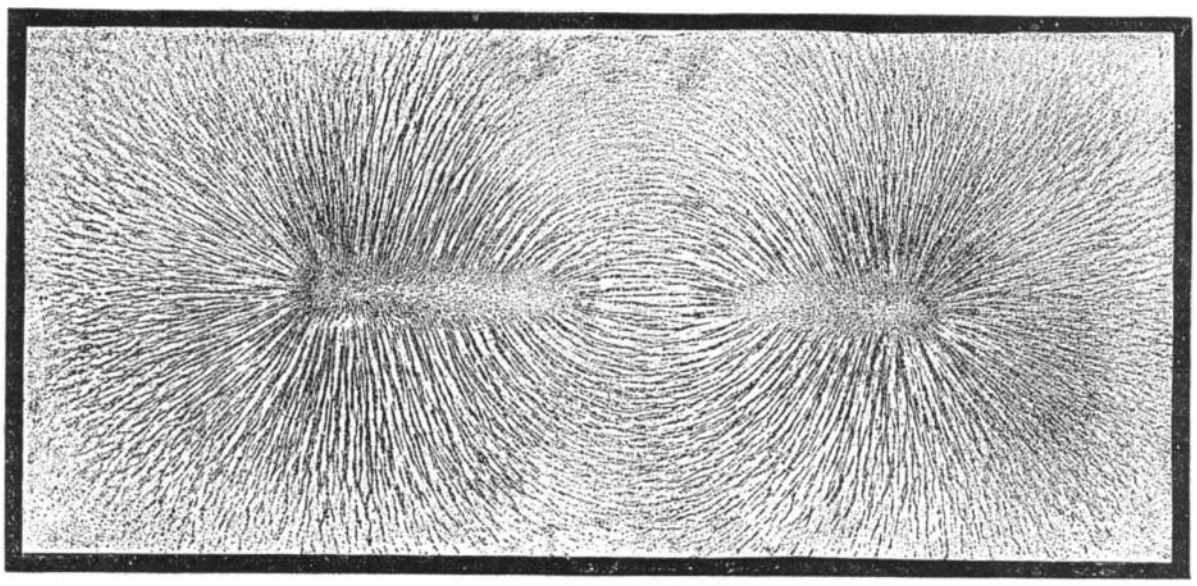
THE MAGNETIC SPECTRUM.

In a lecture delivered by Professor Barker at the Stevens Institute of Technology, and described in the SCIENTIFIC AMERICAN of March 18, one of the most striking experiments was the exhibition of the magnetic spectrum upon the screen. The name magnetic spectrum has been given by physicists to the arrangement which iron filings assume under the influence of the poles of a magnet; and these spectra afford a convenient means of studying the lines of magnetic force. Professor Mayer's method of rendering magnetic spectra permanent will enable any one to obtain plates like that from which the engraving herewith has been made.

Having dissolved shellac in strong alcohol, it is allowed to stand for a week or more until it is perfectly clear. It is then decanted and flowed over a thin glass plate, just as photographic plates are coated with collodion. After carefully drying for a day or two in a place free from dust, "the plate is placed over the magnet or magnets, with its ends resting on slips of wood, so that the under surface of the plate just touches the magnet. Fine iron filings, produced by drawfiling Norway iron which has been repeatedly annealed, are now sifted uniformly over the film of lac by means of a fine sieve. The spectrum is then produced by vibrating the plate by letting fall vertically upon it, at different points, a light piece of copper wire. The plate is now cautiously lifted vertically off the magnet, and placed on the end of a cylinder of pasteboard, which serves as a support in bringing it quite close to the under surface of a cast iron plate (1 foot diameter and ¼ inch thick), which has been heated over a large Bunsen flame. Thus the shellac is uniformly heated; and the iron filings, absorbing the radiation, sink into the softened film and are fixed."



THE MAGNETIC SPECTRUM.

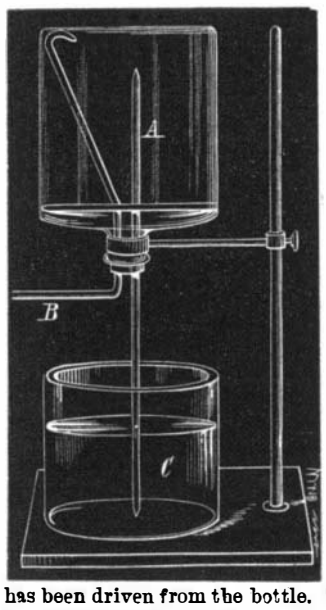
When the plate is to be used for photographic prints, the heat is kept up until the metallic luster of the filings disappears by their complete immersion in the shellac. The photographic prints will exhibit the lines of force in white upon a black ground. When the plates are used for exhibiting them upon the screen, the lines of force will appear black. When prepared with great care, such plates may be used for the most accurate measurements of the magnetic field.

The engraving herewith was made directly from a plate prepared by Professor Mayer. C. F. K.

A NEW LECTURE EXPERIMENT.

One of the most curious and interesting compounds of nitrogen and oxygen is that formed when nitric acid is poured upon copper, silver, mercury, tin, and some other metals, as well as when heated with charcoal. The compound (N_2O_2) is known as nitric oxide, and is the gas employed, in connection with bisulphide of carbon, for photogenic purposes in Sell's new lamp. When this gas comes into contact with free oxygen, it is at once converted into the higher oxides—nitrous and hyponitrous acids, N_2O_3 and N_2O_4. The latter compounds are red vapors, and are very soluble in water. These are the poisonous red fumes always observed on dissolving sugar, starch, or metals in nitric acid.

G. Bruylants has devised the accompanying simple apparatus for illustrating its properties. A very large bottle is fitted with a doubly perforated india rubber stopper through which pass two glass tubes, one of which, A, is drawn out to a fine jet; the other, B, is bent at right angles at one end, and the other end is bent like a J, and drawn out as shown in the engraving, terminating at the bottom of the inverted bottle. The bottle is filled with water, the cork inserted, the tube, A, drawn out so as to project but a little distance above the stopper, and the bottle inverted. Nitric oxide is allowed to enter through B, until nearly all the water has been driven from the bottle. The tube, A, is then pushed in until about four inches from the bottom, as seen in the illustration, and the other end inserted in a vessel of water, C. Oxygen gas is now passed in through B, the aperture at once fills with red fumes, which dissolve in the small quantity of water still in the bottle, producing a species of vacuum. The water then ascends through A, producing a small fountain. If, in admitting the oxygen, excess is carefully avoided, the bottle may be completely filled with water.



The experiment is more instructive if the water be first made blue with litmus; the acid in the vessel then changes it into a fine red.—*Berichte der Deutschen Chemischen Gesellschaft.*

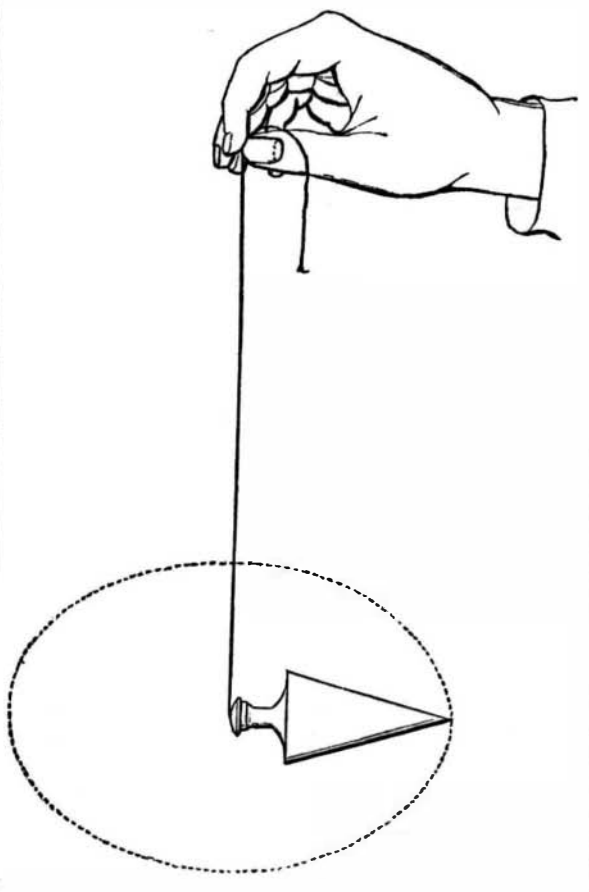
How to Set Out Roses.

Messrs. Dingee & Conard, the great rose raisers, give the following directions for the treatment of their favorite flowers: Make a hole so large that the roots may be spread out nicely. Cover the roots with fine soil, rather deeper than they were grown, and pack down lightly with the hand. It is generally best, though not always necessary, to protect the plants for a few days from the sun and chilling winds, until they become somewhat accustomed to their new position. Paper grocery bags are useful for this purpose, turning the bag completely over the plant, and supporting this with one or more sticks, heaping on a little earth to keep it in place. If the ground is dry, water thoroughly, soaking the earth down to the roots of the plants. Do not water too often. Like persons, rose plants want water only when thirsty. Let them get thirsty before giving them a drink.

SIMPLE FORM OF THE GYROSCOPE.

BY JOHN. C. DEANE.

Take an ordinary plumb bob, with a smooth hole where the cord is attached; wind about three feet of smooth hard cord about the neck of the plumb bob. Hold the end of the cord firmly and let the plumb bob fall; as it descends, and the cord unwinds, it will spin rapidly on its axis like a top, but instead of pointing toward the floor the axis will take a horizontal position at right angles to the cord, as shown in the engraving; and while revolving rapidly on its axis, the



point will slowly describe a circle around the cord, as shown by the dotted line. This form of gyroscope may have been noticed before; but I have never seen it described, and accidentally discovered it only a few days ago.

Indianapolis, Ind.

MESSRS. Frahm and Scharnweber, of Chicago, Ill., request us to state that their spring power, described in our issue of March 11, can be constructed in large as well as small sizes, and that a machine of nearly 3 horse power is now being made.

Correspondence.

Something about Belting.

To the Editor of the Scientific American:

A first class leather belt will do 3½ times the service of the best rubber belt that is found in the market. There is no economy in using a rubber belt at any price, unless it be where there is great heat or dampness.

Leather belts should be thoroughly oiled before using. A good way to apply the oil, where there is much belting to be oiled, is to have the belting run off from one reel to another, through a pot of oil, with suitable rubbers to wipe off the superabundance of oil. Another very good method of applying the oil—and perhaps it would be preferable in a majority of cases—is to put it on with a paint brush. This should be done on both sides, with no sparing hand. A belt thus oiled will not require a second application under ten years, unless there be much dust to absorb the oil, and then it may be put on very sparingly compared with the first application. The advantages that an oiled belt has over a dry one are these: 1. It lasts longer. 2. It requires less power to drive the machinery. 3. It may be run much more slack, which makes the bearings less liable to heat, requiring less oil and less attention.

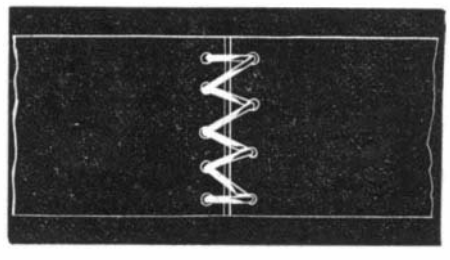
There are but few people who pay any attention as to how they put on a cross belt, consequently they are just as likely to get it on wrong as right. There are but two ways to put such belts on. The right way is this: Put the belt on in such a manner that the drive pulley will have a tendency to rough up the splices; then when the splices come to the crossing they will smooth each other down instead of catching under each other's corners and tearing open a splice.

A quarter twist belt should never be used where it can be avoided; but when it is used, it should be as narrow as practicable, and the pulleys should be large. Increasing the width of a quarter twist belt does not increase its power in the same ratio as in a straight or cross belt. There is not more than one per cent advantage in using an oiled belt with the grain side next to the pulley, which will hardly compensate for the ugly look which a belt presents when put on in that manner.

In lacing a belt, the lacing should never be crossed on either side. To lace a belt in this manner, there must be one more hole in one end than the other, consequently there will be a hole in the middle of one end, which is the place of beginning. Draw the lacing to its middle through this hole, lace each way to the edge and back to the middle again, and you have by far the nicest joint that can be put into a belt. No one will ever lace the old way after once getting "the hang" of this method. But it is old to me, as I have laced in no other way for twenty-five years.

Plaited belts for engine governors and small machinery may be as scientifically laced, and the fastening will last as long as the lacing of a flat belt, with no more unevenness.

To determine the width of a belt to drive all kinds of machinery, where power and speed are known. Rule: Place the number of horse power for a numerator, and the speed of the belt in hundreds of feet per minute for a denominator. That will give what the width of the belt should be in fractional parts of a foot. Example 1: What is the required width of a belt for a planer which requires six horse power to drive it, the verge of the driving pulley running at



900 feet per minute? Answer: $\frac{6}{9}=8$ inches. Example 2: What is the necessary width of a belt for an engine of 10 horse power, running at 100 strokes per minute, with a band wheel 3½ feet in diameter (11 feet in circumference)? Answer: $\frac{10}{11}=10\ \frac{10}{11}$ inches. E. H. DAVIES.

Santa Clara, Cal.

Human Remains in Michigan.

A party of scientists have begun the work of excavating and exploring the mounds at Spoonville, Mich., which were supposed to conceal the remains of prehistoric inhabitants of this region. Two mounds were opened. There were found human skulls, pottery, copper utensils, hatchets, needles, etc. It was the unanimous verdict that they were at least two thousand years old. Further explorations will be made. The scientists are of the opinion that this will prove among the richest discoveries of the kind on this continent.