Alcock Ram Pump (ARP)  
Discharge Valve Assembly Guide

Table of Contents

Parts List ............................................................................................................ 1
Assembling the Discharge Valve ................................................................... 2
   A. Screwing Nuts onto Threaded Rod ................................................ 2
   B. Weight, Shells, and Washer ............................................................. 3
   C. Rubber, Shell, and Tube .................................................................... 4
   D. External Rubber & Steel Hat ............................................................ 5
   E. Top Nuts and Length Adjustment ................................................... 6
   F. Completion and Installation .............................................................. 7

CREDIT: This guide was prepared by members of the Johns Hopkins University  
student chapter of Engineers Without Borders - USA in Baltimore, Maryland, U.S.A.  
We hope you find it useful.

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# Illustrated Parts List

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Threaded Rod</td>
</tr>
<tr>
<td>2</td>
<td>Nut 1</td>
</tr>
<tr>
<td>3</td>
<td>Nut 2 (Lock-nut 1)</td>
</tr>
<tr>
<td>4</td>
<td>Shifting Spanner</td>
</tr>
<tr>
<td>5</td>
<td>Socket Wrench (nut tightener)</td>
</tr>
<tr>
<td>6</td>
<td>Large Shell 1 (curved washer)</td>
</tr>
<tr>
<td>7</td>
<td>Lead Weight</td>
</tr>
<tr>
<td>8</td>
<td>Large Shell 2 (curved washer)</td>
</tr>
<tr>
<td>9</td>
<td>Rubber 1 (rubber disc)</td>
</tr>
<tr>
<td>10</td>
<td>Small Shell (curved washer)</td>
</tr>
<tr>
<td>11</td>
<td>Steel Tube</td>
</tr>
<tr>
<td>12</td>
<td>Top-Half of Discharge Valve</td>
</tr>
<tr>
<td>13</td>
<td>Nut 3</td>
</tr>
<tr>
<td>14</td>
<td>Rubber 2 (rubber disc)</td>
</tr>
<tr>
<td>15</td>
<td>“Steel Hat”</td>
</tr>
<tr>
<td>16</td>
<td>Nut 4</td>
</tr>
<tr>
<td>17</td>
<td>Nut 5 (Lock-nut 2)</td>
</tr>
<tr>
<td>18</td>
<td>Bottom-Half of Discharge Valve (reducing coupling; adaptor)</td>
</tr>
</tbody>
</table>
A. Assembling the Discharge Valve: Screwing Nuts onto Threaded Rod

1. Screw nut 1 (#2) onto the threaded rod (#1).

2. Screw lock-nut 1 (#3) onto rod (#1). Tighten the two nuts against each other (see below).

Holding nut 1 (#2) with a spanner (#4), tighten lock-nut 1 (#3) with the socket wrench (#5). The two nuts should lock tight together to prevent either nut from moving further along the rod. (Lock-nut 1 is hidden inside spanner)
B. Assembling the Discharge Valve: Shells and weight

3. Slide the large shell 1 (#6) onto rod (#1). The curved edges (bowl) of the shell 1 should point away from the nuts.

4. Slide the lead weight (#7) onto rod (#1). The bottom curved surface of the lead weight should align with the curve of the large shell.

5. Slide large shell 2 (#8) onto the threaded rod (#1). The shell should be placed so that its curved-up edges are away from the lead weight. The curve of the shell should thus match the upper curved surface of the lead weight.
C. Assembling the Discharge Valve: Rubber, shell, and tube

6. Slide rubber 1 (#9) onto rod (#1); curve should match curve of shell 2 (#8).

7. Slide small shell (#10) onto the rod (#1) next to rubber 1 (#9).

8. Slide the steel tube (#11) onto the rod (#1).

9. Put the threaded rod (#1) into the top half of the discharge valve (#13).

Note: This may require forceful twisting onto the rod.
D. Assembling the Discharge Valve:  External rubber & steel hat

10. The threaded rod (#1) should come out of the hole that is in the middle of the top-half of the discharge valve (#12).

11. Screw nut 3 (#13) onto the threaded rod (#1).

12. Put rubber 2 (#14) on top of nut 3 (#13), with curve in direction of top-half (#12).

13. Put steel hat (#15) on top of rubber 2 (#13).
E. Assembling the Discharge Valve: Top nuts and length adjustment

14. Add nut 4 (#16) to rod (#1), above the steel hat (#15). Tighten against the top of steel hat (#15) and rest of assembly.

15. Screw lock-nut 2 (#17) onto rod (#1) until it is fully locked tight with nut 2 (#18). Follow the instructions given for nut 1 and lock-nut 1, as shown at bottom of page 2.

Note: Do not over-tighten nut 2. The tightness of nut 2 against the assembly (as backed by nut 1 & lock-nut 1) is an important dimension that needs to be carefully adjusted in order to properly bend the rubbers without blocking the holes. This may require trial and error, and with pump testing between tries.

Note: A thin fixed spanner is needed (instead of the shifting spanner in order to fit between the shell and the locknut.

16. Holding lock-nut 1 (#3) with the shifting spanner (#4), tighten lock-nut 2 (#17) with the wrench (#5).

Note: This step is used to ensure that lock-nut 1 is firmly locked against nut 1 and that lock-nut 2 is firmly locked against nut 2.
F. Assembling the Discharge Valve: Completion and Installation

17. Locate the bottom-half of the discharge valve (#18) and prepare to attach it to the rest of the assembly.

18. Connect the bottom-half of the discharge valve (#18) with the top half of the discharge valve (#12) by screwing them together. (Note: It may be wise to first wrap the threads of the top half with white Teflon pipe tape in order to make the pump easier to disassemble later.)

Use two large pipe spanners (not shown) to make this connection very tight.

19. Attach the assembled discharge valve* onto the rest of the ram-pump pipe assembly. (This will again require the use of two large pipe spanners. See separate “Ram-Pump Assembly Instructions” for further details.

*Note: The discharge valve shown at left is an older model.