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Anaconda Copper Mining Company

GEOLOGICAL DEPARTMENT

THE ELBOF METHOD

of

ELECTRICAL PROSPECTING

By

Tom Lyon

November 10, 1924

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Mr. E.E. Mueser of the Electrical Prospecting Corporation of America, arranged with the New York office to try his method at the Walker Mine, Plumas County, California.

The writer accompanied Mr. Mueser and his party, which included Dr. Hugo Sweibal, N. Gella, E. Perthon, and E. Somer, to the Walker mine where work was immediately started.

It was first suggested that the main ore body should be mapped so that in extending the investigation to ground lying to the north and south in which no underground work had been done, some comparative value of the observations could be obtained. This was found to be impracticable as the pipe and tracks in the mine workings would have more tendency to distort the current lines than the ore body itself. Accordingly an area to the south of the main workings along the general strike of the vein was selected. The area was surveyed and laid out in 75 foot squares. The dimensions are 975 feet across the strike of the vein nearly at right angles by 675 feet along the strike.

Samples of the country rock (Basalt Schist Granite) were obtained and tested for conductivity. The resistance of the country rock was found to be infinite as compared to the vein material which was found to be a good conductor.

APPARATUS

The apparatus was then moved on the ground and set up.

The apparatus may be divided into two parts:

1. The sending medium, which may be a 6-volt storage battery connected to a vibrating coil, which steps the battery voltage up to 1000 or as high as 7500 volts, depending on the pressure needed, having about 800 alternations per second; or a generator similar to those used in sending radio messages from aeroplanes. The generator is connected to a transformer which gives the same voltage as the battery and coil, the alternations are about the same. The current flow is about three amperes.

2. The receiving apparatus consists of a ring attached to a four-tube amplifier when used with the battery, or a two-tube set when used with the generator.

The ring is the most important part of the entire apparatus. A number of turns of copper wire are wound on a wooden ring about 20 inches in diameter, 1½ inches thick and about 3 inches deep. The ring is mounted on a tripod with a swivel head so that it may be turned in any direction. It is also on a hinge joint and may be deflected from a vertical position to a horizontal position in either direction. A wire from the ring extends down one leg of the tripod to the ground. A compass is mounted on the ring over the tripod so that a deflection angle may be measured. The receiving set, consisting of the amplifiers and receiver, are attached to the ring by means of two wires.

THEORY

The current entering the ground takes a theoretical path, if no bodies of high conductivity tend to distort the current lines. (See Plate I) The ring set up on any station in the field, when at an angle with the current line, picks up the signal and it is heard distinctly by the observer. When the ring is in the strike of the current line no noise is heard. By the means of the compass these strikes are recorded, thereby indicating the path of the current. Four current fields are measured and platted on transparent paper which when superimposed over a plate with the theoretical field accurately printed upon it show where and in what direction the distortion of the observed current lines occur. This gives the location of the ore body, if any, in a horizontal plane.

The depth of the ore body is obtained in a similar manner using the ring to find the dip of the magnetic field where the observation on the current line is taken. The dips thus observed indicate the depth of the body of higher conductivity.

CONCLUSIONS

The theory of this method seems reasonable. There are, however, many important things to consider when an attempt is made to interpret the data obtained in the field. It must be remembered that the current flowing in the rocks is very small and without the aid of radio amplifiers it would be very difficult to detect.

In dealing with such a small current flow it is hardly reasonable to assume that in an area in which several ore bodies

occur that each ore body would cause a separate and distinct distortion of the current lines. It might be that the distortion would be a resultant of the effect of several ore bodies. This would indicate then an ore body at a point where the resultant distortion occurred.

Mr. Mueser will undoubtedly submit a report and indicate the most favorable locations to prospect. Until the prospecting has been done it is impossible to state just what the value of electrical prospecting will be.

Respectfully submitted,

TL/P

Tom Lyon,
Geologist.

CC: Mr. Kelley
CC: Mr. Thayer
CC: Mr. Wraith
CC: Mr. Sales

Salt Lake City, Utah
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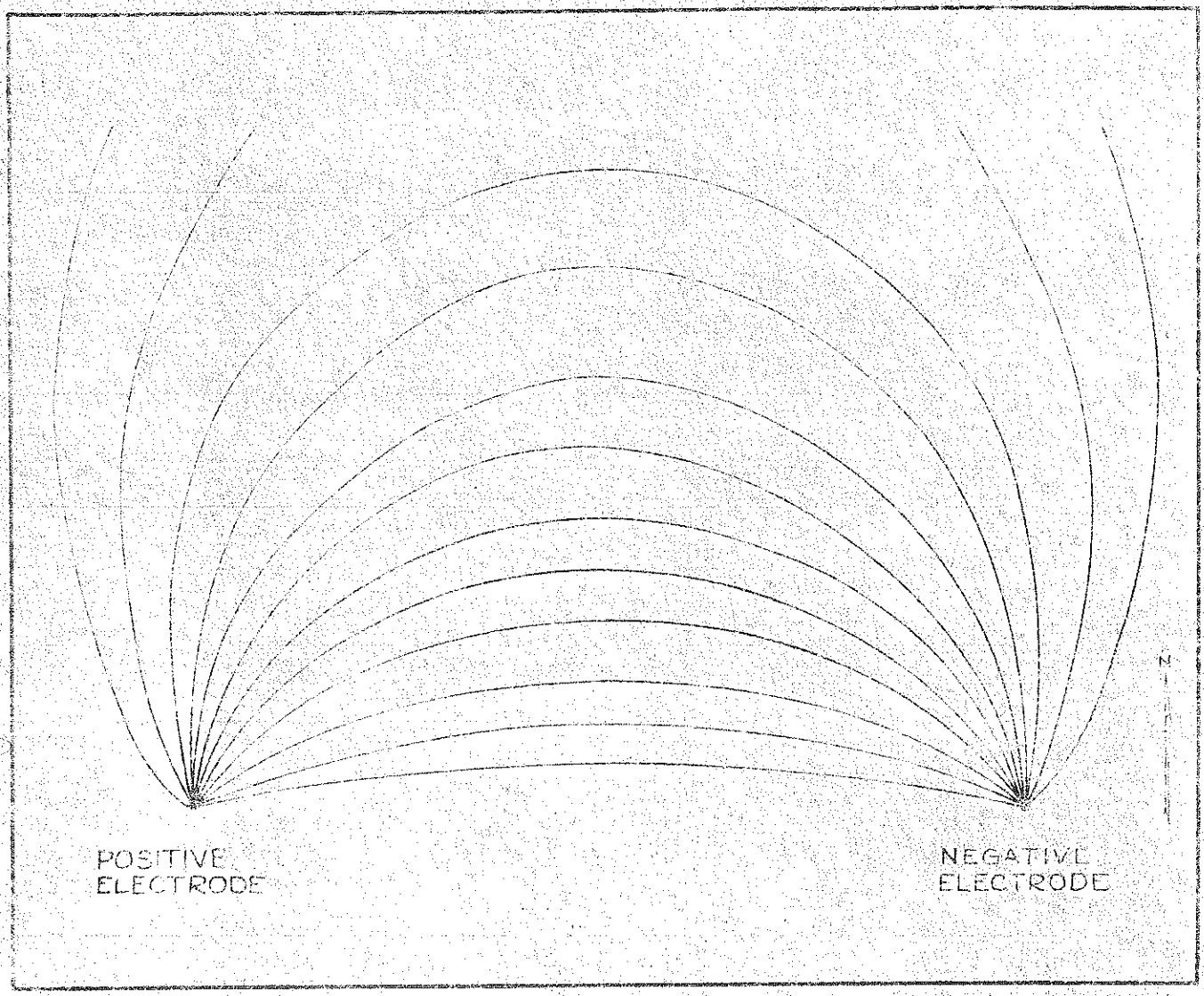

FIGURE I

THEORETICAL FIELD

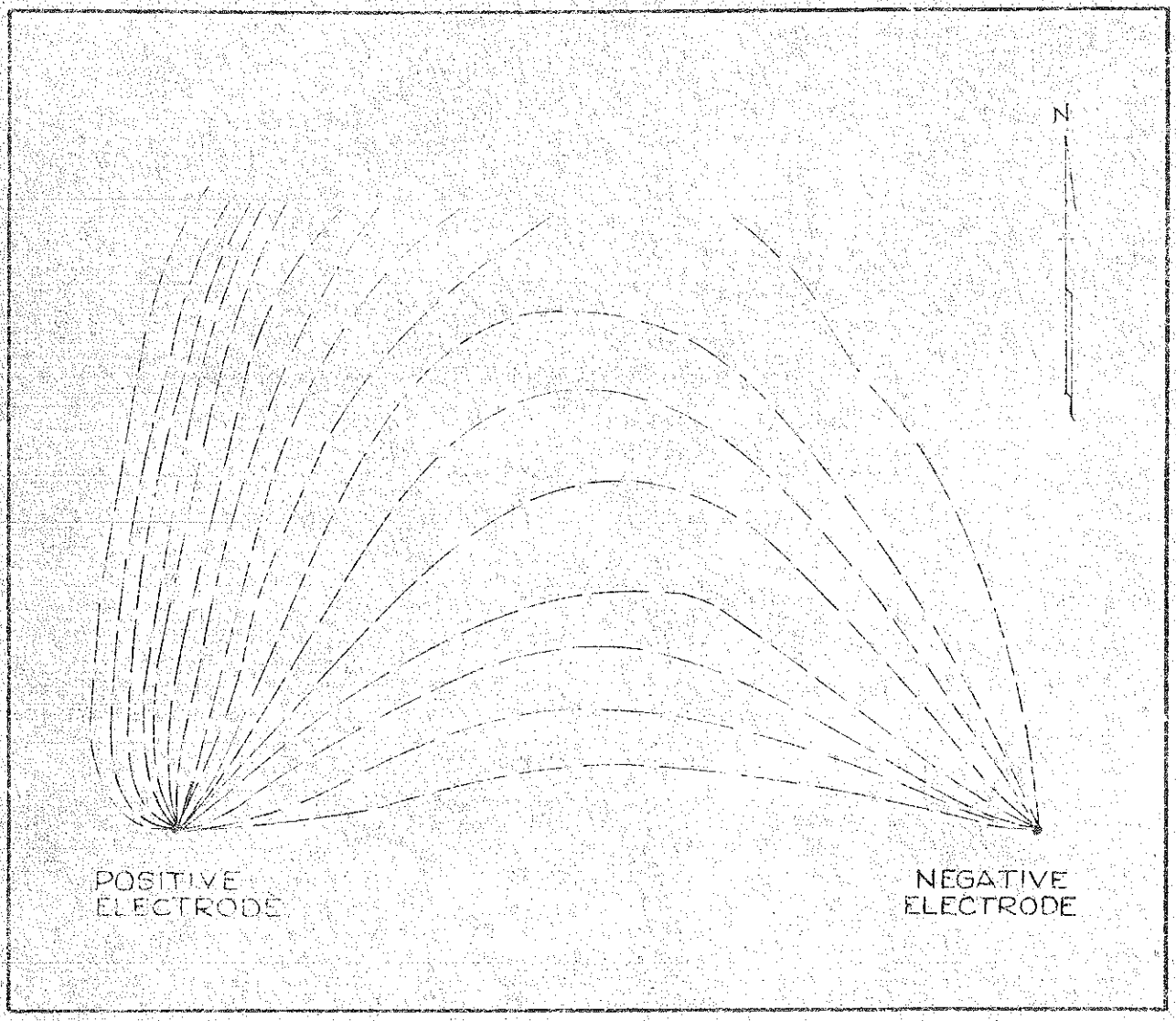

FIGURE II

FIELD SHOWING DISTORTION ON WEST SIDE

INDICATING SOME BODY OF HIGH CONDUCTIVITY BENEATH THE SURFACE-

FROM OBSERVATION