of 70 per cent., and to be saturated when it leaves the body at a higher temperature, then at least 4 cubic feet of air per minute will be required to carry away this vapor.

Taking into consideration these various factors, it becomes evident that at least 4½ cubic feet of fresh air will be required per minute for respiration, and for the absorption of moisture and dilution of carbonic acid gas from the skin. This, however, is only on the assumption that any given quantity of air, having fulfilled its office, is immediately removed without contamination of the surrounding atmosphere; but this condition is impossible, for the spent air from the lungs, containing about 400 parts of carbonic acid gas in 10,000, is immediately diffused in the atmosphere. The carbonic acid does not fall to the floor as a separate gas, but is intimately mixed with the air, and equally distributed throughout the apartment.

It must then be evident that ventilation is, in effect, but the process of dilution and that when the vitiation to be maintained in the apartments is decided, the necessary constant supply of fresh air to maintain this standard may be very easily determined. For the purpose of calculation, 0.6 cubic feet per hour is accepted as the average production of carbonic acid by an adult at rest, and the proportion of this gas in the external air is as 4 parts in 10,000. If, therefore, the degree of vitiation of the occupied room be maintained say at 0.6 parts in 10,000, there will be permissible an increment of only 2 parts in 10,000 above that of the normal atmosphere, or 2 divided by 10,000 equals .0002 of a cubic foot of carbonic acid in each cubic foot of air. The 0.6 cubic foot of carbonic acid produced per hour by a single individual will, therefore, require for its dilution to this degree 0.6 divided by .0002, equals 3,000 cubic feet of air per hour. Upon this basis the following table has been calculated.

Cubic Feet of Air Containing 4 Parts of Carbonic Acid in 10,000 Supplied per Person.

Per hour	6000	4000	3000	2400	2000	1800	1714	1500	1200	1000	525	375	231
Per min.	100	66.6	50	40	33.3	30	28.6	25	20	16.6	9.1	6.2	3.8
Degree of Vitiation of the Air in the Room. (Parts of Carbonic Acid in 10,000).	5	5.5	6	6.5	7	7.33	7.5	8	9	10	15	20	30

The figures indicate absolute relations under the stated conditions, and are generally applicable to the ventilation of schools, churches, halls of audience and the like, where the occupants are reasonably healthy and remain at rest. But the absolute air volume to be supplied cannot be specified with certainty in advance, without a thorough knowledge of all the conditions and modifying circumstances, in fact, the climate, the construction of the building, the size of the rooms, the number of occupants, their healthfulness and their activity, together with the time during which the rooms are occupied, all have their direct influences. Under all these conditions, it is readily seen that no standard allowance can be made to suit all circumstances, and results will be satisfactory only in so far as the designer understandingly, with the knowledge of the various requirements as they have here been given, makes such allowance.

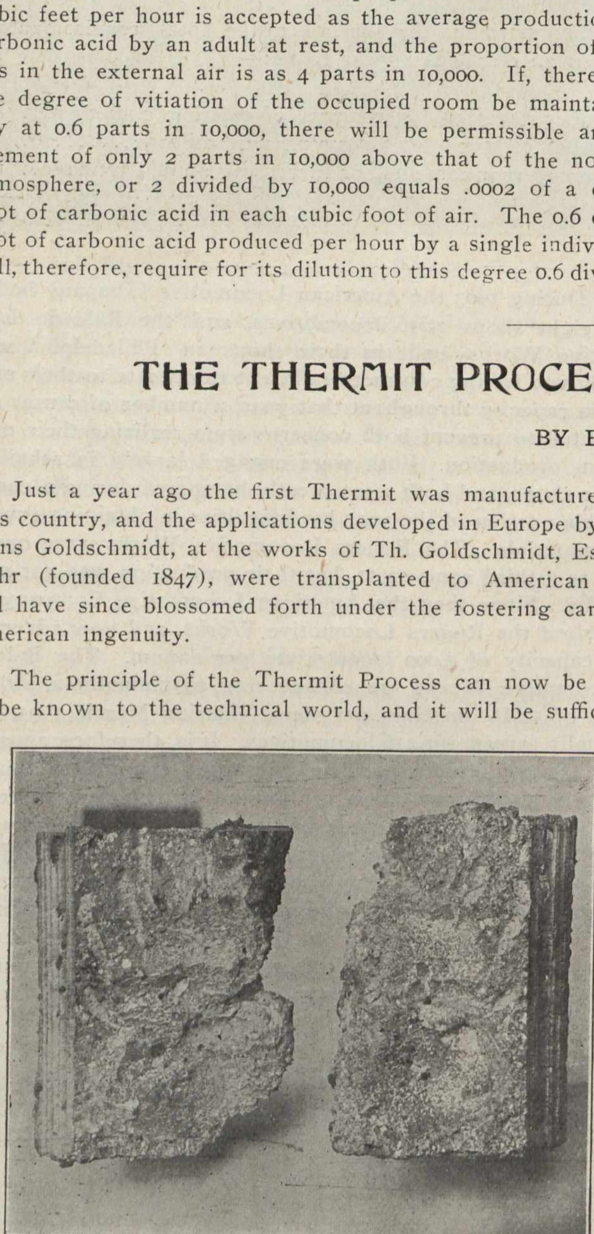
—Extract from Treatise on Ventilation and Heating by B. F. Sturtevant Co., Boston, Mass.

THE THERMIT PROCESS IN AMERICAN PRACTICE.*

BY ERNEST STUTZ.

Just a year ago the first Thermit was manufactured in this country, and the applications developed in Europe by Dr. Hans Goldschmidt, at the works of Th. Goldschmidt, Essen-Ruhr (founded 1847), were transplanted to American soil and have since blossomed forth under the fostering care of American ingenuity.

The principle of the Thermit Process can now be said to be known to the technical world, and it will be sufficient



Break of Welded Bar, 2½ x 2¾, After Pressure of 50 Tons.

to state that through the ignition of finely divided aluminium and metallic oxide, a reaction is started which produces heat of about 5,400° F., and at the same time reduces the iron oxide to a metallic iron almost free from carbon, in a highly superheated liquid state. Thermit Steel has practically twice the temperature of open hearth steel, and a correspondingly greater fluidity. By suitable additions of carbon, in the form of steel punchings, chilled iron shot or Ferro-Silicon, its hardness, and by addition of Manganese, its toughness can be increased to any suitable degree.

The following analyses will confirm this.

The first is one of pure Thermit Steel; the other of the steel in the riser of a welded steel locomotive frame, drawn out under the hammer into a bar some three feet long, and turned down and broken.

Analysis of Thermit Steel.—Illinois Steel Co., The Rookery, Chicago, Ill.

Carbon.	Manganese.	Silicon.	Sulphur.	Phosphorus.	Aluminium.
0.05	0.10	0.204	0.04	0.05	0.18

Tensile Strength, lbs. per sq. in	Elongation, per cent. in 8 inches.	Contraction of Fracture.
59,320	25.33%	59.6%

Pennsylvania Railroad, Altoona.

Thermit Steel, with Addition of 2% Carbonless Manganese 5% Iron Punchings, (Calculated on Amount of Thermit).

Carbon.	Manganese.	Silicon.	Sulphur.	Phosphorus.	Aluminium.
0.102	2.330	1.227	0.034	0.070	....

Tensile Strength, lbs. per sq. in.	Elongation, per cent. in 8 inches.	Appearance of Fracture.
91,600	21.5	Silky.

The simplicity of outfit and manipulation and the speed with which the reaction does its work are its chief recommendations for industrial purposes.

In a crucible some 20 inches high and therefore easily transportable, in half a minute can be produced 30 lbs. of

*A paper read at the annual meeting of the American Society for testing materials, Atlantic City, July 1st, 1905.