slowly progressed as the surrounding country was cleared and settled. The entrance to the harbour was guarded by two block houses ; provision was made for barracks and garrison stores ; buildings were erected for the legislature ; and there the members of parliament, summoned by royal proclamation to “meet us in our provincial parliament in our town of York,” assembled on the 1st of June 1797. Sixteen years later the population numbered only 456. The town was twice sacked in the war of 1812. General Dearborn captured it at the head of a force of upwards of 2000 drawn from the neighbour­ing States. On their advance to the outworks of the garrison, the magazine of the fort exploded, whether by accident or design, killing many of the invaders. The halls of legislature and other buildings were burnt, and the town pillaged. On the restoration of peace the work of creating a capital for Upper Canada had well nigh to begin anew. But the city advanced with the general progress of the country. Trade centred in the little capital; the population in­creased ; and needful manufactures were established. The organiza­tion of Upper Canada College in 1830, with a staff of teachers nearly all graduates of Cambridge, gave a great impetus to the city and pro­vince. In 1834 the population of York numbered fully 10,000 ; and an Act of the provincial legislature conferred on it a charter of in­corporation, giving it for the first time an efficient system of munici­pal government, with a mayor, aldermen, and councilmen, entrusted with the administration of its affairs. Under this charter it was constituted a city, with the name of Toronto. (D. W.)

TORPEDO. Torpedoes may be briefly described as charges of some explosive agent, enclosed in water-tight cases, and moored or propelled under water at such depths that by their explosion they may sink or seriously damage a vessel in their vicinity. The use of torpedoes in naval warfare was proposed and even attempted in the end of the last and beginning of the present century, but no successful application of them was made until the American Civil War of 1861-64. The word “submarine mine” is generally substituted for “ torpedo ” when speaking of defensive or stationary mines, the latter term being reserved for loco­motive torpedoes, or others used in offensive operations.

1. *Submarine Mines.—*Submarine mines are divided into three classes:—(1) observation mines, fired by an electric current when the enemy is observed to be within the de­structive area of the mine; (2) electro-contact mines, which, when struck, fire by automatically completing the electric circuit from the battery ashore; (3) mechanical mines, which, when struck, fire through the action of some con­trivance within themselves, and are not connected with the shore. Mines of the first class are used in places where a channel has to be kept clear for screw steamers to pass, the second class in those parts of the channel where there is little traffic, and the third class in channels which it is intended to bar equally against friend or foe.

Electrical mines have the advantage over mechanical that by the removal of the firing battery the passage of a ship is rendered perfectly safe, and that the condition of the mine can be ascertained by electrical tests, but the electric cables are liable to damage, and add greatly to the expense of the defence.

Gun-cotton and dynamite are the explosives generally used in mines, the charges varying from 30 ft to 500 ft, according to the description of mine. In all mines the charge is exploded by means of a detonator con­taining fulminate of mercury. In mines loaded with gun-cotton the detonator is inserted in a priming charge of dry gun-cotton, this priming charge being in a metal case, closely surrounded by the wet gun-cotton comprising the remainder of the charge. Where dynamite is employed the priming charge is not necessary. Experiments made to determine the horizontal distance at which an ironclad will be vitally injured by different charges have yielded the following general results :—

|  |  |  |
| --- | --- | --- |
| Charge. | Submergence. | Distance. |
| 150 lb mine | 10 to 15 ft. | 4 ft. |
| 250 lb ground mine | 30 ft. | 10 ft. |
| 500 lb ground mine | 60 ft. | 15 ft. |

The explosion of 500 ft of gun-cotton at a horizontal distance of 30 feet would seriously injure a vessel, and 30 ft in contact with the bottom below the armour would probably blow a hole through the outer and inner skin. The depths given above are approximately the best depths to get the fullest effect out of the charges mentioned. When the water is so deep that if the mine were placed on the bottom it could not exert its full destructive effect on the bottom of a ship, it is given enough buoyancy to allow it to float above its moorings,—a mine on the bottom being termed a “ ground mine,” and a mine floating above its moorings a “ buoyant mine.”

If mines are placed too close together the explosion of one will damage those near it, the interval which must be left between them being—for a 100 ft mine, 100 feet ; for a 250 ft mine, 250 feet ; and for a 500 ft mine, 300 feet. There is therefore always a possibility of a ship passing through a single line of mines without coming within the destructive area of any. Mines are therefore generally arranged in two or more lines, the mines of one line covering the spaces left between the mines of the next, or several mines may be laid close together, and the whole exploded simultaneously.

The electric circuit of all electrical mines is very similar. A voltaic battery ashore has one pole put permanently to earth and the other pole joined to the electric cable lead­ing to the mine. This cable passes into the mine case through a water-tight joint, and is connected up to one pole of the electric detonator, the other pole of the deton­ator being connected to the mouth-piece of the mine and consequently to earth. To prevent the mine being fired until the proper moment has arrived, this circuit must be broken somewhere, and means provided for completing it when the mine is to be fired. In the case of observation mines this is done by inserting a firing key in the electric cable near the battery, and in electro-contact mines by a circuit closer in the mine.

The right moment to fire an observation mine is determined by two observers ashore, who have each adjusted two sights in line with the mine, as it was lowered into position,—the stations for these observers being chosen so that their lines of sight may be as nearly as possible at right angles to each other. The electric cable from the mine is led past both observers and connected to a firing battery, one pole of which is put permanently to earth. A firing key inserted in the circuit at the station of each observer renders the simultaneous pressure of both keys necessary to explode the mine. If each observer depresses his firing key as the centre of the enemy crosses his own line of sight, both keys can only be pressed simultaneously if the enemy arrives at the intersection of the two lines of sight, and consequently over the mine. When many mines are placed in one channel, it is usual to moor them in three lines, the prolongation of each line converging to an observing station, where the direction of each line is marked by sights. The electric cables from all the mines come to another observing station, and are there connected to separate firing keys, each of which has one pole joined up to a firing battery. The observer at this station is also provided with a separate sight marking the direction of each mine in all the lines. The former station is termed the “ converg­ing” and the latter the “firing” station. The observer at the converging station telegraphs to the firing station the instant at which the centre of the enemy is on one of the lines of mines, the observer at the firing station determining by means of his sights which individual mine the enemy is over, and he can fire it by pressing the corresponding key.

Instead of separate sights for each mine, observing arcs may be used. These instruments are furnished with a telescope, which can be constantly directed on the enemy, a bar attachment auto­matically closing the circuit when the direction of the enemy cor­responds to a mine. The camera obscura has also been used for determining the position of an enemy in the mine field.

Electro-contact mines are buoyant mines moored about 10 feet below the surface, and are in connexion with an electric battery ashore. They are arranged to explode on being struck by a passing ship, by means of an apparatus contained in the mine itself, called a circuit closer. Many different kinds of circuit closers are in use, but they all depend upon there being a break in the electric circuit while the circuit closer is at rest, the circuit closer completing the circuit when the mine receives a blow. That most commonly used