Emergency Destruction of Documents

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~~Confidential~~

The problem of field destruction of documents to prevent capture is a familiar one. Recently, for the first time, a reliable method has been developed and is now being made available to United States forces. It is based upon the use of sodium nitrate to promote rapid burning.

The problem of destroying classified paper in a minimal time in the face of impending capture has been an awkward one for as long as intelligence has been a factor in war and man has been able to write. With the complexity of modern war the amount of classified paper has become a real menace and the day when the problem could be solved by the courier's swallowing the notes has long since passed. This problem is one which afflicts NSA in common with the Military Services.

The conventional procedure on land has always been destruction by fire. There is no doubt but that this can be highly effective. As anyone who has attempted it knows, however, paper burns slowly when in quantity and particularly when in the form of books and pamphlets. Even a modest-sized book can be thrown in the middle of a fire and yet, after an hour, remain more than half readable. The problem is largely one of adequate oxygen.

Burning is merely the combination of the oxygen of the air with the carbon of the paper to convert the latter to carbon monoxide or dioxide. The remainder of the paper is lost as water and as ash which is the product of mineral impurities present. These reactions take place only at high temperature but produce in turn a temperature which is sufficiently high to be self-sustaining.

The rate of burning is governed by the quantity of burnable material and oxygen which are able to come in contact at any given time. Obviously, in the case of a book or packed paper, this is limited to the surface and edges, and the burning rate is low. For this reason, destruction in an open fire is highly inefficient from the point of view of speed. Similarly, the formation of ash thoroughly and rapidly insulates the burnable material from further oxygen supply.

There are two approaches to the problem. First, by continuous mechanical agitation fresh material can be exposed. Second, a high concentration of oxygen can be supplied to counter the delaying effects. The first solution is cheaply implemented by an enlisted man with a poker, but under combat conditions there is great risk that the reaction will be brought to a rapid close by the death of the agitator. The second solution holds more promise.

There are many ways of supplying excess oxygen. Some are quite efficient, and some less so. Some are expensive, some cheap, some bulky, some prohibitively bulky. The chemist, to avoid the obvious problems inherent in using oxygen gas, naturally gravitates to the idea of an oxygen donor; that is to say, a chemical compound containing oxygen in excess of its own requirements. There are many possible effective compounds.

The first to come to mind are the peroxides, chlorates, and nitrates. Cost militates against the first two which also have an unhappy predilection for explosive reaction. Nitrates on the other hand are comparatively safe, cheap, and readily available. Of the common nitrates, the sodium compound would have the edge both on cost and efficiency per pound. Furthermore, as a common agricultural fertilizer material, it can be found almost everywhere.

Mixtures of paper and sodium nitrate, which is a substance resembling ordinary salt, should burn rapidly and fiercely and, if the proportions are right, undergo complete destruction in a very few minutes. An added benefit is apparent even before experimental tests. The end product of the burning will consist largely of sodium carbonate. At the temperatures encountered this will be a liquid and should actually dissolve the ash. In this way the danger of text being recovered as ghosts on the white flaky ash is eliminated.

There is, of course, nothing new about the concept. Any chemist would automatically arrive at the same idea if he had occasion to face the problem. In fact, long after experimentation began, rumors came to light which indicated that the same or a similar process was employed by the Japanese Embassy in Washington at the outbreak of the late war. If so, they never extended it, as our many captures in the field amply attest. Probably, as in our own Services, there was a simple faith in the efficiency of gasoline, which is actually of somewhat less than no value since the burning gasoline consumes so much oxygen that nothing else has a chance.

The problem arose actively in the post-war period when the question of the files of our own COMINT units [redacted] and others of which were easily taken by paradrop, came to be considered. The requirement was clearly for a cheap, workable destructor which could be used by untrained men who had less than 30 minutes to finish the job. Two ex-chemists, Shinn and [redacted] of PROD, took on the job during their lunch periods, and, with help from R/D, worked out a practical system, using the back lot at Arlington Hall as a test ground. At the same time the

(b)(1)
(b)(3)-50 USC 403
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Army Chemical Corps was consulted and started in the same direction. They were already carrying out somewhat similar work for CIA.

It is a comparatively easy matter to compute the theoretic quantity of nitrate required for a given weight of paper but it is a foregone conclusion that the reaction will never be 100 percent efficient. The experimental period was therefore directed at providing a cheap, quick and practical technique and ascertaining the actual charge required under the circumstances.

The first problem was the container. Since atmospheric oxygen was no longer to be depended upon, there was no need for a draft. Hence a simple can or pit was probably adequate. In fact, the desire to use the molten slag to digest the ash, and the fact that the nitrate would rapidly melt and run to the bottom, required such a design. Probably nothing is more common in a forward area than empty gas and oil drums. With one end cut out, they are the GI hold-all for everything from trash to equipment. No better container for the reaction has been devised.

Second, there was the loading problem. How much admixture was essential? Obviously the simpler the steps the better. Experiment showed that a thin layer of nitrate on the bottom was necessary but that otherwise the loading was far from critical. The sequence finally adopted called for loading the drum in alternate increments of one-fifth of the nitrate and one-fourth of the paper in turn so that the final one-fifth of nitrate formed the top layer. It was further found that the rate and completeness of the reaction was improved if the paper was in the form of books or packages instead of loose or crumpled sheets. The solid bundles of paper sank readily into the molten salt while the loose paper, if present in large amount, tended to float above the most reactive zone. This was a great advantage since it meant that loading could be at maximum speed with no delay required for breaking up folders and books.

The third basic problem was one of ignition. Actually this was no problem at all since it was immediately found that a match applied to a wad of loose paper and nitrate in the top layer was sufficient. Furthermore, the initial speed of reaction was such that the operator could very safely use the same match to light his cigarette before turning and walking away. It was found, however, that a few precious minutes could be saved by speeding up the initial phase. In the final technique, a small igniter charge of nitrate and wood flour was thrown on top and fired with a small pyrotechnic fire starter.

The fourth problem developed in the course of the tests. The violence of the burn at its peak was such that partly burned paper was thrown out, sometimes as much as 20 feet in the air. A simple wire screen fastened over the top of the drum proved completely effective.

The final problem, the ratio of paper to nitrate was settled in the course of the tests. The ratio which was adopted was 65 pounds of paper for 100 pounds of nitrate. This made a proper load for one drum and set 100 pounds of nitrate as a basic kit size.

Based upon this information, the Army Chemical Corps developed a basic destructor kit, the E12. In this kit, which is packed in a fiber drum manageable by a single man, are contained all the necessary items other than the steel drum itself. These consist of 100 pounds of nitrate in five 20-pound packages, one package of igniter compound, fire starters, a wire screen, and its fastenings. These kits are not classed as dangerous and can be shipped and stored under nearly all circumstances.

Burning times with these kits are slightly variable and the time required for the complete burn-out of 65 pounds of documents has ranged from 9 to 18 minutes. This figure is not as large as it appears, since, from the 50 percent point on, the chances of extinguishing the fire are nearly zero. It is probably safe to say that if 10 minutes elapse after ignition and before enemy arrival the destruction is assured.

Loading time is, of course, governed by the physical situation, the number of personnel, and the amount to be done. In theory each establishment should have enough kits to accommodate all critical documents, enough personnel to load and fire the charges simultaneously, and a well worked out drill procedure. With the documents and kit at hand, two men can load and fire a charge in 3 minutes.

Burning of these charges is dramatic. In the early stages the fire is modest and can safely be approached; but at mid-point, the character changes. The black smoke is replaced by white. Flame is projected upward 20 to 30 feet as from a blowtorch (Fig. 1). The drum becomes cherry red and the fire roars like a blast furnace. Molten slag is occasionally thrown out. The conclusion is rather abrupt.

If the drum is tipped over at this point, a greenish liquid slag flows out. This quickly hardens to a cement-like mass. In a proper burn no carbonized paper or ash will remain. Nothing can be recovered from the slag.

This same fire is capable of destroying considerable numbers of cipher machine rotors. Even enclosed in the normal steel carrying case, a set of ECM rotors will be reduced to the steel supporting frames. All bronze, copper, and plastic parts are completely destroyed and dissolved as salts in the slag. As many as 50 rotors

Fig. 1—Test burn in progress. The drum is emitting a blast of intense flame with only a small admixture of white smoke. The drum at the right has already burned out.

can safely be added to a normal document charge without impairing the efficiency of the burn.

The cost of the kit is largely in the packing and handling since the principal ingredient, the sodium nitrate, costs only 40 to 50 dollars per ton. This kit is now obtainable from the Army Chemical Corps. When adequately distributed, it should greatly reduce the danger in exposed units.