THE DYNAMO.

DYNAMO and magneto-electric machines consist essentially of a coil of wire—"the armature"—rotating between the poles of a large magnet, the poles being bent round so as to approach each other and have the armature between them. This magnet may be either a permanent magnet of hard steel, or an electro-magnet consisting of wire coiled round a soft iron core, a current of electricity being made to circle round the wire coil, and thus magnetizing the iron core while it lasts. A magnet produces an influence in the neighborhood around it, and this surrounding neighborhood is known as the "field of force" of the magnet; *i.e.*, the sphere in which its influence can be felt.

A magnetic needle or a bit of iron filing placed in this field sets itself to point along the "lines of force" of this field, that is, the lines along which the magnetic force acts, and which form curves around the magnet, running out, as it where, from pole to pole, curving from one to the other. When a coil of wire, or armature, is made to revolve rapidly in the strong field of force which occupies the space between the poles of a powerful electro-magnet, currents are produced in the coil. These currents alter their direction through the coil every time the latter changes its position with reference to the poles of the magnet. The side of the coil which was opposite the north pole is, after half a revolution, opposite the south pole, and the influence of the south pole tends to produce an opposite current to that of the north pole. Here we have an "alternative current" dynamo machine. As the coil, or armature, rotates with great speed some hundreds of revolutions per minute these currents in alternating directions, succeed each other very rapidly, and if an electric arc lamp is placed on the circuit it will be lit up. In this case it is not necessary that the current be sent around the circuit in one direction only, but although the terminals of the lamp are constantly changing their polarity that is, the north pole, where the current enters, the next instant becomes the south pole, where the current leaves yet, as this occurs many times in one second, the effect produced is the same as if the current was in one uniform direction.

In a "continuous current" dynamo, which is necessary for some purposes, such as electro-plating, where the effect desired could not be produced if the direction of the current was continually altering, the electric current is made to pass always one way round the external circuit. This result is got by using the ingenious device of a commutator, which automatically deflects the current so as always to send it in an unvarying direction. This commutator consists simply of a split tube, which is attached to the revolving armature, and may be seen in any dynamo working on the continuous system. This tube revolves with the revolving armature, and it is divided by an insulating substance into two parts. Each half is alternately on the left and right of the space between the poles of the magnet and the "brushes" which collect the current from the armature; *i.e.*, the bundles of copper wire spread out like a brush, which form each end of the outer circuit, are fixed in position, and the revolving commutator attached to the armature brings alternately one of its half-tubes into contact with a brush. Thus the half of the commutator which receives the current changes at the same time the direction of the current through the coils of the armature is reversed; in this way the current sent out to the brush which receives the electric current from the armature is always in the same direction.—Boston *Journal of Commerce*.

DRAFT.

DRAFT, so-called, is the difference in weight between two columns of air, one hot and the other cold. The former rises by reason of its lightness, and the latter rushes in to supply its place. Hot air is lighter than common air, because, being expanded by heat, it occupies more space for the same volume. Suppose, says the *Engineer*, we have a smoke stack of certain dimensions, it contains a certain number of cubic feet of air If we build a fire at the bottom of it, we expand that air and it increases in volume, raising as it increases. Naturally this makes a column of a given number of cubic feet which is lighter than the column of the same capacity outside of the stack, and this cold air seeks to restore the balance. This is natural draft pure and simple, and as it depends upon a very slight difference in weights only, very little is needed to check it. Carrying the smoke stack or flue horizontally is a tax upon the draft proper, for the horizontal column has to be dragged by the vertical column. The horizontal column cannot rise; naturally, therefore, it has no value for increasing the velocity of the outside column of air, but has to be moved by it. All chimneys should be perfectly smooth inside, without projections of any kind; least of all should they be fouled with soot; this last is one of the greatest of obstructions. Forced or induced draft is simply compressed air driven into a furnace by means of fans, and has an artificial velocity imparted to it by them.

THE WORLD'S FAIR POWER PLANT.

As might naturally be expected, there will be required a very large power plant to drive the machinery at the World's Fair But few, however, realize how much power it will require. Compared with the power plants of former expositions this will be tremendous. It took a 2,456 horse power engine to drive the machinery at the Centennial Exhibition in Philadelphia. At the Paris fair 6,000 horse power was sufficient. The World's Fair at Chicago will require six times as much, or 24 000 horse power, according to present estimates. The following interesting facts in this connection are furnished by the Construction Department:

In the Machinery Hall the machines on exhibition will be driven by six lines of shafting carrying the required pulleys, each line running lengthwise with the building, or about 800 feet. Each of these six lines will be driven into four sections of a length of 200 feet, and each section will be driven by an engine. This necessitates the use for power in Machinery Hall of 24 engines with a capacity of 125 to 200 horse power These sections of shafting will be provided with friction couplings on on their ends, so that in case of accident or the disabling of any engine its section may be driven by the engine on the other side of it. Lengthwise in the Machinery Hall will travel three electric cranes of 20 tons capacity, each having a maximum speed of 400 feet per minute. During the installation of and the removal of these exhibits, these cranes will be used for transporting goods, but during the exposition they will be used to carry passengers through the halls.

At the east end of the Machinery Hall will be located the exhibit of pumping and hydraulic machines in operation. These pumps will supply water for all the grand fountains on the grounds, and for other purposes. Here will be a pumping plant almost equal in capacity to any of the plants of the water works of Chicago. There will be pumps working with a capacity of 40,000,000 gallons per day.

In the Machinery Annex will be located the electric energy plant, where a number of engines of various types will furnish the 16,000 horse power necessary to operate the generators for electricity for light and power. These engines will be located so as to form a compact central station. This plant is elastic in its proposed capacity, and its power can be extended indefinitely. The estimated necessary 16,000 horse power will probably be increased rather than diminished. In the building near the annex will be located the steam plant for furnishing steam power for this electric station.

South of Machinery Hall and opposite the centre of the building will be located the boiler house supplying the steam used in the building. This plant will be a model, and will have a capacity of 8,000 horse power. Only in Machinery Hall will steam power be used. Electric power will be used in all of the other buildings, and will be transmitted by wires from the central electric plant. It is estimated that in Machinery Hall and its annex there will be about 3½ miles of shafting.

It is not yet determined whether crude petroleum or coal will be used for fuel. To run this big plant during the exposition will require at least 75,000 tons of coal or 225,000 barrels of crude petroleum. It will require at least 250 engineers, firemen and attendants to man this plant. To keep it bright and clean during exposition will require 90,000 pounds of waste, and it is estimated that $6,060 worth of lubricating oil will be poured on its innumerable bearings.

In all heating systems designed to use exhaust steam, says the Boston *Journal of Commerce*, care should be taken to have the pipes large enough to allow the passage of the steam with the least back pressure It is a poorly designed system that requires a back pressure of five pounds.