cotton. A 6mm (1/4") hole, F, is drilled at an angle from the oil well to the surface of the block. A second oil duct hole E is drilled in the upper section of
the block to meet hole D. Use lockwashers under the head and nut of the link bolts to lock the bolts and links together. Use plain washers between the links and the wooden parts.

Source:

Abbott, Dr. Edwin. A Pump Designed for Village Use. Philadelphia: American Friends Service Committee, 1955.

Hydraulic Ram

A hydraulic ram is a self-powered pump that uses the energy of falling water to lift some of the water to a level above the original source. This entry explains the use of commercial hydraulic rams, which are available in some countries. Plans
for building your own hydraulic ram are also available from VITA and elsewhere.

Use of the Hydraulic Ram

A hydraulic ram can be used wherever a spring or stream of water flows with at least a 91.5cm (3') fall in altitude. The source must be a flow of at least 11.4 liters (3 gallons) a minute. Water can be lifted about 7.6 meters (25') for each 30.5cm (12") of fall in altitude. It can be lifted as high as 152 meters (500'), but
a more common lift is 45 meters (150').

The pumping cycle (see Figure 1) is:

fig1x108.gif (600x600)

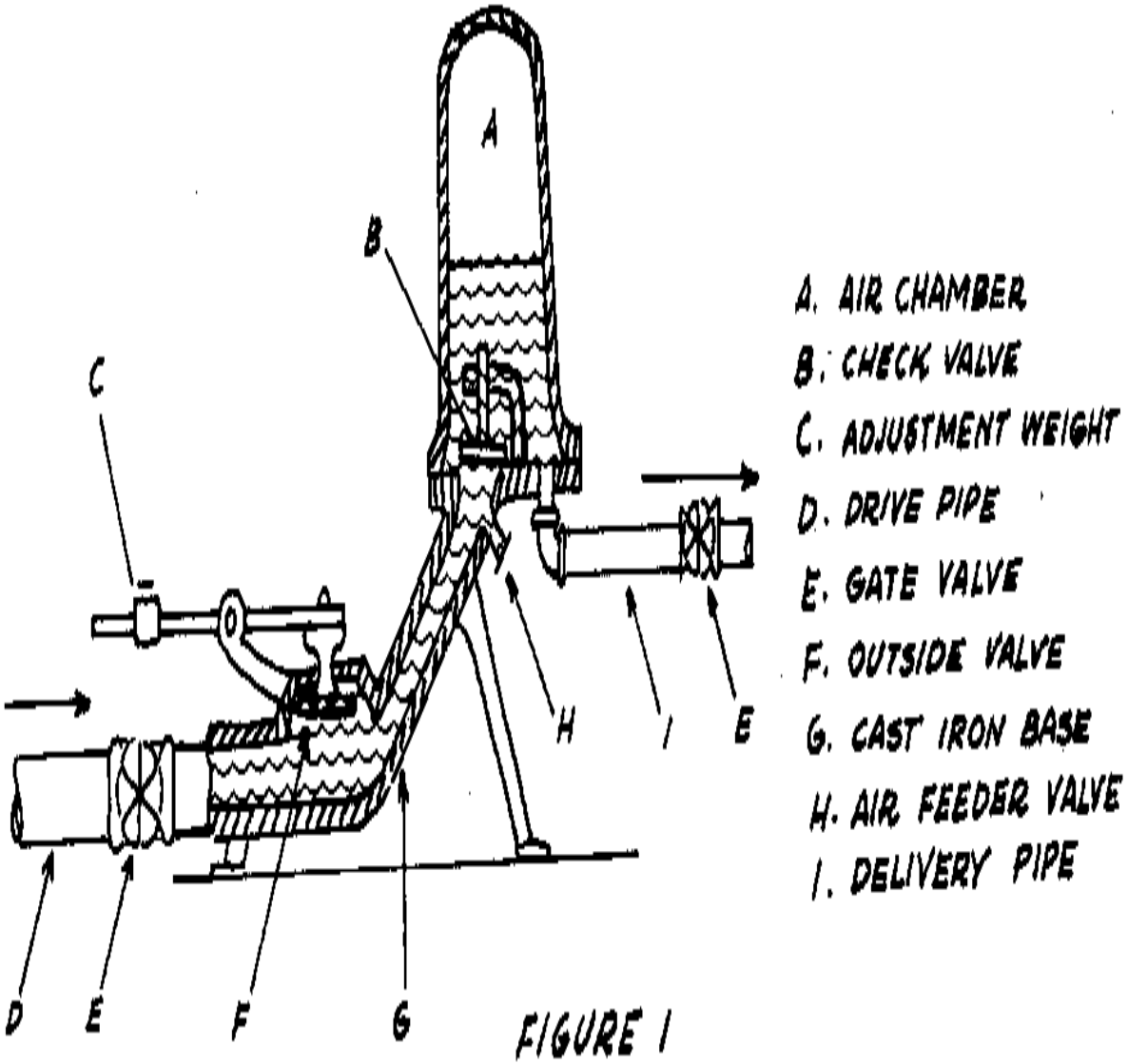

FIGURE I

o Water flows through the drive pipe (D) and out the outside valve (F).

o The drag of the moving water closes the valve (F).

o The momentum of water in the drive pipe (D) drives some water into the air chamber (A) and out the delivery pipe (I).

o The flow stops.

o The check valve (B) closes

o The outside valve (F) opens to start the next cycle.

This cycle is repeated 25 to 100 times a minute; the frequency is regulated by moving the adjustment weight (C).

The length of the drive pipe must be between five and ten times the length of the fall (see Figure 2). If the distance from the source to the ram is greater than

fig2x109.gif (600x600)

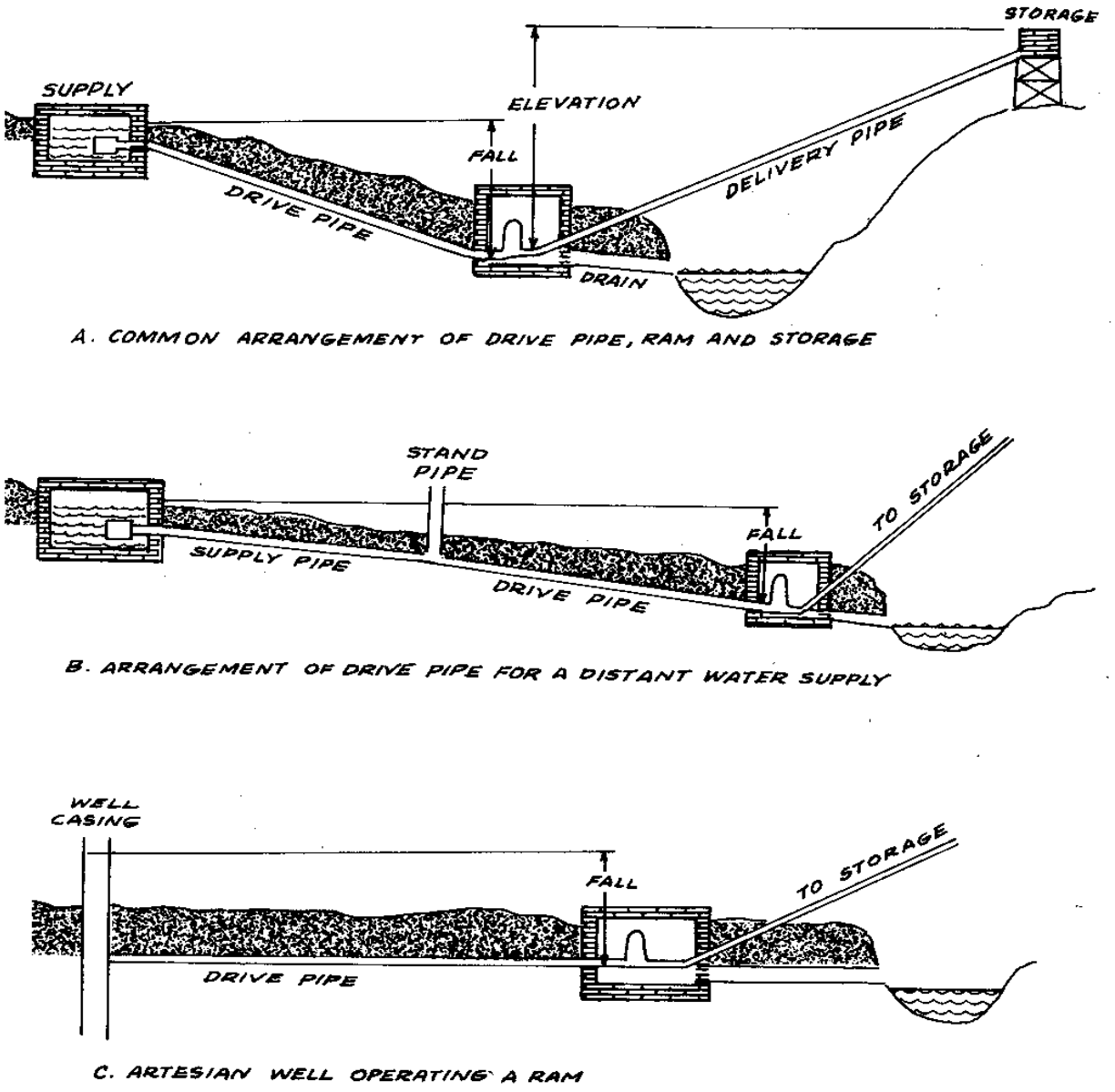

FIGURE 2

**ten times the length of the fall, the length of the drive pipe can be adjusted by
installing a stand pipe between the source and the ram (see B in Figure 2).**

Once the ram is installed there is little need for maintenance and no need for skilled labor. The cost of a hydraulic ram system must include the cost of the pipe and installation as well as the ram. Although the cost may seem high, it must be remembered that there is no further power cost and a ram will last for 30 years or more. A ram used in freezing climates must be insulated.

A double-acting ram will use an impure water supply to pump two-thirds of the pure water from a spring or similar source. A third of the pure water mixes with the impure water. A supplier should be consulted for this special application.

To calculate the approximate pumping rate, use the following equation:

$$\text{Capacity (gallons per hour)} = \frac{V \times F \times 40}{E}$$

V = gallons per minute from source
F = fall in feet
E = height the water is to be raised in feet

Data Needed for Ordering a Hydraulic Ram

1. Quantity of water available at the source of supply in liters (or gallons) per minute

2. Vertical fall in meters (or feet) from supply to ram

3. Height to which the water must be raised above the ram

4. Quantity of water required per day

5. Distance from the source of supply to the ram

6. Distance from the ram to the storage tank

Sources:

Loren G. Sadler, New Holland, Pennsylvania

Rife Hydraulic Engine Manufacturing Company, Millburn, New Jersey

Sheldon, W.H. The Hydraulic Ram. Extension Bulletin 171, July 1943, Michigan State College of Agriculture and Applied Science.

"Country Workshop." Australian Country. September 1961, pages 32-33.

"Hydraulic Ram Forces Water to Pump Itself." Popular Science, October 1948, pages 231-233.

"Hydraulic Ram." The Home Craftsman, March-April 1963, pages 20-22.

**RECIPROCATING WIRE POWER TRANSMISSION
FOR WATER PUMP**

A reciprocating wire can transmit power from a water wheel to a point up to 0.8km (1/2 mile) away where it is usually used to pump well water. These devices