AIR SAMPLER TYPES ESz—K—F—2 ESz—Qu—F—2

By

J. FINNA

In workshops, mines, laboratories and other localities as well as in a number of agricultural branches there is frequent need for testing the atmosphere from the labour hygienic point of view. Such sanitary tests are governed in our days by legal rules. Investigation of the air quality, in fact, is very often of decisive importance also on the basis of purely technical considerations, e.g. in the mounting of electrolytic condensers or in textile mills or in many similar industrial branches.

For performing the required examination, it is necessary to take a sample from the surrounding atmosphere, sufficiently large in volume for the contained foreign matter to be determined by way of analysis. Such specimens are usually taken by air suction, with the foreign substance subjected either to chemical absorption or to physical precipitations.

The most widely adopted method of testing relies upon a sampling procedure, with air either pumped across, or absorbed by a fluid. The accuracy of the sampling process requires identical air volumes to be propelled through during each period of time. The more precisely the samples have been sized the more reliable the test result will be. Former devices used for that purpose quite often failed to furnish trustworthy results because of the high degree of sampling inaccuracy. Apart from that their unmanageable size made them difficult to transport, to say nothing of the time they required for setting to work. It was with due consideration how to avoid such shortcomings that the Finna-type air samplers with manual, electric or automatic drive have been designed. Two years of experience with these types have matured serious results which proved them in matters of precision to surpass the comparable foreign models.

There are records of certain foreign-made apparatus, like the mercury vapour sampler, the fume sampler or various gas samplers, designed for particular samplings, some for simultaneous recording and even for indicating the test result without the need for an analytic process. Although they spare the trouble of analysis yet they remain inferior to the Finna-type sampler, lacking its versatility and consequently failing to furnish reliable data, unless the atmosphere is infected by one single sort of impurity only.

The Finna-type samplers have increasingly gained ground on account of their reduced dimensions, light weight, ease of transport and great precision, combined with a high degree of operating readiness and, last but not least, with low costs.

Here follows a brief description of their designs.

I. Manual air sampler

The apparatus, $300 \times 220 \times 135$ mm in size, 4,5 kg in weight, can be carried on a shoulder strap and hung around the neck during operation. Air samples are taken by the action of a two-cylinder lowering lever of 56 cu. cm. capacity and 1 : 3 transmission ratio, with 200 cu.cm compensation tanks coupled in series to the pump inlet and with

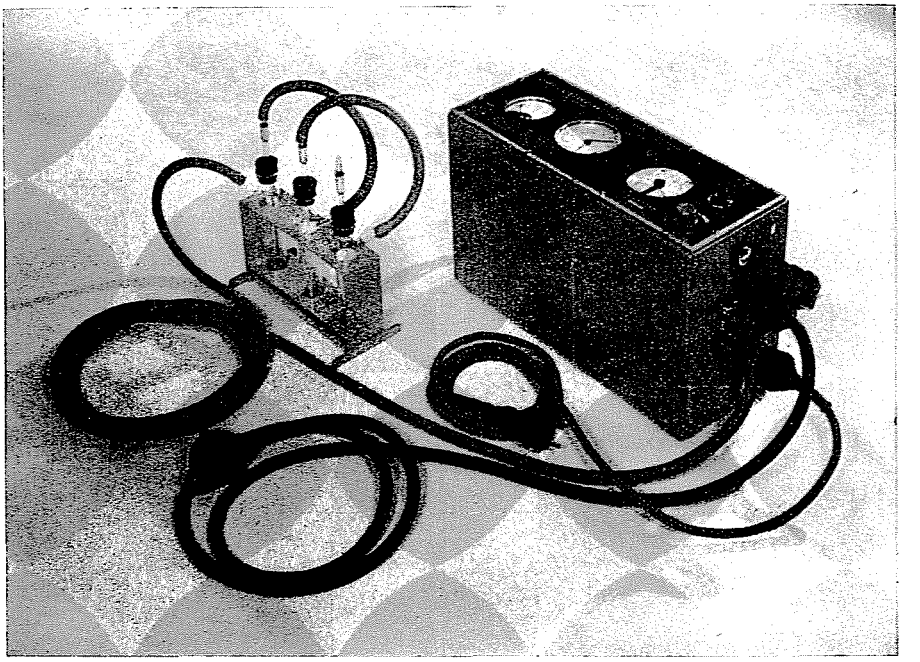

Fig. 1

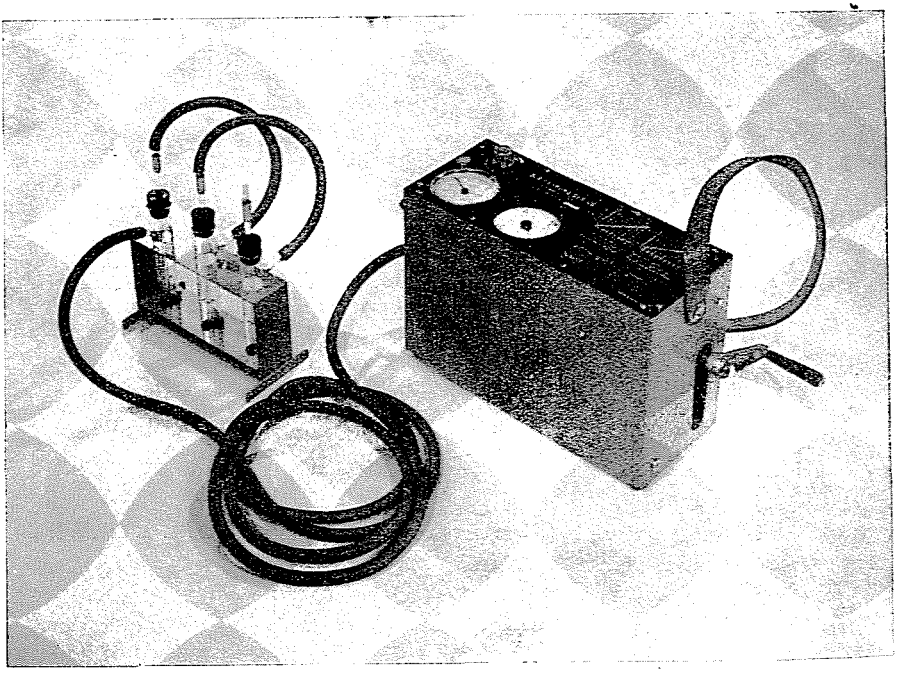

Fig. 2

intermediate needle valves leading from the tanks to the measuring throat. Coupled in series to the outlet orifice of the throat are midget impingers, one or more, charged with the fluid according toneed. The rhythmical rotation of the driving lever, with the needle valve properly adjusted, gives rise to a suction process, acting through the impingers. Measurements are taken by a differential pressure gauge, fitted with dial, covering a range of 0 to 2,5 litres per minute, and coupled to the branchings before and after the measuring throat. An incorporated stop watch allows the sampling period to be fixed by a pressure exerted on its push-button. The product of the instrument indication with the time period gives the volume of the sample. With the positive branch of the measuring throat disconnected, the apparatus can be put to the gauging of rarefied space within a range of 0 to 70 mm W. C. The sampling accuracy is $\pm$ 5 per cent.

The instrument has been calibrated at $+20$ centigrades, under a pressure of 760 mm mercury column. Alternative temperature and pressure rates must be converted by means of a correction chart.

A special advantage of the apparatus is that it can safely be used in explosive atmosphere.

II. Electric air sampler

The apparatus which measures $350 \times 220 \times 140$ mm and weighs 5,2 kg without, or 9,8 kg with, accumulator, is operated from a 110—220 V power mains or a 6 V battery.

From the pneumo-technical point of view it operates along the same lines as the hand-driven type, except for the suction process brought about by an elastic tube-membrane pump, the action of which is controlled by a 6 V 5 W fractional-power d.c. motor. For recording the test period, there is a stop-watch, started by a solenoid switch when the apparatus is cut in and disconnected at the end of the sampling process.

The same motor is used when the apparatus works with electric supply from the power mains, alternating voltage being rectified by a selenium cell and reduced to 6 V. There is a 10 V voltmeter for checking the battery tension. The battery can be recharged from mains without removal. A highly appreciable feature of the equipment is that it can be put to operation in whatever place, irrespective of an available mains connection. The provided remote control switch allows it to be used in places difficult to access, e.g. in mines, vehicles, aeroplanes, etc.

III. Automatic air sampler

The apparatus, $350 \times 220 \times 160$ mm in size and 9 kg of weight including battery, can be carried on a strap hung round the neck. Samples are taken by means of a 6 W magnetic pump, operated either from 110—220 V mains or from a 6 V battery. Its suction output which ranges up to 2,5 litres per minute, can be adjusted by means of a control knob to the fixed rates of 0,5-1-1,5-2-2,5 litres. The pumped-over air volume is recorded by a propeller type counting device employed instead of the differential pressure gauge of the former types. A second knob which serves for the specimen volume to be predetermined, permits samples of 20-40-60-80 or 100 litres to be selected and disconnects the apparatus as soon as it has taken the required air quantity. Supplied as an accessory to each unit is a plastic case of $400 \times 250 \times 180$ mm size and 3,5 kg weight containing 36 impingers. They can be coupled to the apparatus and make it independent of individual sampling; according to need, they permit 12 specimens to be taken automatically, under consideration of the described settings. The accuracy tolerance is within ± 5 per cent.