that in the course of twenty-four hours the atmosphere of the apartment is not once completely changed, and conse­quently renewed, by the direct influence of the fire. Hence it is that the apartment is so easily warmed; but it is this which necessarily renders it so unpleasant.

The stoves now described answer for small apartments. When the place to be heated is large, or when several apartments in the same building are to be warmed, a dif­ferent kind is used. The heat in these cases is in gene­ral not communicated to the apartment or apartments by the direct influence of the stove, but by air heated by its external surface (of course not brought into contact with the fuel), and then conveyed by tubes or otherwise to the places to be warmed, on the principle already illustrated, that when heated it expands and ascends, and consequently rushes along the tubes, the supply being kept up by the constant flow of cold air upon the hot sides of the stove. Stoves for this purpose are made of iron or of brick-work, and sometimes of both. Fig. 9 represents a cast-metal stove of this kind. It may be considered as a double stove ; an outer case, and a furnace or inner stove. The fuel is burnt in the inner stove, and the smoke produced during the process of combustion is carried off by a chimney, which passes through the top of the outer stove, and is con­veyed to the outside of the building. The outer case in­cludes not only the furnace or inner stove, but also a con­siderable space, occupied by the air of the atmosphere, which is freely admitted through a number of openings placed around it ; and when any current of air is produced, it passes off from the space between the outer case and inner stove, and is conveyed by tubes through the body of the apartment But we shall first describe the different parts of which the stove is composed, after which we shall be better able to understand its mode of operation.

Fig. 9 exhibits a perspective view of this stove. AB is the body, which is about three feet high, and of a circular form. C is a square pedestal, on which the stove is placed, and which contains the ash-pit. The height of the pedestal is about a foot, and it is nearly insulated by resting on the spherical supports *a a,* also of cast iron. EEE are open­ings in front of the ash-pit, through which the air enters to support the combustion. These openings can be enlarged or diminished, or opened and shut, at pleasure. FF is the door of the furnace, through which the fuel is in­troduced. This door is attached to the inner furnace, and is double. It is one foot broad, and eleven inches high. GG is tb.e chimney, which passes from the furnace within, through the outer case, and conveys the smoke out of the building. HH are openings in the outer case, and are eight in number, through which the air enters, and being heated, is greatly rarefied, and passes off through the funnel or pipe III. This pipe communicates only with the outer stove, and being shut at the end K, the air rushes out from the small tubes LL, inserted into the side of the pipe III, and thus mixes with the cold air of the apartment. The diameter of the outer case at the bottom is about two feet, and the diameter of the furnace within is about sixteen inches.

The length of the body of a church in which two stoves of the form and dimensions now described are erected, is about sixty feet, and the breadth is about forty-five feet. The tubes III are conveyed along the lower edge of the gallery, about half the length of the church. The fires are lighted about four or five o’clock on the Sunday morn­ing during the earlier part of the cold season, but as the season advances it is usual to light them earlier. From this time till the congregation assembles for the afternoon service, the furnaces are constantly supplied with fuel. By this management the air in the church is kept comfortably warm during the coldest season of the year.

When only one apartment is to be heated by a stove of this kind, the stove ought to be placed in the apartment, because then it is supplied with air from it, which has been previously heated ; whereas, when it is placed in another si­tuation, the supply of heated air thrown into the apartment being derived from without, that within must be forced out to make way for it, and consequently at a great expendi­ture of fuel. When several apartments are to be warmed, suppose those of a dwelling-house, the stove ought to be situated in some part of the lobby, from which the tubes proceed to the rooms. Of course the size of the stove, and the distribution and size of the tubes, must depend on the supply of heat required.

There is one very great objection to the stove as now described. It has been already stated, that when air is pro­jected against a red-hot surface, the impurities constantly floating in it are burned, and emit offensive effluvia; and this is generally the case with metallic hot-air stoves. Hence the necessity of having them so placed that they shall be supplied with air as free as possible from impuri­ties. Instead of having the whole of the stove made *of* metal, the inner part is sometimes metal and the outer covering brick-work ; in which case the chamber between them is generally larger than in the others, consequently the temperature does not become so high, and the objec­tion urged against the metal stoves is in a great measure removed.

The annexed figure represents a vertical section of a stove of this kind. A is the stove of metal, with the door at B and ash-pit at C. DD is the vent, making a turn downwards, and carried into the chimney at E. FGHI is the outer casing of brick-work, completely enclosing the stove, and also the descending part of the vent ; K is the open­ing for the admission of air to the hot chamber. L is the tube for carrying off the warm air, and from this it is conveyed by other tubes to the rooms to be heated. The stove from which this figure is taken is two feet and a quarter in width, six feet in height, and the sides three fourths of an inch in thickness. The brick casing is at the distance of six inches from the metal, and the descend­ing vent within is six inches in diameter. It is used for warming a lecture-room thirty-five feet long, twenty-seven broad, and twenty high, also a large apartment thirty feet long, twenty-seven broad, and eighteen high, besides two smaller rooms and a staircase. The fire is kindled during winter at seven in the morning, and kept burning till four in the afternoon, when it is allowed to go out. The quan­tity of coal amounts daily, on an average, to rather less than half a hundredweight. The temperature of the air from the tubes varies from 120° to 180°, according to the state of the fire. The temperature of the different apartments is kept at about 60°. When first erected, the supply of air for the hot chamber was brought from without; but now the air for the fuel and for the hot chamber are both taken from the apart­ment in which the stove is placed, which is generally at the temperature of 70°.

When the place to be heated is spacious, or when there are several apartments, it is customary to have the part of the stove immediately exposed to the fire lined with fire-brick, in order to prevent the direct action of the fuel on