A Laboratory Switchboard of Low Cost

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The need for a laboratory switchboard is usually met either by some crude and incomplete makeshift, or some elaborately designed equipment involving considerable expense. For the school laboratory there are on the market several switchboards of excellent design, but at prices which, during recent economic conditions at least, many small laboratories could not afford to pay. The apparatus here described was devised after it became necessary to give up the purchase of a proposed equipment which would have cost approximately $300. In the physics department of Aurora College an equipment of the present design is in service and giving satisfaction. The total cost was about $50, not including labor, line wiring, or battery.

The purpose was to supply various laboratory and lecture room outlets with special voltages from a central part of the building. The voltages in this case consisted of regular A. C., generator D. C., and storage battery in steps of 2, 4, 6, 12, 18, and 24 volts. These were to be available at any or all of the outlets, which happened to be eight in number. The general layout is shown in Fig. 1 where the receptacles and connecting conduits are shown without wiring. Standard 4-inch steel outlet boxes are used throughout, with ½-inch conduit pipe for carrying the connecting wires. The box covers are of the type which is fitted with Hubbell polarized porcelain flush receptacles. Connections are made by rubber cords fitted with Hubbell polarized plug caps. The type with a cord grip should be used. The multipliers consist of two sets of receptacles, the five receptacles of each set being connected in parallel but distinct from the other set. They are used only when it is desired to have the same voltage on more than one outlet at a time. The conduit lengths shown connecting the multipliers to the rest of the system are merely for grounding and do not carry wires. An inspection of Fig. 1 will reveal that many combinations are possible. For example, suppose it is desired to have 4 volts on outlets 1, 2, 3, and 4; 12 volts on Nos. 5, 6, and 7; and 18 volts on No. 8. To accomplish all of this, the 4-volt terminal is plugged to one of the multipliers and thence to each of the four required outlets; the 12 volt terminal is plugged to the other multiplier and thence to outlets 5, 6, and 7, while the 24-volt terminal is plugged directly to outlet No. 8.

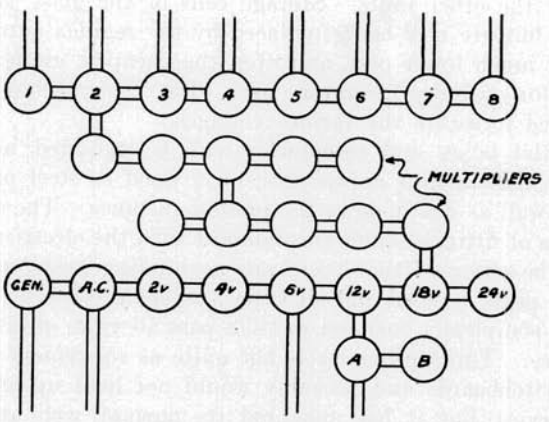

Fig. 1.—Arrangement of Outlets and Conduits. No Wiring Shown.

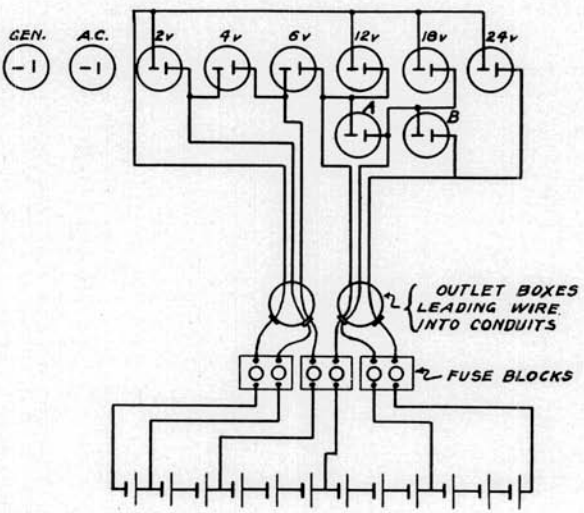

Fig. 2.—Wiring Diagram for Battery Outlets.

The battery is charged by connecting the generator D. C. with the proper terminal. Receptacles A and B are included so that the last two battery units may be charged independently as is already possible with each of the other units. Storage cells of the glass jar type were at first used but are now being replaced by the regular automobile type which are of much lower cost, and even the cheapest grade gives excellent service for ordinary laboratory uses. Fig. 2 shows how the battery cells are wired to secure the various voltages.

The outlet boxes and receptacles may be mounted near together and so as to make a neat appearance, on a wood or steel panel or even on a plaster wall as was done in the present instance. The entire equipment consists of fittings which are standard with the electrical trade.

It will be observed that there are no binding posts, switch blades or other live parts exposed and all wires (except the leads to the storage battery) are completely enclosed so as to pass all rules of city inspection and insurance. This equipment is not quite as convenient as the more expensive switchboards and probably would not hold up as long under extensive service, but it has answered its purpose well and its possibilities have been much appreciated during a period when more elaborate equipment could not be had. It is hoped that this description may be suggestive to other teachers who may have similar interests. Acknowledgment is due to Mr. Charles Singleterry, a student, who did most of the mechanical work and whose suggestions were valuable in revising the design.