nearly the whole of the observations cannot be satisfactorily proceeded with. This arose from the manifest disturbing influence of high winds upon the readings of the barometer at the top of the Ben. Since the two observatories are only about four miles apart in horizontal distance they are virtually one observatory as regards geographical distribution of pressure; and as the observatory at the top was peculiarly exposed to high winds, the violence of many of which those living on the lower levels could really form no conception, while the low-level observatory at Fort William was much sheltered from winds, the two presented conditions for an exact determination of the question of the influence of winds on the barometer, from data which had not hitherto been available.

The observations at the top were made on Beaufort's wind-scale, ranging from 0, representing the calms, to 12, the greatest hurricane likely to occur. These observations had been carefully compared in connection with the registrations of a modification of Robinson's anemometer, which had been specially constructed by Professor Chrystal to meet the exigencies of observing at the top of the Ben. An elaborate comparison had been communicated by Mr. Omond to a meeting of the Royal Society some time ago, in a paper in which he had arrived at the equivalent in miles per hour for each degree of Beaufort's scale.

The next step followed in the present inquiry was to reduce the observation at both observatories to sea-level, and thereafter to enter the differences between the two barometers in columns headed 0, 1, 2, etc., of Beaufort's scale. This had been done for the six months ending January last; and as it was desirable to increase the number of observations at the higher velocities in order to obtain good averages, the observations made five times daily at Fort William from the beginning of 1885 were compared with those made at the same hours at the top of the Ben, when the wind was at 5 and other velocities up to 11. From these results monthly averages of deviations of the two barometers were deduced, with the result that in all cases a reduced barometer for the top of the hill read lower than that at Fort William, and the amount is proportioned to the force of the wind. Thus, in calm weather the Ben Nevis barometer was only one one-thousandth of an inch lower than that of Fort William, and as the velocity of the wind increased, the depression gradually became greater up to force 4, when it was fourteen one-thousandths lower. From this point it more rapidly increased, till at force 7 the depression was half the tenth of an inch; at force 9, fully the tenth of an inch; and at force 11, a tenth and a half of an inch. These differences, being exhibited in a diagram, showed a remarkable curve of depression corresponding with increased velocity of wind.

The results, Dr. Buchan pointed out, might be put to important uses in meteorology, particularly in endeavoring to establish the relation between the barometric gradient and wind velocity in storms. Hitherto this relation had been attempted to be established from the results as observed, though, it had to be confessed, with not very satisfactory results. Now, however, by applying corrections in accordance with what had been arrived at, this important practical question in meteorology could be attacked with good hopes of success. Dr. Buchan further pointed out, that, as regarded the mean distribution of pressure over the British Isles, the lower pressure hitherto determined at places on the west coast peculiarly exposed to strong winds and storms might be due, not so much to a natural depression of the barometer in these regions, as to the lowering of the barometer by the wind force that swept past the stations where the observations were being made.

HOUSEHOLD REFUSE.[1]

THERE are 750,000 tons of household refuse produced in London every year, and the vestries are at their wits' ends to know how to dispose of it. There is a tradition that large fortunes were once made by dealing with such waste, and the "golden dustman" has passed into a proverb. But if ever this was the case, it has long ceased to be so. Either the quality of the dust has changed, or the former means of dealing with it have ceased to exist, as now it is a source of expense from first to last, and the object of all concerned in its removal is to get rid of it as rapidly and cheaply as possible.

At one time the "destructor" opened a prospect which was full of hope to the parish officials, and they grasped at the idea of burning up all the foul rubbish, and thus getting rid of it once and for all. But that time has passed. The suggestion of establishing a destructor in a district sets all the inhabitants into arms, and gives rise to an outcry that cannot be resisted. In theory the incineration of refuse is beautiful, and it can be carried out fairly well in practice, so long as the apparatus works under favorable conditions. But somehow a breakdown occurs every now and then, and the stink of burning animal refuse pervades the neighborhood. It is very easy to see how this may occur if the fires are allowed to get into bad condition. The collecting vans come in irregularly; sometimes several may arrive together, and, if the men tip their damp contents one after another into the furnaces, there is a great probability of the fires being checked and a volume of smoke given off that does not get completely consumed by the appliances provided for the purpose. Much of the evil may be due to carelessness or want of management, but whatever may be the cause, the destructor has earned for itself a bad name with the public, and it is almost impossible to establish one within the precincts of a town.

The plan that was formerly adopted of laying the refuse, or "dust" as it is called, in heaps and sorting it by female labor, requires a considerable amount of space and gives rise to nuisance. The contents of the heaps, shut out from air and light, putrefy, and when they are turned over, the stench spreads far beyond the limits of the ground. In small places this method is still pursued, but it is no longer practicable in large towns. Such places seek the readiest way of getting the dust right away. If they have access to the sea, they take it a few miles out and dump it into the water, with the result that a good deal of it floats back and litters, if it does not defile, the shore. The London vestries discharge their vans into barges and send the contents down the river to be laid on the Essex and Kentish marshes. Here there is abundant fresh air and only a spare population, so that no harm is done. In course of time nature disintegrates most of the elements of the heterogeneous mass, and when mixed with the vegetable mould of the marshes it becomes a fairly productive soil.

A cursory inspection of the contents of a dust-cart leads to the idea that they are mostly valueless and wholly offensive, or capable of becoming offensive under the influence of time and heat. But this is a mistake, due to the large bulk of the lighter and more ordurous constituents. Such articles as empty meat tins, bottles, waste paper and straw, and vegetable refuse, make a large bulk, but only weigh very little. Three-fourths of the weight of the dust collected consists of fuel. A proportion of this has never been on the fire, while most of the remainder is good cinder; it has had the gases expelled, but the carbon remains and makes capital fuel. Of course there is some thoroughly burned ash, but it is wonderful how much less than one would expect to find. The modern servant is not addicted to the use of the riddle, and all she finds in the grate in the morning goes into the dustbin. This is well known to those interested in such matters, and the brickmakers consequently absorb many thousands of tons of breeze from the dust-carts annually, to the great annoyance of their neighbors; for, although the amount of animal and vegetable refuse is relatively small, it is usually sufficient to taint all the other elements in the dust, and to render them offensive when burnt or handled.

It has been the object of sanitary reformers to discover a method by which the valuable part of the dust could be thoroughly cleaned and turned to account, and the useless parts destroyed without nuisance. A process devised for this purpose is now to be seen in active operation on the premises of the Refuse Disposal Company, Chelsea. It is the invention of Mr. Joseph Russell and Mr. J. C. Stanley, and its salient feature is that the dust is dealt with immediately it arrives, and that, during the whole time it is under treatment, it is kept in motion, and is fully exposed to the air in thin layers. It is tipped from the cart into the machine, and immediately commences its passage through the various sorting devices. In a few moments it has been divided into its different constituents, while all that is offensive has been intimately ground up with

[1] Abstract of an article in Engineering of May 15.

other material, mostly carbon, in which it is not only lost, but deodorized. The breeze and ashes find a ready sale among the brickmakers, but there is still a better outlet for them. By mixing them with pitch they can be pressed into briquettes and used for steam raising. It can scarcely be contended that these briquettes are equal to those made from fresh Welsh coal, but they are very fair, and can be sold at a reasonable price. The liquid pitch incloses any objectionable elements they may contain, and the result is that they are inodorous. Another material of value found among dust is paper. Immense quantities of this are collected, and can be used over again for the manufacture of common brown paper for wrapping parcels. After being dried to remove the dust, and passed through the beaters to reduce it to pulp, it becomes as clean and as sweet as when it came home from the grocer's or draper's. Straw can be similarly utilized for strawboards.

We recently had an opportunity of inspecting the company's premises, and feel sure that a short account of them will interest our readers. It is an important feature of the process that it is almost entirely mechanical, as nine-tenths of the material is never touched by hand. The dust as it arrives is tipped into a rotating cylindrical sieve. This runs on a horizontal axis, and is twelve feet in diameter by twelve feet long. The meshes are formed of bars three inches apart, and the progress of the tailings is regulated by an internal worm, which obliges them to make about three circuits of the screen before they can escape. A large exhaust pipe, operated by a powerful fan, draws all the floating dust and small particles forwards, and delivers them into the closed ashpit of a steam boiler. The tailings are mostly bulky articles; the paper, rags, and straw usually roll into balls, although a good deal of small escapes through the meshes. Each thing that comes out is thrown on to its proper heap, while the rubbish for which no use can be found is sent to be ground under edge runners, as will be explained presently.

The articles that pass through the meshes are raised by an elevator, and delivered to a second rotating screen fifteen feet long, six feet in diameter, and an inch and a half mesh. The tailings from this are first subjected to a blast, to take out light paper and straw, and are then dropped on to a revolving sorting table, fifteen feet in diameter. A boy sits beside it, and picks out every thing of value as it passes him, such as bottles, glass, iron, bones, etc. The rubbish, such as animal and vegetable refuse and broken crockery, he allows to go past him to the grinding mill. Here every thing for which no use can be found is reduced to a dry powder, which appears able to absorb all the offensive elements and render them sweet. There are no heaps labelled "miscellaneous" in these works to distract the manager and breed a nuisance. Every thing that is doubtful goes into the mill, which is the *pot au feu* of the establishment. When it comes out it is no longer recognizable. The mixture is carried back and put into the first screen to be again sorted.

Every thing that will pass through an inch and a half mesh falls from the second screen on to a travelling band, which delivers into a third screen fifteen feet by six feet, covered with two meshes, half an inch and three-eighths of an inch. What passes through the former is called ashes, and through the latter breeze. The tails go for steam generating. The ashes are used to mix with clay for brickmaking, and the breeze for burning in the clamps, unless, as indicated above, they are pressed into briquettes, which, of course, fetch a better price. The ashes and breeze pass over a fine shaking-screen, which takes out every thing below an eighth of an inch. This is valuable as manure, being the greater part of the animal and vegetable matter ground up in the mill.

Having traced the dust through its entire passage we must return and notice some of the tailings. As we have already said, every thing for which an immediate use cannot be found is destroyed. At present straw falls into this category, although the success of foreigners in the manufacture of straw-boards leads to the hope that that manufacture may be eventually established here. The straw is all burnt with special precautions to render the smoke inoffensive. An externally fired cylindrical boiler has two grates; on the larger of these the straw is burned, while on the smaller there is a breeze fire through which the gases from the straw are passed to complete the combustion. The paper is re-made on the premises. This seems a curious industry to carry on in Chelsea, but a well has been sunk into the gravel, and an ample supply of water has been obtained to keep three beaters and one paper machine at work. This is the most valuable by-product of all. The special value of the process is, however, that it enables the paper to be cleansed immediately, instead of being retained until a market can be found for it.

The works naturally consume a good deal of steam, particularly for the paper-making, and this accounts for much of the fine fuel. Indeed, it is conceivable that in any general extension of the system it might be worth while to use all the fuel on the premises in winter for the production of electric lighting currents. The total cost of handling would thus be avoided, and possibly a saving of the ratepayers' money effected. To prevent the evolution of smoke and any nuisance that might arise from the nature of the fuel, the five boilers of the works have their smoke drawn by an exhaust fan through scrubbers, in which it is thoroughly washed before it is delivered into the air. The three locomotive boilers are worked with forced draught, by which all the floating dust collected from various parts of the works is thoroughly burned up.

The works have already been in operation for nearly two years, and during that time they have grown up to the present state as the results of prolonged experiments, in the course of which five thousand loads have been treated. Difficulties, often quite unexpected, have been found and met, and new devices have had to be produced as time went on. At present the works are dealing with thirty-five loads a day from Kensington and Westminster parishes, and are on a sufficiently extensive scale to show what the process will do. They are exciting a great amount of attention all over the country, and many parishes are watching them with interest. The disposal of dust is undoubtedly one of the greatest problems of the day, and the process patented by the Refuse Disposal Company solves the question from a sanitary point of view, but of course it would want an examination of their books to decide the exact economic value of the process.

HEALTH MATTERS.

Pathogeny of Diabetes.

BOUCHARD has stated that there are no fewer than twenty-seven theories of the cause of diabetes. None are entirely satisfactory. The most important fact discovered in recent years, says the *British Medical Journal*, is that diabetes follows extirpation of the pancreas in animals, and numerous clinical observers have since then noted pancreatic disease in conjunction with glycosuria. V. Mering and Minkowski, with most praiseworthy scientific reserve, have abstained from formulating any theory to explain the undoubted fact they have put upon record, and Lépine has discovered an additional fact in relation to pancreatic extirpation and diabetes, which must be taken into account when the true explanation of these phenomena is forthcoming. Healthy blood possesses what he terms glycolytic powers. Fresh blood contains a certain percentage of sugar. If the same blood be allowed to stand at the body temperature for an hour before it is examined, a very considerable portion (20 to 40 per cent) of this sugar has disappeared. This number (20 to 40) may be taken as the glycolytic power of healthy blood.

It is considered that this sugar-destroying power is due to a ferment present in the corpuscles, but especially in the white corpuscles, as the glycolytic power of the chyle is as great as that of the blood, and the portions of the blood richest in leucocytes are richest in the ferment, which may be dissolved out from them by salt solution. In cases of diabetes the glycolytic power of the blood falls to 5, 2, or even 1. In animals without a pancreas there is a similar drop. The pancreas thus appears to be the chief source of the ferment.

Lépine believes that the activity of a pancreatic cell is bipolar; by its internal extremity it pours the pancreatic juice into the ducts of the organ, and by its basal extremity it pours into the venous blood and lymph the glycolytic ferment. The absence or