Ratio $= \dfrac{34}{2\cdot5} = 13\cdot6 : 1$

Extra pull on rope $= \dfrac{5040 \times \cdot15}{13\,6} = 55\cdot6$ lbs.

(F) Pressure $=$ load $\times \cdot27 = 3{,}560 \times \cdot27 = 960$ lbs.

Ratio $= \dfrac{28}{2\cdot5} = 11\cdot2 : 1$

Extra pull on rope $= \dfrac{960 \times \cdot15}{11\cdot2} = 12\cdot85$ lbs.

(E) Load same as **F** $= 960$ lbs.

Ratio $= \dfrac{64}{3\cdot5} = 18\cdot3 : 1$

Extra pull on rope $= \dfrac{960 \times \cdot15}{18\,3} =$ say 8 lbs.

Frictional losses deduced to their equivalent pull on rope:—

$$360\cdot00$$
$$33\cdot00$$
$$10\cdot00$$
$$7\cdot84$$
$$4\cdot0$$
$$55\cdot60$$
$$12\cdot85$$
$$8\cdot00$$

Weight of tubs $\dfrac{528\cdot29}{3560\cdot00}$

$4088\cdot29$ lbs. $= 1\cdot83$ tons.

Loss Due to Bending Ropes.

If we take the work done in bending the ropes partially round the sheaves in the system as equal to bending half round three sheaves, we shall be about right.

Load on ropes $= 1\cdot83$ tons.

Loss at 15 lbs. per ton $= 3\left(\dfrac{1\cdot83 \times 15}{2240}\right) = 3\,(\cdot0122) = \cdot0366$ tons; say $\cdot04$

So total load on rope $= \left\{\begin{array}{l} 1\cdot83 \\ \cdot04 \\ \hline 1\cdot87 \text{ tons.} \end{array}\right.$

Breaking strain for machine winding should be seven times working load $= 13\cdot09$ tons, say a 2 in. patent steel rope by Cradock, which gives $14\cdot5$ tons.

The result shows the weight I assumed for the rope to be too great; 16 tons would be nearer the mark. This, however, will make very little difference to the ultimate result.

The following are the formulæ for a rope passing over a pit-head winding pulley:—

Let **w** $=$ weight of cage and tubs in tons.
" **W** $=$ " " rope "
" **fr** $=$ frictional loss in spindle "
" **fb** $=$ loss due to bending rope "
" **R** $=$ ratio between pulley diameter and spindle diameter.

Then—

$$\mathbf{fr} = \frac{2\,(\mathbf{w+W}) \times \cdot15}{\mathbf{R}} = \frac{3\,(\mathbf{w+W})}{\mathbf{R}} \quad .. \quad (1)$$

$$\mathbf{fb} = \mathbf{w+W} + \mathbf{fr} \times \frac{15}{2240} \quad .. \quad .. \quad (2)$$

or, putting in the value of "**fr**" just found in (1)

$$= \mathbf{w+W} + \frac{\cdot3\,(\mathbf{w+W})}{\mathbf{R}} \times \frac{15}{2240} .. \quad .. \quad (3)$$

So pull on rope on engine side of pulley $= \mathbf{w+W+fr+fb}$

If there is a binding pulley at the bottom also—pull $= \mathbf{w+W} + 1\cdot75\,(\mathbf{fr+fb})$

Take the load to be lifted plus an assumed weight of rope. The load on pulley spindle will be twice this so calculate the frictional loss as shown at beginning of this paper. Then add this frictional loss (or "extra pull" due to friction) to the loads (cage, &c., and ropes). This will give you the pull on the engine side of the pit-head pulley. Then for each ton of this pull, add 15 lbs., which is "extra pull" due to the stiffness of the rope, and you have the total pull on rope.

For direct winding you should take a rope giving a breaking strain ten times this load.

Putting this concisely we have:—
Pull on Rope $=$ cage and tubs $+$ rope $+$ frictional loss $+$ loss due to bending.
Frictional loss reduced to a pull on rope:—

$$\frac{2\,(\text{cage and tubs} + \text{rope}) \times \cdot15}{\text{Ratio}}$$

Loss due to bending :—
(This comes out in tons)

$$\text{Cage and tubs} + \text{rope} + \text{frictional loss} \times \frac{15}{2240} = \text{tons.}$$
$$(\textit{in tons}) \quad (\textit{in tons}) \quad (\textit{in tons})$$

If there is a binding sheave at the bottom too,

Pull on Rope $=$
Cage and tubs$+$rope$+1\cdot75$ (frictional loss$+$loss due to bending).

It will be seen that Mr. Eastmead's total load on rope is much higher than mine; this will be accounted for by his—

Assumed weight of rope being higher .... in **A** equation.
50 bottom rollers against my 23, and the assumed weight of each at 56 lbs., whereas the actual weight is 18 lbs........................ } in **B** "

These differences are, however, of no moment, as it is not for accuracy of figures, but rather for the value of the equations that Mr. Eastmead's paper is useful.

MINING NOTES.

Quebec.

At the pits of the Bell's Asbestos Company, Thetford Mines, about 300 persons are employed, and the output for the year, it is estimated, will be larger than at any previous period in the history of the company.

A large quantity of asbestos has been won this season from the Jeffrey mine, where many improvements in machinery and equipment have been made by the Danville Asbestos and Slate Co.

In our last issue it was stated in error that Mr. W. T. Costigan had assumed the management of the property of the Glasgow and Montreal Asbestos Co. at Black Lake. Mr. James Costigan, B.A. Sc., a son of Mr. W. T. Costigan, has the work in hand, assisted by our old-time friend, Mr. A. M. Evans. A cyclone mill has been added to the plant to work over the old dumps.

Several important shipments of chromic iron have recently been made to the United States from the mines at Black Lake.

Mr. John Hardman continues operations on his alluvial property at Slate Creek, the work being carried on in his absence under the superintendence of Capt. Macduff, a miner of large experience in Australia and Nova Scotia.

There is nothing noteworthy to report from the mica mines, at some of which a good deal of activity is noticeable. The old Blackburn mine in Templeton employs about 30 persons, and the Wallingford and McLaurin mines, in the same district, are also active. A steady demand continues for scrap mica and several sales of importance have been concluded, the principal purchaser being the Mica Boiler Covering Co. of Toronto.

Mr. John Penhale is doing some asbestos mining at Broughton, Que., for the United Asbestos Co., Ltd., of London.

The following are the mineral exports from the port of Ottawa as per Customs manifests for the seven months ended 31st July :—

Mica .... 292,334 lbs., of a value of $30,913
Graphite..... ..... 164,300 " " 6,183

NEW COMPANIES.

Manitou Gold Mining Co.—Incorporated under Ontario statutes. Capital, $500,000. Head office Toronto. Formed to carry on mining in the district of Algoma, Rainy Lake and Lake of the Woods. Directors: Simeon H. Janes, W. H. Cawthre and Edmund Bristol, all of Toronto.

Coolgardie Mining Co.—Capital $700,000. W. W. D. Turner, President; J. L. McCulloch, Vice President; L. F. Williams, Sec. Treas. Spokane Wash. Formed to acquire and work mining property at Copper Camp, Boundary Creek, British Columbia. It is stated 1000 tons of ore are on the dump awaiting shipment sampling $27 in gold, silver and copper.

Lake Erie Oil and Gas Co—Under Ontario statutes. Capital $45,000. Directors: A. M. McIntyre, James Poole, D. C. Clay, Colin S. Leitch, all of Dutton Ont. Operations of the company are to be carried on in the townships of Aldborough, Dunwich, Southwold, and the village of Dutton, where the head office of the company is to be situated.

Gold King Mining and Milling Co., Ltd.—Under New Brunswick statutes. Capital $500,000. Head office: Fairville, parish of Lancaster, N. B. Directors: E. G. Evans, Hampton, N. B., E. C. Elkin, St. John, C. P. Baily, St. John, Mark Gallerd, Waterville, Maine, C. J. Wasson, St. John.

Gold King Mining Co.—Chief place of business, Rossland, B.C. Authorized capital $1,000,000. Directors: T. S. Gilmour, Rossland, C. R. Hamilton, Rossland, and A. D. Provand, London, Eng. Formed to acquire and work the Gold King mineral claim in the Trail mining division, B. C.

Pacific Coast Portland Cement Co. has been formed to take over as a going concern the cement works of the Canadian Pacific Railway Co. on Vancouver Island, B. C., to purchase the property of the Saanich Lime Co. situated on Tod inlet, containing 435 acres, and to carry on the business of quarrymen and manufacturers of Portland cement. Head office Vancouver. Capital $500,000.

Eastern Star Gold Mining Co.—Head office Spokane, Wash. Capital $500,000. Formed to carry on mining in British Columbia.

Independent Mining Co.—B. C. statutes. Capital $1,000,000. Head office: New Westminster, B. C. Directors: J. B. Kennedy, Louis Williams, and H. L. De Beck, all of New Westminster, B. C.

Randolph Gold Mining Co.—Head office: Spokane, Wash. Capital $750,000. To carry on mining in B. C.

Dellia Mining and Milling Co.—Head office: Spokane, Wash. Capital $750,000. To carry on mining in B. C.