through one of the seven terminals, and this directs it to one of the seven counters, B, upon whose dial it is registered.

The indications that show the quantity of rain that has fallen remain, then, upon the dials; and these, in order to furnish new indications eight days afterward, must be set again at zero. For this purpose the commutator is made to act by double contact, and, at the instant at which it causes the circuit to pass from the Monday dial into that of Tuesday, for example, it sends into the latter a current that has the effect of ungearing the wheelwork and allowing a spiral spring to carry the index-hand back to the zero or starting point.

M. Collin has not had time to render his apparatus complete by adding to it a totalizing counter, which, connected with the line wire, would have indicated the passage of all the currents coming from the distributer and passing into any one of the dials. In this way there would have been obtained the total quantity of rain that falls during the year, without the necessity of transcribing each week the indications of the seven dials.

The electrical anemoscope which we shall now describe, and which is the invention of M. Bisson, consists of two apparatus, a distributer (Fig. 4) and receiver (Fig. 5). The former of these, which is located in the cupola of the campanile, is arranged as follows: Upon the rod of the weather vane, which enters into the interior of the cupola, and which, revolving upon an agate, participates in the motion of the vane, there is mounted a horizontal cone wheel that gears with a second and vertical one. This latter is mounted upon an axle which carries at the same time a planet wheel, E, that gears with two like wheels, F and G. These latter are loose on the axle to which the planet wheel is fixed. As the result of such an arrangement, in the motions of the planet wheel around the axle if one of the wheels, F, G, is held, the other is carried along, and *vice versa*. Each of the wheels, F, G, carries a ratchet wheel, upon which rests a contact lever that performs at the same time the rôle of a click, so that the motion of the vane in one direction or the other can carry along only one of the two wheels, and consequently send electric currents brought about by the contact levers only into one of the two line wires that start from the latter to go to the receiver. The keys which close the circuits with the lever are connected with an ordinary electric pile.

As we have just seen, the motion that actuates the wheels, F, G, comes from the central axle, which is itself carried along by the rod of the vane.

The receiver (Fig. 5) is constructed upon the same principle, which allows of a circular motion to the right or left; but, as it is necessary to reproduce here the motions of the vane exactly, that is to say, those of the axle of the planet wheel, operations take place in an opposite way. To effect such a result, two electro-magnets have their armatures arranged so as to actuate two wheels like those of the distributer (F and G), although here these wheels have no contact levers or ratchet wheels, the armatures performing the part of clicks. The line wires starting from the distributer terminate at these two electro-magnets, whose second wire is fastened to the pile. The two wheels that are actuated by the electro-magnets gear with a planet wheel whose axle communicates its motion to an index, which, representing the vane, indicates upon a rose the direction of the wind.

The mechanism, instead of being carried along by the axle, as in the distributer, is moved along by the action of the armatures upon the wheels and planet, all the angular motions of the vane producing series of electric currents that bring about like angular motions of the index, whatever be its direction.

Fig. 6 represents the registering apparatus located in the Pas-Perdu hall of the Comptoir d'Escompte, and which, thanks to the mechanism that we have just described, permits the public to be constantly informed as to the direction of the wind, the quantity of rain that has fallen, and the state of the temperature.

Opposite the case containing the registering apparatus there is another, the counterpart of it, which supports a clock that gives the phases of the moon by multiple dials, and the hour in the principal cities of the world. In the anemoscope case there is also a barometer.—*La Nature.*

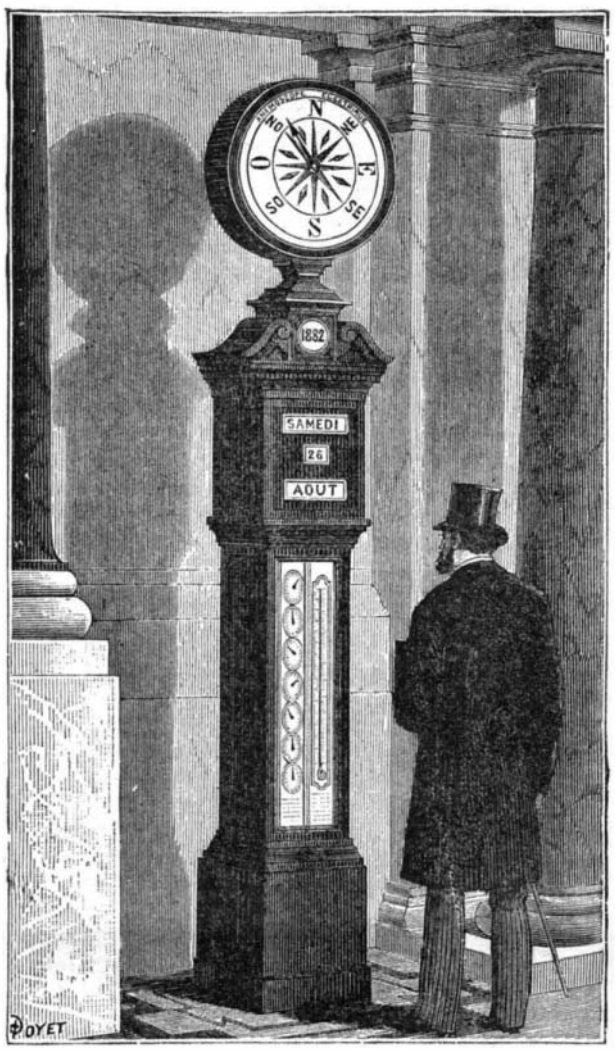
The Sixth Sense.

At a recent meeting of the Anthropological Institute, London, Mr. Francis Galton, F.R.S., exhibited and explained some apparatus contrived by himself, with a view of testing the muscular and other senses. This apparatus consisted of a box, something like a backgammon board, containing trays of weights arranged for measuring the relative delicacy of the muscular sense (the sixth, added by modern psychological science to the five recognized by the ancients) as existing in different persons.

The principle Mr. Galton claimed as a new one. It established, he said, a graded scale of sensitivity, and was applicable, by means of analogous methods, to testing the delicacy of other senses, such as taste and smell. He employed small weights arranged in sequence, which were numbered in succession 1, 2, 3, etc., and differed by equally perceptible variations, as calculated by Weber's law. Hence if a person, A, could just distinguish, say, 1 and 3, he could also distinguish between any two weights two grades apart, as 2 and 4, 3 and 5, etc. Again, if another person, B, were twice as obtuse as A, he would be able to distinguish one grade only where A could distinguish two. In other words, he would be only just able to distinguish between weights 1 and 5, 2 and 6, and so on.

Generally, the number of grades between the weights that any person could distinguish had to be found by trials, and that number became the measure of the coarseness of his sensitivity. The weights used were blank cartridges, filled with shot and wadding, care being taken that the shot should be equably distributed. They were arranged in trays, each tray holding a sequence of three. The person tested had to arrange the cartridges in the tray handed to him in the true order of their weights.

Some provisional results of the plan were mentioned. One was that men had, on the whole, more delicacy of discrimination than women; another, that intellectually able men had more than other men. It further appeared that women sensitive to a morbid degree were not remarkable for their powers of discrimination. Sensation was produced in them by a feeble stimulus, and so was pain, but the intervening numbers of just perceptible differences did not appear in their case to be exceptionally large.



METEOROLOGICAL APPARATUS IN THE GRAND HALL OF THE COMPTOIR D'ESCOMPTE.

JUMPING SEEDS.

These "flea seeds" were brought to notice some time ago, and were described at length in the *Mining and Scientific Press* and *Pacific Rural Press*. It seems, however, that they have made their appearance in Butte County, and are the object of some curiosity, being considered something new. As a matter of general information we give an illustration of the "seed" and the insect, and extract from the report of C. Mason Kinne, of the San Francisco Microscopical Society, who followed their development through to the perfect insect. He says:

JUMPING SEEDS.

"The seeds are very minute, presenting the appearance of a mustard seed, and are of a brown color. On placing them in the open hand the 'seeds' jump about from one place to another in a very lively manner. Even when in a phial or small bottle the same characteristic is manifest, and, as they were somewhat peculiar, the 'flea seeds' have attracted considerable attention.

The gall or cocoon is found lightly attached to the leaf of the oak, and in time falls to the ground, when the noise occasioned by the thousands leaping about, without any apparent cause or organs of motion, sounds very much like the falling of fine rain on the leaves. An examination shows that the extraordinary activity displayed is caused by the spasmodic contraction and concussion of the abdominal parts of the occupant against the side of the shell, which movement does not cease even after the covering is nearly split in halves, if the tender structure of the chrysalis be not injured. That it is the chrysalis and not the larvæ has been shown by the microscope, and its change to the perfect insect has been noted at weekly stages."

The average length of the insect is five-hundredths of an inch, and in each has been found from 60 to 80 pear-shaped ova. The engraving gives its general appearance, with wings raised somewhat unnaturally, for the purpose of showing their size and shape. It was drawn on the wood, from the microscope, by Mr. Kinne, and is enlarged twenty diameters. Its ovipositor is a tiny, though perfect, piece of nature's mechanism, and lies incased in a sheath at the lower part of the abdomen. Mr. Henry Edwards, of the Microscopical Society, furnished the following technical description of the curiosity:

"GENUS CYNIPS—*L. Cynips saltatorius* (nov. sp.).—Black, shining. Head broad between the eyes, which are very prominent. Antennæ fourteen, jointed, the first and second joints being much swollen, and the third joint larger than the other two; the remaining joints are long, simple, and nearly equal. Thorax densely but finely punctured, very globose in front, projecting so far as to almost hide the head. Abdomen globose, shining. Ovipositor cases short, spatulate, received into marginal groove in the body. Ovipositor itself flesh color, curved inwardly toward its middle. The abdomen is six-jointed. Terminal joints of palpi hatchet shaped. Tarsi very hairy throughout, the anterior pair with six and the remainder with seven joints. Coxæ very globose. Tibiæ long, with large and powerful spines at the base."—*Mining and Scientific Press.*

Meerschaum.

This well-known mineral, which consists of silicate of magnesia and water, part of which is hygroscopic and part chemical combined water, is chiefly obtained, says the *Industrie Zeitung*, from near the city of Eski-Scheir, in Asia Minor, where it was mined on a large scale even before the time of the Turks. The city is surrounded by a basin, or depression, which was in all probability a large lake, now dried up. All around the borders of this basin are found masses of meerschaum mixed with pebbles and bowlders in a sort of red earth. The stratum forms an angle of 45° with the hill. Between every two strata of pebbles, which are sometimes interrupted by a stratum of earth, there is found a layer of meerschaum. The meerschaum frequently envelops a block of gravel or piece of quartz rock.

The blocks of meerschaum when first mined are wet and dirty, and to fit them for export they must have the earthy crust removed and be dried, polished, and refined. The refining of a lot of one hundred chests requires two months' work on the part of twelve or fifteen persons, and costs about 1,200 florins ($600). The average price at Eski-Scheir for a chest of merchantable ware has varied since 1873 between 160 and 250 francs, and last year (1881) it was 161 francs ($32.20), while the refuse, fit only for converting into a plastic mass, could be had for 23 to 35 francs.

Ten qualities of meerschaum are recognized, and each is to be had of four different sized pieces. A chest 30 inches long, 8 inches wide, and 15½ inches deep will hold from 25 to 40 of the largest sized masses, 100 to 150 of the second size, 200 to 250 of the third size, and 450 to 650 of the smallest.

In the last two decades the exportation of meerschaum has varied considerably; amounting to only 3,000 chests in 1855, and rising to 9,500 in 1870; in 1875 it fell to 8,300, and rose again to 11,100 in 1881.

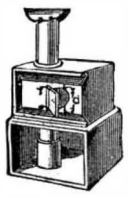
This quantity is handled by fifteen firms in Constantinople, comprising Austrians, Bulgarians, Greeks, Armenians, and Turks. These send their ware to branch houses or consignees in Vienna, which is the only established market for this article. Vienna's immense importation of meerschaum dates from the middle of the year 1850, when the production of pipes and cigar holders received an immense impetus from the exportation to England, France, and America. At the beginning of 1860 a considerable export of pipes to San Francisco began, while at the same time large quantities of cigar holders were sent to Australia and America *via* Hamburg. Since then the conditions have changed, for the introduction of this article into America has been checked by high tariff duties. By the aid of Austrian workmen that have emigrated thither, an industry has been founded in America which competes successfully with the Vienna pipe manufacturers, of which America was formerly the largest customer. The United States, like France and Germany, obtain most of their raw material from Austria.

Siegfried Adler, in a recent book on Constantinople and its neighborhood, says that for the last ten years there has been a steady decline in the meerschaum business, part of which is attributable to an unstable currency in the place where it is found.

SINCE 1850 eighty-two people have thrown themselves from the Vendome column in Paris.

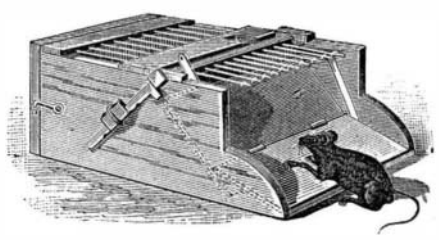
Improved Polyopticon.

In this device the object is to highly illuminate a picture placed at the side of a box or camera, and cause it to be reflected upon a screen in a dark room, the picture being in the process greatly magnified by a lens. By regulating the distance of the instrument from the screen, a small photo or other picture can, it is claimed, be made to appear on the screen of life size or larger, and it can therefore be made practically useful in art work for enlarging designs, etc., as the more expensive wonder cameras have mainly been employed. For business or pleasure it is available to a large number of persons who could not afford the more expensive but less convenient imported cameras. Further information may be obtained by addressing the Murray Hill Publishing Company, 129 East Twenty-eighth Street, New York city.



Improved Animal Trap.

This is a self-setting animal trap, having a box of any suitable size, closed at its rear end by a door, which is wired, as shown, and at the top by the wires which are made fast at their rear ends in a crosspiece, and at their forward ends in a central crosspiece. In front of the crosspiece and near it is journaled in the upper edges of the side pieces of the box, a rock shaft carrying a series of wires, which are of a length about equal to the depth of the box. The shaft is connected by means of an arm and connecting rod to a board, which is hinged to the bottom of the box. On one end of the shaft, outside of the box, is fixed an arm, which is so weighted as to normally hold the shaft so that its wires will be held in a horizontal position, and the hinge board in an inclined position. A tip-up board is pivoted to the hinge board, and arranged so that, when the trap is sprung by an

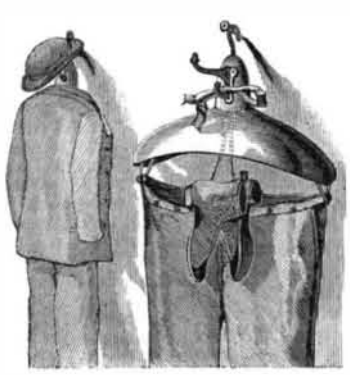


animal, the rear end of the tip-up board will be thrown up, frightening the animal into the box. There is a housing for the bait hook, which protects the bait on the hook from the caught animal. The weighted arm will normally hold the trap set until an animal walks up the board to the bait, and attempts to detach it from the bait hook. This will release the detent, whereupon the weight of the animal, overbalancing the weight of the lever, will cause the board to drop, the tip-up board to rise, and the wires to be swung down into a vertical position, cutting off all retreat of the animal and causing him to jump into the box. The weight of the animal having now been removed from the board, the weight of the arm will turn the shaft and reset the trap ready for the next animal, and prevent all possible escape of the animal in the box. This invention has been patented by Mr. Benjamin F. D. Miller, of Wooster, O.

Suit Hanger.

This is a suit hanger with attached devices for hanging or carrying if necessary an entire suit of clothes, and for keeping them in perfect shape, free from breaking down.

The suit hanger is made to conform in shape to the chest and shoulder portion of the body. It is made of sheet metal, with a neck projecting up from it, having at its top a hook, by which the whole is suspended. Secured to the interior of the hanger, and arranged to project below it, are two close bent wire pantaloon hangers, made with contracted necks, so as to receive opposite side buttons on the waist portion of pantaloons, so that the pantaloons are hung in a spread condition.



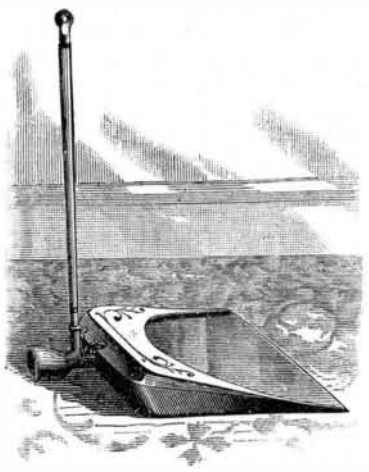
The body part of the hanger serves to receive over it the vest, coat, and, it may be, overcoat of the suit, all of which may be secured on or be prevented from falling off the hanger by buttoning them by their upper buttons thereon. These several garments may be kept smooth or unbroken in their original and proper form, and the shoulders of the coats and the entire suit, in fact, be retained in shape till worn out.

A hook for suspending a pair of shoes is fastened to its bottom, and attached to the front of the neck is a hook for hanging on a hat, and a smaller hook for receiving within it a collar and necktie.

This invention has been patented by Messrs. G. N. Werntz and Henry L. Lemert, of Dresen, O.

Improved Dust Pan.

This dust pan is capable of being held by the foot while the dust, crumbs, or other substance to be removed is swept into it. The pan has a toe-socket for the foot in its handle, and a branch socket for the insertion of an upright removable handle to facilitate the use of the pan. The improvement renders the stooping of the person while using the pan unnecessary. This will be found of great benefit by persons having weak backs, or women in delicate health, and to whom stooping is injurious. With this improvement both hands are left at liberty to ply the broom. This invention has been patented by Annie M. H. Moss, of Monroe, Conn.



Falling from Heights.

With regard to the recent sad suicide of a girl by leaping from one of the towers of Notre Dame, Dr. Bronardeli's expressed view that asphyxiation in the rapid fall may have been the cause of death, has given rise to some correspondence in *La Nature*. M. Bontemps points out that the depth of fall having been about 66 meters, the velocity acquired in the time (less than 4 seconds) cannot have been so great as that sometimes attained on railways, *e. g.*, 33 meters per second on the line between Chalons and Paris, where the effect should be the same; yet we never hear of asphyxiation of engine drivers and stokers. He considers it desirable that the idea in question should be exploded, as unhappy persons may be led to choose suicide by fall from a height under the notion that they will die before reaching the ground. Again, M. Gossin mentions that a few years ago a man threw himself from the top of the Column of July, and fell on an awning which sheltered workmen at the pedestal; he suffered only a few slight contusions. M. Remy says he has often seen an Englishman leap from a height of 31 meters (say 103 feet) into a deep river; and he was shown in 1852, in the island of Oahu, by missionaries, a native who had fallen from a verified height of more than 300 meters (say 1000 feet). His fall was broken near the end by a growth of ferns and other plants, and he had only a few wounds. Asked as to his sensations in falling, he said he only felt dazzled.

The Discovery of Grape Sugar.

At the present time, glucose, or artificial grape sugar, is being made in such quantities, and so much has been said and written for and against it, some regarding it as identical with the natural sugar of fruits and honey, others as differing from it physiologically, if not chemically, that our readers will be interested in the early history of the substance. The first mention of it was made by T. Lowitz in an article published in Crell's *Chemische Annalen* for the first half of the year 1792. This journal, then one of the leading scientific periodicals, is now so scarce that no public library in New York city is in possession of a set of it.

Lowitz discovered a peculiar kind of sugar in honey, and gives in that journal a quaint but interesting description of the manner in which he discovered and prepared it.

We may conclude, says Lowitz, that honey owes its sweetness to the abundance of sugar that it contains, but that no one knew how to separate this from the other constituents. This separation was the chief object of his experiments. First he succeeded in removing the peculiar taste, odor, and color by filtering the diluted honey over charcoal, but on attempting to concentrate the solution by evaporation, it turned brown and showed no tendency to crystallize.

After several months, he continues, there appeared in my honey, which had been treated with charcoal and again concentrated, some very small, white, shining bodies of crystalline nature, which gradually increased in quantity, and finally filled out, for the greater part, the whole mass of the honey. In order to be able to investigate the nature of this granular substance, it was necessary to carefully remove from it the brown, thick, sticky substances. This succeeded best by washing it with cold, highly rectified spirits of wine (alcohol). I was delighted to see that, by mixing strongly together, the alcohol dissolved the adhesive matter without perceptibly attacking the white granular particles, which were finally entirely cleansed from it by frequent washing with fresh alcohol. The sugary substance that remained on the filter, after gently drying, could be rubbed to a fine and perfectly white powder, which did not attract moisture from the air and possessed an agreeable sweet taste.

The author goes on to state that all his efforts to obtain regular crystals were fruitless, that the crystalline masses always resembled cauliflowers (or warts) and consisted of very fine needles. He also found that the solution was turned brown by lime water, and after precipitating the lime, an acid remained. This sugar was also decomposed by other caustic alkalies, he says. After discussing the difference in the action of this sugar and other sugar toward alkalies, Lowitz adds that the other substance extracted from the honey sugar by alcohol differs from it in no other respect except that it cannot be obtained in a dry form by any means; that to this latter substance honey owes its property of turning brown by heat, for when the honey sugar has been freed from it the solution can be boiled over the fire without browning. Moreover, this sweet, sticky substance resembles honey sugar in all other properties, as well in taste as in its action toward caustic alkalies and quicklime.

He concludes with the assertion that there is no hope of our ever being able to make sugar from honey, as something more is necessary than to merely remove the foreign substances.

Reading these remarks with the light that ninety years of research have thrown upon them, they stand forth as remarkable instances of correct observation. The crystals which he obtained were dextrose, or ordinary glucose, while the uncrystallizable sugar is now known as levulose, a mixture of the two constituting fruit sugar as it exists in honey.

Ten years or more elapsed before Kirchhoff discovered the now important fact that this form of sugar could be made from starch by the action of dilute acids; and a half a century rolled away before the manufacture of sugar from starch became one of the large—very large—chemical industries.

Overproduction of Lead.

The following from the *Mining Journal* does not present an encouraging prospect to lead producers. It says that both lead and spelter are steadily continuing on their downward course, and so far as the former is concerned, the outlook is discouraging. Production has been stimulated in an exceptional manner during the last few years, and much capital that was invested in the development of mines and in the building of smelting works has been beginning to show returns in the shape of base bullion. It is not alone the great plants of Colorado, Utah, and Nevada, the existence of which is known to all, but also the large number of small establishments in many mining camps in the West, which are swelling the make of lead. Under this pressure, lead has gradually receded. In pure metal to-day, it can be readily obtained for four and a half cents. The question which all interested in the metal are anxiously attempting to answer is, whether an accumulation will continue. It is true, on the one hand, that the business season for the consumers of lead has passed by; that in sympathy with business in general, building has fallen off; and that corroders have been persistently limiting stocks in course of manufacture. On the other hand, it must not be forgotten that a very large number of the small smelters are located in inaccessible regions, where the supply of raw materials is difficult to get; that few of them have capital enough to buy large quantities of ore and fuel and stack the base bullion besides. Even the large smelting works are affected in the same way, and a restriction of the output may result equal to the reduction in the consumption. These circumstances should not be forgotten at a time when there is a disposition to look only at one side of the question; still, the outlook is gloomy enough, and it is only too likely that the bottom has not been reached.

Commercial Effects of the St. Gothard Tunnel.

The *Continental Gazette* says that the opening up of the St. Gothard route is changing the commercial relations of the countries north and south of the mountains with almost revolutionary rapidity. So long as the formidable Alps remained unpierced, Italy was cut off from direct overland communication with Central and Northern Europe, and its commerce was very largely limited to transactions with Great Britain and France. The Gothard Railway is changing that state of things with unexpected rapidity, and is throwing the Italian trade into the hands of Germany, Belgium, and Holland. The through railway service brings early fruit and vegetables without transshipment from all parts of Italy to Ostend, Antwerp, and Rotterdam, whence they are conveyed by fast steamers to London and other English ports. The Great Eastern Railway Company alone is stated to have carried over 6,000 tons of these goods *via* Antwerp and Harwich in a few months. Malta is thus also brought nearer, and Algerian produce, such as green peas and early potatoes, is made more available.

In the other direction, Italy is receiving an unprecedented, not to say overwhelming, amount of attention from Germany. In the first two months after the opening of the Gothard route, the Germans dispatched 40,000 tons of coal, 107 tons of unmanufactured iron and hardware, 14,000 tons of machinery, 693 tons of copper, 17,409 tuns of spirits, 1,446 tons of paper, and 76 railway wagons—of all of which articles the previous exports had been either *nil* or quite nominal.

Ice Houses and Ice Boats.

The usual annual inquiry as to the construction of ice houses and how to build ice boats has commenced. The best information to be had as to the first (ice houses) may be found in the SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 55, 59, 99, 116; and as to the last, engravings and full instructions as to the building of ice boats may be found in the following numbers of the SUPPLEMENT: 1, 54, 61, 63, 70, 220, 214. To be had at this office or of newsdealers, price 10 cents each.