is still green and hard. The usual remedies, then, must be applied forthwith. In a good season, we mean in the absence of caterpillars, sometimes when the foliage is thick, some may be thinned out a little, so as to allow the sun and air to get a little more readily to the fruit ; but then we are again unhappily confronted by the bird difficulty, when netting must be used, and here the old tennis nets are again of the utmost service. Similarly will they also be useful for the protection of our wall-fruit a little later on.

By the end of the third week in May, our bedding out, and all summer arrangement of the flower garden, should be over : yet, perhaps in the course of the month of June we may find a good many handsome and luxuriant plants still on the stands in our greenhouse. Many of these we can with advantage either plunge in our flower-beds, or we can decorate the sides of our gravel walks with them, and thus acquire an empty greenhouse, or one nearly so, when the opportunity can be best employed for any necessary painting, or if not, then any plants requiring special care or high temperature can, of course, be tended at a time when there is plenty of room for them.

In the kitchen garden, even as early as June, you will find that there are crops to be cleared, while it is hardly necessary to state that you will always find crops to be weeded or to be thinned. Indeed, the kitchen garden *alone* could occupy us in June, for there are peas and beans to stick, potatoes and celery to earth up, and successional crops to sow. A dressing of salt may be given to the asparagus-bed, while in the middle of the month the chief planting of broccoli may be made. Cut the herbs, too, just before they flower, and hang them up in a thoroughly dry room.

AËRIAL PHOTOGRAPHY.

BY WALTER E. WOODBURY.

AËRONAUTS and others have for some time past endeavoured to produce photographs from a balloon, and have met with very considerable success. Students of geodesy have long looked forward to the time when photographs could be made from which plans and maps could be constructed. But besides this, photographs taken from a height have many other uses. For war purposes they would be invaluable, showing the position and movements of the enemy. For explorers, too, they might be the means of preventing the loss of life, and for the advancement of scientific knowledge there is no end to their utility.

Probably in no branch of science have such rapid strides been made as in photography, extending its application to every branch of science, art, and education.

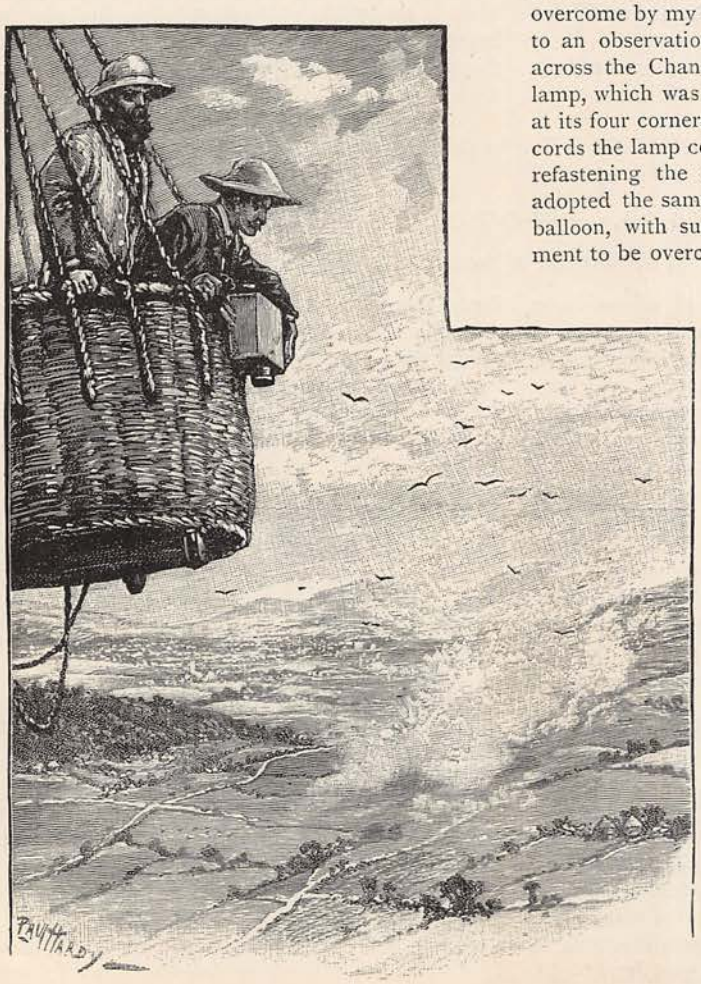
The difficulties which first beset the experimenter in aërial photography have been very much smoothed down by the introduction of the gelatine dry plates, with which photographs can be made in a fraction of a second ; and this is, as will be seen, very essential.

It would be difficult to say who was the first to make photographs from a balloon, but there is no doubt that M. Nadar, of Paris, has done more in this direction than anyone else. Some very satisfactory results were obtained by him by means of a camera attached to the side of the car.

But the idea of sending a camera alone up into the air was one that occupied the attention of scientists,

ELEMENTARY AËRIAL PHOTOGRAPHY.

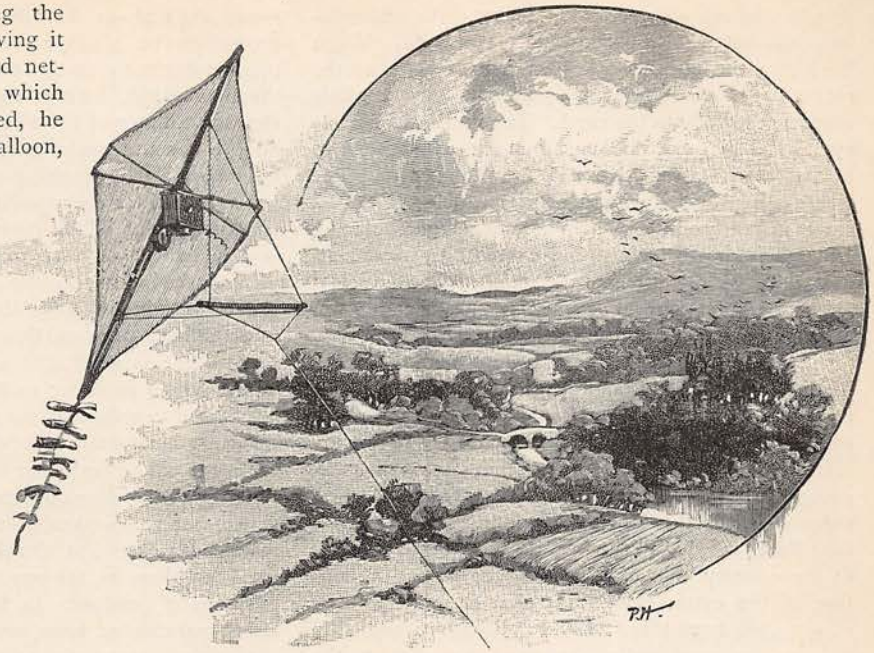
for the reason that it obviated the necessity of sending up aëronauts, and, in consequence, a much smaller balloon would be required. For war purposes the practice of sending men up in a balloon for the purpose of making photographs would be a highly dangerous one. A well-directed shot could hardly fail to bring the whole lot to the ground. Whereas a small camera attached to a captive balloon of small dimensions would be a very difficult object to aim at, and if struck but little damage would be done. In the year 1881 my father, the late W. B. Woodbury, invented and patented a balloon camera of this kind. The principal part of the apparatus is a drum holding four sensitive dry plates; this drum is wound up, and by means of a small electro-magnet a catch was released, and the plates could be brought into position successively. The lens was covered with an instantaneous shutter, opening and closing the lens in the $\frac{1}{250}$th part of a second. This also was controlled by a small electro-magnet. The wires connected with these two magnets, and one for the return current, were enclosed in the rope that held the balloon, so that the operator on *terra firma*, by simply sending a current through these wires, could work the movements of the camera as easily as if it were in his own hands. The operation was this: he touched one button and sent a current to one electro-magnet, which brought a plate into position. By means of a telescope the behaviour of the balloon could be seen. Directly it was in a steady position a current was sent, by pressing another button, through the second electro-magnet; this released the shutter, and the exposure was made. When the four plates had been exposed the camera was drawn to the ground, the plates developed into negatives, and by means of a magic lantern their image was thrown on to a screen or large piece of paper. With a piece of chalk the outlines were sketched out, and the position of the enemy's fortification, their strength and position, could at once be seen by all the officers.



PHOTOGRAPHING FROM A CAR.

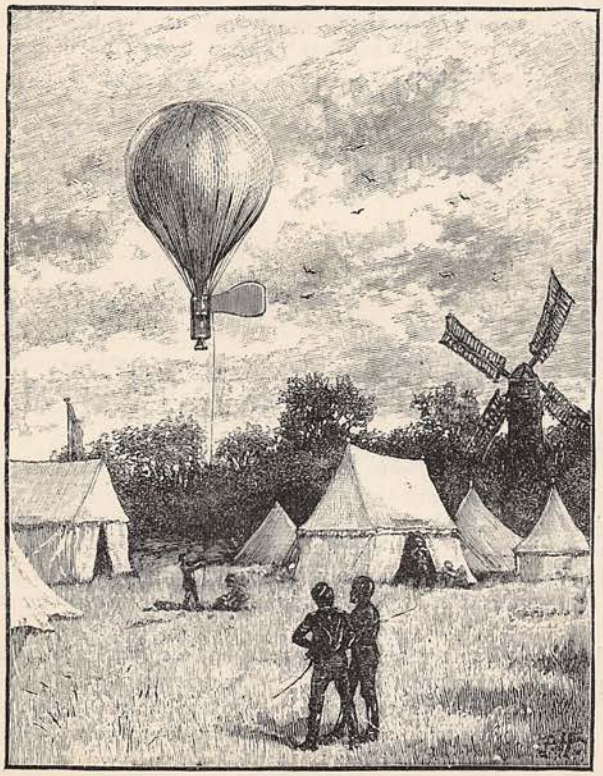
Notwithstanding, however, the possibility of taking pictures from a height in the $\frac{1}{1000}$th part of a second, it was absolutely necessary that the balloon should be perfectly steady. This at first was not the case, until the following movements were overcome:—1st. A swinging movement in the direction of the wind, parallel to the surface of the earth. This was at length overcome by my father, who was indebted for the idea to an observation during a rough nocturnal passage across the Channel of the behaviour of the saloon lamp, which was attached by four india-rubber cords at its four corners to the ceiling. On unfastening the cords the lamp commenced to swing furiously, but on refastening the cords it was perfectly steady. He adopted the same idea in attaching the camera to the balloon, with successful results. The second movement to be overcome was a rotary one. This was at last got rid of by a canvas drum acting as a kind of rudder. This will be seen in the accompanying sketch of a balloon camera ascent at Wimbledon, made in 1880, some very good results being obtained. The third difficulty to encounter was an oscillation by which the balloon deviates from its vertical direction. Some few years back a German, named Meydenbauer, was attracted by the difference between the behaviour of balloons and kites. It will be noticed that a kite will remain suspended motionless in the air for hours. They do not stir, nor do they revolve, but keep their level correctly. He found that this was due to the manner in which the cords were attached and the position of the centre of gravity. With balloons we have the motive power of the wind, the ascending power of the gas, and the retaining cord. Meydenbauer's idea was to suspend them in the same manner. Instead,

therefore, of constructing the balloon of stuff and leaving it free, only held by the cord netting enclosing it, and to which the camera is suspended, he constructed a globular balloon, pierced in the centre by a strong bamboo cane, from the ends of which a strong twine netting enclosed the balloon. At these ends are also attached two cords joined some distance from the balloon to the retaining cord. The camera was placed inside the balloon, the lens only being uncovered.



A PHOTOGRAPHIC KITE.

From a recent number of *La Nature* I have copied a sketch of a photographic kite recently invented by M. A. Balut, of Enlaure. As has already been stated, a kite is far more steady than a balloon when suspended in mid-air. For this reason M. Balut uses a lozenge-shaped kite, provided with a long tail. To the kite is attached a small photographic camera by means of a triangular support fixed to the backbone. The camera is provided with an instantaneous shutter actuated by means of a slow match. Before flying the kite this match is lighted, and when combustion has proceeded so far as to set fire to a small thread, it releases the spring of the shutter, and the exposure is made. Another very novel feature of this ingenious apparatus is the use of a registering aneroid barometer attached to the kite, so that the operator can find out the altitude which the kite has ascended above the ground. This barometer is combined with a photographic registering apparatus, which operates at the same time as the camera. It is enclosed in a light, tight box, and the instant that the shutter of the photographic camera is released, and the exposure made, an aperture closed by the shutter is uncovered through the burning of the match. At the moment the aperture is uncovered the luminous rays strike the dial and print the shadows of the two needles (mechanism and index needles) upon a piece of sensitised paper with which the dial is provided. To the thread attached to the shutter, and which gives the exposure when burnt, is fixed a piece of paper, which at the same time detaches itself and falls to the ground, indicating to the operator that the exposure has been made. The kite is then hauled in and the plate developed.



A BALLOON CAMERA.

Another curious form of aërial photographic apparatus is being developed by a French inventor, M. Denesse. It consists of a photo-

graphic camera attached to a rocket. An umbrella-like parachute is also fixed to the rocket-stick. When fired into the air this is closed, but as soon as the rocket begins to descend it opens out, and the whole returns gracefully to the earth. In this the camera is cylindrical in form, and has round its circumference twelve lenses—a sensitive plate is in the centre. The lenses are provided with a shutter which opens and closes instantly on the camera commencing to descend. It is then drawn back to the operator by a cord attached before the firing of the rocket. The principal advantages of this form of apparatus are cheapness of operating and freedom from risk.

Having now described the different methods of obtaining photographs from a height above the earth, we have next to consider how to make them of practical utility. Their use for war purposes has been already alluded to, but the service they render to students of geodesy requires some little explanation. We will suppose, then, that by one or other of the means described we have succeeded in obtaining views of the country taken from a height above the surface of the earth. How is a plan or a map to be constructed from this? Dr. Frank Stolze says that it may be confidently assumed that during the exposure the sensitive plate on which the photograph is made has hardly ever been horizontal enough to allow the plate to be considered as analogous to a parallel projection of the natural landscape; it is much more likely to be always more or less perspectively foreshortened. There exists, however, a particularly simple and reliable means of finding proper geometrical projections from the perspective projection. This is done after the following manner:—An exact square of large dimensions —say 600 feet—is described upon a flat part of the ground to be photographed, and the four corners marked distinctly, so that they shall be plainly seen in the photograph. From the now perspectively foreshortened image of the square we can find with ease all the constituents of perspective distortion, so that it is possible by working out the perspective backwards to find for every point of the picture the corresponding point of the geometric construction, which is then, when we have to deal with level ground, a comparatively easy matter. But when, however, the ground is hilly and undulating, the matter becomes a more difficult and complicated one. It is then necessary to take as auxiliaries some ordinary photogrammetric views in order to find out the difference of levels, and to reduce all the data on the photograph to the same horizontal. Notwithstanding this, however, the work will be far easier than when one has to trust to terrestrial photogrammetry; and it may, indeed, be stated that views taken from a height and used in this manner far exceed in simplicity and ease all that has yet been done in the way of special views taken for purposes of geodesy. In fact, views taken from balloons, parachutes, kites, or rockets, are undoubtedly the geodesic views of the future.

Many able scientists are working in order to improve upon the present methods of aërial photography, none of which can be said to be perfect. Government has taken the matter up, and many successful experiments have been made at Chatham and elsewhere by Major Templar and other great military scientists. For my own humble part, I hope very shortly to construct a camera which will supersede all that has hitherto been attempted in this direction.

TO BE GIVEN UP.

By KATE EYRE, Author of "For the Good of the Family," "A Step in the Dark," &c. &c.

CHAPTER THE TWENTY-FOURTH.

"CAN IT BE TRUE?"

A LONG awkward silence fell on the little group after Clare had asked her pertinent question.

"My dear Clare, Mrs. Robinson, I am sure, had no idea you were just behind her when she spoke," put in Mrs. Littledale, in a deprecatory tone.

"And she therefore felt at liberty to malign Mr. Dacre since there was no one present to take his part?" replied Clare quickly, with her angry eyes still fixed on Mrs. Robinson.

"Oh, Clare, how can you talk like that?"

"Aunt, I must have an answer to my question. If Mrs. Robinson has not the courage to repeat in my presence what she had evidently been only too eager to say in my absence, I must beg you to supply the information."

"My dear, I know nothing whatever about it."

"But you must know what Mrs. Robinson has been saying, aunt?"

"I think, Miss Eastabrook, it would be better, perhaps, to drop the subject. Any further discussion will, I am sure, only be exceedingly painful to all present," said Mrs. Robinson at length, with a great assumption of dignity.

"You try to take away a man's character behind his back, and then, when one who loves him asks you to repeat what you have been saying, you lack the courage to do so. Once again I ask you of what has Mr. Dacre been guilty that should, in your opinion, necessitate my breaking off my engagement?"