Catalog and Manual

S-83

The SIMPLEX

HOIST CONTROLLER

and

WEIGHT UNITS FOR SMALL MINE HOISTS

To prevent small mine and other type hoists from overspeeding and overwinding, and to compel retardation when approaching the limits of travel.

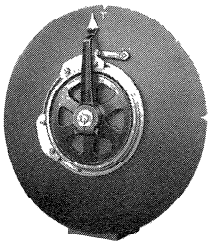


FIG. 1—Front.

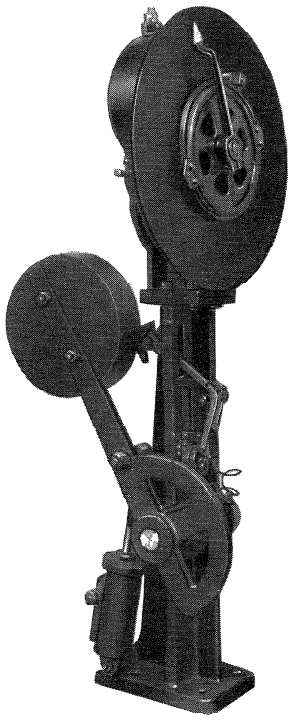


FIG. 2—Simplex Controller with Weight Unit for Hand Brakes.

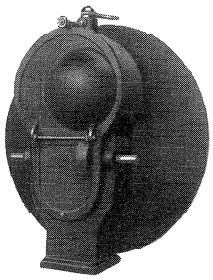


FIG. 3—Back.

Manufactured by

LOGAN ACTUATOR CO.

550 CHIPPEWA RD
HARVARD ILLINOIS U.S.A. 60033

We also manufacture the Models C and D Logan-Lilly Controllers, which are recommended for larger and faster hoists.

To Insure Safety In Hoist Operation

(A) The brakes must be capable of meeting the maximum demands and be responsive to the control of the hoistman.

(B) Suitable automatic safety equipment must be selected and carefully installed.

(C) Correct adjustment of the brakes, the control mechanism, and the automatic safety equipment must be maintained.

(D) Careful inspection of these features must be made regularly by a responsible person who thoroughly understands the equipment, and a written report should be made and retained as a matter of record.

FOREWORD

For more than half a century, the designers of the Simplex Hoist Controller have been engaged in the development and manufacture of the world's finest and most complete line of automatic safety controllers for mine hoists, and have supplied hoist controllers for operation in every continent of the world.

The finest hoists of American and Allied manufacture are regularly equipped with our controllers; the famous Logan-Lilly Hoist Controllers for the larger hoists, and Simplex Controllers for the small hoists.

While all features of the Logan-Lilly Controllers are necessary for the larger and faster hoists, some of these features are not necessary for small hoists, especially where the rope speed is relatively low. The Simplex Hoist Controller, which operates upon the same basic principle as the Logan-Lilly Hoist Controllers, was designed to satisfy the usual requirements of this latter class of hoists, and to sell at a moderate price.

Simplex Hoist Controllers have been in successful operation in many mining districts for more than 50 years.

The first portion of this publication describes the Simplex Controller: available extra options, the emergency weight units, and the principles of operation. The intermediate portion illustrates typical installations of Simplex Controllers on single-drum and double-drum hoists. The latter part contains instructions for installing and adjusting Simplex Controllers, together with typical electrical diagrams showing methods of connecting the switch of the Simplex Controller in hoist circuits.

THE IMPORTANCE OF AUTOMATIC SAFETY EQUIPMENT ON MINE HOISTS

1. Mine hoists are liable to have accidents of various kinds, some of which are beyond the control of the hoistman. These accidents, which are not uncommon among hoists without adequate safety protection, have frequently been accompanied by injuries or fatalities. All hoists should therefore be protected by dependable automatic safety equipment.

2. Hoist accidents may be caused by —

   a — Starting the hoist in the wrong direction when at or near the limit of travel.

   b — Running the hoist too fast without warning for the proper speed limit.

   c — Failure to commence retarding at a sufficient distance from the end of travel to permit the cage or skip to be stopped within the normal limits.

   d — Failure to continue retardation at the proper rate.

   e — Failure to stop the hoist when the normal limit of travel has been reached.

   f — Mistaking the marks on the indicator or drum.

   g — Lowering with the brake, and allowing the drum to run away.*

   h — Releasing the brake from a free drum while the clutch is disengaged, or disengaging the clutch while the brake is released.**

   i — Forgetting that both cages or skips of a double-drum hoist with one or both drums clutch driven, may be at the top or bottom at the same time, clutching and starting in either direction.

   j — Cutting off power at an intermediate position and omitting to set the brake.

   k — Electric power failure, or steam being shut off from the line while the hoist is in motion, without the brake being set to hold the load.

   l — Clutch breaking, allowing a drum to run away.

   m — Breaking the drive pinion or gear, or a key coming out.

   n — Breaking or shearing bolts in the drive gear.

   o — Breaking the drive coupling between the motor and the hoist.

   p — Breaking the connection between the hoistman's lever and the brake mechanism or the brake engine.

   q — Hand lever pawl slipping out of its notch, and releasing the brake.

   r — Indicator drive failing, due to the loss of a key — friction drive being improperly tightened — chain worn out of pitch and climbing on sprockets — chain coming off — or gears working out of mesh.

   s — Hoist being operated by an inexperienced or unauthorized person.

   t — Running too fast with men.

   u — Hoisting men above the man-landing, and possibly dumping them in a bin or chute.

   v — Lowering men into the sump.

   w — Absent mindedness on the part of the hoistman for a moment — falling asleep — fainting — being struck by lightning — being incapacitated or killed by a rope breaking, a pipe bursting, or a gasket blowing out, or dropping dead from natural causes.

3. Accidents resulting from some of these potential causes are comparatively rare, while others have been common, and all possible contingencies should be considered when selecting, installing and adjusting the safety equipment.

*Hoist drums and rotors have burst from centrifugal force.

**The brake and clutch should be interlocked, but some are not.

THE SIMPLEX HOIST CONTROLLER

4. The Simplex Hoist Controller is a simplified and inexpensive safety device for small mine hoists operating at relatively low rope speeds, to prevent overspeeding and overrunning the normal limits of travel, and where the safety requirements do not demand automatic brake regulation, warning alarms, or selective limit switches as standard equipment.

5. The Simplex Hoist Controller is easily installed and adjusted. It has a rugged and efficient governor with an oil dash-pot to steady its action, thereby permitting the maintaining of close and accurate adjustments, and preventing needless interference by the hoist controller with normal hoist operation even if the drive should be slightly irregular or jerky.

THE PRINCIPLE OF OPERATION

6. The operation of the Simplex Hoist Controller depends upon the coordinated action of a centrifugal governor and a pair of cams, the governor driven in synchronism with the hoist drum, and therefore maintaining a direct speed relationship with the drum; and the cams moving in ratio with the movement of the mine cage, and consequently representing its position in the shaft. The combined action of these elements operates an electric switch within the casing whereby in case of an emergency condition, the power of the hoist will be cut off, and the brakes will be applied.

7. The switch is wired to a terminal block from which, through a ½" conduit opening in the top of the casing, connections are made to the safety circuit.

7a. Optional overspeed warning contacts can be added. See Page 8.

7b. Optional selective limit switch arrangements can be added. See Page 13 and Par. 39 to 42.

CAMS

8. The only standard cams on the Simplex Hoist Controllers are two retarding cams, one for each end of travel, corresponding with the top and the bottom of a mine shaft. These cams are furnished with the working face unfinished, and they should be profiled after being installed on the hoist. See Pars. 51 to 54. See also Page 13 and Par. 39-42 for optional added cams.

9. The cams are mounted on a rotary dial, where they may be adjusted to any desired position around the rim of the dial, and each secured by a pair of clamping bolts movable in a circular "T" slot.

10. Each cam guards the approach, retardation and stop for the limit of travel in one direction, the two cams being mounted opposite each other on the dial. The cams, furnished with their working profile unfinished, should be profiled to suit the correct retardation of the hoist on which the controller is installed.

11. The length of the tapered part of the cam should correspond with the distance the rim of the cam dial travels during retardation and acceleration, and the profile should be so that the cam operated arm of the switch will follow as closely as possible to the governor operated arm, during the retardation period while the hoist is operated in a normal way.

12. Any capable machinist can easily profile the cam after the hoist is in operation. See Pars. 51 to 54 incl., and Fig. 45.

13. The full speed adjustment is obtained by means of a screw extending through a boss in the top of the casing, to vary the resistance against the governor. It should be screwed downward to permit the hoist to run faster without opening the overspeed switch, and obviously by adjusting the setscrew upward, the overspeed switch will be opened at a lower hoist speed. When finally adjusted, the screw should be locked by the locknut with which it is provided. See Page 8, Fig. 8 for optional overspeed warning contacts.

14. The adjusting screw is threaded into a bronze bushing which is secured in the casing by means of two dog pointed setscrews. If it is desired to quickly change the maximum speed from time to time to one or more predetermined speeds other than the normal maximum speed, the bushing that carries the adjusting screw can be provided with a pair of opposite spiral grooves on the outside, and an arm at the top, so that by varying the position of the arm, the bushing together with the adjusting screw is raised or lowered, thereby changing the resistance against the governor spring to permit more or less speed as may be desired. See Par. 50.

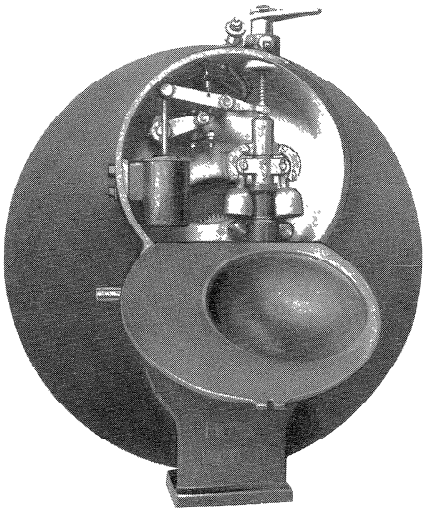


FIG. 4—Back view, with door open.

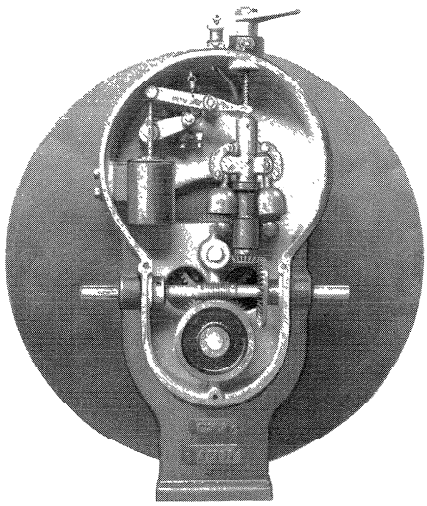


FIG. 5—Back view, with covers removed.

(Illustrations include optional variable speed arm, not standard)

GEAR COMBINATIONS

15. To select the proper gear combination for any hoist, proceed as follows:
Divide the length of rope to be wound, by the rope speed in feet per minute, or—Divide the number of revolutions of the drum for the full trip, by the maximum number of revolutions per minute, obtaining a result "T." Refer to the table of gear combinations, first column, and select the figure that comes nearest to, but not less than "T." That will determine the proper gear combination to use, and the number of the combination will be found opposite in the second column.

16.

TABLE-I—Gear Combinations for "Simplex" Controller (Drive Speed 130 R.P.M.)

Maximum for "T" (85% of dial)	Combination Number	GEARS Driver	Driven	Worm and Gear
.25	1	60	48	Double
.31	2	54	54	"
.39	3	48	60	"
.49	4	42	66	"
.63	5	36	72	"
.82	6	30	78	"
1.10	7	24	84	"
1.27	8	36	72	Single
1.63	9	30	78	"
2.23	10	24	84	"
2.83	11	20	88	"
3.69	12	16	92	"
5.00	13	12	96	"
6.07	14	10	98	"
8.50	15	8	100	"

Note: For extended long trip times, See Page 12 for "Back Gearing", or for "Long Range Drive".

THE ELECTRIC CIRCUIT and MAGNETIC LATCH

17. The Simplex Controller switch usually carries the retaining circuit for the undervoltage protective contactor on electric hoists having magnetic control. If the hoist does not have magnetic control or magnetic release, it will be necessary to install a magnetic contactor to carry the motor current, and to interrupt it in case of an emergency. For an installation of this kind, the Simplex Controller switch will carry the retaining circuit for the contactor.

THE WEIGHT UNIT

18. The pedestal of the E-110 weight unit is arranged to carry a Simplex Hoist Controller and a weighted arm for applying the brakes, together with a magnetic latch to hold the weight arm up in an emergency position, and a hydraulic regulating cylinder to control the fall of the weighted arm when released by the latch.

19. The magnetic latch by reason of the leverage of its arms will hold a heavy weight with a small amount of electric current, and it releases instantly when the electric circuit is opened.

20. The regulating cylinder is fitted with a piston having a series of holes drilled through, and a disc valve held up against the lower side by means of a spiral spring.

21. The purpose of the holes and the disc valve is to prevent the oil from passing through the piston when the weight falls, but to allow the weight to be raised without resistance.

22. There is also a by-pass leading from the top to the bottom of the cylinder, having an adjustable rotary valve for limiting the rate of oil flow through the by-pass. The valve opening may be adjusted by slackening the nut on the end of the valve at the cylinder, and turning the valve to obtain the desired adjustment. A groove on the hexagon head of the valve indicates the direction of the oil passage through the valve.

23. In addition to the by-pass mentioned, there is a leakage relief milled in the cylinder wall for a distance from the upper end, to allow the piston to move rapidly during the first part of its downward stroke, taking up slack in the brakes with the least possible delay.

24. In a standard Simplex Weight Unit, as illustrated in Figs. 2 and 9, a magnetic latch holds the emergency brake weight in its upmost position, and the retaining circuit for the latch coil may be carried through the Simplex Controller switch, or through a contactor or both.

25. The Simplex Weight Unit may also be used for steam hoists, and diesel or gas driven hoists, and latch coils for either line or battery current may be used.

26. When this unit is used for other than electric hoists, it should be equipped with auxiliary devices to shut off the engine.

27. It is necessary to have electric current to energize the latch coil in order to operate the hoist, and its failure causes the magnetic latch to release the brake weight to stop the hoist. The magnetic latch is superior to a mechanically held latch, as its operation is practically instantaneous, and it does not develop lost motion.

27a. The B-410 optional power hydraulic trip-free weight resetting package is available for relatching the weight. See Bulletin 8208, and Page 14.

28. The Simplex Hoist Controller can be furnished with a depth indicator built in, or it can be furnished without the indicator.

29. Indicator dials 24″, 30″ or 36″ in diameter can be furnished, but if an indicator is ordered and the size is not specified, a 24″ indicator will be furnished. A riser block is required with the 30″ or 36″ indicators if the Simplex is mounted on the E-110 unit.

30. The indicator pointer fits on the extended hub of the Simplex Controller cam dial, to which it is secured by a clamping bolt, permitting easy adjusting of the pointer to correspond with positons marked on the indicator dial.

30a. See Page 13 if accessory indicator mounted limit switches are used.

THE SIMPLEX SWITCH

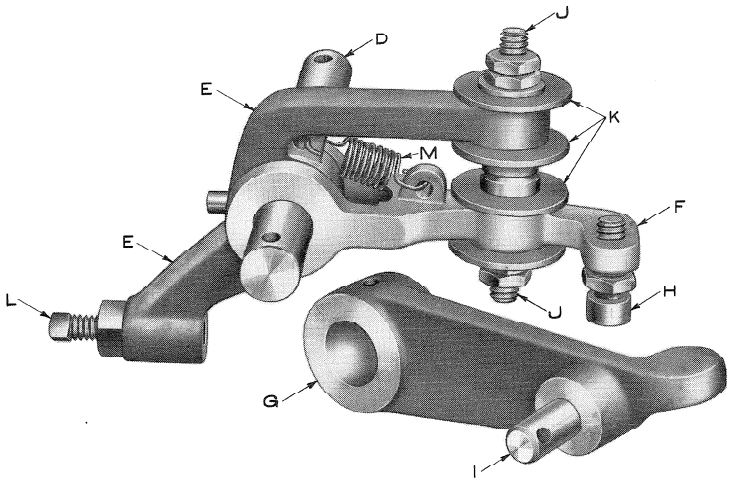
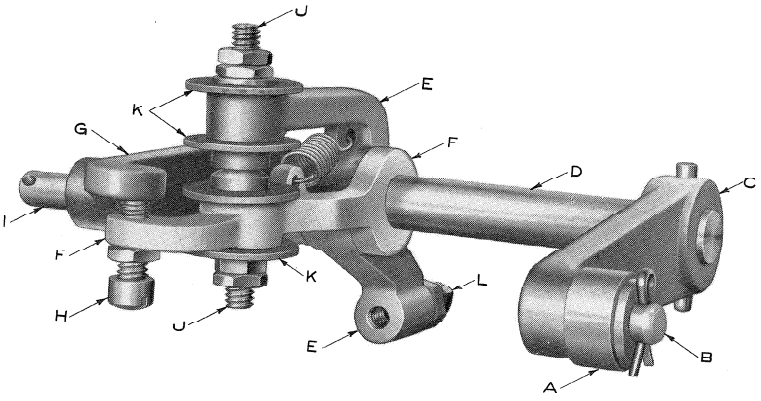


FIG. 6—The Switch and Switch Shaft of the Simplex Controller, with the electrical contacts engaged. The parts indicated by letters are as follows:
(Applying to Figs. 6 and 7.)
A — Roller
B — Roller Pin
C — Roller Arm
D — Switch Shaft
E — Main Contact Arm
F — Auxiliary Contact Arm
G — Governor Operated Arm
H — Adjusting Screw
I — Pin
J — Contact Terminals
K — Insulating Washers
L — Stop Screw
M — Spring

FIG. 7—The Switch of the Simplex Controller with associated parts. Contact Arm "E" and Roller Arm "C" are pinned to the shaft. Forked Contact Arm "F" and the Governor Operated Arm "G" are free on the shaft. The former is retained by being forked at both sides of Arm "E," and the latter by a cotter pin and washer. The switch will be opened by (1) the governor moving arm "G" downward, or (2) the cam moving arm "E" upward faster than arm "G" moves upward by governor action.



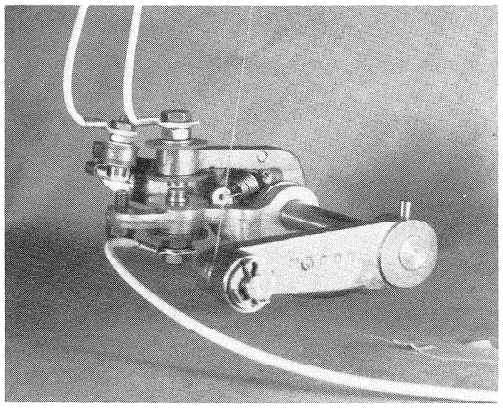


FIG. 8—Accessory overspeed warning contacts may be added to the Simplex Switch to make contact for a warning light E-132 or bell prior to inconvenient overspeed contacts opening.

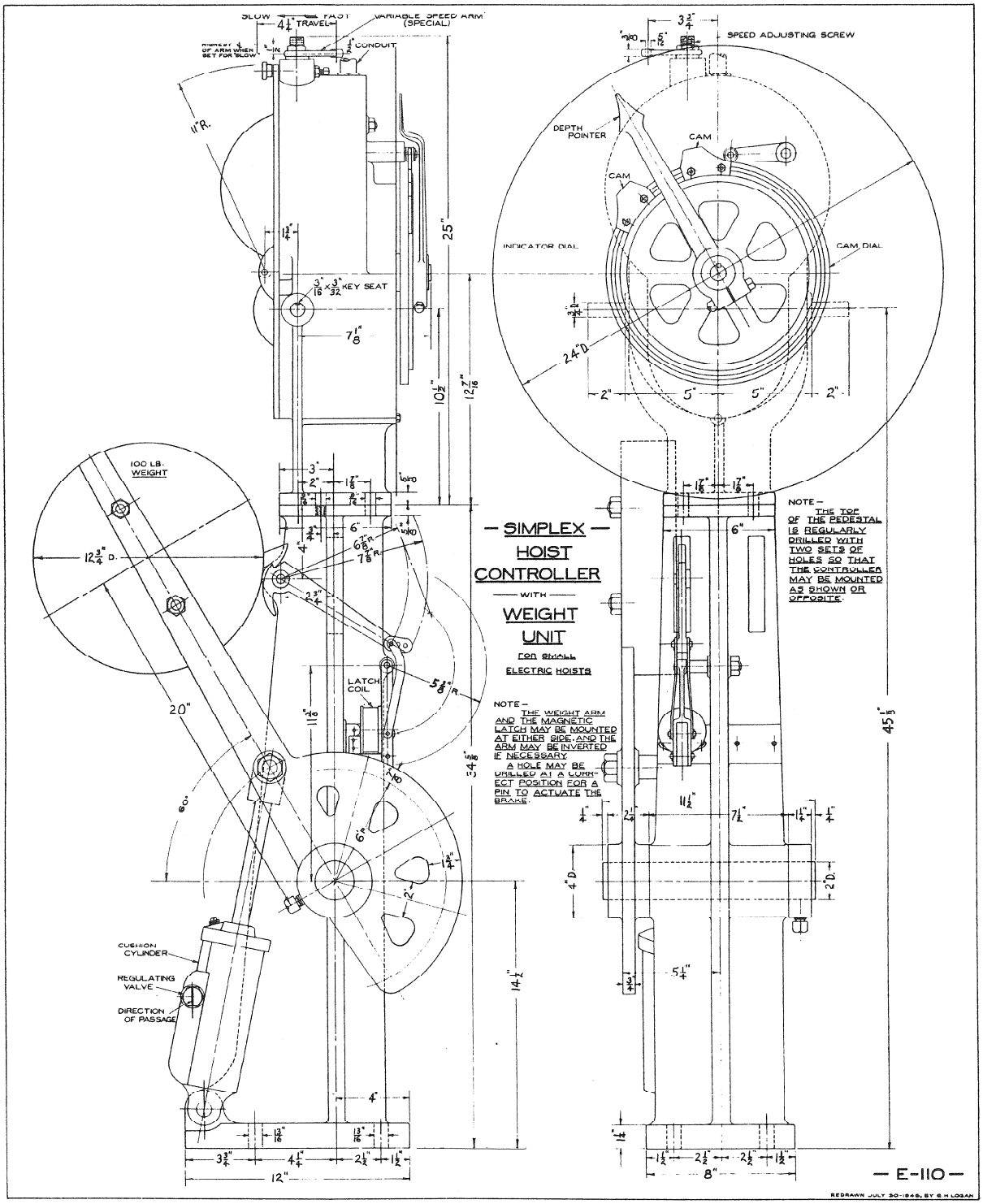


FIG. 9—Assembly of Simplex Controller on E-110 Weight Unit, showing the principal dimensions.

The magnetic latch locks the weighted arm in reserve but instantly releases it in case of power failure or if the retaining circuit is opened by the controller or by an emergency switch. The cushion cylinder prevents severe shock in tightening the brakes and is adjustable for speed of operation. It should be filled with engine oil of about medium weight. The weight arm may be inverted, used on either side, or keyed to an extended shaft. Scale—1½ " = 1 ft. See page 14 for resetting device.

DOUBLE WEIGHT UNITS

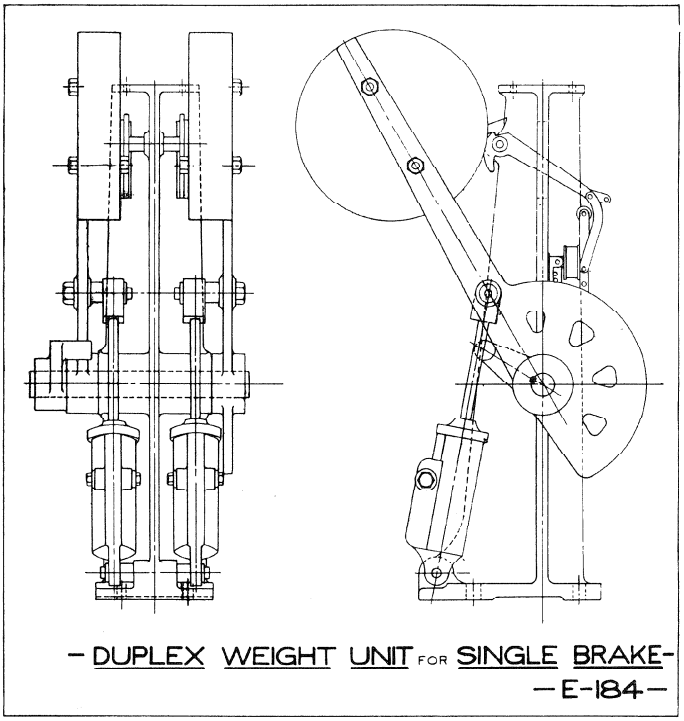


FIG. 10—A double weight unit for a single brake. The advantage of this unit is that the weights may be reset individually, making it easier to reset them than a single weight arm, where a considerable amount of extra weight must be used. Scale—1″ = 1 ft.

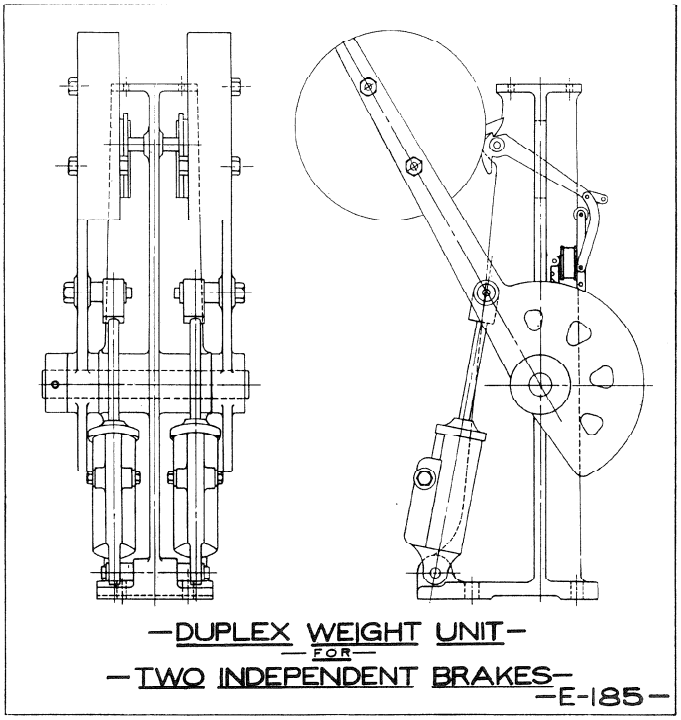


FIG. 11—A double weight unit. This type is frequently desirable for small tandem drum hoists, where two hoist controllers are installed near the drums, and where each of the two weight arms on one pedestal connects independently to operate different brake. Scale—1″ = 1 ft.

SPECIAL OPTIONAL EQUIPMENT

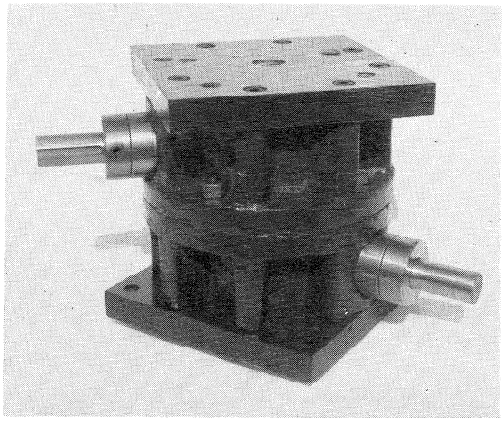


FIG. 12—M-762 Base Unit.

31. When an indicator is on the Controller, the M-762 Base permits locating the Simplex Controller where the drive is the most simple, yet allows facing the Indicator for a straight on view. Also allows more flexibility in location for driving the Simplex Controller when the edge of the indicator dial might interfere with the drive shaft or chain.

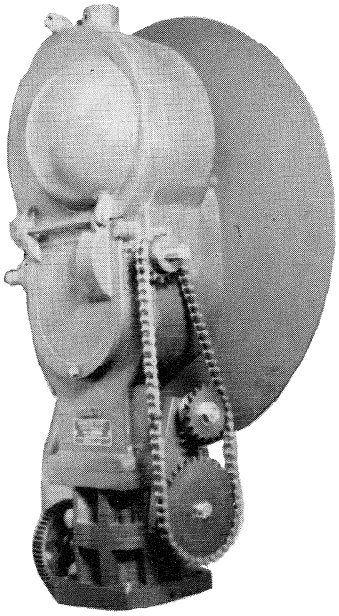
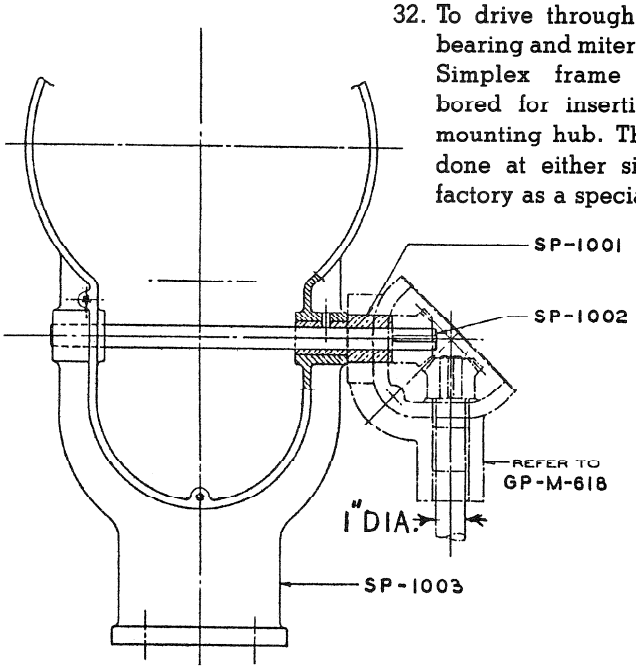


FIG. 13
(Also shows the M-782 Idler)

32. To drive through an angle bearing and miter gears, the Simplex frame must be bored for insertion of the mounting hub. This can be done at either side at the factory as a special order.

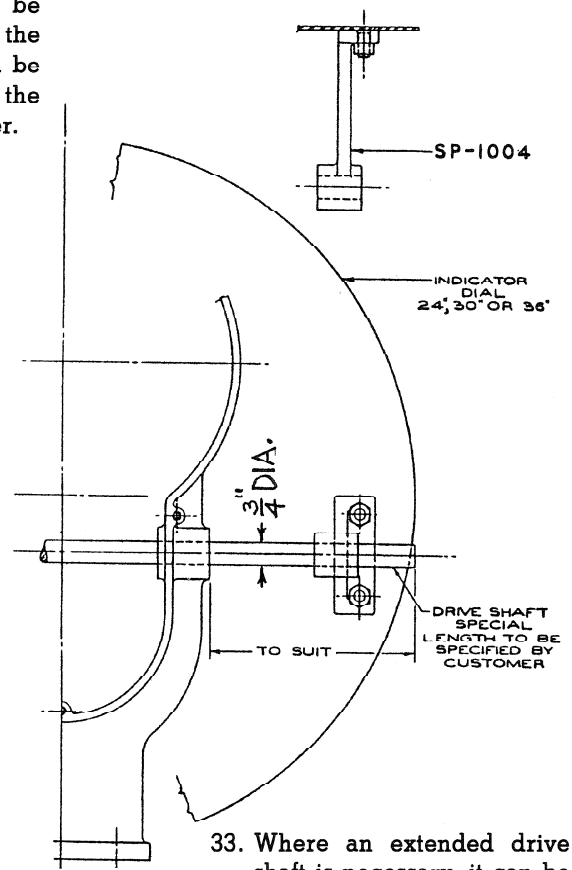


BUSHING
for
ANGLE BEARING DRIVE
FIG. 14

SPECIFY SHAFT EXTENSION WHEN VIEWED FROM FRONT. SHOWN LEFT HAND.

Drg. SP-E-234

34. For other angle bearings, rod heads, rod ends, see Bulletin 810104.



BEARING
for
EXTENDED DRIVE SHAFT

Fig. 15
E-264

SPECIFY SHAFT EXTENSION WHEN VIEWED FROM FRONT. SHOWN LEFT HAND.

33. Where an extended drive shaft is necessary, it can be supplied with an outboard bearing bracket mounted on the indicator dial, as shown, on special order.

Drg. SP-E-264

35. On some long duration slow speed applications, the maximum 8.5 minutes of travel with the standard gearing is insufficient. Back gears per Fig. 16 or Long Range Drive per Fig. 18 can be built into the Simplex Controller for those requirements.

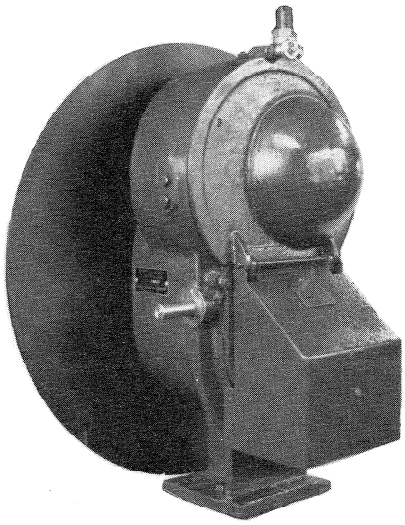


FIG. 16

36. E-450 Back Gears built into the Simplex Controller multiply the travel time by a factor of four. However, the end of travel retarding cams might have very steep profiles because of the slow cam dial movement and slow pointer movement.

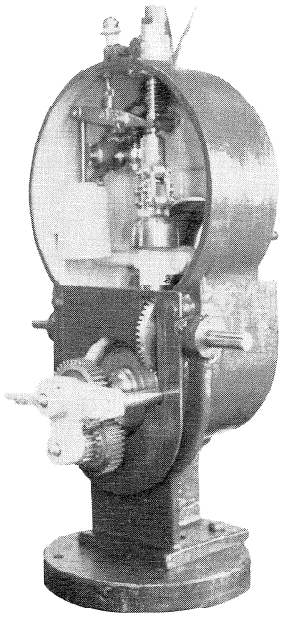


FIG. 17

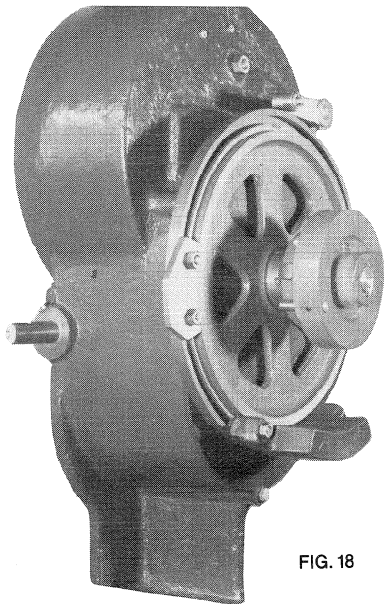


FIG. 18

37. The Long Range Cam Dial Drive E-534, E-535, or E-536, allows the cam dial to idle except in the slow down zones at the end of travel, where it rotates to more quickly engage the retarding cams. The feature allows long travel times while providing better retarding cam profiles because of the faster cam movement in the retarding zones.

38. However, if applied to a Simplex with integral indicator, the pointer would move only in the slow down areas.

TABLE II — MODIFICATIONS FOR LONGER TRAVEL TIME

Gear Comb. Number	Standard "T" Minutes	Extended Time, Minutes Long Range Cam Dial Drives Single E-534	Double E-535	Triple E-536	Back Gear E-450
10	2.23	3.52	5.82	8.11	8.92
11	2.83	4.47	7.49	10.30	11.32
12	3.69	5.83	9.63	13.43	14.76
13	5.00	7.90	13.05	18.20	20.00
14	6.07	9.58	15.83	22.09	24.28
15	8.50	13.43	22.18	30.93	34.00

SELECTIVE LIMIT CAMS

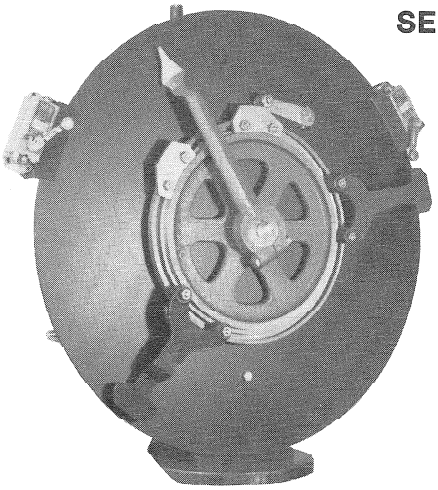


FIG. 19—E-335

39. Optional selective limit switches may be mounted on the indicator dial, when the dial is used. The switch brackets may be clamped wherever desired, in any number, to be operated selectively by one of two extended cams. The switches are N.C./N.O. type.

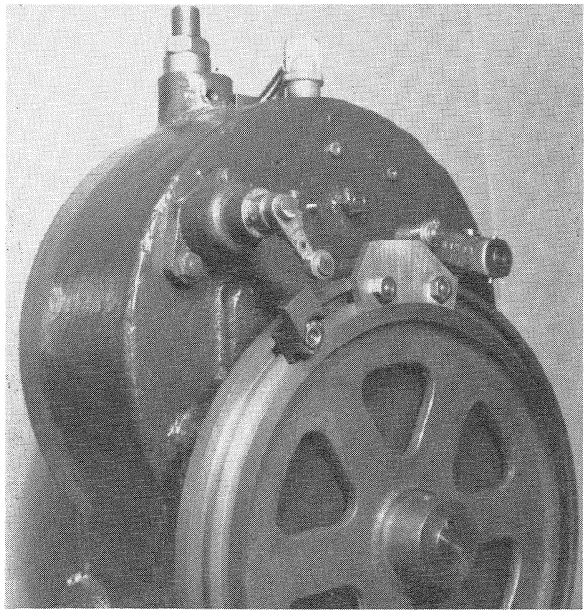
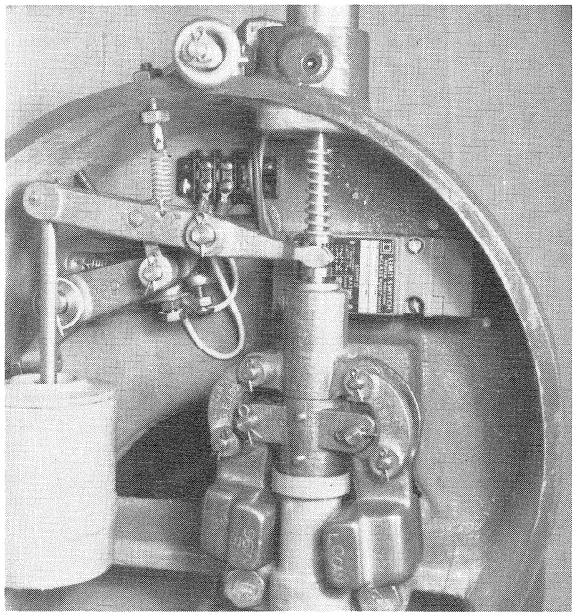


FIG. 21



E-541
FIG. 20

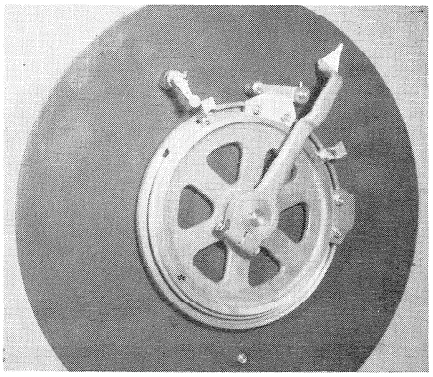


FIG. 22—E-541 and Indicator

40. The E-541 optional limit switch with two contact sets can be mounted inside the Simplex case, per Fig. 20 and Fig. 21, and operated by one of two adjustable cams. One set of N.C./N.O. contacts operates in one direction, and the other set when operated in the other direction. (On older Simplex units, additional mounting holes must be drilled.)

41. If indicator dials are used with the E-541 limit switch, the standard pointers must be replaced with ones having greater offset clearance for the extended switch arm. FIG. 22.

42. Either Fig. 19 or Fig. 21 will allow use of a backout switch at the limits of travel. The Simplex retarding cams can be utilized for backup limits as well as retarding purposes, or they may be modified as per Paragraph 54G.

WEIGHT SETTER

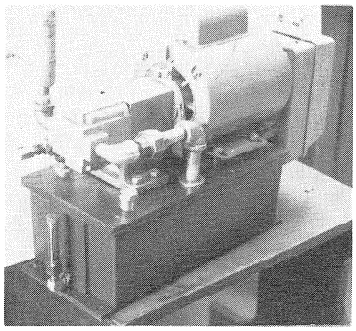


FIG. 23—B-423
HYDRAULIC POWER UNIT

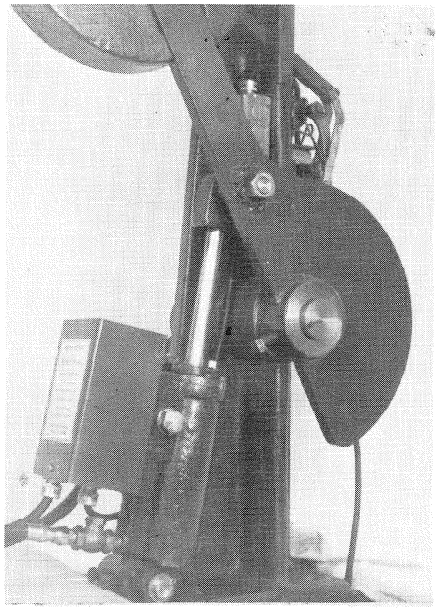


FIG. 24—B-410
CYLINDER UNIT INSTALLED
ON E-110 WEIGHT UNIT

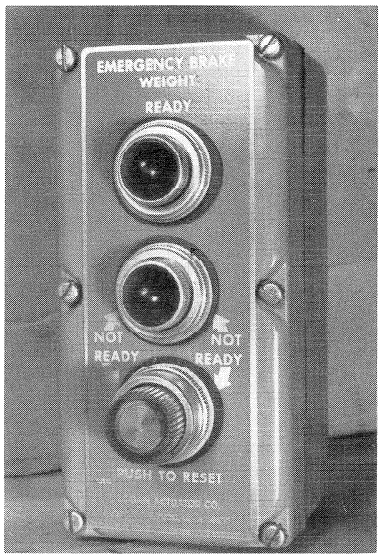


FIG. 25—B-435
PUSH BUTTON UNIT
WITH CONDITION LIGHTS

The above three unit equipment group permits trip-free push button setting of the 100 lb. emergency weight after tripout or upon startup.

INFORMATION TO BE GIVEN WHEN ORDERING

A. Gear Combination (or data from which it may be computed). See Par. 16.
B. Current characteristics.
C. With or without indicator, and size if required. See Par. 28.
D. If a variable speed arm is required, specify. (Not standard.) See Par. 14.
E. Assembled with dial over weight or opposite. Riser block needed?
F. Weight-arm on side shown in Figs. 2 and 9, or opposite.
G. Standard shaft in weight unit, or extended shaft with arm keyed, or arm furnished with keyway to fit shaft to be supplied by customer.
H. If additional weight is required, specify. (100-lbs. is standard.)
I. If double weight arms are required, specify by Figure Number.
J. If accessory selective limit features, M-762 Directionable Base, Idler Bracket, E-450 Back Gears, Long Range Cam Dial Drive, or Overspeed Warning Contacts are desired.
K. If powered weight relatching unit is desired.

TYPICAL INSTALLATIONS

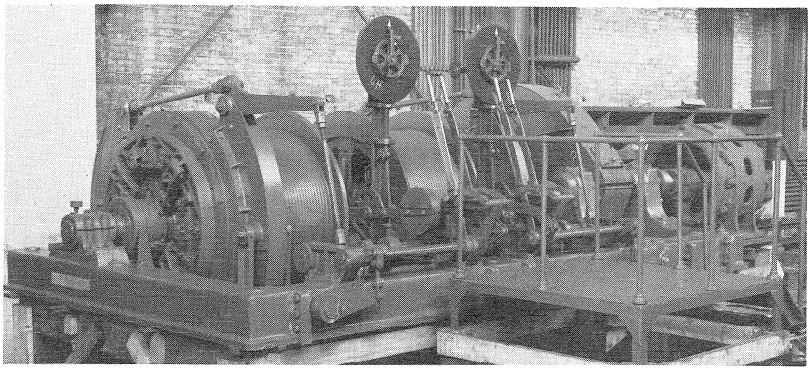


FIG. 26—An Allis-Chalmers double-drum hoist equipped with two Simplex Controllers with depth indicators and weight units. Distance pieces are used to elevate the controllers to clear the depth indicators.

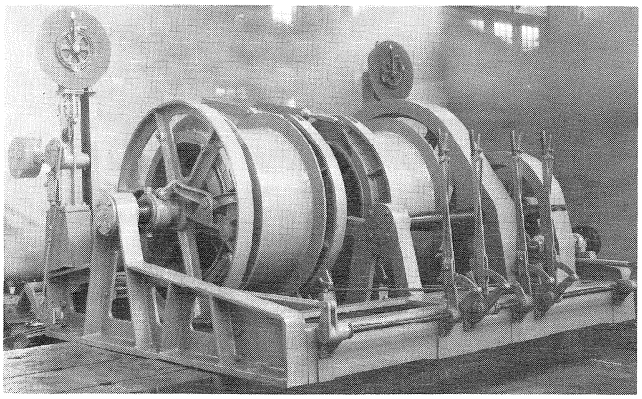


FIG. 27—A Joshua Hendy double-drum hoist equipped with two Simplex Controllers with depth indicators and weight units. The weight units are elevated on pedestals to bring the indicators to the right height.

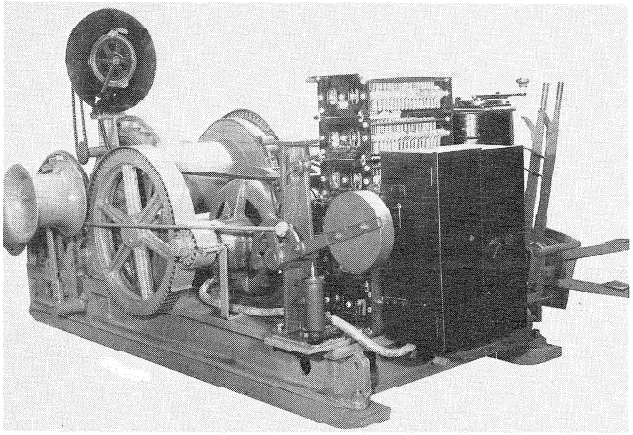


FIG. 28—A small Thomas portable hoist equipped with two Simplex Controllers with depth indicators and weight units. Only one controller is in view.

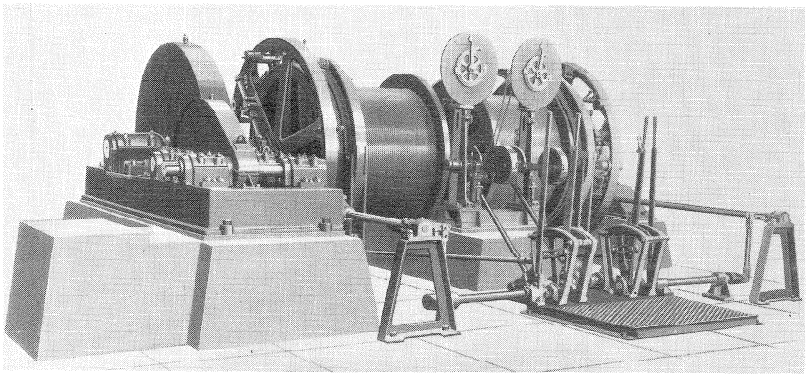


FIG. 29—A Washington Iron Works double-drum hoist equipped with two Simplex Controllers with depth indicators and weight units. The controllers are driven by steel sprockets and roller chain.

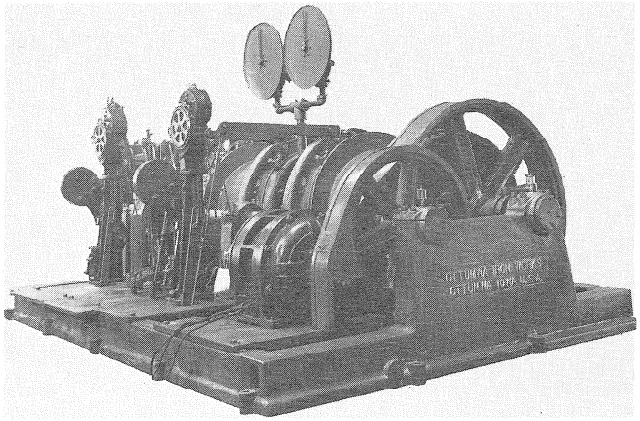


FIG. 30—A double-drum Ottumwa hoist equipped with two Simplex Controllers and weight units. These controllers are without depth indicators.

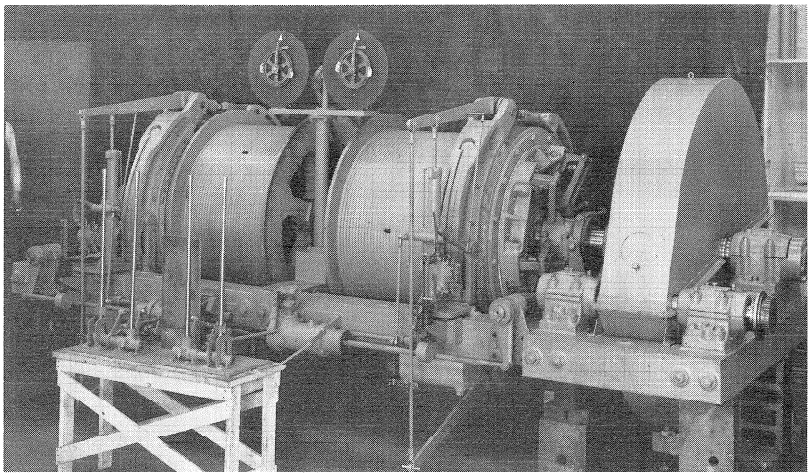


FIG. 31—A Nordberg double-drum hoist with gravity operated brakes handled by hydraulic pressure, and equipped with two Simplex Controllers with depth indicators, which are driven by shafts and gears.

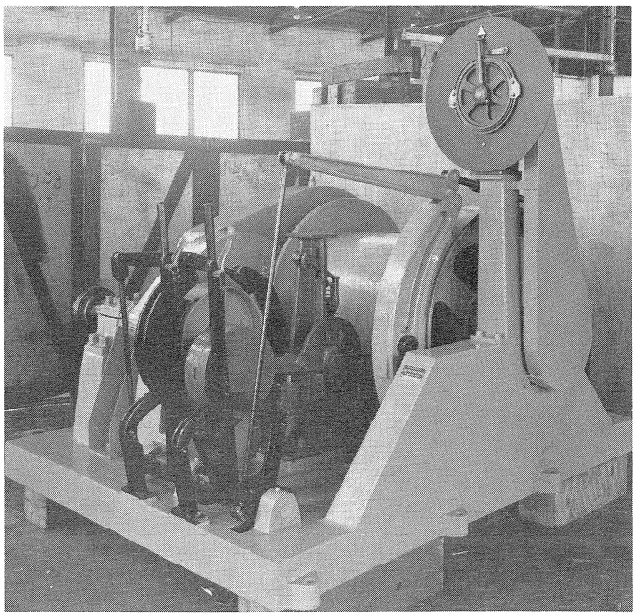


FIG. 32—A small Lake Shore Engineering Company single-drum hoist equipped with a Simplex Controller with depth indicator and weight unit, the controller being mounted independent of the weight unit, and driven by a guarded chain from the end of the drum shaft.

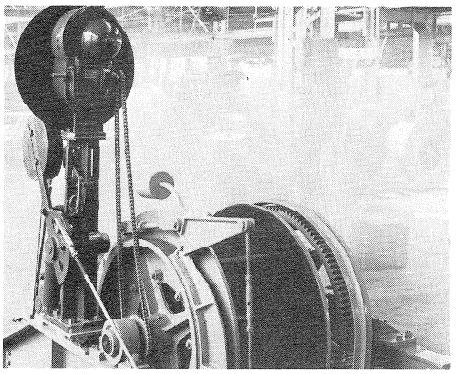


FIG. 33—(Left)—A Vulcan Iron Works (Denver) single-drum hoist equipped with a Simplex Controller with depth indicator and weight unit. The drive from the drum by steel roller chain and sprockets, and the connections to the brake are shown clearly.

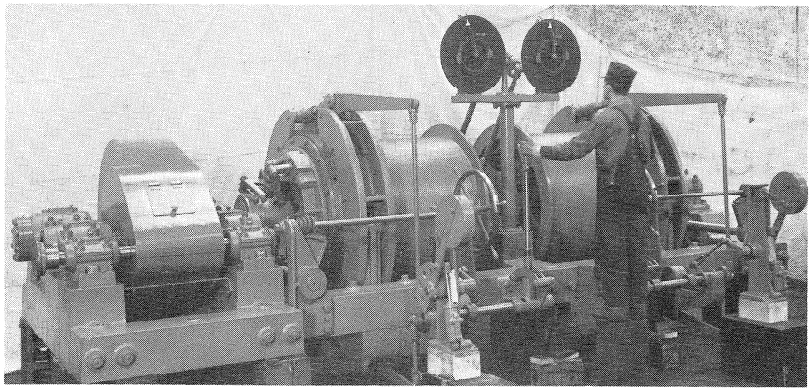


FIG. 34—A Nordberg double-drum hoist with hand brakes equipped with two Simplex Controllers with depth indicators and weight units. The controllers are driven by shafts and gears.

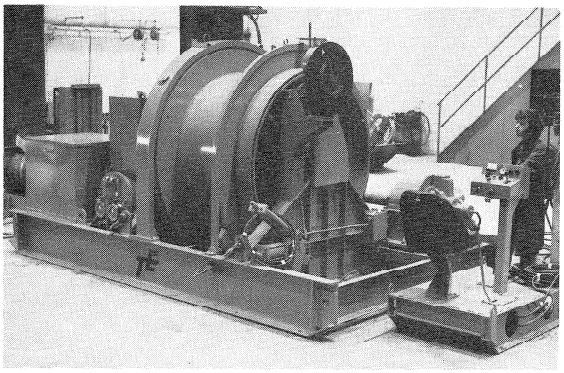


FIG. 35—A Timberland Equipment Limited 250 h.p. Electro Hydraulic sinking hoist with a Simplex Controller and depth indicator.

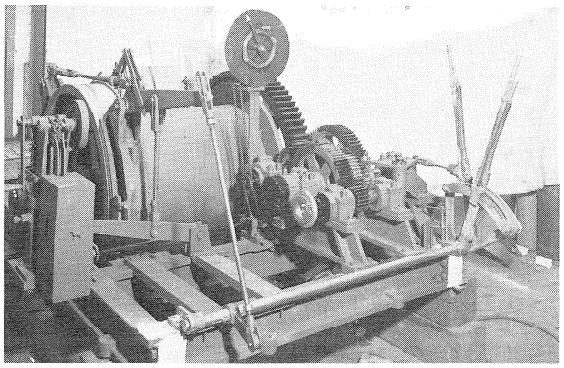


FIG. 36—(Left)—A Vulcan Iron Works (Wilkes-Barre) single-drum hoist equipped with a Simplex Controller with depth indicator and weight unit. The drive from the drum is by steel roller chain and sprockets.

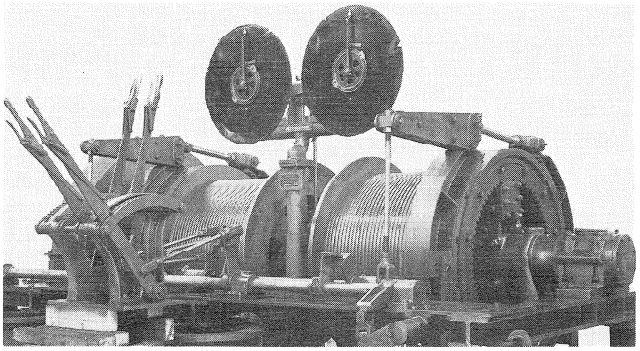


FIG. 37—A Canadian Ingersoll-Rand double-drum hoist equipped with two Simplex Controllers with depth indicators, driven by shafts and gears.

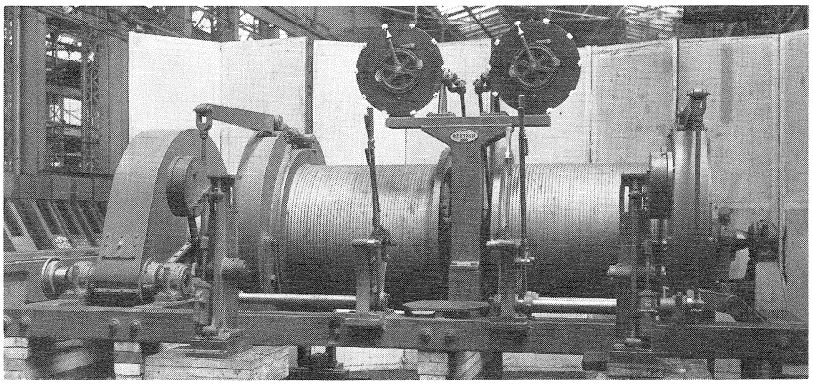


FIG. 38—A John Bertram & Sons double-drum hoist equipped with two Simplex Controllers with depth indicators and weight units. The controllers are mounted independent of the weight units, and driven from the drums by shafts and gears.

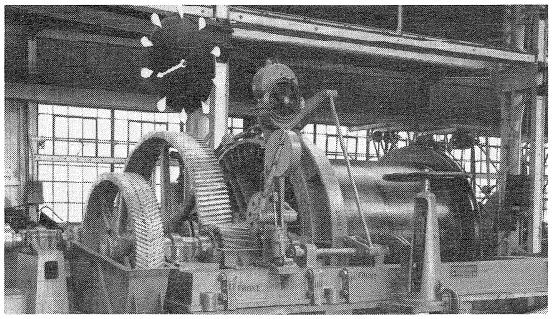


FIG. 39—A Stearns-Roger hoist equipped with a Simplex Controller and weight unit. The controller is not provided with a depth indicator.

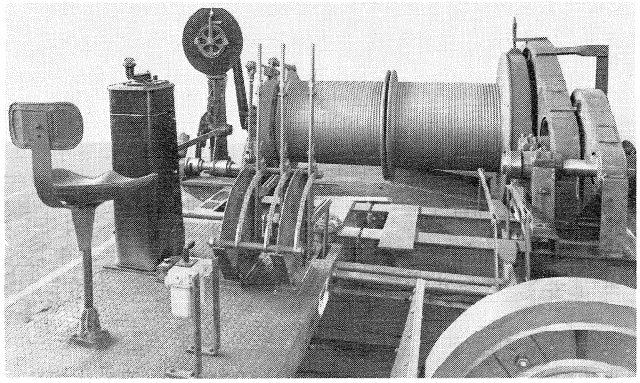


FIG. 40—A Lidgerwood double-drum hoist equipped with a Simplex Controller with depth indicator and weight unit. (The object in the right foreground is not a part of the hoist.)

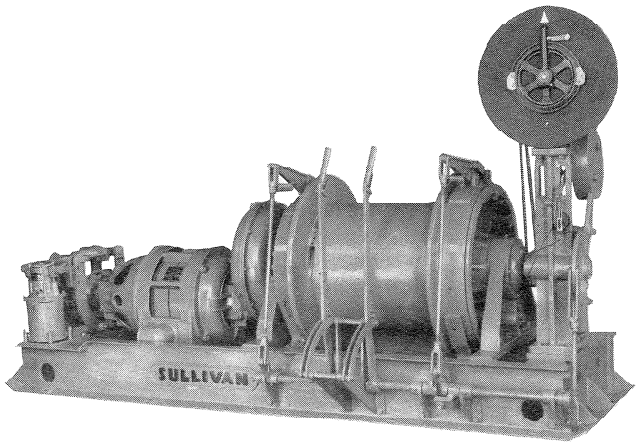


FIG. 41—A small Sullivan portable hoist equipped with a Simplex Controller with depth indicator and weight unit. The connection from the weight arm to the brake is through a follow-arm and lug, with a similar arrangement for the hand lever. Thus the weight arm and the hand operation are independent, and operate the same brake without interfering with each other.

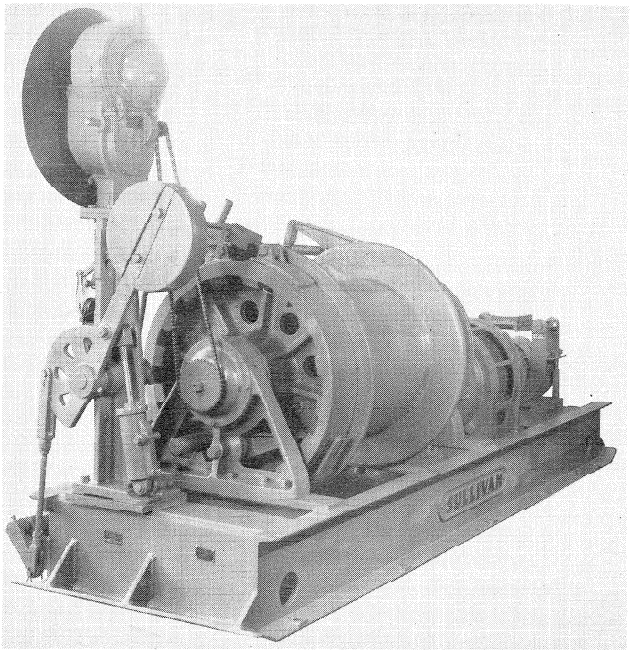


FIG. 42—A rear view of the hoist shown in Fig. 41,showing the brake connection from the weight arm, and the drive from the drum by roller chain and cut steel sprockets.

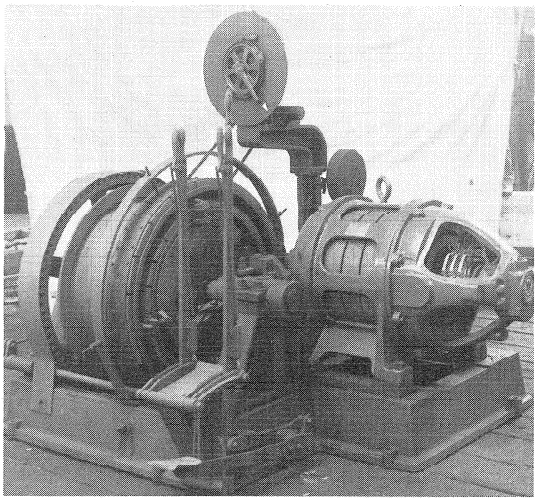


FIG. 43—A small Rogers Iron Works hoist for use in a headframe of a zinc mine, equipped with a Simplex Controller with depth indicator and weight unit. A special bracket bolted to the pedestal of the weight unit carries the controller forward to facilitate the drive from the drum, which is by roller chain and steel sprockets.

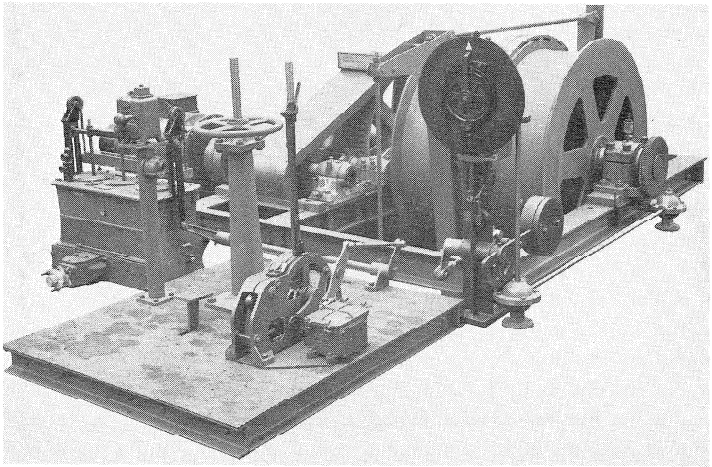


FIG. 44—A small Fullerton, Hodgart & Barclay hoist equipped with a Simplex Controller with depth indicator and weight unit. The drive by gears and shafts is shown clearly.

INSTRUCTIONS

THE LOCATION OF THE SIMPLEX CONTROLLER ON A HOIST

43. The Simplex Controller may be located on the hoist frame, or on a separate foundation. A location should be selected that will best facilitate a drive from the hoist drum or in synchronism with it, and connections to the brake mechanism. While it is usually best to mount the controller on the weight unit, as shown in Figs. 2 and 9, there are cases in which the drive and the brake connections may be arranged to better advantage by mounting the controller on a pedestal or bracket separate from the weight unit. The Simplex Controller and auxiliary equipment should be so located that it will be accessible, and well protected against water, oil, or tar from the ropes, and mechanical injury, such as might be caused by a rope breaking, or interference when repairing or adjusting brakes. See also Par. 31 on the Directionable Base which permits facing the indicator dial in any horizontal direction.

THE DRIVE

44. The controller must be positively driven in ratio with the hoisting drum, and steel roller chain and cut steel sprockets usually form the most convenient and economical drive. Chain of ½" pitch, 5/16" wide is recommended.

45. A horizontal shaft drive may be used, coupling to the end of the Simplex Controller drive shaft, or a shaft drive from a right angle direction may be arranged by installing an extended bushing in one side of the Simplex Controller housing, to support a swivel bearing for the driving shaft, and also to serve as a bearing for the Simplex Controller drive shaft. If this type of drive is desired it should be specified when ordering, and the controller should be provided with the extended bushing built in. See Fig. 14 Angle Bearing, and Fig. 12 Directionable Base.

THE DRIVE SPEED

46. The *standard drive speed for the Simplex Controller is 130 R.P.M.* for all of the gear combinations, and the gears are arranged to give a maximum amount of dial movement for the full trip, while maintaining the normal governor speed. Back Gearing, or Long Range Drive are available. See Fig. 16 and Fig. 18.

ADJUSTING THE SIMPLEX CONTROLLER ON A HOIST

47. The switch adjustment is made at the factory, and should not need to be changed when making the final adjustments on the hoist, but it should be checked before proceeding with the speed adjustments.

48. It is recommended that a "jumper" be placed across the switch, and the cams be removed from the dial to prevent interference until the speed adjustment has been made. One cam should be placed temporarily under the roller, thereby raising arm "F" toward the lug on Arm "G". (Figs. 6 and 7). See that setscrew "H" engages the lug, causing the electrical contacts to separate about 1/16". DO NOT FORGET TO REMOVE THE JUMPER BEFORE LEAVING THE HOIST..

49. Remove the cam, and with the stopscrew "L" contacting the inside of the casing and adjusted so that the roller clears the rim of the cam dial about 1/64", run the hoist at maximum speed, and see that setscrew "H" is about 1/32" away from the lug on "G" (Figs. 6 and 7). Adjust the governor spring adjusting screw at the top of the housing to produce this result, if necessary; downward for more speed, and upward for less speed. Test the hoist lowering a heavy load, and re-adjust if necessary to avoid interference from the hoist controller when lowering loads.

50. When the variable speed arm is used, it should be placed in position for the fastest speed, which is its downward position, and then the governor adjustment should be made as described in paragraph 49. The hoist may then be operated at the lower speeds to which it is to be held by the Simplex Controller, and the position of the variable speed arm adjusted until the contact screw "H" and the lug on "G" are about 1/32" apart. The means for moving the variable speed arm should then have a notch cut, or other provision to relocate the adjustment in the same place when necessary.

THE CAMS

Profiling the working face.

51. After the speed adjustments have been made, and the most suitable retarding distance and rate of retardation has been determined by the hoistman, the cam profile can be traced approximately by a lead pencil on the side of one of the cams, remembering that the length of the profile should correspond with the travel of the outside of the cam dial during retardation, and the contour will be similar to the cams shown in Fig. 45 for similar conditions. The cams may then be shaped by means of a hacksaw and a half round file. A few runs with the hoist will check the accuracy of the profile, and indicate any necessary changes.

52. During normal retardation, the cam should move the roller upward to keep the switch-opening setscrew No. "H", Figs. 6 and 7, within about 1/32" from the lug on the governor operated arm "G", so that as the governor slows down approaching the end of travel, the mechanical contacts will remain approximately the same distance apart, and in the event that the hoist and consequently the governor fails to slow down at the predetermined rate, the cam will open the switch without excessive lost motion such as there would be if the distance were too great between the setscrew and the lug.

53. The finished profile should be such that the roller riding on the cam will keep the switch arm lug within a short distance, usually above 1/32", from the governor operated contact.

54. Cams with various profiles are shown in Fig. 45 all in the position they should occupy when the hoist is at one end of its normal travel. These profiles are described as follows:

A — Cam as furnished. The profile of this cam may happen to be suitable for the hoisting conditions where it is installed, but usually it is necessary to change the profile to suit individual hoisting conditions.

B — Cam profiled for relatively long retardation or shallow hoisting.

C — Cam for relatively short retardation or hoisting a long distance.

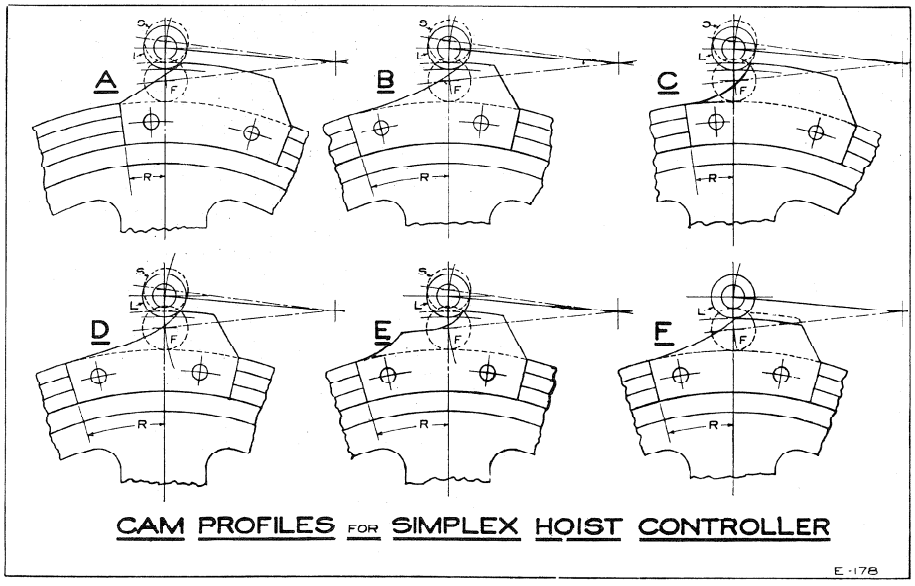


FIG. 45—An original cam "A" and typical finished profiles, B, C, D, E, and F.
The positions of the overspeed switch roller as indicated by letters F, L, and S, are as follows:
F — FOR FULL SPEED OF HOIST.
L — AT THE NORMAL LIMIT OF TRAVEL.
S — IN AN OVERWOUND POSITION, WITH THE OVERSPEED SWITCH OPEN.
R — INDICATES RETARDING TRAVEL.

D — Cam similar to "B" but with a more gradual rate of retardation part way, and more rapid near the end of travel.

E — Cam profiled to compel hoist to slow down to about half speed, and then proceed without further speed reduction to near the end of travel, where the speed must finally be reduced quickly, and the hoist stopped. Cams of this kind are sometimes desirable for critical conditions at the dump or tipple, or at the bottom of the shaft.

F — This cam has the top cut off so that although it will compel the hoist to retard to the limit of the Simplex Controller governor range, it will not ultimately stop the hoist if the speed is below the governor range. When track limit switches are used, the cams should be cut down as shown to eliminate the need of short-circuiting the overspeed switch to back out of overtravel, and the track limit switches are short circuited when necessary by means of a backing-out (or backout) switch. See Fig. 50.

G— The top of the cam can be cut off also when the optional added limit switches are used as shown in Fig. 19 or Fig. 21.

55. Where our standard weight unit is installed, the by-pass regulating valve should be adjusted as described in Par. 22, to cushion the fall of the safety weight, and prevent it from applying the brakes with a severe jerk. Care should be taken to avoid making the brake application too slow, as that would permit a descending load to gain too much speed and it might allow an upcoming load to travel too far near the limit of travel. After slackening the locknut on the end of the valve, it may be adjusted by turning the hexagon head to provide more or less opening. A slot across the hexagon head indicates the direction of the opening through the valve.

THE BRAKE CONNECTIONS

See Fig. 46.

56. "A" shows a common form of connection from a pin in the weight-arm quadrant to a pin in a brake-shaft arm of a hoist. It will be noted that as the weight falls, the leverage increases, reaching its maximum when at the lowest point of travel, where the necessary pull on the brake is greatest. This principle should always be

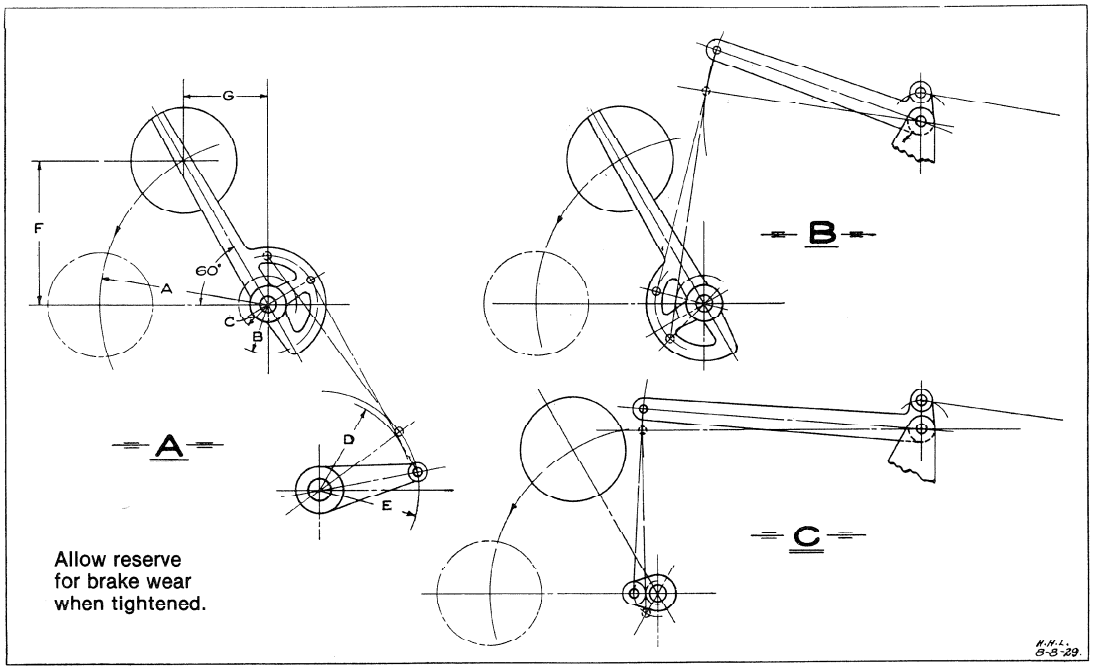


FIG. 46—Brake Connections.

utilized in order to obtain the greatest efficiency from the weight, and to make it possible to tighten the brake in emergency with a minimum amount of weight.

57. "B" shows a common form of connection from a pin in the weight-arm quadrant to the bell-crank at the top of post brakes.

58. "C" shows a connection similar to "B," but instead of connecting from the weight-arm direct, an extended shaft is used, and an arm is keyed on this shaft, from which the connection extends to the brake bell-crank. Obviously, the weight-arm must also be keyed to the shaft in this case.

59. Other methods may be used to connect with the brakes, and an adjustment should be provided in the connecting rod. In cases where the same brake is operated by the hoist operator and the safety device, a slot* should be provided in the end of the rod remote from the weight-arm pin, and also in the operator's connection, so that there will be no interference between the safety device and the hoist operator.

60. The torque produced on the brake shaft in "A," (in inch pounds) when the weight is released $=\frac{WGD}{B}$ and when the weight is at the lowest point of movement, the formula is $\frac{WAE}{C}$, in which W = the weight (in pounds) of the weighted arm at the radius "A," (in inches) and the other letters represent the dimensions indicated by them on the diagram.

61. The radius "A" of the weight-arm as regularly furnished is 20" which makes "F" = 17.32" and "G" = 10".

62. If installed, the M-410 Power Resetter will relatch the weight after release. A pushbutton station with indicator lights is placed at the hoistman's location.

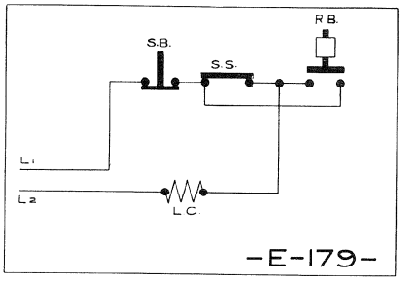


FIG. 47—A simple diagram for a single Simplex Controller installed on a hoist with the Simplex switch acting for overspeed and travel limits. The parts designated by letters, are as follows: (For separate limit switches, see Fig. 50.)
SB — Stop Button
SS — Simplex Switch
LC — Latch Coil
RB — Reset Button. This should be a "time delay" push-button that will remain closed for 15 to 20 seconds to enable the hoistman to reset the brake weights after an emergency limit stop at the end of travel with a cam holding the Simplex switch open. See E-255 Switch, Par. 63-66, Fig. 48.

63. The E-255 Time Delay Switch is for use when resetting the brake weight of a Simplex Controller if stopped at an end of travel with the cam roller on top of a cam.

64. The E-255 switch, when closed by turning the pointer to the right, remains closed for twenty seconds, allowing ample time to reset the brake weight and to back the hoist out from the end of travel, thereby closing the Simplex switch. At the end of the time delay, the E-255 opens automatically, leaving the Simplex switch in control of the safety circuit.

65. Two sets of contacts are actuated within the E-255. The extra set may be used to operate a tell-tale light circuit if desired. Rating 20A-125V.A.C. — 10A-250V.A.C.

66. The switch may also be used for other purposes where the time delay feature is desirable.



FIG. 48

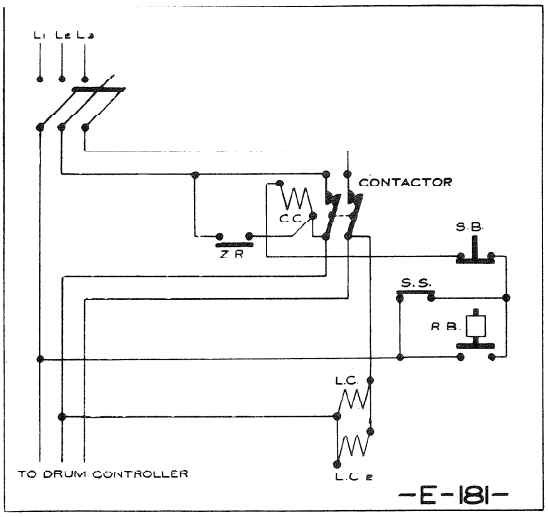


FIG. 49—A typical electrical diagram showing a two-pole magnetic contactor installed in a three-phase line, for an installation on an electric hoist operated by a drum controller.

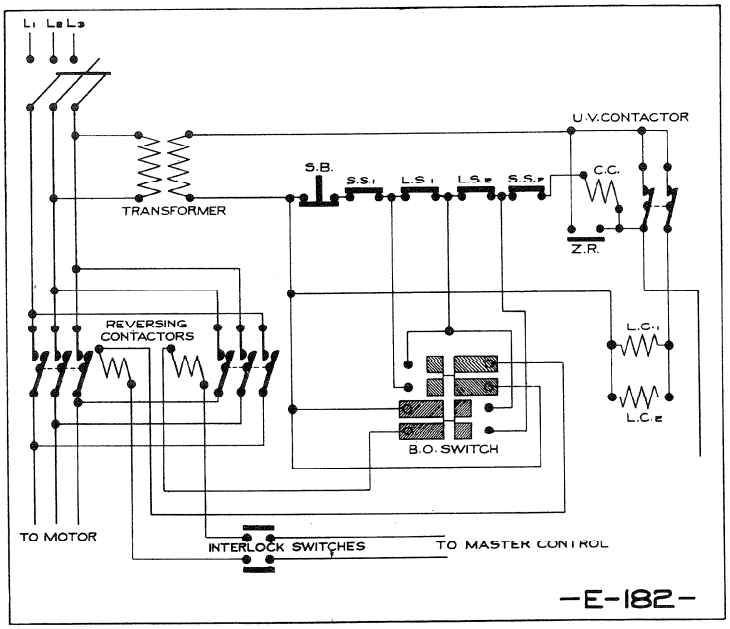
The parts indicated by letters are as follows:
CC—Contactor Coil
SB—Stop Button
SS—Simplex Switch
RB—Reset Button. (See R.B. Fig. 47 for description.)
LC—Latch Coil
ZR—Zero reset in drum controller.

This diagram shows two latch coils in parallel, as used on a double unit such as that in Fig. 10. This diagram can be used with either one or two latch coils.

FIG. 50—A typical electrical diagram for a double-drum electric hoist with full magnetic control, track limit switches, or selective limit switches options (See Page 13) and a backing-out switch. In *order to use this diagram with Simplex Controllers and track limit switches, the cams must be cut down like "F" in Fig. 45.*

The parts, designated by the letters, are:
SB—Stop Button
SS—Simplex Switch (1 & 2)
LS—Limit Switches (1 & 2)*
CC—Contactor Coil
ZR—Zero Reset
LC—Latch Coils (1 & 2)

*Added limit switches per Fig. 19 or 21 might be used with, or in lieu of, Track Limit Switches.



LOGAN ACTUATOR CO.

550 CHIPPEWA RD
HARVARD ILLINOIS U.S.A. 60033