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SIR GEORGE CAYLEY'S GOVERNABLE PARACHUTES.

Fig. 2.

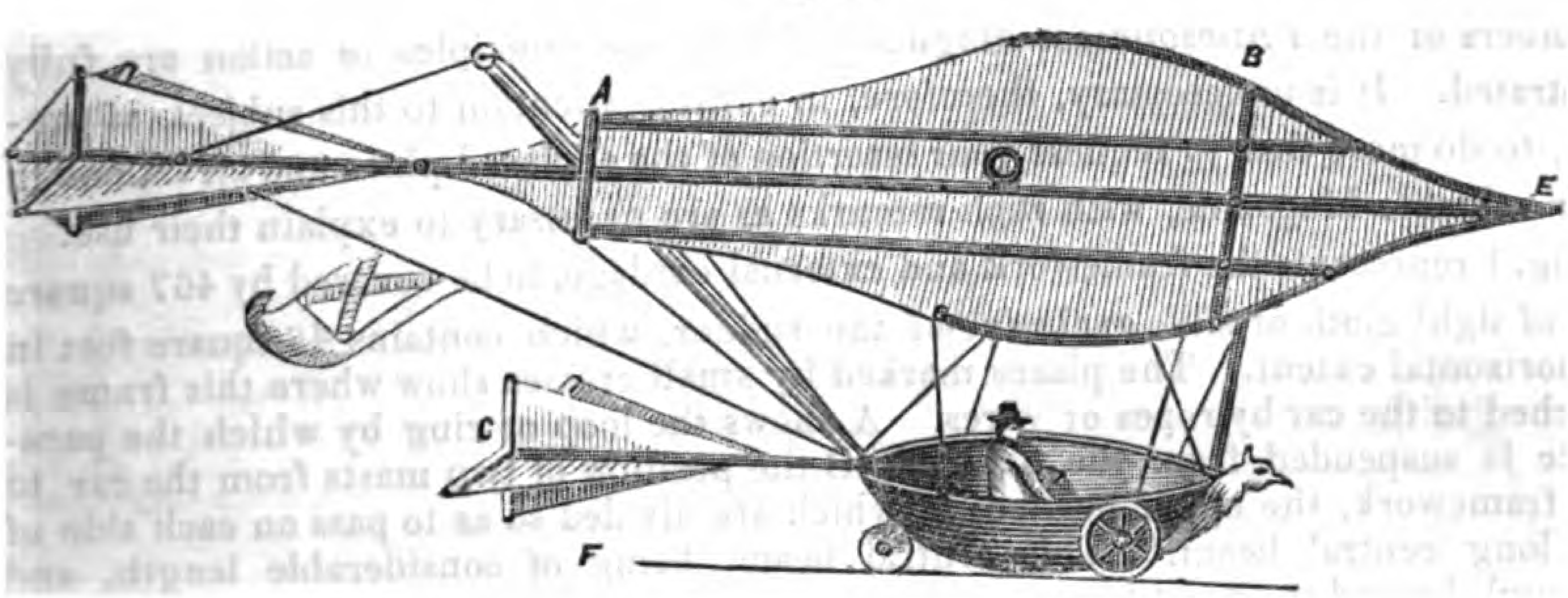
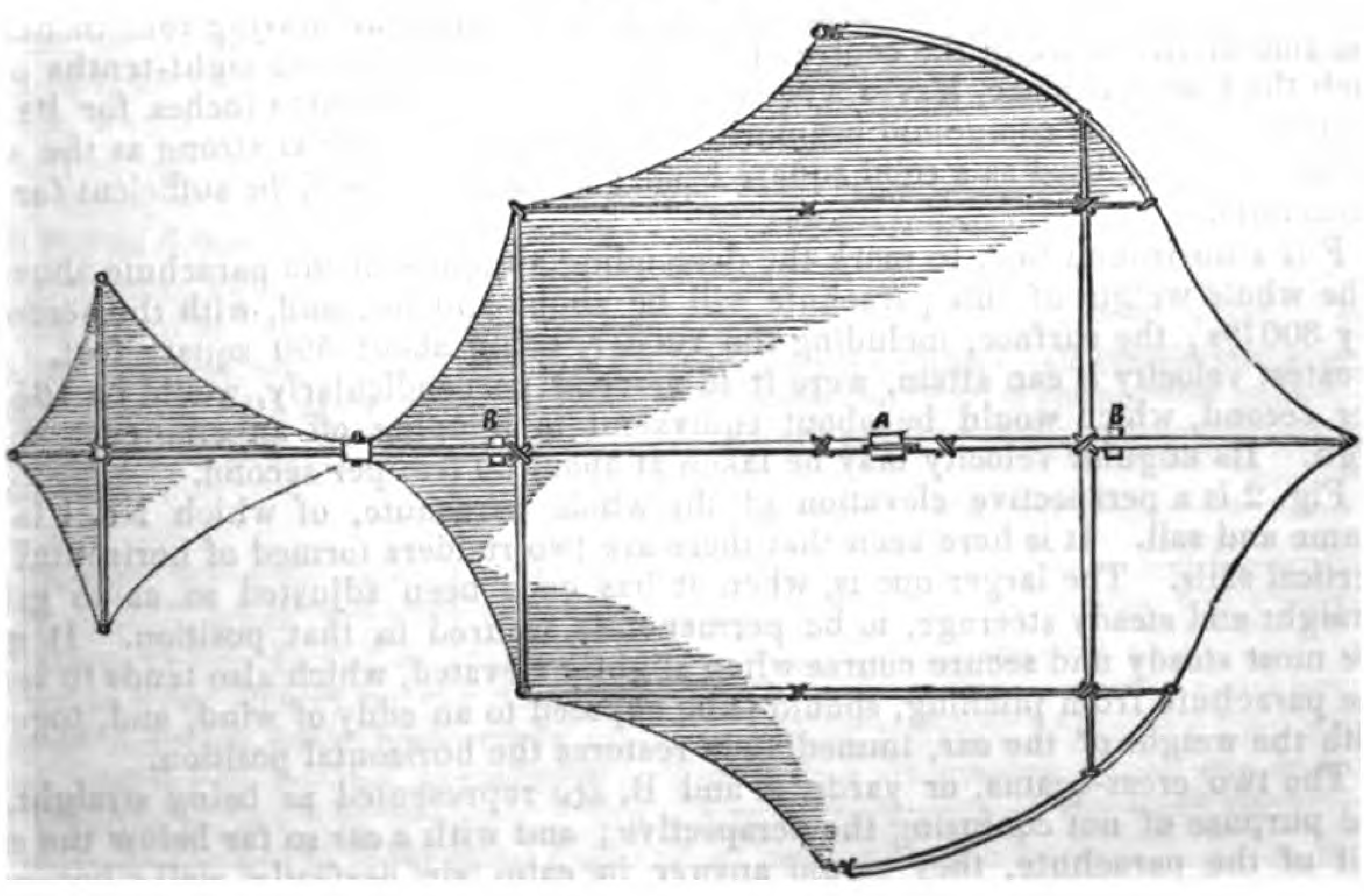


Fig. 1.



SIR GEORGE CAYLEY'S GOVERNABLE PARACHUTES.

SIR,—As the subject of parachutes again attracts public attention, permit me to suggest what would be an interesting addition to the mere hackneyed fact of their descent—their steerage from the moment they are liberated from the balloon to any desired landing-place, within about five to six times the distance horizontally that the balloon is then above the earth. Thus, were the balloon a mile from the earth, the aëronaut would have the command of a descent anywhere within a circle of ten or twelve miles in diameter, having the point immediately under the balloon for its centre. Many years ago, the safe descent and perfect steerage of such parachutes were ascertained on a scale of four hundred feet of surface, and notices of these experiments were published in "Nicholson's Chemical Journal," and the early Numbers of the *Philosophical Magazine*, where the principles in action are fully illustrated. It is unnecessary, therefore, in calling attention to this subject, at present, to do more than to request your insertion of the enclosed plans and elevations in your valuable Magazine, with such remarks as are necessary to explain their use.

Fig. 1 represents the framework and external cordage, to be covered by 467 square feet of light cloth or silk, exclusive of the rudder, which contains 48 square feet in its horizontal extent. The places marked by small crosses show where this frame is attached to the car by ropes or wires. A shows the loop or ring by which the parachute is suspended from the balloon; B the position of two masts from the car to this framework, the upper portions of which are divided so as to pass on each side of the long central beam. This central beam, being of considerable length, and although braced so as not to permit any extensive length of leverage to affect it, will require, as the main basis of the structure, to be firm and strong; and as lightness of construction is required as well as strength, a taper tubular beam would be desirable; but these are difficult to make, and very nearly the same result as to strength combined with lightness of structure is obtained by nailing and glueing together four flat pieces of timber into a hollow square, and making these taper both in width and thickness from the centre towards each end—a beam of fir, having four inches for the side of its square in the centre of its length, each piece being eight-tenths of an inch thick at that place, leaves a square space of two four-tenths inches for its side measure; and this compound beam will be very nearly double as strong as the same weight of wood used as a solid square beam: such a beam will be sufficient for this parachute.

F is a horizontal line, to mark the descending obliquity of the parachute above it. The whole weight of this parachute will be about 150 lbs., and, with the aëronaut, say 300 lbs; the surface, including the rudder, being about 500 square feet. The greatest velocity it can attain, were it to descend perpendicularly, would be 16½ feet per second, which would be about equivalent to jumping off an eminence 4 feet high. Its angular velocity may be taken at about 30 feet per second.

Fig. 2 is a perspective elevation of the whole parachute, of which No. 1 is the frame and sail. It is here seen that there are two rudders formed of horizontal and vertical sails. The larger one is, when it has once been adjusted so as to give a straight and steady steerage, to be permanently secured in that position. It gives the most steady and secure course when slightly elevated, which also tends to secure the parachute from pitching, should it be exposed to an eddy of wind, and, together with the weight of the car, immediately restores the horizontal position.

The two cross-beams, or yards, A and B, are represented as being straight, for the purpose of not confusing the perspective; and with a car so far below the main sail of the parachute, they would answer in calm air perfectly well; but every caution should be taken in trusting human life to so capricious an element, and therefore these yards should form an angle of 160° at their centre, or, what amounts to the same thing, rise in an angle of 8° above their present horizontal line on each side. This form, like the elevation of the rudder, tends powerfully to right the parachute in all cases of accidental disturbance. The smaller moveable rudder C, is sufficient to effect at will the steerage of the parachute, and to elevate or depress its course when occasion requires, or preparatory to alighting on the ground. The main rudder, by means of strong ropes, one of which passes through an eye on the top of the mast at D, can be firmly braced to its best adjustment from the car. Another use may be made of this parachute by making it steer the balloon considerably when ascending with velocity. Let a small rope from the car of the balloon be

Fig. 3.

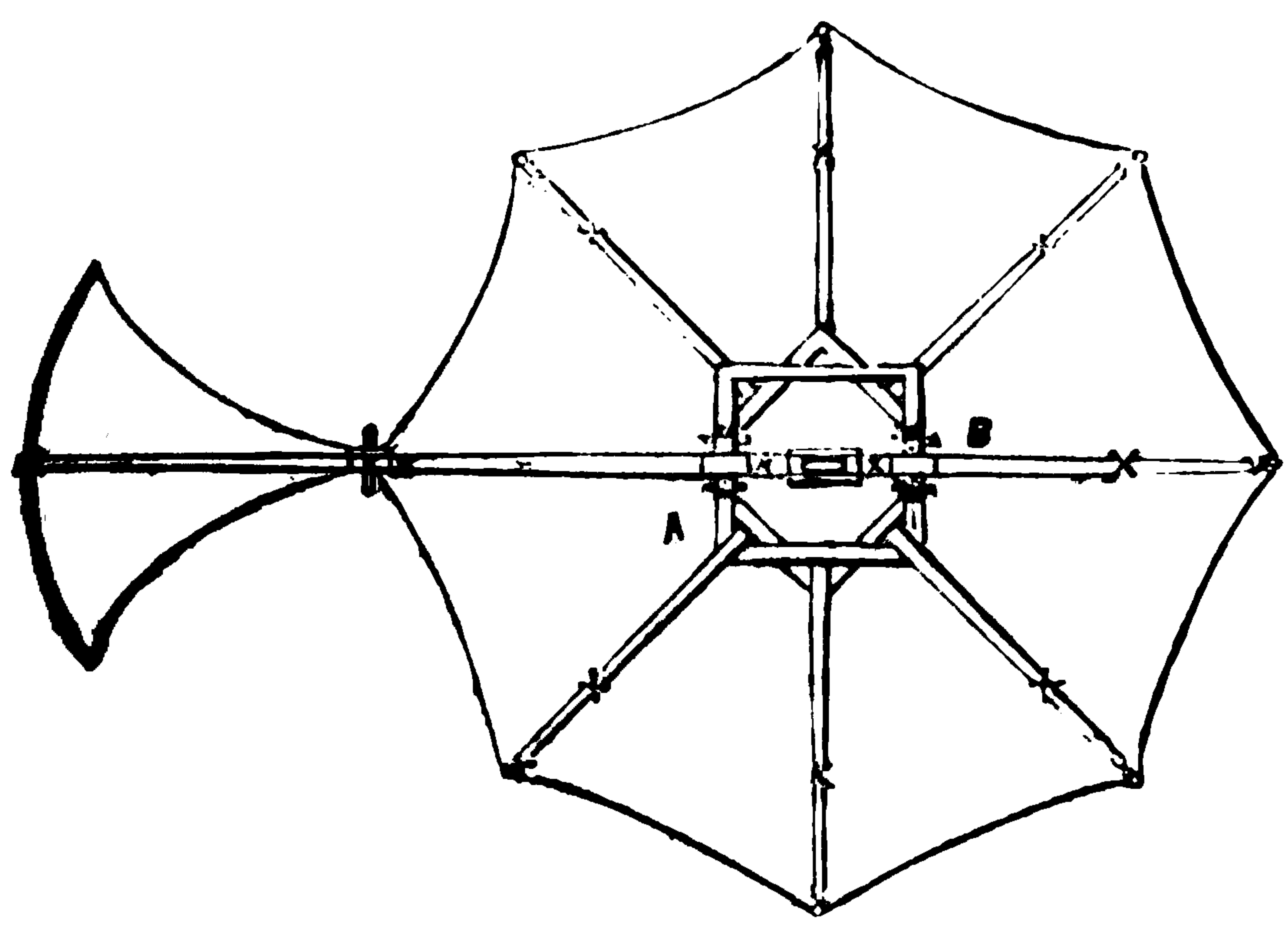
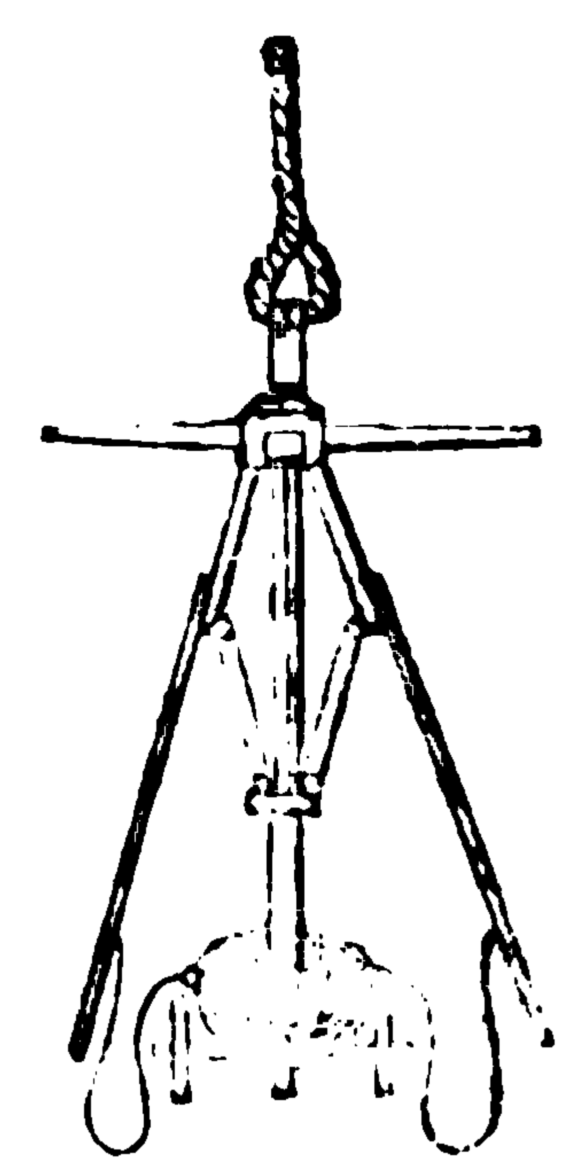


Fig. 4.



fastened to the end of the main beam at E, by which the parachute can be elevated in front to any required angle, when the resistance of the air, acting obliquely upon it, would give the whole combined fabric the power of steerage, by a large vertical rudder in the car of the baloon. The danger of using this mode of action would be from the neglect of liberating this rope, previous to the parachute being freed for its descent.

Fig. 3 represents a guidable parachute, formed on the umbrella plane, so that it can fold down in two halves on hinges at A and B, like the leaves of a table, and thus not obstruct the velocity of the balloon in ascending. Its construction is so readily understood as to require no further explanation. Fig. 4 shows this parachute when not expanded for use. It must have the moveable rudder, as before named, in the car.

Although the safe descent and steerage of such aërial vehicles has been abundantly proved, when properly adjusted, by their being launched from hill-tops into the valleys below, loaded up to a pound weight to the square foot of surface; yet no human lives should be put to hazard in these parachutes, until a considerable series of descents have been made safely with dead weights, exceeding that of the person wishing to try the experiment. The centre of gravity of the car and its load must be so much in advance of the centre of resistance of the main-sail as will incline it downward in front in an angle of 5° or 6° with the horizon. A few trials as to the required position of the permanent rudder, so as to adjust the angle of the descent to be steady, and not subject to alternate rises and falls, will soon enable more extensive ranges to be made. The small irregularity of resistance made by one side of the parachute over the other, which it is impracticable to avoid, has then to be corrected by a slight side movement of the rudder, bringing its vertical surface to act in the contrary direction, and thus to bring the steerage into a straight course.

It need scarcely be further remarked, that were we in possession of a sufficiently light first mover to propel such vehicles by waftage, either on the screw principle or otherwise, with such power as to supply that force horizontally, which gravitation here supplies in the descent, mechanical aërial navigation would be at our command without further delay.

Those who may wish to go more minutely into this subject will find it investigated in the twenty-fifth volume of "Nicholson's Journal of Natural Philosophy," &c., for the year 1810, pp. 83 and 161.

I am, Sir, your obliged and obedient Servant,

GEORGE CAYLEY.

Brompton, September 15, 1852.

ON THE SUBSTITUTION OF BORAX FOR SOAP IN THE SCOURING OF SILK. BY PROFESSOR BOLLEY.

(Translated for the "Mechanics' Magazine" from the "Swiss Journal of Industry.")

Repeated experiments, though only made on a small scale, having proved that borax may be used for the purpose of freeing silk from its glutinous coating, I was induced to make these experiments by the idea that borax, in case it should serve for this purpose, it would not, as is the case with soap, be entirely lost, but might always be recovered from the solutions. My experiments have proved fully that borax in solution in water, when boiling from 1 to 1½ hour with a quantity of silk double its weight, is capable of scouring this latter sufficiently, and that, in order to render the process more complete, the silk need only be boiled a second time with a solution of the same strength; but for practical purposes, I think it would be advisable to accomplish the first part of the scouring (which the dyers call the "degommage") by employing the borax solution, and to complete the process, or what is called by them the "boiling," by means of soap. In order to recover the borax after it has been used, soda should be added to the solution, and the whole submitted to evaporation, which may be done in summer by exposing the solution in the open air in shallow evaporating vats, when the borax will be obtained in the form of crystals. The mother water, which contains albuminous and gelatinous substances, may also be evaporated, and after calcining the residuum and dissolving the same in water, and crystallising, the whole of the borax employed will be recovered.

Silk submitted to this process will be found to be very soft, the yellow sorts will become nearly white, and, on examining the fibres of silk with a microscope, it will be found that they have sustained no injury, and have retained their original strength just as if they had been treated according to the ordinary method. In fact, no danger whatever arises from this process in the quality of the produce. According to the opinion of some of the most eminent Swiss manufacturers, to whom Professor Bolley submitted the samples of silk prepared in this manner, and who were not able to discover the least difference in quality between his specimens and silk treated in the ordinary manner.

As regards cost of the process, this depends entirely on the price of borax, and on the cost of fuel, and of time in the evaporating process, and on other local circumstances, and from the price of soap. Professor Bolley thinks 30 lbs. of soap may be saved on every cwt.