contract the heater must take all the fresh air from out-ofdoors. However, as the number of occupants in the building are few compared with the cubic contents, it will be found perfectly feasible and more economical to return a certain portion of the air from the buildings and the apparatus is so arranged that this can be done. The apparatus is capable of changing the air in all the buildings every 25 minutes, and in the paint shops every 20 minutes.

The office building in connection with this department, as noted above, is heated by the same method, the apparatus being designed to furnish 21,430 cubic feet of air per minute which is discharged into rooms having a total capacity of 289,763 cubic feet, thus providing for a complete change of air about every 15 minutes. The fan of the office building heating plant is not driven by a steam engine, as in the case of the sets furnished for the shop, but is direct-connected to a Sturtevant motor running at 200 revolutions per minute.

## AUTOMOBILE CHARGING OUTFITS.

The question of charging outfits is vital to electrical motive power for automobiles. The increasing recognition of the merits of the electric driven vehicle has called for a charging outfit that shall be inexpensive, thoroughly reliable, substantial, compact, and easily manipulated. Were it not for the ignorance sometimes displayed it would be hardly worth while to repeat that the efficiency of the electric automobile mainly depends upon the performance and maintenance of its battery, and in order that the battery shall do the work for which it is designed and built it requires proper care. For this it is necessary that the charging station shall, in its turn, satisfactorily meet the requirements of everyday service, including use by those unfamiliar with storage battery charging; moreover, the installation should be as cheap as possible, consistent with reliability.



Private Switchboard-Capacity, One Vehicle.

Charging may be derived from any one of three sources: direct current, alternating current, or, independent power. Combinations and variations admit of different styles of charging outfits, and the Westinghouse Electric & Manfg. Co., in working out these problems, have produced a sufficient variety to meet any and all of the peculiar conditions or demands of either the private or public charging stations. With these combinations, one, two, four, twelve or more automobiles can be charged at once. The outfits for charging one or two machines are intended for private use, that with a capacity of four is suitable for clubs, country houses, or small stables, while the standard twelve service is applicable for use by public garages, express and cab companies, or other establishments having a number of vehicles.

One of the chief advantages of the garage installation shown in the illustration, the only one having this valuable feature, is that all controls are at one point, with minimum apparatus, instead of, as in the former practice, having them individualized and spread over considerable space, involving double the trouble and expense. There is also a saving in that instead of being compelled to use twelve voltmeters and twelve ammeters, one of each is sufficient. Another advantage is that the charging may be in serial or simultaneous. The cut shows one of these garage switchboards with the series rheostats installed below it for controlling the charging rates of the various batteries. In this particular case rheostats are provided for eight vehicles, the greater capacity being



## Garage Outfit,

obtained at any time by adding the requisite number of rheostats. Each switch on the board is numbered to correspond with the number of its rheostat and charging stand. The throwing of a switch to the left places a battery in "charge," reversing to the right connects the ammeter so that the current may be read. The voltmeter will indicate for the whole main line, or by pressing the push button corresponding to any switch the voltage reading of its stand can be taken. A separate push button gives the voltage reading on the line beyond the rheostats. Opposite each switch is a numbered hook upon which the charging record of the battery may be kept. In connection with this central switchboard automatic circuit-breakers and fuse blocks are to be used at each charging stand. These switchboards may be connected with any 125 volt, direct current line, whether from central stations, motor-generator set, or independent circuit.

For the one or two vehicles of the private owner, or the small garage designed for four machines, the panels are as shown, with the necessary modifications in each case, and are adapted for direct current voltage of 110 to 125. For single charging the automatic circuit-breaker is mounted directly upon the panel with the meters and fused switch. Where two or more automobiles are to be charged the circuitbreakers are displaced by switches, and the over-voltage circuit-breaker and fuse blocks are located at the carriage charging stands.

The circuit-breakers, under normal circumstances, automatically cut out the battery when the charge is completed, and in all cases protect the battery from any overcharge danger or damage, enabling the owner or attendant to set the charge and pay no more attention to it until the machine is again wanted for use, without loss or damage of any kind. The Motor Starter Rheostats, employed in starting the direct current motors, are mounted on the back of the panels, with handle projecting through; the same as with the Generator Field Rheostats. Where a generator is employed the latter are used for the regulation of the battery charging of one carriage, without requiring the additional series rheostats of the grid or imbedded type. Where the Series Rheostats are needed, they are made in one of three types-grid, embedded or combined. In the first form they are mounted on the floor directly below the switchboard, the grids being of cast iron, set in the open air, thoroughly ventilated, and while they are normally made to carry sixty amperes each, they can be immensely overloaded without injury, surviving unhurt where other types burn out. This is an important