WIRE TRAMWAY IN NORWAY.

Many valuable iron mines are at present either worked to a very small extent, or even left unworked, owing to their being placed at such inaccessible spots as to preclude the possibility of economically transporting the ore to a port of shipment. Frequent examples of such mines are to be found on the coast of Norway situated high up amongst the mountains, which tower above the numerous fiords which indent its seaboard. The only approach to these mines consists of a rugged and zig-zag road quite unfit for the carriage of any large quantity of mineral, and owing to the extreme steepness of the mountain side, often leading a circuit of many miles to reach a spot which is less than half a mile distant in a straight line. To accommodate such cases an arrangement of wire rope incline has been designed and successfully worked, as shown in the engravings from *Engineering*, on pages 212, and 213 It consists of two steel ropes of about 40 tons breaking strain fixed at the mines, and stretching direct to the small pier at the foot of the mountain, spanning a distance of 750 yards without support. On it are run two cages with small grooved wheels, in which are placed about 12 cwt. of iron ore, the fixed ropes being kept in tension by means of weight boxes at the bottom. The loaded cage is made to draw up the light one by means of a light steel rope, which passes round suitable brake sheaves at the mine, and by which the speed of the descending load is governed. On arriving at the bottom, the cage is discharged into a large truck ready to receive the ore, which when full is in its turn discharged into the ship to be loaded. The light cage has meantime arrived at the top, and being filled is allowed to descend, and to draw the emptied cage up The incline is an angle of 65 deg., and the speed at which the cages are run is about 15 to 20 miles per hour. By this means about 100 tons per ten hours are transported at a very low cost, the only expense being the men required to work it, namely, about three at the top and two at the bottom The incline illustrated was made by the Wire Tramway Company, (Limited), from the designs and under the superintendence of their engineer, Mr. W. T. H. Carrington, for some iron mines situated near Aalsund, which are the property of Messrs. Adamson & Co., of London. The work was carried out on the spot by Mr. H. Dunn, one of the Company's assistant engineers.

By the application of such inclines, which from their simplicity are of small expense, it appears probable that many valuable mines, at present unworked, could be utilised and their products brought to market. Tramways on the system of the company are now being erected in many parts of the world, one having lately been opened at Llanelly in South Wales for the carriage of coal, and at Leitrim for a similar purpose, the latter working on an incline of 1 in 3

SEWER GAS.

The following letter, bearing the signature "M.D.," has appeared in a prominent position and type in the *London Times*:—

My own personal experience and the letters which have from time to time appeared in the *Times* prove to me that the modes of excluding sewer gas from our houses are still very imperfectly understood by the public, by the majority, I fear, of builders, and by not a few house surveyors and engineers. Sewer gas finds its way into a house by one or more of five distinct kinds of channels:—

1. Sewer gas very frequently enters a house through the pipes which carry off refuse water, for example, housemaids' sinks, butlers' pantry sinks, baths.

As a rule, the pipes from these places are carried directly into the house-drain The pipes are trapped where they enter the drain, and the traps when of good construction, well fixed, and new, completely shut out sewer gases from the house, the dirty water passes into the sewer, but no gas can pass back into the house. But traps are made of metal, and metal we are, and when the metal is worn the trap lets the water flow into the drain, but no longer keeps back the sewer gas. The pipe from the sink or bath, when the trap is out of order, conveys sewer gas into the house, and the defect in the trap is frequently not discovered till serious illness, due to sewer gas poisoning, has called attention to the state of the drains.

It is easy to prevent the entrance into a house of sewer gas through these pipes. The pipes which carry off refuse water should terminate, not in a drain, but in the open air In London houses they may pour the water directly into the area I had constant trouble from offensive odours in my own house and was frequently put to much trouble and expense for new traps, the removal of area flagstones to ascertain if traps, already existing, were effective, &c., till I had, at a cost of about 30*s.* only, five pipes, which carried refuse water from the house, cut off from all communication with the drain, and made to terminate in the nearest areas. I thus did way for ever with five channels through which, if by accident or wear a trap was defective, sewer gas could enter my house, and obviated the annoyance and expense which recurred every time a trap was even suspected of being defective.

2. Sewer gas may enter a house through the overflow pipes of the cistern.

Every cistern has a pipe to convey away the water which, if the cock of the cistern were out of order, would flood the house as often as the water came into the cistern.

This overflow pipe of the cistern is frequently made to open into the soil pipe of the nearest water-closet—*i.e.*, into a pipe filled with sewer gas.

The reflux of the sewer gas from the soil pipe into the overflow pipe of the cistern is, the builders say, prevented by a bend in the pipe filled with water. So long as the water in this siphon bend is sufficient in quantity, and frequently renewed, it forms an effective trap, but the water in the bend may evaporate or it may become saturated with sewer gas from the soil pipe, and when so saturated it will give off from the cistern end as much gas as it receives at the soil pipe end, and so sewer gas be disseminated in the house and enter into the water of the cistern—water which is used frequently for drinking purposes, filling water bottles for the toilet, &c.

The overflow pipes of all cisterns should terminate in the open air.

3. In towns the water-closets are at the back of the house and the main sewer runs down the centre of the street in front of the house. The consequence is that a drain has to be made under the house from back to front.

Injury to the walls of this drain, may result from accumulated sewer gas, and the escape of sewer gas from the drain through any aperture (accidental or other) in the drain will be in proportion for the pressure of the sewer gas on the walls of the drain. To prevent this pressure the drain should be ventilated—*i.e.*, a pipe should be carried from the drain up the back of the house to a little below the level of the chimney pots.

4. A common practice is to make one pipe to serve the double purpose of ventilating the sewer and of carrying off the rain water from the roof. The pipe serving this double purpose is frequently a channel for the conveyance of sewer gas into a house. For every cubic foot of water that enters the pipe a cubic foot of sewer gas is forced out, and if, as is commonly the case, the top windows are near to the aperture of this pipe, sewer gas finds a ready entrance into the house.

The pipe which conveys the rain water from the roof should open into the area, and never into the drain.

5. The soil pipe of a water-closet, like the house drain, should always be ventilated—*i.e.*, an open pipe should pass from the soil pipe to a little below the level of the chimneys—to an elevated spot, that is to say, at some distance from all openings leading into the house. If the soil pipe of the water-closet be not ventilated, then whenever the closet is used, should there be the least defect from wear or accident in the trap, a certain amount of sewer gas will be forced upwards into the house from the soil pipe.

To sum up, the pipes which convey refuse water from the house and those which convey surplus water from the cisterns should, without exception or excuse, terminate in the open air The main drain of the house and the soil pipes of every water-closet should be ventilated, and the ventilating pipes should be carried up to about 3 or 4 feet below the level of the opening of the chimneys and at some distance from all other openings into the house—*e.g.*, trap doors on the roof, windows, &c. The pipe which conveys rain water from the roof should terminate in the open air, and should never be used for ventilating the sewer.

The above letter has called forth the following correspondence. "Another M.D.," writes.—

It is to be hoped that every householder in the kingdom will read and try to master the five plain facts contained in the letter of "M. D."