Sue

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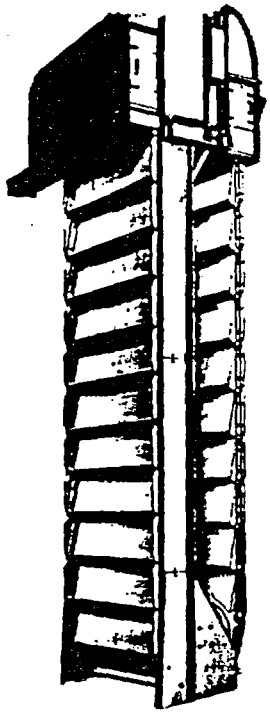
LINK-BELT.
ENGINEERING GROUP

Engineered progress in the creative design, manufacture, and application of materials handling and materials processing equipment



MODELS 45A AND 46A

TRAVELING WATER SCREENS

FP9863 PAGE 12 REV B

2690

GENERAL SERVICE INFORMATION

This manual contains complete instructions for installation, operation and service of Link-Belt traveling water screens. The long life and economical operation built into the machine is dependent to a great extent on the care taken during installation and subsequently to proper lubrication and service.

Procedures outlined here for erecting traveling water screens represent a simple, effective and accepted method. Other procedures may work equally as well and variations may prove necessary and advisable depending on local conditions and surroundings.

Link-Belt traveling water screens, because of their size, bulkiness and individual contract variations must be shipped as smaller assemblies. Sub-assemblies and individual parts furnished for your particular screen are completely specified on the installation drawing provided. Make sure instructions applying to your screen are followed.

The model 45A screen is the larger of the two screens, having 24" pitch trays. The model 46A has 18" pitch trays.

After installing screen, file this manual for reference. All correspondence pertaining to this screen should be addressed to Link-Belt Company, giving model and contract number stamped on screen nameplate.

PREPARATION OF SITE

Before installing screen, check size of well with foundation drawings. Make sure guideways and anchor bolts are properly set. Remove all debris from bottom of well and any obstructions in guideway slots that might interfere with insertion of the screen frame.

PREPARATION OF SCREEN

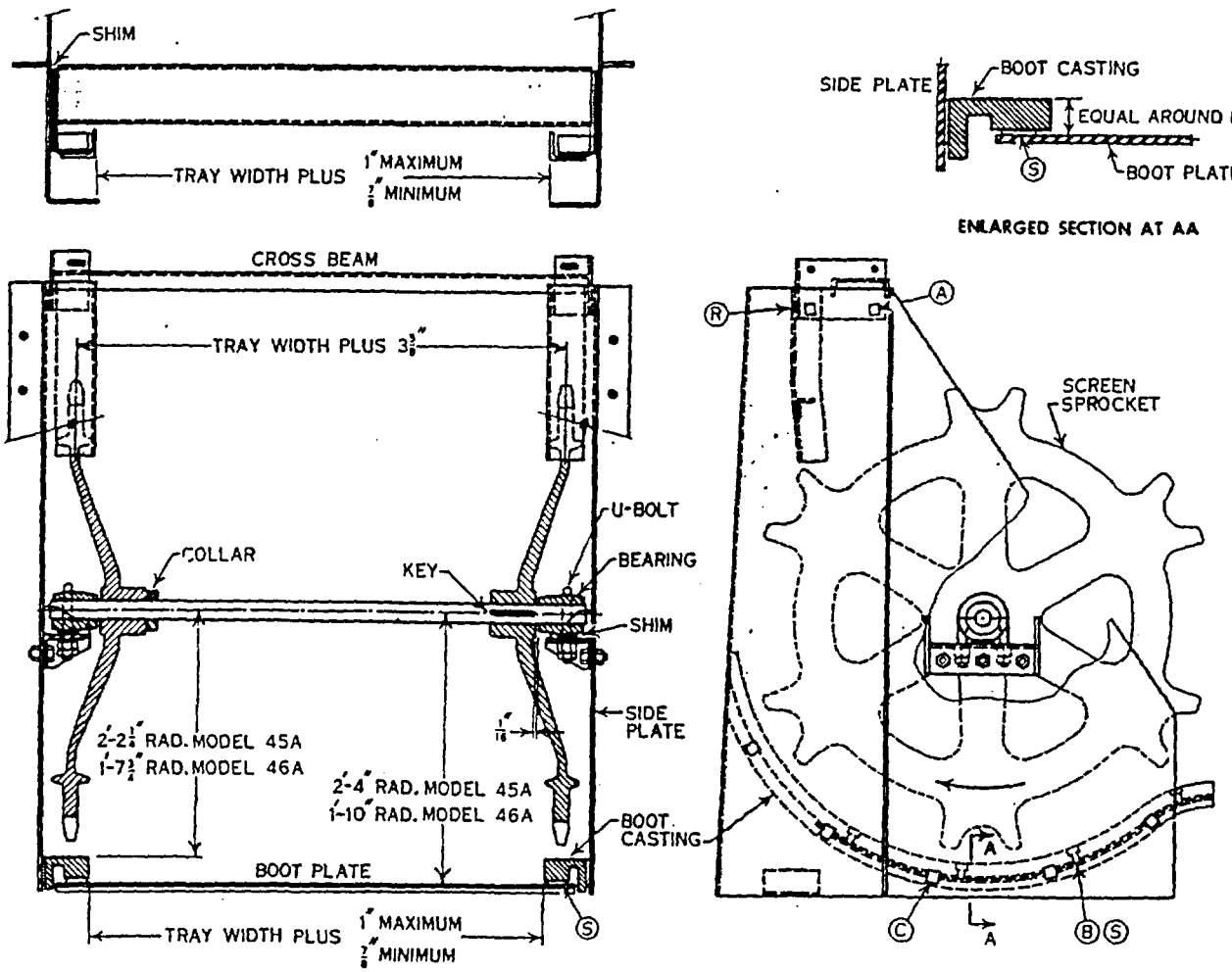


Fig. 5763

FASTENERS

Ⓐ HEXAGON HEAD BOLT 5/8" X 1 1/2"
Ⓡ COUNTERSUNK HEAD BOLT 5/8" X 1 1/2"
Ⓑ SQUARE HEAD BOLT 1/4" X 2 1/2"
Ⓢ WASHER 1/4"
Ⓒ HEXAGON HEAD BOLT 3/4" X 2 1/2"

FP9863 PAGE 13 REV. B

Assembly of boot section

Boot sections are normally shipped assembled as shown in Figure 5763. Field check all dimensions shown to make sure alignment was not disturbed in shipment. Correct variations from dimensions given before placing boot section in pit.

If boot section is received knocked down, assemble it as follows:

1. Bolt boot castings to side plates.
2. Bolt side plates loosely to cross beam and boot plate to boot castings. Use washer shims, if required, to maintain a constant dimension between top surface of boot casting and boot plate.
3. Side plates must be square with the boot plate, in line with and parallel to each other. Adjust distance between boot castings to dimension shown and shim cross beam if necessary to maintain dimension shown between the side plate flanges.
4. Assemble sprockets and collar loosely on shaft and put this assembly and bearing halves in place in boot.
5. Hold bearings loosely in place with U-bolts and align shaft with boot plate and track casting to radii given, by using shims under the bearings. Shaft must turn freely in bearings.
6. Slide sprockets into position so center-to-center distance is correct and sprockets are located symmetrically about center line of boot; lock in place.
7. Adjust bearings along the shaft, if necessary, to provide 1/16" clearance between sprocket hubs and bearings. Tighten U-bolt nuts and jam nuts.

Assembly of head shaft

Head shafts are normally shipped assembled, but if shipped knocked down, assemble as follows:

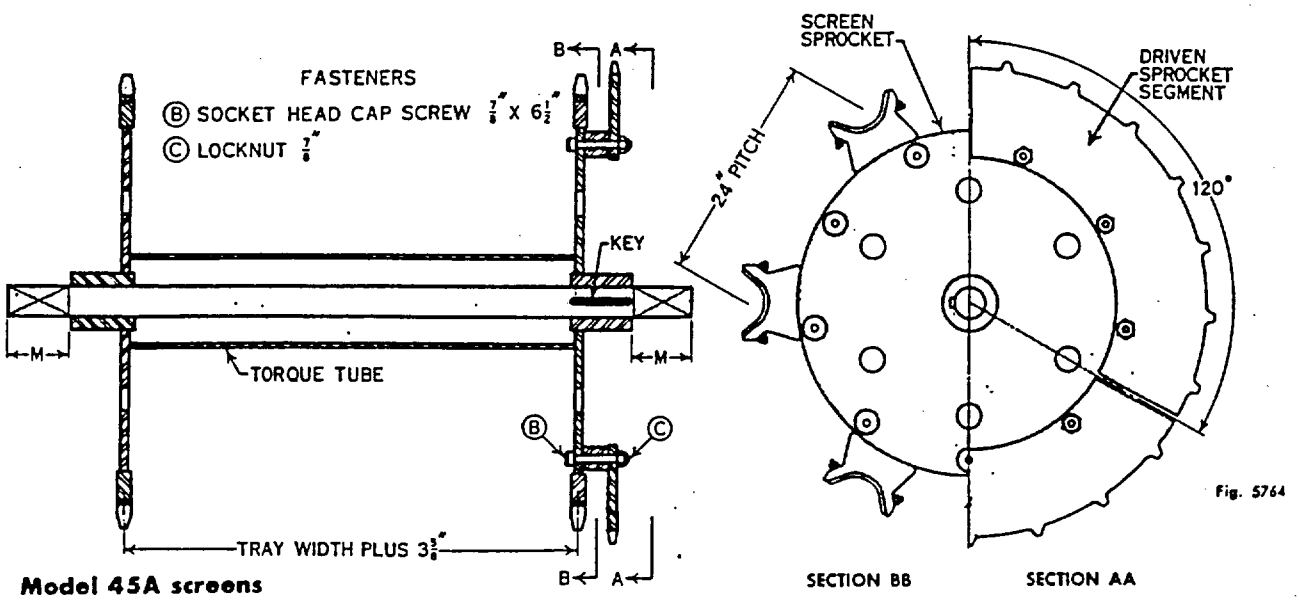


Fig. 5764

Model 45A screens

1. Fit key in shaft and slide shaft into torque tube assembly. Shaft must project from sprocket equally at both ends (dimension M).
2. Bolt drive sprocket wheel segments to screen sprockets, using special socket head cap screws and nuts provided.

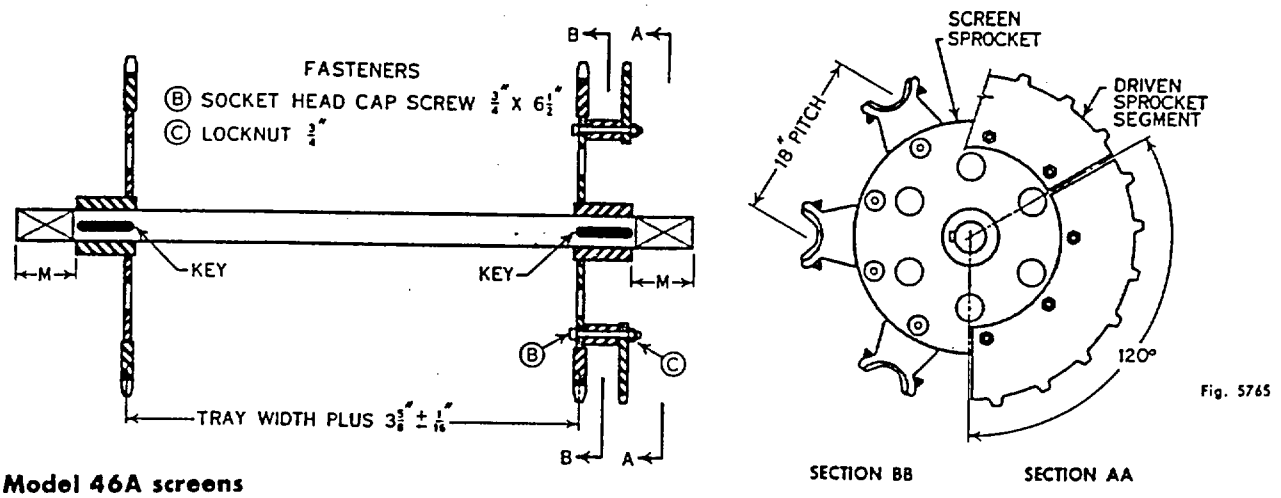


Fig. 5765

Model 46A screens

1. Fit keys in shaft and slide sprockets on shaft to conform with sprocket center dimension above. Shaft must project from sprocket equally at both ends (dimension M).
2. Bolt drive sprocket segments to screen sprocket, using socket head cap screws and nuts provided.

Assembly of head section

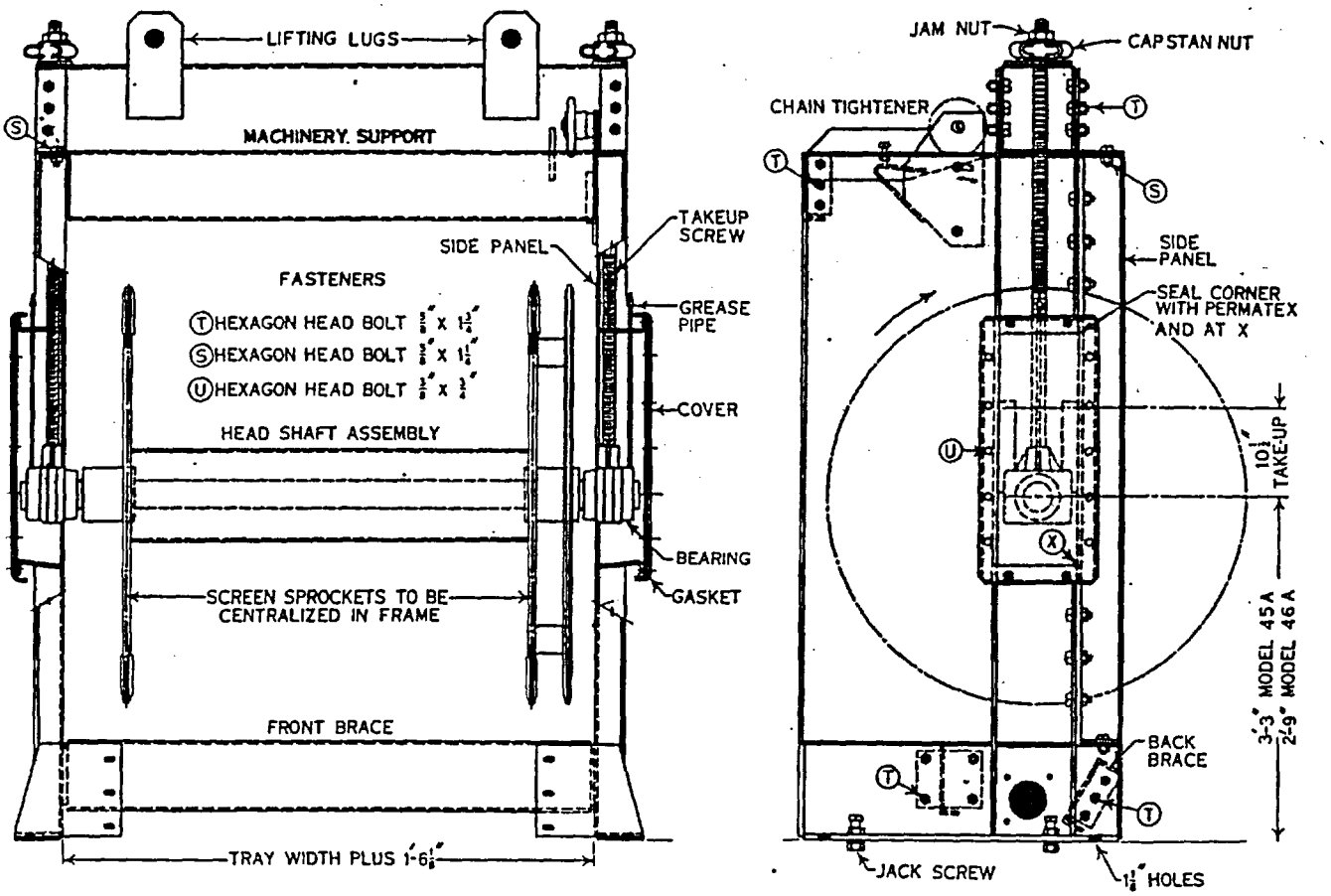


Fig. 5766

Normally, head section is factory assembled as shown in Figure 5766. Field check dimensions shown to make sure alignment was not disturbed or distorted in shipment and correct any dimensional variations before installing.

When head section is received knocked down, assemble as follows:

1. Bolt front brace, back brace and machinery support loosely in position to side panels.
2. Plumb and square frame and tighten all bolts.
3. Head shaft assembly may be placed in position before or after frame is installed on foundation.
4. To assemble head shaft in frame, remove covers, grease pipes and takeup screws from bearings.
5. Slide bearings on shaft, making certain they are clean and lubricated.
6. Remove bolted section from side panel and hoist head shaft into place; hold with hoist.
7. Replace bolted side panel section, grease pipes and takeup screws. Reseal inside corners of takeup housing with Permatex.
8. Raise head shaft and bearings into guides and tighten adjusting nuts until center of shaft is at lowest position of takeup travel as shown in Figure 5766.
9. Tighten jam nut.
10. Cut and punch rubber gaskets to match takeup opening flanges. Bolt cover to seal opening with bolts (U).

FP9863 PAGE 15 REV B

INSTALLATION

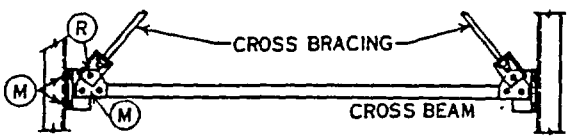
Screen sections are usually bolted together while suspended from operating floor by support bars. They are then lowered into well. Locate intermediate panels, with or without cross bracing, as indicated on installation drawing furnished with order.

Boot section

1. Insert 1 ¼" diameter steel bars thru 1 5/16" holes at top of side panels.
2. Lower boot section into well until support bars rest on operating floor.

Intermediate frame

1. Put side panels and cross beams, and cross bracing when indicated, in place.
2. Plumb, square up and bolt them securely. Shims are provided to obtain dimensions specified.



FASTENERS

Ⓜ HEXAGON HEAD BOLT $\frac{5}{8}$" X $1\frac{1}{2}$"

Ⓟ COUNTERSUNK HEAD BOLT $\frac{5}{8}$" X $1\frac{1}{2}$"

Ⓡ HEXAGON HEAD BOLT $\frac{7}{8}$" X $1\frac{3}{4}$"

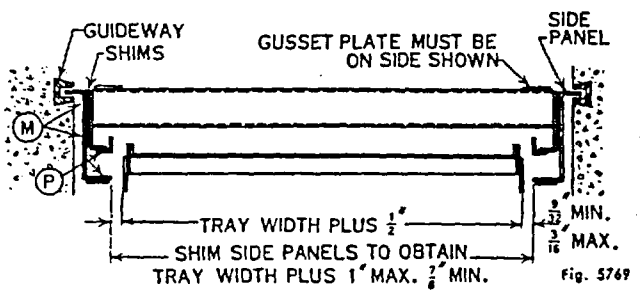
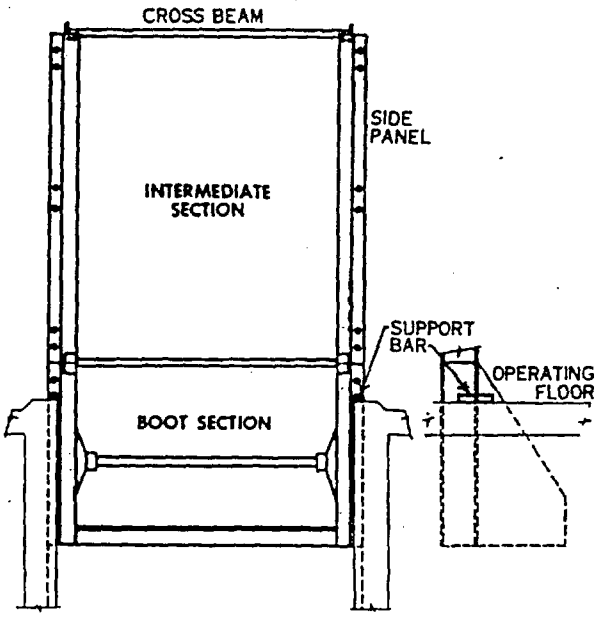


Fig. 5769

3. Lift frame to remove support bars from boot section.
4. Insert support bars in holes in upper ends of guides in side panel.
5. Lower frame into well until support bars again rest on operating floor.
6. Assemble and bolt each succeeding section to previous section until head section is reached and assembled frame is suspended from top by support bars at operating floor.



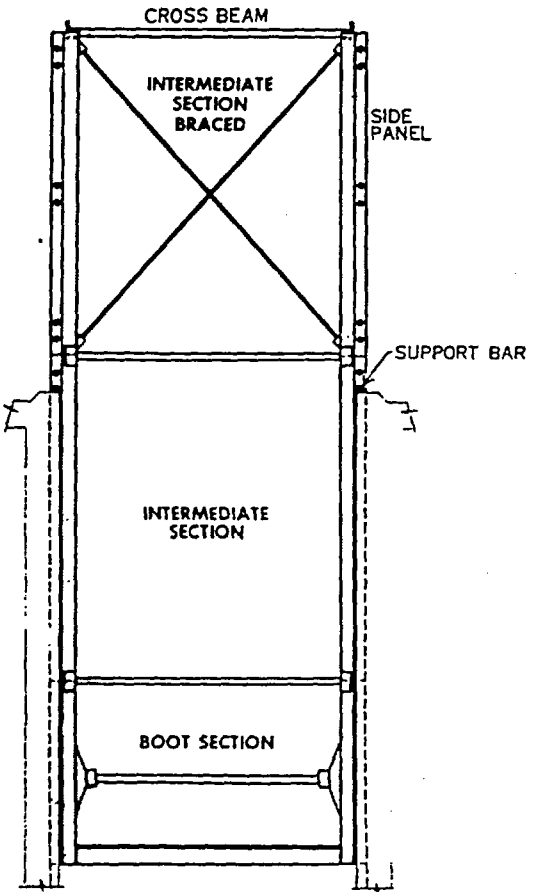


Fig. 5767

Head section

1. Raise head section to position and connect to side panels and knee braces.
2. Bolt all connections securely while head frame is suspended.
3. Raise entire frame and withdraw support bars from holes. Place bearing plates in position on footings.
4. Adjust jack screws to provide the grouting space specified and lower frame into position.
5. Check head section for squareness; level by adjusting the jack screws.
6. Check levelness at machinery support and takeup bearing guideways.
7. Head shaft assembly must be parallel to foot shaft.
8. Head sprockets must be in line with foot sprockets. A plumb line from center of face of each head sprocket must fall through center of face of foot sprocket beneath it.
9. When screens have been set and checked, grout them in place.

Grouting in place

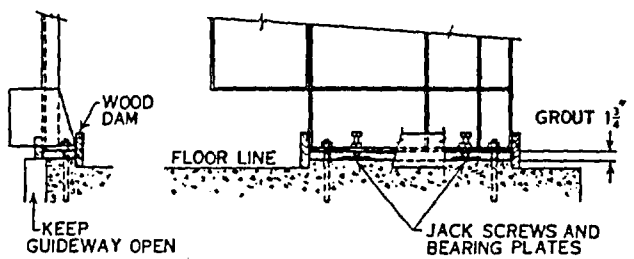


Fig. 5770

Grout must be of good quality; a mix of one part cement and two parts clean sand is recommended. Grout under main shelf angles after screen frame is set and checked. Grout must be worked well under the shelf and held in place by a dam until it has set. If space under boot plate is more than ½" put in timber, grout or rubber hose filler.

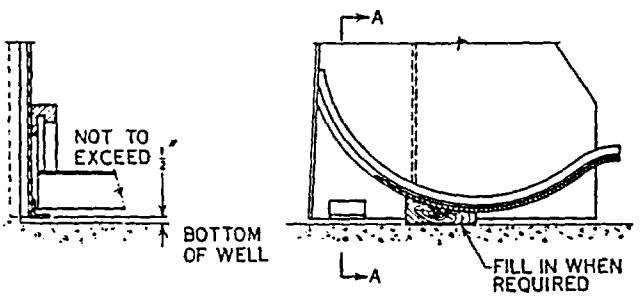


Fig. 5771

When screen cannot be installed in a dry well, a diver should check foot section setting and place filler if needed.

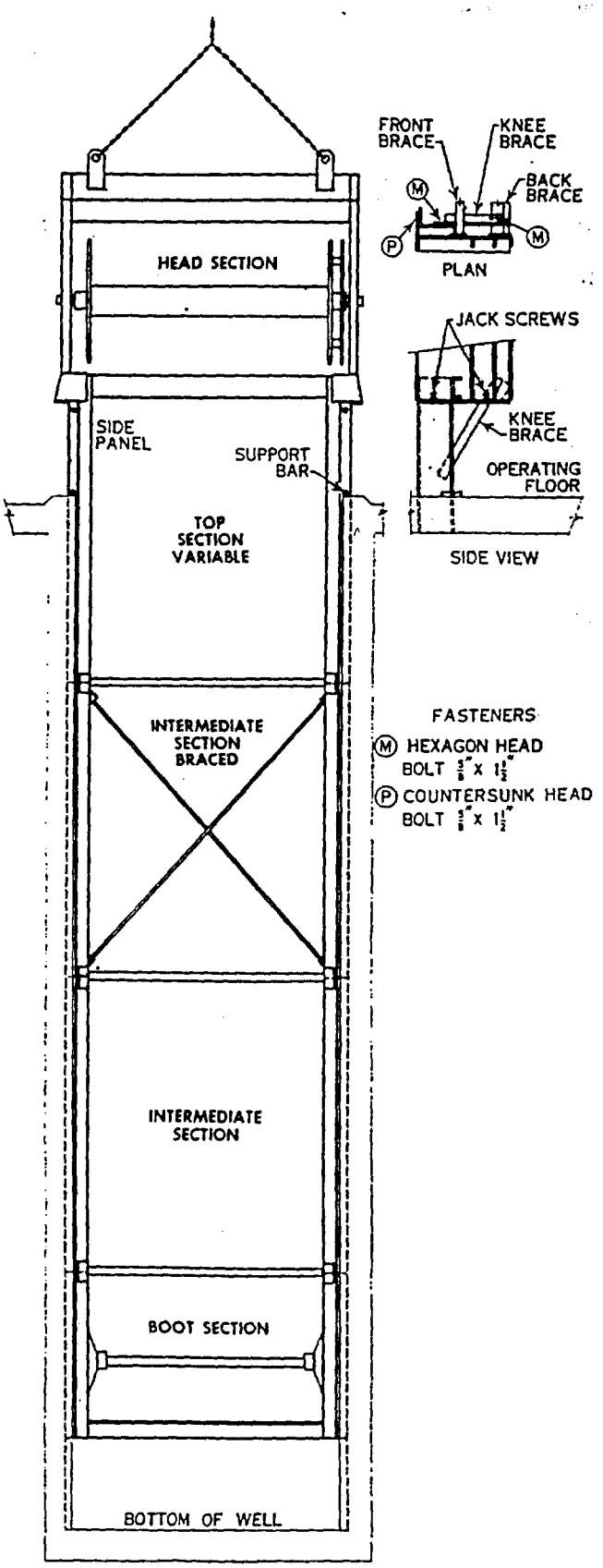


Fig. 5768

FP9863 PAGE 17 REV B

Electrofluid motogear drive

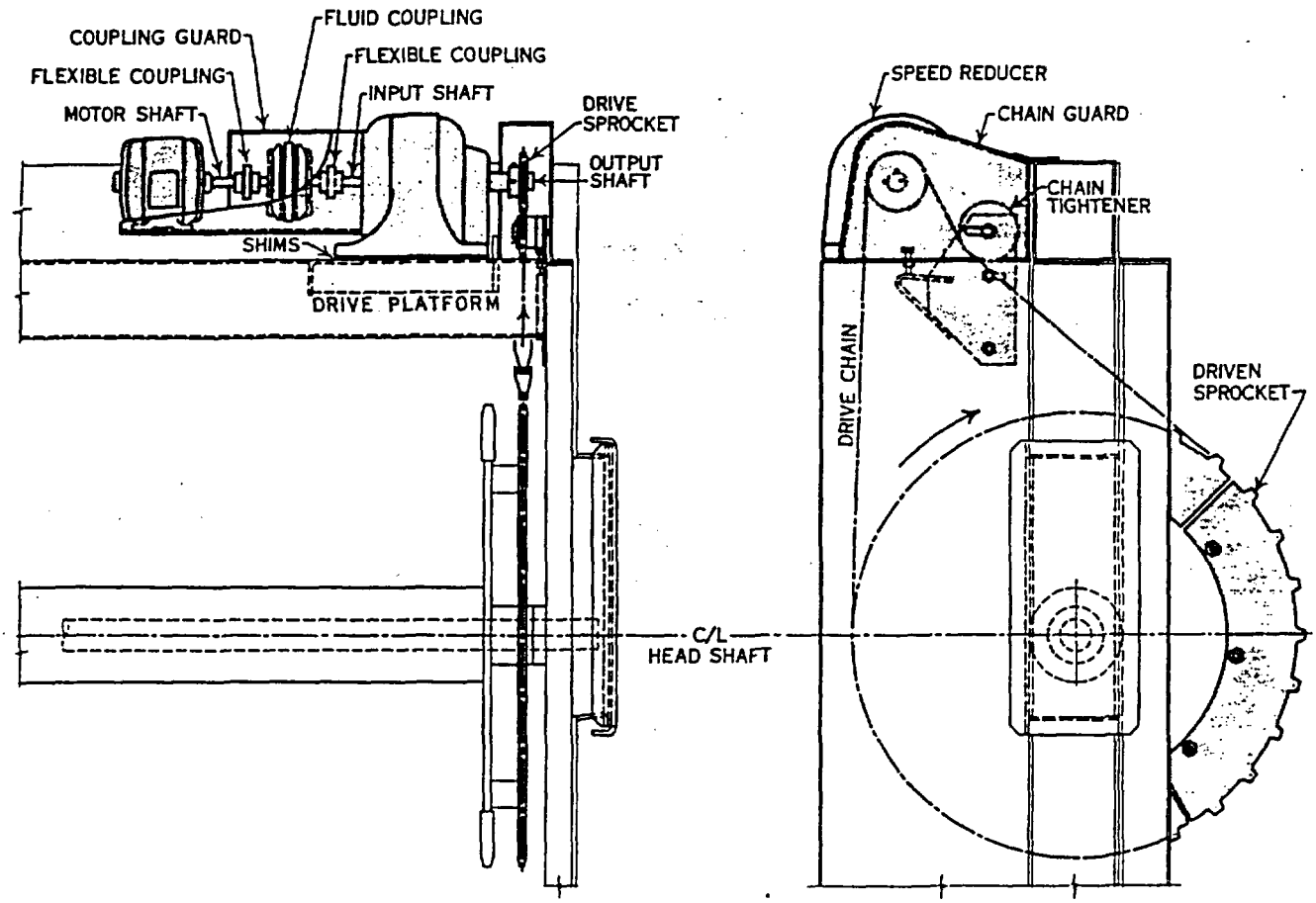


Fig. 5772

1. Align and space motor shaft and speed reducer input shaft as outlined in instructions attached to these units.
2. Mount motor half of the flexible coupling on motor shaft, and fluid coupling with its shafts in accordance with instructions attached to these units.
3. Mount drive chain pinion on output shaft of Electrofluid Motogear, but do not fasten in place. Be careful when mounting sprockets or flexible couplings on drive units. Avoid heavy hammer blows as these may cause damage to the internal gears or bearings. When tight fits are encountered heat sprocket or coupling in oil to 150°F. to 200° F. to expand sufficiently to slide on shaft.
4. Bolt drive into position on platform, level and square it with head shaft of screen using output shaft as a reference. Light steel shims may be needed under the feet to insure uniform support under all four corners.
5. Line up drive chain sprocket wheel with driven sprocket wheel on head shaft and secure it by tightening both set screws. Do not install drive chain until drive has been checked, as outlined under "Final preparation and testing," page 10, and screen chains installed and adjusted.
6. Install chain guard and coupling guard after final adjustment of screen and drive chains has been made.

Screen chains

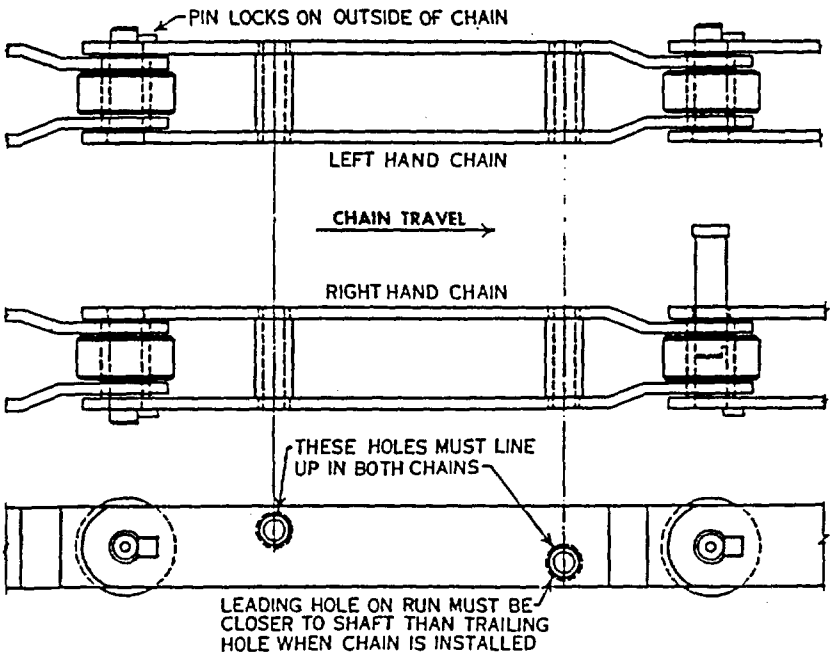
Chains are shipped in strands about 10 ft. long. A coupling pin is furnished with each length of chain.

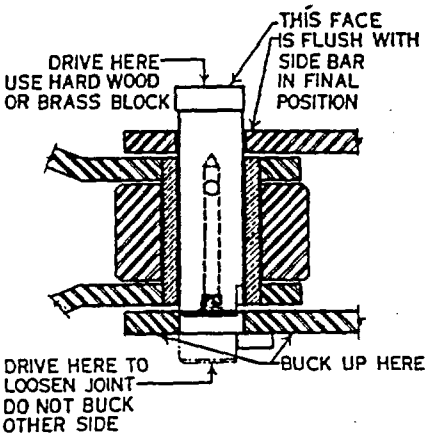
The chains are right and left hand because of the connection to trays. Install carefully so chains will run in proper direction. Right-hand chain must be on right-hand side of screen and left-hand chain on left-hand side of screen. Right-hand side of screen is the side to the right when standing in front of screen looking in the direction of water flow.

Assembling chain strands

1. Remove pin from open end of one strand of chain by tapping it lightly with hammer.
2. Line up pin holes of first strand and bushing of second strand and reinsert pin. Buck up side bar with heavy object as shown, before driving pin home with a maul.
3. When pin is driven flush, drive it back ¼" without bucking up to loosen joint.

Do not use emery cloth on pins for easier assembly as life of chain may be shortened if fit between pin and link is not water tight.





SECTION THROUGH CHAIN JOINT BEFORE ASSEMBLY Fig. 5773

Installing screen chains

1. Install chains in sections, threading the first pair over the head sprockets until open ends are in position.
2. Couple second pair.
3. Turn head shaft until open ends are again in position; couple third pair, etc.

Final screen chain adjustment

When the chains have been coupled, raise head shaft to the operating position.

1. Loosen jam nuts and turn capstan takeup nuts to raise head shaft. Turn the nuts on both sides the same amount so the head shaft is level at all times.
2. Raise head shaft until chains are tight. Then loosen capstan nuts 1 ½ turns to obtain running freedom in machine.

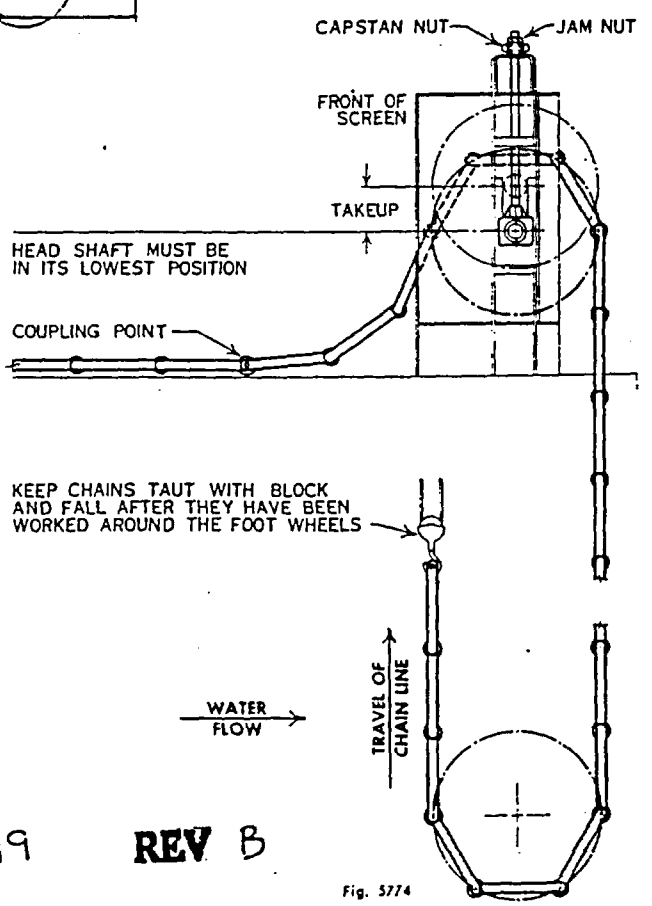


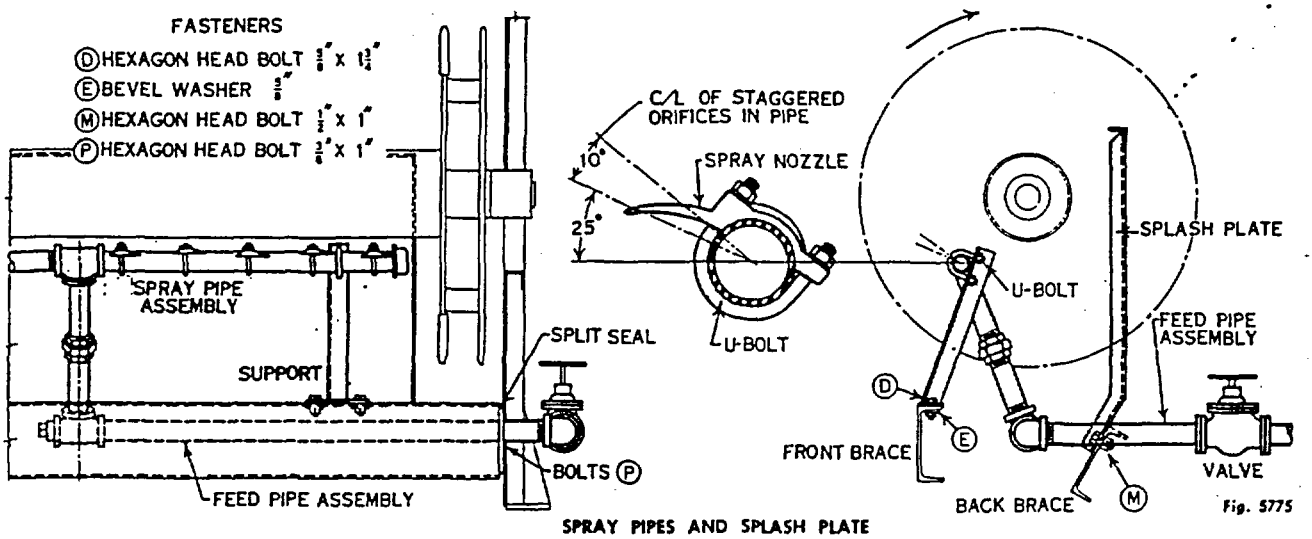
Fig. 5774

F P9863 PAGE 19 REV B

Spray pipes and splash plate

Install spray pipes and splash plate after main chains are in place, but before trays are bolted to chains.

1. Bolt supports to front brace and fasten spray pipe assembly to the supports with U-bolts.
2. Push feed pipe assembly in place through hole in head section side panel; screw tight.
3. Tighten feed pipe assembly, connect valve and make final connection to spray water feed line.
4. Fasten spray nozzles in place with U-bolts. Locate nozzles so curved surface of nozzle is even with the top of hole in the spray pipe and centered longitudinally with the hole. A line through the center of pipe and spray hole should make an angle with the horizontal as shown in side elevation above.
5. Bolt splash plate to rear cross channel.
6. Install split seal and cover plate around feed pipe to side panel with bolts (P). Install solid seal on other side panel to close opening without pipe.



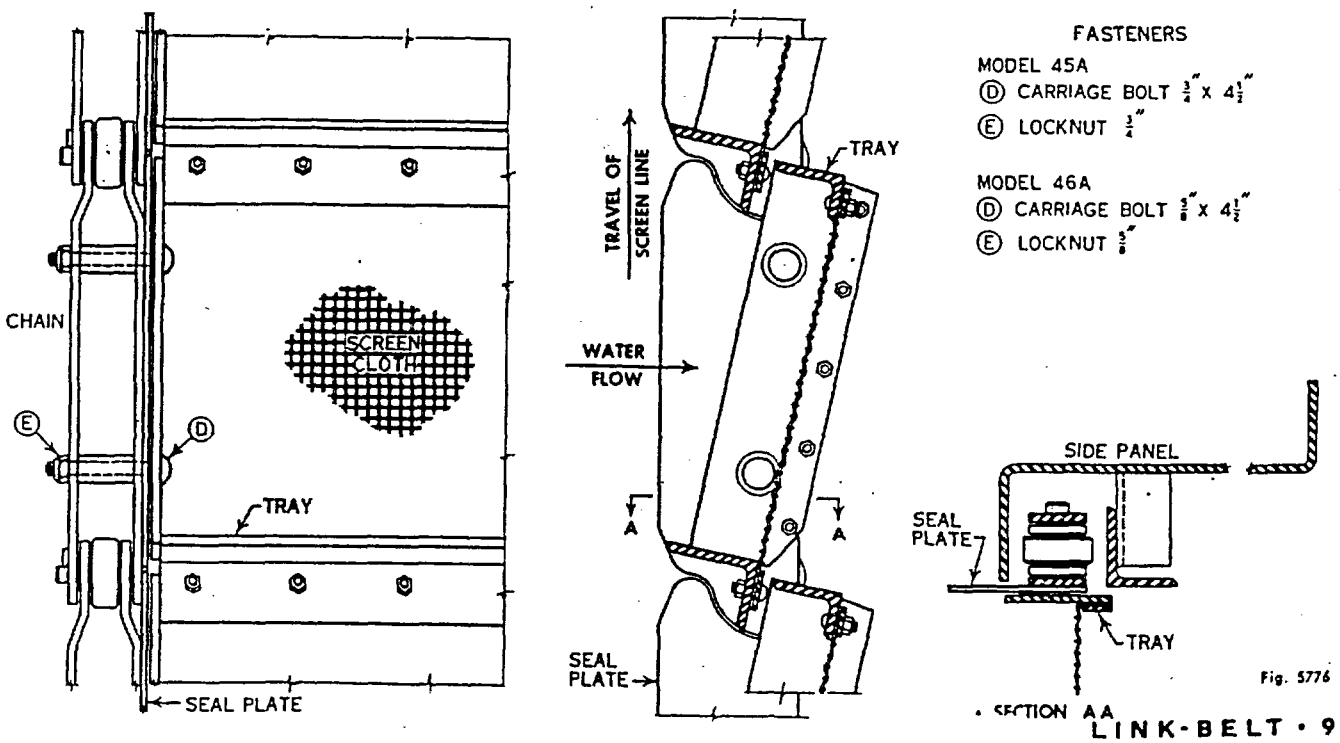
SPRAY PIPES AND SPLASH PLATE

Screen trays

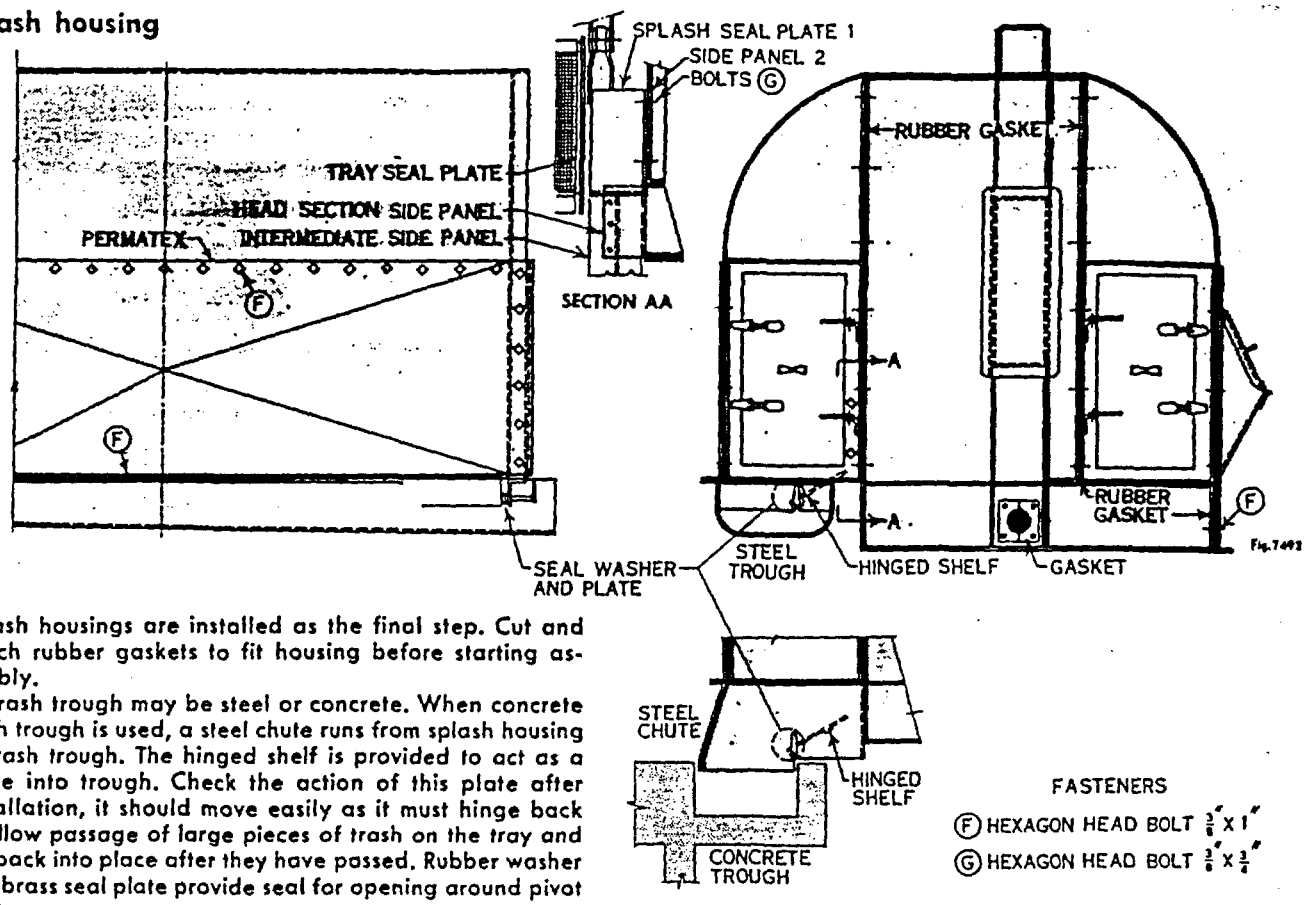
Screen trays are installed after spray pipes are in place but before erection of splash housing.

When attaching trays to chains it is good practice to mount three or four trays on chain and then run these half way around and install an equal number. Run machine one-quarter-way around and install three or four more trays. Run machine half-way around and again install an equal number. This method keeps chain and tray line fairly well balanced at all times until all trays are in place.

Make sure seal plates are in place between tray and chains before putting bolts in place and tightening nuts.



Splash housing



Splash housings are installed as the final step. Cut and punch rubber gaskets to fit housing before starting assembly.

Trash trough may be steel or concrete. When concrete trash trough is used, a steel chute runs from splash housing to trash trough. The hinged shelf is provided to act as a chute into trough. Check the action of this plate after installation, it should move easily as it must hinge back to allow passage of large pieces of trash on the tray and fall back into place after they have passed. Rubber washer and brass seal plate provide seal for opening around pivot shaft.

Bolt splash seal plate 1 to door frame of side panel 2, (Section A-A) with bolts provided.

Spray water

The quantities and pressures in table below will insure proper flushing of trays for all normal operating conditions. If specific data is given on general arrangement drawings, follow it rather than this table.

Condition of tray	Pressure at orifices, pounds per square inch	Gallons per minute flow					
		Tray width, feet and inches					
		3-0 to 4-0	4-6 to 5-0	5-6 to 6-6	7-0 to 7-6	8-0 to 9-0	9-6 to 10-0
Small amount of refuse	40	83	111	139	167	195	220
Leaves and general refuse	60	102	136	170	204	235	270
Refuse clinging to tray, jellyfish, etc.	85	120	160	200	240	280	320

Final preparation and testing

Before this screen is placed in regular operation, the following instructions should be observed:

1. Fill speed reducers with oil. All Link-Belt speed reducers are shipped without oil and must be filled to correct level before operating. Follow instructions attached to drive and on nameplate.
2. Check oil level in fluid coupling. The fluid coupling is located between speed reducer and motor. The coupling is lubricated at the factory but check oil level to be sure that oil has not been lost in shipment. Note that coupling must not be filled to the top.
3. Lubricate all bearings on screen proper, as shown in Figure 5778, page 11.

Check motor and adjust controls

Single-speed screen

Operate screen and check for proper direction of travel. See drive installation drawing, Figure 5772, page 7.

Dual-speed screen

Dual-speed screens are normally furnished with star connected dual voltage motors and suitable controls. The two sets of windings available in this type motor are utilized, together with an auxiliary gear reduction in drive to produce two screen speeds. The fluid coupling provides the same protection from machinery overloads in both cases.

When operating on parallel connected windings, by setting starter control level at high speed position, the motor develops full horsepower to operate screen at about 10 FPM.

When starter control lever is set at low speed, it operates the motor on series connected windings to develop about one-quarter full motor torque. The motor runs in a direction opposite to high speed rotation and in so doing automatically engages an auxiliary 4 to 1 gear reduction in the speed reducer to operate screen at about 2½ FPM.

The speed reducer is designed so reversal of motor rotation does not reverse direction of screen travel.

Screen speed may be changed from high to low or from low to high at any time by reversing the position of the control lever on the starter.

Wire drive control in accordance with wiring diagram to assure proper overload protection provided by the

drive. To make sure control is properly wired, check the following:

1. High and low speed push buttons, or other pilot signals, must close their corresponding high and low speed contactors in the control.
2. High speed contactors must be connected to the low voltage connections in motor and the low speed contacts to the high voltage connections in motor.
3. Check drive operation by placing control level in high speed position and start motor. See drive installation drawing, Figure 5772, page 7, for proper direction of screen travel. Speed reducer output shaft should revolve at the high speed stamped on drive nameplate.
4. If reducer output shaft does not operate at high speed, reverse motor rotation by interchanging any two of the three power supply leads to the control. Do not reverse motor by interchanging leads at any other point.
5. Reducer output shaft should now rotate at high speed with the control lever in high speed position and at low speed with control lever in low speed position.
6. If work is performed on power supply, controls, or motor, repeat above checks before placing unit back in operation.

Operate screen

Operate screen with power for a period of one hour or more to check all drives and bearings for excess heating due to tightness or misalignment.

If screen is operating in a dry well, lubricate foot shaft bearings with oil.

Check spray nozzles

Check spray nozzle orifices and make sure they are open and correctly positioned.

OPERATION

Single-speed screen

Link-Belt traveling water screens are designed to handle the capacity specified in the contract when screen cloth is clean. The normal head loss between the front and back of the screen will be quite small when trays are clean. An operating schedule should be worked out depending upon prevailing conditions, so trays will be cleaned often enough to prevent difference in head exceeding 6 to 8 inches.

If screen stalls due to excessive head, lower head by removing obstructing material, stopping the main pumps momentarily if necessary before again operating.

If screen stalls due to an obstruction in well, correct cause of stalling before resuming operation.

The life of moving parts will be lengthened if screen is operated intermittently. Do not operate continuously unless absolutely necessary.

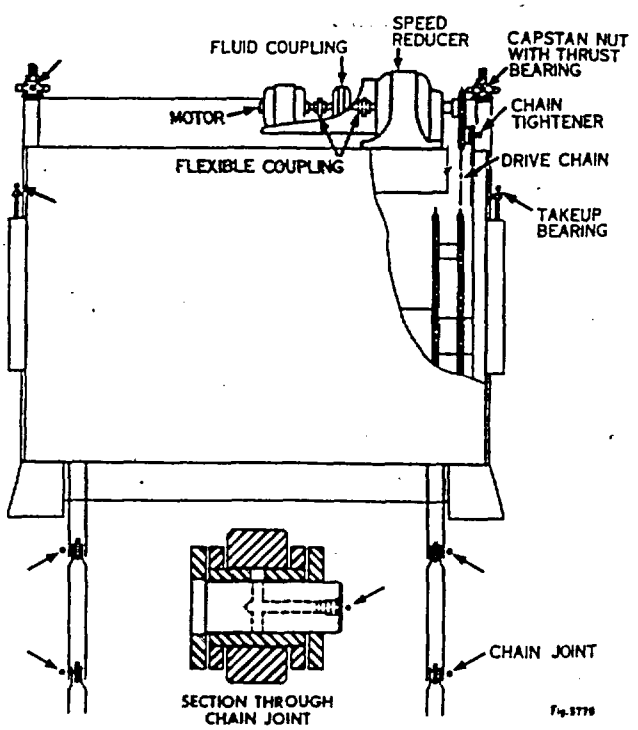
Always operate water sprays before starting screen.

Dual-speed screen

The preceding instructions regarding operation of the single-speed screen also apply to the two-speed screen.

The two-speed drives on these screens provide a high speed of approximately 10 FPM for quick cleaning cycles of short duration. A low speed of about 2½ FPM is provided for continuous operation during periods when volume of incoming trash to be removed from the water is heavy, or during periods when operator is not present. This slow speed is used to protect against sudden influx of trash which would block screen unduly when stationary. Under exceptional conditions it may be necessary to operate screens continuously at 10 FPM although this is not recommended except as an emergency measure.

LUBRICATION



Lubrication points are shown in drawing above.

Change oil in speed reducer, regrease motor and replenish fluid coupling oil as specified in instructions originally furnished with these units.

Lubricate drive chain once a week with a water repellent grease applied with a paddle or brush.

Lubricate head shaft and chain tightener bearings daily with water repellent grease; three grease points.

Lubricate takeup nuts before turning each time head shaft is adjusted. Keep takeup screws coated with same grease used on drive chain; two grease points.

Lubricate screen chain joints with water repellent grease intermittently, depending upon operation. Lubrication once every 200 hours of actual running time is recommended.

Typical lubricants recommended for screen chains

Manufacturer	Lubricant
Sinclair Refining Company	Sinclair Shamrock Lubricant F
Mobil Oil Company	Mobilgrease L-2
Standard Oil Company (Ind.)	Arctic Compound #1. 12% Zinc Stearate 88% Petroleum Oil
Dearborn Chemical Company	No-Oxild "E"
ESSO Standard Oil Company	Cazar 2

MAINTENANCE

Adjusting tension in screen chains

Screen chains must be sufficiently tight to keep them in place on the foot wheels. If chains are loose, undue wear will occur on boot tracks and chain rollers; if extremely loose, damage will result from accumulation of excess slack at point where down-stream chains join foot sprocket.

When tightening chains, keep head shaft level at all times. Turn adjusting nuts, simultaneously, and each exactly the same number of turns. The nuts have 6 threads per inch. Tighten chains until rollers are tightened into the pockets of the foot wheels, then back off each capstan nut 1½ turns to obtain running freedom.

Screen trays

An occasional check-up, to make sure that the bolts which connect the screen trays to the chains are tight, may prevent a serious breakdown.

Cleaning spray pipes

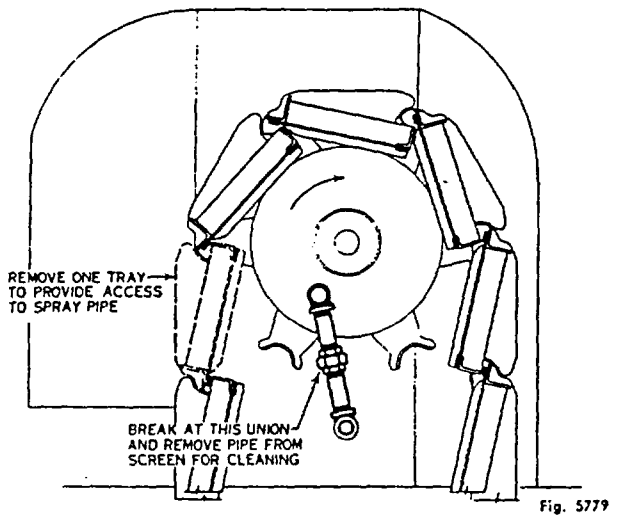


Fig. 5779

Check washing action of the sprays every few days to make sure dirt or slime has not clogged the orifices in the spray pipes.

Remove and clean the spray pipes if the orifices become clogged.

Replacement of head sprocket parts

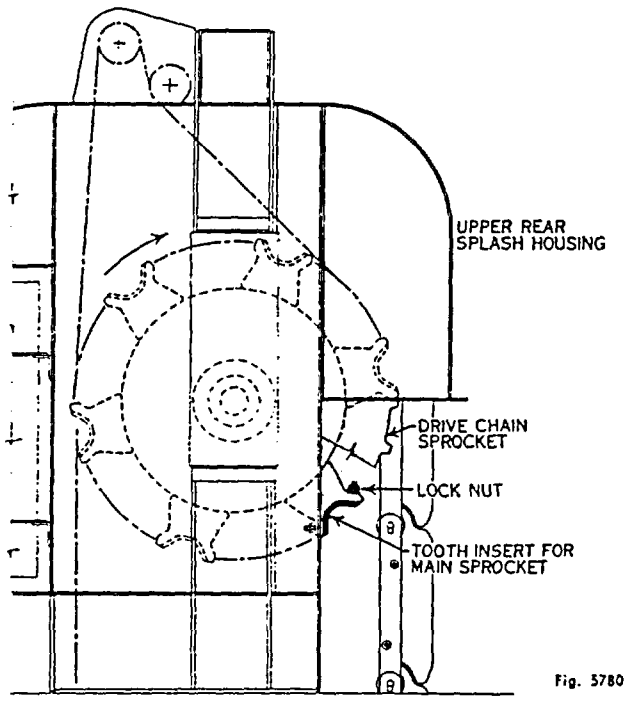


Fig. 5780

The main sprocket tooth inserts may be replaced, one pair at a time, without disturbing the screen line or the drive chain sprocket. Rotate screen to position indicated above and replace one pair of inserts. Repeat for successive teeth. Do not re-use the fibre insert lock nuts, replace them with new nuts.

DIFFERENTIAL HEAD CONTROL

Operation

The differential head control is an optional accessory used to operate the traveling water screen automatically or actuate an alarm when the differential head exceeds a predetermined setting. It is a factory assembled, floor mounted self contained unit requiring only external connection of air and power lines at installation site.

An air purge system is utilized to measure the differential head across the screen and provide means for actuating the control. In operation, air is fed through open end tubes immersed in the water on each side of the screen and the air flow adjusted by means of needle valves and rotameters so the flow is the same in each tube.

When a differential in head occurs, the pressure in the downstream tube will drop. This pressure difference is used to actuate either a pneumatic force-balance transmitter or a mercury manometer, depending on which type is furnished. These instruments in turn operate the necessary electrical controls to start spray water pumps and screen motor in an automatic system, or an alarm in a manual system, when setting of instrument is exceeded.

With an alarm control system the spray pipe valve and screen drive motor must be operated manually after the alarm functions and screen must be operated until the head returns to normal.

When an automatic control system is used, a starter, three position selector switch and a reset timer are supplied. When selector switch is in automatic position and the differential head is exceeded the solenoid valve on the spray pipes and the screen drive motor are automatically operated and timer reset. When the head returns to normal the timer automatically continues operation of screen until all trays are cleaned.

When selector switch is in manual position the automatic controls are by-passed and screens must be operated manually. This control setting permits operation of screen for routine testing regardless of whether a difference in head exists.

After use in manual position, return selector switch to automatic so the instrument can control the operation of screen based on differential head.

Installation

1. Bolt control panel to floor as close to screen as possible, making sure that there is access room at rear of panel. Panel should be well lighted, clean and free from excessive vibration and temperature extremes. If a mercury manometer is used be sure it is level.
2. Install upstream and downstream purge lines making sure lower ends of copper tubes are at same elevation, and to a depth that will assure the ends being submerged at least 12 inches under minimum water level when operating. Clamps are provided for securing tubes to wall. Be sure tubes clear path of trays.
3. Connect purge lines A and C to proper high (upstream) and low (downstream) fittings on control panel. All joints must be air tight.
4. If mercury manometer is used, fill manometer body with mercury. Consult manufacturer's instruction book furnished for instructions.
5. Connect air supply to fitting B on control panel. Be sure all valves on control panel are closed before opening main air supply valve.
6. Connect control lines M from starter and timer to proper terminals on control panel as shown on wiring diagram provided with equipment.

FP9863

Page 23 Rev. B

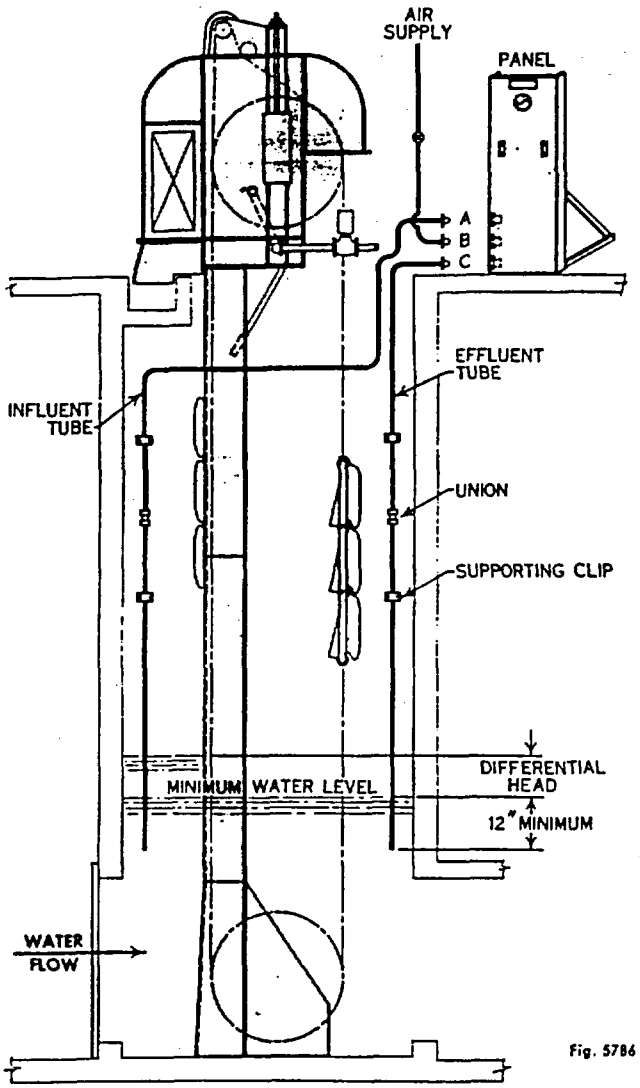


Fig. 5786

7. Set meter N for differential head desired. Recommended differential head setting is 2" of water. Instrument is now ready for final adjustment and operation.

Final adjustment

Mercury manometer controls

1. Adjust regulator E until gauge F indicates a pressure in pounds per square inch of 1.1 times maximum water depth in feet. Thus, for a 50 foot maximum water depth the gauge reading would be 50 × 1.1 = 55 psi.
2. Adjust valves at rotameters G so float is approx. centered on scale. Both rotameters should indicate same flow although the exact rate is unimportant.
3. Set timer for a period of time long enough to permit screen to complete one cycle.
4. Open equalizing valve K and close valves J and L, meter N should register zero. Open valves J and L, meter N should still register zero if water level in front and in back of screen is the same. If meter N does not register zero when valves K, J and L are all opened, consult meter manufacturer's manual furnished, for further instructions.
5. Close valve K. Always open valve K before opening or closing valves J and L and close valve K after operating J and L. If valves are not operated in proper sequence, meter can be damaged by over travel.

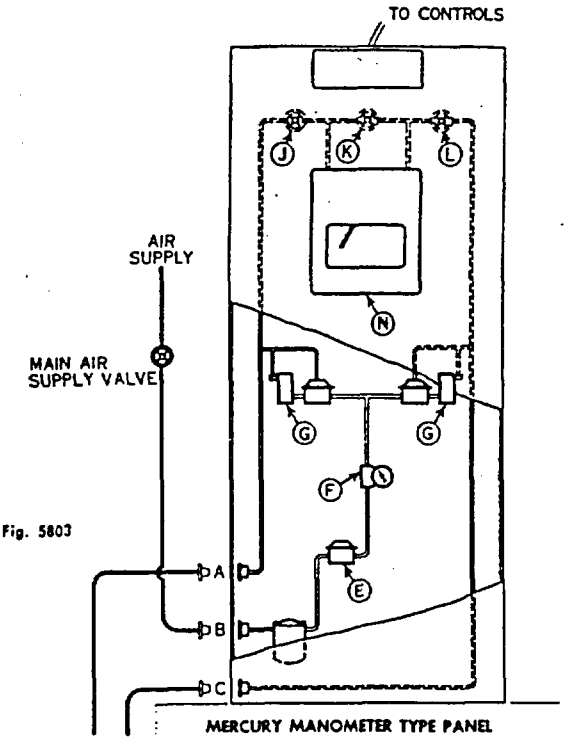


Fig. 5803

MERCURY MANOMETER TYPE PANEL

Pneumatic controls

1. Adjust regulator E until gauge F indicates a pressure in pounds per square inch of 1.1 times maximum water depth in feet. Thus, for a 50 foot minimum water depth the gauge reading would be 50 × 1.1 = 55 psi.
2. Adjust valves at rotameters G so float is approximately centered on scale. Both rotameters should indicate same rate of flow although the exact quantity is unimportant.
3. Set timer for a period of time long enough to permit screen to complete one cycle.
4. Adjust regulator O until gauge P indicates a pressure of 20 psi. Gauge R should now indicate difference in head in inches of water when it occurs. Consult the meter manufacturer's manual furnished, for additional information.

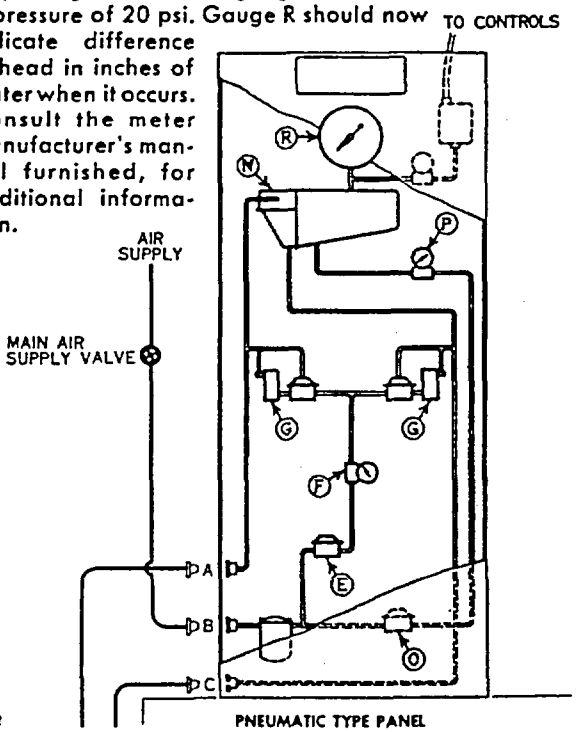


Fig. 5802

PNEUMATIC TYPE PANEL

PARTS LISTS

When ordering traveling water screen parts please furnish order number stamped on nameplate, symbol and description as listed in following tables. Reference to drawing provided with screen and part identification given will also be helpful.

Foot shaft

Symbol	Description
A	Sprocket with keyseat and set screw
B	Sprocket
C	Key
D	Collar
E	Bearing halves
F	U-bolt with nuts
G	Shaft

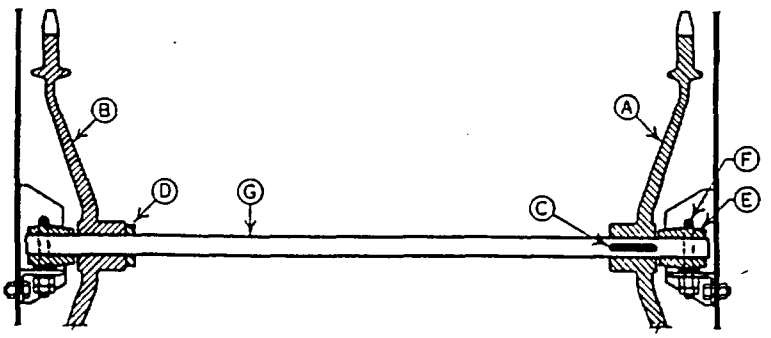


Fig. 5781

Head shaft • Model 45A

Symbol	Description
A	Shaft
B	Key
C	Torque tube assembly without tooth insert
D	Sprocket tooth insert
E	Bolts with locknuts
F	Driven sprocket
G	Bolts with locknuts
H	Takeup bearing with bushing
J	Takeup bearing bushing
K	Takeup screw
L	Thrust bearing
M	Adjusting nut
P	Jam nut

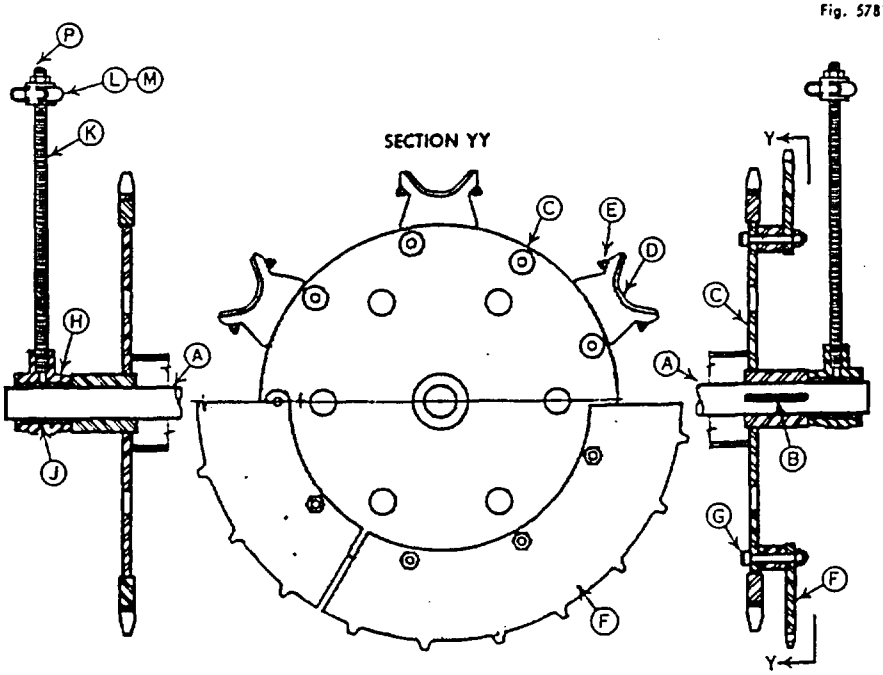


Fig. 5782

Head shaft • Model 46A

Symbol	Description
A	Shaft
B	Key
C	Sprocket, less tooth insert (with bosses)
D	Sprocket, less tooth insert (plain)
E	Sprocket tooth insert
F	Bolts with locknuts
G	Driven sprocket
H	Bolts with locknuts
J	Takeup bearing with bushing
K	Takeup bearing bushing
L	Takeup screw
M	Thrust bearing
N	Adjusting nut
P	Jam nut

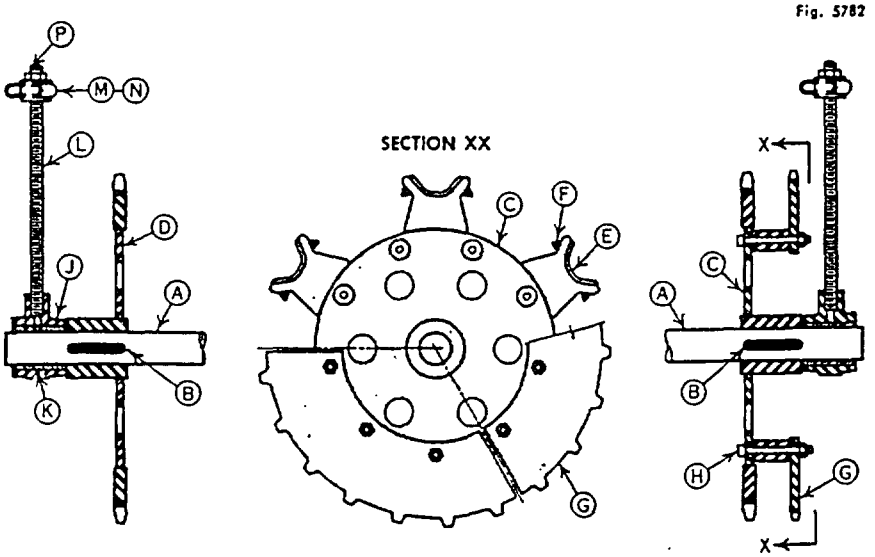


Fig. 5783

F P9863 PAGE 25 REV B

Drive machinery

Symbol	Description
	Electrofluid Motogear
A	Motor
B	Flexible coupling
C	Fluid coupling
D	Flexible coupling
E	Speed reducer
F	Drive sprocket
G	Drive chain
H	Chain tightener sprocket

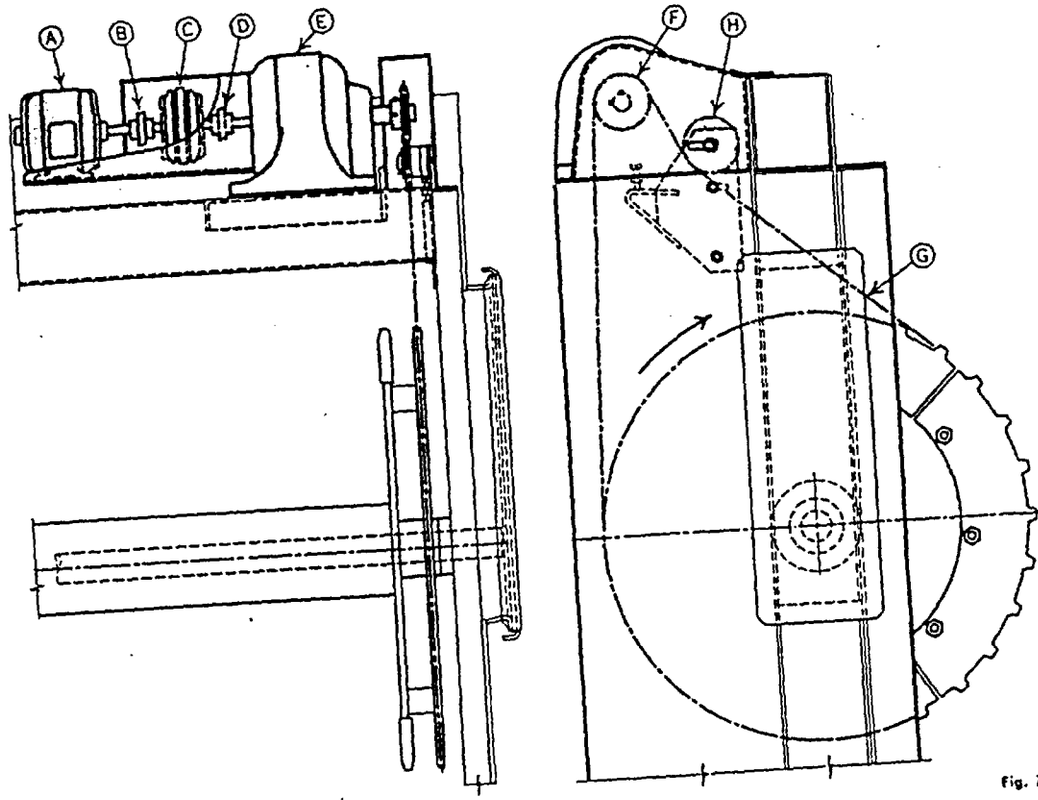
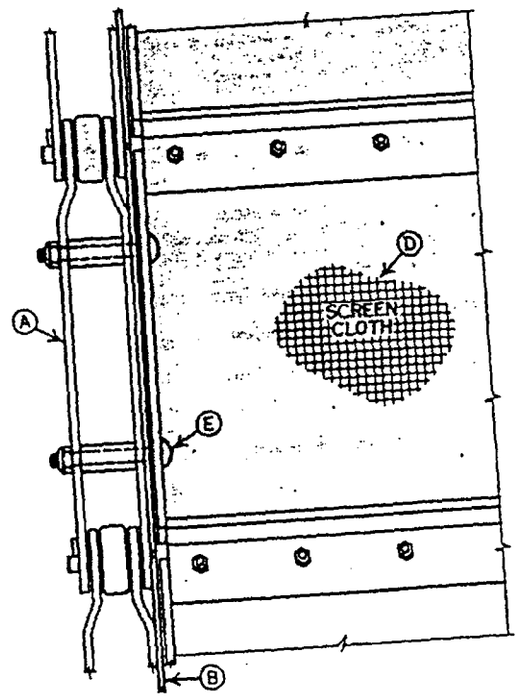


Fig. 7494

Trays and chain

Symbol	Description
A■	Chain assembly, right hand and left hand
B	Seal plates
C	Tray frame
D	Screen cloth
E	Tray bolts with locknuts

■ It is advisable to order complete chains.



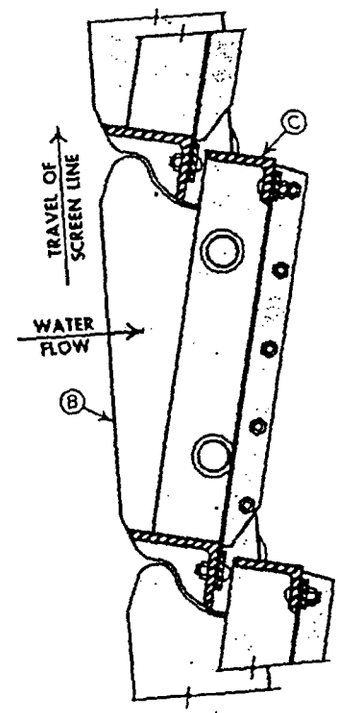


Fig. 5784

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