

13277.

# *Assembly & Erection of Metters Windmills*

13291  
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TYPE 'K' &  
MASTER NUOIL

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STEEL  
TANK STANDS  
& SQUATTERS  
TANKS

•

**METTERS LIMITED**  
**ADELAIDE, SOUTH AUSTRALIA**

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*Having demonstrated in a practical manner your confidence in the products of Metters Limited by your selection, it is our desire to render further service by assisting you to obtain maximum efficiency from the article you have purchased.*

*Whether it be a Windmill, Tankstand, or Squatters' Tank, it is most imperative that it be assembled correctly, and if the directions contained in this book are implicitly carried out, no difficulty should arise, and maximum satisfaction should be obtained.*

*Before proceeding with the assembly of your Windmill, the various packages and contents should be carefully checked in order to ascertain whether all the parts have arrived. The number of packages received should coincide with the number mentioned in the advice card, and any shortages should be immediately reported to the transport authority concerned and a claim lodged.*

*The contents of the individual packages for the various pattern Metters windmills are described in detailed packing lists, and any shortages should be reported to the Distributor or Agent from whom you purchased your windmill or to Metters Limited direct.*

*Conditions in different parts of the world vary to some extent, and in order to satisfy demands, slight deviations from standards are necessary.*

*Hence the reason for including in this book separate packing lists and directions for Type "K" Windmills with wire braced towers, as supplied overseas and interstate, and Type "K" Windmills with Tension braced towers, as supplied locally.*

*Materials mentioned herein are standard, but during periods of short supply, suitable substitute materials are used where possible. Circumstances may possibly necessitate alteration to design.*

# PACKING LIST

## OVERSEAS AND INTERSTATE

Applying to Windmills packed singly.

### 6 ft. Type "K" Windmill Head with Wheel and Tail

#### 1 CRATE containing:

- |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>1 Windmill Head with Tower Cap, Base Block and Bush, Furling Gear, Timber Cross Guide, Tail Pin and Tail Bracket.</li> <li>12 Sails.</li> <li>12 Large Clips.</li> <li>12 Small Clips.</li> <li>4 Inner Section Rings 1 x 1/2 Flat.</li> <li>4 Outer Section Rings 1 x 3/16 Flat.</li> <li>1 Tail Hanger.</li> <li>2 Tail Straps.</li> <li>2 Tail Vanes.</li> <li>4 Spokes.</li> <li>1 Pump Rod with Wood-Rod Connection.</li> <li>1 Box Fittings containing:—               <ul style="list-style-type: none"> <li>4 - 2 x 3/8 Hex. Bolts and Nuts for Wood-Rod Connections to Wood-Rod.</li> <li>2 - 1 x 3/8 Hex. for Tail.</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>16 - 1 x 3/8 Hex. for Base Block and Tower Cap to Main Angles.</li> <li>4 - 1 x 3/8 Hex. for Outer Ring to Spokes.</li> <li>9 - 1 x 3/8 Hex. for Hub to Spokes.</li> <li>9 - 3/8 x 3/8 Hex. for Outer Ring to Ring and Inner Ring to Spoke.</li> <li>2 - 3 1/2 x 3/8 Hook Bolt for Timber Cross Guide.</li> <li>60 - 1/2 x 1/2 Hex. Sails to Clips.</li> <li>108 - 1/4 in. Spring Washers.</li> <li>48 - 3/4 x 1/2 Hex. Bolts Clips to Rings.</li> <li>8 - 5/16 x 5/16 Hex. Bolts Tail Vane to Straps.</li> <li>3 - 3/4 x 3/8 Hex. Bolts Tail Iron Work.</li> <li>3 - Spring Washers Tail Iron Work.</li> <li>8 - 5/16 Spring Washers Tail Iron Work.</li> <li>1 - Furl Chain, 1 Guard for Sheaf Wheel.</li> <li>1 - Sheaf Wheel, 2 No. 3 Lubricators.</li> <li>1 - Pipe Cap, 1 Bottom Pump Rod Connection.</li> </ul> |
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#### 1 PACKAGE — Tail Bone

### 8 ft. Type "K" Windmill Head with Wheel and Tail

#### 1 CRATE containing:

- |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>1 Windmill Head with Tower Cap, Base Block and Bush, Furling Gear, Timber Cross Guide, Tail Pin and Tail Bracket.</li> <li>18 Sails.</li> <li>18 Large Clips.</li> <li>18 Small Clips.</li> <li>6 Outer Sail Rings 1 in. x 1/2 in. Flat.</li> <li>6 Inner Sail Rings 1 in. x 3/16 in. Flat.</li> <li>1 Tail Hanger.</li> <li>2 Tail Straps.</li> <li>2 Tail Vanes.</li> <li>6 Spokes.</li> <li>1 Pump Rod with Wood-rod Connection.</li> <li>1 Box Fittings containing:—               <ul style="list-style-type: none"> <li>4 - 2 x 3/8 Hex. Bolts and Nuts for Wood-Rod Connection to Wood-Rod.</li> <li>16 - 1 x 3/8 Hex. for Base Block and Tower Cap to Main Angles.</li> <li>3 - 1 x 3/8 Hex. for Tail.</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>6 - 1 x 3/8 Hex. for Outer Ring to Ring.</li> <li>7 - 1 1/2 x 3/8 Hex. for Inner Ring to Ring and Spoke.</li> <li>13 - 1 1/2 x 3/8 Hex. for Hub to Spokes.</li> <li>7 - 1 1/2 x 3/8 Hex. Outer Ring to Spoke.</li> <li>24 - 3/8 Nuts, Lock Nuts Spokes to Hub and Rings to Spokes.</li> <li>2 - 3 1/2 x 3/8 Hook Bolts for Timber Cross Guide.</li> <li>90 - 1/2 x 1/2 Hex. Bolts and Nuts, Sails to Clips.</li> <li>90 - 5/16 in. Spring Washers.</li> <li>72 - 3/4 x 5/16 Hex. Bolts and Nuts, Clips to Rings.</li> <li>8 - 3/4 x 5/16 Hex. Bolts and Nuts, Tail.</li> <li>72 - 5/16 Spring Washers.</li> <li>2 - 1 in. x 3/8 Hex. Bolts and Nuts, Tail.</li> <li>2 - 3/8 in. Spring Washers.</li> <li>1 - Furl Chain.</li> <li>1 - Guard for Sheaf Wheel.</li> <li>1 - Sheaf Wheel.</li> <li>2 - No. 3 Lubricators.</li> <li>1 - Pipe Cap.</li> <li>1 - Bottom Pump Rod Connection.</li> </ul> |
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#### 1 PACKAGE — Tail Bone

### 10 ft. Type "K" Windmill Head with Wheel and Tail

#### 1 CRATE containing:

- |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>1 Windmill Head with Tower Cap, Base Block and Bush, Furling Gear, Timber Cross Guide, Tail Pin and Tail Bracket.</li> <li>18 Sails.</li> <li>18 Large Clips.</li> <li>18 Small Clips.</li> <li>6 Inner Rings 1 in. x 1/2 in. Flat.</li> <li>6 Outer Rings, 1 in. x 5/16 in. Flat.</li> <li>1 Tail Hanger.</li> <li>6 Tail Straps.</li> <li>2 Tail Vanes.</li> <li>6 Spokes.</li> <li>1 Pump Rod with top Wood-Rod Connection.</li> <li>1 Box Fittings containing:—               <ul style="list-style-type: none"> <li>2 - 3 1/2 x 3/8 Hook Bolt for Timber Cross Guide.</li> <li>4 - 2 1/2 x 3/8 Hex. Bolts and Nuts for Wood-Rod Connection to Wood-Rod.</li> <li>6 - 1 x 3/8 Hex. Bolts and Nuts for Outer Ring to Outer Ring.</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>6 - 1 1/2 x 3/8 Hex. Bolts and Nuts for Outer Ring to Spokes.</li> <li>6 - 1 1/2 x 3/8 Hex. Bolts and Nuts for Inner Ring to Spokes.</li> <li>12 - 1 1/2 x 3/8 Hex. Bolts and Nuts for Spokes to Hub.</li> <li>3 - 1 1/2 x 3/8 Hex. Bolts and Nuts for Tail.</li> <li>16 - 1 x 3/8 Hex. Bolts and Nuts for Base Block and Tower Cap.</li> <li>12 - 3/8 Hex. Nuts, Lock Nuts for Inner Ring to Spokes and Outer Ring to Spokes.</li> <li>12 - 1/2 in. Hex. Nuts, Lock Nuts for Spokes to Hub.</li> <li>90 - 1/2 x 1/2 Hex. Bolts and Nuts for Sails to Clips.</li> <li>90 - 5/16 in. Spring Washers.</li> <li>72 - 3/4 x 5/16 Hex. Bolts and Nuts for Clips to Rings.</li> <li>10 - 3/4 x 5/16 Hex. Bolts and Nuts for Tail.</li> <li>72 - 5/16 Spring Washers.</li> <li>2 - 1 1/2 x 3/8 Hex. Bolts and Nuts for Tail.</li> <li>2 - 3/8 in. Spring Washers.</li> <li>1 - Furl Chain, 1 Guard for Sheaf Wheel, 1 Sheaf Wheel.</li> <li>2 - No. 3 Lubricators, 1 Pipe Cap.</li> <li>1 - Bottom Pump Rod Connection.</li> </ul> |
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#### 1 PACKAGE — Tail Bone

# PACKING LIST

## OVERSEAS AND INTERSTATE

Applying to Towers packed singly.

### Wire Braced Towers for 6 ft., 8 ft. and 10 ft. Type "K" Windmills, 20 ft.

3 POST.		4 POST.	
Bundle Marked	Contents	Bundle Marked	Contents
No. 1 x 3	3 - 10 ft. Top Main Angles. 2 - 10 ft. Ladder Rails. 2 - 5 ft. Ladder Rails. 6 - Ladder Steps. 3 - 1 ft. Girts. 3 - 2 ft. Girts. 3 - 3 ft. Girts. 3 - 4 ft. Girts.	No. 1 x 4	4 - 10 ft. Top Main Angles. 2 - 10 ft. Ladder Rails. 2 - 5 ft. Ladder Rails. 6 - Ladder Steps. 4 - 1 ft. Girts. 4 - 2 ft. Girts. 4 - 3 ft. Girts. 4 - 4 ft. Girts.
No. 2 x 3	3 - 10 ft. Main Angles. Nos. 1 and 2 Wires. 2 - Standard Angle Stays. 1 - Tail Bone. 1 - Bag Bolts for 20 ft. Section. Hex. Bolts and Nuts 36 $\frac{3}{8}$ x5/16, 26 1x5/16, 4 $1\frac{1}{2}$ x5/16, 7 1x $\frac{1}{2}$ , 4 $\frac{3}{8}$ x $\frac{3}{8}$ , 4 1x $\frac{3}{8}$ BRH Bolts and Nuts, 7 2 $\frac{1}{2}$ x $\frac{1}{2}$ , 4 1 $\frac{3}{8}$ x5/16, Washers 4 5/16, 7 $\frac{1}{2}$ , 5 3/8. (Packed in Crate with Head Bolts)	No. 2 x 4	4 - 10 ft. Main Angles. Nos. 1 and 2 Wires. 3 - Standard Angle Stays. 1 - Tail Bone. 1 - Bag Tower Bolts for 20' Section. Hex. 54 $\frac{3}{8}$ x $\frac{3}{8}$ , 36 1x $\frac{3}{8}$ , 5 1 $\frac{1}{2}$ x $\frac{3}{8}$ , 9 1x $\frac{1}{2}$ , Washers 7 $\frac{3}{8}$ , 9 $\frac{1}{2}$ , BRH Bolts 9 1 $\frac{1}{2}$ x $\frac{3}{8}$ , 9 2 $\frac{1}{2}$ x $\frac{1}{2}$ . (Packed in Crate with Head Bolts)
No. 3 x 3	3 - Anchor Posts. 6 - Anchor Plates. 1 - Furl Lever. 3 - Platform Boards. 3 - Platform Irons. 3 - Cross Guide Stays. (10 ft. only).	No. 3 x 4	4 - Anchor Posts. 8 - Anchor Plates. 1 - Furl Lever. 3 - Platform Boards. 2 - Platform Irons. 2 - Crossguide Stays (10 ft. only).
No. 6 x 3	= 25 ft. Section. 3 - 5 ft. 3 in. Main Angles. 3 - 5 ft. Girts. 3 - No. 3 Long Wires. 3 - No. 3 Short Wires. 2 - 5 ft. Ladder Rails. 2 - Ladder Steps. 1 - Bag Bolts for 25 ft. Section Hex. 15 $\frac{3}{8}$ x5/16, 4 1 $\frac{1}{2}$ x5/16, 7 1x5/16, Washers 4 5/16. (Packed in Crate with Head Bolts)	No. 6 x 4	= 25 ft. Section. 4 - 5 ft. 3 in. Main Angles. 4 - 5 ft. Girts. 4 - No. 3 Long Wires. 4 - No. 3 Short Wires. 2 - 5 ft. Ladder Rails. 2 - Ladder Steps. 1 - Bag Bolts for 25' Section. Hex. 5 1 $\frac{1}{2}$ x $\frac{3}{8}$ , 22 $\frac{3}{8}$ x $\frac{3}{8}$ , 9 1x $\frac{3}{8}$ , Washers 5 $\frac{3}{8}$ . (Packed in Crate with Head Bolts)
No. 7 x 3	= 30 ft. Section. 3 - 10 ft. Main Angles. 3 - 5 ft. Girts. 3 - 6 ft. Girts. 2 - 10 ft. Ladder Rails. 4 - Ladder Steps. Nos. 3 and 4 Wires. 1 - Bag Bolts for 30' Section. Hex. 17 $\frac{3}{8}$ x5/16, 13 1x5/16, 7 1 $\frac{1}{2}$ x5/16, Washers 7 5/16. (Packed in Crate with Head Bolts)	No. 7 x 4	= 30 ft. Section. 4 - 10 ft. Main Angles. 4 - 5 ft. Girts. 4 - 6 ft. Girts. 2 - 10 ft. Ladder Rails. 4 - Ladder Steps. Nos. 3 and 4 Wires. 1 - Bag Bolts for 30' Section. Hex. 22 $\frac{3}{8}$ x $\frac{3}{8}$ , 18 1x $\frac{3}{8}$ , 9 1 $\frac{1}{2}$ x $\frac{3}{8}$ , Washers 9 $\frac{3}{8}$ . (Packed in Crate with Head Bolts)

NOTE— $\frac{3}{8}$  in. HEXAGON BOLTS MAY BE SUPPLIED IN LIEU OF 5/16 in., AND VICE VERSA.

#### Platform Timber Specifications:—

- 6, 8 and 10 ft. Type K x 3 Post Tower—3 - 3 ft 2 $\frac{1}{2}$  in. lengths 6 x 1 Hardwood.  
6, 8 and 10 ft. Type K x 4 Post Tower—3 - 3 ft. lengths 9 x 1 Hardwood.

# PACKING LIST

## LOCAL

### 6 ft. Type "K" Windmill Head with Wheel and Tail

- 1 Package Windmill Head with Tower Cap, Base Block, Bush, Furling Gear, Tail Casting and Pin.
- 2 Packages Sails = 4 Sections.
- 1 Package containing—1 Tail, 1 Pump Rod with Anti-Swivel fittings.
- 1 Package Spokes = 4.
- 1 Box Fittings containing:—

- 1 Tin Oil.
- 1 Furl Chain.
- 1 Guard for Sheaf Wheel.
- 1 Sheaf Wheel.
- 2 No. 3 Lubricators.
- 1 Pipe Cap.

- 16 1 x  $\frac{3}{8}$  Hex. Bolts and Nuts for Base Block, Tower Cap.
- 2 1 x  $\frac{3}{8}$  Hex. Bolts and Nuts for Tail.
- 8 1 x  $\frac{3}{8}$  Hex. Bolts and Nuts for Hub to Spokes.
- 8 1  $\frac{1}{2}$  x  $\frac{3}{8}$  Hex. Bolts and Nuts for Rings to Spokes.
- 4 1  $\frac{1}{2}$  x  $\frac{3}{8}$  Hex. Bolts and Nuts for Rings to Rings.

### 8 ft. Type "K" Windmill Head with Wheel and Tail

- 1 Package Windmill Head with Tower Cap, Base Block, Bush, Furling Gear and Tail Pin.
- 3 Packages Sails = 6 Sections.
- 1 Package containing—1 Tail, 1 Pump Rod with Anti-Swivel fittings.
- 1 Package Spokes = 6.
- 1 Box Fittings containing:—

- 1 Tin Oil.
- 1 Furl Chain.
- 1 Guard for Sheaf Wheel.
- 1 Sheaf Wheel.
- 2 No. 3 Lubricators.
- 1 Pipe Cap.
- 24  $\frac{3}{8}$  Hex. Nuts or Spring Washers.

- 18 1 x  $\frac{3}{8}$  Hex. Bolts and Nuts for Base Block, Tower Cap.
- 6 1 x  $\frac{3}{8}$  Hex. Bolts and Nuts for Rings to Rings.
- 7 1  $\frac{1}{2}$  x  $\frac{3}{8}$  Hex. Bolts and Nuts for Rings to Spokes.
- 7 1  $\frac{1}{2}$  x  $\frac{3}{8}$  Hex. Bolts and Nuts for Rings to Spokes.
- 13 1  $\frac{1}{2}$  x  $\frac{3}{8}$  Hex. Bolts and Nuts for Hub to Spokes.
- 3 1 x  $\frac{3}{8}$  Hex. Bolts and Nuts for Tail.

### 10 ft. Type "K" Windmill Head with Wheel and Tail

- 1 Package Windmill Head with Tower Cap, Base Block, Bush, Furling Gear, Tail Casting and Pin.
- 3 Packages Sails = 6 Sections.
- 1 Package containing—1 Tail, 1 Pump Rod with Anti-Swivel fittings.
- 1 Package Spokes = 6.
- 1 Box Fittings containing:—

- 1 Tin Oil.
- 1 Furl Chain.
- 1 Guard for Sheaf Wheel.
- 1 Sheaf Wheel.
- 2 No. 3 Lubricators.
- 1 Pipe Cap.
- 12  $\frac{3}{8}$  Hex. Nuts or Spring Washers.

- 12 1  $\frac{1}{2}$  x  $\frac{3}{8}$  Hex. Bolts and Nuts for Rings to Spokes.
- 6 1  $\frac{1}{2}$  x  $\frac{3}{8}$  Hex. Bolts and Nuts for Rings to Rings.
- 16 1 x  $\frac{3}{8}$  Hex. Bolts and Nuts for Base Block, Tower Cap.
- 2 1  $\frac{1}{2}$  x  $\frac{3}{8}$  Hex. Bolts and Nuts for Tail.
- 12 1  $\frac{1}{2}$  x  $\frac{1}{2}$  Hex. Bolts and Nuts for Hub to Spokes.
- 12 Extra  $\frac{1}{2}$  in. Nuts for Double Nutting Spokes to Hub.
- 1 Tail Bracket.

# PACKING LIST

## LOCAL

### Tension Braced Towers for 6 ft., 8 ft. and 10 ft. Type "K" Windmills

#### 3 POST.

Bundle Marked	Contents
No. 1 x 3	3 Main Angles Punched for Base Block and Tower Cap. 2 Ladder Rails each 10 ft. 2 Ladder Rails each 5 ft. 6 Steps. 3 Girts each 1 ft. 3 Girts each 2 ft. 3 Girts each 3 ft. 3 Girts each 4 ft.
No. 2 x 3	3 Main Angles each 10 ft. 3 No. 1 Long Stays each 4 ft. 10 3/4 in. 3 No. 1 Short Stays Bent each 4 ft. 3 in. 3 No. 2 Long Stays each 5 ft. 2-13/16 in. 3 No. 2 Short Stays Bent each 4 ft. 7-1/16 in. 3 No. 3 Long Stays each 5 ft. 9 in. 3 No. 3 Short Stays Bent each 5 ft. 1-5/16 in. 2 No. 2 V Stays each 2 ft. 10-5/16 in. 2 No. 3 V Stays each 2 ft. 8-15/16 in. 9 Tension Pieces. 1 Bag Bolts for 20 ft. Section containing— Hex. Bolts and Nuts: 57 3/4 x 3/8, 18 1 x 3/8, 9 1 1/4 x 3/8, 6 1 x 1/2; B.R.H. Bolts and Nuts: 6 2 1/2 x 1/2, 3 1 1/2 x 3/8, 2 1 x 3/8; Hook Bolts and Nuts: 2 2 x 3/8, 6 1/2 in. Washers.
No. 3a x 3	3 Platform Timbers.
No. 3 x 3	3 Platform Irons (10 ft. differ from 6 ft. and 8 ft.). 3 Anchor Posts. 6 Anchor Plates. 1 Furl Lever. 1 Pipe Stay with U Bolts and Rod Guide.
No. 4	1 Package — Pump Rod.
No. 7 x 3=30 ft. Section.	3 Main Angles each 10 ft. 3 Girts each 5 ft. 3 Girts each 6 ft. 2 Ladder Rails each 10 ft. 4 Steps. 3 No. 4 Long Stays each 6 ft. 4 1/2 in. 3 No. 4 Short Stays Bent each 5 ft. 8-11/16 in. 3 No. 5 Long Stays each 7 ft. 1 1/8 in. 3 No. 5 Short Stays Bent each 6 ft. 5 7/8 in. 2 No. 4 V Stays each 2 ft. 7-15/16 in. 2 No. 5 V Stays each 2 ft. 7 1/8 in. 6 Tension Pieces. 1 Bag Bolts for 30 ft. Section containing— Hex. Bolts and Nuts: 32 3/4 x 3/8, 6 1 x 3/8, 6 1 1/4 x 3/8.

#### 4 POST.

Bundle Marked	Contents
No. 1 x 4	4 Main Angles Punched for Base Block and Tower Cap. 2 Ladder Rails each 10 ft. 2 Ladder Rails each 5 ft. 6 Steps. 4 Girts each 1 ft. 4 Girts each 2 ft. 4 Girts each 3 ft. 4 Girts each 4 ft.
No. 2 x 4	4 Main Angles each 10 ft. 4 No. 1 Long Stays each 4 ft. 10 3/8 in. 4 No. 1 Short Stays Bent each 4 ft. 3 in. 4 No. 2 Long Stays each 5 ft. 2-13/16 in. 4 No. 2 Short Stays Bent each 4 ft. 7-1/16 in. 4 No. 3 Long Stays each 5 ft. 9 in. 4 No. 3 Short Stays Bent each 5 ft. 1-5/16 in. 3 No. 2 V Stays each 2 ft. 10-15/16 in. 3 No. 3 V Stays each 2 ft. 8-15/16 in. 12 Tension Pieces. 1 Bag Bolts for 20 ft. Section containing— Hex. Bolts and Nuts: 70 3/4 x 3/8, 24 1 x 3/8, 12 1 1/4 x 3/8, 8 1 x 1/2; B.R.H. Bolts and Nuts: 8 2 1/2 x 1/2, 8 1 1/2 x 3/8, 2 1 x 3/8; Hook Bolts and Nuts: 2 2 x 3/8; 8 1/2 in. Washers.
No. 3a x 4	3 Platform Timbers.
No. 3 x 4	2 Platform Irons (10 ft. differ from 6 ft. and 8 ft.). 4 Anchor Posts. 8 Anchor Plates. 1 Furl Lever. 1 Pipe Stay with U Bolt and Rod Guide (Angle Iron).
No. 4	1 Package — Pump Rod.
No. 7 x 4=30 ft. Section.	4 Main Angles each 10 ft. 4 Girts each 5 ft. 4 Girts each 6 ft. 2 Ladder Rails each 10 ft. 4 Steps. 4 No. 4 Long Stays each 6 ft. 4 1/2 in. 4 No. 4 Short Stays Bent each 5 ft. 8-11/16 in. 4 No. 5 Long Stays each 7 ft. 1 1/8 in. 4 No. 5 Short Stays Bent each 6 ft. 5 7/8 in. 3 No. 4 V Stays each 2 ft. 7-15/16 in. 3 No. 5 V Stays each 2 ft. 7 1/8 in. 8 Tension Pieces. 1 Bag Bolts for 30 ft. Section containing— Hex. Bolts and Nuts: 42 3/4 x 3/8, 8 1 x 3/8, 8 1 1/4 x 3/8.

# Detailed Directions for the Assembly and Erection of METERS TYPE "K" WINDMILLS

The most efficient method of erecting a Type "K" Windmill is to assemble the tower, head and tail on the ground, erect it, then fit the windwheel to the head. When the location of the mill is such that it cannot be assembled on the ground, it will be found that the tower can be built up piece by piece from the bottom and a derrick used to pull up the head and lower same into the tower.

## GROUND PREPARATION FOR FOUNDATIONS

It is imperative that the anchor posts be embedded in concrete, as this is undoubtedly the most reliable method of ensuring safe anchorage against storm.

First prepare the holes so that the concrete bases may set and be ready to take the weight of the tower to be assembled.

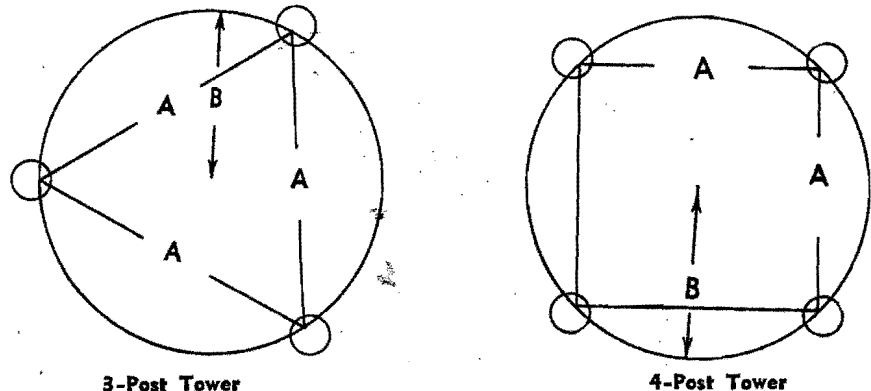


FIG. 1

HEIGHT OF TOWER	6' 8' & 10' MILLS			
	3 POST		4 POST	
	A	B	A	B
20'	4' 6 <sup>3</sup> / <sub>4</sub> "	2' 7 <sup>5</sup> / <sub>8</sub> "	4' 6 <sup>1</sup> / <sub>8</sub> "	3' 2 <sup>1</sup> / <sub>2</sub> "
25'	5' 6 <sup>3</sup> / <sub>8</sub> "	3' 2 <sup>5</sup> / <sub>16</sub> "	5' 5 <sup>3</sup> / <sub>4</sub> "	3' 10 <sup>1</sup> / <sub>2</sub> "
30'	6' 7 <sup>1</sup> / <sub>4</sub> "	3' 9 <sup>3</sup> / <sub>4</sub> "	6' 6 <sup>5</sup> / <sub>8</sub> "	4' 7 <sup>7</sup> / <sub>8</sub> "
40'	8' 7 <sup>1</sup> / <sub>16</sub> "	4' 11 <sup>7</sup> / <sub>8</sub> "	8' 7 <sup>1</sup> / <sub>16</sub> "	6' 0 <sup>5</sup> / <sub>8</sub> "

The tower dimensions at ground level are given in Fig. 1, which also illustrates the most reliable method of marking the positions for the holes. Using the dimension "B" as the radius, mark a circle around a centre peg driven in a position where the centre of the Mill is to be, bearing in mind that the pump rod connecting the Mill to the pump must be absolutely plumb centre. Drive a peg into the ground on the circle where one leg is to be, then another where the dimension "A" cuts the circle measured from the first peg. Mark the third peg position similarly from the first, then check the distance between the second and third. In the case of a four-post tower proceed as above, but establish the fourth peg from the second or third. If all measurements have been correct all the pegs will be equi-distant from each other. If not, check the measurements until they agree with the plans as in Fig. 1. These pegs now represent the spot at which each leg enters the ground. Before disturbing them, start a hole 12 inches in diameter. The pegs should be deep enough so that their exact location will not be lost. The holes should be made to slope outwards so as to follow the slope of the tower legs which is 1 <sup>1</sup>/<sub>2</sub> inches per foot of depth. For 6 ft. and 8 ft. Mills the depth of the holes to be 3 ft. 4 in., and for 10 ft. Mills 4 ft.

If the windmill is being erected on a hillside the lowest hole must be the full depth as stated and the others deeper so that the bottoms are all level.



# GROUND PREPARATION FOR FOUNDATIONS

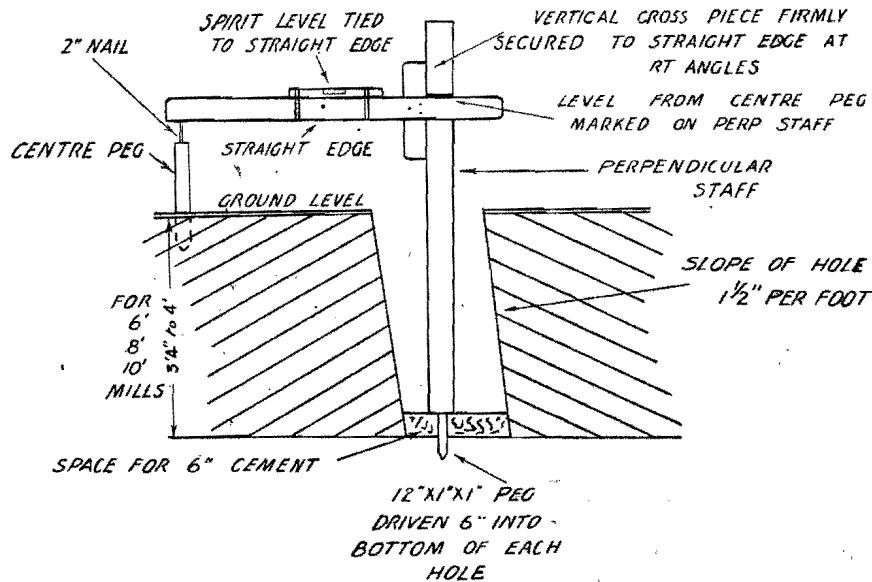


Fig. 2.

**Figure 2** illustrates the method of obtaining level concrete foundations. Drive a wooden peg six inches into the bottom of each hole, leaving six inches above the bottom = peg twelve inches long. Then hold upright a length of timber 4 ft. to 5 ft. long (perpendicular staff) with the bottom end resting on the top of one of these pegs. Rest one end of a straight edge with a spirit level firmly attached in the centre, on the same centre peg that was used to determine the position of the holes. The straight edge to have a short vertical crosspiece securely fixed to form a cross square, which is to be held firmly against the perpendicular staff. When the straight edge is perfectly level as indicated by the spirit level and square with the perpendicular staff, mark the staff as a guide to levelling the remaining holes.

Then place the perpendicular staff in the next hole with the bottom end resting on the top of the wooden peg and determine the level in a similar manner by holding the short vertical crosspiece attached to the straight edge against the perpendicular staff.

The mark previously made on the staff should indicate the level of the hole, but should the staff be too high carefully tamp down the peg until the straight edge, showing level on the spirit level, is level with the mark on the staff. Then adopt the same procedure in respect to the remaining hole or holes. When driving the wooden pegs into the bottom of the holes it is advisable to leave the pegs slightly on the high side for the reason that it is easier to tamp the pegs down than to raise them. By using this method all of the holes are levelled from the one point, namely, the centre peg thus ensuring uniformity. Mix and pour sufficient concrete to fill in to the exact peg tops and make the concrete wet enough to tamp so that it settles level.

Should circumstances prevent a centre peg from being driven into the ground, such as erecting the mill over a well, a suitable alternative would be a length of timber secured to the ground with the peg firmly fixed in an upright position and in the centre of where the tower is to be erected.

In the case of a steel cased bore a wooden plug could be driven into the top of the casing and a nail driven into the centre of the plug.

# WIRE BRACED TOWER ASSEMBLY

## NOTES ON ASSEMBLY

1. ALL ANCHOR POSTS SET IN CONCRETE
2. GIRTS BOLTED OUTSIDE MAIN ANGLES
3. DIAGONAL STAYS BOLTED INSIDE MAIN ANGLES
4. LADDER BOLTED INSIDE GIRTS
5. NO STANDARD ANGLE ON LADDER SIDE OF TOWER.

NAME OF PART	BOLT SIZE.
TOWER CAP	1 x $\frac{3}{8}$
BASE BLOCK	1 x $\frac{3}{8}$
No. 1 GIRT	$\frac{3}{4}$ x $\frac{5}{16}$ OR $\frac{3}{8}$
PLATFORM	2 $\frac{1}{2}$ x $\frac{1}{2}$ BRN
PLATFORM TO IRONS	1 $\frac{1}{2}$ x $\frac{3}{8}$ BRN
IRONS TO MAIN A.	$\frac{3}{4}$ x $\frac{5}{16}$ OR $\frac{3}{8}$
LADDER	$\frac{3}{4}$ x $\frac{5}{16}$ OR $\frac{3}{8}$
No. 2 GIRT	1 x $\frac{5}{16}$ OR $\frac{3}{8}$
LADDER	$\frac{3}{4}$ x $\frac{5}{16}$ OR $\frac{3}{8}$
MAIN A. JOINT	$\frac{3}{4}$ x $\frac{5}{16}$ OR $\frac{3}{8}$
No. 3 GIRT	1 x $\frac{5}{16}$ OR $\frac{3}{8}$
LADDER	$\frac{3}{4}$ x $\frac{5}{16}$ OR $\frac{3}{8}$
CENTRE STAY	1 $\frac{1}{2}$ x $\frac{5}{16}$ OR $\frac{3}{8}$
CENTRE STAY	1 $\frac{1}{2}$ x $\frac{5}{16}$ OR $\frac{3}{8}$
No. 4 GIRT	1 x $\frac{5}{16}$ OR $\frac{3}{8}$
LADDER	$\frac{3}{4}$ x $\frac{5}{16}$ OR $\frac{3}{8}$
MAIN A. JOINT	$\frac{3}{4}$ x $\frac{5}{16}$ OR $\frac{3}{8}$
CENTRE STAY	1 $\frac{1}{2}$ x $\frac{5}{16}$ OR $\frac{3}{8}$
LADDER	$\frac{3}{4}$ x $\frac{5}{16}$ OR $\frac{3}{8}$
No. 5 GIRT	1 x $\frac{5}{16}$ OR $\frac{3}{8}$
STANDARD ANGLE	$\frac{3}{4}$ x $\frac{5}{16}$ OR $\frac{3}{8}$
LADDER	$\frac{3}{4}$ x $\frac{5}{16}$ OR $\frac{3}{8}$
No. 6 GIRT	1 x $\frac{5}{16}$ OR $\frac{3}{8}$
MAIN A. JOINT	$\frac{3}{4}$ x $\frac{5}{16}$ OR $\frac{3}{8}$
ANCHOR PLATES	1 x $\frac{1}{2}$

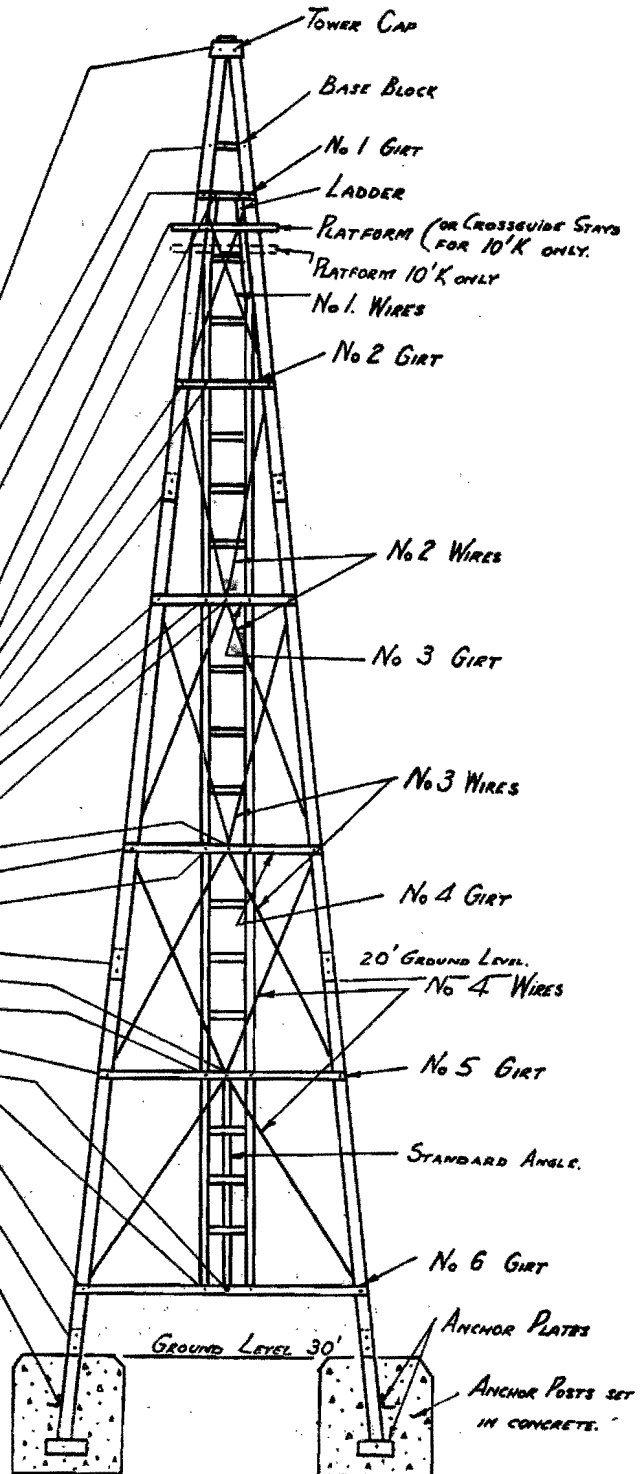


Fig. 3.

# WIRE BRACED TOWER ASSEMBLY

Open the bundles and segregate contents in threes for 3-post tower, or fours for 4-post tower—of similar sizes and kind—but do not disturb the labels on the wire braces. Sort out the bolts in a similar manner (see Fig. 3), then assemble all ladder sections (Fig. 5).

Start at the top end by bolting the 10 ft. leg sections to the inside of the tower cap, then bolt the base block corner bolt lugs upwards in position at the next series of holes down from the tower cap. The girts go outside of the legs and the braces inside. Bolt the shortest girts and the single braces at the first set of holes from the top and on one side, also include the first 10 ft. ladder section inside and flat against the girts, but over the braces. The heads of the bolts go on the inside of the tower. Leave all bolts with a full nut, but untightened, until the tower is complete. Add girts, braces (Fig. 4), ladder (Fig. 5), and legs (Fig. 6) progressively until finished, and when a five-foot leg section is included in the tower, such section is always placed at the bottom end. Standard angles about 5 ft. long are provided and are to be bolted between the centres of the bottom panel girts, one each side, with the exception of the ladder side on all towers regardless of heights, as per Fig. 3. When bolting leg section together the bottom of the upper angle must be outside the top of the lower angle (Fig. 6).

## THE FOREGOING COMPLETES A 20 FT. TOWER.

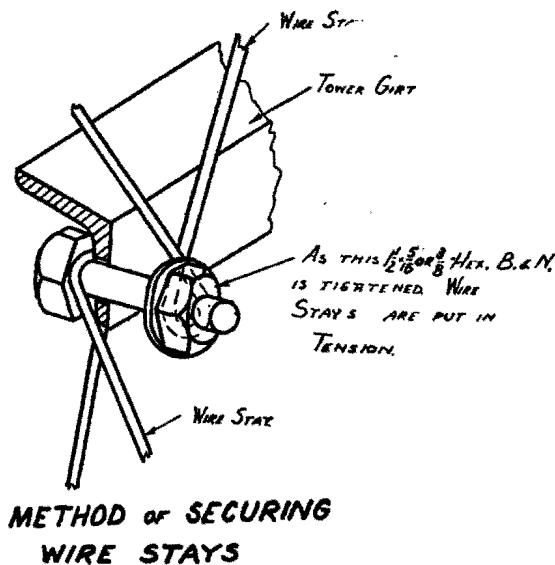


Fig. 4.

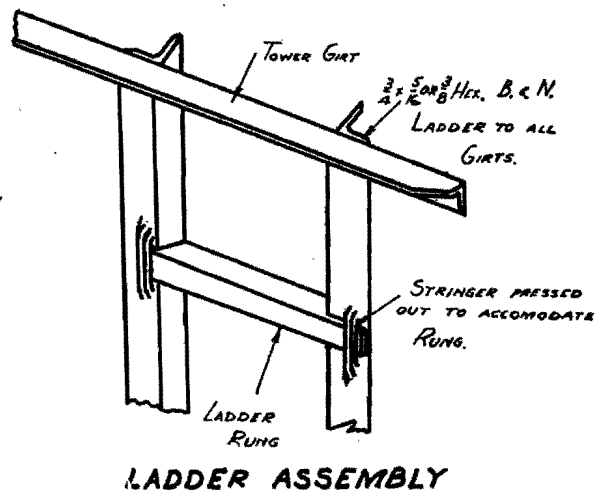


Fig. 5.

**TOWER BRACES** (all given lengths are overall). No. 1 Braces are single and go between the first and second girts, as shown on Fig. 3. No. 2 Brace bundle has double or "hairpin" braces 4 ft. 10 $\frac{1}{4}$  in. long, also double braces 5 ft. 1 $\frac{3}{4}$  in. for each side of the tower. The two ends of the 4 ft. 10 $\frac{1}{4}$  in. brace bolt one on each end of No. 2 girt with the centre loop bolted to centre of No. 3 girt. The centre loop of the 5 ft. 1 $\frac{3}{4}$  in. brace goes on the same bolt, but on the opposite side of No. 3 girt, and its two ends bolt one on each end of No. 4 girt.

## WIRE BRACED TOWER ASSEMBLY

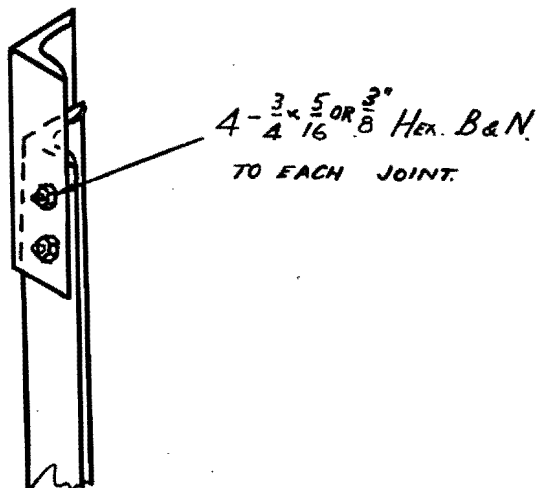


Fig. 6.

### MAIN ANGLE JOINT

No. 3 Brace Bundle has double braces 4 ft.  $11\frac{5}{8}$  in. in length and double braces 5 ft.  $4\frac{1}{8}$  in. for each side of tower. The ends of the shorter ones go to girt No. 3, and those of the longer to girt No. 5, with their crossed looped ends to the centre of No. 4 girt.

**THIS COMPLETES A 25 FT. TOWER.**

No. 4 Brace Bundle has double braces of 5 ft.  $1\frac{3}{4}$  in. in length and double braces 5 ft.  $7\frac{1}{4}$  in. for each side of tower. The ends of the shorter go to No. 4 girt, and those of the longer to No. 6 girt, with their crossed looped ends to No. 5 girt.

**THIS COMPLETES A 30 FT. TOWER.**

#### For 40 Ft. Tower—

No. 5 Brace Bundle lengths are 4 ft.  $11\frac{5}{8}$  in. and 5 ft.  $10\frac{1}{2}$  in.  
No. 6 Brace Bundle lengths are 5 ft.  $7\frac{1}{4}$  in. and 6 ft.  $2\frac{1}{2}$  in.

#### For 50 Ft. Tower—

No. 7 Brace Bundle lengths are 5 ft.  $10\frac{1}{2}$  in. and 6 ft.  $6\frac{1}{2}$  in.  
No. 8 Brace Bundle lengths are 5 ft.  $7\frac{1}{4}$  in. and 6 ft.  $10\frac{1}{2}$  in.

#### For 60 Ft. Tower—

No. 9 Brace Bundle lengths are 6 ft.  $6\frac{1}{2}$  in. and 7 ft.  $3\frac{1}{4}$  in.  
No. 10 Brace Bundle lengths are 6 ft.  $10\frac{1}{2}$  in. and 7 ft. 8 in.

It is better to bolt the looped ends in the centre before doing the two lower ends; the legs can easily be strained inward and the end with its bolt inserted into the hole. Do the girt end lying on the ground first, then hold the head of the bolt in place at the top end of the girt, with a footprint or "Stillson" pipe wrench, one jaw under the bolt head, the other on the outer side of the leg, with the jaws well extended, while you insert the top end of the girt on the bolt.

When the foregoing parts are assembled, the whole tower can now be tightened up, starting with the long centre girt bolts. Use reasonable pressure so as to tighten thoroughly, but not break the bolts. Then attach the platform (Fig. 7).

# WIRE BRACED TOWER ASSEMBLY

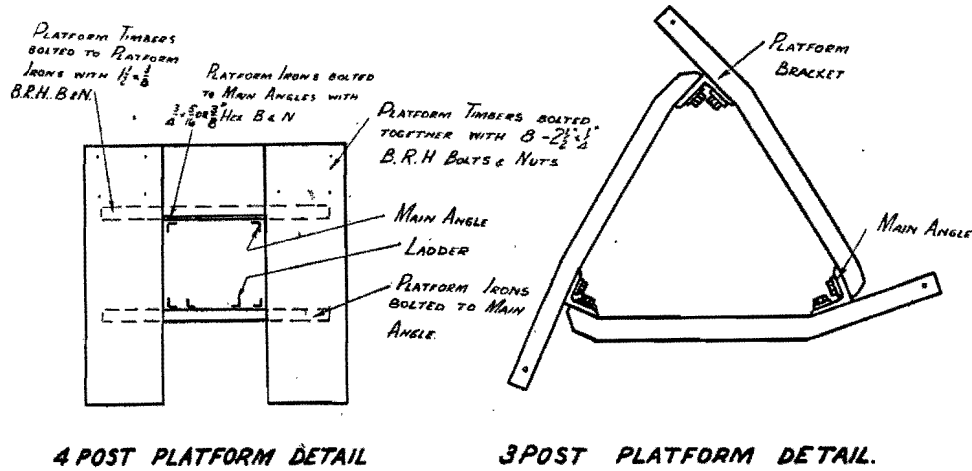


Fig. 7.

## TENSION BRACED TOWER ASSEMBLY (Fig. 9)

The directions given in respect to wire-braced towers apply also to tension-braced towers, with the exception of the braces otherwise known as diagonal stays (see Fig. 8). The short tension strap should be at the bottom of each panel (between girts), one end bolted to the inside of main angle, and the other end, which is bent at right angles, bolted to the short diagonal stay. Tension stays should alternate from one side to the other side of each panel so as to even the tension.

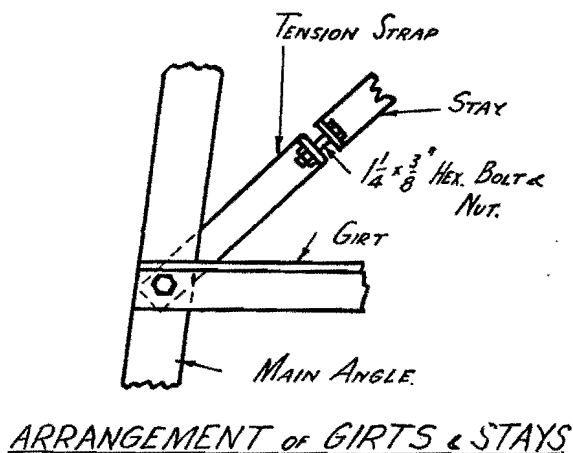


Fig. 8.

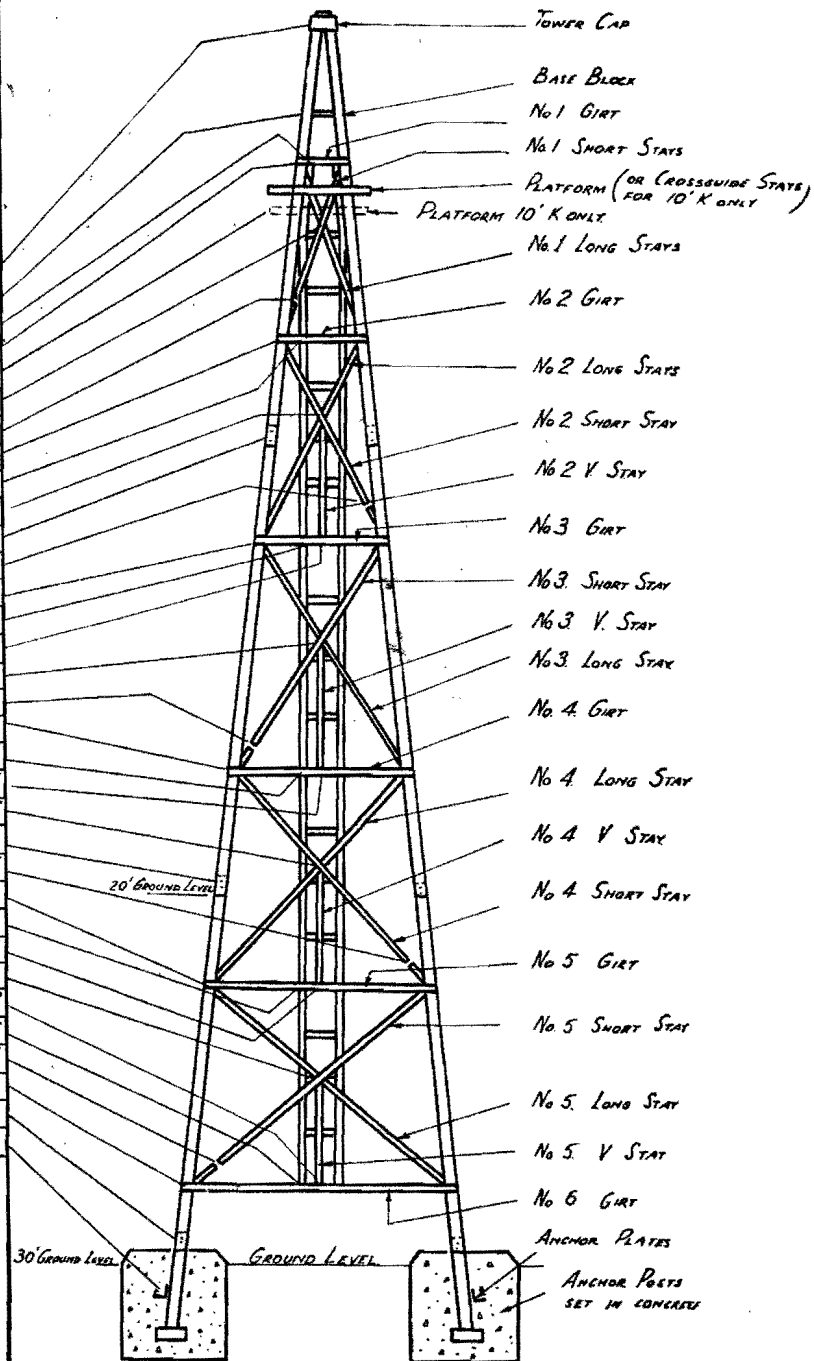
The top end of the Vertical (V) stays are to be bolted to the diagonal stays where same cross and the bottom end of the V stays are to be bolted to the centre of the lower girts of each panel on all sides of tower, except ladder side.

# TENSION BRACED TOWER ASSEMBLY

## NOTES ON ASSEMBLY

- 1 ALL ANCHOR POSTS SET IN CONCRETE
- 2 GIRTS BOLTED OUTSIDE MAIN ANGLES
- 3 DIAGONAL STAYS BOLTED INSIDE MAIN ANGLES
- 4 LADDER BOLTED INSIDE GIRTS
- 5 NO V STAYS ON LADDER SIDE OF TOWER.

NAME OF PART	BOLT SIZE
TOWER CAP HEX	$1 \times \frac{3}{8}$
BASE BLOCK	$1 \times \frac{3}{8}$
LADDER	$\frac{3}{4} \times \frac{3}{8}$
6 <sup>TH</sup> GIRT	$\frac{3}{4} \times \frac{3}{8}$
PLATFORM	$\frac{3}{4} \times \frac{3}{8}$
CENTRE STAY	$\frac{3}{4} \times \frac{3}{8}$
TENSION BOLT	$1\frac{1}{2} \times \frac{3}{8}$
5 <sup>TH</sup> GIRT	$1 \times \frac{3}{8}$
LADDER	$\frac{3}{4} \times \frac{3}{8}$
CENTRE STAYS	$\frac{3}{4} \times \frac{3}{8}$
MAIN ANGLE JOINT	$\frac{3}{4} \times \frac{3}{8}$
TENSION BOLT	$1\frac{1}{2} \times \frac{3}{8}$
4 <sup>TH</sup> GIRT	$1 \times \frac{3}{8}$
LADDER	$\frac{3}{4} \times \frac{3}{8}$
VERT. STAY	$\frac{3}{4} \times \frac{3}{8}$
CENTRE STAY	$\frac{3}{4} \times \frac{3}{8}$
TENSION BOLT	$1\frac{1}{2} \times \frac{3}{8}$
3 <sup>RD</sup> GIRT	$1 \times \frac{3}{8}$
LADDER	$\frac{3}{4} \times \frac{3}{8}$
VERT. STAY	$\frac{3}{4} \times \frac{3}{8}$
CENTRE STAY	$\frac{3}{4} \times \frac{3}{8}$
MAIN ANGLE JOINT	$\frac{3}{4} \times \frac{3}{8}$
TENSION BOLT	$1\frac{1}{2} \times \frac{3}{8}$
2 <sup>ND</sup> GIRT	$1 \times \frac{3}{8}$
LADDER	$\frac{3}{4} \times \frac{3}{8}$
VERT. STAY	$\frac{3}{4} \times \frac{3}{8}$
CENTRE STAY	$\frac{3}{4} \times \frac{3}{8}$
VERT. STAY	$\frac{3}{4} \times \frac{3}{8}$
LADDER	$\frac{3}{4} \times \frac{3}{8}$
TENSION BOLT	$1\frac{1}{2} \times \frac{3}{8}$
BOTTOM GIRT	$\frac{3}{4} \times \frac{3}{8}$
MAIN ANGLE JOINT	$\frac{3}{4} \times \frac{3}{8}$
ANCHOR PLATES	$1 \times \frac{1}{2}$



# TYPE "K" HEAD ASSEMBLY (10 FT.)

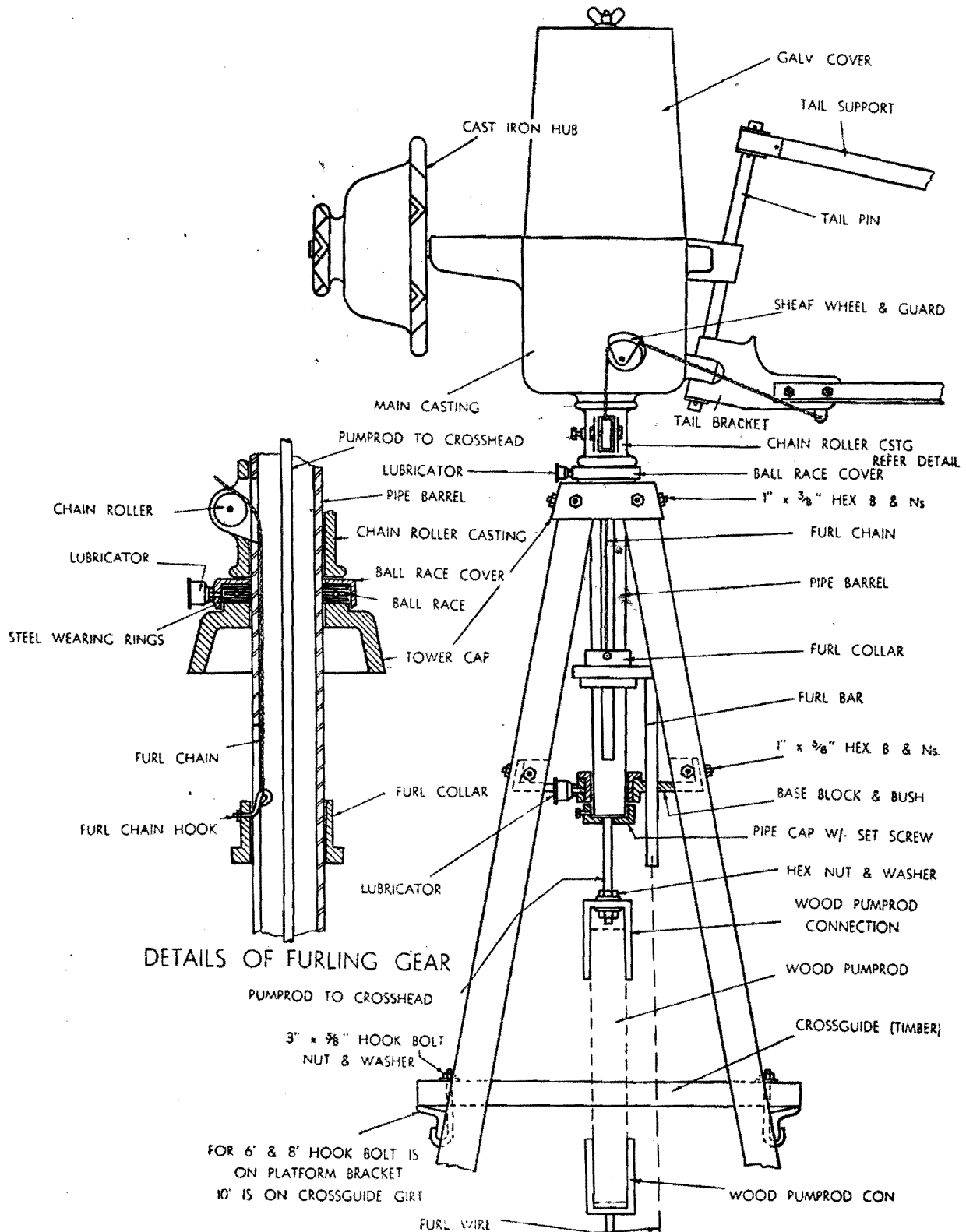


Fig. 10.

## FITTING TYPE "K" WINDMILL HEAD TO TOWER (FIG. 10)

The furl collar, furl bar and pipe collar should be removed from the pipe barrel. Place the furl collar and furl bar in position in the base block with furl bar through the slotted hole in the base block. Then place the head with the chain roller casting, ballrace and ballrace cover fitted on the pipe barrel in position by guiding the pipe barrel through the tower cap, furl collar and baseblock. The ballrace with one washer above and the other below fits inside the ballrace cover.

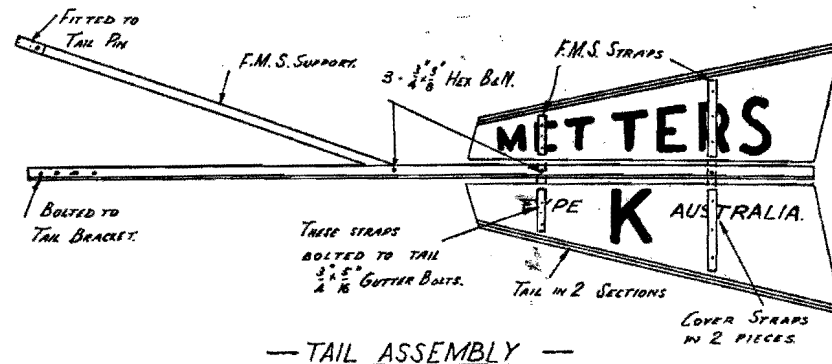


Fig. 11.

The tail may now be fitted (Fig. 11). The furl chain, with the furl collar hook, should be passed over the sheaf wheel and chain roller and down outside the pipe barrel for 6 and 8 ft. mills and inside pipe barrel for 10 ft. mills. Something flat can be used to push the end of the hook through the hole in the furl collar. The nut should be tightened on the thread and will leave the hook loose in the furl collar (see Fig. 10). Tail pin should be oiled at top where connected to tail support and where it passes through casting. Tail casting must be quite free and square with wind-wheel when mill is unfurled.

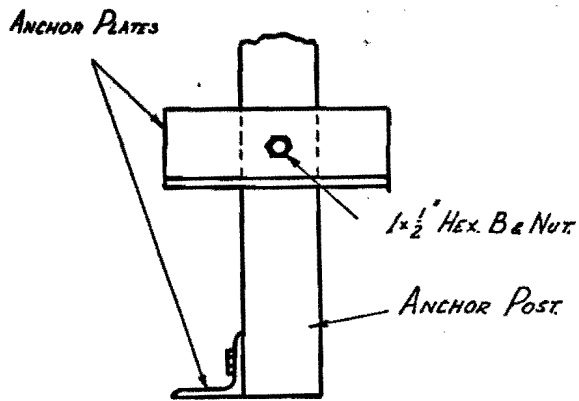
The top end of the chain is then secured to the tail mount and the pipe collar fitted over the bottom end of the pipe barrel underneath the base block. The pump rod is then passed up through the pipe barrel and secured in the cross head. Extra care should be exercised to make sure the chain is not twisted. When fixing chain to tail and furl collar see that the chain travel corresponds with the slotted hole in pipe barrel. Should chain be too long, take in link or links at tail end.



# ERECTION OF TOWER

## Applicable to Type "K" and Master Nuoil Windmills.

Bolt the anchor plates to the anchor posts (Fig. 12) and place one in each foundation hole. Place the leg bolts in a handy position ready for use. Firmly bolt a board, long enough to span two of the holes, and strong enough to support two legs across the outside of the legs lying on the ground. Adjust the tower with the boarded legs mid-way across and over two of the foundation holes.



ANCHOR POST ASSEMBLY

Fig. 12.

In the case of towers 30 ft. or more high, the two legs taking the strain when the tower is being pulled up should be temporarily supported from the bottom to above the bottom girt by a short length, approx. 3-4 ft. of timber or piping securely lashed to each. These supports must not protrude below the legs.

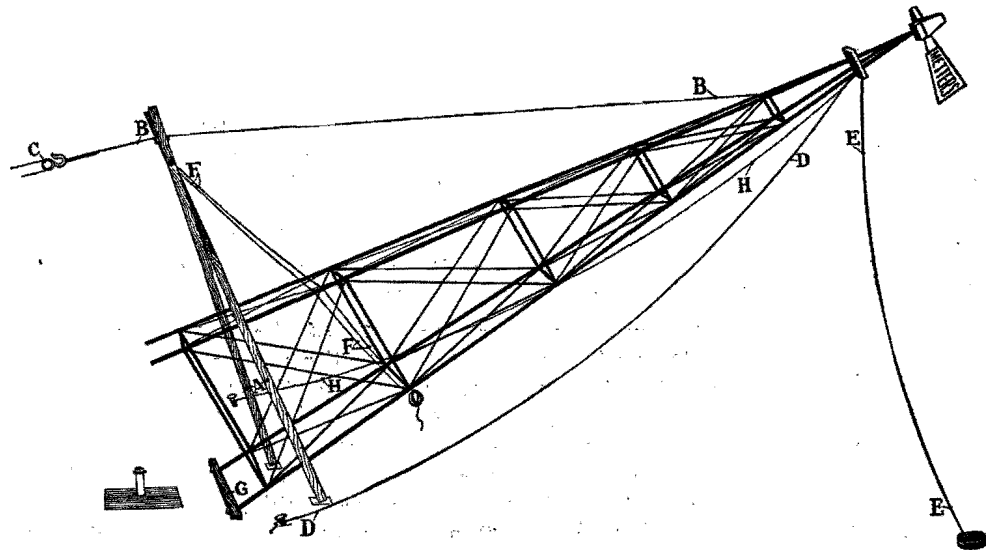


Fig. 13.

## ERECTION OF TOWER

### ESTABLISH HAULING TACKLE (FIG. 13).

- (a) Gin poles of timber, or two lengths of pipe, crossed at the top, securely tied, and the legs spread beyond the width of the tower. These poles should be approximately two-thirds of the length of the tower.
- (b) Hauling ropes of ample strength.
- (c) Pulleys—the more sheaves the easier to haul.
- (d) and (h) Guy ropes to be used as safeguard.
- (e) Back guy rope. Essential to prevent the tower from being pulled beyond the perpendicular and for pulling the tower legs to the line of the anchor post bolt holes.
- (f) Tie rope, holding gin poles in position.
- (g) Timber bolted under the tower legs, which, coming into contact with the foremost anchor posts, prevents the tower from dragging too far forward when being pulled up.

The length of the hauling rope "B" from the tower to the gin poles should set the gin poles at an angle of approximately 45 degrees before taking the lift.

The pull on the hauling rope by men, truck or tractor, can be direct, or with the aid of double and single tackle, according to the weight of the tower. If tackle is used, the block with the fall rope should be attached to the primary pull "C" when the free leg or legs approach their positions over the foundation holes; bolt the anchor posts to them, then lower the leg or legs gently on to the concrete bottom. Pull one guy so as to take the weight of the other leg or legs, unbolt the board and bolt the legs to anchor posts, then lower on to concrete. Three post tower legs are anchored separately. Four post tower legs are anchored in pairs. With the tower now resting on its legs in the holes, test it for plumb with a spirit level placed on a straight edge held across the bottom girts close to the legs. Test each side, and, if necessary, pack a low leg until the tower is plumb. Do not test with the spirit level on the girts.

Plumb the tower for centre over pump or bore, and, with four-leg tower, measure across corners to see that the tower is square, then pour the concrete into the holes, adding a few four to six-inch stones, tightly packed, if available. The concrete mixture should consist of  $3\frac{1}{2}$  parts  $\frac{1}{2}$  to  $\frac{3}{4}$ -inch stones, 2 parts clean, sharp sand, and 1 part cement. An earth mound tightly tamped down around each leg is advisable so that water will drain away from leg.

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## ASSEMBLY AND ERECTION OF BUILT UP TOWER

The same method of preparing the ground for foundations apply as illustrated and described in Fig. 1 and Fig. 2. With a four post tower, two opposite sides of the bottom section, each including two legs, should be assembled on the ground with the girts outside of the legs, and stays or braces inside, and the anchor posts bolted to the legs (see Fig 12), then up-ended on to the concrete bases in the holes. The remaining two sides are then formed by bolting the girts and stays to the two assembled sides, which, when the ladder is fitted, makes the complete bottom section.

With a three post tower, assemble one side of the bottom section, including two legs with anchor posts attached, then up-end on to the concrete bases. Place the third leg, with anchor post attached, into the hole, and bolt on the girts and stays of the remaining two sides and the ladder section. Refer Figures 4 and 5 and explanatory.

Before proceeding to build up the other sections it is advisable to check the bottom section for plumb by using a spirit level placed on a straight edge, held firmly across the bottom girts and against the legs. Check each side, and, if necessary, pack up a low leg between bottom of anchor post and concrete base. Do not check with spirit level on the girts themselves. The next section up is then fitted by bolting the legs to the lower assembled section legs (see Fig. 6), then the girts and stays and ladder. The

## ASSEMBLY AND ERECTION OF BUILT-UP TOWER

same procedure is employed until the tower is complete. Bolt the tower cap outside and over the top of the legs, then the base block inside of the legs with the bolt lugs upwards (see Fig. 10).

For both safety and comfort, it is advisable for the erector to stand on a wooden board placed immediately inside of the tower leg and resting on the girts of two sides of the tower. All bolts should be full nutted, but untightened until the tower is complete and the head fitted in, then tightened evenly, commencing from the top. Sight the tower for centre, then pour the concrete into the anchor holes. Concrete mixture:  $3\frac{1}{2}$  parts  $\frac{1}{2}$  to  $\frac{3}{4}$ -inch stones, 2 parts clean, sharp sand, and 1 part cement.

The head and tail are now placed in position with the aid of ropes and pulleys, and a derrick firmly secured to the tower and sufficiently high to allow the pipe barrel to pass through the tower cap and base block (see Fig. 21).

### WHEEL ASSEMBLY (Figs. 14 and 23)

Bolt the spokes loosely to the hub, nuts outward, then bolt the assembled wheel sections to the spokes. The inner rings fit underneath the cross bars or spacing pieces inside the spokes, and the outer rings are fitted outside the end of spokes. The second or inner hole in a ring section attaches to the spoke—one pair of ends of each ring section should lap under, and the other pair lap over the rings of the next section. Put on one section then turn wheel around to the opposite point and put on another section so as to balance the preceding section. As the remaining sections are fitted, the wheel balance should be maintained. No attempt should be made to strain or bend any part. If the wheel is being assembled correctly the bolts should fit into position without any straining. Do not tighten any of the wheel bolts until the complete wheel is assembled.

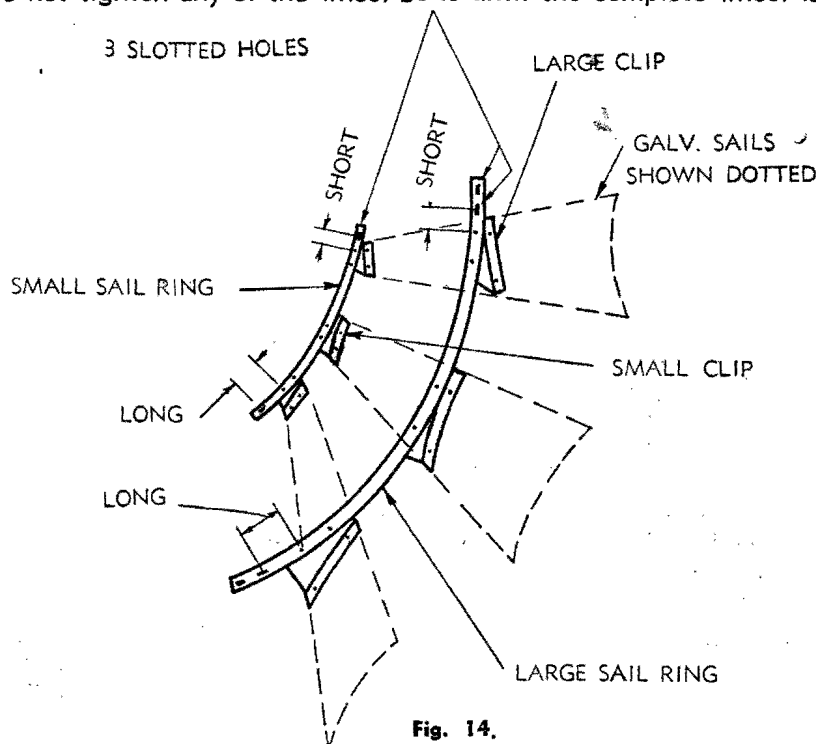


Fig. 14.

In order to reduce shipping measurements, wind-wheels are despatched overseas and interstate with unassembled sections, i.e., sails and sheet iron sail clips not attached to ring sections. The large and small clips are to be bolted to the sails and rings (see Figs. 14 and 23). The 5 and 6 ft. Type K Wind-wheels turn anti-clockwise and consist of four spokes and four sections, each section comprising three sails. The outer ring passes through a slotted hole in the sails. The 8 and 10 ft. Wind-wheels turn clockwise and have six spokes and six sections, each section has three sails. The outer ring does not pass through the sails as in the case of 5 and 6 ft.

Clamp the furl lever (Fig. 15) to the most convenient tower leg, and connect No. 8 gauge wire to the lever. The top end of the wire is to be attached to the furl bar underneath the mill head. Adjust the furl lever to get the range of the lever movement to conform to the movement of the tail. Take off the galvanised cover and turn the wheel around slowly to see that everything is quite free, then pour in sufficient oil to cover the bottom crank movement of the pitman arms.

Check and tighten all bolts, commencing from the top and working down.

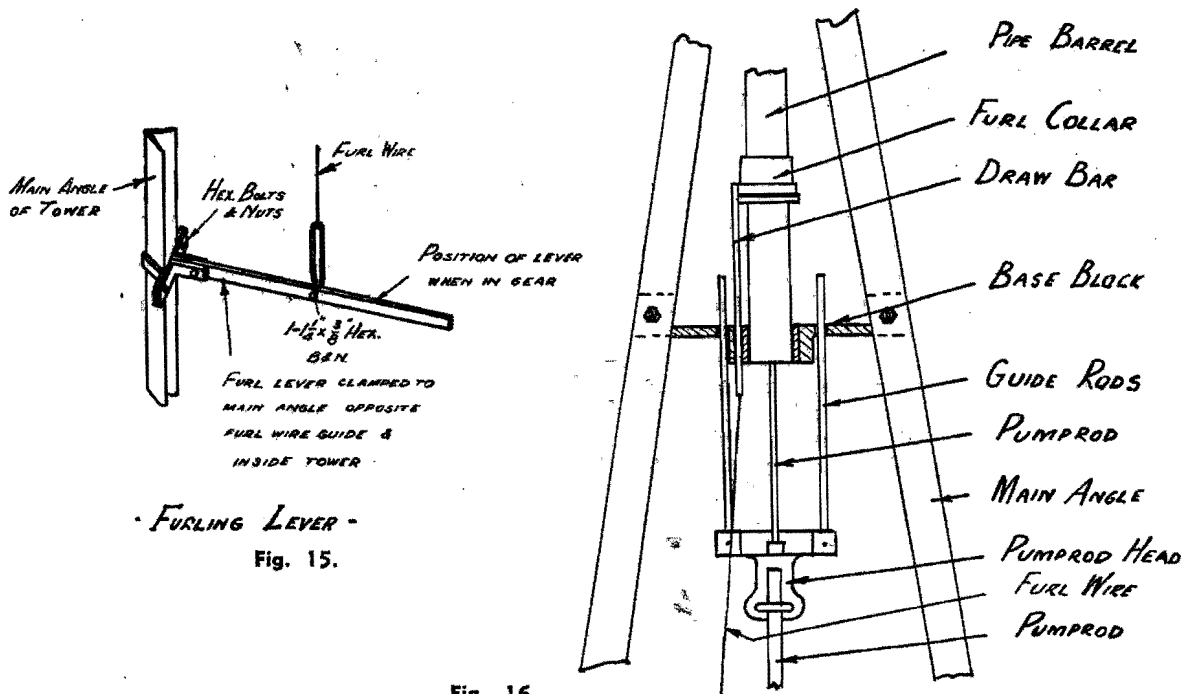


Fig. 16.

## PUMP ROD ANTI-SWIVEL

If wooden pump rod is being used, slip same up through the square hole in the wooden guide and attach it to the swivel at the lower end of the mill rod. Turn the mill around until the mill rod is at the bottom of the stroke, then fit to tapped connections provided for the pump rod. Raise the pump rod  $1\frac{1}{2}$  inches from the bottom of its stroke, then mark and cut the wooden pump rod to the required length. Bore holes to suit the connection and bolt up.

Make certain that the wood guide and rods are exactly in line and do not bind together: Any binding caused through non-attention to this detail will considerably increase the load, especially in the case of smaller windmills. Figure 10 includes illustration of the method of fitting wood pump rod anti-swivel.

Type "K" Windmills supplied locally are equipped with different pattern pump rod anti-swivel (see Fig. 16). Two round steel guide rods pass through holes in base block, one each side, and connected at bottom underneath base block with cast iron pump rod head. The bottom end of the main pump rod is shaped to fit into the recess in the rod head casting so as to enable the rod to swivel in the casting, which is prevented from turning by the round guide rods passing through the base block. The rod leading to the pump is then secured by a steel clamp bolt to the rod head casting.

Before unfurling the mill, turn the wheel round a few times by hand to see that the gears and pump rod are free, then make sure that the mill head turns freely on its turntable. See page 31 relating to oil.

Diagram illustrating the components of a pumpjack assembly, labeled as follows:

- CROSSHEAD SPINDLE
- GUIDE ROLLER (PAIR)
- CROSSHEAD WITH CLIP AND RING
- GEARWHEEL
- PITMAN
- BUSH FOR GEARWHEEL
- LONG HUB SHAFT BEARING
- HUB
- HUB SPINDLE
- PINION
- MAIN CASTING WITH TEE IRON LOOP AND PIPE BARREL WELDED
- GEARWHEEL SPINDLE
- HALF BEARING FOR GEARSHAFT
- CAP FOR GEARSHAFT BEARING
- OIL SLEEVE
- WING NUT
- PITMAN
- GEARWHEEL
- TAIL SUPPORT PIN
- TAIL BRACKET
- BOLT FOR BUFFER SPRING
- SHORT HUBSHAFT BEARING
- GUARD FOR SHEAF WHEEL
- CHAIN ROLLER CASTING
- BALLRACE COVER
- STEEL WASHER FOR BALLRACE
- BALLRACE WITH BALLS
- STEEL WASHER FOR BALLRACE
- TOWER CAP
- DRAW BAR
- FURL COLLAR
- BUSH FOR PIPE BARREL
- BASE BLOCK
- PIPE COLLAR
- ANTI-SWIVEL GUIDE ROD
- PUMPROD
- PUMPROD HEAD
- CHAIN ROLLER
- SHEAF WHEEL
- FURL CHAIN
- FURL COLLAR HOOK

See next page for serial numbers and letters.

# COMPONENT PARTS OF METTERS TYPE "K" WINDMILL HEAD

First figure denotes size of Mill — 6 = 6 ft. 8 = 8 ft. 9 = 10 ft.  
Second and third figures represent: number of parts.  
Parts for 5 ft. Mill same as for 6 ft.

	6 ft.	8 ft.	10 ft.
Anti-Swivel Guide Rod (round) .....	KH639	KH839	KH939
Ball Race with Balls .....	KH646	KH846	KH946
Ball Race Cover .....	KH649	KH849	KH949
Base Block for 3 or 4 Post Tower to be specified .....	KH635	KH835	KH935
Bolt for Buffer Spring .....	K630	K830	K930
Buffer Spring .....	K629	K829	K929
Bush for Base Block .....	KH655	KH855	KH955
Bushes (only) for Gear Wheel .....	KA634	KA834	KA934
Cap for Gear Shaft Bearing .....	K605	K805	K905
Chain Roller Casting .....	KH613	KH813	KH913
Chain Roller .....	KH612	KH812	KH912
Crosshead with Clip, no Ring .....	KH620	KA820	KA920
Crosshead Spindle .....	K621	K821	K921
Draw Bar .....	KH618	KH818	KH918
Furl Collar .....	KH615	KH815	KH915
Furl Collar Hook .....	KA616	KA816	KA916
Furl Chain .....	K617	K817	K917
Galvanised Cover .....	KH632	KH832	KH932
Gearwheel with Bushes .....	KA608	KA808	KA908
Gear Wheel Spindle .....	K623	K823	K923
Guard for Sheaf Wheel .....	K611	K811	K911
Guide Rollers (pair) .....	KA637	KA837	KA937
Half Bearing for Gear Shaft .....	K604	K804	K904
Hub .....	K606	K806	K906
Hub Shaft Bearing (long) .....	K602	K802	K902
Hub Shaft Bearing (short) .....	K603	K803	K903
Hub Spindle .....	K624	K824	K924
Main Casting with Tee Loop and Pipe Barrel .....	KH601	KH801	KH901
Oil Ring only .....	K626	K826	K926
Oil Sleeve .....	—	K833	K933
Pinion .....	KA607	KA807	KA907
Pipe Collar .....	KH619	KH819	KH919
Pitman .....	K609	K809	K909
Pumprod .....	KH625	KH825	KH925
Pumprod Head (bottom Anti-Swivel Casting) .....	KH-38	KH-38	KH-38
Sheaf Wheel .....	K610	K810	K910
Tail Bracket .....	KH627	KH827	KH927
Tail Support Pin .....	KH631	KH831	KH931
Tower Cap for 3 or 4 Post Tower to be specified .....	KH636	KH836	KH936
Washer for Ball Race (bottom) .....	KH648	KH848	KH948
Washer for Ball Race (top) .....	KH647	KH847	KH947
<b>Applicable to Overseas and Interstate Pattern only.</b>			
Connection from Wood to Iron .....	E653	E853	E953
Pumprod .....	E661	E861	E961
Swivel to Wood Rod .....	E652	E852	E952
Wooden Pump Rod Guide .....	E656	E856	E956

When ordering replacement parts, please state size, pattern, and age of windmill, and the names, letters, and serial numbers of the parts required.

# PACKING LIST

## OVERSEAS AND INTERSTATE

**Applying to Windmills packed singly.**

### 8 x 20 MASTER NUOIL WINDMILL

Package Marked	Contents of Package
8x20M No. 1	Crate 53" x 28" x 33" containing 1 Head, 6 Spokes, 18 Sails, 18 Small Sail Clips, 18 Large Sail Clips, 6 Inner Sail Rings, 6 Outer Sail Rings, 2 Sections Tail Vane, 1 Wood Pumprod Connection, 1 Cast Crossguide, 1 Wood Crossguide, 1 Furl Wire and Disc, 1 Tie Bar and Casting, 1 Tail Carrier, 1 Sheaf Wheel and Guard, 1 Tail Bracket, 4 Anchor Posts, 8 Anchor Plates, 2 Platform Irons, 1 Furl Handle, 1 Bag Bolts including 4 Grease Cups and 1 Furl Chain for Head, 1 Bag Bolts for Tower, 3 Platform Timbers.
8x20M No. 2	Bundle 120" x 5" x 5" containing 8 Main Angles.
8x20M No. 3	Bundle 108" x 5" x 4" containing 16 Diagonal Stays.
8x20M No. 4	Bundle 97" x 10" x 4" containing 2 Ladders, 4 Top Girts, 4 Second Girts, 4 Third Girts, 1 Main Pumprod, 1 Tail Bone.

### 8 x 30 MASTER NUOIL WINDMILL

8x30M No. 1	Crate same size and contents as 8x20.
8x30M No. 2	Bundle 120" x 5" x 3" containing 8 Main Angles.
8x30M No. 3	Bundle 120" x 5" x 3" containing 8 Main Angles.
8x30M No. 4	Bundle 130" x 6" x 5" containing 24 Diagonal Stays.
8x30M No. 5	Bundle 117" x 10" x 6" containing 3 Ladders, 4 Top Girts, 4 Second Girts, 4 Third Girts, 4 Fourth Girts, 1 Main Pumprod, 1 Tail Bone.

### 8 x 40 MASTER NUOIL WINDMILL

8x40M No. 1	Crate same size and contents as 8x20.
8x40M No. 2	Bundle 120" x 5" x 3" containing 2 Main Angles.
8x40M No. 3	Bundle 120" x 5" x 3" containing 2 Main Angles.
8x40M No. 4	Bundle 142" x 8" x 7" containing 32 Diagonal Stays.
8x40M No. 5	Bundle 117" x 11" x 6" containing 4 Ladders, 4 Top Girts, 4 Second Girts, 4 Third Girts, 4 Fourth Girts, 4 Fifth Girts, 1 Main Pumprod, 1 Tail Bone.

### 10 x 20 MASTER NUOIL WINDMILL

Package Marked	Contents of Package
10x20M No. 1	Crate 40" x 39" x 28" containing 1 Head, 1 Tail Carrier, 1 Tower Cap, 1 Base Block, 1 Bailrace, 1 Bailrace Cover, 1 Pipe Barrel, 1 Sheaf Wheel and Guard, 6 Spokes, 24 Sails, 24 Large Sail Clips, 24 Small Sail Clips, 6 Inner Sail Rings, 6 Outer Sail Rings, 1 Tail Bracket, 1 Wood Crossguide, 1 Cast Crossguide, 1 Bag Bolts including 4 Greasecups and 1 Furl Chain for Head, 1 Bag Bolts for Tower, 1 Furl Wire and Disc, 1 Tie Bar and Casting, 1 Draw Bar and Casting, 6 Tail Straps, 4 Anchor Posts, 8 Anchor Plates, 2 Platform Irons, 1 Tail Hook, 1 Furl Handle, 3 Platform Timbers, 1 Woodrod Connection.
10x20M No. 2	Crate 61" x 22" x 3" containing 2 Sections Tail Vane.
10x20M No. 3	Bundle 120" x 5" x 5" containing 8 Main Angles.
10x20M No. 4	Bundle 108" x 5" x 4" containing 16 Diagonal Stays.
10x20M No. 5	Bundle 97" x 10" x 4" containing 2 Ladders, 4 Top Girts, 4 Second Girts, 4 Third Girts, 1 Main Pumprod, 1 Tail Bone.

### 10 x 30 MASTER NUOIL WINDMILL

10x30M No. 1	Crate Windmill Head, measurement and contents as for 10x20.
10x30M No. 2	Crate Tail Vane, measurement and contents as for 10x20.
10x30M No. 3	Bundle 120" x 5" x 3" containing 6 Main Angles.
10x30M No. 4	Bundle 120" x 5" x 3" containing 6 Main Angles.
10x30M No. 5	Bundle 130" x 6" x 5" containing 24 Diagonal Stays.
10x30M No. 6	Bundle 117" x 10" x 7" containing 3 Ladders, 4 Top Girts, 4 Second Girts, 4 Third Girts, 4 Fourth Girts, 1 Main Pumprod, 1 Tail Bone.

### 10 x 40 MASTER NUOIL WINDMILL

10x40M No. 1	Crate Windmill Head measurement and contents as for 10x20.
10x40M No. 2	Crate Tail Vane measurement and contents as for 10x20.
10x40M No. 3	Bundle 120" x 5" x 3" containing 8 Main Angles.
10x40M No. 4	Bundle 120" x 5" x 3" containing 8 Main Angles.
10x40M No. 5	Bundle 142" x 8" x 7" containing 32 Diagonal Stays.
10x40M No. 6	Bundle 117" x 11" x 7" containing 4 Ladders, 4 Top Girts, 4 Second Girts, 4 Third Girts, 4 Fourth Girts, 4 Fifth Girts, 1 Main Pumprod, 1 Tail Bone.

# PACKING LIST

## OVERSEAS AND INTERSTATE

Applying to Windmills packed singly.

### 12 x 20 MASTER NUOIL WINDMILL

Package Marked	Contents of Package
12x20M No. 1	Crate 47" x 44" x 31" containing 1 Head, 1 Pipe Barrel, 1 Tail Carrier, 6 Spokes, 18 Sails, 18 Small Sail Clips, 18 Large Sail Clips, 1 Tail Bracket, 7 Tail Straps, 1 Ballrace, 1 Ballrace Cover, 1 Tower Cap, 1 Base Block, 1 Sheaf Wheel and Guard, 1 Wood Crossguide, 1 Cast Crossguide, 1 Bag Bolts including 4 Grease Cups and 1 Furl Chain for Head, 1 Bag Bolts for Tower, 1 Furl Wire and Disc, 1 Tie Bar and Casting, 1 Draw Bar and Casting, 4 Anchor Posts, 8 Anchor Plates, 2 Platform Irons, 1 Furl Handle, 3 Platform Timbers, 6 Inner Sail Rings, 6 Outer Sail Rings, 1 Wood Pumprod Connection.
12x20M No. 2	Crate 67" x 23" x 3" containing 2 Sections Tail Vane.
12x20M No. 3	Bundle 120" x 5" x 5" containing 8 Main Angles.
12x20M No. 4	Bundle 108" x 5" x 5" containing 16 Diagonal Stays.
12x20M No. 5	Bundle 97" x 10" x 5" containing 2 Ladders, 4 Top Girts, 4 Second Girts, 4 Third Girts, 4 Fourth Girts, 4 Fifth Girts, 8 Flat Stays, 1 Furl Wire Guide and Pulley, 1 Main Pumprod, 2 Tower Steps.
12x20M No. 6	Bundle 130" x 3" x 1 1/2" containing 1 Tail Bone.

### 12 x 30 MASTER NUOIL WINDMILL

12x30M No. 1	Crate Windmill Head, measurement and contents as for 12x20.
12x30M No. 2	Crate Tail Vane, measurement and contents as for 12x20.
12x30M No. 3	Bundle 120" x 5" x 3" containing 6 Main Angles.
12x30M No. 4	Bundle 120" x 5" x 3" containing 6 Main Angles.
12x30M No. 5	Bundle 131" x 8" x 5" containing 24 Diagonal Stays.
12x30M No. 6	Bundle 117" x 11" x 6" containing 3 Ladders, 4 Top Girts, 4 Second Girts, 4 Third Girts, 4 Fourth Girts, 4 Fifth Girts, 4 Sixth Girts, 8 Flat Stays, 1 Furl Wire Guide and Pulley, 1 Main Pumprod, 2 Tower Steps.
12x30M No. 7	Bundle 130" x 3" x 1 1/2" containing 1 Tail Bone.

### 12 x 40 MASTER NUOIL WINDMILL

12x40M No. 1	Crate Windmill Head, measurement and contents as for 12x20.
12x20M No. 2	Crate Tail Vane, measurement and contents as for 12x20.
12x20M No. 3	Bundle 120" x 5" x 3" containing 8 Main Angles.
12x40M No. 4	Bundle 120" x 5" x 3" containing 8 Main Angles.
12x40M No. 5	Bundle 142" x 8" x 7" containing 32 Diagonal Stays.
12x40M No. 6	Bundle 117" x 11" x 6" containing 4 Ladders, 4 Top Girts, 4 Second Girts, 4 Third Girts, 4 Fourth Girts, 4 Fifth Girts, 4 Sixth Girts, 4 Seventh Girts, 8 Flat Stays, 1 Furl Wire Guide and Pulley, 1 Main Pumprod.
12x40M No. 7	Bundle 66" x 15" x 3" containing 1 Safety Ladder
12x40M No. 8	Bundle 130" x 3" x 1 1/2" containing 1 Tail Bone. (Safety Hoop and Fittings when supplied included in crate containing Head, etc.)

### 14 x 20 MASTER NUOIL WINDMILL

Package Marked	Contents of Package
14x20M No. 1	Crate 58" x 43" x 32" containing 1 Head, 1 Pipe Barrel, 1 Tail Carrier, 6 Spokes, 18 Sails, 18 Small Sail Clips, 18 Large Sail Clips, 1 Tail Bracket, 3 Long Tail Straps, 16 Short Tail Straps, 1 Ballrace, 1 Ballrace Cover, 1 Tower Cap, 1 Baseblock, 1 Sheaf Wheel and Guard, 1 Wood Crossguide, 1 Cast Crossguide, 1 Bag Bolts including 4 Grease Cups and 1 Furl Chain for Head, 1 Bag Bolts for Tower, 1 Furl Wire and Disc, 1 Tie Bar and Casting, 1 Draw Bar and Casting, 4 Anchor Posts, 8 Anchor Plates, 2 Platform Irons, 1 Furl Handle, 3 Platform Timbers, 6 Inner Sail Rings, 6 Outer Sail Rings, 1 Wood Pumprod Connection.
14x20M No. 2	Crate 80" x 25" x 3" containing 2 Sections of Tail Vane.
14x20M No. 3	Bundle 120" x 5" x 5" containing 8 Main Angles.
14x20M No. 4	Bundle 131" x 8" x 5" containing 16 Diagonal Stays.
14x20M No. 5	Bundle 97" x 10" x 5" containing 2 Ladders, 4 Top Girts, 4 Second Girts, 4 Third Girts, 4 Fourth Girts, 4 Fifth Girts, 8 Flat Stays, 1 Furl Wire Guide and Pulley, 1 Main Pumprod, 2 Tower Steps.
14x20M No. 6	Bundle 130" x 3" x 4" containing 1 Tail Bone.

### 14 x 30 MASTER NUOIL WINDMILL

14x30M No. 1	Crate Windmill Head, measurement and contents as for 14x20.
14x30M No. 2	Crate Tail Vane, measurement and contents as for 14x20.
14x30M No. 3	Bundle 120" x 5" x 3" containing 6 Main Angles.
14x30M No. 4	Bundle 120" x 5" x 3" containing 6 Main Angles.
14x30M No. 5	Bundle 131" x 8" x 5" containing 24 Diagonal Stays.
14x30M No. 6	Bundle 117" x 11" x 6" containing 3 Ladders, 4 Top Girts, 4 Second Girts, 4 Third Girts, 4 Fourth Girts, 4 Fifth Girts, 4 Sixth Girts, 8 Flat Stays, 1 Furl Wire Guide and Pulley, 1 Main Pumprod, 2 Tower Steps.
14x30M No. 7	Bundle 130" x 3" x 4" containing 1 Tail Bone.

### 14 x 40 MASTER NUOIL WINDMILL

14x40M No. 1	Crate Windmill Head, measurement and contents as for 14x20.
14x40M No. 2	Crate Tail Vane, measurement and contents as for 14x20.
14x40M No. 3	Bundle 120" x 5" x 3" containing 8 Main Angles.
14x40M No. 4	Bundle 120" x 5" x 3" containing 8 Main Angles.
14x40M No. 5	Bundle 142" x 8" x 7" containing 32 Diagonal Stays.
14x40M No. 6	Bundle 117" x 11" x 6" containing 4 Ladders, 4 Top Girts, 4 Second Girts, 4 Third Girts, 4 Fourth Girts, 4 Fifth Girts, 4 Sixth Girts, 4 Seventh Girts, 8 Flat Stays, 1 Furl Wire Guide and Pulley, 1 Main Pumprod.
14x40M No. 7	Bundle 66" x 15" x 3" containing 1 Safety Ladder
14x40M No. 8	Bundle 130" x 3" x 4" containing 1 Tail Bone. (Safety Hoop and Fittings when supplied included in crate containing Head, etc.)



# PACKING LIST

## LOCAL

### 8 ft. Master Nuoil Windmills

#### HEAD WITH WHEEL AND TAIL

Package Marked	Contents of Package
8M No. 1	Head with Tower Cap and Base Block.
8M No. 2	6 Wheel Spokes.
8M No. 3	2 Sections Wheel.
8M No. 4	2 Sections Wheel.
8M No. 5	2 Sections Wheel.
8M No. 6	1 Tail.
8M No. 7	1 Pumprod with anti-swivel fittings, 1 anti-swivel bar and casting, 1 cross-guide, 1 furl wire and disc, 1 furl bar and casting, 1 tie bar and casting, 2-15 in. long angle girts.
8M No. 8	1 Tin bolts: 4 $\frac{3}{8} \times \frac{3}{8}$ , 6 $1 \times \frac{3}{8}$ , 18 $1 \frac{1}{2} \times \frac{3}{8}$ , 6 $1 \frac{1}{2} \times \frac{3}{8}$ , 10 $1 \frac{1}{2} \times \frac{3}{8}$ , 24 extra $\frac{3}{8}$ nuts, 10 $\frac{3}{8}$ washers, 1 furl chain, 1 chain guard and pulley, 1 gallon oil, 1 small tin grease, 5 No. 3 grease cups.

#### 8 x 20 MASTER NUOIL TOWER

8x20M No. 9	4 Top Main Angles.
8x20M No. 10	4 Bottom Main Angles.
8x20M No. 11	4 Anchor Posts.
8x20M No. 12	8 Anchor Plates.
8x20M No. 13	2 Ladders, 4 top girts, 4 second girts, 4 third girts, 4 ft. of 2x2 hardwood, 1 furl handle.
8x20M No. 14	8 Diagonal Stays.
8x20M No. 15	8 Diagonal Stays.
8x20M No. 16	Pumprod to Ground Level.
8x20M No. 17	Platform with irons attached.
TOWER BOLTS—44 $\frac{3}{8} \times \frac{3}{8}$ , 20 $1 \times \frac{3}{8}$ , 10 $1 \frac{1}{2} \times \frac{3}{8}$ , 8 $1 \times \frac{1}{2}$ , 2 $3 \times \frac{3}{8}$ , 4 hook bolts $3 \frac{1}{2} \times \frac{3}{8}$ , 1 rod guide, 1 U bolt.	

#### 8 x 30 MASTER NUOIL TOWER

8x30M No. 9	4 Top Main Angles.
8x30M No. 10	4 Middle Main Angles.
8x30M No. 11	4 Bottom Main Angles.
8x30M No. 12	4 Anchor Posts.
8x30M No. 13	8 Anchor Plates.
8x30M No. 14	3 Ladders, 4 top girts, 4 second girts, 4 third girts, 4 fourth girts, 8 ft. of 2x2 hardwood, 1 furl handle.
8x30M No. 15	8 Diagonal Stays.
8x30M No. 16	8 Diagonal Stays.
8x30M No. 17	8 Diagonal Stays.
8x30M No. 18	Pump Rod to Ground Level.
8x30M No. 19	Platform with irons attached.
TOWER BOLTS—64 $\frac{3}{8} \times \frac{3}{8}$ , 22 $1 \times \frac{3}{8}$ , 18 $1 \frac{1}{2} \times \frac{3}{8}$ , 8 $1 \times \frac{1}{2}$ , 4 $3 \times \frac{3}{8}$ , 4 $3 \frac{1}{2} \times \frac{3}{8}$ hook bolts, 2 rod guides, 2 U bolts.	

### 10 ft. Master Nuoil Windmills

#### HEAD WITH WHEEL AND TAIL

Package Marked	Contents of Package
10M No. 1	Head with Tower Cap and Base Block.
10M No. 2	6 Wheel Spokes.
10M No. 3	2 Sections Wheel.
10M No. 4	2 Sections Wheel.
10M No. 5	2 Sections Wheel.
10M No. 6	Tail.
10M No. 7	1 Pumprod with anti-swivel fittings, 1 anti-swivel bar and casting, 1 cross-guide, 1 furl wire and disc, 1 furl bar and casting, 1 tie bar and casting.
10M No. 8	1 Tin bolts 8 $2 \times \frac{1}{2}$ , 2 $2 \frac{1}{2} \times \frac{1}{2}$ , 12 $1 \frac{1}{2} \times \frac{1}{2}$ , 6 $1 \frac{1}{2} \times \frac{3}{8}$ , 6 $1 \frac{1}{2} \times \frac{3}{8}$ , 6 $1 \times \frac{3}{8}$ , 12 extra $\frac{3}{8}$ nuts, 12 extra $\frac{1}{2}$ nuts, 10 $\frac{1}{2}$ washers, 1 furl chain, 1 chain guard and pulley, 1 small tin grease, $1 \frac{1}{2}$ gallons oil, 5 No. 3 grease cups.

#### 10 x 20 MASTER NUOIL TOWER

10x20M No. 9	4 Top Main Angles.
10x20M No. 10	4 Bottom Main Angles.
10x20M No. 11	4 Anchor Posts.
10x20M No. 12	8 Anchor Plates.
10x20M No. 13	2 Ladders, 4 top girts, 4 second girts, 4 third girts, 4 ft. of 2x2 hardwood, 1 furl handle, 1 furl wire guide and pulley.
10x20M No. 14	8 Diagonal Stays.
10x20M No. 15	8 Diagonal Stays.
10x20M No. 16	Pumprod to Ground Level.
10x20M No. 17	Platform with irons attached.
TOWER BOLTS—46 $\frac{3}{8} \times \frac{3}{8}$ , 20 $1 \times \frac{3}{8}$ , 10 $1 \frac{1}{2} \times \frac{3}{8}$ , 8 $1 \times \frac{1}{2}$ , 2 $3 \times \frac{3}{8}$ , 2 $2 \frac{1}{2} \times \frac{3}{8}$ B.R.H., 1 rod guide, 4 hook bolts $3 \frac{1}{2} \times \frac{3}{8}$ , 1 U bolt.	

#### 10 x 30 MASTER NUOIL TOWER

10x30M No. 9	4 Top Main Angles.
10x30M No. 10	4 Middle Main Angles.
10x30M No. 11	4 Bottom Main Angles.
10x30M No. 12	4 Anchor Posts.
10x30M No. 13	8 Anchor Plates.
10x30M No. 14	3 Ladders, 4 top girts, 4 second girts, 4 third girts, 4 fourth girts, 8 ft. of 2x2 hardwood, 1 furl handle.
10x30M No. 15	8 Diagonal Stays.
10x30M No. 16	8 Diagonal Stays.
10x30M No. 17	8 Diagonal Stays.
10x30M No. 18	Pumprod to Ground Level.
10x30M No. 19	Platform with irons attached.
TOWER BOLTS—66 $\frac{3}{8} \times \frac{3}{8}$ , 22 $1 \times \frac{3}{8}$ , 18 $1 \frac{1}{2} \times \frac{3}{8}$ , 8 $1 \times \frac{1}{2}$ , 4 $2 \times \frac{3}{8}$ , 2 rod guides, 2 U bolts, 4 $3 \times \frac{3}{8}$ , 4 $2 \frac{1}{2} \times \frac{3}{8}$ hook bolts.	

When Tower is supplied with head, tower bolts are included in tin with head bolts.

# PACKING LIST

## LOCAL

### 12 ft. Master Nuoil Windmills

### 14 ft. Master Nuoil Windmills

#### HEAD WITH WHEEL AND TAIL

Package Marked	Contents of Package
12M No. 1	Head with Tower Cap and Base Block.
12M No. 2	6 Wheel Spokes.
12M No. 3	1 Section Wheel.
12M No. 4	1 Section Wheel.
12M No. 5	1 Section Wheel.
12M No. 6	1 Section Wheel.
12M No. 7	1 Section Wheel.
12M No. 8	1 Section Wheel.
12M No. 9	1 Tail Bone.
12M No. 10	1 Tail Vane.
12M No. 11	1 Pumprod with anti-swivel fittings, 1 anti-swivel bar and casting, 1 cross-guide, 1 furl wire and disc, 1 furl bar and casting, 1 tie bar and casting.
12M No. 12	1 Tin bolts 8 2x $\frac{1}{2}$ , 2 2 $\frac{1}{2}$ x $\frac{1}{2}$ , 24 1 $\frac{1}{2}$ x $\frac{1}{2}$ , 6 1 $\frac{1}{2}$ x $\frac{1}{2}$ , 24 extra $\frac{1}{2}$ nuts, 10 $\frac{1}{2}$ washers, 1 furl chain, 1 chain guard and pulley, 1 small tin grease, 2 gallons mill oil, 5 No. 3 grease cups.

#### 12 x 20 MASTER NUOIL WINDMILL TOWER

12x20M No. 13	4 Top Main Angles.
12x20M No. 14	4 Bottom Main Angles.
12x20M No. 15	4 Anchor Posts.
12x20M No. 16	8 Anchor Plates.
12x20M No. 17	2 Ladders, 4 top girts, 4 second girts, 4 third girts, 4 fourth girts, 4 fifth girts, 8 stays, 1 furl wire guide and pulley, 4 ft. of 2x2 hardwood, 1 furl handle, 2 tower steps.
12x20M No. 18	8 Diagonal Stays.
12x20M No. 19	8 Diagonal Stays.
12x20M No. 20	Pumprod to Ground Level.
12x20M No. 21	Platform with irons attached.

TOWER BOLTS—18  $\frac{3}{8}$ x $\frac{3}{8}$ , 4 1x $\frac{3}{8}$ , 44 1x $\frac{1}{2}$ , 32 1 $\frac{1}{2}$ x $\frac{1}{2}$ , 8 1 $\frac{1}{2}$ x $\frac{1}{2}$ , 6  $\frac{3}{8}$  washers, 2 3x $\frac{3}{8}$ , 4 3 $\frac{1}{2}$ x $\frac{3}{8}$  hook bolts, 2 2 $\frac{1}{2}$ x $\frac{3}{8}$  B.R.H., 1 rod guide, 1 U bolt.

#### 12 x 30 MASTER NUOIL TOWER

12x30M No. 13	4 Top Main Angles.
12x30M No. 14	4 Middle Main Angles.
12x30M No. 15	4 Bottom Main Angles.
12x30M No. 16	4 Anchor Posts.
12x30M No. 17	8 Anchor Plates.
12x30M No. 18	3 Ladders, 4 top girts, 4 second girts, 4 third girts, 4 fourth girts, 4 fifth girts, 4 sixth girts, 8 stays, 8 ft. of 2x2 hardwood, 1 furl handle, 2 tower steps, 1 furl wire guide and pulley.
12x30M No. 19	8 Diagonal Stays.
12x30M No. 20	8 Diagonal Stays.
12x30M No. 21	8 Diagonal Stays.
12x30M No. 22	Pumprod to Ground Level.
12x30M No. 23	Platform with irons attached.

TOWER BOLTS—22  $\frac{3}{8}$ x $\frac{3}{8}$ , 6 1x $\frac{3}{8}$ , 60 1x $\frac{1}{2}$ , 32 1 $\frac{1}{2}$ x $\frac{1}{2}$ , 16 1 $\frac{1}{2}$ x $\frac{1}{2}$ , 6  $\frac{3}{8}$  washers, 4 3x $\frac{3}{8}$ , 4 3 $\frac{1}{2}$ x $\frac{3}{8}$  hook bolts, 2 2 $\frac{1}{2}$ x $\frac{3}{8}$  B.R.H., 2 rod guides, 2 U bolts.

#### HEAD WITH WHEEL AND TAIL

Package Marked	Contents of Package
14M No. 1	Head with Tower Cap and Base Block.
14M No. 2	3 Wheel Spokes.
14M No. 3	3 Wheel Spokes.
14M No. 4	3 Sails with Clips.
14M No. 5	3 Sails with Clips.
14M No. 6	3 Sails with Clips.
14M No. 7	3 Sails with Clips.
14M No. 8	3 Sails with Clips.
14M No. 9	3 Sails with Clips.
14M No. 10	1 Tail Bone.
14M No. 11	1 Tail Vane.
14M No. 12	1 Pump rod with anti-swivel fittings, 1 anti-swivel bar and casting, 1 cross-guide, 1 furl wire and disc, 1 furl bar and casting, 1 tie bar and casting.
14M No. 13	1 Tin bolts 8 2x $\frac{1}{2}$ , 2 2 $\frac{1}{2}$ x $\frac{1}{2}$ , 24 1 $\frac{1}{2}$ x $\frac{1}{2}$ , 6 1 $\frac{1}{2}$ x $\frac{1}{2}$ , 54 $\frac{3}{8}$ x5/16, 24 extra $\frac{1}{2}$ nuts, 10 $\frac{1}{2}$ washers, 1 furl chain, 1 chain guard and pulley, 1 small tin grease, 2 gallons oil, 5 No. 3 Grease Cups.
14M No. 14	6 Inner Sail Rings.
14M No. 15	6 Outer Sail Rings.

#### 14 x 20 MASTER NUOIL TOWER

14x20M No. 16	4 Top Main Angles.
14x20M No. 17	4 Bottom Main Angles.
14x20M No. 18	4 Anchor Posts.
14x20M No. 19	8 Anchor Plates.
14x20M No. 20	2 Ladders, 4 top girts, 4 second girts, 4 third girts, 4 fourth girts, 4 fifth girts, 8 stays, 1 furl wire guide and pulley, 4 ft. of 2x2 hardwood, 1 furl handle, 2 tower steps.
14x20M No. 21	8 Diagonal Stays.
14x20M No. 22	8 Diagonal Stays.
14x20M No. 23	Pumprod to Ground Level.
14x20M No. 24	Platform with irons attached.

TOWER BOLTS—18  $\frac{3}{8}$ x $\frac{3}{8}$ , 4 1x $\frac{3}{8}$ , 44 1x $\frac{1}{2}$ , 32 1 $\frac{1}{2}$ x $\frac{1}{2}$ , 8 1 $\frac{1}{2}$ x $\frac{1}{2}$ , 6  $\frac{3}{8}$  washers, 2 3x $\frac{3}{8}$ , 4 3 $\frac{1}{2}$ x $\frac{3}{8}$  hook bolts, 2 2 $\frac{1}{2}$ x $\frac{3}{8}$  B.R.H., 1 rod guide, 1 U bolt.

#### 14 x 30 MASTER NUOIL TOWER

14x30M No. 16	4 Top Main Angles.
14x30M No. 17	4 Middle Main Angles.
14x30M No. 18	4 Bottom Main Angles.
14x30M No. 19	4 Anchor Posts.
14x30M No. 20	8 Anchor Plates.
14x30M No. 21	3 Ladders, 4 top girts, 4 second girts, 4 third girts, 4 fourth girts, 4 fifth girts, 4 sixth girts, 8 stays, 8 ft. of 2x2 hardwood, 1 furl handle, 2 tower steps, 1 furl wire guide and pulley.
14x30M No. 22	8 Diagonal Stays.
14x30M No. 23	8 Diagonal Stays.
14x30M No. 24	8 Diagonal Stays.
14x30M No. 25	Pumprod to Ground Level.
14x30M No. 26	Platform with irons attached.

TOWER BOLTS—22  $\frac{3}{8}$ x $\frac{3}{8}$ , 6 1x $\frac{3}{8}$ , 60 1x $\frac{1}{2}$ , 32 1 $\frac{1}{2}$ x $\frac{1}{2}$ , 16 1 $\frac{1}{2}$ x $\frac{1}{2}$ , 6  $\frac{3}{8}$  washers, 4 3x $\frac{3}{8}$ , 4 3 $\frac{1}{2}$ x $\frac{3}{8}$  hook bolts, 2 2 $\frac{1}{2}$ x $\frac{3}{8}$  B.R.H., 2 rod guides, 2 U bolts.

When Tower is supplied with head, tower bolts are included in tin with head bolts.

When circumstances necessitate reduction in weight of any package, the contents as shown above will be divided into two packages and the second marked with letter "A" after the number.

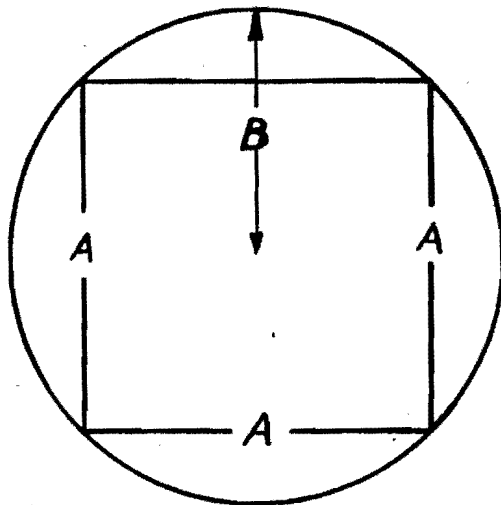
# Detailed Directions for the Assembly and Erection of METERS MASTER NUOIL WINDMILLS

**GROUND PREPARATION FOR FOUNDATIONS** is similar to that for Type "K" Windmills (see Figure 2, pages 6 and 7), but the tower dimensions at ground level are as Figure 17.

## TOWER ASSEMBLY (Fig. 18)

Unwire all bundles and lay out tower legs (these are the larger angles), stays, and girts in proper sets and sizes; sort out all bolts in the various lengths, and check with packing list.

Follow the directions given below, performing the work just as it is here set out, and thereby avoid confusion.



Four of the angle legs will be found slightly tapered at one end; these are to be the top of the tower. Take two of these legs and lay them upon the ground, flat side up; now make these two legs up to their full length (20 or 30 feet, or whatever height tower is to be) by bolting on the lower angles, being careful to note that these angles have the outer corners rounded off a little at one end (the top) to allow their fitting closely inside. You will find the cross girts in sets of four, one of which in each set having two holes punched near the centre for attaching the ladder. Take one of the longest set (one without the ladder holes in it) and bolt it across the two legs (inside the angle) at the third hole from the bottom, with the flat side of the angle girt to the top of the tower. Now bolt one of each set of girts in like manner. The diagonal angle stays will be found in sets of eight. Take any two of the longer ones (if there is only one set they will be of equal length) and bolt them together in the form of the letter X; then with the two long legs downward, bolt them to the tower legs (on the outside of the angles, on the same bolt as the girt), beginning at the bottom of the tower. See that the stay which goes from the bottom lefthand corner to the top righthand corner has the angle outwards. All bolts should be so placed with nut end of bolts inside of tower.

8', 10', 12' & 14' N. O. MILL		
TOWER	B	A
20'	3' 10"	5' 4"
30'	4' 1"	5' 9"
40'	5' 4"	7' 6"

FIG 17.

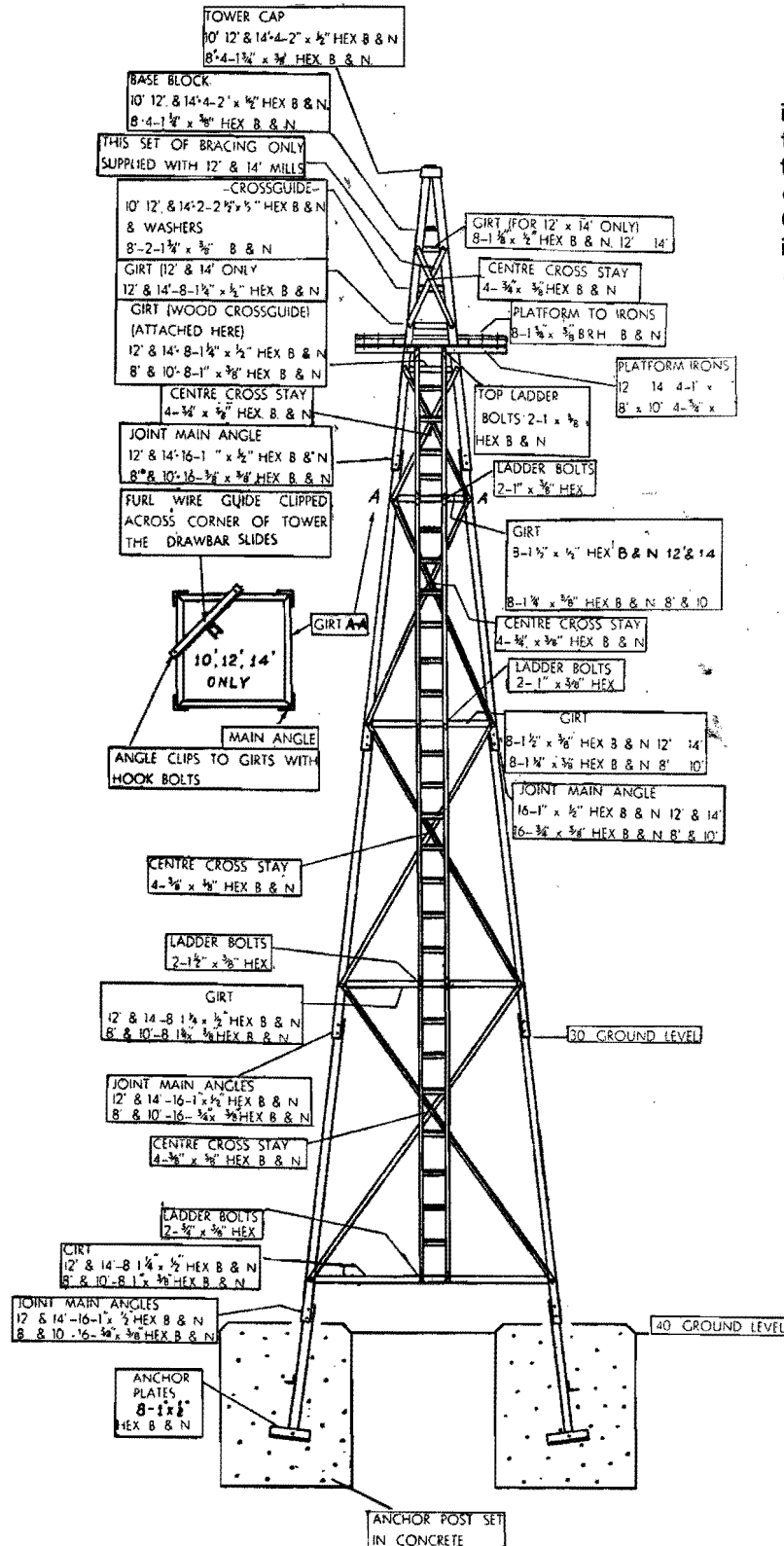
To guide you as to number of stays and girts required for the various height towers, we give the following schedule:—

Eight and ten feet mills with 20 ft. towers have two sets of angle diagonal stays and three sets of girts.

Twelve and fourteen feet mills with 20 ft. towers have three sets of diagonal stays (2 angle and 1 flat) and five sets of girts.

Each additional 10 ft. of tower for all size mills add one set of diagonal stays and one set of angle girts to above.

# TOWER ASSEMBLY (Fig. 18)



When you have completed putting this side of the tower together, turn it right over, and raise the top end of tower high enough to enable you to put on the platform. Get the platform or stage, and pass it over the top end of tower legs manhole upwards, and angle with irons of stage towards the bottom of tower; bolt it to the tower legs at holes which meet the holes in platform irons.

Now take away any supports you may have under tower, and allow the platform to rest on the ground. See that tower is not allowed to sag downwards under its own weight; to prevent this, place a block under angles about half-way between platform and the bottom end of the tower.

Next place base block in position and bolt same to tower legs. Then proceed with side girts in their proper rotation, and follow on with other tower legs. Be sure the ladder girts are placed on the same side of the tower as the platform manhole. Fit tower cap over and outside of the top of the four angle iron legs and fix ladder to outside of tower. Leave tower cap and baseblock nuts slightly loose until head is in position and turns freely.

The tower is now ready to erect (see Fig. 13 and explanatory). Should circumstances necessitate assembling and erecting tower by building up piece by piece, the foregoing directions for Master Nuoli Windmill Tower should be read in conjunction with directions applying to building up Type "K" Tower (pages 16 and 17).

Fig. 18.

## FITTING MASTER NUOIL HEAD TO TOWER (Fig. 20)

This can be done before or after the tower is pulled up according to circumstances, but in the case of 10, 12 and 14 ft. Master Nuoil Windmills it is advisable to fit the head to the tower after the tower has been erected with the aid of ropes and pulleys, and a derrick firmly secured to the tower, and sufficiently high to allow the pipe barrel to be lowered through the tower cap and base block (see Fig. 21).

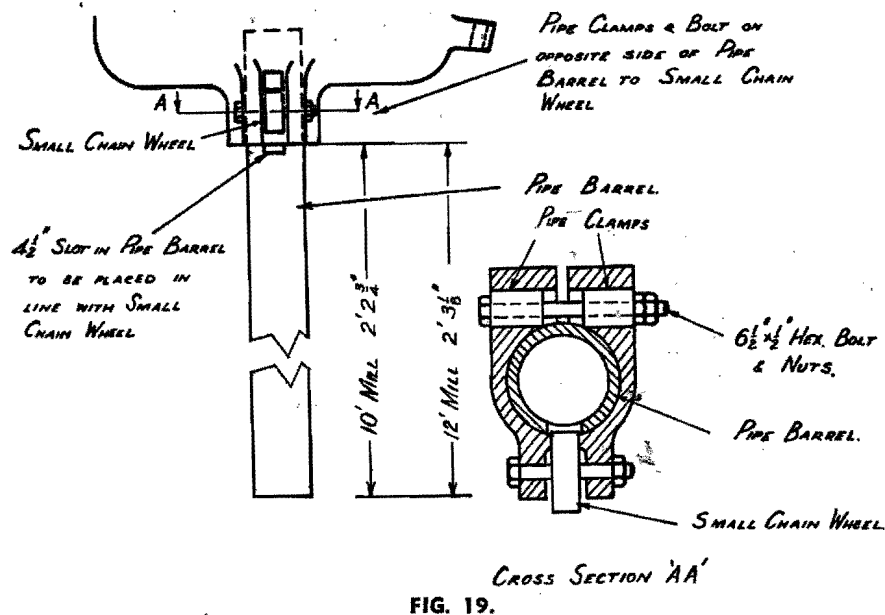


FIG. 19.

In order to reduce shipping measurements, pipe barrels are removed from 10 ft., 12 ft., and 14 ft. heads prior to despatch overseas and interstate.

To fit pipe barrel into head take away  $6\frac{1}{2}" \times \frac{1}{2}"$  hex. bolt and nuts, cylindrical shaped pipe clamps, and small chain wheel from bottom of main casting. Drive pipe barrel into main casting, taking care not to burr the end. Make sure that the  $4\frac{1}{2}"$  slot in pipe barrel is right behind the small chain wheel, as this allows the furling chain to work down through the barrel. After driving up to measurements shown in Fig. 19, replace pipe clamps, bolt and small chain wheel and tighten bolt until barrel is securely clamped.

Make sure that the steel ball race and the ball-bearings which sit on it and the ball-race cover are all fitted on the pipe barrel before lowering the head. See that the projections which are on top of the ball-race cover are correctly seated in the slots on the flange of the main casting, with the grease-cup placed on the accessible side.

When the head is in position, fit the cast tie bar collar on to the bottom end of the pipe barrel and underneath the baseblock. Make sure that the bend of the tie bar fits into the gap in the bottom of the pipe barrel. Place the furl wire disc in position inside of the draw or furl bar casting and the tie bar through the slotted hole in the cast cross-guide and the pump rod through the round hole in the cross-guide. The cross-guide should then be bolted in position diagonally across the tower.

# MASTER NUOIL HEAD ASSEMBLY

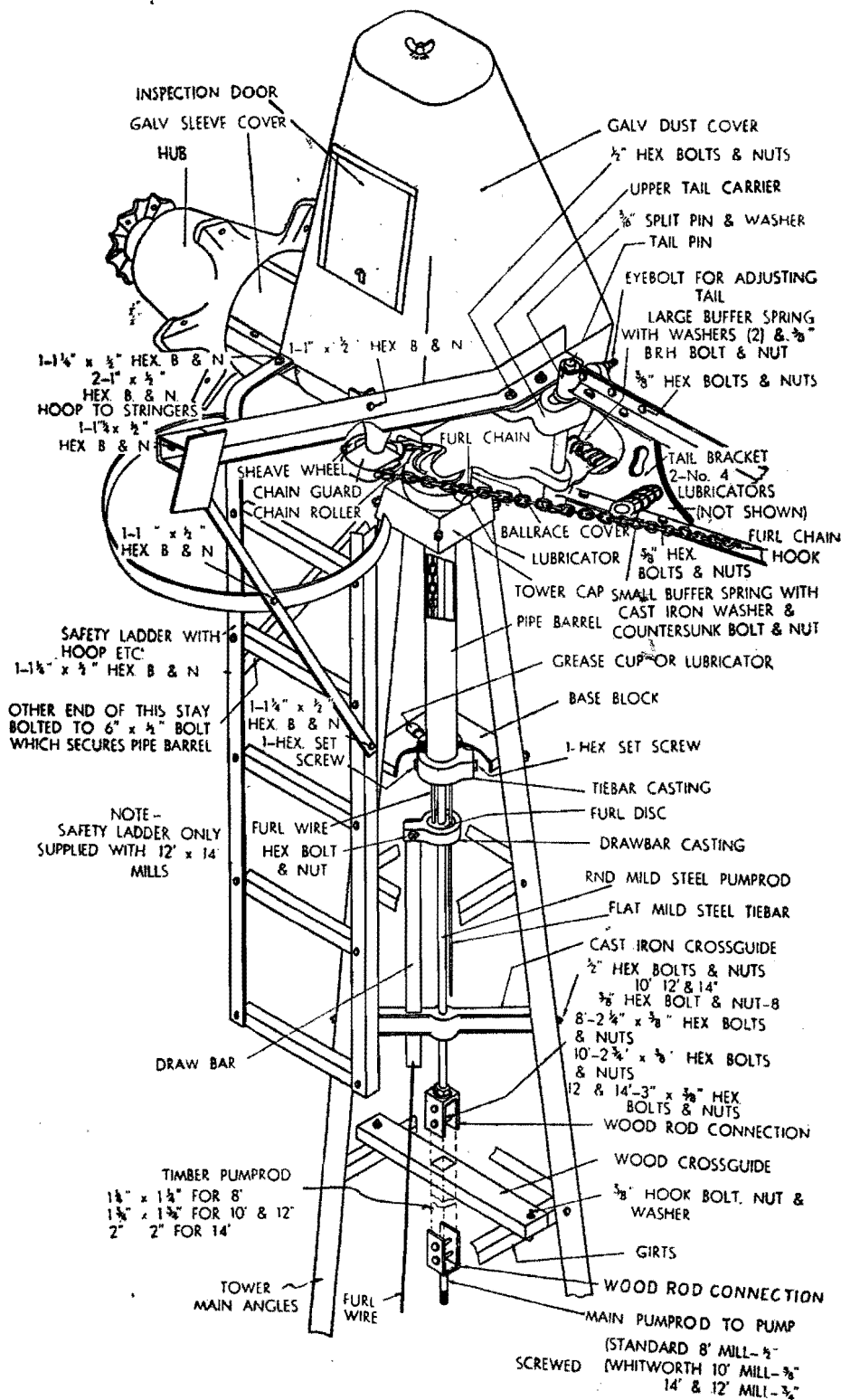
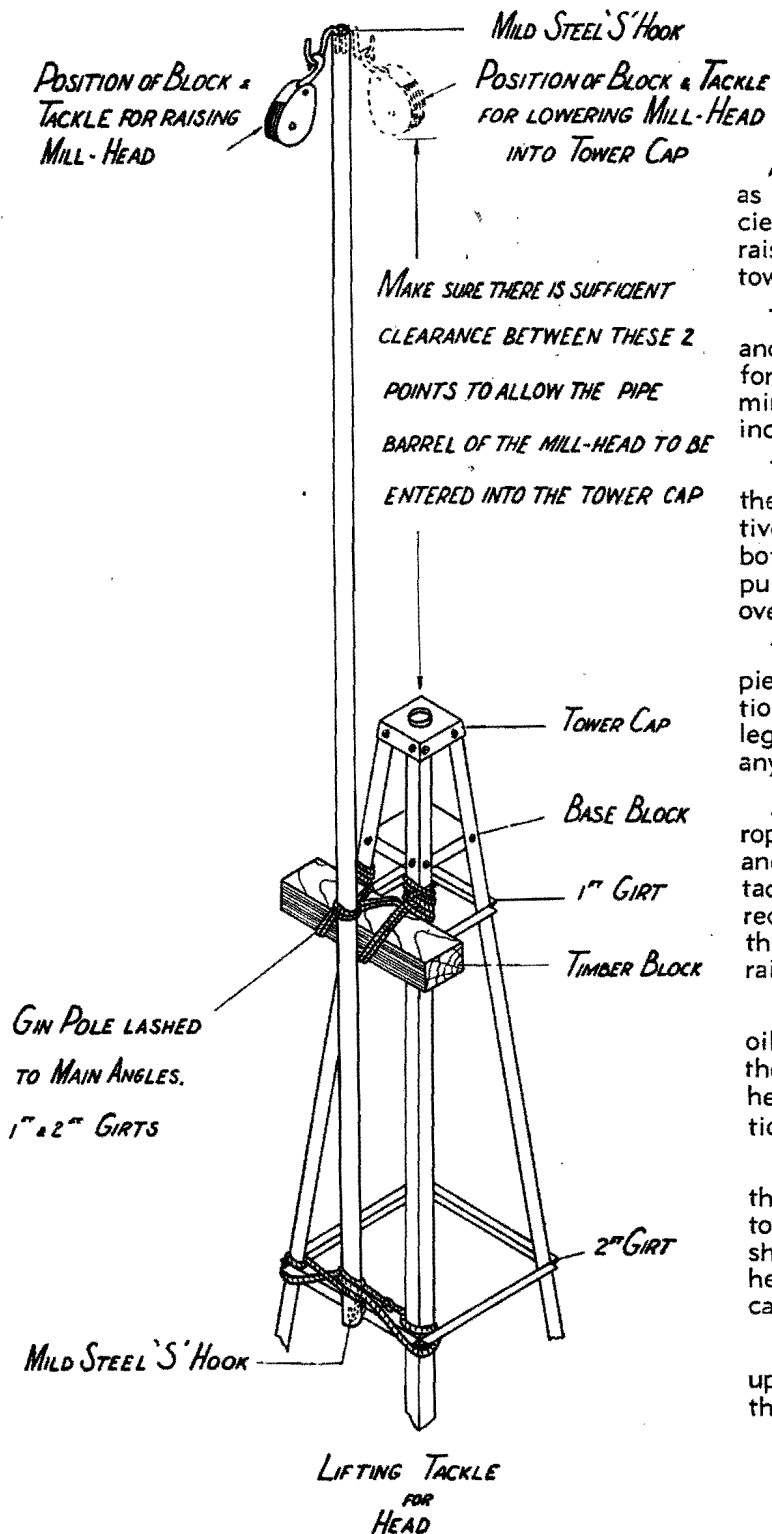


FIG. 20.

14/12 ft. Master Nuoil  
Head Assembly with  
safety hoop and ladder  
and overseas pattern  
anti - pumprod swivel.  
Local pattern anti-swivel  
see Page 32.

# FITTING WINDMILL HEAD TO TOWER



A length of steel piping is usually used as a derrick or gin pole, and must be sufficiently long to allow the mill head to be raised high enough to be lowered into the tower cap.

Two inch pipe should be used for up to and including 8 ft. windmill heads, but for 10 ft., 12ft., and 14 ft. heads the minimum size of the pipe should be 2½ inch.

The length of the "S" shaped hooks at the top and bottom of the derrick respectively must permit of ample safety margin both inside of the pipe and to take the pulley block at the top end and to hook over tower girt at the bottom end.

The block of wood is used as a spacing piece to keep the derrick in a vertical position, and should be lashed to the tower legs and derrick in such a way to prevent any side movement of the derrick.

A strong sling consisting of either stout rope or chain must be secured to the head and the hook on bottom pulley block attached to the sling. A guide rope is also recommended, and should be attached to the head to guide the head whilst being raised.

As a precautionary measure the cast iron oil trough and clip should be removed from the top of the tee iron guide loop in the head and replaced when the head is in position.

After the mill head has been raised to the required height, the "S" hook at the top of the derrick carrying the pulley block should be swivelled around to allow the head to be lowered straight into the tower cap and base block.

The same derrick can be used for pulling up the tail and for taking the weight whilst the tail is being fitted to the head.

FIG. 21.

## FITTING MASTER NUOIL HEAD TO TOWER

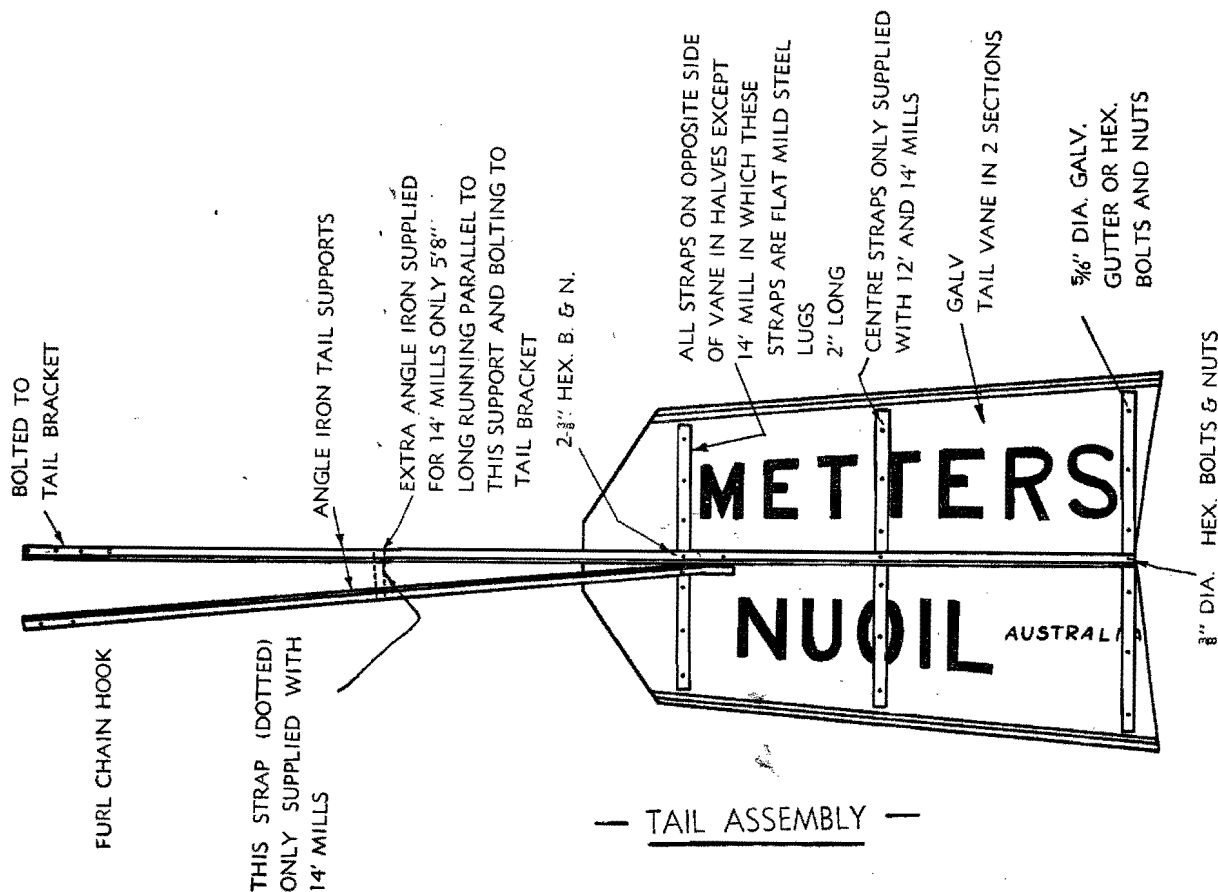


Fig. 22.

The tail can now be assembled and the two angle steel tail mounts bolted to the tail bracket (Fig. 22). Now pass the furl wire up through the furl bar casting so that the disc attached to the wire comes in contact with the furl casting and turns freely in it. Then pass the furl chain over the two sheaf pulleys and down through the main casting into the pipe barrel, and hook the end of the chain into the furl wire and close the hook. Draw the chain up and hook to the tail. The chain should be hooked up on the tail to the correct adjustment, that is, so that when the mill is pulled out of gear, the tail folds sufficiently in line with the windwheel to ensure the latter being completely out of the influence of the wind. The chain should be adjusted on the furl wire so that furl wire disc cannot drop off the end of tie bar.

Pass the threaded end of the pump rod up through the cross guide and pipe barrel, being careful not to twist the furl chain around it. Put the lock nut on the pump rod and screw it into the cross head; put split pin in above the cross head, then screw pump rod back until the split pin is tight against the cross head; tighten up the lock nut under cross head. Fit the furl lever (Fig 15) on the corner post of the tower next to the furl bar, and connect the wire. The larger towers are equipped with a furl wire guide, which consists of a length of angle steel with a roller on centre, and with hook bolts to secure it to the upper cross stays of the tower. This guide keeps the furl wire out near the centre, and causes a straight pull on the furl bar.



# WHEEL ASSEMBLY

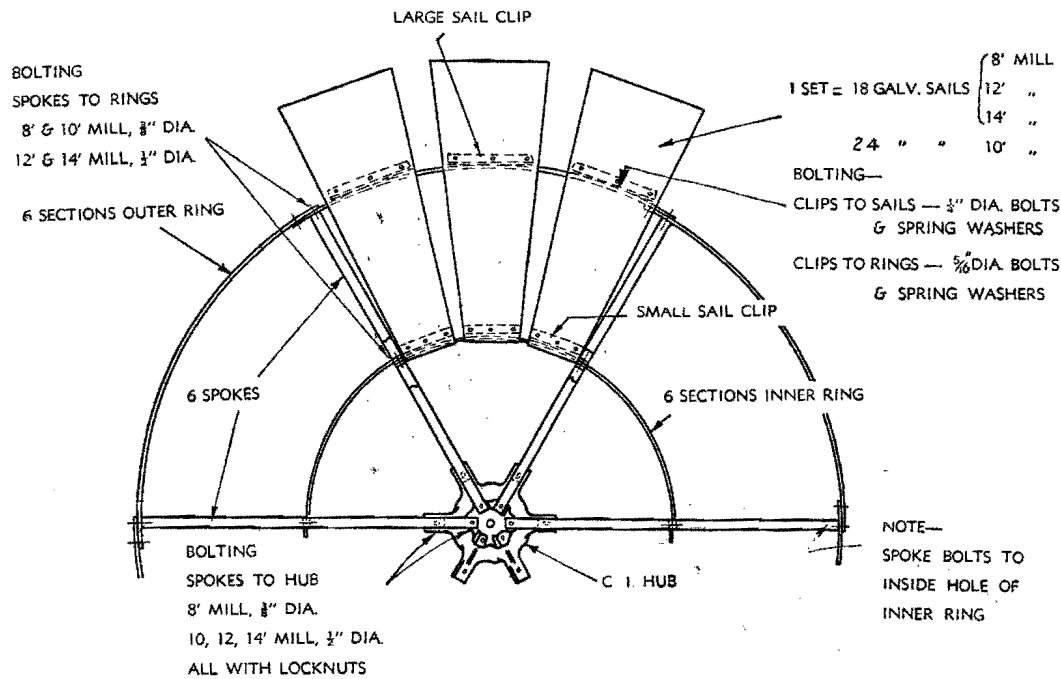


Fig. 23.

The method of assembling **MASTER NUOIL WINDWHEELS** is the same as described on page 17 in respect to Type K Windwheels. The 8 ft. Master Nuoil Wheel is identical to the 8 ft. Type K—the 10 ft. has four sails to each of the six sections instead of three as on the Type K.

The 12 ft. and 14 ft. are of similar design and have three sails to each section, but in the case of 14 ft. the sails are always despatched separately. Portion of the 14 ft. sail clips are cut to allow cleating over the ring after assembled to give extra support to the sails.

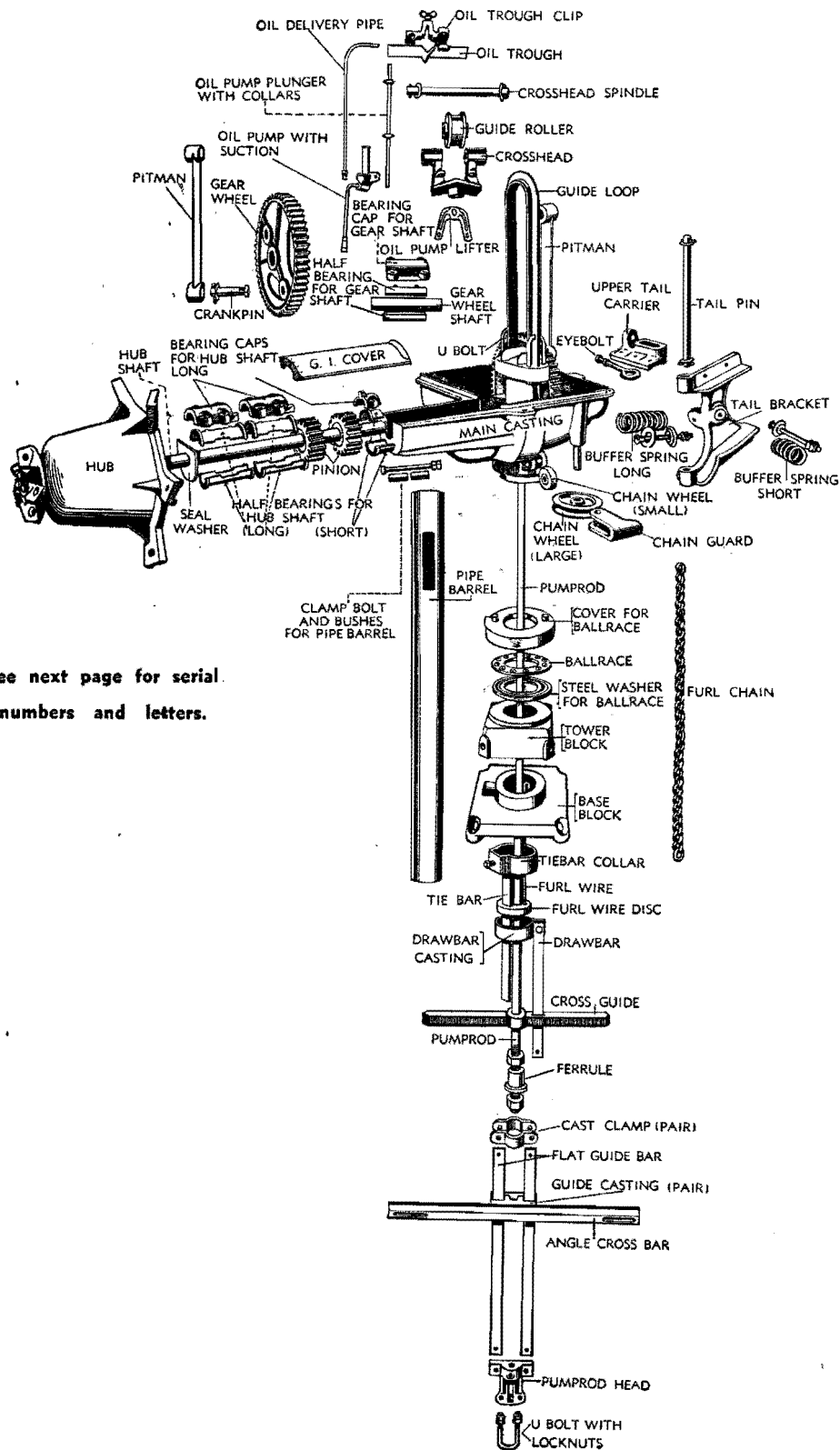
After fitting the windwheel see that the mill head turns freely on the turntable before finally tightening the bolts which secure the tower cap and the baseblock to the tower, as otherwise the castings may pinch on the pipe barrel.

Fill the grease cups and put only sufficient oil into the main casting for the crank pins to dip into when the mill is set on the short stroke. Turn the wheel around a few times to make sure that the oil pump is functioning properly before putting on the galvanized weatherproof cover.

The **GOVERNING** of the **Master Nuoil Windmill** can be altered by adjusting the nuts on the eyebolt at the top of the tail pin. By setting the tail pin nearer to the eyebolt lug the mill is allowed to travel faster, and by setting the tail pin further away from the lug the opposite effect is obtained. Any alteration to the position of the top of the tail pin must be accompanied by a corresponding alteration to the adjustment of the long buffer spring bolt. The tail should be square with the windwheel when mill is unfurled.

**OIL** should be changed after nine to twelve months. The old oil can be drained out by removing the plug at the bottom of the main casting and allowing the oil to drain into a tin or other suitable vessel. The inside of the main casting should be cleansed and plug replaced before fresh oil is put in. Ordinary motor oils aerate or emulsify under the churning action of the gears. Special Windmill Oil should be used.

# COMPONENT PARTS OF MASTER NUOIL WINDMILLS



See next page for serial numbers and letters.

# COMPONENT PARTS OF MASTER NUOIL WINDMILLS

"X" denotes 8 ft. Mill, "Y" 10 ft., "Z" 12 and 14 ft.

	8 ft.	10 ft.	12 ft. or 14 ft.		8 ft.	10 ft.	12 ft. or 14 ft.
Anti-Swivel Ferrule ....	X61	Y61	Z61	Guide Roller ....	X21	Y21	Z21
Anti-Swivel Cast Clamp (pair) ....	X55	Y55	Z55	Half Bearing for Gear Shaft ....	X8	Y8	Z8
Anti-Swivel Flat Guide Bar ....	X56	Y56	Z56	Half Bearing for Hub Shaft (long) ....	X6	Y6	Z6
Anti-Swivel Guide Casting (pair) ....	X57	Y57	Z57	Half Bearing for Hub Shaft (short) ....	X7	Y7	Z7
Anti-Swivel Angle Iron Cross Bar ....	X58	Y58	Z58	Hub Shaft ....	X27	Y27	Z27
Base Block ....	X13	Y13	Z13	Hub ....	X28	Y28	Z28
Ballrace ....	X41	Y41	Z41	Main Casting with Caps and Bearings ....	X1	Y1	Z1
Bearing Caps for Hub Shaft (long) ....	X2	Y2	Z2	Oil Pump Lifter ....	X20	Y20	Z20
Bearing Caps for Hub Shaft (short) ....	X4	Y4	Z4	Oil Pump Only ....	X40	Y240	Y240
Bearing Cap for Gear Shaft ....	X5	Y5	Z5	Oil Trough with Clip ....	X22	Y22	Z22
Buffer Spring (long) ....	X33	Y33	Z33	Oil Delivery Pipe ....	X50	Y50	Z50
Buffer Spring (short) ....	X34	Y34	Z34	Oil Plunger with Collars ....	X51	Y51	Z51
Chain Wheel (small) ....	X43	Y43	Z43	Oil Suction Pipe with Valve ....	X46	Y46	Z46
Chain Wheel (large) ....	X42	Y42	Z42	Pinion ....	X29	Y29	Z29
Chain Guard ....	X44	Y44	Z44	Pipe Barrel ....	X31	Y31	Z31
Clamp Bolt and Bushes for Pipe Barrel ....	X32	Y32	Z32	Pitman ....	X3	Y3	Z3
Cover for Ballrace ....	X38	Y38	Z38	Pump Rod Head ....	X59	Y59	Z59
Crankpin ....	X26	Y26	Z26	Pump Rod with Nuts and Washers ....	X36	Y36	Z36
Cross Guide ....	X45	Y45	Z45	Seal Washer for Hub Shaft ....	X53	Y53	Z53
Crosshead ....	X19	Y19	Z19	Stay Bar for Guide Loop ....	—	—	Z54
Crosshead Spindle ....	X24	Y24	Z24	Steel Washer for Ballrace ....	X39	Y39	Z39
Drawbar ....	X17	Y17	Z17	Tail Bracket ....	X11	Y11	Z11
Drawbar Casting ....	X18	Y18	Z18	Tail Pin ....	X30	Y30	Z30
Eyebolt for Adjusting Tail ....	X10	Y10	Z10	Tie Bar with Collar ....	X35	Y35	Z35
Furl Wire and Disc ....	X49	Y49	Z49	Tower Block ....	X52	Y52	Z52
Furl Chain ....	X48	Y48	Z48	Upper Tail Carrier (Bolts to Main Casting) ....	X9	Y9	Z9
Gear Wheel ....	X23	Y23	Z23	U Bolt for Loop ....	X16	Y16	Z16
Gear Wheel Spindle ....	X25	Y25	Z25	3/8 U Bolt with Locknuts ....	X60	Y60	Z60
Guide Loop ....	X15	Y15	Z15				

When ordering replacement parts, please state size, pattern, and age of windmill, and the names, letters, and serial numbers of the parts required.

# ERECTION OF METTERS STEEL TANKSTANDS

## FIGURES 24 AND 25.

Lay out the bottom girts and ascertain the site of excavations for concrete foundations. Put together bottom section. Bolt on anchor posts and 2 anchor plates to each leg (see Fig. 12). Ten ft. and 20 ft. tankstands have separate anchor posts. With 15 ft. stands the anchor posts are integral with legs.

Put end of bottom section (anchor post) on 6 inch concrete base in bottom of holes and true up with a spirit level attached to a straight edge placed across stand from girt to girt. Girts go on inside of the legs and the stays go on outside of the legs.

Anchor posts are left protruding four to six inches above the ground level.

Should stand be higher than 10 ft., erect a temporary platform across the 10 ft. section already in position so that person building tankstand may stand on same. Then take the angles for the second section and build them on, girt for girt, and stay for stay. The girts go in between the two main legs. Then put the lugs in the lug holes, which are three holes in top of main angles not far from each other. The lug is bolted on each side of the main angle.

The timber frame rests on the lugs. Then mark out and bore the frame and bolt same on. Two of the long timbers are joggled out and the centre bearer has a lip on same with two shoes, one at each end, which fit into the joggle, which then goes down flush. Then mark holes where shoe holes are, bore holes, and put in bolts.

When fitting deck, start from the corner of the frame with the smallest piece of timber, then place remainder on frame from corner to corner. See that it is all true, and then nail same down on to the bearers.

All bolts should be full nutted, but untightened until the stand is complete.

Pour concrete into anchor holes— $3\frac{1}{2}$  parts  $\frac{1}{2}$  to  $\frac{3}{4}$ -inch stones, 2 parts sand, and 1 part cement.

### TIMBER SPECIFICATIONS FOR METTERS STEEL TANKSTANDS (HARDWOOD).

1,000 gallon	2,000 gallon	3,000 gallon
DECK 6" x $1\frac{1}{2}$ "	DECK 8" x $1\frac{1}{2}$ "	DECK 8" x $1\frac{1}{2}$ "
6—6 ft. lengths	5—8 ft. 6 in. lengths	2—10 ft. 6 in. lengths
2—5 ft. 3 in. lengths	2—8 ft. lengths	2—10 ft. 3 in. lengths
2—4 ft. 6 in. lengths	2—7 ft. 3 in. lengths	2—10 ft. lengths
2—3 ft. 3 in. lengths	2—6 ft. lengths	2—9 ft. 6 in. lengths
	2—4 ft. 3 in. lengths	2—8 ft. 8 in. lengths
		2—7 ft. 8 in. lengths
		2—6 ft. 6 in. lengths
		2—4 ft. 4 in. lengths
Frame 6 in. x 3 in.	Frame 9 in. x 3 in.	Frame 12 in. x 4 in.
4—4 ft. 3 in. lengths	3—5 ft. 9 in. lengths	3—7 ft. 2 in. lengths
	2—6 ft. 3 in. lengths	2—7 ft. 10 in. lengths

# ERECTION OF METTERS STEEL TANKSTANDS

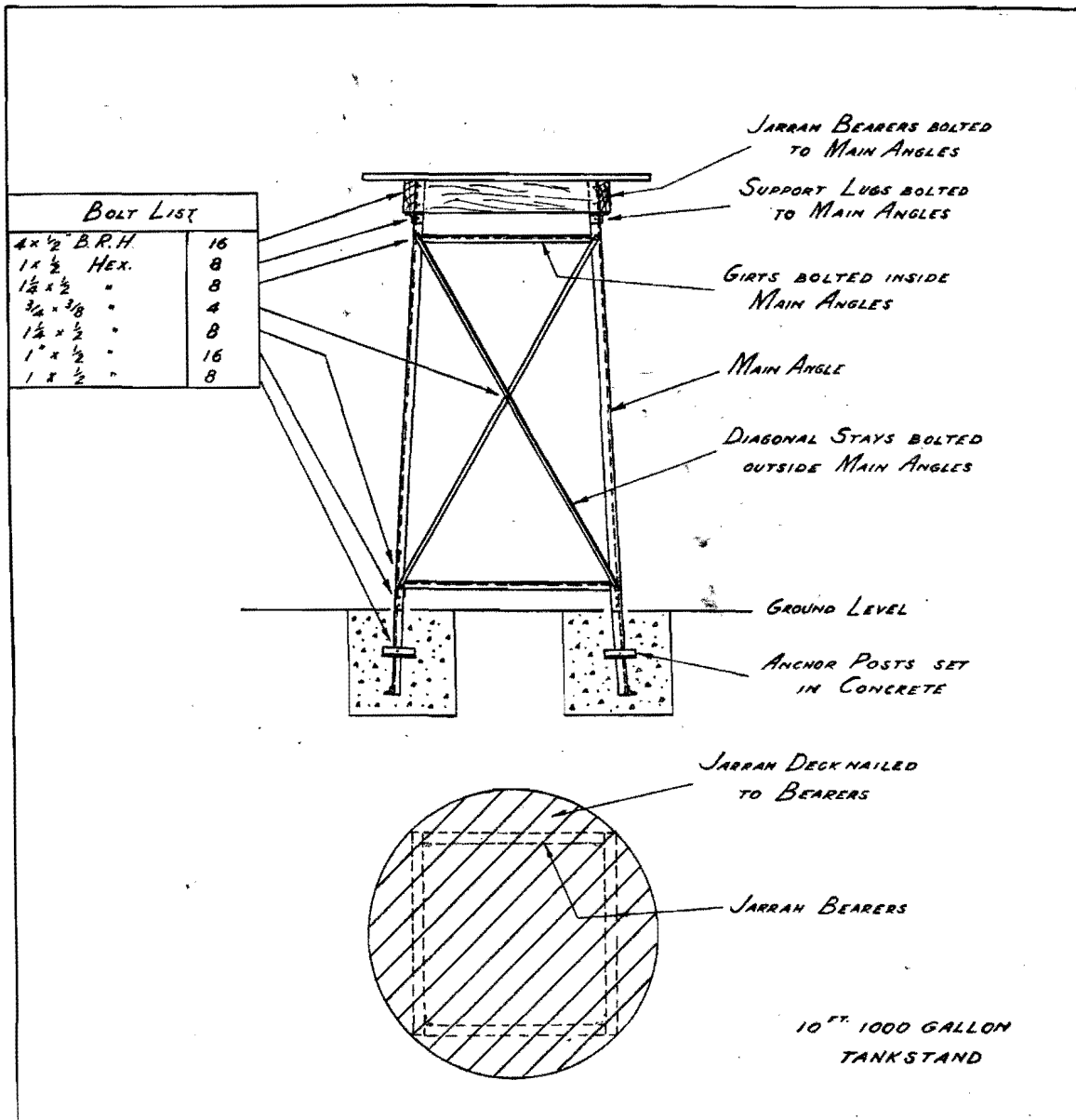


FIG. 24.

Illustrating assembly of Tankstand 10 ft. high for 1,000 gallon tank.

# ERECTION OF METTERS STEEL TANKSTANDS

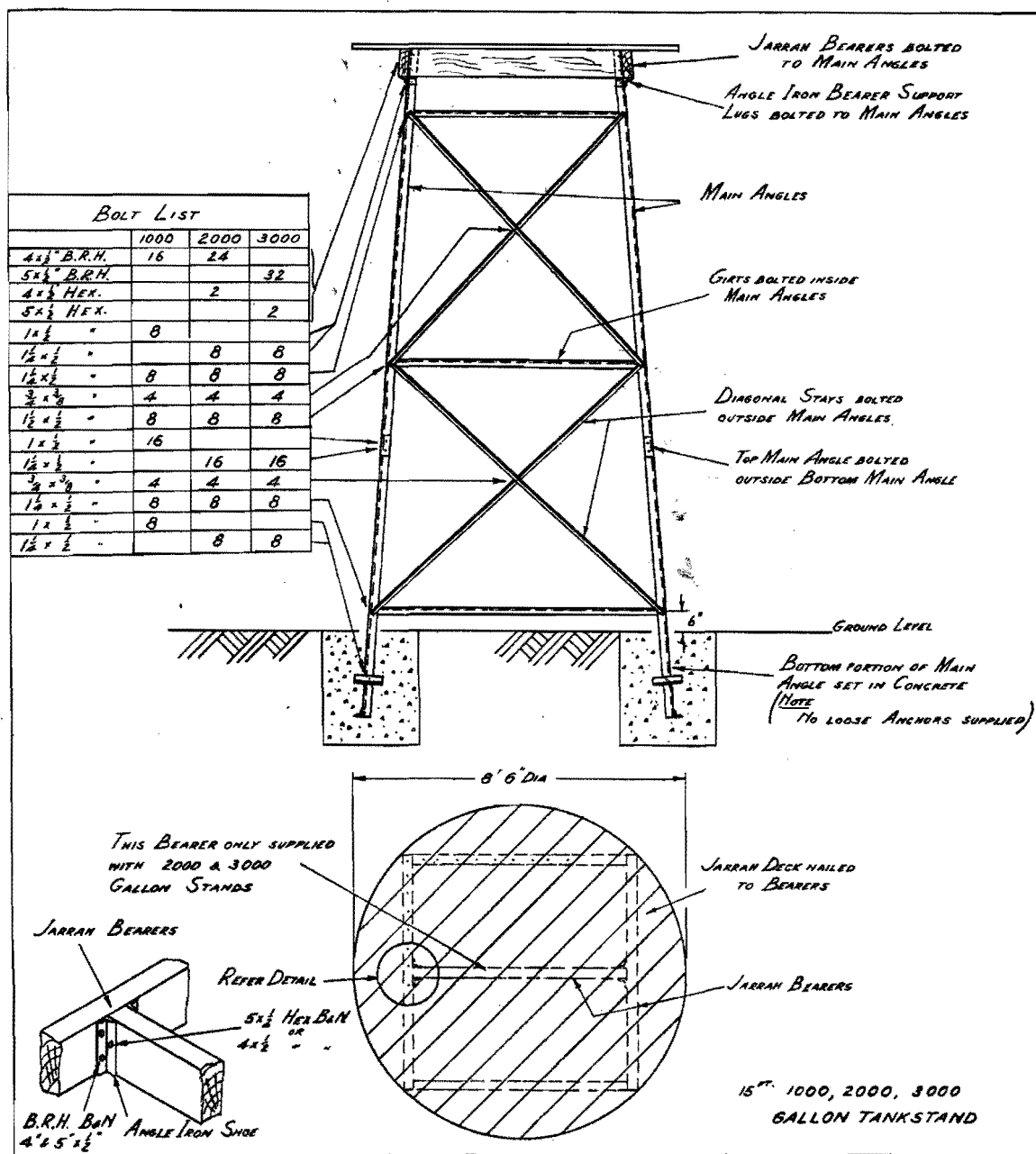


FIG. 25.

Illustrating assembly of Tankstand 15 ft. high for 1,000, 2,000 or 3,000 gallon tank.

# ASSEMBLY AND ERECTION OF METTERS STEEL SQUATTERS TANKS

## WITHOUT STEEL BOTTOMS.

Check the number of sheets, sections of angle iron ring, long and short battens with the list given below, and segregate bolts of various sizes, then level the ground where the tank is to be assembled.

Half the number of sheets will be found to have two extra holes at 3-inch centres in middle at top. These are to be placed alternately between the other sheets. The two extra holes in alternate sheets match up with the holes in the angle iron ring, which is to be bolted to the outside of the tank. The long steel battens with eleven holes are to be bolted inside, and the short battens on the outside, with the tarred felt packing between the sheets. All bolts should be full nutted, but untightened until the assembly is complete, then tighten up. Good, water-holding clay forms a very suitable bottom, which should be from six to nine inches deep inside of the tank, and a clay mound twelve inches high around outside of tank. The finest clay should be reserved for the top layer. The clay should be well puddled and covered with a few inches of water for twenty-four hours. If found to be holding throughout, put in another foot of water; let this stand for another twenty-four hours and continue until the tank receives its full pressure. In cases where suitable clay is not obtainable, and for other reasons, a concrete bottom is desirable, it will be found that concrete, properly reinforced, also forms a suitable bottom, and should be six inches thick, with a concrete wall nine to twelve inches high around the outside. The bottom edge of the tank should rest in concrete. The mixture should be  $3\frac{1}{2}$  parts  $\frac{1}{2}$  to  $\frac{3}{4}$ -inch stone, 2 parts clean, sharp sand, and 1 part cement. A top coat consisting of  $1\frac{1}{2}$  parts sand and 1 part cement should be spread dry and wetted as smoothed on.

### BLACK 14 GAUGE WITHOUT BOTTOM

STANDARD SIZE SHEETS 72" x 48"

Approx. Capacity	No. of Sheets	Diameter	Sections of Angle Iron Ring	Approx. Weight	Battens	
					Long	Short
5,000 Galls.	12	14 ft. 8 in.	6	11 $\frac{1}{2}$ cwt.	12	12
10,000 Galls.	16	19 ft. 6 in.	8	15 $\frac{1}{2}$ cwt.	16	16
15,000 Galls.	20	24 ft. 6 in.	10	19 $\frac{1}{2}$ cwt.	20	20
20,000 Galls.	22	27 ft.	11	21 $\frac{1}{2}$ cwt.	22	22
30,000 Galls.	26	31 ft. 8 in.	13	25 $\frac{1}{2}$ cwt.	26	26

### GALVANISED 18 GAUGE WITHOUT BOTTOM

STANDARD SIZE SHEETS 72" x 48"

Approx. Capacity	No. of Sheets	Diameter	Sections of Angle Iron Ring	Approx. Weight	Battens	
					Long	Short
5,000 Galls.	12	14 ft. 8 in.	6	8 $\frac{1}{2}$ cwt.	12	12
10,000 Galls.	16	19 ft. 6 in.	8	11 $\frac{1}{2}$ cwt.	16	16
15,000 Galls.	20	24 ft. 6 in.	10	14 $\frac{1}{2}$ cwt.	20	20
20,000 Galls.	22	27 ft.	11	15 $\frac{1}{2}$ cwt.	22	22
30,000 Galls.	26	31 ft. 8 in.	13	18 $\frac{1}{2}$ cwt.	26	26

### Quantities of materials required for concrete bottom 6 inches thick for Steel Squatters Tanks.

Tank Capacity	Cement	Sand	Gravel
5,000 Gallons	26 bags	2 cubic yards	3 $\frac{1}{2}$ cubic yards
10,000 Gallons	44 "	3 $\frac{1}{2}$ "	5 $\frac{1}{2}$ "
15,000 Gallons	67 "	5 "	8 $\frac{1}{2}$ "
20,000 Gallons	80 "	6 "	10 $\frac{1}{2}$ "
30,000 Gallons	107 "	8 "	14 "

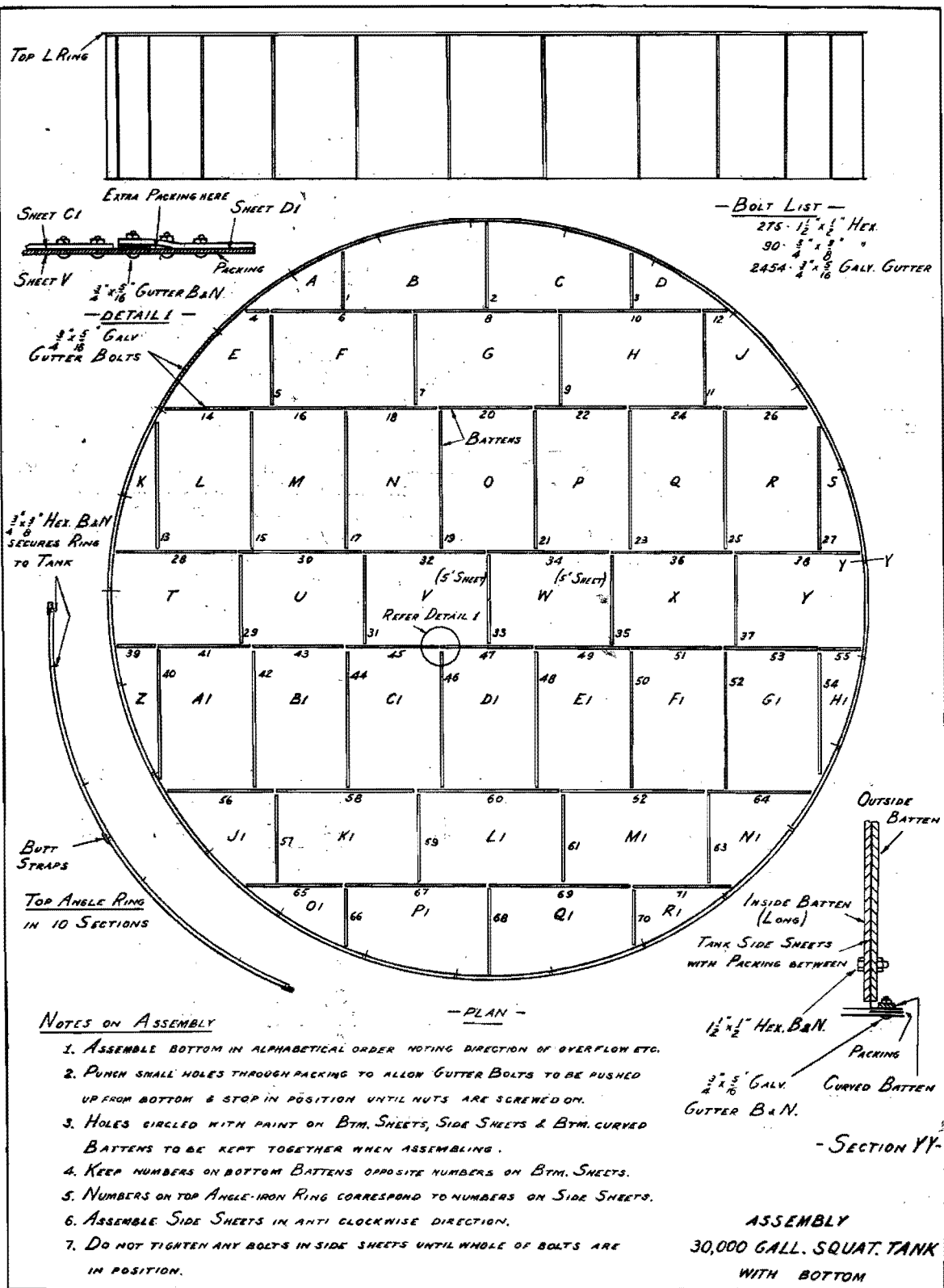


Fig. 26.



# ASSEMBLY AND ERECTION OF METTERS STEEL SQUATTERS TANKS

## BLACK 14 GAUGE WITH STEEL BOTTOM STANDARD SIZE SHEETS 72" x 48"

Approx. Capacity	Diameter	No. of Sheets for Bottom	Approx. Weight
5,000 Galls.	13 ft. 5 in.	11	17½ cwt.
10,000 Galls.	18 ft. 3 in.	17	25½ cwt.
15,000 Galls.	23 ft. 2 in.	26	35½ cwt.
20,000 Galls.	25 ft. 6 in.	31	43 cwt.
30,000 Galls.	30 ft. 6 in.	42	54 cwt.

## GALVANISED 18 GAUGE WITH STEEL BOTTOM STANDARD SIZE SHEETS 72" x 48"

Approx. Capacity	Diameter	No. of Sheets for Bottom	Approx. Weight
5,000 Galls.	13 ft. 5 in.	11	12 cwt.
10,000 Galls.	18 ft. 3 in.	17	17½ cwt.
15,000 Galls.	23 ft. 2 in.	26	24½ cwt.
20,000 Galls.	25 ft. 6 in.	31	28 cwt.
30,000 Galls.	30 ft. 6 in.	42	37 cwt.

Add 4 inches to diameter of tanks with bottom for bottom flange.

### WITH STEEL BOTTOM.

After segregating and checking the sheets, angle iron ring sections for the top and flat iron ring sections of the bottom, and long and short battens and bolts of various sizes, level the ground where the tank is to be assembled and proceed as per plan Fig. 26, which contains assembly details of a 30,000 gallon Squatters Tank with bottom. The method of assembling the smaller tanks is the same, but, of course, the number of sheets, battens, bolts, etc., is less. The number of sheets, angle iron ring sections and battens for the sides is the same as for a tank without bottom, and the number of sheets for the bottom is given in the foregoing lists. The system of lettering the lesser number of sheets for the bottom is alphabetical as follows: 5,000 gallon tank from A to K; 10,000 from A to Q; 15,000 from A to Z; 20,000 from A to Z and from A1 to E1; 30,000 from A to Z and from A1 to R1. The lettering commences at top lefthand corner as Fig. 26, and extends to the right, then down to the left of the next row, and so on, according to the size of the tank. Should the bolts turn when nuts are being tightened a soft wooden board placed under the bolt head will overcome this difficulty.

In the case of Steel Squatters Tanks larger than 10,000 gallon, it is advisable to fix diagonal twitching wires across the top of the tank as a means of resisting the extra pressure when the tank is full and exposed to the winds.

## USEFUL INFORMATION

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When erecting a Windmill, special care should be taken to see that same is perfectly plumb, so that all the working parts will receive their proper proportion of strain, and be correctly lubricated, and the pumprod has a perfectly true up and down movement.

It is advisable to check and tighten all bolts on a new Windmill two or three months after erection.

Remember that a Windmill is a machine, and must be properly oiled to obtain the best results. Do not use ordinary lubricating oils, as the continuous action of the gears creates frothing; use special Windmill oils. The oil sump should be drained at least once a year, thoroughly flushed out with flushing oil, and replaced with fresh oil. Do not put in too much oil: all that is required is sufficient to cover the bottom crank movement of the pitman arms.

It is most important for the safety of the Windmill that during the winter months the turntable be kept well greased, as this is a safety device during a storm.

A small pump will often raise more water over a period than a larger pump, because it requires less wind, and a greater number of strokes per minute are obtained.

Never load a Windmill to its maximum. A geared Windmill, if correctly loaded, should commence to operate on a wind velocity of five or six miles per hour.

When forcing water from a deep bore or well, a compensator established at ground level would have greater efficiency than a stuffing box. Compensators are not recommended for use on shallow lifts where there is no compensating weight of pumprod.

An air chamber is essential in all long delivery pipe lines, but it must be positively airtight, otherwise it will not be effective; a check valve should also be used.

Long delivery pipes above ground expand and contract according to weather conditions. Provision should be made for expansion and contraction by establishing an expansion joint in the line of pipe.

Barrel unions or flanged joints should be included in long pipe lines to enable the line to be disconnected without disturbing the full length.

Sharp angles in a pipe line cause considerable friction, and should be avoided wherever possible. Should it be necessary to change the direction of the pipe line, use easy curves or bends instead of sharp elbows.

In reticulation from tanks, height is the only factor which creates pressure. The quantity of water stored does not influence the pressure in any way.

The practical limit of a suction pipe is 25 feet, but to obtain the best results the pump should be placed as near to the water line as possible.

Where the pump is above the water, a foot valve should be screwed to the bottom of the suction pipe.

Use cylinder pumps wherever possible, because they require less power.

When establishing pump, see that the valves are free and the length of the pumprod permits ample water clearance between plunger and top and bottom pump castings.

A pump with a new leather fitted should be placed in water, given a few strokes, and left for 12 hours to ensure reasonable tight fitting of leather. Should leather after soaking be too tight, it should be dressed down to permit free movement in barrel.

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