A New Form of Photographic Telescope.

Prof. E. C. Pickering, of Harvard, has made a strong plea in favor of certain new methods of conducting astronomic work. A great number of very large telescopes of nearly the same form, he says, have been given to observatories during the last few years. Although such instruments are indispensable, in a limited number of investigations, yet when the latter are divided among so many telescopes the results obtained by each are often disappointing to the donors. These instruments have been erected, with two or three exceptions, in places selected from local or political motives, and without regard to meteorological or astronomical conditions. For this reason, the great observatories of the world are near large cities or universities where the very conditions that have rendered the countries great have rendered them unfit for the most delicate astronomical research. Nine-tenths of these instruments are in the temperate zone in Europe and the United States, while the southern hemisphere has been entirely neglected and many of the most interesting parts of the southern sky have not yet been examined by a modern telescope of the largest size.

This duplication of expensive instruments in unsuitable localities is rendered still more objectionable by another condition. All the telescopes are similar in form, their focal length being from fifteen to eighteen times the aperture, and, therefore, all are best adapted to the same kind of work. In view of these numerous precedents, it was a bold step to deviate from it. But this step was taken, and taken by a woman, Miss Catherine W. Bruce, of New York, who gave $50,000 to the Harvard College Observatory to construct a telescope of 24 inches aperture, in which the focal length should be only six times the aperture. Fortunately, this experiment succeeded, and the Bruce photographic telescope is mounted in Arequipa, Peru, in a climate unsurpassed, so far as is now known, for astronomical work. Its immediate results are charts, each covering a large part of the sky and showing such faint stars that 400,000 appear upon a single plate. By its aid, many new stars of the peculiar fifth type have been found in the Large Magellanic Cloud, showing an additional connection of this object with the Milky Way. A group of forty nebulæ, hitherto unknown, has been found in another part of the sky. The most important work of the Bruce telescope, however, is that every year it sends hundreds of photographs to the great storehouse at Cambridge. Besides the immediate discoveries made from these plates, they doubtless carry with them many secrets as yet unrevealed, and many images of objects of the greatest interest yet to be discovered. A striking example of this kind is found in the recent discovery of the planet Eros, which, next to the moon, is sometimes our nearest neighbor in the heavens. Calculation showed that this planet must have been near the earth, and therefore bright, in 1894. An examination showed that this object, although not discovered until 1898, had not escaped the Harvard telescopes. Two images of it were found upon the Bruce plates, fifteen upon the Draper plates and three upon the Bache plates. It can thus be followed through nearly half a revolution. Six images were also obtained in 1896, when it was more distant and much fainter.

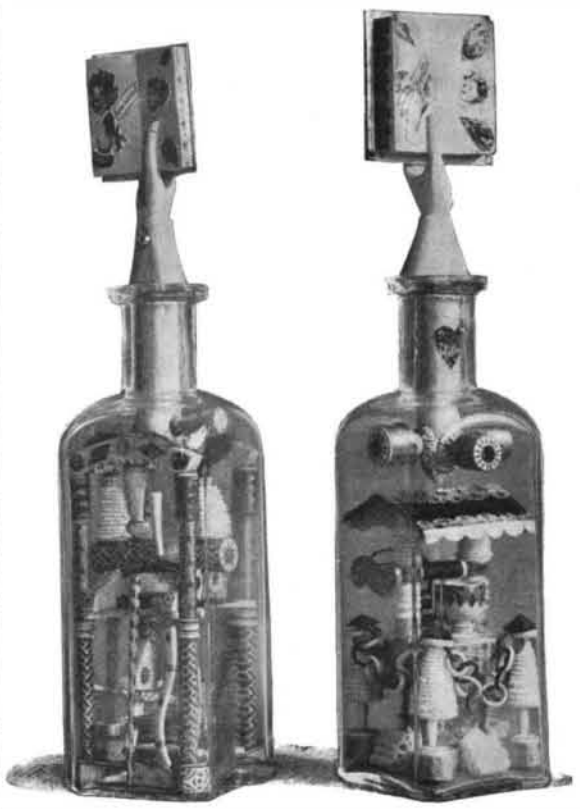
These examples show the advantages of trying new forms of telescopes instead of duplicating those now existing. The Bruce telescope is well adapted to investigations in which the focal length is small. It will therefore be interesting to try the effect of a great focal length. It is proposed to build a telescope with an aperture of 12 to 14 inches and a focal length of 135 or 162 feet. This telescope would probably be placed horizontally and the star reflected into it by means of a mirror. The motion of the earth would be counteracted by moving the photographic plate by clockwork. It would thus become a large horizontal photoheliograph. This method of mounting a telescope for use on the stars was advocated by the writer in 1881, and has been used here since then with successive telescopes of 2, 4, and 12 inches aperture. The instrument here proposed would be adapted to investigations for which a great focal length would be needed, as the latter would be more than a hundred times the aperture. Several such investigations may be suggested, any one of which, if successful, would amply justify the construction of such an instrument.

Prof. Pickering says the best instrument now in use for photographing the sun is the horizontal photoheliograph. It is a small instrument of this form. Under favorable atmospheric conditions finer details on the sun's surface could be obtained with a large instrument than have yet been photographed. It could also be used in photographing the protuberances, and it should not be forgotten that preparations must be soon made to observe the solar eclipse of May 28, 1900. The new instrument might be useful in photographing the spectrum of the reversing layer and in showing the details of the inner corona. Images of the moon obtained with such a telescope would be more than a foot in diameter, even if printed without enlargement. These would probably surpass the best photographs yet taken. It is possible that good results could be obtained with Jupiter, Saturn, and perhaps Mars. The planet Eros approaches the earth in 1900. This will be a more favorable time for observation than any other until 1927. Careful preparations should, therefore, be made for observing Eros when east and west of the meridian, since the distance of the sun can probably be determined with more accuracy in this way than by any other method of observation yet attempted. This is one of the greatest problems of astronomy, although it was supposed to be solved in the eighteenth century, but it will probably be left until the twentieth century for a satisfactory solution. It is expected that the positions of the adjacent stars could also be determined with this instrument, with an accuracy approaching that of the heliometer.

A CONVICT'S INGENUITY.

Not infrequently it happens that the inmates of prisons display a degree of ingenuity not always possessed by their more fortunate fellowmen. How dextrous prisoners are, even in the making of trifles, is well exemplified in two little bottles which have been sent to us by an inmate of the State's Prison at Windsor, Vt., who has built up a small trade in selling his products. The small price at which these bottles are sold is hardly proportionate to the time and labor spent in making them.

METHOD OF LOCKING THE STOPPER-ARMS.



CURIOUS BOTTLES MADE BY A CONVICT.

In these bottles there have been inserted a number of objects of a size and structure which would apparently preclude their entrance through the bottle-neck.

To carve over seventy-five pieces of wood, to put those pieces into a four-ounce medicine bottle, and to combine and fasten them together so that they shall assume the forms of utensils employed in everyday life, is assuredly a task which requires no little skill.

Within one of the two bottles in question a little carpenter's shop has been fitted up. Here may be seen a small shaving-bench with its draw-knife, a gayly colored chopping-block with a hatchet half-embedded in the wood, and an ax ornamented with glittering tinsel, propped against the bottle-wall. Upon a sawbuck in the upper half of the bottle a motley-colored log, nearly severed by a cross-cut saw, is mounted. At its inner end the bottle-stopper is provided with two projecting arms held in sockets by means of elastic strips of rubber.

Within the second bottle a miniature well, with its windlass and bucket, is arranged; and upon the edge of the well there stands a wooden goblet. In each corner of the bottle a delicately whittled tree has been placed. From tree to tree runs a little chain formed of colored pieces of wood, the cutting of which was no doubt the work of days. The stopper of the bottle is provided with four projecting arms. The manner in which these arms are locked in place is shown in one of our illustrations, and certainly constitutes one of the most remarkable features of the work. To the inner ends of the arms strings have been attached and passed up through a central passage running longitudinally through the stopper. By pulling the strings the arms would naturally be forced against the stopper; after having been thus pulled into place, the arms were permanently held by gluing or cementing the strings to the stopper.

One naturally asks, How were all these numerous pieces inserted? The pieces of wood are all smaller than the neck of the bottle, and only the ingenious manner in which they have been combined and fastened together gives to each object its peculiarly large size. The separate pieces were first dipped in glue and then put in place by means of a long and slender pair of wire pliers.

These curious bottles are remarkable for the great patience required in fashioning each piece and for the delicacy of touch and deftness necessary in placing the parts in their proper positions.

March Number of Our Building Edition.

The March number of the Building Edition of the SCIENTIFIC AMERICAN is the handsomest number of this journal which has ever appeared, and it is certainly one of the most artistic numbers of any periodical which we have ever seen. The cover consists of a beautiful colored plate representing a residence at San Rafael, Cal. The house is an adaptation of the Moorish "mission" style that is coming into great favor, not only in the Southwest, but also in the North. The style is an evolution of the "adobe" and is one of the most picturesque houses imaginable, being located upon a side hill, the mountain in the rear forming an appropriate background. On opening at the first page we find the courtyard of the Mattei Palace, Rome, illustrated by an exquisite half-tone. There are also thirteen pages of engravings of modern residences, including colonial and gambrel-roofed houses, a casino, and a modern stable. The literary matter in the number is of more than usual interest. It includes a critical review of the exhibition of the Architectural League, and it also contains considerable matter valuable to not only builders, but to those interested in the building of a home. Those of our readers who are not acquainted with the Building Edition should purchase a copy of this unique number, which gives them an admirable idea of the scope of this publication.

The Current Supplement.

The current SUPPLEMENT, No. 1210, contains a number of articles of prime importance. "How to Make a Sewing Machine Motor Without Castings" is an article by Cecil P. Poole. This article is accompanied by no less than twenty-five working drawings, which will enable any mechanic of average ability to complete a highly efficient motor for operating sewing machines or light machinery. This is another article in the electrical series which we are publishing. "Nernst's Electric Light," by James Swinburne, is a very important paper read before the Society of Arts. The Nernst light appears to have an enormous future in store for it. "Trade Suggestions from the United States Consuls" occupies another page and is a new department of the SUPPLEMENT which will be continued regularly. "Transcaspian Railway" is an illustrated article. "An Abstract of the Report of the Commissioner of Patents for the Year 1898" gives a valuable summary of the work and needs of the office and desired legislation. Dr. Howard's "Economic Status of Insects as a Class" is completed. "Nutrition Investigations at the University of Tennessee" is an elaborate paper.

Contents.

(Illustrated articles are marked with an asterisk.)