average, to ± 0.002 sec. The average distance between the spark point and the paper is about .5 mm. and the average angle of deflection of the spark is less than half of 45°; therefore the average variation in the spark is less than ± 0.001 sec.

The chronoscope may be adapted for the measurement of longer intervals, as in the study of association, by two minor changes which can be made in a minute. A small weight is fastened on the top of the upper bob. This makes the pendulum swing so slowly that it takes three seconds to cover the arc of the scale. A corresponding scale, graduated empirically in hundredths of a second, is clamped over the regular scale. The accuracy is nearly proportional to the speed of the pendulum.

Similarly, if there should be a demand for finer readings than those obtained by the standard adjustment, an extra weight may be placed on the lower bob that will cause the pendulum to cover the arc of the scale, for example, in one third of a second. If the corresponding scale is graduated in thousandths of a second each unit will occupy, on the average, 1 mm. of space. The degree of accuracy will be nearly proportional to the speed, because the latent time of the spark is negligible and the action is frictionless.

Much of the value of a chronoscope lies in its adaptation to the attachment of a variety of accessories. The possession of the soundless make and break contacts for the stimulus circuit makes it possible to connect all sorts of electric stimulus apparatus, such as the telephone receiver, the touch key, the tachistoscopes, etc.

For regulating time-exposures, a movable pendulum contact is attached to the front of the base and adjusted, by reference to the scale, for any desired length of exposure from a hundredth of a second to three seconds. This contact may be used either as a make or break and the circuit may be completed either through the make or the break of the stimulus contacts.

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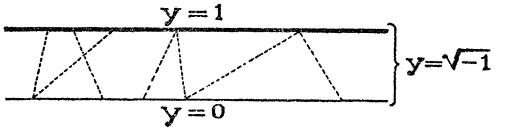
A VECTOR DIAGRAM

Apropos of Carl Barus's interesting note in Science of August 2, p. 149, it may not be amiss to call attention to a representation that I used in a communication to the March meeting of the Chicago Section of the American Mathematical Society.[1]

I represent a real point (x', y') in the plane by a dot and call it a black point, while an imaginary point $(x' + ix'', y' + iy'')$ is represented by a blue point coincident with the real point $(x' + x'', y' + y'')$ and joined to (x', y') by a real vector. Where no confusion



is caused the real vector is drawn straight, but otherwise it may be curved, it being understood that the direction is determined by the end points. Furthermore, if the vector moves its end points describe a black curve and a blue curve. Thus the line

$$y = \sqrt{-1}$$

is represented by joining every point in the black line

$$y = 0$$

to every point in the blue line

$$y = 1.$$

In the accompanying diagram the "blue line" is drawn heavy, the "red lines" broken.

Ellery W. Davis

QUOTATIONS

LIVING ON OUR CAPITAL

The passion to beat our records in material advancement tends to blind the thought to the fact that we are rapidly consuming the very fundamental resources on which the prosperity of the country rests. Without doubt the timber supply of the United States is disappearing far more rapidly than any increment of growth. The treatment of the soil in much

[1] *Bulletin of the American Mathematical Society*, June, 1907, p. 436.