

gradually over the furnaces and thence into sheet-iron coolers, when sufficiently cool these were emptied on to the floor, and finally trenched ready to receive the contents of the pails, these latter and the charcoal were then thoroughly mixed, and in a few days the manure was ready for the farmer. Large quantities of this manure were sold to Lincolnshire farmers at remunerative rates and bid fair to become a great success, but unfortunately the corporation advanced the rent of the premises and increased the prices of their refuse to that extent that the manufacture was finally abandoned. Mr Chantrell who had taken shares in payment for his patent, was dissatisfied with the chemist of the company and his mode of management, determined to withdraw, and he was fortunate shortly afterwards to sell all his shares at the highest price, realising a very handsome sum.

One singular mistake made by the chemist and manager was the non-utilisation of the gases given off in the carbonisation of the street sweepings, which would have largely increased the value of this manure. He might mention that this charcoal manure was always drilled in with the seed, showing that the Lincolnshire farmers knew what they were about.

Mr. Chantrell then mentioned some interesting experiments he was engaged upon in connection with the growth of plants, and particularly the part played by fungus and crystallisation in their decay. Some 12 months ago he examined a number of leaves of the well-known American Water Thyme, which has become such a pest in many of our canals as at times to impede the navigation, this weed the "anacharis alinastrum" is a great favorite amongst microscopists for showing the circulation. A stray leaf had been left in an ordinary brass live-box, in fact thrown on one side, when about a month afterwards he by chance looked at it, and noticing something peculiar, he examined it under a microscope, and found to his surprise a curious fungus growth round about the leaf, a sort of mycelium. He applied the polariscope and then were revealed some most beautiful crystals, evidently proceeding from the fungus, and singular to say, this leaf continues to throw out the mycelium, and the crystals go on forming although the live-box is wrapped up in cotton wool and shut up in a tin box excluding the light, air and moisture, the fungus and crystals continue their growth, the only pabulum being this leaf of anacharis, now 12 months old. This investigation has led to some new discoveries in connection with portland cement, a manufacture which is assuming enormous proportions, and may be particularly observed in Liverpool, in its extensive use in the construction of the improved street pavements and tramways; one can hardly believe that the first of these pavements, that in North John Street, has been down 10 years, and with one of the heaviest traffics in the world, is hardly a bit worse; it is the pavement of the future. The testing of cements is becoming more general amongst Engineers, and tensile strain has been much increased of late, so that 500 lbs. to the inch (seven days after gauging) is by no means uncommon. It has always been said that the increase of the strength of cement was due to crystallisation. Mr. Grant's (the Engineer to the Metropolitan Board of Works) well-known experiments, ranging over years, points to this, but no one seems to have thought of using the microscope and polariscope to absolutely see, so to speak, the inner life of cement. I have been engaged for several months past in watching the crystallisation of portland cements, and I am able in 6 or 7 minutes to see the needles of crystallisation forming round the minute particles of cement, in star-like forms, these needles in course of a few days change, followed by crystals of carbonate of lime, etc., after a while the field assumes under the polariscope beautiful aesthetic forms, and a continued variety of crystals go on forming, ever changing and ever beautiful, and showing that by continued crystallisation it is that cement increases in tensile power.

The subject is an interesting one, and much of the quality of cements may be judged with the yet imperfect data, and promises important results in the future.

Mr. Buchanan said the remark made by Mr. Chantrell brought to his mind a connection he had with the "Carbon Fertilizer Co." of Oldham, who built large works in the outskirts of the town, and contracted with the corporation for the collection and treatment of the night soil and town's refuse, for manufacturing into artificial manure.

The Company supplied boxes in the closets for the collection of the refuse, which was deodorised with charcoal, and then conveyed by carts to their works, emptied on floors, and the liquid drained off into tanks below. The solid matters were conveyed to drying ovens, entering one end, thus carried

to the further end by scrapers, and discharged in a semi dry condition on to bands, which carried it to a mill, to be broken and sieved as required; further bands then conveyed it to an elevator, which delivered it on to the top of a "Buchanan and Vicker's Patent Kiln" to be carbonized. This kiln was constructed so that all the moisture and gases given off could be collected, condensed and utilised.

The material discharged from the kiln was satisfactory in quality, but the quantity was disappointing, owing to the light specific gravity of the material, a low temperature could only be used in the kiln, too much heat caused expansion. Elaborate plans were prepared for pressing the wet materials into cubes to be dried the same as bricks, then to be ground and carbonized, but through the stoppage of the company this work was not executed.

He thought that had the same principle been carried on by a private firm and under economical management, the results financially would have been satisfactory.

Mr. Hill said he thought that the manure question was receiving more attention, as during the last year or two the price of ammoniacal liquor from gas works had risen considerably.

The President thought that he might mention that in Cornwall a great quantity of woollen rags was used on the land for manure, and also sea weed got from the shore, together with the sand. In Cornwall they have to manure the land very highly, as the rent per acre runs as high as £30 to £40.

Mr. Smetham in reference to Mr. King's remarks with regard to successful farming in the future, thought it was not so much a question of manures, as now manures were to be applied. In reply to Mr. Chantrell he thought it very wise for him to get out of the company as soon as possible, for it was perfectly evident that no charcoal of any commercial value could be obtained from street sweepings on account of sand being mixed with it, as to drilling the manure into the seed it was a very common practice. The crystals would probably be due to the formation of acid oxalate of potassium.

In regard to Mr. Hill's remarks as to the price of sulphate of ammonia, the principal cause of its enhanced value was scarcity of the nitrate of soda coming from Peru and Chili, and the nitrate being so expensive, more sulphate of ammonia has been used as manure. Brunner, Mond & Co. used a considerable quantity of ammonia also, for the soda ammonia process. They are the only makers in England that used this process, although there are many on the continent who use it. In reference to Mr. Siddeley's remarks, if he, Mr. Smetham, remembered rightly, some of the sand picked up from the Devonshire coast contained 55 per cent. of carbonate of lime, and consequently the sand would be of considerable use as manure, especially if the land were deficient in lime. He thought £40 an acre was very high. He also thought market gardening could be engaged in profitably by farmers, many of these round Liverpool obtaining remunerative results by this means. The A B C process for treating sewage consists in adding alum, blood and charcoal. As far as his experience went he could not say the system was a profitable one, and he doubted very much whether it could be made profitable. There were all sorts of systems for treating sewage, but the cheapest plan was, where practicable, to send it right out to sea—the quantity of water in it, where the water closet system is used, rendering the extraction of the valuable constituents extremely difficult.

Gen. Scott had a system of treating sewage which consisted in allowing the sewage to ferment until the nitrogenous matters are converted to ammonia, then phosphoric acid and magnesia were added, by which means the ammonia was precipitated as ammonia magnesia phosphate, and then collected and dried and used for manure. Certainly a very excellent manure was obtained in experiments made at South Kensington. But in actual practice the process was not remunerative.

A unanimous vote of thanks was awarded to Mr. Smetham.

INCREASED EFFICIENCY OF RAILWAYS.

At a meeting of the Am. Soc. of Civil Engineers, held on the 16th of May, Mr. O. Chanute made the following remarks on the "Increased Efficiency of Railways"—the subject of a paper read before the Society at a previous meeting.

He suggested that it was worth enquiring whether the diminished average mileage obtained from cars is an unmixed evil and whether there have not been changes in the methods of transporting business, which, while requiring less movement of cars, yet added to economy of trade and convenience of customers, and also whether the diminished mileage may