

to a point about 150 feet below the edge of the crater. We now saw repeated the conditions of 1890 with this exception, that the building-up process had not reached the summit. From a secure position we could look down upon the molten lava and observe all the phenomena of the immature eruptions.

In 1896 the rising column of lava had once more forced a way for itself through the mountain's base. Again the crater was a dark, roaring cavern. But this time the vent was in the direction of the observatory to the west of the summit. The liquid lava had covered many acres, destroying a part of Cook's carriage road, and piling up a new hill a hundred feet high. A few inches beneath the surface this hill was still red hot, while from its summit two or three streams of live lava flowed sluggishly down its side.

In about five years Vesuvius had passed through one constructive cycle. These must succeed each other until the walls of the crater have sufficient resistance to allow the accumulation of an explosive energy. Then comes the short destructive period during which the retaining walls are seamed and shattered. In general the number of elementary cycles between great paroxysms will be in direct proportion to the work of restoration necessary, and this in turn will depend directly on the violence of the eruption immediately preceding.

X-RAY TRANSPARENCY. BY ARTHUR L. FOLEY.

[Abstract.]

Many experiments have been made to determine, and many tables given to show, the relative transparency of bodies to the X Rays. No two have been in agreement. The varied results cannot be attributed to uncertain methods or experimental errors, or, indeed, to the size, shape and general construction of the different tubes used. The degree of the vacuum seems to be the chief factor.

Two of the tubes used in this investigation were of the usual type—non-adjustable vacuum. At first they increased in efficiency, then decreased, and finally almost entirely lost their power of affecting a fluoroscope or photographic plate. At first the rays possessed little penetrating

power; that is, bodies were rather opaque. But as the vacuum became higher the penetrating power of the rays became greater, especially for dense bodies.

The third tube used was one of Queen's adjustable vacuum tubes. To obtain what is here called a low vacuum, the auxiliary spark gap was closed or short-circuited. To obtain a high vacuum the gap was made as long as possible. A photograph of the hand with a low vacuum showed flesh and bones almost equally opaque, while with a high vacuum the flesh was almost transparent. A photograph of a piece of glass, aluminum, steel, carbon, rubber and cork showed that the glass, aluminum and steel were more transparent to the high than to the low vacuum rays. The reverse was true of carbon and cork. No difference was noted with the rubber.

Soon after the X rays were discovered Edison announced that what are known as slow plates are the fastest for X rays. Here again the degree of the vacuum must be taken into consideration. For high-vacuum rays fast plates are most rapid.

The fluoroscopic action of the rays also changes with the vacuum, a rather low vacuum giving the best results.

Whatever be the nature of the X rays it is certain that they possess properties analagous in some respects to pitch and color.

THE TROUBLE WITH INDIANA ROADS BY DANIEL B. LUTEN.

A good road is defined as a road that is hard, smooth and serviceable at all seasons of the year.

The State of Indiana has 60,000 miles of wagon roads, of which about 8,000 miles have been improved by graveling or "piking," and now constitute our free gravel road system, maintained and repaired by the counties. The remaining 52,000 miles are nearly all dirt roads, and are maintained and repaired by the townships.

If we are to judge of Indiana roads by the above definition of good roads, we must admit that less than one per cent. of our 60,000 miles of roads are good roads. I do not mean that the remaining ninety-nine per cent. are always bad; but I do mean that for five or six months of every year they are bad, some of them extremely bad, and that at such