OTTAWA February 28th, 1942.

REPORT

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1169.

Crack Tests on Steel Helmets.

(Copy No. 6 .)

BUREAU OF MINES
DIVISION OF METALLIC MINERALS

ORE DRESSING AND
METALLURGICAL LABORATORIES

CANADA
DEPARTMENT
OF
MINES AND RESOURCES
MINES AND GEOLOGY BRANCH

O T T A W A

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Origin of Material and Nature of Work:

On February 24th, 1942, two steel helmets were received from W. O. Gliddon, M.D., Medical Adviser, Office of Civil Air Raid Precautions, Department of Pensions and National Health, Ottawa, together with a request for the following crack tests: (a) equivalent to an ordinary brick falling two storeys and four storeys; and (b) equivalent of an ordinary man falling one storey, such as from the ground floor into the basement, and either landing on his head or landing against a metal obstruction such as an angle iron.

Testing Method:

The first part of the testing was conducted in the following way: A hard brick (outside brick) weighing five pounds and five ounces (5 lb. 5 oz.) was dropped from various heights on the main part of the helmet, which was sitting flat on its rim. The height of the average storey was assumed to be $8\frac{1}{2}$ feet.

The second part of the testing was carried out by means of sand bags to which the helmet was solidly fixed in an inverted position, only the rim of the helmet being in contact with the sand bags. The total weight of the bags and helmet was 145 pounds, which was assumed to be the average weight of a man. The helmet and bags were dropped from a height of nine feet onto a channel iron, 2 inches wide.

Results of Tests, and Discussion:

In Figure 1 is shown the steel helmet sent for examination, after deformation by a brick falling 17 feet. The total amount of work done by 90 foot pounds on the main part of the helmet can be seen; the dent is approximately $\frac{1}{8}$ inch at its deepest. Figure 2 shows the same helmet after being deformed by a brick falling from a height of 34 feet (energy, 180 foot pounds). The second dent in the helmet is approximately 5/8 inch deep.

Figures 3 and 4 show the dents produced under similar conditions by a brick falling from 17 and 34 feet, respectively, on manganese steel army helmets.

Figure 5 depicts the large recess made by the helmet falling on a two-inch channel iron, the total energy of deformation being 1,305 foot pounds. The recess is over 1 inch at its deepest. Approximately the same deformation

(Results of Tests, and Discussion, cont'd) -

was obtained on a manganese steel army helmet (shown in Figure 7).

Conclusion:

The deformation obtained on two steel helmets by a brick falling on its flat face with 90 and 180 foot pounds energy is practically the same as that obtained on the standard manganese steel army helmet. Similarly, the deformation made by the helmet falling on a two-inch channel iron with an energy of 1,305 foot pounds is comparable to that obtained on a standard manganese steel army helmet.

It is felt that these steel helmets may not be sufficient protection from heavy bodies, especially with sharp corners, falling from heights exceeding twenty-five feet.

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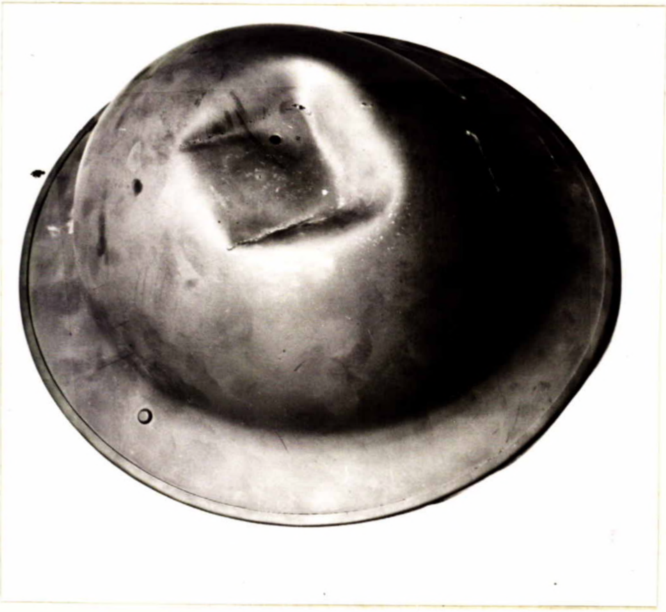
Figure 1.



Steel helmet deformed by a
brick falling from a height
of 17 feet.

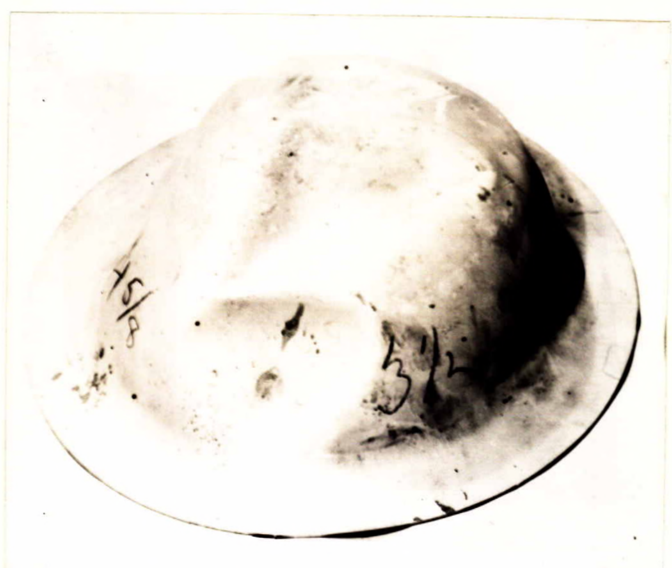
Figure 2.

Steel helmet deformed by a
brick falling from a height
of 34 feet.

Figure 3.

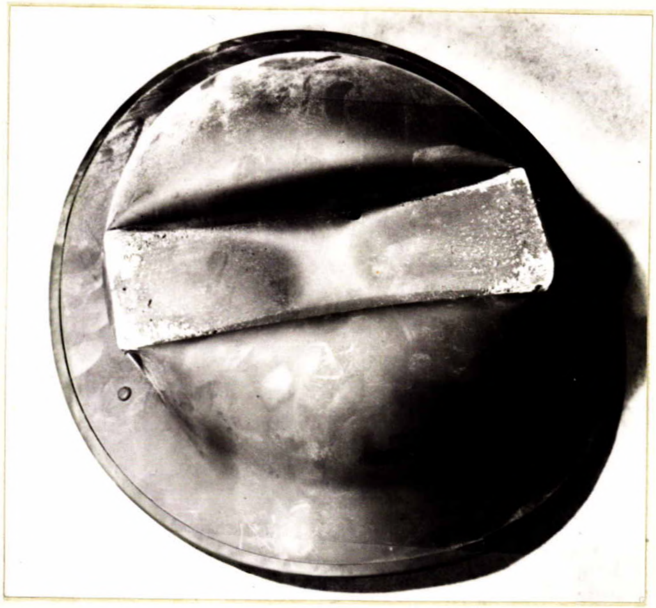
Standard manganese steel army helmet deformed by a brick falling from a height of 17 feet.

Figure 4.



Standard manganese steel army helmet deformed by a brick falling from a height of 34 feet.

Figure 5.



Steel helmet deformed by falling onto a two-inch channel iron with 1,305 foot pounds energy.

Figure 6.

Standard manganese steel helmet deformed by falling onto a two-inch channel iron with 1,305 foot pounds energy.

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