

of this type of mask without affecting in any way the working efficiency of men operating inside the building. The importance of this will be apparent when it is realized that the men may be required to deal with a second fire at short notice.

The canister which is at present being used is the general-purpose type manufactured by the Mines Safety Appliance Company of Pittsburg, U.S.A., which gives two hours protection against smoke and low concentrations of all gases likely to be met with at fires. This canister has up to the present been used with simple mouthpieces, half-masks, and full face-masks, and is carried in a satchel of similar type to the standard military pattern. Experience with this equipment has shown that in addition to the greater comfort of the firemen, the attack on interior fires, and also the salvaging and ventilation operations, have been speeded up, with a considerable saving in the damage resulting from fire, smoke, and water.

It is therefore evident that the development of smoke-masks not as emergency equipment, but for use at all fires where heavy smoke is experienced, is desirable. If a suitable mask can be obtained at a reasonable price there appears no reason why the smoke-mask should not ultimately become just as much a part of the individual firemen's personal equipment as the small axe or hand-line normally carried. The indications are that its use would be required more frequently than either of these items.

For some time past negotiations have been in progress with the agents for the general-purpose canisters referred to, but it has not been found possible to obtain a supply of this type at a reasonable cost owing to the fact that the makers limit the use of the canister to the face-mask supplied by them. This latter is considered less satisfactory, and is very much more expensive than the military type. The price of the complete mask places it beyond the finances of the smaller brigades except as emergency equipment.

In view of this difficulty investigations were made into the possibility of using the military face-mask fitted with the practice canister supplied to the Army for training purposes. This canister contains absorbent layers of cotton wool, charcoal, and cellulose, and is designed to have resistance to the smoke type of gases. A severe test was carried out by the Wellington Fire Brigade staff, the canister taken for test being selected at random from the military stores, and having been in use for a period of six years for training purposes. The following is the Superintendent's report:—

"A fire was built up in an out-building 9 ft. by 10 ft. by 12 ft., from the following materials: flint, xylonite, flock, kapoc, oily waste, and shavings, the whole being covered over with wet sacks. The fire was then ignited and allowed to burn for several minutes until dense smoke and fumes were given off. Members of the staff on duty were given ten minutes each to test out the mask; the total time of actual use being two hours. A number of the staff volunteered to try out the conditions without the use of a mask, and the maximum time suffered by any member was two minutes; then only after severe punishment. The staff reported very favourably on the efficiency of the unit, more especially considering the severe conditions of the test."

In the use of these military masks for fire-brigade purposes there must be a definite understanding of their limitations. The tests made show that the mask is quite efficient for use at all ordinary fires, but it must be clearly understood by the firemen that it should be used as a protection against smoke only and not against poisonous gases. The mask should never be used, for instance, where fumigating gases such as sulphur dioxide or hydrocyanic acid have been used, where cylinders of compressed gases such as ammonia or chlorine have been discharged, nor for entry into atmospheres heavily charged with coal gas or petrol vapour. It does not give protection against carbon monoxide, and should not therefore be used in fires where this gas is likely to accumulate, such as slow-combustion cellar fires.

In such cases as those quoted the poisonous gases are liable to be in such concentration that there is insufficient oxygen to support life, and even the gas-resistant canister mask, which will protect the bearer against small percentages of gas up to about 3 per cent., is dangerous to use. The only equipment which is absolutely reliable as a protection against poisonous gases, particularly where concentration is unknown, is the self-contained type of oxygen-breathing apparatus. Half-hour sets of this equipment are now on the market at a reasonable price, and it is recommended that all brigades in the cities and larger towns should be equipped with at least one and preferably two of these sets for rescue work and for use either at fires or other emergencies when it is necessary to enter atmospheres which are or may be charged with poisonous gas.

The military mask has several advantages over most other types. It is light, the standard satchel equipment makes it convenient for fitting rapidly, and the contents of the training canister which it is proposed to use are much less susceptible to damage from moisture than most other types. The masks can therefore be used for drill and training without affecting their efficiency for use at fires. The adoption of the military mask for fire-brigade purposes will also ensure that at least a small staff in each town is familiar with the equipment, and brigade members would be available to train the public in their use in case of emergency. A recommendation has been made to the controlling authorities for all brigades that each fire-engine should be equipped with a minimum of four of these masks.

#### HAND FIRE-EXTINGUISHERS.

The servicing of hand fire-extinguishers in commercial use by the local fire brigades has been continued during the year, and a number of additional brigades have undertaken this work. The evidence obtained during this servicing shows that these appliances are a very valuable safeguard against fire. Complete records are not available, but during the year the Auckland and Wellington brigades have recharged fifty-three extinguishers which were used at incipient fires. The more general installation of these appliances is therefore to be strongly recommended, but it is necessary to again call attention to the fact that regular servicing is absolutely essential if the extinguishers are to be kept in an efficient condition and safe for use.