author made some remarks upon the pathology of miner's nystagmus.

Dr. Snell, in the course of the discussion which followed, maintained that it was not the lamps but the position of the men at work that caused the trouble.

Dr. Tatham Thompson, Cardiff, said before he went to reside in South Wales he held the belief that the position was the cause of the disease, but he had opportunities of examining the Welsh miners, and further experience had convinced him that Dr. Snell's theory was not the correct one. The men in that district who worked with safety lamps never did any holing, or lay upon their sides to win the coal, and yet nystagmus was common among them. That was in the steam coal pits. On the other hand, the miners who used naked lights and worked the house coal always did holing, and lay upon their sides, but the disease was absent from among them.

Dr. Pegler, London, and formerly of Stonebroom, said he was present at some of Dr. Court's examinations, and they were strict and accurate. The results were against Dr. Snell's theory.

The president said they must look upon the disease from a wide point of view, and added that nystagmus might occur by continued effort to fix the sight under difficult conditions of light.

Breaking of a Steel Wire Rope.

M. Jacob, engineer in the French Corps des Mines, has made a communication to the *Annales des Mines* for July on the breaking of a steel wire rope on an incline at the Lavie Works, Constantine, Algeria. He opens the subject by observing that this accident brings prominently forward the rapid disorganisation of wire ropes through passing over pulleys of too small diameter, and owing to successive windings in different planes. The incline, partly underground, is 1,165 m. (1,275 yards) long, with a uniform gradient of 0 158 m. per metre (or 1 in 6.33), except near the stations, where it is 0·2 m. per metre (or 1 in 5) for a short length. It has only one line of way, of metre gauge, with pass-by for the automatic crossing of the trains, each of which consists of a truck weighing 1.4 ton, and carrying three trams, weighing together 0.52 ton, the total useful load being 1½ ton. The rope consists of a hemp core with six strands wound round it, each strand being formed of eight steel wires 1½ mm. in diameter, and of a core consisting of four iron wires 1 mm. in diameter. The diameter of the rope is 20 mm., and its weight 1 4 kilog. per metre—say 2½ lb. per yard the indicated strength being 100 kilogs per square milli metre (63½ tons per square inch) of steel wire. The endless rope is arranged on either side of the line of way, where it is carried by cast iron rollers. At the bottom of the incline it takes two and a-half turns round a pull., 1·4 m. (4 ft. 7 in.) in diameter, driven by turbines with tele-dynamic transmission of power. At the top the rope passes over a pulley of the same diameter, with tension truck, the pulley being arranged in a vertical shaft with guide pulleys of 1 m. (3 ft. 3⅜ in.) in diameter. All the pulleys are of cast iron, and their grooves have no lining.

The rope broke when the two trucks fully loaded were near the pass-by. The automatic brakes did not act, and the two trucks ran down the incline. After passing the crossing point, where the gradient is 0.2 m. per metre the first truck left the rails and ran against the mouth of the tunnel, the side frames being twisted or broken. Immediately afterwards, the second truck collided with the first and completed its destruction, the pieces being thrown to a distance of 40 m., while the rails and sleepers were torn up.

The causes to which the fracture of the rope is attributed are: Wear of and strain on the rope added to bad quality of the metal. The steel wires broke under a tensile strain of 166 kilogs. per square metre (67 tons per square inch), and also after seven double bendings in a vice, the jaws of which had rounded edges struck with 5 mm. radius, while the iron core broke under a load of 66 kilogs. per square millimetre (42 tons per square inch).

The maximum tension in a state of rest on the upper portion of the rope is 1,000 kilogs., or 1 metrical ton, being determined by the weight of the tension truck, which is 2,000 kilogs.; and the tension of the lower half of the rope is at the outside 1,000 - 540 = 460 kilogs. Now, in the state of motion, this distribution of strain is modified. Referring to a supposed diagram, let T_1 and T_1' represent the tensions on the upper and lower halves of the rope respectively, T_2 and T_2' the corresponding tensions in the other half, and R, the motive power at the rim of the pulley, representing the equivalent of the whole resistances to the motion. Then $T_1 + T_2 = 2{,}000$ kilogs., $T_1 - T_2' = R$, $T_1' + T_2' = 2{,}000 - 2\ (540 + 250) = 420$ kilogs., and $T_1' - T_2' = R$. Observation of the rope in motion shows that T_2' is very slight, whence it may be deduced that R is equal to about 400 kilogs. The greatest tension in the upper portion of the rope will therefore be 1·200 kilogs., or 14 kilogs. per square millimetre (under 9 tons per square inch), if the iron cores be left out of consideration, and 11·6 kilogs. in the contrary case, these figures being high without being exaggerated.

The turn round the pulley causes increased tension in the rope, generally represented by $E\frac{S}{D}$, S being the diameter of the wire and D that of the pulley. In reality this expression represents the elastic tension of the outside fibre of a wire, of diameter S, passing over a pulley of the diameter D, so that this formula gives, at the outside, a higher limit of the strain on the wires, and affording no very useful indication.

If a series of wires placed alongside one another in a parallel direction be taken, they will, together, have the same stiffness as a bar of the same substance similarly distributed; but if the wires be arranged spirally, the suppleness of the rope will increase as the pitch of the spirals diminishes. It seems, therefore, that the determination of the diameter of the pulleys should depend as much on the composition of the rope as on the diameter of the wires; but, as a matter of fact, it is only the latter element which is taken into consideration. The passage of ropes over the pulleys not only gives rise to a supplementary strain, but it also sets up, in a similar sectional area, an unequal distribution of the working load, which may be considered as uniformly distributed in a straight portion. This fact is due to the deformation of the spirals, the pitch of which becomes elongated on the convex portion of the rope and lessened in the concave portion; and this deformation, which is caused by the displacements of the elements of the rope, gives rise to friction and consequently to inherent wear.

At the above named works, as the working loads of the two portions of the rope, and the conditions of their passing over the pulleys, were very different, the two portions of the rope showed a marked difference of appearance. The lower portion gave evidence of wear on the outside, appreciable, but not very pronounced. On the inside, at the first glance, the rope seemed intact; but on examining a single wire separately, small facets of wear might be observed, recurring at each spiral of the rope. These marks, as might be seen by inspection of the rope with a strand removed, were produced by the friction of the wires of one strand against those of a neighbouring strand; but in the same strand there is no sign of wear due to friction of the wires one against another. In the upper portion of the rope the outside wear is much more evident, attaining half the thickness of the wires over all the outer surface of rope, and showing that the latter were subjected to torsional movements which brought all the points in the circumference, one after the other, into contact with the pulley grooves. The internal wear, also very considerable, takes the form of transverse furroughs, due to the friction of the wires of one strand against those of the neighbouring strand, of longitudinal furroughs due to the friction, one against another, of the wires of one and the same strand; and, lastly, of a furrough resulting from the friction between the steel wires and the iron core of the strands. At these points the sectional area of the rope is much reduced, on account, first, of the wear, and secondly, of the permanent elongation of the wire, the metal of which had become brittle, while shortly before the fracture, an appreciable elongation of the rope had been noticed.

The relative displacements of the strands and the wires, on passing the upward landing, had, moreover, the effect of preventing the tar, with which the rope was often coated, from remaining attached, so that internal oxidation was very marked.

MINING NOTES.

[From our Own Correspondents.]

Nova Scotia.

Cape Breton.

Reports of the bonding of some of the leading collieries in Cape Breton are well founded. Amounts varying from $5,000 to $10,0 0 have been paid on options, which certainly looks as if the American syndicate meant business.

Work has continued fair during the season, and the steamers engaged in the Gulf trade are promptly loaded. Receivers at Montreal claim that receipts are 50,000 tons more than to this date last season, and are asking a halt in shipments. The new collieries, the Emery and Gardiner, are both in fair shape, and it is reported that the Low Point Company are shortly to make an opening on a recently discovered seam, said to be specially adapted for bunker. The Bridgeport area and colliery, owned by the General Mining Association, is reported sold to the International Coal Company for $100,000. The Sea Coal Bay Company are engaged in building a wharf, and expect shortly to commence shipping.

Cumberland County.

The sale of the Joggins mines is reported to some New York capitalists, and preparations are to be made for an increased output.

Work has been comparatively dull at the Springhill mines, the mildness of last winter having saved the coal stocks of the different railways. Screening and dumping at the north slope of these mines will shortly be done away with, as the boxes from it will run on self-acting inclines to and from the west slope screens.

The Cruickshank mine, two and a half miles from Maccan Station, has, it is said, a contract to supply 10,000 tons to the Government. An engine has been erected, and a large bankhead is nearly completed. Mr. Alfred Babine, late of Maccan, is manager. Thirteen men are presently employed underground. This force will be increased immediately.

Pictou County.

Except at the Intercolonial Colliery, which is engaged in filling large orders for the Intercolonial and Grand Trunk Railways, work is very dull.

The New Glasgow Coal, Iron and Railway Company made a fine display at the recent Toronto Exhibition. The exhibit consisted of car-load of pig iron, the first produced at the recently erected Ferrona furnace, specimens of the ores and fluxes mined on the company's property, specimens of coke made, coals from the mines in the neighborhood, etc. The other specimens consisted of products of the Steel Company's works. Immense ingots of steel, weighing over a ton each, just as they were turned out of the moulds; an immense cogging roll twenty-six inches in diameter and weighing some seven tons; steel billets rolled or hammered down from the ingot, and ready for other processes of manufacture; heavy railway and marine forgings; machinery steel in many sizes, made for many different purposes; carriage and waggon tire steel; sleigh shoes; a large assortment of shapes of sectional steel for structural purposes; angles, channels, plow beams, fish plates, etc.; mould boards, harrow teeth, hay rake teeth, harrow discs and cultivator teeth, as used in the manufacture of agricultural implements, and also a pyramid of shafting made to order for the Massey-Harris Company, Toronto, to be used in the manufacture of harvesting machinery.

At Ferrona the furnace stack is 65 feet high by 15½ feet bosh. There are three Massicks-Crookes stoves each 60 feet high by 17 feet diameter. There is a coal washing plant with storage towers, and a battery of 36 coke ovens of most modern design, said to be one of the best coking plants in America. And there are the blowing engines, the casting house, and everything else necessary for successfully carrying on the business. The steam required to drive the blowing engines and all the other machinery is generated from a battery of eight multitubular boilers fired with the waste gases from the coke ovens. The capacity of this furnace is about 30,000 tons per annum. The plant is arranged so that another furnace can be added whenever desired, the number of hot blast ovens increased, etc. In fact, everything is arranged with a view to increasing the capacity of the works. The construction of this plant was begun only in August of 1891, and the first iron was made in August, 1892.

The steel company are increasing their works by the addition of a new machine shop, 175 x 70 feet, in which some very heavy tools and machinery will be placed. Included in this will be a lathe 46 feet long with a swing of 112 inches between centres, intended for turning heavy marine work. There will also be a 24 inch slotting machine for slotting crank shafts. A new 350 x 120 feet rolling mill is about being built in connection with the steel plant.

Killag District.

The mill of the Old Provincial Co. in this district was reported ready on Sept. 1st, but no quartz available for crushing. The Company has experienced great difficulty in getting miners to work in the new vertical shaft on account of the large amount of water flowing in between the surface and bedrock, and falling down the shaft. Mr. H. S. Mackay is the managing owner of the Company.

Goldenville.

The Alexandra property in this district has been sold to Messrs. Stuart, Hamilton, et al., for the sum of $5,000. The openings made have shown a three foot lode of quartz, supposed to run from half an ounce to one ounce of gold per ton. No other properties in the district are working, and the probabilities are that little or nothing will be done this winter.

Stormont.

The recent decision of the Privy Council, in the case of the Palgrave Gold Mining Co. vs. McMillan et al., in favor of the Palgrave Co., will lead to the re-opening of their property on Hurricane Island very shortly. Mr. H. K. Fisher, President of the Company, is now making arrangements to that effect.

The North Star Co. is to erect a ten stamp mill of old pattern near the Barke lead. Mr. Rod. McLeod, formerly of Molega and Whiteburn, is the resident manager.

The owners of the Richardson gold mine, so-called, distant about a mile and a half east of Isaac' Harbour, have had a new road built, and contemplate the erection of a ten stamp mill of modern design. The lode, as openings on it are extended, shows a crevice about six feet in width, of which at least four feet is milling stuff. Occasional sights of coarse gold are seen; and if the rock will mill ten dollars a ton the property should become one of the largest gold producers of the province.

Country Harbour.

The Copeland mine continues to be a large producer, although the average per ton is somewhat diminished.

The McNaughten property is idle, and wages are reported in arrears.

Caribou.

The lessees of the Truro Co.'s property in this district have struck it rich, the pay chute showing specimens