conductors than the enclosing rock, and those which are, comparatively speaking, insulators. A good conducting lode changes the shape and intensity of the normal field, elongating it in the direction of the strike. Waves are brought to the surface by the lode, and there is a concentration of energy over the apex of the lode, and a corresponding increase in sound. When, however, the receiving electrodes are equidistant from the apex of the lode, a point of equipotential is reached, and a marked diminution in sound occurs, if not absolute silence, which, to the untrained operator, it appears to be.

Practical Application of the System.

(1) To locate an outcrop covered by a few feet of subsoil:—The transmitting electrodes are placed in the ground in a line at right angles to the direction of the strike of the lodes. Two operators, each holding a receiving electrode and a telephone, proceed, at a few paces apart, cross the field to be tested in a line parallel to the transmitting electrodes. The receiving electrodes are thrust a few inches into the subsoil, taking care to make a good contact, and the sounds heard are noted. On approaching a metalliferous lode the sounds are intensified, and the operators then come closer together, and proceed more cautiously, only moving electrodes a foot or so at a time, until silence is obtained. A post is then planted in the ground midway between the electrodes, and this post represents the apex of the lode, or the spot under which the metalliferous body will be found.

In the case of an insulated lode, such as a quartz reef, the sound will be most intense over the apex of the lode. The method adopted in this case is to earth the transmitting electrodes in a line parallel to the strike of the lode, when the waves in the centre of the field travel in a parallel direction, and if the apex of the lode is not too deep down, a "shadow" takes place in the earth at the back of the lode. This method is called "shadowing."

(2) To locate a lode at depth:—The test as to depth is obtained by restricting the electric field so that audible sounds are only obtained over a given diameter, and with waves of the highest potential possible. Once ascertaining this radius, and contracting it by cutting down the prime energy used and shortening the base line, i.e., narrowing the distance between the transmitting electrodes, the approximate depth to which the waves penetrate is calculated and obviously a lode situated below that depth can show no variation in the field above.

The Application of Electricity to Location of Ore Bodies.

When we consider the many physical properties possessed by ore bodies lying in the near surface of the earth's crust, it seems apparent that there must be some method of detecting their presence by means other than that of visual observation and geological inference. A vein is a comparatively thin sheet more or less mineralized, possessing both length and depth. The movement of the earth gives it a rotary speed of approximately one thousand five hundred feet per second and the orbital speed through space of about nineteen miles per second. Numerous lines of force and vibration of many orders from inter-stellar space are cut and corresponding phenomena must be produced in the ore body. In many cases oxidisation and other chemical changes are taking place and various portions of a vein are subjected to thermal differences,—all of which must set in motion forms of energy.

There are at least six theoretically possible methods of determining the presence of position of a mineralized vein:—

1st.—Resistance.
2nd.—Electro-chemical affinity.
3rd.—Magnetism.
4th.—Electro-magnetic induction.
5th.—Radiations or Emanations.
6th.—Conduction.

Radiations and Emanations.

Whenever oxygen combines with any metal or mineral an "emanation" is thrown off. The nature of this emanation is unknown. It apparently proceeds in straight lines and passes through water, soil and any rock capable of absorbing water, but it is arrested by oil, mica, etc. It affects the salts of silver like light waves and photographic plates exposed to its influence are darkened. Practically the whole surface of the land on the earth is bathed in this emanation, as wherever tests were made in Europe and America it has been present. It is especially strong in some mining areas. In fact, veins undergoing considerable chemical changes can often be located by its presence. In carrying out tests of this kind, phenomena has been observed that could not possibly arise from this emanation, and the character of which proves to me at least that a class of radiation of the order of light or possibly longer electro-magnetic waves is being emitted from strongly defined veins.

In the case of some classes of quartz veins which may be highly payable in gold values and at the same time, too sparsely mineralized to conduct as well as the enclosing rocks, these can often be located by negative methods. Usually waves of low potential would be used for such work. On encountering an insulating vein and finding free passage barred, the waves would be deflected and travel up the wall to the apex of the vein and escape in the material between the apex and the surface of the soil. In this case assuming the distance from the apex to the surface to be twenty-five feet, most of the train of waves travelling half a mile or more underground would be deflected upwards and crowd over in the twenty-five feet of material available to their passage. Obviously, the electricity in the telephone would be increased suddenly on encountering such a flux of energy. By patiently exploring an area and mapping up the increase and the decrease of the flux of energy, and more particularly, the direction of the flow, the positions of many veins can be determined.

Waves carried to great depth and distance by a persistent vein frequently arrive at the return electrode a fraction of a second late, and they cause interference which is manifested in the receiver by a lack of synchronism. When a section of the wave flow has been carried at an acute angle from the normal flow through the subsoil, a cross field is formed giving effects of retardation in the telephone. Where these effects are noticed, a conducting vein must be present in the area energised and by tracing the source of the cross field, the vein can be located.

Pneumatic Brush Gear.

You will have noticed that the question of a steel shaft of a turbo-generator rotating at a very high speed has a tendency to develop two centres. The first centre is the normal mechanical centre which could be the one and only centre if it were possible that the steel shaft could have the same homogenity. This result, of course, is scientifically impossible to obtain. Therefore, around the centre we have two unequal bodies and the greater speed that these bodies obtain the greater variation, therefore, we have another centre revolving around the ordinary mechanical centre. Consequently the strain on any bearings on which this shaft travels is increased practically developing an eccentric motion. To overcome this difficulty pneumatic brush gear for direct current generators has been introduced on account of air being extremely resilient and able to take up the slightest vibration in pressure, which would otherwise cause disintegration of the carbon blocks. It is also a well-known fact that springs under compression tend to crystallize and become fatigued and lifeless. This will give a brief idea of the pneumatic brush gear. The air compression is maintained by means of a small foot pump, the pressure being about three to four pounds per square inch.

Another modern invention which I had my attention drawn to is what is termed an inkless combined feeder log which has been adopted by electrical departments of Glasgow and several other corporations. One can obtain simultaneous readings of watts and frequency, volts and amperes, power factor and frequency, etc. Absolute synchronism and accuracy of time contacts is thereby obtained. An inkless recording meter, as the name designates, is a meter which records without the use of ink or pen, the chart being formed by series of contacts made over a type-writer ribbon, the contact impulse being actuated from a control clock which can give an impression every second, and as close as one