SOME EXPERIMENTS WITH THE SERVICE RIFLE AT CLOSE RANGE.

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The following experiments were carried out with the ordinary Service rifle and ammunition. Targets of white cardboard at distances from the muzzle of 3 inches, 6 inches, 9 inches, 12 inches, 18 inches and 24 inches respectively were used. Also targets of new chamois leather gummed on white cardboard were employed, the distances in the latter case being 1 inch, 3 inches, 6 inches, 9 inches, and 12 inches. The cartridges were of two types: (a) English, (b) American.

In the former the explosive was cordite, the threads of which are closely packed longitudinally in the case of the cartridge.

In the latter the explosive was a nitro-cellulose powder. This powder was of a steel-grey colour, and consisted of short cylindrical pieces, about \( \frac{1}{16} \) inch long, and small diameter. The cartridges were marked U15.VII on the base of the case. The experiments are of importance, since they indicate the signs to be looked for in the case of wounds on the bare skin at close range. In the important decision of whether a wound is "self-inflicted" or not, the diagnosis of the range—i.e., the distance of the muzzle from the body—is of great moment.

(A) ENGLISH AMMUNITION (CORDITE).

I.—Targets of White Cardboard.

(1) Distance from Muzzle equals Three Inches.—No burning of the cardboard occurred. There was some blackening over an area of five inches by five inches, but this was superficial in character and could to some extent be wiped off with a damp cloth. The bullet hole was a small round hole corresponding to the size of a bullet. The tattooing—i.e., the marks from unconsumed powder—occupied an area two inches by two inches round the bullet hole. It was superficial in character and consisted of a number of small lines about \( \frac{1}{16} \) inch long.

(2) Distance from Muzzle equals Six Inches.—In this case very faint blackening occurred, which can readily be wiped off with a
damp cloth. The bullet hole was a small round hole corresponding to the bullet. The tattooing occupied an area three inches by three inches. It was superficial in character, and consisted of small longitudinal lines of length from \( \frac{1}{10} \) inch to \( \frac{1}{2} \) inch.

(3) Distance from Muzzle equals Nine Inches.—No blackening occurred. Bullet hole as before. Tattooing was slight, it occupied an area of four inches by four inches, and consisted of a few longitudinal lines of maximum length \( \frac{1}{2} \) inch, some of the marks being mere points. It was very superficial in character.

(4) Distance from Muzzle equals Twelve Inches.—No blackening occurred. Bullet holes as before. The tattooing occupied an area \( 6\frac{1}{2} \) inches by \( 6\frac{1}{2} \) inches. It consisted of some very superficial marks, some of which were longitudinal, about \( \frac{1}{2} \) inch long; but most of them were much shorter, some of them being mere points.

(5) Distance from Muzzle equals Eighteen Inches.—Bullet hole as before. No blackening. Tattooing almost absent. It consisted of four superficial longitudinal marks about \( \frac{1}{3} \) inch, \( \frac{1}{4} \) inch, \( \frac{1}{5} \) inch, \( \frac{1}{10} \) inch long, within three inches of the bullet hole.

(6) Distance from Muzzle equals Twenty-four Inches.—Bullet hole as before. No blackening. Tattooing of very slight character. A few faint dots or lines in an area three inches by three inches around the bullet hole.

II.—Chamois Leather Targets.

(1) Distance from Muzzle equals One Inch.—The chamois leather was torn away round the bullet hole for a distance of one inch by one inch. Slight scorching of the leather occurred. There was marked blackening over an area two inches by two inches. The tattooing consisted of slight marks immediately around the bullet hole.

(2) Distance from Muzzle equals Three Inches.—Bullet hole consisted of a small round hole the size of the bullet. Tattooing was slightly marked and consisted of a few faint impressions in an area \( 1\frac{1}{2} \) inch by \( 1\frac{1}{2} \) inch around the bullet.

(3) Distance from Muzzle equals Six Inches.—Very faint blackening occurred in an area \( 1\frac{1}{2} \) inch by \( 1\frac{1}{2} \) inch around the bullet hole. Tattooing was of such a slight character as to make scarcely a mark on the leather.

(4) Distance from Muzzle equals Nine Inches.—No blackening occurred. Tattooing was of such a slight character as to be practically unnoticeable.
(5) Distance from Muzzle equals Twelve Inches.—No blackening occurred. Tattooing was unobservable.

(B) **American Ammunition (Nitro-Powder in Short Rods.)**

I.—**Targets of White Cardboard.**

(1) Distance from Muzzle equals Three Inches.—No burning occurred. Blackening occurred over an area nine inches by nine inches. It was more marked than in the case of cordite explosive. Tattooing was marked and occupied an area three inches by three inches around the bullet hole. It consisted of a number of small dots.

(2) Distance from Muzzle equals Six Inches.—Blackening occurred over an area of six inches by six inches. Tattooing was marked. It consisted of a large number of small points occupying an area of five inches by 5 inches around the bullet.

(3) Distance from Muzzle equals Nine Inches.—Faint blackening occurred over an area of six inches by six inches. Tattooing was marked and consisted of a large number of small points occupying an area 5\(\frac{1}{2}\) inches by 5\(\frac{1}{2}\) inches round the bullet hole.

(4) Distance from Muzzle equals Twelve Inches.—Blackening was extremely faint. Tattooing was marked, and consisted of a number of small points occupying an area of six inches by six inches round the bullet hole.

(5) Distance from Muzzle equals Eighteen Inches.—No blackening occurred. The tattooing was slight, and consisted of about twenty isolated tiny marks occupying an area six inches by six inches around the bullet hole.

(6) Distance from Muzzle equals Twenty-four Inches.—No blackening and no tattooing occurred.

II.—**Chamois Leather Targets.**

(1) Distance from Muzzle equals One Inch.—Slight scorching occurred around the bullet hole. Blackening was very marked, occupying an area of four inches by four inches around the hole. Tattooing was marked in an area 1\(\frac{1}{2}\) inch by 1\(\frac{1}{2}\) inch around the bullet hole. In one experiment the disruptive effect of the discharge was so great as to split the chamois leather and to tear it away from the cardboard on which it was gummed.

(2) Distance from Muzzle equals Three Inches.—No scorching occurred. Blackening was marked over an area of six inches by six inches. Tattooing was marked, and consisted of a number of
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small points occupying an area 2½ inches by 2½ inches round the bullet hole.

(3) Distance from Muzzle equals Six Inches.—Blackening occurred in an area six inches by six inches round the bullet hole. It was not marked. Tattooing occurred and consisted of a few faint marks in an area of three inches by three inches around the bullet hole.

(4) Distance from Muzzle equals Nine Inches.—Faint blackening occurred over an area of four inches by four inches around the bullet hole. Tattooing was of a very slight character, and consisted of a few superficial points in an area of four inches by four inches around the bullet hole.

(5) Distance from Muzzle equals Twelve Inches.—Blackening was of an extremely faint character in an area of 4½ inches by 4½ inches around the bullet hole. Tattooing consisted of a few very faint superficial marks which were scarcely noticeable.

Conclusions.

(1) In all bullet wounds produced at close quarters it is of the utmost importance that any signs of blackening, scorching, or tattooing should be carefully looked for before the wound is surgically cleansed. Notes as to these conditions should be made at the time.

(2) It is essential that the type of ammunition used should be known. This can generally be determined by the mark on the cartridge case.

(3) The chamois leather experiments probably represent fairly closely the conditions that would be obtained on human skin.

(4) With cordite ammunition some blackening occurs up to a distance of six inches, but on human skin it would probably be easily washed off. Tattooing with cordite ammunition on human skin would be of an extremely slight character. Up to a distance of one inch tattooing would be not noticed owing to the disruptive effect of the discharge. From one to three inches it would be very slight. Beyond three inches it would be unnoticeable.

(5) With American ammunition (nitro-cellulose powder in short rods) on human skin blackening would occur up to a distance of nine inches, though it might be readily washed off. Up to a distance of one inch tattooing would not be noticed owing to the disruptive effect of the discharge. From one inch to six inches
tattooing would be shown by slight marks on the skin around the bullet hole.

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The effects produced by pistol wounds with nitro-cellulose powder and ordinary gun powder at close ranges are dealt with in a paper, "The Medico-legal Importance of Wounds produced by Fire-arms," *Transactions of the Medico-Legal Society*, 1907-08, by W. H. Willcox.