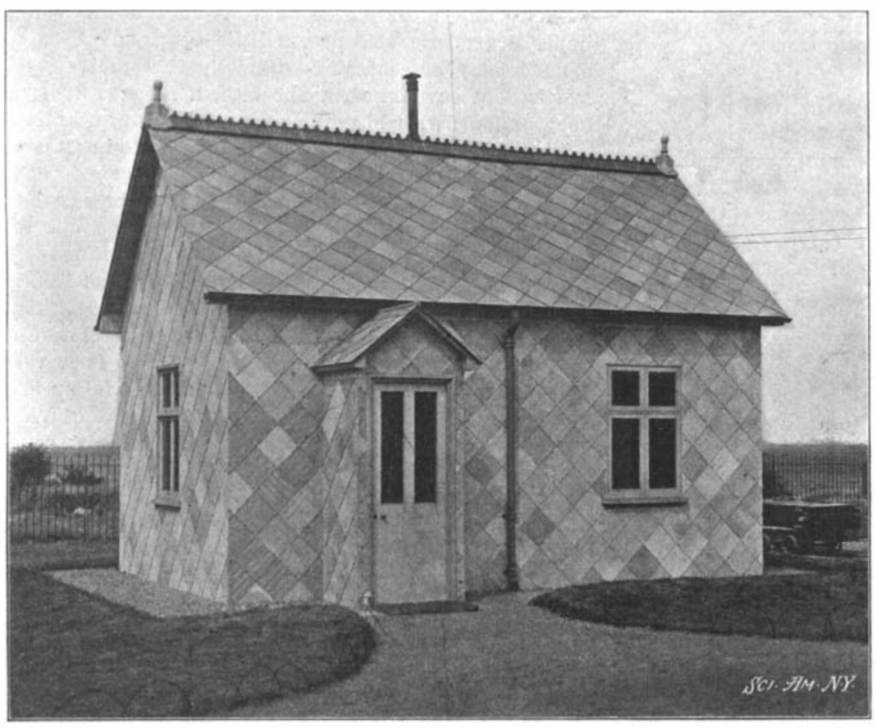
THE MANUFACTURE OF THE NEW FIREPROOF MATERIAL URALITE.

BY THE LONDON CORRESPONDENT OF THE SCIENTIFIC AMERICAN.

Some interesting experiments have been carried out in England with a new fireproof material called "Uralite." It originated in Russia, being the invention of Col. Ichenetsky, of the Russian artillery, and takes its name from the Ural Mountains, where a large quantity of asbestos, which constitutes the fundamental component of uralite, is obtained. It has proved a highly efficacious fire-resisting material, capable of withstanding a much greater degree of heat, without exhibiting any apparent effect, than any fireproof material at present on the market. Coupled with this fact it is extremely light, is of great strength, is durable, and is manufactured in sheets of varying sizes and thickness, thus rendering it a first-class material for building purposes. Another recommendation in its favor is its extreme lightness.

Although asbestos enters largely in the composition of uralite, it is by no means the only important substance incorporated in its manufacture, since asbestos in its pure form, although it will resist high degrees of heat, is liable to disintegrate under the influence of excessive temperature, and this peculiarity to a great extent nullifies its utility.

The asbestos in its raw state is thoroughly cleansed, so as to free it entirely from sand and other impurities of a similar nature. It may be mentioned incidentally that both the Russian and Canadian products are employed, though the former is preferable owing to the greater strength of the fibers. After cleaning, the asbestos is passed between rollers fitted with short, sharp projecting pegs which tear the fibers of the material to pieces during its passage between the rollers. As the disintegrated asbestos issues from the machine a blast of air plays upon it, and the disintegrated fibers are carried into a trunk to the underside of which hoppers are fitted. The light separated fibers are blown a considerable distance by the air into the trunk and fall into the bins farthest away from the machine, while the heavier matted pieces fall into the hoppers nearest the separating machine, and are once more passed through the rollers.



FIREPROOF HUT, CONSTRUCTED THROUGHOUT OF URALITE.

The finely-separated fibers in the other bins are thrown into another mill containing whiting in the proportion of 1 to 6. In this machine the fibers of the asbestos are still further separated, but at the same time extreme care has to be taken to prevent its being reduced to powder, this being obviated by the addition of the whiting. The length of the treatment of the material in this mill varies with its condition, the finer grades from the previous machine only wanting a few minutes' treatment, while the coarser grades require longer manipulation.

From this second mill it is conveyed to a Krupp disintegrator, while the fibers are loosened pretty thoroughly, though not absolutely, and the air blast is once more requisitioned in connection with this process. As in the first instance, the air blast carries the lighter portion of the material and deposits it in the most remote hoppers, while the heavier masses fall into the bins nearest the machine.

Now that the asbestos has been thoroughly disintegrated, the manufacture proper of the uralite commences, and this is the parting of the ways. The material is made in different colors, and upon its arrival in the mixing room, although the process of manufacture is largely the same, different materials have to be employed to supply the desired color to the article. If white uralite is required, whiting is used; if gray, the whiting is toned down with a quantity of carbon black; and if the article is to be red in hue, red oxide is added to the whiting. The latter material is first beaten into a stiff cream, by throwing the dry material with a quantity of water into a mixer. When the proper consistency has been obtained, the cream is passed through a sieve, by which means all foreign objects such as pieces of wood and so forth which may have been incorporated in the mixture are removed. From the mixer the whiting is passed into a large hollander containing the asbestos, and the two components are beaten up into an emulsion and thoroughly mixed. The mixing is accomplished by means of revolving screws and propellers. In this machine again care is observed to prevent the rotating blades tearing the fibers of the asbestos.

From the hollander the emulsion issues into a stuff chest, where the mixing is continued to prevent the settling of heavier material, and thence passes into another mixer, where the mixture is mixed with a quantity of water in the proportion of one of the latter to three of the former. It is thoroughly beaten into a pulp by revolving blades, the process being somewhat similar to the manufacture of pulp for paper.

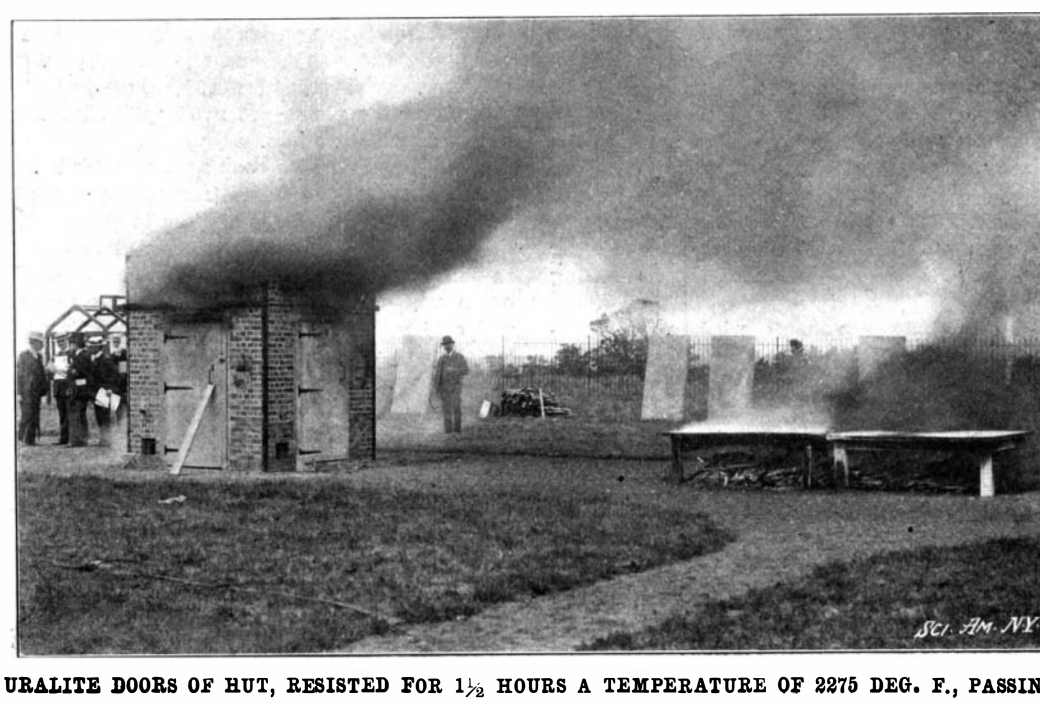
From the mixer the pulp flows into a trough and thence passes into what is called the millboard machine. A roller revolves in this trough and drives the pulp over a sheet of rubber onto another large revolving roller covered with gauze. As this roller rotates it becomes covered with a sheet of pulp, the thickness of which is gaged by a regulating rubber-covered roller pressing against the gage roller. The usual thickness, however, is 1-50 inch. As the pulp passes over the latter roller, the water drains through the gauze and is carried away to a tank to be used again.

By passing between these two rollers the mixture is converted into a soft, damp sheeting of pressed pulp, and as it passes from the rollers it is carried upon an endless felt blanket, and upon this is conveyed over a number of rollers which drive out any water present in the substance and finally deliver it onto a large collecting roller at the end of the machine. The uralite sheeting on the collector roller is practically a veneer, being only 1-50 inch in thickness, and the material is now built up to the desired thickness by superposing the sheets and cementing them firmly together so as to form one homogeneous whole. When the uralite is collected on the collector roller the substance is brought into contact with a felt-covered roller steeped with a solution of colloidal silica, gathered from a trough containing the chemical solution in which the roller rotates. The colloidal silica is a composition of solutions of water glass and sodium bicarbonate. In this manner the uralite can be built up to any desired thickness, and when the latter has been attained a knife is automatically brought into service and cuts through the sheet, which is removed to an endless belt, and is thus conveyed to a cutting table, where it is divided into conveniently sized sheets measuring about 6 feet 2 inches by 3 feet 1 inch.

AFTER THE FIRE. WOOD PLATFORM DESTROYED, URALITE PLATFORM INTACT.

Of course, during all these operations the material is tolerably damp, but at the same time it can be handled and cut without danger of tearing. The sheets after being cut up into sizes are stacked into a pile with a wire mat and an iron plate alternately interposed between each sheet of uralite, to prevent a sheet coming into contact with its neighbor. The pile is built to a height of about 3 feet 6 inches and is then transferred intact to a hydraulic press, and subjected to a gradually increasing pressure until the maximum of some 200 pounds per square inch is attained. This abnormal pressure is maintained for about 90 minutes, after which the pile is allowed to stand for 24 hours to harden. At the end of this period they are taken in hand once more for the next operation—stoving. Each sheet is now placed vertically with a thick skeleton wire frame between to protect it from its neighbor. The stoves are of huge size, ranged in three tiers, and the sheets are placed therein mounted on trucks. Heating is achieved by means of producer gas. The stoving operation is a very protracted one, since drying has to be accomplished very slowly. The trucks containing the sheets are inserted at the cooler end of the uppermost tier, where the temperature is 20 deg. C., and gradually removed along toward the hotter end, where the thermometer stands at 75 deg. C. The thick skeleton frames between each sheet of uralite permit the moisture as it is evaporated from the sheets to pass away. When the highest heat in the top tier has been reached—the process occupies 24 hours—the sheets are transferred to the second tier at the cooler end, where the temperature is 35 deg. C., and gradually working in the same way as before toward the hotter end—120 deg. C.—an operation also lasting 24 hours. The second stoving accomplished, the sheets are transferred to the cooler end of the lowest tier in a temperature of 100 deg. C. and gradually removed along once more toward the hottest end, where the temperature is 250 deg. C.—a process involving another 24 hours. Complete stoving therefore occupies no less than 72 hours.

After stoving, uralite is subjected to further chemical treatment to insure stability. The truck of sheets just as it emanates from the stoves is lowered into a



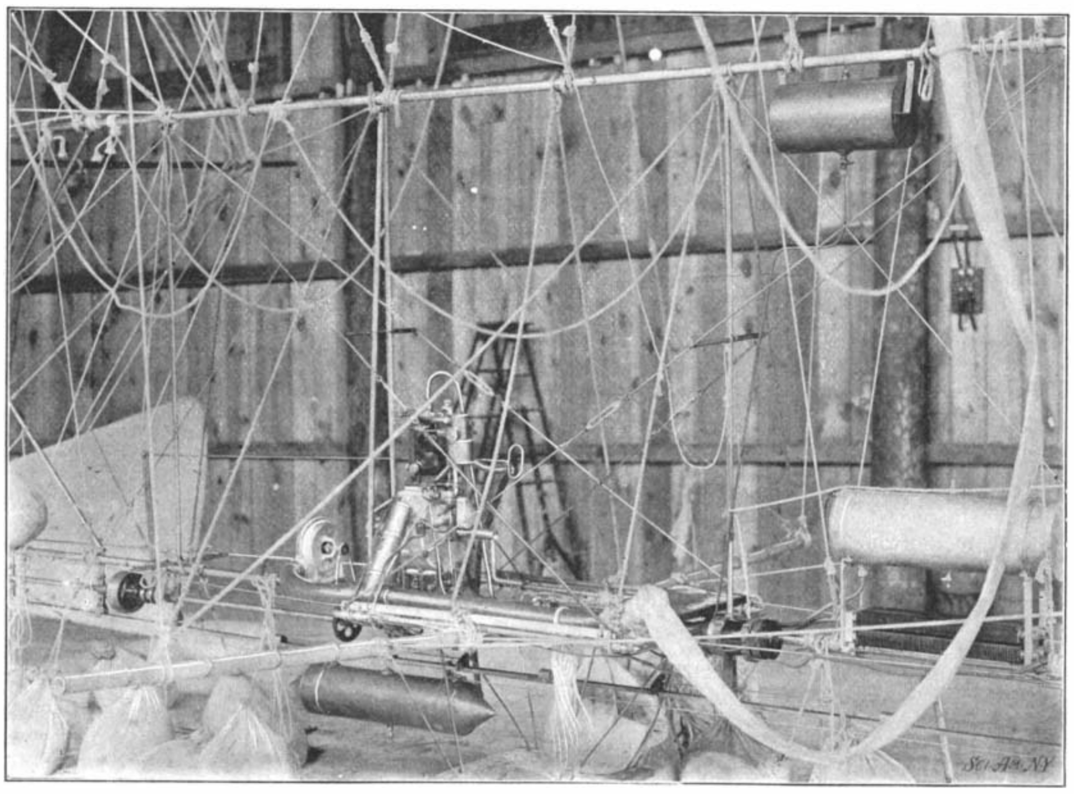
URALITE DOORS OF HUT, RESISTED FOR 1½ HOURS A TEMPERATURE OF 2275 DEG. F., PASSING NO FLAME.

tank filled with sodium silicate, and remains immersed therein for two hours. The sodium silicate for this purpose is supplied as solid glass, containing about 70 per cent of silica, and is thus practically insoluble in cold water, but when the substance is digested at 60 pounds in a boiler, it dissolves in a few hours. When the uralite has become thoroughly impregnated with the sodium silicate, it is permitted to stand for a time to enable the superfluous solution to drain away. This accomplished, the sheets are once more stoved for 36 hours in a low temperature, and then redipped in another solution of bicarbonate of soda for 24 hours, which bath decomposes the silicate of soda. The uralite is then washed for two hours in another tank and once more stoved. These chemical impregnation processes exercise a powerful hardening effect upon the substance, but to insure absolute stability the sheets are again steeped in the baths of silicate and bicarbonate of soda respectively, washed and stoved. The sheets are then finally immersed in a solution of calcium chloride to remove the remaining traces of the soda. It is desirable that this latter chemical should be entirely removed, since if it be allowed to remain a white efflorescence appears on the surface of the material, which though not deleterious to the material is unsightly, although it will disappear after a short exposure of the uralite to the weather. This protracted chemical treatment of the uralite converts it into a solid, homogeneous mass, which cannot laminate, has no planes of cleavage, and is fire-resisting to the highest degree.

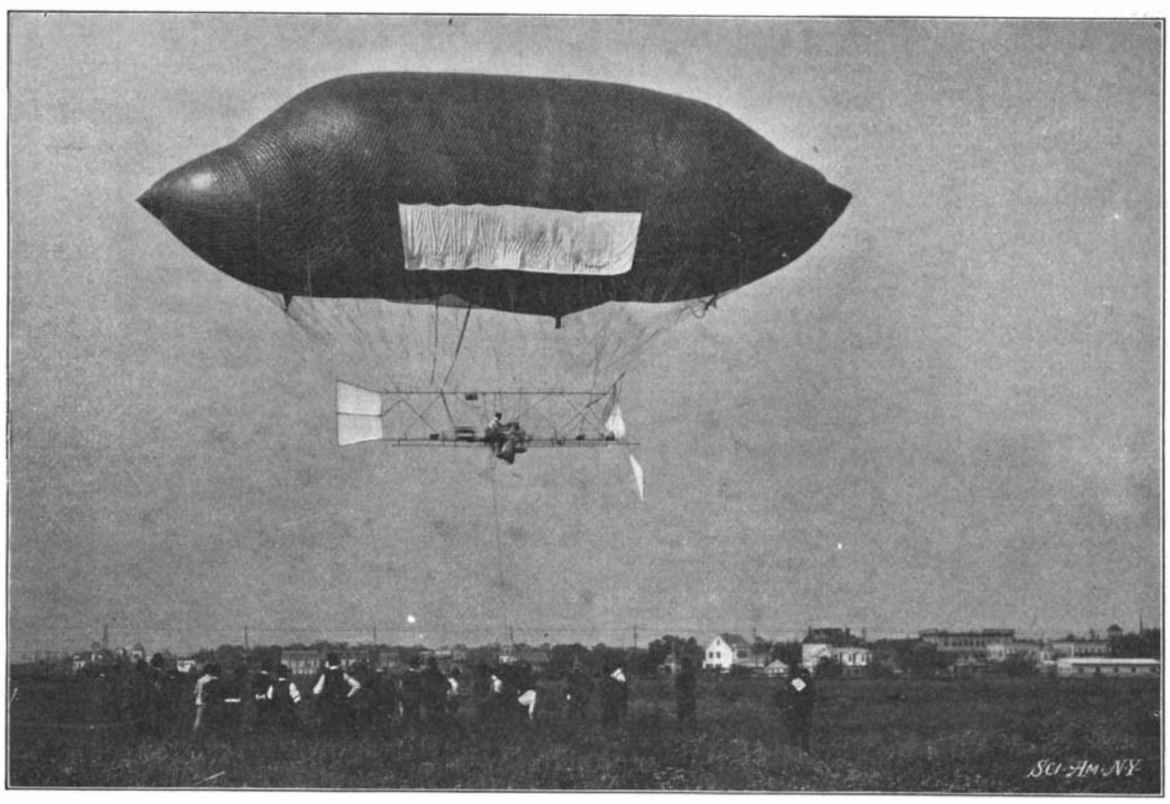
The most noticeable feature of uralite is the facility with which it may be handled and adapted to other materials as a protection against fire. It can be glued and nailed without any fear of its splitting during the latter process. It is specially available for paneling or other similar purposes, and can be grained or otherwise treated precisely as if it were wood. It does not swell or shrink under fluctuating climatic conditions, is waterproof, and is a complete electric insulator. The remarkable immunity of the material from climatic changes may be gathered from the fact that a piece of the substance may be plunged into boiling water and then immediately steeped into frozen mercury without showing any shrinking, disintegration or other change, physical or chemical. It is capable of withstanding a great strain—18 tons per square inch in comparison with Portland cement, which is only capable of supporting 9 tons—so that it is an ideal material for floorings and ceilings. Its cost is very low—7 cents per square foot.

A practical proof of faith in the fire-resisting capabilities of uralite is attested by the fact that in London the fire insurance companies have decreased their rates where this material is employed from $5.25 to $1.90. It is being adopted on the overhead railroad of Liverpool; in the Soudan for roofing purposes; and also by the Russian Admiralty.

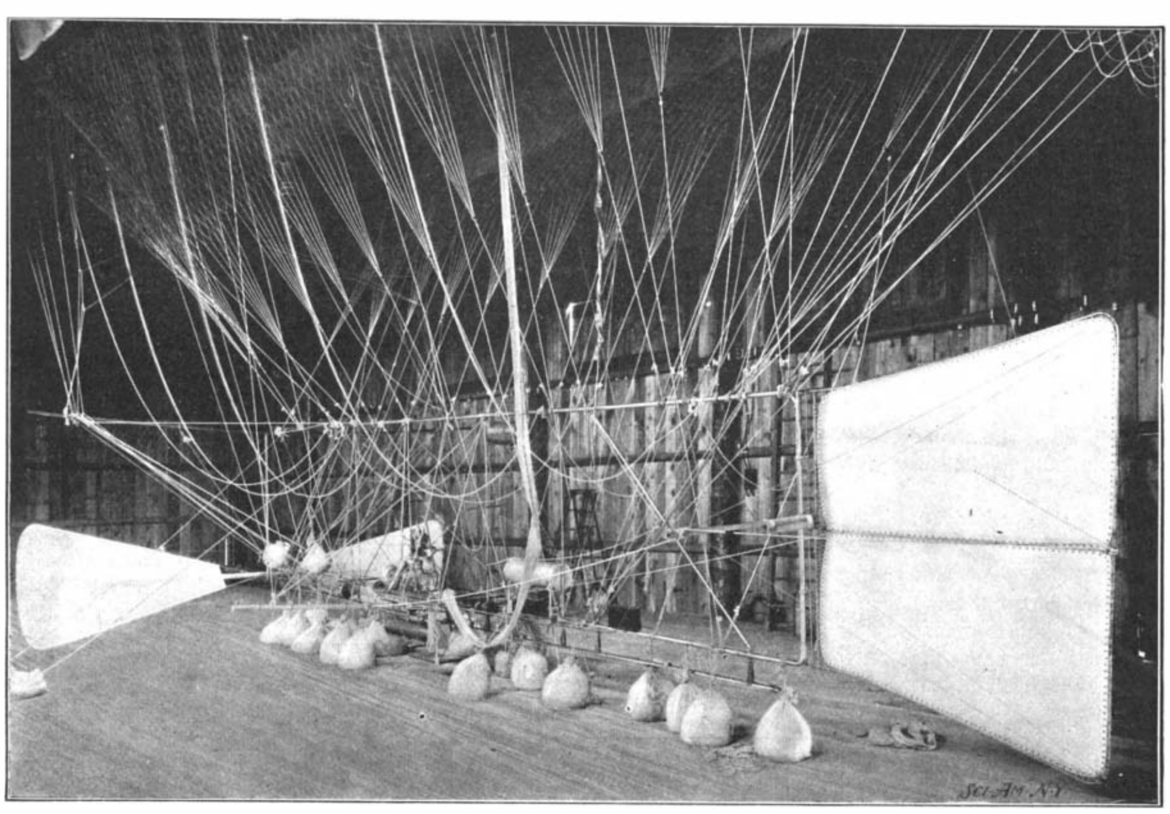
The refractory properties of this new substance are vividly demonstrated in the accompanying illustrations.



THE MOTOR AND THE SLIDING WEIGHT.



THE SECOND ASCENT OF STEVENS' AIRSHIP AT MANHATTAN BEACH.



GENERAL VIEW OF THE FRAMEWORK.

STEVENS' AIRSHIP.

The number of aeronauts who are attacking the problem of aerial navigation by means of dirigible airships has been increased by the advent of Leo Stevens. Manhattan Beach has recently been the scene of two ascents made by him in a flying machine of his own design. It cannot be said that much has been achieved. Despite the inventor's indomitable confidence in his contrivance the tests thus far made have not been satisfactory. At no time was a free ascent made. In both the trials made the airship was held captive by a stout rope, and was not allowed to rise more than 150 feet above the ground.

The construction of Stevens' flying machine, although substantially following the lines laid down by previous aeronauts, nevertheless presents novel minor features that should prove of interest to investigators in the same field. The gas-bag is inclosed in an outer envelope, of the usual cigar shape, with ogival ends. The space between the gas-bag and outer envelope is filled with air by means of a blower driven from the motor. During the airship's flight the air is allowed to pass down again through the flexible tube by which the space was filled, to the motor, in order that it may cool the cylinders, the air being driven down through the tube by the expansion of the interior gas-bag.

At each side of the gas-bag envelope a canvas-covered frame is mounted to swing in a vertical direction. The lateral surfaces thus formed act together as a parachute. As the machine rises it is obvious that they will hang down from the envelope and will in no way retard either the ascent or backward and forward flight. When the airship descends the parachute surfaces will spread by reason of the air's resistance, and will thus retard the velocity of the descent.

The net surrounding the outer envelope is secured by cords to the upper member of a rectangular steel frame by which the motor, propeller, rudder and ballast are supported. From our illustration it will be seen that the motor is placed approximately in the middle of the frame, and that the aeronaut takes up his position immediately behind it.

The propeller is mounted at the bow; the rudder at the stern. It therefore follows that the flying machine is not driven from the rear, but is rather drawn along. Tiller ropes lead from the rudder to the aeronaut's seat.

Along the bottom of the rectangular frame a rail extends upon which a weight is arranged to slide. It is the purpose of this weight to keep the flying machine in proper longitudinal trim and to permit the aeronaut to change the direction of his flight vertically. A somewhat similar principle was employed by Von Zeppelin in his colossal airship. By moving the