

glass is a photographic camera lens or enlarger, consisting of two double lenses symmetrical in form and position, at some inches apart, each one consisting of a concavo convex crown and convexo concave flint glass. This throws an enlarged erect image of the sun on the plate exposed in the posterior or camera end shown in the figure, where the chemical and optical rays are again brought to the same focus. The pointing and adjustment of the instrument are facilitated by the use of ground glass, both in the camera, and in a small pointer fixed to the side of the tube. In the focus of the object-glass are fixed cross wires, and immediately beyond them is an exposing shutter, consisting of a close sliding brass plate with a small horizontal slit admitting of adjustment to greater or less width. The shutter is pulled down by a strong spring, but can be raised and held above the field of view by a piece of thread and pulley, on cutting which the shutter flies across the field, every part of the sun being photographed by the momentary exposure given through the slit in its rush over the field. For a rapid series of photographs, such as it is wished to obtain of the advance of the planet on the solar disc, another device is employed, which is a modification of Jausen's revolving shutter, which exposes in succession a number of small circular spots, arranged in a circle on the plate, which is itself made to revolve so as to bring each one in turn in the required position. The chief difficulty is to avoid the bad effect of vibration, which appears to have been done by Mr. Christie's arrangement, to the satisfaction both of the Astronomer Royal and Monsieur Struvé. The idea of employing photography, as we noticed in our previous article, we owe to Mr. De La Rue, who first brought solar photography to such a high standard of perfection and accuracy. The dry process which is adopted is that advocated by Captain Abney, R.E., who has directed the training of the photographers of the expedition. The mounting of the photograph is that of an equatorial; the design we prefer to Summ's on the whole. We cannot say the same for the fitting and motion of the wheels; but all is good. The systematic observations necessary to establish the exact latitude and longitude of each station are carried out at the main stations by transits, altazimuths, or vertical circles, and in one case by telegraph comparisons. At the secondary stations it is done by portable instruments and comparisons of various kinds.

The transits are made by Simms (40 in. focal length, 3 in. aperture). They have moveable systems of wires connected with micrometers. The altazimuths and vertical circles differ from each other chiefly in the former having horizontal circles read by microscopes in four places and in many details. The altazimuths are supplied to stations whose latitude is such that azimuth readings are required. Fig. 2, shows the instrument belonging to the Kerguelen Station, which is the best in design and in its performance.—*Engineer.*

LEAD MINING IN CANADA.

Lead-mining operations in the Dominion of Canada have hitherto been limited to what may be called surface explorations, although the finest rock of lead ore exhibited at the late Paris International Exhibition came from Canada. We learn from a prospectus of the Canadian Leading Mining and Smelting Company (Limited) that extensive operations are about to take place to develop the champion mineral lodes in the township of Lansdowne, in the county of Leeds, Ontario. Sir Wm. Logan, Geological Survey, has frequently called attention in his official reports to the promising character of the lead lodes in this district. He says, speaking of the nature of the lode, that "through the gangue, which is calc-spar, galena (lead) is found in masses, sometimes 5 or 6 inches in diameter. A trial shaft of 50 feet, which was sunk in one of the lodes, is said to have yielded sufficient ore to pay the expenses of sinking, and that four other lead-bearing lodes run parallel with the main, the whole being included in a breadth of about 1,000 feet."

PACIFIC RAILWAY.—It has been determined to survey the valley of the Fraser River, with a view to making the terminus of the Pacific Railway at Burrard's Inlet. Mr. Sandford Fleming has received orders to proceed with the work at once.

WEAVING.

ANCIENT LOOMS.

When it is considered how little is known of the early history of weaving, it may be easily understood how much less likely it would be for a description of its various processes to exist. The products of the loom, under certain advantageous circumstances, may be preserved for thousands of years, and still give proof of their peculiarities, either in excellence or defect of manufacture. Thus, the mummy cloths of Egypt supply abundance of proof, not only concerning the existence of weaving 4000 years ago, but of the general excellence of the products then produced. Numerous specimens of this cloth, still wrapped round the embalmed bodies, are to be seen in the various public museums, and nothing could give more conclusive evidence regarding the state of the art in those, the earliest periods of history.

Although woollen and cotton cloth have always been most commonly used for clothing and other purposes, it is fortunate that the Egyptians did not enshroud their dead with either of those materials, and particularly so with wool, which owing to its property of breeding, or being liable to become infested with worms and insects, would be more likely to perish than linen cloth. Thus linen was purposely chosen for shrouds on account of its cleanliness and lasting qualities. The dead were encased in its folds, so that the bodies should be preserved uninjured, for a period of 3000 years, when it was believed that the former spirit would return, after its transitional state and habitation of the bodies of various animals, to resume its previous existence.

It is to this circumstance that we owe what actual knowledge of ancient weaving we now possess. The Egyptians also used wool and cotton for weaving purposes, the poorer classes being clothed with woollen cloth, and the rich with cotton and wool. The priests wore linen, in accordance with their idea of its purity, for they were not allowed to enter the temples with any article of dress composed of wool, that material being considered unclean, from the circumstances before mentioned.

But although it is possible to preserve cloth for long periods of time, when it has been prepared and deposited for that purpose, it is quite another matter as regards the loom in which it was woven. It is characteristic of many things in every-day life which have long been in use, that they rarely suggest to the mind that they may be supplanted by quite different methods, and for the old systems to become totally forgotten. How many of the ancient arts have been lost through the historian making no record of their processes? We therefore cease to wonder that no certain knowledge of the ancient loom exists. Fortunately, there are a few very ancient paintings on the walls at Thebes representing several processes of weaving and spinning, but the looms are not clear enough to understand.

An account of these paintings is given by Sir Gardiner Wilkinson in his "Manners and Customs of the Ancient Egyptians," to which work we are indebted. Thus Fig. 1, on the page 327, represents a weaver at work upon a piece of cloth, woven in a horizontal position on the ground, and Figs. 2 and 3, represent vertical looms—for both vertical and horizontal looms were used by the Egyptians. In Fig. 2, the weaver is shown weaving cloth with a coloured border, and in Fig. 3, two females are shown at work at the loom. It required the services of two to weave with the vertical loom—one, perhaps, to open the shed and attend to the warp, and the other to work the shuttle and attend to the weft.

It will be noticed in both Figs 2 and 3, that the weaver holds a stick, or lever, in the right hand; at the end of these levers there is a hook. Sir Gardiner tells us that he thinks these hooks were for the purpose of drawing the weft thread through the warp—in a similar manner, we may suppose, to willow or horse hair weaving, where short lengths only can be used. If such a system really was in use by the Egyptians, and the cloth which now exists was woven by drawing the thread through the warp shed, the cloth would give evidence of it, for it must necessitate the formation of an open selvage, or fringe, on at least one edge of the cloth, and, even if the thread was drawn through by the hook, in such a manner as to use long lengths of weft, it would then have a double weft thread, with a perfect selvage on one edge of the cloth, and an open one on the other—similar to the weaving by some of the modern shuttleless looms. But the Egyptian cloth that we have seen has no double threads, and both the selvages are