



# JOB GUIDE



FOR

## MAINTENANCE OF THE INDIA MARK II DEEPWELL HANDPUMP

PREPARED UNDER A JOINT-VENTURE PROJECT OF  
THE WORLD HEALTH ORGANIZATION (WHO) AND  
THE NORWEGIAN AGENCY FOR INTERNATIONAL DEVELOPMENT (NORAD)

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# PREFACE

## JOB GUIDE PROJECT

A NORAD senior officer once said that enough water and sanitation "monuments" have been built around in the world, it was about time people were given more guidance in how to operate and maintain these facilities. This comment stimulated a joint-venture project of the World Health Organization and the Norwegian Agency for International Development (NORAD). The project concentrates on the development of job performance guides which focus on the installation, operation or maintenance of unsophisticated water supply and sanitation equipment in the village setting. Job guides developed under this project are intended to be used by manual workers, craftsmen or technicians. Job guides are certainly not a cure-all, but we believe they can contribute substantially to better operation and maintenance.

## JOB GUIDE AND THE INTENDED USER

This job guide "Maintenance of the INDIA MARK II Deep Well Handpump" has been prepared during a field mission to the Rukwa Region, Tanzania. It is a supplement to already existing installation, operation and maintenance manuals prepared by the Regional Water Engineers (RWE) office and the pump manufacturer.

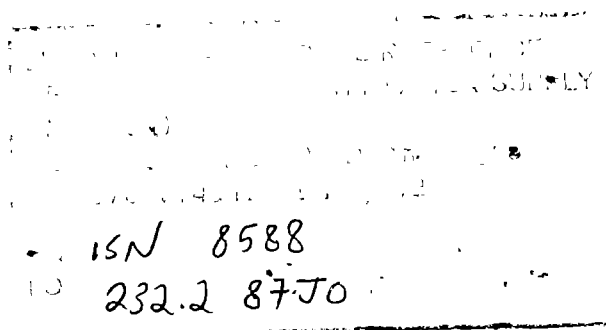
This job guide covers some of the duties and responsibilities for the village caretaker as agreed between the village and the RWE's office. It is intended to be used as an "aide-mémoire" in both the training setting and at the job site. Thus, the guide is intended for the use of the trainers of the village caretakers and the village caretakers themselves.

Operation or maintenance items outside the scope of this job guide are normally responsibilities covered by the RWE Office.

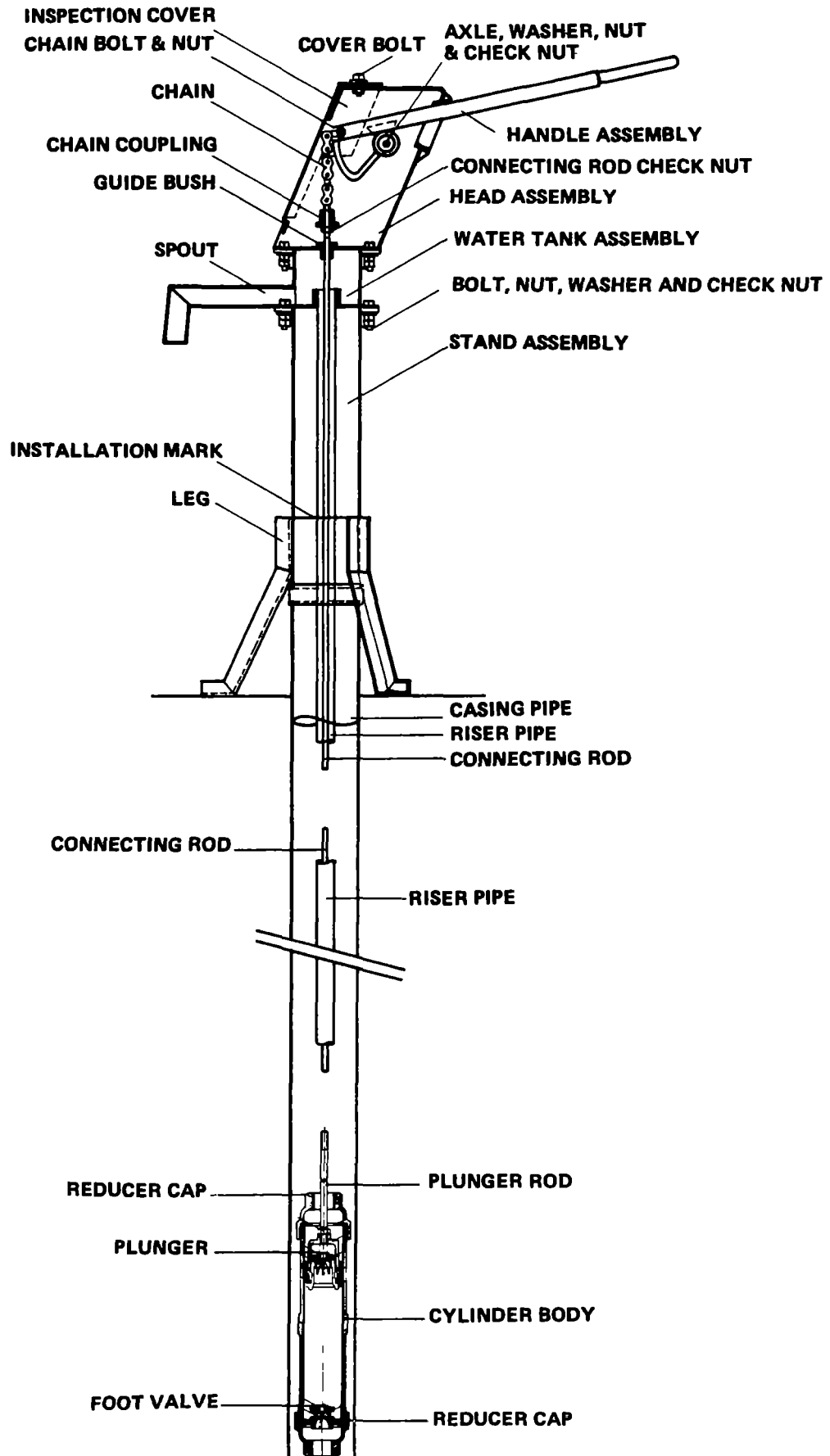
## ACKNOWLEDGEMENTS

The willing cooperation of the following personnel from the RWE's office is gratefully acknowledged: Zacharia Kisanga; Oscar Kameme; Zacharia Ngunda; and Arnfinn Wiken. Without their help this job-guide would not be possible. The patient guidance and coaching of Neil Carefoot (WHO) throughout the development work is also greatly appreciated.

S. Agnar Gundersen  
Associate Professional Officer  
World Health Organization



# SECTION VIEW OF INDIA MARK II DEEPWELL HANDPUMP



# TOOLS AND SUPPLIES FOR THE VILLAGE CARETAKER

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LIFTING SPANNERS



LIFTER PIPE



CRANK SPANNERS 17x19mm



CONNECTING ROD VICE



CONNECTING ROD LIFTER (TEE-LIFTER)



AXLE PUNCH



HEAVY DUTY CLAMP



PIPE WRENCH 93mm

SMALL PIPE WRENCH 91mm



OPEN ENDED SPANNER 17x18mm

OPEN ENDED SPANNER 18x19mm



GARAGE SCREW DRIVER



WIRE BRUSH



PUMP CYLINDER (COMPLETE SET)



OIL CAN



CHAIN COUPLER SUPPORTING TOOL



HAMMER



HEMP

GREASE

# MAINTENANCE SCHEDULES: WEEKLY & MONTHLY

4

## ONCE EVERY WEEK :

TOOLS AND SUPPLIES REQUIRED - ONE BUCKET

### 1. COUNT NUMBER OF STROKES TO FILL THE BUCKET WITH WATER:

- IF NO WATER
- IF MORE THAN 45 STROKES ARE NEEDED TO FILL BUCKETS
- IF 15 OR MORE STROKES ARE NEEDED BEFORE WATER STARTS TO FLOW
- IF THE HANDLE IS LOOSE
- IF THERE IS MUCH RESISTANCE IN HANDLE

FOLLOW  
TROUBLE-  
SHOOTING  
GUIDE

## ONCE EVERY MONTH :

TOOLS AND SUPPLIES REQUIRED

- ONE CRANK SPANNER
- WIRE BRUSH
- GREASE

### 1. LUBRICATE CHAIN - SEE PAGE 8

- 1.1 REMOVE INSPECTION COVER
- 1.2 CLEAN CHAIN
- 1.3 APPLY GREASE TO CHAIN
- 1.4 REFIT INSPECTION COVER

### 2. CHECK THAT ALL 8 FLANGE BOLTS ARE PRESENT AND TIGHT

- IF LOOSE: TIGHTEN WITH CRANK SPANNERS
- IF MISSING: REPLACE WITH NEW BOLTS PROVIDED BY MAJI

# MAINTENANCE RECORD SHEET (SAMPLE)

VILLAGE \_\_\_\_\_

MONTH \_\_\_\_\_ 5

CARETAKER \_\_\_\_\_

## WEEKLY

NUMBERS OF STROKES TO FILL THE BUCKET:

PUMP No.

WEEK 1

WEEK 2

WEEK 3

WEEK 4


FILL IN DATA WHEN ANY OF THE FOLLOWING PROBLEMS APPEAR:

NO WATER

MORE THAN 45 STROKES ARE NEEDED TO FILL BUCKET

15 OR MORE STROKES ARE NEEDED BEFORE WATER FLOWS

THE HANDLE IS LOOSE

MUCH RESISTANCE IN HANDLE


## MONTHLY

CARRIED OUT CLEANING AND GREASING

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NUMBER OF BOLTS

- LOOSE

- MISSING


DATE \_\_\_\_\_

SIGNATURE \_\_\_\_\_

# TROUBLE SHOOTING GUIDE

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PROBLEM	POSSIBLE CAUSE	REMEDY	REF .
NO WATER (LITTLE RESISTANCE IN HANDLE)	CHAIN DISCONNECTED	REMOVE INSPECTION COVER REFIT CHAIN	
	CONNECTING ROD DISCONNECTED	DISASSEMBLE PUMP - <u>FOLLOW JOB GUIDE</u> - UNTIL DISCONNECTED ROD APPEARS	P 8
	VALVE GUIDE OR PISTON DISCONNECTED	DISASSEMBLE PUMP - <u>FOLLOW JOB GUIDE</u> - EXCHANGE OLD PUMP CYLINDER WITH NEW PROVIDED BY MAJI DISTRICT OFFICE	P 8
	LEATHER CUP WORN OUT	DISASSEMBLE PUMP - <u>FOLLOW JOB GUIDE</u> - EXCHANGE OLD PUMP CYLINDER WITH NEW PROVIDED BY MAJI DISTRICT OFFICE	P 8
DISCHARGES LESS THAN ONE FULL BUCKET OF WATER ON 45 STROKES	LEAKAGE IN FOOT VALVE	DISASSEMBLE PUMP - <u>FOLLOW JOB GUIDE</u> - REMOVE OLD CYLINDER CLEAN FOOT VALVE TEST FOOT VALVE BY FILLING CYLINDER WITH WATER <u>IF WATER REMAINS IN CYLINDER THEN:</u>  FIT CYLINDER TO RISING MAIN. REINSTALL PUMP.	P 8



# TROUBLE SHOOTING GUIDE CONTINUED

PROBLEM	POSSIBLE CAUSE	REMEDY	REF .	
<p>15 STROKES OR MORE ARE NEEDED BEFORE WATER FLOWS (CONTINUED)</p>	<p>LEAKAGE IN RISING MAIN PIPE SOCKETS</p>	<p><u>IF WATER LEAKS:</u> EXCHANGE OLD CYLINDER WITH OVERHAULED CYLINDER PROVIDED BY MAJI DISTRICT OFFICE</p> <p>DISASSEMBLE PUMP</p> <ul style="list-style-type: none"> <li>- <u>FOLLOW JOB GUIDE</u> -</li> </ul> <p>DISCONNECT RISING MAIN UNTIL LEAKAGING APPEARS: WATER VISIBLE IN RISING MAIN BELOW LEAKING SOCKET</p> <ul style="list-style-type: none"> <li>- REINSTALL PUMP</li> <li>- PACK EACH JOINT PROPERLY</li> </ul> <p><u>FOLLOW JOB GUIDE ON HEMPING</u></p>	<p>P 8</p>	
	<p>LEAKAGE IN REDUCER CAP</p>	<p>DISASSEMBLE PUMP</p> <ul style="list-style-type: none"> <li>- <u>FOLLOW JOB GUIDE</u> -</li> <li>- REMOVE REDUCER</li> <li>- CLEAN THREADS</li> <li>- PACK THREADS</li> <li>- REFIT REDUCER</li> <li>- REINSTALL CYLINDER</li> </ul>	<p>P 8</p>	
	<p>LOOSE HANDLE</p>	<p>HANDLE AXLE LOOSE</p>	<p>TIGHTEN BOLT FOR HANDLE</p>	
	<p>RESISTANCE IN HANDLE</p>	<p>HANDLE AXLE DRIED OUT</p>	<p>DISASSEMBLE AXLE HANDLE</p> <ul style="list-style-type: none"> <li>- APPLY GREASE ON AXLE</li> <li>- REINSTALL HANDLE AXLE</li> </ul>	<p>P 19</p>
	<p>EXPANSION IN LEATHER CUPS</p>	<p>DISASSEMBLE PUMP</p> <ul style="list-style-type: none"> <li>- <u>FOLLOW JOB GUIDE</u> -</li> <li>- EXCHANGE OLD PUMP CYLINDER</li> <li>- WITH NEW PROVIDED BY MAJI DISTRICT OFFICE</li> </ul>	<p>P 8</p>	

# MAINTENANCE OF THE PUMP: DISASSEMBLY

8

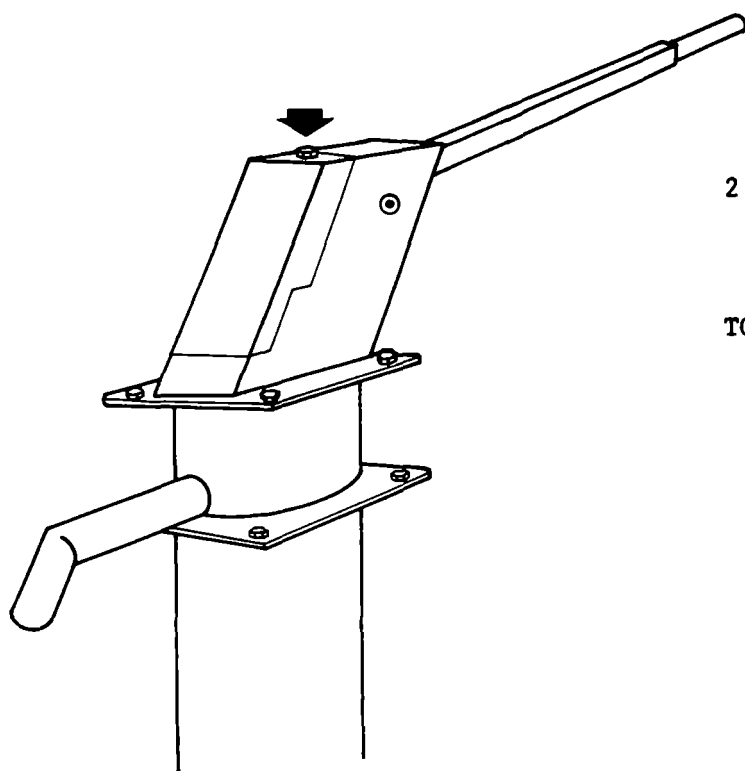
## 1. PREPARE FOR DISASSEMBLING OF "INDIA MARK II" HANDPUMP

1.1 CHECK NEEDED TOOLS, HEMP, AND SPARE SOCKETS

1.2 CLEAN AREA AROUND PUMP STAND

1.3 FILL 4 TO 6 BUCKETS OF WATER BEFORE DISASSEMBLING  
FOR CLEANING OF RISING MAIN, CONNECTING RODS, ETC.

## 2. REMOVE INSPECTION COVER



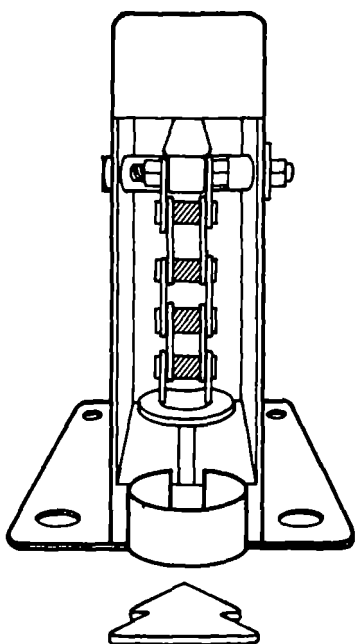
2.1 UNSCREW BOLT INDICATED BY  
THE ARROW


TOOL: 

# MAINTENANCE OF THE PUMP: DISASSEMBLY

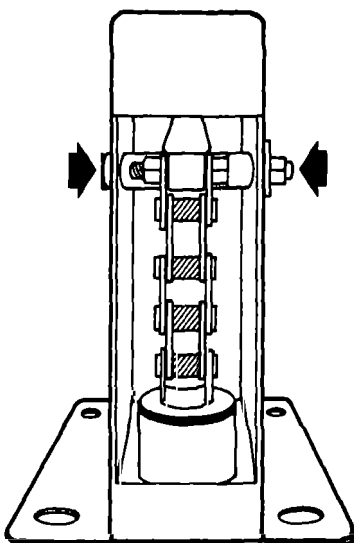
9

## 3. INSERT CHAIN COUPLER SUPPORTING TOOL



TOOL: 

## 4. REMOVE NYLOC NUT AND BOLT



- 4.1 LIFT HANDLE IN TOP POSITION
- 4.2 UNSCREW BOLT AND NUT INDICATED BY ARROWS

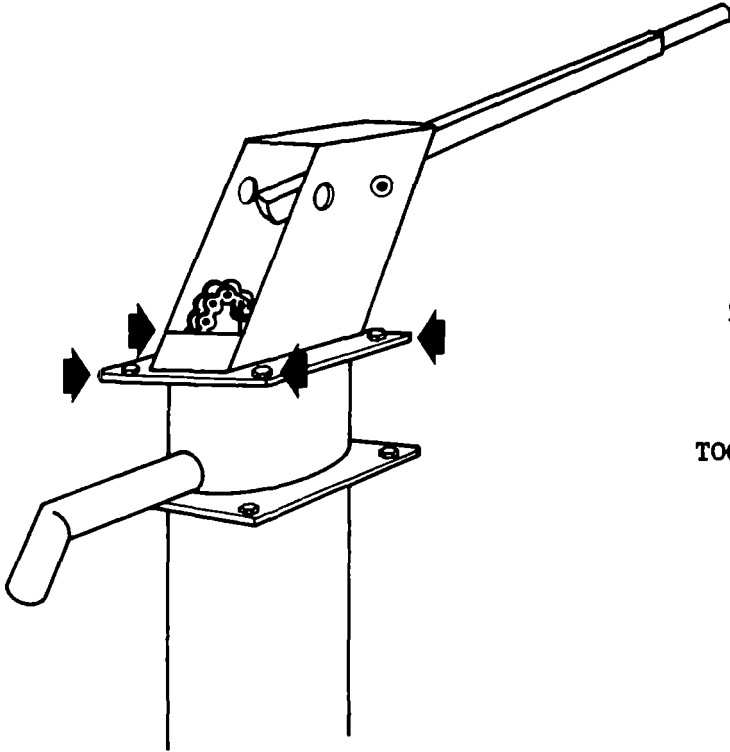
TOOLS:



# MAINTENANCE OF THE PUMP: DISASSEMBLY

10

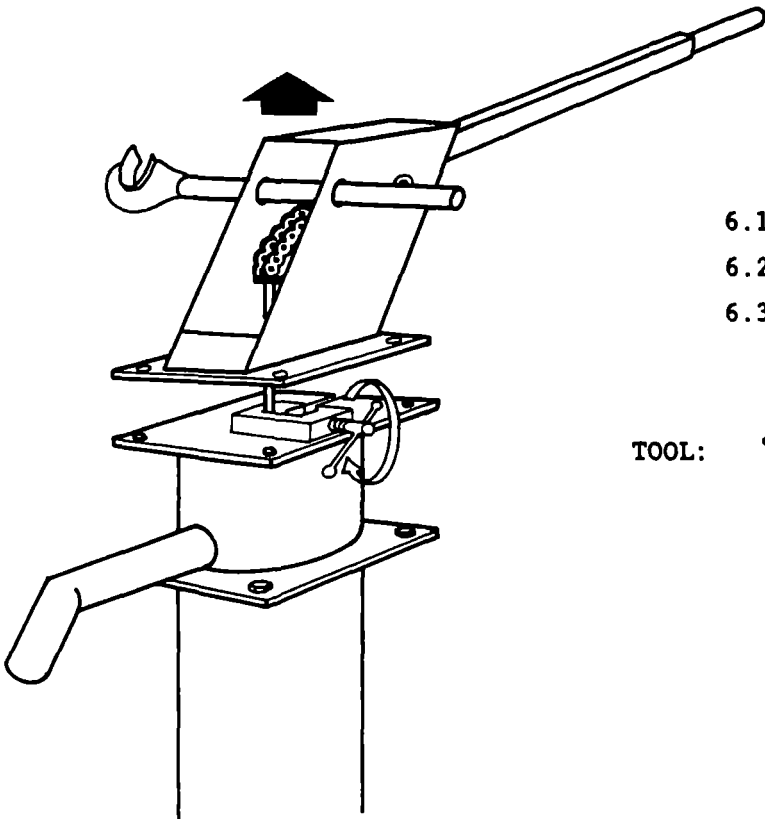
## 5. REMOVE FLANGE BOLTS FROM HEAD ASSEMBLY



5.1 UNSCREW BOLTS INDICATED BY THE ARROWS

TOOLS: 

## 6. FIT CONNECTING ROD VICE



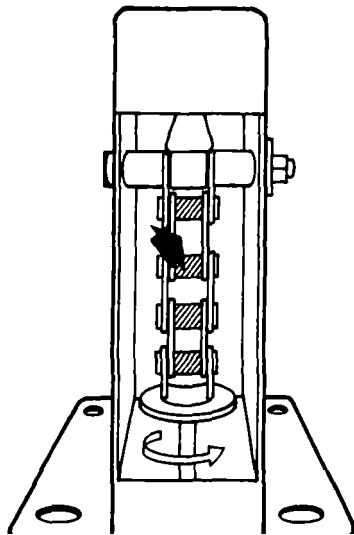
6.1 INSERT LIFTING SPANNER  
6.2 LIFT HEAD ASSEMBLY  
6.3 TIGHT VICE FIRMLY

TOOL: 

# MAINTENANCE OF THE PUMP: DISASSEMBLY

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## 7. REMOVE CHAIN FROM CONNECTING ROD

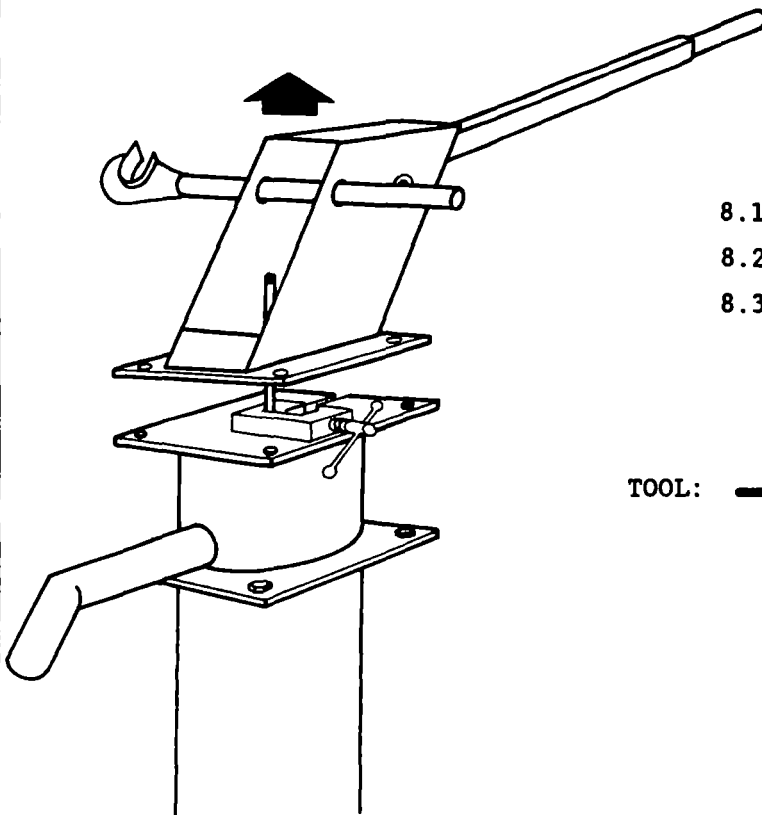


7.1 INSERT SCREWDRIVER INDICATED BY THE ARROW

7.2 TURN IN  DIRECTION

TOOL: 

## 8. REMOVE HEAD ASSEMBLY



8.1 INSERT LIFTING SPANNER

8.2 LIFT HEAD ASSEMBLY

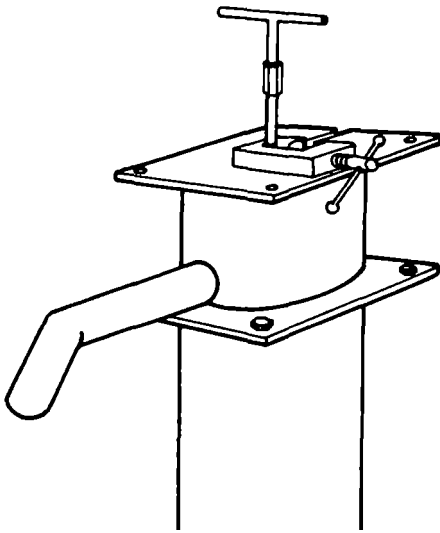
8.3 PLACE HEAD ASSEMBLY 5-6 METRES FROM PUMP

TOOL: 

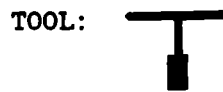
# MAINTENANCE OF THE PUMP: DISASSEMBLY

12

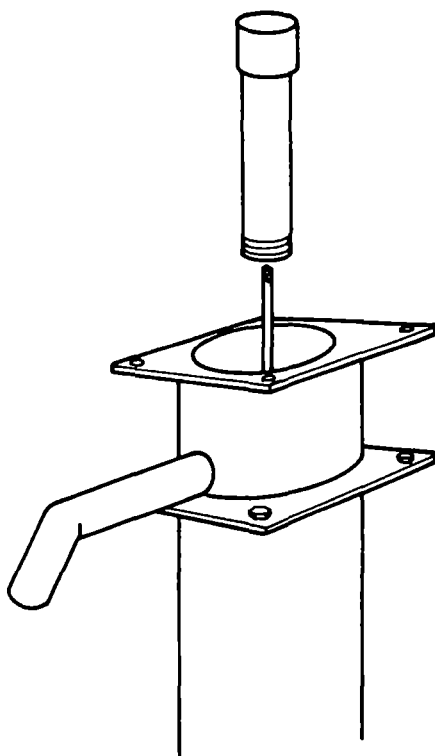
## 9. FIT CONNECTING ROD LIFTER



- 9.1 SUPPORT ROD
- 9.2 RELEASE VICE AND LOWER ROD CAREFULLY
- 9.3 REMOVE CONNECTING ROD VICE



## 10. FIT PIPE LIFTER TO WATER TANK



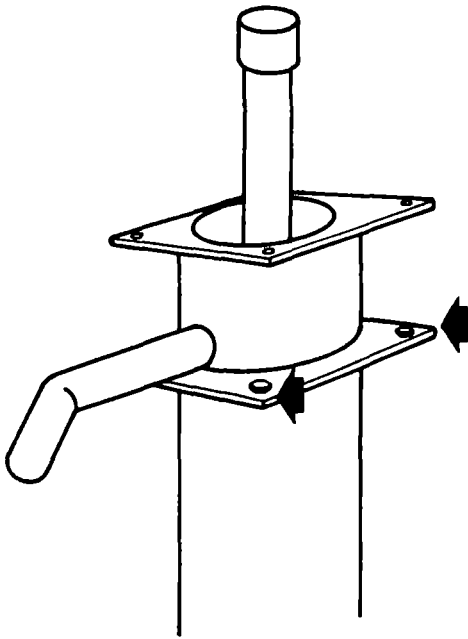
- 10.1 REMOVE CONNECTING ROD LIFTER
- 10.2 FIT PIPE LIFTER FIRMLY



# MAINTENANCE OF THE PUMP: DISASSEMBLY

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## 11. REMOVE WATER TANK FLANGE BOLTS

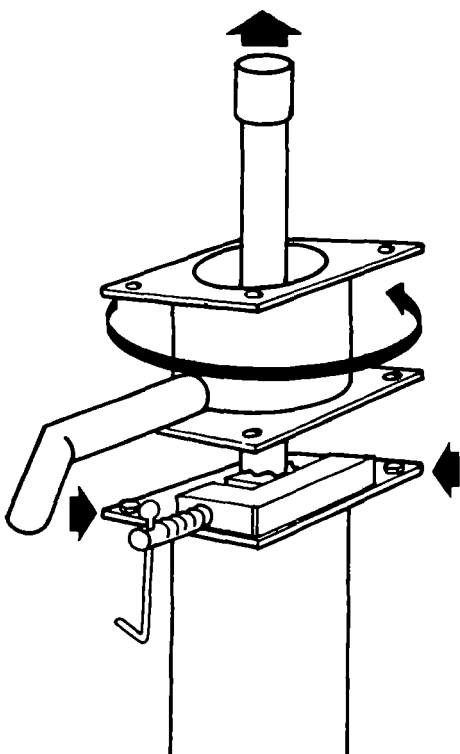


11.1 UNSCREW THE 4 BOLTS ON WATER TANK FLANGE

TOOLS:



## 12. FIT HEAVY DUTY CLAMP\*



12.1 LIFT WATER TANK WITH LIFTING SPANNERS

12.2 TIGHTEN CLAMP FIRMLY

12.3 FIT TWO BOLTS FOR CLAMP AS SHOWN BY ARROWS

12.4 REMOVE WATER TANK BY UNSCREWING COUNTERCLOCKWISE (AS SHOWN BY ARROW)

TOOLS:

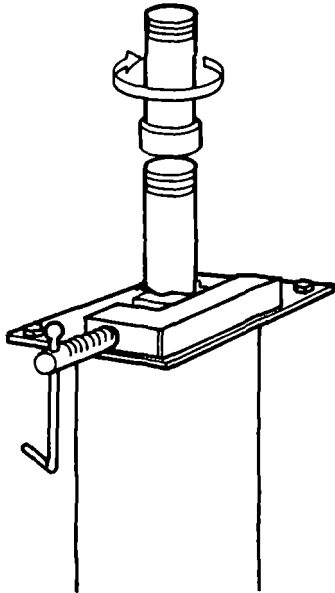


\* CAUTION: IF THE CLAMP IS NOT FIRMLY TIGHTENED, THE VISING MAIN MAY SLIP, FALL TO THE BOTTOM OF THE WELL AND BE SEVERELY DAMAGED OR PERMANENTLY LOST.

# MAINTENANCE OF THE PUMP: DISASSEMBLY

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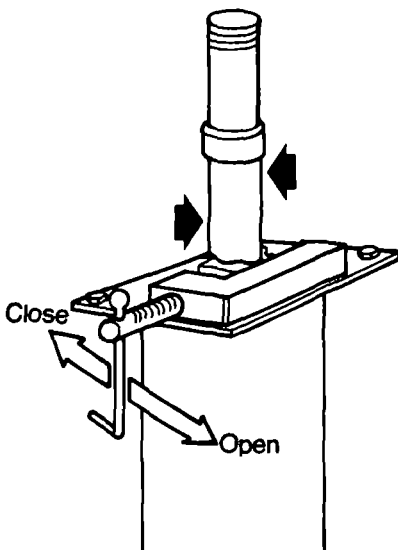
## 13. FIT PIPE LIFTER TO RISING MAIN



13.1 TIGHTEN FIRMLY

TOOLS: 

## 14. LIFT RISING MAIN



14.1 SUPPORT RISING MAIN WITH LIFTING SPANNERS

14.2 RELEASE HEAVY DUTY CLAMP CAREFULLY

14.3 LIFT RISING MAIN\*

14.4 TIGHTEN HEAVY DUTY CLAMP FIRMLY

14.5 REPEAT UNTIL NEXT SOCKET APPEARS

TOOLS: 

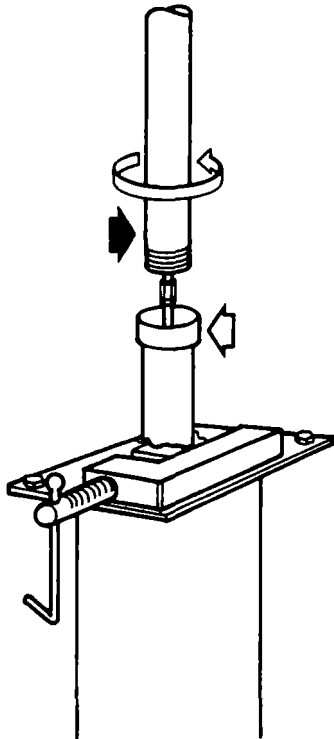
\* THE WEIGHT OF THE RISING MAIN WILL DETERMINE THE HEIGHT OF THE LIFT



# MAINTENANCE OF THE PUMP: DISASSEMBLY

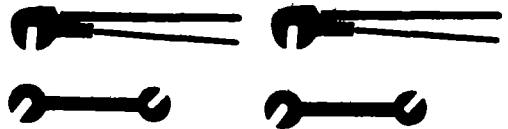
15

## 15. DISCONNECT RISING MAIN AND CONNECTING RODS

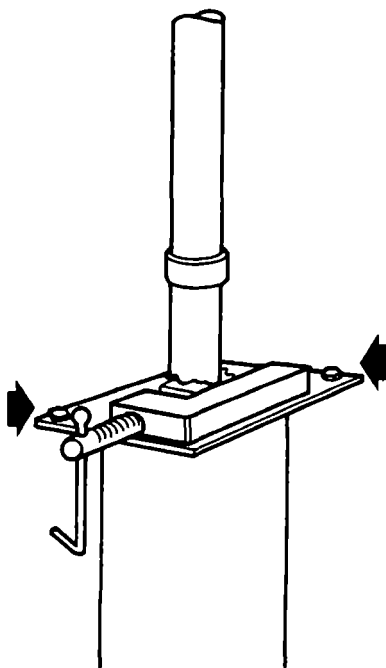


- 15.1 SUPPORT SOCKET (INDICATED BY WHITE ARROW) WITH PIPE SPANNER
- 15.2 TURN PIPE (INDICATED BY BLACK ARROW) WITH ANOTHER PIPE SPANNER COUNTERCLOCKWISE
- 15.3 LIFT PIPE UNTIL ROD CONNECTION APPEARS
- 15.4 SUPPORT CHECK NUT WITH OPEN ENDED SPANNER
- 15.5 TURN CONNECTION WITH ANOTHER OPEN ENDED SPANNER
- 15.6 REMOVE PIPE AND CONNECTING ROD
- 15.7 REPEAT UNTIL CYLINDER APPEARS

TOOLS:



## 16. REMOVE HEAVY DUTY CLAMP



- 16.1 TIGHTEN CLAMP FIRMLY ON LAST PIPE
- 16.2 REMOVE BOLTS FROM CLAMP INDICATED BY THE ARROWS
- 16.3 REMOVE CLAMP WITH PIPE AND CYLINDER
- 16.4 RELEASE CLAMP
- 16.5 DISCONNECT CYLINDER

TOOLS:



# MAINTENANCE OF THE PUMP: PREPARATION OF RISING MAIN PIPES & CONNECTING RODS

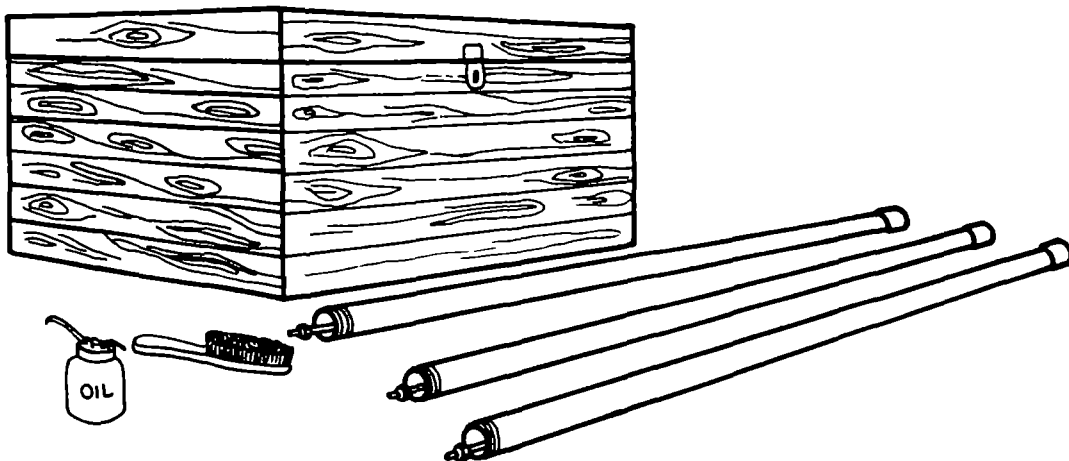
16

## 1. PREPARATION OF RISING MAIN PIPES & CONNECTING RODS FOR ASSEMBLY

TOOLS REQUIRED: - WIRE BRUSH  
- OIL CAN  
- HEMP



## 2. ARRANGE PIPES, TOOLS AND TOOL BOX



# MAINTENANCE OF THE PUMP: PREPARATION OF RISING MAIN PIPES & CONNECTING RODS

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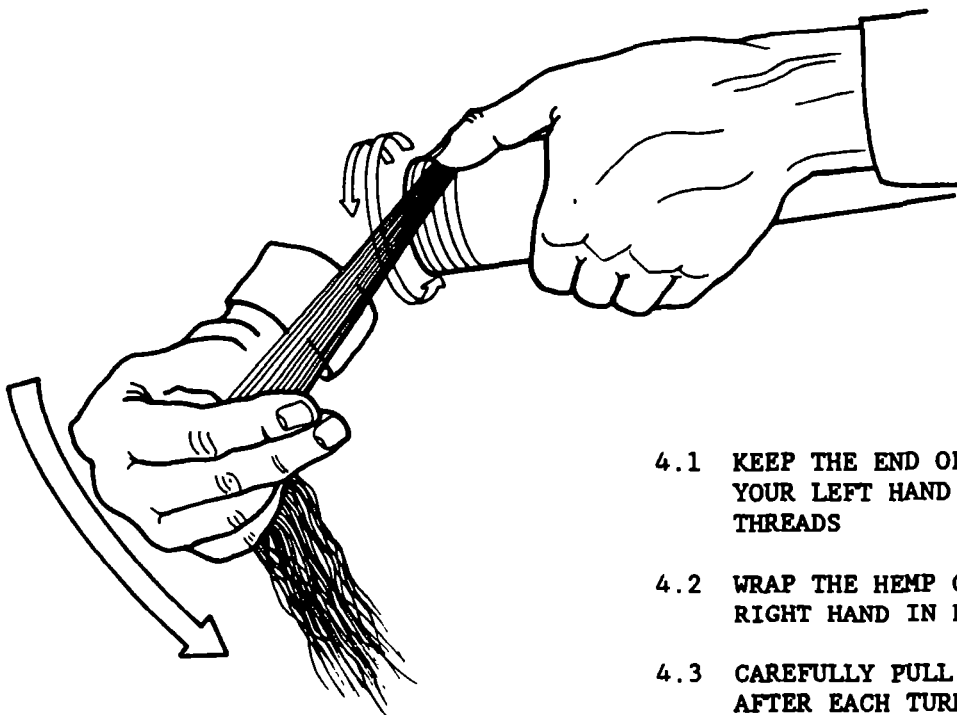
## 3. SUPPORT PIPE ACROSS YOUR LEGS



3.1 CLEAN THREADS WITH WIRE BRUSH

3.2 KEEP LONG END OF PIPE TO YOUR LEFT SIDE

## 4. APPLY HEMP ON THREADS



4.1 KEEP THE END OF THE HEMP BETWEEN YOUR LEFT HAND THUMB AND THE PIPE THREADS

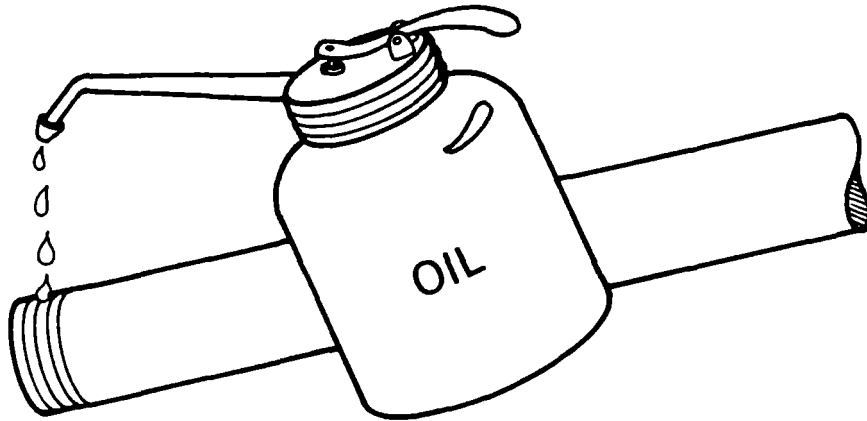
4.2 WRAP THE HEMP CAREFULLY WITH YOUR RIGHT HAND IN DIRECTION OF ARROWS

4.3 CAREFULLY PULL THE HEMP TIGHT AFTER EACH TURN

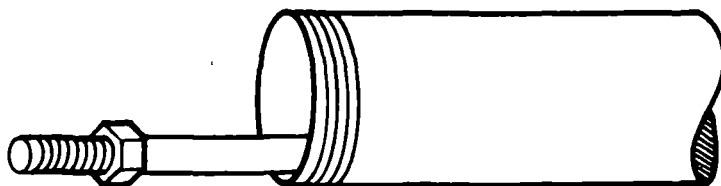
# MAINTENANCE OF THE PUMP: PREPARATION OF RISING MAIN PIPES & CONNECTING RODS

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5. APPLY 4-5 DROPS OIL ON HEMP



6. TURN CHECK NUT ON CONNECTING ROD TO THE END OF THREADS



# MAINTENANCE OF THE PUMP: REMOVAL OF THE PUMP HANDLE

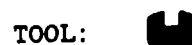
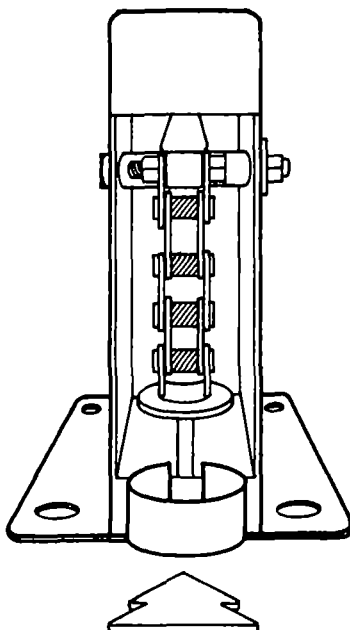
19

## 1. REMOVE INSPECTION COVER

1.1 UNSCREW BOLT AS INDICATED BY  
THE ARROW



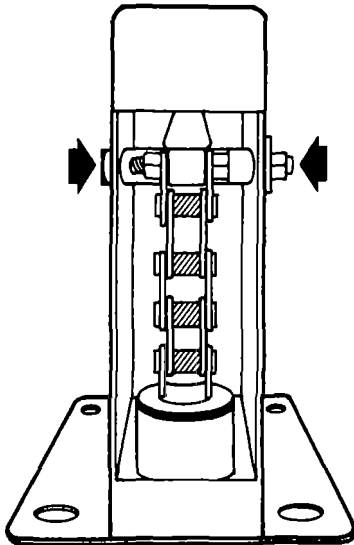
## 2. INSERT CHAIN COUPLER SUPPORTING TOOL



# MAINTENANCE OF THE PUMP: REMOVAL OF THE PUMP HANDLE

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## 3. REMOVE NYLOC NUT AND BOLT



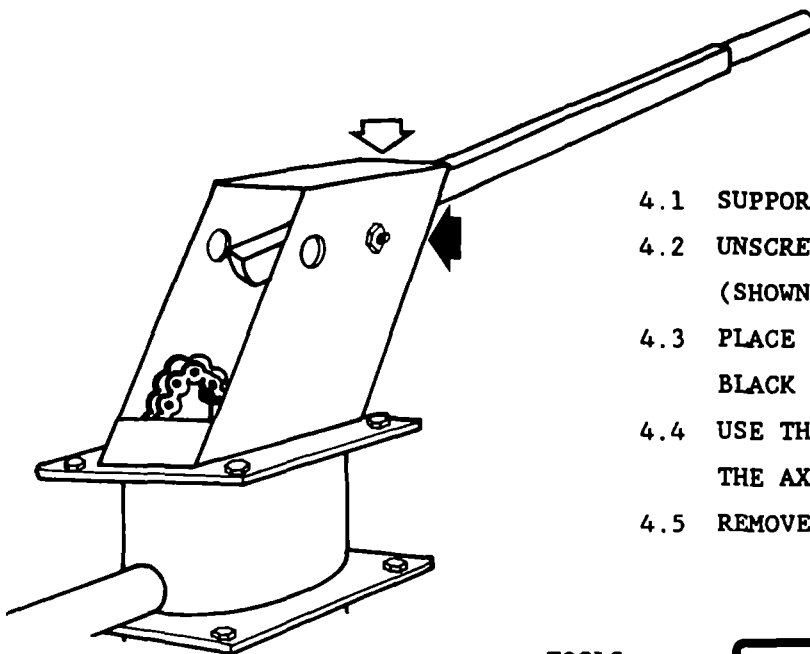
3.1 LIFT HANDLE IN TOP POSITION

3.2 UNSCREW BOLT AND NUT INDICATED  
BY THE ARROWS

TOOLS:



## 4. REMOVE AXLE BOLT



4.1 SUPPORT HANDLE

4.2 UNSCREW WASHER NUT AND CHECK NUT  
(SHOWN BY WHITE ARROW)

4.3 PLACE AXLE PUNCH ON BOLT (SHOWN BY  
BLACK ARROW)

4.4 USE THE HAMMER CAREFULLY TO REMOVE  
THE AXLE BOLT

4.5 REMOVE THE HANDLE

TOOLS:

