

Tools.—The tools and workshop appliances used by plumbers, their form and use, the materials of which they should be made, and their maintenance.

NOTE.—There will be no practical test in this grade, but the following syllabus may be followed by students in their second year:—

Use of soldering-iron; soldering straight; patches; tinning-union. Lead and galvanized-iron work, including step-flashings; single step; herringbone; aprons; chimney-gutter; forming box; forming drips; roll and roll-ends; single and double welts; clips; making solder; cutting soakers.

2. INTERMEDIATE COURSE.

This course is intended to occupy two years.

(a) Theory.

The mensuration of irregular and curved surfaces and volumes: setting out angles and making detailed drawings of leadwork for roofs.

Physical and chemical properties of lead and other metals and alloys used in plumbers' work. Effects of heat on metals used in roof-work: methods of laying to counteract effect of sun, wind, rain, and capillary action. Electrolysis from metals in contact.

The use of sheet metals, including lead and copper.

Weights of lead and copper sheets of specified thickness.

Cutting out sheet metals for flats, valleys, box and other gutters, dormers, skylights, cesspools, drips, falls, hips, and ridges; apron, step, and other flashings.

Methods of joining sheet metals with rolls, single and double welts. Precautions to avoid capillary action and to ensure generally that sheet work shall be waterproof. Rain-water heads and pipes.

Cold-water Supply.—Temporary and permanent hardness. Soft, hard, mineral, and peat water, and their effects upon pipes, cisterns, &c. Contamination of water. Head of water and pressure on fittings. The connection of pipes to mains; methods of fixing pipes; house-cisterns, their construction and fittings, valves, taps, water-waste preventors, flushing-tanks, warning and overflow pipes; water-hammer; causes of noise in pipes; air-traps; practical means of protecting water fittings against frost; methods of tracing leakage.

Simple water-raising appliances. Action and principle of syphons. Pumps, hand- and machinery-driven: sizes and performances.

Gasfitting.—Installation of pipes and fittings, sizes of pipes, testing for soundness. Fixing of gas cookers, gas fires and radiators, and gas- and oil-heated boilers and circulators for domestic hot-water supplies. Ventilation of gas-heated appliances. Effects of radiant and convected heat on air in rooms heated by gas or oil.

(b) Practice.

Forming gutter with drip; undercloak and turnover; intersection roll; flats and rolls; breaks; cesspools; wiping in downpipes; wiping in birdsmouth outlets; wiping in cesspools; Preparation of small joints; and wiping $\frac{1}{2}$ in. and $\frac{3}{4}$ in. underhand upright and branch joints; forming slates; wiping solder dots; wiping angles for tanks; pipe-bending; forming safe wastes, pipe wastes, vent-pipes, and flush-pipes; preparation of upright, horizontal, and branch joints; erection of sectional cast-iron boilers; repairing pumps and rams; stop-valves, ball traps; making up of various jointing-materials.

3. FINAL EXAMINATION COURSE.

This course is intended to occupy two years.

(a) Theory.

Workshop Arithmetic.—Taking out quantities from plans for all descriptions of plumbers' work; calculating weights and sizes of pipes for any specified duty; sizes of cisterns or tanks for storing water or acids; relative capacities and discharging-power of pipes. Effects of bends, orifices, and obstructions.

Workshop Geometry and Drawing.—The setting-out to scale of coverings for domes, turrets, and finials for buildings, embodying the development of cones, frustra of cones, pyramids, cylinders, &c., including their plans and sections.

Water.—Sources of water-supply; qualities and properties of water from deep and shallow wells, springs, and other sources; storage, filtration, and distribution. Causes and prevention of pollution. Water-softening