The committee conclude their report by stating that many other excellent articles of philosophical apparatus attracted their attention, but that they were brought to the exhibition at so late a period as to be excluded by the rules from becoming the subjects of a report.

Practical & Theoretical Mechanics & Chemistry.

*A Plan for the more speedy and effectual Extinction of Fires, especially in Dock-yards, and other Public Establishments. By D. J. MURPHY, Holborn.**

The security of Her Majesty's dock-yards, on which so intimately depends the efficiency of our national bulwark—the British navy—is an object of such deep and vital interest, that any plan which may tend to effect so important a purpose, must be received with approbation, both by the government and the country. The principal, if not the only, means by which that security can be endangered, arises from the calamity of a fire occurring in any of our great naval arsenals, which may originate, either from accident, including spontaneous combustion, or from design. Due caution and vigilance will, in a great measure, if not entirely, prevent the latter cause; but the former source of such an evil cannot always be guarded against, as was fully evinced by the late fire which occurred in the dock-yard at Devonport, and the still more recent one in the armory of the Tower.

As it is, therefore, evident that the calamity of fire cannot always be prevented from occurring by the greatest care and caution, the next best mode of security is, to be enabled to diminish its injurious effects in the shortest time possible, by checking its ravages in the most effectual manner. The most general, in fact, almost the only, agent employed to accomplish this purpose, is water, discharged from fire engines. Now, water is, in a great proportion, composed of oxygen, the chief nourisher of flame, and, therefore, it has seldom the desired effect, except it be discharged in sufficient quantities, so as to act by its weight and volume, and thus to stifle, or smother, as it were, the flame. Thrown in small quantities, which must always be the case when discharged from fire engines, and when the flame has reached a considerable height, the water only supplies fuel to the flame,† or else is rarefied into steam from the great heat that arises. Even when discharged in sufficient quantities, so as to reach the source of the flame, its effects are only temporary, and it does not

* Communicated by J. Tyler, Jr., Esq.

† This view, that water is decomposed when thrown upon a fire, we conceive to be erroneous, but retain the author's words.—COM. PUB.

prevent the burning material from catching the flame again, when the extreme heat has dissipated, or dried up the moisture. Without the necessity of adducing as an instance the late great fire at *Hamburgh*, all experience confirms the fact that pure water is either an inefficient, or only an inadequate agent for subduing the ravages of an extensive fire, within a certain limited period.

Next, if we look to the origin and course of fires in general, we find that at first they make little progress in most substances. Wood, or timber, except in some peculiar circumstances, is the chief article on which they operate, and even with this, unless accompanied by flame, their advance is slow. It is the blaze, or flame, which arises, that always extends the fire, and commits the greatest ravages; and if the former can be speedily extinguished, the latter will expire of course. Yet the means for effecting this very important object are simple and efficacious, and it only surprises how long they escaped the researches of scientific men. The story of *Columbus* and the egg may well apply in this case, as being another apt illustration how easily the cause is overlooked, and simple means are neglected in seeking for a remedy. Hence the multitude of plans for fire-escapes, and other modes of diminishing the dangers and lessening the calamities arising from the frequency of fires.

The process now proposed for extinguishing fires speedily, is simple and effectual, and does not much interfere with the machinery employed at present. It is merely saturating the water discharged from the fire engines with a certain proportion of the chloride of sodium, or muriate of soda, (common salt,) and potash, both cheap articles; and indeed the former alone will be found quite effectual in all ordinary cases. The proportion of these ingredients to be employed may vary from one-tenth to one-thirtieth of the weight of water so discharged, of which it will be found that a considerably less quantity will be required from being so saturated. In low elevations, and when the flame has not reached a great height, the stronger impregnation may be used with advantage; but where the flame has arrived at a considerable elevation, the weaker impregnation can only be employed, arising from the greater resistance of the air, the increased weight of the materials, and the augmented difficulty of passing through the valves of the fire engine; though, even then, the stronger impregnation can be successfully discharged to attack the flame at its base, or root, which is perhaps the best course to pursue in all cases. A fireman in his ordinary dress, and only simply armed with an elastic tube conveying this stronger impregnation, may boldly and securely face the strongest and fiercest flame, and make himself a passage through it, by commencing, cautiously at first, to discharge

the impregnation on each side of him, for, where it falls, it not only subdues the flame, but, by leaving a coating of the materials, it prevents the flame from readily catching again the substance on which it previously fed; the result being, that the muriatic acid of the salt becomes volatilized and flies off,* while the soda, which is indestructible, is converted into a glaze on the surface. The root, or base, of the flame, is, therefore, the point to which the force, power, and efficacy of the impregnation, ought always to be directed.

This impregnation, it is to be observed, can be so managed, by the addition of other ingredients, when found necessary, or where the expense is disregarded, such as the diluted mineral acids and their salts, as to produce a temperature approaching, and even considerably below, the freezing point on Fahrenheit's scale, and yet preserve its fluidity; for it is by its chemical combination it acts against the flame, and also in serving to reduce the temperature of the surrounding heated atmosphere. The effect of several engines acting at the same time by the weaker and stronger impregnations, must be all-powerful, as may be easily conceived; and no fire, whatever degree of head it may have previously attained, can resist the power and efficacy of this impregnation for any period exceeding half an hour, though the fire at the Devonport dock-yard continued to rage for more than six hours. Even water saturated with fine clay, slacked lime, finely powdered chalk, &c. &c., all cheap articles, and slow conductors of heat, may be employed with great advantage on flames of low elevation; for it is desired to impress the idea that water alone is used as the medium for conveying these substances, as well as the others, to the body of the flame, or rather to its source, such as the body on which it feeds. Let this be completely coated with those ingredients, for the water will be quickly evaporated by the intense heat; and the effect produced, namely, the extinction of the fire, will be the immediate and necessary consequence.

The security which this plan affords for the protection of Her Majesty's dock-yards from the extension of a fire occurring there, is certain and infallible; because, in this case, the stronger impregnation can be employed without any difficulty, together with such additional ingredients as must make it all-powerful, and because the necessity of using fire engines can, in a great measure, if not entirely, be dispensed with. To accomplish this object, it will be necessary to construct an elevated and covered tank, in any central and convenient part of the dock-yard, which tank may be about 60 feet long, 30 wide, and 5 deep, which will contain about 250 tons of the impregnated water, or

* Common salt is not decomposed by heat, as is here supposed, but actually volatilizes without decomposition.—*COM. PUE.*

about 9000 cubical feet; and, as each cubical foot weighs 62 lbs.,* it will contain 558,000 lbs., or about 55,800 imperial gallons, each gallon weighing 10 lbs. This quantity is fully more than sufficient to extinguish any fire, even if it raged to the extent of the late one at the Devonport dock-yard, because the effect of the impregnated water is more powerful and more instantaneous, in a considerable degree, than water in its pure state. The elevation at which the tank should be constructed may be thirty feet, or about two-thirds of the height to which a first rate ship of war on the stocks may reach. Now, for the purpose of conveying the impregnation directly to the body of the fire, it will be necessary to provide elastic tubes of a greater diameter than those at present attached to fire engines, and to have them previously prepared to screw on a certain number of stop-cocks at all sides of the tank, near its bottom, by which the impregnation can be brought to bear at once on the fire, and, of course, will command and extinguish all within the range of, and below, this elevation; and the force and weight of the body of the impregnated water, at its source in the tank, will raise it to a higher elevation if the fire originate above this level, or a very small force only will be necessary to be employed to give the due elevation above the level of the bottom of the tank. To preserve the impregnation in all its parts, and at all times, duly saturated, it will be necessary to have three or more small vanes, with short sails attached, like the arms of a windmill, to be operated upon by the wind, and projecting from the top of the tank, so as to give motion to a certain number of horizontal paddles, extending to near its bottom, by which the impregnated water will be preserved constantly in a due state of preparation for use. The same course as here detailed may be pursued for the extinction of fires in, and preservation of, all the other public establishments.

With fires originating in private houses, manufactories, &c., the means of preparation and security cannot be so easily provided or adopted, and, of course, their more speedy and effectual extinction must arise from the efficacy of the impregnated water when discharged from fire engines; and, in this case, it will be necessary to provide, and to have each engine accompanied by, a tender on wheels, and the larger the better, in which the prepared ingredients can be kept in a due state of agitation by any motive power, or such as the engine itself is worked with, and through which the water must pass from the source of supply to the engine, by which means it will take with it a certain proportion of the ingredients so dissolved and diffused. The tender attached may be 8 feet long, 4 wide, and 4 high, and will

* This number is nearly the weight of a cubic foot of water without the salt, but the error is unimportant.—*COM. PUB.*

contain 128 cubical feet of the impregnated water, or $3\frac{1}{2}$ tons, or about 800 gallons,—a quantity almost certain of extinguishing the ordinary range of fires; for it is scarcely necessary to observe that a smaller quantity of water will be required when so impregnated, than in the usual course pursued at present. A very few tons will then be sufficient to extinguish, in a short time, the most intense and extensive fires; whereas, according to the present mode of proceeding, several tons are necessary, and a long period of time, to produce the desired effect.

If the increased expense of the new plan be estimated, it will be found insignificant, compared with the benefit it will confer, and the innumerable evils and calamities which will be prevented. Taking the average of the quantity of the ingredients required, as forming one to twenty of the weight of water, it would amount to about 400 lbs. of salt and potash to saturate sufficiently the above quantity, and the estimated cost of these ingredients would not much exceed thirty shillings,—an expense no insurance company would withhold, with the certainty of saving some thousands of pounds' worth of property, and probably the lives of a few human beings. But even this is the very highest estimate of the expense; for, from some small experiments made by the proposer of the plan, he has found that, with only 4.10 parts of common salt to 95.90 of water, which reduced the temperature to 27.9° degrees on Fahrenheit's scale, fully three degrees below the freezing point, this slight impregnation was discovered to be sufficiently effectual, and produced a surprising effect. The proportion, however, is always to be regulated, not so much by the height of the flame, as by the height of its source, or the materials on which it feeds. This, in general, is not higher than the first, second, or third floor of a dwelling house; and the proportion of ingredients may be regulated accordingly, which a small degree of practice will soon ascertain, and so as to admit of good working order in the engine; but, taking the quantity as above, about 100 pounds' weight of salt will be thus conveyed and spread over each floor of the house. And here it may be necessary to observe, that the pumps employed in drawing up the brine from the salt pits in Cheshire, for the purpose of converting it into manufactured salt, are used on much stronger impregnations than any that will be required, by this new plan, to pass through the fire engines.

The same principle, which, it is evident, solely depends on the efficacy of the impregnation, may be carried into effect in subduing and dissipating the foul and inflammable air which is sometimes generated

* The temperature to which the salt reduces the temperature of the mixture depends essentially upon the previous temperature, which is not here stated.—*COM. PEN.*

in coal, and other, mines, and which so frequently leads to the destruction of many lives. Any necessary degree of strength can be given, in this case, to the impregnation, and it will have the same beneficial result by purifying and neutralizing the baneful effects of this inflammable gas; for which purpose it will be requisite *only* to employ a small engine, or even the small garden machine for spreading water over flowers and vegetables. One of these may likewise be preserved in dwelling houses, and used with advantage in many cases, when charged with the impregnated water, in checking and subduing the incipient origin of many fires.

Having thus detailed the principles, and the full practical workings, of the plan for extinguishing fires more speedily and effectually than heretofore, it only remains for a humane and intelligent government to carry it out into full operation, as far as the protection of the national establishment is concerned. As for the proposer himself, he will always feel bound to bow with grateful thankfulness to the Great Disposer of events, for being made the humble instrument in conveying so important a discovery; and it will ever afford him a subject of consolation, under all circumstances, that he will have contributed to lessen some of the calamities and sufferings which so frequently arise from sudden and unexpected fires.

The Practice of Fresco Painting.

Extracts from Appendix to Report of Commissioners on Fine Arts, for decorating the new House of Commons.

The whole scheme and invention of a series of frescos should *not* only be settled, but all the large drawings made, by the time the building is ready; for the work can then advance rapidly. Supposing the present buildings to be ready in seven years from this time, Cornelius says it is time to begin the designs. The German artists, expert as they are in drawing, always take some years to prepare their cartoons. Cornelius' cartoon for the altar-wall of the Ludwig-Kirche at Munich, was executed in Rome; he went there for the purpose. If Westminster Hall, or any other building already in existence, is to be adorned with frescos, the wall should be prepared with the first rough coat of mortar at once; for this ought to be on the wall, if possible, for some years before it receives the final preparation immediately before painting, unless very old lime be used in the first instance: but, even in that case, six or twelve months should elapse before painting on it, to give it ample time to harden.

The Cartoon.—It may be assumed that it is impossible to retouch a fresco painting to any extent. The portion of the work undertaken in the morning must be completed during the day. The partial remedies and contrivances in case of unavoidable delay, or accidental defects, will be hereafter considered.

Hence every part of the design must be defined in preparatory