

EQUIPMENT HANDLING AIDS

This E.I. deals with the equipment handling aids used for internal plant installation.

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1. GENERAL.

- 1.1 Equipment handling aids reduce physical effort to a minimum, remove the possibilities of damage to equipment during transport and reduce the probability of accidents during positioning and handling of equipment. By their use a reduction in the number of men required for any handling operation is often possible.
- 1.2 Precautions in the operation, maintenance and storage of equipment handling aids are also detailed here.
- 1.3 Standard types of mechanical aids, acceptable as Departmental units for this class of work, are described. However, available plant capable of doing the same function should not be scrapped and replaced by a new unit unless conditions are favourable to such a change.
- 1.4 When new or additional aids are obtained, they should be shared by divisions to economically justify their provision.

2. PRECAUTIONS.

- 2.1 Safety. The equipment aids have adequate safety factors and all attachments must be used in their correct position. The high tensile bolts and special parts requiring great strength should be coloured red for identification purposes. In no circumstance must temporary appliances replace these correctly designed fittings.

It is the responsibility of the Officer-in-Charge of material handling operations to see that all working areas are free of obstructions, that every operation is safeguarded by inspection before it takes place, that adequate protection, including barricades and guard rails, is in position at doorways, catheads, etc., that flooring protection is provided to prevent damage to floor or floor coverings, and that the building is suitably protected at the corners and ledges.

Electrically driven machines must be inspected to see that they are in safe working order.

Overloading of any device must be avoided at all times.

Ropes, Blocks and Tackles. See E.I. INTERNAL PLANT INSTALLATION Practice A 0010, for safety measures in handling ropes, blocks and tackles.

The working or unloading areas must be kept free of oil or grease.

Where the movement of heavy or bulky units is involved, skids must be correctly positioned and adequate braking facilities must be provided.

2.2 Dust. Material in transit must be protected against dust.

A tarpaulin must cover cases in transit but a sisal-craft sheet must be placed over -

- (i) all cases with a damaged outer casing,
- (ii) all cases which have been opened for inspection purposes,

before covering with the tarpaulin, as an added safeguard against dust penetrating through damaged inner lining.

Before covering with tarpaulins all uncrated equipment must be protected by dust exclusion coverings, such as sisal-craft paper or prefabricated transportation boxes.

3. MAINTENANCE OF EQUIPMENT AIDS.

3.1 All mechanical aids, appliances and slings must be regularly examined and, where applicable, must be in accordance with the appropriate local authorities' requirements for safe operating.

In handling material from storage to installation areas, obtain the services of the Mechanical Aids Division, External Plant Section.

Where the Mechanical Aids Division operates the aids, it will be their responsibility for safe loading and correct operation of the plant employed.

Where equipment is obtained on loan from the Mechanical Aids Division, the operating instructions must include a certificate that the equipment is in satisfactory, and safe working order.

3.2 Before and during use -

- (i) all devices must be examined for fractures, crystallisation and other forms of mechanical strain;
- (ii) all attachments must be checked to see that they are of the designed type;
- (iii) all mechanically operated aids must be well oiled and greased;
- (iv) rust-preventative treatment must be done at regular intervals;
- (v) the general finish of all basic parts and appliances will be such as to obviate dirty handling conditions in any operation;
- (vi) any sign of deterioration of any aid must be reported to the Divisional Engineer.
- vii) where appliances which are the responsibility of other Sections, are used they must be tested at regular intervals, to see that they are safe.

4. STORAGE OF AIDS WHEN NOT IN USE.

4.1 The storage of any mechanical aids must -

- (i) prevent deterioration of the equipment.
- (ii) house all attachments in portable containers.
- (iii) permit ready access to the aid.

4.2 A register must record the names of approved operators, the locations where the aid is used and and repairs required..

4.3 To avoid deterioration of mechanical aids, which are used solely for handling material inside buildings, care must be taken against exposure to the weather; these must not be stored in open or exposed positions.

5. USE OF EQUIPMENT HANDLING AIDS.

5.1 Equipment handling aids are used in -

- (i) installation depots and stores.
- (ii) transit from installation depots to installation areas.
- (iii) installation areas.

Some of the aids have special application in small buildings where catheads are not provided.

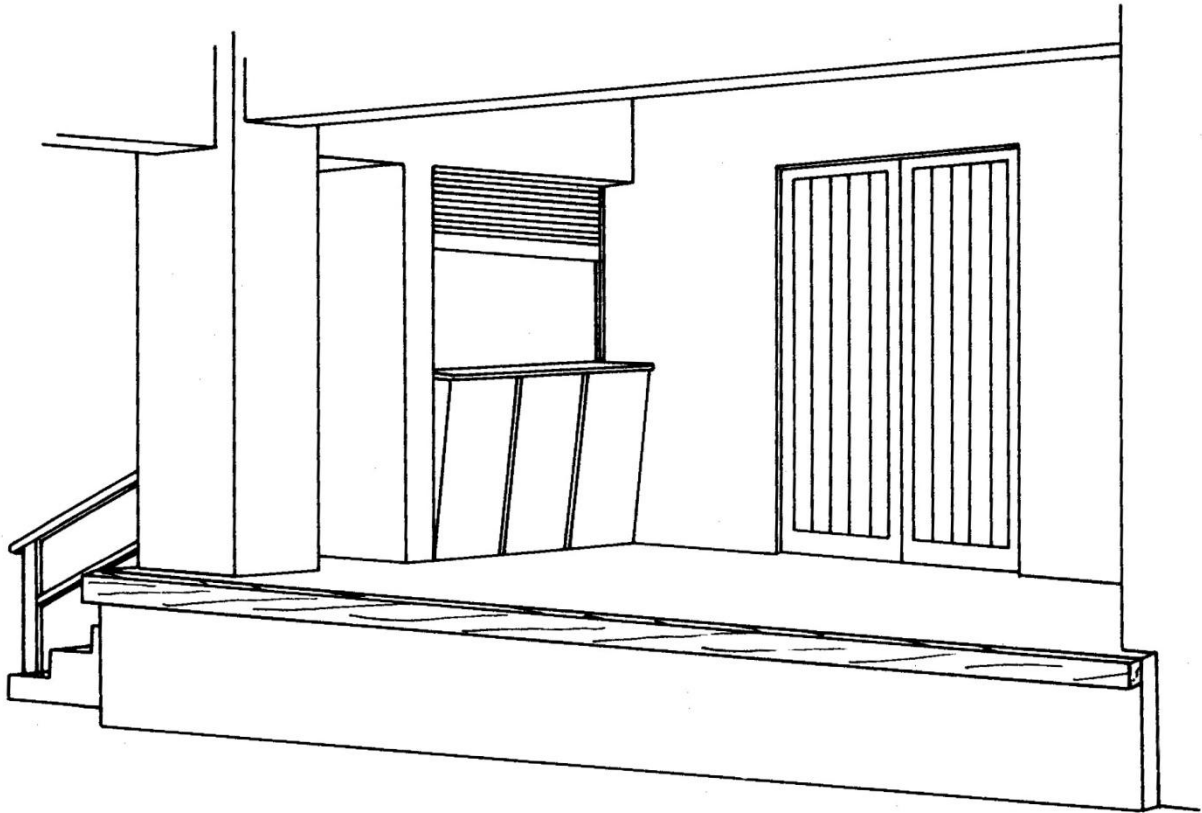
5.2 Installation Depots. In installation depots the main purpose of equipment handling aids is to -

- (i) handle heavy cases of equipment;
- (ii) assist in the opening of cases;
- (iii) facilitate examination of equipment; and
- (iv) aid storage of items in selected areas for subsequent quick despatch to the installation project.

5.3 Transport. Transporting equipment, e.g., from a depot to an installation area, requires the use of handling aids to load, unload and secure it during transport. Low loading devices are used for the transport of equipment and portable buildings of various types. All uncased material must be protected against dust during transportation.

5.4 Installation Areas. In installation areas, equipment handling aids are required for the receipt or despatch of equipment. These aids include -

- (i) Goods lifts or catheads of various types to which are fitted hand-operated or electric-driven hoists.
- (ii) Loading ramps, docks or platforms. (See Fig. 1.)



TYPICAL LOADING DOCK.

FIG. 1.

In addition to the permanent facilities provided in either group, portable equipment aids are required for -

- (i) taking equipment from packing cases;
- (ii) lifting;
- (iii) moving to selected positions;
- (iv) siting in permanent location.

5.5 Where catheads are not provided for unloading, temporary scaffolding or stagings, etc., can be erected to assist in the handling of material.

6. TYPES OF EQUIPMENT HANDLED BY AIDS.

6.1 Each of the following classes of equipment requires the application of various types of aids (see Section 7) for either storage, transport or positioning in buildings -

Racks of equipment.
Manual switchboard positions.
Machine driven equipment.

Power rectifier cubicles.
Heavy battery parts.
Cases of heavy machinery parts.
Bulk items such as cased or bundled ironwork.
Cable drums.
Prefabricated structures.
Portable buildings, including exchanges.

7. LOCATIONS WHERE AIDS ARE USED.

7.1 The following lists are typical of the aids required at different locations:-

Installation Depots.

Catheads. With associated lifting gear.
Mobile gantries.
Case opening devices.
Equipment extraction devices.
Mobile bins.
Mechanical tilting devices to enable racks to be stored in vertical positions.
Transportation fixtures, including slings, ropes and weather protection.
Free rolling trollies.

In Transit.

Slings.
Transportation clamps or fixing devices.
Ropes.
Unloading devices including jacks.
Portable gantries, gantry trucks or crane trucks.
Dust covers of approved types.

A gantry truck can be used for the transportation, as well as the unloading, of equipment into a building.

Installation Areas.

Catheads, including hoists (mechanical or electrical).
Slings of various types.
Devices for extraction of equipment from crates.
Mechanical aids for carrying equipment and changing of plane, positioning and permanent siting.
Inclined rollers.
Jacks.
Attachable trolley legs.
Free rolling trollies.
Steel rollers.
Cable drum handling aids.

Loading Ramps or Platforms.

Free rolling trollies.
Steel rollers.
Planks.
Skids.

8. TYPES OF AIDS, AND METHODS OF HANDLING EQUIPMENT.

8.1 Gantries, Jibs and Beams. These are used for raising material into buildings where normal lifting devices are unavailable. They may be erected, when necessary, on roofs, over lift wells and in other suitable locations. (See Figs. 2, 3, 4.) When jibs are erected to raise loads outside s building the following precautions must be taken -

- (i) The jib must be incapable of tilting.
- (ii) The load must not foul the building at any part, such as a parapet.
- (iii) The jib must be capable of lifting the load above the parapet so that it can be swung into position.
- (iv) The safe load at any angle must be prominently marked on the jib.

When beams are used to raise loads up lift wells, etc., similar precautions must be taken.

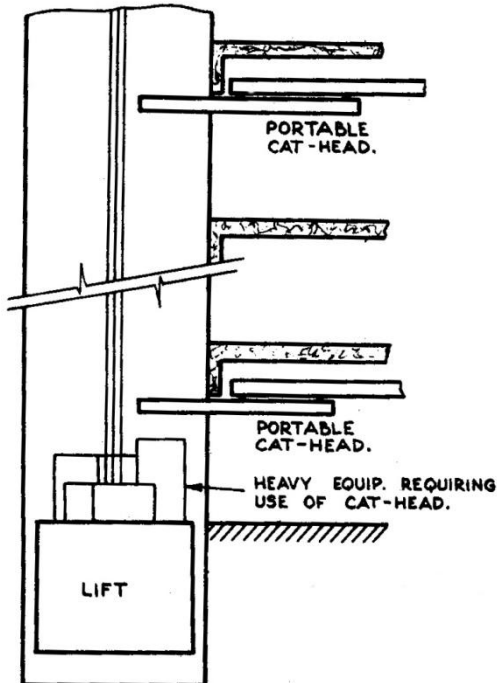


FIG. 3. PORTABLE CATHEAD AS USED IN LIFT WELL.

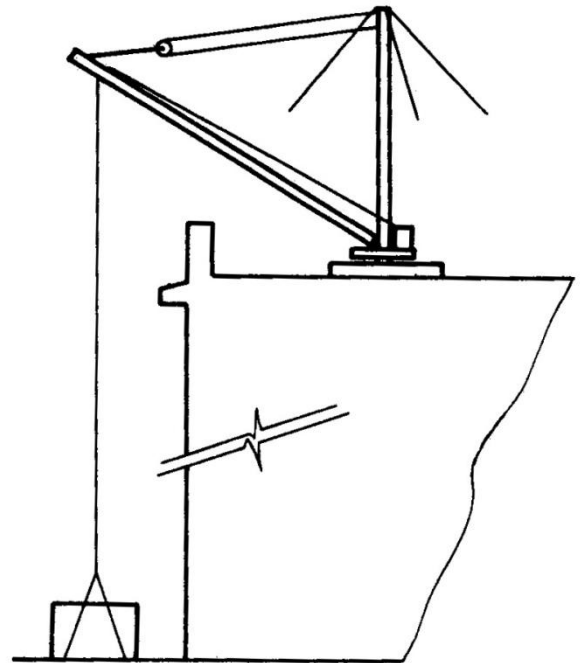


FIG. 2. JIB MOUNTED ON TOP OF BUILDING TO GIVE ACCESS TO EVERY FLOOR

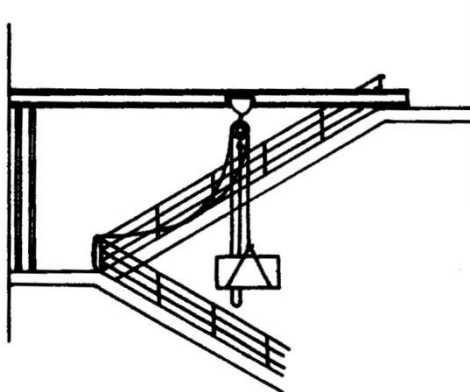
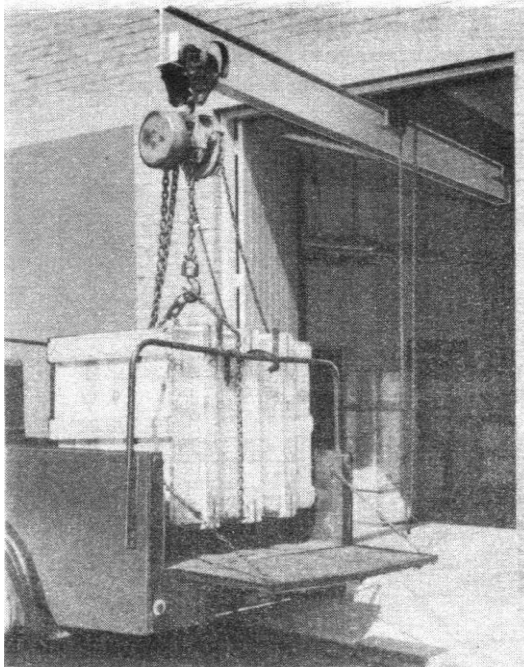
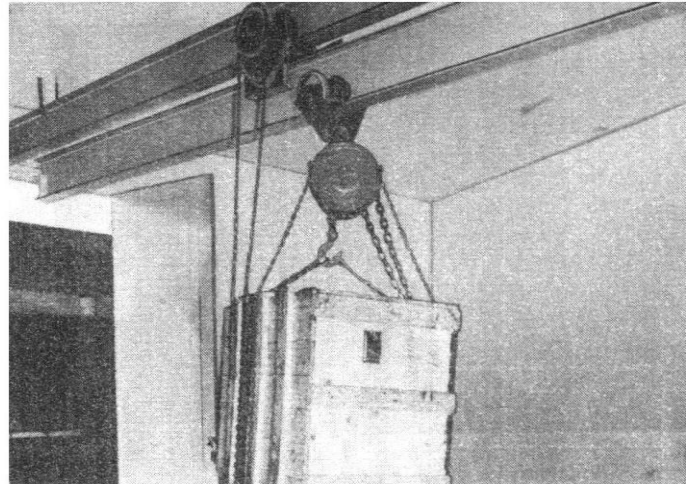


FIG. 4. BEAM WITH PULLEY BLOCK ASSEMBLY

8.2 Retractable Catheads (See Fig. 5) are used where external appearance of the building is an important consideration. The Officer-in-Charge of the receipt end handling of equipment must see that the safety of staff is constantly watched and that the building is not damaged due to free rolling of the load.



(a) Cathead Extended

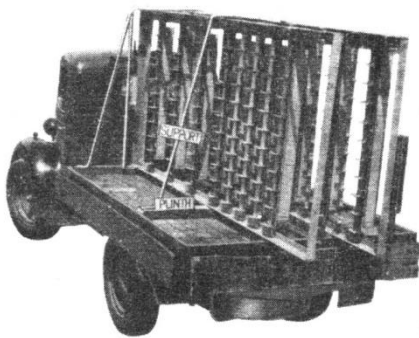


(b) Cathead Retracted

RETRACTABLE CATHEAD.

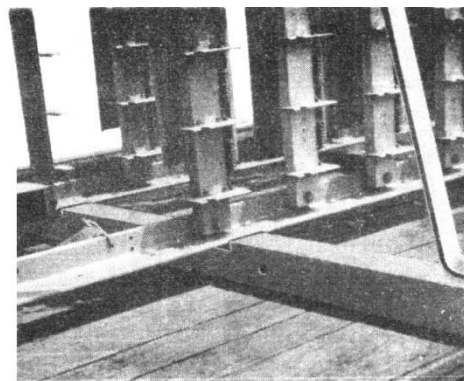
FIG. 5.

8.3 Mechanical Devices Required when Transporting Equipment. The stability of equipment during transport is essential and bracing members are supplied for this purpose. Suitable methods are shown in Figs. 6 and 7.



SUPPORT DURING TRANSPORTATION.

FIG. 6.



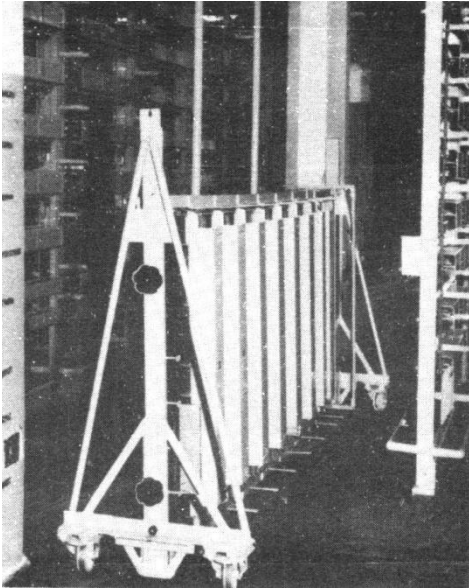
PLINTH USED TO HOLD RACK.
NOTE CHECKED OUT SECTION.

FIG. 7.

Dust protection coverings have not been included in Figs. 6 and 7. A sisal craft paper or a transportation boxing is placed below and over the racks before tarpaulins are positioned. Protection against rain and fog is also achieved in this way.

8.4 Transporting Heavy Equipment by Private Contractor. Sometimes very heavy units, including huts, portable exchanges and items of power plant, etc., must be removed and it may be desirable to employ a contractor who specialises in this type of work. In such cases the normal departmental procedure of arranging transport is to be followed.

8.5 Rack Handling under Restricted Ceiling Heights. Where racks cannot be transported into an equipment area vertically they should be transported on their side. The use of a typical aid is shown in Fig. 8 and details of the aid in Fig. 18.



HANDLING RACK UNDER A LOW CEILING.

FIG. 8.

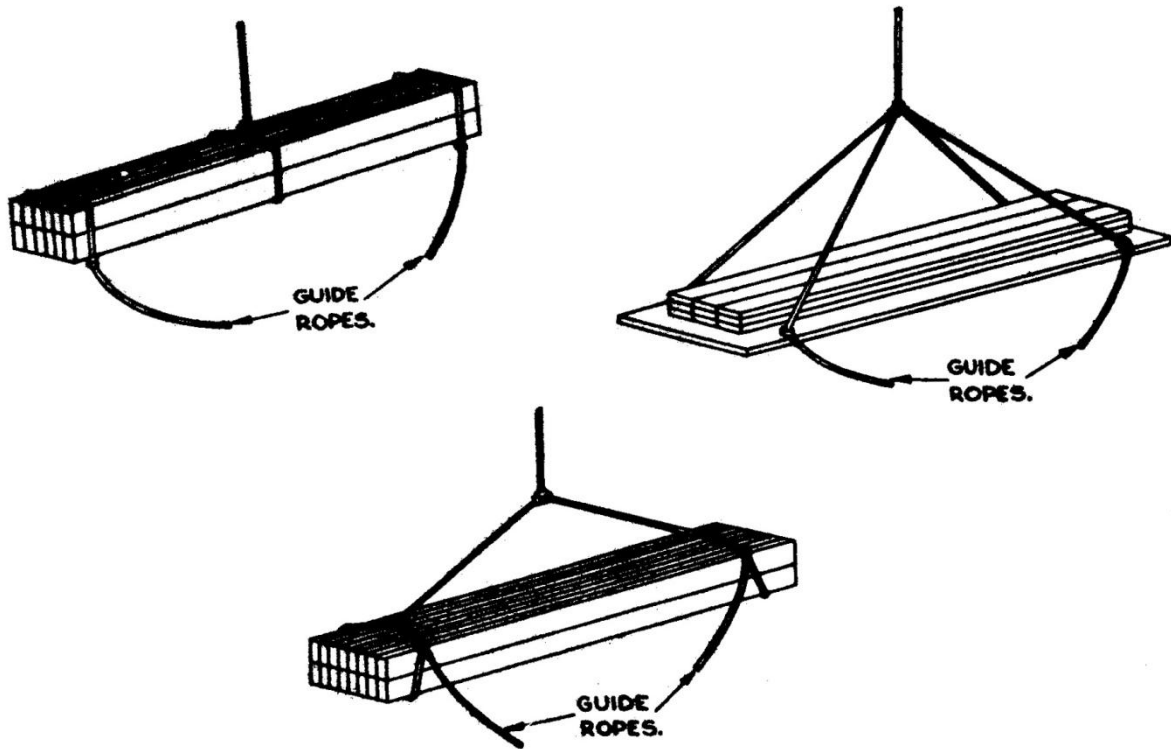
NOTE: PROTECTION OF VERTICAL COLUMN.

8.6 Slings are of three main types -

- (i) wire rope;
- (ii) manilla (or other fibre) rope;
- (iii) chain.

8.7 Adequate Safety Measures must be adopted when using slings to obviate risk of accident; the following precautions must be taken:-

- (i) Use only properly designed slings.
- (ii) Ropes and wire procured for other purposes, such as tying or binding bundles, must not be used as slings.
- (iii) When tying loads such as copper bus-bar, long lengths of timber, etc., take care to see that the load cannot tip or slide out of the sling or from the platform. The load must be lifted until it is free of the ground and then checked for balance and guide ropes attached. (See FIG. 9.)
- (iv) All lifting hooks must be fitted with a safety mouse.



LIFTING LONG LOADS.

FIG. 9.

8.8 Case Opening Devices include -

- (i) an offset jemmy used with hammer;
- (ii) nail extractor, percussion type.

The type used must be selected according to the contents of the case. Percussion type must not be used when the contents of the case are fragile. To prevent distortion of case contents particular care must be taken in using a jemmy.

8.9 Crowbars and Pinchbars are used extensively when handling equipment but take care to obviate damage to floors and building surfaces. The officer supervising material movements will be responsible for the selection of the correct type crowbars for the job.

A pinchbar is suitable for moving equipment very small distances or when moving racks into their final position on the plinth.

8.10 Free Rolling Trollies, Steel Rollers, Hand Trucks are useful when moving cases and heavy equipment in an open installation or depot area. Wheels and rollers should be rubber covered and of sufficient size to avoid damaging floor coverings. In the absence of these aids, coir mats or bags may be used in an emergency. See Fig. 10.

8.11 Skids. Skids or steel roller conveyors may be used when unloading plant into pre-fabricated buildings, or onto ramps and platforms. When using grease on skids take care to avoid the spread of grease to walls and other surfaces.

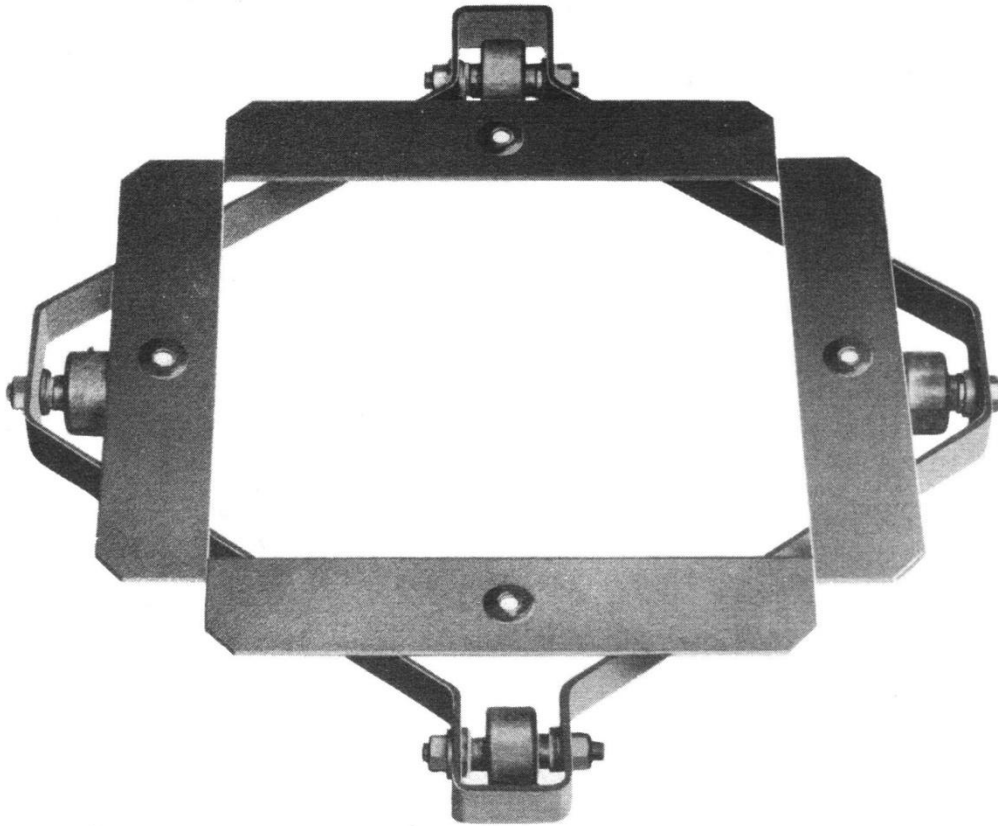
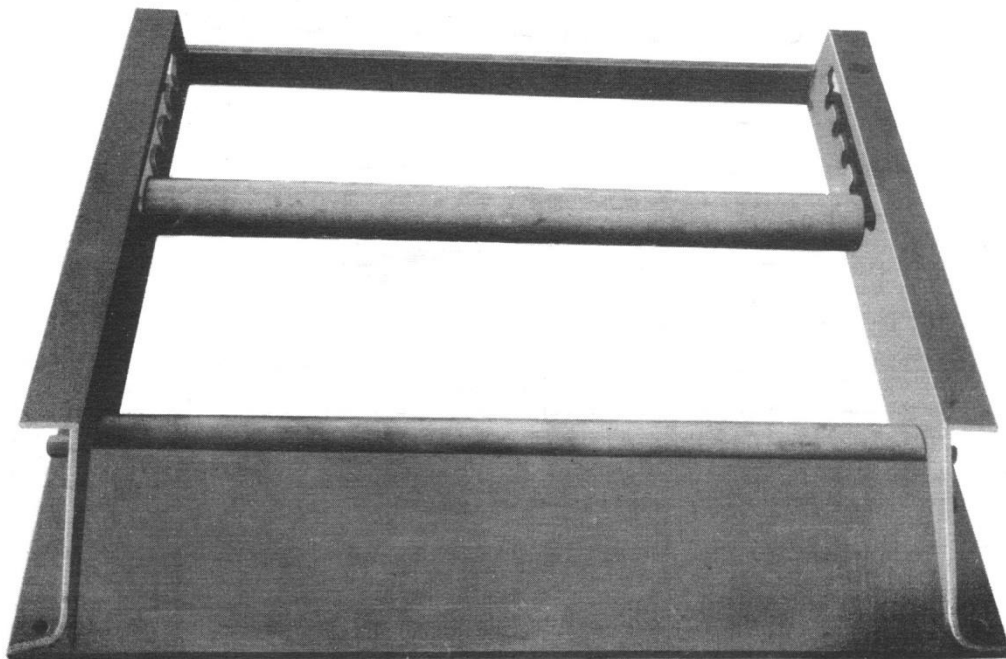


FIG. 10. FREE ROLLING TROLLEY.



CABLE DRUM ROLLER - TO BE USED ONLY IN STORAGE AREAS.

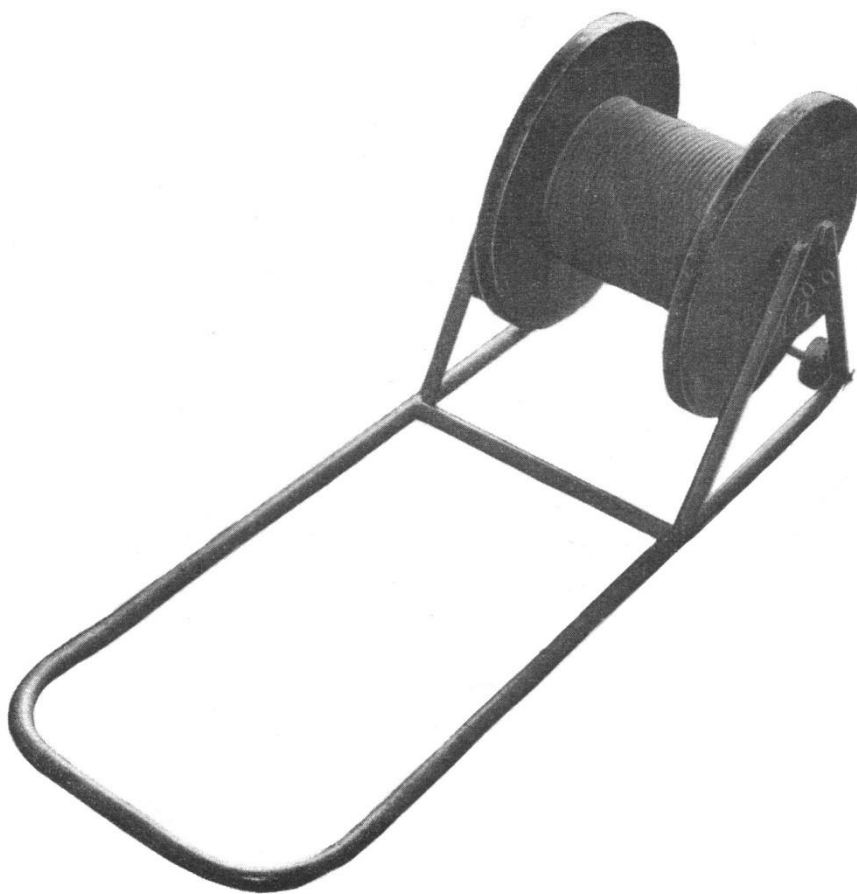
FIG. 11.

8.12 Cable Handling Devices.

- (i) Cable on drum. Suitable devices for handling cable drums are shown in Figs. 11-16 and their use in Figs. 11 and 12.
- (ii) Cable in coils may readily be handled by the use of modified wiring barrow (see Fig. 17).

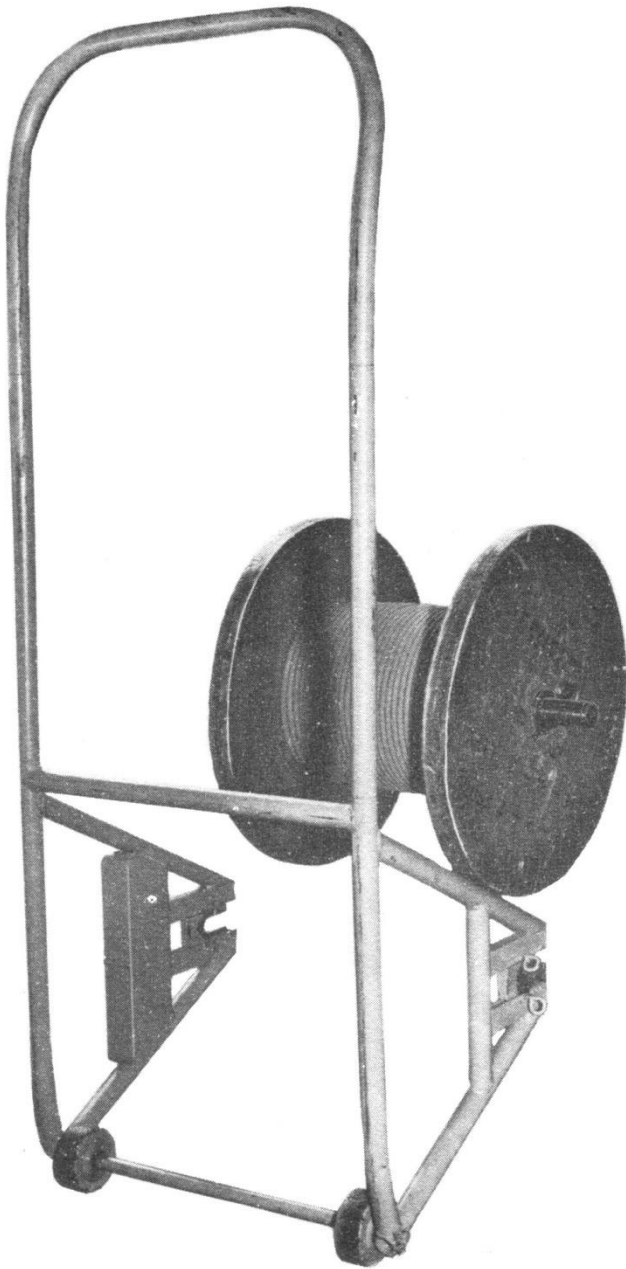
These figures show the approved types for future use. Where replacement of existing cable handling devices is proposed, then the type illustrated must be introduced.

8.13 Special Marking of Attachments. Different colours should be used for identifying aids and their attachments.



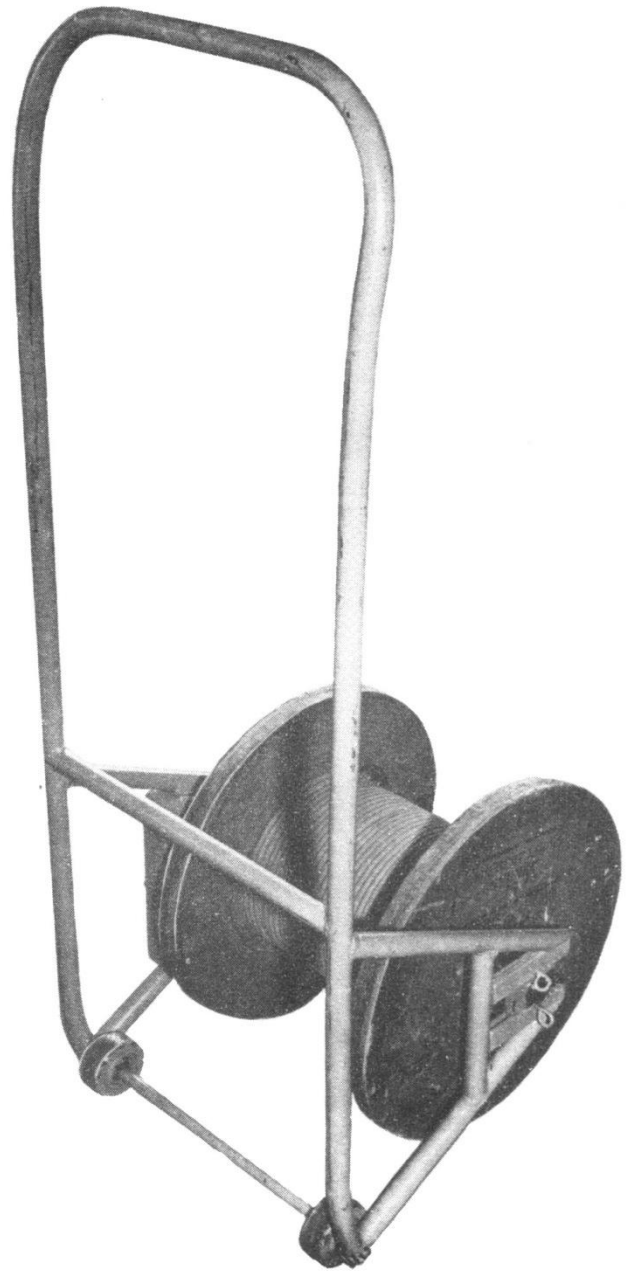
CABLE DRUM CARRIER - FOR USE IN INSTALLTION AREAS -
READY TO BE USED TO MEASURE OFF LENGTHS OF CABLE.

FIG. 12.



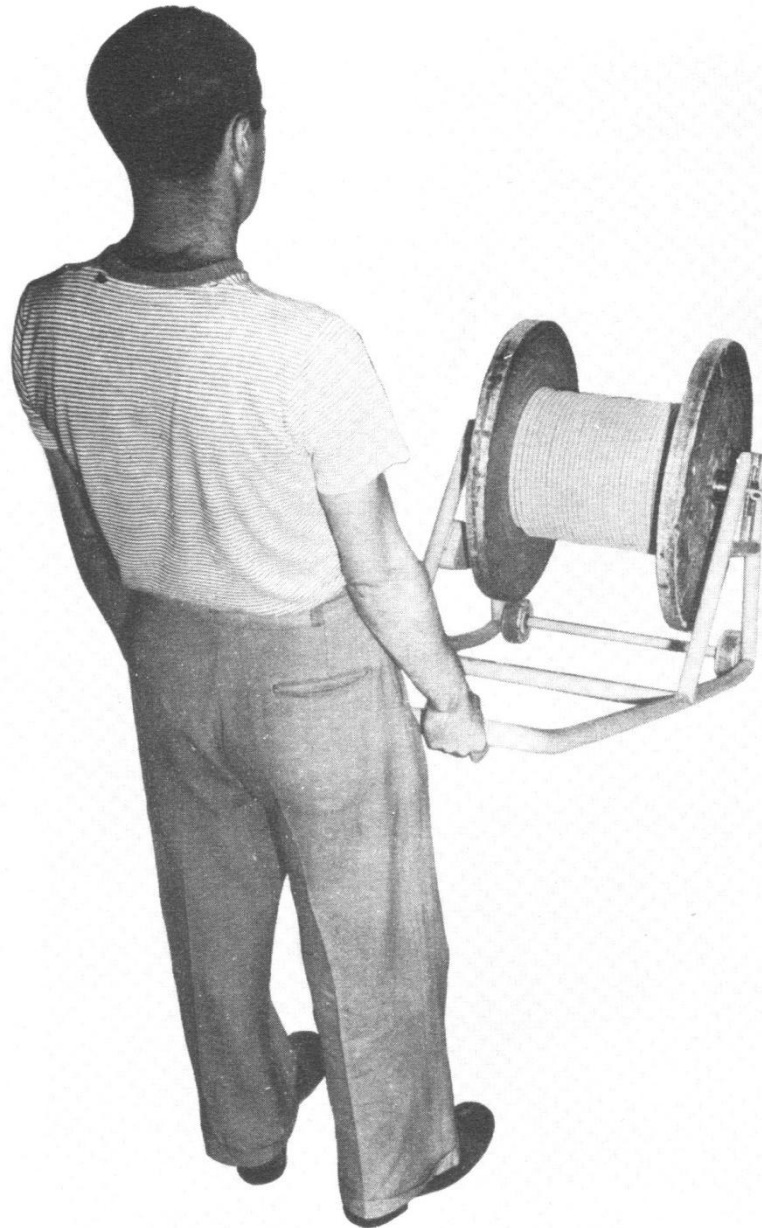
CABLE DRUM CARRIER - PREPARING TO LOAD
CABLE DRUM

FIG. 13.



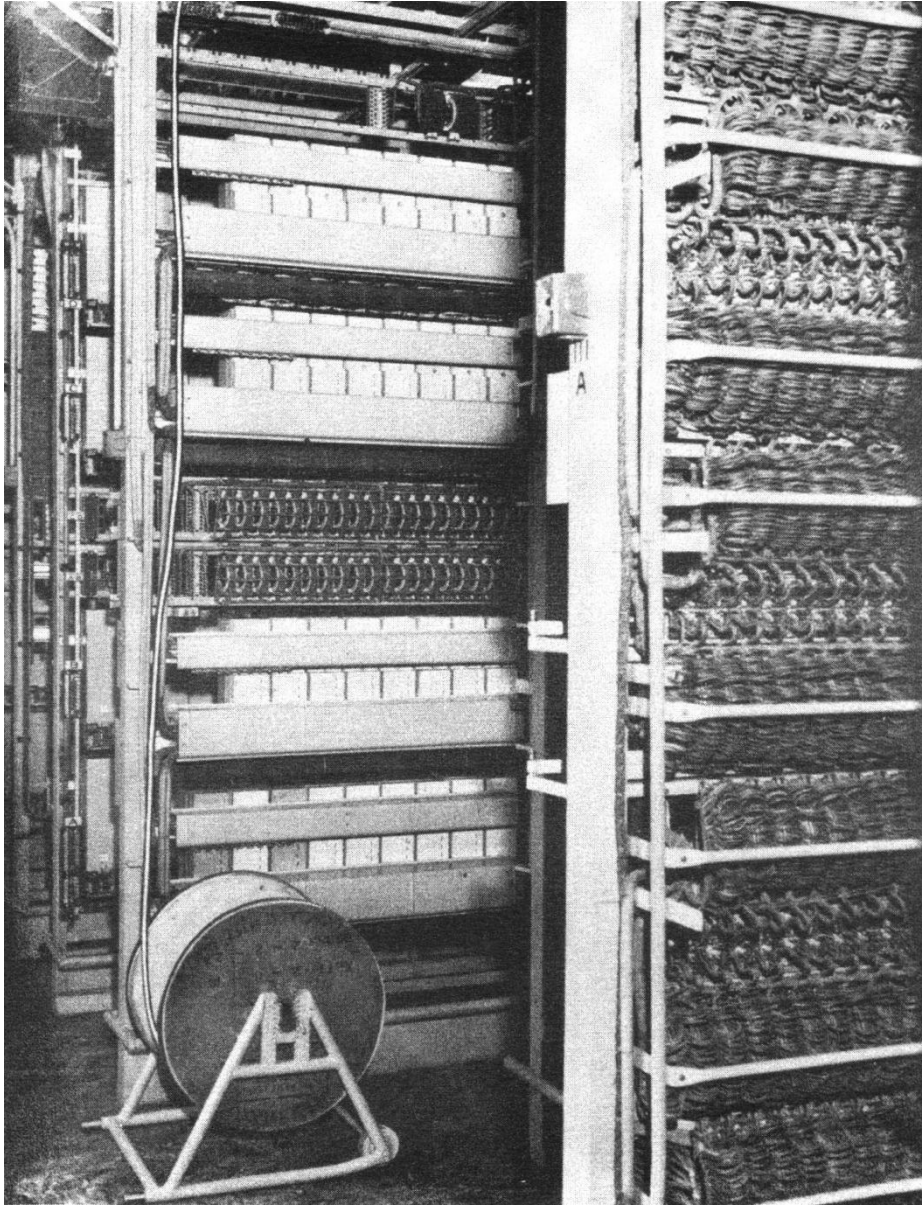
CABLE DRUM CARRIER - CABLE DRUM LOADED
ON CARRIER.

FIG. 14.



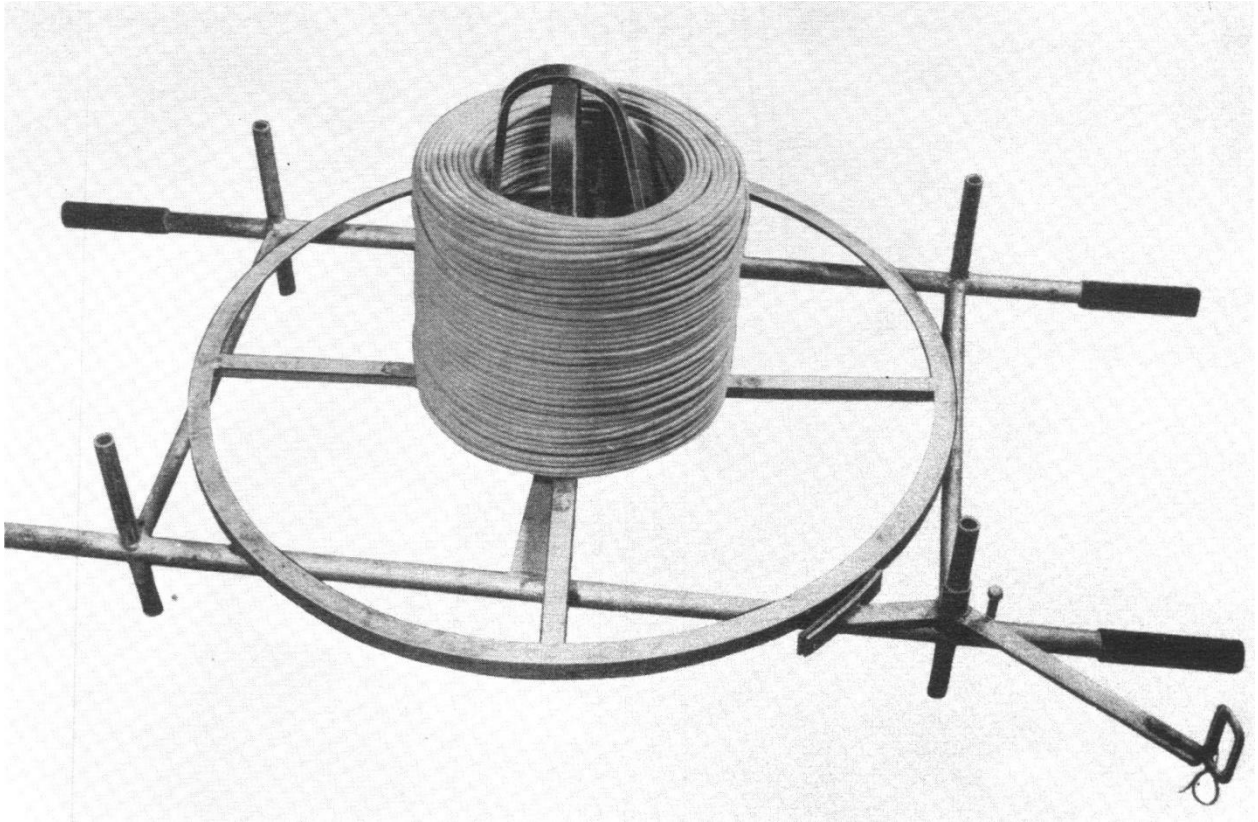
CABLE DRUM CARRIER - WHEELING DRUM INTO POSITION.

FIG. 15.



CABLE DRUM CARRIER - FEEDING CABLE ON TO RUNWAY.

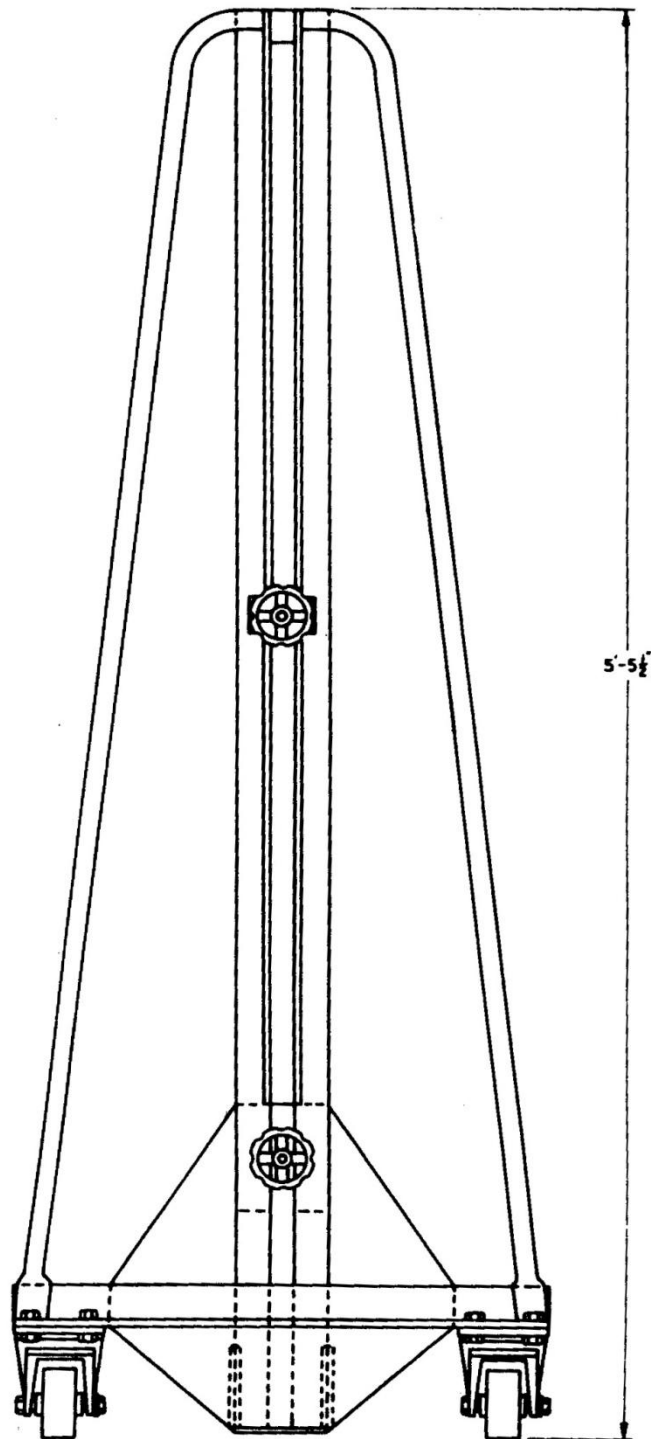
FIG. 16.



MODIFIED WIRING BARROW.

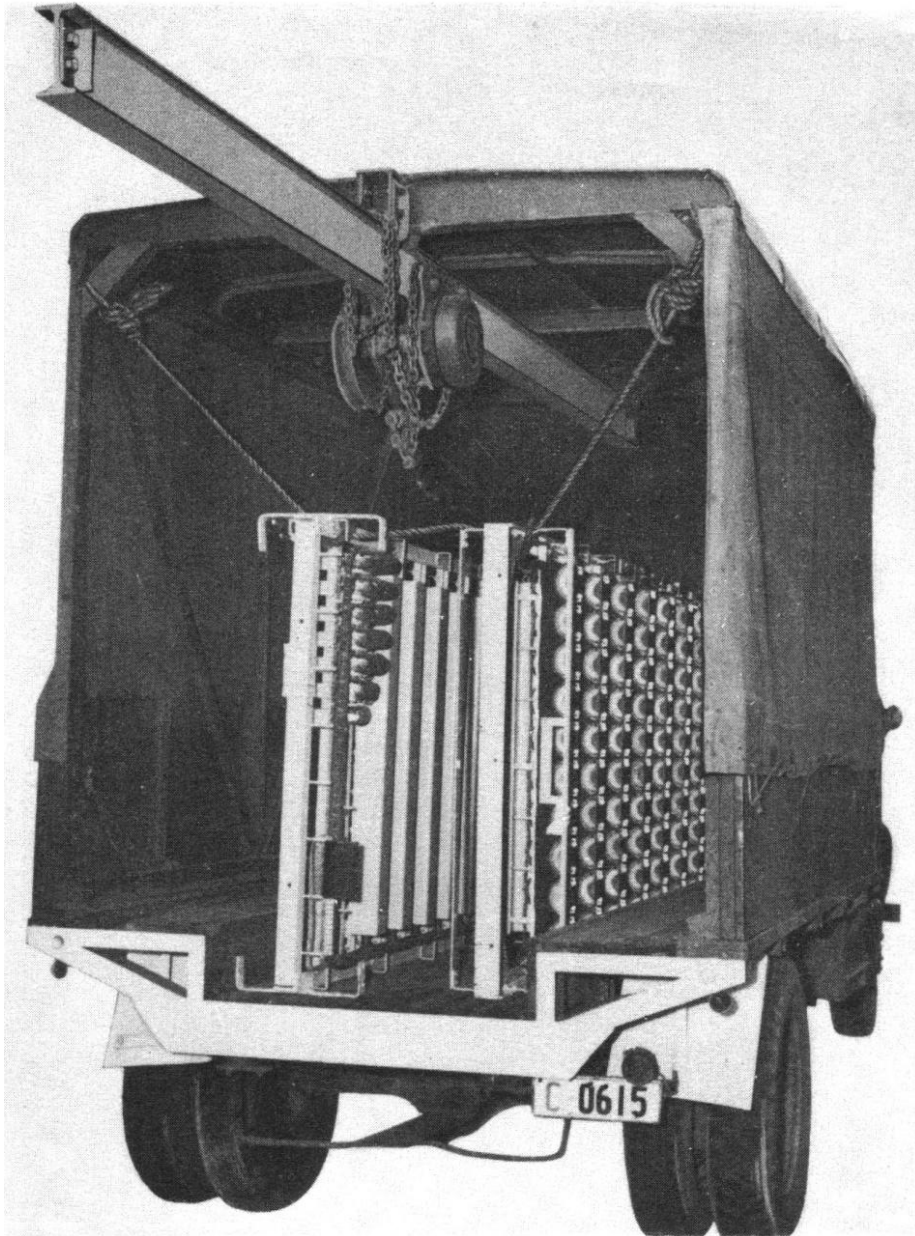
FIG. 17.

(Center detail must be made
of tubular material to
reduce the possibility of
damage to the cable sheath.)



Note the Continuously Variable Clamping Arrangement. This is provided by a sliding clamp between two vertical angles. The manufacture of any future rack "side runners" should include this facility.

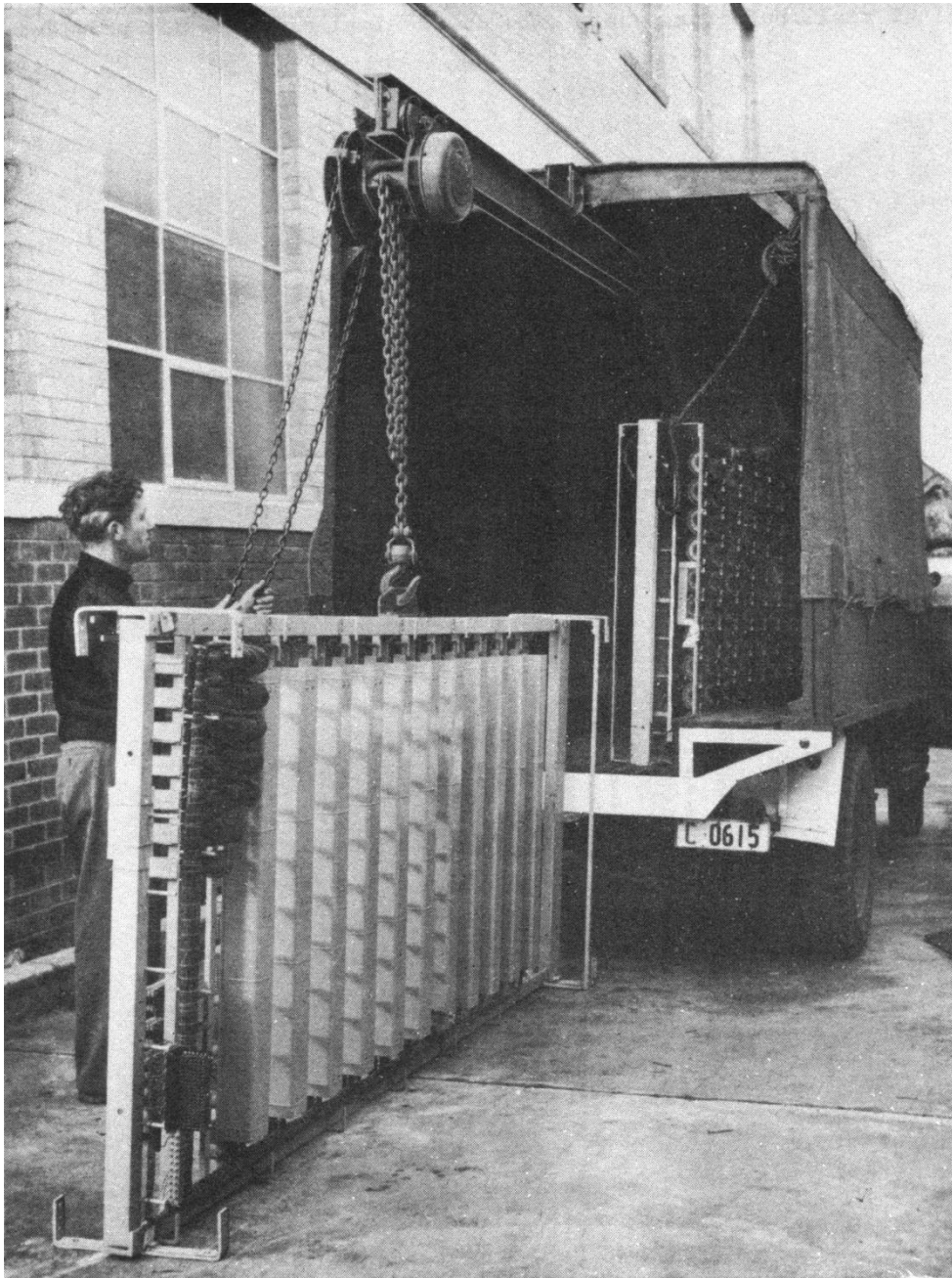
8.14 Gantry Trucks. (See Figs. 19 and 20.) As mentioned in para 8.2, these are used for unloading equipment into the exchange building. This method is particularly useful at small buildings where other mechanical aids are not provided.



GANTRY TRUCK - DELIVERING RACKS.

FIG. 19.

(Dust protection coverings used during transit have been removed to show the racks.)

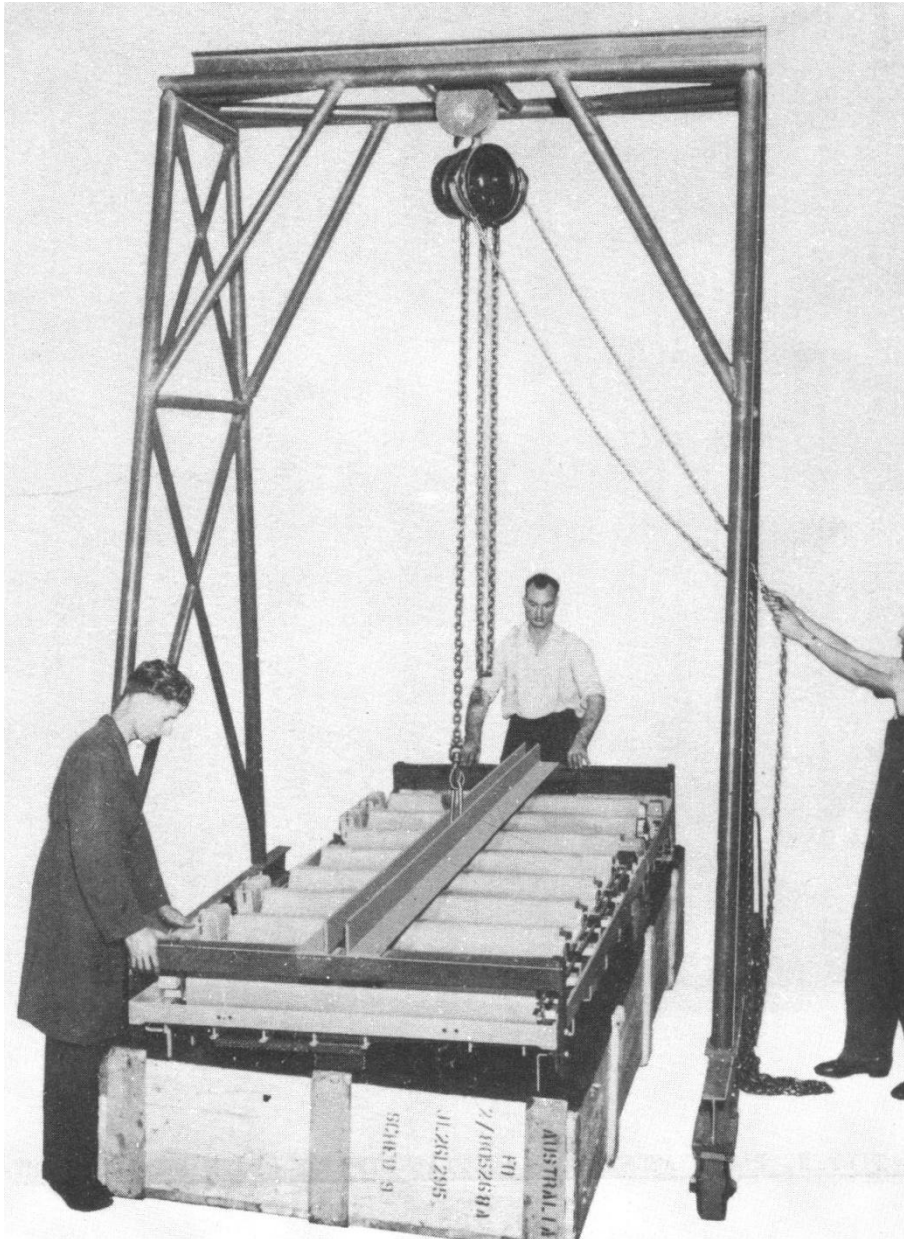


GANTRY TRUCK - LOWERING RACK BEFORE TAKING INTO EXCHANGE.

FIG. 20.

(Dust protection coverings used during transit have been removed to show the racks.)

8.15 Mobile Gantry and Claw. (See Fig. 21.) Used for horizontal removal of rack from crate.



MOBILE GANTRY AND CLAW.

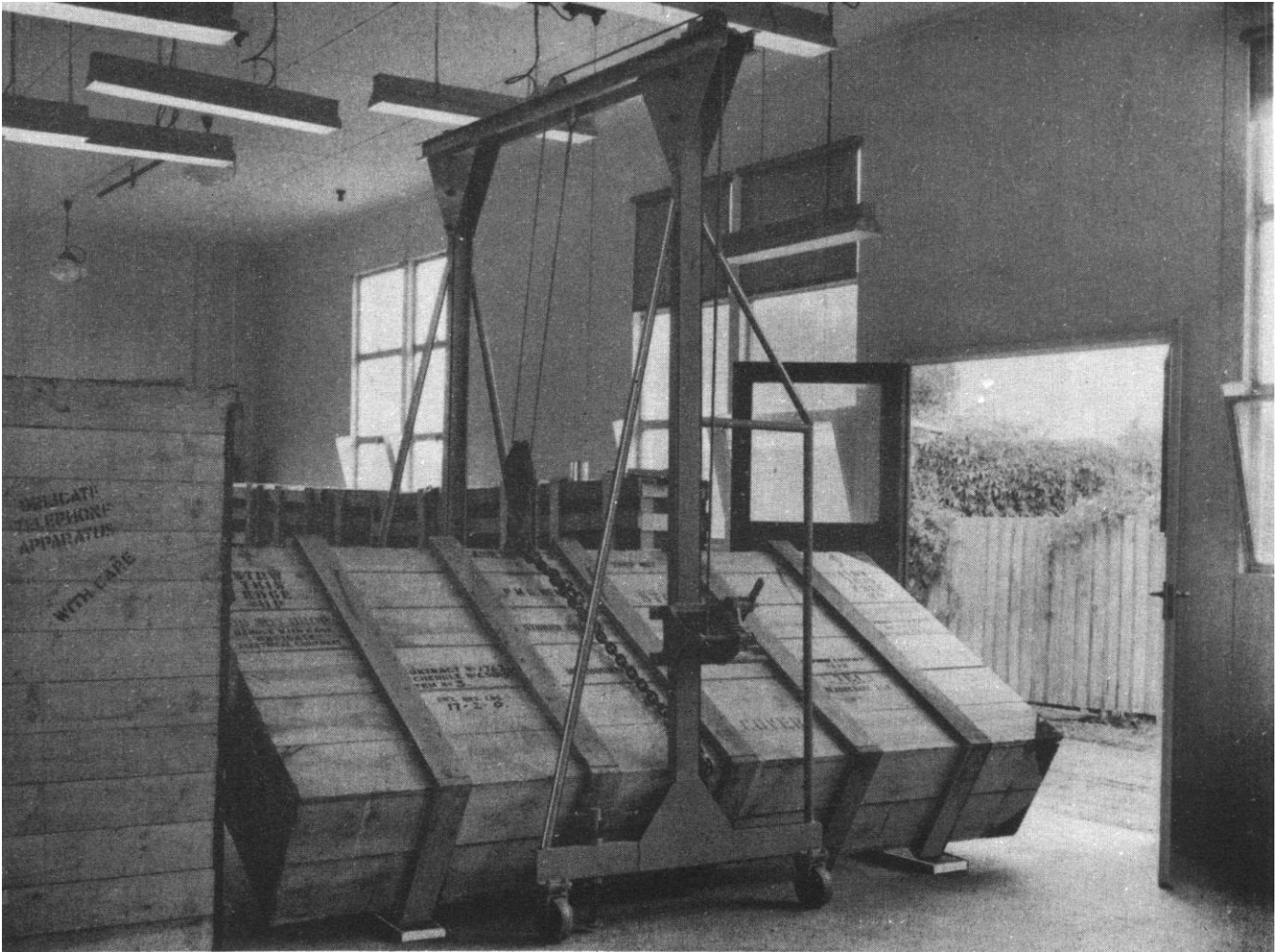
FIG. 21.

8.16 Hoist and Tilting Plate Assembly. (See Figs. 22-24.) Used for removing rack from crate and standing it up.



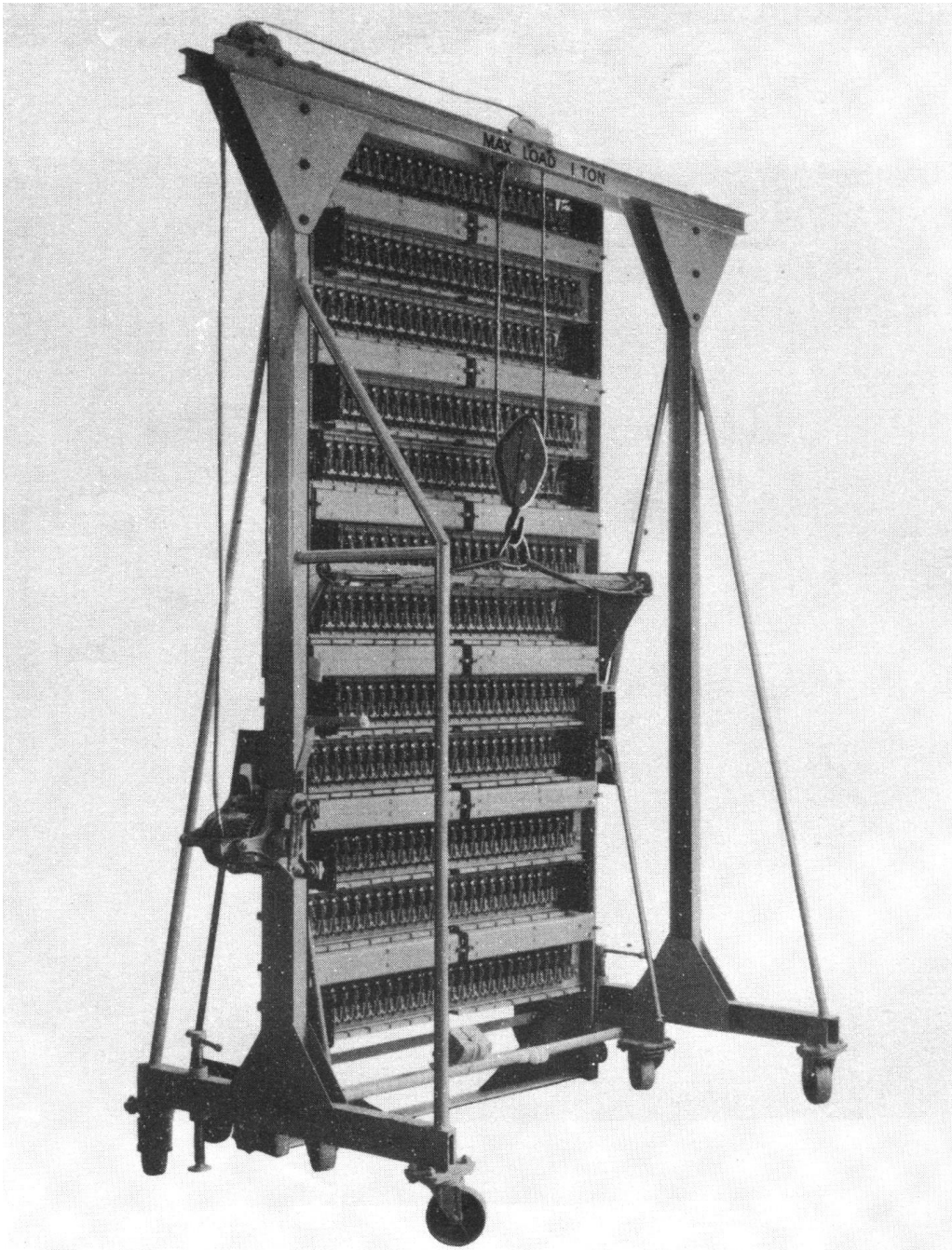
HOIST AND TILTING PLATE ASSEMBLY - INITIAL LIFT OF CRATE FROM TROLLEY.

FIG. 22.



HOIST AND TILTING PLATE ASSEMBLY - LOWERING CRATE ON TO SUITABLY PLACED BOARDS.

FIG. 23.



HOIST AND TILTING PLATE ASSEMBLY - FINAL STAGE WITH RACK VERTICAL.

FIG. 24

8.17 Mechanical Devices for Shifting Racks into Position. A number of types of mechanical devices are used for changing the plane of racks and moving them into position. These are -

- (i) Units which accept the equipment horizontally enabling it to be tilted vertically.
- (ii) Individual units to which are fitted
 - (a) additional aids for lifting, and
 - (b) variable Base units, for the handling of racks of various widths.
- (iii) Attachments which can be fitted to a vertical or horizontal rack for movement to, and positioning on, plinths, etc.

8.18 Various methods are used for handling material, depending on the type of building and the built-in aids provided, for example:-

- (i) Prefabricated buildings are without any built-in aids.
- (ii) Buildings (such as stores) are equipped 'with
 - (a) mobile gantry and claw for removing rack horizontally from crate,
 - (b) rack carrier .and tilter for moving rack and tilting vertical,
 - (c) side runners fitted to rack for moving rack into position.

The series of pictures in the Instruction Sheets listed below show the complete series of operation for each of the above conditions.

INSTRUCTION SHEET NO.3. HANDLING EQUIPMENT IN A PREFABRICATED BUILDING IN WHICH A CATHEAD HAS NOT BEEN PROVIDED.

INSTRUCTION SEEET NO.4. HANDLING EQUIPMENT IN BUILDING EQUIPPED WITH HOIST.

INSTRUCTION SHEET NO.5. HANDLING EQUIPMENT IN BUILDING USING MOBILE GANTRY AND RACE TILTER.

INSTRUCTION SHEET NO.6. HANDLING LONG LINE EQUIPMENT RACES WITH HOIST AND TROLLEY IN BILDING.

END.