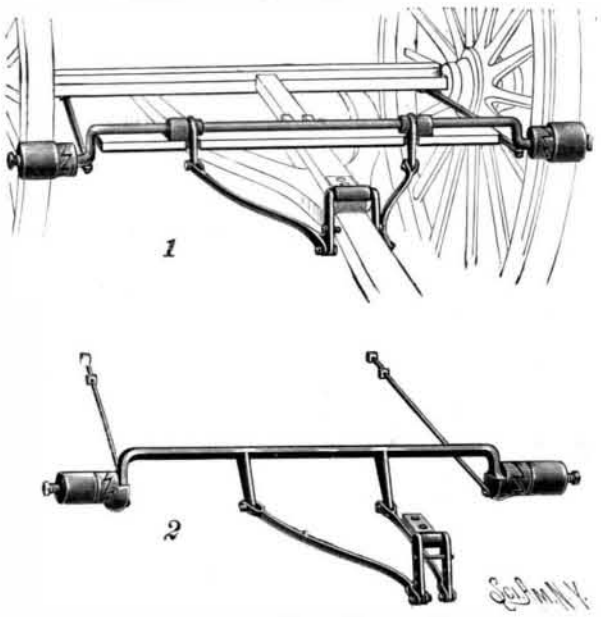
AN AUTOMATIC VEHICLE BRAKE.

This brake, which has been patented by Mr. H. D. Cool, is applied by the team in holding back, as in going down hill, and is so constructed that, without removing the shoes from engagement with the wheels, the vehicle may be as readily backed as if the brake were not applied. Fig. 1 represents the application of



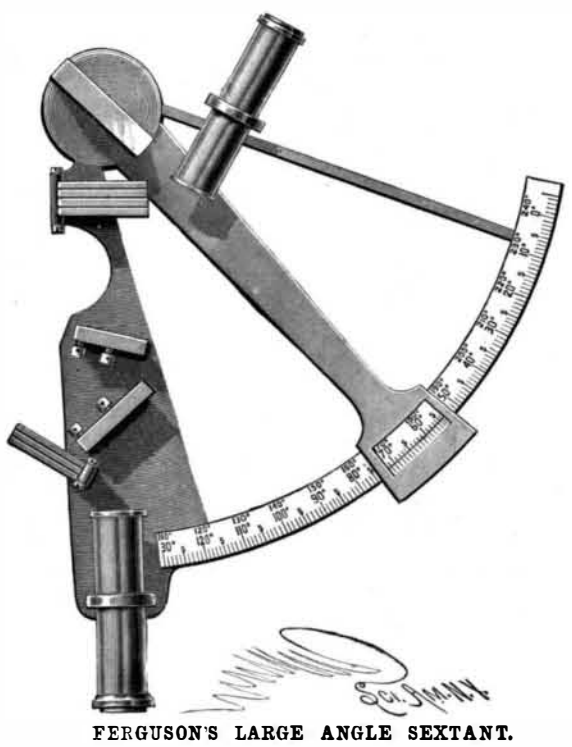
COOL'S VEHICLE BRAKE.

the device, it being shown in Fig. 2 detached from the vehicle. Mounted on or supported from the rear hounds is a rockshaft having at each end a crank arm in front of each rear wheel, and each arm carries a cylindrical shoe made in two sections, both loosely mounted, and having opposing clutch faces. The outer section is constantly held in engagement with the inner one by a spring confined on the crank arm by a cap or stop, and the space between the sections is guarded from dirt by a shield. The movement of the brake to and from the wheel is controlled by rods pivotally connected with the inner sections of the shoes, eccentrically or concentrically, the opposite ends of the rods being attached to an axle. The reach of the vehicle has more or less end movement, and to it it attached a clevis connected by links with crank arms on the rock shaft, the links being adjustably connected that the power with which the brake is applied may be increased or diminished. The holding back on the part of the team, causing a rearward movement of the reach, effects the application of the brake, the inner sections of the shoes being held stationary by the rods projecting from the axle, and by the engagement of the clutch teeth, preventing the revolution to the rearward of the outer sections of the shoes, which are at the same time brought into contact with the periphery of the wheel. As the outer sections of the shoes are, however, free to revolve in the opposite direction, the backing of the vehicle will not be interfered with.

This improvement is being introduced by Mr. Charles G. Locke, of Randolph, N. Y.

A LARGE ANGLE SEXTANT.

The sextant attachments shown in the illustration convert the ordinary sextant into a measur-



FERGUSON'S LARGE ANGLE SEXTANT.

ing instrument for measuring large angles, extending the range of the sextant to the measurement of angles up to 240 degrees. The improvement has been patented by Mr. Thomas T. H. Ferguson, of the imperial Chinese customs service, Peking, China. The instrument is still essentially a sextant, and may be of the most improved and accurate kind, its affixures rendering it capable of spanning the larger arcs without detriment to its accuracy and nicety of adjustment. The same index arm is used, and the same vernier and arc divisions, but the value of the angle is taken from figures engraved above the old figures on the silver arc, additions which can be made to any sextant by a maker of ordinary skill. The engraving shows the arrangement of parts, there being behind the horizon glass another horizon glass in every respect similar, except that it is slightly broader, and it is mounted perpendicularly, being firmly fixed to an extension of the framework, allowing of the usual adjustments around horizontal and vertical axis. Its center is placed on the line which connects the centers of the old horizon and the index glass, and it makes with the old horizon glass an angle of exactly sixty degrees, its back turned toward the back of the old horizon glass. In newly constructed instruments it is better to mount the two horizon glasses on a common base plate to be fixed to the framework of the sextant. The set of dark glasses usually found behind the horizon glass, being moved from their place by the new horizon glass, must be shifted further back on the visual line of the first telescope, as they have now a double function to perform, for when using the second telescope it is advisable to raise those glasses so as to shade off noxious reflections from the back of the first horizon glass. The improvement enables one to measure each angle over 120° twice, first the angle itself and then its supplement. Supposing all parts to be properly adjusted, a mere shifting of the eye from the usual telescope to another fixed at another part of the instrument is all that is needed to use the sextant in its large angle capacity.

The Falls of Niagara.

The Niagara River extends from Lake Erie to Lake Ontario, a distance of 30 miles. It receives the waters of all the upper lakes—Erie, St. Clair, Huron, Michigan, Superior, and a number of smaller ones. From source to outfall it has a total descent of 334 feet, but greater part of the fall occurs within a distance of 7 or 8 miles, beginning with the rapids, 2 miles above the great falls, which received their name—Niagara, meaning the "thunder of waters"—from the aborigines. Their roar, under favorable circumstances, may be heard at a distance of 15 miles.

There are three distinct falls: The Horseshoe Fall—so called from its crescent shape—is by far the largest, and is in the direct course of the river. It is 2,000 feet wide and 154 feet high. The American Fall is 660 feet wide, and the Central Fall 243 feet, each having a fall of 163 feet.

The water flows on perpetually the same, full and clear; neither the snows of winter nor the evaporation of summer, neither rains nor drought materially affect it—excepting that about once in every seven years there is a gradual rise and fall, which is attributed to some undiscovered disturbance that affects Lake Erie.

"Of all the sights on this earth of ours which tourists travel to see," wrote Anthony Trollope, "I am inclined to give the palm to Niagara. In the catalogue of such sights I intend to include all buildings, pictures, statues, and wonders of art made by men's hands, and also all beauties of nature prepared by the Creator for the delight of his creatures. This is a long word; but, as far as my taste and judgment go, it is justified. I know of no other one thing so beautiful, so glorious, and so powerful."

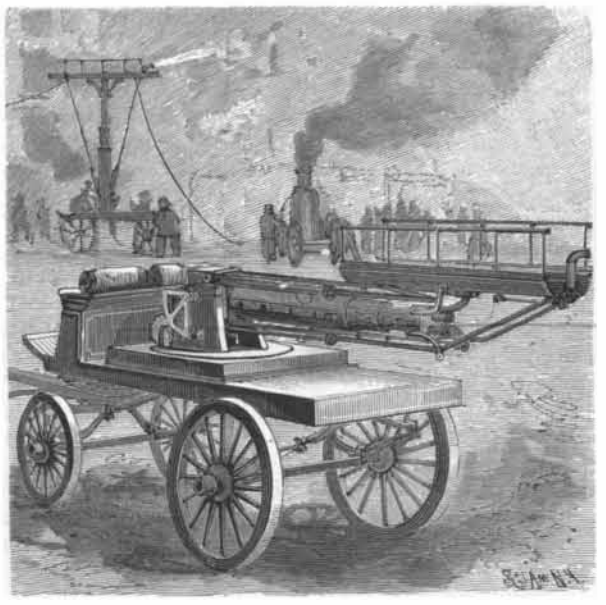
This wonderful cataract is 447 miles from New York, within a single day's journey, and is reached most directly by the New York Central and Hudson River Railway, of which it forms the western terminus.—Dr. A. N. Bell.

Interesting Records of the Wanderings of Derelicts.

In a recent issue we referred to a decision of the Admiralty and Board of Trade of England, which condemned the United States charts referring to the position of derelicts, on the ground that the charts probably exaggerated the danger from this source. The distance which such vessels traverse is, however, much greater than is generally supposed. Such wrecks are sighted from time to time by vessels and their position at the time is recorded, and a careful record of all these observations makes it possible to prepare a chart which, in a general way, will show these wanderings. According to a chart of this kind, recently published, the derelict Fannie E. Wolston has traveled during the past five years somewhat more than 10,000 miles. This calculation is based upon forty-six reports made by various vessels. Another derelict, which started on its wayward course in 1891, drifted about 3,500 miles up to the time it was last seen, or a period of 615 days. Another remarkable derelict, the W. L. White, floated about the North Atlantic for 310 days, covering in that time some 5,910 knots. All these long-lived derelicts have been heavily loaded with lumber and they have, therefore, been able to keep afloat for very long periods. The lumber buoys them up and prevents the storms from crushing them. Derelicts are moved for the most part by the force of various ocean currents. And in general they eventually float to that portion of the North Atlantic known as the Sargasso Sea, where the currents are very sluggish and weak. This region is, fortunately, outside the track of most of the Atlantic commerce. It can readily be seen, however, that in these wanderings the derelicts are likely to prove very dangerous.

A HOSE BRIDGE AND TOWER.

The illustration represents an apparatus for fire departments, which may be collapsed and folded into small compass or extended and raised as required, forming a hose bridge to carry lines of hose over a railway or street. The apparatus is also arranged to discharge water from the bridge without the use of the hose, thus enabling it to be employed as a fire tower, with revoluble nozzle operated from the truck. The improvement has been patented by Messrs. James Blake and Emil F. Begiebing (address E. F. Begiebing, No. 285 Canal Street, New York City). The truck carries a bed plate with circular track supporting rollers on which is a turn table carrying the superstructure, the table being rotated by means of a gear and pinion connection with a crank within easy reach of the driver's seat. On the table are pillow blocks in which are journaled the trunnions of the lower section of the tower, this section having an enlarged casing at its lower ends serving as a housing for the gear at the foot of the tower. The trunnions have toothed segmental racks engaging worms on shafts whose gear wheels engage a driving gear with a crank handle, also near the driver's seat, by which the sections of the tower may be raised to a vertical or turned down to a horizontal position. The lower tower section has



BLAKE AND BEGIEBING'S HOSE BRIDGE AND TOWER.

in its opposite sides anti-friction rollers, enabling the second section to be moved up easily, which is effected by means of a screw whose driving gear is actuated by the turning of a crank, the screw also entering and engaging racks in the third tower section, thus serving to raise both sections. The several sections of the tower have at their upper ends hooks adapted to support ladders, and at the upper end of the top section are brackets for the support of a bridge, so fulcrumed that by removing a pin, the bridge may be swung to lie substantially parallel with the body of the tower. The bridge has hand rails, or guards, and is held rigidly in horizontal position by hinged braces, which are extensible to provide for the varying height of the tower. The apparatus also has telescoping pipes in the tower sections, connecting at the top with a cross pipe to which a hose may be attached, or from which water may be discharged directly upon a fire, the head connected with the pipe having the movement of a universal joint, and being turned by means of pinions and an extensible shaft, with a hand wheel at its lower end, to discharge the water in any desired direction. The apparatus may also be employed as a fire escape.

Wool Scoured with Naphtha.

In a new method of scouring wool, naphtha is employed as the cleansing substance. By means of a pump the naphtha is forced through and through the wool, extracting all the natural oil. It is claimed that the naphtha does not injure the fiber of the wool, as alkali cleansing, but leaves the fleece in better condition than when cleansed by any other process.

A further valuable feature of the new method is that after the grease is extracted from the wool it may be again extracted from the naphtha in a pure state, thereby becoming valuable as a medicinal agent or for a saponification into the purest of soaps. It is claimed that a plant following this method scoured 500,000 pounds of wool, and had saved a product of 80,000 pounds in pure wool oil.

Science Notes.

Electrolysis of Glass.—A very curious experiment upon the action of currents traversing glass has recently been made by Mr. Stansfield. He placed amalgams of potassium, sodium, and lithium in a balloon and immersed the latter in a bath of mercury kept at a temperature of 200°. The anode of a powerful electric battery was introduced into the balloon, while the cathode dipped in the external mercury. At the end of a few hours, the balloon was taken from the mercury, when the following phenomena were observed: With the amalgam of lithium, the glass had become very fragile and had lost a little of its transparency. The bath of mercury contained sodium.

With the sodium the same phenomenon, but the glass had undergone no alteration.

With the potassium there had been no transfer of metal.

Mr. Roberts-Austen attributes these singular results to the size of the atoms. According to him, the potassium, having too large a molecule, cannot substitute itself for the sodium in the glass for want of space. The lithium, having too small a molecule, replaces the sodium, but separates the constituent molecules and thus diminishes the cohesion. As for the sodium transported by the current, that substitutes itself in the glass for the silicate base without any other modification than a continuous carriage.

Building Materials of Wood Fiber.—According to the Schweizerische Bauzeitung, an inventor has just patented in Switzerland and other countries a new process for the manufacture of objects from wood fiber, such as paving blocks, building materials, etc. The wood fiber is mixed with a suitable agglomerant having mortar as a base. Previous to this, the fiber is impregnated with vitriol, sublimate, etc., to render it antiseptic, after which it is thoroughly dried. The plastic mass obtained through the mixture of wood fiber and mortar is well pulverized and pressed into moulds. As soon as the material has set it is removed from the mould and dried. It is said that the objects thus obtained are light, porous, and tough, and are bad conductors of sound and heat. They can be sawed, nailed, drilled, and otherwise treated, just like wood.

Solder for Glass.—According to the Revue Universelle, an alloy formed of 95 parts of tin and 5 of copper adheres to glass with such tenacity that it may be employed as a solder for connecting tubes end to end. It is obtained by first melting the tin and then adding the copper, the mixture being stirred all the while with a wooden rod. This mixture is run into a mould and melted anew when needed for use. The addition to it of from ½ to 1 per cent of zinc or lead renders it more or less hard.

Artificial Rubber.—According to the Revue de Chimie Industrielle, an artificial rubber of more or less strength may be obtained by dissolving 4 parts of nitrocellulose in 7 parts of bromo-nitro-toluol. Upon varying the proportion of the nitro-cellulose there may be obtained a material possessing elastic properties and much resembling India rubber, and even gutta percha. The bromo-nitro-toluol, says the Revue, may be replaced by nitrocumol and its homologues.

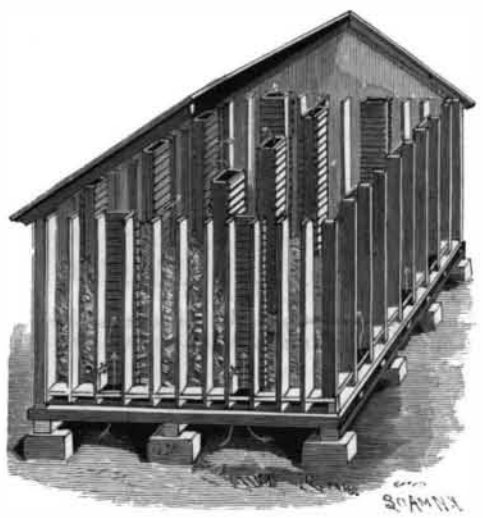
Preservation of Polished Surfaces against Rust.—L'Energie Electrique says that the polished surfaces of steel tools, such as chisels, saw blades, etc., may easily be preserved against rust by the following process. Half an ounce of camphor is dissolved in a quart of melted lard, and the scum which rises and floats on the surface is collected and mixed with sufficient graphite to give it the color of iron. The tools, having first been wiped, are covered with this mixture. At the end of twenty-four hours they are wiped with a soft rag. Thus treated, the tools will remain free from the least spot of rust for several months.

New Process for Hardening Glass.—Since the failure of the Bastie method of tempering and hardening glass, various other processes have been tried which have given more or less satisfactory results. Among these there is one, says the Revue de Chimie Industrielle, which originated in France, and consists in melting hard glass. The crude material, after having been melted in a peculiar style of crucible furnace, is run into moulds, as in casting iron, with the difference that instead of sand there is employed a special substance, and that the mould and the glass are heated and cooled at the same time. To replace the sand a material is selected that has the same conductivity and the same calorific capacity as glass. In this way the glass and the mould form, as it were, a homogeneous mass and the glass can be cooled without crackles, even though the cooling should be effected with relative slowness, this being indispensable whenever it is desired to obtain a hard glass. If care be taken that the surface of the glass do not approach the external envelope of the mould, it makes little difference in what manner the cooling is afterward effected, since the main point is that the mould and the glass shall be brought to the same high temperature, which must be rather greater than that at which glass hardened in a press is usually produced. After the mould has been perfectly heated, it is removed from the furnace and left in the open air, the effect of which is generally rapid enough to produce a proper hardening of the glass. After the whole has become well cooled the mould is opened and the piece removed.

Liquid Cement for Porcelain.—An excellent cement for china and porcelain, says the Revue Scientifique, may be obtained by melting together 75 grains of fish glue and 5 drachms of crystallized acetic acid, and afterward heating the solution until it becomes of a sirupy consistence, so as to form a jelly upon cooling. To use it, the jelly is placed upon a stove, so as to bring it to a liquid state, after which the edges of the broken crockery are coated with it and the pieces strongly compressed.

AN IMPROVED GRAIN BIN.

The illustration represents a bin which may be readily changed from a ventilated bin for ear corn to an inclosed bin for shelled corn, wheat and other grain, protecting the ear corn from the weather and thoroughly drying it by currents of air, and the change being quickly made to adapt the bin for the two uses. The improvement has been patented by Mr. Samuel E. Kurtz, of Mansfield, Ill. The sides and ends of the bin are preferably boarded with drop siding to render them weatherproof, and ventilators are formed in the bin by nailing slats or cribbing on a portion of the side and end studdings, whereby a series of flues is formed at certain distances along the sides and ends of the structure. When further ventilation is desired, or when middle studding is required, as may be necessary in an elevator building or a structure of several stories in height, some of the central studdings are similarly connected in pairs by means of slats, the ventilating flues thus formed each communicating with an opening in the floor, thus permitting a free circulation of air throughout the interior of the largest storage space. When the bin is to be used for shelled corn, oats, wheat, etc., the bottoms of the



KURTZ'S GRAIN BIN.

ventilators are closed by short pieces of boards, the grain then filling the ventilators, or, if desired, wire gauze may be fastened over the slats of the ventilators, whose bottoms may then be left open, and a good circulation of air thus insured through the shelled corn and grain. It is claimed that a storage bin of this construction will last as long as a residence, and may be used with advantage as a shelter or for other purposes when not occupied for storage.

Perfumes—Natural and Artificial.

Almost all the natural perfumes are of vegetable origin, and are derived from treatment of flowers and fruits. In this way are obtained the aromatic essential oils of rose, mint, anise, santal, thyme, cloves, etc., and the perfumes of the violet, iris, and jasmin. Musk is the only important perfume that is of animal origin.

For a long time now, however, the odor of fruits has been imitated with the aldehydes and ethers of fatty acids, such as the acetates, valerianates, benzoates, salicylates, and butyrates of methyl, ethyl, and amyl, which, mixed in definite proportions, recall the odor of strawberries, apples, pears, etc. The following are two examples of such mixtures:

PERFUME OF THE PINEAPPLE.

Chloroform	10 grains.
Aldehyde	10 "
Butyrate of ethyl	50 "
Butyrate of amyl	100 "
Glycerine	30 "
Alcohol, 100 per cent	(liter) 1

PERFUME OF THE APPLE.

Chloroform	10 grains.
Nitric ether	10 "
Aldehyde	20 "
Acetate of ethyl	10 "
Valerianate of amyl	100 "
Glycerine	40 "
Alcohol, 100 per cent	(liter) 1

The aroma of rum and cognac and the bouquet of wines have also been reproduced artificially. We shall not dwell upon the danger that accompanies the use of these products in a large quantity when they are mixed with beverages and alimentary substances.

Professor Lowe's Experiences with Balloons.

Professor T. S. C. Lowe, whose successes at Pasadena, Cal., in opening the wonders of Mt. Lowe are now well known, contributes an interesting paper in a recent number of the Mt. Lowe Echo, in which he gives some of his early balloon experiences. We make the following extracts:

The significance I attached to my early balloon work can be better understood if my reader compares and considers it with the "kite flying" of Benjamin Franklin. So much does the modern scientific world think of Benjamin Franklin and his simple kite, that one of the most imposing statues of the World's Columbian Exposition represented him in the act of flying the kite, and it occupied the post of honor at the main entrance of the Electrical building. It seemed a small and insignificant affair, and yet it was that "kite flying folly" that led to the discoveries which have made possible the telegraph, submarine cables, telephone, phonograph, electric lights, electric railways, and the thousand and one scientific and useful instruments and appliances of modern electricity. All these wonderful and useful inventions are the indirect result of that one little experiment of Franklin's, thus demonstrating the value of even small things, when directed for a scientific purpose by a scientific mind.

Few people understand the deep scientific interest that was felt by Joseph Henry and many men of his intellectual stamp in my balloon trip from Cincinnati in April of 1861. The trip was made purely in the interests of science. There was no monetary or other inducement in connection with it. In my observations of air currents I had become absolutely convinced of the existence, in the higher atmosphere, of a current which uniformly and almost invariably moved eastward, with but slight variations, no matter how diverse the surface currents might be. In order to test the existence of this current, over the ocean as well as the land, I planned the exact and necessary machinery to carry on the work, and the trial of it so interested a number of the prominent Eastern bankers and merchants that they offered to help sustain the expense, with a view—provided it was shown to be perfectly safe—to the inauguration of a balloon system which would convey information across the Atlantic in much less time than that occupied by the mail steamers. In those days there was no telegraphic communication between the United States and Europe, the first Atlantic cable having failed, and the only way, therefore, of getting mercantile news across the ocean was by means of the steamers. The merchants knew that the reduction by a day, or even, sometimes, of but two or three hours, in the time of the receipt of important news on business or other affairs would often make a difference to them of many thousands of dollars, enabling them to dispose of, or buy up, goods ahead of their competitors. This was the secret of their willingness to aid in sustaining the expenses of my earlier experiments. I was ready to receive their help, but my object in the work was purely for the interests of science, and to further the organization of the Weather Bureau elsewhere spoken of, and which has since been accomplished on the lines I suggested, by the United States government.

I had already constructed the aerostat for my Atlantic journey. It was the largest one ever built and has never since been approached in size or equipment. With it I safely lifted from the earth, including its own weight, sixteen tons, so that I was thoroughly convinced that I could safely convey across the Atlantic all the materials I required for comfort and safety. Not only was this balloon to carry ample instruments, provisions for the crew, and all the implements, etc., required for observation, and the manipulation of the balloon, but also a full rigged lifeboat schooner with airtight compartments, built of light steel plates.

Chambers's and other encyclopedias state that this balloon would lift 22½ tons. In order that the reader may not misunderstand the apparent discrepancies between their statements and mine given above, permit me to explain that had the balloon been filled with pure hydrogen gas, it would have lifted 22½ tons, but on this occasion I had to use the ordinary coal gas, which, being heavier, permitted me to lift only 16 tons.

Professor Henry, however, was so adverse to my running any risk by making the trip over and across the Atlantic, that he suggested before doing so I should thoroughly test the existence of this current over a long land distance. He advised me to go west with my balloon, make an ascent when the earth currents were blowing strongly to the west, and then, if when reaching the upper currents I sailed across the continent east, the existence of this eastward current, which I claimed did exist, would be sufficiently demonstrated to justify his urging the government to aid me in continuing the experiments, with a view to the organization of the Weather Bureau, to which object I had devoted my attention for so many years.

Acceding to Professor Henry's request, I left my large balloon, and, taking my smaller experimental balloon, went to Cincinnati, and for about a month