level to a tripod to which a plumb-bob has been attached (Fig. 4). The first sight is taken levelled to the proposed height of the filled dam, and a reverse view from the same position taken in the downstream direction to a sighting pole notched in feet and inches. The reading is the fall between the point on which the pole rests and the proposed dam water level. Further readings down to the power house site should be taken downstream with the sighting level and tripod erected to the same height (hence the necessity for the plumb-bob) over the point where the staff had been previously held. The sum of these readings less the height above ground of the level at each shift after the first will give the total head. The working head will, where an open headrace is necessary, be the total head less the fall between the dam level and the pipeline intake.

Estimating Theoretical H.P.

The theoretical H.P. available can be calculated from the formula H.P. = (head measured in ft.) × flow (cubic ft. per minute) ÷ 530.

EXAMPLE:—

Assuming head 40 ft.; flow cubic ft. per minute (previous example) 224 ÷ 530.

(40 × 224) ÷ 530 = approx. 17 h.p.

Actual Power Available

It should be realised that the theoretical energy so estimated cannot all be translated to electrical energy for a number of reasons. Unavoidable losses will be caused by such factors as seepage in the intake raceway, length and diameter of the pipeline from intake to power house, pipeline bends, and the efficiencies of the turbine or waterwheel, together with the dynamo, in converting mechanical to electrical energy. Thus, in reckoning the actual H.P. a safe allowance is 50 per cent. of the theoretical H.P.

Most farm power plants are designed so that the generator is running continuously, and in these circumstances the dam serves only to divert the volume of water along the raceway which is immediately required to operate the plant. Large storage dams similar to those of the major hydro-electric schemes would, on the score of cost, be out of all reason for a small farm hydro-electric scheme. If the power demand is for short periods only and the stream is incapable of sustaining this load continuously, a small storage dam will be necessary to build up a water reserve which can be drawn on when power is required.

Power Requirements

	Watts.
SHED:	
Milking shed motor 1 h.p. ..	746
Separator and Water Pump Motors, 2-¾ h.p.	374
Hot water cylinder, 750w. ..	750
Shed lights, 3-60w.	180
DOMESTIC:	
Electric range (2 elements burning)	1,500
Hot water cylinder	750
House lights, 7-60w., 1-150w.	570
Toaster 550w., Radio 60w., Iron 750w., Kettle 1,000w., Cleaner 44w., Washer 186w., etc.	2,590
Total	7,460
H.P.	10

Fig. 5.—Listing the total power demand.