

and whether any sudden puffs are heard before the end. Times of burning are about the following: 24-pr. Hale, 10 seconds; 9-pr., 8 seconds; Boxer life-saving, $4\frac{1}{2}$ seconds.*

**GENERAL INSTRUCTIONS FOR THE GUIDANCE OF THE ROYAL ARTILLERY
IN CHARGE OF MAGAZINES OR AMMUNITION STORES.**

1. No one will pass the barrier at the entrance of a magazine or ammunition store except in the presence of the officer, master gunner, or non-commissioned officer, in local charge of the building, who will be responsible that all persons entering comply with the necessary precautions, and that they have no articles of a combustible nature in their possession.

2. All persons employed in magazines, cartridge stores, and in shell stores when connected with cartridge stores, will, before entering the same, change their own clothes and boots for magazine clothing and slippers. This will be effected in the place appointed for shifting, where the boots and clothing taken off will be deposited.

3. Smoking is strictly prohibited near any magazine or ammunition store, and any soldier entering them with a pipe or lucifer match in his possession will be made a prisoner.

4. Only the hand magazine lantern will be used within the magazine or ammunition stores, and then only in the presence of the person in actual charge.

5. Laboratory operations will not be carried on in any magazine, cartridge, or shell store, or in any of the passages connected therewith, but only in the building, or tent, specially provided for the purpose (*vide* Regulations for Laboratories).

6. Every favourable opportunity will be taken for airing the magazines on the principles given in the memorandum attached. Common thermometers will be issued to all magazines containing 100 barrels and upwards of loose powder.

7. Magazines will never be left open unguarded, and sentries will be particularly attentive to the earliest appearance of a storm, however distant, and upon hearing thunder, or seeing a flash of lightning, they will give the necessary notice, in order that the doors and ventilators may be immediately closed.

8. The floor of a magazine or ammunition store will be kept scrupulously clean and free from loose grains of powder. The passages will be covered with hides, wadmiltits, or hair cloths, when powder in bulk is being moved; these coverings should be frequently lifted and dusted.

9. Barrels, cylinders, and cases will be placed so that the air can circulate freely round them. They should be at least six inches from the masonry of the building.

10. No packing or shifting of cartridges, or issue of powder from cases or barrels, will be permitted within the block containing the magazine or cartridge stores. These operations will only be carried on in the Laboratory.

11. No friction, detonating or common tubes, fuzes, quick or slow

* As previously mentioned in the text, the 24-pr. Marks IV. and V., will burn about 6 seconds, the 9-pr., Marks V. and VI., about 4 seconds.

match, signal lights, rockets or primers will be kept in any magazine or cartridge store, or admitted within the enclosure of a magazine where gunpowder alone is stored. Tubes and fuzes may be kept in the shell stores.

12. Small-arm ammunition, which contains its own means of ignition, will not be stowed in the same chamber of a magazine with gunpowder, whether the latter is loose or in filled cartridges.

13. Oiled rags, cotton waste, oakum, or cloths for cleaning, are not to be kept in magazines, ammunition stores, or their passages.

14. All boxes, cases, and barrels placed in magazines or ammunition stores will be labelled, and no empty boxes, cases, or barrels will be allowed to remain in them. Barrels containing powder will never be rolled along the floors of magazines or passages, but will be carefully transported from one place to another.

15. Officers, master gunners, and non-commissioned officers in charge will at all times be particularly careful with everything in or about the magazines, and will take immediate notice of any irregularity they may observe. They will also be very prompt in reporting any defects or repairs necessary either to the interior or exterior of the buildings.

16. An inventory board, showing the contents of the magazine or ammunition store, will be hung up in the lobby or passage leading thereto.

17. The keys of the magazines and ammunition stores will be labelled, and when not in use deposited in a secure place.

18. A copy of these instructions attached to a board will be hung up on the inside of outer doors and on the wall of the entrance to the magazines. Copies for this purpose, printed on foolscap paper, can be obtained on demand.

19. W. O. Form 939 (Standing Orders for Artillery Magazines, dated Horse Guards, 1st December, 1865) has been cancelled.

MEMORANDUM RESPECTING THE VENTILATION OF MAGAZINES.

1. The dampness complained of in buildings will frequently be found to arise from condensation of the watery vapour of the air which enters the building. Buildings with thick walls and vaulted roofs, and especially those covered with earth, are particularly liable to dampness from this cause.

2. Air always contains some proportion of watery vapour. When the proportion is small the air is said to be dry, and when large the air is said to be damp; when the proportion is the greatest that can be diffused through air at a given temperature, the air is said to be saturated at that temperature.

3. The proportion of watery vapour which saturated air contains varies with the temperature, being greater for high than for low temperatures. Air containing a particular proportion of moisture is rendered less capable of depositing moisture by its temperature being raised and the reverse when it is lowered.

4. Air may be brought to a state of saturation by reducing its temperature. If the air contains but little moisture, the reduction of

temperature must be considerable; but if it contain much a slight reduction will bring it to a state of saturation.

5. If air be cooled below the degree of temperature at which it will be in a state of saturation, a portion of the watery vapour contained therein will be deposited on any cold substance with which it may come in contact. The degree of temperature at which air will thus begin to deposit moisture is called its *dew-point*.

6. When warm air enters a comparatively cold building the temperature of the air is reduced by coming in contact with the interior walls and other cold surfaces: and if its temperature be thus reduced below the *dew-point*, condensation will take place. In the latter case it is obvious that the admission of fresh air will not tend to dry a building, but to render it damp.

7. If a magazine, 40 feet by 24 feet by 12 feet, the temperature of whose internal walls, &c., is 45 degrees, were to be filled with saturated air having a temperature of 50 degrees, and the magazines were then closed, nearly a pint of moisture would be deposited during the cooling of the fresh air to the temperature of the walls. The pint of moisture would result from the quantity of air sufficient merely to fill the magazine; but if the ventilators were open, the air might be renewed many times in the course of a day, and very much more than a pint of moisture be deposited.

8. Air entering a building, whose temperature is higher than its own, becomes capable of absorbing moisture from damp surfaces.

9. The efficiency of the ventilation of a magazine will depend upon the degree of dryness which the fresh air admitted into it possesses, and the rapidity of the current of dry air passing through the building.

10. The dryness of air is indicated by the number of degrees by which its temperature exceeds its *dew-point*.

11. The ventilators of magazines should, in all cases, be constructed so as to exclude or admit the external air at discretion, *and the instructions for their use should be framed with a view to the exclusion of the external air, when the temperature of its dew-point is above that of the interior of the building, and the admission of the air when its dew-point is below the temperature of the interior of the building.*

12. For the foregoing reasons, the common practice by which, under Art. 491, Ordinance Regulations, 1855, magazines are open for purpose of ventilation on "every fine day," is considerably modified.

13. The interior of a bombproof magazine with thick walls and a vaulted roof is commonly colder than the outside air in summer and warmer in winter. Winter is therefore the most favourable season for ventilation; but in the climate of England the exceptions to this rule are numerous, owing to the prevalence during winter of warm damp winds from the south and west, and during summer of cold dry winds from the north and east.