

additional slow speed is added, making three speeds in all. Alternating-current generators are required to give a sine wave as nearly as possible under all conditions. The field excitation for simple alternators should be at either 65, 110 or 220 volts. The variation of pressure at the terminals between full load and open circuit under the same conditions of speed and excitation must not exceed 6 per cent. of the normal on a non-inductive load, or 20 per cent. on a load with a power factor of 0.8. Motors are classified as open, protected, ventilated or totally enclosed, a "protected" motor being one in which the interior is shielded from accidental contact without interfering with the ventilation; and a "ventilated" motor, one in which, although ventilated, access to the interior is only possible by opening or removing the casing. Direct-current motors are standardized in 15 sizes, from  $\frac{1}{4}$  to 100 brake horse-power, inclusive; single-phase motors in 11 sizes, from 1 to 25 brake horse-power, and two and three-phase motors in 17 sizes, from 1 to 100 brake-horse-power. The speeds at full load are given for every size; and in the cases of alternating-current motors the figures are the synchronous speeds at no load, and a reduction of speed from  $7\frac{1}{2}$  per cent. in the smaller sizes to  $2\frac{1}{2}$  per cent. in the larger at full load must be allowed for. In connection with the work of the committee, experiments are being carried out at the National Physical Laboratory to determine the safe temperature rise allowable in the coils of dynamos and transformers. The results are not quite ready for publication, although the report indicates that they will be of considerable value, and will result in the recommendation of higher temperatures than have been advised by either the German or American standardization committees. Meanwhile, it is of interest to note that the temperature of the hottest part of a coil, as determined by measurements with a thermo-couple, never exceeds the mean temperature of the coil, by more than  $25^{\circ}$  C.



### THE SIROCCO FAN.

Among the instructive exhibits at the World's Fair, St. Louis, is a set of fans made by the Sirocco Engineering Co., of New York. This consists of a steam driven 30-in. fan, an electrically driven 30-in. fan, and a  $12\frac{1}{2}$ -in fan, electrically driven, for high pressure service. There is also a testing apparatus for comparing the efficiency of the various types of fans.

This fan, which is now to be placed on the Canadian market, is of British origin, the principle upon which it works having been discovered by a Mr. Davidson, of Belfast. In form the fan looks like a squirrel cage, and is composed of shallow blades set closely together with their outer edges inclined, strange to think, in the direction of rotation. The inlet for the air, and the outlet for its discharge, are approximately of a diameter equal to that of the fan itself.

These features are a reversal of previous theory and practice in regard to fan construction; but the practical effect of this new construction is, that in this centrifugal fan the volume of air discharged per revolution is several times greater than in other centrifugal fans of equal diameter. In describing this fan, the makers say: The inlet and discharge openings for the air passing through the "Sirocco" centrifugal fans being (relatively to the fan diameter), about four times larger in area than in centrifugal fans of other standard makes, the frictional resistance to the passage of a given volume of air per minute through the "Sirocco" is therefore only a sixteenth of what it is in other centrifugal fans; consequently "Sirocco" centrifugal fans show a higher efficiency in actual work done for the power applied, and much less weight and bulk, in relation to output. The velocity of air into the inlet opening of the fan is equal over the whole area of the intake, the air entering the fan inlet, so to speak, as a solid cylinder. The adjustment and arrangement of the other edges of the blades, relatively to the inner edges, are such that "Sirocco" fans possess the remarkable peculiarity, that the velocity of the air issuing from the discharge or delivery pipe of the fan exceeds the circumferential speed of the blades by about 80 per cent.;

whereas in other centrifugal fans it seldom equals, and is generally less than, the circumferential speed of the blades. As a consequence, for a given duty, "Sirocco" fans can be run at much lower speeds than other makes; or, at a given speed, are capable of imparting a much higher velocity to the air than other fans of equal diameter. In "Sirocco" fans, the construction of the blades is such that the detrimental eddies which occur in other fans are obviated, as the circumferential speed of the inner edges of the blades is only slightly less than that of the outer edges, the difference between the diameters of the respective circles being unusually small. The organ-like "note" caused by such internal eddies, when the flow of air is at a very high velocity, is thus avoided, so that the "Sirocco" fan is practically silent in operation, even when running at speeds. Another remarkable thing is that there is no end thrust on the fan shaft, even when the air is drawn into the fan on one side only. "Sirocco" fans are made in a number of different types to suit various requirements, and are applicable for driving by belt or rope any form of motor, or may be direct-coupled to such motors. A difficulty which is often experienced in regard to the employment of direct-coupled fans motors, is the fact that the speeds for which standard types of motors are wound, relatively to their power, are usually more or less unsuitable for the duty required from the fan. For instance, one fan may absorb 2-h.p. at 500 revolutions, while another fan may only absorb this amount of power at, say, 1,500 revolutions. Now the standard speed of a 2-h.p. motor may be about 1,000 revolutions, and, obviously, therefore, stock sizes of motors cannot always be used for such varying requirements, and a necessity has existed for getting the motors specially wound to suit each individual case. To meet this difficulty, the makers have designed and patented an arrangement of back-gearing, which is applicable to any form of motor, and by means of which the full power of the motor can be transmitted at any required speed to the fan shaft, while at the same time the arrangement is so designed that, if it is desired for any reason to withdraw the armature of the motor for examination or repairs, it is not necessary to dismantle the gearing. This gearing, however, is itself detachable, so that the motor can be converted at will either from an ordinary into a back-gear motor, or vice versa.

The fans have been remarkably successful for induced draft on boilers, both for stationary and marine use. One of these has been installed in the new Canadian Government cruiser launched in September from the shipyards of the Polson Iron Works, Toronto. A reference will be made to that in a description of the cruiser.



### RULES FOR THE ENGINE ROOM.

- 1st. When you enter the engine room spit on the floor. We have water, lye, soap and brushes, and we will clear up as soon as you leave.
- 2nd. Rub your hands on the polished work, it will give some one work to use the surplus polish.
- 3rd. Put your hands on the engineer's bright work, you will know whether it is smooth, hot or cold. Tell others to do the same.
- 4th. Stop in the engine room as long as you please. The engineer has nothing to do but entertain visitors.
- 5th. Be sure to tell the engineer that his engine is pounding or not running right, as he will not know unless you do; he will stop and make repairs while you wait.
- 6th. Don't tell the engineer who you are, he is a mind reader, and already knows who you are. Go anywhere in the engine room and you will please him.
- 7th. Advise him what to do, as you know best. The engineer is only there every day and does not have a chance to see as much as you will in an hour.
- 8th. When the engineer is busy making repairs, tell him a good story and if possible get in the way.
- 9th. Be sure and tell him all you know, it will not take long.
- 10th. Call again and repeat as long a story as you can.
- 11th. Pull out a cigar and light it, don't ask him to have one for if you do he will accept it.