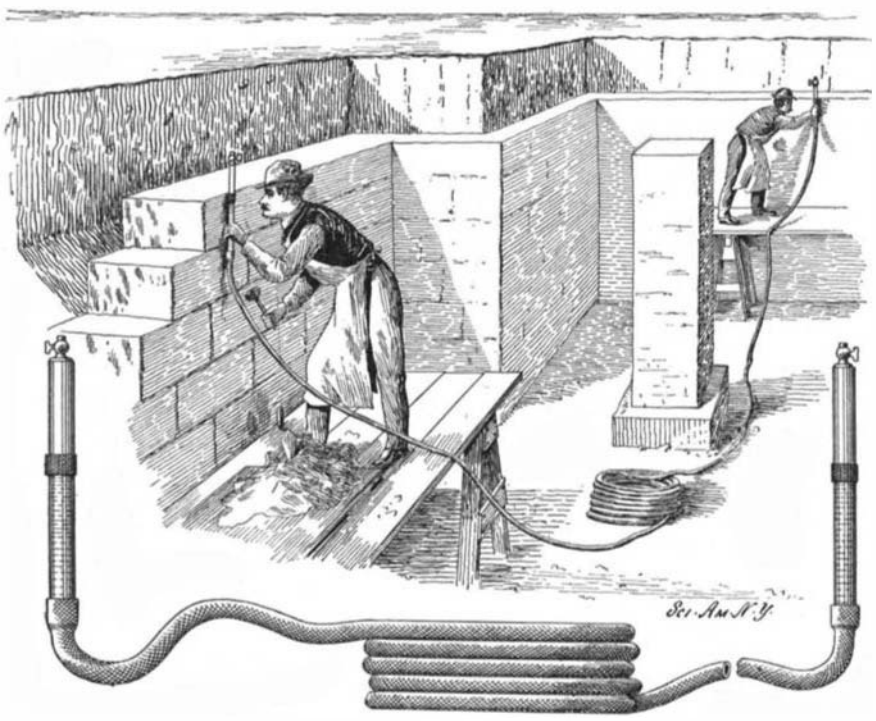
THE PRACTICAL APPLICATION OF THE HYDROSTATIC LEVEL IN BUILDING CONSTRUCTION.

BY OWEN B. MAGINNIS.

The science of modern building construction necessitates the introduction of such instruments, tools, and appliances as will expedite the work and lessen expense by economizing time. Such an implement is the hydrostatic or water level, shown in the accompanying drawing. The instruments most popular for leveling in laying out large works are the engineer's transit, theodolite or architect's Y level, all of which are of the utmost utility for mechanical operations. However, the form of improvised water level shown in our engraving is, perhaps, most adaptable, as it can be easily and cheaply made, is accurate in its action and simple in its application. As will be seen, it consists of a long piece of ribbed rubber hose or pipe, half an inch internal diameter, with pieces of transparent glass tubing, twelve or eighteen inches long, inserted in each end. These glass tubes should, if obtainable, be graduated into inches and parts of inches down to sixteenths, but if graduated tubes are not to be had, smooth tubes of clear thick glass of chemical tubing will do, and a quarter or half-inch section can be cut off the end of the rubber pipe and set over the glass tubes, which will slide up or down so as to form a gage.



A SIMPLE HYDROSTATIC LEVEL.

Water is poured into the rubber hose pipe and glass tubes till the ends overflow, when they are kept full by placing a small tip or faucet at the ends of the tubes, as shown. When in use, the faucets must be opened in order to allow the water to find its own level. One glass tube is placed against the wall which has been built to the required height, being held firmly against the face of the wall with the gage set four, six or eight inches from the top as desired, the gage being kept at the edge of the brick or stone wall templet, from which the required level is to be measured. Here it is held by one man, while another carries the other glass tube to the object to be measured. When the water is exactly on the line of the gage, the level point is determined, and the distance of the detail above or below the gage will denote the discrepancy in the relative heights. This will be readily understood from the engraving, where this simple instrument is represented in use as setting the levels on top of a foundation wall for templets for iron beams, or in a position where the transit or Y level and staff would not be so convenient or so applicable. Many masons use this instrument with a rod for finding depths of trenches for walls, piers, etc., for leveling for templets, sills, water tables, or other details, especially in an excavation which is crowded with piers, shores, derricks or appliances, which, of course, render the use of the transit or Y level impossible.

THE FRENCH METEOROLOGICAL OBSERVATORY AT TRAPPES.

It is, perhaps, not generally known that Major Baden-Powell, who has distinguished himself more than once in the Transvaal war, is not only a soldier of unquestionable ability but a scientist whose meteorological investigations have been stamped with the official approval of England's war ministry. It was through his influence that the English army abandoned the cumbrous military balloon and adopted in its stead the more easily controlled and more simply constructed kite.

The experiments made by the English major in collaboration with his brother officers have been described in Pearson's Magazine. As a result of the experiments in question, it was asserted that a man could be lifted several hundred feet in the air without the slightest danger and without the aid of any gas receptacle. An apparatus strong enough to lift two men weighs hardly more than 100 pounds. Kites can be assembled and sent into the air in five minutes. Their descent can be regulated by a parachute. The cost is hardly a fiftieth part of that of a balloon ascension.

Baden-Powell began his experiments in 1893. If he has not magnified the importance of the results which he has obtained, it is not too much to hope that, before the Transvaal war has seen its close, the utility of the kite as an instrument in modern warfare will be assured. If the truth must be told, it is difficult to imagine a man suspended 2,000 feet above the ground from a machine which is the plaything of the winds and which is only too ready to plunge down at any moment. But it is still more difficult to imagine this same man, without that feeling of security so essential to accurate observation, spying upon an enemy and endeavoring to gather such information as may be of value.

The proper sphere of the kite's usefulness would seem to be in that field of meteorological experiment in which Franklin was a pioneer. That the kite can also be used for military purposes (signaling and the like), and especially for taking bird's eye photographs by means of automatic apparatus, seems likely enough. But the lifting of a man to the dizzy height of a thousand feet or more, so that he may leisurely study an enemy's position, transcends the bounds of possibility.

In France both the kite and the balloon are also used; but not so much for military observation as for scientific study. At Trappes, between Versailles and Rambouillet, not far from the famous ruins of Port Royal des Champs, a camp and an observatory have been established where a few earnest scientists are devoting their time to the study of the upper strata of the atmosphere. This meteorological station owes its existence to the untiring energy of M. Léon T. de Bort, who has sacrificed not only his time but also his fortune to furthering the science of meteorology.

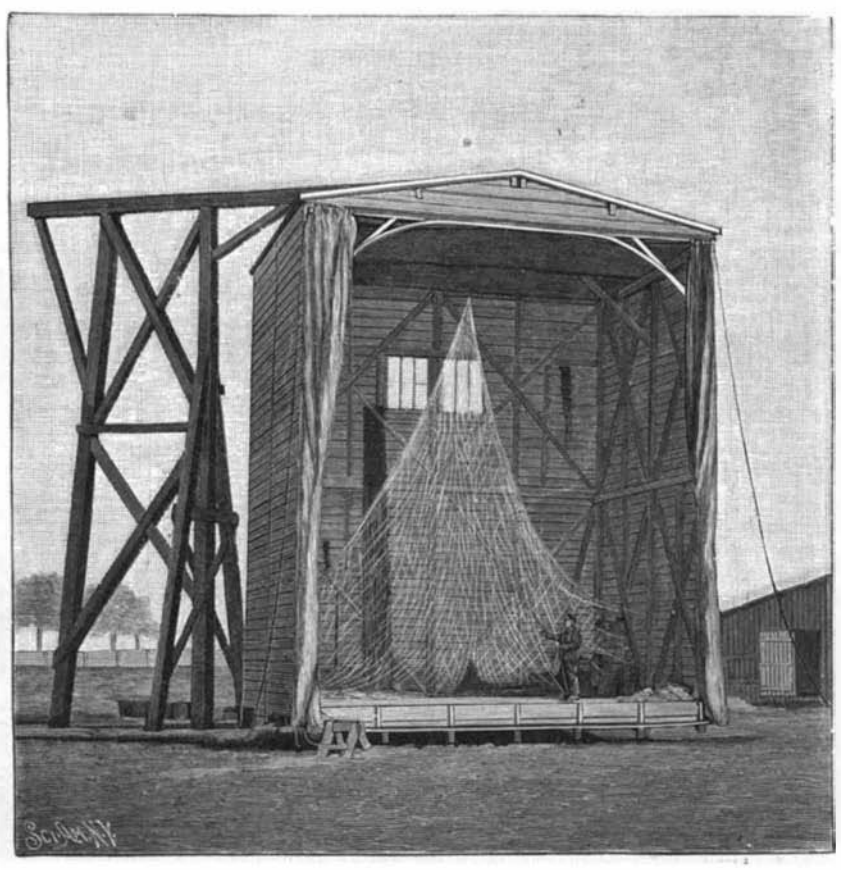
Perhaps the most curious structure among the isolated buildings which comprise the station at Trappes is the rotating house in which balloons are inflated. The house is mounted upon rollers so that it can be turned to suit the direction of the wind, and is connected by underground pipes with the hydrogen plant which forms an annex to the balloon and kite shed. In one of the adjacent buildings such instruments of precision as thermometers, barometers and the like are kept. The remaining houses serve either as photographic dark rooms and camera obscuras for photographing clouds, or as working rooms in which mathematical computations are made.

The experiments at Trappes are conducted with pilot-balloons and kites. The pilot-balloon is free. Once inflated and left to itself, it rises and drifts away to fall whenever its gas has escaped. If it lands in a country in which the people are enlightened and civilized, it is sent back to the starting place, together with all the automatic recording apparatus with which it was equipped.

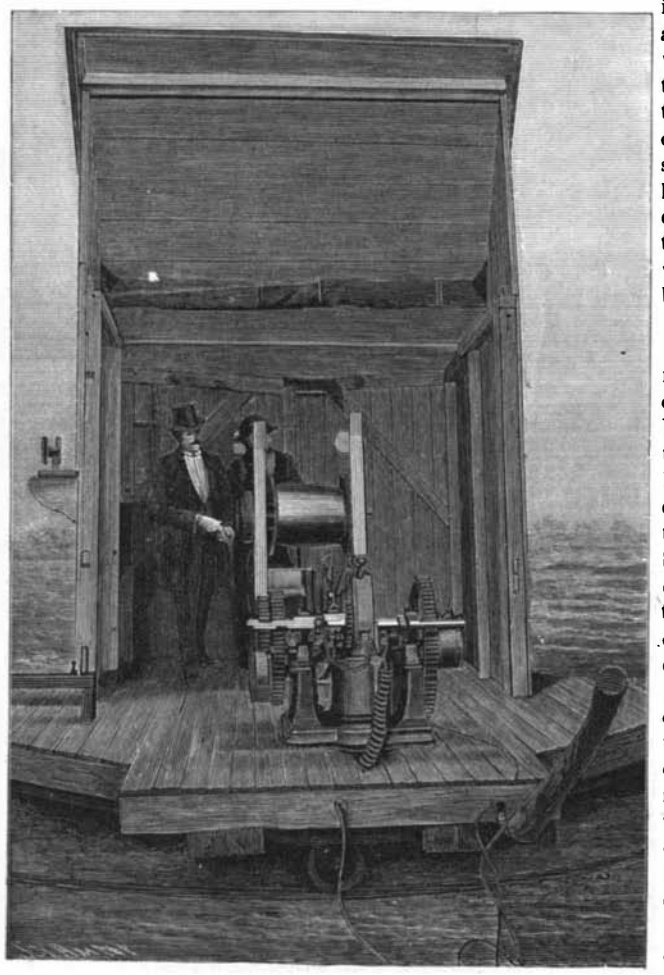
The recording apparatus referred to comprises several small aluminium cages. Upon a cylinder rotated by clockwork, three pens register the thermometric, barometric, and hygrometric conditions. As a matter of precaution, each instrument is accompanied by a checking apparatus, with the records of which the indications of the first instrument must agree.

Although the Trappes Observatory for dynamic meteorology has been in existence but two years, as many as 174 pilot-balloons have been sent up from its grounds. These balloons have attained an average height of 6,000 meters (19,680 feet), and almost all have fallen in the east, whatever the distance they covered. One balloon fell in the very heart of the city of Berlin. That the prevailing winds in the upper strata of the atmosphere are therefore southwest or southeast is obvious.

In addition to pilot-balloons, Hargrave box-kites are used, varying in height from 6 to 8 feet. They are secured to a windlass upon which 10,000 meters (32,800 feet) of steel wire are wound. The windlass is driven by an electric motor. At the ground end of the wire an instrument is mounted which indicates the length of wire paid out and the angle of its inclination. Within the box-kites other instruments are placed which record the temperature, pressure of the atmosphere, and hygrometric condition of the strata which have been traversed.



BALLOON-INFLATING HOUSE.



KITE-LINE-WINDING APPARATUS.

THE Department of Works of New South Wales is about to introduce a large floating crane for use at the port of Sydney. The crane, which is to be constructed within the colony, is to have a lifting capacity of 80 tons at a speed of 5 feet per minute, and 20 tons at a speed of 14 feet per minute. It is estimated that it will cost about one hundred thousand dollars.

Automobile News.

A new apartment house in course of erection on West End Avenue and Seventy-ninth Street, New York, will have attached to it automobile stables for housing the automobiles of tenants. Facilities for charging the electric vehicles are provided on the first floor, and the second floor is intended for living apartments for the vehicle attendants.

The new system of electrically propelled vehicles known as the Lombard-Gerin automotor has recently been put in operation at Vincennes Park. In this system the car, a kind of omnibus, is driven by a motor attached to one of the axles; it takes its current from an overhead wire, which supports a rolling trolley carriage from which hangs a flexible cable connected with the vehicle. At Vincennes a series of posts have been erected along the road which passes around Lake Daumesnil. As there are, of course, no rails, two bare copper wires are strung upon the posts; upon this rolls the carriage, carrying the flexible cable. The cable passes into a hollow mast supported on the top of the vehicle; its length may be increased or diminished, the slack being partly taken up by a counterweight contained in the column. The trolley is itself provided with an electric motor, which operates two friction rollers driving the main pulleys, which travel over the wire. The motor of the vehicle is of the continuous current type with series winding. On the opposite end of the shaft it carries a collector formed of three rings, by which alternating current, three-phase, is taken when the motor is in operation. This current is used to drive the motor of the trolley, and to this end the cable uniting the latter to the vehicle has six wires, two of these being direct current at 500 volts to the motor of the vehicle; this current then returns to the trolley in the form of three-phase current by three wires of the cable. The sixth wire is used to control a brake on the motor of the trolley. This system has been previously tried over a stretch of road five miles in length along the quay of Issy-les-Moulineaux, outside of Paris, where it succeeded very well. The tests made at Vincennes have met with equal success, and show to the public the method of working and the advantages of the system.

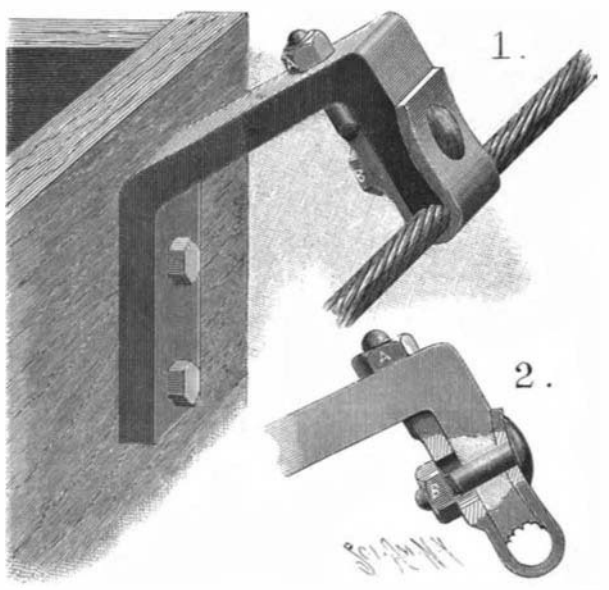
One of the most interesting features in the recent series of military maneuvers carried out in France has been the use of automobiles for transporting the officers and for carrying searchlights. The officers are now commencing to use the automobile, and find it a great convenience. General Brugère, for instance, has professed quite a liking for the automobile; during the maneuvers he made a trip from Chartres to Rambouillet, in order to pay his respects to President Loubet. Mounted on a 16 horse power machine, he made a speed of 36 miles an hour, the train making only 30 miles; he now prefers the automobile to the horse. General Lucas also favors the automobile, but prefers to travel at somewhat safer speeds. The officers had prepared a surprise on the occasion of the maneuvers, in the shape of an automobile searchlight. This was kept secret until the last moment, having been constructed under the supervision of General Brugère. M. Marcel Renault is the inventor of the system. The automobile used is of the road-wagon type, having two seats in front. In the rear has been constructed a light column which supports the searchlight at the top, carrying an arc lamp entirely inclosed in a metallic case which takes about 7 horse power. Below is a small dynamo of 7 horse power; it is mounted on a secondary shaft, which may be connected with the main shaft of the motor by a transmission system capable of being disconnected at will. The machine started out after dark on the immense plain of Beauce, which extends around Chartres, making a certain distance lighted only by its acetylene headlight, which covers about 150 feet. At intervals the machine stopped, and by means of a lever the dynamo was set in motion; the searchlight then sent a stream of light covering a distance of two miles, and by its means the country around was explored. After proceeding a certain distance this maneuver was repeated, and it was seen what valuable services an apparatus of this kind would render in such cases. The military staff were greatly satisfied with its performance, and there is no doubt that this automobile searchlight will prove a valuable adjunct to the army. For illustrations see the current SUPPLEMENT. On one occasion, a member of General Brugère's staff traveled over 100 miles in an automobile in a very few hours, and was able to supply the commander-in-chief of the army with full details of the operations accomplished by the various detachments. The Scotte train appears to have distinguished itself also in these maneuvers. One morning this train left Paris at six o'clock in the morning with a load of 30,000 pounds of corn for the front, and returned the same night, having accomplished a total distance of 50 miles. To perform the same task with animal labor it was estimated that thirty-six horses would have been required, and that they would have occupied three days to cover the same distance with the same convoy, which would have been twice as long and would have required a larger escort.

A CABLE-GRIP FOR MINING-CARS.

The accompanying illustrations represent an improved cable grip invented by Mr. George C. Niles, of Arcata, Cal., for use on mining-cars and other vehicles to be propelled by a traveling cable. Fig. 1 represents the device in perspective; Fig. 2 in partial section.

The grip comprises a fixed jaw secured to a bracket and a U-shaped clamping-band between the unequal members of which the jaw projects. The lower middle portion of the band clamps the cable against the free end of the fixed jaw. The band is clamped to opposite sides of the fixed jaw by means of a bolt and nut, *B*, the bolt passing through a slot in the longer member of the band. The end of the longer member of the band is screw-threaded, passes through a slot in the bracket of the fixed jaw, and is held in place by a nut, *A*.

When the nut, *B*, is released and the nut, *A*, screwed



AN IMPROVED CABLE-GRIP.

up, the clamping-band forces the cable up against the free end of the fixed jaw. This adjustment having been made, the nut, *B*, is screwed up so as to hold the members of the clamping-band firmly in position on opposite sides of the fixed jaw. The short member of the clamping-band is bent to fit the correspondingly-shaped outer face of the fixed jaw, so that the lower curved portion of the clamping-band properly fits the cable after having been adjusted.

A CONVENIENT ENVELOP MOISTENER AND SEALER.

An invention which has recently been patented by Charles L. Vose, of Westerly, R. I., provides a simple device for moistening and sealing envelops in a manner which is certainly far more cleanly than the method with which we are all familiar.

The moistener and sealer consists essentially of a central glass tube provided at one end with a soft rubber nipple in which a sponge is received, and at the

VOSE'S ENVELOP MOISTENER AND SEALER.

other end with a hard rubber cap in which the metal bearings of a soft rubber roller are held. The central glass tube contains water which is fed to the sponge. In sealing an envelop, the gummed flap is moistened by means of the sponge. The device is then turned around, and the moistened flap evenly and squarely sealed by means of the rolls journaled in the cap previously mentioned.

For the purpose of holding the moistener and sealer when not in use, Mr. Vose employs a holder composed of a soft rubber suction base upon which a glass holder is mounted. When the rubber suction base is moistened and pressed down on a table or desk so that the air is expelled, the holder will be so firmly affixed that its removal requires no little effort.

A CORRESPONDENT in Providence, R. I., suggests that wireless or aerial telegraphy be called "airograph."

Science Notes.

The tomb of Sir Humphry Davy, at Geneva, which has been in a neglected state for some time, has recently been restored.

Astronomer Wolff, of Heidelberg, has, by means of his photographic process, discovered three asteroids in a single night.

Nearly every window in Paris, specially in the poorer quarters, has plants growing in pots. A wealthy philanthropist has had the idea of opening a hospital for sick plants in the Faubourg St. Antoine. Greenhouses have been built and there are gardeners to look after plants that are brought in until they recover. They are then returned to their owners.

A basket modeler has been invented by Mr. Thomas Taylor, the superintendent of the Liverpool School for Indigent Blind, for the purpose of assisting blind people in the construction of their baskets. The device consists of a wooden base-board drilled with holes into which are fitted steel pins arranged to the required shape. The wicker is then worked over these pins with the utmost ease and rapidity.

The Prussian government is making systematic inquiries with a view to increasing knowledge upon the subject of cancer. Every registered physician has received a paper asking questions relative to experience in cancer cases. An attempt is being made to find out if cancer is hereditary, if it is contagious, and whether it is connected with any particular habit, such as over-indulgence in alcohol, tobacco, etc., and whether it is more prevalent in one district than in another.

Widespread damage has been caused in the Archæological Museum in Florence through the madness of a door-keeper. He at first endeavored to murder the director of the museum, but as his efforts in this direction were frustrated, he seized a chair and commenced to smash everything that came within his reach. Before he was overpowered he had hopelessly pounded to fragments an ancient historic vase discovered in China in 1844 and estimated to be worth $100,000, and also a Roman chariot found in Egypt which was worth over $600,000 and which we have illustrated.

A short time ago, during some digging operations in Chester, England, an interesting relic of the Roman occupation of Great Britain was unearthed. This was a section of lead piping, supposed to have been laid about the year 79 A. D., and was utilized for the purpose of carrying water to the Roman camp. About twelve months ago a similar piece of piping was unearthed near this same spot, but its origin was disputed. This new discovery, however, sets all such controveries at rest, since upon the piping are plainly inscribed the words "Cnœus Julius Agricola." This relic is additionally interesting since it is said to be the only inscription extant bearing the Roman governor's name.

One effect of the cotton crisis in Liverpool, Manchester, and the other towns of Lancashire, owing to the failure in American cotton, has been the introduction of Egyptian cotton upon the English market. Efforts have been made for some time past to induce the spinners of Lancashire to experiment with the Egyptian product, but with only indifferent success, since the supply from America was so adequate. But America's shortage has proved Egypt's opportunity, and now several spinners are using Egyptian raw material. If the latter article obtains a strong footing among the Lancashire spinners, it will possibly be a heavy blow for the American growers, since the Egyptian producers will exert themselves to the utmost to flood the market. If they can only succeed in meeting the demand, they will be sure of an increasing and lucrative trade.

M. Schoen has devised a new photographic printing process. The inventor bases his discovery upon the use of diazo compounds, as in the primulin process and feer-type. He converts ortho-amido-salicylic acid into its diazo compound by the action of sodium nitrite on a well cooled solution of the acid in dilute hydrochloric acid. The precipitated product which results is washed with small quantities of water, and is subsequently dissolved in a dilute sodium carbonate solution. The paper to be coated is either immersed in this solution, or the latter may be applied to the paper with a brush; or with a mixture of it and gelatine, and then dried in the dark room. The paper is then placed in the printing frame under the negative, and printed in the ordinary way until a strong red image is obtained. The fixing and toning of the prints are exceedingly simple, since the print has only to be washed in water, as is the case with ferro-prussiate paper, until the yellow color of the unexposed parts of the paper has disappeared, when the finished picture in red is obtained. This red substance is the resultant effect caused by the light acting upon the diazo compound. The color does not change at all through exposure to the light, but a variety of tones may be obtained by immersing the finished picture in solutions of salts of iron, cobalt, etc., or in lime or baryta water.