Building a "Fronty-Ford" Race Car

(Secrets of Speed Series)

Written for
FORD OWNER AND DEALER

By the Builder
ARTHUR CHEVROLET

EDITOR'S NOTE:—The consistent performance as well as the splendid speed shown by the Fronty-Ford racers in the 1923 Memorial Day races at Indianapolis, when a Fronty-Ford won fifth place at an average speed of 82.25 miles an hour, has awakened unusual interest in these cars. Through the kindness of their famous builder, Mr. Arthur Chevrolet, we are fortunate in being able to publish definite information telling just how these cars are built. "Fast Ford" enthusiasts will find much of interest and profit in this article.

FOR DIRT track races—which are won on the turns—a shorter wheel base allows increased speed and decreases the weight. And so the following instructions for a racer of 88 inch wheel base, which we consider most satisfactory, will be given.

Cut the side members of a standard Ford chassis frame at a distance of 21 inches from the front face of the rear cross member. Then shorten this 21-inch section of the frame to 15 inches. Now insert this in the long side members—which are tapered. In other words, telescope the 15-inch length into the main part of the frame, and clinch the two sections of the frame together with a few rivets.

Purchase an extra front cross member, and rivet this on the front part of the frame, 8 inches back of the original front cross member (this 8 inches is from center-to-center of each cross member). Do not disturb the standard front cross member as the front spring fastens to this original cross member in the regular manner, while the added cross member carries the front engine support. This will set the engine 8 inches further back than in the standard car. And it has been our experience that this is necessary in order to secure a properly balanced car for dirt track racing.

Front Axle

Take a regular Ford front axle and cut the I-beam in two at the center. Then cut a section, 5 inches long, from the left half and weld the two halves together. (This welding must be done by a competent welder with a welding rod of approximately the same proportions as the steel in the axle—this is very important.) After the axle is welded and joined together, shape two pieces of steel to fit in the channel of the I-beam. These pieces should be approximately 8 inches long, and one piece should be welded in the channel on each side of the axle. This is done to insure against breakage of the axle in the weld.

Now install a set of front underslinging brackets, which fasten with the bolts furnished through the spring perch hole in axle. Also install a special offset front spring in the regular way, with standard Ford shackles.

Install a pair of special radius rods, the front ends of which are drilled for the underslung bracket bolt to go through top and bottom. Now bring these radius rods alongside the frame, and mark the center of hole in radius rod on frame. Then rivet a pad, shaped somewhat like a carburetor flange, on each side member of frame. And drill a ⅝-inch hole through frame, which is the same size hole as in the pad.

Install the case-hardened radius rod anchor bolts, and put lock nuts and cotter pins on inside of frame. Install a set of special racing steering knuckles in the usual manner. This completes the front axle assembly (for a car off-set 5 inches towards the left or inside of the track) which we have found to be of great benefit in taking turns on flat tracks at high speeds. This of course narrows the tread of the car to 51 inches.

Rear Axle (Roller Bearing)

One method of underslinging the rear axle is by the use of special underslinging brackets which are attached as follows: Remove spring perches, and install these spring perches in center holes of each bracket, but leave them loose until the brackets are in place. Install brackets, using large bolt to fasten the bracket to place where spring perch was originally located, with the front end of the bracket resting on rear radius rod.

Drill a ⅜-inch hole through radius rod (to register with the hole in bracket) put bolt in place and tighten. Turn spring perch to perpendicular position—but upside down—install spring shackle, and fasten to rear spring. Let weight of car rest on spring, tighten spring perch nuts as tightly as possible, and put in cotter pins.

When a more substantial or stronger construction is desired for rear underslinging, dismantle rear axle completely. Take right side axle housing first; remove all brakes and connections, remove roller bearing sleeve and spring perch. Cut off the rivets which hold the brake flange in place, and drive out rivets. Remove collar from inside of axle tube. Press brake flange off axle tube, turn flange one-quarter of a turn forward, so as to bring spring perch hole in line with propeller shaft. This brings brake lever at bottom of axle, but does not interfere with the proper working of the brake.

Press flange back as far as it was originally. Drill new holes in axle tube, and rivet flange on axle tube. Install spring perch in perpendicular position (facing upwards as before) and tighten. Now spread radius rod just enough to allow it to clear the spring perch. Use the hole, which was originally the top hole for the radius rod, as bottom hole. Insert bolt, and drill a new top hole for radius rod. Replace bearing sleeve, bearings, etc.

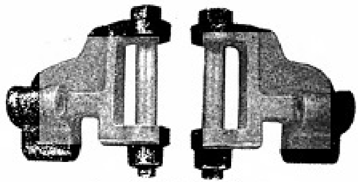
For the left side axle tube, proceed in the same manner as described, except that when the brake flange is removed, 5 inches must be cut off axle tube. Then machine outside of axle tube to proper diameter to receive brake flange. Also bore inside of axle tube to proper size to receive roller bearing sleeve.

Replace brake flange, turned one-quarter turn forward in bring spring perch hole in line with propeller shaft, and reassemble.

Cut off 5 inches from differential end of axle shaft. Cut new groove for split ring, and a new keyway at same distance from end of axle shaft as formerly. This completes the axle housings for a 51-inch tread car, offset 5 inches to the left, the same as the front axle.

Special Axle Shafts

As the weight of the car is thrown on the right-hand axle when making turns at high speeds, the severe strains of racing make it desirable to use stronger axle shafts. Since the quality can hardly be improved by the use of better materials, we advise the use of larger axle shafts to increase the factor of safety.



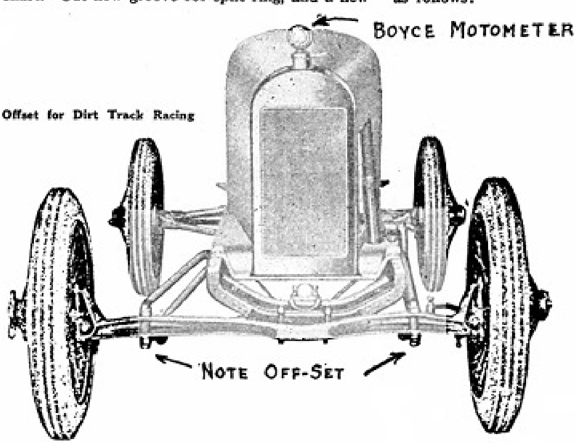
Front Underslung Brackets

We can furnish special roller bearings, with smaller rollers, which allows the use of a new shaft of 1 5-16 inch diameter (where the shaft fits in the bearings), instead of the usual 1 1-16 inch size. These special axle shafts are made of electric crome vanadium steel and are heat treated and ground-to exact dimensions. When installing these oversize axles, it is necessary to bore out the wheel hubs to a larger size. This can be done by any good machinist on a lathe.

Rear Axle (Ball Bearings)

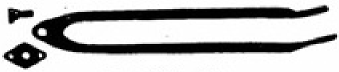
When it is desired to have the axle shafts run on ball bearings, (which is the construction we use on our own cars and recommend) proceed as follows:

Offset for Dirt Track Racing



Refer to instructions above, at point where the brake flange has been taken off. Bore out axle tube just enough to get a good smooth hole and, about one inch further in than rivet holes. Get a piece of seamless steel tubing; 2½ inch outside diameter and 1½ inch inside diameter. Turn this on a lathe to proper diameter for a press fit in axle tube and of proper length to reach shoulder in axle tube. Then press the sleeve in place, leaving enough of the 2½ inch tubing to length-on axle tubing ¼ inch. After pressing the sleeve in place, it may be found that the brake flange will not fit over the axle tube, on account of the axle tube being expanded by the sleeve. This is caused by too tight a fit and the remedy is, of course, to take a light cut over the outside of the axle tube, to bring it back to its original dimension.

Now press flange back into place, as explained,



Front Radius Rods

with spring perch hole in line with propeller shaft. Drill rivet holes in flange to 9-32 inch through axle tube and sleeve, and tap these holes to 5-16 by 24. Countersink holes in brake flange, put in cap screws and cut these off about 1/8 inch above flange and rivet them. The reason for not using rivets clear through is that the heads of rivets inside the axle sleeve would interfere with axle shaft.

Machine end of axle tube and sleeve to proper diameter to fit snugly a No. 1211 New Departure ball bearing. This bearing is mounted in a special carrier, which bolts against the brake drum, using the same bolts. It is necessary, however, to cut a slight recess in brake drum, approximately 1-32 inch deep, of the exact diameter of this carrier, so that the load will rest on the shoulder of this recess and relieve the bolts of the load. This construction also includes the use of the large axle shafts.

Propeller Shaft and Housing

Install standard Ford crank case in frame, with front end resting on motor support fastened on second cross member, and drill new holes in

Offset Springs

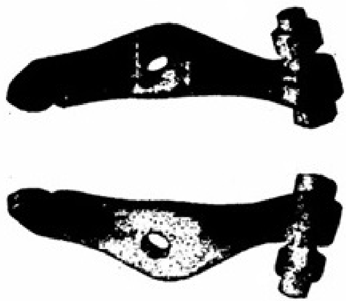
frame to match holes in rear engine brackets.

Take a universal ball cap, front, which fits into the front end of the crank case. (We recommend a special ball-bearing cap for this purpose.) Bolt this on crank case in the two lower holes of the cap. Next, mount the regular propeller shaft and housing on rear axle. Install rear spring in rear cross member in usual manner with regular Ford rear spring clips. But install these clips upside down—that is, with the nuts uppermost. This is done in order to get more clearance over the axle. In order to keep these clips from slipping sideways, it is necessary to drill the plate which is now on top, and to put in a pin to fit hole in the cross member.

When building off-set car, it is necessary to use a special off-set rear spring. Bring the ball end of the propeller shaft housing against the ball cap which is fastened on the rear end of crank case. Assemble these parts, putting bolts through both parts of ball cap and tighten bolts. Make sure that the propeller shaft housing is exactly parallel with frame side members, and measure distance from rear spring on frame to spring perch on axle. That is the exact amount that drive shaft and housing will have to be cut off. For a car with 88-inch wheel base, the measurement will be approximately 25½ inches.

To shorten propeller shaft and housing, proceed as follows: After measuring length to be cut off, carefully mark off this same distance on propeller shaft from front of universal joint end, and saw off shaft at this point. Machine shaft to same diameter as formerly, to fit bearing in propeller shaft housing, and mill a new square section on end of shaft.

Cut propeller housing at a point about 4 inches from the rear end, then mark the same distance



Rear Underslung Brackets

on front part of housing as was cut off drive shaft, approximately 25½ inches, and cut this off. Bore both halves of housing just enough to get a good smooth hole to a depth of about 6 inches in each half. Take a piece of steel tubing of 2 inch outside diameter and 1⅝ inside diameter, and turn this on a lathe to exactly the same diameter as the hole in the housing. Heat housing to about blue heat, and insert smaller tube to depth of 4 inches and allow to cool off. Heat other half of housing to same blue heat, and insert other end of smaller tube; taking care that radius rod eyes, in front end of housing, are in same relative position to holes in base of housing as before cutting.

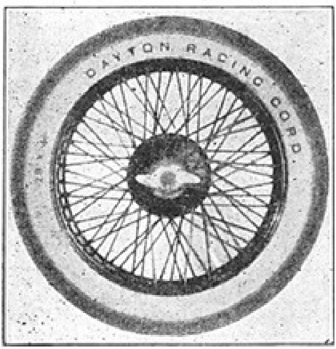
Weld at joint through to smaller tubing. Install shaft and bearings in housing, mount pinion on shaft, hold housing upright with pinion resting on floor. Plaee universal joint in place and be sure that it is in as far as possible and resting against babbitt bearing in housing. Mark hole through universal joint on shaft for pin which holds universal joint in place. Dismount shaft from housing and drill hole of same size as was in end of drive shaft originally.

Cut radius rods at a point about 12 inches from rear end, and cut off a piece towards front end about 22 inches long. Flatten this out and telescope in short rear piece to proper length to fit on axle. Then put in two small rivets to clinch this in place and weld at the joint.

Gear Ratios

Many drivers entering the racing game have the notion that by installing a higher gear ratio, such as 3-to-one, they will be able to derive greater speed from the car. While this may be the case where all running is done on long stretches of road, the exact opposite is the case in dirt track racing.

In the up-to-date racing car, fitted with a small engine, the increase in power is due to higher engine speeds and, the smaller the engine, the higher the engine speeds. It therefore stands to reason that, when the engine design has been altered so that engine speeds of 3,500 to 3,800 are possible (instead of 1,800 to 2,000), it would be folly to also increase the gear ratio which, provided that the engine could pull this high gear ratio and still attain this high engine speed, would give the car a speed of 100 miles an hour or more.



Dayton Racing Wheel

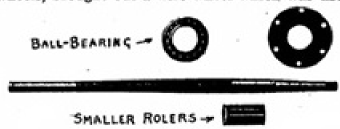
Now it is a well-known fact that it is practically impossible to use a speed of more than 70 miles an hour on any half-mile dirt track; so the logical thing to do is to install a lower gear ratio, which will give a speed of approximately 70 miles at full engine speed. The benefit of this low gear ratio is most apparent when car is rounding turns and picking up speed on the short stretches. And the car with the lower gear ratio will gather speed much quicker than the car with the higher gear ratio, and will easily outdistance it on half-mile tracks. This is done by simply substituting a 10-tooth pinion for the 11-tooth pinion, which is the standard Ford pinion. Any Ford dealer can supply this.

For mile tracks, we recommend that the standard gear ratio, which is 3.63-to-one, be used. When it is desired to make speed trials on a straight-away course of a mile or more in length without any turns, then the 3-to-one ratio is recommended.

Wheels

The wheels are a very important factor in any racing car. No one should ever attempt to drive a racing car equipped with wood wheels, as they are not strong enough to withstand the severe strains imposed on them by taking turns at high speeds. While some drivers favor disc wheels, we recommend wire wheels for racing on half-mile dirt tracks.

After numerous experiments we have, in connection with the makers of the Dayton wire wheels, brought out a wire wheel which was used



Oversize Axle Shaft

in winning fifth place in the Indianapolis race, without wheel or tire changes of any kind, being the only car in the race to make this record.

Tires

For dirt track racing, nothing but the best will answer the purpose, as the driver's life depends on the tires. Several tire makers are making special racing tires for Fords which we can honestly recommend.

Steering Gear

The steering gear is a very important item in the construction of a racing car. We do not recommend the use of the regular Ford steering gear, as we do not consider it substantial enough for racing car use. We used the C. P. C. balanced pressure steering gear at Indianapolis, and this gear was also used on several of the other cars in the same race. This gear is very light and very strong. The steering gear is mounted on the frame by means of a bracket that is furnished with the gear, and a drag link or steering gear connecting rod is also furnished with the outfit.

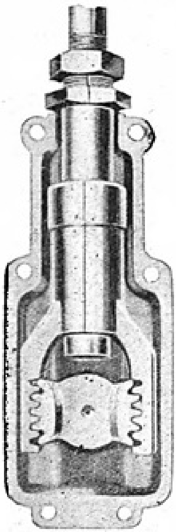
Engine Changes

Use regular Ford crank case and cylinder block (starter type). Some drivers prefer to have the new block reground, in order to secure a smoother finish. But our opinion is that the finish on the regular block is entirely suitable for racing purposes.

On account of the increase in power developed by the use of the Frontenac cylinder head, the regular Ford crank shaft (or any other crank shaft of the same size, whether it is counterbalanced or not) will break sooner or later and thereby cause great damage to the engine. To overcome this, we have brought out a special oversize crank shaft which entirely overcomes this defect.

In order to fit this special crank shaft to the cylinder block, it is necessary to fit larger bearing caps, which we can supply, and to bore out the main bearings (with new caps in place) to 1¾ inch diameter. And then re-babbitt these main bearings and bore babbitt to 1⅝ inch, which is the size of the larger crank shaft on the main bearings—instead of the usual 1¼ inch Ford standard size.

The connecting rod journals on this special crank shaft are 1⅓ inch (instead of the 1¼ inch on regular shaft), and it is necessary to bore the connecting rods to 1½ inch diameter, re-babbit them, and bore out the babbitt to 1⅜ inch to fit the larger crank shaft.



Balanced Pressure Steering Gear

The connecting rods, which are standard Ford rods, should be accurately balanced at both ends. That is, all the big ends should weigh the same, and all the small ends or piston pin ends should be of the same weight. To accomplish this, proceed as follows:

Balancing Is Important

Secure a pair of accurate scales, such as drug stores use, which balance on knife edges. Do not use spring scales of any kind. Then let small end of connecting rod rest on bench or table, at same height as scales and at proper distance to allow big end to rest on scales. Now determine which rod is the lightest, taking care that all rods rest at same distance from scales. After finding lightest rod, balance scale with weight on graduated bar—then remove as much material from big ends of the other three rods as will reduce them to the same weight as the lightest rod.

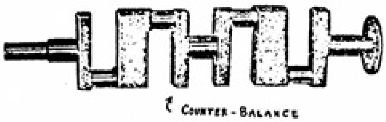
After the big ends have been balanced, proceed in the same manner with the piston pin ends of the rod. After all the big ends and all the piston pin ends have been equalized, then place the entire rods on the scales and find out which rod is the lightest. There should not be any material difference but there may be some. This can be taken care of by removing a small amount of material from the I-beam section of the rod, or by drilling small holes in this section of the web at equal distances from each end.

Fly Wheel

The regular Ford fly wheel is used, but the magnets and magneto coil assembly are removed. The fly wheel should be turned down to 10-inch or 11-inch diameter. Do not attempt to build a racing engine with a full size fly wheel, as there is great danger of the full size fly wheel breaking and doing a lot of damage. After turning flywheel to proper diameter, it should be carefully balanced.

Pistons

Now fit light pistons into the cylinder block. We consider aluminum alloy pistons good for this purpose on account of their light weight as this is a very important factor at high engine speeds. The pistons should also be balanced accurately (with pins and rings installed) as there may be a slight variation in the weight of the pistons, the piston pins or piston rings.

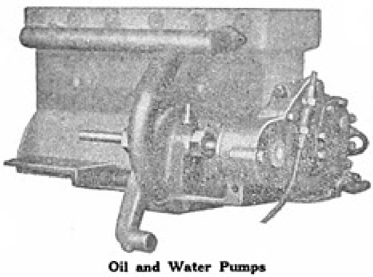


Oversize Crankshaft Counterbalanced

The balancing of moving parts should be done very carefully, as it has great bearing on the performance and durability of a high-speed engine. All aluminum alloy pistons should be allowed approximately .003 inch clearance per inch of bore, on the skirt of the piston. And as the Ford cylinder is of 3¾ inch bore, this means that pistons require approximately .012 inch clearance on the skirt. From the piston head to the third piston ring, this clearance should be at least .006 inch per inch of bore, so that for the Ford size, this will be approximately .024 inch.

Piston Rings

The rings should be as narrow as possible. We recommend and use rings only ⅛ inch wide in our own cars, for the reason that they seat more quickly. Also in view of the fact that racing pistons must have such excessive clearance that wider rings do not adhere to cylinder wall when piston goes over center and rocks slightly in the cylinder at the time of explosion. The wider ring, at this period, only touches the cylinder wall at the upper edge of the ring on one side and at the lower edge of ring on the opposite side, causing the face of the ring to become slightly rounded after a short time, and allowing



Oil and Water Pumps

part of the exploded gases to escape down into the crank case, thus injuring the lubrication and causing overheating and loss of power.

We also recommend that a lighter and different style of piston pins than the Ford pins be used, as the Ford pins are rather heavy for racing use, and are liable to break where they are notched for the clamp screw in the connecting rod.

Oiling System

Provision must be made for a pressure feed oiling system. The crank shaft, as previously described, is drilled from the main bearings through to the connecting rod bearings. The front main bearing feeds oil to No. 1 connecting rod. The center main bearing feeds oil to No. 2 and No. 3 connecting rods, and the rear main bearing feeds oil to No. 4 connecting rod bearing and also, through an opening through the rear end of the shaft, to the transmission shaft (which is drilled in the center far enough to allow a small hole to be drilled on shaft to feed oil to the main transmission bushing.)

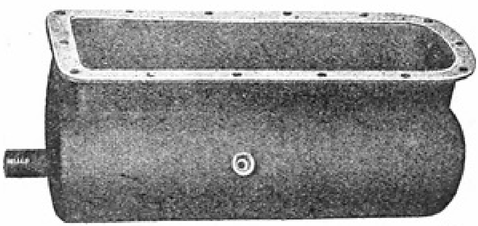
In order to get the oil to the crank shaft, it is necessary to bring an oil line from the oil pump to the left side of the engine. This line is of 3/8 inch copper tubing. Then, at a point exactly between No. 1 and No. 2 cylinders and 2 inches above lower edge of cylinder casting, drill a 7-16 inch hole and tap a 1/4 inch pipe. Install a 3/8 inch Tee, with 1/4 inch pipe thread, the part of this Tee which screws into the cylinder block should be tapped on the inside to 1/8 inch pipe thread to receive another smaller Tee, which should be of 1/8 inch pipe on one part and 1/4 inch copper tubing on the other ends. This smaller Tee is then inside of cylinder block.

Then run one 1/4 inch line from this Tee to the front main bearing, and another line to the center main bearing. Drill another hole, at a point exactly between No. 3 and No. 4 cylinders, tap out 1/4 inch pipe and install by-pass regulator. Connect this to other Tee, which is already on front end of block, with 3-8 inch copper tubing. The part of by-pass, which fits into cylinder block is tapped out 1/8 inch pipe. Into this opening install 1/4 inch tubing elbow, and run oil to rear main bearing.

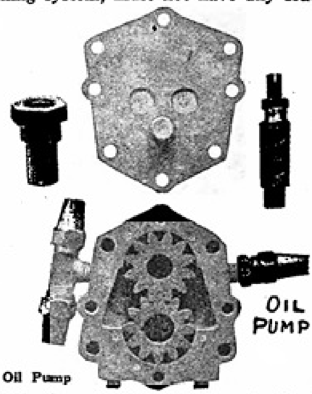
There are still two 1/8 inch pipe openings in by-pass. These openings face towards rear of engine. Into the first opening (nearest to the cylinder block) install an elbow for 1/4 inch tubing and connect this to oil gauge on dash. At a convenient place on the line, install a 1/4 inch tubing Tee to provide an oil connection to rear bearing of transmission, as explained in section on transmission.

Into second opening of by-pass, which is the overflow, install an elbow for 5-16 inch tubing and run a 5-16 inch line to top of transmission, so placed that the overflow of oil will spray on the transmission bands. Drill main bearing caps in center with 11-32 inch drill and tap out 1/8 inch pipe. Install elbows for 1/4 inch copper tubing and connect.

Care must be taken to drill these holes in main bearing caps so that they will register with holes in crank shaft. Cut a circular groove in bearing, approximately 1-32 inch deep, to allow oil to reach crank shaft at all times. The bearings, with this oiling system, must not have any side



SUB-BASE FOR OIL



Oil Sump and Oil Pump

grooves or flats of any kind, such as are standard practice on regular Ford bearings. In other words, they must be 100 per cent. bearings, as otherwise the oil will run out of the sides of the bearing throwing too much oil into the cylinder and causing spark plugs to foul, and not feeding enough oil to connecting rod bearings, allowing them to melt or burn out.

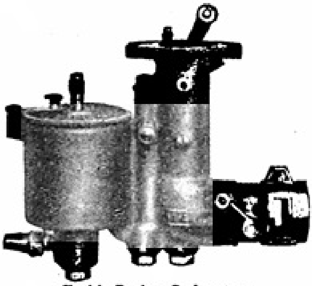
Bearings

All engine bearings should be burned in—but not as much as on standard Ford engines. After burning-in, shims should be added to give .001 to .002 inch clearance. Use the regular Ford cam shaft and bearings, but we recommend that a special cam shaft big gear, made of nickel steel, be used. The regular Ford cam shaft gear (being made of cast iron with only four spokes) will break in a few minutes running at high speed.

The end of cam shaft, extending beyond threads for nut, should be cut off, and a cam shaft extension (which drives oil pump and is threaded to serve as a cam shaft gear nut) installed.

Oil Pump

An oil pump is attached to the cam shaft extension and connected to the oiling system, making necessary connections from oil pump to connections in side of cylinder block to feed oil to the crank shaft. Install a sub-base oiler, which fastens to the underside of crank case in place of the regular Ford crank case lower cover door. At the rear of the sub-base oiler, there is a piece of ¾ inch pipe which projects about 1½ inches. Mark a space on the fly wheel housing to correspond with this pipe. Drill hole large enough for a ¾ inch pipe, and weld a short length of pipe in this housing. Replace sub-base oiler with gaskets, and connect both pipes with a short piece of radiator hose of suitable size. Now connect opening at side of sub-base oiler to right side of oil pump.



Zenith Racing Carburetor

Timing

The cam shaft should be timed at the same mark which is used for regular Ford engines, no special timing or special cam shaft being necessary if the Frontenac cylinder head is used. Now install the high-tension magneto, which should be installed with a suitable coupling to provide means for timing the magneto.

The magneto should be so timed that, with the spark lever at full retard position, the breaker points open exactly at the time that the piston reaches upper center coming up, and before passing center. Any excessive spark advance is of no benefit, on the contrary, it will slow up any engine and will specially retard acceleration of the car.

Transmission

The regular Ford transmission is used, the only change necessary being to drill a hole in middle of center of main shaft, and a small hole to register with the bushing, in order to oil the transmission properly. Drill also another hole in shaft to throw oil to the triple gears. These holes should be drilled with a No. 55 drill.

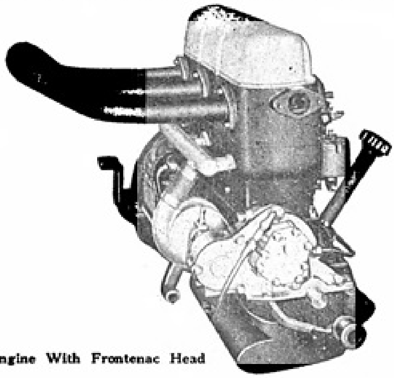
The overflow opening in by-pass regulator, included in oiling system, should be connected with a 5-16 inch tubing to transmission cover and placed so as to spray oil on transmission bands. The other opening on by-pass should be connected to oil-gauge on dash by means of ¼ inch tubing. At a convenient place on this line, a Tee should be installed; and a line run from this to the rear transmission bearing and ball cap. The opening, in the connection fastened to the transmission cover, should be plugged with solder and drilled with a No. 60 drill, otherwise too much oil will be fed by this bearing into the universal and rear axle.

It is advisable to balance the transmission with fly wheel as a unit. The regular Ford transmission bands are used.

Cylinder Head and Carburetor

Now install the Frontenac cylinder head and special racing carburetor with intake pipe. We advise fitting a piece of flexible tubing to the air intake opening of the carburetor, long enough to come through the dash, cutting a hole in the dash to accomodate this pipe. There are two reasons for using this tube, the first being that on dirt tracks especially, there is so much dust that a considerable quantity of dust is taken into the engine while running. And this dust acts as an abrasive which causes rapid wear of all parts of the engine. By taking the air from the dash, the amount of dust is considerably reduced. The second reason is that the engine will pick up better—after shutting off—with this tubing in place, owing to the column of moving air in this tube.

Install special racing exhaust manifold and cylinder head. When head is installed, the bolts which hold head on cylinder block should be pulled as tightly as possible. The valve push rods should be given .020 inch clearance, after running the engine a short time, just enough to warm up. The cylinder head bolts should be tightened again, and the valves adjusted to .020 inch clearance for intake, and .015 inch clearance for the exhaust valves. Before starting engine, it is necessary to prime the oil pump. This is done by removing the top connection on the oil pump and filling pump and line with oil, and replacing the connection before starting the engine. It is also necessary to prime oil pump every time the oil is drained out of crank case.



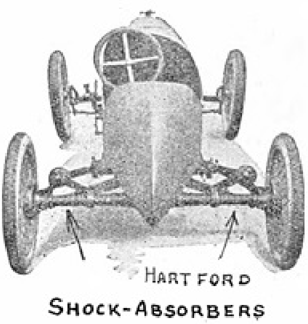
Engine With Frontenac Head

Breather Tube

It is necessary to install a breather pipe on the cylinder block, preferably on left front side, to be also used as an oil filler. (The breather pipe from a Chevrolet or Oldsmoblie engine is suitable for the purpose.) When the engine s built, it should be filled with a generous supply of common light oil and run for about half an hour. Then this oil should be drained, and castor oil or other good heavy cylinder oil put in. For racing ,we recommend castor oil only, as it is the best lubricant known, such brands as Oilzum, Owl Cold B Pressed, or Baker A. A. A. are very suitable for this purpose.

Radiator

We can use a regular Ford radiator, with the addition of a special shell which is stream-lined to reduce the wind resistance. For the best results, however, we recommend a special radiator which is more efficient. The radiator should be



mounted directly over the second or extra cross member and fastened in the usual manner.

Racing Bodies

While it is true that some cars are being driven on race tracks without any body outside of a seat fastened to the frame, we do not approve of this as it is very dangerous. For the reason that any bumps on the track or a tire blow-out will jar the driver off his seat, and very likely cause him to lose control of his car, causing an accident which may result in serious injuries to himself and to other drivers.

When the racing car is equipped with a substantial body, the driver becomes, in a manner of speaking, part of the car and is able to control the car much better. This is a very important point in winning races. The body should be equipped with a double tank behind driver's seat, one part of tank for oil and the larger part of tank for gasoline.

Fuel Pressure Feed

It is imperative that gasoline be fed to the carburetor under pressure, as gravity feed will not supply the carburetor fast enough at high speeds. The oil should be fed to engine, as required, under pressure. It is necessary that the caps on the fuel and oil tanks be air tight. The gasoline line, from the tank to the carburetor, should be of 3-8 inch copper tubing, well supported along the frame, and equipped with an easily accessible shut-off valve. The gasoline line should be cut at a convenient place near the carburetor, and joined together with a piece of good rubber hose. This is done to stop vibration, which would eventually cause the copper tubing to break.

On the dash board of the body, a hand pressure pump should be installed within easy reach of the driver. Then a short line of ¼ inch copper tubing run from this pump to a Tee, then from each side of the Tee run a separate ¼ inch tube to gasoline tank and to oil tank. In the line which runs to the oil tank, a shut-off valve should be provided within easy reach of the driver, in order that the air pressure can be cut off from oil tank when empty. Otherwise, when oil tank is empty, the air pressure from gasoline tank will escape through oil tank outlet.

The outlet pipe, from oil tank to engine, should be of rather large size. We recommend at least ½ inch pipe, and this should be provided with a valve within easy reach of the driver so that, when oil gauge on dash begins to give indications that oil in engine is getting low, a fresh supply can be allowed to run in to engine at once, without stopping engine or car.

There should also be mounted on the dash an oil pressure gauge that will register at least 75 pounds, and an air pressure gauge that will register 10 pounds. While racing, a pressure of 3 to 4 pounds should be maintained on gasoline tank while, for road work, a pressure of one pound is sufficient.

Steering Wheels and Controls

The steering post bracket should now be fastened to the dash board in the most convenient position to suit the driver of the car with the steering wheel in place. The steering wheel should be of the best material obtainable. We recommend the use of a special spring-steel spoke steering wheel, as it eliminates all danger of the driver being injured by the spokes of the steering wheel, as is often the case in an accident.

Both ignition switch and spark advance control may also be mounted on the dash. A regular carburetor control, or dash adjuster, is entirely suitable for this purpose.

A Moto-Meter should be installed on radiator cap and the Moto-Meter should be watched very closely while running, on account of the fact that any sudden rise in the temperature of the engine is a sure indication of trouble;—either lack of water in cooling system, lack of lubrication, or faulty timing of ignition. A lean mixture in carburetor will also cause overheating.

Shock-Absorbers

Shock-absorbers should be installed on any racing car, as they not only protect the car from severe shocks, but are a great help in controlling the car at high speeds.

A car built according to these instructions should easily negotiate any good half-mile track in 30 seconds, or even less if the track is banked. It will negotiate a mile-track in 46 to 50 seconds, according to surface and the turns on the track. On straight-away racing, equipped with 3-to-one or 2¾-to-one gear ratios, it will attain speeds of 100 miles per hour and over. Such cars will run consistently and should be regular winners in any dirt track race meet.