

*Heat.*—Nature of heat; effects produced; temperature; quantity; specific heat; latent heat; vaporization; mechanical equivalent; combustion; calorific value of a fuel.

*Transmission of Heat.*—Radiation; conduction; convection; practical examples.

*Behaviour of Gases.*—Elementary consideration of relative changes in such properties as volume, pressure, temperature; internal energy; common values of compression ratios in engines.

*Principles of Operation of Two- and Four-cycle Engines.*—Reasons for the positions of opening and closing of valves; principles underlying the construction and function of each detail of a typical engine.

*Balancing of Engines.*—Consideration of arrangements of cylinders and cranks, and firing-order in two- four- and six-cylinder engines, with reference to torque and balance.

*Valve Mechanism.*—Types of cams and tappets; lift of valves; effective opening; valve timing diagrams for high- and slow-speed engines; effect of steam-leakage; weak springs; jammed valves; setting valves.

*Carburation.*—General principle of action of a carburettor, and description of forms in common use; methods employed to supply a constant-quality mixture; importance of supplying heat to the mixture; methods of supplying heat; common faults and their correction.

*Fuel-supply Systems.*—The location and correction of faults; gravity and vacuum systems.

*Cooling-systems.*—Air, thermo-siphon, and pump systems; types of radiators; fans; arrangement of passages for liquid; causes of overheating.

*Lubricating-systems.*—Splash, force-feed, and dry-sump systems; accessories; indicators; pumps, &c.; location of faults and their correction.

*Clutches.*—Construction of various types; methods of operating and adjustment.

*Change-speed Systems.*—Necessity for construction and operation of selective three- and four-speed gear-boxes. Epicyclic systems.

*Transmission of Power to Back Axle.*—Shafts and universal joints.

*Back-axle Assembly.*—Principles of various types of constructions; differentials; final drives; live and floating axles; adjustments.

*Brake-construction.*—Linkages; equalizers, internal and external types; transmission and back-wheel brakes; front-wheel brakes; adjustments and repairs.

*Principle of Chassis-construction.*—Systems of springing; methods of drive, and torque reactions; variation of torque and braking effect; engine suspension.

*Front-axle Assembly.*—Setting of front axle and wheels; Ackerman principle; practical adjustments.

*Steering-gear.*—Adjustment and principle of worm and sector; split nut; screw, variable ratio; Marles and Ross systems.

*Electrical.*—Sufficient idea of principles to locate common faults in battery and magneto ignition systems; setting and adjustment of H.T. inductor and rotary armature magnetos; care and adjustment of points and symptoms of common faults in battery and magneto systems; changing from magneto to battery and *vice versa*; timing ignition; Ford system.

*Batteries.*—Testing condition, and maintenance of batteries.

*Wiring-circuits.*—Diagrams of simple lighting, starting, and ignition circuits; location and remedy of simple faults in wiring-systems.

#### 4. Workshop Practice.

Filing to a reasonable degree of accuracy and a certain amount of chipping; marking out, drilling, and reaming; use and care of dies and taps; brazing, riveting, and soldering; making and tempering of hand-cutting tools; sharpening drills; lathe-work, turning, boring, setting up, &c., elementary blacksmithing, also bending and annealing of copper pipes.

#### SYLLABUS OF COURSE FOR THE FINAL EXAMINATION FOR MOTOR MECHANICS.

##### 1. Theoretical and Practical Course.

For the final examination a candidate will require a more thorough knowledge of the subject-matter outlined for the intermediate examination, and in addition a knowledge of the following:—

*Liquid Fuels.*—Properties of heavy oils, petrol, paraffin, alcohol, benzol, and conditions under which they may be employed.

*Carburation.*—Effect of petrol-air ratios on running, efficiency, and exhaust products; importance of manifold constructions; turbulence and causes of detonation.

*Carburettors.*—Adjustment of standard types for best performance; details of construction; principle of compensation, and constant mixture.