

objective is down to the axis about which the mirror rotates. Use the plane side of your mirror, and reflect the image of a distant object, e g., a dot on a window-pane, *which must also be in the line of the axis of the mirror's rotation*, into the field of view so that the aforesaid dot will appear in the centre if the mirror is directly beneath.

If all is properly adjusted, on moving the mirror-bar to and fro, the dot will always appear reflected from the centre of the mirror. The angle through which the mirror-bar must be swung, so that the image of the dot may be first where the apex of one branch of the hyperbola was and then where the other apex was, will be the optical angle in air (2E). The angle, which may be swung from where the dot disappears on one side to where it disappears on the other, will give the angular aperture of the objective used.

#### SUBDIVISIONS OF THE AZOIC ARCHÆAN IN NORTHERN MICHIGAN.

BY M. E. WADSWORTH, STATE GEOLOGIST, HOUGHTON, MICH.

THE work of the Michigan Geological Survey in 1890 made it clear that the Azoic system of the Lake Superior district of northern Michigan was composed of at least three unconformable formations. This conclusion was published by me early in 1891, in an article entitled "A Sketch of the Geology of the Marquette and Keweenaw Districts," which was appended to a pamphlet called "Lake Superior—Along the South Shore," New York, 1891. These general conclusions have been confirmed by the work of the two subsequent seasons, and two other unconformable formations rendered probable, although not yet proved conclusively. A discussion of these points will subsequently be given in detail in the reports of the State geologist.

The following are the formations as made out and named from prominent localities by the Michigan Survey, commencing with the oldest. There are given with this the formations as determined by the United States Geological Survey, showing their supposed equivalency.

| Azoic, or Archæan, System. | Michigan Geological Survey. |   | U. S. Geological Survey. |
|----------------------------|-----------------------------|---|--------------------------|
|                            | Laurentian (?) Period.      | Cascade Formation.                        | Fundamental Complex.     |
|                            | Huronian (?) Period.        | Republic Formation.                       | Lower Marquette Series.  |
|                            |                             | Mesnard Formation.                        |                          |
|                            | Michigan Period.            | Holyoke Formation.<br>Negaunee Formation. | Upper Marquette Series.  |

#### POTATO SCAB.

BY H. L. BOLLEY, FARGO, NO. DAKOTA.

THIS disease of the potato-tuber need not longer mar the appearance, quality, and economic value of the crop. The corrosive sublimate treatment, recommended in Bulletin No. 4, of North Dakota Experiment Station, has had another year's trial, not only at this station but by potato-growers, and it has again proven effective in a degree beyond previous expectation. Though the damage done each year by this disease is so great and widespread in its occurrence, no plant-disease now successfully combated is so easily prevented and at such a slight cost.

As indicated in my work of previous seasons, it is again demonstrated this past season that the damage to the yield of the crop is very much in excess of that usually supposed. The disease attacks not only the tubers but the base of the vines also; the result is a shorter-lived vine, a greater number of potatoes set upon the vines than there would be under normal conditions, and, third, much smaller tubers. The second of these statements, perhaps, needs some explanation. I have only one to offer, which I think to be about the correct one, i. e., the disease early attacks the young tubers as they set upon the vines, normal growth is

checked, and the excess of vigor in the vines which is at its highest stage at this time finds expression in the formation of new tubers to the further detriment of those already set upon the stems.

The results of this summer's work when averaged for all tests show an average gain of one-half pound per hill in favor of the treated seed-tubers, and 99.33 per cent of total product void of disease; while untreated seed in all cases gave a product in which less than one per cent undiseased tubers were found.

The cost of treatment for a crop of two or three acres of potatoes need not exceed fifty cents, aside from that of one or two days' extra labor.

Details of the season's work will soon appear in bulletin form.

THE fourteenth edition of Franklin Leonard Pope's "Modern Practice of the Electric Telegraph" has just appeared (D. Van Nostrand Company, 234 p., 8°, \$1.50). This is a technical handbook for electricians, managers, and operators, and contains 185 illustrations. As this book has been a standard authority on telegraphy for almost a quarter of a century, it is unnecessary to say anything to those already familiar with it, except that it has been rewritten, enlarged, and brought to date. To others, it is sufficient to repeat that this is the fourteenth edition of a comprehensive and handsomely illustrated work.

—The Johns Hopkins University has published a large geological map of the vicinity of Baltimore, prepared by Professor G. H. Williams. It is an extension of a similar map prepared by Williams and Darton and published by the U. S. Geological Survey some months ago; but the coloring on the present issue departs from the color system adopted for the Survey maps; as if experimentally to try another device, better applicable to the region here included. The experiment is successful; but it does not follow from this isolated instance that the color scheme of the Survey should be changed in its uniform application to the great series of maps for which it was prepared.

—The Geological Survey of Missouri, Arthur Winslow, director, has issued an atlas report on the Higginsville map-sheet, with two colored maps and several pages of text, chiefly concerning the coal measures of the region. The large form of the report avoids the difficulty of folding the maps, which constitute its chief feature; but the size of the atlas is inconveniently large for easy keeping in the library or on the desk. As a forerunner, however, of what we shall have to deal with when the publication of similar atlases of maps and texts is begun by the U. S. Geological Survey, the Higginsville atlas gives us useful practice. The extension of such a series of reports to include the other map-sheets of Missouri will add greatly to our information about that State.

—Professor F. A. Forel of Morges, Switzerland, has long been known as a careful investigator of the natural history of Lake Geneva, on whose borders he was born and bred. Several years ago he published a small pocket volume on the various features of the lake; and now we receive from Rouge of Lausanne the first of three volumes, entitled "Le Léman; Monographie Limnologique." Judging the whole work by what now appears, as well as by the high standard of Forel's previous writings, it is not too much to say that it will take an eminent place among scientific monographs, ranking with Favre's "Alps of Savoy" and Heim's "Mechanism of Mountain-Making." The division of the present volume which will excite most general interest is the serious discussion of the origin of the lake, from which Forel concludes that, of all suggestions, the one which ascribes the basin to the warping of a pre-existent valley is by far the most probable. The winds of the lake are fully described; but in the excursions in connection with them into the theory of cyclones and anticyclones, the author evidently ventures into a field somewhat unfamiliar to him; his suggestions on this subject not being made in view of all that is known about it. The second volume will include an account of the *seiches*, or oscillations, of which Forel has already written so much; the third will discuss the biology of the lake and its human antiquities. An excellent map accompanies the first volume.