

in which the aluminous element predominates. The hearth is of lime, magnesia or pure alumina, and the crucible is of carbon lime or magnesia. The latter portion is made in a single piece, by molding a mixture of pure graphite, gas carbon, or pure coke, in a cylindrical shaft or mold of bloom plate, and raising the whole in temperature to nearly a dark red heat for some hours. A very hard compact mass without fissures or joints is thus obtained.

The hearth is enclosed in a conical sheet iron shaft, secured by dowels to the pig iron plate which carries the tunnel. The crucible is movable, and simply rests against the lower part of the hearth. It is held in place by small blocks. The entire arrangement is such that the working parts of the apparatus can be easily renewed or repaired in a short time. The blast is heated to at least 726 Fah. and its pressure equals from 5.07 to 5.85 inches of mercury.

AUGUSTE DE LA RIVE.

This distinguished philosopher, who was among the foremost of European savans for more than half a century, died on the 29th of November, at Marseilles, France. He was on his way to one of the numerous health resorts of the South of France, but was unable to reach it.

Among De la Rive's earliest investigations are to be found some important researches on the specific heat of many simple and compound gases, and here commenced his fame, and his influence in the Academy of Geneva, of which he was, up to the day of his death, the guiding spirit. The science of electricity was scarcely in existence at this time (1825), and its rapid development during the past 50 years has received much impulse from the labors of De la Rive, whose zeal in investigation was indomitable. In 1840, he discovered the value of the voltaic current in depositing gold on silver and brass, and at once published it, declining to make any profit from the invention. For this, the French Institute awarded him their premium of \$600.

De la Rive was a man of almost universal culture, and his society was sought by literary men, politicians, and artists, as well as by his fellow scientists. The Swiss Confederation intrusted him with the delicate mission of laying before the British Government the danger that Switzerland was exposed, to by the absorption of Savoy and Nice into France, and he had the satisfaction of obtaining from Lord Palmerston a declaration that any attempt on the part of France against the independence of Switzerland or Belgium would be considered a *casus belli* by England.

The labors of De la Rive were universally recognized as of the highest value, and honors and distinctions from scientific bodies in all parts of the world were conferred upon him. He died in the 73d year of his age.

DEATH IN THE SCHOOL ROOM.

Despite the frequent casualties due to imperfect ventilation, together with the generation of noxious gases in large populated buildings, though assisted by the oft repeated counsels of the best sanitary authorities as to the proper mode of remedying the evil, our progress in learning how to afford a constant supply of pure fresh air is, at best, sadly discouraging. The *New York World*, with commendable enterprise, has recently employed Dr. Endemann, of the Board of Health of this city, to make a careful chemical examination of the condition of the atmosphere in our public schools; and the results of that gentleman's investigations, as published with much detail in the above mentioned journal point to a state of affairs that is simply disgraceful.

Graham and Liebig have pointed out that the mean amount of oxygen in the atmosphere is 20.9 volumes per cent, leaving a balance of 79.1 nitrogen, carbonic acid, and other constituents. The normal quantity of carbonic acid gas is, however, very small, and is estimated by De Saussure at 4 parts in 10,000. Dr. Parkes considers that an increase of this proportion to 6 parts in 10,000, or 0.06 of 1 per cent, is the highest permissible impurity. In analyzing the samples of air, Dr. Endemann used Pettenkoffer's method, by which the air is introduced into a glass globe, together with a solution of caustic baryta of definite strength. The alkalinity of the baryta solution is diminished in proportion to the amount of carbonate of baryta formed, and will be neutralized by a proportionally less quantity of a given solution of oxalic acid, thus furnishing the elements of an accurate calculation of the amount of carbonic acid in the air contained in the globe. A measured amount of lime water of known strength may be used instead of the caustic baryta solution. The effect of the carbonic acid is then to neutralize and precipitate a quantity of lime in the form of chalk, and the oxalic acid determines the proportion of lime subsequently remaining. The difference in the quantity of lime before and after the action upon the air enables the operator to calculate the existing ratio of carbonic acid.

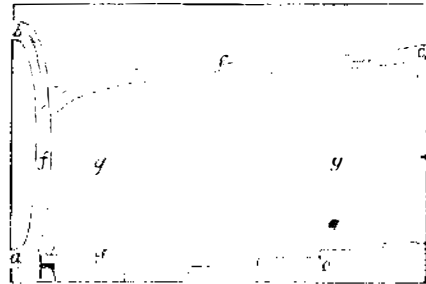
Carbonic acid is the product of perfect combustion and of the breathing of animals, the oxygen in the latter case uniting with carbon in the system; and the air expired contains about 4 1/2 per cent of carbonic acid gas. This, however, in open atmosphere, soon diffuses itself, but, if confined in circumscribed quarters, contaminates the air to such an extent that, if atmosphere containing one two-hundredth part of it be breathed, headache and lassitude result. Such a proportion is, however, far from fatal, for Berzelius points out that five or six per cent may be inhaled with safety, and that life may continue for some time in an atmosphere containing thirty per cent. This latter assertion, we imagine, must be based on an extreme case, as it is generally conceded that twenty-five per cent of carbonic acid is sufficient to cause speedy death. Dr. Endemann, in his report, exemplifies the mortal effects of the gas in a statement that children

breathe about fourteen cubic feet of air per hour, and this air, when exhaled, will contain 430 times the normal amount of carbonic acid. If 100 persons be placed in a room, say 18 feet square by 11 feet high, and the doors and windows be hermetically closed, so that there could be no circulation, in about two hours and a half all the air would be inhaled and probably not a soul would be living.

Space necessarily forbids our following the carefully prepared details of the report before us, but the citation of a few cases will serve to show the flagrant neglect which must characterize the sanitary regulations of our schools:

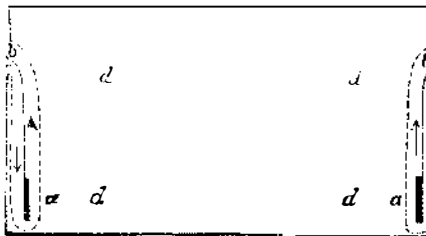
- (1) Rooms 18 by 16 feet: 42 scholars; temperature, 62° Fah.; carbonic acid in 10,000 parts, 26.1, or 6.6 times the normal amount. The air was described by the inmates as generally oppressive.
- (2) Large class room, 20x18 feet: Odor very foul; 47 scholars; 4 times the normal amount.
- (3) Class room on top floor: 65° temperature; air described as constantly bad, and very correctly, as analysis showed 8.1 times the normal quantity of carbonic acid. In the next two tests, this proportion is 7.5 and 5 times.

The annexed engraving is a specimen of the heating and ventilating arrangement in the well known 12th street school, an establishment accommodating 1,200 female scholars. *a* is the register, and *b* the ventilator. The heat, entering, roasts



the back of the teacher at *d*, ascends, and immediately escapes at *b*, or, in case the window is open, diverges into another current, *p*. The cold, heavy carbonic gas is, as is evident, totally unaffected by the draft, and settles down upon the children at *e*. Mr. Lewis W. Leeds made a report regarding this school some time since, which, for some occult reason, the Board of Education saw fit to suppress. He pointed out the difficulties above indicated, and also explained a neat arrangement of the janitors, in converting the fresh air ducts to the furnaces into hen roosts, partitioning the same off, so that the air supply was obstructed; but a copious odor of poultry was added to the hot current. "Fowl" air, he very truly remarks.

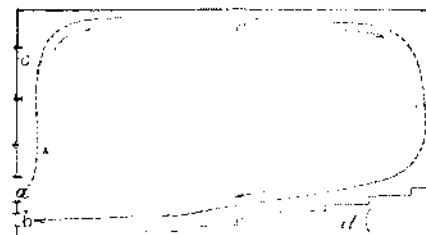
Example 6 consists in analyses made in a room heated by steam; teacher and children all complaining. The temperature was 60°, and 8.3 times the normal proportion of carbonic acid was indicated. Passing over succeeding tests, none of which show a larger percentage of carbonic acid than last mentioned, we notice repeated cases of the most dense ignorance displayed in the steam heating arrangement. In one school the ventilators were shut, choked by rust, and the janitor had no conception of their use. In another the steam heaters were arranged after the fashion indicated in the next



engraving. The current of air from the heater, *a*, escapes through the opened window, while the cold air from the latter pours down. There is a constant circulation, as indicated by the arrows, at the sides of the room, while the center of the apartment becomes packed with foul air.

There is no necessity of entering into further minutiae. In this city there are 59 grammar schools, 42 primary schools, and 6 schools for colored children, and the number of pupils thus subject to the dangers we have noted is estimated at from 80,000 to 100,000. There is unquestionably a decided need for simple and efficacious plans of ventilation, which may be promptly put in practice in these institutions at no very large expense. Dr. Endemann suggests the following system:

Here the warm fresh air, flowing in at the register, *a*,



ascends to the top of the room. The windows being closed, it cools gradually and descends, returning to the ventilator, which is either below or on a level with the register, where it is drawn off and escapes through the flue.

The *New York World* has done good work in thus exposing the shameful condition of our schools, and parents would do well to profit by the warning. It supplies the explanation of many a pale face and aching head, if not of severer maladies, engendered by a system of slow poisoning. Other cities may take the hint, and investigate their own educa-

tional buildings. To architects and builders generally, the subject expressly addresses itself for a speedy and efficient solution.

TO OUR FRIENDS.

In dealing with our legions of friends, it is our earnest desire to give satisfaction to every one of them. But should any suppose that we have overlooked their requests or slighted their interests, we hope they will at all times promptly inform us. Postal cards only cost a penny. Speak plainly, and do not hesitate to complain.

Our mail writers and folders are under special injunctions to write our subscribers' names upon the envelopes legibly, and fold each paper neatly. We shall be glad to be informed if anybody receives slovenly work from this office.

At the beginning of the year, many thousands of subscriptions are renewed, new clubs formed, etc. If any person fails to receive the paper, or any premium to which he is entitled, we will thank him to inform us promptly.

If, by any chance, any editor or publisher, who by any agreement is to receive our paper, should fail to receive it, we shall be glad to be informed.

Persons who have written to us upon business or sent enquiries for the paper which have not been answered, are requested to repeat their enquiries. Letters sometimes fail to reach us. Be particular to mention the State in which you live. In some cases we are perplexed to know where to direct, when no State is given and there are many post offices of the same name.

SCIENTIFIC AND PRACTICAL INFORMATION.

FOG SICKNESS AMONG ENGLISH CATTLE.

The recent heavy fogs about London and its vicinity have been productive of an unusually large outbreak of sickness among the cattle gathered at the Smithfield Club show. The sufferings of the animals are described as very great, and are so clearly traced to the peculiar state of the weather as to excite apprehension that some similar malady may attack the stock on this side of the water, if the dense mists, which have prevailed to such an extraordinary degree during the present winter, continue. The *Field* says that, on the third day of the show, which opened with every appearance of a successful exhibition, and with a fine variety of prize cattle, ninety of the animals were removed, seemingly choking, and it was found necessary to slaughter fifty immediately. The illness was not confined to the single locality, but affected the horned cattle in the markets and in the suburbs; so that it was not, as has been suggested, due to foul air or lack of ventilation in the Smithfield Club building. Sheep and pigs, moreover, were not affected. The treatment used was an abundant supply of pure air and a sedative tincture of aconite. The sickness lasted for about five days, until the dissipation of the fog.

NEW OBSERVATIONS OF STELLAR MOTION.

Dr. H. Vogel, at the new observatory at Rothkamp, near Kiel, Germany, has recently made some researches into the movements of certain stars with relation to the earth by observing the position of the rays of their spectra. The stars thus examined are α Lyra and α Aquila. It appears that α Lyra is approaching the sun at the rate of 52 miles per second, a result which accords with previous observations made by Huggins, in which the speed was estimated at between 45 and 54 miles. α Aquila is moving in similar direction at the rate of 48 miles per second. Dr. Vogel applied his method to the constellation of Orion some time ago, and determined that it receded from the sun at a speed of about 16 miles per second.

DECORATING WOOD BY PRINTING.

Mr. Thomas Whitburn, at a recent meeting of the English Society of Arts, described a process, recently patented by him, adapted to express, on flat surfaces of wood, effects of light figures on a dark ground, or of dark figures on a light ground, or of figures light and dark in parts on a ground intermediate in shade. The designs or patterns are engraved in the ordinary way on box wood, and, from the blocks, the wood is imprinted on a common hand printing press with printer's ink. The process is capable of being used with two or more colors, and is designed for the ornamentation of door panels, furniture, etc.

NEW PHOTOGRAPHIC PROCESS.

We have heretofore mentioned a recent improvement in dry plate photography which consists in using gelatin instead of the ordinary collodion. The nitrate of silver, for sensitizing the gelatin, is mixed with the gelatin solution. The only drawback to this new process was the fact that the gelatin solutions could not be long preserved, especially in warm weather. This difficulty has been lately overcome by Mr. Burgess of England, who prepares the sensitive gelatin solution in any quantity that may be desired, and, after preparation, desiccates or dries the same by spreading the solution on glass plates. The dried film is then broken up into small bits and packed away in dried condition for use. Thus prepared, it will always keep good and only requires to be dissolved in water, to form an excellent sensitized solution.

THE ALIGNMENT OF THE HOOSAC TUNNEL.—Mr. Charles Fosdick, of Fitchburg, Mass., writes to say that the credit of the calculations in boring the Hoosac tunnel and the almost perfect alignment is due to Mr. Frank D. Fisher, the first assistant of Mr. B. D. Frost, the chief engineer. Mr. Fisher is a native of Massachusetts, and was educated at the Institute of Technology in Boston.