built and a valve placed on both lines leading away from it. In fact it will be found of great convenience to have plenty of valves in the system so that any one section may be cut out with the least possible interference with the rest of the system. It is most important that the supply for the water-cooler on the air compressor be as independent as possible, for the lack of a little water here will practically stop the operation of the plant.

Hydrants should be placed at convenient points, but not too near the buildings. By having them near the tracks they may be used for supplying the locomotive crane. An automatic sprinkler system should be installed in the template shop.

The ends of all branches should be arranged with plugs or caps so as to permit of being extended as the plant grows, and tees should be put in at points wherever there is the slightest possibility that a branch might be needed in the future.

Sewers and Drains.—The drainage system and its arrangement will depend entirely upon local conditions and the amount of fall obtainable. With a minimum grade of ⅛ inch in one foot for a twelve-inch glazed tile sewer it will require three such to properly drain the plant as first constructed. Assuming that they empty into a trunk sewer on the street and that they are to be four feet deep at the manhole in the stock yard, the trunk sewer will have to be at least thirteen feet deep where the drains enter into it. If the depth be a little more than this, something might be saved in cost by running one twenty-four-inch sewer about three hundred feet into the property and connecting the twelve-inch sewers to it. The question of sewers, however, depends so entirely on local conditions that nothing in the way of a definite design can be worked out at this stage. In general, however, it may be said that in addition to providing for carrying off the rain water from the buildings and the sewage, the surface water that may collect on the site must be taken care of. Special care should be taken to keep the sub-grade of the tracks well drained. All pits for machinery and other low spots should be connected with the sewers as well as all drain-offs and drips from water tops, steam pipes, etc. Sewers other than tile drains should not run near foundations if it can be avoided. In case such arrangement is found necessary, then the foundations must be carried down below the level of the sewer. Manholes with catch basins should be built at all junctions of the large sewers.

Fuel Oil System.—Where light fuel oil of a uniform grade and at reasonable price is readily obtainable, its use in riveting heating forges and other furnaces is well worth considering. The rapidity with which a furnace can be heated, the ease in obtaining a uniform temperature, and the absence of the dirt incidental to the use of coal and coke, are all points in its favor. Only satisfactory results can be obtained, however, from a correctly designed system, and while for a small plant the first installation will be expensive, it may be easily extended in the future at very little cost.

The great secret of success with fuel oil is clean oil of a uniform grade, and large distribution pipes. For storage purposes two 12,000-gallon iron tanks will be required. These are to be buried in blue clay near the tracks at least thirty feet from other buildings, so that a tank car may be unloaded into them by gravity. The tanks should have one end exposed in a pit or concrete cellar roofed in to protect it from the weather. This pit should be large enough to contain a small electric pump which will be required to maintain a sufficient pressure in the distribution system. The first tank serves as a receiving and settling tank. The second tank is connected with the first by a pipe so as to draw off the oil a foot or two from the bottom of the first. It will be necessary to drain the sediment out of the settling tank at regular intervals.

The distribution system should not be made of less than 1¼-inch pipe and should form a closed circuit or duplicate system, having a return pipe or overflow back to the second tank. By this means the oil is kept circulating at all times, and congestion from any cause is prevented. If trouble should occur at any point, that section may be cut out by means of valves and the rest of the system need not be interrupted.

For keeping the oil from congealing in winter, steam coils should be put in the storage tanks and the distribution pipes should be laid in iron casing through which steam may be blown.

Heating System.—The question of heating structural steel plants deserves special consideration in each particular case. It is a question that is involved in the choice of a location. To heat brick buildings of ordinary type is not necessarily a very difficult problem. The office can be heated by means of steam coils in the usual way. For the template shop, compressor room and machine shop a hot air system with fan will give satisfactory results if properly designed. This system is cheaper to install than steam coils and interferes less with the arrangement of the benches, machines, etc.

The heating of the main building is a more difficult problem. The volume of air to be heated is so great, uncontrolled by partitions, the conductivity of the corrugated iron and glass which forms the walls is so high, and the large doors have to be opened so frequently, that the cost of a plant that will give satisfactory results is almost prohibitory, to say nothing of the cost of operating it. Then, again, the capital invested in a heating plant lies idle a large part of the year. In fact, in Southern Ontario severe weather seldom lasts more than a few days at a time at intervals during the winter months. Under such conditions a heating plant is not necessary as "salamanders" or open fires burning coke or charcoal can be placed around at convenient points. The cost of such fires, even with the time lost by the workmen in keeping warm added to it, will not equal the interest on a heating plant and the cost of operation.

If care is taken to make a corrugated iron building air-tight, it will be found to be much warmer than such a building is usually expected to be. Large glass areas, such as are becoming so common in manufacturing buildings, if in a south wall, will produce the same warming effect which takes place in a greenhouse. This will add very materially to the warmth of a building on bright days, but it must be counteracted in summer time by good ventilation and circulation of air. Ribbed glass must also be used to diffuse the light.

Erection Equipment.—The equipment required for erecting steel work is merely to be mentioned here to call attention to it as being an item not to be overlooked. Such equipment depreciates so rapidly and the requirements vary so much with every contract, that a large part of the cost of it should be charged up to the work on which it is first used. This should be taken into consideration in making up the estimate for a piece of work. Special equipment, such as travellers, derrick cars, etc., can safely be left for consideration when the time comes to take contracts that require their use.

Order of Procedure in Construction.—When sufficient capital is immediately available the owners will very probably want the plant ready for full operation just as soon as possible, even if it costs more to rush the work. If, on the other