

### SIMPLE APPARATUS FOR PRODUCING THE MANOMETRIC FLAME.

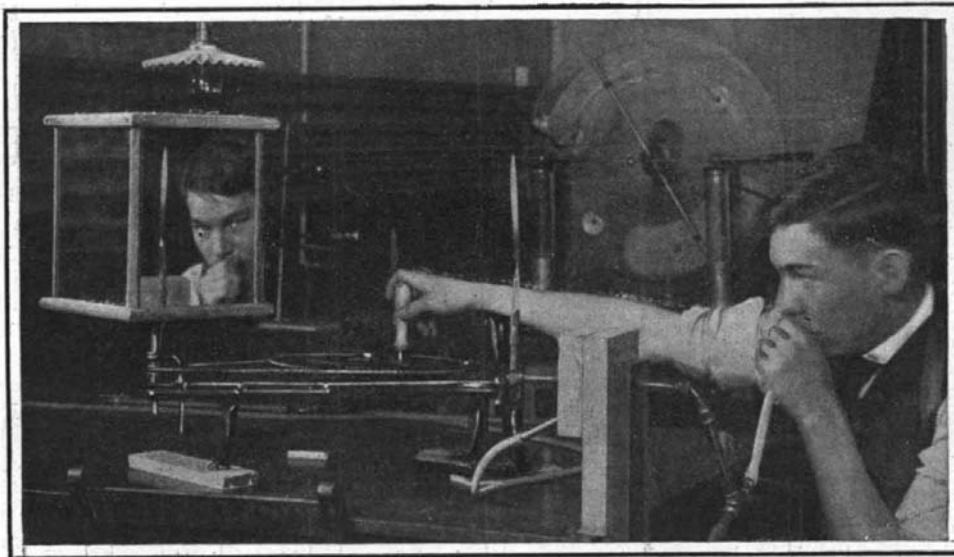
BY W. W. MILLS.

The manometric flame is a very attractive experiment in the study of sound. The apparatus and manipulation of this experiment are generally too difficult for high school pupils, but with some notes may be satisfactorily performed even by pupils of that age. Take four pieces of good mirror glass about 8 x 10 inches (French plate is preferred) and fit them nicely into horizontal grooves above and below on the four faces of a block of wood of the same dimensions (whitewood is suitable). The four edges of the block where the glass plates meet are now *passee-partouted* with gold tape, which sets off the apparatus to good effect. In the base of the block is fitted a square plug of wood large enough to prevent it from working loose, and this is glued into place. In the center of this plug the upright end of the whirling machine or an ordinary centrifugal machine of the laboratory is fitted, so that as the block whirls it will do so evenly. This will be found to cover the mirror part of the apparatus. With this preparation the idea is to throw the image of the vibrating flame into the mirror, so a diaphragm is necessary. Take two pieces of smooth whitewood about 6 inches by 18 inches by 1 inch, and near the top end of them take out a circle of 4 inches in diameter by  $\frac{1}{2}$  inch deep, so that when the two are fitted together you will have a space there of 1 inch depth. Between the two now place a very thin piece of dental rubber cloth, usually termed dam rubber. Glue it to the wood around the edges and bring it up rather taut. Now place the pieces of wood together with four suitable screws, and glue the seam up, so the chamber will be hermetically sealed. We will now name these two apartments separated by the rubber the "front" one and the "rear" one as we face the mirror block. The flame coming from the flame apparatus should strike the mirrors about midway of their height. Through the front chamber at an angle of 45 deg. with the table to which the apparatus is fastened, run a  $\frac{3}{16}$ -inch hole, into which insert a piece of gas pipe 3 inches long. On this fasten the gas hose from the gas cock. Upward from the front chamber run a 3-inch gas pipe, on which fasten a small piece of rubber tubing in which is fitted tightly a 2-inch glass tube, one end of which is drawn out to a  $\frac{1}{16}$ -inch hole. Now if the gas is turned on and lighted, its height may be adjusted to strike the middle of the mirrors. The distance separating the two may be varied, depending on what is desired. From the center of the rear chamber backward run another  $\frac{3}{16}$ -inch gas pipe 4 inches in length, on which fasten a rubber tube about 3 inches in length. Now if one person is intended to talk or sing into the chamber, this will be enough; but if two or more persons are to do it, a T is necessary, or if more, a three-way or four-way tube will be needed. Generally, a two-way tube will be found sufficient. Now have the singers take their places and sing into the chamber through the tubes, but be careful that the necessary jar is communicated to the rubber diaphragm by the air column, and this may be best effected by allowing the singers or speakers to set their teeth against the tube held in the mouth. If this is not done, the necessary jar will not be communicated to the diaphragm, and the flame will not be made to jar or vibrate, and consequently the flame will not vibrate. Now darken the room so that the flames may be clearly seen, and slowly turn the mirrored block. Sing into the chamber, and a notched band of light will appear across the mirror's face. The lower the pitch the coarser the notch will be, and the reverse. The tip of the notches will bend away from the direction of motion. If two pitches are shown at once, they will be represented on the mirror. As many effects may be shown as figures by the Chladni plates. A little experiment will overcome obstacles.

One of the accompanying illustrations shows the apparatus in use, and the other, reproduced from Ganot's "Physics," shows the vowel E sung in two notes an octave apart.

### A Two-Cycle Motor Test.

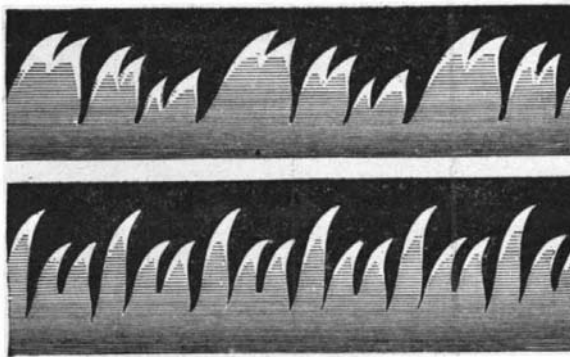
The Automobile Club of France has awakened to the fact that the two-cycle gasoline motor, on account of its extreme simplicity, is valuable for automobiles. In order to promote its use for this purpose, the club will



SIMPLE APPARATUS FOR PRODUCING THE MANOMETRIC FLAME.

hold an international competition for two-cycle automobile motors next October. These motors must develop 8 horse-power as a minimum and 24 horse-power as a maximum; and each motor must develop its maximum horse-power at a speed of not less than 800 revolutions per minute and not more than 1,500 revolutions per minute. The tests will comprise:

- I. A six-hour test of the motors at full load.
- II. A three-hour test at half load.
- III. A three-hour test at no load, at the same speed at which the motor ran at full load.



NOTCHED BANDS PRODUCED BY SINGING THE VOWEL E.

The fuel consumption will be noted during these three tests. Any suitable liquid fuel may be used. The specific cost of consumption will be figured in francs per horse-power-hour, according to the cost of the various fuels at Paris, exclusive of the duty on said fuels.

The basis of valuation will be:

- I. The massique power of the motor under the best conditions of operation, in horse-power per kilogramme.



A REMARKABLE OUTCROP OF PURE SILVER.

- II. The specific cost of consumption in francs per horse-power-hour, corresponding to the maximum power. These two bases of valuation will be used for classification with equal coefficients. The motor which shows the least specific consumption will receive the maximum number of points (100); the others will receive a number of points proportionately less, the

minimum specific consumption being taken as unity. The same will be the case with the motor which obtains the maximum power with the least weight; this motor will be given the maximum number of points (100), the others receiving a number of points proportionately less. All motors will be weighed with their carbureters or atomizers and with their complete ignition outfits, but without mufflers, fuel, oil, or grease.

The motor which receives the maximum number of points will be the winner, the others following in the order of points obtained.

Any motor which does not go through all three trials under the conditions given, will not be classed. The consumption tests at half-load and no-load will not serve as a basis of classification, unless several competitors obtain the same number of points. The trials cannot be adjourned and, once begun, must be continuous. Competitors will be allowed one day for suitably mounting the motors on the testing benches, and a second day for any preliminary trials which they wish to make. The third day they must carry out the first test of six

hours' duration, the fourth day the two tests of three hours, and on the fifth day the motor must be taken away.

Competitors will be given notice of the date of their test fifteen days in advance.

The entrance fee will be twenty dollars per motor.

The expense of mounting the motor on the testing bench and the cost of the fuel used must be borne by the competitors.

The competition will take place in the laboratory of the Automobile Club of France. Applications for entrance of motors in this test must be received before July 31, and must be accompanied with the plans, cross-sections, and descriptions of the motors.

### A REMARKABLE OUTCROP OF SILVER.

The accompanying photograph pictures one of the most wonderful outcrops of pure silver that has ever come to our notice. The vein was discovered last May near Cobalt, Ontario. Projecting about nine inches above the bed rock, as will be seen by the foot-rule in the picture, it measures six feet in length, while in width it varies from a maximum of nine inches to about four or five inches. A nugget weighing 500 pounds has already been taken out. For our photograph we are indebted to Mr. J. F. Gillis, of Cobalt, Ontario.

### London Fires.

From the official return just issued by the London Fire Brigade, we regret to find that the inexcusably thoughtless practice of dropping matches and other lights was responsible for more than 21 per cent of the 3,843 fires which occurred last year in the County of London. Children playing with fire and matches are far less dangerous members of the community, for their antics resulted in no more than 6 per cent of the total number of outbreaks. Unprotected lights gave rise in one way or another to 257 fires, and oil lamps to 148 outbreaks. The continuance of improperly fixed stoves is again demonstrated by 67 fires, to which we must add 98 due to hot ashes and 235 to sparks from grates, giving fireplaces the unenviable responsibility for no fewer than 300 fires. Escapes of gas aided by the insane habit of searching for leakage with lights were the occasion of 134 fires, and defective electric circuits are debited with 100 outbreaks. That faulty wiring, and especially the use of ineffective casing, constitutes a real danger has been recognized by the revised regulations of the Institution of Electrical Engineers, and we hope that architects

will insist upon the adoption of these in all installations with which they are concerned. The disastrous fire a few days ago in Camden Church, Camberwell, is one of the most recent examples of the danger lurking in apparently harmless electric wires, and which are absolutely harmless if only the necessary safeguards are provided.—The Builder.