which encroach on the coast, filling the deep dark fiords with frozen snow. As summer advances, those portions of the glacier that project into the sea are undermined by the waves, and fall with tremendous noise, rocking in the foaming water till they gain equilibrium, when, perfect icebergs, they float here and there, impelled by winds and currents. Many are borne by the polar current southward. They meet the warm waters of the Gulf-stream in latitude 50 degrees, where they melt, and deposit the loads of earth and stones borrowed from the Greenland soil. According to Maury, this has probably, in course of time, formed the Grand Bank of Newfoundland. They are in incredible numbers. As many as five hundred have been counted in sight together, ranging from fifty to three hundred feet in hight, and of all sizes up to a mile in extent. Their appearance is very beautiful and no less extraordinary. Gothic churches, Egyptian temples, aerial palaces with pillars and arched windows festooned with crystal draperies, are only some of the inconceivable varieties of form displayed, while they gleam under the summer sun like mountains of burnished silver, with pinnacles and cliffs of clear sapphire or the palest green, from which rush cataracts of limpid water mingled with fragments of ice. These various hues arise from several causes. Bergs are originally composed of fresh water ice of different ages, but that formed from salt water frequently overlays it in parts. A great deal of snow lies on their summits, and forms large ponds of fresh water, when dissolved by the heat of the sun. Finally, the solar rays touch the bergs with colors, changing with the position of the spectator. Only one-eighth of their total thickness is seen above water. Frequently bergs capsize in consequence of the sea undermining their base. An ominous rolling motion gives notice of this event; it continues for some time, and at last the berg heels over and disappears with a terrific plunge, sending up columns of spray. It reappears bottom upwards, balances itself, and floats quietly on with a changed face.

All the antarctic land yet discovered consists of gigantic cliffs without a single opening, three thousand feet high in some places, descending in others to one hundred feet. The whole is faced with ice of enormous thickness, and covered with snow, so that at a glance the eye can scarcely imagine it to be land at all, but for spots showing the dark stone where the cliff is too perpendicular to admit of even ice maintaining its hold. Nothing is so tenacious as the cold of the antarctic regions. In February, the warmest summer month of 1841, the thermometer never rose above 14 degrees at noon near the continent. It is rarely above 30 degrees in the sun at mid-day during summer, and falls in winter more than 50 degrees below zero. The sun stays a week longer north of the equator than it does south, making the winter and night of the antarctic regions longer. South Georgia, in a latitude corresponding with that of Yorkshire in the northern hemisphere, is always covered with frozen snow, and produces scarcely anything but mosses and lichens. The immense preponderance of water south of latitude 50 degrees, allows the fierce westerly winds to blow round and round the world, a perpetual cyclone, keeping the sea in constant agitation.

The two polar circles differ greatly in physical conditions. The antarctic has a marine climate, that is to say, it is equable. Though wet and stormy, it is not subject to extremes of temperature, and it is believed that the south pole must be warmer than the north in winter. Arctic sunshine raises the thermometer to 66 degrees or 70 degrees, and hung in the shade immediately after, the mercury falls to the freezing point. The arctic climate is continental—dry, calm, and variable. The thermometer has a range of about 120 degrees; and while the round of the seasons brings but little change in the frightful antarctic wastes, nothing can surpass the beauty of the arctic summer—"an endless blaze of light, the air and sea and earth teeming with life," plains glowing with richly tinted flowers, and strange, glittering forms sailing past "in stately and solemn procession." Its currents are strong, and bear large numbers of bergs to meet the warm Gulf-water, and, as it is natural to suppose, bergs are found to be most numerous where the drift is strongest. The antarctic seas are in direct opposition to this. Not only are its currents sluggish and feeble, but the most powerful of them, Humboldt's Current, carries few bergs along the Chilian coast, while the main ice-drift is towards the Falklands on one side, and the Cape of Good Hope on the other, where there is scarcely any motion of the water. This is a fact which no navigators are able to explain, except perhaps on the supposition that there may be strong submarine currents at a great depth below the surface. Bergs have been observed in Baffin's Bay drifting rapidly to the north, where there was a powerful surface-current running against them, showing that in consequence of their weight and immense draft of water (in some instances more than a thousand feet), they must be influenced by some "resistless undertow" yet stronger.

ILLUMINATING GAS—WHAT IT IS, AND HOW IT IS MADE.

The illuminating gas made in large gas works, and used almost universally for lighting the buildings and streets of large cities throughout the civilized world, is composed of products of the distillation of bituminous coal in close retorts.

The retorts used are made of refractory clay in the form of hollow half cylinders, the semi-cylindrical or arched portion being the top, and the flat floor the bottom as they are placed in the furnace. The ends of these retorts are open before they are set, but when placed in position the inner ends communicate with upright iron pipes or cylinders, which are secured at the top and communicate with what is called the hydraulic main, which we will describe further on. The outer ends of the retorts are closed when in action by iron doors, luted with fire-clay to prevent the escape of gas. The retorts are usually placed in groups of five, under which the fire-grate is placed.

The "hydraulic main" is a large iron pipe or cylinder many times larger than the recurved pipes, which connect it with the retorts. These tubes penetrate the hydraulic main, which is partially filled with water, and terminate beneath the surface, so that the gas which passes from the retorts when at work bubbles up through the water, and is prevented by it from escaping when any of the retorts are opened for repair or recharging with coal. This main receives all the distilled products from all the retorts, frequently numbering hundreds in large works, and of course has to be of a size sufficient to convey all away freely.

Before going further in our description of the apparatus employed, we will enumerate the products obtained from the distillation of coal as it is performed in gas retorts. They vary considerably in proportions according to the quality of the coal used. They are olefiant gas, light carbureted hydrogen, carbonic acid, carbonic oxide, hydrogen, oily vapors, sulphurous acid, sulphureted hydrogen, ammonia, steam, nitrogen, tar, and coke which remains in the retort and contains all the matters which are not distilled over. Beside these substances there are many others which occur in small quantities, and which, although they need not be mentioned here, are not altogether unimportant.

The volatile products which pass over, are totally unfit for use in their mixed and crude condition; the object of all the intermediate apparatus between the retorts and the gas holder is to eliminate those products which render the gas unfit for use, if we except the pump used to remove the back pressure against the ends of the tubes connecting the retorts with the hydraulic main.

About 120 lbs. of coal are used as a charge for each retort. It takes about six hours to work off one of these charges. When the volatile products are removed by the action of heat, the residue (coke) is raked out and and quenched with water.

A considerable proportion of the tar is deposited in the hydraulic main, from which it is removed as it accumulates. It contains the ammonia and the oily vapors, but the gas being still quite hot contains a large amount of impurities, much of which will deposit upon subsequent cooling. The gas is therefore passed from the hydraulic main to the condensers, a series of upright pipes surrounded with cold water, and through which the gas is successively forced. During the process of condensation the gas deposits more of its impurities, which trickle down through the pipes and are collected in a receiver provided for that purpose. From the condensers the gas passes to and through the scrubbers. The latter are large cylindrical structures filled with stones, through which running water is allowed to flow, the gas at the same time passing through to their tops. Being thus brought in contact with a great surface of water, the gas is washed and more of its impurities are absorbed and carried down by the running water to a reservoir below.

Between the scrubbers and the purifiers is situated the "exhauster" or gas pump above alluded to. There are several varieties of these in use, and we shall not attempt a description of any of them. Their sole object is to remove pressure from the hydraulic main, by exhausting the gas from the portions of apparatus already described.

The gas having passed through the exhauster is carried along to the purifiers. The chief impurities which remain at this stage of the process are the sulphur compounds and carbonic acid. Portions of these compounds have been absorbed by water in the scrubbers, but enough still remain to render the gas offensive and deleterious to health, and to greatly impair its illuminating power. Among the substances employed to effect their removal, none have been so largely used as lime, which fact indicates the value of that substance for the purpose as compared to others. It is employed in two ways. The lime is either used dry, in which case it is placed upon trays with open-work bottoms, upon which layers of straw, moss, or other similar materials are laid, and the lime spread upon them; or it is in the form of cream of lime, and the gas is made to bubble through it until the impurities combine with the lime and are thus eliminated. Both methods have their special advantages; but the dry lime process has obtained latterly in large cities in this country on account of the greater ease with which the spent lime can be disposed of, and greater freedom from offensive odor. A method of purification by the use of brown hematite (bog iron ore), to absorb the sulphur compounds, has been employed with success in Europe, and although it is said not to remove the impurities so thoroughly as the lime, the disagreeable smell emitted from the latter when the purifiers are discharged is avoided.

An opinion prevails among many, that the vicinity of gas works must be unhealthy on account of the odors emitted. Experience, however, has shown that these odors do not engender disease, but really act as a preventive of epidemic and sporadic complaints. The sulphureted hydrogen and sulphide of ammonium escaping from the lime when it is taken out of the purifiers, are undoubtedly unwholesome, when the air is sufficiently saturated with them; but although their smell is extremely disgusting to most people, it is rare, we believe, that they contaminate the air in the vicinity of gas works so much that their effects upon public health need be feared.

After the process of purification is performed, the gas passes to the gas holder, an immense iron vessel inverted in a cistern containing water, through which the gas bubbles up under the receiver. Its buoyancy enables it to raise the receiver as the gas accumulates. As the receiver descends by its own gravity when the gas is drawn off through the general service, a constant pressure may be maintained. We say *may be* maintained, for we have pointed out in previous articles how a diminution of pressure may be made to wrong the consumers and enrich the producers. The consumer may be greatly wronged also by the improper purification of gas, paying for sulphurous acid or carbonic acid gases the same price per cubic foot as for good gas, while their presence interferes with illuminating power, and contaminates the air in dwellings.

The meter system now in use only measures bulk. It does that well enough, but it does not tell us anything about the quality or the pressure under which the gas is delivered, and is thus defective in two radical points. We will not, however, say anything more upon the subject of meters, having in previous articles exhausted the topic.

A case is now pending between the Metropolitan Gas Company, of New York, and the Board of Health, originating in the refusal of the Company to obey an order of the Board directing the former to either discontinue the manufacture of gas at the present location of their works, at the foot of West Forty-second street, or to adopt a method of purification (the iron process above described) that does not involve the escape of deleterious gases. The case is exciting much attention, and experts and chemists are called upon to give testimony in the case. The testimony seems strangely conflicting, so much so as to excite the suspicion that personal interest has given a bias to the opinions of some of the witnesses. Be this as it may, we give it as our opinion that nothing yet discovered, or likely to be discovered, is equal to lime for gas purification; and we also believe that the free escape into the open air of the gases to which objection is made, is preferable to permitting any larger portion of them to pass through the service and be delivered into the close rooms of our residences and offices, a necessary consequence of a more imperfect system of purification.

The smell of a gas works is disagreeable, and real estate is always less valuable in their immediate vicinity than in more favored localities; now, is it the increased health of the people, or the increased value of real estate, that would result from the removal of the above works, that is the ruling motive in this raid against the Metropolitan Gas Light Company?

How to Build Houses.

Build your houses in the country, in preference to any place near the seacoast. In the country, choose a slope rather than a plain to build upon, and where the sun can have full access to it, if possible, all the day. Be sure (if need be, by effectual drainage) that the soil is thoroughly permeable to water. Let no moisture from the soil, from any source, be permitted to distill its pernicious influences upon the future dwelling or its inmates. Let the rooms be large, of substantial breadth rather than hight, and so pierced by windows that the air may have a bounteous and free entrance and exit. Let fireplaces be built in every room and chamber,—fireplaces made for real use, not kept for show, and not closed with iron plates which are to be pierced for air-tight stoves. Eschew all furnace heat except for warming the entries and corridors.

Outside the house let there be ample space for air and sunlight. One or two trees may be permitted to grow near the house, but not to overshadow it, for nothing but evil comes from too much shade, either of trees or climbing vines. Both of these may very materially prevent the warm rays of the sun from reaching and bathing the exterior, or from penetrating the interior of the house, which they should be allowed to do freely, even in the depths of summer. Nothing so deadens the atmosphere as the too constant closure of the windows, blinds, and curtains, whereby light and heat, as well as fresh air, are excluded. Every morning let the windows be opened widely, so as to drive off the remains of foul air that has necessarily accumulated from the sleepers during the previous night. Every night let a part of the windows be left open, and, if possible, at the top and bottom, so that during sleep there may be still a plenty of fresh, unbreathed air for the children and adults to use. Of course, the amount of space thus opened will vary with the season; but often, even during our Northern winters, especially in a furnace-heated house, a small aperture, at least, may thus be left. Two or three extra blankets only will be needed for any coldness thus caused.

As to the value of fresh air, alike for the healthy and the invalid, there seems to exist great doubt in this community. Even the healthy have no real faith in its efficacy as a means of giving health. Invalids, almost without exception, we have to educate to that faith. They have so many doubts about the weather. It is too cold, too hot, too windy, or too blustering. It is cloudy, or an east wind prevails. These and a hundred other trivial deviations from perfect weather are noted, and the unfortunate invalid quietly stays within doors, day after day, to avoid them. Nothing is more pernicious, no behavior more unwise. Both invalids and healthy persons ought to eschew all such views as arrant folly. "Whenever *in doubt*," we say to our patients, "about going out, *always go out*. If a violent storm is raging, to which no one would willingly expose himself, then keep to the house, but the moment it ceases, seize the occasion for exercise out of doors." "It would be better," said the late John Ware, "for everybody, sick and well, to face every storm, than to be fearful, as we now usually are, of even a trace of foul weather.—*Dr. H. I. Bowditch in the Atlantic Monthly.*

Persevering Inventors.—Evan Skelly, one of our old clients, writing from Iberville Parish, Louisiana, says: "I shall send you another model in a few days. I have to work on it at night time, after my day's work is done. Now, is not that much better than spending time in a grog shop? I have now 32 orders for sulphurous acid machines, for the next crop. Patented September 15, 1868, thanks to the Scientific American Patent Agency—long may it prosper."