pass a government examination as this would exclude many good practical men, it was thought that there should be some proof of their ability and experience given by those who come into the Province in future to take charge of mines or to assay, in order to keep out the frauds who constantly masquerade in new mining camps as experts.

Messers. McConnell and McEvoy of the Geol. Survey were elected honorary members. The President delivered an address. Papers were read by Howard West, A. R. S. M., on the "Valuation of Prospects", and by the Secretary on "Mineral in Place". Considerable discussion ensued on these.. These papers will appear in our next issue.

WIRE ROPES.

Practical Points for the Consideration of Engineers and Mining Students.

We are indebted to the Transactions of the British Society of Mining Students for the following interesting contributions on the subject of wire ropes :—

Round Ropes vs. Flat Ropes.*

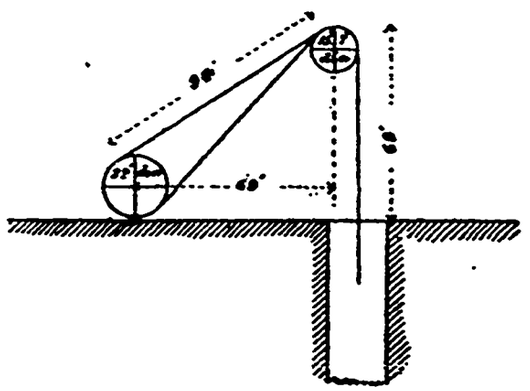
It has been for some considerable time generally admitted that the use of flat wire ropes for pit winding purposes is not only very troublesome, in consequence of the trouble entailed by the stitching breaking, and the difficulty of getting the component strands to take an equal share of the load, or to secure equal tension of the component strands and wires, but also that it is most expensive in comparison with the use of round winding ropes.

Yet there are probably many who still hesitate to make the necessary alterations, and to adopt round ropes in the place of flat ropes, possibly because of the cost entailed in the alteration of the engine, drums, and pulleys. To such it may be of service to know exactly, in one instance, what the cost per ton of coal drawn by round ropes is, in comparison with what the cost per ton by flat ropes was, working in the same shaft under the same conditions.

At a colliery that was using flat ropes, about 680 yards each, 4¾ in. by ⅞ in., weighing from 5½ to 6 tons each, and where the standard cost per ton (to which all rope-makers who were favored with the orders had to conform, by guaranteeing that that cost should not be exceeded) was ·55d. for the over-lap rope and ·60d. for the under-lap rope, these figures were frequently exceeded by the actual results, much to the dissatisfaction of the maker. The average life-time was about eight or nine months.

About three years ago the owners decided to adopt round ropes. They made the necessary alterations in the engine (in which the eccentrics were only 9 ft. apart) and altered the drum which was 19 ft. in diameter when working flat ropes, to 22 ft. in diameter for the round ropes, and put in new pit-head pulleys 15 ft. 7 in. in diameter on trod, which was the diameter of the old flat rope pulleys; they then put to work two ropes each 5¼ in. circumference, best plough steel, weighing from 3½ to 4 tons each, with the result that the under-lap rope has raised 247,000 tons of coal, and on the invoice value of the rope the cost was ·119d. per ton of coal (without taking into consideration the fact that they wind from 200 to 300 tons of rubbish per day), against the previous cost by flat ropes of ·60d. per ton. It is therefore clear that the value saved during the life of this round rope would be the amount of difference betwixt ·60d. and say ·12d., equal to .48d. per ton, and this multiplied by the tonnage drawn, *i.e.*, 247,000 gives a result of £494 saved during the life of one rope, or say £988 saving effected by the life of two ropes.

A rough diagram of the position is attached, from which it may be seen that the vertical angle at which the under-lap rope has to work is about 42°, and that for the over-lap rope 58°, and as they have a distance of about 44 inches to traverse along the



barrel of the drum, the angle from the pulley-line will be about 1° 7′ on each side. It was feared that the round ropes would not coil properly on the drum, but to avoid that they grooved the lagging, and it is satisfactory to know that it is successful, and further that it has reduced the side friction at the drum to the lowest possible degree. They wind from a depth of 530 yards, the speed being about 45 seconds, or about 24 miles an hour.

The output is about 1,300 tons per day. They wind two trams of coal each lift, the cage being double deck. The working load independent of the rope is :—

Cage, detaching hooks, bridles, caps, &c.....	5 tons.
Coal.....	3½ "
Two trams, 10 cwt. each.....	1 "
Total.....	9½ "

The shaft is down-cast, and free from any injurious influences.

Whereas the cost per ton by flat ropes amounted to ·60d. or ·001136d. per ton per yard, the cost per ton by round ropes is ·12d. or ·000226d. per ton per yard.

With reference to the suggestion which the writer gave in his last contribution to this Journal, and to which he is glad to see Mr. Bulman has responded by sending in particulars and results of certain winding ropes; it is, however, a matter for regret that a greater number of the members have not done so.

The object the writer had in view in making such a suggestion was, not merely to give information about the various rope costs under a variety of working conditions, but more particularly, if possible, to get such data as would enable the Society to find out a definite figure that would represent a reasonable and fair value, or rope cost, per ton of coal per yard depth of winding.

Colliery managers very frequently may be heard to say that it is impossible to make a fair comparison with two ropes working in different pits, chiefly on account of the difference in the depth of the shafts, but if it were possible to arrive at a definite cost per ton per yard, this difficulty would disappear, and all the other conditions being usual, they would be able to ascertain what the winding-rope cost per ton for a pit of any depth should be, by multiplying the cost per ton per yard by the depth of the shaft.

The writer feels that such knowledge could hardly fail to be very useful to all mining students, &c., and if the matter is taken up thoroughly, he will be glad to carefully tabulate the various particulars that may be sent in, and endeavor to show from such actual records what a fair rope cost per ton per yard, or fathom, should be. It will therefore be apparent to all that the more data there is to work upon, the more reliable will be the resulting figure; it is therefore to be hoped that it is not yet too late for many of the members who are interested in such matters to follow Mr. Bulman's example, and send all the particulars they can, and, in doing so, it is important that they should clearly state whether the shaft is an "up" or "downcast," and if there are any injurious influences to contend with, and also what class or type of engine is used in each case.

Wire Ropes from a User's Point of View.†

Mr. Westgarth's remarks on Wire Ropes, with a description of the Westgarth patent rope, in No. 4 of Vol. 17, are largely written from a maker's point of view; perhaps a few remarks written from a user's point of view may not be out of place.

So much has been written on Wire Ropes, that no attempt will be made to write fully concerning them, so as to avoid, if possible, going over old ground; but there are certain points upon which further information is much required.

Charcoal iron ropes, with a breaking strain of 40 tons per square inch, having disappeared, the choice of materials for ropes lies between patent crucible steel or patent improved crucible steel, with a breaking strain of 75 to 85 tons per square inch, and plough steel, with a breaking strain of 100 to 120 tons to the square inch. By using the latter, from one-fifth to one-quarter of the weight of the former rope is saved, which is a very great consideration for collieries winding large outputs out of a single shaft, unless there be a balance-rope beneath the cages. It is also often of vital importance for underground haulage, when the "leads" are long and extensions are necessary, and may prevent the putting down of supplementary haulage engines, with their attendant additional labor, or the addition of larger drums to the present engine.

The cost of plough steel is so much greater, however—the additional cost being generally about two-thirds—that, except for the above special reason, the improved steel is generally preferred.

Recently, a plough steel rope, 2 in. circumference, was put by myself on an incline with a very slight gradient, but worked but eleven months when it was replaced by a 2¼ in. circumference Lang's patent improved crucible steel rope, which appears likely to last much better.

This size of rope we generally use on our inclines and on two haulage planes.

A question of much difficulty and of great importance is when should a rope be condemned. If a rope frequently breaks it is clear that there is weakness somewhere, and if after examination and cutting out the bad parts breakages still occur, it must be clear that the nature is out of the rope, and that this rope requires changing.

If the system of haulage be main and tail, this will naturally happen to the tail rope, when a new main rope must be put on, the bad part of the tail rope cut out and part or the whole of the former main rope put in the tail rope But what is wanted is, before breakages occur, to be able to decide with certainty that the rope is too weak for its work. There appear to me to be no hard and fast rules to decide this. All can tell when a rope is worn, but where to draw the happy line is the difficulty. This is of course particularly necessary when the system of haulage is main and tail rope, or main rope only, and the train travels at a high speed. With endless ropes it is naturally not so important.

Winding ropes are never allowed to wear to any extent, and the number of broken wires generally governs the time when they are taken off, and many, as a precaution, refuse to allow a rope to remain on more than two years.

It would be useful if a number of members would state what life they obtain in actual practice from winding ropes, both flat and round, and from main ropes, main and tail, and endless haulage ropes.

Unfortunately in our case, flat winding ropes, 3½ in. x ¾ in., are used; they are galvanized and generally wear 20 to 22 months. Few would now adopt flat ropes, as the additional weight of some one-fifth, the consequent additional cost, and the trouble caused by the stitching mean increased working cost.

The main haulage ropes on our No. 1 haulage plane, on which journeys run of 12 tubs, tareing 8 cwts. and carrying 23 cwts. of coal, and when stone fully 30 cwts., and the inclination of which may average 1 in. per yard, last 14 months, being turned at the end of 7 months, and after use as a main rope worked as a tail rope.

That on our No. 2 plane lasts but 9 months. In this case the journey consists of 24 tubs, and the length of plane is 1,200 yards, or about double the other, while the average inclination is but ⅝ in. or so per yard. The main rope is generally turned end for end after working 4½ months, and used as a tail rope at the end of the 9 months.

The shorter life of this rope is probably due to a portion of the plane being wet, while the No. 1 plane is dry throughout. It has always been a question with me whether a stronger rope ought not to be used on this No. 2 plane, and whether this would not produce an increased life and be an economy.

While the winding ropes are galvanized the haulage ropes are not; yet in my opinion the No. 2 rope ought to be galvanized, and if so, should wear a longer time, if its short life is due to the plane being in part wet. The additional cost being but 5/- per cwt. this should prove an economy.

Although our planes are well rollered and the rollers and pulleys well oiled, yet there is a considerable amount of wear on the wires of the ropes, while although the ropes are always got from the same firm, and that a well-known and first-class firm, and are of the same description, yet there appears a wide difference in the hardness of the ropes, which of course means a shorter life obtained from the softer ropes. Is this a general experience? if so, how is the difficulty met?

At some collieries it is the custom of the rope-maker to guarantee a certain life for each rope, and if the life is not obtained, to compensate the firm. This appears to me to be reasonable, provided the rope is fairly used, and should meet the difficulty.

Another point upon which information would be valuable is that of oiling. While

* By Mr. Westgarth.

† By Mr. G. E. J. McMurtrie, A.M.C.E.