expenditure of power. The heater, however, is the most distinctive part of the apparatus. It consists of a section of hollow cast iron section or bases divided by a diaphragm midway of their length and into which is screwed a triple verticle row of wrought iron pipes which by means of horizontal connecting pipes at the top (seen in the cut of the heater) serves as a means of communication between the ends. Steam is admitted at one end of these sections by independent supply pipes and finds its way up over and down through the pipes of the other end of the section whence it is removed by means of a steam trap. This arrangement insures a positive circulation of the stream through the entire heater.

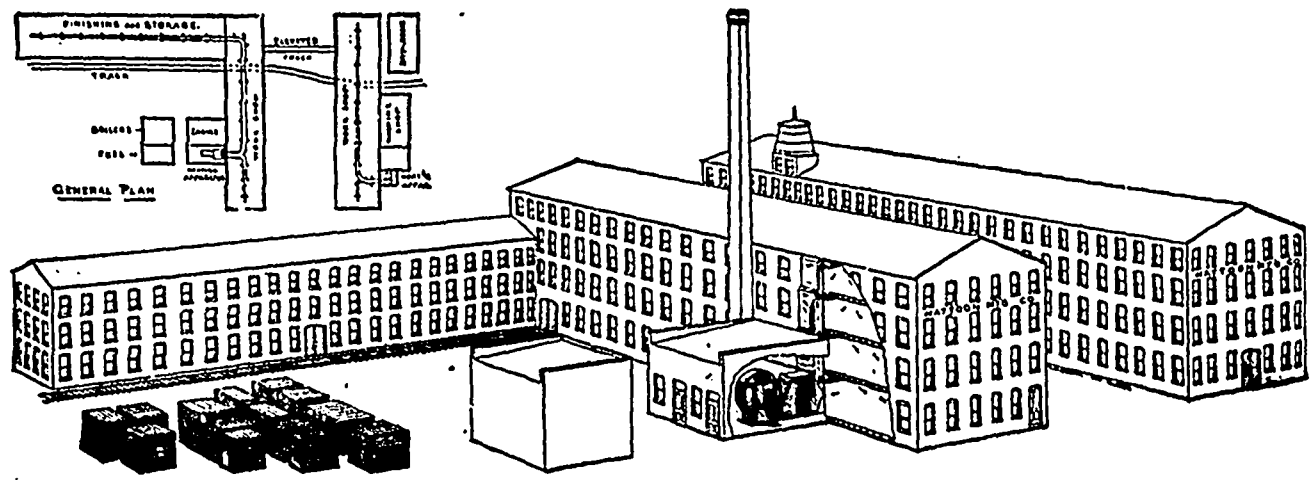
Air from out-of-doors is led by means of suitable passages to the end of the heater (or air when pure enough may be taken from the apartments in which the apparatus stands) through which it is drawn by the suction of the fan, the inlet of which connects with the heater. The steam pipes are so arranged that the air is compelled to take a more or less zig zag course in passing between them, being thereby brought into intimate contact with every foot of pipe. The result as one of the marked characteristics of this method of heating. The constant bringing of cooler air in contact with the pipes causes a condensation of the steam much greater than that which takes place in the open radiator. The amount of heat given out is measured by the weight of steam condensed, hence the greater the amount condensed per square foot, the less the number of square feet required to do a given amount of heating. In the "Sturtevant Hot Blast Apparatus" this efficiency is increased three to five-fold, or in other words 66 2-3 to 80 per cent. of the pipe is saved when the system adopted in place of one of direct radiation by means of steam coils strung around the rooms. Furthermore, instead of having air cocks and valves all over the building, and steam pipes liable to leak, freeze or cause a fire, and to which an engineer must give the closest attention, there are required in this system only a few valves on the engine and heater, and these are but a few feet apart.

The entire heater (pipes and bases) is enclosed in a steel plate jacket, entirely removed from wood work and the air leaving the blower mouth is only of moderate temperature. This point is of special importance, when the apparatus is used in a dry kiln, the reduction in insurance rates often being sufficient to pay the interest on the cost of the plant.

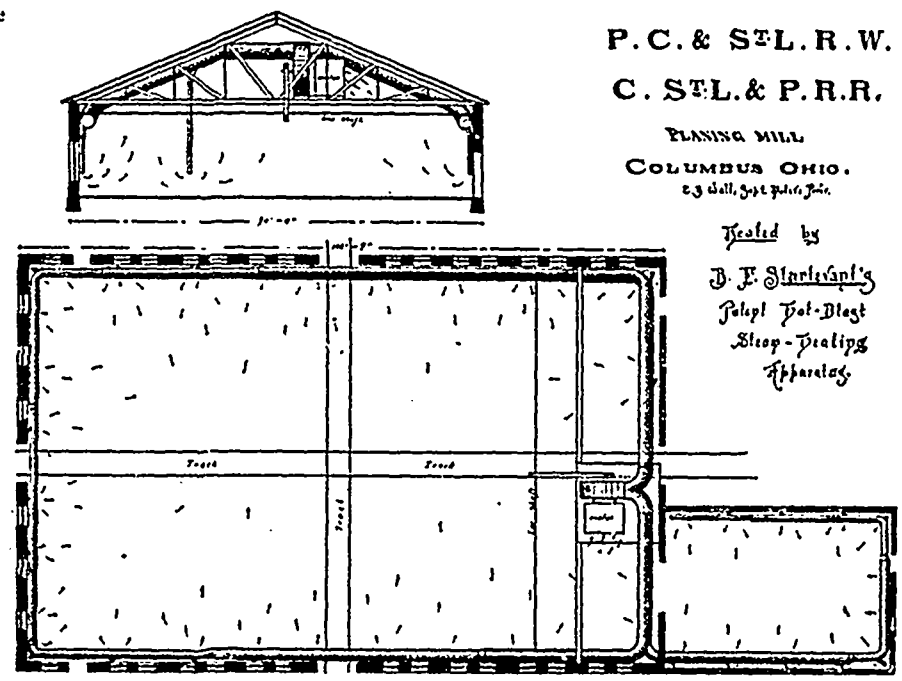
The heated air discharged from the mouth of the fan is conducted to the various parts of the building by a system of pipes or flues dependent in their arrangement upon the construction of the building and the use to which it is to be put. The entire apparatus is very compact and occupies but little space, can be made of any desired form and placed in any position. In one story shops the monitor pitch in the roof affords an excellent place for the apparatus, entirely out of the way, leaving the floor unobstructed, where such location is not possible the apparatus may be placed in any convenient position within the building or in the basement, when such exists or (as is very often the case) in a small special building adjacent to the main building.

The manner of warm air distribution in wood-working establishments is very clearly shown in the accompanying cuts which represent two decidedly different classes of structures. The one story building is the planing mill of the P. C. & St. L. R. R. at Columbus, Ohio, and forms one of the plant of six independent buildings recently fitted with heating apparatus by B. F. Sturtevant. The other cut illustrates, as arranged by the same party, the extensive furniture factory of the Matton Mfg. Co. of Sheboygan, Wis. These buildings, among many as heated by the Sturtevant system, have been chosen as typical of their classes. The former stands for the ordinary class of mill buildings of one story with pitch roof. In this case the apparatus is seen to be well out of the way, interfering with none of the machinery and being drjven direct from line shaft. The air is distributed through a system of galvanized iron pipes extending entirely around the interior of the building close to the walls and just below the level of the eaves. The complete circuit made by these pipes insures an equal and constant distribution of the air, any lack from one direction being made up from the other direction. Economy of material as well as more uniform pressure is secured by gradually reducing the sizes of the pipes (proportionately to the outlet from them) as they recede from the blower. The position occupied by these pipes is such that they are entirely out of the way, interfering neither with workmen, shafting or belting. From these mains the heated air is delivered through small verticle pipes extending down to within a few feet of the floor. By proper designing the velocity of the air, and the relative area of the pipes is such that the air is discharged with just sufficient impulse to fall to the floor which is thereby warmed. The natural circulation caused by the cooling action of the outer walls aids in this action as it also does in causing the warm air delivered from the pipes to move gradually towards the center of the building and thence to raise to the pitch of the roof where it may be allowed to escape if desired.

By placing the heating system near the outer walls the vulnerable point is attacked, and currents of cold air through crevices in the walls must encounter a warm body of air before reaching the workmen. Dampers or registers may of course be placed in the outlet pieces to regulate the delivery of the air.



PLANT OF THE MATTON MFG. CO., SHEBOYGAN, WIS.



P. C. & ST. L. R. W. PLANING MILL, COLUMBUS, O.

Although as originally designed provision was to be made for taking fresh air from out of doors and passed it through the heater, yet up to the present time, all air has been taken from within the building itself. Owing to the comparatively small number of workmen in such shops the fresh air which enters through cracks, open doors and windows, keeps the atmosphere sufficiently pure and decided economy is secured by repeating the already warm air. The amount of steam required in the heater is proportional to the number of degrees through which the air is heated. If then air of 60 degrees temperature can be taken from the building in place of air at 0 degrees from out of doors, and if in either case it is to be heated to 120 degrees there will be a resultant saving of 50% in the amount of steam consumed.

The plant of the Matton Mfg. Co., is representative of that class of buildings devoted to the manufacture of various articles from wood, being comparatively narrow with considerable longitudal extent, and having several floors. As will be seen by the small plan a separate apparatus was provided for each building and as shown in perspective, the fan is driven by a direct connected engine in any projections within the rooms, a delivery flue was built into the side of the building and the pipe main for the various floors are taken out from this, the vertical flue being proportionally reduced in area. On account of their narrowness a central distributing pipe was adopted from which the air is delivered through properly spaced outlets. This arrangement results in the greatest saving of pipe, the diameter being reduced proportionally to the outlets, thereby securing both economy of material and uniformity of pressure and discharge. In both cases here shown the system has met with unqualified approval, accomplishing successfully all that was required of it.

Briefly summerized the principal advantages of the Sturtevant system of heating are —compactness. The entire Hot Blast apparatus is so closely combined that no steam piping is required throughout the building, and all valves are near at hand. Economy—Only one-third to one-fifth the pipe is required that would be necessary in a system of open steam coils in the various parts of the building. It costs nothing to run the engine for the exhaust steam is used in the heater. Safety — All the steam pipe is enclosed in a steel jacket entirely removed from proximity to any wood work and all danger from fire is absolutely avoided. The lessened insurance rates often pay the interest of the plant. Efficiency—Being [illegible] the heated air reaches all parts of the building and the occupants are not only warmed but when desired are provided with constant changing fresh air. Controlability—The entire system is under immediate control. The amount may be varied by the dampness or by changing the speed of the engine, while its temperature is dependent upon the amount of steam admitted to the heater.

The Sault Ste. Marie Canal.

The great water power canal at Sault Ste. Marie is finally a fixed fact. At a very enthusiastic meeting held recently the balance of the $100,000 asked from the citizens, as a bonus, was cheerfully subscribed, and with a like sum from the LaCrosse syndicate—the amount necessary for start will be secured. The work begins on the 16th inst., and will be pushed to a final completion as rapidly as men and money will accomplish the work and it is anticipated that it will be finished within a year. The undertaking is a gigantic one, and in magnitude the "Soo" power canal will far exceed anything of the kind on the continent. The total length is 14,100 feet; average width, 100 feet, with a depth of fifteen feet. The mill pond to this great raceway is quite large, being 32,000 square miles in extent, viz., the whole of Lake Superior. This is beyond question the largest mill pond in the world, and affords an exhaustless supply of water for the multitude of industries projected at the "Soo." Apart from the possibilities of Niagara, that of Sault St. Marie far transcends all the world beside. The canal will give 18,000 horse-power and has a current of four miles per hour. Its course runs back of the present village, but within a few years the "Soo" will be be densely built up, so as to place the canal in the center of the fast growing city. The work of making it will be one of great labor, as for 2,000 feet it will have to be cut through solid trap rock. But the work when completed will be one for countless ages to come, and as a manufacturing centre, Sault Ste. Marie will have no successful rival in the world.