and high pressure air pistons. The upward movement causes the high pressure air piston 10 to compress the air in the upper end of the high pressure air cylinder to its final pressure, and to discharge it through passage *v*, past discharge valve 41, and through passage *w* into the main reservoir. Steam is exhausted from the upper end of the low pressure steam cylinder through passage *d*, chamber D and passage *e* to the atmosphere.

After the low pressure steam piston 8 has completed its upward stroke, as explained, the lower end of the high pressure air cylinder, is of course, filled with air compressed from the lower end of the low pressure air cylinder, and the lower end of the low pressure steam cylinder is filled with steam exhausted from the lower end of the high pressure steam cylinder. However, just as the low pressure steam piston 8 has completed its upward stroke, steam is by-passed through three by-pass grooves *x* from the lower to the upper side of this piston, thereby preventing an accumulation of back pressure in the lower end of the high pressure steam cylinder.

At this stage of the cycle, also, the upper end of the low pressure air cylinder is filled with air at atmospheric pressure and the upper end of the high pressure steam cylinder is filled with live steam; but just before the high pressure steam piston 7 completes its downward stroke, reversing valve plate 18 engages the button end of the reversing valve rod, moving it downward and carrying the reversing valve to its extreme lower position, thereby closing passage *n*, cutting off the supply of live steam to chamber N, and connecting passage *m*, cavity B and passage *b*, thereby exhausting steam from chamber N on the face of the large main valve piston. Since the

pressure against the inner side of the large piston is now greater than the pressure exerted against the inner side of the small piston 1, the piston valve moves to the right or in the direction of chamber N, and all parts are in the position shown in Plate 2.

Live steam is now supplied from passage *a*, through chamber A, and passage *g*, to the lower end of the high pressure steam cylinder, forcing upward the high pressure steam piston 7 which, as already explained, carries with it the low pressure air piston 9. At this time also, steam is exhausted from the upper end of the high pressure steam cylinder, through passage *c*, chamber D and passage *d*, into the upper end of the low pressure steam cylinder. At the same time—

(a) the low pressure air piston 9 is compressing the air in the upper end of the low pressure air cylinder and forcing same past the intermediate valves 39 and through passage *u* into the upper end of the high pressure air cylinder, and—

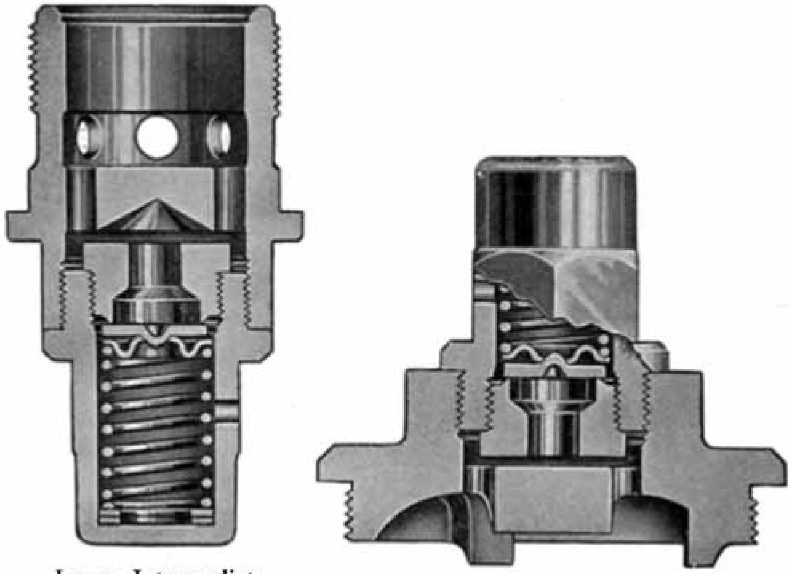
(b) air at atmospheric pressure is drawn into the lower end of the low pressure air cylinder, through the air strainer, lower inlet opening, past the lower inlet valve 38 and through ports *s*

Again it will be observed that the steam in the low pressure steam cylinder and air in the high pressure air cylinder act simultaneously against their respective pistons, steam being exhausted from the upper end of the high pressure steam cylinder through passage *c*, chamber D and passage *d*, to the upper end of the low pressure steam cylinder, in which it acts expansively on the low pressure steam piston. At the same time steam is exhausted from the lower end of the low pressure steam cylinder, through passage *f*, chamber F and passage *e*, to the atmosphere. The downward movement of the low pressure steam piston causes the high pressure air piston to compress the air in the lower end of the high pressure air cylinder, to its final pressure, forcing same through passage *v′* past discharge valve 42, and through passage *w′* into the main reservoir.

When the pistons have moved as explained, the low pressure steam piston 8 has completed its downward stroke; the upper end of the high pressure air cylinder is filled with air compressed from the upper end of the low pressure air cylinder; and the upper end of the low pressure steam cylinder is filled with steam exhausted from the upper end of the high pressure steam cylinder. However, just before the low pressure steam piston has completed its downward stroke, steam is by-passed through the three by-pass grooves *x′* from the upper to the lower side of the low pressure steam piston, thereby preventing an accumulation of back pressure in the upper end of the high pressure steam cylinder. At this stage of the cycle also, the high pressure steam piston 7 has completed its upward stroke; the lower end of the low pressure air cylinder is filled with air at atmospheric pressure; and the lower end of the high pressure steam cylinder is filled with live steam. Here again the compressor is reversed, by means of the reversing valve plate attached to the high pressure steam piston coming in contact with the shoulder of the reversing valve rod, which in turn, actuates the reversing valve, and the cycle of operation already described is repeated.

The function of the relief valves as shown above inlet valve 37 and under intermediate discharge valve 40,

Plates 1 and 2, is to relieve the pressure acting on the low pressure air piston, should it exceed the normal amount due to back leakage past the intermediate discharge valves. In the event of the development of excessive pressure, valve 158 is unseated against the force of spring 161, which opens a passage between the air cylinder and the exhaust port in the relief valve body. Spring 161 is adjusted to a slightly higher pressure than that normally developed in the low pressure air cylinder, and the relief valve will thus prevent the accumulation of pressure which might interfere with normal operation of the compressor.



Lower Intermediate Valve Cage with Relief Valve

Upper Inlet Valve Chamber Cap with Relief Valve

Fig. 7. Sectional Views of the Relief Valves

Fig. 8. Photographic Views of the Filter Unit and the Complete Type "G" Air Filter

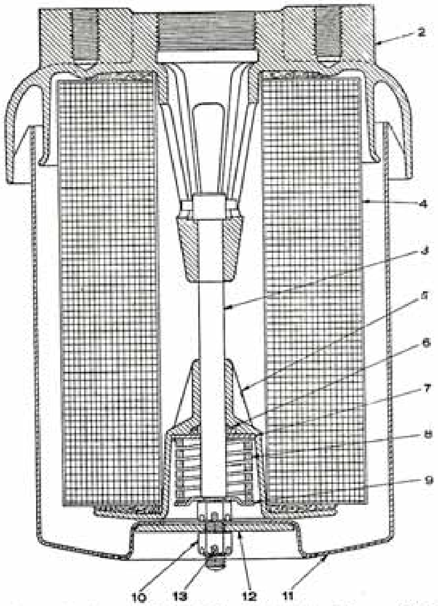


Fig. 9. Sectional Assembly View of the Type "G" Air Filter

TYPE "G" AIR FILTER

The Type "G" Air Filter is of the "cartridge type" which permits removal of the filter unit without the necessity of dismounting or disconnecting from the air compressor. Fig. 8, illustrates the filter unit and the exterior of the air filter, while Fig. 9 is a sectional assembly view showing the construction.

The inlet opening is formed in the under side of the cover 2 as an annular ring around the casing 11. As the air enters this opening, it passes upward and inward to the inside of the casing where it strikes a baffle and is directed downward before passing through the filter unit into the discharge opening. Some of the heavier particles of dirt are carried downward and deposited at the bottom of the casing cavity.

The cover is centrally threaded for the pipe connection to the air compressor, and is also provided with two mounting lugs tapped for ¾ inch studs for mounting purposes. The casing is of pressed steel and is attached to the cover by means of tie bolt 3, washer 12 and nut 10. The casing houses the filter unit and acts as a dirt chamber. In the bottom are several small holes to permit drainage of moisture from this chamber. To dismantle the air filter for cleaning or replacing the filter unit, it is necessary to remove the cotter and nut from the end of the tie bolt to release the casing, and then a second nut from the tie bolt to release the spring retainer assembly and the filter unit.

The filter unit comprises a corrugated and radial wire mesh assembly, covered with a layer of thick felt so constructed that the actual filtration area is many times the inlet or outlet passage areas. This unit is also provided with large felt washers on each end to seal on shoulders surrounding the outlet passage on the upper end and with the spring cage on the lower end.

No. 54 AIR STRAINER

As will be seen from Figs. 10 and 11, this is a very large double cylindrical strainer (overall dimensions approximately 10"x14") with an inner strainer of perforated sheet steel, galvanized, and an outer strainer of coarse galvanized wire mesh, the intervening space being well packed with curled hair. A galvanized iron shell encircles the strainer proper, preventing dirt, oil and water from striking directly against the strainer and thereby reducing the possibility of trouble from clogging. The strainer may be quickly and conveniently taken apart, without disturbing any pipe connections, by removing the nuts from the four studs.

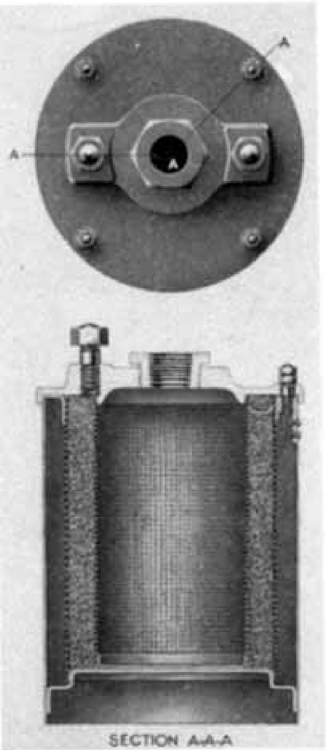


Fig. 10. Sectional View of the No. 54 Air Strainer

In order to facilitate cleaning of the strainer between "shoppings" of the locomotive, some roads use a "blow-back" arrangement, as illustrated in Fig. 12. This consists of a ¾" pipe connected to the main reservoir supply (but not to the discharge pipe), in which is placed a ¾" cut-out cock having a warning port drilled from the outer end of the key into the cored passage so that a small amount of air will discharge when the cock is open and thereby help to guard against it being left open. The cock is placed near the point at which this connection to the main reservoir supply is made so as to reduce the liability of delay in case of pipe breakage beyond the cock. A tee is substituted for the ell at the strainer, and the blow-back pipe is connected through an ell to the tee opening which points vertically upward so that the blast of air will be downward into the strainer. To use the blow-back merely requires opening the ¾" cock for a few seconds at any time when main reservoir pressure is at maximum and the compressor is shut off.

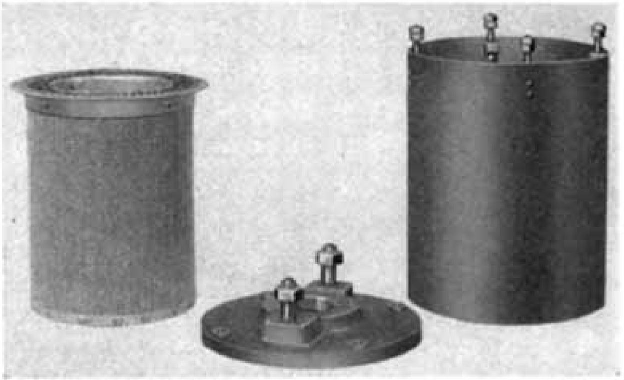


Fig. 11. Disassembled View of the No. 54 Air Strainer

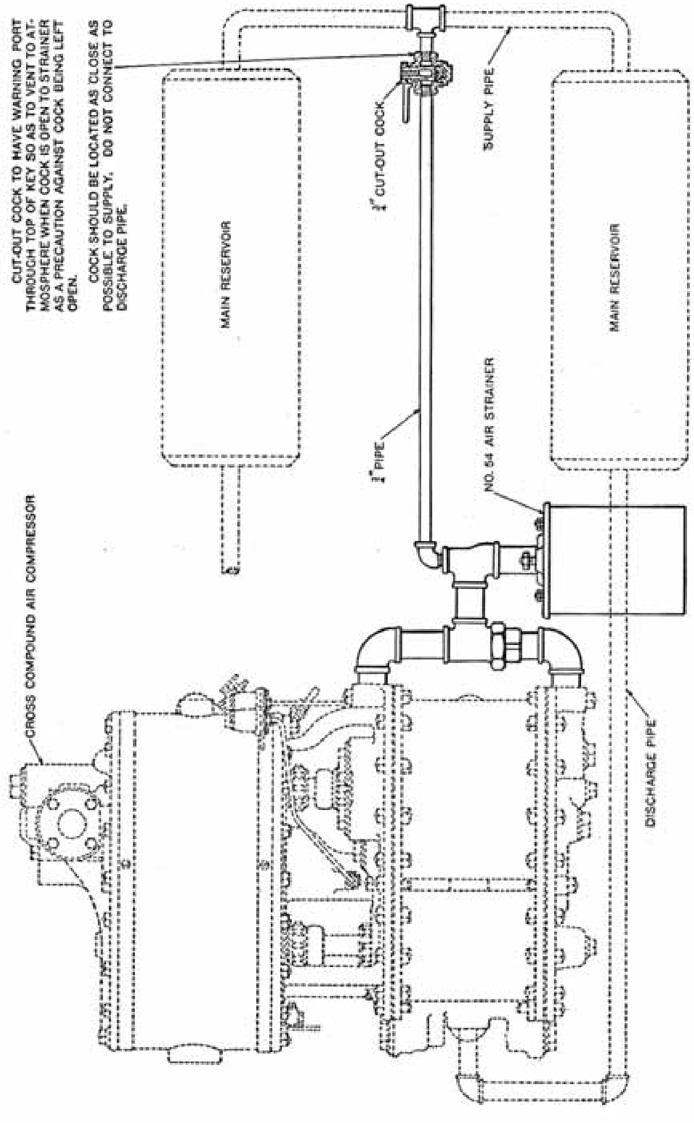
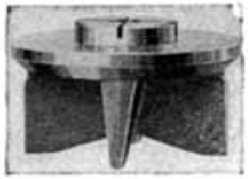
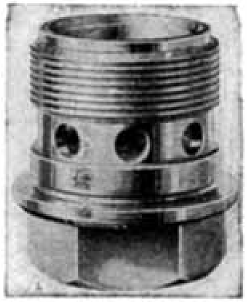


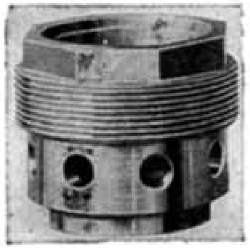
Fig. 12. Showing "Blow-back" arrangement in use on some roads for Cleaning Out the No. 54 Strainer



Valve



Cage



Seat

Seat

Air Valves, Seats and Cages

Replacements with Westinghouse valves, cages and seats are easily accomplished. Cages and seats are cut from special grades of steel, each piece made to exact dimensions and the threads, seats, etc., individually checked to insure correct valve lift. Air valves are forged from a special grade of steel bars and then oil tempered to produce a uniform structure. They are individually checked for correct alignment of seat and wings. The seats are spherically ground so that when a new valve is applied to a compressor, it immediately establishes a line bearing fit without any wearing in.

8½" Compressors—General Data

	8½"—150		8½"—120	
Diameter of High Pressure Steam Cyl.	8½	in.	8½	in.
Diameter of Low Pressure Steam Cyl.	14½	in.	14	in.
Diameter of High Pressure Air Cyl....	9	in.	8¼	in.
Diameter of Low Pressure Air Cyl....	14½	in.	13⅛	in.
Length of Stroke....................	12	in.	12	in.
Steam Admission Pipe...............	1¼	in.	1¼	in.
Steam Exhaust Pipe.................	1½	in.	1½	in.
Air Admission Pipe..................	2	in.	2	in.
Air Delivery Pipe....................	1½	in.	1½	in.
*Designed for Steam Pressure of	200	lbs.	160	lbs.
Working against an Air Pressure of...	140	lbs.	140	lbs.
Normal Speed, single strokes per minute, under above conditions..........	131		131	
Displacement, cubic feet per minute, under above conditions..........	150		120	
Overall Dimensions: Height	54¼	in.	54¼	in.
(Approximate) Width........	37	in.	37	in.
Depth........	18⅛	in.	18⅛	in.
Approximate Net Weight............	1475	lbs.	1475	lbs.
Average Weight, boxed for shipment.	1700	lbs.	1700	lbs.
Lift for Air Valves..................	3/32	in.	3/32	in.

*NOTE—All 8½" air compressors are designed to operate at approximately 131 single strokes per minute with saturated steam pressure of 200 pounds for the 8½"-150 and 160 pounds for the 8½"-120 compressor. For higher boiler steam pressures, or where steam and air conditions are such as to cause excessive speed of the compressor, it is recommended that a choke fitting be installed in the steam inlet connection. The proper size choke will be specified upon application to our nearest district office.

Maximum allowable steam pressures are:—275 pounds for the former standard 8½"-150 and 8½"-120 compressors, 300 pounds for the 8½"-150-D and 8½"-120-D compressors, and 400 pounds for the 8½"-150-S compressor.

SIZE OF GOVERNOR, STEAM VALVE AND PIPING FOR TWO COMPRESSOR LOCOMOTIVE INSTALLATION

	8½"—150 and 8½"—120
Governor	1½ in.
Steam Valve	1½ in.
Steam Admission Pipe	
Main Pipe	1½ in.
Branch Pipe	1¼ in.
Steam Exhaust Pipe	
Main Pipe	2½ in.
Branch Pipe	1½ in.
Air Admission Pipe	See Fig. 13
Air Delivery Pipe	
Main Pipe	2 in.
Branch Pipe	1½ in.

	10½" Compressor
Governor	1½ in.
Steam Valve	1½ in.
Steam Admission Pipe	
Main Pipe	1½ in.
Branch Pipe	1½ in.
Steam Exhaust Pipe	
Main Pipe	3 in.
Branch Pipe	2½ in.
Air Admission Pipe 2" pipe to strainers, or 2½" if length of pipe to strainer exceeds 5 feet.	
Air Delivery Pipe	
Main Pipe	2 in.
Branch Pipe	1½ in.

NOTE—Compressor Plants for Industrial service are illustrated by Installation Diagrams in Instruction Leaflet No. 2341.

10½″ Compressors—General Data

Diameter of High Pressure Steam Cylinder......	10½	in.
Diameter of Low Pressure Steam Cylinder......	16¾	in.
Diameter of High Pressure Air Cylinder........	9½	in.
Diameter of Low Pressure Air Cylinder.........	14½	in.
Length of Stroke	12	in.
Steam Admission Pipe.........................	1½	in.
Steam Exhaust Pipe...........................	2½	in.
Air Admission Pipe...........................	2½	in.
Air Delivery Pipe............................	1½	in.
Designed for Steam Pressure of...............	100	lbs.
Working against an Air Pressure of............	80	lbs.
Normal Speed single strokes per minute, under above conditions	131	
Displacement, cubic feet per minute, under above conditions	150	
Overall Dimensions: (Approximate) Height.................	55⅜	in.
Width.................	42	in.
Depth.................	21	in.
Approximate Net Weight.......................	1825	lbs.
Average Weight, boxed for shipment...........	2075	lbs.
Lift of Air Valves: Intermediate..............	⅛	in.
Inlet.................	5/32	in.
Discharge.............	5/32	in.

INSTALLATION AND OPERATING INSTRUCTIONS

PIPING. All pipes should be hammered to loosen the scale and dirt, have fins removed, and be thoroughly blown out with steam before erecting; bends should be used wherever possible instead of ells, and all sags avoided. A suitable compound to make a tight joint should be applied on the *male threaded portion only*, and *never* in the socket. Do not use red or white lead.

Figs. 13 and 14 show the recommended arrangement and sizes of piping for one 8½″ compressor and also for a two 8½″ compressor installation. The size of the steam supply pipe may be reduced one size when a choke fitting in the steam inlet is required to limit the compressor speed, as explained by notes under the installation diagrams. This applies to the branch pipes only in a two compressor installation. (The 10½″ compressor being essentially an industrial compressor, the installation diagrams are not included with this pamphlet).

*In a single compressor installation the governor should be located in the steam supply pipe *between the lubricator connection and the compressor* in order to insure its receiving the necessary lubrication. The lubricator connection consists of a tee, the side outlet of which connects to the lubricator. In a two-compressor installation the governor should be located in the main steam supply pipe between the lubricator fitting and the steam branch pipe leading to each compressor.

***NOTE—Where the "F-1-A" Mechanically Operated Lubricator is used, these instructions do not apply. See section of this pamphlet covering the "F-1-A" Lubricator.**

The intake filter or strainer should be installed vertically, as shown in the various illustrations, and bolted under the running board at some protected point where the cleanest and driest air is available—never where a probable steam leak may saturate the air at the intake. Only one intake strainer is required per compressor and this may be connected to the two inlet openings by piping or by means of a Single Air Inlet Fitting.

STARTING AND RUNNING. The drain cocks are placed at the lowest points of the steam passages, as shown, for the purpose of draining condensed steam when the compressor is stopped and when starting it. They should always be left open when the compressor is to stand idle for any length of time. These drain cocks are provided with suitable union fittings, so that drain pipes may be connected if desired.

In starting the compressor, always run it slowly until it becomes warm, permitting the condensed steam to escape through the drain cocks and the exhaust, until there is sufficient pressure in the main reservoir (25 to 30 pounds) to provide an air cushion. Then close drain cocks and open the steam (throttle) valve sufficiently to run the compressor at the proper speed, according to circumstances. Racing or running at excessive speeds should not be allowed. The compressor governor automatically controls the starting and stopping of the compressor.

TO STOP THE COMPRESSOR. (1) Close the feed and steam valves on the sight-feed lubricator, if the compressor has a separate one, or the feed, if supplied from the locomotive lubricator; (2) then close the steam (throttle) valve; (3) and open all the drain cocks on the compressor. Keep the steam valve closed and the drain cocks open when the compressor is not working. The main reservoir drain cocks should also be left open when the compressor is stopped for any length of time. The compressor should always be stopped while the locomotive is over the ash pit. If permitted to run, ashes and dust will be drawn into the air cylinder and injure it, besides clogging up the air strainer.

LUBRICATION. On account of the high temperatures developed by air compression, the variation between maximum and minimum delivered air pressures, and the necessity of preventing oil from passing into the system, one of the vital problems in efficient compressor operation is to provide a simple means for supplying lubrication to the air compressor in proper quantity and at regular intervals. Non-automatic methods may be employed and satisfactory results obtained as long as care and attention are exercised to provide just enough lubrication to keep the compressor in a properly lubricated condition, but experience has shown that this is very difficult to obtain. The ideal method is obviously that which involves feeding the proper amount of lubricating oil during each cycle of the pistons and causing this feeding of oil to cease when the compressor stops operating. These "automatic" requirements are fully satisfied by the Type *"F-1-A" Mechanically Operated Lubricator*, with which the only manual operation necessary is that of filling with oil at the required intervals.

See section beginning on page 43 for description, operation, etc., of the "F-1-A" Lubricator.

While the Type "F-1-A" Lubricator is regularly supplied with cross compound air compressors, many com-

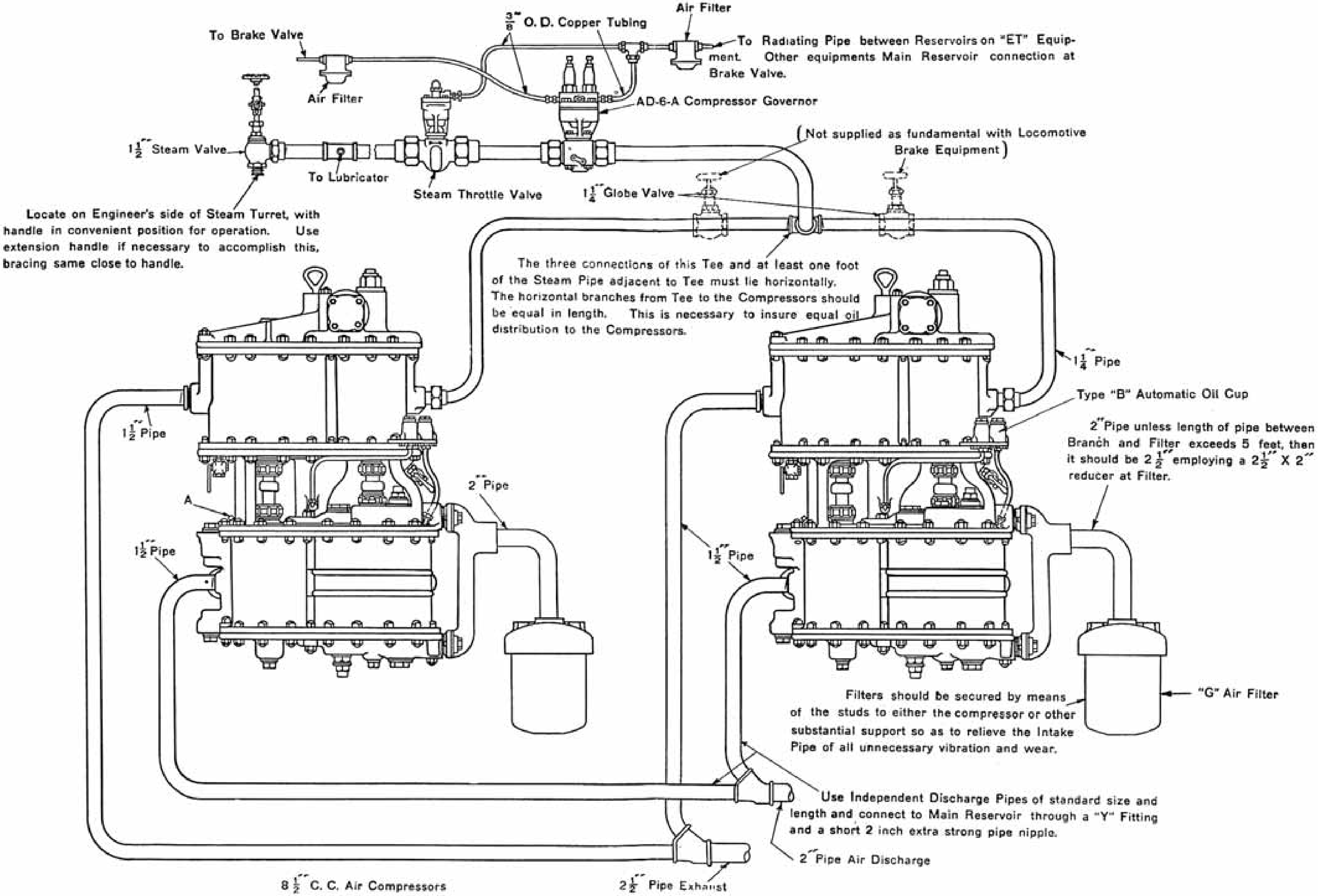


Fig. 13. Installation Diagram of Two 8½" Cross Compound Air Compressors

NOTE—When a choke fitting in the steam inlet is required to limit compressor speed to the normal rate, it is satisfactory to use 1 inch pipe for the steam supply branch lines instead of 1¼ inch pipe as indicated on the diagram.

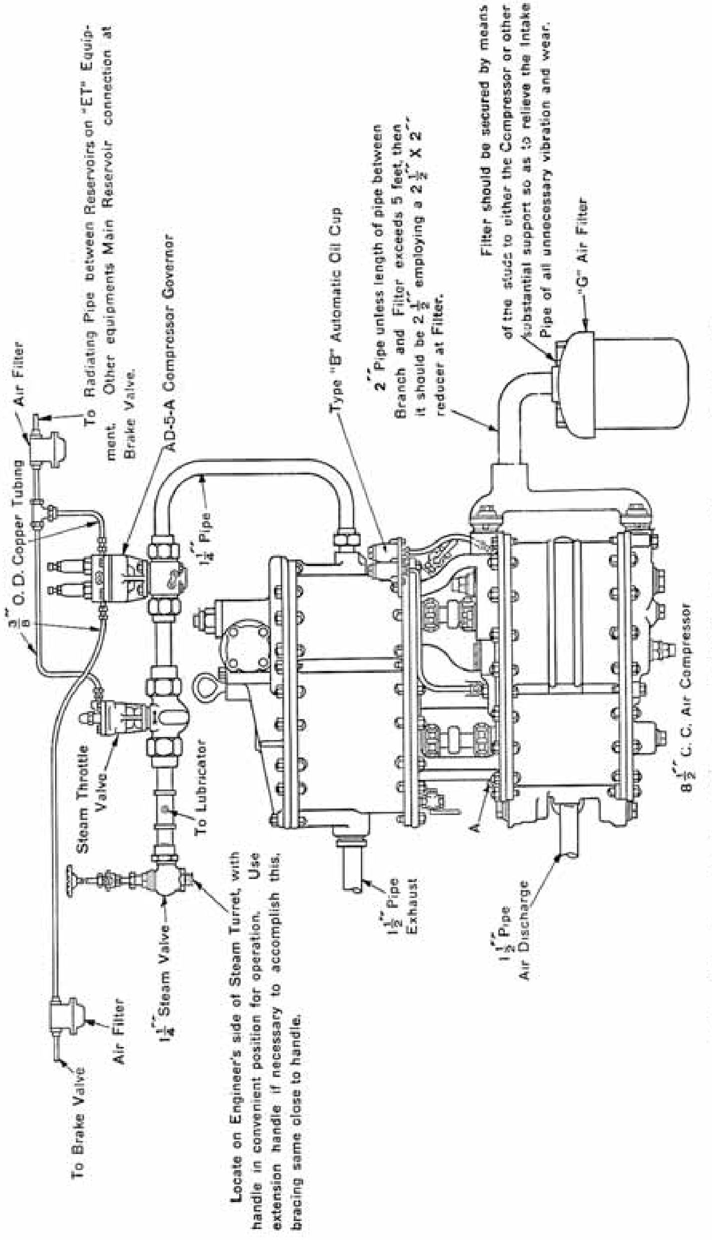


Fig. 14. Installation Diagram of 8½" Cross Compound Air Compressor

NOTE—When a choke fitting in the steam inlet is required to limit compressor speed to the normal rate, it is satisfactory to use 1 inch pipe for the steam supply line instead of 1¼ inch pipe as indicated on the diagram.

pressors in service are equipped with the Type "B-3" Automatic Air Cylinder Oil Cup.

The construction and operation of the automatic oil cup are very simple, as will be evident from the sectional illustration, Fig. 15. There is an oil chamber *a* which is filled from the top when the cap nut 5 is removed. The cap nut is provided with a vent hole *f* so located that when the seal between the cap and body is broken the air pressure is vented to the atmosphere, thereby permitting the filling operation to be performed while the compressor is running. The stem portion 3 of the body 2 has a central passage *b* communicating at the bottom with the pipe connection leading to the air cylinder, and at the top with chamber *a* through the cavity in the cap nut. This passage has its top outlet on the side so as to permit chamber *a* to be filled without possibility of pouring oil directly into the passage, which would defeat the very purpose of the lubricator.

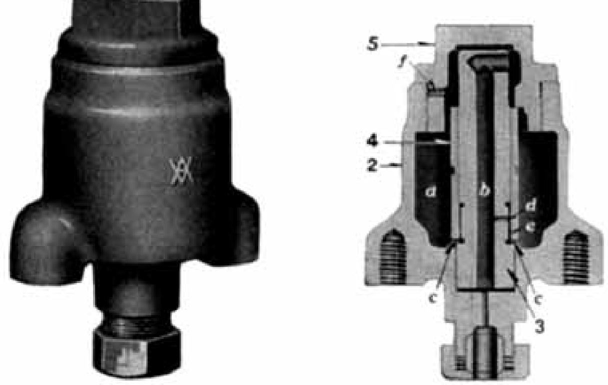


Fig. 15. Exterior and Sectional Views of the Type B-3 Automatic Oil Cup

An oil port *d* of definite size is located in the stem and connects passage *b* to an annular feeding cavity *e* which is formed by a recess in the stem and the neat fitting sleeve, around it. This sleeve has two diametrically placed notches *c* at its lower end which connect chamber *a* with cavity *e*.

When the compressor makes its upward stroke, air is forced up through passage *b* and into the space above the oil in chamber *a*.

The lubricant in the cup will flow through the notches "*c*" into the space between the stem 3 and the sleeve 4 and rise in space *e* by capillary attraction and will then enter opening *d* to passage *b*, from which, on the downward stroke of the compressor, the lubricant is carried with the flow of the air from the chamber on top of the oil, through passage *b* into the compressor cylinder. This small amount of oil supplied regularly and reliably is ample to adequately lubricate the air cylinder.

Due to the ability of this type of lubricator to supply minute particles of oil in uniform quantities to the air cylinder of the compressor during each cycle of operation, one filling of its oil chamber will supply sufficient lubrication to the compressor air cylinder for the average trip of a locomotive.

A good grade of standard locomotive saturated steam valve oil only should be used in the air cylinders. Superheater oil is not recommended for air cylinder lubrication because it tends to restrict the air passages, causing the compressor to heat unduly and to wear faster than with the lighter valve oil recommended.

LUBRICATION—STEAM CYLINDERS. The steam cylinder lubricator (if used) should not be started until all condensation has escaped from the compressor and the drain cocks closed. After closing the drain cocks, start the lubricator to feed in ten or fifteen drops of oil as rapidly as possible, then regulate the feed to about two or four drops per minute *for each compressor*. No definite amount can be specified, as the amount of lubrication required depends on the work the compressor has to do, the quality of the steam, condition of compressor, and so on. Keep the lubricator feeding while the compressor is running.

A *swab*, well oiled, is essential on each piston rod.

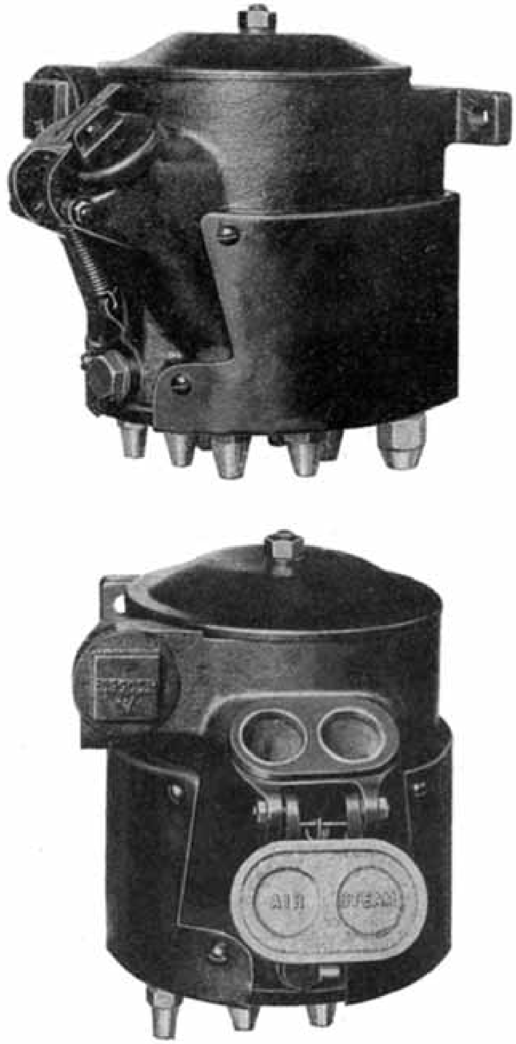


Fig. 16. Photographic Views of the Type "F-1-A" Mechanically Operated Lubricator

TYPE "F-1-A" LUBRICATOR

The Type "F-1-A" Mechanically Operated Lubricator is designed to feed the minimum adequate quantity of oil positively to all critical operating parts and at a rate which is directly proportional to the compressor speed. It is operated by a self-contained pneumatic engine, and is equipped with six adjustable oil delivery pumps and a two chamber oil supply so arranged that different oils may be used for the steam and air ends. Four pumps are connected to one chamber and two pumps to the second but both chambers may be connected together if desired.

Fig. 17 shows a sectional assembly of this lubricator where reference numbers are given to identify the various parts as they will be explained. The pipe connections are also numbered from 1 to 9 for convenience of reference and designation of each pipe as shown on the installation diagrams.

Reference 28 shows the ratchet wheel which is doweled to and readily removable from the oil pump actuating cam 27. Reference 33 shows the operating piston which operates the ratchet wheel by means of pawls 4 and *4a*.

The operating cam 27 rotates on a drilled spindle in which there are two lubricating wicks 52 and 53, the lower end of each wick reaching to the bottom of the oil reservoir. The upper end of wick 52 is in a groove in the cam spindle and lubricates the cam bearing by capillary action. Wick 53 extends above the upper plate of the ratchet wheel assembly, and oil drawn up this wick by capillary action flows down the inclined surface of the plate to lubricate the operating and holding pawls at

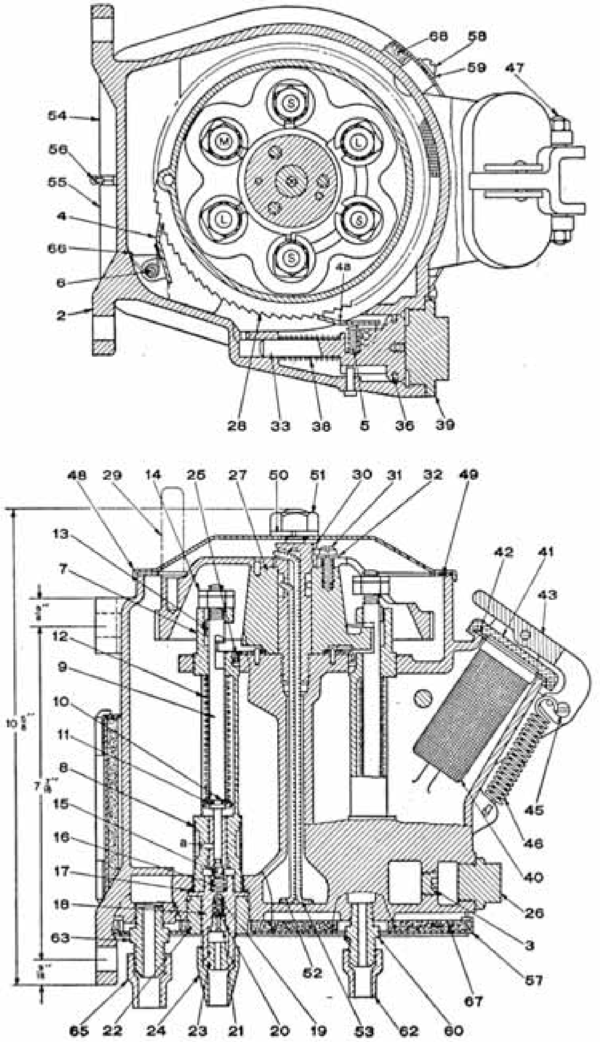


Fig. 17. Sectional Assembly Views of the "F-1-A" Lubricator

their contacts with the ratchet wheel teeth, and then creeps to the pawl pivots and on to the operating piston to lubricate these parts.

A sectional view of one of the oil pumps is illustrated in this drawing, Fig. 17. Each of the six pump units consists of a cylinder body 7, plunger 9, plunger spring 12, two ball check discharge valves 15 and 19 in series, discharge fittings with choke 21, and plunger stroke adjusting nuts 14. The plunger spring 12 is secured on the plunger 9 by spring retainer 11 in such a manner that the force of the spring acts to keep the plunger 9 to the lowest point in its cylinder that adjusting nuts 14 will permit.

Reference 40 shows the close mesh strainers provided in the entrance to the oil chambers to prevent foreign matter from being carried in with the oil supply. Additional close mesh strainers 8 are provided around each individual oil pump intake as a further protection against sediment in the reservoirs entering the oil pumps. One oil reservoir has one-half the capacity of the other, the small reservoir supplying two oil pumps for lubricating the air cylinders of the compressor, and the large reservoir supplying four oil pumps for lubricating the steam cylinders of the compressor and the governor and throttle valve. The separate oil reservoirs, as previously stated, permit the use of a different type of oil in the steam and air cylinders. When the same oil is used for both the steam and air ends of the compressor, both reservoirs may be connected together by removing plug 3. Removal of cap nut 26 drains the large reservoir, and the small reservoir may be drained by removing plug 3.

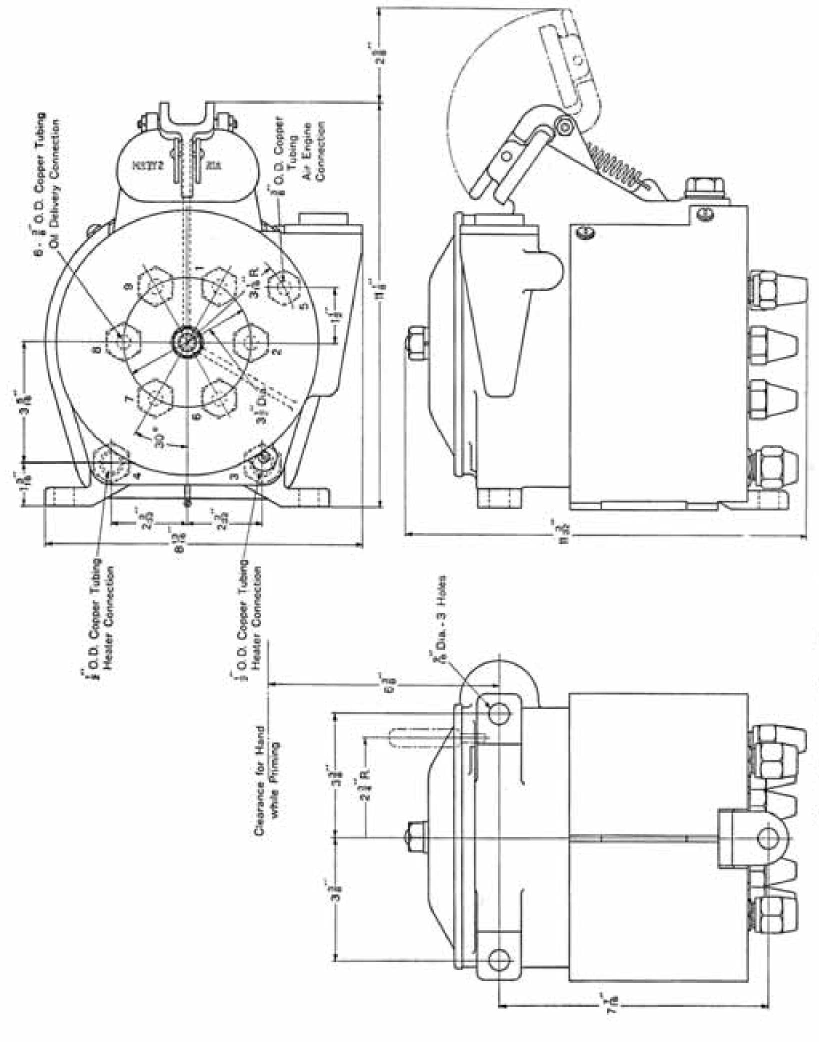


Fig. 18. Outline Drawing of the Type "F-1-A" Lubricator

A heating chamber, which is connected to the steam exhaust pipe of the compressor, is provided to keep the oil in the lubricator at a proper temperature to insure satisfactory operation. Lagging is applied to the body of the lubricator to afford additional assurance that the oil is maintained at a proper operating temperature when the lubricator is exposed to low temperatures. This lagging is held in place by a suitable removable metal covering secured to the body of the lubricator.

While the standard construction has six oil pumps, if any of these are not required for a particular installation, they can be omitted and their outlets blanked with a blanking disc.

Operation

Referring to section assembly views, Fig. 17, as the low pressure air piston of the compressor moves up, air pressure is developed on the face of the lubricator operating piston 33 and moves it against the force of piston spring 38, carrying with it pawl 4*a*, which engages with a tooth in ratchet wheel 28. This rotates the ratchet wheel two notches, and pawl 4 drops into a tooth of the ratchet wheel to prevent the wheel moving backward. On the down stroke of the compressor low pressure air piston, the pressure is reduced on the face of operating piston 33, and spring 38 returns the piston and attached pawl to their original position.

The ratchet wheel, as previously stated, is attached to the cam 27. The upper side of the cam flange is an inclined plane, and as the cam is moved, the thin edge of the inclined plane enters a slot in the plunger rod. As the cam continues to move, it lifts the plunger in its

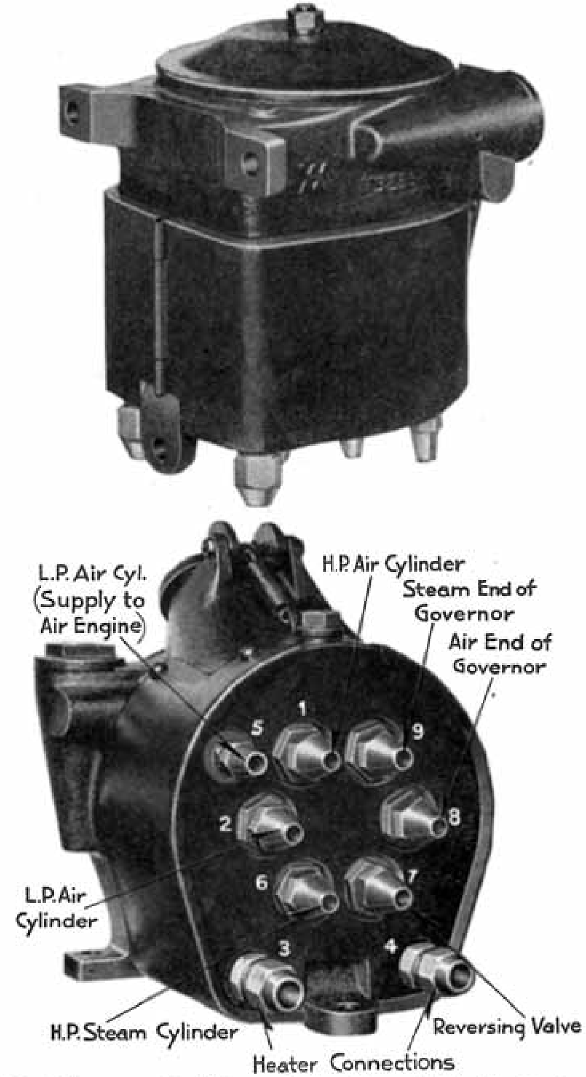


Fig. 19. Photographic Views of the Type "F-1-A" Mechanically Operated Lubricator

cylinder, above the intake port *a* and the oil from the reservoir flows into the pump cylinder, filling the space above discharge ball check 15. When the cam passes out of the plunger rod slot, spring 12, now free to act on the plunger, forces it down until it is stopped at the desired stroke by adjusting nuts 14 contacting with the upper end of the plunger rod guide.

The rapid down-movement of the plunger discharges the oil in the oil pump cylinder at high pressure and forces it past the two discharge ball check valves 15 and 19, through the delivery pipe to the compressor or governor fitting and past the non-return check in the terminal fitting to the part to be lubricated.

Each of the six plungers makes one stroke during a complete revolution of the ratchet wheel which occurs during 50 double strokes of the compressor.

Adjustment

The amount of oil delivered per stroke is controlled by the distance the plunger is allowed to move downward, the adjustment being made by means of adjusting nuts 14. To increase the amount of oil delivered, the nuts are turned to the left and to decrease the oil delivered, the nuts are turned to the right. After adjustment the two nuts are tightened together or "locked". In order to change oil feed adjustment, remove nut 51 and lock washer 50 then lift the cover 48. The adjusting nuts 14 are then accessible through an opening in the ratchet wheel. With the older Type F-1 lubricator, it is necessary to remove the ratchet wheel (by means of three screws 31) to expose the adjusting nuts.

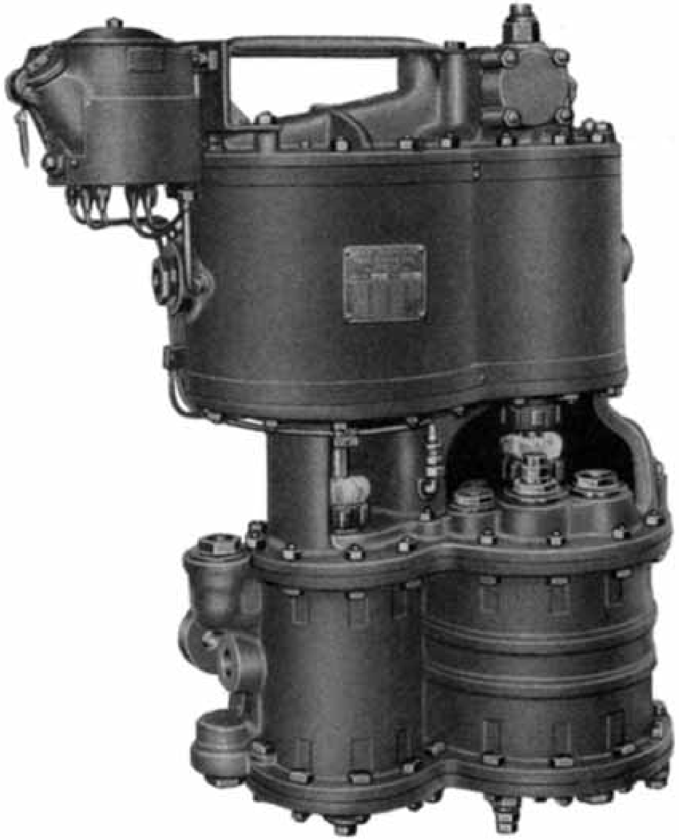


Fig. 20. Front View of the Air Compressor with the "F-1-A" Lubricator

To check or adjust the length of the plunger stroke, the cam should be turned by use of the primer handle, until the plunger to be checked or adjusted is in its uppermost position. The distance between the lower face of the bottom adjusting nut and upper end of the plunger rod guide is the working stroke of the plunger. The recommended stroke adjustment of the oil pump plunger is specified in the following table:

Port No.	Pump Size	Pump Stroke	Pipe Designation	Oil Delivered Per 100 Strokes
1	Small	$\frac{3}{16}$"	Oil Delivery Line to High Pressure Air Cylinder	2. C.C.
2	Small	$\frac{3}{16}$"	Oil Delivery Line to Low Pressure Air Cylinder	2. C.C.
3&4			Heater Intake and Discharge Pipes which can be Reversed if Desired	
5			Air Engine Pipe to Low Pressure Air Cylinder	
6	Large	$\frac{3}{16}$"	Oil Delivery Line to High Pressure Steam Cylinder	20. C.C.
7	Medium	$\frac{3}{16}$"	Oil Delivery Line to Reversing Valve	10. C.C.
8	Small	$\frac{1}{8}$"	Oil Delivery Line to Air Piston of Governor	.6 C.C.
9	Large	$\frac{3}{16}$"	Oil Delivery Line to Main Steam Line Ahead of Governor	20 C.C.

In re-applying when ratchet wheel has been removed, for any reason, care must be exercised to make certain that the pawls 4 and 4*a* are in place on the teeth of the ratchet wheel and that lubricating wick 53 is above the upper sheet steel plate of the ratchet wheel assembly.

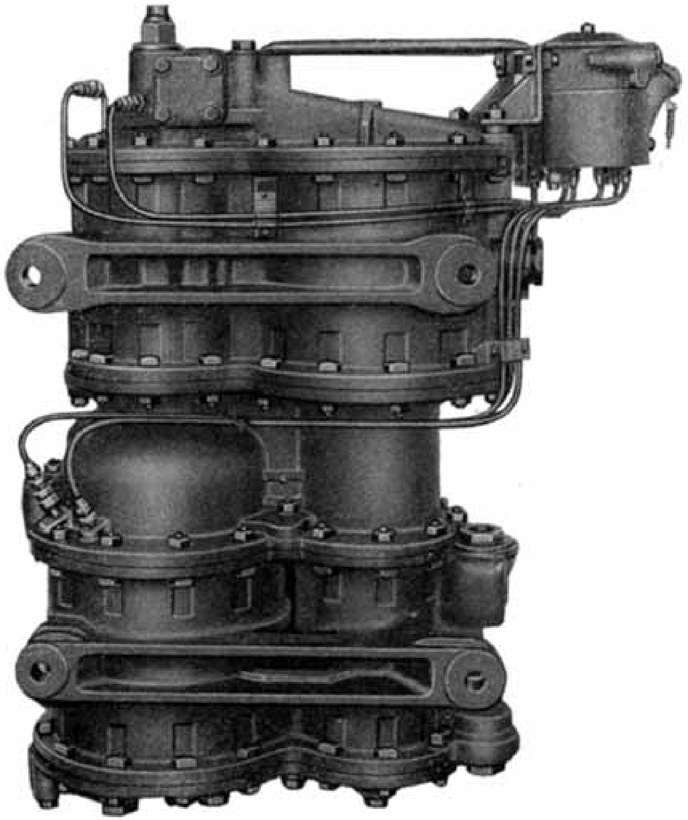


Fig. 21. Rear View of Air Compressor with the F-1-A Lubricator

Mounting of Lubricator

The lubricator should be mounted in relation to the air compressor so that all connecting copper tubing shall be as short as possible consistent with avoiding sharp bends. It should be located so that proper drainage of the condensate from the steam heated manifold to an exhaust steam line will be assured. The lubricator connections and corresponding pipes have been numbered from 1 to 9 inclusive, as shown by Figs. 18 and 19. This system of numbers will serve to simplify installation instructions and prevent the possibility of wrong connections when the tubing has been removed for repairs or renewal. The nine connections or ports with their corresponding pipes are given in the table on page 51.

When the method of installing these pipes has been determined it should be recorded in maintenance instructions so that there will be no chance for these pipes being improperly connected during repairs.

When the lubricator is applied to a compressor and before it is operated, the delivery tubes must be filled with the proper oil. This can be accomplished either by filling the tubes before they are attached to the lubricator or after they are attached by turning the lubricator by hand for a sufficient time to fill the tubes. It has been found that at least 80 turns of the ratchet wheel are required for the recommended tubing if the tubes are not initially filled with oil. The alternate tubing with greater volume or tubing of unusual length will require more. If the tubes are filled, the ratchet wheel should be turned at least ten times to prime the pumps before the compressor is started.