have been decided *à priori*, without experiment, that a magnet *at rest* could not give rise to a current. For that would have violated the law of the conservation of energy, agreeably to which work can be done only provided a like quantity of work has been previously expended in some way. Yet Faraday discovered the law, harmonizing perfectly with the principle of the conservation of energy, that if a magnet be *approached* to a closed spiral circuit it will evoke in the circuit a sudden current lasting only for the moment of approach, but that when the magnet is *drawn away* from the spiral a current in the opposite direction to the first will be momentarily set up therein. Instead of a magnet, a closed circuit carrying a current may be approached and removed, or, instead of the latter, the current in the circuit may be made alternately to appear and disappear, or its strength may be alternately increased and diminished.

Currents thus produced are called "currents of induction," and apparatus designed to generate induced currents, rapidly alternating in direction, by means of common currents, are called "induction-coils." An induction-coil consists (1) of a soft iron core, (2) of a primary wire spiral or helix enveloping the same and receiving an ordinary electric current, and (3) of a secondary wire spiral of thin wire and many turns, enveloping the first. The current sent through the primary spiral magnetizes the iron core (compare the first discovery). The magnetized core then attracts a little iron hammer which is placed before it and regulated by a spring. This movement of the hammer breaks the metallic connection with the primary spiral so that the current is interrupted and the iron core again unmagnetized. The hammer immediately jumps back from the iron core, the current is again set going, and the action described is repeated anew. By this apparatus, thus, we are enabled to make the current in the primary spiral repeatedly and alternately appear and disappear. According to Faraday's laws, now, every appearance of the main current in the primary coil must produce in the secondary coil an induced or "closing current," as it is called, flowing in the opposite direction, and lasting but for a moment; whilst conversely every disappearance of the current must evoke an induced current flowing in the same direction with the main current, and called the "opening current." Thus are produced in the secondary spiral in quick succession currents which flow in alternately opposite directions. These induced currents are of brief duration, but of enormous tension. Their powerful physiological action on the human body is familiar to every reader.

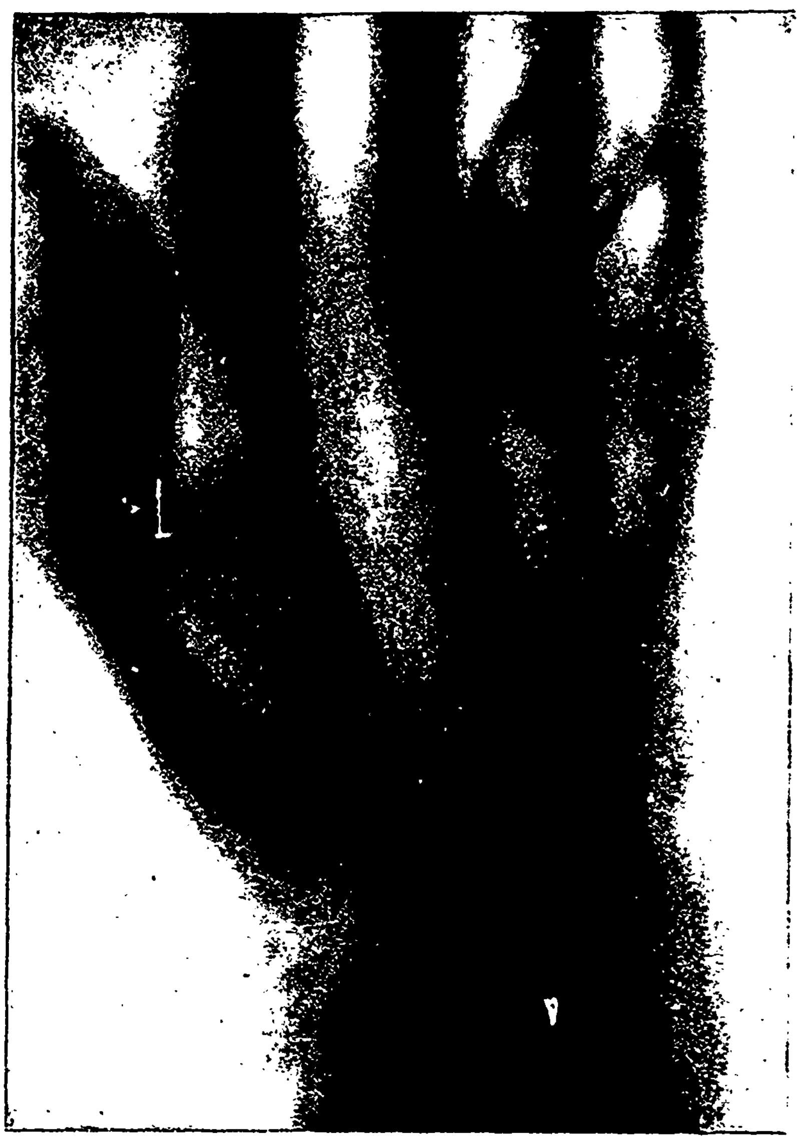

Fig. 2.

It is to these induction currents, discovered by Faraday in 1831, that we owe all the recent magnificent development of electro-technics. For not only is the art of telephoning based upon induction effects, but the performances of large dynamos, or machines designed to produce, by mechanical work, electrical currents of great intensity and high tension are primarily rendered possible by induction effects.

So much for the induction current which is produced from the Rhumkorff coil. The coil must be agitated by an electric current, and the voltage must not be too high; twelve volts, passing through a Rhumkorff coil, will produce a voltage of, possibly, 100,000, but of very high potential. This current, on passing through tubes that are exhausted to a greater or less extent, produces phenomena characteristic to the degree of exhaustion. The tubes that were first exhausted, and on which experiments were conducted, were made by Geissler, of Bonn, and named after him. The degree of exhaustion was about 1-400 of an atmosphere. In the two ends of these tubes are soldered platinum terminals called electrodes. On connecting these electrodes with an induction current the enclosed gas, through which the current must pass, is set in a vivid state of incandescence. The point at which the current enters is the positive, or *anode*, and the other the negative, or *cathode*. A bright, narrow fringe is observed at the cathode, and, subsequently, a relatively dark-bluish light, the *glow-light*, or *cathode-light*: whilst at the anode, as also in the largest part of the space intervening between the two electrodes, striæ of bright and reddish-yellow light are distinctly visible.

Hittorf, in 1869, carried the degree of rarefaction in these tubes to a more minute degree of density, and substituted platinum plate in place of the platinum wire electrode. The bluish glow-light of the cathode spread, in this greater rarefaction, until it nearly filled the tube.

Crookes carried the rarefaction still further up to one-millionth of an atmosphere, and these tubes are called Crookes tubes, and from these the "X" rays of Roentgen are produced.

It, therefore, gives me a great deal of pleasure in presenting to you, to-night, some negatives I have succeeded in making by these "X" rays.

We all must appreciate very highly the work done at Toronto University and the School of Practical Science in the early part of the year; yet none of it had any particular bearing on the application of the discovery to medical or surgical investigation. They reduced the time of exposure, and demonstrated the reflection of the rays, etc., which are of great aid