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# PARTS LIST #9591
# and
# INSTRUCTION MANUAL

## for

## STRAIGHT LINE, HORIZONTAL
## DOUBLE ACTING
## WATER COOLED COMPRESSORS

American
AIR COMPRESSOR
CORPORATION
DELL AVE. AND 48TH ST., NO. BERGEN, NEW JERSEY

SERIAL [redacted] TYPE [redacted]
SIZE [redacted]

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AMERICAN AIR COMPRESSOR CORP.
48th STREET & DELL AVE. NORTH BERGEN, N. J.

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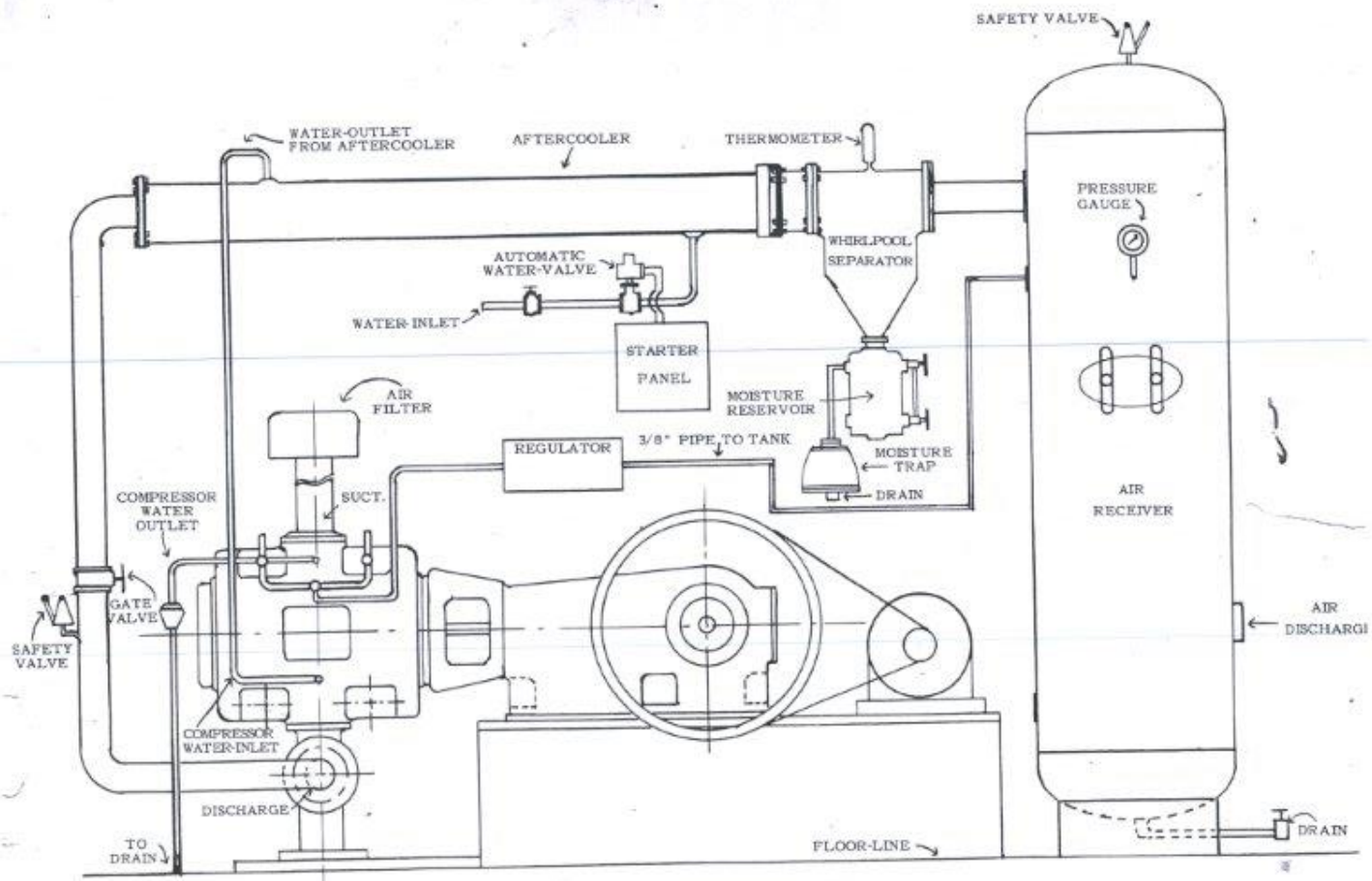



NOTE – THIS DRAWING SHOWS A SUGGESTED PIPING PLAN AND GENERAL INSTALLATION. ONLY ITEMS SPECIFICALLY CALLED FOR ON PURCHASE ORDER ARE SUPPLIED BY AMERICAN AIR COMPRESSOR CORP.

## INTRODUCTION

The information and recommendations contained in this bulletin are offered to assist in maintaining and operating the compressor up to its maximum efficiency in accordance with the best accepted practice. Conditions ordinarily encountered are contained herein.

Practical considerations and applications require that some variation from the average design data and arrangement given in this book may be expected in any one unit.

A study of the cross-sectional assemblies and the parts list cuts will assist operators in understanding more clearly the construction, operation and adjustment of the compressor. It is, therefore, to the advantage of the operating company that a copy of this bulletin be made available for reference and guidance of the person or persons directly in charge of the maintenance and operation of the unit.

## LOCATION

The compressor should be installed in a clean, light place with ample space provided all around to permit cleaning, inspection, adjustment, and removal of such parts as pistons, piston rods, etc., without interference from adjacent machinery or building walls. The proper location and installation of the unit will materially reduce maintenance and operating costs.

## FOUNDATION

All reciprocating machines have inherent shaking forces due to the movement of the piston, rod, crosshead. Because of the varying angularity of the connecting rod throughout the stroke it is impossible with any weight of counterbalance to balance the horizontal reciprocating force closer than plus or minus 20% of this force.

Therefore, as all compressors do have such disturbing forces, it is necessary that an adequate foundation be provided to prevent objectional vibration.

Since the responsibility for a successful foundation rests with the purchaser, the following suggested points should be carefully checked.

The subsoil should be checked by digging test pits to determine its nature. Load deflection tests should be made for wet or springy soils.

The foundation plan furnished for the unit shows the minimum size recommended for hard, firm ground like well packed sand and gravel or hard clay, and which will always be dry. If this soil is less firm, the foundation should be increased and other precautions taken.

The foundation should, where possible, be carried down to a firm footing. Where the foundation is exposed to freezing temperatures, its depth should be below the frost line.

Where the depth of the foundation is made greater than that shown on the foundation drawing furnished, the base area of the foundation should be then proportionately increased. Such an increase in the base area is also necessary where the unit is elevated above the floor line greater than that shown on the drawing. Where the sides of the foundation do not abut well tamped soil, the base area must likewise be increased.

Where solid rock is encountered the depth of the foundation may be reduced to within one foot of the floor line.

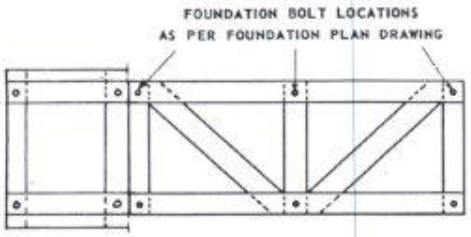
It is always advisable to isolate the foundation from any building footings, walls or floors or prevent any vibration being carried into the building structure.

Where more than one unit is being installed and the units are relatively close to each other it is advisable to cast the foundations enbloc on a common concrete mat.

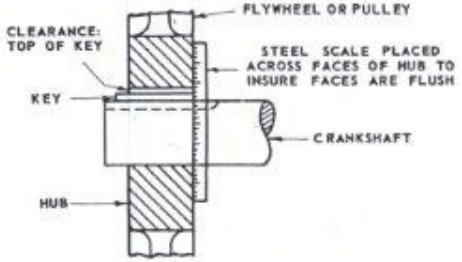
Where there is any question on soil conditions and where any transmitted vibration may be objectionable, it is recommended that a competent foundation specialist be consulted.

The extra cost of good foundation is usually small and is a very poor item on which to economize, as the cost in correcting is always high and difficult to effect.

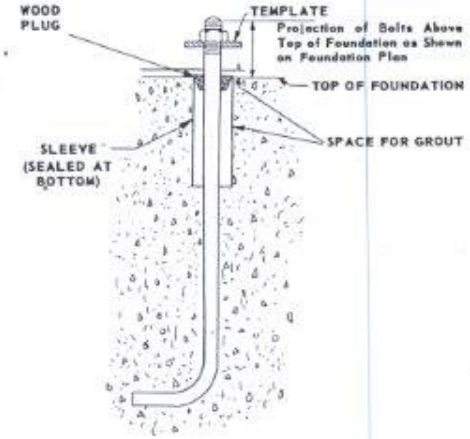
The unit and its drive should be installed on a good solid foundation preferably of concrete. Foundation plans, giving general dimensions and showing the location of all foundation bolts are furnished for each installation.




PLAN VIEW OF
TYPICAL COMPRESSOR FOUNDATION TEMPLATE
FIG. 1

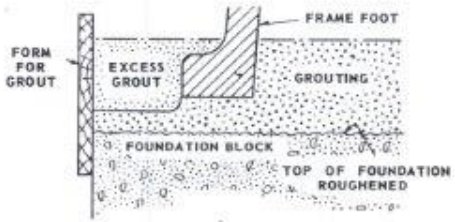



SPLIT HUB PULLEY INSTALLATION
FIG. 3




SUGGESTED FOUNDATION BOLT INSTALLATION
FIG. 2


Q D HUB ARRANGEMENT
FIG. 4




GROUTING
FIG. 5

When a concrete foundation is constructed, a template such as that shown in Fig. 1 must be made to properly position the foundation bolts during the pouring of the concrete. A template of wood with properly located holes for suspending the foundation bolts is satisfactory for a single foundation.

The foundation bolts should be suspended from the template, care being taken to use the different length bolts in their proper locations and to project above the foundation level as specified on the foundation drawing.

In addition to hanging the foundation bolts and sleeves from the template, the bolts should also be wired or tack welded to adjacent reinforcing rods, at the bottom, so as to remain plumb and in proper position throughout the pouring of the concrete.

A suggested foundation bolt arrangement is shown in Fig. 2. A sleeve 2" larger in diameter than the foundation bolt should be placed around each bolt for a distance at least 1/3 the full length of the bolt. Such sleeves will prevent the concrete, when the foundation is poured, coming in contact with the bolts for the length of the sleeves and thus allow for movement of the upper portion of the bolts should such be required to align the bolts in the frame bosses.

A thin tube, for the sleeve, such as a piece of gutter drain pipe is excellent for this purpose. The sleeve should be sealed at the bottom and at the top to prevent concrete entering this space when the foundation is poured. A convenient way to seal the opening of the sleeve at the top, is to use a wooden plug with a hole in the center just large enough to pass the foundation bolt through. Such plug will also center the bolt in the sleeve. Any other convenient method of sealing this opening or space temporarily should prove satisfactory.

Some reinforcement by means of standard steel reinforcing rods should be used in the foundation particularly at any pit or openings in the foundation.

Before the concrete takes its final set, the top surface of the foundation should be made rough by raking to provide a good surface for the bonding of the grout, which will be applied after the equipment is aligned and set on the foundation.

The surface should be roughened to the extent that the aggregate will be exposed, and the indentations in the surface are at least 1/2" deep and irregular.

The foundation should be allowed to cure for at least a week before the equipment is placed thereon. Such curing can be accomplished by the use of a curing compound or by keeping the surfaces wet for a period of 7 days if normal temperatures exist, or longer at lower than normal temperatures.

## ERECTION

Roughen and clean the top of the foundation, brushing and washing it to remove any loose particles. Remove the material used to seal the opening at the top of each foundation bolt sleeve, together with the template and all forming lumber.

The units are usually shipped with the cylinder attached to the frame and the running gear completely assembled therein. The unit thus assembled should be set over the foundation bolts on shims and wedges at such height as to allow for the depth of grout as indicated on the foundation drawing. The shims and wedges required to level the unit should be placed adjacent to each foundation bolt to permit an even distribution of the support of the unit so as not to distort the frame or other component parts during the leveling and alignment of the unit.

The foot piece or foot elbow (if used) should be attached to the cylinder and also set on shims and wedges. Such foot pieces or foot elbows, when supplied, are intended to carry the greater portion of the weight of the cylinder and therefore in aligning and leveling the unit, care should be taken to properly distribute the support and maintain the alignment of the unit.

Set the motor or other type of driving equipment on shims and wedges over its foundation bolts. Make a check of the center to center distance, as indicated on the foundation plan, between the compressor shaft center and the driving equipment shaft center.

Proceed to align and level the assembled unit by driving in on the wedges until the unit is level and the weight of the unit is evenly distributed on the wedges under the frame and the cylinder foot piece. The unit should be made

level parallel to the centerline of the crankshaft and at right angles to it, using the crosshead bottom guide, the upper cylinder port opening and the crankshaft extension as leveling points.

When the level of the unit is established pull down evenly on all foundation bolt nuts to secure in position and to retain the setting during the grouting of the unit to the foundation. Check to insure that the tightening of the foundation bolt nuts has not disturbed the level condition of the unit.

Place the driven pulley or sheave on the crankshaft and secure it in place with its key and hub bolts. The key should be fitted to the keyways in the shaft and pulley hub with a light drive fit on the sides with a clearance of at least .010" between the top of the key and the keyway in the pulley hub. If this latter condition is not properly established the pulley will ride the key and cause the pulley to run out of true or wobble.

When a split hub sheave, pulley or flywheel is used the bore may be opened for assembly on the shaft by driving a wedge with shims into the lengthwise split of the hub. Due care must be exercised to place the shims and wedges at the center of the hub and that the wedge is not driven too hard or too far, otherwise a cracked hub may result. The wedge should be removed as soon as the pulley, sheave or flywheel is in place on the shaft. The faces of the hub must be made absolutely flush one with the other, otherwise the sheave will wobble or run out of true. (see Fig. 3).

## MOUNTING INSTRUCTIONS FOR QD SHEAVES

When Q D (quick-demountable) hubs are used with the sheave or pulley, apply the hub and wheel as follows:

1. Back out cap screws and remove Q D hub from sheave. Be sure taper bore of sheave and cone surface of the hub is free of dirt, grit and paint. Wiping these surfaces with a slightly oiled rag will insure uniform draw-up.

2. Loosen lock screw in Q D hub flange and slide Q D hub on shaft, flange end first, and assemble key. Do not tighten set screw over key until instruction No. 3 is completed.

3. Position Q D hub on shaft, and tighten lock screw in flange until Q D hub is snug on shaft. Do not use excessive force on lock screw as it is intended to hold only Q D hub on shaft against lateral movement while assembling rim on Q D hub.

4. Tighten set screw in flange over key.

5. Place sheave in position on taper of Q D hub, align cap screw holes in rim with tapped holes in flange and assemble cap screws and lock washers.

6. Draw up tightly but evenly on cap screws. If sheave hub draws up to actual contact with Q D hub flange shaft is seriously undersize or bore in Q D hub is seriously oversize. If this condition exists the Q D hub should be replaced with one of proper bore size.

## DISMOUNTING INSTRUCTIONS FOR QD SHEAVES

1. To dismount sheave remove cap screws and replace two of the screws in threaded holes in sheave rim hub to act as jack screws to start sheave off taper, after which sheave can be lifted from Q D hub.

2. Loosen lock screw and set screw and slide Q D hub from shaft. If Q D hub is tight on shaft, it can be easily loosened by driving small wedge or screw driver in split part of flange.

Apply the driving pulley or sheave to the motor or driving equipment shaft and align it with the driven pulley or sheave on the shaft of compressor. Shifting of the motor or driving equipment on its base plate may be required to perfectly align the pulleys or sheaves. When the alignment of the drive is completed, the foundation bolts of the driving unit should be securely tightened.

## GROUTING

A dam or form should be built around the foundation sufficiently high to create a level or grout inside the hollowed out portion of the frame at least 1" above the bottom flange face as shown in Fig. 5. Also build forms around cylinder feet (if used) and motor slide rails or

baseplates. Wet the foundation thoroughly about 1/2 hour before the grout is poured and keep wet to insure a good bond between the foundation and the grout. Recheck alignment of entire unit and prepare to grout using a mixture consisting of one part cement and one and one half (1-1/2) parts clean properly grade concrete sand mixed with sufficient water to make it placeable.

The use of a non-shrinking compound in the grout mixture such as "Embeco" is recommended as manufactured by the Master Builders Company of Cleveland, Ohio, or a similar compound to solidly fill the grouting space and insure even bearing of the load, to the end that the unit will be firmly held in position. The slight extra cost will be negligible compared to costly shutdowns and repairs which may result from improper application of grout and mixture and consequently the unit becoming loose on the foundation.

If, through error, it is necessary to increase the grouting thickness appreciably over that specified on the drawing, it is essential that a nonshrinking material such as Embeco be mixed with the grouting to avoid excessive shrinkage.

First fill all the foundation bolt sleeves to the top of the foundation, then proceed to pour the grout preferably from one side of the frame, to all points within the form. The grout should be spread evenly and worked beneath the frame flange eliminating any tendency to form air pockets therein. Do not grout if there is any danger of freezing.

Before the grout has fully set but after it will no longer flow, remove the excess grout and trim the grout in line with the vertical edge of the frame flange as indicated in Fig. 5. Trimming the grout in this manner will prevent the possibility of oil, spilled around the unit, seeping underneath the frame flange and in time cause disintegration of the grout, and subsequent loosening of the unit on the foundation. To facilitate easy removal of the shims and wedges, open a trench in front of each before the grout hardens. After the grout is completely hard, remove all wedges and shims and regrout the space the wedges occupied.

CAUTION: THE REMOVAL OF THE SHIMS AND WEDGES IS ABSOLUTELY ESSENTIAL for if it is not done, the unit will be suspended on the wedges and shims, and in time, due to reciprocating forces will become loose on the foundation.

Recheck the alignment and level of the unit again after the grout has set and the foundation bolts have been pulled down tightly. Make correction if alignment or level does not check properly.

## ASSEMBLING

After being certain that the grout has become sufficiently hard, the parts that have not already been installed or assembled can be placed, completing the assembly of the unit. The flywheel (if used) should be installed insuring that the hub and rim faces of the halves of the flywheel are flush with each other and that there is clearance between the top of the flywheel key and the bottom of the key in the flywheel. Failure to install the flywheel properly will result in the flywheel running out of true or wobbling.

Install the Multi-V-Belts on the sheaves by placing the motor in its full forward position on its base or slide rails.

Adjust the center distances of the motor and the unit until the belts seat solidly in the grooves. Once the unit is started and load placed thereon further adjustment may be required to apply the proper operating tension on the belts. The proper operating tension is attained when the tension is just beyond the point where slippage is eliminated.

CAUTION: Do not set up V-Belts too tightly as this will cause excessive wear of the belts and result in breakage. Excessive belt tension will also load up the bearings of the motor and the compressor excessively and cause heating of the bearings and failure. Do not use belt dressing on V-Belts.

## PIPING

Air Intake Piping: A clean, cool, dry air supply is essential to the satisfactory operation of an air compressor and wherever possible the compressor intake should be piped to the outside air. The intake or suction piping must be thoroughly cleaned before installation and should terminate six feet or more above the ground or roof and be located far enough from steam, gas or oil engine exhaust pipes so as to insure cool clean dry air free from dust, dirt or moisture and free from contamination by exhaust gases. The open end of the intake pipe

must be well hooded and screened to prevent rain and dirt or dust from entering.

The use of commercial filter of the proper size for the compressor intake or suction is recommended.

The diameter of the intake pipe must be equal to, or larger than, the connection on the cylinder. If a long suction line is necessary, care must be taken to increase the pipe size to provide minimum pressure drop therein.

Never put discharge lines, steam lines, hot water lines, etc. in the intake duct as such practice will raise the temperature of the intake air and cause considerable loss in the efficiency of the unit. A fact that must be remembered in this connection is that for every five degrees reduction of the temperature of the intake air there is an actual capacity gain of approximately one per cent.

If a concrete duct is built to use as an air intake, it must be built with a smooth, hard interior surface, for if the concrete crumbles or disintegrates, due to the air rushing through, the ingredients are carried into the compressor cylinder and cause rapid wear. Painting the interior of the concrete duct with a good waterproof paint is advisable.

Gas Intake Piping: When using gas as the compressed medium, trouble will be experienced unless provisions are made to clean and dry the gas before it enters the compressor. Such provisions may consist of scrubbers, traps or tanks of suitable size to rid the gas of dirt and entrained moisture. Extreme care should be taken in arranging the suction or intake piping so as to prevent loops or pockets in the line where condensate might collect and eventually be drawn into the compressor cylinder as a slug and cause serious damage.

It must be borne in mind that excessive wear on the valves, cylinder bore, piston, and piston rings will result if precautions are not taken to prevent moisture or condensate getting into the cylinder ports and bore.

If suction pressures are below atmosphere, exercise care that no leaks occur around pipe joints, packing or suction valve covers, since air drawn into the cylinder will cause contamination of the gas or cause an explosive mixture depending upon the nature of the gas. Special provisions must be made to pipe the release from unloading mechanism, pipe valves, etc., back to the suction or intake line.

Discharge Piping: The discharge line between compressor and receiver or aftercooler shall be the same size as the discharge opening of the compressor cylinder or larger (if long) and should drain away from the cylinder. The discharge line should be made as short as possible and short bends and fittings should be avoided.

A by-pass valve should be provided in discharge line to aid in the starting of the unit on occasions when receiver pressure is atmospheric or below the pressure necessary to permit the unloaders to function properly.

If gases which cannot be discharged to atmosphere are being handled such by-pass should be piped to the suction line.

When a globe or gate valve is used in the discharge line between the compressor and receiver, a pop safety valve of sufficient size should be installed between this valve and the compressor to prevent any damage to the compressor in the event the unit is started with the valve and by-pass closed. Set the safety valve to operate at ten pounds above the pressure which is to be carried in the discharge line. A drain valve should be provided at the lowest point in the discharge line to permit draining periodically of accumulations that may form.

If more than one compressor is piped into the same receiver, the installation of an American silent automatic check valve in each discharge line is recommended.

Aftercoolers: Air when compressed is heated and as it cools any entrained moisture is condensed. The installation of a proper size American AFA Aftercooler and separator will cool the air to within 10-15$^{O}$ of the incoming water temperature.

Receiver: The air receiver or tank should be placed in a cool place as close to the compressor as possible preferably on the outside of the building where it has an opportunity to radiate some of the heat due to compression. The receiver should be of sufficient size, 1/6 to 1/10 the free air capacity of the unit to equalize the discharge pulsations, thus providing a steady flow to the service line. A

drain valve should be provided on the receiver to permit periodic draining. The pressure gauge and a safety valve should be connected to the receiver.

CAUTION: All safety valves and gauges should be tested regularly and kept in good working order.

The service line to controls should be piped to the receiver at a point where the driest air is obtainable. Such piping should be free from dirt or scale, of the same size as control connection or larger and provided with a drain valve at its lowest point close to the control, to permit draining of water or oil accumulations and insure proper function of control and unloaders. A shut off valve should be contained in this line with unions properly placed to allow cleaning and repairing of control while unit is operating.

Provisions should be made during this cleaning and repairing period to control discharge pressure either manually or automatically by some other unit connected to the system.

CAUTION: This shut off valve should be closed only during the cleaning and repairing period, being wide open during normal operation.

Cooling Water Piping: Jacket water enters the lower center section of the cylinder on one side and leaves the cylinder at the upper center of the cylinder on the opposite side. The flow of cooling water into and out of the cylinder heads is accomplished through cored holes in the ends of the cylinder connecting with similar holes in the heads.

The inlet and outlet connections should be provided with valves for controlling the flow of water through the jackets. A sight feed open funnel should also be provided for the outlet so that the flow of water can be noted.

The use of dirty water should be avoided as it clogs the water jacket and reduces cooling efficiency. Hand holes are provided on the cylinders to facilitate cleaning of the jackets.

Automatic Water Control: To prevent starting of compressor without water supply, the installation of a magnetic water valve is recommended.

## LUBRICATION

It is recommended that the lubricating oil requirements for the unit be referred to a reputable oil refiner obtaining their recommendations for the proper oils to use in the crankcase and compressor cylinders. The type and size of the unit, the horsepower rating, the speed, the type of lubricator, the character of the air; gas, or vapors to be pumped and the pressure conditions at which the unit is to operate, should be given in detail to the representative of the oil supplier to aid in the proper selection of the lubricating oils.

It would be well to have the oil supplier representative inspect the compressor cylinder bore and elements periodically to observe the effectiveness of the lubricant being used, particularly if wet corrosive gases or vapors are being pumped.

It is a policy of American Air Compressor Corporation not to recommend the use of a particular brand or the products of a particular refiner of lubricating oil to be used in units supplied by the Company.

As a general guide in the selection of oils, the following may be of value.

Crankcase Oil: The running gear in the frame is splash lubricated. As the crankshaft rotates the connecting rod dips into the oil in the oil sump and throws the oil around the entire interior of the crankcase. The oil is thus caught in pockets above the main bearings and crosshead guide from which the oil drains into the bearings and on the crosshead guides.

The connecting rod dips into the oil in the crankcase and splashes oil into the crankpin bearings. A portion of the oil splashed is collected in a small reservoir and is piped to the connecting rod at the wrist pin end from which oil drains into the wrist pin bearing for lubrication.

For lubrication of the running gear in the frame a good grade of straight run mineral oil having a viscosity of approximately 200" Saybolt Universal at 130° F. should be suitable.

The particular selection of an oil to be used in the crankcase will depend upon the surrounding temperature. In general the higher temperature requires a higher viscosity oil than the colder temperature.

Compressor Cylinder Lubricant: The compressor cylinder is lubricated by means of a separate mechanical force feed lubricator driven by a linkage to the crosshead.

The lubricating oil in the sump of the lubricator is forced, by action of the individual pumping units for each feed, through tubing and check valve to the cylinder bore, suction port and metallic packing (when used) for lubrication of the various elements. Instructions for operating the lubricator are supplied with the lubricator.

The selection of the proper grade of oil will depend entirely on the quality of the air, gas or vapors to be compressed.

Cylinder Oil Specification: In general, a straight run mineral oil having a flash point of 375° F. to 400° F. and an approximate viscosity of 55" Saybolt Universal at 210° F. should be suitable when dry, clean conditions of the air or gas handled prevails.

In the starting of a new unit the oil to the cylinder should be fed in fairly good quantity so as to produce a glazed surface after which the amount can be gradually cut down to the minimum feed shown in the following table under the various cylinder headings. In general, the better way to determine the minimum amount of lubrication is to examine the bore of the cylinder periodically to determine if the cylinder walls show a film of oil all the way around.

The approximate minimum amount of cylinder oil required for good lubrication for various cylinder sizes is as follows:

| Cylinder Diameter in inches | Oil Feed, Minimum* Drops per Minute |
|---|---|
| 6" to 10" | 2 |
| 10" to 12" | 2-4 |
| 12" to 15" | 4-6 |
| 15" to 18" | 6-8 |
| 18" to 24" | 8-10 |
| 24" to 30" | 10-12 |

*NOTE: Figures given are for gravity sight feed lubricators. For glycerine sight feed lubricators divide figures given by 3, but feed should never be less than one drop per minute under any condition.

NOTE: Use the minimum amount of oil shown in table only when clean and dry condition prevails. Wet and dirty condition of air or gas handled requires much greater lubrication as conditions may indicate.

General: Regardless of the amount of oil feed to the compressor cylinder, in the course of time, little pools of oil will form in the cavities of the cylinder ports, low points of the piping and receivers. This does not necessarily indicate that the amount of oil fed into the cylinder is excessive since the oil which is fed in the cylinder has a tendency to deposit at certain points of the system and such accumulations should be drained at regular intervals.

Packing Lubrication: When provisions are made for lubricating the piston rod packing (plastic or metallic), sufficient quantity of oil should be fed to the packing or that portion of the piston rod entering the packing to create a film on the piston rod. The quantity should be such as to not only lubricate the packing rod but also to aid in creating a seal in the packing itself against leakage. The best way to determine the amount to feed is by trial.

## PUTTING UNIT INTO SERVICE

Tighten all parts, including foundation bolts. Fill the lubricator with the proper cylinder oil and open all feeds on the lubricator to permit maximum feed. Disconnect oil lines at the check valve, operate the lubricator by hand until oil drips where the lines are broken indicating that the oil piping is full of oil. Reconnect piping and operate the lubricator a minute or so longer to inject an appreciable amount of oil into the cylinder.

Thoroughly clean the crankcase and running gear. Fill crankcase until oil splashers dip about one and one-quarter inches in the oil when in their lowest position. Mark this level on crankcase oil gauge and keep oil at approximately this level. Liberally oil the main bearings, crankpin boxes, wristpin boxes and crosshead slides, so sufficient oil will be available for the start.

Be sure that the suction line leading to the cylinders is thoroughly clean and free from rust, pipe scale, welding shots, sand or similar grit and dirt. Such foreign material if not removed from the suction line will be drawn into

the cylinder and cause excessive wear of the various elements. The suction ports of the cylinder should also be thoroughly cleaned, removing any foreign material that may have collected during the erection of the unit.

Turn on the jacket water and wait until it flows into the outlet cone insuring that the jackets are full and cooling water is circulating. Bar the unit over by hand several times making sure that it works freely and that everything is clear. Check the pipe lines leading to and from the compressor cylinder insuring that there is no obstruction.

Check the Multi-V-Drive insuring that the sheaves are securely installed on their shafts and that the V-belts have the proper tension. During the running in period a slight additional tension must be applied to take up the initial wearing in or seating of the belts in the grooves.

Push the starting button and immediately push the stop button to observe the direction of rotation of the unit, thus making sure the unit will run in the correct direction of rotation as indicated on the foundation plan. The correct direction of rotation is such that the top of sheave or pulley rotates toward the cylinders.

After the correct direction of rotation is established the unit can be started and run for short periods.

During the short period of operation the various elements of the unit should be observed quite closely seeing that all are operating properly, and that all parts are well lubricated. Shut the unit down and make a careful inspection of the elements of the running gear and noting particularly that there is no tendency of the bearings to heat up.

Run the unit in this manner at increasing intervals observing closely the operations of all parts until a continuous run of at least two (2) hours is obtained without any overheating of the bearings or knocks or noise in the running gear, or any overheating of the motor or unusual noise therein.

The additional time taken to run-in the unit and to insure that it is operating properly will be compensated for by the increased satisfaction resulting in the performance of the unit throughout its life. It is recognized that occasionally conditions are such that a unit must be put more quickly into service, without a good breaking in period, but where conditions do permit, it will pay dividends in the long run to break the unit in slowly.

After this run-in period has been completed satisfactorily the unit can be placed into service, gradually building up the load. This can be done by gradually closing the atmosphere bypass valve on discharge line and the drains on receiver building up the pressure or load over a period of approximately an hour or longer if deemed necessary. The compressor and driving unit must be watched closely during the loading period and for the first few days to see that all parts are functioning properly and that lubrication is adequate.

CAUTION: Do not start a belt driven compressor against pressure because it throws extreme overload upon the driving equipment and wears the belts, nor should such units be stopped against load.

During the running-in period the controls can be operated and their operation noted, adjustments being made if found necessary.

After a run of a few days in actual service the oil feeds from the lubricator can be gradually cut down to the minimum as shown in the table under lubrication. The condition of the intake (especially where vapors or foreign material is present) will govern the amount of lubrication necessary. Wet vapors or foreign matter tend to destroy the lubricating oil film and if wet vapor is handled the cylinder bore and valves should be inspected periodically through a valve opening to make sure ample lubrication is present.

Periodic inspections should be made of the working parts of the frame and cylinder especially during the first few weeks of operation to insure that no foreign material is being drawn into the cylinder from the system and that lubrication of the various elements is adequate.

The jacket water should be shut off when the compressor is not in use. Also see that the jackets are completely drained when the unit is not in service during freezing weather. Sufficient cooling water must be used to keep down the heat of compression.

Frequently, pressure and temperature conditions of a condensable vapor are such that

when this gas or vapor contacts the cylinder walls, condensation will take place if the wall temperature is lower than the temperature of the gas or vapor. The precipitation produced by such a condition, which in addition to destroying lubrication may result in corrosion producing elements and the following common difficulties may result:

1. Piston Ring Wear
2. Cylinder Wear
3. Wear of Valve Seats
4. Valve Breakage
5. Packing Leakage and Wear
6. Piston Rod Wear

Assuming that the gas has been properly scrubbed and passes to the compressor cylinder free from pipe scale, rust, welding shots, sand, etc., the only means preventing condensation of the gas on the cylinder walls or ports is to provide for jacket water temperatures somewhat higher than the temperature of the entering gas. A jacket water temperature at least 30 degrees warmer than the inlet gas temperature should be maintained.

Outlet water temperature, therefore, from the cylinder jackets should never be less than the incoming gas temperature. The quantity of water should be so regulated that the outlet water temperature will not be more than 120 degrees F. with an absolute maximum outlet water temperature of 160 degrees F. This will provide for an adequate quantity of circulating water resulting in reasonable velocities through the water passages, thereby eliminating possibility of air pockets forming.

This water quantity should also be considered from the standpoint of final discharge gas temperature which should be maintained as low as possible consistent with the compression ratio and suction gas temperature, but should never be allowed to exceed a maximum temperature of 400 degrees F.

PRECAUTIONS:

(a) Do not circulate water through the jackets after the unit has been shut down as moisture will form on the cylinder walls and destroy lubrication, causing rusting and premature wear.

(b) Keep water temperature leaving the cylinders up to at least 100° F. (higher for wet gases).

(c) Keep jackets and passageways clean.

(d) Do not allow higher water pressure than that for which cylinders are designed.

(e) Do not allow water to freeze in jackets.

(f) Do not start unit without first turning on cooling water. Should the unit be started without cooling water, shut down long enough for the cylinders to cool, as cold water is very apt to crack the hot cylinder.

VALVES

The cylinder is fitted with American Ring Valves. The valve element consists of light steel discs or rings so shaped as to completely cover the circular slots which form the passages through the valve seat.

The valves should be given an occasional examination to make sure that the valve assembly is securely seated in the cylinder casting. All valve parts should be kept clean and free from foreign material. The required frequency of examination is determined by local conditions.

In general, the suction valves should operate cool, while discharge valves will always feel hot to the touch. If any of the valves get unduly hot, investigate the cause and remedy at once.

Valves should be held tightly against valve seats. If the valve is loose the valve will hammer its seat, spoil the gasket, cause leakage and may break the valve. Such breakage falling into the cylinder might cause serious damage.

To tighten a valve on its seat, loosen jam screw lock nut and tighten jam screw which forces the valve against its seat and seat gasket; then tighten lock nut. Whenever a valve is replaced place the proper valve in the proper cylinder port solidly on its seat and seat gasket, then place yoke solidly on valve face.

Release jam screw lock nut and back out jam screw sufficiently to clear the valve yoke and permit the cover to seat solidly on its seat.

Tighten the cover squarely on its seat and seat gasket, then tighten jam screw firmly and tighten jam screw lock nut locking it firmly.

The best procedure to follow in removing a valve cover for inspection or valve repairs, is to back off the jam screw several turns before removing the valve coyer from cylinder thus leaving the jam screw ready for readjustment after valve cover is replaced.

Suction Unloading Valves: The unloading valve is used in connection with automatic control of the compressor. The unloader mechanism consists of a pressure and spring actuated piston and diaphragm attached to the unloader fingers for opening the valve rings.

Suction valves do not require any adjustment except when applying a new unloader to the valve. At such time the unloader fingers may require filing to insure clamping of the rings firmly against the spring holder when air pressure is applied to the plunger and diaphragm.

Whenever an unloading valve assembly is replaced in the cylinder suction port, make sure that gasket is in good condition and the valve seats on its seat solidly. Proceed to apply valve cover and tighten unloading valve assembly on its seat gasket by the aid of jam screw lock nut as previously described.

CAUTION: Always remember that whenever valve covers (whether unloading valves or otherwise) are removed, the jam screws and lock nuts must be re-tightened.

When repairing valves, extreme care should be taken and such work should be done with the thought in mind that the valves are in a sense the heart of the unit. Make sure that the seats and spring holder are free from nicks, cuts, burrs or foreign material which will cause breaking of valve rings if not removed.

Should the seats be nicked or cut, the seat should be ground or lapped to remove such condition and to present a clean smooth unbroken surface for seating of Valve Rings.

The same precautions are necessary when nicks or cuts occur in the cavities of the spring holder to insure a smooth backing for the rings and that the rings move freely in their respective cavities.

Such corrections can be made in the case of small nicks, cuts, etc., but should nicks or cuts be too large to remove by hand from the guard properly, or ground from the seat, the guard or seat should be replaced.

CAUTION: Whenever a valve with a broken ring is removed from a cylinder for repairs, all pieces of the broken ring must be found and removed from the cylinder bore and cylinder valve port, as such pieces may ultimately get in other valves and cause further breakage.

Whenever conditions indicate a valve ring is broken, the broken ring should be replaced immediately. When the process does not permit immediate replacement of a broken ring and the unit runs a considerable period under this condition, it is desirable to replace all the valve rings as the excessive temperatures resulting will reduce the life of the unbroken rings and result in further breakage. The running of a unit with a broken valve ring in a valve is a dangerous practice and should be avoided.

## FRAME

The frame, a heavy and rugged casting, extends to the cylinder flange, providing a firm flat base for bolting and grouting to the foundation. The frame crosshead guides and main bearing housings are accurately machined so that the running gear of the frame is held in true alignment. The frame contains the main bearings, connecting rod and its bearings and the crosshead and pin: normally called the running gear.

A knock in the running gear usually indicates a loose bearing and proper adjustments should be made as soon as possible. Continued operation with loose bearings may result in crystallization of essential parts and subsequent damage.

CAUTION: After taking up on a bearing watch it very carefully for a while so as to be sure it is not too tight.

Main Bearing: Machines equipped with roller main bearings are adjusted at the plant and no immediate adjustment of the main bearing is necessary. When it becomes necessary to make such adjustment because of end play in the shaft, the following instructions should be followed.

1st: Remove shaft oil cover.

2nd: Loosen clamp bolt on lock nut.

3rd: Pull up adjusting nut tightly.

4th: Back off adjusting nut 1/16 turn.

5th: Tighten clamp bolt holding lock nut so that it does not turn.

6th: Replace shaft oil cover.

The roller bearings are a push fit in the bearing or roller housing.

It is advisable to disconnect connecting rod from the crank pin before making adjustment on the main bearings. With the crank shaft free from the running gear and turning the shaft by hand, the feel of the bearings can be noted. This procedure will enable the operator to know definitely that proper adjustments have been made and that the bearings are not adjusted too tightly.

Connecting Rod: The connecting rod is cast alloy steel. It is fitted with adjustable renewable babbitted bearings for the crank pin bearing and adjustable renewable bronze bearings for the wrist pin or cross head pin bearing.

Connecting rod may be removed by taking out bolt and block at forked crank pin end.

Access to the crank pin bearing is afforded by removing the frame end cover. Wedge adjustment is provided for the crank pin bearing halves. Adjustments can be made on the crank and wrist pin bearings whenever wear occurs by loosening lock nut on wedge bolt, then turning wedge bolt to draw wedge tighter. Then tighten lock nut.

CAUTION: Turn wedge bolt only 1/4 turn at a time, then run unit to be sure bearing does not overheat. Repeat as necessary until desired adjustment is obtained. When wedge adjustment is all used up, new bearings are required.

If the connecting rod is removed for repairs or other work be sure to reinstall it with the oil holes for lubricating the bearings on top.

The running clearance for the crank pin bearing is approximately 1 thousandths per inch of diameter; for the wrist pin bearing an approximate running clearance of .001" to .002 is normal.

Crosshead and Pin: The crosshead is Marine type.

The crosshead pin (non-floating) has a ground tapered fit in the crosshead. The dowel pin located on the larger end of the wrist pin permits proper location of the pin therein.

NOTE: The crosshead pin should be replaced each time a new crosshead pin bearing is installed.

Frame Oil Shed: Two hand hole openings are provided in the distance piece to afford access to cylinder and frame oil shed stuffing boxes. The chamber with which the hand holes communicate is completely isolated from the crankcase by an intermediate oil shed which contains metallic oil scraper rings; thus avoiding the possibility of transferring the oil used in the crankcase to the interior of the cylinder.

No adjustments are necessary on these oil scraper rings, but these should be removed, cleaned and inspected whenever the unit is overhauled. The oil scraper rings should have .002" to .003" end clearance in their case. When replacing scraper rings make sure the scraper rings have this amount of clearance. Any greater clearance than this will cause clicking noise and excessive wear.

CAUTION: When removing piston rod always remove oil scraper rings first for if threaded portion of piston rod is forced through these scraper rings the bearing surface and scraping edge of the oil scraper rings will become damaged. Install oil scraper ring after piston rod is replaced in the same numbered sequence as before removal.

## CYLINDERS

The cylinders and heads are both provided with liberal water jackets for cooling water circulation. Hand hole covers are provided on the cylinders and ports in heads to provide means of inspection and cleaning of the jacket water passages therein. These jacket water passages should be inspected and cleaned periodically to maintain the full efficiency of the cooling surfaces. This is found to be necessary particularly when hard or muddy water is used for cooling.

Should scale deposit on the cooling surfaces in the jackets, as a result of using scale depositing cooling water, do not attempt to remove this scale by the use of acid. The cooling

surfaces or system may contain materials which may be attacked or damaged by some of the more readily obtainable acids. Instead, rely upon commercial descaling compounds recommended by a reputable concern manufacturing such material.

The cylinder wall of a solid bore cylinder is of such a thickness that reasonable reboring can be made, should excessive wear result requiring a truing up of the bore. Reboring of the cylinder bore will require oversize piston rings and piston to suit the new size created by this reboring.

Piston: The piston in the compressor cylinder is usually made of cast iron, held as a solid assembly on the piston rod by the piston nut. Each piston contains one or more piston ring grooves, depending upon the cylinder diameter and operating pressures, in which are fitted piston rings.

Cylinder-Piston Clearance: The minimum running clearance (on the diameter) for the piston in its cylinder is one and one quarter (.00125") thousandths per inch of the cylinder diameter. The smaller pistons (6" and smaller) require slightly greater clearance.

Renewing Piston Rings: Before removing piston from cylinder, fit new rings into cylinder bore. Push these back until the rings are square against the piston face. When in this position, the ring should have a minimum joint clearance of about three thousandths in. per inch of cylinder diameter.

If necessary, file the ends of the rings until proper clearance is obtained, otherwise insufficient clearance will result in breakage or binding and excessive wear. Bear in mind that the rings expand under operating temperatures. To place new rings on the piston use several thin metal strips spaced about the piston surface and slide rings into their respective slots. Rings should fit fairly loose in the slots and if raised drop with their own weight in their respective slots.

Gaskets: Whenever it is necessary to renew the head gaskets, any good grade graphited asbestos fiber sheet 1/16" thick is suitable. A rubber gasket must not be used as it deteriorates rapidly when subjected to heat and oil. If upon inspection of valves or other repairs, the gaskets are found to be damaged, replace same, as numerous small leaks will reduce the efficiency and proper functioning of the unit.

In replacing gaskets, make sure both gasket seats are absolutely clean, smooth and free from nicks or lumps.

Cylinder End Clearance: Should a knock or pound develop in the unit and all the bearings are properly adjusted, the cause may be either a loose piston or insufficient clearance. If due to a loose piston the trouble can be corrected by sledging the piston nut up tightly.

When due to the piston striking the head, it is necessary to equalize the clearance on both ends of the stroke by first removing a valve from each end of the cylinder. Bar the unit over and as the piston nears the end of the stroke, insert a soft lead wire between it and face of cylinder head. When dead center position is reached, the wire will be flattened out equal to the amount of clearance.

Thickness gauges (feelers) may be used for measuring the cylinder end clearance by inserting such gauges between cylinder head and piston when piston is on the dead end centers. In general the head-end cylinder end clearance is made slightly more than the crank-end cylinder end clearance thus compensating for expansion of piston rod due to operating temperatures.

The clearance should be checked at each end of the stroke and adjusted by loosening the crosshead nut and backing it away from the crosshead. The piston rod can now be screwed in or out of the crosshead the required amount. Finally sledge the crosshead nut tightly up against the face of the crosshead to lock the rod and maintain the adjustment.

Piston Rod Packing: A sufficient quantity of high grade packing is furnished with each unit for the first application. To install new packing, soak the packing in lubricating oil and then force each ring into place separately, taking care to stagger the joints. After the box is full of packing, force gland in tightly. Do not use a wrench at first to draw up gland, as this will crowd the packing, squeeze out lubricant and cause packing to score the piston rod. A few drops of oil with an oil can will help to properly break in the new packing.

After the unit has warmed up the gland should be tightened just enough to prevent blowing. In taking up the gland, be careful to take up all sides evenly, as cocking the gland to one side may result in scoring the piston rod or insufficient and unequal pressure on the packing.

Metallic packing when used, is made up of numerous sections, each section containing two rings. Each ring is divided into segments which are held to the rod by a spiral spring. The parts of the rings and section of the packing are numbered and lettered. When installing the packing, see that the rings are put together as numbered and lettered.

Each pair of rings must be inserted in its proper packing section or case. The lettered side of the rings must face toward the pressure. The small pin in the slant cut ring is entered between any of the spaces in the straight cut rings or in hole drilled for it in its companion ring, otherwise rings will not enter their case or section. It will be noted that the segments of each ring are numbered 1-2, 2-3, 3-4 and rings must be assembled so that the numbers mate accordingly, i.e., 1 to 1, 2 to 2, 3 to 3. The rings are lettered A, B, C, D, etc. The "A" ring should be placed nearest the cylinder bore, followed in sequence by rings bearing the consecutive letters of the alphabet.

When the unit is to remain idle for a considerable length of time, it is advisable to rotate the unit a few revolutions daily to prevent corrosion of that portion of the piston rod which is in contact with the packing.

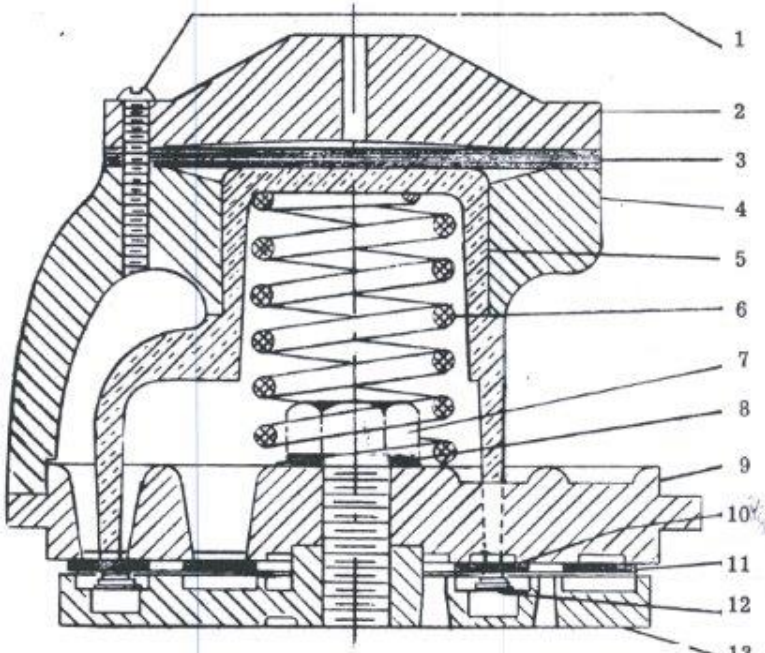
When oil lanterns are contained in the packing, these should be placed properly in the stuffing boxes in direct communication with the oil line connection or oil hole and vent hole drilled therein. As a general rule the oil is fed into the oil lantern from the lower connection with the vent being taken from the upper connection. This vent is to be piped back to the suction line of the cylinder.

Pressure regulation or control of power driven compressors is accomplished by the use of unloading elements mounted on the suction valves of the unit actuated by pneumatic pressure through an electrically operated three-way solenoid valve or a pressure operated valve termed a "trigger valve" or "regulator valve".

Pressure applied to the piston and diaphragm of the suction valve unloaders, by action of these valves, forces the valve rings solidly against the valve guards thus holding them open. This action unloads the compressor entirely and the air or gas can pass freely in and out of the cylinder through the suction valves, doing no work. The pressure in the system is held from entering the compressor cylinder during this unloaded period by the discharge valves. Such action of the suction unloaders is commonly termed "by-passing or by-pass control. Sectional assemblies of suction valves unloaders of the various types used are shown in the parts list section.

The control is entirely automatic, loading and unloading the unit as the pressure controlled varies according to the demand or requirements for air or gas in the system. Various arrangements of pressure regulation or control are supplied for power driven units termed as "by-pass control", "automatic start and stop control" and "dual control" which are fully described in supplementary sheets attached hereto applying particularly to the type with with the unit is equipped.

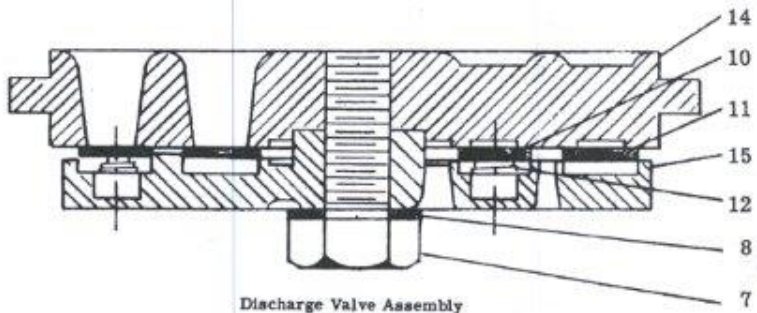
# PARTS LIST




Suction Unloading Valve Assembly
Part No. 26

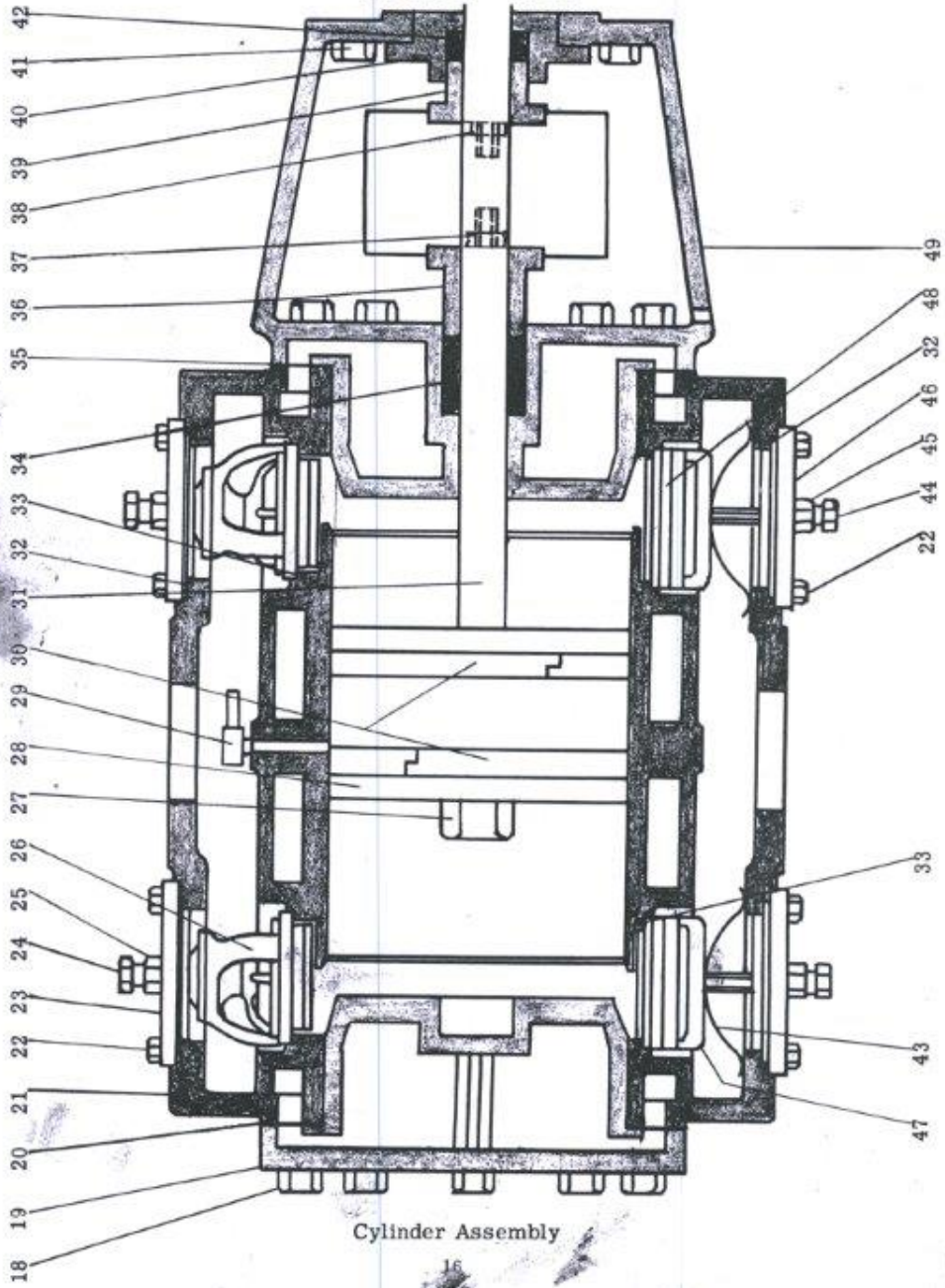
1 - Suction valve diaphragm cover screws
2 - Suction valve diaphragm cover
3 - Suction valve diaphragm
4 - Suction valve holder
5 - Suction valve unloading fork
6 - Suction valve unloading fork spring
7 - Valve guide cap screw
8 - Valve guide cap screw lock washer
9 - Suction valve seat
10 - Valve ring (Inner)
11 - Valve ring (Outer)
12 - Valve springs (~~Volute~~) COIL
13 - Suction valve guide
14 - Discharge valve seat
15 - Discharge valve guide

3½ SPECIFY TYPE




Discharge Valve Assembly
Part No. 48

Note: Valves up to and including 3-1/2 have only single rings No. 11. Ring No. 10 not Req.
Ring No. 10 not Req.

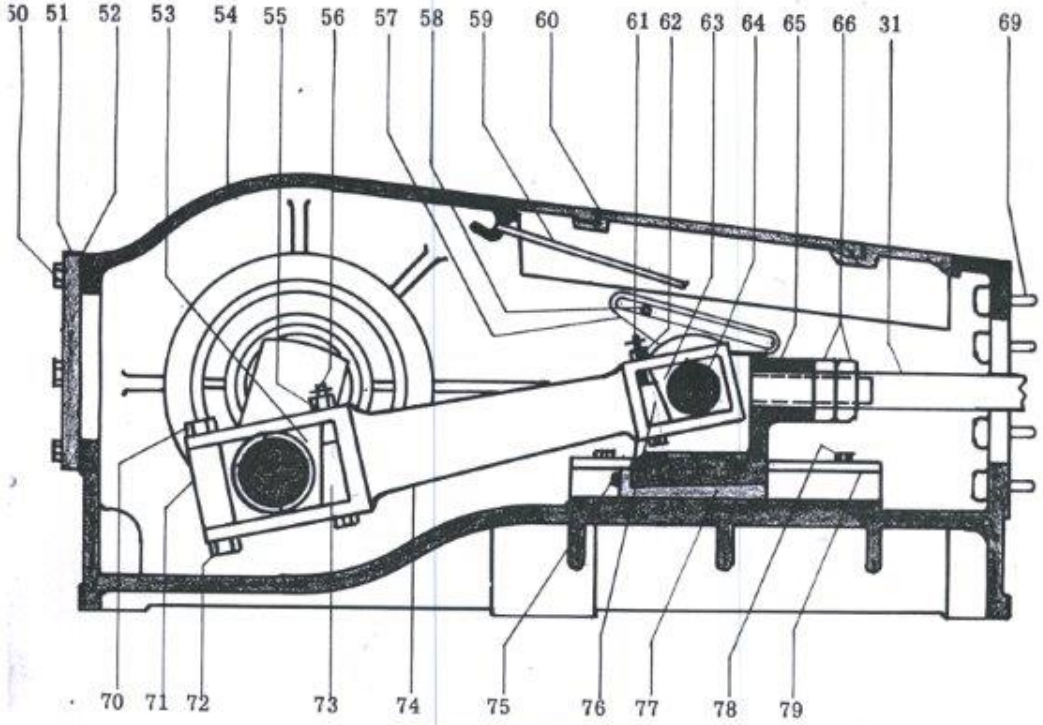



Cylinder Assembly

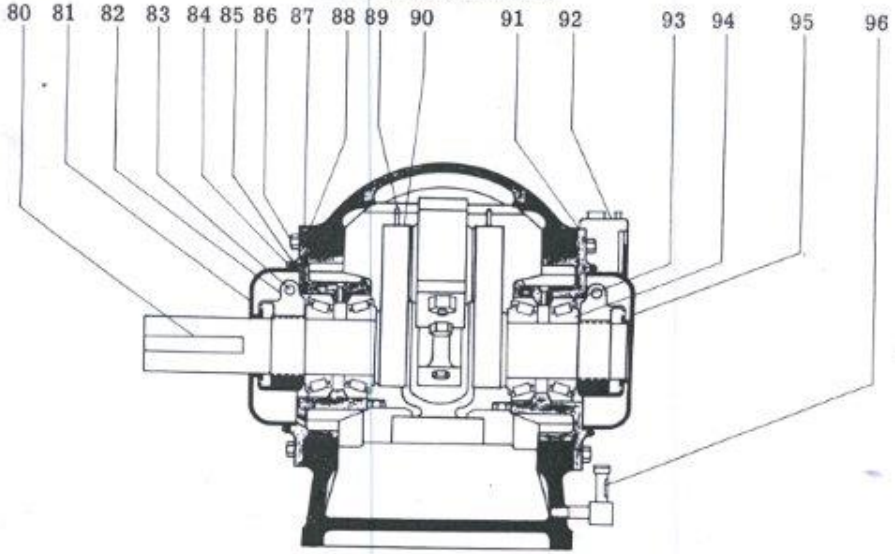
# PARTS LIST

## CYLINDER ASSEMBLY

18 - Back head studs & nuts
19 - Back head
20 - Back head gasket
21 - Air Cylinder
22 - Valve cover bolts
23 - Suction valve cover
24 - Suction valve cover set screw
25 - Suction valve cover set screw lock nut
26 - Suction unloading valve assembly
27 - Piston nut
28 - Piston
29 - Lubricator line check valve
30 - Piston rings
31 - Piston rod
32 - Valve cover gasket
33 - Valve seat gasket
34 - Front head stuffing box packing
35 - Front head gasket
36 - Front head stuffing box gland
37 - Front head stuffing box studs & nuts
38 - Oilshed stuffing box studs & nuts
39 - Oilshed stuffing box gland
40 - Oilshed stuffing housing
41 - Distance piece & frame stud nuts
42 - Oilshed stuffing box packing
43 - Discharge valve assembling spring
44 - Discharge valve cover set screw
45 - Discharge valve cover set screw lock nut
46 - Discharge valve cover
47 - Discharge valve holder (Crab)
48 - Discharge valve assembly
49 - Distance piece front head




Frame Assembly (Side View)




Frame Assembly (End View)

# PARTS LIST

## MAIN FRAME ASSEMBLY

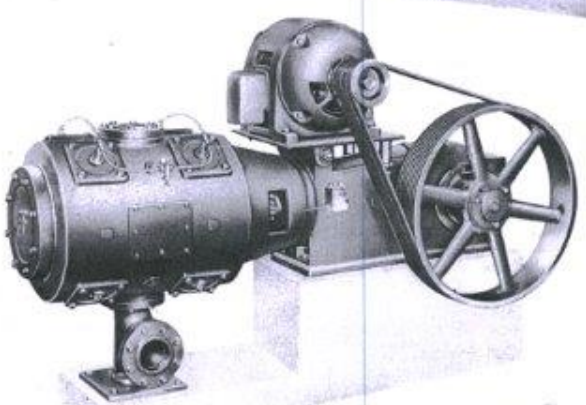
50 - Frame back cover screws
51 - Frame back cover
52 - Frame back cover gasket
53 - Crank pin bearing (2 halves)
54 - Main frame
55 - Crank pin bearing wedge bolt nut
56 - Crank pin bearing wedge bolt & cotter pin
57 - Lubricator driver
58 - Lubricator driver bearing
59 - Crosshead pin oil pipe
60 - Frame top cover
61 - Crosshead pin bearing wedge bolt & cotter pin
62 - Crosshead pin bearing wedge bolt nut
63 - Crosshead pin bearing (2 halves)
64 - Crosshead pin & nut
§ 65 - Crosshead
66 - Piston rod nut & lock nut
31 - Piston rod
69 - Studs (Frame to distance piece)
70 - Crank pin bearing block bolt
*71 - Crank pin bearing block
72 - Crank pin bearing block bolt nut & cotter pin
73 - Crank pin bearing wedge
74 - Connecting rod
75 - Crosshead shoe cap screws
76 - Crosshead pin bearing wedge
§77 - Crosshead shoe
78 - Crosshead guide cap screws
79 - Crosshead guide
80 - Crankshaft key
81 - Main bearing oil guard
82 - Main bearing adjusting nut
83 - Main bearing adjusting nut cap screw and lock washer
84 - Main bearing oil guard cap screws
85 - Main bearing oil guard gasket
86 - Main bearing housing cap screws
87 - Main bearing housing
88 - Main bearing housing gasket
89 - Crankshaft oil dipper (on early models only)
90 - Crankshaft
91 - Main bearing housing (Closed end side)
92 - Mechanical force feed lubricator
93 - Main bearing cup
94 - Main bearing cone
95 - Main bearing oil guard (Closed type)
96 - Frame oil gauge

* Not sold without connecting rod.
§ Part No. 65 & 77 sold as assembly only.

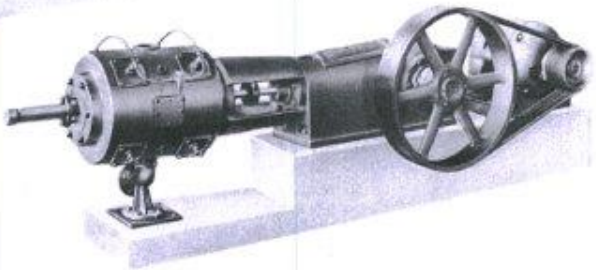
#1 Face to Face

# AMERICAN AIR COMPRESSOR CORP.

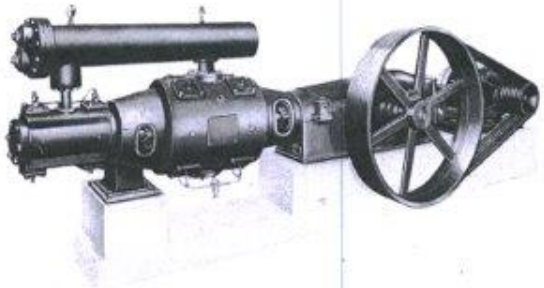
AF-1—7" and 9" Stroke Single Stage, available with Grooved or Flat Belt wheel.



AF-1—Overhead "V" Belt Drive. Available all sizes.



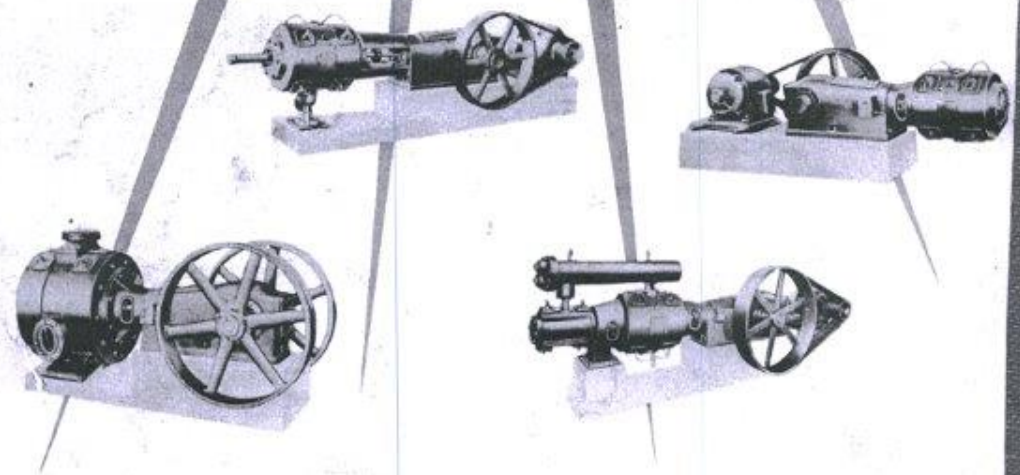
AF-O—Oilless with carbon rings. Extended distance piece—cylinder support and tail rod.



AF-2—Two stage Tandem. Available in belt or steam driven types for pressure up to 500 lbs. Intercooler over or under cylinders (optional).

FIRST AMERICAN AIR COMPRESSOR
BUILT 1902

AMERICAN AIR
"SILENT PLATE VALVE PIONEERS"



## AMERICAN FOR OVER 50 YEARS

The present American Air Compressor is constructed on a completely modern basis including enclosed frame, "Island" plate valves, self-oiling, initial unloading, Timken bearings, V-belt drives and direct-connected.