BRITISH MINING No.28

MEMOIRS 1985

Hewer, R.E. (Ed.) 1985
"The Wire Rope and its Applications"
British Mining No.28, NMRS, pp.56-64

Published by the

THE NORTHERN MINE RESEARCH SOCIETY
SHEFFIELD U.K.

NB
This publication was originally issued in the A4 format then used by the society. It has now been digitised and reformatted at A5. This has changed the original pagination of articles, which is given in square brackets.

ISSN 0309-2199

THE WIRE ROPE AND ITS APPLICATIONS
by **W.E. HIPKINS – 1896**

An extract by R.E. Hewer

Introduction

The following article is an extract from a NMRS library book. The book was published as a guide and catalogue of Messrs. J. & E. Wright Ltd., Birmingham, 1896. Unfortunately over half of the catalogue has been used as a scrap book and many pages have been cut out. A number of glued clippings were removed revealing coloured illustrations, the appropriate text had to be found beneath further clippings. A great deal of effort has gone into producing the following illustrations and I am most grateful to Mr. R.H. Bird for final retouching and reproduction of the illustrations. Of the 41 plates shown in the catalogue 15 have been reproduced.

'The manufacture of wire ropes made rapid strides after its commercial value became generally recognised. In 1857 the first attempt to span the Atlantic Ocean with a cable was made. This and succeeding efforts, however failed, and it was not until 1865-1866 that a cable was manufactured of sufficient strength, resistance, etc. to enable the design to be carried out. This cable was invented and patented by J. & E. Wright. The directors of the Atlantic Telegraph Company appointed a Scientific Committee to advise them upon the cable to be used. J. & E. Wright's Patent Compound Hemp and Wire Cable was adopted.' (Edited)

The following is a brief description of the first Atlantic Cable.

Conductor

Copper strand, consisting of seven wires (six laid round one) and weighing 300 lbs. per nautical mile, embedded for solidity in Chatterton's Compound. Gauge of single wire .048 Gauge of strand .144.

Insulation

Gutta Percha, four layers of which were laid alternately with four thin layers of Chatterton Compound. Weight 400 lbs. per nautical mile.

External Protection

Ten solid wires of .095 Gauge Galvanized Homogeneous Iron, each wire surrounded separately with 5 strands of Manila Yarn, saturated with preservative compound, and the whole laid spirally round the core, the latter was padded with hemp and preservative.

Weight in air

36 cwts. 3 qrs. per nautical mile.

Weight in water

14 cwt. per nautical mile.

Breaking strain
7 tons, 15 cwts.

Deepest water encountered – 2,400 fathoms.

Length of cable shipped – 2,300 nautical miles.

[56]

AERIAL CABLEWA YS

The efficiency and economy of aerial wire rope transportation in countries where the irregularity of the land renders surface haulage impracticable are leading to its adoption in situations equally favourable to other systems, as being lower in initial cost, maintenance and working. There are practically no difficulties presented by natural formations which cannot be overcome by the Wire Rope.

The capital outlay for erecting a cable-way is minimised and the cost varies directly with the requirements. It must be borne in mind that in the event of the line being no longer required it can be moved to other situations easily.

We propose therefore to give a brief description with illustrations of the leading systems of aerial rope transportation, making it sufficiently clear to enable our readers to grasp the principles involved with a probable view of applying them to their own requirements.

[57]

FLAT ROPES

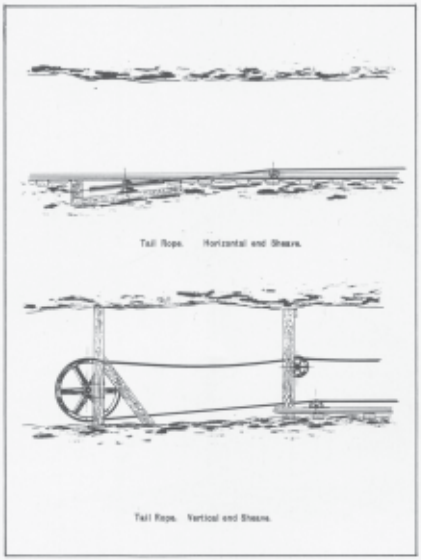
should be avoided, but the following table will be useful where such are already in use.

IRON WIRE.			STEEL WIRE.			HEMP.			
Size.	Weight per Fathom.	Price per Cwt.	Size.	Weight per Fathom	Price per Cwt.	Size 4 Strand.	Weight per Fathom	Price per Cwt.	Breaking Strain.
In.	lbs.		In.	lbs.		In.	lbs.		Tons.
1⅜ × ½	8		.....	.....		3 × 1	16		15
2 × ⅝	10½		.....	.....		4 × 1⅛	20		17½
2½ × ½	10¾		.....	.....		4¼ × 1⅛	21½		18
2¾ × ½	12¼		.....	.....		5 × 1¼	23		20
2⅞ × 9/16	14		1⅜ × ½	8		5¼ × 1¼	24½		23
3 × ⅝	16		2 × ⅝	10½		5½ × 1⅜	26		27
3¼ × ⅝	19		2⅜ × ½	10¾		5¾ × 1⅜	28		30
3⅜ × 11/16	21½		2¾ × ½	12¼		6 × 1⅜	30		35
3¾ × ¾	24½		.....	.....		6½ × 1⅜	33		40
4 × ¾	26		2⅞ × 5/16	14		7 × 1⅜	36		44
4½ × 13/16	29¾		3 × ⅝	16		7⅜ × 2⅛	40		49
4½ × ⅞	33½		3¼ × ⅝	19		8½ × 2¼	45		55
4¾ × 13/16	36		3⅜ × 11/16	21½		.....	.....		60
5 × 1	39		.....	.....		.....	.....		65
5¼ × ⅞	40		3¾ × ¾	24½		.....	.....		66
5⅝ × 15/16	42½		.....	.....		.....	.....		70
5¾ × 1	46		4 × ¾	26		.....	.....		77
6 × ⅞	46		.....	.....		.....	.....		77

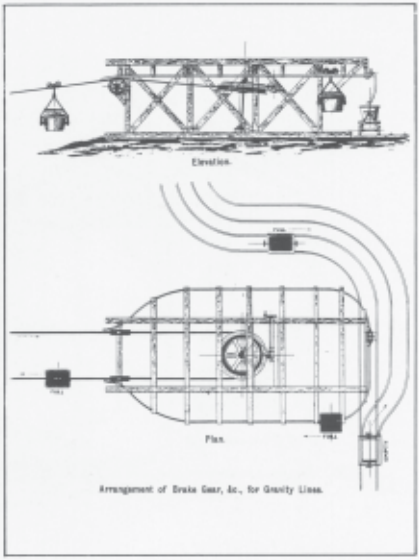
REMARKS.

WORKING LOADS.—For quick winding, the load, including weight of rope between pulley and pit bottom when the cage is down, should be taken at about *one-tenth* of the breaking strain.

NOTE.—The weights per fathom are given for Flat Wire Ropes, made with Hemp Cores in each Strand; for Wire Cores add about *one-ninth* to the given weight.



Main and Tail Rope Haulage System



Arrangement of brake gear

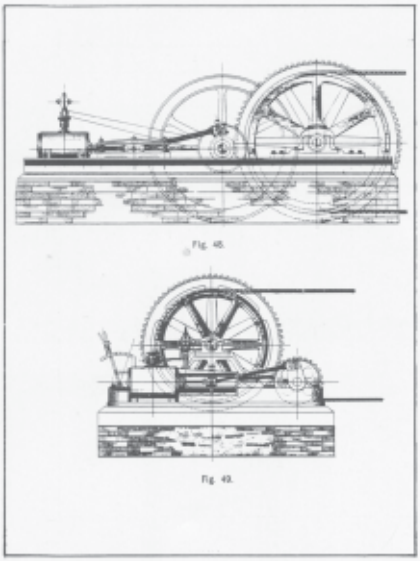
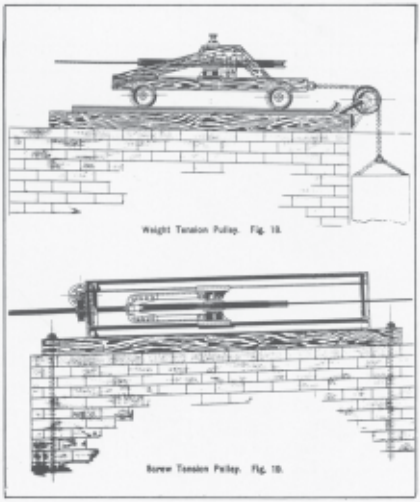
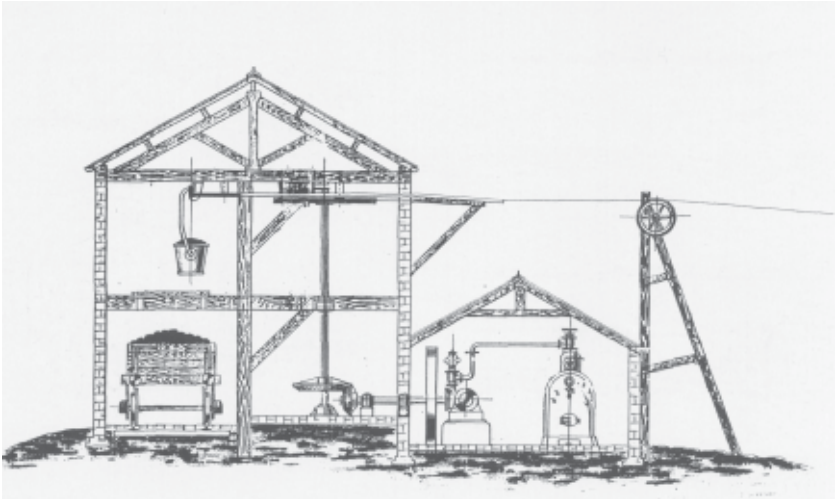


Fig.48 Endless rope haulage. Engine with heavy fly wheel and governors. Fig.49 Endless rope haulage. Engine with reversing gear.



Examples of two types of tensioning, used on ropes which are run over long distances. Fig.18 Weight Tensioning pulley. Uses a simple automatic tensioning device by means of a chain from the pulley bogey running over a static wheel to a container in a pit. Weights are placed in the container to the correct requirements. Fig.19 Screw Tension Pulley, Tension is maintained by a worm through a cog. For correct tensioning Messrs. Wright provided a reference table.



ARRANGEMENT FOR DRIVING BY STEAM ENGINE.

UNLOADING STATION.

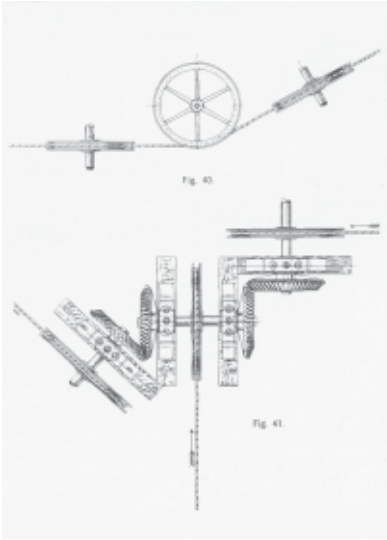
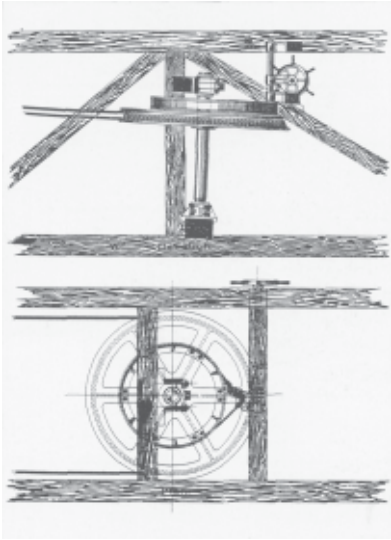
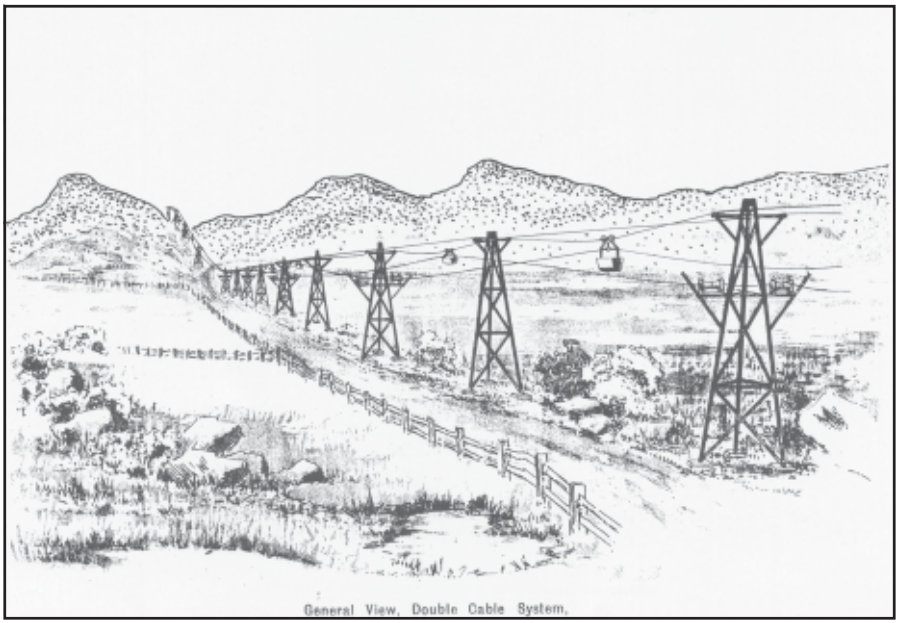


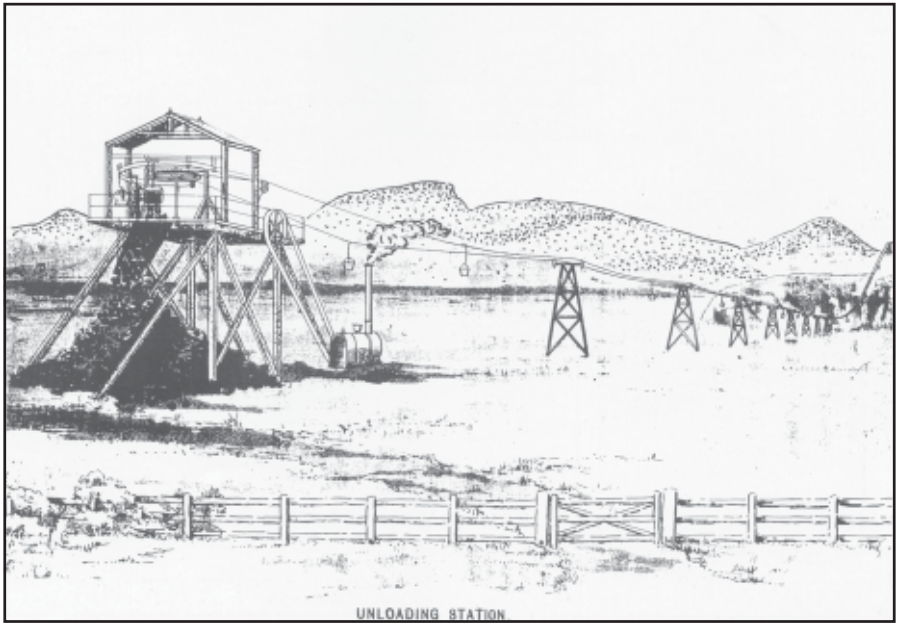
Fig.40 Wire rope driving horizontal angle pulleys. Fig.41 Wire rope driving bevel wheels, transmitting power and changing direction.



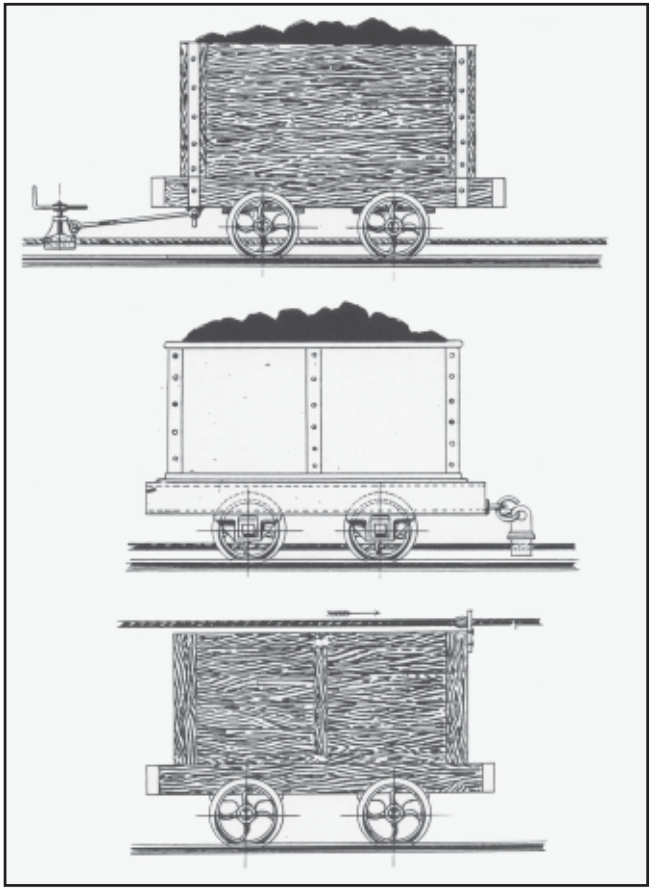
Details of Brake Gear. Braking effected by turning the capstan wheel connected to a rod and worm, which draws a toothed segment along the worm thus tightening the brake band.



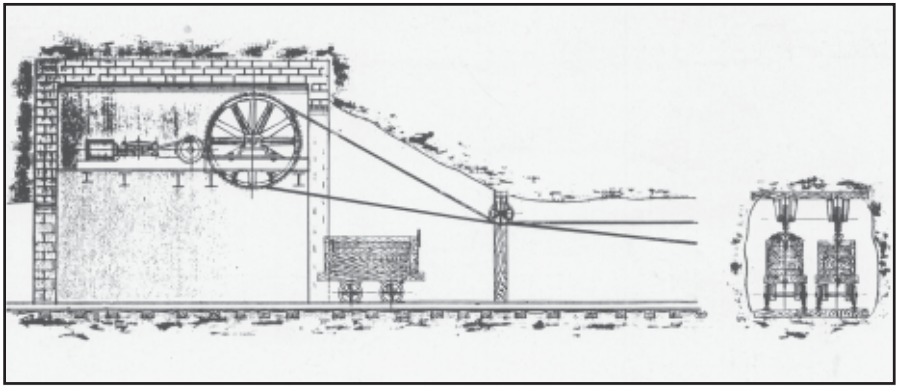
The use of a double cable system.



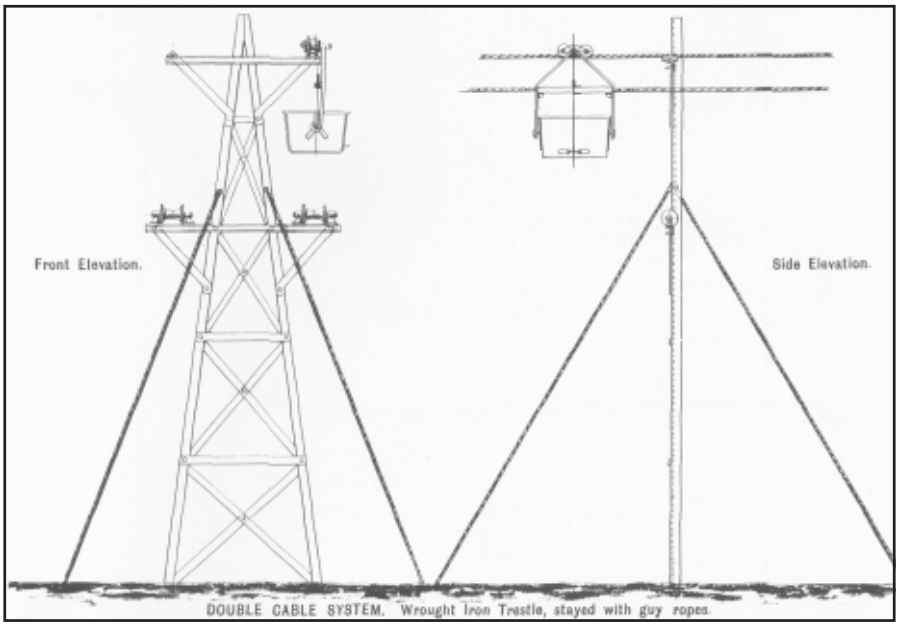
The Universe System. This system consists of an endless rope running continuously between two fixed points or stations. The rope is *kept in position by supports or standards sited between 70* & *120 feet apart.*



Mining Trams, tubs and cars.



Underground endless rope engine house with roof pulley guides and tup haulage.



A view of one pattern of standard. Other types available were Tubular Wrought Iron, Rectangular Wood Trestle, Round Fir Pole Trestle, Four post Trestle, depending on loads and exposed positions.

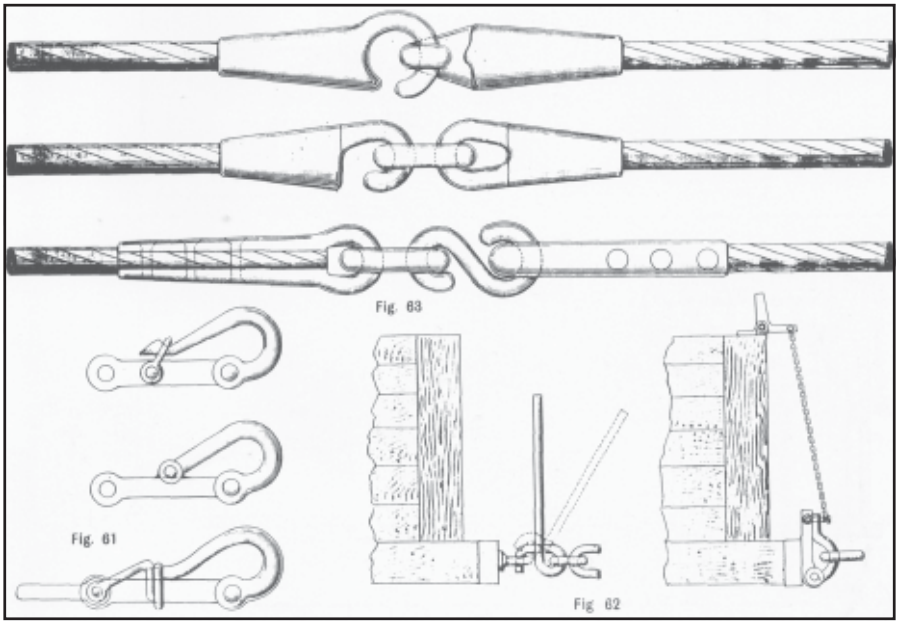
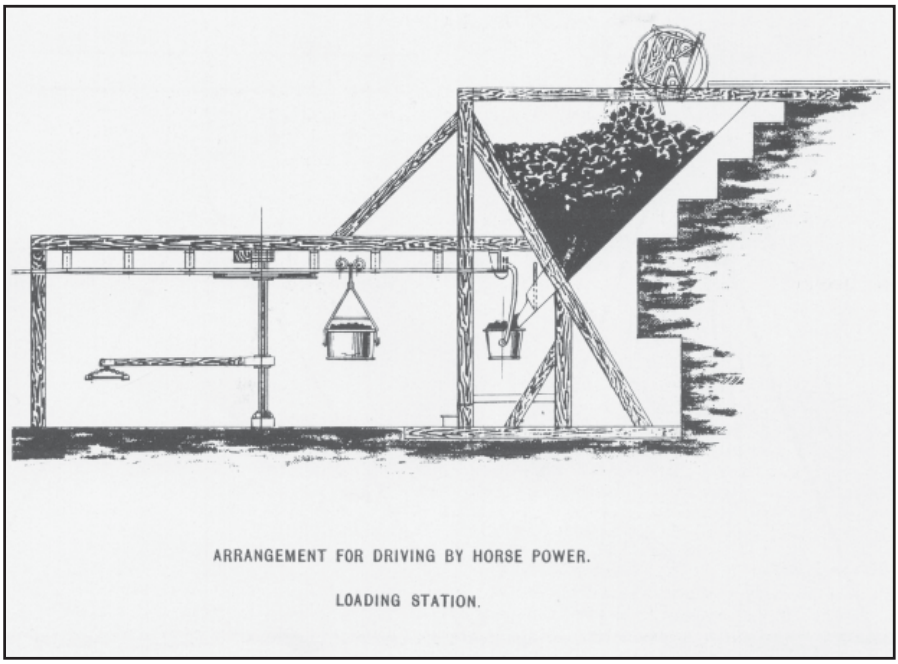
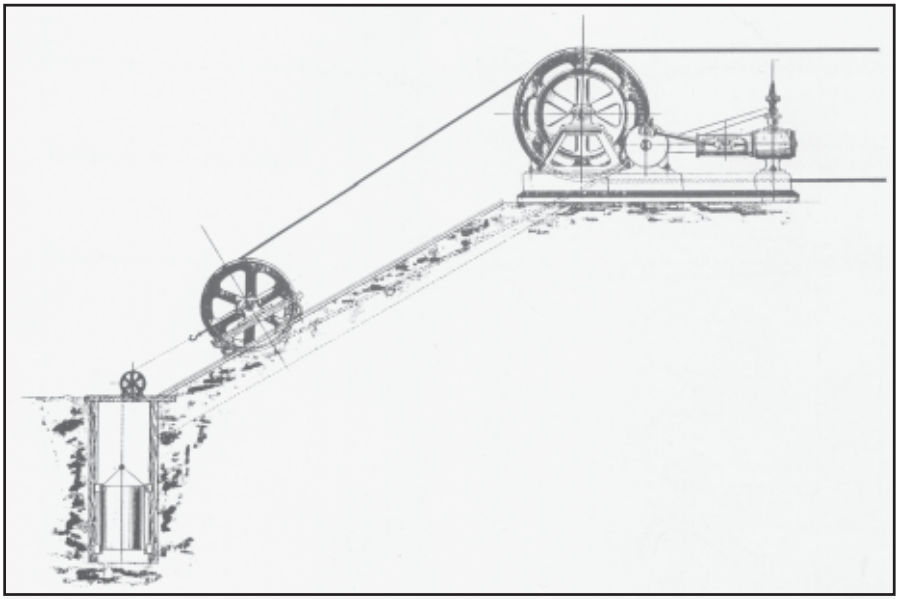


Fig.61 Main and tail rope haulage, knock off hooks Fig.62 Main and tail rope haulage, automatic hooks. Fig.63 Main and tail rope haulage, tail and branch couplings.



ARRANGEMENT FOR DRIVING BY HORSE POWER.

LOADING STATION.



Slow speed transmission. Counter pulley on Tension Carriage.