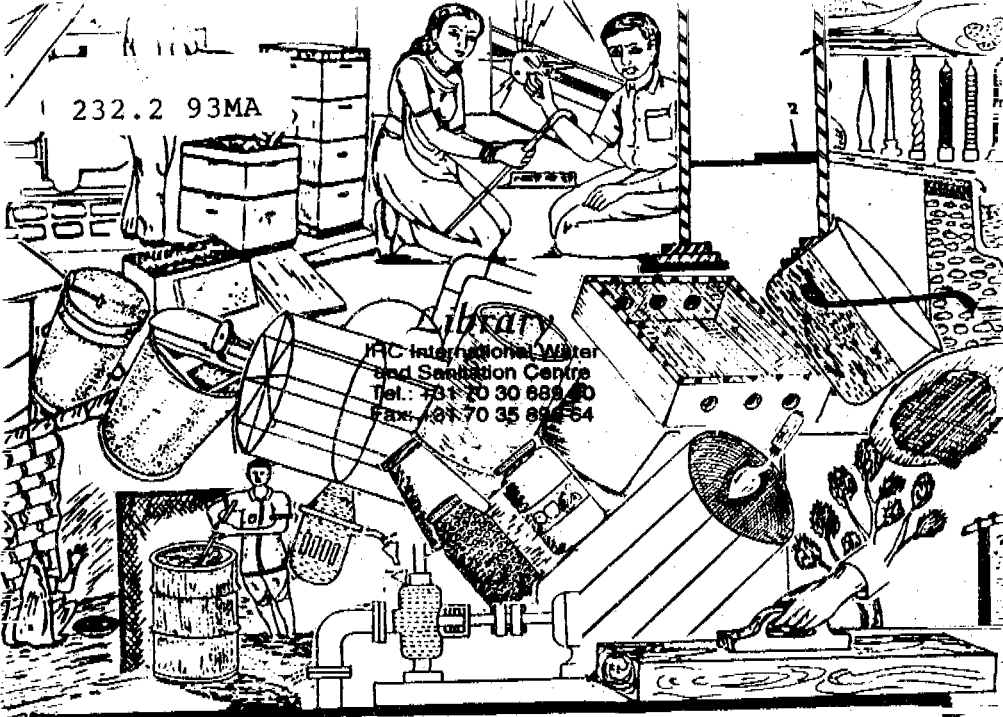
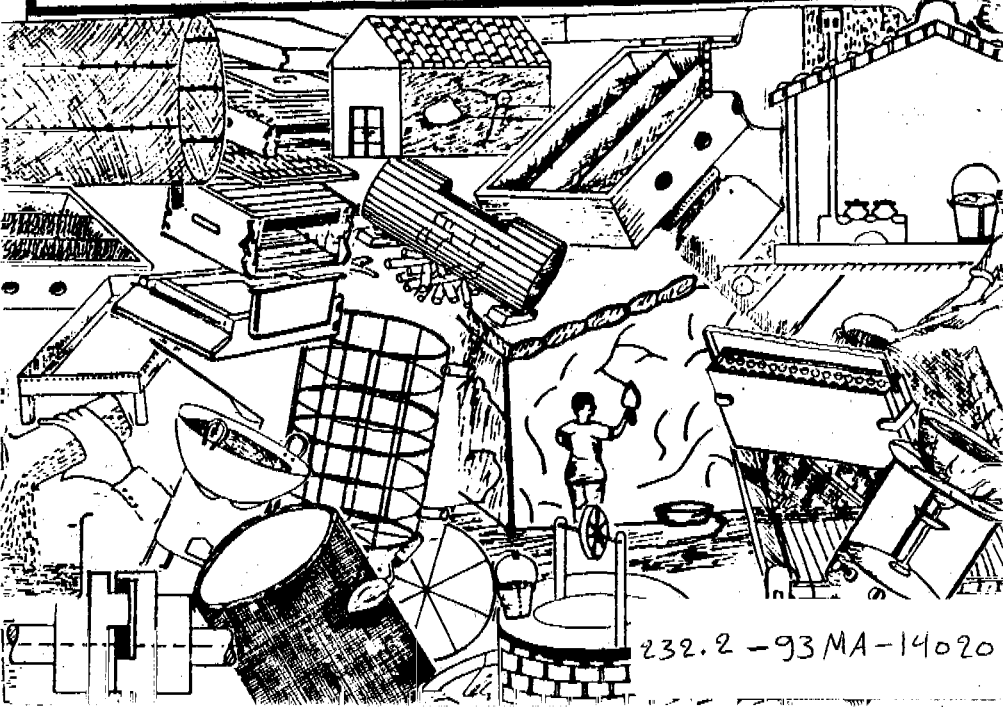


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## Do-it-yourself Maintenance of India Mark-II Hand Pump



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# **MAINTENANCE OF INDIA MARK - II HAND PUMP**

**Mahesh Mishra**

Water from stream and open well usually carries disease, but the tube wells are sealed to protect harmful germs. The deep well Hand Pump is one of the safest source of clean water. Generally it seems that in comparison to other Hand Pumps India Mark-II Hand Pumps are used frequently. To get fresh water from the pump it is necessary that the hand pump should always work properly and effectively. For good service it is also necessary that the Hand Pump is installed properly and the maintenance has been done periodically.

## **WORKING PRINCIPLE OF INDIA MARK - II HAND PUMP AND THEIR PARTS :**

India Mark - II Hand Pump is simply working on the principle of reciprocating pump. Its operation can be briefed as under :

When the plunger is raised (upward stroke), the space in the cylinder below the plunger fills with air from the suction pipe. On the downward stroke the entrapped air is compressed between plunger and the bottom of the cylinder. Then air lifts the plunger valve and escape through the priming water. On the next up stroke more air will be drawn out of the pipe and the water will rise higher. On the next downward stroke the plunger and valve pass through the water. When the plunger reaches the bottom of the cylinder and stops, the plunger valve closes, thus trapping the water above the plunger. On the next up stroke the water above

the plunger will be lifted out from the pump.

The India Mark-II Pump can be divided by function into three main parts:

- 1) The Pump stand assembly at top of the well (Pump head assembly see fig. 1).

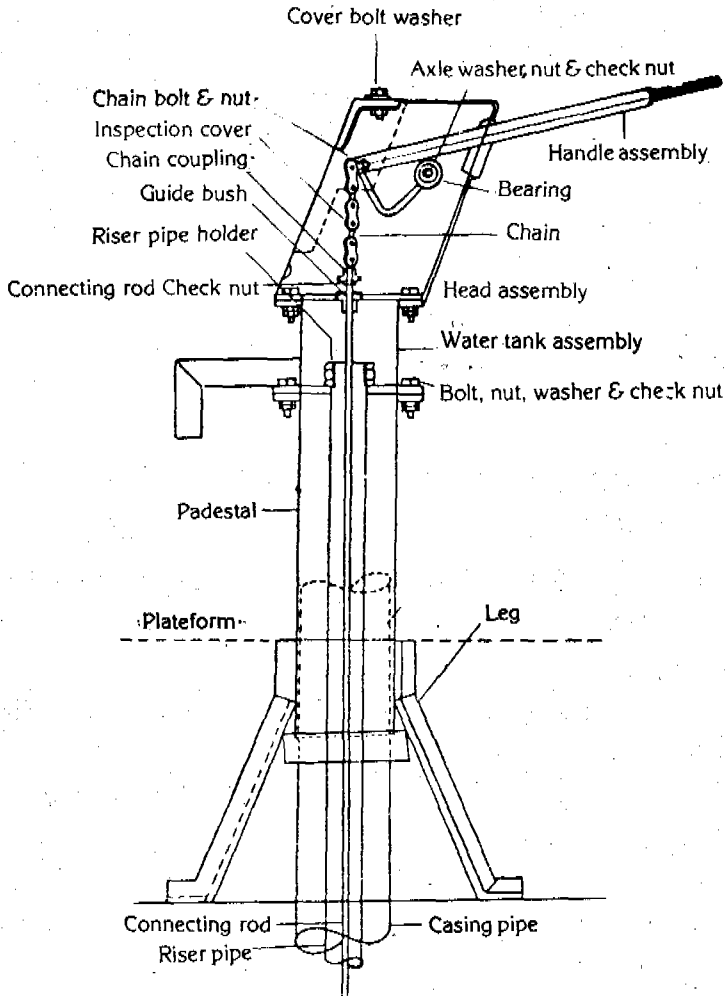
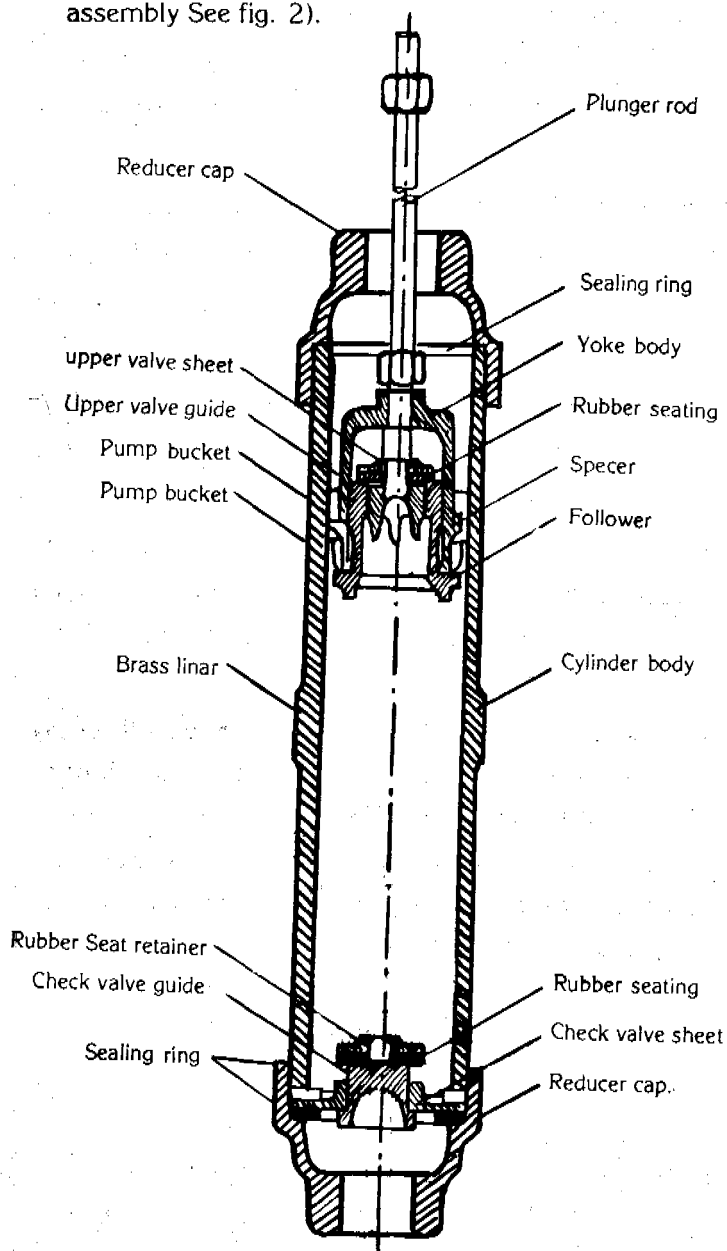


Fig. 1

2) The Pump cylinder assembly in contact with water (cylinder assembly See fig. 2).



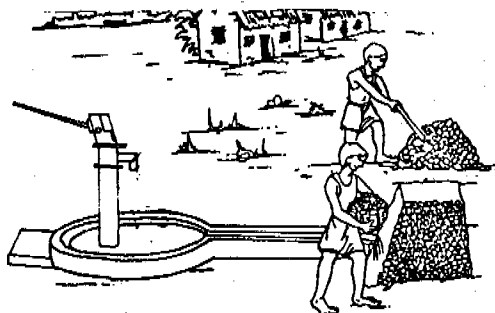
- 3) The connecting assembly which joins the pump stand and cylinder with the help of riser main pipes and connecting pump rods.

### PRECAUTION TO BE TAKEN BEFORE USING THE INDIA MARK - II HAND PUMP:

To increase the life and for better performance of the pump, following points should be remember before using the Hand Pump:

- i) Do not use the Hand Pump roughly.
- ii) You should operate the pump handle with slow and long stroke.
- iii) You should try to keep the area around the platform dry and don't let water collect around the platform.
- iv) Make the proper arrangement for the disposal of waste water and if it is possible then use the waste water for nearby gardening or by constructing soakage pit. It will avoid collection of waste water around the Hand Pump.

Soakage pit is easy to construct and can be made with locally available materials. It is a simple rectangular pit in which brick ballast of different size and soil is filled up in pit and now waste water will fall in soakage pit through open channel. Waste water being absorbed in the soil of soakage pit. It does not allow to collect water nearby and also helps to make space clean (See fig. 3).



(Fig. 3)

## HAND PUMPS TROUBLE AND REMEDIES

S. No.	Trouble	Likely Cause	Remedy
1.	Pump Handle works easily but no water delivered.	a. It is due to no water at the source and well is dry.	Development of the boring should be done properly. If possible then cylinder may be lowered below water level in boring by increasing the riser pipe and pump rod.
		OR	
		b. Pump has lost its Priming.	Prime the pump.
		OR	
		c. The cylinder cup washer (leather) may be worn out.	Replace the cylinder cup washer by new.
OR			
		d. Pump rod joints may be opened.	Check the all joints of the pump rods and tightned it.
OR			
		e. Due to broken of Pump Rod.	Broken pump rod must be renewed and this usually means pulling the drop pipe and cylinder out of the bore well.

S. No.	Trouble	Likely cause	Remedy
		f. Hole in Suction Pipe.	Renew suction pipe. Cylinder may be lowered below water table in bore well.
		OR	
		g. Leakage at base of cylinder.	Check the cylinder gasket. If require then renew cylinder gasket.
		OR	
		h. The Pump Cylinder may be cracked.	Replace the Pump cylinder by new.
		OR	
		i. The suction pipe may be plugged.	Dismantle the suction pipe and clear it.
2. Pump runs but delivers only a small quantity of water.		a. Plunger leathers badly worn out.	Renew Leathers.
		b. Refilling capacity of bore well is not enough.	Make the proper development of the bore well.
		OR	
		c. Valve leaking.	Repair/renew valve.



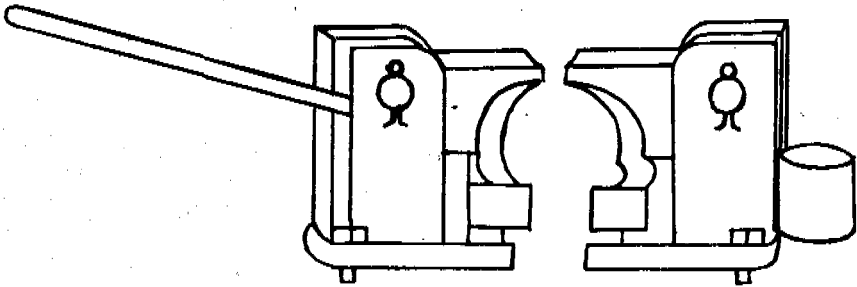
S. No.	Trouble	Likely cause	Remedy
3.	Pump needs too many strokes to start Pumping.	a. Pump has lost its priming.	Prime the pump.
		OR	
		b. The cylinder cup seals may be worn out.	Renew the cylinder cup seals.
4.	Pump's handle springs up after down stroke.	a. Suction pipe plugged up below pump cylinder.	Remove the pump and clean out suction pipe. If well has filled with dirt upto suction pipe, then the pipe should be cut off.
		OR	
		b. Suction pipe is too small.	Replace it with larger suction pipe.
		OR	
		c. Water table is too far below from pump cylinder assembly.	Place the cylinder nearer to water.
5.	Pump is noisy	a. Pump handle or other working parts of the pump are loose.	Tighten the loose parts.
		OR	

S. No.	Trouble Likely cause	Remedy
	b. Pump rod is not correct in size. OR	Check the pump rod size.
	c. Pump rod is being loose. OR	Check and tighten the loose pump rod.
	d. Top flange of the pump stand assembly is not in level. OR	Check the level of the top flange of pump stand assembly and levels it.
	e. Hand Pump stand assembly is loose on ground. OR	Check and if stand assembly is not grouted properly then grout it again with cement, sand and coarse aggregate and allow concrete (repaired portion) to set for a week.
	f. Hand Pump stand assembly requires lubrication.	Make proper lubrication.

## TOOLS REQUIRED FOR DISMANTELLING OF THE HAND PUMP:

Pump dismantelling may be required for rectification of previously mentioned trouble. So for as repair and dismantelling of pump is concerned, it is necessary that one should arrange some special tools as detailed below:

1. **Self Locking Clamp/Locking Clamp** : It will help at the time of pulling and lowering of riser pipe (see fig. 4). If self locking clamp is not available then arrange/fabricate two pieces of such type of clamp (see fig. 4A).

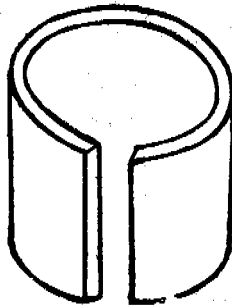


(Fig. 4)



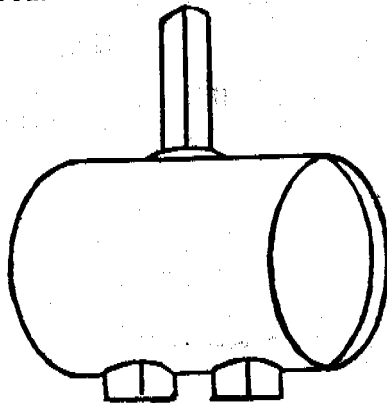
(Fig. 4A)

2. Pipe wrench, Slide Wrench and Spanners. : Size as per requirement.
3. Tool for holding the chain coupler : It helps to attach the chain with handle and will be use between chain coupler and head assembly flange (See Fig-5).



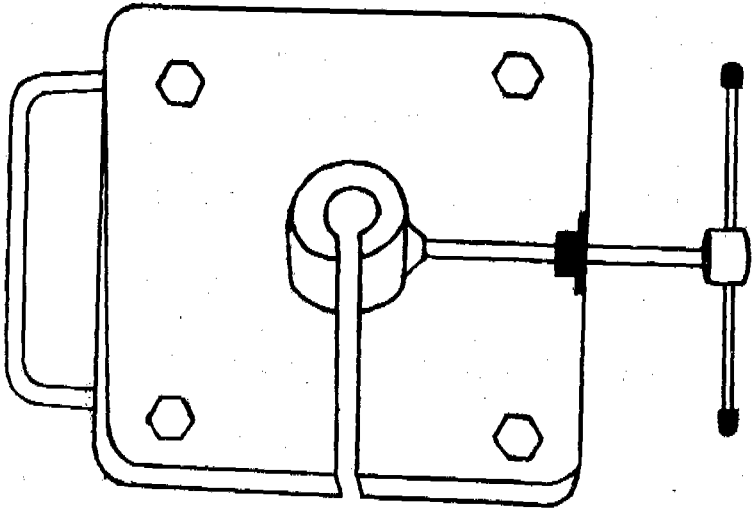
(Fig. 5)

4. Tool for lifting/lowering of the pump rod. : As per requirement, pump rod can be lift out with the help of lifting tool (see fig 6).



(Fig. 6)

5. **Pump rod vice** : It is use for holding the pump rod at the time of repairing or thread cutting (See fig 7).

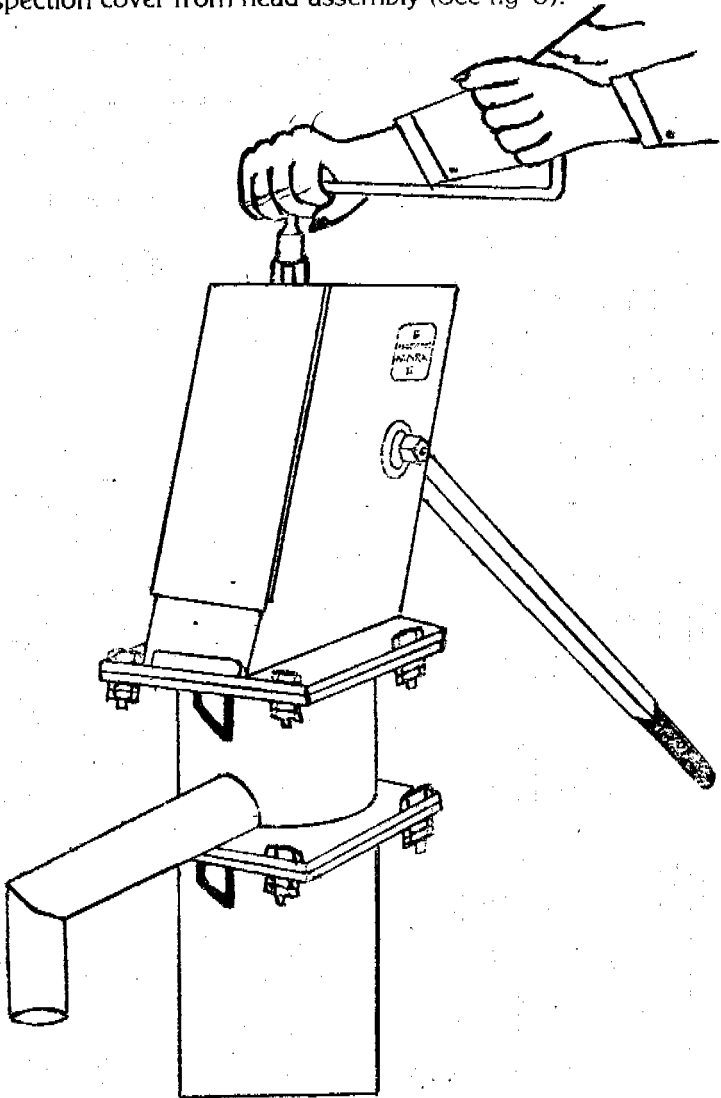


(Fig. 7)

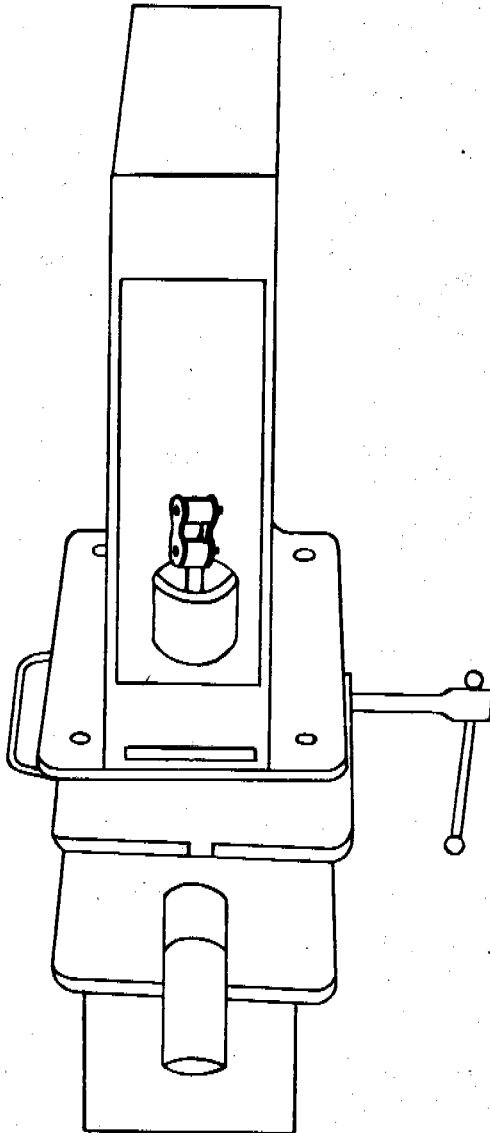
6. **Other general** : Hammer, Screw Drivers, Punch and Pipe wrench etc.

**DISMANTELLING OF PUMP**

- For dismantling of pump for repairing, at first remove the inspection cover from head assembly (See fig 8).

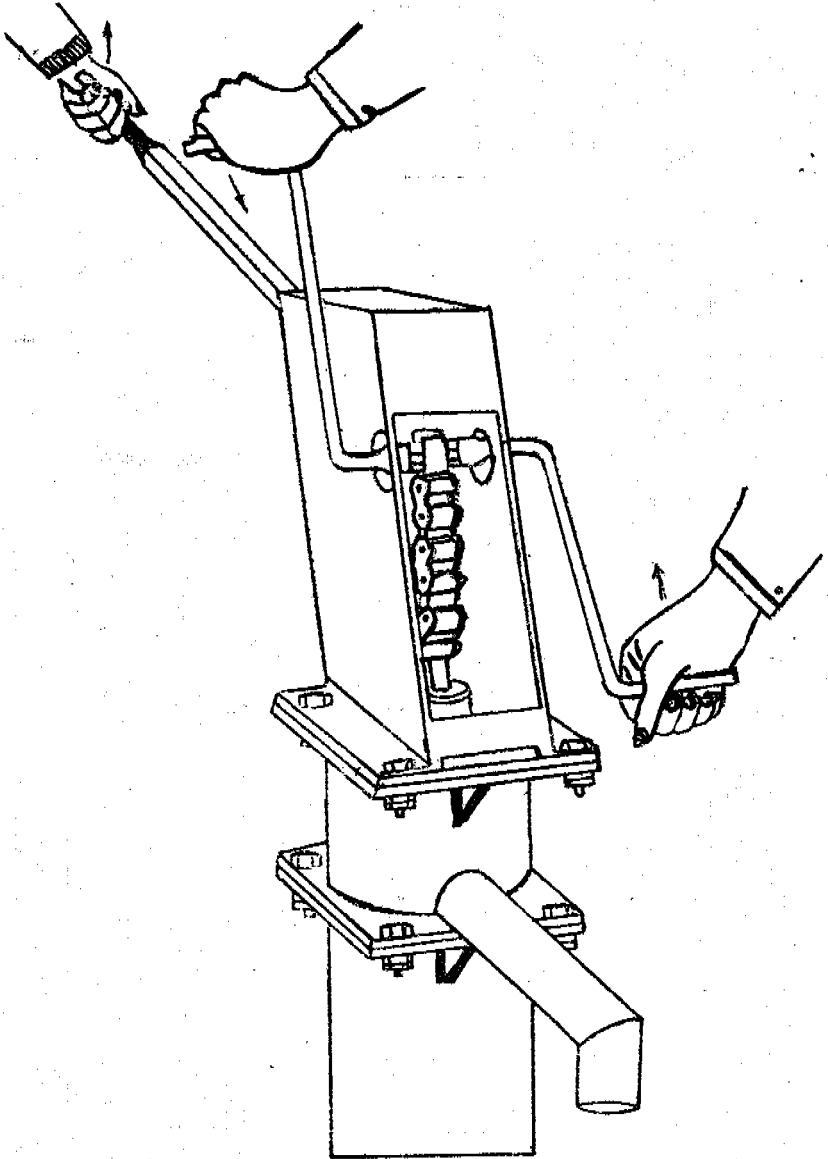
**(Fig. 8)**

- Fix the tool for holding the chain coupler inside the head assembly. (See fig - 9)



(Fig. 9)

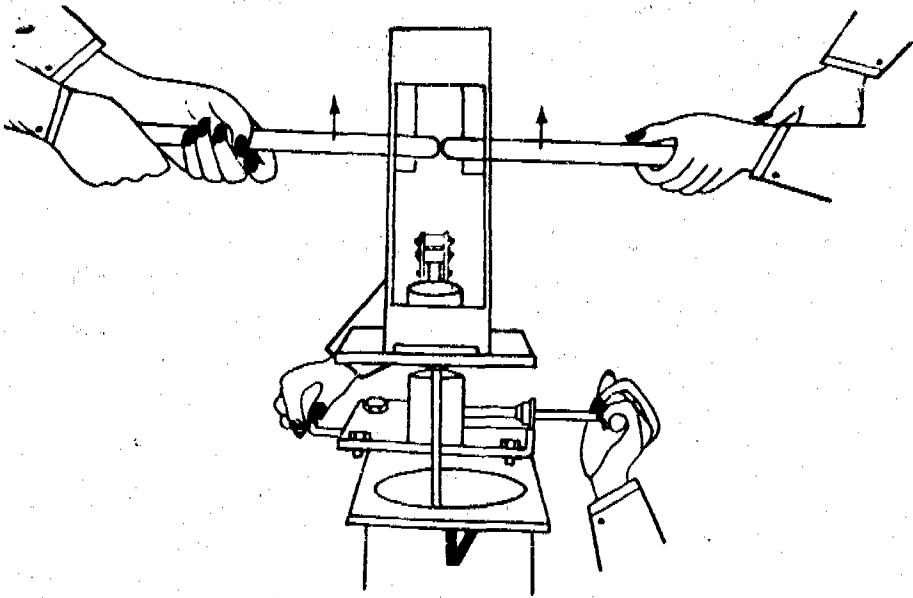
- Release the chain with handle after loosening the nut and bolt in the upward position of the handle (see fig- 10).



(Fig. 10)



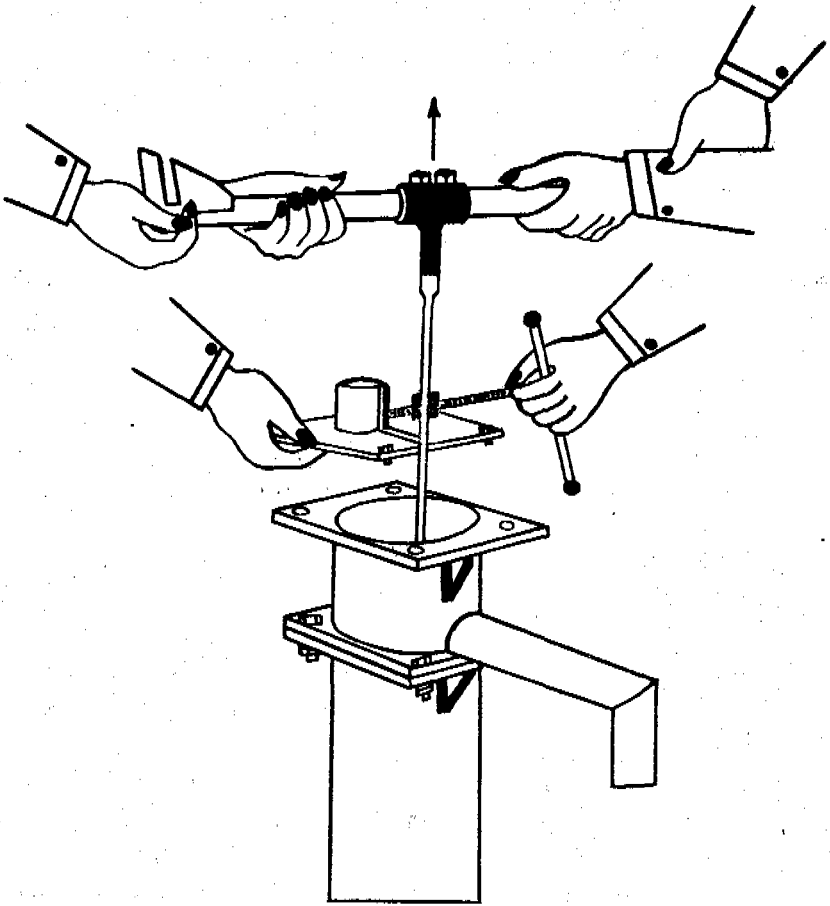
- Now, carefully release the handle axle by using the punch and hammer. Again release the handle and flange bolts from head assembly.
- Insert the pipe spanners in the both side holes of the head assembly and lift the head assembly in upward direction (see fig - 11).



(Fig. 11)

- Fix the pump rod vice in the flange of water tank after lifting of head assembly in upward direction and make assure the holding of pump rod with the vice.
- Rotate the head after loosing the lock nut of head assembly. Remove the chain assembly and head assembly.

- Remove the pump rod vice after lifting the pump rod in upward direction with the help of lifter (pump rod clamp). Remove the lifter after lowering of pump rod in downward direction (see fig 12).



(Fig. 12)

- Again hold the riser main pipe by self locking clamp/locking clamp and remove the water tank after loosening of bolts of bottom flange of water tank.

- Collect the riser main pipe and pump rod at a clean place after dismantling. Remove the self locking clamp/locking clamp at the time of dismantling of last riser pipe and pump rod.
- Dismantle the last riser pipe and pump rod from cylinder by hand after pulling the last pipe connected with cylinder assembly and to the last pump rod.
- Check the all threads of the dismantelled pump rod and riser pipe and remove the rust & dust with help of emery paper. If it is necessary then make the new thread on the riser pipe/pump rod. If the pump rod has been damaged/bend, it is advisable to replace the old (damaged) pump rod by new.

### ASSEMBLY OF THE PUMP :

After repairing reassemble the pump properly - As per following instructions:|

- At first joint the plunger rod with pump rod (first pump rod) and pump cylinder with riser pipe (first pipe) and tighten properly after applying the safeda on the threads. After tighten the pump rod and riser pipe if you feel their are excess safeda then remove it otherwise it will increase the impurities in the tube well.
- Now lower the cylinder, first pump rod & first riser pipe in the tube well through the pump stand assembly.
- Properly hold the riser pipe with the self locking clamp/clamp. Again joint the first pump rod with second pump rod and first riser pipe with second pipe and tighten it properly after applying the safeda on threads.
- Lower the pump rod and riser pipe slowly and slowly after loosing of locking clamp. Repeat the same process upto last pump rod and last riser pipe.

- Lock the last riser pipe with locking clamp.
- Mount and tighten the water tank on the threads of last riser pipe.
- Hold the riser pipe properly with the help of pipe wrench after tighten a small piece of pipe in their coupling of water tank. Release the locking clamp from stand (after loosening the riser pipe).
- Lower the water tank carefully in down ward direction and fix it on the flange of pump stand.
- Release the excess piece of pipe which is fitted in the coupling of water tank.
- Tighten the all four nut and bolts of the water tank & pump stand flange.
- Lowering the last pump rod carefully in down ward direction after fixing of lifter on the threads of last pump rod and hold it properly in pump rod vice.
- Release the lifter from pump rod after properly resting of pump rod vice on water tank.
- Lowering the pump head through pump rod in down ward direction up to pump rod vice and tighten the chain to pump rod (up to three or four threads only ) at this time.
- Tighten the chain coupler by the revolving of pump rod.
- Put the chain coupler holding tool inside the pump rod.
- Allow the lowering of pump rod (after loosening of pump rod vice) up to resting of chain coupler on chain coupler holding tool.
- Release the pump rod vice after pulling the pump head in up ward direction with the help of pipe spanners.

- Rest the properly pump head on water tank after carefully lowering of pump head in down ward direction.
- Put the handle assembly in side the pump head.
- Insert the handle axle inside the hole with the help of punch and hammer. Tighten the all nuts with the help of spanner.
- Connect the chain with handle and be sure that handle shall be in upward position at the time of connection.
- Tighten the nuts of chain & handle by spanner and make the proper lubrication on chain with grease.
- Make the handle in down ward direction and release the tool (tool for holding the chain coulper).
- Now, be assure that all nut & bolts are tighten properly and after assuring mount the inspection cover on head assembly and tighten it.

Finally, start the pumping but it is advisable not to use the water at this time.

As chlorination of tube well is necessary after repairing work therefore pour the chlorine solution into tube well. Remember that hand pump must not be used at least for six hours after chlorination.

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