three points, namely, A, c, and c ; it has a hinge at H; the point c is stationary when the point P moves about; the wheel c turns in different directions, indicating the area described by P. The nature of the instrument is such that, when the point P moves from D via A to B, the wheel c indicates the area of the figure A, B, c, D; if P is moved further from B via E to D, the wheel c subtracts the area B, c, D, E, leaving indicated the area A B E D. The wheel c , with the assistance of a *vernier*, gives three figures in the reading, and the wheel e moved by a worm-screw gives the fourth figure; the instrument gives a nicety of four figures in the reading, which is sufficient for most practical purposes.

The planometers are always made so that the point P is to be moved with the sun. However irregular a plan-figure might be, the point P moved through the whole boundary, gives the area on the wheels c and e . The cross-section A, B, b , is obtained by moving P in the boundary from A via B, b , and back to A.

When it is desired to know the area of all the cross-sections, it is not necessary to read off every one of them, but continue to move through all the boundaries and the wheels will add up the whole to one sum, which, multiplied by 2 and the distance between the sections, gives the displacement; though care must be taken not to take the greatest section α twice. Suppose all the areas of the figure before us is to be taken for the displacement: Move P from A to B b A, B a A, B E D A, further from A to 2 B A, 1 B A, and the wheels will show the total sum of half the sections.

Mr. Amsler, formerly a resident of Philadelphia, returned about a year ago to his native country, Switzerland, the only place where the planometer is now manufactured. It is sold by McAllister, Chestnut street, Philadelphia, and by Elliot Strand, London, where more complete descriptions of the instrument can be had.

For the Journal of the Franklin Institute.

Indian Method of Making Fire.

In the "History of the Manufacture of Instantaneous Light," in the December number of the *Journal*, Prof. Lyon Playfair states that "the savages of various countries found for themselves a means of getting a light which was far from instantaneous. I think that it would require much more dexterity than we can employ to demonstrate how a light may be got by rubbing together two pieces of wood."

Perhaps many of us have tried the experiment with the same success as the lecturer; and as I have never seen published the method by which it is accomplished, the following explanation may not be without interest to your readers:—

I have a pair of the sticks used by the Indians on the Northwest Coast of the United States for obtaining fire; have seen the same sticks in use to produce fire, and have myself produced fire therewith. Each is sixteen inches long; the thicker is three inches in circumference, and has been cut so that a section would give a rough ellipse with the

largest diameter one and one-eighth inch. The smaller is one and three-quarters of an inch in circumference. Both are crooked, just as they grew, and after depriving the smaller of its bark, it was whittled so that a section would give an irregular polygon; this was done for a good reason, as will be apparent. I cannot say what the wood is, but it presents an open network when examined in section; they are apparently of the same kind, but the smaller has more compactness, and shows signs of a slower growth. The Indians always select pieces with that difference. Both have been thoroughly roasted, and were carried carefully wrapped in skin, to prevent the absorbing of moisture; accompanying them is carried a bunch of the inner bark of the cedar, picked very fine and dried.

To use them, the larger has a shallow circular hollow, less than one-eighth of an inch in depth, made on its broad side, near one end, and a narrow groove or channel cut from this to the side; the smaller stick has one end made very slightly rounding. The Indian squats, holds the larger stick upon the ground with his bare feet, and places under the groove a small bunch of the bark fibre. The smaller stick is then held upright, the rounded end placed in the hollow of the larger stick, and with both hands at top and the stick between them, he commences to rapidly revolve it by rubbing the hands upon each other backward and forward, at the same time exerting pressure downward, by which his hands gradually slip down; he dexterously—and this is *the* point of success—runs his hands to the top and repeats the previous operation. A fine brown powder is soon produced by the attrition, and is carried along the side groove among the bark fibre. This powder is finally ignited, and the burning transmitted along the groove to the bunch of bark fibre, which is quickly seized by the operator and blown into a flame.

With the sticks in my possession I have seen them produce a flame in about one minute, and have frequently done so myself in three minutes. In eleven years' experience on the Western Coast, I never saw but this pair of sticks, when we were thrown among a tribe previously unacquainted with white men. The Indians generally used lucifer matches bought from the Hudson Bay Company or trading vessels.

GEORGE DAVIDSON.

Germantown, Pa., Jan. 18, 1863.

For the Journal of the Franklin Institute.

St. Elmo's Fire.

JOHN F. FRAZER, LL.D.

DEAR SIR—In accordance with your desire, I have the pleasure herewith to furnish you with an account of my close contact with "St. Elmo's Fire."

About sixteen years ago—being then traveling in Ireland—I left my hotel at Castlederg, County Donegal, to post it to Stranorlar. I started about 5 o'clock in the evening of a lowering and chilly November day. I traveled in a fancy or sporting vehicle known in