that the filter units are easily removed from the frame for cleaning and recharging.

If the unit filters are cleaned *progressively* the resistance and volume of air delivered may be kept practically constant. By cleaning a predetermined number of filters every week—or every month, as the case may be—the resistance and consequent air volume can be held at any desired figure.

Obviously, the resistance and efficiency of a unit air filter of the adhesive impingement type depends upon the velocity at which the air is handled and the condition of the unit—that is, whether the unit is clean or dirty.

The efficiency of the unit is usually highest after it has accumulated approximately 75 per cent of its maximum load of dirt, as the dirt and dust accumulated in the cell usually are efficient media for the further collection of solids from the air.

The resistance of the commercial unit air filter of the adhesive impinge-

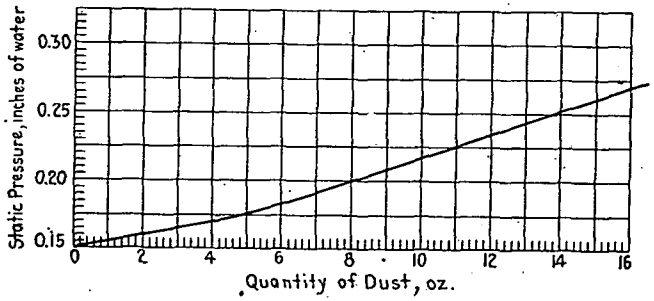

FIG. 2. CHART SHOWING CHANGE IN RESISTANCE DUE TO DUST ACCUMULATION

ment type varies from 1/16 to 3/8 in. water gage when clean, depending, of course, upon the design selected. As dust accumulates in the filter, usually the resistance and cleaning efficiency rise. (See Figs. 1 and 2).

Fig. 1 shows the resistance to air flow of a typical unit air filter, which is built in three types, having, respectively, 1/8, 1/4 and 3/16 in. water gage resistance when operated at a velocity of approximately 365 lin. ft. per minute. Fig. 2 shows the change in resistance due to dust accumulation. Under actual operating conditions one pound of dust represents about eight weeks of normal service. The resistance of an installation of filters under the conditions cited could be held at any point between 0.15 in., the resistance of a clean filter, and 0.27 in., the resistance after accumulating one pound of dust, by cleaning a sufficient number of cells each week to maintain the desired average.

To make sure of proper periodic cleaning of the units the installation of a standard draft gage is recommended.

Proper washing, drying and recharging equipment should be installed as convenient to each set of filters as possible.

Automatic Viscous Filters

Unit air filters have certain limitations in the amount of dirt which can be handled. If the dirt reaches the filter too rapidly, or in such quantities that the adhesive liquid does not have sufficient opportunity to soak through and wet the successive layers, the cleaning efficiency drops off. Removals for unit filter cleansing sometimes prove so frequent as to be objectionable or impracticable.

This fact, and perhaps the age-old effort to eliminate dependence where possible on the human element, brought forth the self-cleaning or automatic viscous filters, several distinct types of which are now available.

In the main these filters are based on the same fundamental principles as unit viscous filters. All utilize the principle of adhesive impingement. Various ingenious arrangements of struts, woven wires or foraminous metal sheets are arranged to move progressively through the bath of charging liquid, the dirt thus being flushed off, while in other types the filter media itself remains stationary, and the charging liquid moves over the dirt-collecting surfaces, flushing off the accumulated dirt at regular intervals, usually once in 24 hours.

Dry Air Filters

There are now available various types of unit and automatic air filters in which the dust is impinged upon or filtered out through felt, cloth, paper, etc., screens. These devices require no adhesive liquid of any kind, but depend on the straining or screening action of the filter media.

The filters are cleaned or reconditioned by rapping or vibrating the screens. In some cases the air flow is reversed during the reconditioning period. Practically all of the various types of dry filter media have a definite length of useful life depending upon the nature and strength of the texture.

Dry filters, as a class, therefore, differ from the all-metal viscous type in that their filtering media must be replaced periodically as the end of its useful life is reached.

Because of the close texture of the filtering media used in most of the dry filters, the surface velocity, or velocity of the air through the media is considerably lower than in the viscous types. The initial resistance, or the resistance when the filter media are clean, is likewise somewhat lower. The usual practice is to allow the dirt to accumulate on the filtering surface until the resistance has reached a predetermined maximum. At this point the load of dirt is removed by some mechanical means and the filter thereby reconditioned. A constant resistance such as is obtained with the automatic viscous filters cannot be maintained, in a practical way, with the present dry filters. However, an average operating resistance results, provided the filter is properly maintained and reconditioned.

DUST REMOVAL EFFICIENCY

The efficiency in dust removal of air-cleaning devices can be determined by means of tests made with air at stated capacities and with dust of definite quantity and quality. There are a number of excellent com-