HINTS TO THE YOUNG STEAM FITTER.

BY WM. J. BALDWIN.

RADIATION.

Heating surfaces are divided into three classes: 1st, direct radiation; 2d, indirect radiation; and 3d, direct-indirect radiation.

Direct radiating surfaces embrace all heaters placed within a room or building to warm the air, *and are not directly connected with a system of ventilation,*

The best place in a room to put a radiator is where the moist air is cooled—namely, before or under the windows, or on the outside walls. When the heater is a vertical tube radiator, or a short coil, which can occupy only the space of one window, and, as often happens in corner rooms, there are three windows, the riser should be so placed as to bring the line of radiators in front of and under the windows where they will do the most good—say the middle window; or, better still, when a small extra cost is not considered, use two heaters, and place one in front of each extreme window.

When the room is large and has many windows, the heating surface should be divided into as many parts as there are windows; or, if the occupants object to so many windows being partly obstructed, divide into half as many parts and distribute accordingly.

In schools or buildings with many windows, where children or persons cannot change their positions, but have to remain seated for several hours at a time, care must be taken that the heating surface is very evenly distributed. A miter coil run the whole length of the outside wall is best, but if any kind of short heaters are used, every window should have its quota. Should a single window be left unprovided for, it will be found by experiment that a cold current of air will fall down in front of said window and flow along the floor in the direction of the nearest heaters, and cause cold feet to any who are in its passage.

The natural currents in a room, with the outside atmosphere the coldest, are down the windows and outside walls, and up at the center or rear walls. This downward and cold current should be met by the heated and upward current from the radiator, and reversed and broken up as much as possible.

Indirect radiation embraces all heating surfaces placed outside the rooms to be heated. *and can only be used in connection with some system of ventilation.*

There are two distinct modifications of indirect radiation. One where all the heating surface is placed in a chamber, and the warmed air distributed through air ducts and impelled by a fan in the inlet or cold air duct. The other where the heating surface is divided into many parts, and placed near the lower ends of vertical flues leading to the rooms to be heated.

The first of this class—namely, *chamber-heat*—has not proved a great success, and architects and steam heating engineers are likely to have very little more to do with it, as it has been found that in windy weather it is almost impossible to force air to the side of a house or building against which the wind blows. The second of this class has done better, as it admits of taking advantage of the force of the wind to aid in bringing the warmed air into the rooms.

In estimating the heating surface for low pressure indirect radiation it is well to nearly double what would be used for direct radiation; but when the steam pressure is high, and the supply ample to maintain the pressure in the heater, the surface may be reduced directly as to the increase in temperature of steam to be carried.

The indirect heater is usually boxed, either in wood lined with tin or in sheet metal. The former is best when the cellar is to be kept cool, as there is a greater loss by radiation and conduction through metal cases; otherwise metal is best, as it will not crack, and when put together with small bolts, can be removed to make repairs without damage.

The vertical air ducts are usually rectangular tin flues built into the wall when the building is going up; sometimes they are only plastered; but round, smooth metal linings with close joints give much the best results. The cross section of an air duct should be comparatively large, as a large volume of warmed air with a slow velocity gives the best result.

There should be a separate vertical air duct for every outlet or register. In branched vertical air ducts, one is generally a failure.

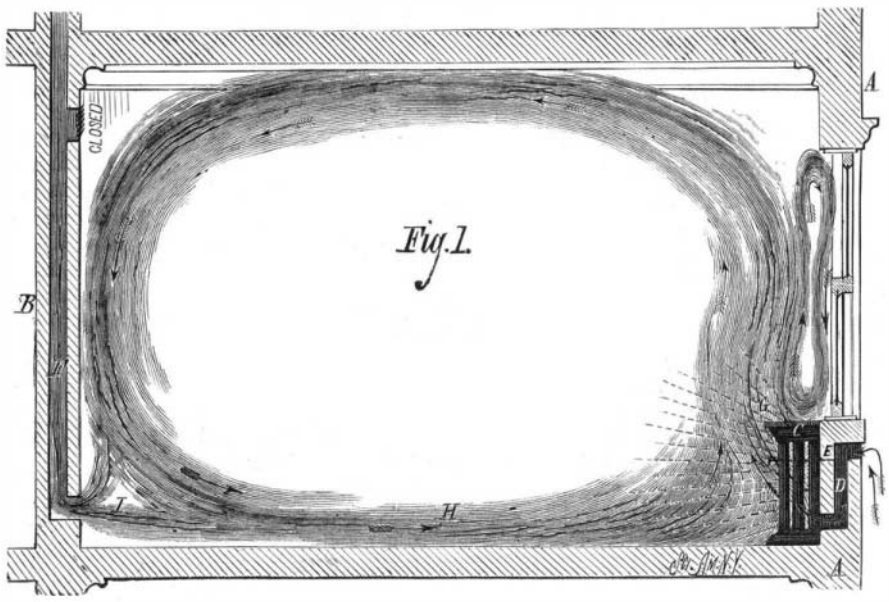
The heated air from one heater, may be taken to two vertical air ducts, when they start directly over it; but one should not be taken from the top, and the other from the side; if so, the latter will be a total failure, unless the room to which the flue runs is exhausted: *i. e.*, the cold or vitiated air of the room is drawn out by a heated flue or otherwise.

Inlet or cold air ducts are best when there is one for every coil or heater; and its mouth or outer end, should face the some way as the room to be heated. By this means when the wind blows against that side of the house, the pressure is into the cold air duct, and materially assists the rarefied column of air, in the vertical duct, to force its way into the room.

Often the steam heater uses only one large branched cold air duct; but this system will give trouble unless all the rooms are exhausted.

A steam heater should not take a job of indirect heating unless the building has been arranged especially for it with some efficient system of flues, enough for a total change of air in a given time, say not to exceed one hour.

Ordinarily the architect makes no provision for drawing out the cold or depreciated air, other than an open fireplace, and often they make *no* outlet. Such a room cannot be warmed by indirect heating at all. But when there is a chimney, or an unwarmed outlet or foul air flue, the heated column of air in the vertical hot air flue is generally sufficient to force its way through. Very large rooms with high ceilings are difficult to warm by indirect heating.

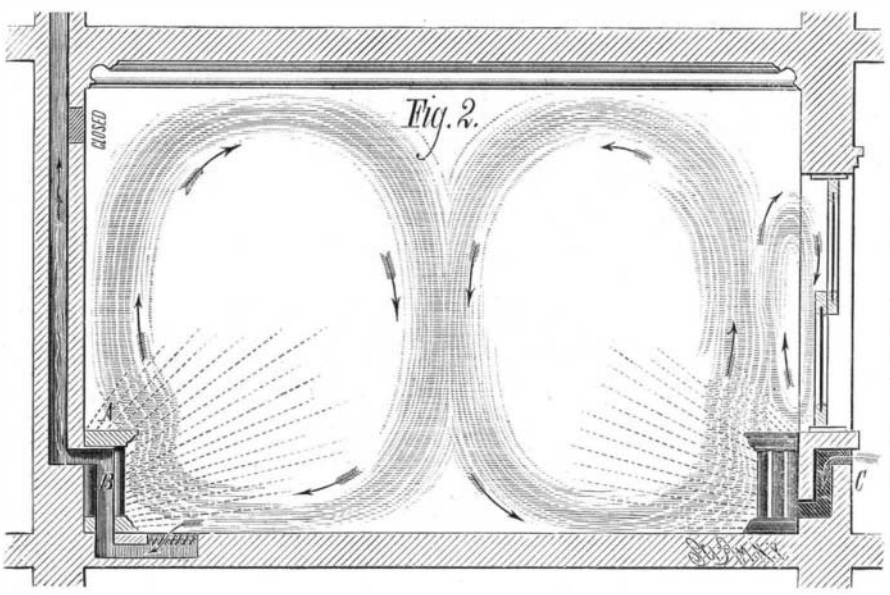


DIRECT RADIATION WITH VENTILATION.

A cheap and good way to draw, or exhaust, outlet or foul air flues, is to connect them all to one large annular flue, around the boiler chimney flue.

Warmed fresh air flues, should be in or near the outside walls, and should discharge near the windows; and foul air flues should be in the inner walls, and have an opening near the floor and ceiling, with register valves, to allow the occupant to use either or both as he thinks proper.

To find the time in *minutes*, it will take for a room of known cubical contents, to change its air through a flue of one square foot cross section: Multiply the velocity of the air through the flue in feet per second, by 60, and divide the result, into the cubical contents of the room in feet. Thus: Velocity of air 5 feet × 60 = 300 ÷ into cubical contents, say, 4,000=13·3 minutes.



MODIFICATION OF DIRECT-INDIRECT RADIATION.

To find the time for other sized flues, multiply the result by the cross section of flues in square feet or fractions thereof.

The velocity of the air in heating flues with only a natural draught, rarely reaches 8 feet per second, no matter what the conditions; and 2 feet, 4·5 feet, and 6·2 feet respectively, being fair averages of velocities for first, second, and third floors of a house.

Direct-indirect radiation embraces all heating surfaces placed within or partly, within the room to be warmed, *in direct connection with some system of ventilation.*

Heaters of this class are usually placed on the outside walls or under windows, following the same general rules as direct radiation, excepting the clusters are deeper, so as to prevent the cold air from rushing through without being warmed.

Fig. 1 shows a much used modification of this style of heating. It is a section of a room showing the action of the currents of air. A A, outside wall; B, partition wall; C, radiator; D, inlet flue; E, damper or valve; F, ventilating flue or foul air outlet; G, fresh air mixing with the air of the room; H, air of the room passing along the floor to the heater; I, a percentage of the air in the room passing off by the ventilator.

Fig. 2 shows another modification of direct-indirect radiation, where some of the *local heat* is employed to exhaust or draw out the vitiated air of the room. The arrows show the action of the air currents. A is a section of a radiator built with a sheet iron flue, B, between the tubes, and passing through a hole, cored in the base, which connects with the register in the floor, and a foul air flue, in the wall.

Some of the radiant heat, etc., from the radiator, A, warms the sheet iron flue, B, which in turn warms the air within it, causing an acceleration of the current in the foul air flue, and consequently drawing an equal amount of fresh air in at the opening, C.

There is this further distinction between the three systems of radiation: Direct radiation warms only the air of the room and maintains the heat. Indirect heating warms only the air that passes in and cannot warm the same air twice, and consequently has to raise the temperature of all the air that passes, from what it is outside, to what is necessary to maintain the temperature of the room, and make up for the loss by ventilation. Direct-indirect radiation warms part of the air over again, and warms all the air there is admitted for ventilation, which latter can be varied to suit the occupants.

NEW INVENTIONS.

Mr. Ole C. Nuubson, of Mount Horeb, Wis., has patented an improved milk cooler, which consists in a milk cooler with trough, gauges, and faucets, and divided into separate chambers by a diaphragm whose central tube extends through the cover.

Mr. Chas. V. Richards, of Skowhegan, Me., has invented an improved clasp, which consists in a case having its edges so arranged as to form jaws, between which a flanged finger piece is pivoted. A wire loop or tongue is adapted to pass through a slot in the case, and has its ends passed through the flanges of the finger piece.

An improved buckle shield, patented by Mr. David Mosman, of New Britain, Conn., consists of a metal plate with curved ends provided with transverse slots and arranged over the buckle, the object being to ornament the harness and to prevent the horse's tail and mane from catching in the buckle.

An improved lubricator, patented by Mr. Oscar A. Rollins, of Campello, Mass., relates to the class of oil pumps designed for supplying oil for lubricating purposes to steam engine cylinders. It consists of an oil forcing piston driven with a intermittent motion by connection with some of the moving parts of the engine.

Mr. John F. Curtice, of Fort Wayne, Ind., has patented an improved device for heating sad irons upon the top of a stove. The invention consists in an improved sad iron heater formed of an open bottomed box divided into compartments by vertical partitions, having the middle part of its top stationary and provided with a handle, and the side parts of its top inclined and formed of doors shutting air tight, or nearly so, and provided with spring catches, to adapt the device for use in heating sad irons upon the top of an ordinary stove.

Mr. Henry S. Kratz, of Chicago, Ill., has patented an improved shelf for attachment to stovepipes for the purpose of supporting culinary vessels, dishes, clothes, or other things requiring to be kept warm or dried.

An improved road-scraper, patented by Mr. Samuel H. Dudley, of Bantam Falls, Conn., consists in the combination of guard bars having their upper ends bent forward at right angles to fit into the notches in the upper edge of the plank, and having sockets formed in their lower parts to receive the rear ends of the draw rods, with the plank, the draw rods and the staples of a scraper.

Mr. Charles A. Gale, of Piqua, Ohio, has patented an improved apparatus for taking solar prints from negatives. The invention consists in the combination of the two frames, hinged to each other at one edge, and provided at the other edge with a bolt and hand nut or equivalent clamp.

Mr. Antoine B. Dembrun, of New Orleans, La., has invented an improved furnace for cooking and baking, and various other uses. It consists in the combination of a furnace, an iron basket, and a hinged grate to form a compact, convenient, and portable furnace.

Messrs. Cornelius Bennett and Parker Burnham, of Silver City, Territory of New Mexico, have patented an improved apparatus for separating gold and other metals from dirt and sediment by what is known as the "dry" process. The invention consists in a combination of devices which cannot be explained without engravings.