The Gordon Smith Compressor

Adapting and Preserving the Workhorse Model A Engine

By Stan Johnson

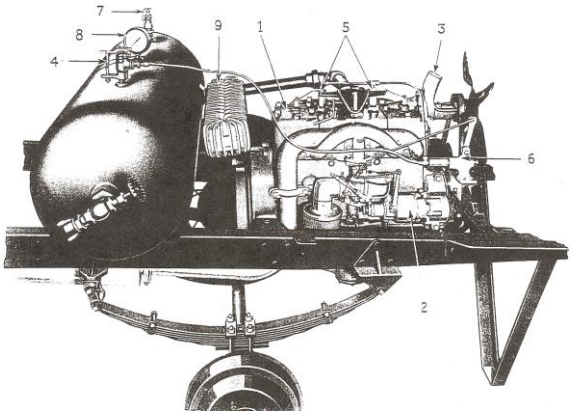
Introduction. Several years ago a Model A enthusiast spotted a rusty, but familiar looking, cowl and radiator in a field in Eastern Oregon. On closer inspection he was confused by what he saw. It looked like a Model A engine, but it had many odd changes and additions that he couldn't explain. So he placed a message and pictures on a Model A Ford bulletin board on the Internet and asked for help in identifying the strange engine. He got the same answer from all over the country: It was a Gordon Smith Compressor, based on a Model A Ford engine. Several who responded offered explanations of how the compressors were used: One said construction work; another said Mining; a third said they were used by the Railroads. They were all correct.

The Oregon Mystery Engine

Background. Gordon Smith was a clever man who in the late 1920's lived in the Bowling Green area of Kentucky and worked for the Kentucky &Tennessee Light and Power Company. In the era before the great depression, several companies built large stationary compressors for use in mines and industrial applications. Jack Hammers and rotary drills used the compressed air in mines where air could be piped to them. Gradually, large mobile compressors were developed to allow use of the air tools at non-fixed sites. However, they were expensive. Kentucky & Tennessee Light and Power Company needed mobile compressors, but found the available large mobile units to be very expensive. They only bought one, and when that one and only compressor was destroyed in a train accident, Gordon Smith evaluated the situation and decided he could make a smaller compressor from an automobile engine. He experimented first with an old four-cylinder Chevrolet engine and then did his final development using the Model A and B engines.

Necessity is the Mother of Invention, it is said. The *Father* of Invention hasn't been named, but it could well be Availability – availability of components to use in the invention. At least that is what aided Gordon Smith in his quest to solve the need for a low cost mobile air compressor. As the years went by in the 30's, 40's and 50's, the millions of Model A Fords turned out by the Ford Assembly Plants began to become available in the junkyards. Some were victims of accidents, and others were discarded after many miles of faithful service. So when Gordon Smith had to pick an engine on which to base his compressor components, it made sense for him to pick the ubiquitous Model A.

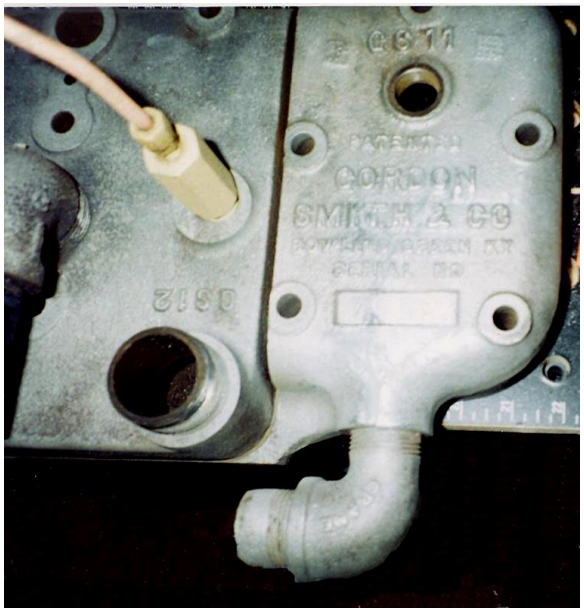
Smith Compressor Components & Functioning..



Smith Compressor Components – 1- Special Cylinder Head, 2- Governor, 3- Model B water pump, 4- Pressure Regulator in main tank, 5 – Pressure pistons over reed valves, 6 - Pressure piston on idling device, 7 - Pop-off valve, 8 – Pressure gauge, 9 – intercooler (only on some models)

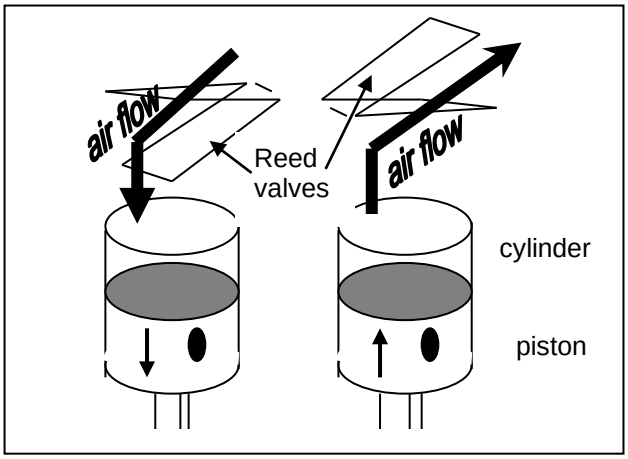
The compressor Gordon Smith developed is simple, yet ingenious. He used part of the engine to power the compressor, and part of that same engine to pump and compress the air. How'd he do that? By retaining normal functioning of the alternating strokes of pistons #1 and #4, he retained steady pulses of power in the engine. Then he used the alternating strokes of pistons #2 and #3 to pump the air. But to accomplish this he had to develop an entirely new cylinder head for the Model A engine.

The Gordon Smith Head. That new head kept the same internal design as the stock head for cylinders # 1 and #4, but for the two middle cylinders, the Smith head incorporated large reed valves which



The Gordon Smith Cylinder Head

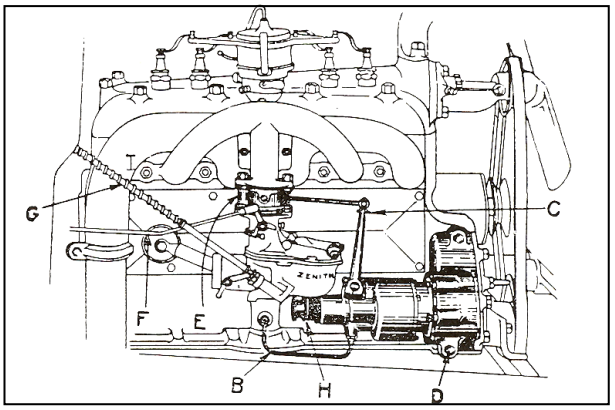
allowed air to be drawn in through 1¼" intake pipes in the head, and forced out through a similar pipe to a compressed air storage tank. The original valves for cylinders #2 and #3 were cut off so they did not lift as the camshaft rotated. No air entered or departed the two middle cylinders through the normal valves and engine manifolds. As a result, the end cylinders continued as a normal four-stroke engine. This half-engine drove the two interior pistons that pumped air on every stroke. The latter occurs because as each piston descends it creates a vacuum that pulls open the reed valve, and then on the up-stroke the compressed air forces the intake reed valve shut and the air is forced out through an inverted exhaust reed valve to the compressed air storage tank. Smith's head is designed to accept a Model B water pump. For this design, Gordon Smith was issued US Patent number 1992400 in 1932 for "converting the Model-A motor into half engine half compressor."



Reed Valve Functioning

So the heart of the Gordon Smith Compressor is the specially designed cylinder head. But more than a redesigned cylinder head is required to have an operational compressor. A method is needed to regulate the amount of air being produced, and to regulate the pressure of the air in the storage tank.

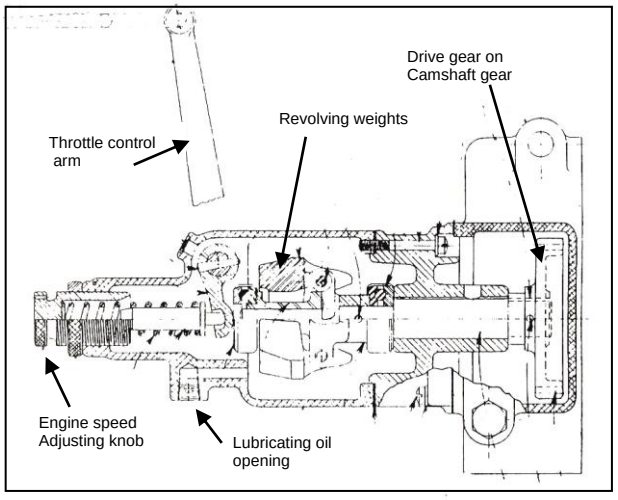
Speed Regulation: The Pierce Governor. The volume of air produced is a function of the speed of the engine. A governor made by the Pierce Governor Company of Anderson, Indiana regulated



Pierce Governor on Model A Engine

B-special oil supply line from block; C- throttle control arm; E- auxiliary valve box not used on Smith Compressor; H- speed adjusting screw

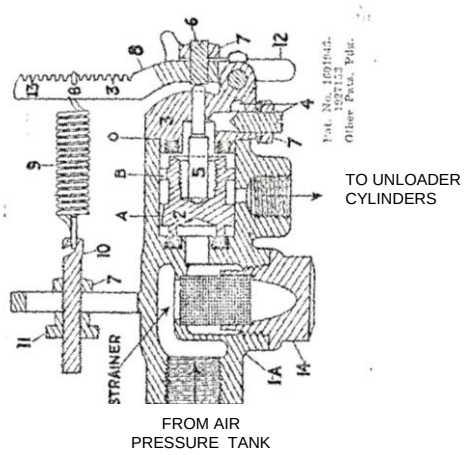
the speed on many of the Gordon Smith Compressor engines. This governor was mounted to the carburetor side of the engine. The small side timing gear cover was removed and the governor mounted it its place.



Pierce Governor Internal Functioning

A gear in the governor housing meshed with the camshaft gear and drove the governor. Weights and springs within the governor housing moved the governor's main control arm back and forth as the speed of the engine increased or decreased. This arm was connected to the throttle arm of the carburetor, in place of the normal Model A foot throttle mechanism. Thus, as the engine speed decreased, the arm moved forward and speeded up the engine. As the engine speeded up beyond the pre-set rpm limit, the arm moved backward and slowed the engine speed. The governor had an adjusting wheel at the back end that permitted the operator to select the desired engine speed.

Pressure Regulation. Regulation of the pressure required additional components. If left unregulated, the compressor would continue to pump air into the pressure tank until the engine stalled against the load, or until the pressure exceeded the limits of the pressure system, resulting in a catastrophic failure of the tank. Fortunately, the R. Conrader Company of Erie, Pennsylvania produced a pilot valve that became a key component of the Smith Compressor.



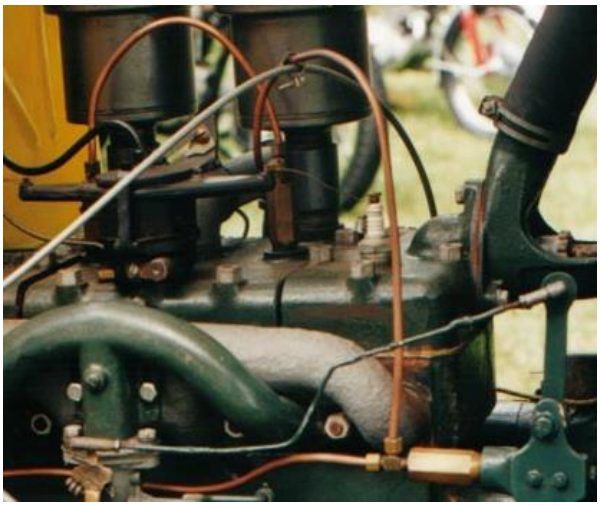
R.C. Unloader Pilot Valve

The RC. Unloader Pilot Valve consisted of a housing that contained a piston (2) and stem (5), a spring (9) and an unloader lever (8). The piston chamber was connected to the air pressure tank. A spring-mounted lever held down the stem, which was connected to the piston. When the pressure built up to a certain point, the piston and stem would overcome the force of the spring. As it moved upward the compressed air would rush through an opening in the housing into a network of copper tubes. These tubes were connected to three Unloading Cylinders. The operator could also unload the compressor by simply lifting up on the unloader lever.

Unloader Pilot Valve on top of tank

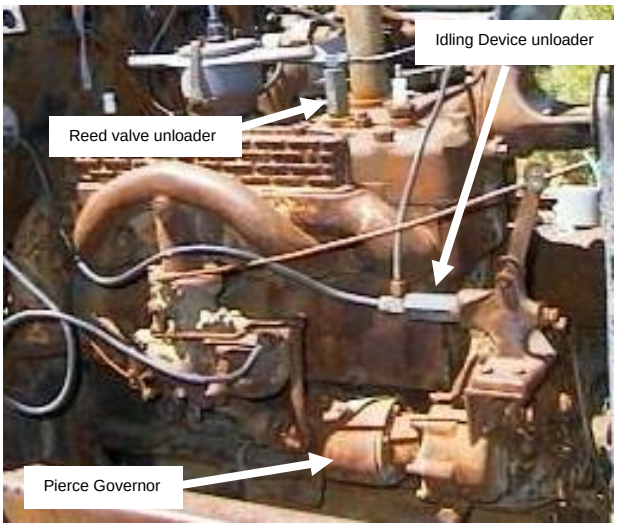
The Unloading Cylinders operated much the same as the Pilot Valve, but in reverse. Two of the unloading devices were mounted on the cylinder head and one was mounted near the governor. When the pressurized air entered the Unloading Cylinders, a piston was forced outward, and a stem protruded out. In the case of the two unloaders on the cylinder head, the stem pushed against the intake reed valves

and held them in an open position. This caused the air pumping cylinders to stop compressing air.



Unloader Device locations on Model A Engine

The third unloader is mounted on the idling device. It pushes against the bottom end of a pivoted lever. The other end of that lever arm is connected to the carburetor. The unloader action overcomes the governor, and throttles the engine back to idle. Eventually as the pressure in the main pressure tank is reduced, the spring on the pilot valve arm forces the piston back and deprives the unloader system of compressed air. As a result, the unloader pistons are forced back by internal springs causing the reed valves to close and allows the governor to resume regulating engine speed. In short, the compressor "kicks back in".



Unloader System

Operation and Maintenance.

TO START: Turn switch key on and press starter, using choke if necessary. Open hose valve on air receiver so pressure will not build up until motor is warm or lift lever on pilot valve when pressure is over 40 pounds. This unloads compressor and allows motor to run at idling speed

IF MOTOR DIES WHEN COMPRESSOR LOADS UP: Motor is not thoroughly warmed up or idling speed is too slow. Be sure governor snaps carburetor open when compressor loads up. (governor arm or connecting rod may be binding so governor can not work freely. To increase idling speed, screw in cap screw at front end of idling device. This screw should take the thrust of the idling device instead of the screw on the carburetor arm.

IF COMPRESSOR FAILS TO DELIVER FULL CAPACITY: Valve strip may be broken or unloader piston is sticking and holding intake valve open. Remove unloader cylinder and sand paper the fabric cup until piston is free in the cylinder. Lubricate with dry graphite only. To replace broken valve strip, disconnect $1^{1}/_{4}$" pipe union and remove four cylinder head stud nuts, also two cap screws on under side of overhang in head. Remove valve guard and replace strip. Be sure strip is free and not caught under end of valve guard when being replaced. Use a large screwdriver and draw the guard down tight. Be sure the countersunk lock washer is in place.

IF THE MOTOR LACKS POWER: The ignition may be too slow and should be advanced slightly more than the standard Ford setting. Motor valves may be burned or warped in the power cylinders. Motor Governor may not be opening carburetor sufficiently. Try holding carburetor open by hand. See Governor instruction sheet. Carburetor or gasoline line may be clogged and need cleaning.

IF COMPRESSOR FAILS TO UNLOAD: Pilot Valve may be stuck and need cleaning. Piston may be stuck in unloader cylinder or cup badly worn. Remove Unloader Cylinder and check condition of

piston and unloader pin.

IF PILOT VALVE CHATTERS: Read instruction sheet, "The R. C. Unloader Pilot Valve". We can exchange rebuilt pilot Valve for old one at a charge of $3.50.

General Information

Use a good grade of S.A.E. 20 oil in winter and S.A.E. 30 in summer. Change oil every fifty hours of operation. Never allow gasoline to accumulate in the crankcase. Lubricate fan shaft, distributor, generator, spring shackles, etc. same as on car or truck.

Wash air cleaners regularly with hot water and soda or other inflammable liquid. DO NOT USE GASOLINE. Adjust motor governor for the lowest speed to deliver sufficient volume of air. Higher speed causes unnecessary wear and valve breakage.

Types of Gordon Smith Compressors.

Gordon Smith implemented the design described above by marketing his product in two ways. First, he bought used Model A chassis and modified them into trailer- mounted air compressors, complete with bright yellow paint and a Smith Motor Compressor nameplate. He also sold a kit that could be used by customers to build their own compressor using available Model A engines. The latter explains the wide variety of Smith Compressor "finds" by Model A enthusiasts across the country.

Constructing a Gordon Smith Compressor from Parts.

The following description and drawings are for the 1928 and 1929 Model A Ford, but all frame dimensions would be the same for the 1930 and 1931 models also.

Figure 1, A plain view of the frame showing the location of the air receiver and tow connection. Dimensions are taken from the rear side of the motor hanger brackets. The front end of the frame is cut off 1 *1/2"* ahead of the front cross member. The rear end is cut off at dimension D, but this may be left until the battery box has been mounted behind the air receiver.

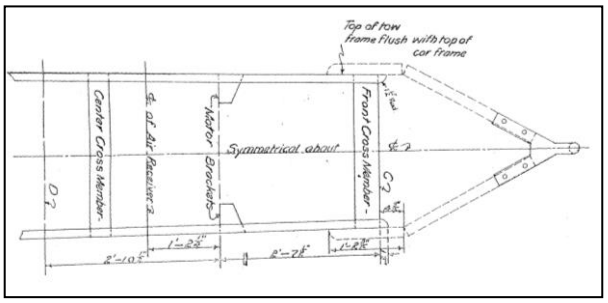


Figure 1. Plan View of Frame with dimensions

Figure 2. A detailed drawing of the tow connection using the ball and socket hitch. This hitch is especially desirable when compressor is to be towed behind a car as it eliminates all loose connections and rattle. The dimensions shown are for the angle iron required, and has not been furnished with the hitch. The angle iron may be sawed on one side for easy bending. The holes in the angle iron are drilled so as to line up with the holes already in the Ford frame. The space of *3-1/4"* must be left straight to allow for mounting the swinging stand.

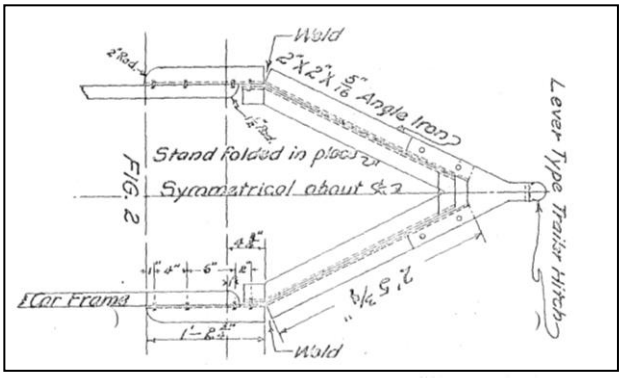


Figure 2. Trailer Towing Connection

Figure 3. This shows the stand which folds up inside the tow connection when machine is being towed. Dimension A must be determined after the machine is mounted on wheels so as to allow the machine to set level. A "v" is cut out of each side so the ends may be bent parallel for the mounting. Theses points are welded after they have been fitted to the tow connection.

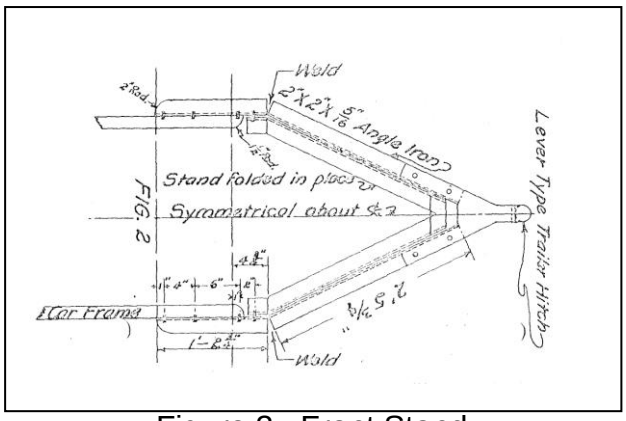
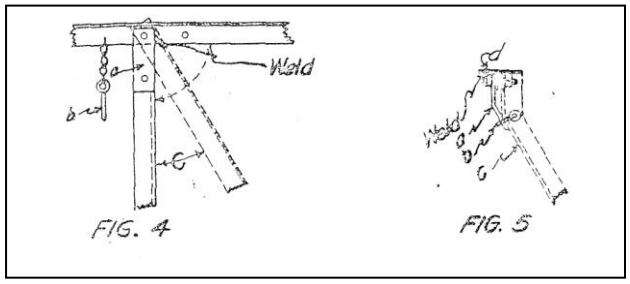


Figure 3. Front Stand

Figure 4 and 5. Show details of the bracket to hold the stand in position. This piece is *1/4"X2"X6"* iron welded to the outside of the angle and bent so as to fit against the stand.



Figures 4 & 5. Front Stand Brackets

Figure 6. Shows how the cowl is cut out to allow the receiver to fit into it. The cut may be made with a hacksaw using a fine tooth blade, The cowl remains in the position on the car.

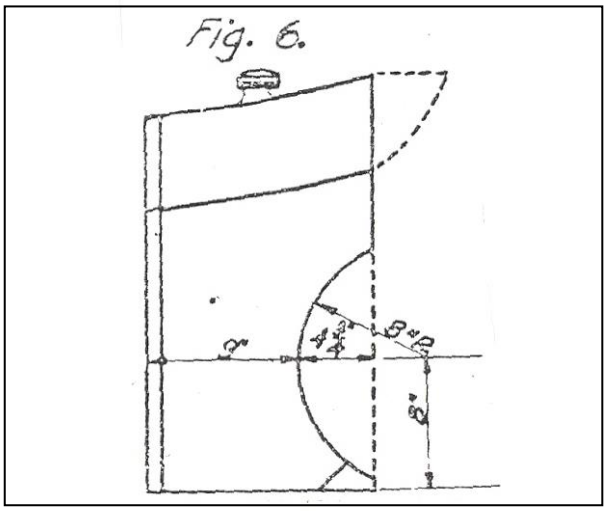


Figure 6. Cowl Tank Cut-out

Figure 7. Shows the details of the air receiver. The size is 16" X 44". Two rods threaded at both ends are bent around the air receiver and fastened through the frame with nuts on the threaded ends.

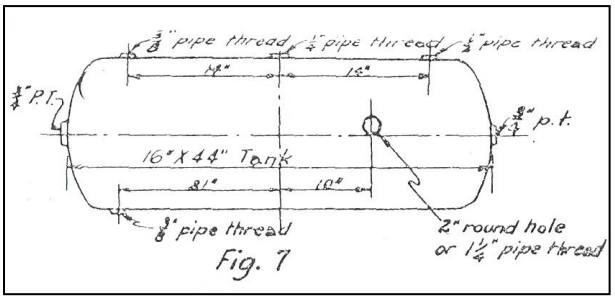


Figure 7. Pressurized Air Tank Dimensions

Figure 8. Shows the pipe fitting required to carry the air from the compressor to the receiver. The fitting should be made up and the receiver clamped in place before the sleeve is welded into the tank. This procedure assures perfect alignment. (We furnish tank with sleeve welded in correct position. ,

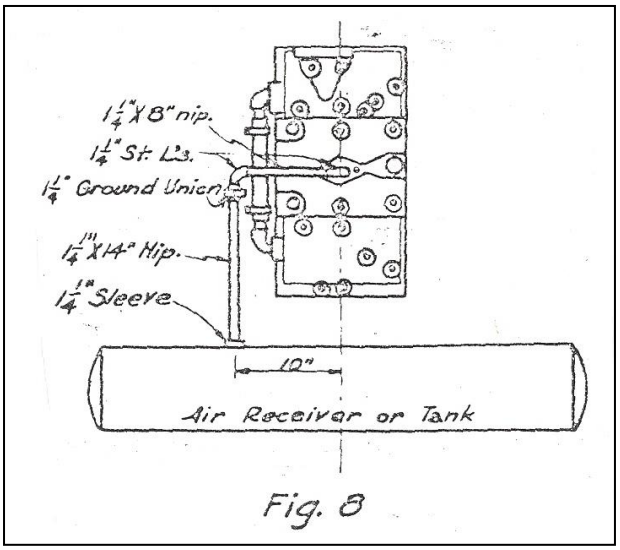


Figure 8. Pressure Tank and Pipe Fittings

Figure 9. shows how the axle and springs may be oriented. The axle should be located so as to barley clear the' rear axle of the motor flywheel. Model A front springs may be used with alternate leaves removed. The Ford axle may be used with the spindles welded in a rigid position, or we can furnish a 1-3/4" straight axle with spindles for Model A wheels. We can also furnish spring hangers.

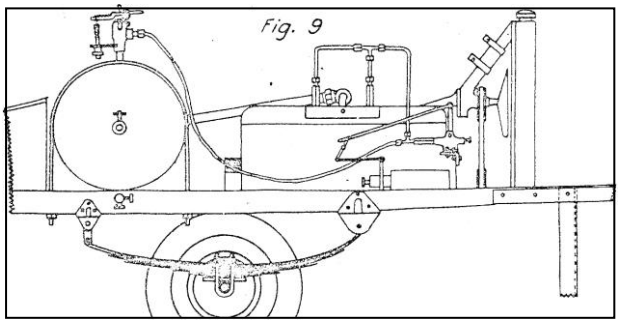


Figure 9. Axle and Spring Orientation

Figure 10. Shows how our 1-3/4" X 5'5" round axle and Model A Ford front springs are used. The spring saddles have 9/16" holes for head of spring tie bolt. Springs should be mounted on compressor frame before spring saddles are welded to axle. Axle may then be centered and clamps tightened. Weld ~xle to spring saddles after axle is properly aliened. If a 1-3/4" square axle is used, the 9/16" holes may be drilled 1/2" deep in the axle, for spring tie bolts. Spring saddle may be omitted, but square end U bolts must be used.

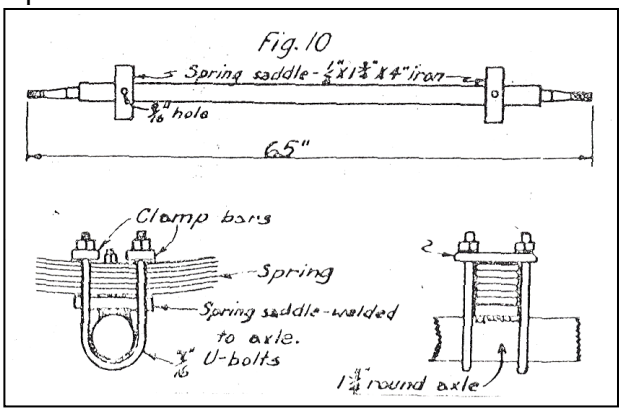


Figure 10. Axle Dimensions and Placement

Figure 11. Shows inside dimensions of a combination battery and tool box.

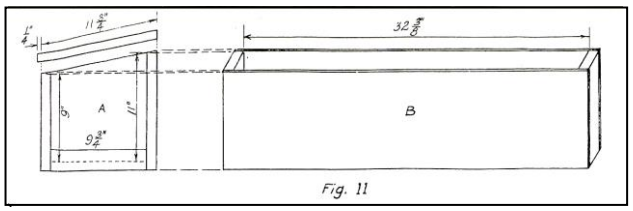


Figure 11. Tool Box & Battery Case

Figure 12. Shows a bracket to be mounted on the steering column clamp on the Ford dash.· This bracket is for a 5/16" rod extending to the starter button on the starter. A gear shift bail or accelerator button may be used on the upper end of this rod.

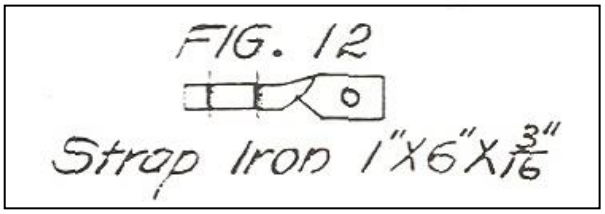


Figure 12. Starter Rod Support

General Information.

For continuous operation a truck radiator will be required on the 1926 and 1927 models.

Air cleaners should be used on the carburetor and air intakes, especially where the compressor operates in dusty atmosphere.

It should be understood that the machine may be assembled differently if other sizes of air receivers are available at less cost or different trailer hitch, axle wheels or battery box is desired. In some cases it me be desirable to make up a special frame, canopy, gasoline tank and instrument panel similar to other makes of compressors instead of using those Ford parts. We do not recommend the use of an air receiver any smaller than 16”x42” because the air may be sufficiently hot to damage the hose when running continuously. Larger air receivers are recommended for stationary machines.

We are always glad to furnish further information on request.

Air cleaners should be used on the carburetor and air intakes, especially where the compressor operates in dusty atmosphere.

It should be understood that the machine may be assembled differently if other sizes of air receivers are available at less cost or different trailer hitch, axle wheels or battery box is desired. In some cases it may be desirable to make up a special frame, canopy, gasoline tank and instrument panel similar to other makes of compressors instead of using those Ford parts. We do not recommend the use of an air receiver any smaller than 16" X 42" because the air may be sufficiently hot to damage the hose when running continuously. Larger air receivers are recommended for stationary machines

We are always glad to furnish further information on request

There arre many Model A enthusiasts who have extensive knowledge of the Gordon Smith Compressor. Hopefully, some of them will read this article and point out additions, oversights or errors in this description, and perhaps create a movement for a special interest group within MAFCA or MARC. One of the leading knowledgeable individuals is Charles Brown of Nashville, Tennessee. In 1976 Charlie's MAFCA chapter, the Mid-Tennessee Model A Ford Club, hosted the National Meet. Charlie wrote an/ extensive article about the Smith Compressor for the Official Meet Program. The host club had restored a Smith Compressor for presentation to the Ford Museum as part of the National Meet activities. Charlie provided a copy of the program article and several other documents which form a significant portion of the factual basis for this article. Charlie's knowledge comes first hand. He was an employee of the Peterson Machinery Company of Tennessee. In late 1932 the Peterson Company of Nashville, a construction equipment company, became the first authorized builder and distributor of Smith Compressors. The Peterson Company would purchase for $25.00 any good Model A in running condition. It has been estimated that at least 1,000 Model A's were purchased and converted into air compressors by the Peterson Company.

As described in Brown's article, "Three employees constituted the work force of the Gordon Smith Company when it was formed in 1932. The production goal that first year was 50 units. When that goal was reached, it was changed to one machine for each working day or 250 machines per year. This goal required a long time to achieve, but when it was attained, the goal was immediately changed to two per day. "

Apparently there was even more demand for the compressors than the staff of the Gordon Smith Company could meet. Brown's article states, "Three months before the stock market crash of 1929, John Peterson mortgaged his home to raise the capital necessary to enter the business world as the Peterson Machinery Company." By 1932 that company began producing additional Smith Compressors. Brown's article continues: "in 1938 Mr. L.C. Skinner came to work for Peterson. Who was L.C. Skinner? None other than the personal mechanic of Henry Ford. Skinner knew Model A engines inside and out, backwards and upside down, even though he bad worked mostly on Ford's Lincoln. In many ways Skinner was responsible for the long life of the air compressor. As the machine came to be replaced by larger, better ones; Peterson's became one of the few places where expert, authorized service could be obtained. The result was that Skinner was keeping the Model A air compressor going long after they bad been "officially" discontinued. Until his death in 1970, L.C. Skinner remained with Peterson. His son is a Peterson employee today. "

Model A/smith compressor/Smith Article2-17-07new.doc