

the following committee to consider and bring in to-morrow a report concerning the future of the library: Messrs. Aylsworth, Wright, Wickson and A. H. Gregg.

Mr. Aylsworth then read a paper entitled "A Chapter from my Note Book—Building Methods in Rome," which will appear in our March issue.

The President asked how the vaults referred to by Mr. Aylsworth were held together.

Mr. Aylsworth presumed they were built a good deal in the same way as bakers' ovens. In the case of a room 15 feet square or thereabouts, a scaffold might be erected and covered with sand and the vault formed over that. In some cases they were of brick work, but not at all carefully done, seeming rather to depend on the strength of the mortar.

The Registrar stated that the Italian vault was something he had had an opportunity of seeing something of, having been shown through a mansion at Florence, owned by an American, who had described to him the way in which it had been built. Every floor was vaulted with an elliptical brick vault. The walls were not very thick, as even the top floor, which was unused, had the benefit of a good deal of vertical wall. It had occurred to him that the process was one which might be adopted in other countries, even our own. The process of vaulting, as described to him, was to outline on each wall with chalk the form the vault was to take; then to mark the courses on these outlines and stretch strings across, laying the courses to the string as in ordinary walling. Every third or fourth brick was propped up by a stick from the platform the bricklayers were working from, until the course was completed and held itself. The bricks were not laid as in an arch, but edge to edge, and as the Italian brick is thin the vault was not more than two inches in thickness—and this over quite a large room. The moment the last brick was in, while the mortar was still new, the workmen got on the back of the vault to continue building. On one occasion a derrick pole had fallen and broken through the crown of each floor, but only made a small hole. If fire-proof building is to be talked about a construction of this kind might well come in for consideration.

Mr. Aylsworth said there was no reason why we should not have fire-proof buildings, using concrete more than we do. He believed in California they used concrete beams in which sufficient iron rods were laid and the concrete floor laid at the same time.

## SECOND DAY.

The convention resumed its session at 10 o'clock a.m., when Mr. D. G. Baxter, of Stratford, read a paper on "Points on Acoustics," which will be printed in a later issue.

At the close of Mr. Baxter's reading the President called on the members for any remarks they might have to make on the subject, and the Registrar suggested that the President, having a wide experience in the erection of churches, would be able himself to give the convention some valuable information.

The President said one method he had found very effective was to have a flat wall behind the speaker. He had known instances where by reason of an octagon form behind the speaker, the echo had been such that he could hardly be heard, and this was in a great measure remedied by cutting off the octagon.

Mr. Wickson enquired if there was not some theory about the ellipse being the most perfect form; he had been given to understand that it was, although he had not found any authority for the statement.

Commander Law remarked that the Mormon Temple at Salt Lake City, Utah, was said to be almost perfect in its acoustic properties, and was shaped like half an egg.

Mr. Edwards added that the form of the pavilion at Grimsby Park was suggested by the Mormon Temple referred to by Commander Law, but although, as that gentleman had said, the Salt Lake building was believed to be acoustically the most perfect on the continent, the Grimsby imitation bore the reputation of being the very worst in that respect.

Mr. Wickson said he had heard it remarked by a musician that any building which was good to speak in was poor to sing in. It seemed almost universal that a church or any building which pleased singers was not one that pleased speakers.

The Registrar suggested that if the choir was placed in a recess of resonant wood above the level of the speaker, he would not be effected.

Mr. Baxter said the objection to seating the choir in a groined recess behind and above the speaker was, that it formed a volume of air behind him which he had to maintain in vibration all the time he was speaking and which weakened the sound. The higher the recess could be raised behind the speaker the better. He had noticed one church in which the choir was directly above the speaker, the front of the choir gallery being brought out about four feet, the under side of it forming a cove, which to a great extent kept the sound vibration directed from him out to the audience, and leaving a clear and sympathetic vibration which did not affect the main church at all.

Mr. Edwards agreed with the essayist that it was difficult to formulate any definite laws on the subject of acoustics; it was a case in which "doctors differ." The whole theory of wave sound was doubted by some, who adduced very good reasons in support of their unbelief, contending that it takes so much effort

to set in motion the atmosphere which is the means of communication, or which is the matter on which the wave sound has to act. As an illustration of that they contended the distance the sound of a grasshopper is heard would require tons of power to produce the wave sound at such a distance if the wave theory were correct. That being the case, it was necessary to look carefully at the beginnings on this subject, and to avoid building up any superstructure before the foundations were securely laid, and he thought the foundations of the matter required some further negotiation yet.

Mr. Geo. Browne (of Winnipeg) related his experience of a church in Winnipeg which on account of its great height was very defective in acoustic properties, and in which it was almost impossible to speak effectively. It was at last decided to take down the building and re-erect it on the same foundations, but with the height greatly reduced, and after that was done the pastor stated that whereas the old church was one of the very worst he had spoken in, after being so rebuilt it was one of the very best. He thought this demonstrated that not only length and width, but height also, had a very important bearing on the subject of acoustics. He had this summer completed a Presbyterian church, which was built exactly square, about sixty-five feet square, in which he had adopted the American system of placing the preacher in a corner. It had a gallery on two sides and coved plaster ceilings, and the tie beams formed deep panels in the ceiling. The result had been one of the finest buildings for speaking in the city, so much so that whenever religious meetings were held requiring a building with good acoustic properties, the persons interested tried to get this church to hold them in. In the Convocation Hall of Manitoba College they had a hall 65 x 35 feet, and he was told by the principal that he found no difficulty whatever in speaking in it. There was a gallery at one end of the room and a coved ceiling. From his experience he believed that the coved ceiling aided very materially in causing the sound to travel freely throughout the hall.

Mr. Wickson asked if a coved ceiling at the end of an audience room opposite the speaker had the effect of causing an echo.

Mr. Browne said he always continued the cove all around the building; he thought it reflected the sound.

Mr. Baxter said he had observed in nearly all the Chicago buildings that the cove on the rear wall was far deeper than around the sides, in fact they drew the cove line right round so that the entire body of sound was directed right down, and there was no chance for the formation of an echo, whereas, if there were any straight line between the curve and the floor of the gallery, it would not have so good an effect.

Mr. Paull said an important matter was what should be the limit of size in a church in order to secure proper acoustic qualities. He had heard it said that 1200 persons was the greatest number that could be accommodated so that the preacher could command their hearing. The church in Winnipeg spoken of by Mr. Browne as 65 feet square would have about that capacity. He would like to ask Mr. Browne how the extremities of the panels in the ceiling of that church were finished? Were they coved at the ends.

Mr. Browne stated they were finished simply by running up a false rib. The tie beams came across and then they ran them down on the cove to a small projecting cornice.

The President stated that in regard to the remarks of Mr. Edwards about the grasshopper, he thought it was necessary to take into consideration the number of vibrations in the air; he supposed the more rapid the vibrations of the air the more penetrating the sound would be.

Mr. Edwards said he had not the confidence in coved ceilings that had been expressed by some of the members. He had in his mind a large room or auditorium which was almost as bad acoustically as the Grimsby temple, the ceiling of which was very deeply panelled and with a very extensive cove and all the other features which had just been pronounced of no great advantage. It was really a most miserable place to speak in. At one time the platform was placed on the long side of the building, but the echo was so bad that it had to be changed to the other side, which produced slight improvement, though it was not perfect by a great deal yet. These things did not always work in accordance with one's preconceived ideas. He had happened to have a building somewhat similar to the Winnipeg church rebuilt by Mr. Browne, and he had recommended putting in a gallery, which he hoped would remedy the trouble that existed.

Mr. Browne said he regarded a gallery as necessary to secure good acoustic properties in a church. Another matter he wished to mention was that the windows in Westminster church had circular heads, cutting into the cove, just the same as a vault or groin, and he would not at all wonder but that assisted the sound.

Mr. Edwards said one of the best auditoriums he had ever been in, speaking from the acoustic point of view, was the Casino, of New York, which was built very much after the style of the Massey Hall in Toronto, only the recesses were much deeper all round. This had a very beautiful effect from the artistic standpoint, as well as being very beneficial to its acoustic properties.

The President said that in view of Mr. Browne's opinion that a gallery was necessary to good acoustic properties in a church, it would be interesting if any one could tell what had been the effect in St. James Cathedral in this city, from which the galleries