The same result would be realized, if the battery wires were miles in length instead of but a few feet, as in this case. This is indeed an impressive application of this wonderful force. Blasts, torpedoes, and all explosives requiring heat for their action, can be fired by an operator, safely hidden at any distance. In the famous Flood Rock explosion in New York harbor, effected but a few months ago, this principle was strikingly displayed. Many tons of explosives were placed within a cavity in the rock; wires ran from this to the engineer's office; and when all was in readiness, his little daughter, seven years' old, pressed a button, and in response to her baby touch, the most terrific of artificial explosions ever arranged by human agency, was brought about. What greater example of potential energy, or of man's superiority over the elements and forces of nature could be wished for?

Among the most striking of the applications of electricity to domestic uses, are the arrangements for lighting gas by the electric agency. It will be remembered, that in the beginning of this evening's lecture, sparks were formed by breaking the circuit, and this was especially marked in the experiment with the file. On a previous occasion, I had the pleasure of demonstrating to an audience in this hall, that the electric spark was capable of lighting gas. Now, the spark created by breaking the battery circuit, is very much intensified if the conducting wire be first coiled many times around a piece of iron, or a bundle of iron wires. You observe on the table here, an ordinary gas lamp, and a rubber hose connecting it with the gas pipe. The burner, however, is somewhat different from the ordinary gas burner. Over the jet, a couple of metallic points are seen in this case of platinum. Invisible wires pass from these points to the battery and spark coil, stowed away in a convenient corner. I simply pull on this pendant chain, attached to the burner, and without the application of a match or any other ignition material, the gas is at once turned on and lighted. A second pull, as you see, shuts off the gas, after which it can be re-lighted as before. Turning on and off by pulling the chain, is purely a mechanical contrivance, with which we are not required to deal in a lecture on electricity; but the lighting calls for our attention. A pull on the chain closes the circuit, and breaks it again, thus causing a spark to pass between the metallic points over the jet already alluded to, and this spark lights the gas.

Here is a contrivance even more ingenious still. A battery and a spark coil are connected with the gas bracket, seen attached to the wall. Within the burner case is a magnetic attachment by which the gas is turned on and off, and the passage of the spark is provided for as in the preceding case. Now, as you readily see, by simply pressing a finger on this push button, I am able to ignite the gas at pleasure, and by another push on a button, seen alongside the other, the gas is put out again. Attached to the same burner, also, is a pendant push, as it is called. A flexible cord, enclosing, however, a pair of fine wires, is here seen terminating in an ornamented handle, on which are a pair of very small buttons. By pressing one of these the gas is lighted, as you observe, and by operating the other, the light is lowered or entirely extinguished. Think of the convenience and practical value of such a device. The handle of such a push could be hung near the bedside, within easy reach of the hand, and the gas is lighted with scarcely an effort.

A circuit maker has been affixed to the door leading to the stage room on my left and an attachment has been effected with the gas jet as before, and also with an alarm bell, the principle of which we will refer to briefly hereafter. This gentleman has promised to act the part of a burglar by way of illustration. You see he slyly opens the door as if an expert in the business, but behold the result—the gas is lighted and the alarm bell is set ringing loud enough to rouse any sleeper and put him on his guard. But see, the indicator attached to the alarm bell shows "front door" as the place at which the entrance has been effected. Attachments of such a kind could be readily made with all the doors and windows of a house; suppose then a burglar attempts an entrance, as soon as the door is opened or the window lifted, the resident of the house is roused by the ringing of the bell in his room, the gas is lighted there, and the indicator shows at once the place of assault.

Here is still another device of a similar nature. A foot push is here arranged so that as a person walks across the circuit is perfected, and the alarm gives us notice of the intrusion. The indicator in this case you observe, shows "dining room" as the place of disturbance. By means of switches of course, all of these attachments can be completely cut out during the daytime or whenever desired.

The electric bell already used now calls for a brief explanation. It depends for its action on the principle of the electro-magnet which is this.

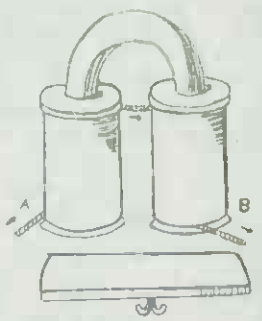

Fig. 6. Electro-magnet.

I have in my hand a bar of iron, shaped in a horse-shoe form; the two arms being each covered with a continuous coil of wire. I bring the ends of this bar near a piece of iron lying on the table, without any very marked result. Now I attach the wires from the battery so that the current traverses the coils; and again I approach the piece of iron as before; the latter flies toward the coils, indicating a very strong kind of magnetic attraction; you see I can easily pick from the floor this heavy bar of iron by simply bringing the magnet near it; but see—as soon as the connection with the battery is broken, the magnetic power vanishes, and the iron falls to the ground. Such a magnet—one depending for its efficacy upon the passage of an electric current is termed an *electro-magnet*. (Fig. 6.) This principle is made very extensive use of. Soft iron is always used for the core within the coil; for if hard iron or steel were employed, the magnetism would appear more slowly, and would remain after the breaking of the circuit. In the electric bell, one battery wire connects with the electro-magnet coil, thence passes to a spring and contact breaker here shown (Fig. 7) and back to the battery. A push button is here inserted in the wires for readily closing the circuit. As soon as the current passes, the magnet becomes active and draws the soft iron armature toward it, causing the hammer which is rigidly affixed to the armature, to strike the bell.

But the mere act of drawing the armature toward the magnet, breaks the circuit, and renders the magnet inactive; then by a spring the armature is thrown back again, thus