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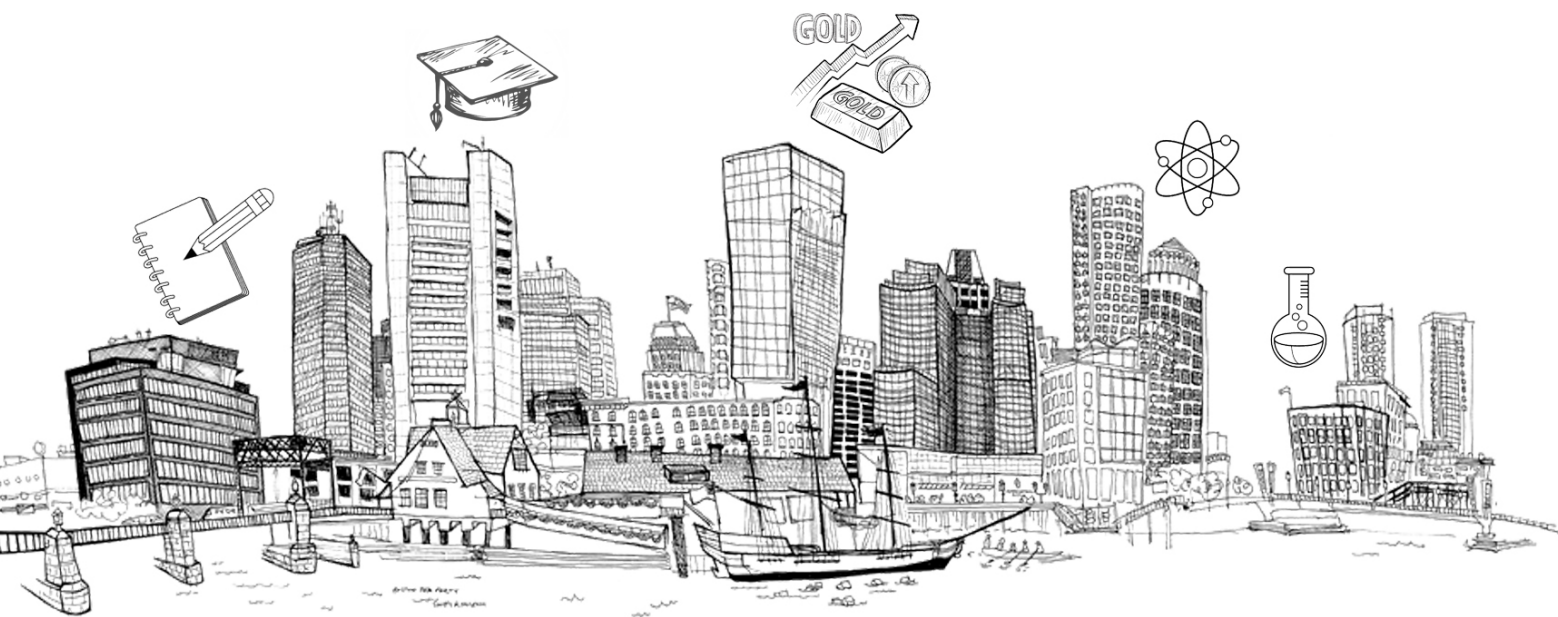
THE ART OF SCIENTIFIC MIND

COLLECTION OF SCIENTIFIC PAPERS

WITH PROCEEDINGS OF THE V INTERNATIONAL SCIENTIFIC AND PRACTICAL CONFERENCE

SCIENTIFIC PRACTICE: MODERN AND CLASSICAL RESEARCH METHODS

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SECTION X. FIRE AND CIVIL SAFETY

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INCREASING THE EFFICIENCY OF EXTINGUISHING WITH GEL-FORMING COMPOSITIONS WITH AN EXTENDED BARREL OF AN ELBOW TYPE

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UKRAINE

Since the early 1990s, 82 % of fires in the world have been extinguished with the use of water [1]. Liquid water-based fire-fighting means have found the most common application owing to availability and convenience of transportation to the place of a fire. In addition, water contributes to wide possibilities of using various technical means and tactical techniques to ensure safe work of personnel of fire brigades.

However, it should be emphasized that despite all the advantages of water, it has a major drawback, which is related to its huge consumption when flowing down inclined surfaces and leading to needless flooding of sites located below, which eventually decreases its fire-extinguishing effectiveness [1].

Another advantage of GFC is a high fire-retardant action, caused by the cooling influence of water contained in gel. Moreover, after the evaporation of all water from a gel layer, a porous layer of dried xerogel is formed, which prevents repeated ignition.

The relevance of this work is predetermined by the need for further development of technical means to deliver gel-forming compounds to a fire site to enhance the effectiveness of their use when extinguishing fires at buildings and facilities.

Extinguishing fires with gel-forming compositions was found to be a promising direction of increasing the extinguishing efficiency, especially at multi-storey buildings and facilities for different functional purposes, because it makes it possible to prevent unintended damage from flooding the lower floors.

To extinguish fires at residential and industrial buildings rapidly, the new installation for fire extinguishing by gel-forming compositions was proposed. The rational use of the fire-extinguishing capacity of gel-forming compositions in it is achieved through the application of a cranked extended barrel with a special mixer and a sprayer. This new installation enables extinguishing by gel-forming compositions from the distance of 3–5 m to the fire site, ensuring safety of a firefighter-rescuer.

The full-scale sample of the original two-cranked barrel-sprayer of the portable installation was constructed, manufactured, and tested. By performing experimental research, it was proven that its use, due to its compactness in the folded state and the ease of unfolding into operating position, provides convenience of transportation and operation efficiency under rapidly changing conditions of a fire, especially in high-rise buildings.

Feeding gel-forming compositions in the finely sprayed form decreases their consumption for extinguishing fires by 1.5 times, compared with the previously proposed technical solutions.

To determine the effective value of dispersion and intensity of spraying gel-forming compositions in mathematical models of consumption for extinguishing the simulated fire and the time to extinguish it, we used second degree polynomials. Unknown coefficients were determined by the standard least square method. As a result, the rational values of the diameter of droplets (1 mm) and intensity of feeding (0.6 l/s) of gel-forming compositions were determined, which ensured the technical optimum of their use. Thus, it was found that the parameters of extinguishing the simulated fire 1A by the finely dispersed gel-forming compositions correspond to the total consumption of 2.5 kg, which is 3.5 times less compared with water.

References:

- [1] Ostapov K.M., Kirichenko I.K., Senchykhyn Y.M., Syrovyi V.V., Vorontsova D.V., Belikov A.S., Karasev A.G., Klymenko H.O., Rybalka E.A. (2019) Improvement of the installation with an extended barrel of cranked type used for fire extinguishing by gel-forming compositions. *Eastern-European Journal of Enterprise Technologies*. (100). P. 30–36. doi: 10.15587/1729-4061.2019.174592.