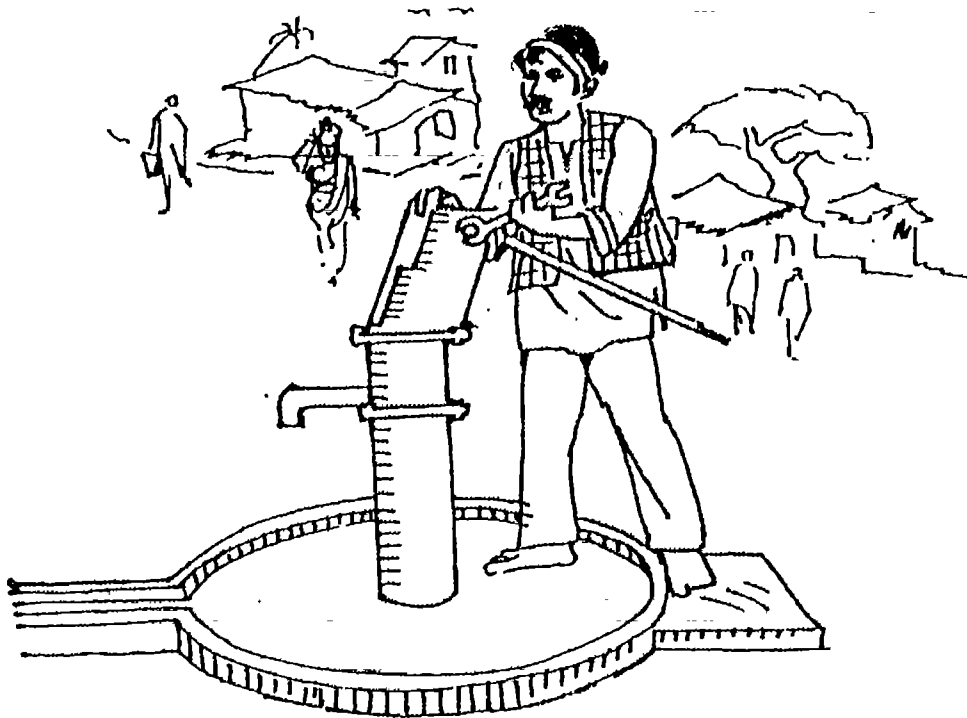


MAINTENANCE AND REPAIR OF HAND PUMPS

TRAINEE'S GUIDE



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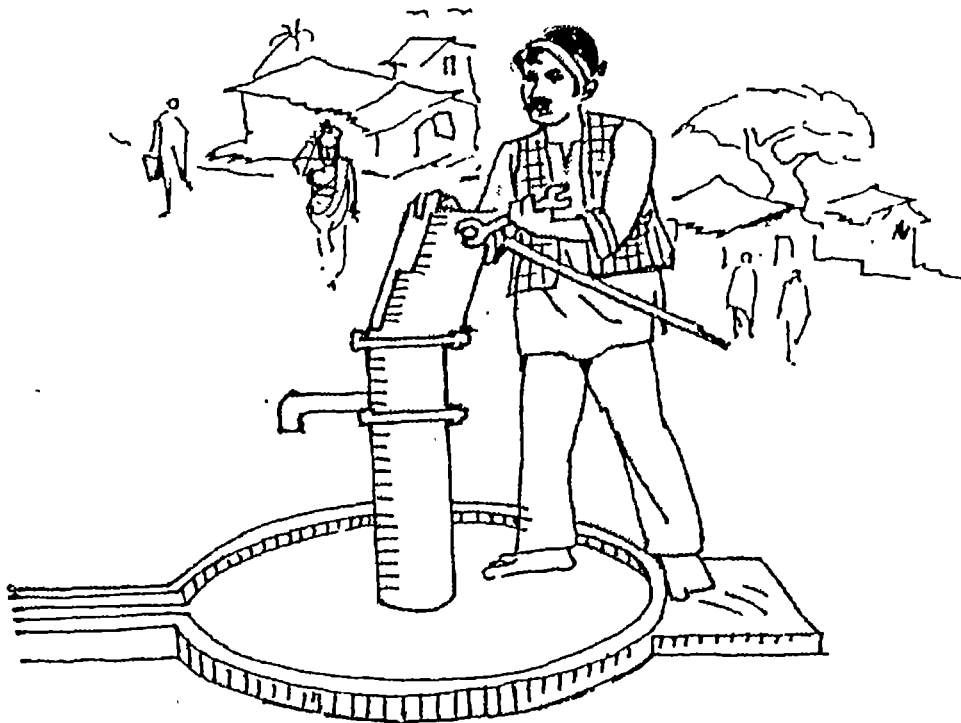
1995

CENTRE FOR RURAL DEVELOPMENT
TECHNICAL TEACHERS' TRAINING INSTITUTE, BHOPAL

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MAINTENANCE AND REPAIR OF HAND PUMPS

TRAINEE'S GUIDE

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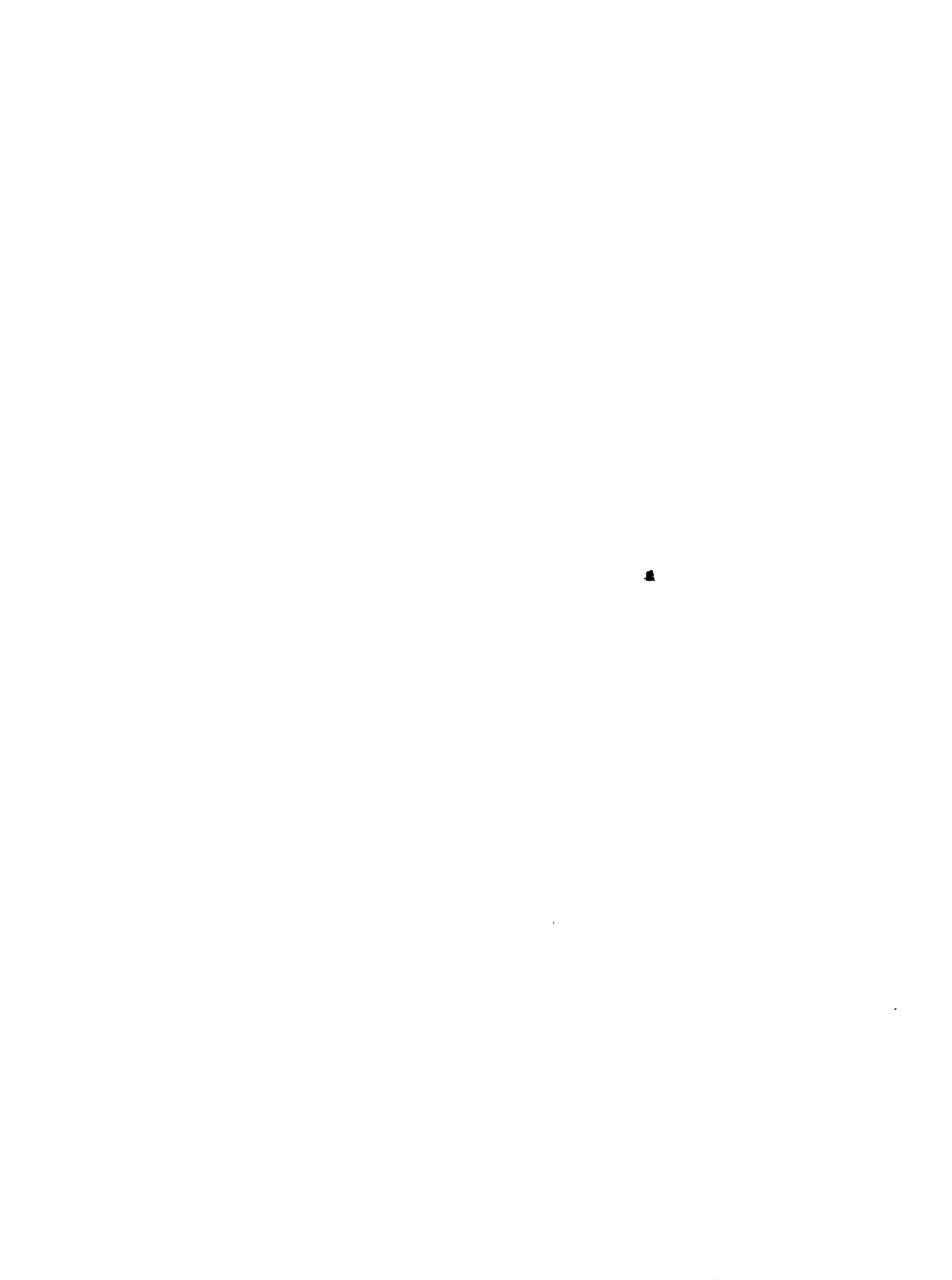
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1995

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TECHNICAL TEACHERS' TRAINING INSTITUTE, BHOPAL



PREFACE

Hand Pump is one of the safe source of drinking water in the villages. If there is any fault in the hand pump, rectification takes about 3-4 weeks. The non-functioning of hand pumps for such a long period disrupts the supply of safe drinking water. To avoid this problem to the villages, there is an urgent need for trained local handpump mechanic.

Under the aegis of Rajiv Gandhi National Drinking Water Mission, rural youths are trained for maintenance and repair of hand pumps. Each rural hand pump mechanic is expected to maintain 20-25 hand pumps in Panchayats. They will get honorarium from the respective Panchayat for this task. Rural Hand Pump mechanics can pursue this as a means of earning as well as do source to society. This trainees guide on maintenance and repair of hand pumps will be useful to them for further reference after the training.

We would like to express our gratitude to Prof. R.K.Mani, Director T.T.T.I, Bhopal and Prof. S.C.Saxena, Head Centre for Rural Development, T.T.T.I, Bhopal for providing support and guidance.

We would like to thank Dr.N.K.Banthiya, Head Mechanical Engineering Department and Continuing Education Centre, Prof.S.D.Patki, Professor in Media Research and Development Centre, for refining this package.

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Bhopal

1995

R.G.Chouksey

S.Lahiri

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MAINTENANCE AND REPAIR OF HAND PUMPS

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CHAPTER - 1

TITLE: ENSURE DRINKING WATER FROM YOUR HAND PUMP

COMPETENCY

ENSURE HYGENIC AND WELL MAINTAINED
SURROUNDINGS.

SPECIFIC OBJECTIVE:

- i) Describe conditions of well
maintained surroundings of
hand pump.

CHAPTER - 1

ENSURING SAFE DRINKING WATER FROM YOUR HAND PUMP

1.0 INTRODUCTION:-

In most of the villages hand pumps are the only means of safe drinking water. Hand pumps draw water from under the ground. The surface water gets filtered because of layer of earth surface. The water from hand pumps is tested before it is recommended for drinking purpose. So water of hand pump is safe for drinking.

1.1 HAND PUMP SURROUNDINGS:

In rural area because of lack of care the hand pumps surroundings become filthy. The dirty surroundings of hand pump shown in Fig 1.1 makes the underground water source polluted. Drinking polluted water will cause killer diseases like cholera, typhoid, dysentery etc. Hence it is essential to drink water from safe sources only.

Would you like to drink water from such a hand pump ?

None of us would like to use the water from a poorly maintained source either for drinking or cooking. Hence it is our duty to keep the surroundings of the hand pump clean and pay attention to the following points.



- * Platform of hand pump should be kept clean and drainage of water should be ascertained.
- * There should be no cracks or holes on the platform of hand pump.
- * Toilets should not be situated near the hand pump.

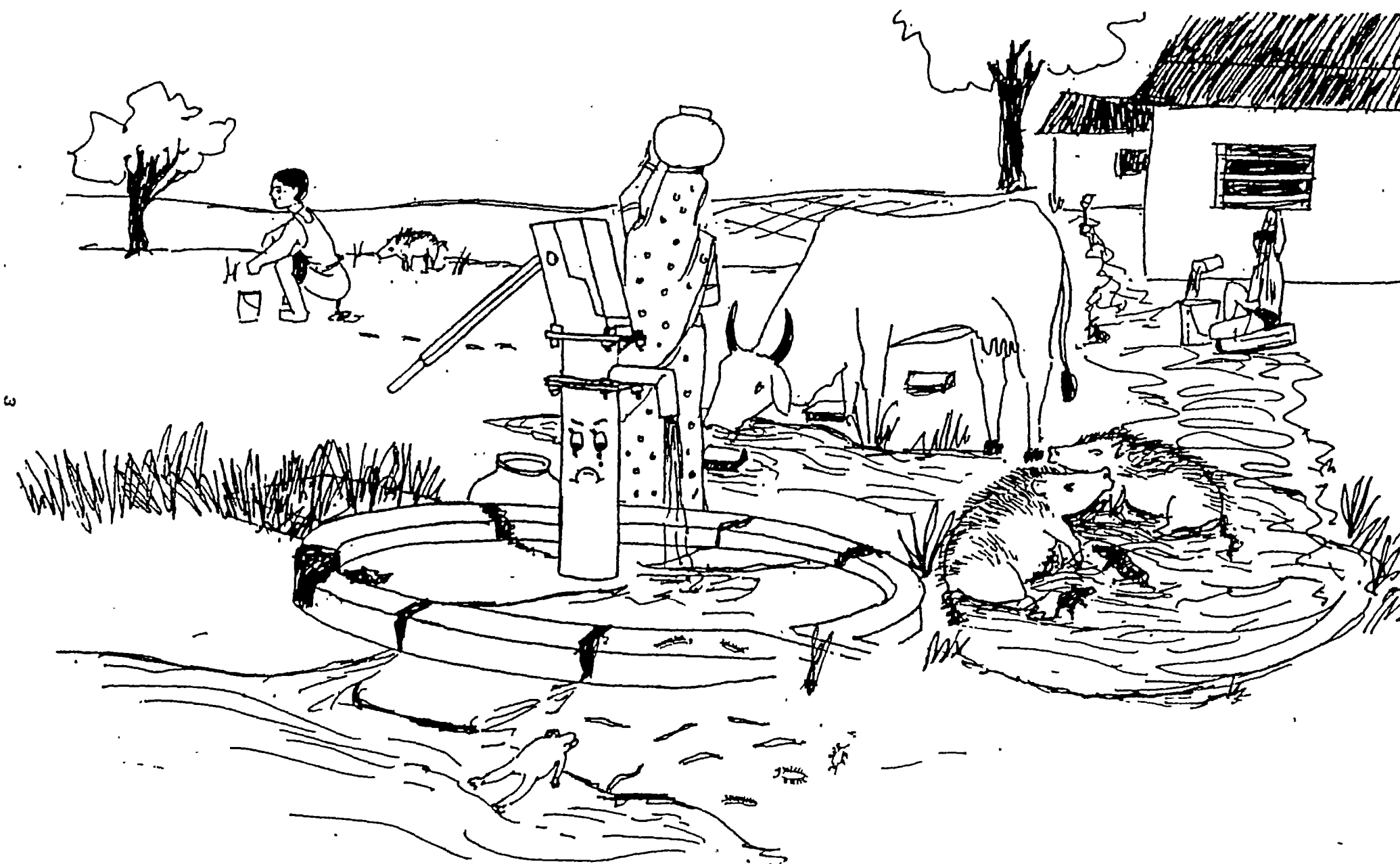


FIG:1.1 POORLY MAINTAINED HAND PUMP SURROUNDINGS.

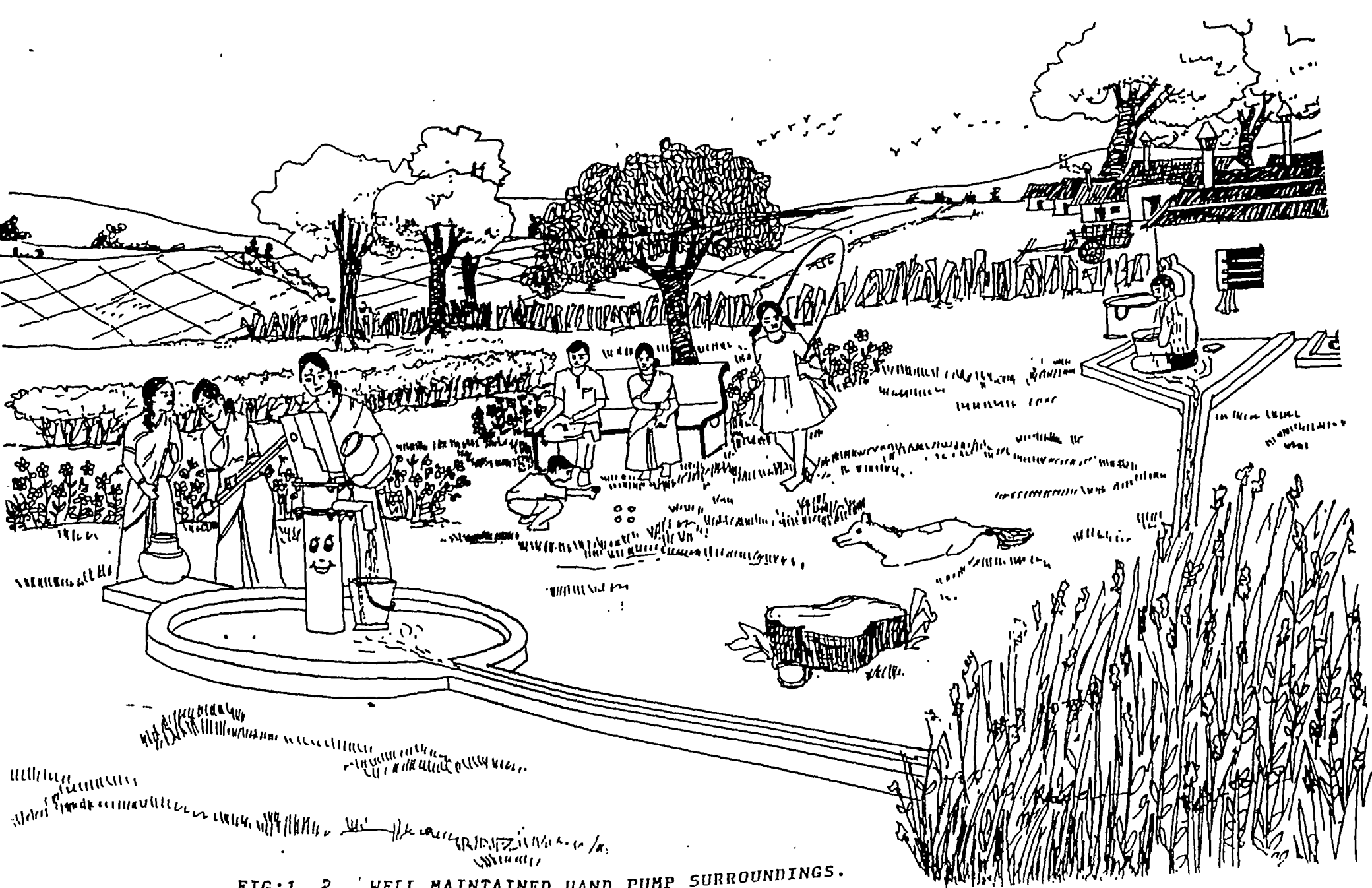


FIG:1. 2 WELL MAINTAINED HAND PUMP SURROUNDINGS.



- * For bathing purpose a different platform should be used.
- * Hand pump should always be kept under running conditions. If there is any fault the hand pump, mechanic should be asked to repair it immediately.

If we pay attention to the above points and do our job sincerely then surroundings of the hand pump will become beautiful. The surroundings around hand pump should be as shown in the Fig. 1.2.

1.2 OPERATION AND MAINTENANCE OF HAND PUMP:



Hand pump is so important and useful for us that we must work together in organising its proper use and maintenance. Apart from the co-operation and partnership of all villagers it is also essential to have a trained person (rural youth) in the village who can look after the maintenance and repair work. This work can be done by a trained and competent hand pump mechanic. Hence it is essential to have such a mechanic in our village. The mechanic can give service to the community and also make it a source of livelihood. We believe that this profession is very respectable and an important service to the society.

Can we also become hand pump mechanic ?

Who can be a hand pump mechanic ? Any men or women who have interest in working by hand and willingness for pursuing hand pump mechanics job as a career can obtain competency through training. In many areas women are also doing this job efficiently.

1.3 HOW TO KEEP THE SURROUNDINGS OF HAND PUMP CLEAN ?

There should be a platform near the hand pump. This platform is used to fill up drinking water. Arrangement for bathing can be made at a distance from the hand pump. Due to the platform water does not spread to nearby areas and flow via the inclined slope of the platform and channels to a distant place. To avoid filth near the drainage channel there should be a soak pit at the end of the channel. If there is a garden or agricultural land nearby, this waste water can be utilized for irrigating plant or crops respectively.

There should be no cracks in the platform because the polluted water will enter and pollute the underground water also. Precaution should be observed so that no stone or other solids enters the bore hole because it will obstruct the flow of water.

1.4 CONSTRUCTION DETAILS OF SOAK PIT:-

The soak pit is either rectangular or circular. In the hand pumps where we are expecting 200-250 litre of waste water soak pit of 90 cm x 90 cm x 90 cm is constructed. The soak pit should be constructed about 15m away from hand pump. The waste water from hand pump and washing platform should be brought to soak pit by drainage channel.

For construction, a pit of 90 x 90 x 90 cm is dug. First 25 cm layer is filled by big bolders of 12-15 cm diameter, second 25 cm layer is filled by 10 - 12 cm diameter bolders, another 25 cm layer is filled by pieces of bricks and small stones, details are given in Fig. 1.3. Top 15 cm layers is covered by tree branches in layers of 5-6 cm and smaller gravels 5-6 cm layer and remaining 5 cm is covered by dry soil.

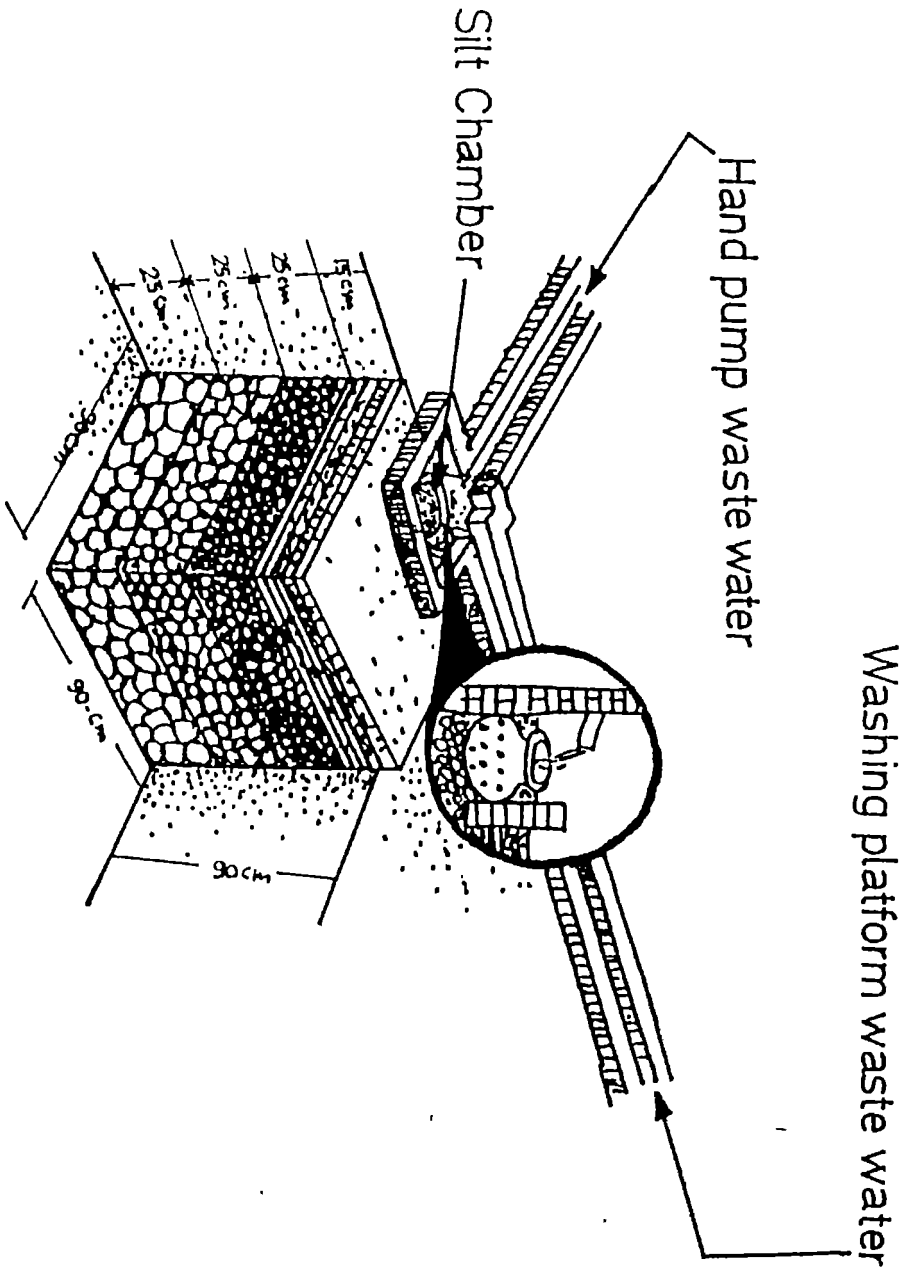


FIG:1.3 SOAK PIT

On the top a concrete, Brick or Stone Silt chamber of 15 x 15 x 15 cm is made. In the silt chamber, a mud pitcher or mettalic container is placed. It will allow solid waste and impurity of washing to settle at bottom and waste water will go into soakage pit. The mud pitcher or metallic container should be cleaned every week.

CHAPTER - 2

WORKING PRINCIPLE OF HAND PUMP

2.0 INTRODUCTION:

Hand pump is a commonly used device in rural areas for safe drinking water. For regular supply of safe drinking water, there is need of hand pump mechanic. He/She should have knowledge of working principle of hand pump to keep the pump in good working condition.

2.1 WORKING PRINCIPLE OF HAND PUMP:

In a hand pump, the connecting rod joins cylinder assembly and handle. As the handle moves down, plunger inside the cylinder assembly, moves up. When the plunger moves up it pushes water up and creates vacuum below it, the non-return valve opens and water comes in and fills the space. With the frequent movement of handle, plunger pushes water up and water levels increases gradually in the riser pipe as shown in Fig 2.1 at point A,B,C. When water level reaches above spout pipe level, it comes out.

2.2. PARTS OF HAND PUMP:

Following are the main parts of hand pump as shown in Fig.2.2.

- i) Pump Head Assembly;
- ii) Handle Assembly;
- iii) Water Tank Assembly;
- iv) Stand Assembly;

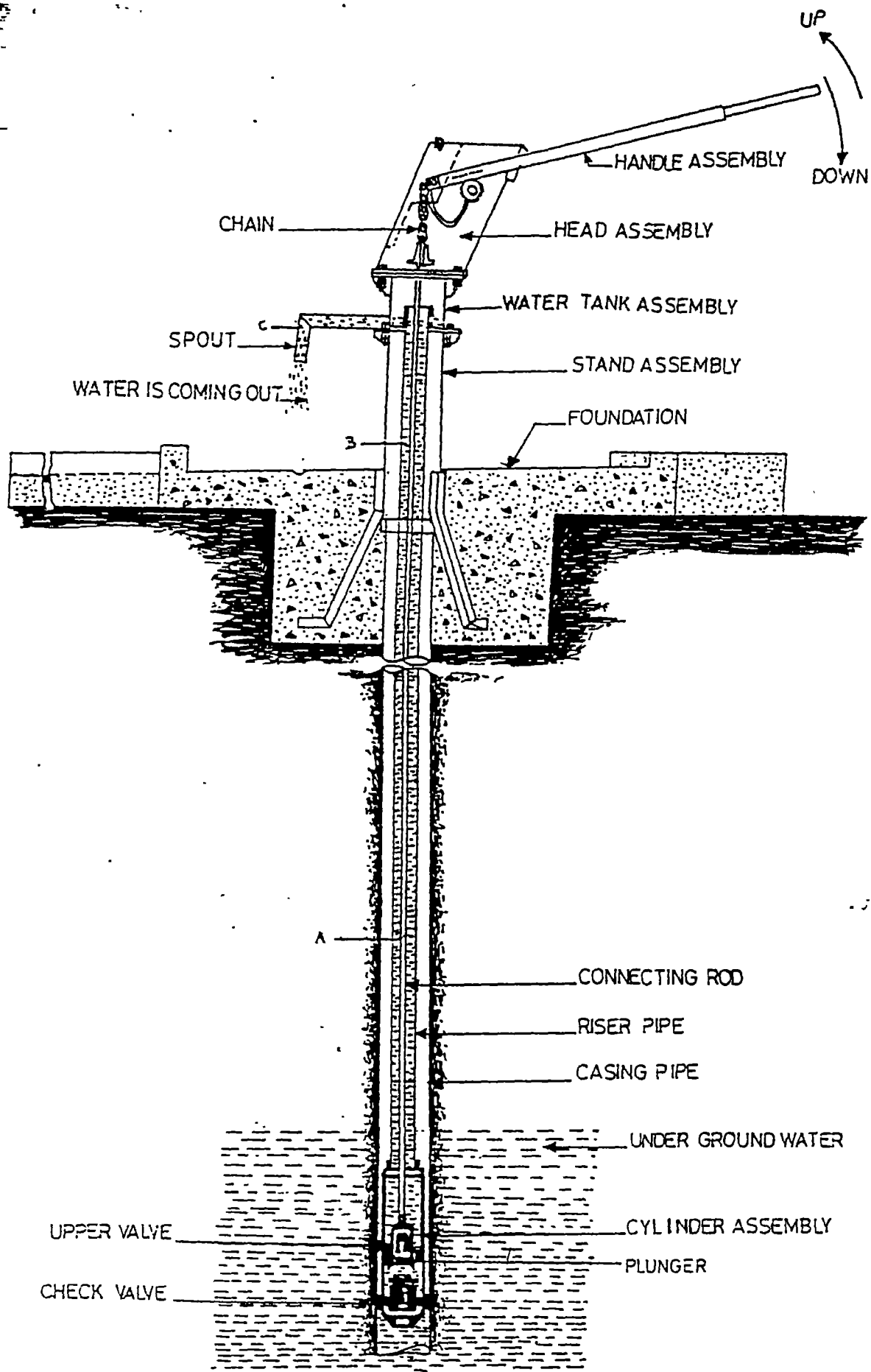


FIG:2.1 WORKING PRINCIPLE OF HAND PUMP

v) Riser Pipe Assembly;

vi) Cylinder Assembly.

i) **Head Assembly:**

This is the upper portion of the hand pump. It is made of 4 mm and 6 mm plates with machine bushes welded on the side plate and head flange.

ii) **Handle Assembly:**

It consists of axle, nut bolt, bearing, chain coupling and a special type of nut (Nyloc nut) and a washer.

iii) **Water Tank Assembly:**

It is the lower part of head assembly. It consists of water tank, water disposal spout, and riser pipe holder.

iv) **Stand Assembly:**

It is a pedestal having three legs. The legs are grouted firmly in cement concrete upto the top end of the leg.

v) **Riser Pipe Assembly:**

It is 32 mm GI pipe. The length of a piece of riser pipe is 3 meter.

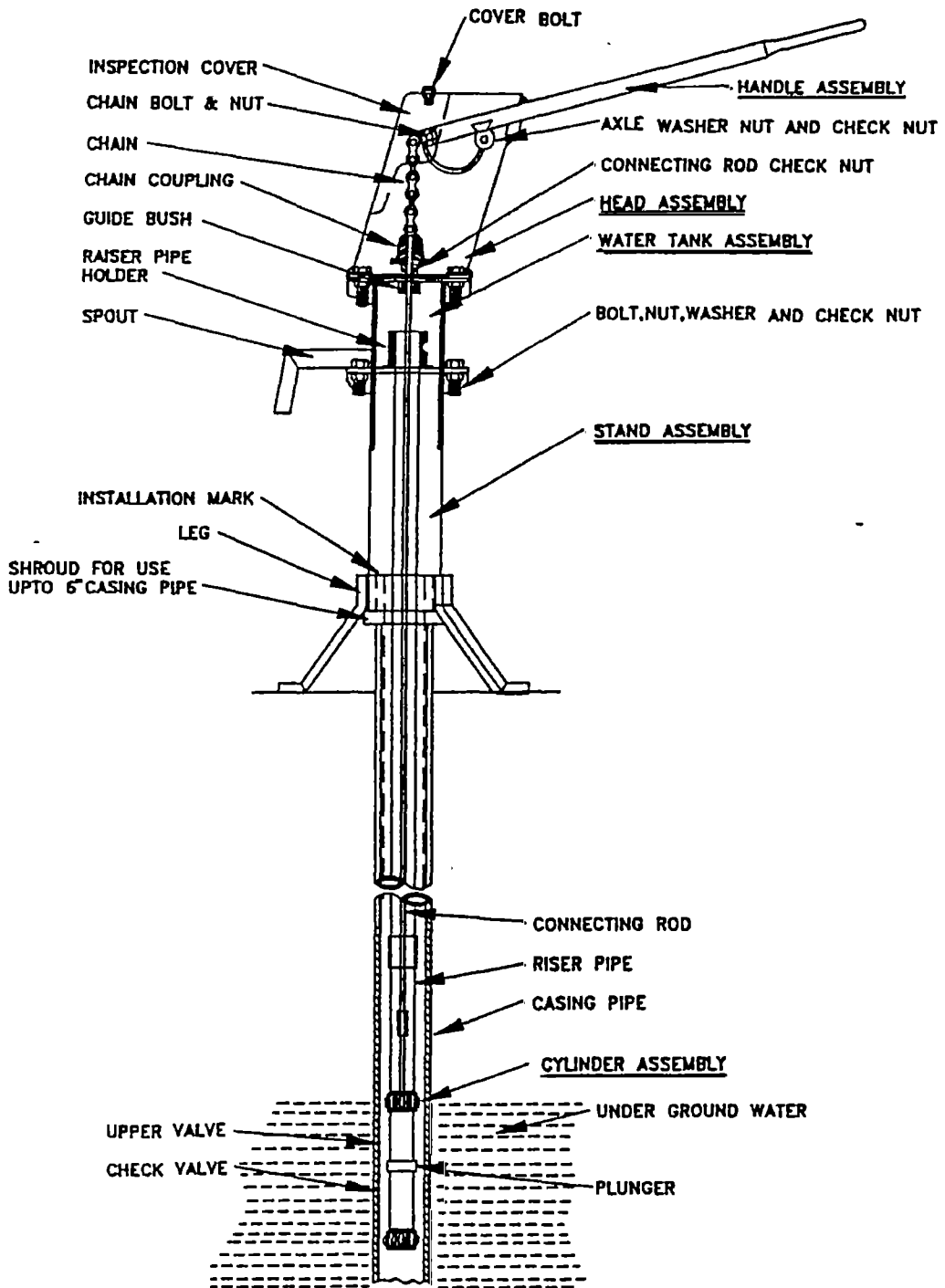


FIG:2.2 DETAILS OF HAND PUMP ASSEMBLY

vi) Cylinder Assembly:

It consists of cast iron outer casing with solid drawn brass tube inserted and flared. This provides excellent surface finish for operation of plunger assembly and outer casing provides rigidity and protection from damage. The top and bottom caps are made of cast iron and accurately machined to ensure interchangeability.

2.3 INDIA MARK II AND INDIA MARK III HAND PUMP:

In India commonly two types of hand pumps are used

- i) India Mark II
- ii) India Mark III

India Mark II hand pump and India Mark III hand pumps are identical in design. India Mark III hand pumps is improved version of India Mark II hand pump. India Mark III hand pump are more versatile, rugged, easy to maintain and repair.

The main difference in India Mark II hand pump and India Mark III hand pump is based on depth of water lift. India Mark III is suitable where depth of water is upto 50 m. India Mark II extra deep hand pump is suitable where depth of water is more than 50 m. Some of the technical difference are given in the table.

Difference in India Mark III and Extra Deep India Mark II
Hand Pump.

S.No.	Specification	India Mark III	India Mark II
i.	Depth of water to be lifted	20 - 50 M	50 - 90 M
ii.	Water Discharge	15 litre/min for 40 strokes	12 litre/min for 40 strokes
iii.	Handle length	1170 mm	1310 mm
iv.	Handle section	32 mm sq.bar	40 mm sq.bar
v.	Raiser pipe	65 mm G.I.pipe	32 mm G.I.pipe

MAINTENANCE AND REPAIR OF HAND PUMPS

CHAPTER - 3

TITLE : COMMON TOOLS AND SPARES USED IN HAND PUMPS MAINTENANCE

COMPETENCY:

USE VARIOUS TOOLS FOR MAINTENANCE AND REPAIR OF HAND PUMP.

SPECIFIC OBJECTIVES:

- i) List out the tools for village hand pump mechanic.
- ii) Use various types of tools.
- iii) List spare parts for hand pump.

CHAPTER - 3

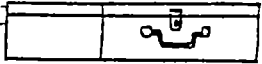
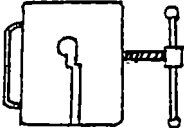
COMMON TOOLS AND SPARE USED IN HAND PUMP



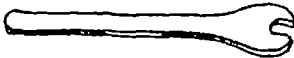
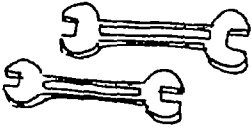
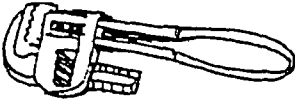
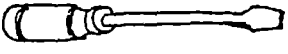
3.0 INTRODUCTION:


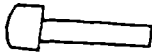
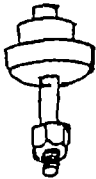
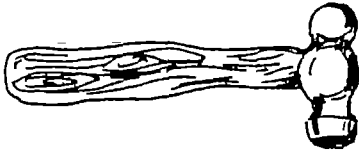
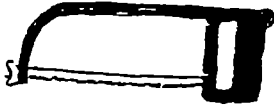
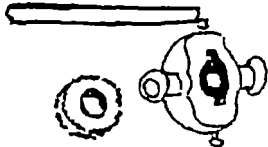
For supply of safe drinking water in rural areas, hand pump is an essential device. It needs to be maintained and repaired properly for which tools and spares are required.







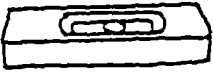
Maintenance and repairs of hand pump can be done with the help of standard tools available in hardware shops. But it is cumbersome and at times dangerous and unsafe. It is, therefore, desirable for hand pump mechanic to use specific tools for maintenance and repair of hand pump. They are simple and safe.

3.1. VILLAGE HAND PUMP MECHANIC TOOLS:

S.No.	Name of Tool	Diagram	Purpose/Use
i.	Tool box/Canvas bag		For carrying Tools & essential spares.
ii.	Connecting rod vice		To hold connecting rod while screwing and un screwing.

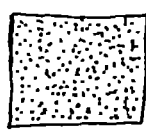
S.No.	Name of Tool	Diagram	Purpose/Use
iii.	Connecting rod lifter		Raising or lowering the connecting rod.
iv.	Chain coupler supporting tool		Fixing of chain on to the handle assembly. It is placed between chain and the bottom flange of head assembly.
v.	Rod coupling spanner		Tightening and unscrewing connecting rod coupler-quickly & easily.
vi.	Double-ended spanner		For tightening and unscrewing nut and bolts.
vii.	Pipe wrench		Tightening and unscrewing pipes.
viii.	Screw driver		Tightening unscrewing screws.

S.No.	Name of Tool	Diagram	Purpose/Use
ix.	Flat File with handle		Filing the rough surface.
x.	Handle axle punch		Used for driving out the handle axle without damage to axle threads.
xi.	Bearing mounting tool		Used for fixing bearing in the bearing housing of handle assembly.
xii.	Ball peen hammer		Used for hammering, job fixing and removing.
xiii.	Hack-saw frame with spare blades		For cutting pipes and other items.
xiv.	Die with die holder		For threading pipe.

S.No.	Name of Tool	Diagram	Purpose/Use
xv.	Crank spanner		Used for tightening or loosening flange bolts, check nuts, chain nyloc nut and anchor bolts, cover bolts, axle nuts etc.
xvi.	Pipe Lifter		Used for lifting pipe.
xvii.	Tank Lifter		Used for lifting water tank.
xviii.	Pipe Vice		Used for holding pipe tightly.
xix.	Brush		Used for cleaning hand pump surface.
xx.	Oil cane		Used for applying mobile oil on moving surfaces.
xxi.	Spirit Level		Used for checking level of pedestal flange.

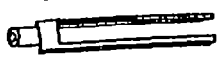
S.No.	Name of Tool	Diagram	Purpose/Use
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xxii. Sand Paper



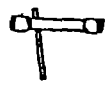
Used for rubbing hand pump surface for painting and fine smoothing rough surface.

xxiii. Check valve lifting adapter



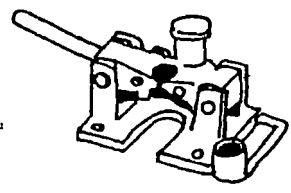
Used for seperating valve from plunger assembly.

xxiv. Box spanner Ring



for tightening or loosening the push rod.

xxv. Self locking clamp



for raising or lowering the raiser pipe.

3.2. List of Recommended Spare parts for Hand Pump:

The following spares are recommended to be procured and stored for hand pump by village hand pump mechanic.

3.2.1. Spares for pump head		Qty.
1.	Hexagonal bolts M12x1.75x40mm long	8 Nos.
2.	Hexagonal nuts M12x1.75	18 Nos.
3.	Washers M12	10 Nos.
4.	High Tensile Bolt M10x1.5x40mm long	1 No.
5.	Nyloc Nut M10x1.5	2 Nos.
6.	Handle axle (stainless steel)	1 No.
7.	Washer (4mm thick) for handle axle	1 No.
8.	Bearing (6204 Z)	2 Nos.
9.	Spacer	1 No.
10.	Chain with coupling	1 No.
11.	Bolt for front cover M12x1.75x20mm long	2 Nos.
3.2.2. Spares for cylinder:		
12.	Nitrile rubber cup washers	4 Nos.
13.	Upper valve rubber seating	2 Nos.
14.	Check valve rubber seating	2 Nos.
15.	Rubber 'O' rings	4 Nos.
16.	Rubber sealing rings	4 Nos.
3.2.3 Spares for connecting rods and G.I. riser pipes:		
17.	Hexagonal rod coupling M12x1.75x50mm long	2 Nos.
18.	Pipe sockets (65mm Medium grade hot dip galvanised)	4 Nos.
3.2.4 Others		
19.	Graphite grease	
20.	Mobile Oil	
21.	Kerosene Oil	

MAINTENANCE AND REPAIR OF HAND PUMPS

CHAPTER - 4

TITLE: MAINTENANCE OF HAND PUMP

COMPETENCY :

PERFORM MAINTENANCE OF HAND PUMP, DIAGNOSE FAULTS AND RECTIFY THE SAME.

SPECIFIC OBJECTIVES:

- (i) Do preventive maintenance of hand pump.
- (ii) Disassemble hand pump.
- (iii) Check and replace defective parts of hand pump.
- (iv) Diagnose faults in hand pumps by using trouble shooting charts and flow chart.
- (v) Assemble hand pump.

CHAPTER - 4

MAINTENANCE OF HAND PUMPS

4.0 INTRODUCTION:

For supply of safe drinking water, hand pump is an important device. Number of hand pumps, installed in the villages, are nonfunctional because of minor maintenance problems. Due to this there is no availability of safe drinking water. For regular supply of safe drinking water, maintenance of hand pumps should be done by local people themselves. So there is a need of trained hand pump mechanic in villages. To avoid any major breakdown in hand pump, it is required to perform preventive maintenance.

4.1. PREVENTIVE MAINTENANCE SCHEDULE:

The Handpumps are to be properly maintained to ensure safe portable drinking water to the rural people. Proper and regular maintenance will prevent breakdowns and ensure continuous working of the hand pumps.

Handpump is like any other mechanical machine. Any machine is to be kept clean. All parts of a Hand Pump are inspected for formation of rust, insufficient lubrication, loose bolts, nuts, etc., to prevent major failures.

The various schedules of maintenance are recommended at following intervals

4.1.1 Daily:

- i) Clean the hand pump and spout pipe by hand.
- ii) Check all the flange nuts and bolts and tighten, if required.
- iii) Make sure hand pump is firm on its base, if loose, fix it with the help of mason.

4.1.2 Weekly:

- i) Check axle bolt, if loose, tight it.
- ii) Make sure lock nut is tight.
- iii) Make sure hand pump is firm on its base.
- iv) Check flange bolts fastening water chamber to pedestal and make sure, they are tight.
- v) Clean out trash from spout pipe.

4.1.3 Monthly

- i) Tighten the handle axle nut and lock nut
- ii) Check for loose or missing flange bolts and nuts. Tighten if required.
- iii) Open the cover, clean inside the pump.
- iv) Check the chain anchor bolt for proper position. Tighten if, necessary.
- v) Clean the chain assembly.
- vi) Look for rusty patches. If seen, the same may be cleaned with the help of wire brush and apply anticorrosive paint.
- vii) Find out whether the handpump base is loose. If it is loose, arrange for new foundation.

4.1.4 Annual:

Examine the pump carefully and check whether:-

- i) Discharge is satisfactory;
- ii) Handle is shaky;
- iii) Guide bush is excessively worn out;
- ix) Chain is worn out;
- v) Roller chain guide is excessively worn out.

Note: Any defects found should be corrected with help of trouble shooting chart given.

4.2 DISASSEMBLY OF HAND PUMP:

If there is any fault in hand pump, it need to be disassembled. The given steps should be followed:

- i) Loose pump head cover bolt (Fig. 4.1)
- ii) Remove inspection cover from head assembly. (Fig. - 4.2)
- iii) Insert chain coupling supporting tool. (Fig. - 4.3)
- iv) Lift the handle to the top position and disconnect chain from handle by removing the nyloc nut and bolt. (Fig -4.4)
- v) Take out handle axle. While removing, use handle axle punch to protect axle thread and remove handle from head assembly. (Fig. - 4.5)
- vi) Remove flange bolts from head assembly. (Fig. - 4.6)
- vii) Remove head assembly from the water tank (Fig. - 4.7)
- viii) Place the connecting rod vice on to the water chamber top flange; tighten vice against connecting rod and allow the head assembly to sit on the connecting rod vice. (Fig.- 4.8)

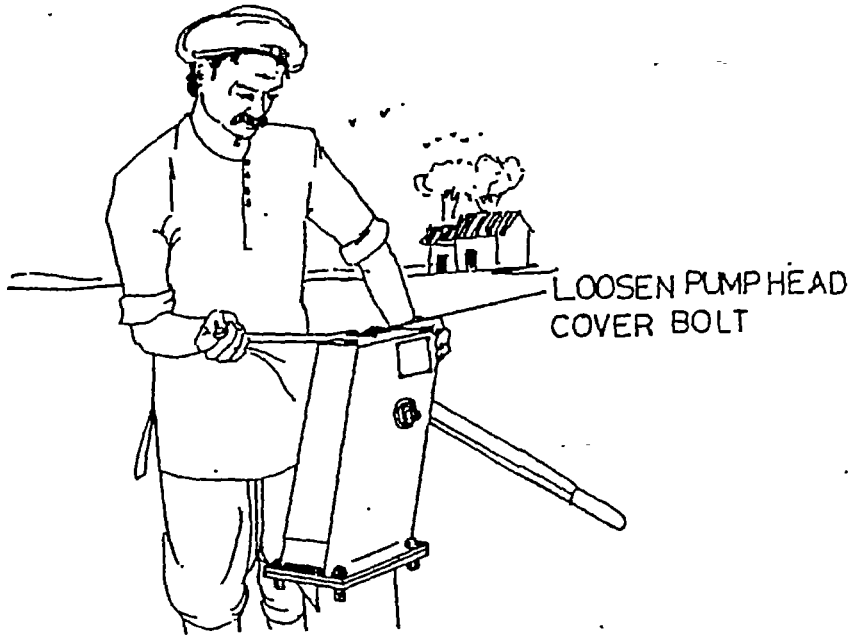


FIG:4.1 LOOSE HAND PUMP COVER BOLT

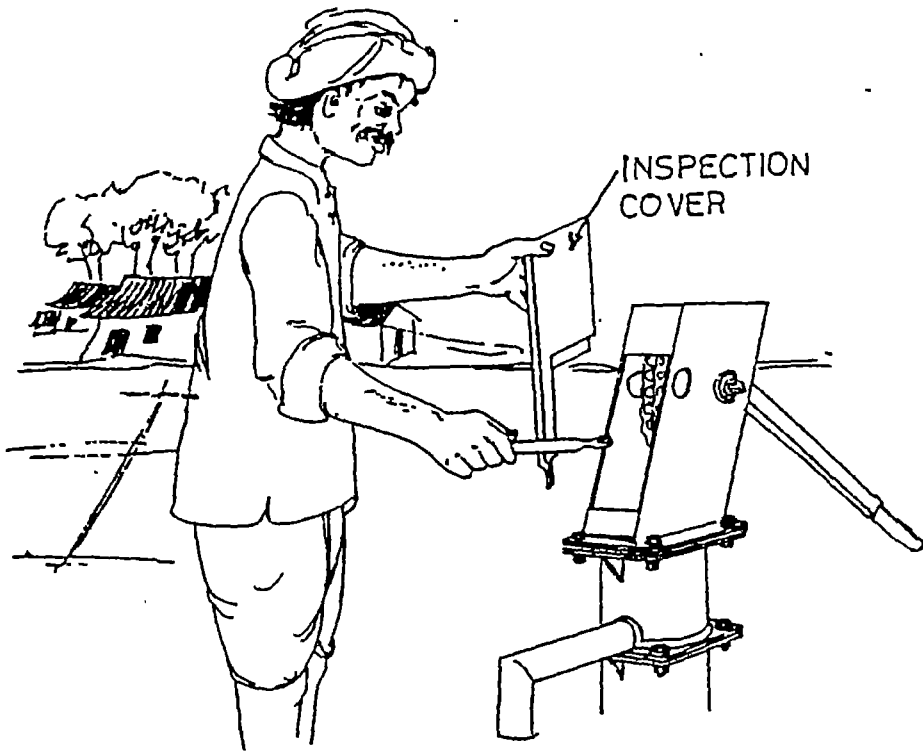


FIG:4.2 REMOVE INSPECTION COVER

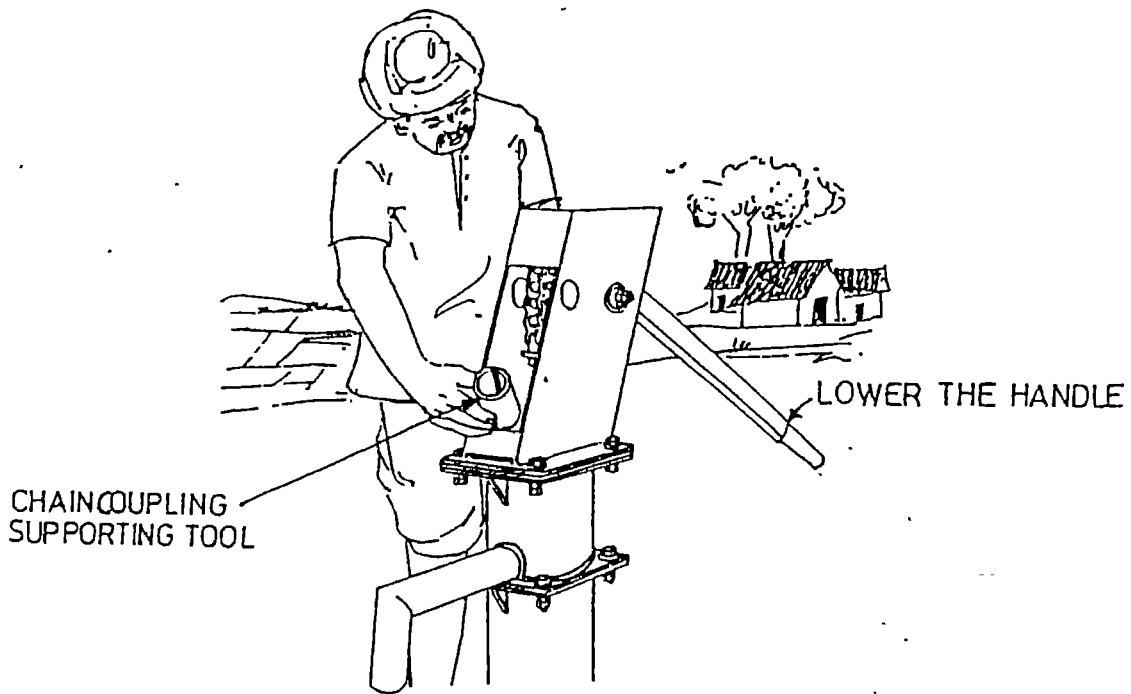


FIG:4.3 INSERT CHAIN COUPLING SUPPORTING TOOL

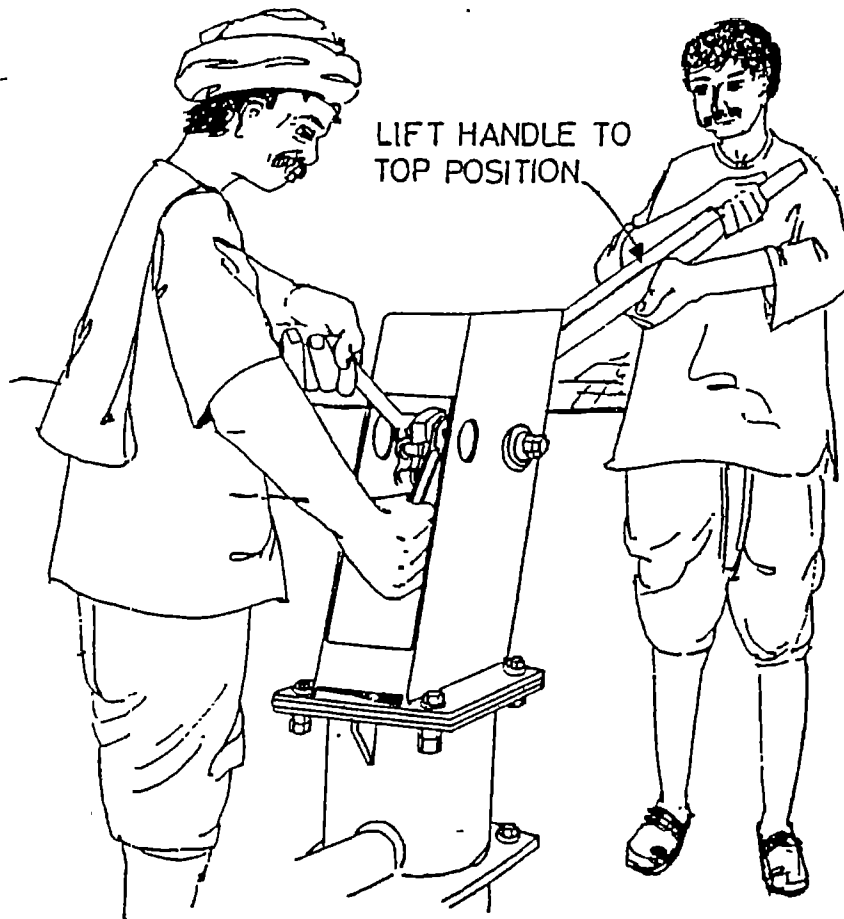


FIG:4.4 DISCONNECT CHAIN FROM HANDLE

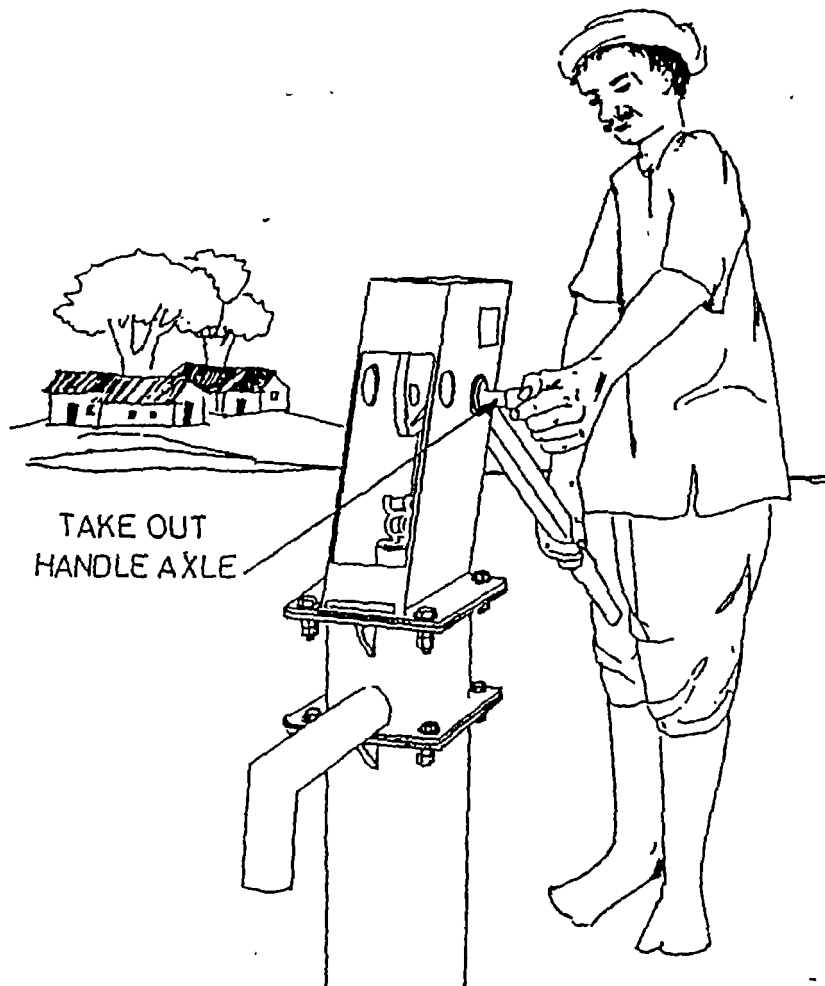


FIG:4.5 TAKE OUT HANDLE AXLE

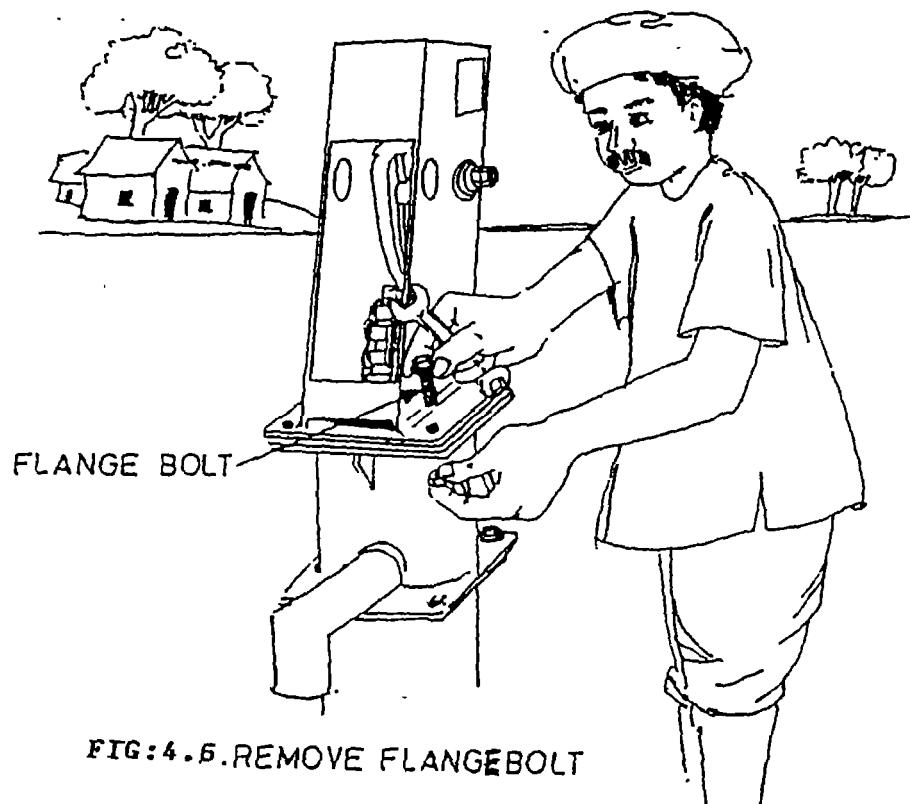


FIG:4.6.REMOVE FLANGE BOLT

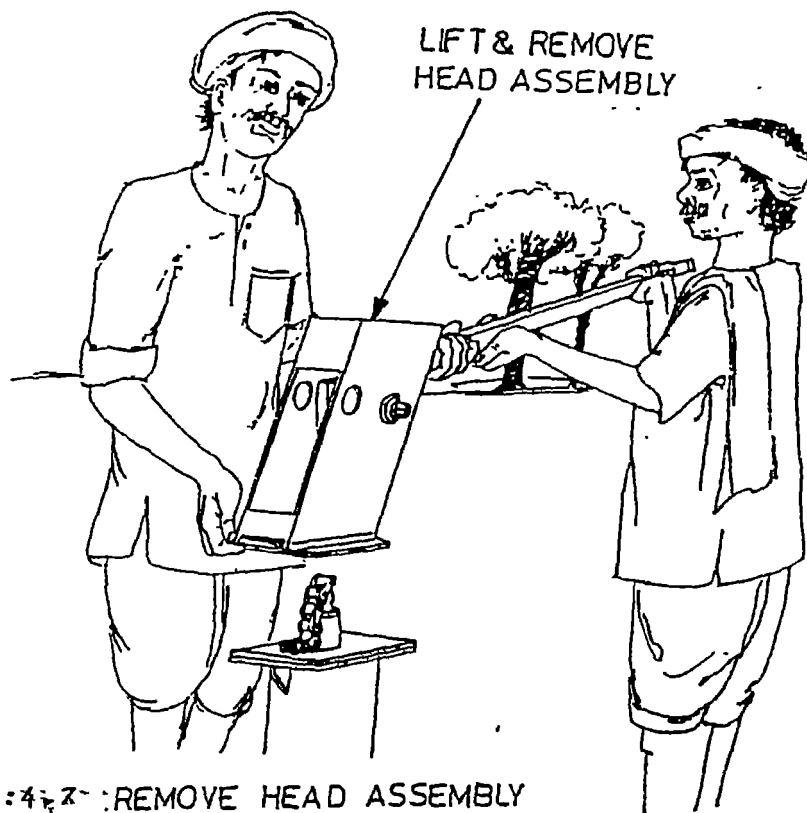


FIG:4.7 REMOVE HEAD ASSEMBLY

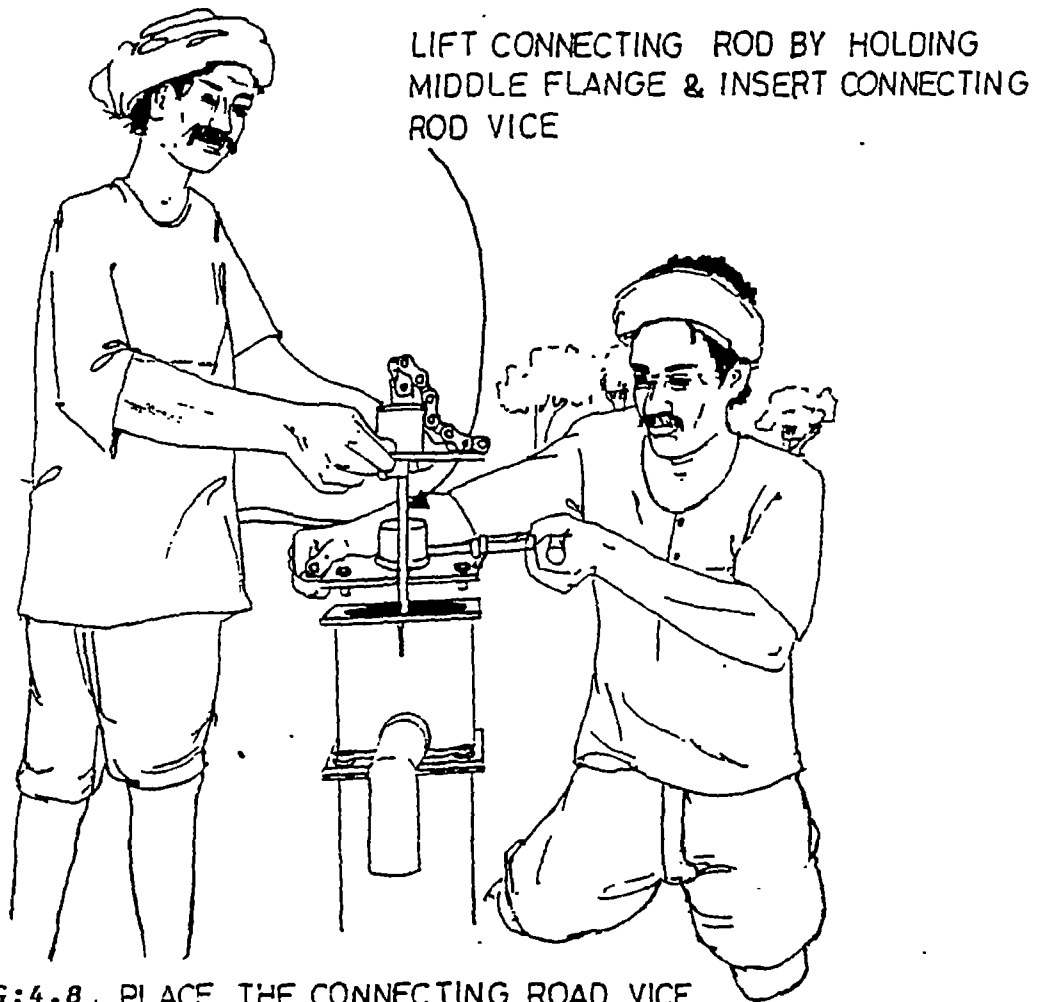


FIG:4.8 PLACE THE CONNECTING ROAD VICE

- ix) Disconnect the chain assembly from connecting rod (Fig-4.9)
- x) Support connecting rod with connecting rod lifter, loosen connecting rod vice and remove. Gently lower connecting rod to sit on check valve. Remove connecting rod lifter. (Fig-4.10)
- xi) Loose water tank nuts and bolts and remove water tank bottom flange bolts. (Fig.4.11)
- xii) Lift water tank by using tank pipe lifter and lifting spanners. (Fig.4.12)
- xiii) Fit self locking clamp and remove water tank. (Fig.4.12)
- xiv) Join plunger assembly to check valve by turning the rod lifter in clock wise direction . (Fig.4.13)
- xv) To take out water from the pipe, remove the rod lifter. Join the rod lifting adaptor to the connecting rod. Place head assembly over water tank and fix handle to the lifter (Fig.4.14)
- xvi) Remove water from riser pipe by pushing down handle suddenly. (Fig.4.15)
- xvii) Lift handle upward slowly and disconnect connecting rod lifting adapter and takeout head assembly . (Fig.4.16)
- xviii) Tighten the connecting rod lifter to connecting rod and lift connecting rod and fix connecting rod vice (Fig.4.17)
- xix) Hold the connecting rod, slowly loosen rod vice and lift rod. Tighten vice and loosen, then remove the first connecting rod. Repeat the process till the last connecting rod with plunger and check valve is pulled out (Fig.4.18)

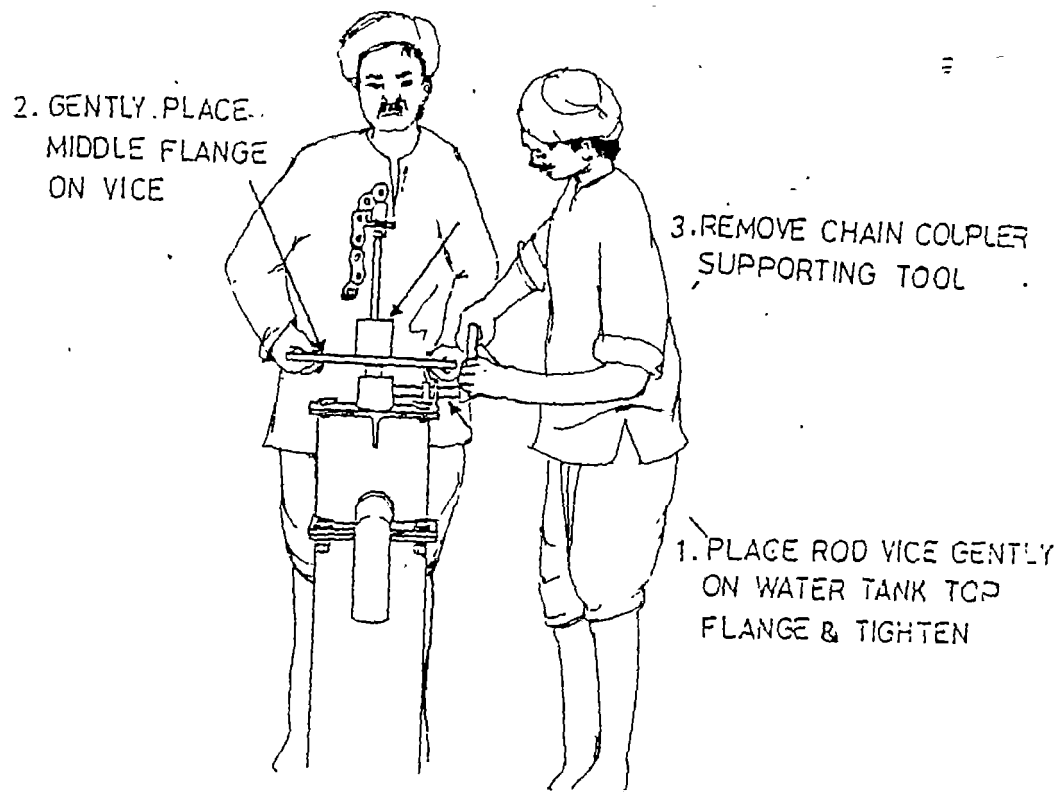


FIG:4.9 DISCONNECT THE CHAIN ASSEMBLY

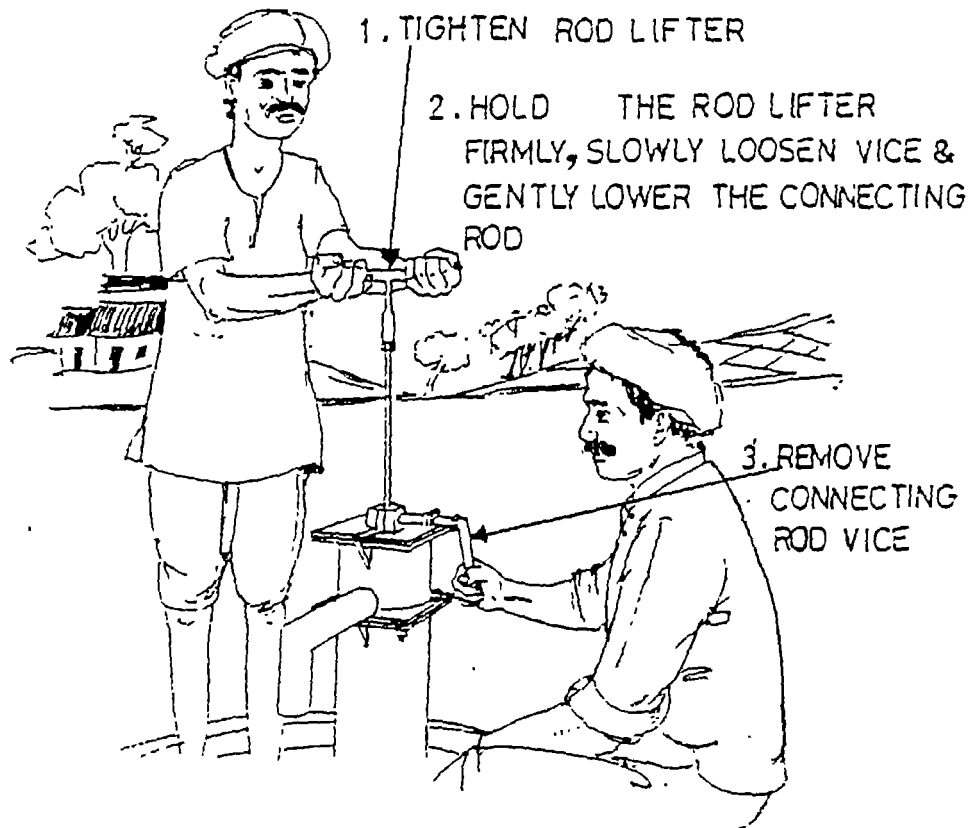


FIG:4.10 LOWERING CONNECTING ROD

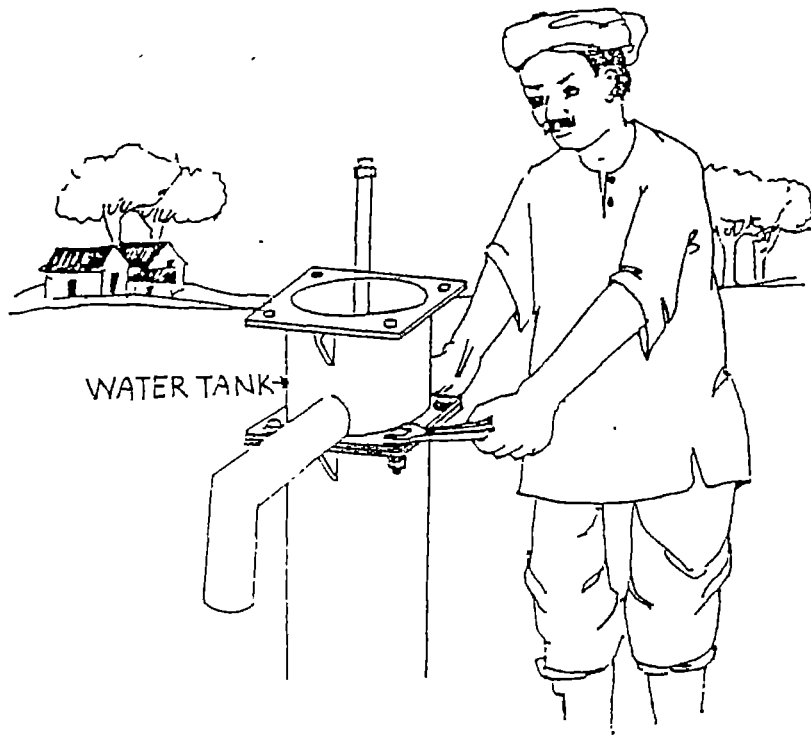


FIG:4.11 LOOSE WATER TANK NUTS & BOLTS



FIG:4.12 : REMOVE WATER TANK

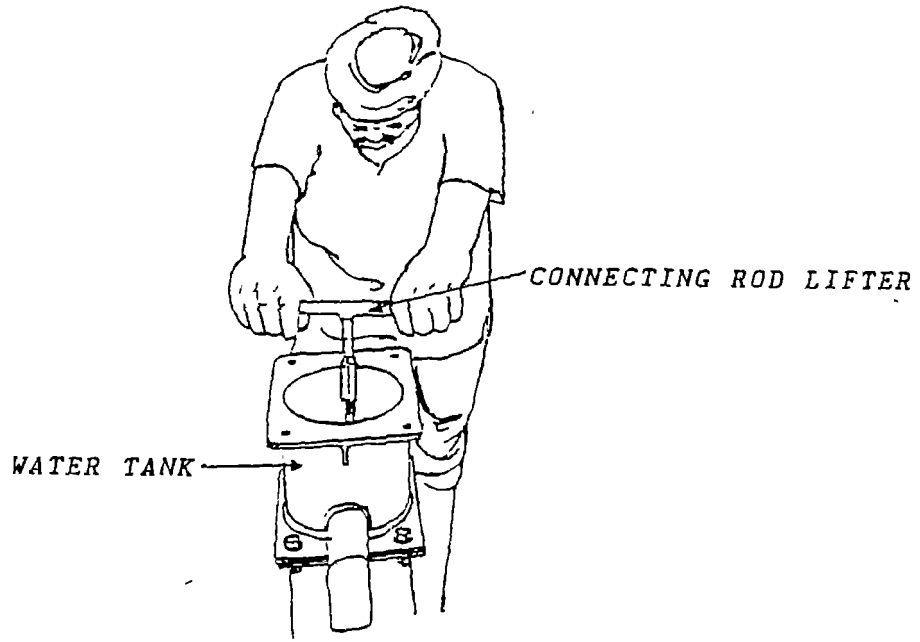


FIG:4.13 JOIN PLUNGER ASSEMBLY TO CHECK VALVE ASSEMBLY

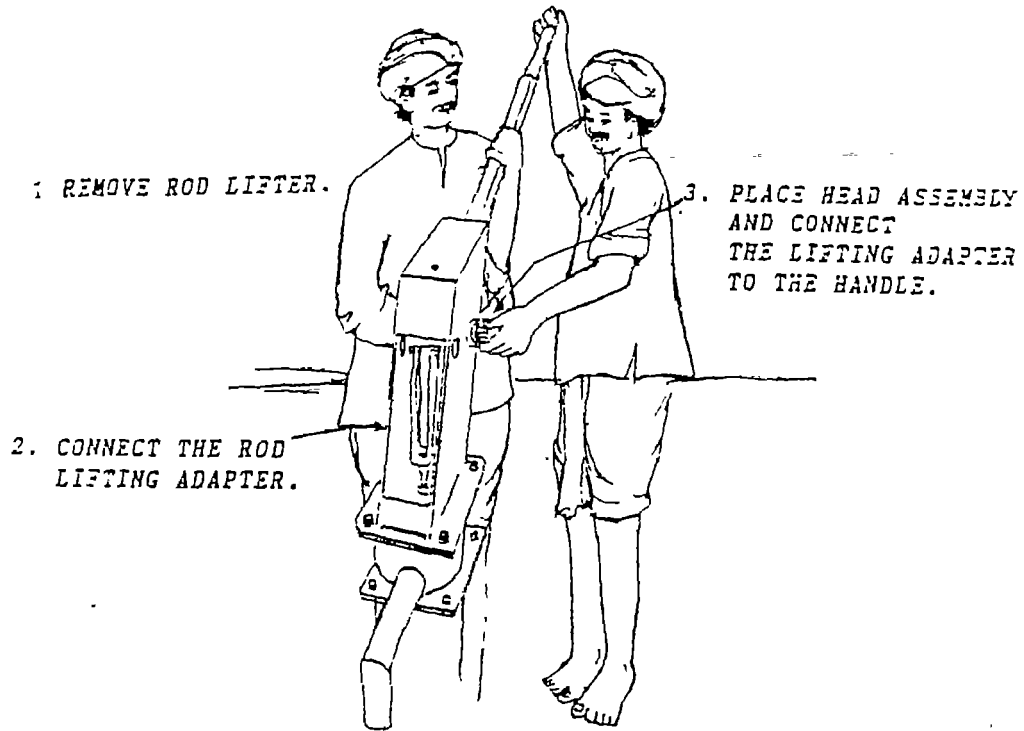


FIG:4.14 FIX HEAD ASSEMBLY & HANDLE

PUSH HANDLE DOWN SUDDENLY AND
WAIT TILL WATER COLUMN IN RISING
MAIN DRAINS.

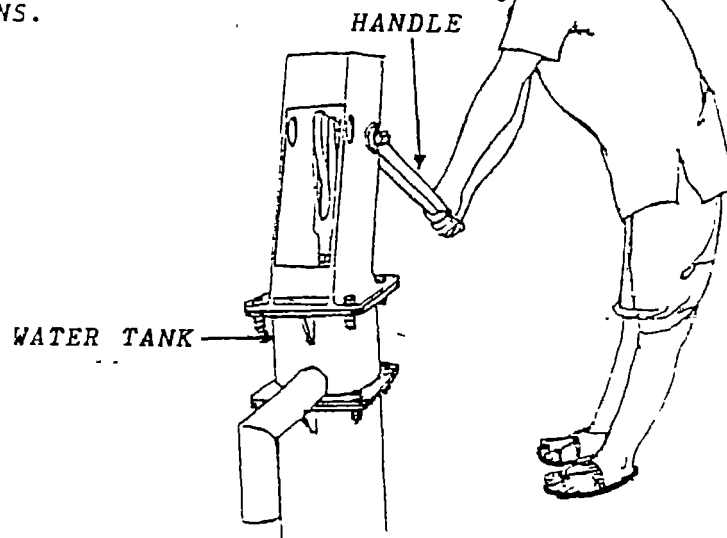
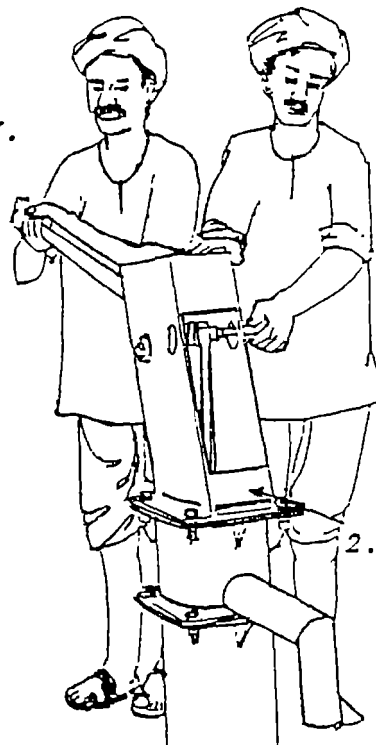


FIG:4.15 REMOVE WATER FROM RISER PIPE

1. LIFT HANDLE
UPWARD SLOWLY.



2. DISCONNECT ADAPTER.

FIG:4.16 REMOVE CONNECTING ROD LIFTING ADAPTER.

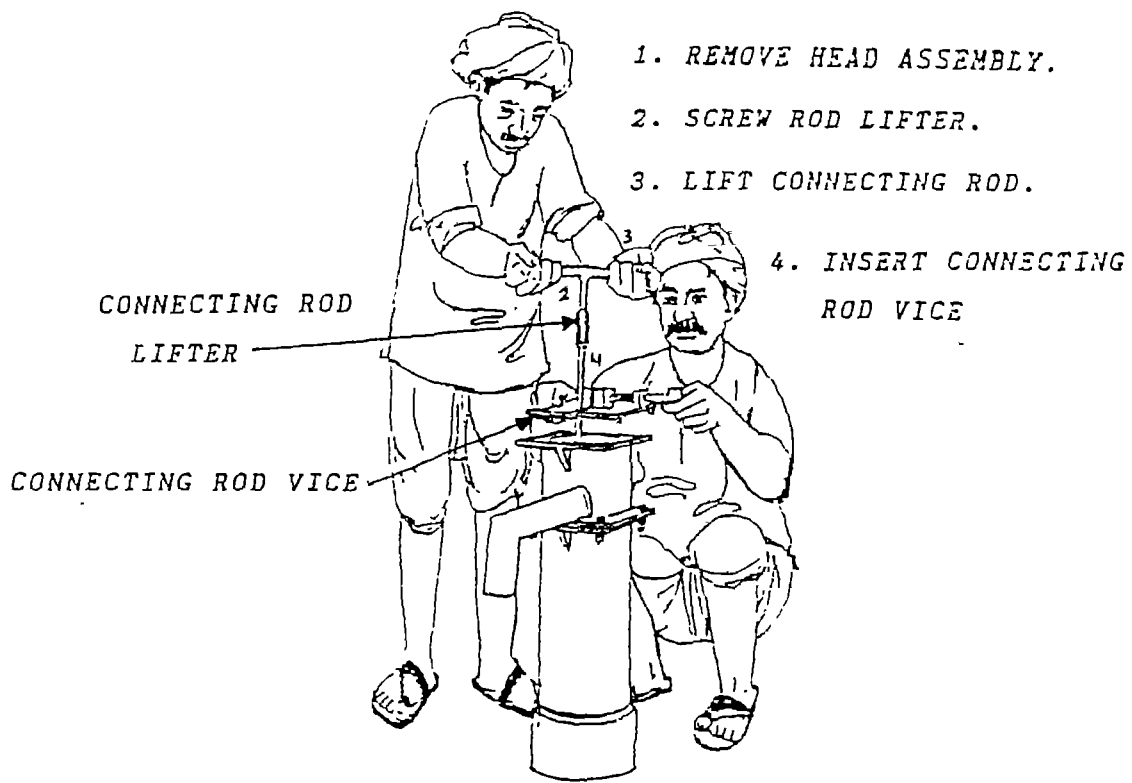


FIG:4.17 FIX THE CONNECTING VICE.

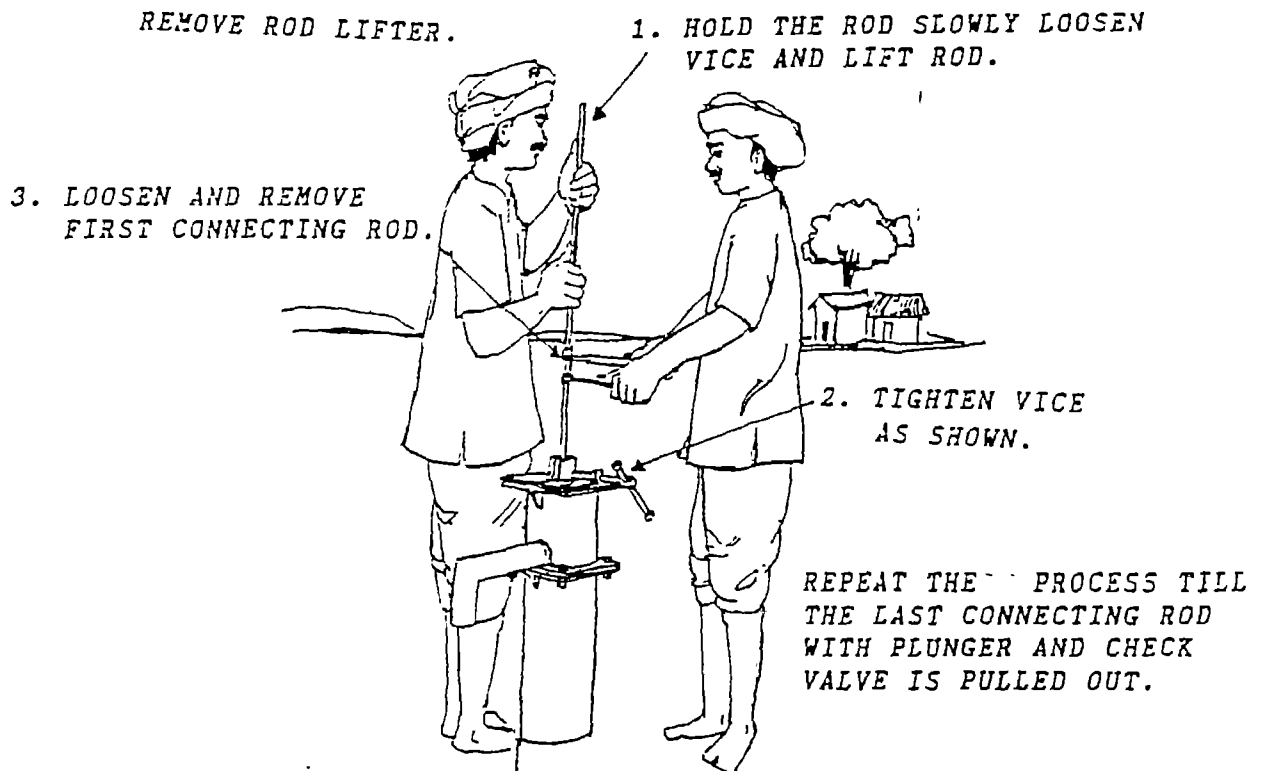


FIG:4.18 REMOVE CONNECTING ROD ONE BY ONE WITH THE HELP OF CONNECTING ROD VICE COUPLER.

xx) Seperate check valve from plunger (Fig.4.19)

xxi) Unscrew plunger from check valve (Fig.4.20)

xxii) Remove all parts of check valve and clean them (Fig.4.21)

4.3 INSPECTION FOR REASSEMBLY OF HAND PUMP:

I) Inspection of hand pump components:-

Before starting the inspection of hand pump components, first of all inspect the water tank assembly for water leakage or damage. Wash and clean all parts, using a mixture of kerosene oil and water. Inspection should be carried out at site on a firm ground which should be clean.

4.3.1 Stand Assembly:

Stand assembly should be on perfect level. It can be seen by spirit level. If not, should be corrected with the help of mason.

4.3.2 Water Tank Assembly:

Following should be checked:

- i) Water tank for leakage and cracks
- ii) Coupler for broken threads
- iii) Flanges and spout pipe for cracks and leakage

4.3.3 Handle Assembly:

It consists of axle, bearings and chain. It should be ensured that all the parts are clean and free to operate. Apply graphite grease in bearing and chain.

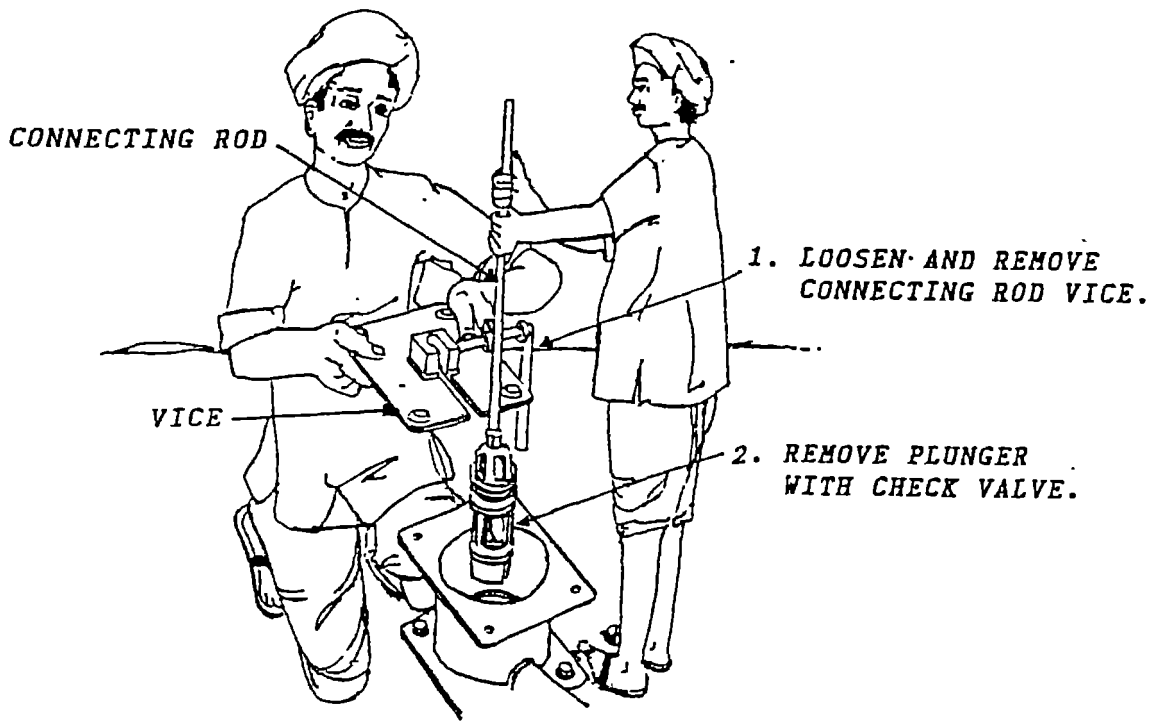


FIG:4.19 SEPERATE CHECK VALVE FROM PLUNGER

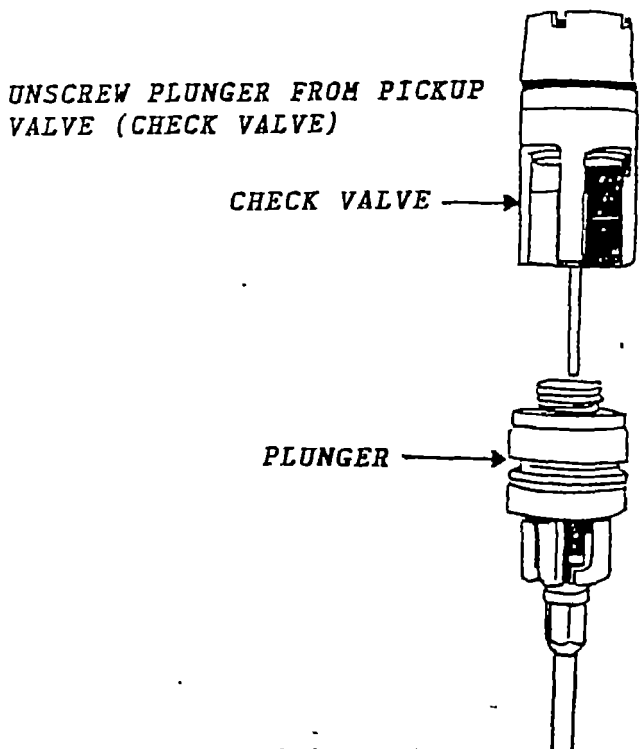
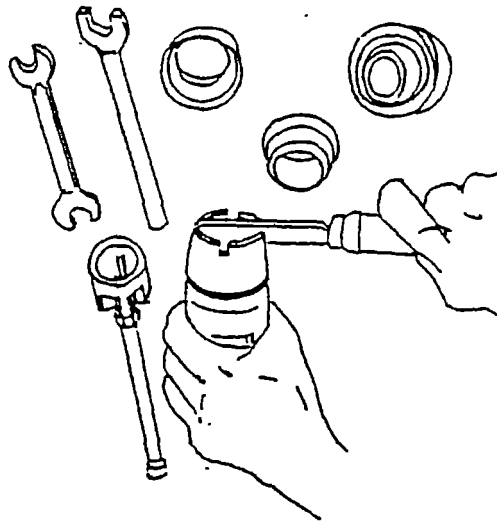


FIG:4.20 REMOVE PLUNGER CHECK VALVE.

**DISMANTLE ALL COMPONENTS FROM PLUNGER
AND CHECK VALVE ASSEMBLIES AND INSPECT.**

**REPLACE WORN OUT AND DAMAGED COMPONENTS
ASSEMBLE PLUNGER AND CHECK VALVE ASSEMBLIES**



**AFTER ERECTION CHECK WHETHER THE PUMP IS
WORKING WELL IN ALL ASPECTS.**

FIG.4.21 REMOVE ALL PARTS OF CHECK VALVE & CLEAN THEM.

4.4. REASSEMBLY OF HAND PUMP:

4.4.1. General:-

Hand pump reassembly should be carried out in a proper sequence. Arrange all lubricants, special tools and parts. Before starting assembly, parts should be:-

- Cleaned and dried
- Lubricated with oil and grease (only moving parts)
- Ensure good condition of parts.
- Check 'O' ring, cup seal etc. besides other parts, replace, if defective.

4.4.2. Assembly of Hand Pump:-

After inspection of various parts, The pump should be assembled in the following steps:

- i) Remove cover of casing pipe for fixing stand assembly.
(Fig. - 4.22)
- ii) Place stand assembly over casing pipe and make sure that it is vertical and check level of flange by spirit level.
(Fig. - 4.23)
- iii) Fix water tank assembly on the stand flange by tightening the nuts and bolts.(Fig. - 4.24)
- iv) Join check valve and plunger (Fig - 4.25)
- v) Connect plunger to connecting rod (Fig. - 4.26)
- vi) Insert the plunger assembly connected with check value as the riser pipe and connect riser cupler to the water tank.
(Fig. - 4.27)

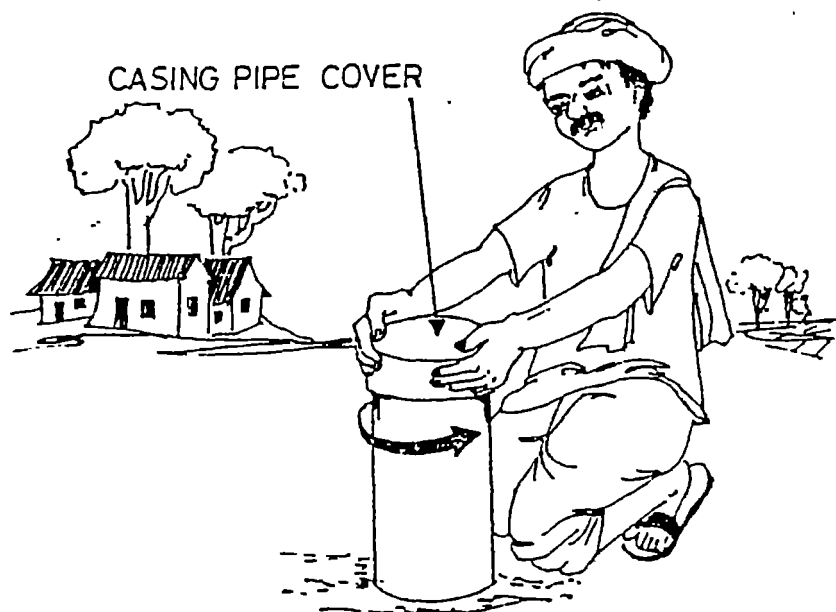


FIG:4.22 REMOVE COVER OF CASING PIPE

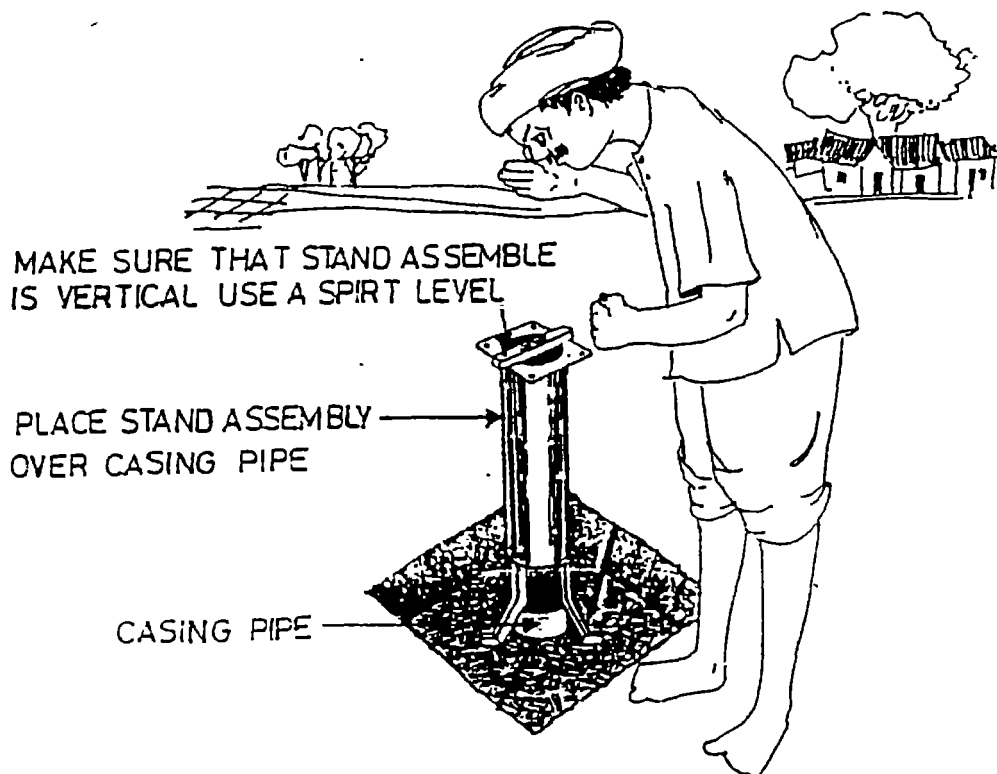


FIG:4.23 LEVELING STAND ASSEMBLY FLANGE

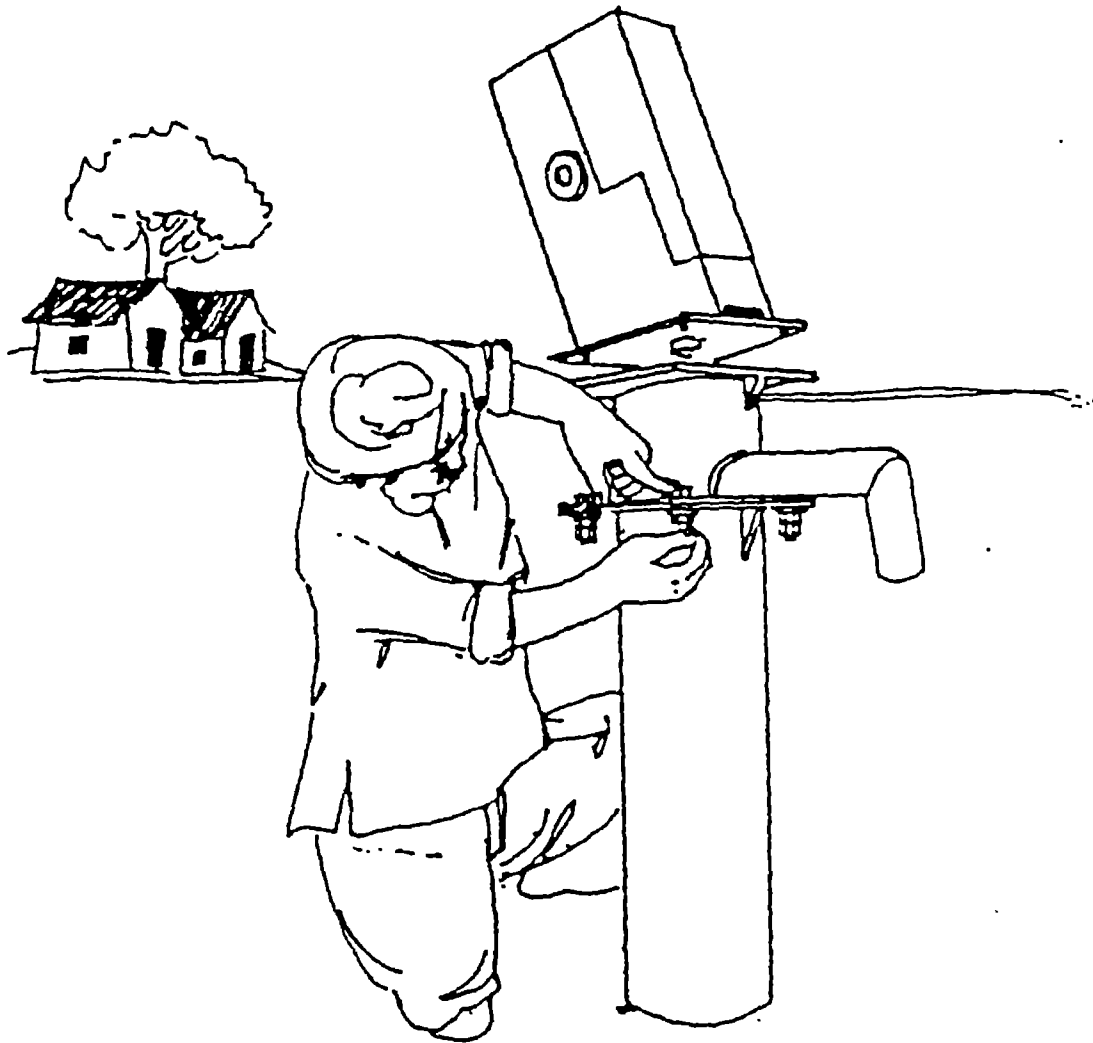


FIG:4.24 FIX WATER TANK ASSEMBLY

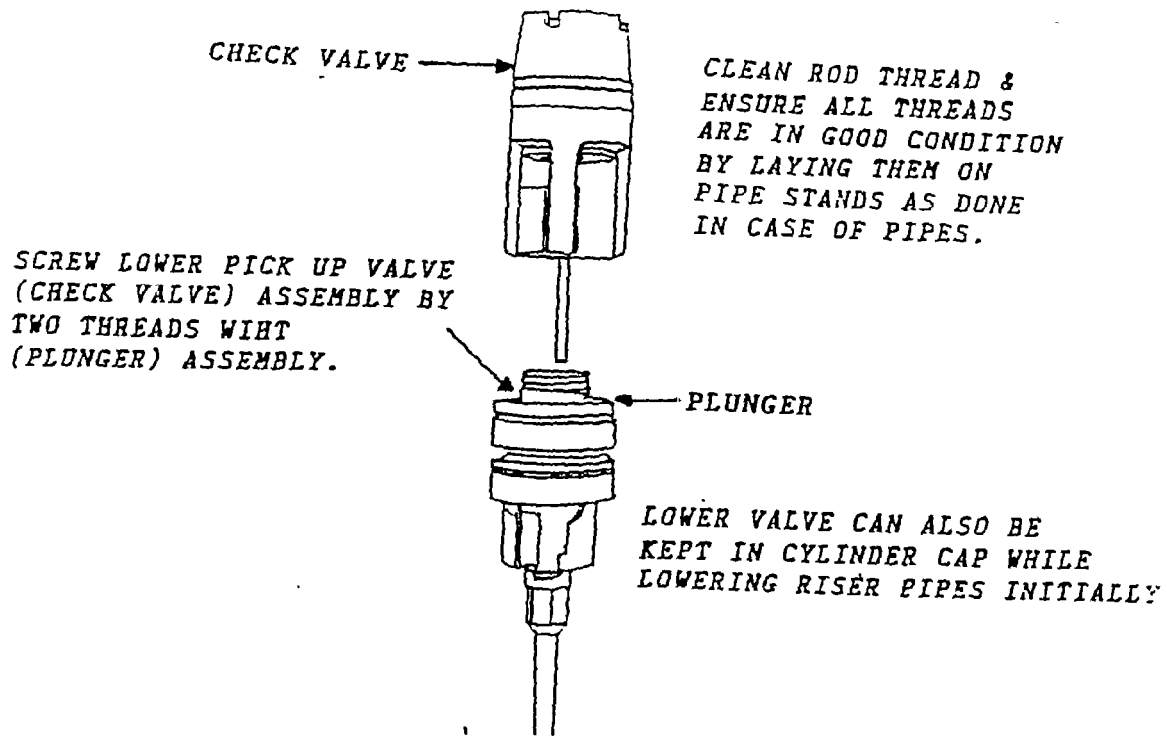


FIG:4.25 JOIN CHECK VALVE WITH PLUNGER.

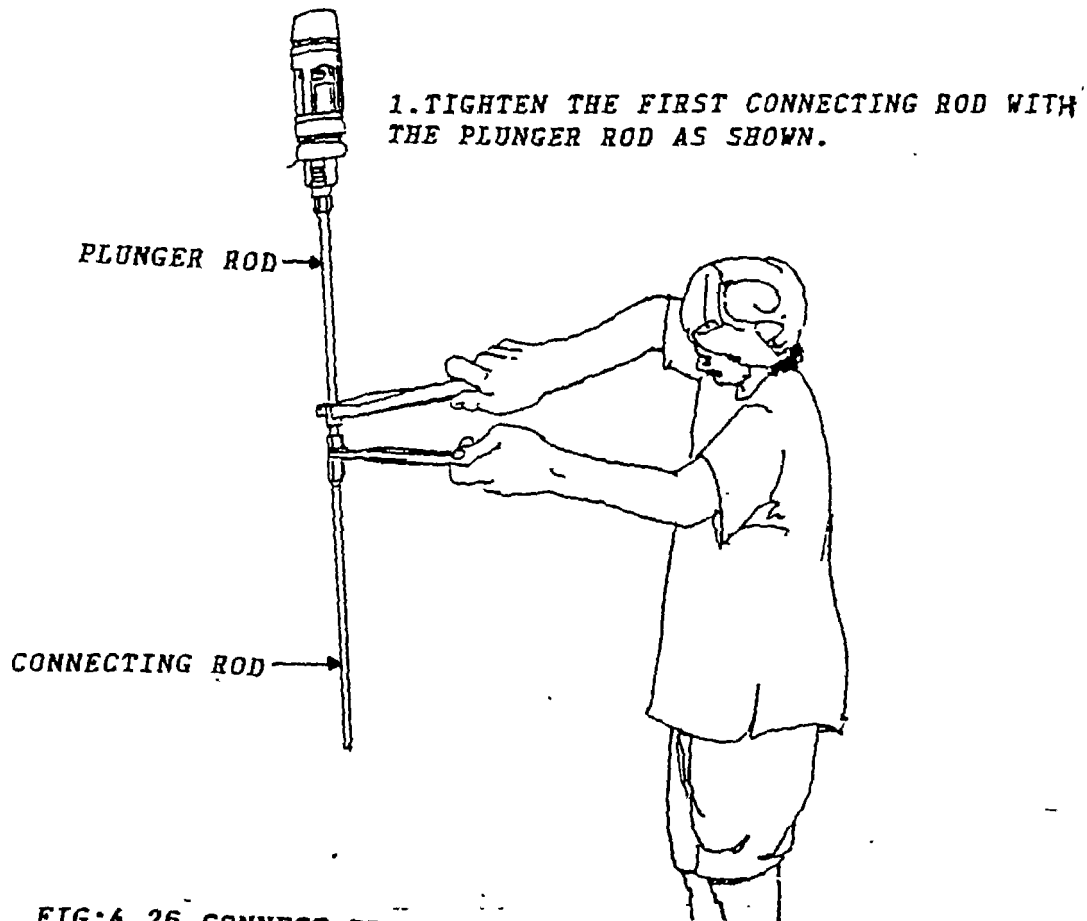


FIG:4.26 CONNECT PLUNGER TO CONNECTING ROD.

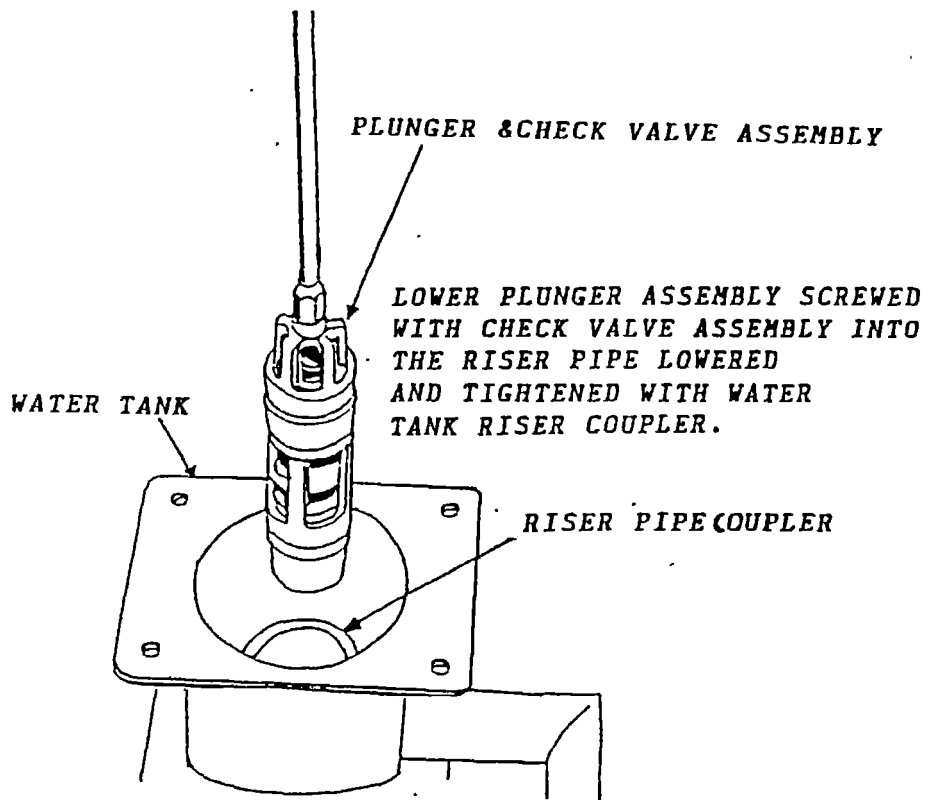


FIG:4.27 INSERT PLUNGER ASSEMBLY IN THE RISER PIPE

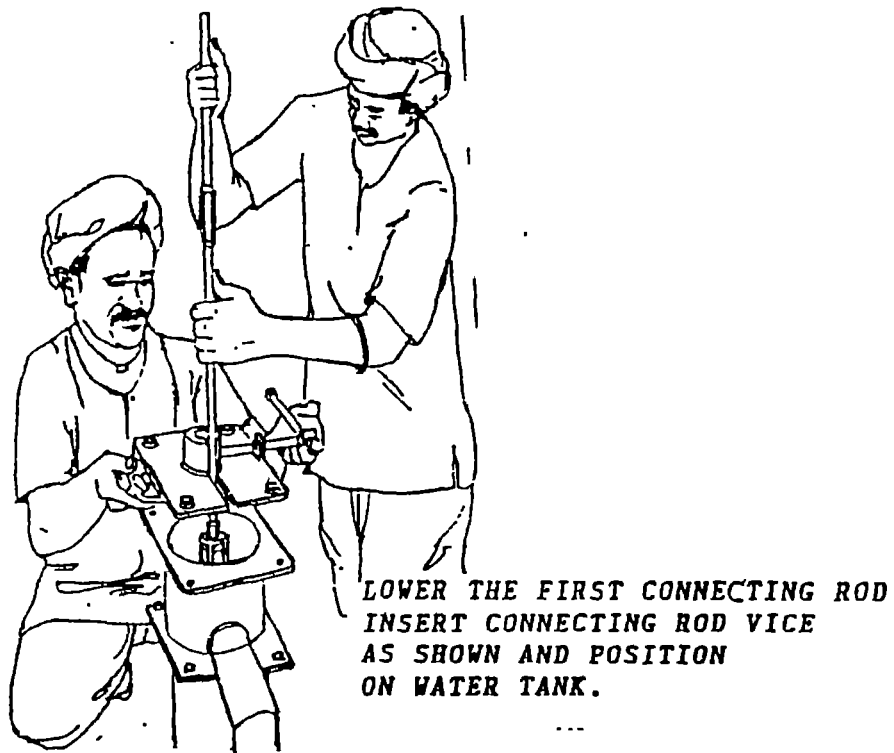


FIG:4.28 INSERT LOWER END OF THE CONNECTING ROD IN THE RISER PIPE.

- vii) Insert the lower end of the connecting rod in the riser pipe, to place the connecting rod over the water tank and fix it to the vice. (Fig. - 4.28)
- viii) Join the connecting rod pieces as per the requirement and insert in the riser pipe. (Fig. - 4.29)
- ix) Remove the connecting rod vice from the water tank by holding the top end of connecting rod. (Fig. - 4.30)
- x) Fix the connecting rod lifter to the top end of the connecting rod and to rotate in the direction of arrow so as to separate the check valve the plunger and ensure that it reaches the bottom plate. (Fig. - 4.31)
- xi) Make a mark by hack saw on the connecting rod at the level of water tank. (Fig. 4.32)
- xii) Lift the connecting rod assembly, fix the connecting rod vice and tighten the connecting rod. (Fig. - 4.33)
- xiii) To cut the connecting rod as per the marking after removing the connecting rod lifter. (Fig. - 4.34)
- xiv) Smoothen with the help of file the cut surface of connecting rod. (Fig. - 4.35)
- xv) Make necessary threads on the top most end of connecting rod. (Fig. 4.36)
- xvi) Fix the middle flange on top of water tank and ensure that all four corners coincides. (Fig. - 4.37)
- xvii) Tighten check nut at the top of the connecting rod.
(Fig. - 4.38)

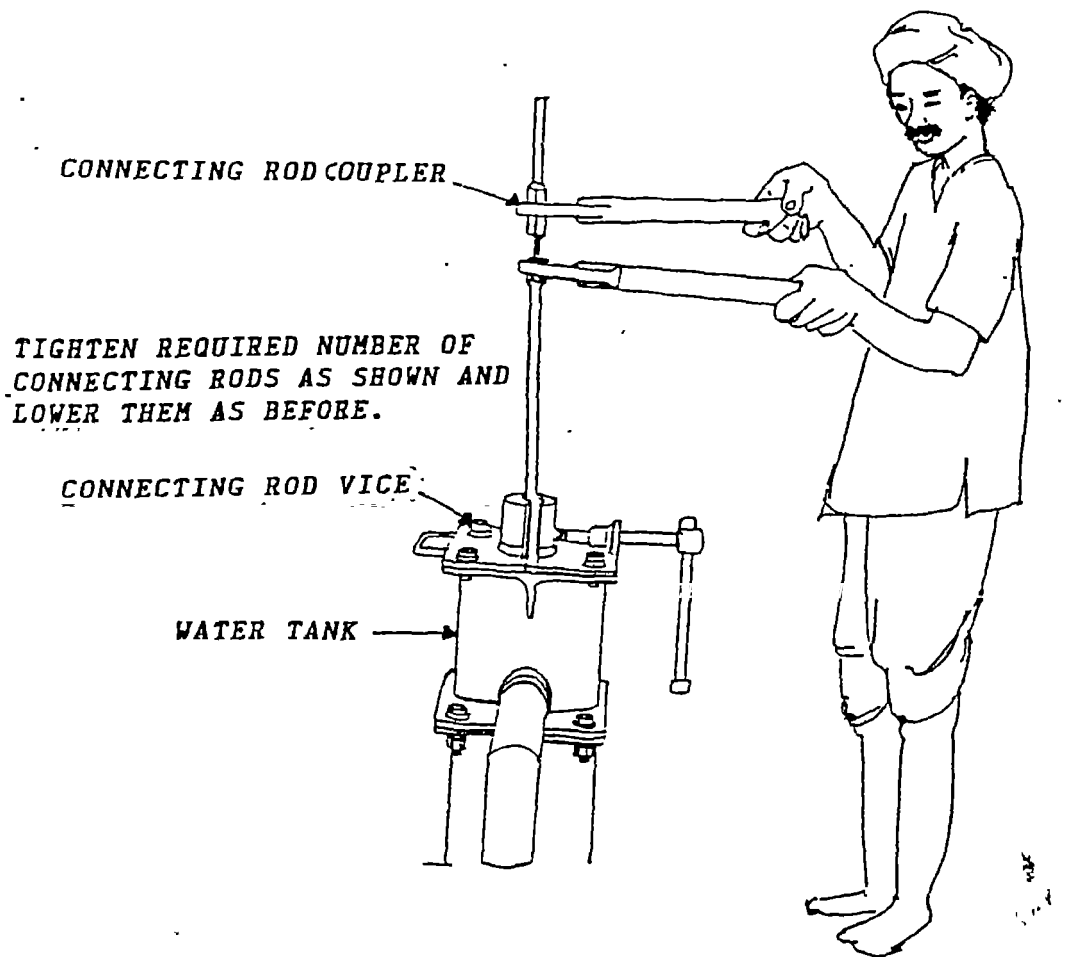


FIG:4.29 JOIN THE CONNECTING ROD AS PER REQUIREMENT.

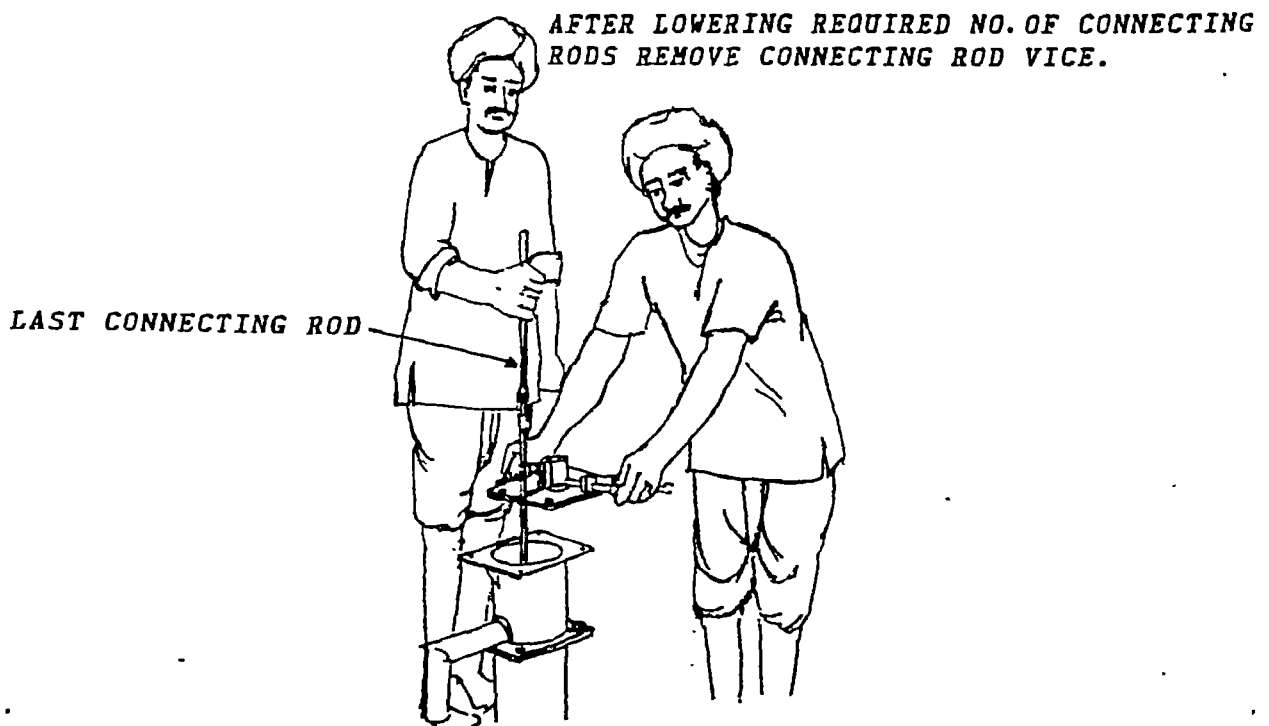


FIG:4.30 REMOVE THE CONNECTING ROD VICE FROM THE WATER TANK.

CONNECTING ROD LIFTER

SCREW & TIGHTEN THE ROD LIFTER ON THE THREADS & TURN IT ANTICLOCKWISE SO THAT THE LOWER PICK UP VALVE (CHECK VALVE) IS UNSCREWED & LEFT IN THE BOTTOM CYLINDER CAP.

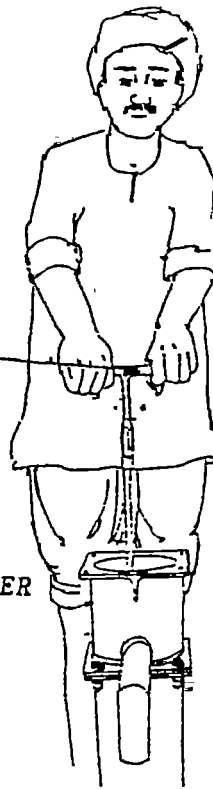


FIG:4.31 FIX LIFTER TO THE TOP END OF CONNECTING ROD.

1. PUSH THE CONNECTING ROD ASSEMBLY TO BOTTOM MOST POSITION.

2. MARK ROD IN LEVEL WITH TOP OF WATER TANK.

HACKSAW

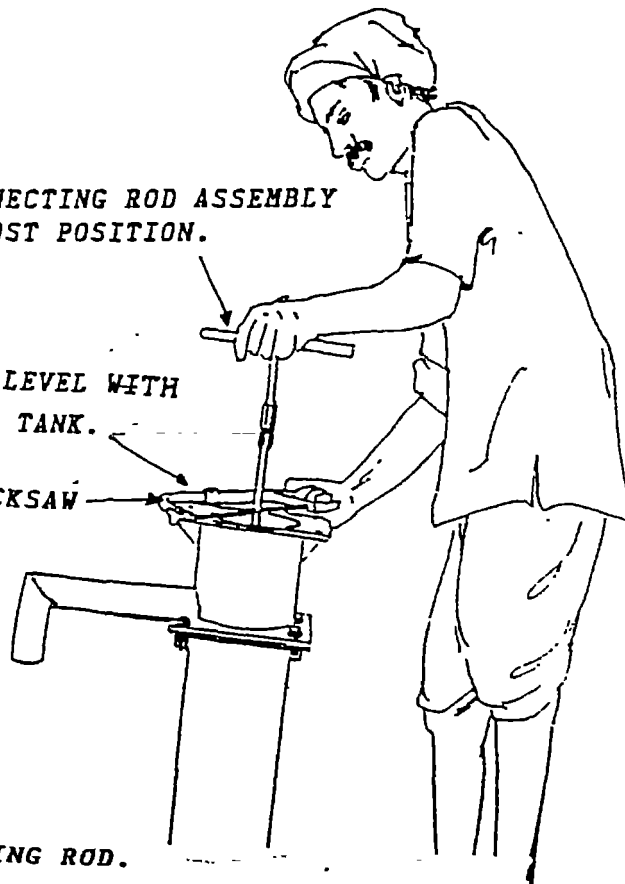
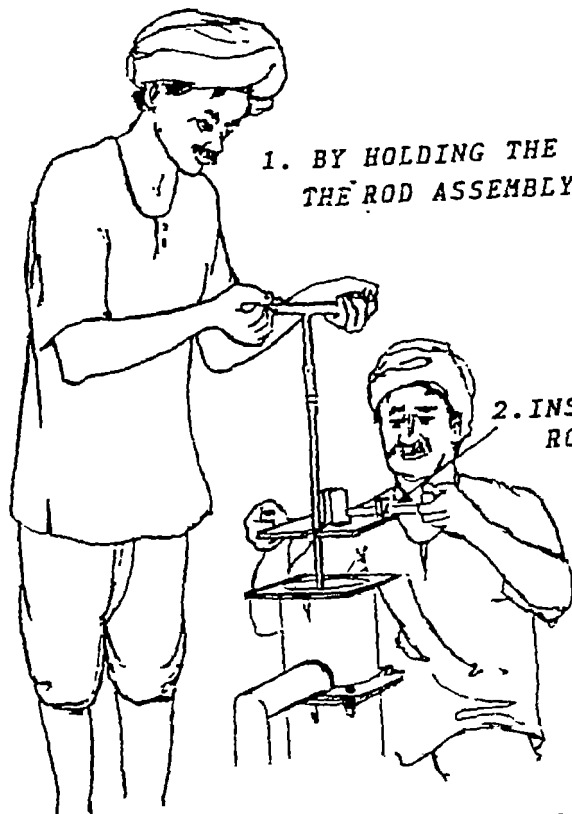


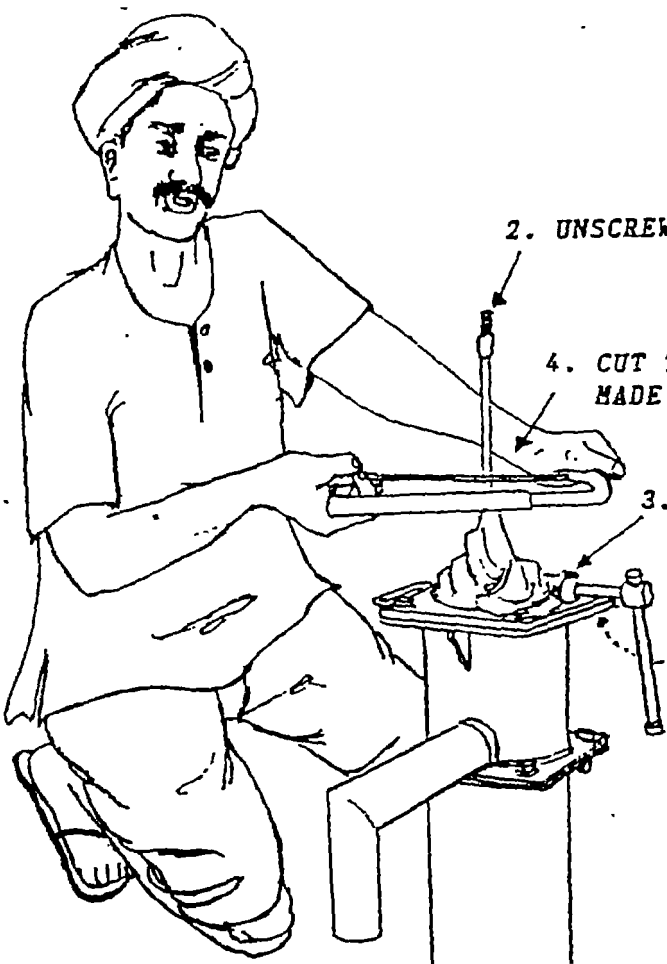
FIG:4.32 MARK THE CONNECTING ROD.



1. BY HOLDING THE ROD LIFTER, LIFT THE ROD ASSEMBLY AS SHOWN.

2. INSERT CONNECTING ROD VICE AS SHOWN.

FIG:4.33 TIGHTEN THE CONNECTING ROD



2. UNSCREW THE CONNECTING ROD LIFTER.

4. CUT THE CONNECTING ROD AT THE MARK MADE EARLIER.

3. WRAP CLOTH AROUND TOP OF CONNECTING ROD VICE SO THAT METAL CUTTING DO NOT FALL INSIDE THE RISER PIPE.

1. TIGHTEN THE CONNECTING ROD VICE.

FIG:4.34 CUT THE CONNECTING ROD.

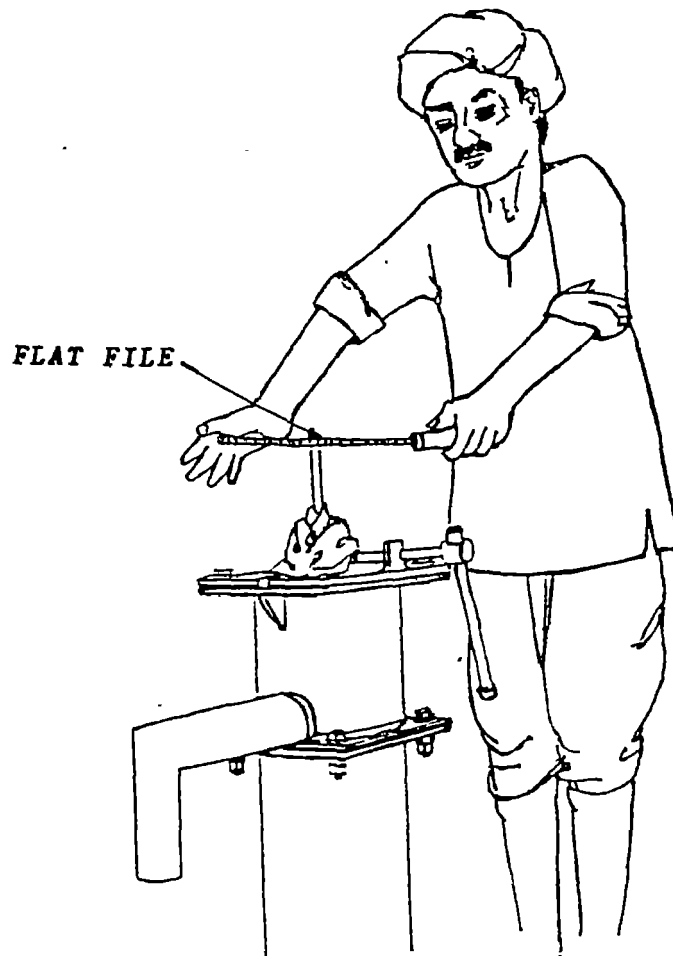


FIG:4.35 SMOOTHEN THE CUT SURFACE OF CONNECTING ROD.

CHECK THE THREADS WITH CHECK NUT. YOU MUST BE ABLE TO SCREW THE NUT ALL THE WAY DOWN BY HAND.

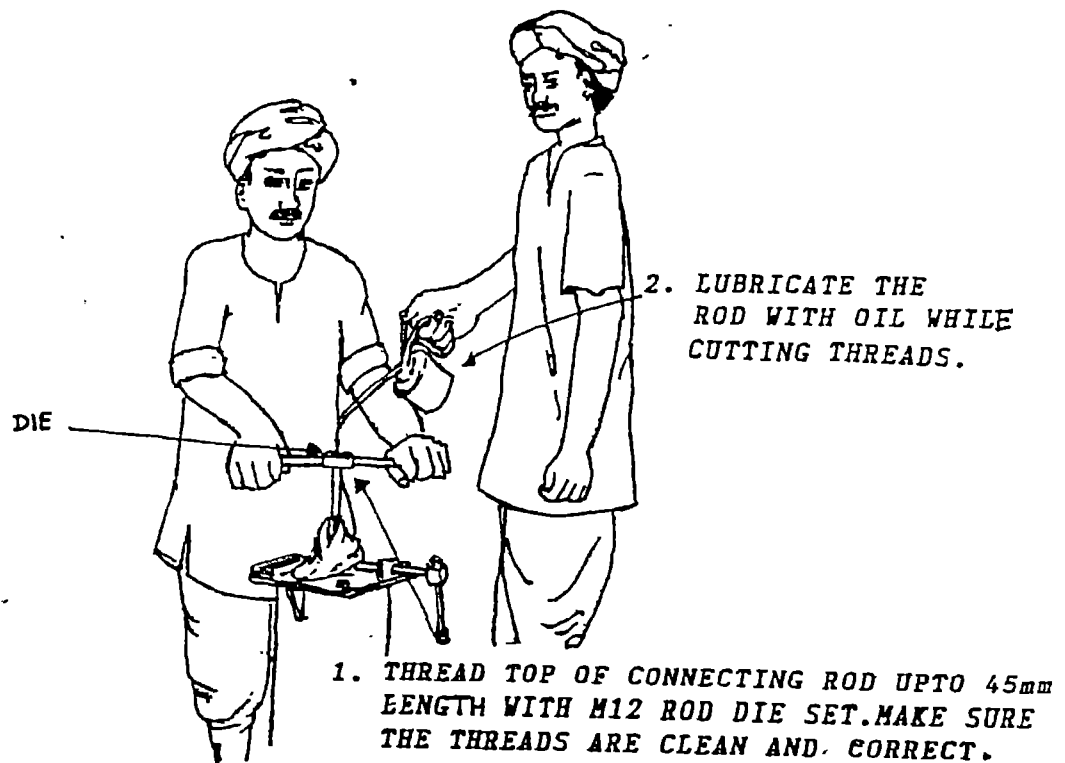


FIG:4.36 MAKE THREADS ON THE TOP MOST END.

INSERT THE MIDDLE FLANGE HELD VERTICALLY AS SHOWN INTO THE CONNECTING ROD

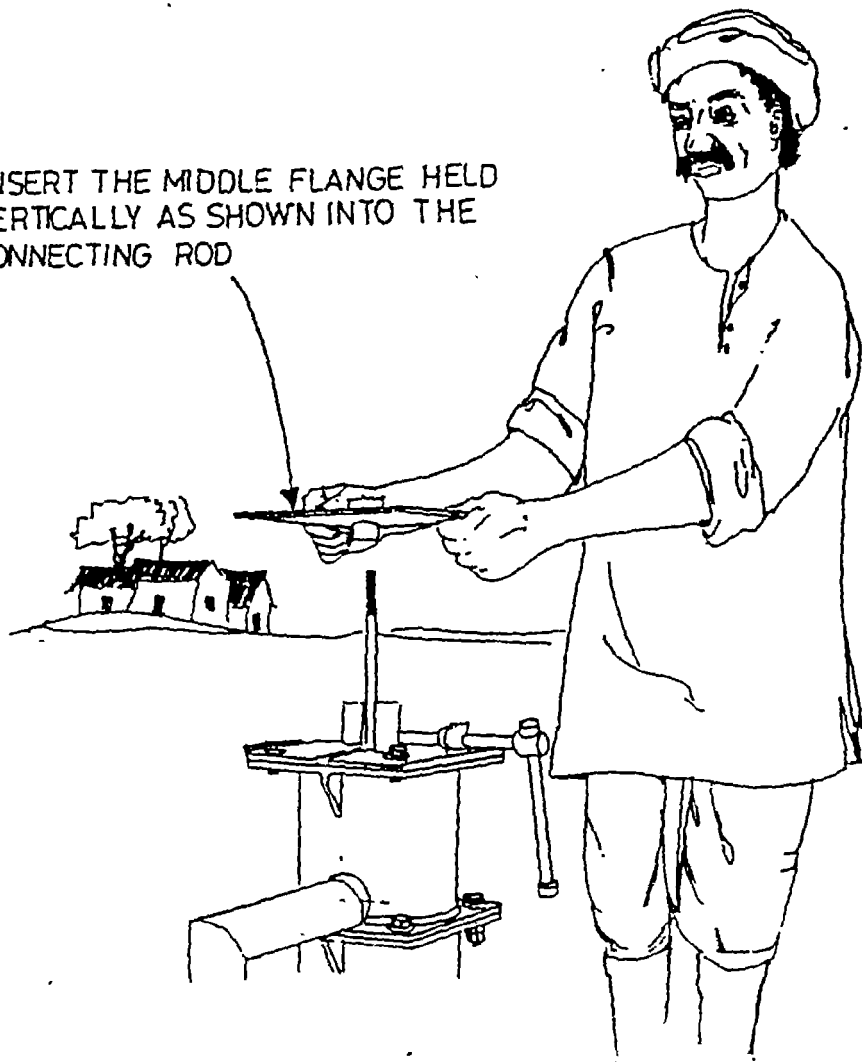


FIG:4.37 FIX MIDDLE FLANGE

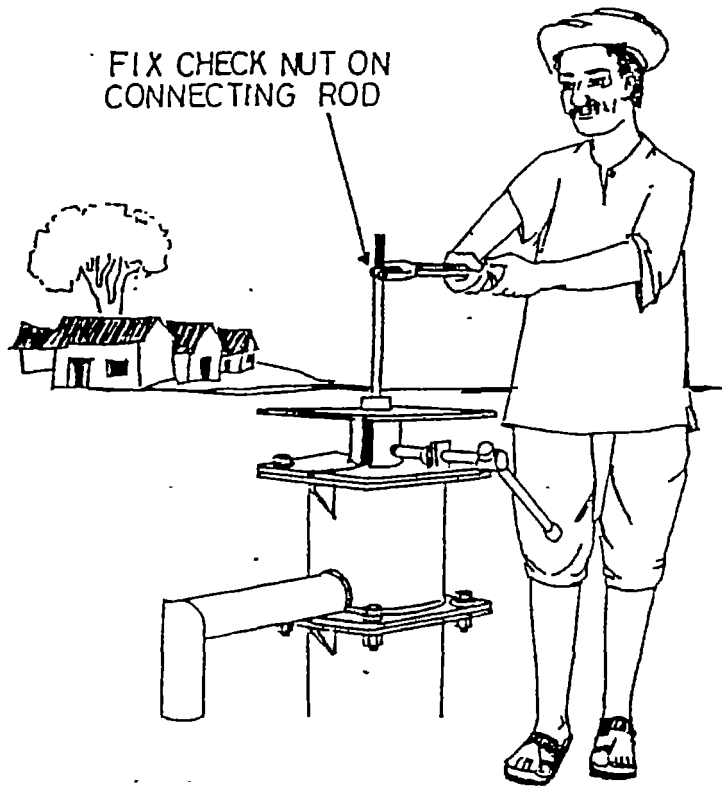


FIG:4.38 TIGHTENING CHECK NUT

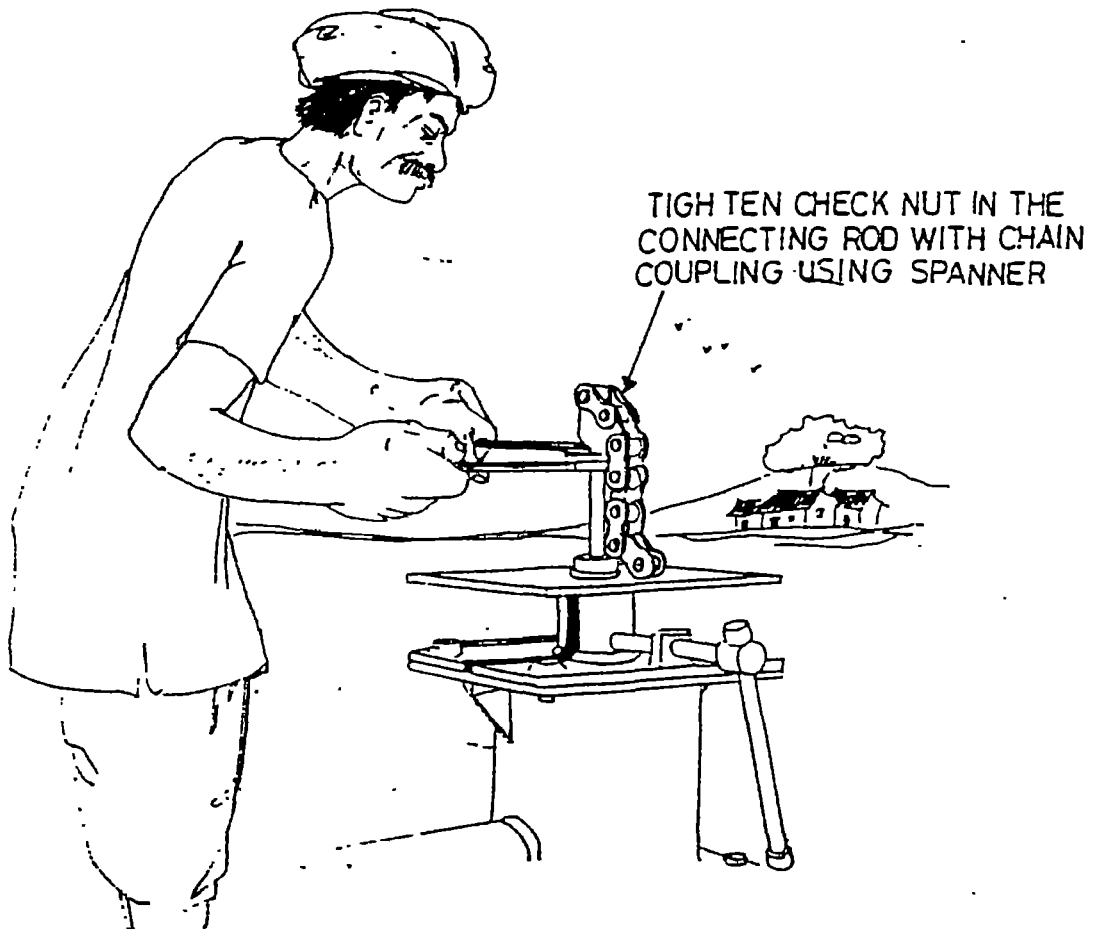


FIG:4.39 FIX CHAIN ON CONNECTING ROD

- xviii) Screw chain on to the connecting rod. (Fig. - 4.39)
- ix) Place chain coupling supporting tool on middle flange and remove rod vice (Fig. 4.40)
- xx) Place middle flange and set flanges with water tank, (Fig. 4.41)
- xxi) Place head assembly over the middle flange and tighten by spanner. (Fig. - 4.42 and 4.43)
- xxii) Place handle assembly and insert the handle axle by handle axle punch. (Fig. - 4.44)
- xxiii) Lift the handle for fixing chain and tighten chain anchor bolt and nyloc nut fully. (Fig. - 4.45) Remove chain coupler supporting tool by lowering the handle.
- xxiv) Lift handle up and apply Graphite grease on the chain. (Fig. - 4.46)
- xxv) Lower down handle and fix inspection cover tighten cover bolt fully by crank spanner. (Fig. - 4.47)

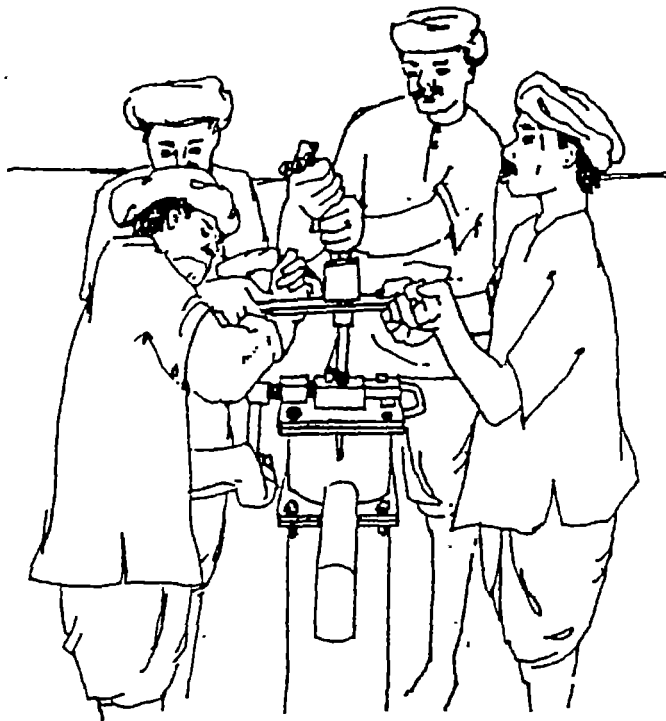


FIG:4.40 FIXING CHAIN SUPPORTING TOOL



FIG:4.41 PUTTING MIDDLE FLANGE OVER WATER TANK

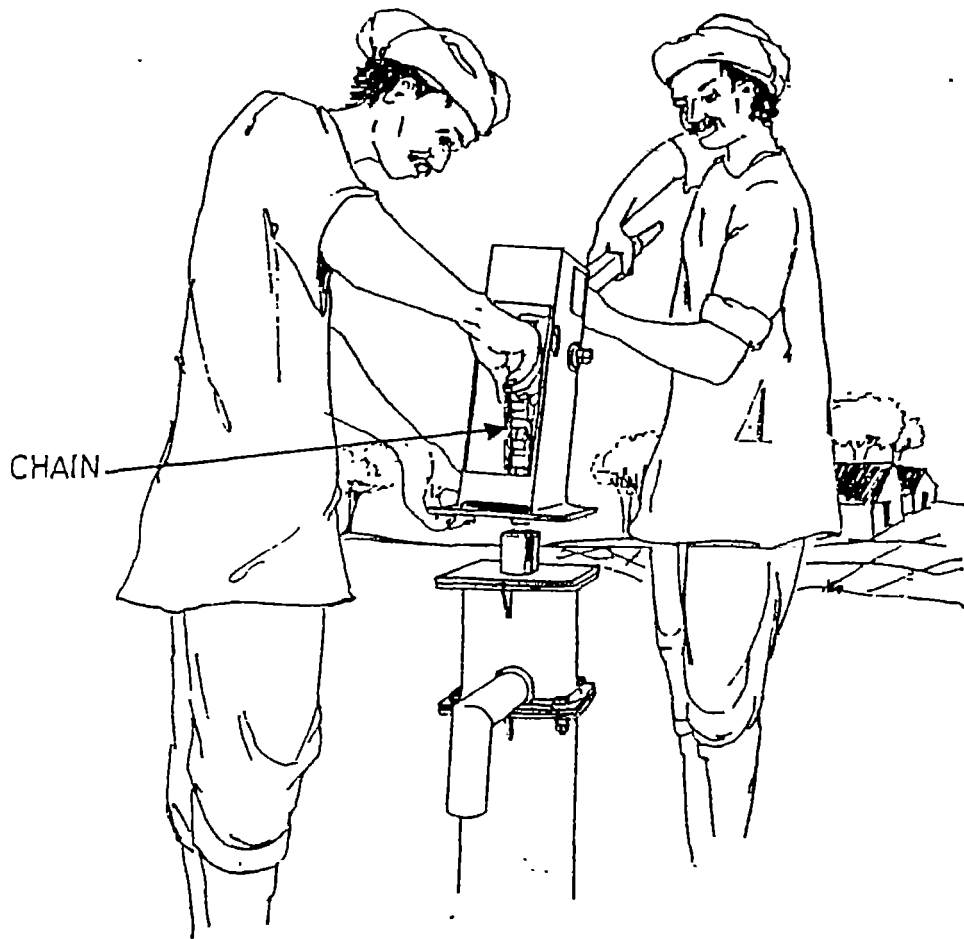


FIG:4.42 FIXING HEAD ASSEMBLY

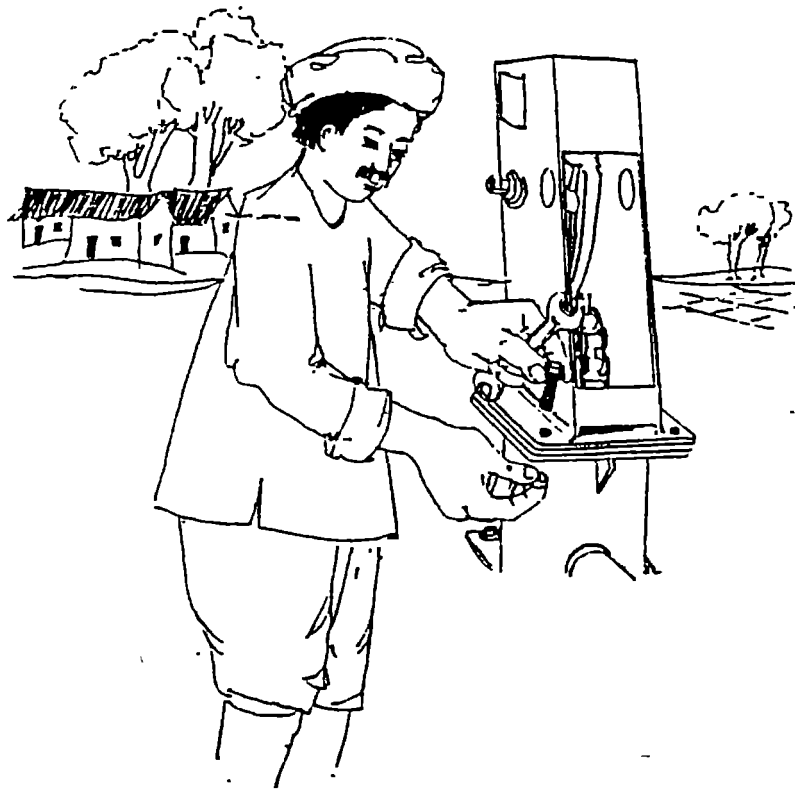


FIG:4.43 TIGHTEN HEAD ASSEMBLY

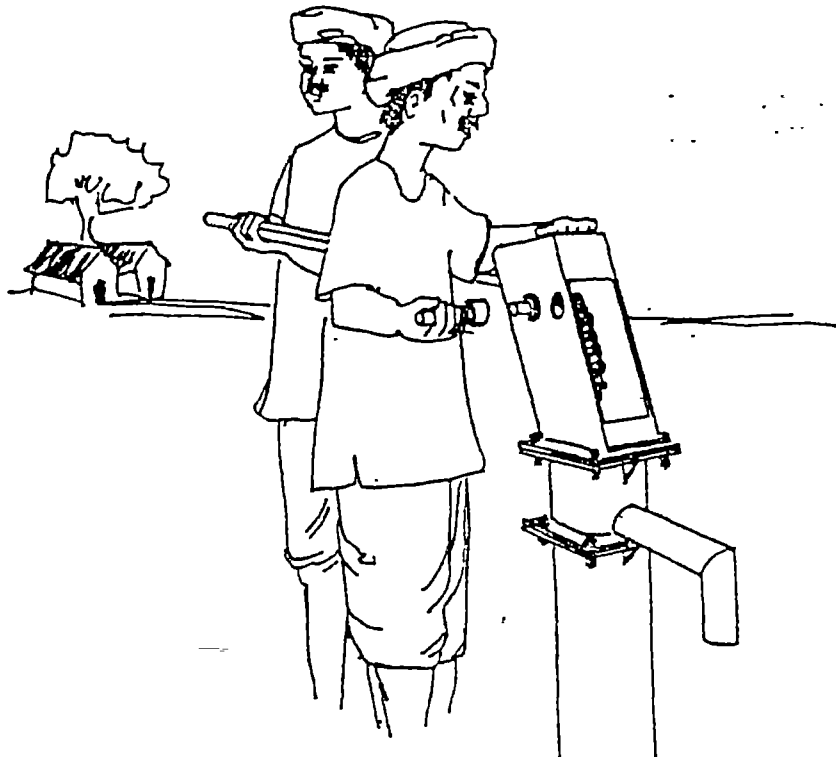


FIG:4.44 FIXING THE HANDLE AXLE

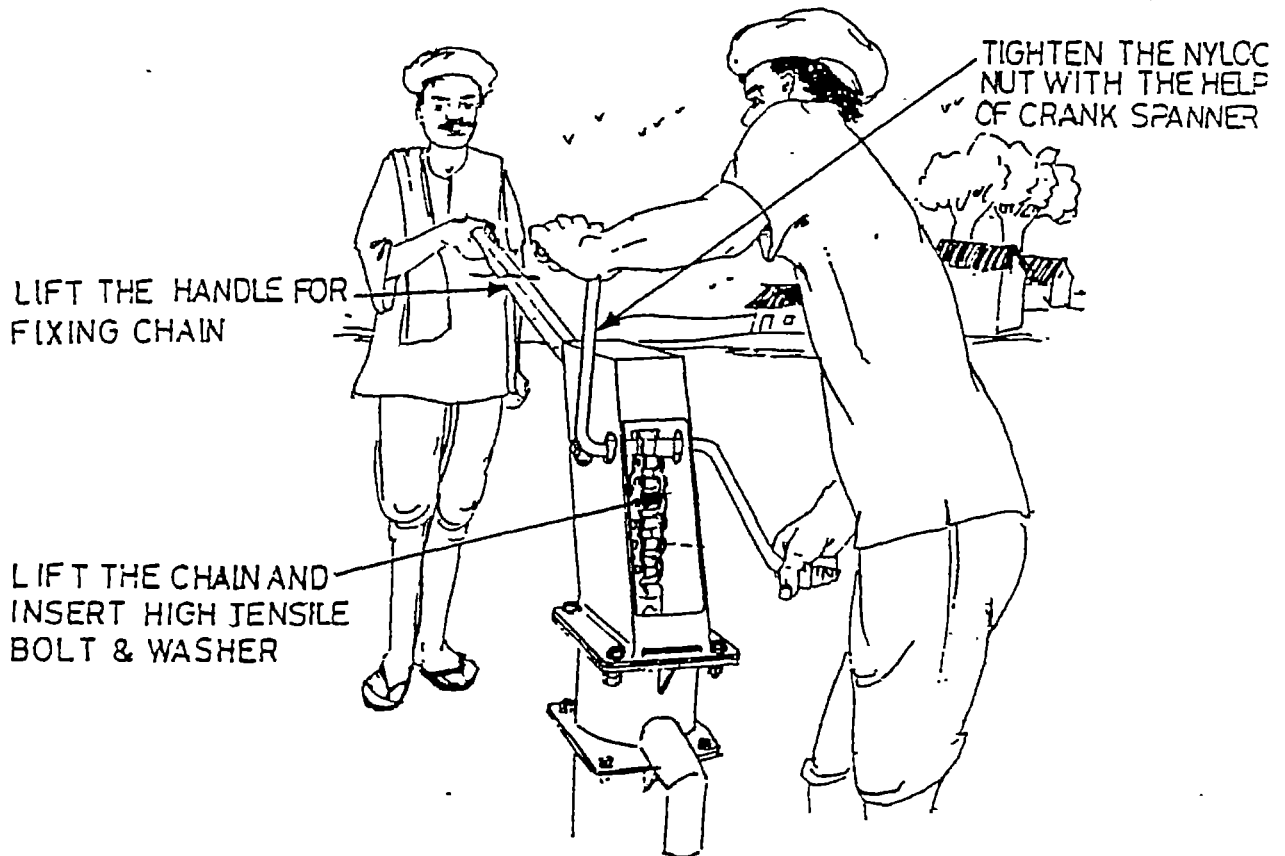


FIG:4.45 LIFT THE HANDLE FOR FIXING CHAIN

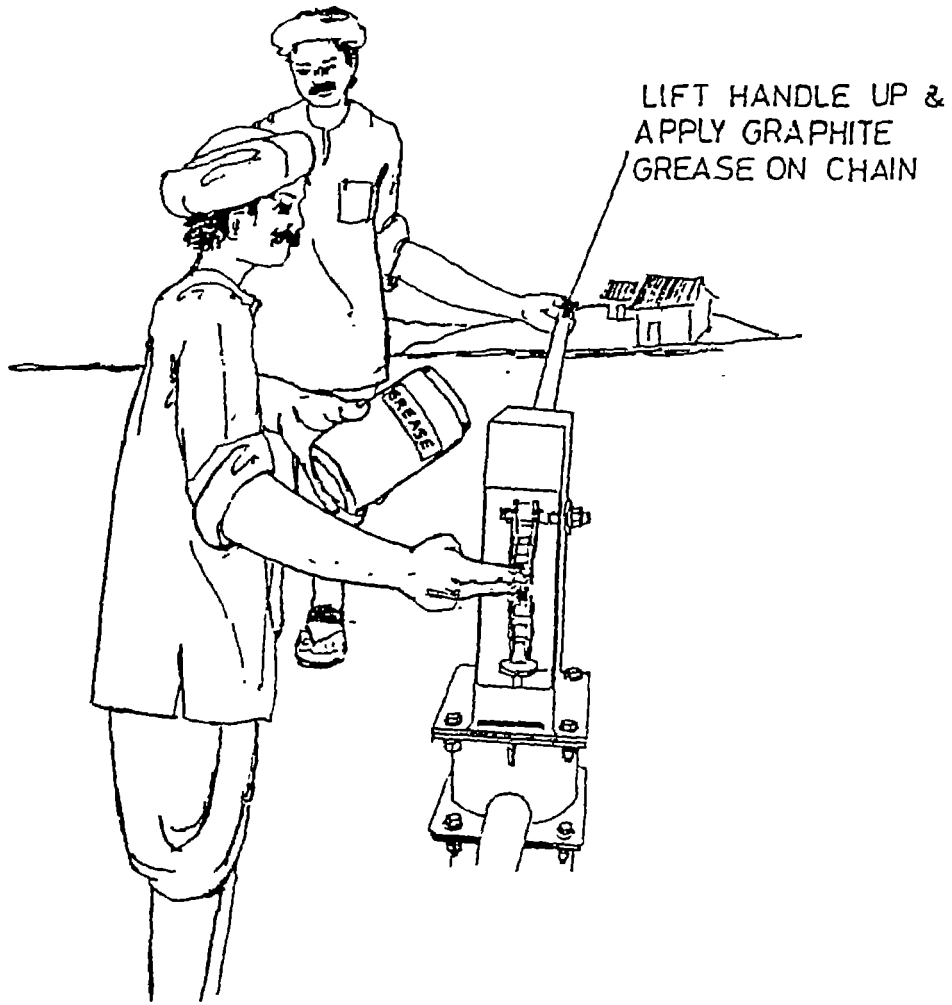


FIG:4.46 GREASING OF CHAIN

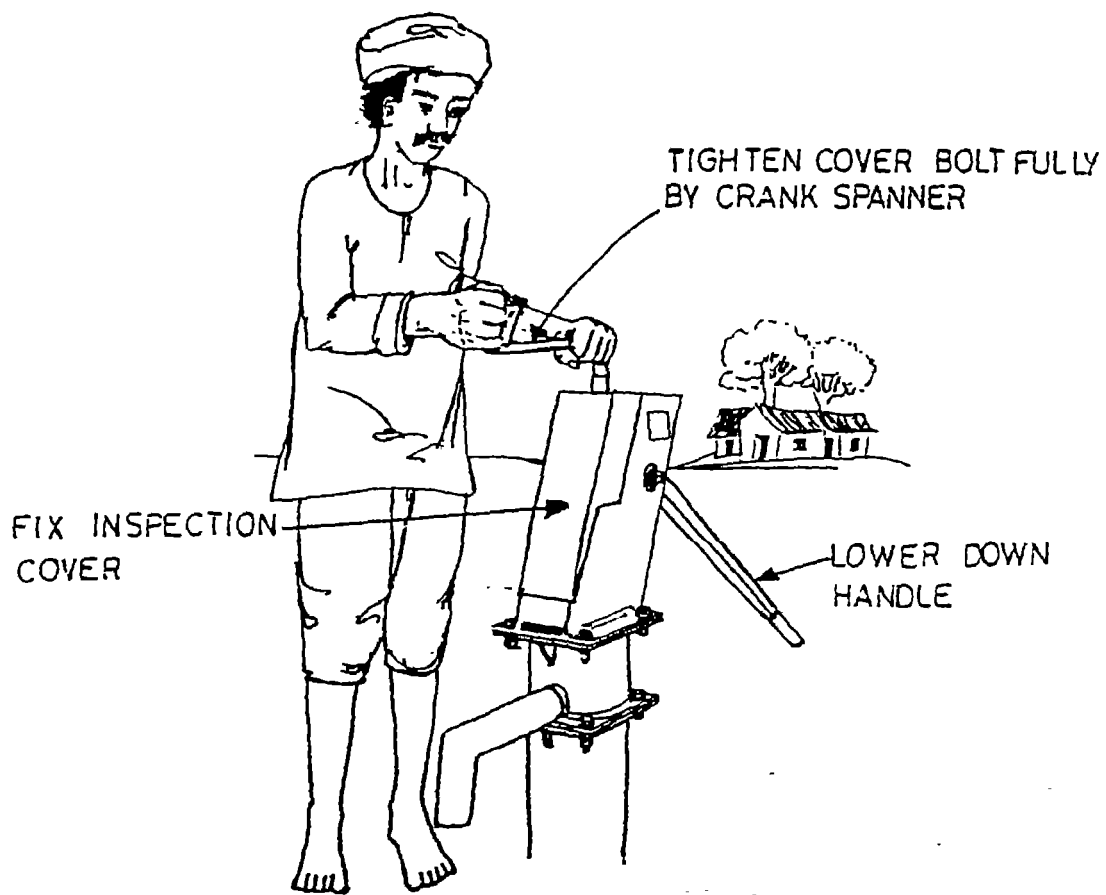


FIG:4.47 FIX INSPECTION COVER

4.5 TROUBLE SHOOTING CHART:

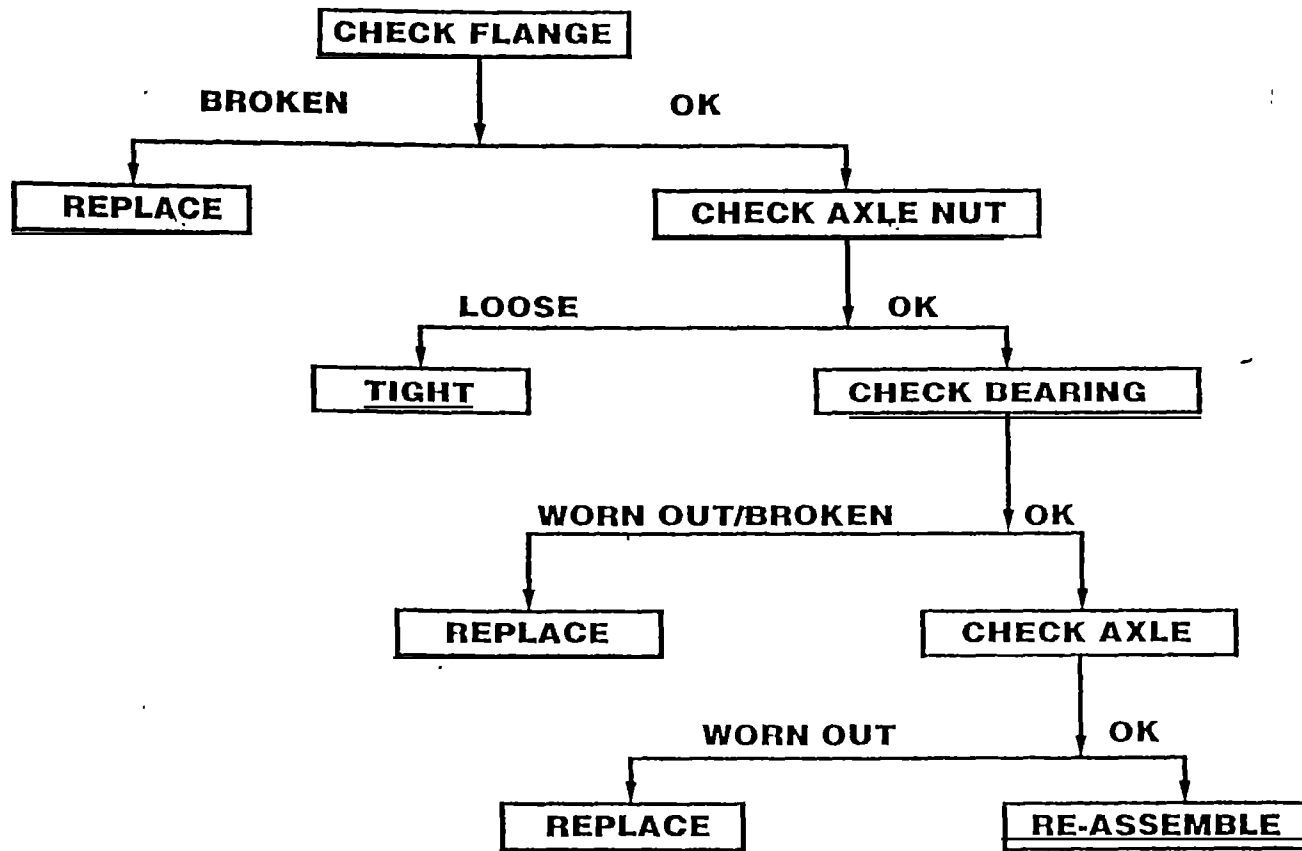
Different people use hand pump differently. Mishandling and continuous use will cause break downs in hand pump. A step-by-step procedure is given to locate the problem. The possible causes along with remedy is given in tabular form:

S.No.	Trouble	Cause	Remedy	
1.	Pump/handle shaky	a) Broken flanges	a) Replace the flanges	
		b) Loose axle nuts	b) Tighten the axle nuts	
		c) Worn out or loose or broken bearings	c) Overhaul the complete or tighten or change bearing.	
		d) Worn out axles	d) Replace the axle	
		e) Spacer damaged or short in length	e) Replace spacer	
2.	No water	a) Handle easy to operate	a) Rod is disconnected	
		b) Handle difficult and heavy to move	b) Pipe disengaged	
		c) Movement of the handle normal	i) Cup seals completely worn out	c) i) Overhaul the cylinder
			ii) Valve seats worn out or leather cup worn out	ii) Replace the respective valve assembly
			iii) Water level below cylinder	iii) Add more pipes & rods.

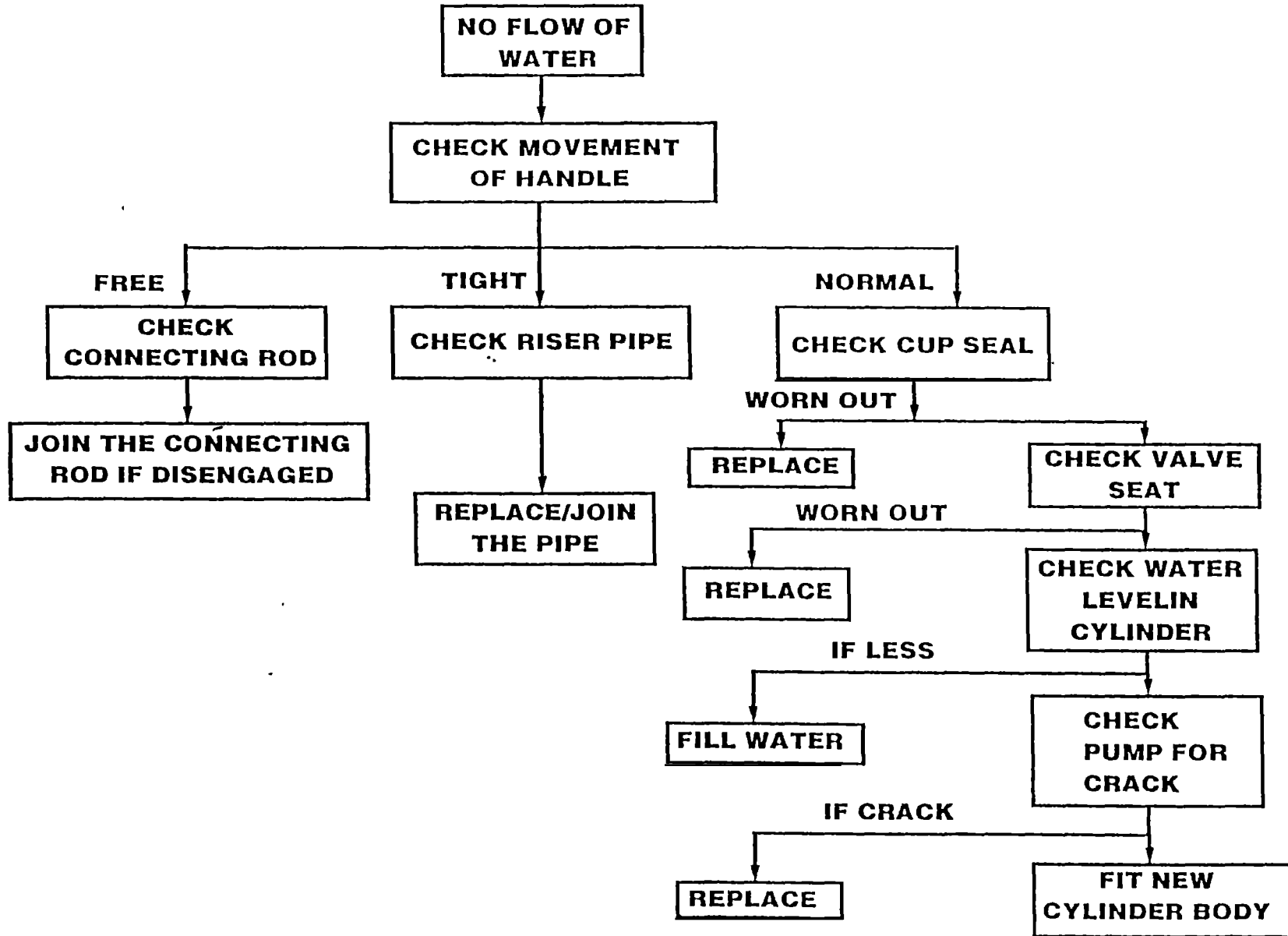
S.No.	Trouble	Cause	Remedy
		iv) Pump cylinder cracked	iv) Fit a new cylinder body
3.	Delayed flow or small flow	a) Leakage in assembly cylinder bottom check valve or upper valve b) Leakage in pipe assembly c) Leather cup washer worn out	a) Overhaul cylinder. Replace rubber seats b) Replace rising main c) Overhaul the cylinder replace rubber sheet
4.	Abnormal noise while operating the pump		
	a) Normal Operation	a) Rod rubbing the guide bush/ pipes on account of pedestal flange not in level	a) Level the pedestal flange
	b) Inconvenient Operation.	b) Bent connecting rod	b) Replace the connecting rod
5.	Folding of Chain during return stroke	a) Improper erection b) Leather cup washers getting jammed inside the cylinder	a) Adjust the length of last connecting rod suitably b) Overhaul the cylinder and replace leather washer

HAND PUMP: (TROUBLE SHOOTING)

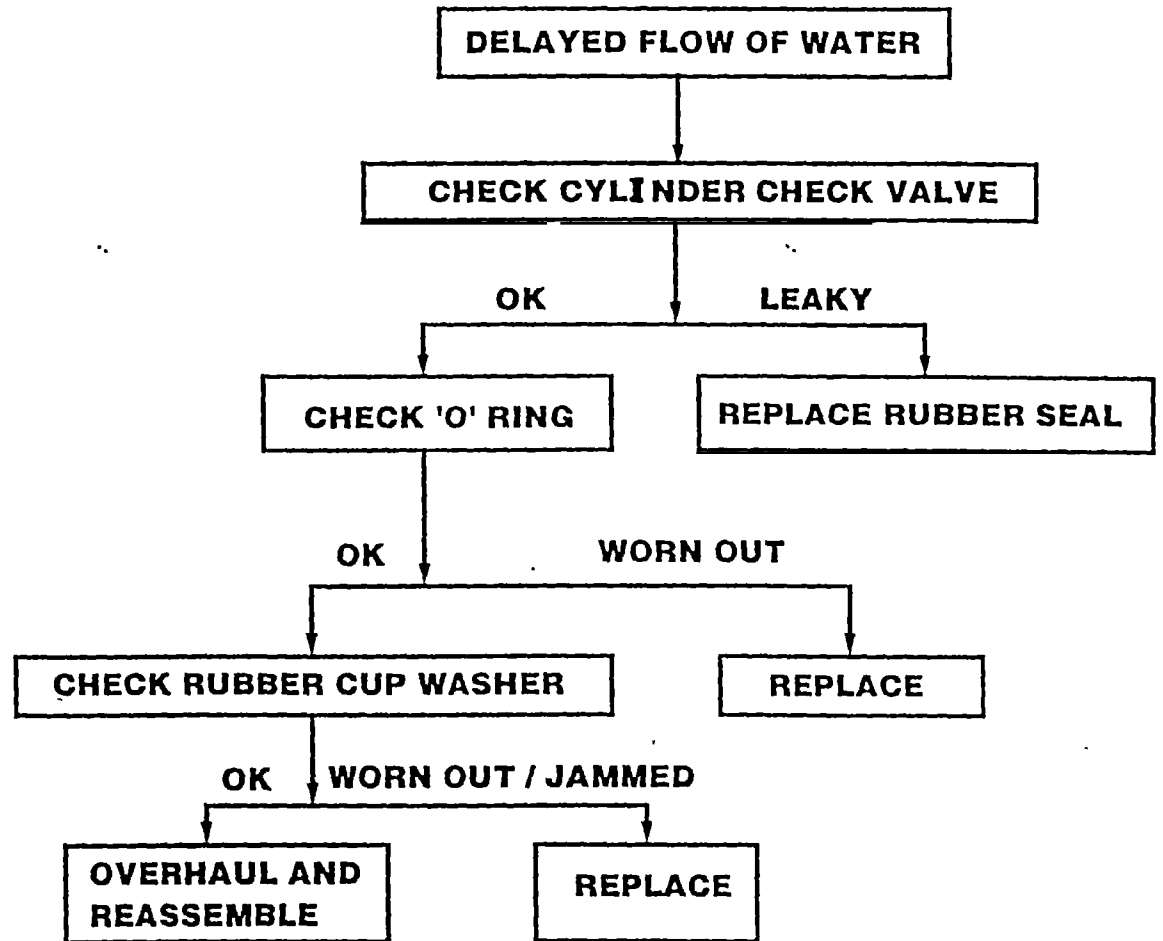
PROBLEM STATMENT NO. 1: HAND PUMP HANDLE SHAKING



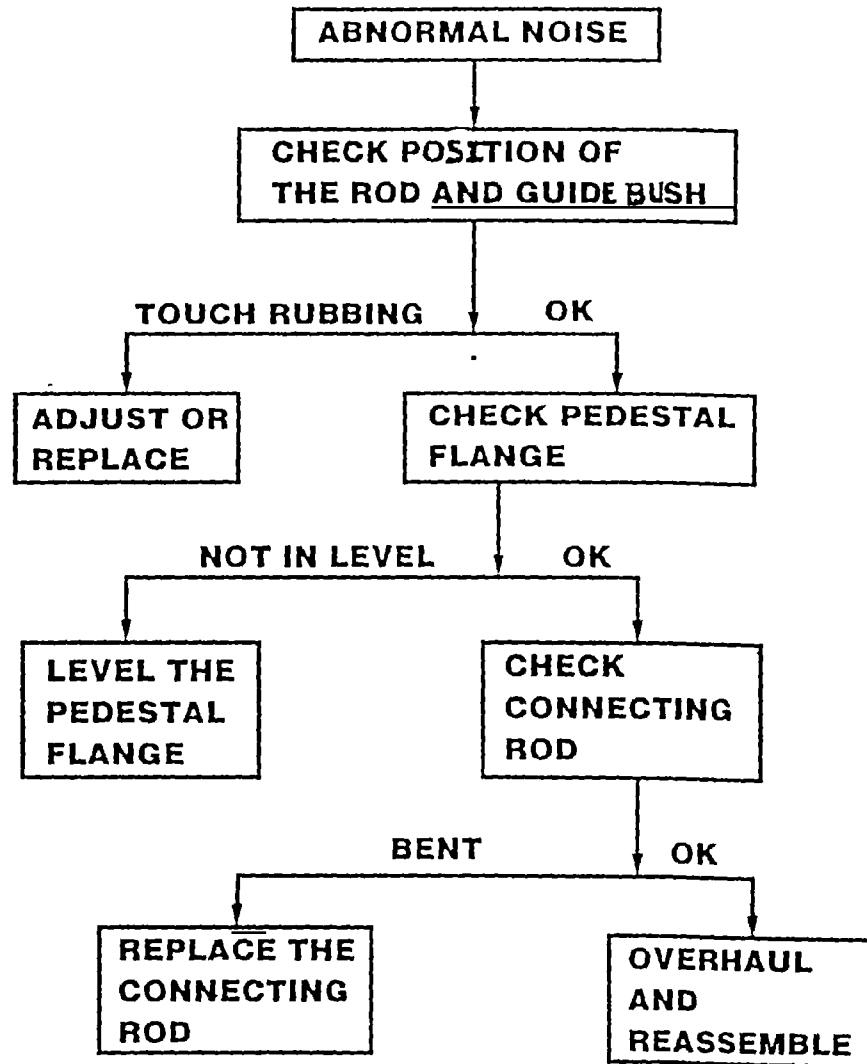
PROBLEM STATEMENT NO. 2 : NO FLOW OF WATER THROUGH THE SPOUT PIPE OF HAND PUMP



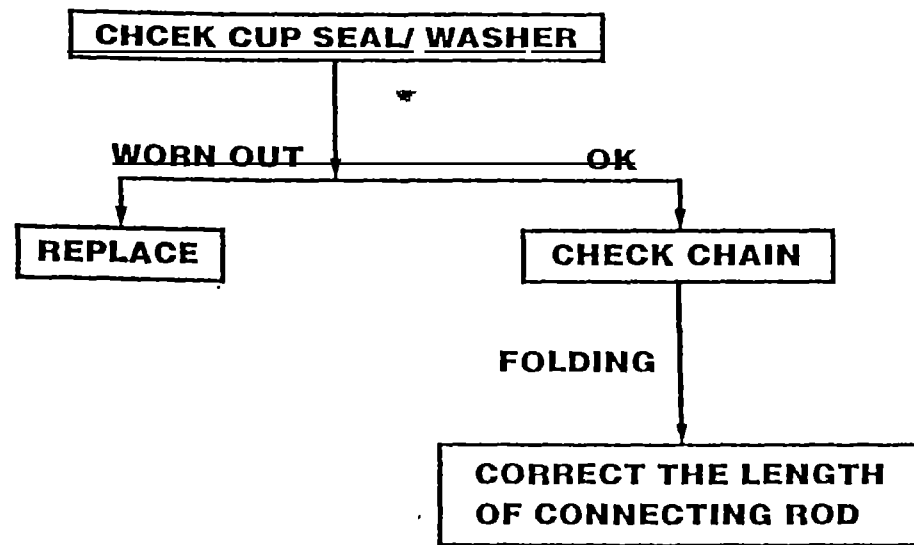
PROBLEM STATEMENT NO.3: DELAYED FLOW OR A LITTLE FLOW OF WATER



PROBLEM STATEMENT NO.4: ABNORMAL NOISE WHILE OPERATING THE HAND PUMP



PROBLEM STATEMENT NO.5: CHAIN FOLDING DURING RETURN STROKE



R E F E R E N C E S

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2. Annons, India Mark III (VLOM) Deep Well Hand Pump Installation and Maintenance Manual, UNICEF, South India Office, Madras, 1991.
3. Annons, Istri Shakti, Maintain Your Own Hand Pump (in Hindi) UNICEF, Lodi Estate, New Delhi.
4. Annons, Training Booklet on Minor Repairs of Hand Pump by Women Pump Mechanic Training, (in Hindi) Public Health Engineering Department, Govt. of Madhya Pradesh, 1992.
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