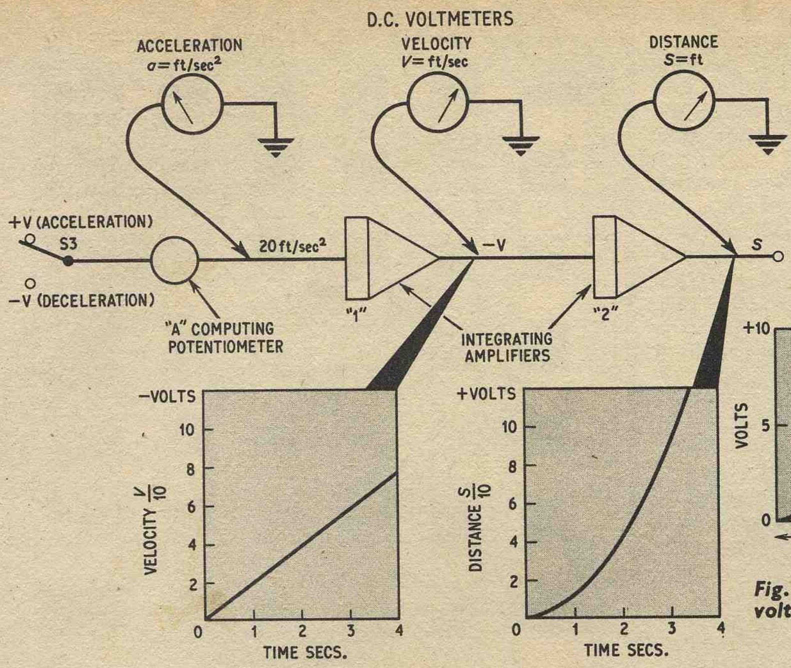


Fig. 1.3a (left). The use of integrators is illustrated in this diagram. In this example the rate of acceleration, velocity, and distance covered by a motor car are computed and can be read off the potentiometer dial and meter scales

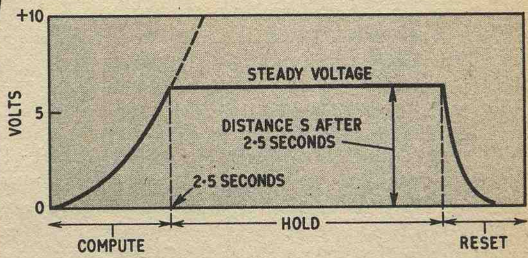


Fig. 1.3b. Arresting a computation to give a steady voltmeter reading

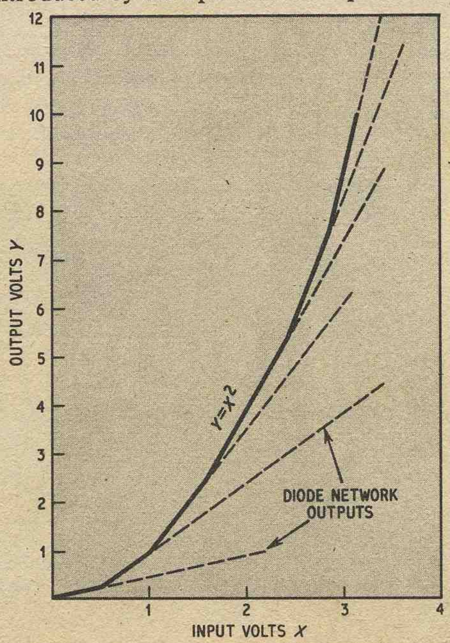
meter. If switch S3 is moved to the −V position, the car will decelerate and stop.

COMPUTE, HOLD AND RESET

It is obviously inconvenient to take readings from voltmeters when pointers are on the move, and it is impossible to do so if time t is very short, as with fast events, or when the computer is speeded up to some fraction of real time. The sequence governing switches S1 and S2, in Fig. 1.2c, is therefore arranged to provide three facilities, called "compute", "hold", and "reset".

The purpose of the "hold" facility is to allow a steady meter reading to be taken at any point on the voltage/time curve output of an integrator. The high gain introduced by the operational amplifier effectively multiplies the capacitance of C_f when the integrator input is disconnected from input resistors and reset resistance R_r. With amplification, C_f becomes the equivalent of a very large capacitor which is capable of holding a charge for a relatively long time. In practice, the ability of an integrator to "hold" or store a voltage will also depend on low amplifier drift.

Fig. 1.3b shows graphically the effect of compute, hold, and reset modes, when applied to the distance curve of Fig. 1.3a. In this case, it is necessary to halt the computation after an elapsed time of 2·5s, and obtain a value for distance in the form of a steady meter reading.



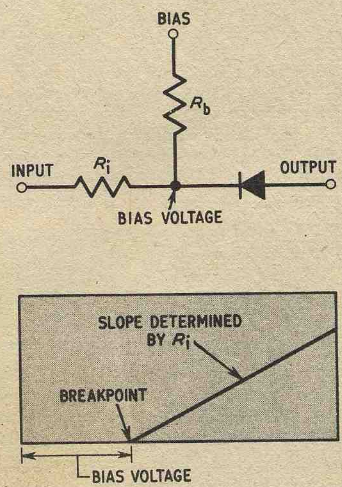


Fig. 1.4a (left). Illustrating how a mathematical function can be constructed from a series of straight line tangents

Fig. 1.4b (above). A single diode network and its output characteristic