

tiously working out on true artistic lines architectural forms, and I do not despair of the result. Whether this result will be in the formation of a new style or whether such is possible I will not take time to consider now, but hope to refer to it in another lecture.

I have been briefly sketching the progress of architecture in England as being nearer to us and in closer relation than any other country, but I must glance at the architecture of France, which is well worthy of a more extended notice than I can give it to-night. France possesses many splendid cathedrals, some early, as the Abbeys at Caen and other parts of Normandy, and others later, as Notre Dame at Paris, Chartres, Rouen, and notably Amiens, but the French—always an artistic people—have never had much sympathy with Gothic, and accordingly have had no Gothic revival as we have just seen took place in England, but instead of that they have developed what might almost be called a style of their own, which is known as French Renaissance. The early Renaissance had a charm of picturesqueness and marvellous variety of feature and detail which inclined to the classic at one time, as in the Chateau Blois and Chambord, and several others, and in the old Hotel de Ville, at Paris; and again in to the Gothic, as in the Palace de Justice at Rouen, Hotel de Cluny at Paris, and others.

Latterly they have, and I think wisely, swept away all copying from the antique and have developed a free classic, which if now and then voluptuous is yet at all times fresh and refined.

The new Hotel de Ville at Paris modelled somewhat on the lines of the one burnt down, promises to be one of the most thoughtful and clever buildings of the century, and is worthy of the most careful study.

In America, until within the last few years, there has not been much in the way of architecture which could earn even a modest modicum of praise, but on a recent visit I was surprised to see what immense strides had been made. Where they have tried to be original in my opinion they have been least successful, but many of the rising architects, having been trained in Paris and London, are introducing great vitality and freshness, and at the same time maintaining the true principles of art.

They are privileged in that they are less trammelled with conservatism than in the old country, and have larger opportunities in the way of lavish expenditure. The new City Hall and buildings at Philadelphia, many of the new houses and buildings in New York and Boston are advances—by leaps and bounds on the old.

Of Canada I cannot say so much. We are not so favoured as our neighbours across the border in means, and our climatic requirements are such as to hamper freedom of design. I think, however, we have a few buildings and notably the centre block of the Parliament Buildings at Ottawa of which there is no need to be ashamed. In position this building I have named is almost second to none that I know of, and for grouping and planning and picturesque outline, it is very creditable to the Dominion.

I think, however, that Canada is not to be behind-hand in architecture, and that in that department she is by no means at a standstill. She may not be in the van, but I am sure she will not be in the rear.

In my next lecture I hope to examine some of the

principles which underlie all true design whether in architecture or engineering and to glance at some modern requirements in their bearings on our work.

THE ARMAMENT OF TORPEDO BOATS.

(For illustrations see page 68.)

The necessity of arming torpedo boats with light and efficient machine guns has been long fully recognised, for in consequence of the large and rapidly increasing numbers of this class of vessels in possession of the different navies, there is no doubt that in any future naval campaign they will be called upon to perform other duties besides that of attack on ironclads, and that there will be engagements of torpedo boats with each other, and with the armed guard boats, used to protect the larger fighting vessels against torpedo boat assaults.* Such guns will also prove very valuable for firing at electric search lights, for driving the gunners from the machine guns placed in exposed positions, and for covering a retreat. For all these reasons those governments which possess navies have under consideration the development of torpedo boats into more perfect fighting machines than was contemplated when this means of attack was adopted. The principal difficulties in arming torpedo boats, particularly those of the light second-class, is the extra weight which a gun and an adequate quantity of ammunition entails, and the consequent loss of speed thereby occasioned, but it would appear that the value of a gun armament outweighs to a great extent this disadvantage. The requirements of such armament may be summed up as follows:

1. A minimum weight of armament and ammunition supply.
2. The smallest possible number of men to work the guns.
3. Sufficient power of projectile to perforate and put *hors de combat* any existing torpedo, or other similar boat.
4. Rapid fire and great facility of pointing during the swiftest motions of the boat.
5. The use of the same ammunition carried by the machine gun armament of the larger vessels, so that the supply of the torpedo boats may be replenished from their magazines if necessary.
6. A fore-and-aft fire, and if possible a an all-round fire, so as to provide equally for an attack or a retreat.
7. The smallest possible reactions and vibrations from firing so that no special strengthening of the existing torpedo boats may be required to stand the shock of the discharge.

One type of gun† which is now being largely adopted in Continental and other foreign navies for arming the so-called first-class and larger-sized torpedo boats, is the 37 mm. (1.46 in.) Hotchkiss revolving cannon; the total weight of this gun with its pivot and socket is 550 lb. It can be worked by two men and fired at the rate of about sixty shots per minute, the explosive shell employed having an energy sufficient to penetrate any existing torpedo boats, while canister can also be used against open boats at short ranges. As the recoil is very slight, no strengthening is necessary from this cause for the torpedo boats.

The gun is, however, considered too heavy for the armament of the lighter second-class torpedo boats, for which purposes Messrs. Hotchkiss and Co. are now manufacturing a rapid-firing single-barrel gun adapted for the same ammunition as the 37 mm. revolving cannon. This class of gun has been adopted to a greater or less extent in fifteen different navies.

Figs. 1 and 2 are general views of this gun, which resemble a large wall-piece mounted on a pivot; the breech-block slides vertically through a mortice, and is actuated by a lever, forming at the same time the trigger-guard. As will be seen it is provided with a stock, which bears against the left shoulder of the operator, and on the right is a pistol-grip for pointing, so that without the aid of any elevating or directing mechanism the work of sighting and firing (as is the case with the revolving cannon) is placed in a single hand, which, the makers claim, gives more accurate work, and better results are obtained than with any combination of men to sight and fire. The body of the gun is made of Whitworth's fluid compressed steel, it is square at the breech, and the trunnion ring (of steel) is screwed on in such a place that the gun is exactly balanced in the trunnions. The breech action consists of the square

* Vide the "Story of the Battle of Port Said," *ENGINEERING*, vol. xxxv. pp. 1, 27, 51, 80, 111, 133.

† For illustrated description of the Nordenfolt machine gun, see *ENGINEERING*, vol. xxxv. p.p. 51, 77, 123, 147.