C. Friction drop in the pipes must be computed for each section where there is a change in area or in velocity. Find the velocities in each section of pipe starting with the branch furthest from the fan. The friction drop for these sections can be determined by reference to Table —. Total friction loss in the piping system is the friction drop in furthest branch plus the drop in the various sections of the main, plus the drop in the discharge pipe.

The total maintained resistance of the system—or static head required at the fan $= A + B + C$.

SELECTING THE FAN

Having determined the volume of air and static head required, the size of exhaust fan, speed and horsepower can be found by reference to the manufacturers performance tables or charts covering the type of exhaust fan selected.

The usual types of ventilating fans are unsuitable for exhaust systems which are required to handle materials such as shavings, sawdust, emery dust, etc. Higher pressures are required than in ventilating work and in addition housings and blast wheel must be so constructed that the materials handled do not deposit in same. While the fans used in different exhaust systems are more or less of the same general type, modifications are frequently necessary to fit them for handling such materials as long shavings, strips of paper, cotton, pulverized coal, etc.

The most common method of separating the dust and other materials from the air is to pass the mixture through a centrifugal or "cyclone" collector. In this type of collector the mixture of the air and material is introduced on a tangent, near the cylindrical top of the collector, and the whirling motion sets up a centrifugal action causing the comparatively heavy materials suspended in the air to be thrown against the side of the separator, from which position it spirals down to the tail piece, while the air escapes through the stack at the center of the collector.

For most systems, the nominal size and number of the collector will be the same as the diameter in inches of the main pipe leading to it. The nominal sizes of the different makes of collectors vary greatly, and it is advisable to make sure that a collector is large enough to do the work without excessive pressure drop, irrespective of nominal number or size. The larger the collector the better will be the separation, and the less will be the back pressure on the fan and power consumed.

Special construction is sometimes required for fine dust, also some blow pipe manufacturers use a special type of collector for furnace feed, the object being to deliver the material to furnaces as uniformly as possibly.

When more than one fan delivers into a single collector a back pressure valve is required to prevent one fan blowing back through the other in case the second fan should stop for any reason.

In most plants, where wood refuse is used for fuel, it is delivered by gravity directly from the collector to the furnace. The discharge pipe leading from the bottom of the collector is divided and the junction furnished with a switch or valve so arranged that when the material comes too fast for the fires it can be diverted into a reserve bin.

The furnace feeder should be hinged where it is attached to the lower end of the discharge pipe, in order that it may be disconnected from the furnace when the fan is shut down. Also great care must be taken to provide an absolutely tight switch. Otherwise, when discharging refuse to the storage bin, fine sawdust will sift through this valve and settle in the furnace feed pipe, and, in case the fireman has neglected to disconnect the feeder from the furnace, the flame may flash back, following this train of fine sawdust, into the collector.

Other forms of collectors or separators, are: settling chambers, cloth screen and bag collectors, bag houses, air washers and electric precipitators.

DESIGN OF HOODS

The mechanical design as regards shape and construction of the hoods is extremely important. Probably more systems fail from improper hood construction than from any other one cause.

If the material to be moved is already in motion, as are the chips thrown off from wood-working machines, the hoods should be arranged in the path of the particles so that the velocity of the particles assists the air in carrying the material to the throat of the hood.

Hoods should be arranged to draw dust and fumes away from the face of the operator. They should be placed as close as possible to the source of dust or waste material and wherever practical, the hoods should entirely enclose the dust producing operation.

Hoods are usually constructed of galvanized sheet iron or other equally substantial and durable material. The material should be heavy enough to stand the abrasive action of the dust and refuse. The hoods should be of sufficient mechanical strength to keep their shape and should be well braced and substantially supported. Galvanized iron used should never be lighter than No. 22 gage.

If acid or corrosive fumes are present heavy material painted with acid resisting paint should be used, or the hoods may be made of non-corrosive material.

The exposed edges of all sheet metal hoods should be bound with wire or band iron, not only to give the necessary stiffness, but also to prevent the operator from being cut by the raw edges of the sheets.

CONVEYOR PIPES

The conveyor pipes leading from the hoods to the fan and thence to the collector are commonly made of galvanized iron, the gage of which varies from No. 24 to 14, depending upon the diameter. The piping should be free from dents, fins and projections of all kinds on which refuse material might catch.

All permanent circular joints should be lap-jointed, riveted and soldered, and all longitudinal joints either grooved and locked or riveted and