be positive. The static pressure can be obtained by subtracting the velocity pressure from the dynamic pressure.

In making a test where the static pressure within the duct is below that of the atmosphere, connect apparatus as shown for exhausting test in Fig. 69. The upper manometer will record the velocity pressure which will be positive, while the lower manometer will record static pressure which will be negative.

As stated in the above report, for accuracy the velocity corresponding to each reading should be calculated separately and then the velocities should be averaged. However, for field work, if the readings are taken at the positions shown in the centers of the rings or circles of equal area, there will be no appreciable error if the readings are averaged and the velocity computed on the mean.

Corrections must be made for the specific gravity of the gasoline and the inclination of the manometer.

*Example.*—In a blowing test conducted as here outlined, using a manometer inclined 1 to 10 for the velocity reading, and using colored gasoline with a specific gravity of 0.74, a reading of one inch was observed. The air was practically dry at 120 deg. fahr., barometer at 30 in. The equivalent inches of water will be $1 \times 1/10 \times 0.74$ or 0.074 inches of water. The weight of the air will be

$$W = \frac{0.0028862 \times 30}{1 + 0.0021758 \times 120} = 0.0687$$

then

$$v = 1096.5 \sqrt{\frac{0.074}{0.0687}}$$

$$v = 1140 \text{ ft. per minute.}$$



CHAPTER XXIII

# EXHAUST AND COLLECTING SYSTEMS

PNEUMATIC exhaust and collecting systems may be classified in various ways. They may be classified by the economic purpose to be accomplished by the industries served, or by the type of system used.

Classifying exhaust systems by industries served, they fall in subdivisions such as, metal working, woodworking, leather and shoe manufacturing, rubber industry, flint grinding, pottery works, pulverizing works, celluloid manufacturing, printing establishments, felt hatting and fur manufacturing, textile mills, grain and cereal industry, etc.

## TYPES OF SYSTEMS

The type of exhaust system to be used is determined by the industry served, kind of material handled, and the work to be accomplished. There are two general arrangements; the central and the group systems. In the central system a single or double fan is located near the center of the shop with a piping system radiating to the various machines to be served. In the group system, which is sometimes employed where the machines to be served are widely scattered, small individual exhaust fans are located at the center of the machine groups.

The group arrangement has the advantage of flexibility. It is, however, more difficult to balance than the central, and also the large number of small diameter trunk lines required show a much higher friction loss per foot of length than with the central system where one large main pipe serves a considerable number of machines.

Exhaust systems are also characterized by the means employed to collect the dust or other material handled. The dust or refuse may be collected and controlled by enclosing hoods, open hoods, inward air leakage or general room exhaustion.

With another class of machinery it is not feasible to closely hood the machines and in these cases open hoods over or adjacent to the machines are provided to collect as much of dust and fumes arising as possible. In this class come such machines as rubber mills, package filling machinery, sand blast, crushers, forges, pickling tanks, melting furnaces, and the unloading points of various types of conveyors.

The open hoods should be placed as close to the source of dust or fumes as possible with due regard to the movements of the operator.

When the hood has to be placed at some distance above the machine it should be large enough to encompass an area of considerable extent as diffusion is usually quite rapid.

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Material for this section was prepared especially for THE GUIDE by H. M. Nichols, Boston, Mass.