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X

NATIONAL COAL BOARD

WESTERN AREA

CHATTERLEY WHITFIELD COLLIERY

WINSTANLEY SHAFT WINDING ENGINE

MANUAL OF OPERATION

FOR

WINDING ENGINEMEN

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WINDING ENGINEMEN

INFORMATION FOR ENGINEMEN

2. SPECIFICATION

2.1	Type	Single parallel drum winder. ✓
2.2	Drive	Alternating current motor. ✓
2.3	Manufacturer	
	Electrical	Met Vicks. ✓
	Mechanical	Tinsley. ✓
	Brakes	Tinsley. <i>Blacks.</i>
2.4	Date of Installation	1967. <i>1966.</i>
2.5	Drum	8'-6" diameter 9'-0" wide. <i>9' DIA 8'6" WIDE.</i>
2.6	Motor details	3,500 volts 125 HP 585 r.p.m. ✓
2.7	Maximum rope speed mineral	12 f.p.s. <i>11.5 ft/sec (3.5 m/s)</i>
2.8	Maximum rope speed men	12 f.p.s. <i>11.5 ft/sec (3.5 m/s)</i>
2.9	Maximum drum speed	135.5 <i>22.2</i> r.p.m. <i>22.2 rpm.</i>
2.10	Automatic contrivance	Lilly Speed Controller.
2.11	Type of Brakes	Tinsley Accumulator low pressure hydraulic. <i>Blacks Spring/oil type</i>
2.12	Depth of Wind	739 ft. <i>717 ft. (218.5m)</i>
2.13	Conveyances	Twin single deck cages with both used for manriding. ✓
2.14	Type of guides	<i>4 guide rope</i> Rope - two guides per cage + two rubbing ropes.
2.15	Winding rope	26mm diameter. ✓
2.16	Balance rope	none fitted. ✓
2.17	Weight of cage and suspension gear	2.9 Tons. <i>2.6 TONS</i>
2.18	Number of men/cage	12 men North side cage only. <i>BOTH CAGES.</i> ✓
2.19	Weight of material or equipment	2.5 Tons. ✓
2.20	Maximum Out of Balance	3 Tons. ✓

26 to 1 R

3. DESCRIPTION OF THE ELECTRICAL EQUIPMENT OF THE WINDING ENGINE

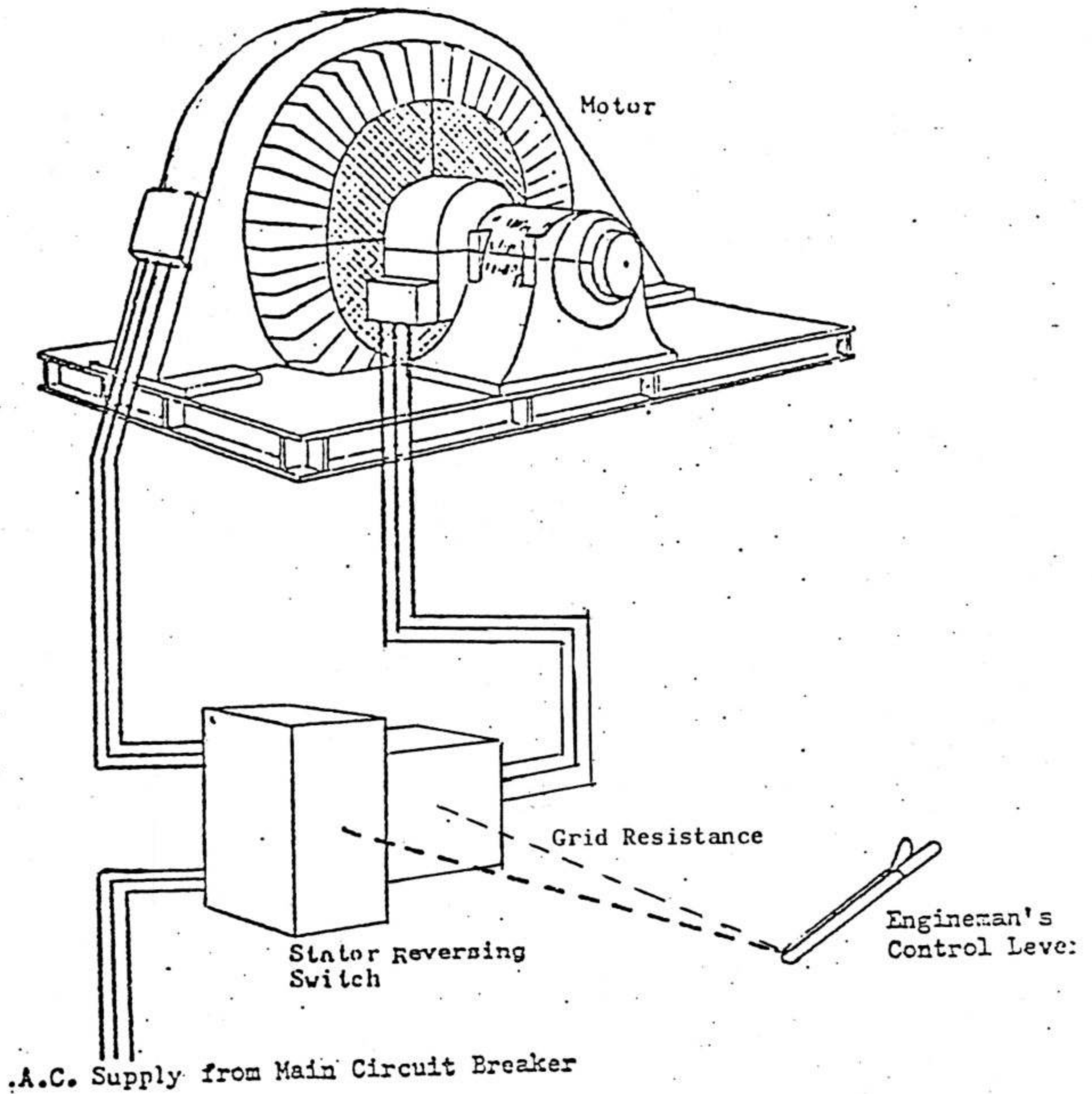
3.1 The Chatterley Whitfield ~~Winstanley~~ winding engine is of the A.C. type and a 125 H.P. A.C. Motor, 585 r.p.m. drives through a double reduction gear.

3.2 Electricity from the main colliery power supply at 3,300 volts A.C. is supplied directly to the switch in the engine house.

3.3 This switch is situated on the ground floor of the winder house as indicated on the floor plan. This switch is operated by the Winding Engineman. Should any other 3,300 volt switch require operating, then an electrician must be notified. ✓

3.4 Speed Control

The speed of the winder motor is controlled during acceleration by inserting resistance in the 'rotor' circuit. The resistance is gradually reduced as the motor speeds up. This external resistance is provided by a bank of metal grid type resistances. Contactors operated by the Winding Engineman's power lever close to gradually reduce the amount of grid resistances in circuit as the engine speeds up. ✓



SKETCH OF TYPICAL A.C. MOTOR AND CONTROL EQUIPMENT

3.5. Reversal of Rotation

The direction of rotation of the motor is determined by the connections of the power supply to the coils wound on the stator. Reversal of rotation is achieved by changing over two of these connections, this is done by the stator reversing switch. The switch is made up of "forward" and "reverse" contactors which closes when the engineman's control lever is in the "forward" or "reverse" direction.

4.

DESCRIPTION OF THE MECHANICAL EQUIPMENT OF THE WINDER

4.1

The mechanical equipment consists of :-

- (a) The drum.
- (b) The drum shaft, gears and bearings.
- (c) The mechanical brakes.
- (d) The automatic contrivance.
- (e) The depth indicator.

4.2

The drum is 8'-6" in diameter. It has coiled on it the 2 x 26mm diameter winding ropes, and it is driven through a double reduction gear train and a flexible coupling by the 125 H.P. motor.

4.3

All bearings are ^{correct only for down} white metal lined and ring oiled. X The oil is topped up by hand as required through inspection covers.

4.4

Mechanical braking of the winder is achieved by the friction linings of the brake shoes being forced into contact with the brake paths of the winder drum. ~~A low pressure oil hydraulic brake engine controls the operation of the brake. Hydraulic pressure on the top of the Brake Engine piston applies the brake and applying the same pressure on a larger area underneath the piston allows the engineman to control the release of the brakes.~~

~~In the event of a power failure or oil leakage the weights of the hydraulic accumulator impose forces on the brake linkage to fully retain the brakes in the full on position.~~

The brakes operate in response to the winding engineman's brake lever or a trip condition initiated by the automatic contrivance (see paragraph 4.5) or tripping of the safety circuits (see paragraph 6.2).

BRAKES
NOW
APPLIED
BY
COMPRESSION
SPRINGS.

4.5

The Lilly automatic contrivance required by Statutory Regulations is a Safety Device, in which the drum speed and cage positions, in the shaft are co-ordinated by mechanical governors and cams which operate electrical contacts. These contacts are connected into safety circuits of the winder and should overspeed or overwind conditions arise these contacts will open, trip the safety circuit and the winder will be brought to rest. The automatic contrivance thus provides the following features :-

- (a) Prevents the maximum permissible speed in mid shaft from being exceeded.
- (b) The man/coal lever is set permanently in the MEN position, the auto contrivance shadows the man winding cycle and initiates a trip if the speed of the winder exceeds this setting. It also ensures that the descending cage cannot pass the lowest landing at a speed in excess of 5ft/sec. (1.525m/sec.).
- (c) Warns the driver of an impending overspeed condition by illuminating a warning light, so that he can slow down before a trip occurs.
- (d) Stops the cage when being raised from travelling more than a pre-set distance above the highest landing.
- (e) Prevents, together with the associated electrical equipment, the safety circuits being re-set and the winder being driven in the direction of the overwind, after having been tripped as in (d) above. ✓

4.6

The vertical depth indicators is situated on the right hand side of the drum, and is driven by suitable gearing from the drum shaft. This indicator has two mimics representing the psotion of the cages in the shaft.

5. DRIVERS CONTROL DESK

5.1 The drivers control desk is provided with levers and indicators conveniently grouped for ease of operation (sketch 11 relates to this desk).

5.2 The levers provided and their purpose are :-

- (a) Control Lever - is labelled FORWARD/REVERSE. It controls the speed and direction of rotation of the winder
- (b) Brake Lever - is labeled BRAKE ON/ BRAKE OFF and is used to apply or remove the mechanical brakes as required.
- (c) Man/Coal
Safety Lever ^{Switch} - is used to select the appropriate protection provided by the auto-contrivance. It also switches on the "MEN" light on the control desk. (Ref. No. 4), and the "MEN" light on the pit bank. This is permanently retained in the "MEN" position. ✓

6. SCHEDULE OF WINDER PROTECTION

There are two different types of trips and these are :-

6.1 SAFETY CIRCUITS

CONDITIONS FOR TRIPPING OF THE "WINDER MAIN SWITCH"

6.1:1 There are certain protective devices included which are arranged to open the "WINDER MAIN SWITCH" and remove electrical power from the winder and motor, and these are detailed in Appendix 1.

6.2 CONDITIONS FOR TRIPPING OF THE SAFETY CIRCUIT

6.2:1 Appendix II lists the protective devices which are provided and arranged to trip the secondary safety circuit. On operation of this trip, power is removed from the winder motor and the mechanical brakes are automatically applied.

CONDITIONS FOR TRIPPING OF THE "WINDER MAIN SWITCH"

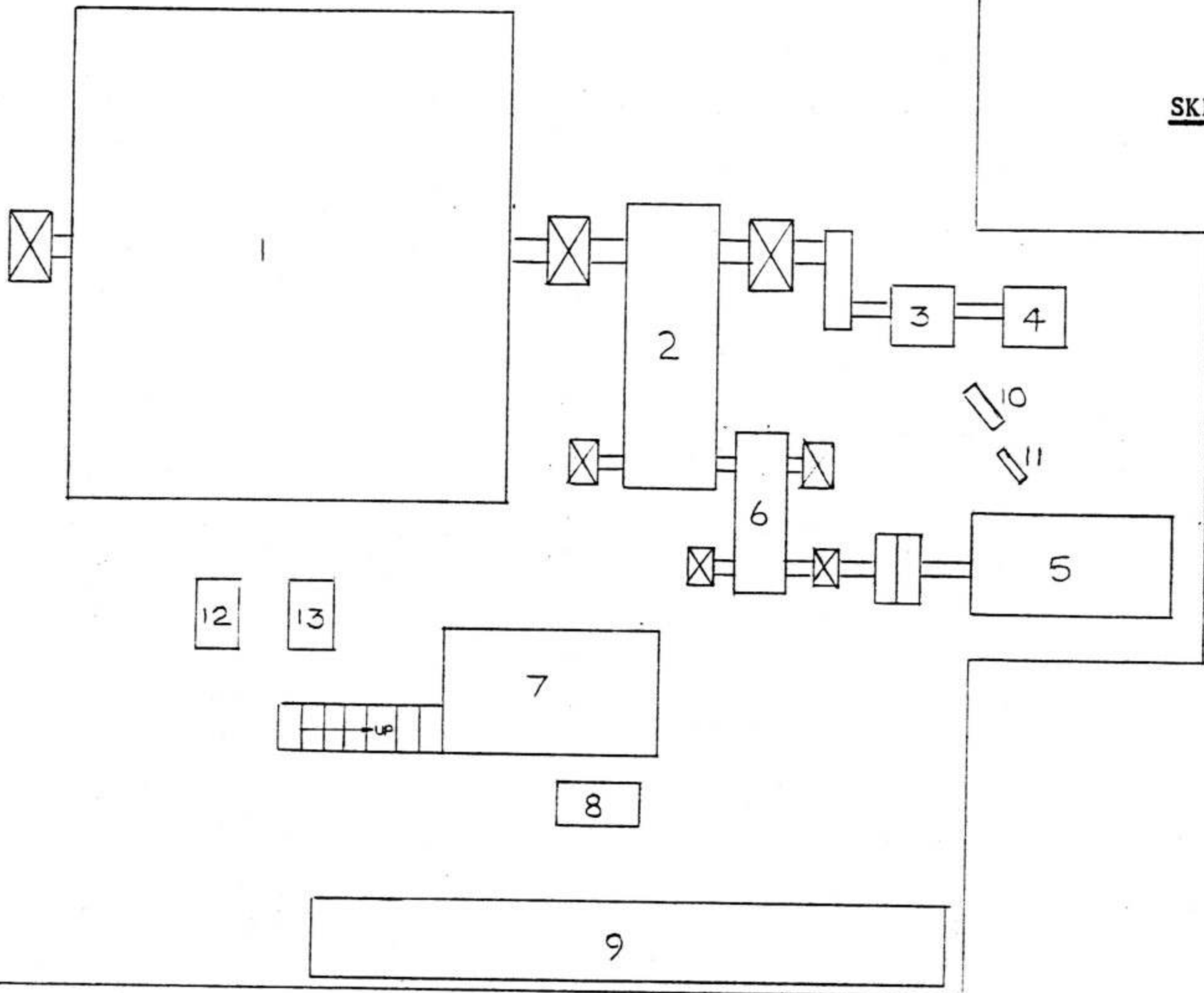
Protection Device		When Operated	Reason for Operation	Location of the Indication that the device has operated	Remarks
Type	Location				
Overcurrent Protection Tripping Device.	Winder main switch.	Excess load on motor.	Prevents failure of main motor due to overloading.	None.	-
Earth leakage Tripping Device.	Winder main switch.	Earth fault on winder motor.	To cut off electricity on failure of insulation.	Winder main switch.	-
Door Interlock.	Live Enclosure door.	When the enclosure door is opened.	To ensure that access cannot be obtained whilst alive.	None.	-
Remote Emergency winder trip switch.	Drivers Desk.	On winder engineman's judgement.	Operated in case of any mal-function or emergency on winder equipment.	None.	Trips Safety Circuit.
Depth Indicator limit switches.	Depth indicator.	After Lilly failed to trip safely.	Approaching overwind conditions after failure of Lilly.	None.	-
Ultimate Limit switches.	Headgear.	When Lilly and depth indicator trips fail.	To prevent the cage running into headgear.	NONE.	-

CONDITIONS FOR TRIPPING THE WINDER AUXILIARY

Protection Device		When Operated	Reason for Operation	Location of the Indication that the device has operated	Remarks
Type	Location				
Emergency Stop Button.	R. H. Side of Driver's Forward and Remote Lever.	On winding engine-man's judgement.	Operated in case of any malfunction or emergency on winder equipment.	None.	Trips Main Switch.
Overspeed Switch.	Lilly controller.	Overspeed conditions obtained during wind.	To prevent a dangerous or excessive speed.	Warning lamps on Driver's Desk.	-
Overwind Switches.	Lilly controller.	Overwind conditions at end of wind.	To prevent overwind.	Driver's Desk.	-
Slack Rope Switches.	Top and Bottom rope holes in winder house.	Operated by slack rope.	To prevent winding with descending cage held.	Driver's Desk.	-
Brake Interlock Switch.	Mechanical brake.	When the mechanical brake is ON.	To prove correct operation of the brake lever.	DRIVERS CABIN.	-
OFF position interlock.	Master controller.	When the Master controller is in the OFF position.	To prove correct operation of the control lever.	None.	-

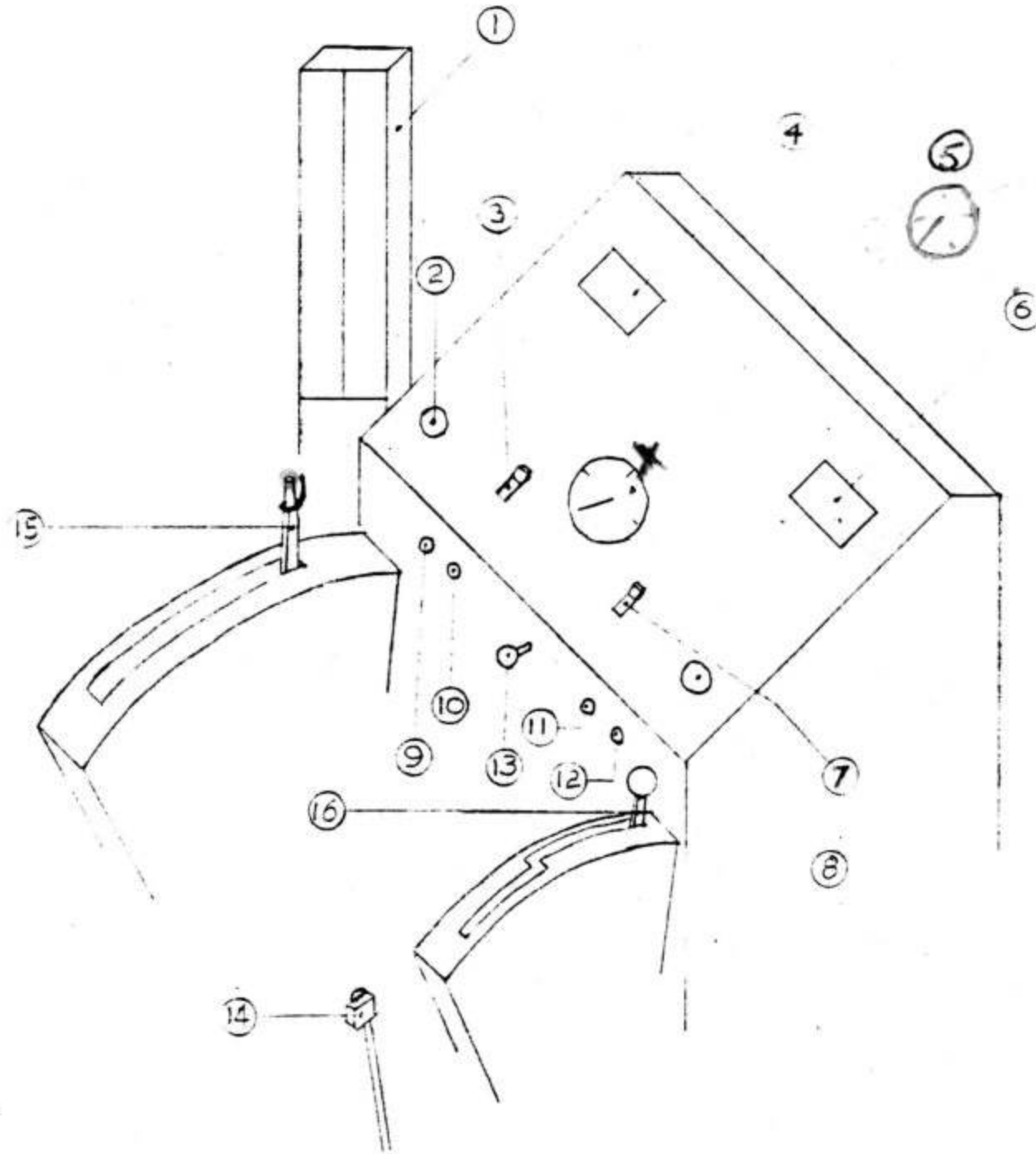
WINSTANLEY WINDER

SKETCH I



Item No.	Equipment	Location
1	Drum.	Ground Floor.
2	Second Reduction Gears.	Ground Floor.
3	Depth Indicator.	Ground Floor.
4	Lilly Controller	Ground Floor.
5	Motor.	Ground Floor.
6	First Reduction Gears.	Ground Floor.
7	Winding Enginemans Cabin.	Ground Floor.
8	Main Switch.	Ground Floor.
9	Resistors.	Ground Floor.
10	Ammeter.	Ground Floor.
11	Rope Speed Indicator.	Ground Floor.
12	Brake Pump. N°1	BASEMENT.
13	Brake Pump. N°2.	BASEMENT.

SKETCH II



Item	Equipment
1	Signal Panel.
2	Backing out light
3	Backing out switch.
4	Nº1 BRAKE PUMP RUNNING LAMP
5	Brake fluid pressure guage (outside cabin)
6	Nº2 BRAKE PUMP RUNNING LAMP
7	Men/Coal Switch.
8	Overspeed warning light.
9	Start button No. 1 pump.
10	Stop button No. 1 pump.
11	Start button No. 2 pump.
12	Stop button No. 2 pump.
13	Emergency stop (main switch).
14	Emergency stop (Safety circuits).
15	Brake lever.
16	Controller (forward and reverse).

Chatterley Whitfield Winstanley Winder Drivers Control Desk

Emergency Stop

Men riding
Bank
Stop
Raise
Lower 2
Men 3
Raise Steadily 4
Lower Steadily 5
S/S Slack rope
Keps In
Keps Out

Men riding
Pit bottom
Stop
Raise
Lower 2
Men 3
Raise Steadily 4
Lower Steadily 5
N/S Slack rope
Keps In
Keps Out

7. WINDER OPERATION

7.1 Pre-Start Set Up

7.1:1 Check the desk and ensure that the control lever is in the "OFF" position and that the brake lever is in the "ON" position.

7.1:2 Check the 3300 volt switch and close up the switch labelled "Main Winder Switch".

7.1:3 Ensure that the Drum and Depth Indicator lights are lit.

7.1:4 Check that the power is on to the shaft signals.

7.1:5 Check generally around the winding engine and all auxiliary equipment. Any defects found must be reported to the Mechanic/Electrician-in-charge as appropriate.

7.2 Starting Up and Preparing to Wind

7.2:1 From the desk start up the auxiliary equipment listed below by pressing the relevant start push buttons. In each case an illuminated indicator will show when the drive is running (See Sketch 1).

(a) Brake oil pump. (Ref. No. 12).

7.2:2 Check the man/coal safety lever is in "MEN" position.

7.2:3 Check with the Banksman that the signals are in order.

7.2:4 Trip the safety circuit by means of the desk emergency stop push button (Ref. No. 13) and then reset.

7.3 Winding

7.3:1 Operation of Engine

The winding engineman can now proceed to operate the winding engine in the following manner.

- 7.3:2 Move the control lever a little way in the required direction, where upon the stator current will build up rapidly.
- 7.3:3 Move the brake lever to the fully "off" position whilst simultaneously moving the control lever to the "forward" or "reverse" position, according to the direction of the wind required. (Note the present acceleration rate cannot be exceeded). The winder will speed up to its present maximum of 11 f.p.s. (3.36) and continue at this speed.
- 7.3:4 When the appropriate mark on the depth indicator shows the approach of the end of the wind, speed is reduced by moving the control lever towards the "power off" position and the brake lever to the "brakes on" position. At the end of the wind the control lever should be moved to the "power off" position and the brake lever to the "fully on" position.
- 7.3:5 When stopping the winder other than at the end of the wind, the action of moving the control and brake levers as previously described should be used.

7.3:6 Pre-Shift Tests

At the commencement of each shift the winding engineman shall carry out a static brake test. The cages are place in mid shaft and the brakes fully applied. Power is then applied to the motor until the ammeter reads 50 amps.

- 7.3:7 The winding engineman will carry out the necessary test winds as specified in the Coal and other Mines(Shafts, Outlets and Roadways) Regulations 1960 paragraph 21 (2) (See paragraph 9.2).

7.3:8 Normal Winding

The winding engine can now be operated in response to the signals the winding engineman receives.

- 7.3:9 When set in motion as previously described the winder will speed up to its present maximum speed of 11 ft/sec (3.36) and continue at this speed. (Note : The present acceleration rate cannot be exceeded).

- 7.3:10 If the cage approaches the surface too fast or travels approximately 14" beyond the normal end of wind, the automatic contrivance will operate the safety circuit. The following procedure must be followed after an overwind has occurred :-
- (a) Ensure the brake lever is in the fully "ON" position.
 - (b) Ensure the control lever is on the "OFF" position.
 - (c) Reset hand operated "backing out" device which allows power to be applied only in the opposite direction. (Ref. No. 3).³
 - (d) By the usual combination of the control and brake levers "back" the cage out of the overwind. It will only be possible to drive the winder in the correct direction, but enough power must be applied to the motor to ensure that the winder does not move further into the overwind under the influence of gravity.
 - (e) When clear of the overwind condition release the Hand ~~foot~~ operated device.
- 7.3:11 Additional overwind protection is provided on the depth indicator and also in the headgear. These are arranged to operate later in the wind than the automatic contrivance overwind trip, and are provided to give additional protection should the first trip not operate correctly. If the latter of these protective devices be operated, then the Electrician-in-charge and the Mechanic-in-charge must be notified, as their services will be required to enable the cage to be "backed out". It will also be necessary for the automatic contrivance and the electrical circuits to be checked and any faults corrected.

7.5 Closing Down Procedure

- 7.5:1 After completion of winding the winding engine must be closed down and left in a safe condition as detailed later.
- 7.5:2 Position the cages in the shaft away from the pit bank (DO NOT leave the **cages** in the mid shaft position).
- 7.5:3 Ensure that the brakes are fully applied and that the "Brake Lever" is in the "ON" position.
- 7.5:4 Ensure that the "Control Lever" is in the "OFF" position.
- 7.5:5 Remove all power from the winder by pressing the winder switch trip push button on the desk (Ref. No. 13). This will open circuit the winder switch and thus isolate all power equipment.
- 7.5:6 Briefly examine all equipment, particularly ensuring that brake shoes and brake paths are cool and there is no fire risk.

8. TEST PROCEDURE

8.1 Daily

These tests will be carried out by the Mechanic-in-Charge and the Electrician-in-Charge after prior arrangement with the winding engineman and will be :-

- (a) With conveyance balanced and brakes in the OFF position manually trip one of the safety devices to prove correct operation of the safety circuit and the emergency brake solenoids by automatic application of the brake.
- (b) Carry out checks on the shaft signals.
- (c) Operate each slack rope device by hand.

8.2 Weekly

These tests will be carried out under the joint supervision of the Mechanic-in-Charge and Electrician-in-Charge and will comprise :-

- (a) A static brake test where the cages are placed in mid shaft and the brakes applied. Power is applied to the motor until the ammeter attains 50 amps.
- (b) Tripping the automatic contrivance overwind catches by raising slowly each cage in turn above the highest normal landing.
- (c) Tripping each ultimate overwind device by hand.

8.3 Quarterley

The Area Test Engineer, accompanied by the Unit Mechanical and Electrical Engineers or their duly appointed representatives, will supervise the carrying out of the following tests :-

(a) Carry out the full series of tests as directed by the Area Test Engineer, which will necessitate :-

- (i) Loading each cage in turn with the approved load.
- (ii) Setting up and working to an artificial landing in the shaft.
- (iii) Tripping depth indicator overwind switches by raising slowly each cage in turn above the highest normal landing.
- (iv) Restoring to normal winding levels and checking for correct operation.

(b) Carry out the weekly tests of brakes and overwind limit switches as specified under paragraph 8.2.

8.4 Half Annual

When rope cappings are carried out carry out tests 8.3 (a) (iii) by movement of the cage and additionally operate the slack rope devices by slowly moving the winder with each cage supported by an R.S.J. in turn.

INSTRUCTIONS FOR WINDING ENGINEMEN

9. WINDING ENGINEMAN'S OTHER INSTRUCTIONS

9.1. These are listed in Appendix IV.

9.2. The duties performed by the winding engineman must comply at all times with the Mines and Quarries Act 1954; Shafts, Outlets and Roadways Regulations 1960; S.I. 1960, No. 69 Part IV. These duties include the following :-

(a) At least once during the shift an external examination must be made of all the winding apparatus, cleaning and oiling where necessary.

(b) After any cessation of winding exceeding two hours and before lowering or raising any person, the brakes must be tried for normal operation, and the emergency stop button operated and two full winds must be carried out.

(c) The skips shall not be set in motion if any signal transmitted to the engineman is incomplete or inconsistent, or does not conform to the standard Code of Signals stated in Part VI of the above mentioned regulations.

9.3. The normal maximum out of balance load for this winder is 3.0 Tons.

9.4. The winding of all out of balance loads exceeding the above figure shall be supervised by a competent and authorised member of the mechanical staff.

(a) The supervising engineer shall inform the winding engineman, the banksman and the onsetter of the intention to wind an abnormal load and tell the winding engineman of the weight of the load.

(b) The load shall be loaded into the conveyance and secured under the supervision of the above mentioned engineer.

(c) When the supervising engineer is satisfied that the abnormal load is secure and will not protrude into the shaft, and that if required a suitable counterbalance is provided, then he shall give instructions for the wind to proceed.

(d) On completion of the wind, the supervising engineer shall ensure that a competent and authorised person supervises the off-loading of the abnormal load.

(e) When the operation is complete the supervising engineer shall inform the winding engineman, the banksman and the onsetter that normal winding can be resumed.

9.5. When capping of the ropes, changing winding ropes or cage changing operations are to be carried out, the winding engineman will be notified by the supervising engineer and the normal Code of Signals must be used.

- 9.6. Inspections of shaft equipment shall be carried out at intervals not exceeding 24 hours and before competent and authorised persons are allowed on to the top of the conveyance, the winding engineman must be notified. The standard Code of Signals shall be used at all times when examinations take place, and the winding engineman must wind at a speed satisfactory to the person or persons carrying out the examination.

At any time when men are riding on the top of the conveyance the winder shall not be operated at a speed in excess of 5 ft./sec. (1.525 m/sec.).

10. EMERGENCY PROCEDURE

- 10.1. When men are being wound and there is a complete power loss at the colliery, the procedure to be followed is as shown in the emergency egress regulations, and this will include working to the instructions of the Senior Mechanical Engineer and Senior Electrical Engineer on duty at the time.

11. CODE OF SIGNALS

11.1 Mineral and Material Winding

Raise up	1
Lower down	2
To stop when in motion	1
To raise steadily	4
To lower steadily	5

11.2 Men Winding

All signals to be preceded by	3
Raise up	1
Lower down	2
To stop when in motion	1
To raise steadily	4
To lower steadily	5

11.3 Special Signals

Onsetter leaving bottom	6
Materials or heavy loads being carried through shaft	7
Men working in sump	8

SELECTED STATUTORY REQUIREMENTS/SELECTED REGULATIONS

APPERTAINING TO WINDING ENGINES AND WINDING ENGINEMEN

MINES AND QUARRIES

**The Coal and Other Mines (Shafts, Outlets and Roads)
Regulations, 1960**

PART IV

*Duties of persons operating winding apparatus and rope haulage apparatus
in shafts, staple-pits and unwalkable outlets*

20. A person operating any winding apparatus or rope haulage apparatus which is used for carrying persons through a shaft, staple-pit or unwalkable outlet shall not leave the controlling gear when the apparatus is in motion or he has any cause to believe that anyone is in the cage, carriage or kibble.

21.—(1) Every person operating any such winding or rope haulage apparatus shall at least once during his shift carefully examine the external parts of the apparatus under his charge and any apparatus ancillary thereto, unless such an examination has been carried out during his shift by another person in pursuance of paragraph (2) of regulation nineteen of these regulations.

(2) After any cessation of winding or haulage exceeding two hours the person operating any such winding or rope haulage apparatus shall, immediately before lowering or raising any person, run the cage, carriage or kibble at least once between the top of the shaft, staple-pit or outlet and the lowest entrance thereto for the time being in use or the bottom thereof in order to ascertain whether all the apparatus is in order.

(3) If during the course of any such examination or test or on any other occasion a person operating any such winding or rope haulage apparatus discovers any defect likely to affect the proper working of the apparatus, he shall not put the machinery in motion again until the defect has been reported to the manager, an under-manager or the official under whose direction he works and he has been instructed to operate the machinery by one of those persons.

22. Every person operating any such winding or rope haulage apparatus shall during his shift keep the apparatus under his charge cleaned and oiled, unless some other person is appointed so to do.

23. No person in charge of any winding apparatus or rope haulage apparatus with which a shaft, staple-pit or unwalkable outlet is provided shall allow it to be operated under his supervision (on an occasion to which subsection (1) of section forty-two of the Act does not apply) by any person other than one authorised in writing by the manager so to do.

24. No person operating any such winding or rope haulage apparatus shall set the machinery in motion in pursuance of any signal transmitted to him which is indistinct or in pursuance of any series of signals which is or appears to him to be incomplete or inconsistent.