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ROPE NETS FOR THE HANDLING OF BOMBS AND SUSPICIOUS PACKAGES

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In connection with the Civil Defense Program of New York State, Police Commissioner Glenn H. McClellan of Buffalo has directed the Laboratory Staff of his department in a number of studies and experiments pertaining to the practical handling of suspicious packages and explosive bombs. The primary purpose of this work has been to devise methods and procedures for the handling, transporting and disposal of explosive bombs with a minimum of danger to citizenry, personnel and vital property.

Before planning any experimental work a survey was made of the available literature treating of the nature of improvised bombs of the type used by anarchists, saboteurs, homicidal maniacs and other anti-social individuals. This preliminary study brought to light the significant point, upon which recognized authorities on this subject unanimously agree, that infernal machines differ widely in type of construction and method of operation. From their experiences these men have found that some homemade bombs are very crude and uncertain in their action while others have been fashioned with a skill that is nearly diabolic. Despite their individuality however, there are certain attributes that are characteristic of nearly all of the bombs that have been used for non-military purposes. These are:

(1) *The explosive commonly used is dynamite or some other commercially available explosive of equivalent strength.* Lacking suitable training, reagents, and apparatus required for the manufacture of explosives, the bomb maker usually obtains this material by other means. Seldom does he purchase explosives through legitimate channels for he knows that all such sales are recorded and that such records might lead to his ultimate apprehension. In nearly every instance where explosives have been used illicitly it has been found that they were stolen from some legitimate owner.

(2) *The weight of explosive employed in the average bomb usually does not exceed five pounds.* Experienced investigators indicate in their reports that the average homemade bomb contains less than ten half pound cartridges of dynamite or blasting gelatin. Since practically all bombs of this type are portable, large quantities of explosives would be objectionable because they would be bulky and awkward to handle.

(3) *Bombs are usually built and transported in small, common containers like cigar boxes or suitcases.* Suspicious looking packages which might attract the attention of police officers or potential witnesses have seldom been used in the fabrication or placement of bombs.

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Since improvised bombs have been and probably will be discovered that exceed any one and sometimes all of the attributes listed above, any protective measures or devices for handling bombs or suspected explosives must represent some sort of compromise. Certainly no practical single device for the handling of such material could be built that would offer complete protection from all conceivable types of explosives. Realizing then the futility of attempting to design such a piece of equipment this idea was abandoned early in this study. It was felt that the construction of a device that would offer a measure of protection to the police and public from the ordinary bomb would, at least, constitute a progressive step in the direction of preparedness for emergencies of this type.

Before embarking upon a discussion of the standards that were used to judge the relative merits of several proposed handling contrivances it might be well to briefly review in a general sort of way the theory and operation of bombs. Fundamentally, every bomb consists of two essential elements, namely, the explosive and the actuating mechanism. The latter may be described as an arrangement by which the explosive is ignited or detonated. The explosive agent can be defined as a liquid or solid substance which upon suitable excitation can be converted into large volumes of gas in a very short interval of time. Work performed by an explosion then is due to the very rapid expansion of these gases. Practically, bomb explosions cause damage to and destruction of life and property in more than one way. They can produce their destructive effects by concussion, by fragmentation, or by a combination of both. The danger area due to concussion is limited to a relatively small area immediately surrounding the explosion center. With fragmentation, however, the pieces of bomb container or neighboring objects can be thrown considerable distances with attendant danger to human life.

When the time came for the actual construction of the bomb protective device several materials and types of construction were considered. It was obvious that a basis for comparison had to be set up so a proper selection could be made. After due consideration the following standards of evaluation were agreed upon. They are, in order of their relative importance:

(1) *Safety Factor.* The prime requisite of this device was that it should offer a maximum of protection to human life even at the expense of valuable property. It was felt that risk to the life of the personnel operating this instrument should be considered just as carefully as that of the citizenry. It was thought that this end could be achieved if provision were made for the remote handling of bombs.

(2) *Selective Retention.* Another important property of this piece of equipment was that it would allow for the free expansion of gases while yet restraining flying fragments.

(3) *Composition.* It was decided that this contrivance had to be strong enough to restrain flying fragments and yet if the explosive wave were of sufficient strength to rupture the container that the pieces broken away

would not themselves constitute dangerous projectiles.

(4) *Portability.* An essential feature of this safety appliance was to be its portability. Should an eventuality such as the discovery of a suspected bomb in the lobby of a large hotel occur then the bomb protector could be carried into the hotel and dropped over the bomb while the building was being evacuated.

(5) *Weight.* While this device had to be portable, still it could not be too light. If a bomb were to explode under this device and if it lacked sufficient mass then the so-called protective instrument might in itself act as a projectile and prove nearly as dangerous as the original bomb. Then too, the greater the weight of this safety appliance the more it would rob the expanding explosive gases of their kinetic energy as they raised it from its resting place. Consequently the destructive power of these gases would be lessened.

(6) *Size.* The size of this instrument had to be such that it could be dropped over a large sized suit case covering it completely; yet not be too awkward for three men to handle.

After weighing the advantages and disadvantages of the several plans for

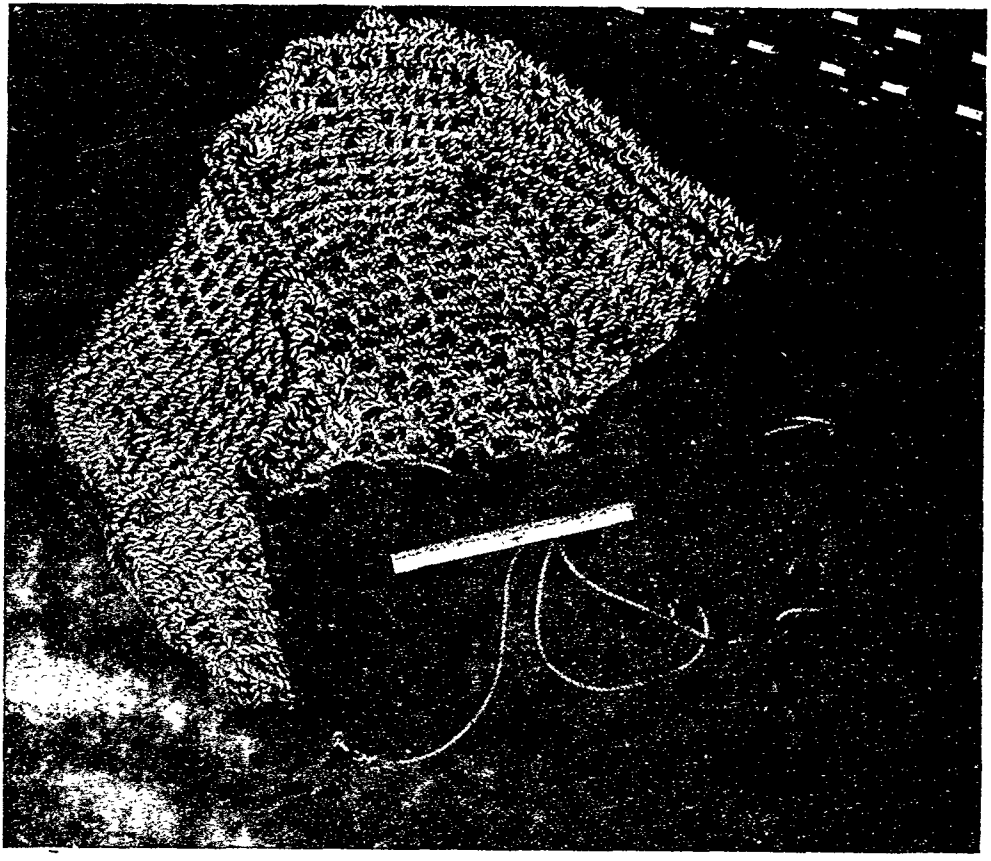

FIGURE 1

Rope Net Device Used By the Buffalo Police Department for the Handling of Suspicious Packages and Explosive Bombs

the bomb instrument in the light of the standards listed above it was finally decided that a rope net woven in the form of a box having one open end would be the most suitable. A net was therefore woven of manila rope having a diameter of three-quarters of an inch. When completed this net measured three feet long, three feet wide and two feet tall and weighed one hundred and sixty pounds. The net was fashioned with a simple over-and-under weave and the distance between adjacent strands averaged one and one-quarter inches. Light frames of seven-eighths inch white pine were made to support the net. The net was then subjected to a series of tests to ascertain its effectiveness as a protective device for the handling of bombs.

In the first test a one-half pound cartridge of forty percent blasting gelatin was placed in a closed box. This box was made of one-half inch white pine and it was twelve inches long, six inches high, and six inches wide. After the rope net had been set up on one of the wooden frameworks with the open side facing downwards the wooden box was placed under the net and the charge was detonated electrically. The net which had been resting on the frozen ground was lifted about three feet into the air but fell to the earth undamaged. It apparently retained all the fragments of the shattered wooden box and framework. It is pertinent to note that the ground surface on which these tests were conducted was extremely hard. It was a frozen iron slag which served to reflect the expanding gases upward with only slightly diminished velocity.

In the second test three half pound sticks of the same explosive were placed in a box identical to the one used in the first test. The net was again supported on a light wooden framework and the blasting gelatin exploded as before. This time the net was blown into the air to an estimated height of ten feet. The net again apparently retained all of the fragments.

A hole eight by ten inches was blown in the top of the net and the ropes were loosened generally. In this test as in the first one there was no ground displacement or crater formation noted.

In test number three, five sticks of the same kind of blasting gelatin were placed in a wooden box and fired under the same conditions cited above. In this instance the net was blown about thirty feet into the air. It did however confine most of the box and frame fragments. The hole in the top of the weakened net was enlarged to eighteen by twenty-four inches but the sides remained practically undamaged. Even in this test there was very little ground displacement discernible. No doubt the extreme hardness of the ground at the testing location added to the severity of these tests. The earth reaction was so slight that this base served to intensify and direct the explosive gases upward rather than absorbing and diminishing them. Had the test bombs been fired on a wooden floor or softer earth the net would have been subjected to less strain.

The purpose of the fourth test was to determine the effectiveness of the rope net in retaining fragments of iron. A pipe bomb was made from a piece of three inch pipe twelve inches in length

and sealed at both ends with cast iron caps. Three half pound cartridges of Hercules forty per cent blasting gelatin were used as the explosive agent. Because of the hole in the top of the net it would have been pointless to use the net as originally intended, i.e., supported on the wooden framework. The net was, therefore, folded double and concentrically placed over the bomb. When the bomb was exploded fragments of the pipe and caps penetrated the net and were hurled upward and outward at all angles. Some of these pieces were thrown a full three hundred feet. The net was raised about thirty-five feet but it suffered only slight additional damage. The net did serve to confine many of the fragments. A number of them were found where the net had been resting when the explosion occurred. Some of these fragments had pieces of rope still clinging to them.

Up to this point no mention has been made about the function of the piece of canvas on the bottom of the net. The original purpose of this accessory was to permit the remote handling of suspected bombs. It was intended that the rope net would be so built that it could be carried to the suspected bomb location and set up over the bomb. The canvas could then be drawn under the bomb by means of long ropes. If no explosion occurred the net with the

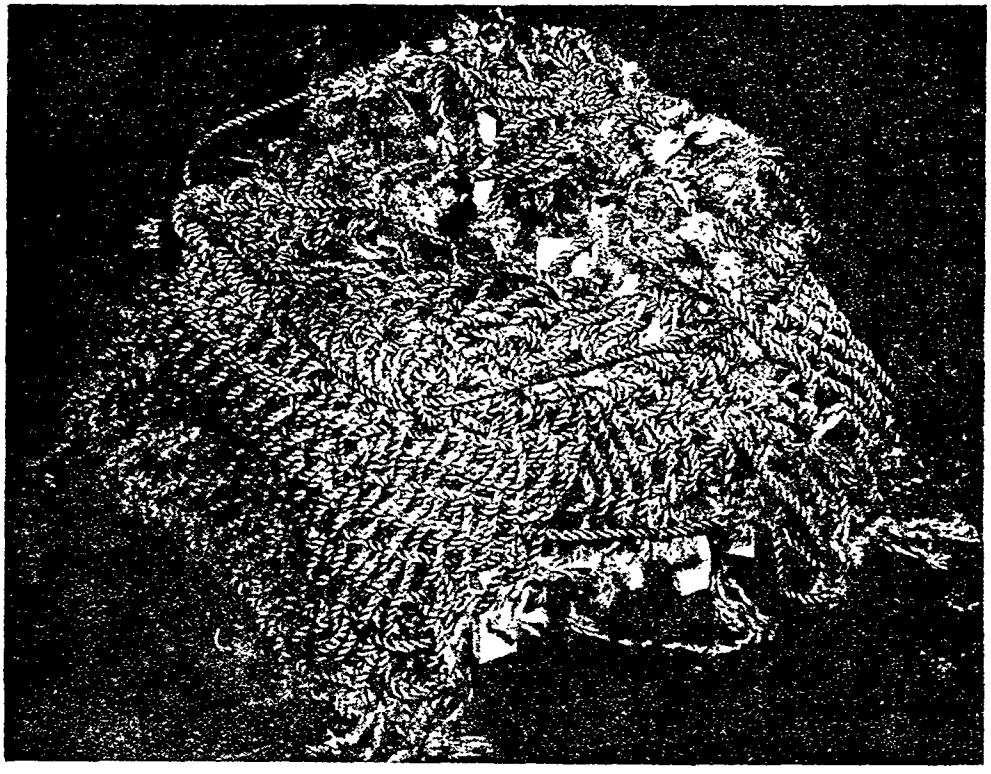

FIGURE 2

Rope Net After Four Different Test Explosions

enclosed bomb could be dragged to the street where it could be transported on a special trailer to an isolated area where it could be examined and/or destroyed. The policy of this department is to destroy suspected bombs as quickly as possible.

The conclusions reached by the experimenters with regard to this series of tests are as follows:

(1) The rope net in its present form is an effective and dependable protective device for the handling of ordinary improvised explosive bombs.

(2) Certain constructional refinements could be advantageously incorporated into this type of net, namely:

(a) A double top (the inner one being freely suspended) would considerably strengthen this member and add to the safety factor of the net.

(b) Replacement of the canvas bottom with a sheet of inflexible material like wall board or prestwood would, no doubt, lend greatly to the practicability of the remote handling of suspicious packages.

(3) More experimental work is planned along these same lines for the purpose of increasing the safety factor of bomb handling devices.

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