MODERN SUNDIALS.

In some former articles we endeavored to show how much ingenuity and artistic feeling were displayed in the construction of sundials before the telegraphic transmission of time and the advent of the cheap watch. We did not then believe that the sundial was still in current use, and our object was particularly to insist upon the utility of its study as regards the teaching of cosmography. Since then, new documents have reached us, furnished in part by the readers of *La Nature*. We have thus learned, not without some surprise, that the sundial is still frequently employed. Under a complex form, it may be adapted to various uses, while of very simple construction, but of large dimensions, it permits of attaining sufficient precision for the regulation of watches of medium accuracy. Finally, in certain of these instruments, a special arrangement permits of directly reading the mean time. Such, for example, is the case with the dial devised by

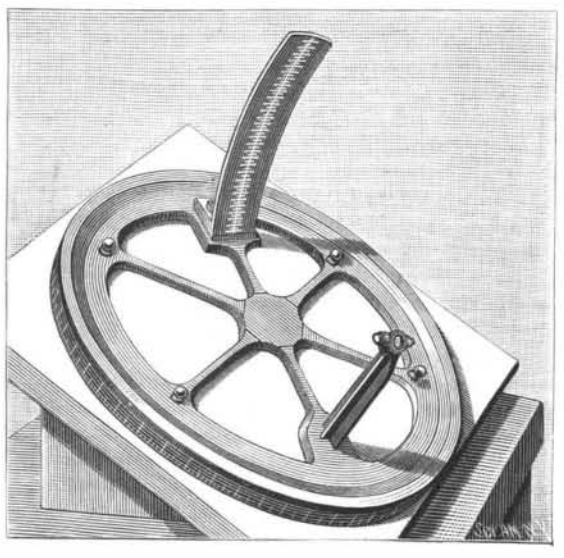


Fig. 1.—THEVENOT'S SUNDIAL.

Major General Oliver (Fig. 2). The time is read upon an equatorial circle, A, while the shadow is projected, not by a simple rod, but by an enlargement, B, of the style, the section of which is given by the well known curve of the equation of the time. According to the season, the time will be read to the right or left of the shadow. The circle, C, carries a division in degrees that permits of regulating the instrument for all the boreal or austral latitudes.

Fig. 1 represents a dial constructed by Mr. C. Thevenot. It consists of a sort of bronze wheel 767 millimeters in diameter carried by an axle that revolves in an aperture formed in a marble table upon which the wheel is exactly applied. This table is inclined toward the horizon by an angle equal to the complement of the latitude of the place, the line of the greatest slope being oriented from north to south. In this way, the axle of the wheel is parallel with the axis of the world. A lens of about 50 centimeters focus projects the image of the sun upon a piece curved into an arc of a circle and carried upon the wheel at a point diametrically opposite. The observation consists in bringing the image upon the median line of the arc of a circle. The time is then read upon the circumference of the wheel opposite an index sealed in the marble. The dimensions of the apparatus constructed by Mr. Thevenot are such that a minute of time corresponds to a length of 1·6 millimeters at the circumference. It seems that it is possible without difficulty to determine the true time within a few seconds. The mean time is deduced therefrom by adding to it the equation of the time given in a table.

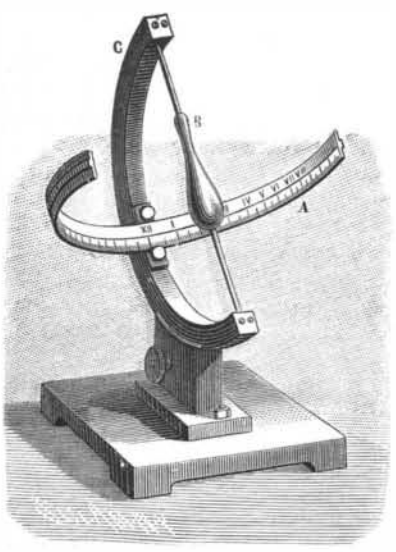


Fig. 2.—OLIVER'S MEAN TIME SUNDIAL.

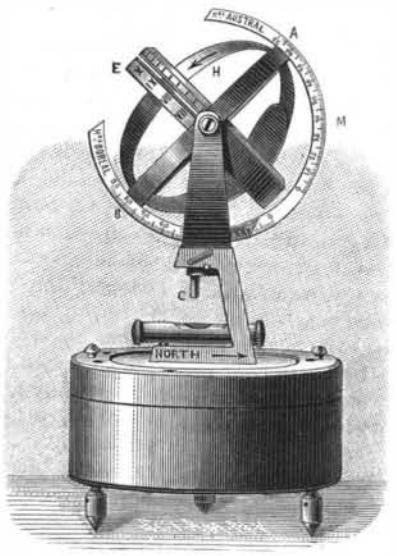


Fig. 3.—FLECHET'S UNIVERSAL SUNDIAL.

The dial (Fig. 3) constructed by Flechet, as long as thirty years ago, is much more complex. It is designed for observations in traveling, and can be arranged, under a small bulk, in a box that serves as a support for it when it is desired to effect a measurement. It consists, like several of the instruments previously described: (1) of a meridian circle, M, cut away on the side toward the sun so as not to interfere with the observation; (2) of an equator, E; and (3) of a horary circle, H, movable around the axis, A B. The circle, H, is provided with a small hole corresponding to a circular hollow of the circle, E. It is through this that pass the solar rays that form a luminous point upon a screen carried by the circle, H, and upon which has been traced the curve of the mean time, accompanied with dates of four to four days for the entire year. The instrument revolves around an axis, C, placed vertically by means of the level that the instrument carries. Let us suppose that we have regulated the instrument according to the latitude of the place by means of the division of the circle, M. It will remain for us to put the latter in the meridian. To this effect, we direct the horary circle toward the sun, so as to form the image upon the curve of the mean time. We know that this curve must be described in one year by the image of the sun, which must recede from or approach the equator of the instrument at the same time that the sun itself recedes from or approaches the terrestrial equator. Turning, then, simultaneously, the dial around the axis, C, and the circle H, around A B, we make the luminous point describe a part of the curve, and we fix the instrument when such point marks the date of the day of the observation At this moment we are sure that the circle, M, is in the meridian and that the circle, H, indicates the actual time upon the equator. Up to here the instrument does not differ essentially from a very old sundial that we have already described. But the curve of the mean time will permit us to determine even the latitude of the place, if we do not know it. It will suffice for this to observe the passage of the sun at noon. To this effect, let us place the horary circle upon the midday of the instrument, and let us give the axis, A B, an inclination such that the image of the sun shall form upon the curve of the mean time at the place corresponding to the date of the day of observation. If the operation has been begun before noon, we shall see the image descend upon the curve. It will be carried back constantly by lowering the axis, A B. The motion will gradually become slower, and will soon cease entirely. The axis, A B, will then be parallel with the axis of the world, and it will suffice to read the position of the circle, M, in order to know the latitude. Starting from this moment, the instrument will be able to serve for determining the hour.

Of all the sundials constructed up to the present, the latter is doubtless the completest, and the one that is best adapted for all the approximate determinations that one may have to make on a voyage. In this respect it is worthy of having the attention of explorers called to it.—*La Nature.*

HICKORY WOOD CARVED BY WORMS.

We recently received from a valued correspondent a strip of hickory wood, the surface of which is ornamentally carved or grooved as represented in our engraving. Our correspondent writes as follows:

"I send you a piece of hickory wood beautifully carved by the worms, which perhaps will be of some interest.

"Some days ago, in cording up storewood, I came across this piece, which is a curiosity to me. It appears that the eggs were deposited in a central groove made by the insect parallel with the grain of the wood, and after being hatched the larvæ began to 'cut' the wood, each one at a certain angle, which is uniform throughout. I account for the gradual widening of each groove by the growth of the worm.

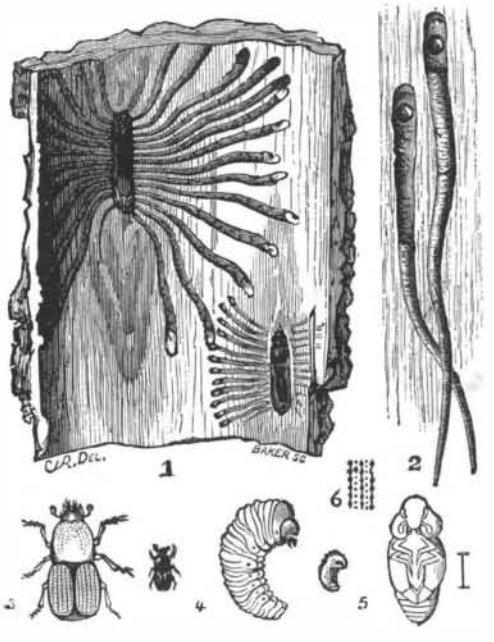
"It will also be noticed that the outside worms turned their course and worked parallel to grain of the wood, but in no case does it seem that any one cut across his brother's pathway. However, when one died, those on each side soon found it out and began to draw closer to each other, until they were at an equal distance apart. All the pieces I examined were the same as the one I send you. There is something beautiful about the 'carving,' at least, and to my mind is worthy of notice and study. Hence I send this piece to you, believing that it would not prove uninteresting to the SCIENTIFIC AMERICAN.

"ARTHUR R. SPAID.

"Wilmington College, Wilmington, Ohio."

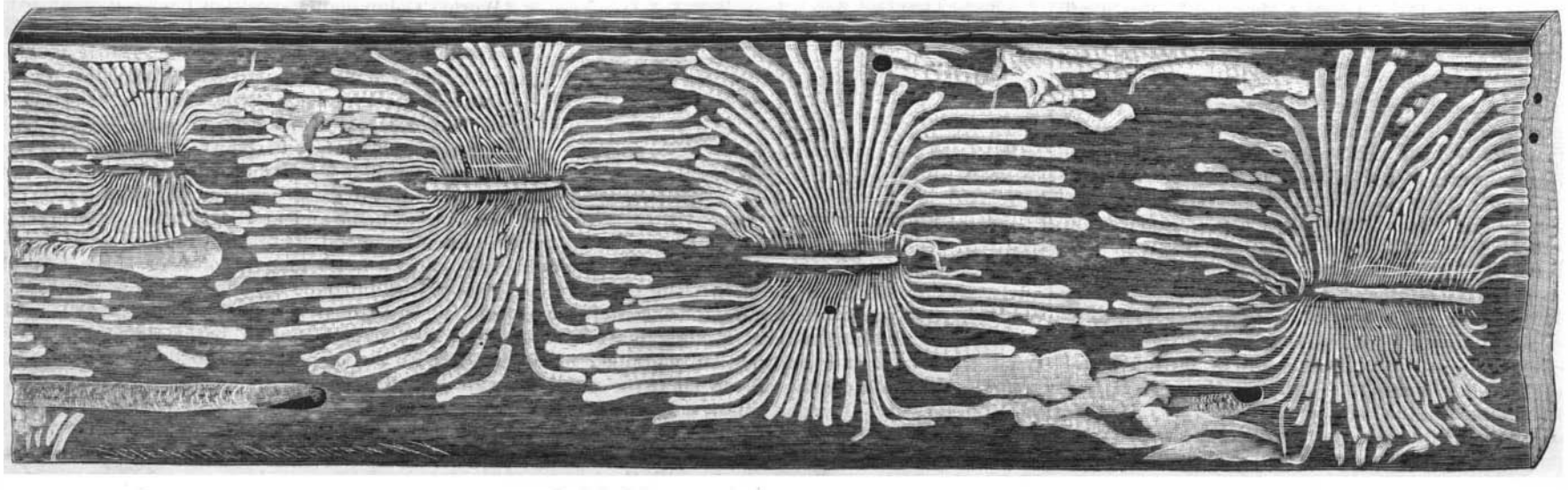
The specimen was so interesting that we submitted it to Dr. C. V. Riley, entomologist, of the Department of Agriculture, who has favored us with the following:

Reply by Professor C. V. Riley.—The specimen sent by Mr. Spaid is a very fine illustration of the workings



THE HICKORY BARK BORER. (*Scolytus 4-spinosus.*)

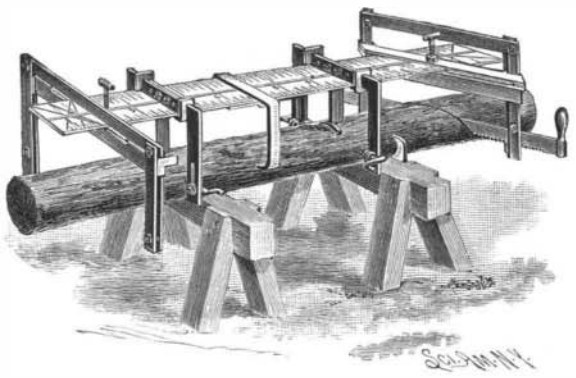
of the hickory bark borer, and his remarks both as to the non-crossing of the burrows and the closing up of the space left by any of the grubs which die are quite correct and are true of almost all of the bark borers belonging to the family Scolytidæ. This particular species was first illustrated and described by me in the *Prairie Farmer* for February 2, 1867, under the name of *Scolytus caryæ*, and a fuller account of it is given in



HICKORY WOOD CARVED BY WORMS.

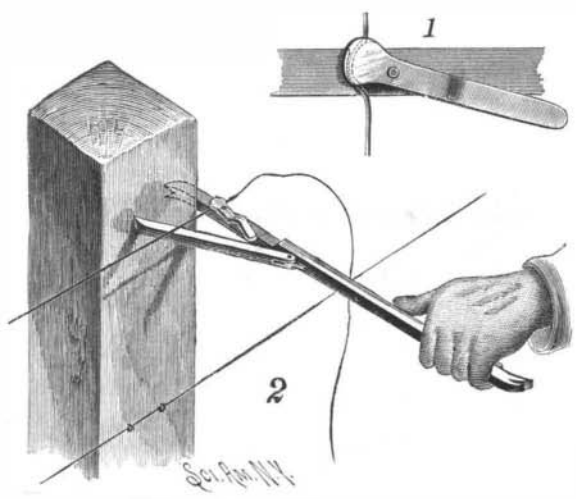
my fifth report on the insects of Missouri, 1871, pp. 103-8. My first acquaintance with it was through Mr. Arthur Bryant, of Princeton, Illinois, a brother of the late William Cullen Bryant. Mr. Bryant had a beautiful hickory grove of trees growing on rich soil bordering on Bureau River. The hickory was the bitter-nut and this borer had sadly thinned out the beautiful grove at the time he sent me specimens.

In connection with the illustration it is hardly necessary to describe the characteristic burrows, which



JOHNSTON & SANDBERG'S SAW GUIDE.

it is needless to state are made by the larvæ. The beetles issue from the tree the latter part of June and early part of July, and, after pairing, both sexes bore into the tree, the male for food and the female mostly for the purpose of laying her eggs. In thus entering the tree they bore slantingly and upward. The female, after boring through the bark, makes a vertical chamber and places her eggs on either side of it. She frequently dies in this chamber, and ordinarily her remains will be found after her progeny have commenced working. The larvæ bore their little cylindrical channels, at first transversely and diverging, until finally the burrows are lengthwise with the bark. They always crowd the widening burrows with their pow-



DURR'S FENCE WIRE STRETCHER.

dery excrement, which is of the same color as the bark. The full-grown larva is soft, yellowish and without trace of legs. It remains torpid in the winter and transforms to the pupa state during the following May. The exit holes from which the newly developed beetles issue are direct from the sapwood and not slanting, as in the case of the entrance holes, and a tree badly infested looks as though it had been peppered with No. 8 shot.

The sexes differ considerably from each other, the males having four spines on the truncated portion of the abdomen not possessed by the female. The eggs are deposited during the months of August and September, and the whole transformations are effected within one year, as no larvæ will be found remaining in the tree during the latter part of July. The description was originally drawn up from the female only, and after the male was discovered it was found to be the *Scolytus 4-spinosus* of Say, the female of which had not been previously known. Hence the proper name of our hickory bark borer is *Scolytus 4-spinosus*.

The larger elliptical or flattened burrows in the piece of wood sent by Mr. Spaid are made by a long-horned beetle (*Saperda discoidæ*, Fab.), a species which is almost invariably found associated with the bark borer in its destructive work.

There are several parasites, as, for instance, *Spathius trifasciatus*, Riley, and *Bracon scolytivorus*, Cress., which prey upon this bark borer, and fortunately keep it in check.

So far as remedies are concerned, the habits of these bark borers rather defy our efforts to prevent their injury, especially on large trees and in large groves. There are two methods of dealing with them: *i. e.*, to cut down and use the trees the moment they are noticed to be attacked, and to encourage the natural enemies which are already helping. The species affects most of the species of the genus Carya, including the bitter-nut, shell-bark, pig-nut and pecan.

A SAW GUIDE TO FACILITATE LOG SAWING, ETC.

A device by means of which a saw may be conveniently guided in making straight or angular cuts, at measured distances or otherwise, is shown in the illustration, and has been patented by Messrs. Henry L. Johnston and John E. Sandberg, Butte City, Montana. A top plate having graduations and angle lines is supported in two or more carriers, each having a leg with curved foot resting on top of the log, while the head of each carrier has apertures for the horizontal members of L-shaped arms to be bolted together on top of the plate, and adjustable to fit over logs of different diameters. The vertical members of the arms have slots, in each of which is adjustably held a bolt with handled screw rod to fasten the arms in place on the log to prevent lateral shifting of the plate. That the plate may be conveniently folded, it is made in two parts hinged together, and one leg of an L-shaped arm extends over the hinge joint, the other leg having a point adapted to be driven into the side of the log. In each of the free ends of the plate turns and slides a set screw screwing in the top of a frame on the top of the plate, and in the ends of this frame are vertical guide-ways in which slide the ends of a frame supporting vertical bars held a sufficient distance from the frame to permit a free passage of the saw blade. The frame and its bars straddle the log, and the saw is reciprocated through the space between the depending ends of the frame and the bars, set screws resting on the back of the saw and permitting the frame to descend as the depth of the cut increases. Before commencing to saw, the operator adjusts the frame to the desired graduation on the top of the plate, when the saw in its downward movement follows the position of the frame, so that the angle indicated on top of the plate will correspond with that of the cut made by the saw. The several parts of the device may be readily taken apart and folded up in small compass for carrying.

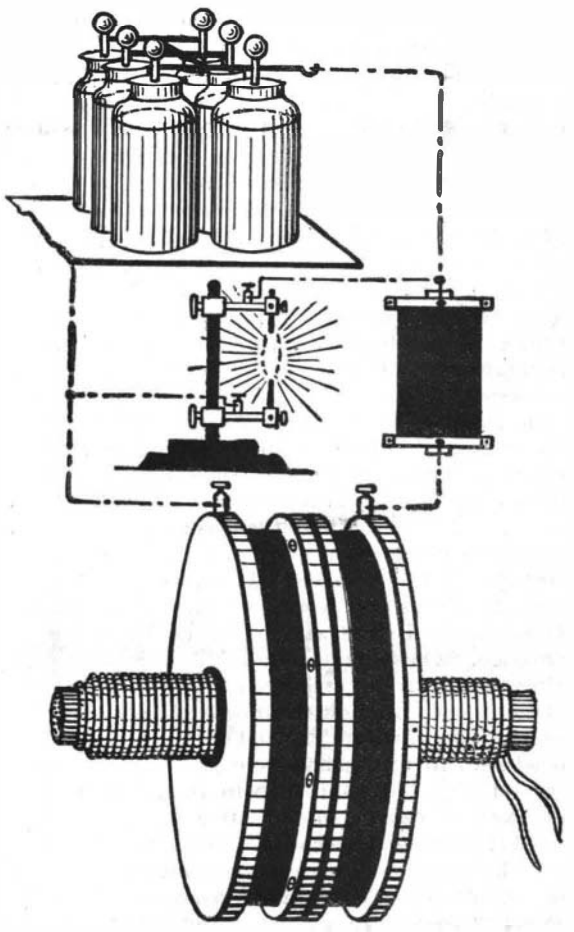
A CHEAP AND SIMPLE FENCE WIRE STRETCHER.

This improved tool for stretching wire strands while applying them to fence posts, holding the wire taut while the operator drives a securing staple in the post, has been patented by Mr. Franklin Durr, of Pittsfield, Ill. The main bar or lever of the implement has toes on its forward side edge, and there is an open recess on its top side, the forward shoulder of the recess being curved toward the end of the lever and slightly rounded. On the recessed part of the lever a locking limb is pivoted, as shown in Fig. 1, the end of such limb being rounded to form a crimping shoulder, and a guard flange projecting over the forward shoulder of the recess in the lever, to prevent a gripped wire from slipping off the shoulder. An offset bend in the handle portion of the locking limb enables the operator to work this piece without injury to his hands. A brace bar is pivoted to a side edge of the lever, to be brought in engagement with a post, as shown in Fig. 2, when the proper strain has been produced upon the strand, the brace bar then holding the wire taut until it is permanently secured, and preventing a recoil movement of the lever. With this tool one man can readily build a long line of barbed wire fencing without assistance in the matter of stretching and securing the wire strands.

AN INDUCTION COIL FOR ALTERNATING CURRENTS.

R. W. WOOD.

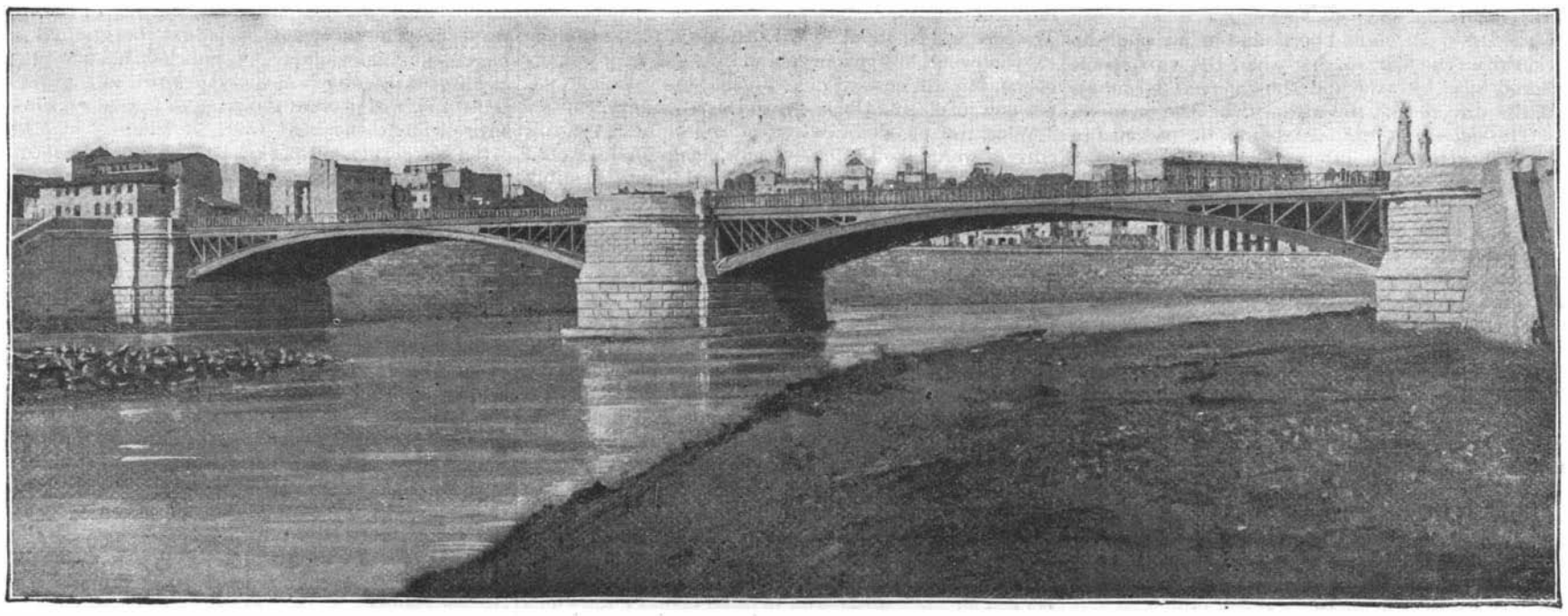
As the ordinary Ruhmkorff coil is not well adapted for use with alternating currents, and as no coils are



INDUCTION COIL FOR ALTERNATING CURRENTS.

on the market capable of being run to advantage by currents supplied for illuminating purposes, I think that the description of a cheap but powerful instrument will be of general interest to the readers of the SCIENTIFIC AMERICAN.

For spectroscopic and other work requiring a powerful discharge, it has been customary to employ a large Ruhmkorff coil in connection with a galvanic battery; but this form of apparatus, owing to the large initial cost and the expense of constantly renewing the cells, is not as suitable or economical as an instrument that can be run by currents, furnished at low cost for light-



THE GARIBALDI BRIDGE OVER THE RIVER TIBER AT ROME.—[See page 150.]