## THE PRACTICAL APPLICATION OF THE HYDROSTATIC LEVEL IN BUILDING CONSTRUCTION.

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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.

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.

A SIMPLE HYDROSTATIC LEVEL.

## 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 descentcan be regulated by a parachute. Thecost 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.

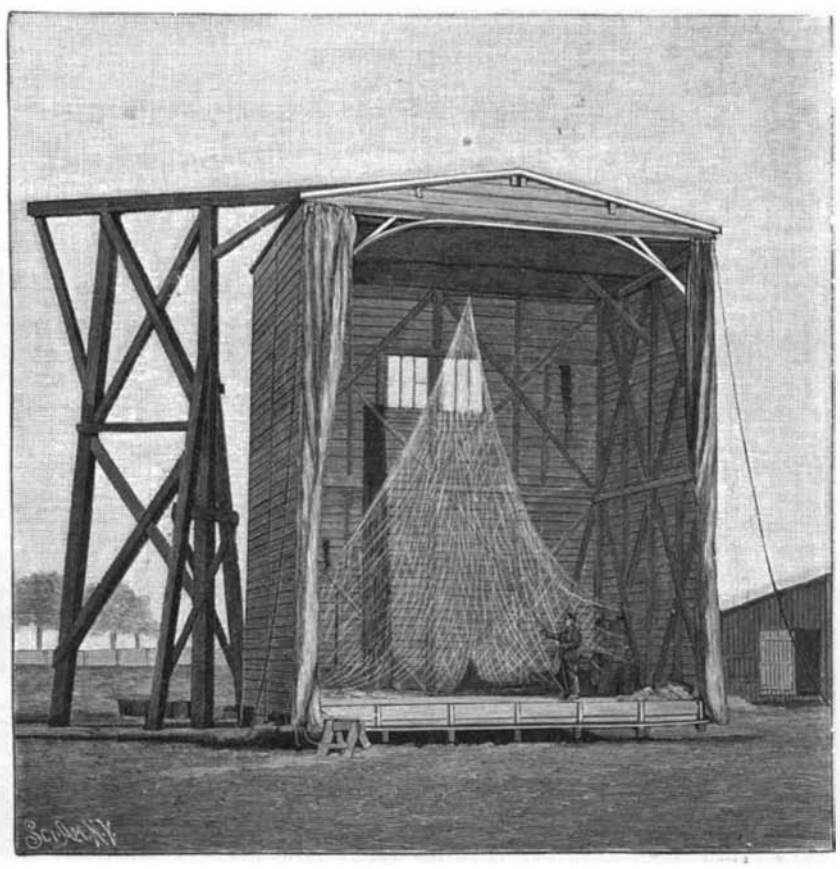
Perhaps the most curious structure among the isolated buildings which comprise the station at Trappes is the rotating house in which balloons are inflated. The house is mounted upon rollers so that it can be turned to suit the direction of the wind, and is connected by underground pipes with the hydrogen 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.

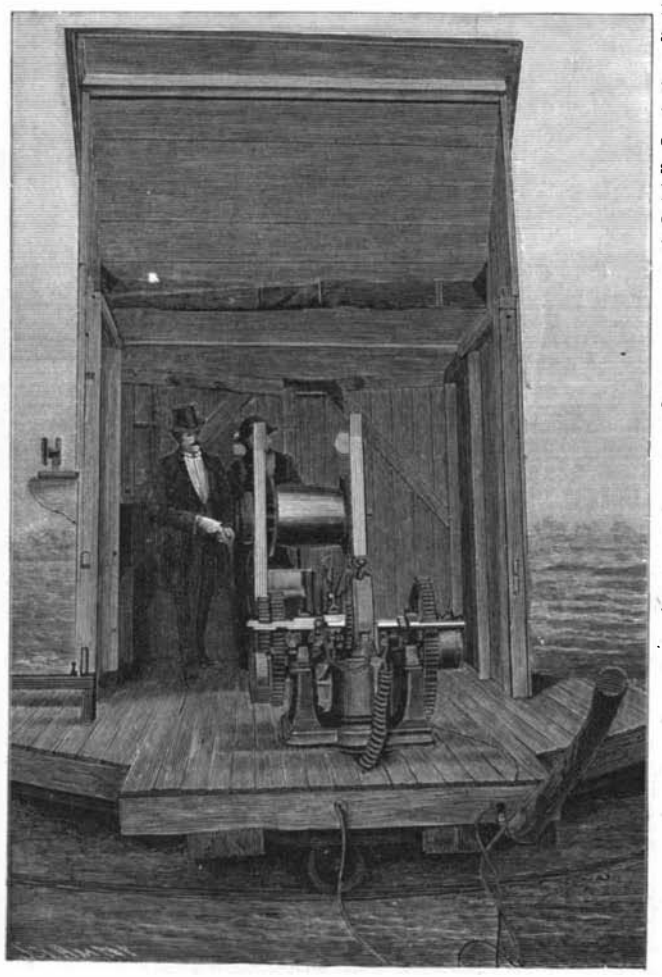
The recording apparatus referred to comprises several small aluminium cages. Upon a cylinder rotated by clockwork, three pens register the thermometric, barometric, and hygrometric conditions. As a matter of precaution, each instrument is accompanied by a checking apparatus, with the records of which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