false. But it would seem that a belief so widely prevalent, even among scientific persons, must have some foundation, and it would be interesting to know if it has really ever been demonstrated as a fact by observation. I should be glad to hear from other writers in regard to this disputed question, and to know if any have ever "tried the experiment," and been able to corroborate the statements or establish the observations so long accepted as truthful by students of astronomy.

Washington Irving, in his charming story of "The Alhambra," has given currency to this belief, and contributed to the popular error, if such it be, for he thus mentions an observation of the kind: "He caused the cave to be enlarged so as to form a spacious and lofty hall, with a circular hole at the top, through which, as through a well, he could see the heavens and behold the stars even at midday." If this belief is indeed a fallacy, it is surprising that it should have been allowed to remain so long uncorrected and accepted as a scientific fact; and for the benefit of students and the general public, the truth should be known and published in every textbook on astronomy. Any prominent celestial object, such as the moon, a large comet, or the planet Venus when most brilliant about five weeks before or after inferior conjunction, would in all probability be visible from a deep well or shaft, if favorably located directly over the opening, even in bright sunshine, as they are plainly seen by the naked eye in the daytime when not too near the sun. But in my opinion no star, except perhaps Sirius, would be visible in daylight from such a locality, for the very evident reason that the darkness is merely local and does not extend far enough into the sky for any stars to be seen, especially with the naked eye.

Notwithstanding the superficial darkness of the well or other inclosure, the great atmosphere, extending to an unknown height above the earth's surface, would still be brilliantly illuminated, and the diffused light of the sun would, it seems to me, be sufficient to prevent any ordinary star being seen in the daytime even from the darkest and deepest shaft. We should be confronted with a luminous atmospheric envelope compared with which any well or shaft, of whatever size and depth, would be insignificant; and it seems reasonable to conclude that the darkness would not be intense enough, with the glaring sunshine overhead, to render the stars visible under the circumstances we have mentioned.

As an offset and in direct opposition to the statements commonly accepted, we have the positive testimony of Prof. William H. Pickering, the eminent American astronomer, who from actual observation has been able to effectually dispose of the question and refute the popular belief together with another equally prevalent and absurd. The Century Magazine for March, 1903, contains an illustrated article by this well-known writer and observer entitled "An Outlook Into Space," being an account of a far search by American astronomers for an observatory site, in which he says: "This expedition to Pike's Peak helped to destroy one old popular superstition. It had frequently been stated that from the bottom of a deep well or from the top of a high mountain the sky would appear dark even at noon, so that some of the brighter stars could be seen. Observations from the bottom of deep mining-shafts had disproved the first statement, and our expedition disproved the second. From the top of El Misti, in Peru, at an altitude of over 19,000 feet, the sky is somewhat darker, perhaps, than at sea-level—what might be described as a deeper color—but it is not enough so to warrant the old-time belief."

This important testimony, emanating from such a trustworthy and authoritative source, supports my own views expressed above, and appears to establish beyond a doubt the fallacy of the belief which, however, does not reflect in any way unfavorably upon astronomy as an "exact science," as the writer in the English Mechanic seems to imagine. I am glad that he has called attention to the question, and trust that his letter and my own will arouse an interest in and a further discussion of the subject, which has been so long neglected and misunderstood.

Battle Creek, Mich. ARTHUR K. BARTLETT.

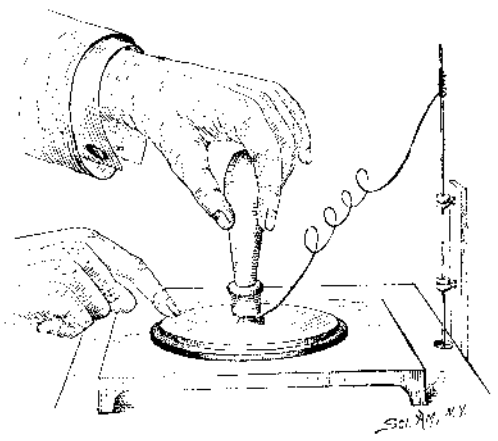
[We have no personal experience on the subject, have not been able to locate any authority who makes this statement, except Ball; and Ball carries a very high reputation for veracity in astronomical circles, which would give his statement some weight at least. There is no question that it is at least very probable that stars should be visible under the conditions mentioned. The reason why we do not see them ordinarily is that the glare of the light diffused by the atmosphere blinds the eyes; even then, Venus can sometimes be seen in daytime. At the bottom of a well, in the dark, the eyes have a greater light-collecting power, owing to the expansion of the pupil, which might make the matter possible, and besides a good deal of the glare that strikes the retina from the sides is cut out. That even a small telescope will show up the brighter stars at any time cannot be questioned. Observations on Sirius are frequently taken in bright sunshine; and records of many such observations can be found in the publications of various observatories. If we are not very much mistaken, the Greenwich annuals contain some, among others.—ED.]

A HOME-MADE WIRELESS SIGNALING TRANSMITTER.

BY A. FREDERICK COLLINS.

In a recent issue of the SCIENTIFIC AMERICAN an account was given of two home-made wireless telegraph receivers; in connection with these it may prove interesting to your readers who are desirous of making their own experimental apparatus, to describe an exceedingly simple form of wireless transmitter.

In sending wireless signals the essential factor is a disruptive discharge or spark, and this should take place between the ends of two wires, one of which



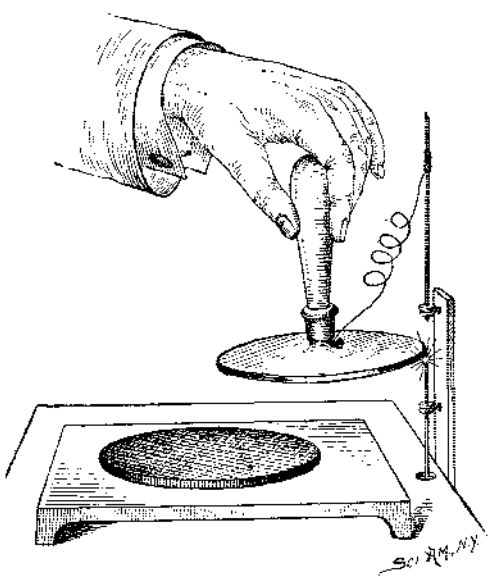
CHARGING THE LID OF THE ELECTROPHORUS.

projects vertically upward in the air, and the other is connected with the earth; or if the signals are to be sent over a short distance, say 15 or 20 feet in a room, the latter wire may be connected to a bit of tin or copper plate and merely allowed to rest on the floor.

The simplest way to obtain an electric spark is by means of an apparatus called an electrophorus, an instrument for generating static electricity by induction. This little device is usually made of a flat disk of resin on which rests a metal disk having an insulating handle of glass or vulcanite.

Our illustrations show clearly the tin or brass plate and resinous disks; and although the former is placed on the latter, their surfaces touch each other in only a few places, since the air forms a thin insulating film which practically separates them.

To construct an electrophorus, it is only necessary to fill a shallow tin pan—a pie-tin answers admirably—with a mixture of resin, Venice turpentine, and shellac in equal parts. When these substances are heated to the melting point, they should be thoroughly mixed by stirring, which should be carefully done so as to prevent the formation of air bubbles. If the turpentine is not readily obtainable, it may be dispensed with. Care must be taken in either case that the mixture does not take fire. When the mass has cooled, it will become hard and brittle and it will then be ready for use. This constitutes the sole of the device. A lid may be made by obtaining from the tinners a disk of tin cut half an inch smaller all around than the resin sole. A stick of sealing wax forms a good handle. The lid may be made of a disk of wood covered with tinfoil, and a handle may be



PRODUCING THE SPARK IN THE ANTENNA.

made by attaching to the center of the wood a heavy piece of wire covered with rubber tubing. Either of the former makes a satisfactory lid.

Used as a wireless telegraph transmitter, the aerial or suspended wire should be attached to the metal plate of the lid in such a manner that when the plate is charged, the wire will not touch the sole. The wire leading to the earth or metal plate on the floor should have its upper end attached to a table, wall, or any convenient place, so that the charged lid carrying the aerial wire may be held closely to it, when a spark will pass between the edge of the tin disk and the end of the lower wire, as shown in one of our views. There will then be set up in it and the aerial wire a series of strong electric oscillations, the energy of which will be damped out in the form of electric waves.

In order to charge the metal plate, the resin disk must first be excited by whisking or rubbing it with a piece of hot flannel or a silk pad. After the resin is well rubbed, the tin lid is placed upon it for a few seconds, and the finger occasionally touching it as shown.

Now, on lifting the lid, if the knuckle or wire leading to the earth or floor is presented to it, a spark will pass, showing that the plate was charged. If a receiver, such as either of those referred to, is set up at a little distance, even though the walls of a room or two intervene between it and the electrophorus transmitter, the instant the spark passes a characteristic click is heard in the telephone receiver.

In order to repeat the process, the lid will need to be recharged, and this will require merely the placing of it on the resin sole and removing it again, although the plate will have to be freshly excited occasionally if energetic sparks are to be produced. It will be readily seen that the electrophorus is in fee simple a miniature electric machine.

The theory of the apparatus is very simple. The resin when rubbed briskly is negatively electrified and the neutral electricity is divided into positive and negative charges. When the lid is resting on the resin the former is acted on inductively and not by direct contact, since the resin is a non-conductor, and touches the lid at only a few parts. When the lid is touched with the finger, the free negative electricity is dispersed through the body of the operator when, simultaneously, the positive charge of the sole is communicated to the lid, which with its attendant aerial wire will be positively electrified. The wire leading to the earth will be charged to the opposite sign, and the mutual attraction between the two results in a spark. By grounding the terminals of the sending and receiving instruments, a distance of several hundred feet should be easily obtainable.

The Camphor Industry of Japan.

One of the most interesting exhibits made by Japan at the late St. Louis Exposition, illustrating camphor and its by-products, was shown in the Forestry Building. This large collection formed a part of the Formosan government exhibit and represented a great national industry known as the camphor monopoly. By a provision of the law of 1903 the sale of camphor produced in Japan is monopolized by the government through a restriction of the sale of crude camphor and camphor oil.

Every part of a camphor tree, even to the leaves, contains camphor. The forests are not confined to Formosa alone, but are also found in Japan proper. With the extension of the industry the large areas of this tree have been greatly reduced, though replanting and cultivation are practised to a considerable extent, a tree requiring fifty years to attain a diameter of one foot. In Formosa, however, there is still an extensive supply of native forest growth, and many huge trees are to be found in regions still unexplored. The supply, therefore, is assured for years to come.

Camphor is found in the form of crystals in the wood tissues, and is separated from the crude oil by double distillation. From the first distillation is secured an oxidized product, camphogenotol, the principle of the camphor oils of commerce. The crude camphor is a dark-colored substance fusing at 170 deg. C.

Among the by-products may be mentioned crude camphor oil, which comes out simultaneously with the camphor; white oil, obtained by sublimating the crude oil, and used in the manufacture of soap. Red oil is also obtained from the crude camphor oil, as well as black oil, which is extensively used in the preparation of varnishes. A turpentine is secured from the white oil that is in great demand for medical and industrial purposes. From red oil is obtained the product known as saffrol, employed to a considerable extent in the manufacture of perfumery, and also soap; and a disinfectant is also distilled from red oil, after the addition of other substances, claimed to kill the cholera bacillus. Another product is an insecticide, which when mingled with 100 parts of water, destroys insects injurious to farm crops.

The camphor products are: Refined granular camphor obtained by sublimation from crude camphor, price in Tokyo, yen 0.85, about 40 cents per pound; refined camphor, sublimed and compressed, worth one yen per pound; and refined camphor tablets, of Fujisawa camphor, obtained from crude camphor, worth yen 1.70 per pound.

The annual export of camphor from Japan is about 6,000,000 pounds, three-fourths of which is produced in Formosa, the other fourth coming from Japan proper, chiefly from Kyushu and Shikoku. The superior jury at the St. Louis Exposition awarded the Japanese camphor exhibit a grand gold medal.