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.

Where considerable quantities of explosive dust or inflammable materials pass through the exhaust fan, the blast wheel should be constructed of brass composition, copper or other soft metal and in all cases ample clearance should be provided between blast wheels and housings.

Where stringy or fibrous material is to be handled through the fan be sure to employ a fan wheel especially designed for that purpose.

COLLECTORS

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 inlet size of the collector may be the same as the diameter in inches of the main pipe leading to it. The larger the collector within certain limits 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 possible.

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 woodworking 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 soldered. Circular laps should be in the direction of the flow, and piping installed out-of-doors should have the longitudinal laps at the bottom. Every change in pipe size should be made on a taper not by an abrupt change.

All pipes passing through roofs should be equipped with collars so arranged as to prevent water leaking into the building.

The main trunks and branch pipes should be as short and straight as possible, strongly supported, and have the dead ends capped to permit inspection and cleaning. All branch pipes should join the main at an acute angle, the junction being at the side or top and never at the bottom of the main. Branch pipes should not join the main pipes at points such that the material from one branch tends to enter the branch on opposite side of main.

Cleanout openings having suitable covers should be so placed in the main and branch pipes that every part of the system can be easily reached in case the system clogs. Either a large cleanout door should be placed in the main suction pipe near the fan inlet or a detachable section of pipe, held in place by lug bands, may be provided.

Elbows should be made at least two gages heavier than straight pipe of the same diameter, the better to enable them to withstand the additional wear caused by changing the direction of flow. They should