The power equipment must include a motor-generator set, as direct current will be required for variable speed motors, such as cranes, reamers, etc. The motor side of this set should be of the synchronous type with sufficient capacity to correct the power factor of the plant. On account of the varying loads on the motors, the power factor is sure to be very low. The capacity of the generator should be well able to take care of the needs of the plant, including the lighting system and the extra travelling cranes which might be added in a year or two. A set with a capacity of 100 kilowatts direct current and a synchronous motor of 125 k.v.a. should give satisfaction.

The high voltage current will be brought down the tower at the end of the power house to the transformers, and from thence the low voltage current will be taken in conduits to the bus-bars of the switchboard. A separate switchboard will be needed for the direct current system. From the switchboards feeders in conduit will run to the machines in the power house and template shops. For the main shop the feeders will pass up the tower and over head to cross-arms on the trusses of the building. A separate system, each on its own switch, should be provided for the different departments, so that any one can be cut out without interrupting the others. There should be three sets of A.C. feeders, one for each aisle of the shop, with room on the cross-arms for the additional aisles to be added later. There should be two pairs of D.C. feeders, one for the north cranes and one for the south cranes. If separate switches are provided at convenient points for cutting out each crane, it will hardly be necessary to have separate feeders for the other D.C. machines in the shop. There will only be one or two of these machines other than the reamers.

All wires above the bottom chord of the trusses will be carried on cross-arms bolted to the steel work, but wires below this level must be put in metal conduits. The starting switches for each machine should be as near the machine as possible. For the portable reamers a series of outlets must be provided on the columns about every forty feet down the shop so that the reamers can be connected up by means of a plug and a flexible chord wherever needed. Each outlet and, in fact, every branch circuit, must have a separate cut-out. In this and in all other particulars the rules of the fire underwriters must be followed, and every precaution taken to prevent short circuits and injury to the workmen.

For general illumination modern D.C. flaming arc 110-volt lights give as suitable and as economical a light as any. One light in every other bay arranged alternately on the right and left-hand side of the centre of each aisle will be sufficient for general illumination, while they may be spaced closer over the laying-out skids and the assemblers. As the power circuit is 220 volts, it will be necessary to connect two lights in series. Each pair must have a cut-out and every four lights should be controlled by a two-pole switch.

Sixteen-candle-power incandescent lights must be provided for each machine. These must be on good lamp chord and protected by wire cages having wooden handles. The power for these lights may be obtained by tapping the circuit that supplies the machine.

For the template shop the best illumination can be obtained by means of 100-watt tungsten lights suspended from the roof, three in each twenty-foot bay. Along the walls, over tables, or near machines, 16-candle-power carbon lights on drop chords will be used to give special illumination where needed.

Compressed Air Systems.—The transmission of power by means of compressed air is a very expensive method, but it is so convenient to handle, and can be adapted to so many uses, that it would be impossible to get along without it. A pressure of 90 to 100 lbs. per square inch is usually used for operating pneumatic riveters, hammers, reamers and hoists. The plant can easily be supplied by a 700-foot-per-minute, two-stage compressor. When the demand gets beyond this, it will be advisable to add a 1,400-foot machine to the equipment and the piping, etc., should be installed at the outset with this object in view. By having two machines of different capacity, the varying demand for air can be supplied a great deal more economically than by one large compressor.

The compressor will be belt-driven by a 125-h.p. induction motor. It should have an automatic throttling device which will cut off the supply of free air completely when the pressure in the system reaches its maximum. Such a governor can be adjusted to regulate the pressure within three pounds. This small variation need not be considered, as the method is much more economical in power than if a regulator were used which would permit just enough air in the intake to maintain the pressure constant. It causes great fluxations in the power used, however, as the compressor runs light when the intake is cut off.

In order to keep the pressure in the distribution system as constant as possible, and to relieve it of shocks, it is necessary to have a storage tank near the compressor. This tank will also act as a cooler, and in it will collect a great deal of the moisture that would otherwise pass into the distribution pipes. A large second-hand fire-tube boiler can be converted into a splendid storage tank. It should be set in a vertical position so as to allow a natural circulation of air through the tubes. The inlet should be near the top and the outlet about eighteen inches from the bottom. A convenient place for this tank is in a corner of the boiler-room. From it the air main can be taken underground to the centre of the main shop, and from thence by three vertical branches to the roof trusses, one branch each for the air hoists in the girder shop and structural aisles and one branch with drop pipes down every other column of the centre row, having outlets for the riveting machines, reamers, etc.

All horizontal pipes should be given a slight slope downward in the direction of the flow of air so that any moisture that is carried past the storage tank will not obstruct the flow. At the tank and at all low points in the system blow-off valves must be provided to the drains, and these should be opened at regular intervals. Care in this particular and abundantly large pipes will do away with all trouble from frost in winter. It will not pay to provide special means to re-heat the air before using, and it is not convenient to arrange a satisfactory indirect method.

A low pressure system—about twenty pounds per square inch—will be required for the oil forges. The blower, which will be driven by a small motor, can be supported between the trusses. The distribution system, which will be made of galvanized iron pipes, will be carried over head and down columns near the rivet forges. Ultimately a separate blower will be required for the rivet-making plant and the blacksmith shop, but for the present the one machine will do.

Water Supply System.—Apart from the amount of water required for drinking, sanitary purposes and fire protection, it will only be used for the water-cooler of the compressor, and in the boiler of the heating plant. A 6-inch pipe will supply enough for several fire streams if the pressure is good. The source of supply will probably be a public main on the street to the north of the property. The best place to bring in the private main is along the west boundary. Here it will be always accessible and not likely to be covered up with materials, etc., and furthermore, in case of a break it cannot do much damage to tracks or foundations. Where the first branch in the main occurs a manhole should be