(7) *Motors.*—Cause of rotation; torque; back electro-motive force; necessity for starter; speed-control; three- and four-wire starters; characteristics of series, shunt, compound, and interpole motors; brush-setting; connecting up and reversing; faults in operation; B.H.P. and efficiency.

Regenerative braking: its applications; connections; faults in operation.

Boosters and balancers: Types; conditions requiring their use; connecting up; faults in operation.

(8) *Wiring Circuits and Systems.*—Diagrams of connections for house circuits; looping in; minimum number of wires required; two-way switch circuits; service panels; casing; conduit; insulators; sheathed single wire; temporary wiring.

Supply systems: Two- and three-wire D.C.; two- and three-wire A.C.; three-phase four-wire A.C.; voltage relation between phases, and between phase and neutral; earthing.

Building-construction: A general idea of the construction of a building and the precautions to be taken to ensure the installation of conductors with the least damage to premises or weakening of joists, beams, walls, &c.; cutting floors; concealed works on finished buildings; attachment of electrical accessories to walls and ceilings of various materials.

(9) *Wiring Rules and Regulations.*—A knowledge of Electric Wiring Regulations, and a general understanding of the underlying reasons for their adoption, with special reference to earthing of conduit and apparatus, size of conductor, outlets per circuit, bunching of wires, metallic continuity, protection from shock and fire risk. Minimum-resistance testing, &c. (NOTE: The carrying-capacity of the common conductors should be known.)

(10.) Treatment in case of electric shock.

B.

Practical Work.—The examination will cover the syllabus in practical work for the wiremen's intermediate examination, and in addition the following: Chipping and filing to a reasonable degree of accuracy, marking out; drilling and reaming; use and care of taps and dies; soldering; sweating; brazing and riveting; making and tempering of hand and machine cutting-tools; sharpening drills; lathe-work, including setting up, turning and boring.

FINAL EXAMINATION FOR ELECTRICAL FITTERS.

A.

Electrical Theory.

The course will cover more completely the syllabus for the intermediate examination, together with the following:—

(1) *Elementary Theory of Alternating Currents.*—Fundamental ideas of an alternating current; terms in common use; phase, frequency, impedance; representation of alternating current and electromotive force; vector diagrams; maximum, virtual, and average electromotive force; phase difference; addition of electromotive forces; inductance, capacity, reactance, impedance; circuits containing inductance and capacity, apparatus in series or parallel; relation between applied electromotive force and current, &c.; power-factor and power-factor correction; reactive component; polyphase circuits; single-phase, three-phase three-wire, three-phase four-wire, three-phase star and delta connections; combined resistance and reactance drop in feeders.

(2) *Measurements and Measuring-instruments.*—Wattmeter; watt-hour meter, kilovolt-ammeter and kilovolt-ampere hour-meter, power-factor and frequency meters; current and potential transformers and their use with instruments.

(3) *Transformers.*—Construction; ratio of transformation; no-load current; operation under load; insulation; ventilation; cooling; grounding; star and delta connections; voltage ratios; single-phase and three-phase transformers; intermittent and all-day efficiency; constant-current transformers; auto-transformers, general features, voltage ratios, connections, comparison with other transformers.

(4) *Alternators.*—Principle and construction of single-phase and three-phase alternators; stator windings; rotor windings; frequency and wave shape.

(5) *Alternating-current Motors.*—

(*a*) Three-phase induction motors: Principle and construction; characteristics; rotating fields; windings and connections of stators; wound rotors; speed, torque, and slip; star-delta *v.* compensator and resistance starters; speed-regulation; operating faults.