APPARATUS YOU MAY NEED.

BY E. L. HARRINGTON,

Rock Port, Mo.

When I took charge of the laboratory here I found neither an electric key, nor a commutator, and I feel safe in saying that there are many high school laboratories none too well supplied with them. As I would need all the money the board could spare me to purchase apparatus I could not make, I decided to make my commutators, keys, and considerable other apparatus.

The drawing shows the kind of keys constructed. From a sheet of spring brass was cut a strip 12 cm. long and 1.2 cm. wide. About 2.5 cm. of this was cut off for a contact plate, while the rest was bent as shown in drawing. Battery bolts were used for the binding posts, and the corners of the spring and plate near these were bent downward and pressed into the wood to prevent turning. Lacking the ebonite buttons found on most electric keys, it was found necessary to cut a strip two mm. wide from each side of the vertical portion of the key spring. These were bent backward, and on them, and the top of the key spring a button of sealing wax was molded. These keys were found to be quite satisfactory.

The inconvenience and often the expense connected with the use of the old-fashioned mercurial commutators by an ordinary high school pupil, led me to devise a new kind—simple in construction, substantial, always ready for use, and of sufficient accuracy for elementary use.

The four brass plates of the commutator were made by cutting along the diagonals of a brass sheet about 6.5 cm. square. About 4 mm. of each of the inner corners were pressed vertically into the wood base, while the outer corners were cut off to fit the base which was 7 cm. by 11 cm. in size. Battery bolts

were used for binding posts. The turn key was made 6 cm. long out of a piece of wood not easily split. For each of the end bridges I used a piece of brass spring 2.7 cm. by 1.5 cm. each end of which was divided into three parts, the outer and narrower portions being clamped over the end of and in notches cut in the turnkey. By tightening the center screw, the contacts were made as firm as desired. Enough of these commutators were made to supply the class, and they were found to be satisfactory in use. Their action is instantaneous and they may be used for a key and a commutator at the same time.

By a visit to the rubbish pile of the city telephone office I secured a supply of horseshoe magnets, generators, electro-magnets, parts of telephones, battery bolts, and a large quantity of insulated copper wire of various sizes. From these things were made galvanometer coils, galvanoscopes of three windings, resistance spools, which I mounted substantially after the class had wound them to various resistances, Wheatstone bridges, a contracting helix, etc. High resistance coils, so expensive to buy, may be made by carefully mounting on wood bases the electro-magnets of telephone ringers. Through such methods about \$125 worth of apparatus was secured for our high school laboratory with practically no cost. All apparatus made was carefully constructed, painted and polished, so that it would present an attractive appearance. And I found that by keeping the apparatus as though it were on display in the cases, the scholars were more careful and interested in the laboratory, and especially the school board became interested in and generous in the support of the laboratory.