

If construction provides as a bursting course, a cushion of a foot or two of earth, then a matress of logs or beams, the weight of the blow is distributed, and with a couple of feet more earth, as a cushion on top of a solid roof, a 5.9 shell will do no more than extinguish a candle inside the dug-out. A layer of 6 inches of earth on top of all, will arrest the splinters from the shell in some measure. This type of dug-out, with roof level with or raised but little above the surface of the ground, is the only kind possible where the ground is low and wet. When used well forward, it has the great advantage that the garrison can get out of it quickly after the barrage has lifted.

#### Mined Dug-outs.

These are, in the true sense, "dug-outs". They are used for a variety of purposes, and are of many types. Their construction is properly the work of the tunnelling companies.

#### Galleries.

Mined "dug-outs" are reached by galleries, strongly timbered, and have two or more entrances, which must open away from enemy artillery fire. When placed on the reverse slope of banks, such as hill sides, ravines, and sunken roads, the galleries run in level or with a slight grade until at least twenty feet of head cover is found. From trenches, steps at an angle of forty-five degrees extend down to the required depth, and often have right angle turns for protection from fire or bombs. Horizontal galleries may be lined according to standard mining methods, using half round mine props supporting girders, with "spilling" boards overhead, and "lagging" on the sides of boards, expanded metal or corrugated iron. The chambers themselves will often be lined in the same manner. Other gallery frames are made of 3 inch x 9 inch sawn material, 6 ft. 4 in. high in the clear, 4 ft. wide at bottom, and 3 ft. 6 in. at top.

The entrance frames are of two types, both of which are constructed of standard material 3 in. x 9 in. Type I, is 6 ft. 4 in. by 2 ft. 9 in. in the clear, and those for inclined entrances, are stepped down so as to completely line the gallery. Type II is lower, being 5 ft. in the clear. Frames of this type are placed in the form of a tube at right angles to the slope. Steps are set in at proper intervals on cleats. At steep slopes, the latter type gives actually as much

head room as the former. At the bottom, the second type of frame is fanned out to meet the horizontal gallery.

#### Types of Mined Dug-outs.

Among the various types, are four which have been found particularly useful,—

(a) Type "A", or "Cubicle" type, designed by R. E.'s for use in damp or wet blue sandy clay, under a head cover of 15 to 35 feet. The chamber is 6 ft. wide, of the same height, and 11 ft. long, providing space for bunks for 8 men. It is cased entirely on 3 in. x 9 in. material. The bunks occupy the rear half of dug-out, and there is room for the garrison to stand and put on their kits quickly when called to stand to.

(b) Type "B", "Traversed Corridor", was designed by 2nd Canadian Tunnelling Co., 2nd Army. The chambers for bunks are 3 ft. wide and 14 ft. long, and are recessed on alternate sides of a corridor 3 ft. wide. Each traverse holds 8 bunks. Such construction may be used in dry sand with 25 ft. head cover. The material used for lining is usually 3 in. x 9 in., the roof being supported by props under suitable girders. This type has the disadvantage that occupants, when not in bunks, block the subway, but it is econo-

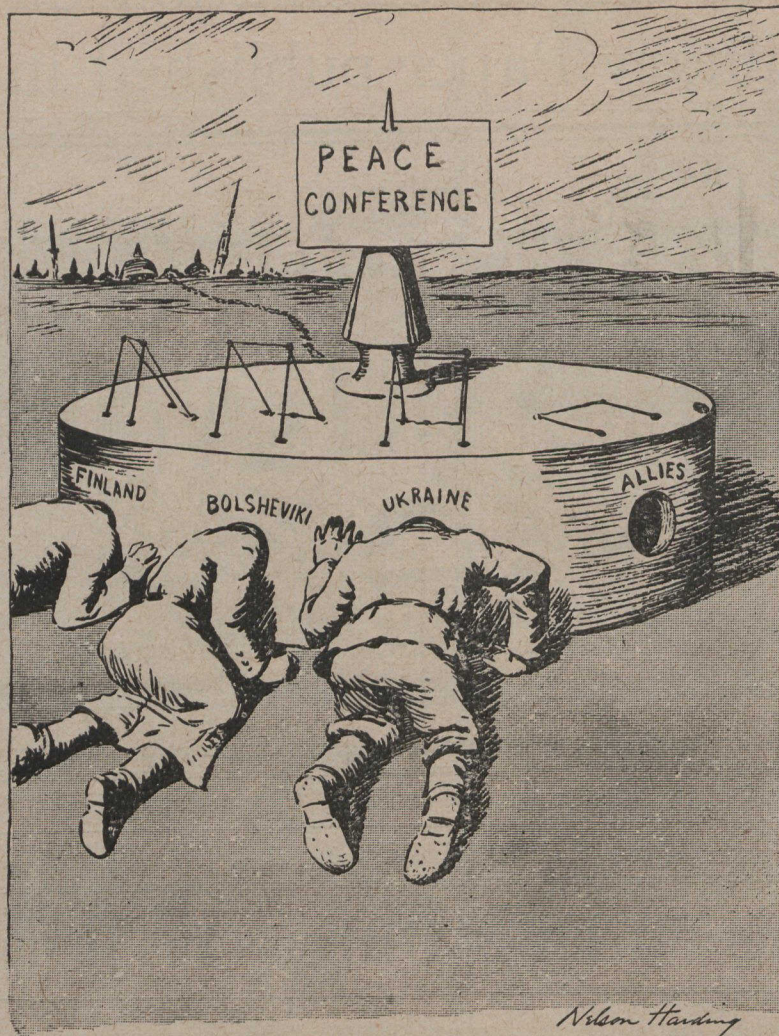
mical, strong, and affords a free flow of air.

(c) Type "C", "Elephant Corridor",—is lined with arched steel with very large corrugations, each section with a chord of about 7 feet, each pair of arches bolted together at the top. It gives 6 ft. 7 in. maximum height, with 8 ft. 6 in. width between the timber supports, and affords a passage-way 3 ft. wide, with a row of bunks on each side. It is used only in swelling blue clay which will stand during excavation.

(d) Type "D", is framed overhead with I-beams and sheet metal.

#### Sizes of Dug-outs.

Those for machine gun sections may be only 6 x 6 feet on the floor. Six ft. to a maximum of nine feet is standard width for all these dug-outs. Fourteen feet gives a comfortable length for machine gun use. Dug-outs to hold a half platoon, will be 32 feet long by 9 feet width, and may have the two entrances one each side of a long traverse in the trench. A battalion headquarters by the 256th Company R. E. was reached by three inclined galleries of 19 steps each opening into a long corridor 9 feet wide and 90 feet long, and had another room 9 feet x 16 feet. A brigade headquarters, also by the R. E. was entered by three hori-



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