out, however, desiring to unduly exaggerate the difficulties that at first confronted the Shell Committee, their task was by no means easy. Their first inquiry was for a quantity of empty shrapnel shells and it may not be out of place to mention that an empty shrapnel contains everything but the bursting charge and pellets. The Committee began by dissecting an 18-pounder shrapnel shell, and obtained from the Quebec Arsenal their manufacturing cost for each component part. Estimates were made of the cost of producing them in quantities and of machining and assembling the shell and a price at which the Committee could undertake to supply 200,000 shells was cabled to the War Office in London. This resulted in two orders being placed, one for 100,000 empty 15-pounder shrapnel and the other for 100,000 empty 18-pounder shrapnel, both of which were received on September 22nd, 1914.

The first stage in this shell is a blank of steel Fig.1; this blank is pierced on a forging press to form the forging from which the shell is machined. During the machining process, the shell is heat treated to put the steel in the required condition, the disc is inserted and the end of the shell nosed in. The shell is completed by the assembly of the powder cup, ignition tube, bullets and socket, and the final machining required after the assembling. Fig. 2.

The steel required the first consideration. This is required to conform to quite a rigid specification, which does not define the chemical composition but the physical requirements after heat treatment. The first difficulty experienced by the Committee was the specification that this steel should be acid open hearth. There was only one acid furnace in Canada and that was of small capacity and it was, therefore, practically imperative to induce the authorities to accept basic steel. Col. Thos. Cantley obtained the suitable analysis from some acid steel in the possession of the Arsenal, made up a heat of basic steel to correspond with it and rolled it into bars. These were forged at the Arsenal, made up into shells and tested with satisfactory results. Colonel Carnegie went to England with two of the shells and word came back that basic steel that met the balance of the specifications would be accepted. I have no doubt that the authorities were realizing by that time that if they wanted shells they would have to accept basic steel, but this does not detract from the importance of the concession that the experiment justified, a concession that made the entire steel making capacity of the country available for munition work.

The permission to use basic steel did not conclude the steel makers' difficulties by any means. He still had to determine the exact quality of steel that would comply with the balance of the specifications which, during the first four months, gave him considerable trouble. Experience developed that a minimum about 0.42 per cent of carbon was necessary in order to meet the physical requirements but many failures occurred before the steel makers obtained sufficient experience to ascertain the exact grade required. The Nova Scotia Steel Company took the pioneer part in this work and were unsparing in their efforts to produce the proper