INSTRUCTIONS

GEI-50143

ML-11 STORED ENERGY OPERATOR

CONTENTS

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the General Electric Company.

SEPTEMBER, 1957

MEDIUM VOLTAGE SWITCHGEAR DEPARTMENT

GENERAL ELECTRIC

PHILADELPHIA, PA.

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ML-11 STORED ENERGY OPERATOR

GENERAL DESCRIPTION

The new charged-spring stored-energy mechanism will close and latch Magne-blast breakers with momentary current ratings up to and including 60,000 amperes in voltages from 4.16 kv to 13.8 kv and in interrupting ratings from 150 mva to 750 mva, inclusive. The operating force for the mechanism is supplied by a high speed 1/2 hp. gear motor. See Fig. 1. The energy from the motor is stored in powerful springs which are capable of closing the circuit breaker at its required speed under all conditions. Only after the mechanism is fully charged can it be released to close the breaker. As soon as the circuit breaker has been closed by the mechanism, the motor immediately recharges the springs for another closing operation. The spring charging time of five seconds and the fast circuit breaker closing time of six cycles or less provides ample time margin for all normal duty cycles.

When the high speed gear motor - Fig. 1 is energized, a chain drive transmits the power to the gear reduction unit (2). The torque is thus increased so that the output crank of the reduction unit will compress the closing springs (3) through the spring arms (4) to the fully charged position. When the springs are fully compressed, a cut-off switch (7) de-energizes the motor. In this position, the output crank is stopped against the stop latch (5). When the breaker control switch is turned to "close", the release solenoid (8) is energized which displaces the release latch (9) and permits the release roller (10) to drop free of the stop latch (5). The control mechanism kick-off spring (11) rotates the stop (5) which engages the reduction unit output crank roller and pushes it positively to a position where the closing springs continue the motion. The overrunning clutch in the reduction unit allows the output crank to rotate freely so that the closing springs can discharge their energy to the breaker mechanism through the connecting links (12). Immediately upon its release the cut-off switch starts the motor and the springs are again charged.

MANUAL CHARGING AND RELEASE OPERATION

Closing of the breaker by manual operation of the mechanism is possible if control voltage is lost. The springs are charged through the use of an easily operated manual charging handle, (13) on the end of the motor shaft until the semaphore reads "charged". Release of the springs is accomplished through a manual release plunger (14). Because the closing speed of the breaker is independent of the method of charging the spring or release of the control mechanism, the breaker closes after a manual charging and releasing operation at exactly the same speed as for an electrical operation. The use of the ratchet wrench provides for maximum safety in the event that control power is suddenly restored without warning. In this event, the motor drive takes over again and continues to charge the mechanism.

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ADJUSTMENTS

Although the breaker has been completely adjusted and tested at the factory, it is possible that unusually rough handling during transportation may have caused some loosening or disturbance of parts of the apparatus. It is therefore advisable to review all adjustments before placing the breaker in service, making readjustments wherever necessary.

A standard ratchet wrench and 1" socket are recommended for manually charging the springs and slow closing of the breaker for contact adjustment. With the springs in the fully charged position and the breaker open remove the bolt in the maintenance gag plate (21) Fig. 2 and move the plate to the right until it hits the stop. (Approx. 1-1/2"). Release the springs against this plate by pushing the manual release button (6) Fig. 3. The springs will now be confined in this position while the gear motor, reduction unit, crank and linkage are free to close the breaker slowly by turning the manual charging handle in a counter-clockwise direction.

For adjustments of the primary contact wipe, arcing contact wipe and primary contact gap refer to the magne-blast circuit breaker instruction book.

TRIP LATCH WIPE

Refer to Fig. 2. The wipe of the trip latch (4) on the trip roller (6) should be from 3/16" to 1/4". This can be measured by putting a film of grease on the latch (4) closing the breaker part way, and tripping. The mechanism has the proper trip latch wipe when the latch rests against the stop pin (5). No adjustment is provided and a visual inspection is usually all that is required. If this setting is not correct, look for insufficient travel of the trip shaft (3).

WHEN WORKING ON THE MECHANISM IN THE CLOSED POSITION, KEEP FINGERS CLEAR OF THE LINKAGE, AS ACCIDENTAL TRIPPING CAN CAUSE SEVERE INJURY.

PROP CLEARANCE

Refer to Fig. 2. With the breaker closed as far as possible with the manual charging handle, the clearance between the closing pin (8) and the prop (10) should be 1/32" to 3/32". Measure the prop clearance with a feeler gage to determine whether or not an adjustment should be made, and if so, exactly how much adjustment will be required. To make the adjustment, it will first be necessary to loosen the four screws holding the bearing blocks (28) and remove or add one or more spacers (29) as required. Bolt bearing blocks securely in place before checking the prop clearance again. When prop clearance is within tolerance, turn manual closing handle counter-clockwise to fully charge the springs. Manually trip the breaker and check the trip latch to be sure it has reset properly.

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If the trip latch fails to reset, it will be necessary to add a thin shim under the bearing block (28) using the same procedure described above.

CLOSING LATCH

The closing latch (11) Fig. 3 should have 3/16" to 1/4" wipe on the roller. To check this dimension the springs must be charged and the GAG PLATE MUST BE APPLIED. A slight motion of the latch may discharge the springs and close the breaker causing severe injury. The latch can be adjusted by loosening the lock nut (8) and turning the set screw (7) in or out as required. Tighten lock nut to secure the set screw and recheck adjustment.

MOTOR SWITCH

The motor cut-off and auxiliary switches (10) Fig. 3 should be set to operate when the gear reduction unit crank is approximately 1/4" from the final stop as indicated on Fig. 2. The inertia of the high speed gear motor and gear reduction unit will carry the crank into the stop latch (25) Fig. 2. The adjustment should be made using the manual charging handle and with the GAG PLATE APPLIED TO THE SPRINGS. Be sure all power is removed. Each switch can be adjusted individually by the locking ring in the rear. After adjustments are complete, remove the gag plate from the springs and apply power to the motor. Before making any further measurements or checks APPLY GAG PLATE TO SPRINGS. With the maintenance operating handle check to see if the output crank (23) Fig. 2 is seated against the stop latch (25).. Readjust switches if necessary using the same procedure as above until the output crank roller stops against the stop latch.

INTERLOCK SWITCH WIPE

Referring to Fig. 4, rotate the interlock shaft (2) manually clockwise to release the interlock switch arm (3). The point at which the contacts make can be determined with a circuit continuity tester such as a light indicator or bell set. To obtain adjustment on the interlock switch (4) bend the interlock switch arm (3). The roller and crank on the interlock switch (4) should have 1/32" to 1/16" overtravel after final adjustment.

FRICTION CLUTCH

Refer to Fig. 6. The friction clutch (5) should be tested with a torque wrench to have a break-away torque of 300 to 350 inch-pounds. With the springs fully charged and secured with the mainenance gag plate, turn the motor slowly with the torque wrench until the crank roller (18) is firmly against the stop latch (19). Continue turning slowly until the clutch slips and note the value on the torque wrench. Do not continue to turn motor if the torque value exceeds 350 inch pounds. If adjustment

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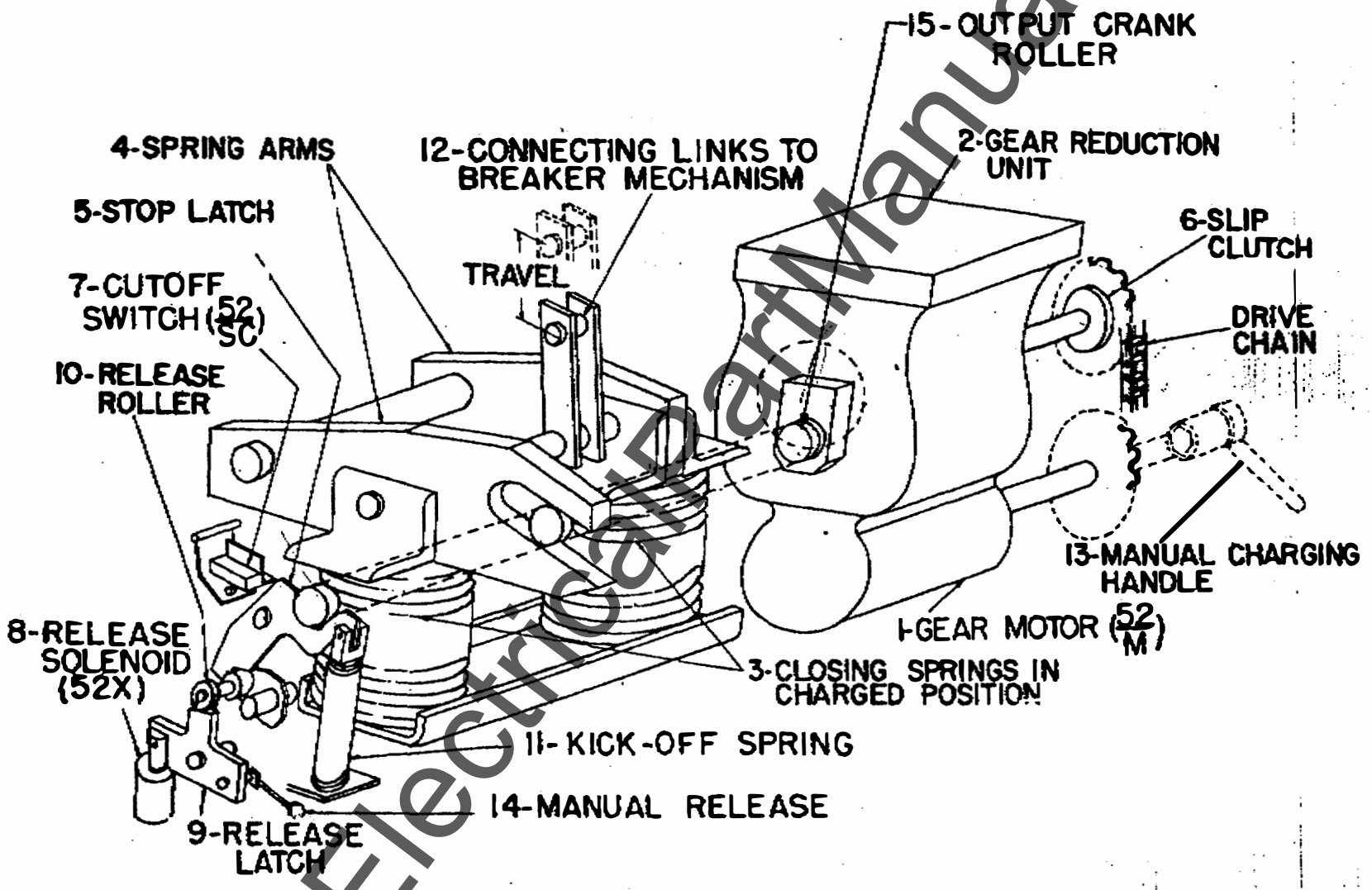

Fig. 1 Exploded Schematic of Stored Energy Operator

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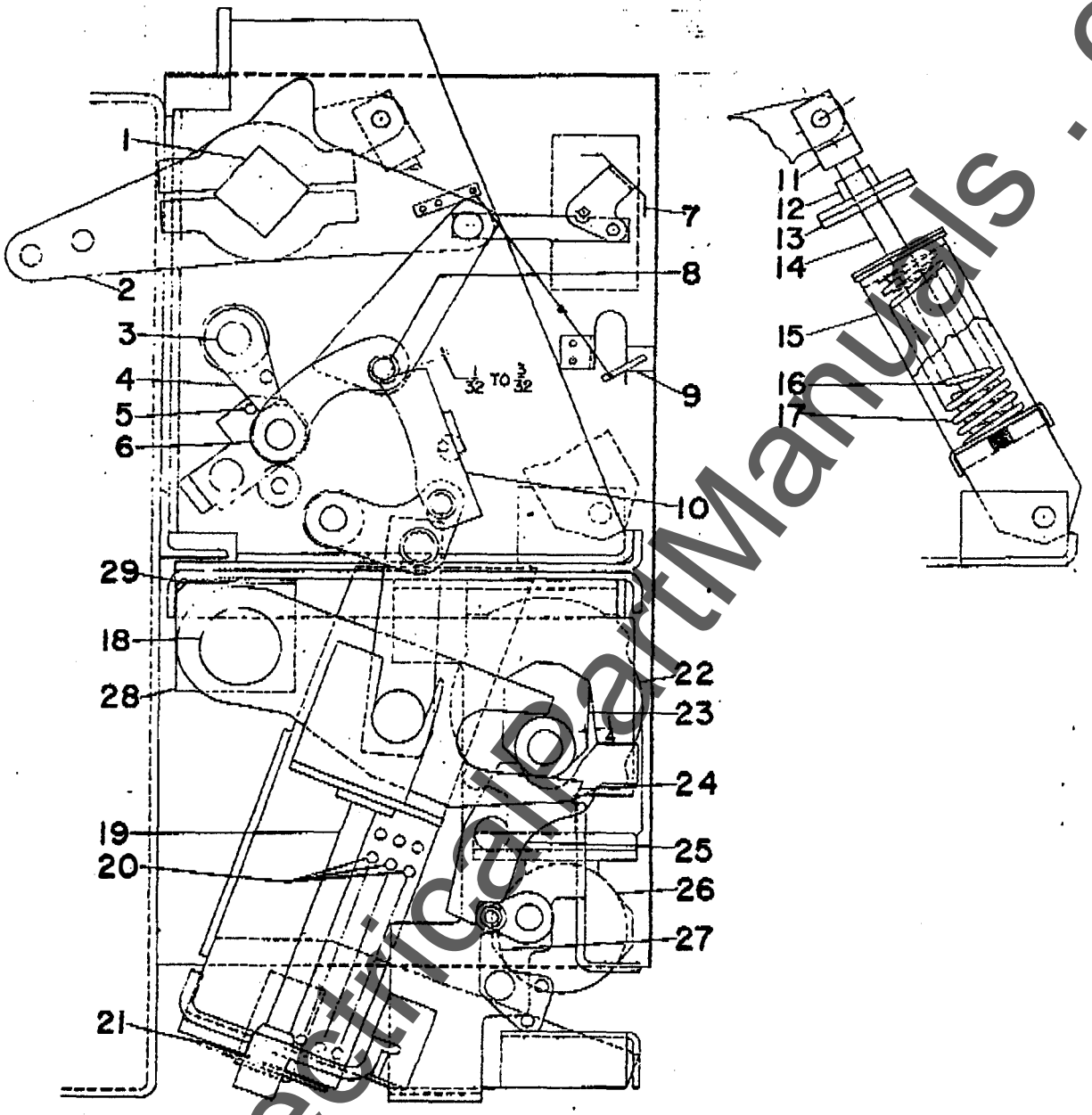

Fig. 2 (ST1957)

1. Main Operating Shaft
2. Main Crank
3. Trip Shaft
4. Trip Latch
5. Trip Latch Stop
6. Trip Roller
7. Position Indicator
8. Closing Pin
9. Counter
10. Prop
11. Clevis
12. Check Nut
13. Adjusting Nut
14. Adjusting Stud
15. Opening Spring Housing
16. Opening Spring Inner
17. Opening Spring Outer
18. Main Spring Shaft
19. Spring Yoke Assembly
20. Closing Springs
21. Maintenance Spring Gag Plate
22. Gear Reduction Unit
23. Output Crank
24. Spring Compression Arm
25. Stop Latch
26. Gear Motor
27. Close Latch
28. Bearing Block
29. Spacers

Fig. 2 Cross Section of ML-II Mechanism

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Fig. 3 (8023795)

1. Safety Latch
2. Position Indicator
3. Manual Trip
4. Opening Spring Unit
5. Positive Interlock
6. Manual Release
7. Latch Adjusting Screw
8. Locking Latch
9. Kick-off Spring
10. Cut-off Switch
11. Closing Latch
12. Spring Gag Plate

Fig. 3 Left Side View ML-11 Mechanism

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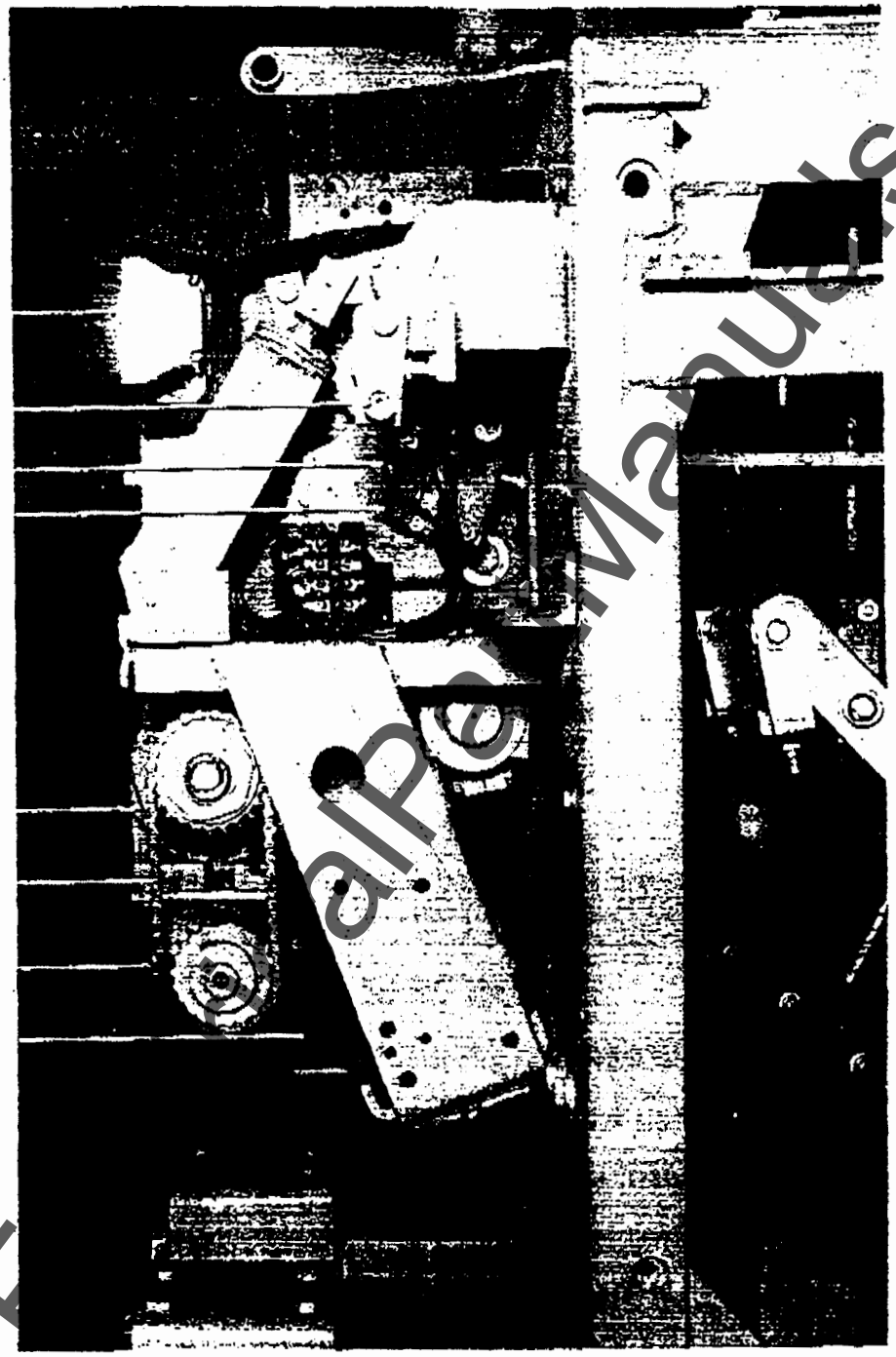

Fig. 4 (8023793)

1. Breaker Auxiliary Switch
2. Positive Interlock
3. Interlock Switch Arm
4. Interlock Switch
5. Gear Reduction Unit
6. Chain Drive
7. Gear Motor
8. Spring Release Solenoid

Fig. 4 Right Side View ML-11 Mechanism

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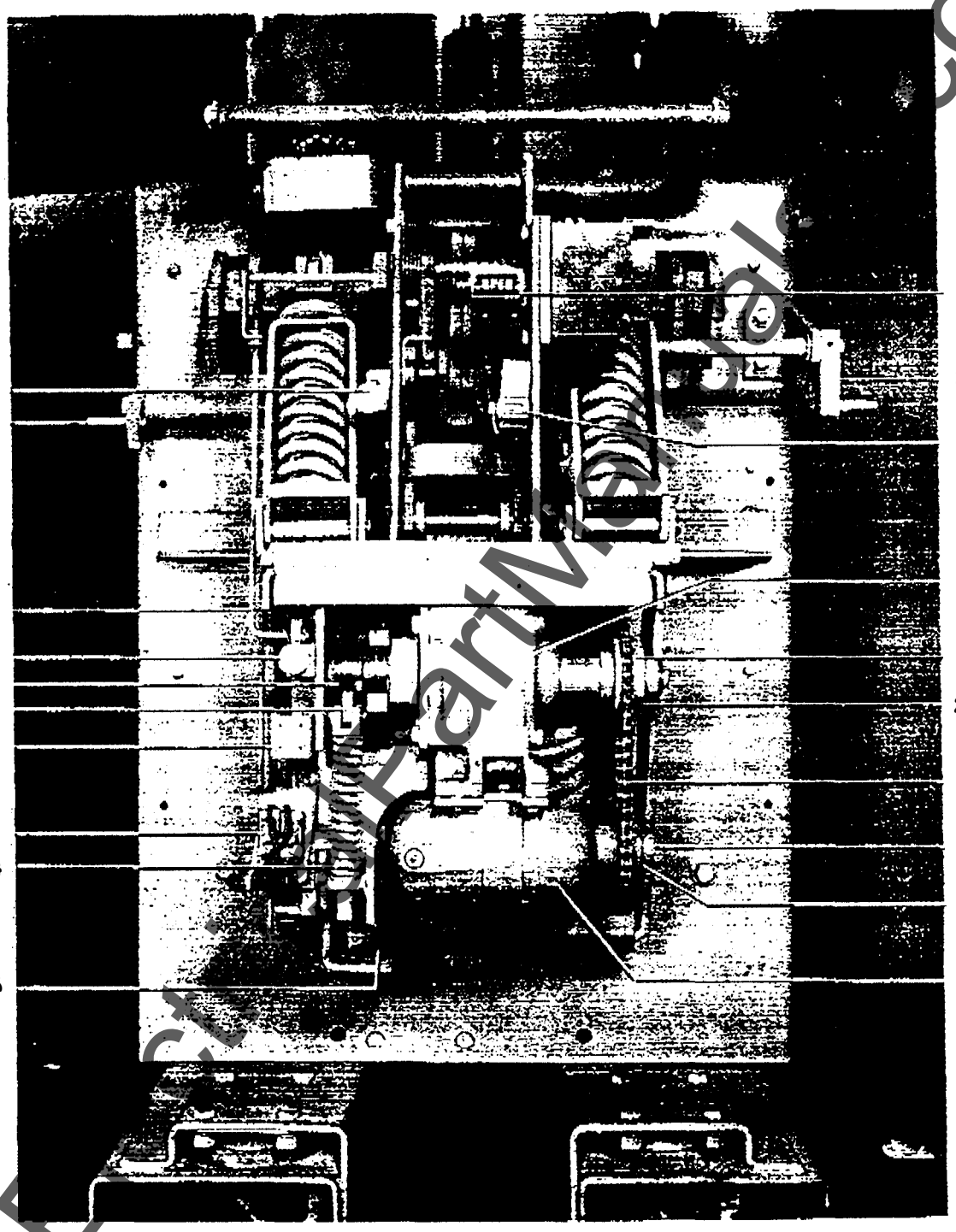

Fig. 5 (8023794)

1. Position Indicator
2. Positive Interlock Arm
3. Operation Counter
4. Gear Reduction Unit
5. Clutch
6. Chain Drive
7. Gear Motor
8. Manual Trip
9. Safety Latch
10. Positive Interlock
11. Manual Release
12. Spring Indicator
13. Cut-off Switch
14. Kick-off Spring
15. Spring Release Solenoid
16. Washers
17. Gear Motor
18. Crank Roller
19. Stop Latch
20. Clutch Adjustment Nut

Fig. 5 Front View ML-II Mechanism

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TITLE SPRING CLOSING MECHANISM

FIRST MADE FOR POTENTIAL TRIP

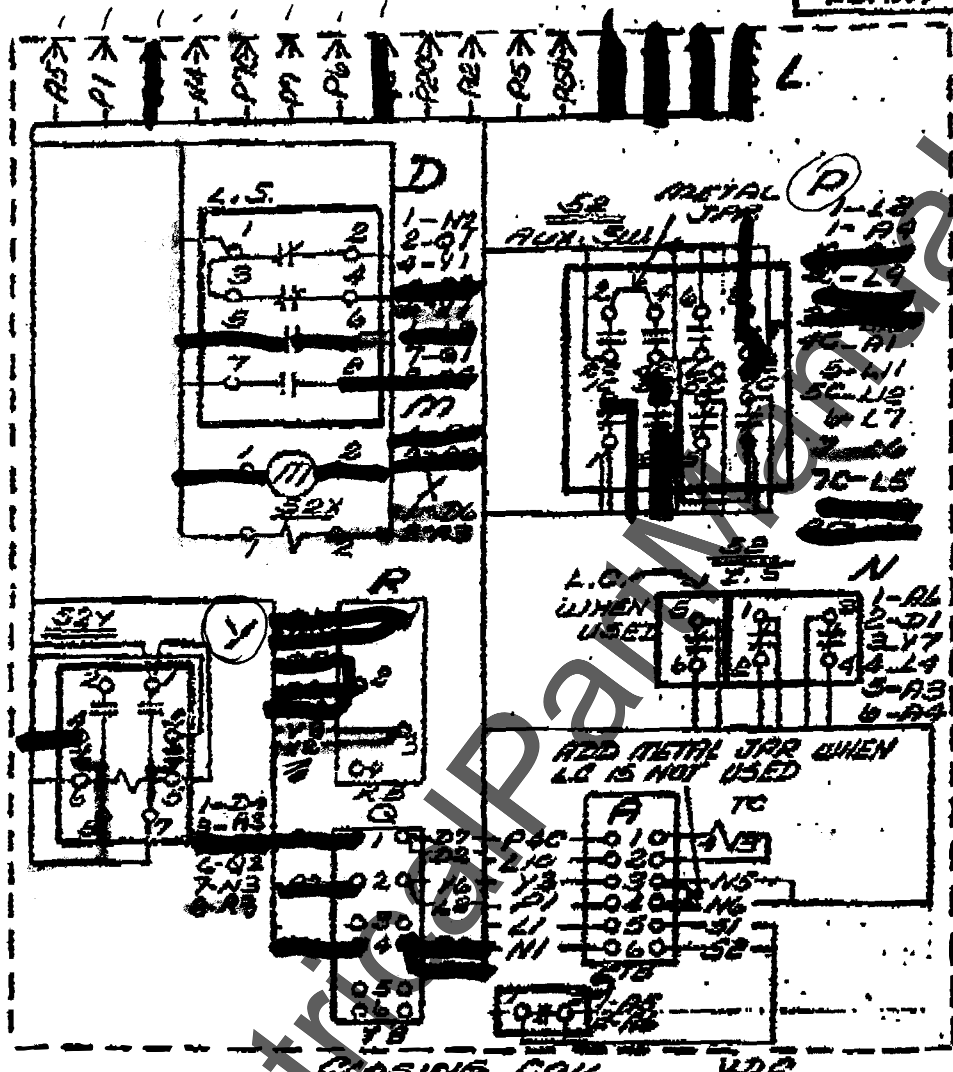
CONT. ON SHEET SH NO.

2X MOMENTARY RATED COIL OPERATES LATCH WHICH RELEASES CLOSING SPRING TO CLOSE BKR.

REFER TO 456A374 FOR WIRING IN ELEMENTARY FORM

REVISIONS

Rich Humphries 606 276 3841



Trip - 9, 10
close 1-8
latch

CLOSING COIL VDC
TRIP COIL VDC

NOTES:
INTERLOCK SWITCH CLOSED WHEN 52 IS IN FULLY RAISED OR FULLY LOWERED POSITION
L.S. (1-2) & (3-4) OPENS WHEN CLOSING SPRINGS ARE CHARGED AND NOT GAGGED.
L.S. (5-6) & (7-8) CLOSED WHEN CLOSING SPRINGS ARE CHARGED AND NOT GAGGED
GAG SW - PREVENTS ENERGIZING MOTOR WHEN SPRINGS ARE GAGGED

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"H"	Indicates a standard breaker with type ML-13 Stored Energy Mechanism. These breakers match and line-up with breakers having type ML-11 or ML-12 mechanisms, except as follows: (a) 750 MVA -5H or later (M36HN M/C)
"C"	Indicates a breaker with type ML-13 Stored Energy Mechanism that matches and lines up with a breaker having type MS-13 Solenoid Mechanism with positive type interlock only.
"L"	Indicates a 750 MVA Breaker with type ML-13 Stored Energy Mechanism that matches & lines-up with breakers originally used in M36H M/C. These breakers match and line-up with breakers having type ML-11 mechanisms.
"F"	Indicates a 750 MVA Breaker with type ML-13 Stored Energy Mechanism that matches and lines up with a breaker having a type MS-13 Solenoid Mechanism originally used in M36H M/C.
"D"	Indicates a standard breaker with type ML-13 Stored Energy Mechanism for use in Horizontal Drawout M/C.
"S"	Indicates a standard breaker with type MS-9 or MS-13 Solenoid Mechanism. These breakers have either positive or trip type interlocks for ratings of 75, 150, 250 or 500 MVA.
"B"	Indicates a High Momentary breaker.
"R"	Indicates a Repetitive Duty breaker.

No breaker with type ML-13 Stored Energy Mechanism is available for interchangeability with Solenoid Breakers having two (2) seven point couplers and trip interlock.

6) When checking for breaker interchangeability consideration must also be given to control voltage, connection diagram, and the presence of any special design features.

R. W. Simpson
Senior Design Engineer

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