forcibly struck with the vital importance of the results. On his return to England shortly afterward, he endeavored, by a series of popular lectures which he illustrated by suitable experiments, to overcome public prejudice, and advance the general adoption of coal gas as an illuminant.

After many unsuccessful attempts, Winsor succeeded in forming a company in the year 1810, when an act of incorporation was obtained under the title of "The Gas Lighting and Coke Company;" the royal charter, however, not being granted till the year 1812. But from that time to this the use and manufacture of gas for illuminating, domestic, and manufacturing purposes has steadily and enormously increased, till at the present day it forms the center of one of the most important and profitable of the industries which invariably accompany the triumph of civilization and science over the dark mist of ignorance and superstition.—*A. C. Wilson.*

Magnesia.

Dr. Frank, of Charlottenburg, refers to the previous experiments of Vicat, Macleod, and Deville, who had noticed the possibility of employing magnesia as a cement, but it was not until the need of finding some use for the enormous quantities of refuse magnesia salts, arising as by-products in the manufacture of potash at Stassfurt, that the subject again recently attracted attention. The question is of all the more importance in that the other compounds, the chlorides combined with the magnesia at Stassfurt, are valuable for the production of bleaching powder and hydrochloric acid. When Sorel pointed out, in 1867, that a cement could be produced by mixing chloride of magnesium and magnesia, it was hoped that good results would ensue. The composition of this cement was based upon much the same principles as the white stopping used by dentists, made of zinc oxide and chloride of zinc. This cement of Sorel, in spite of many attempts to use it, proved a failure in consequence of a tendency, often noticed also in calcareous cements, to swell and blow, owing to deferred hydration. Dr. Grundmann, of Hirschberg, has recently patented a new method of treating the magnesia, for whereas formerly the material was merely calcined and made up with water, he now carefully slakes the calcined magnesia, and subsequently exposes the compound or casting to the action of carbonic acid gas, much in the same way that builders have been in the habit of drying and hardening plastered rooms by confining the air and burning coke in them, so as to liberate carbonic acid gas. The natural carbonate of magnesia, known as magnesite, is a mineral of great hardness and density, and the similar substance obtained by the above treatment resembles magnesite in its hardness and in its capacity for taking a good polish. Grundmann also employs the magnesia as a cementing agent for various materials, for instance, by the use of marble dust an artificial dolomite is obtained. The magnesia can also be improved by adding to it soluble silicates of the nature of water glass, and it can be used as a stucco for building purposes.

Liability of the Telegraph Company.

A lumber dealer in Bangor, Me., delivered to the Western Union Telegraph Company at that city, for transmission to his correspondent in Philadelphia, the following message: "Will sell 800 M laths delivered at your wharf two ten net cash. July shipment. Answer quick." The message as delivered in Philadelphia omitted the word "ten," making the price read "two net cash." The offer contained in the telegram was accepted immediately by telegraph. The laths were shipped at the price named in the telegram as delivered, viz., two dollars per M, and the Bangor dealer brought suit against the telegraph company to recover for the loss sustained by him. The company relied, among other things, upon a stipulation printed on the blanks to the following effect: "It is agreed between the sender of the following message and this company that said company shall not be liable for mistakes or delays in the transmission or delivery or for non-delivery of any unrepeated message, whether happening by negligence of its servants or otherwise, beyond the amount received for sending the same." The company also urged that the plaintiff was not bound by the erroneous message, and need not have delivered the laths to his Philadelphia correspondent. The Supreme Judicial Court of Maine (Ayer vs. Western Union Telegraph Company) decided against the company upon both grounds. It held in the first place that the stipulation referred to did not bind the sender, but was void, as against public policy, declaring it to be essential for the public good that the duty of the company to use care and diligence should be strictly enforced. In the second place, the court held that the sender of the message was bound by it, even if erroneously delivered, but that he had his remedy over against the telegraph company. As between sender and receiver, however, it held that the party selecting the telegraph as the means of communication should bear the loss caused by the errors of the telegraph.

John B. Cornell.

The senior member of the great iron manufacturing firm of J. B. & J. M. Cornell, of New York City, died October 26, at Lakewood, N. J., in the 67th year of his age. He commenced work in this industry when fifteen years old, and in 1847, with a brother, opened a factory in New York City. The first year they employed only four or five hands, but their business grew steadily, and the firm now employs upward of 1,000 men, being among the largest manufacturers of iron for building purposes in the United States. They furnished a large part of the iron for the elevated railroad structures in New York, and are now furnishing the iron for the Brooklyn elevated railroads. Mr. Cornell was a trustee of the Broadway Savings Bank, a member of the Union League Club, and a prominent member of the Methodist Episcopal Church, being President of the Board of Trustees of Drew Theological Seminary. His gifts and charitable contributions to the church have been very large, and he always took a lively personal interest in its work. He leaves a widow and seven children.

Iron Brick Paving Stones.

Paving blocks called iron brick are now being introduced by Louis Jochum, of Ottweiler, near Saarbrucken, Germany. This brick is made by mixing equal parts of finely ground red argillaceous slate and finely ground clay, and adding 5 per cent of iron ore. This mixture is moistened with a solution of 25 per cent sulphate of iron, to which fine iron ore is added until it shows a consistency of 38° Baume. It is then formed in a press, dried, dipped once more in a nearly concentrated solution of sulphate of iron and finely ground iron ore, and is baked in an oven for 48 hours in an oxidizing flame and 24 hours in a reducing flame. The German government testing laboratory for building materials has reported favorably on this brick.

Simple Method for Reviving Persons Apparently Dead.

At a meeting of the last congress of German scientists this subject was discussed, and Dr. H. Frank mentioned that there are but two ways to stimulate the heart—electricity and mechanical concussion of the heart. The first is considered dangerous by him, as it may easily destroy the last power of contraction remaining in the organ. But what is termed "pectoral concussion" is decidedly preferable. Dr. F.'s method is as follows:

He flexes the hands on the wrist to an obtuse angle, places them both near each other in the ileo-cæcal region, and makes vigorous strokes in the direction of the heart and of the diaphragm. These strokes are repeated from fifteen to twenty times, and are succeeded by a pause, during which he strikes the chest over the heart repeatedly with the palm of his hand. In favorable cases this method is early successful, and sometimes a twitching of the lids or the angles of the mouth appears with surprising rapidity as the first sign of returning life. As soon as the symptoms are noted, the simple manipulations above described must be earnestly continued and persevered in from a half to one hour, for, with their cessation, the phenomena indicating beginning return of life also cease. Generally, the face assumes a slight reddish tint, and at the same time a faint pulsation maybe felt in the carotids. By this method Dr. F. has seen life return in fourteen cases, among whom were such as had hung themselves, drowned, and asphyxiated by carbonic oxide, and in one case by croup. In three cases of asphyxia by coal gas and in one case of apparent death by chloroform the method described alone succeeded.—*Med. and Surg. Reporter.*