THE CROSSLEY REFLECTING TELESCOPE AND ITS NEW MOUNTING.

The new mounting for the Crossley reflecting telescope, presented in 1895 to the Lick Observatory by Mr. Edward Crossley, of Halifax, England, has been completed. The telescope, which has a 3-foot aperture and a focal length of 17 feet, 6 inches, was built about 1888 for the private observatory of Dr. A. A. Common, a wealthy English amateur astronomer, for the purpose of proving his theory of the construction of large reflectors and their mountings. Later the instrument was acquired by Mr. Crossley and set up in his private observatory. Recognizing the injurious effect which the climate of England would sooner or later have upon the telescope, and the great climatic advantages of the location of Lick Observatory, Mr. Crossley presented the telescope and its dome to that institution.

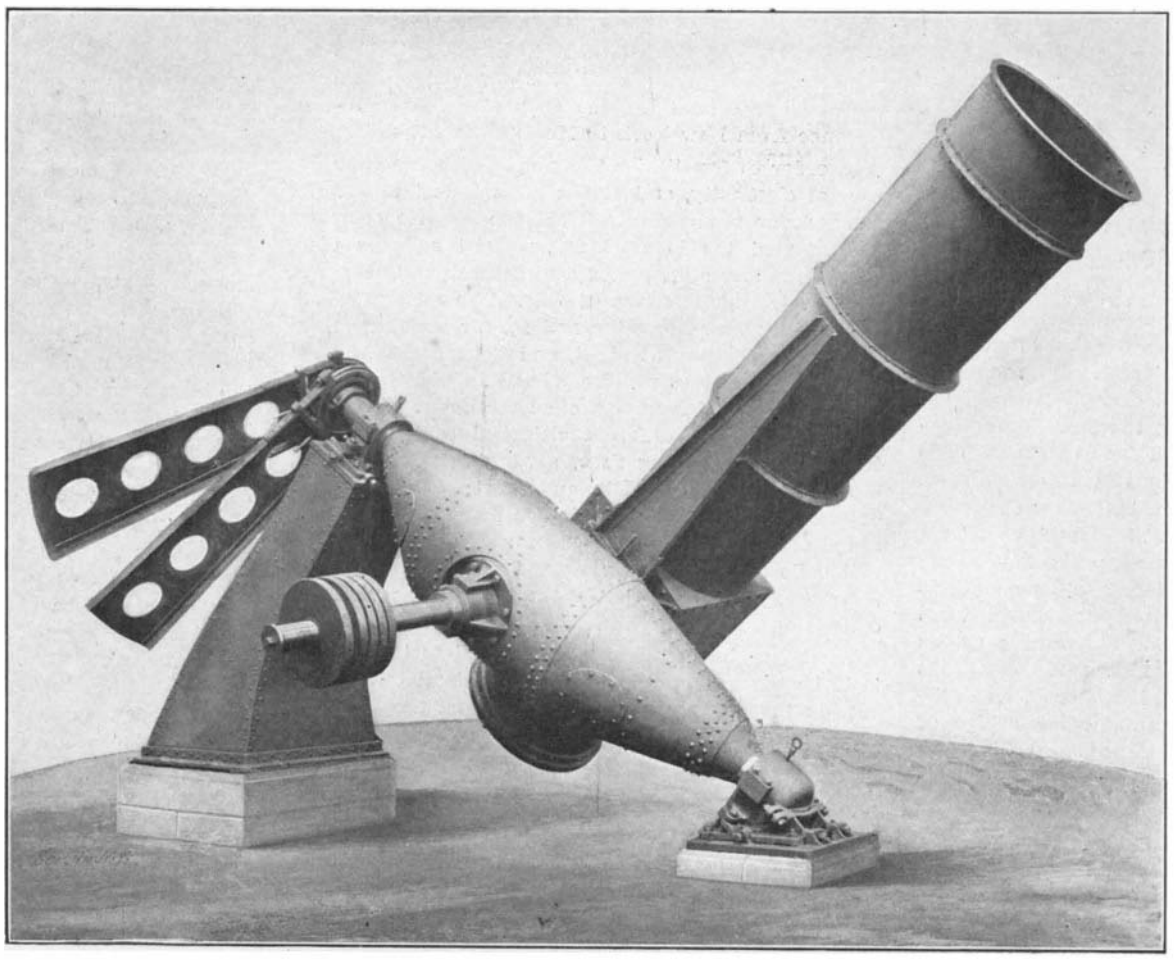
It was with the Crossley reflector that Dr. Keeler, in 1898-1900, did so much successful photographic work. The instrument is of peculiar interest, marking as it does the beginning of a new period in the use of a much-neglected form of telescope. The original Crossley mounting was unsuited for long photographic exposures by reason of flexure and other defects. A new and more stable mounting of the equatorial form was therefore devised by Harron, Rickard, & McCune, of San Francisco. The steel tube carrying the mirror and plate holder is attached to a heavy steel declination axis, passing through the middle of a long polar axis, which is supported at both ends. The polar axis is adjusted exactly parallel with the axis of the earth, so that by rotating the telescope on the polar axis at the speed of the earth's rotation and in the opposite direction, a celestial object will apparently remain stationary and can be photographed by exposing a plate for a long time. Since the bearings for the polar axis are on separate piers, some means were necessary for their ready adjustment. For that reason the surfaces on which the bearings rest have been made cylindrical in a direction at right angles to the polar axis. The bearing-plates can be adjusted in altitude and azimuth.

A leaning pier, 8 feet high, supports the north end of the polar axis, which pier is built up of heavy steel plates riveted to castings at the top and bottom and strengthened by two angle iron frames in the interior. The steel pier will in turn be supported by a brick and concrete foundation 6 feet high. The south bearing plate will rest directly on a brick and concrete foundation.

The polar axis is 14 feet long, in order to permit the lower end of the tube of the telescope to move freely under it in all positions.

The tube of the telescope consists of a strong cubical section, which is attached directly to the declination axis, and of five circular sections. Below the cubical section is a circular section of heavy sheet steel, to which is attached a cast-iron cell holding the mirror. The upper sections of the tube are of light sheet steel bolted to steel flanges. The last section is short and can be rotated about the axis of the tube. In the center of this end section the apparatus for holding the photographic plate and for guiding during the exposure is held by four webs of steel.

In this reflecting telescope, as in all reflecting telescopes, the light from the star passes down through the tube to a concave mirror placed at its lower end, in the focus of which mirror an image of the object is formed. The focus of the Crossley reflector is 17 feet, 6 inches from the mirror. For the sake of convenience, a diagonal flat mirror is usually inserted in the cone of light before it comes to a focus, so that the light is reflected at right angles and an image formed just outside of the main tube of the telescope. The introduction of this diagonal mirror causes a loss of light, in order to obviate which, in the mounting of the Crossley telescope, the photographs will be taken in the principal optical axis.

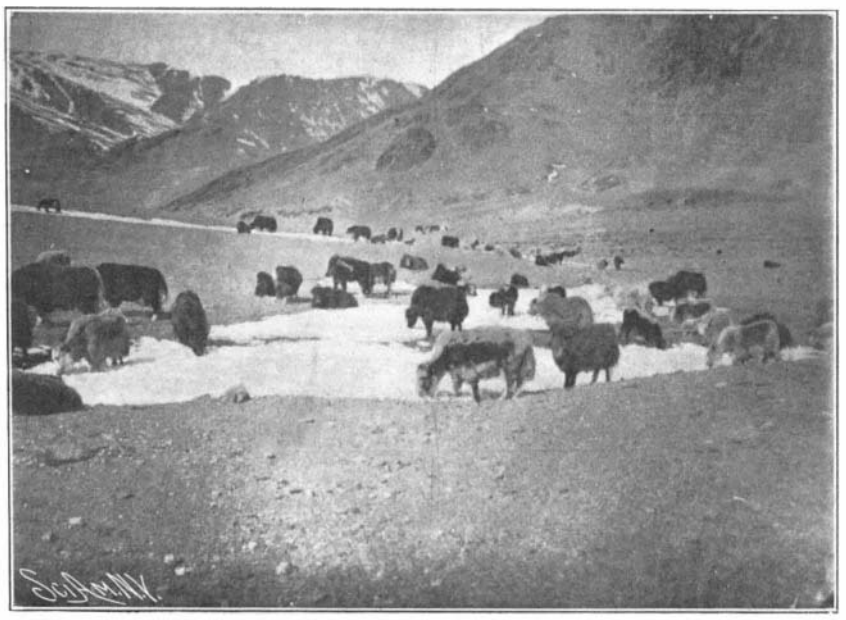


THE CROSSLEY REFLECTING TELESCOPE.

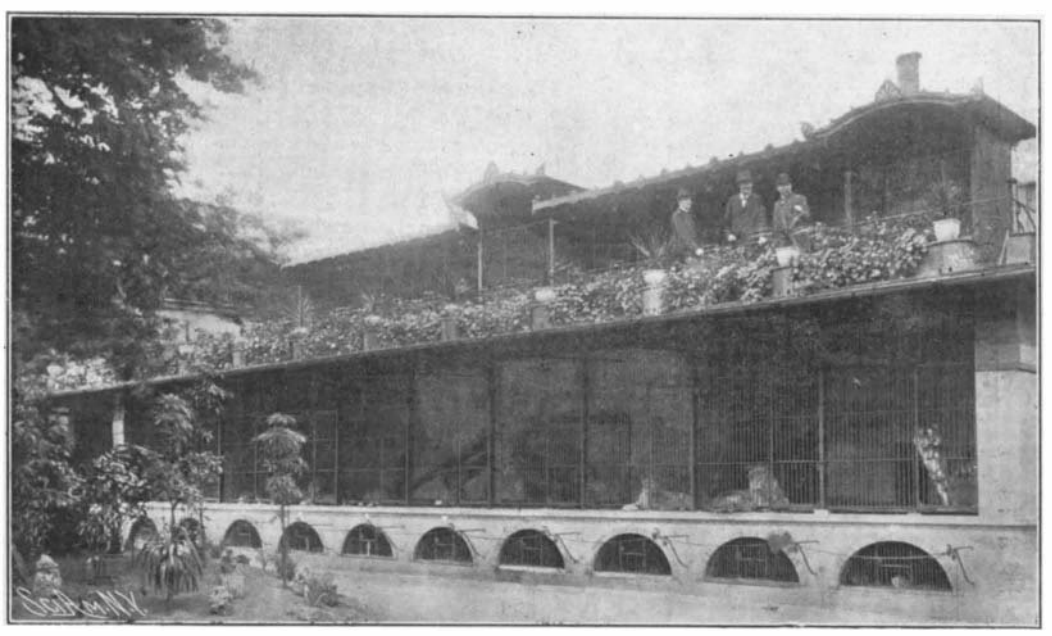
No matter how accurate the driving mechanism of a telescope may be, it is impossible to keep exact pace with the apparent motion of the star toward which it is directed. Hence an auxiliary telescope is attached rigidly to the plate-holder to serve as a guiding-telescope. This guiding-telescope is provided with a pair of fine cross wires. During the time in which a photograph is being taken, the image of a star is kept at the intersection of these cross wires. If the star image moves from the intersection of these wires, it is brought back by means of two screws, which screws also control the plate-holder. The plate-holder and cross wires will be moved by rods which extend in from the side of the telescope.

The driving mechanism of the telescope is a clock train of the conical pendulum type, which drives two sectors of 8 feet radius, attached to the north end of the polar axis. A single sector will run the telescope for an hour. During this time the idle sector will be reversing, ready to be set in gear to run the telescope as soon as the first sector has run down. The thrust of the polar axis is taken directly on a ring of hardened steel balls at the lower end, the greater portion of the weight falling on counterbalanced rolls. The telescope tube with the mirror and the various attached apparatus are counterbalanced by adjustable weights on the opposite end of the declination axis.

J. M. B.



Herd of Yak in Northern Thibet.



Animal Cages at Hagenbeck's.

THE TRADE IN WILD ANIMALS.

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BY HAROLD J. SHEPSTONE.

Hamburg is by far the principal depot for the shipment of wild beasts. Nearly the whole of the trade here is in the hands of one man, Mr. Carl Hagenbeck. Some idea of the immense amount of business done by this well-known dealer is evidenced when it is stated that in the course of a single twelvemonth he dispatched from Hamburg some 76 lions, tigers, and panthers, 42 different sorts of bears, 52 elephants, 64 camels and dromedaries and some 730 monkeys, besides a large number of other animals and birds. The greater portion of this vast collection is sent to America to the various towns and is purchased by directors of zoological gardens and by circuses.

During the week the writer was in Hamburg Mr. Hagenbeck shipped $2,500 worth of animals to Cincinnati and $3,500 worth to Philadelphia. He was also busy preparing a large consignment for the New York Zoological Society. When Prof. Hornaday, the Director of Bronx Park, visited Europe in the autumn of 1902 he spent $17,000 among the European dealers in the purchase of animals. He bought 6 lions, 2 tigers, a leopard, jaguar, cheetah, 2 black leopards, mountain goats and sheep, a chimpanzee, an ibex, a wild hog, a number of snakes and a lot of large and small birds. When I mentioned this to Mr. Hagenbeck he admitted the fact that there is a growing interest in zoos and that in a few years' time the United States will boast of some magnificent gardens. He also told me that his thirty-six years' experience as an animal dealer had taught him that the three great nations