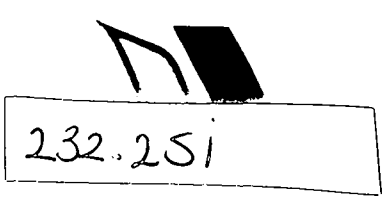
mple water pump

Bulletin No 1 (Revised)

Tropical Agricultural Engineering Information

Overseas Liaison Department
National Institute of Agricultural Engineering
Silsoe Bedfordshire England



O.L.D. TECHNICAL BULLETIN NO. 1 (REVISED)

SIMPLE WATER PUMP

Contents *Page*

1 Introduction

The need for a simple manually operated water pump of limited performance is widespread, the main requirements being ease of local manufacture with limited facilities, and a minimum of maintenance. The pump described in this bulletin has been in successful operation for some years now, the idea originating in Afghanistan, and subsequently being described in detail in the "Village Technology Handbook".[1] It came to the notice of the Overseas Liaison Dept. in 1965 in Nigeria and two sizes of unit were constructed and tested at the N.I.A.E. Details of the units and results of these trials were published originally as Bulletin No. 1, Tropical Agricultural Engineering Information.

2 Performance

The table below shows the output obtained during trials at the N.I.A.E. with two sizes of pump at different lifts.

Diameter of pipe in.	Length of pipe ft.	Lift ft.	Output gal./min.
3	4½	3	35
3	14½	13	10
6	6	4	65
6	8	6	55

3 Description

This pump is designed for hand operation (Fig. 1) and consists of a pipe to which is attached, at the top end, a spout with a flap valve; the top of the pipe is sealed (Fig. 2). The pump is hung by the top bracket from one end of a wooden handle which is pivoted about a suitable wooden post. It is operated by moving the handle up and down, causing the pump to rise and fall in the water, keeping the open end below the surface. The effect of this movement is to cause the water to rise in the pipe and flow from the spout.

Fig. 1 Simple water pump in use in Hong Kong.

Fig. 2 6 in. and 3 in. pumps showing flap valves with shields removed.

4 Construction

4.1. Materials required

Steel sheet, of approximately 20 swg, should be used for making the pipe, shield, shield cover, top of pipe and spout; it should preferably be galvanised. If available, light-weight ready-made pipe may be used but it must be airtight.

$^3/_{16}$ in. or $^1/_8$ in. mild steel plate should be used for making the top bracket, valve bottom, and valve top. If mild steel plate is not available it would be possible to make the bracket and valve bottom from several thicknesses of old oil drum metal and the valve top from a piece of ¾ in. thick flat wood.

The flap hinge can be made from $^3/_{16}$ in. welding wire, or similar material, and old inner tube or sponge rubber sheet can be used for the valve seal.

Both the post and handle can be made from wood. A list of nuts and bolts required is given below.

3 in. Pump
- 2–1½ in. x ¼ in. dia. fully threaded bolts
- 4–¼ in. nuts
- 1–5 in. x $^3/_8$ in. dia. bolt and nut for attaching lever to pump
- 1–6 in. x $^3/_8$ in. dia. bolt and nut to pivot lever on post

6 in. Pump
- 2–2 in. x ¼ in. dia. fully threaded bolts
- 4–¼ in. nuts
- 1–8 in. x ½ in. dia. bolt and nut for attaching lever to pump
- 1–6 in. x $^3/_8$ in. dia. bolt and nut to pivot lever on post

Very large nails or suitable pins of wood can be used in place of the two larger bolts.

4.2. Tools required

Welding or soldering equipment, hand drill, hammer, saws, tinsnips, anvil.

4.3. Notes on construction

1. All seams and joints on the pipe and spout should be completely airtight. For short lifts it is possible to pump with a slight air leak but efficiency is reduced.

2. The flange on the spout which forms the seat for the flap valve must be flat.

3. The flap valve must be flat and assembled so that the seal is held tightly between top and bottom plates, but it must be attached to the hinge wire loosely so that it can align itself with the spout flange.

The dimensions for two sizes of pump are shown in the diagrams on pages 6, 7 and 8: other sizes can be used to suit locally available materials.

5 Operation

The pump will prime itself for both low and high lifts. For low lifts the 3 in. pump should be operated in short strokes (6–8 in.) at a rate of about 120 strokes/min; for the 6 in. pump the rate is approximately 90 strokes/min. There is a knack in operating these pumps and experience will determine the length and rate of stroke required for efficient operation. Long, slow strokes are required to prime the 3 in. pump at high lifts, but when it has been primed, shorter, faster strokes can be used satisfactorily.

For ease of operation the distance between the pump and pivot is important. Generally for the 3 in. pump good results can be obtained with a distance of 20 in. between pump and pivot, and with the 6 in. pump a distance of 12 in. is best. The distance, however, can be adjusted to suit the operation. In some circumstances a better performance can be achieved by two men working together.

6 Suggested applications

Due to its simplicity and lack of working parts, the pump is probably the only economically feasible unit for use in remote areas where more complicated pumps would have a short life because of lack of maintenance. It is also ideally suited for pumping water with a high sediment and trash content.

Practical uses include:

(i) lifting water from shallow well, river, or irrigation canal to small plots with surface irrigation.

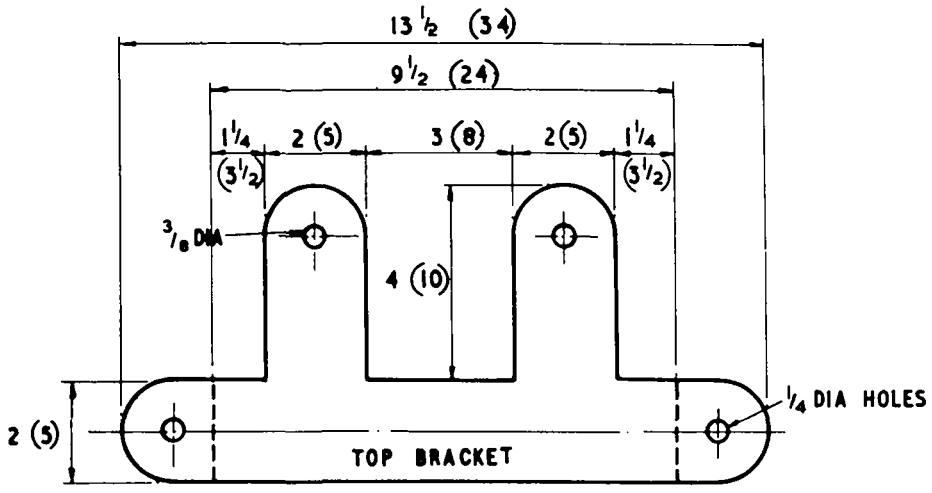
(ii) filling stock water troughs from river, or shallow bore hole.

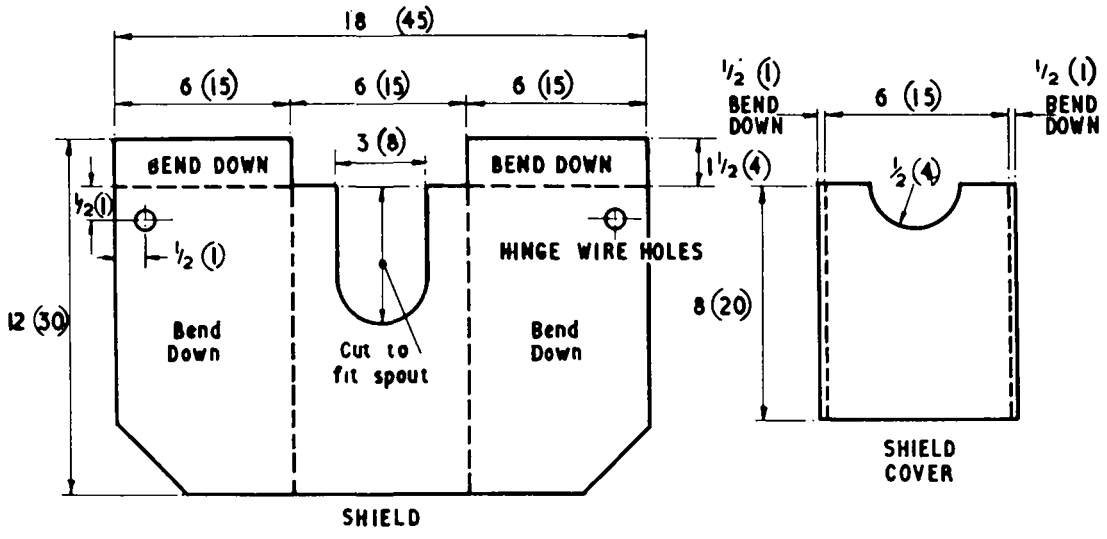
7 Reference

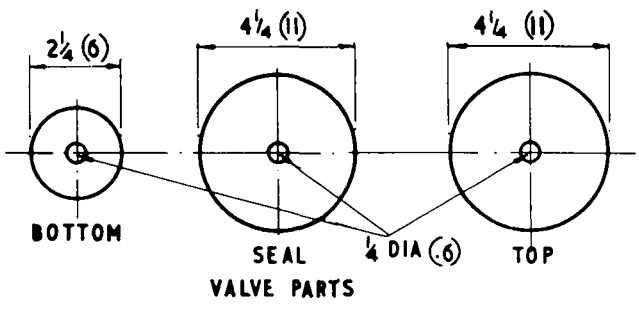
1. Village Technology Handbook 1. U.S. Department of State, Agency for International Development, Communications Resources Division, 1963.

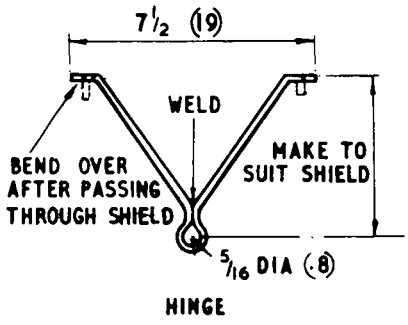
3 INCH (8 CM) PUMP

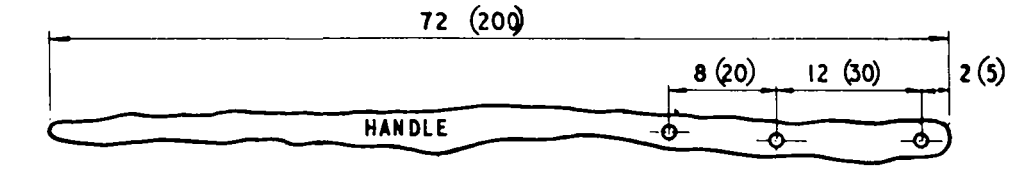
DIMENSIONS SHOWN IN INCHES AND CENTIMETRES

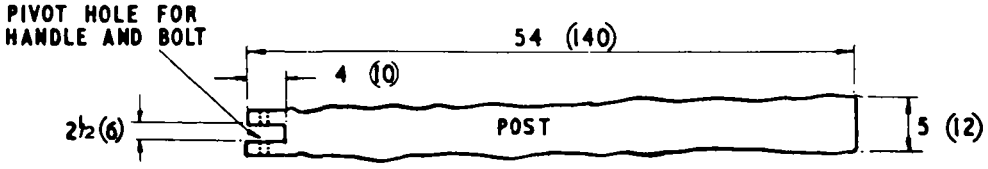






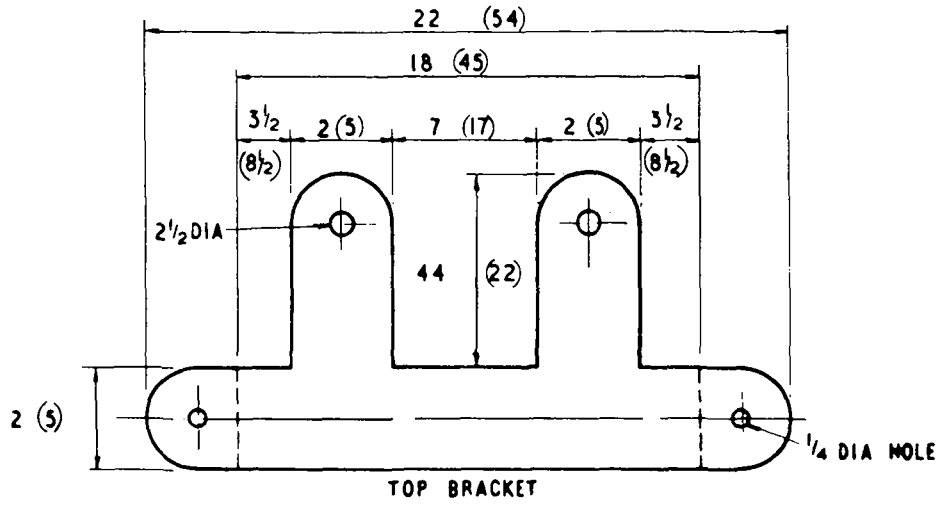


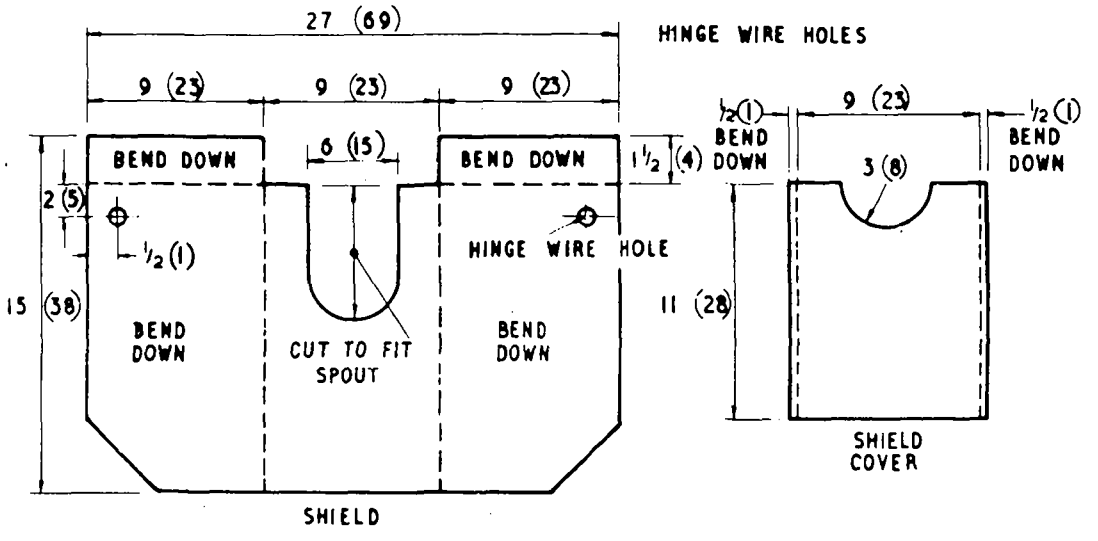


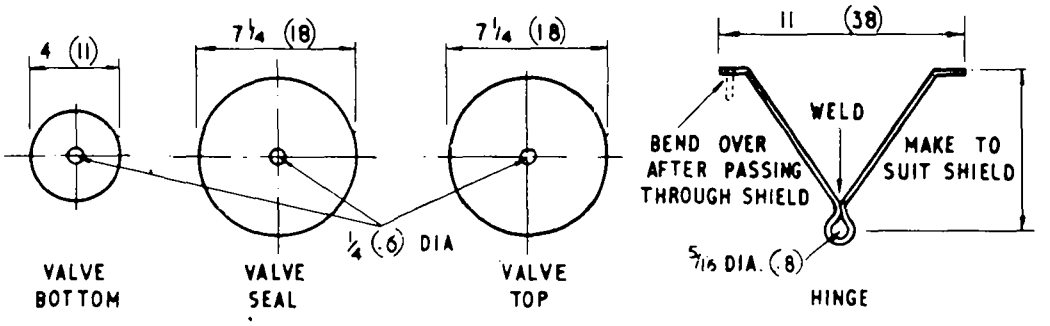


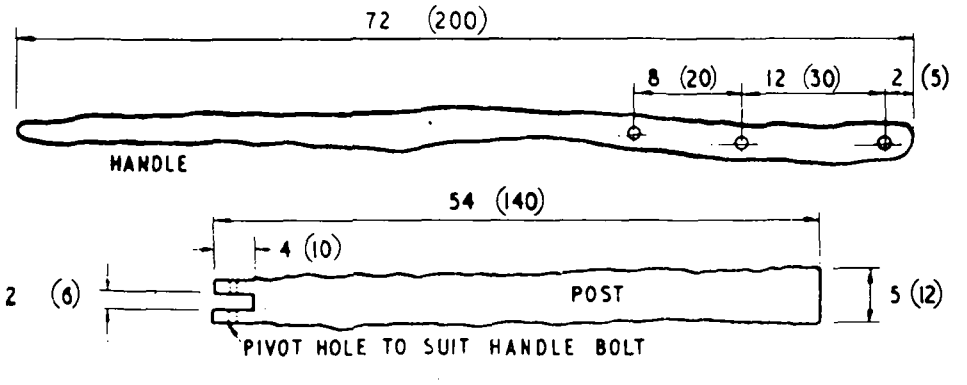
6 INCH (15 CM) PUMP

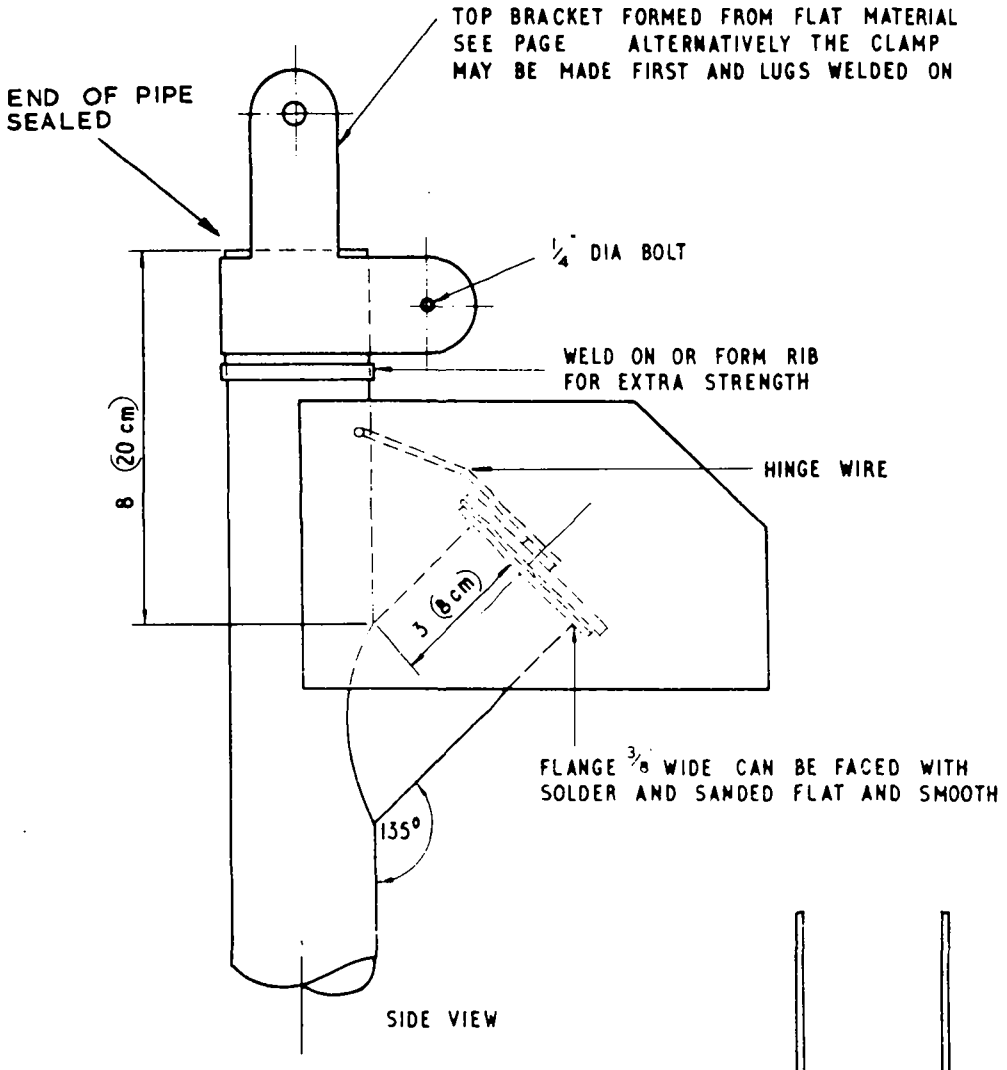
DIMENSIONS SHOWN IN INCHES AND CENTIMETRES

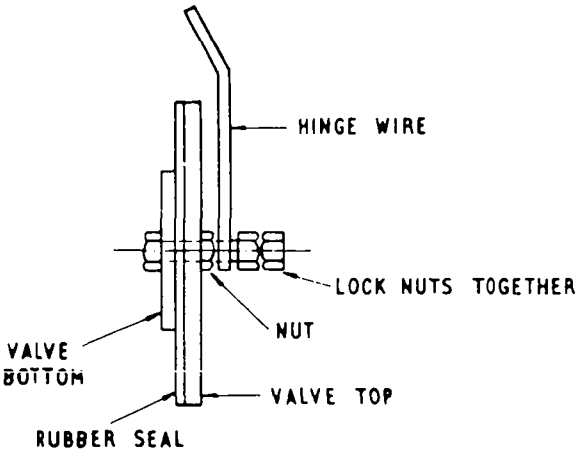




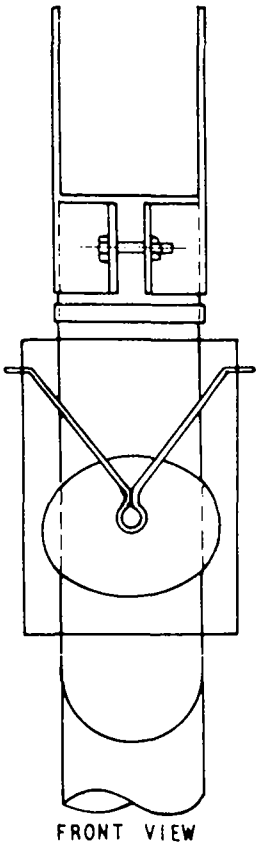








VALVE DETAILS



FRONT VIEW

For further details of this and other subjects contact the:

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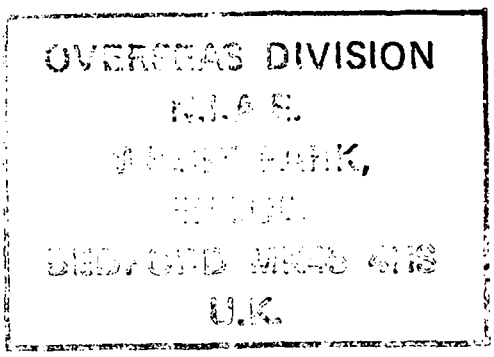

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