the chairs, or even tents of the scraps of carpet, which alone should be allowed in their dominions. But, ten to one, something worse than confusion will catch the eye,—or some sense,—of Sir X. Z. "What is this, nurse, —do you burn gas in the nursery?"—"Only at night, sir."—"And how long has this smell been perceptible?" "Well, I think I perceived something when we came back to town; but we keep the door open. All gas-pipes smell, sir!"—"Bring me a box of matches." The physician strikes a light and approaches it to the gas-pipe, runs it along to the joint, and a slight, fairy-like flash blows out the match. Or the hot-water pipes, carefully and conveniently laid into the night nursery, for the benefit of the bath, bring up aroung them a little jacket of foul air from the scullery or worse places. And then the closet itself,—but we need not go further. These are instances which must be familiar to us all. The little sufferer wanted the physician, indeed; but he was in far more urgent need of the gasfitter, or, rather of the quiet, decided, grave man, who should say, on going down, "My dear Mr. So-and-so, if you wish to have your children grow up healthy, send immediately to your tradesmen, and have all these matters looked to under proper advice."

One example,—and we are sure it will awaken an echo of sympathy from many a one who has learned sad lessons from experience,—may serve for all. In spite of the labours of twenty or thirty years, of books, pamphlets, leadingl articles, lectures, speeches, Acts of Parliament; in spite of the loss of the noblest, the brightest, the dearest from our side by this fatal and subtle poison, to the spread of which, what are to a certain extent sanitary improvements, if unwatched by a competent eye, may directly tend; how many of our palaces, mansions, public offices, are stil maintained as the seed-beds of preventible disease? We make one more appeal. Will not the eminent men who so well know the truth of what we say come forth, and endorse our recommendation; enforce it, rather, by turning advice into practice?—*The Builder.*

BRAKELL'S PUMPING ENGINES AND BLOWERS.

(See page 293.)

The accompanying illustrations show various improvements in detail, and recent adaptations of a simple pump, blower, or air compressor, designed by Mr. C. Brakell, of Westminster chambers, some illustrations referring to the earlier forms of which were given in *The Engineer* of 6th October, 1876. Fig. 1 shows the design—except that the suction and discharge are at the top instead of at the bottom—of two of Brakell's pumping engines now in course of erection for the local board of Skipton, for their sewage works. These engines are capable of raising over seven millions of gallons of sewage per day to a height of 20ft. The same figure also represents a Brakell air compressor for 15 lb. pressure per square inch; and one of similar design is now working at the Sanitas Chemical Works, Bethnalgreen, for 3 lb. blast pressure per square inch.

Fig. 2 shows a pumping engine with vertical shaft, as made for Messrs. John Brigden and Sons of Bridgend, South Wales, capable of raising 80,000 gallons per hour 30ft. high. The space occupied by this engine is 2ft. 6in. diameter, and 4ft. 6in. in height. A similar pump is now in hand for the South Staffordshire Mines' Drainage Commissioners.

Figs. 3, 4, and 5 show modifications of these machines as arranged to be driven by gearing, belt, or hand-power, and have, we understand, been recommended for ventilating purposes in India, to be worked by bullock-power. The mode of obtaining angular reciprocation of the flat pumping diaphragm is clearly illustrated in these diagrams, the diaphragm being seen in the vertical position in Fig. 5.

The construction of these machines admits of very large valve area, and of the application of every description of valve, such as the circular plate valve, illustrated in *The Engineer* of October 6th, 1876; also a modification of the "Perraux," or lip valve; or the flap valve shown in Fig. 5, the quick action of which is secured by steel springs of the spiral, or coil, or flat form, or by similar means. For the sewage pumps a specially designed valve has given much satisfaction, and consists of an India-rubber flap valve working loosely on a fixed brass spindle, the bearing being cast in the solid India-rubber, which is said to entirely obviate the liability of sticking or jamming, common in sewage pump valves. These valves, moreover, allow of a full opening, there being no cross-bars or ribs.—*Engineer.*

It is said that turbine water-wheels have saved three hundred million dollars worth of fuel to this country since their invention.

THE FLOATING DERRICK OF THE NEW YORK DEPARTMENT OF PUBLIC WORKS.

(See page 293.)

The derrick is originally a nautical invention, the original being the sailor's contrivance made of a spare topmast or a boom with the appropriate tackle. This simple contrivance is even now used on shipboard for masting, and for placing boilers, engines, and other heavy articles on shore. The derrick is more commonly used in the United States than in Europe, and has in consequence acquired a corresponding degree of perfection. The Floating Derrick which we herewith illustrate is "Levytyped" and described from *Knight's American Mechanical Dictionary.* This derrick is in use in the New York Department of Docks, and was built under the supervision of Mr. Newton, assistant engineer of the department. It was constructed expressly for the purpose of transporting from the work-yards the blocks of granite and artificial stone that are to form the river wall. Its lifting and carrying power is 100 tons; the float which carries the derrick is of rectangular form, 66 by 71 feet, and 13 feet in depth. The tower which supports the king-post and booms is made of twelve balks of pine, 63 feet 3 inches in length and 14 inches square. These balks or legs are stiffened from one end to the other by struts and braces; their lower ends are bolted into a heavy cast iron circle which pass through the bottom of the floor. At their upper extremity these legs are brought close together and are inserted in a cast iron cap, to which they are bolted. The tower forms a frustrum of a dodecagonal pyramid, 40 feet in diameter at the top. The front or hoisting boom of the derrick consists of two wrought iron box girders, 22 inches deep by $9\frac{3}{4}$ inches wide. These girders are made of planed plates, are spaced 24 inches asunder, and are held parallel by braces of wrought iron; on the upper and inner edges of these girders a track or slide of polished brass is fastened by counter screws. These tracks have a projector which extends a short distance downwards; the carriage is composed of two plates of iron, $\frac{3}{4}$ of an inch thick and spaced 10 inches asunder; its length is 8 feet, its depth 3 feet. The iron boom is supported by 18 diagonal rods, $2\frac{1}{8}$ inches in diameter. These converge near the top of the king-post, and are secured to it by three heavy forgings which straddle the iron cap on the top of the post.

The king-post is of wrought iron, 40 inches outside diameter. It is hollow, and its shell is three-fourths of an inch thick. It revolves in a circular casting, swinging the boom completely around.

All the machinery is placed on the float under the tower, and the levers which operate it and give the various movements are brought together on a platform 35 feet above the deck of the float, so that the person operating them acts in full view of the load that is being handled.—*Polytechnic Review.*

A Pneumatic Railway in London.—A company is now being formed, we learn from the *Engineer*, to construct a pneumatic railway between the South Kensington Station of the District Railway and the Albert Hall. The line will rise the whole way to the Albert Hall, the ruling gradient being 1 in 48. The train will be blown through the tube by an ejector, in other words, a great centrifugal pump, two feet in diameter, fixed close to the District Station, and worked by a pair of condensing engines exerting about 170 indicated horse-power. The tunnel will be of brick, and the floor will be paved. Its cross-sectional area will be 105·5 square feet; at the end of the train is fixed a screen or piston, with an area of 104 square feet, the difference being allowed for windage. The train will consist of six carriages, of very light build, the rail guage being four feet. This train will hold 200 passengers, and the total load will be thirty-two tons, or ten tons less than the weight of a single engine on the Metropolitan Railway. The maximum resistance at twenty miles an hour will be about 2,240 lbs.

Brain and Muscle.—Men who use their muscle imagine that men who use their brains are strangers to hard work. Never was there a greater mistake. Every successful merchant does more real hard work in the first ten years of his business life than a farmer or blacksmith ever dreamed of. Make up your mind to work early and late, if necessary, that you may thoroughly master every detail of the business upon which you purpose to enter. The habit of persistent, rapid work once formed, you have gained a momentum that will carry you very successfully through many a pinch in business where a less persistent worker would find it vastly easier to lie down and fail.