

CIVIL DEFENCE ORGANISATION  
SOUTH AUSTRALIA

HAULING AND LIFTING EQUIPMENT

TIRFOR

The object of this precis is to introduce the 'TIRFOR'.

- (a) With the vast areas of damage which we could be confronted with in the event of a nuclear disaster, it is essential for rescue parties to be equipped with a portable, versatile and adaptable machine.
- (b) The Tirfor has these attributes and by virtue of its lightness can be carried forward from the rescue vehicle over debris without seriously impairing the men's efficiency for their life saving task.
- (c) The appliance consists of a machine or casing through which passes a long steel cable which is attached to the load to be hauled or lifted. The operation of a lever handle backwards and forwards pulls the cable through the machine, which, if properly anchored, causes the load to be hauled towards the machine.

The equipment consists of:-

- (a) A pulling and lifting unit complete with a swivel hook to enable it to be secured.
- (b) A detachable telescopic tubular steel handle for operating the unit.
- (c) A length of flexible steel wire rope 60 feet long, 7/16 in. diameter, fitted with a hook at one end, the other end being tapered and fused. This rope is coiled onto a reeler for convenience in carriage.

The machine unit consists of a steel casing enclosing two pairs of automatic jaws which grip the cable passing through the casing. These two pairs of jaws are moved in opposite directions by means of linkage when the handle is operated backwards and forwards.

FORWARD AND LIFTING MOVEMENT

When the handle is put on the lever at the side of the casing and is moved towards the hook, the pair of jaws fixed to the crank shaft move in the same direction, gripping the cable and carrying it forward. Simultaneously the other pair of jaws, actuated by connecting rods fitted on the same crank shaft, moves away from the hook, sliding along the cable.

When the handle is moved in the opposite direction, the pair of jaws fixed to the crank shaft moves away from the hook, sliding along the cable, while the other pair of jaws moves forward in its turn gripping and carrying the cable in the same direction as before and pushing it through the first pair of jaws in which it slides, and so on. The alternating operation of the handle results in a hauling or lifting movement of the cable of about 2 3/4 inches for each complete forward and backward stroke of the lever, which with normal operation on a light load results in travel of about 11 feet 6 inches per minute.

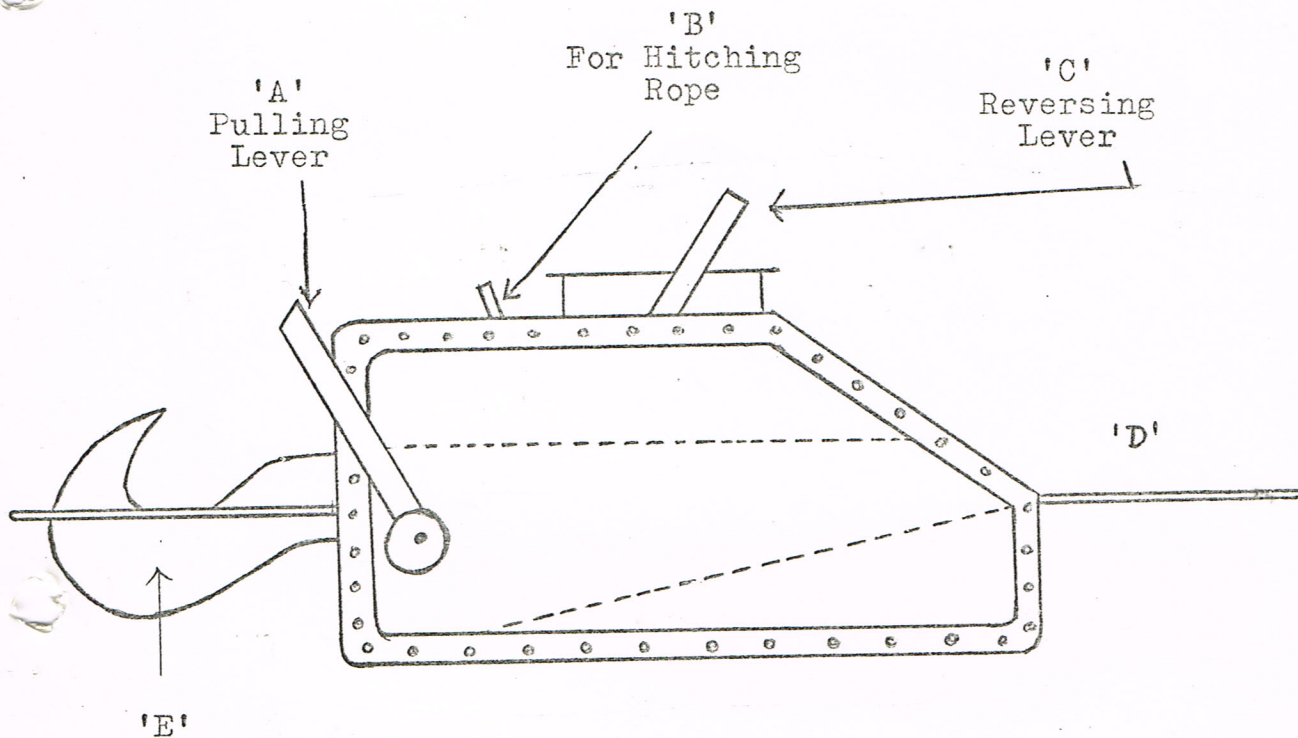


This unit provides a mechanical advantage of 1.43. Its size is 24 ins. x 12 in. x 6 in. wide and it weighs 39 lbs. Its S.W.L. (safe working load) capacity is: pulling up to 30 cwts., lifting up to 20 cwts.

#### REVERSE OF LOWERING MOVEMENT

By transferring the operating handle to the lever on the top of the casing, a reversing action is obtained. This passes the cable through the machine in the opposite direction and enables the load to be lowered. The cable is under constant tension while the load is on it and does not jerk or slip during the lowering. Any jerky movement will be due to lack of lubrication, a fault which should be rectified immediately.

The following operating instructions are those issued by the manufacturers of the machine:



- (1) Pull lever 'B' firmly towards hook on machine, until it is seated in the notch.
- (2) Push the rope into the machine at 'D' until it protrudes through the hole in hook at 'E'.
- (3) Pull the rope through the machine until the desired length is reached.
- (4) Place lever 'B' back into the operating position - this is done by lifting the lever out of the notch and allowing the spring inside the machine to carry it into its operating position.
- (5) The rope is now firmly gripped in the jaws of the machine. To pull the rope through a machine, place telescopic operating handle on lever 'A' and move it along the direction of the rope. The rope moves through the machine on both forward and backward strokes of the lever.



- (6) To reverse rope through the machine, remove the telescopic handle from 'A' and place it on lever 'C' and move it again in the direction of the rope. The rope is paid backwards through the machine on both strokes of the lever.
- (7) To remove rope, pull lever 'B' towards hook as in (1) and pull rope through the machine.
- (8) If the operator cannot move the load with the telescopic operating handle fully extended, the load is too great for the machine, and the snatch block supplied should be used to increase the machine's power.
- (9) Always use slings of sufficient strength to withstand the load.
- (10) Keep the wire rope wound onto the reller when not in use.
- (11) Never allow any kinks in the rope to enter the machine as this causes internal damage.
- (12) Only use the wire rope supplied with the machine.
- (13) Do not leave the rope release lever 'B' in its release position when the machine is not in use as this will shorten the life of the springs.
- (14) Never operate 'C' and 'A' at the same time as this will cause internal strain.
- (15) Never anchor the machine by the tip of the hook, always use a sling.

#### LUBRICATION

- (a) Heavy gear oil should be poured into the slot at the top of the machine. The machine should then be shaken to allow the oil to reach all working parts, the surplus oil being drained off through the rope holes.
- (b) Oil regularly through the oil holes which are situated on both sides of the lever shaft 'A'.

#### MAINTENANCE

- (a) Before using the machine:
  - (i) Check wire rope to see that it is free of kinks and broken wires. Never use a damaged rope as this jams inside the machine.
  - (ii) Put rope in machine and move it to and fro with levers 'A' and 'B': this movement should be easy and free from jerks.
  - (iii) Make sure that the machine is lubricated correctly.
- (b) When using the machine:
  - (i) Should the machine become filled with dirt or dust from the debris it must be immersed in a bath of kerosene and shaken well. This operation must be repeated until the dirt or debris dust is removed. The machine must be well lubricated before use.
  - (ii) Should the machine become jammed with small pieces of dirt or debris dust, the casing bolts must be removed and one half of the casing should be lifted off. The dirt or debris can be scraped out of the

machine. When the casing is replaced ensure that the cross bar on the spring tubes always fits properly into the slots on both casings. This can be done by looping a piece of wire round the bar and holding it in position until the bolts are fitted. Ensure that the hook and rope entry guide are fitted. Make sure that all nuts and bolts are replaced and properly tightened.

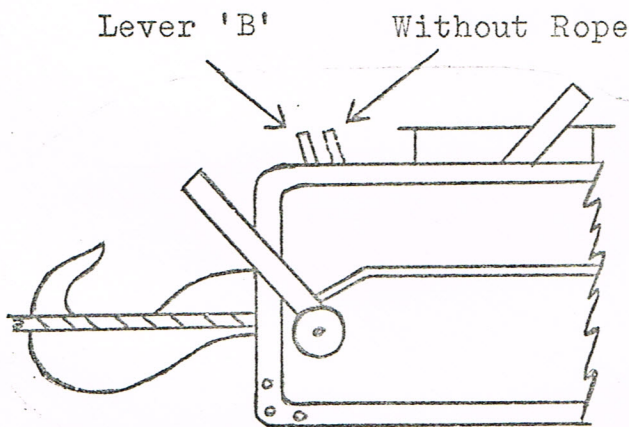
- (iii) Should the motion become jerky when lowering, this is due to lack of lubrication and the machine should be oiled immediately.

(c) After using the machine:

The wire rope must be coiled back onto the rope reeler.

(d) Examinations at monthly intervals:

- (i) Check for wear or misuse.
- (ii) Make sure that the rope hook is properly fastened on the rope.
- (iii) Measure distance 'X' on the rope hoop and anchoring hook; if it is more than  $2\frac{3}{4}$  in. the hook has been strained and should be replaced.



- (iv) Make sure that the nuts and bolts on the casing are fitted and properly tightened.

(e) Monthly check on wear of machine jaws:

- (i) Remove wire rope from the machine and let the release lever 'B' return to its normal position.
- (ii) Mark this position on the casing.
- (iii) Pull lever 'B' forward into its groove, and feed rope into the machine.
- (iv) Return lever 'B' to its normal position with the rope in the machine, as through the machine was about to be used.
- (v) Mark the new position of lever 'B' on the casing.



- (vi) There will now be two marks on the casing. The distance between these should never be less than  $\frac{1}{2}$  in. if less it is a sign of excessive wear on the jaws and these should be replaced.

#### OPERATIONAL USES:

As a device for lifting and hauling, the machine has innumerable uses and applications. Being light and compact it can be attached to any convenient holdfast or hung from overhead beams or girders, slung from or attached to derricks or sheer legs, and even attached to the load itself, if the cable end is anchored to an immovable object.

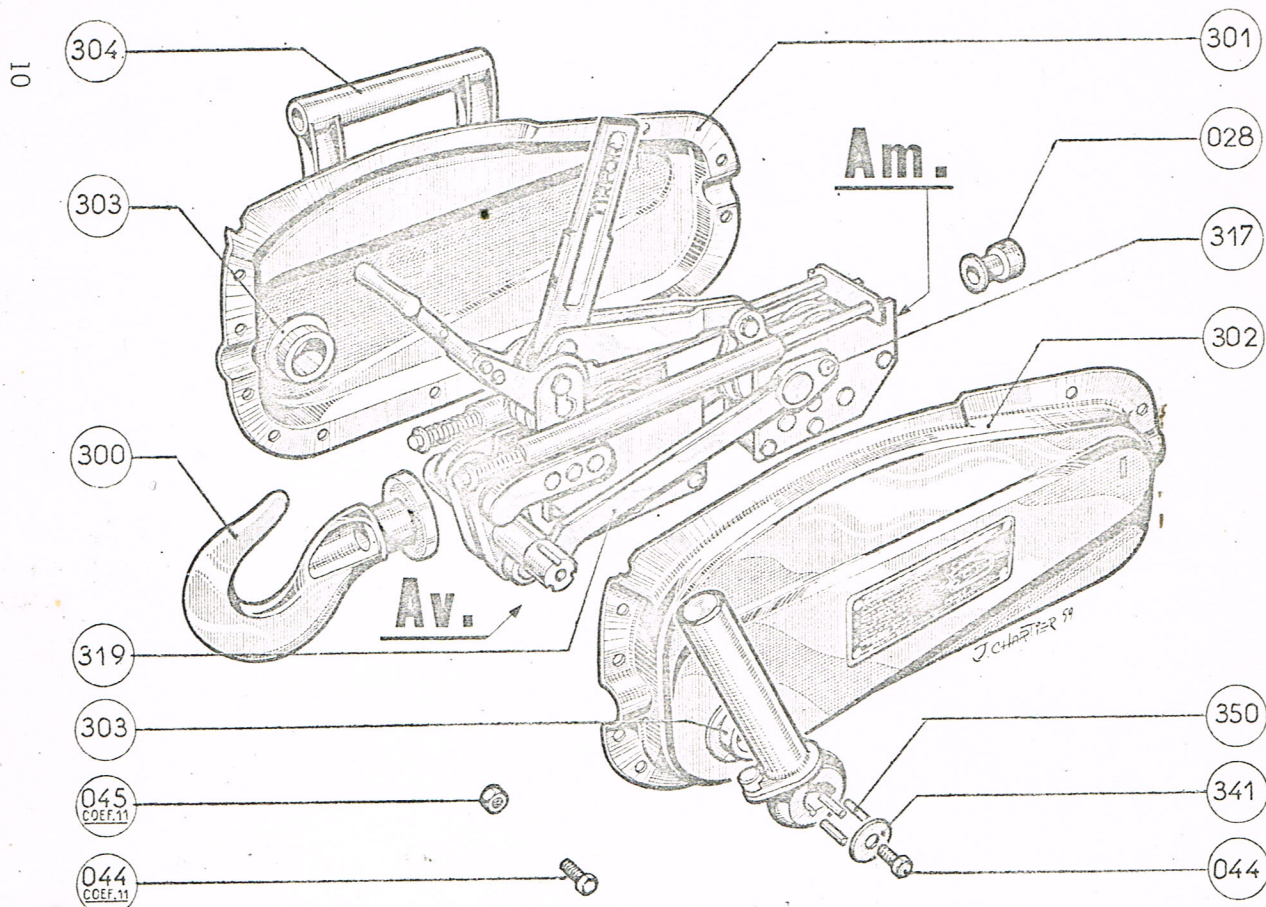
The 60 feet cable enables the load to be lifted, lowered or hauled considerable distances without changing the position of the machine, and in conjunction with the snatch blocks, permits the most convenient position to be selected for fastening the machine, while the rope can be taken over the pulleys, through window or door openings or down through floors to wherever the load may be. It can also be passed over a block at the head of a derrick or sheers to obtain height for raising load, such as blocks of masonry or for erecting tall poles or posts.

#### ANCHORING THE MACHINE:

The efficiency, and indeed the safety of all applications of the hauling and lifting machine depends upon the security of the anchorage or holdfast. This may be anything sufficiently strong or immovable, but it must be firm enough not to show signs of failure under load.

Secured near the base of stout posts, lamp standards, stanchions, bollards, etc. by means of wire bonds, the machine will be able to haul in its cable and move, lift or lower its load without fear of sudden failure.

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Exploded view of the Tirfor T. 13

028	Rope Guide
044	Hex. bolt for casing and operating shaft
045	Hex. nut for casing
300	Machine anchoring hook
301	Casing, right hand
302	Casing, left hand
303	Boss
304	Carrying handle
317	Pin
319	Connecting rod
341	Washer for operating lever
350	Handle securing pins

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