Building a Single Seater Dirt Track Racing Car

THE plans which accompany these directions for building a dirt track racer are prepared after the design of the single seater shown in Figs 33 to 37. The car was designed and built by Don Campbell of Cincinnati, an experienced racing car builder and dirt track driver. It is one of the most successful he has ever worked on. Although he no longer drives in the races he follows them very closely and has been able to have the racer pushed around the half-mile ovals at record-breaking speeds. In his first try-out at the Hamilton-Cincinnati Speedway he was able to navigate the half-mile oval in 24.2 seconds. The car was easily the class of the race. At a later race, on the Winchester (Indiana) track, the time made by Campbell's driver was 23.4 seconds for the oval. At the time these records were made they constituted not only track but national records. Later on these records were broken by 0.8 seconds. The percentage of speed over that attained by the racer described herein is not very great, so that those who are anxious to build a job which is really fast need not hesitate in following the general plan as laid down on the blueprints. This car has a record for the Milwaukee flat dirt mile circular track of 91.58 miles per hour. It is a consistent winner.

It is not anticipated, of course, that anyone is going to follow these plans exactly as they are given. As long as the dimensions are not varied too greatly, there is no reason to believe that the cars built will not be quite successful. By following out the directions given herein and that given on the drawings, a great deal of time will be saved in the building up of the chassis and the cost of building the chassis need not be very heavy. As a matter of fact, almost all of the parts required may be secured at very little expense indeed.

Naturally it is necessary to consider the engine first of all. Here, however, the lines are not so hard and fast as might seem at first. It is a well known fact that many very successful cars have been built from the Ford T engine block. It is also a well known fact that these Ford T blocks are nothing more than the backbone of the engine and most of the other parts in the engine are quite special. It is for this reason that it is suggested that thought be given to the possibility of making use of some other type of engine than the Model T, unless such parts as may be secured from reputable firms, long trained in the building of racing car parts, are to be purchased.

Our records show that while a standard Model T engine will develop about 17 horsepower under normal conditions, the Model A engine, under normal conditions, will develop approximately 40 horsepower. It is for this reason that it is so much easier to get real speed and power out of a Model A. The Model B Ford engine described in Chapter 4 is well adapted to this single seater chassis.

On the other hand, by taking the Model T block and building from it, it is quite possible to get a very powerful and very fast engine. You will have to go to some racing car parts supplier for the special race car parts.

The point to be remembered here, however, is simply this. It is possible to mount not only a Model T or Model A Ford block in this chassis, but it is also possible to make use of other four-cylinder engines, as, for instance, an Overland, Chevrolet, Star, and personally I see no reason why you could not get results by fitting an Essex six into this frame. On the other hand, you may be able to purchase a Fronty Ford 16 valve engine and so duplicate the car illustrated.

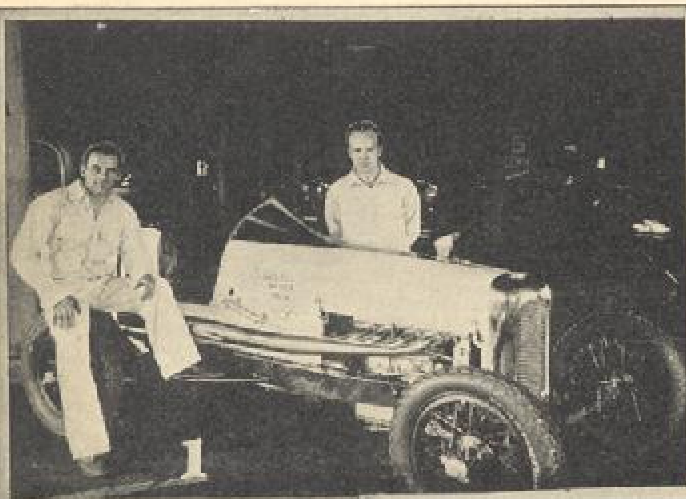
While we do give some instructions on building up an engine, such as is used, we say again that it might be that the Frontenac motor, such as was built into the single seater, might not be possible with you. In that case give considerable thought to the type of engine you are going to use.

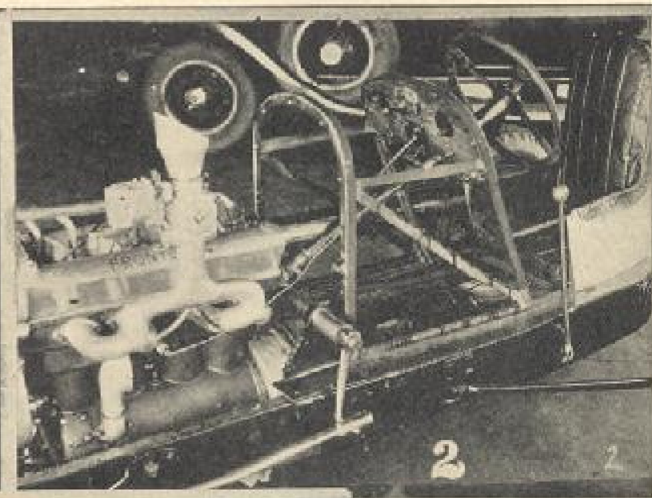
It is not possible for me, in these instructions, to give you complete directions for selecting and fitting up an engine for your racing car. I would refer you to my book, AUTOMOBILE RACING, Edition 2. In that you are able to secure most of the information you will need to have, in order to build, or find for yourself, a successful engine for this racer.

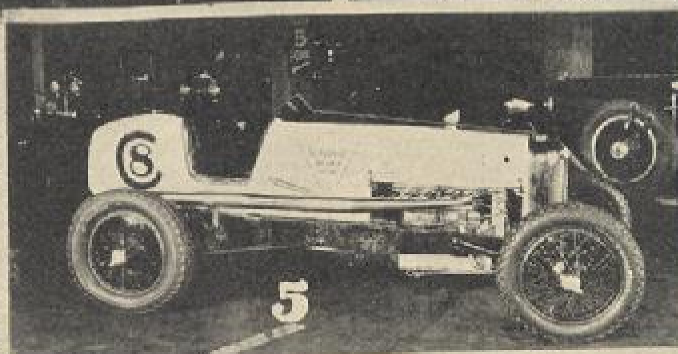
Having determined on your engine, consider the main dimensions of the engine and transmission. Check these carefully and I believe you will find in most cases that it will be possible for you to fit the engine into the space allowed for the hood. If you find it necessary to vary these dimensions somewhat, do not hesitate, but go right along and make the changes. As long as you keep the weight distributed approximately as that which is shown in the plans, that is setting the engine back about 6 inches, we do not anticipate that you would have any difficulty in building a well-balanced car.

Car Balance

The weight of one of these dirt track racers should not exceed approximately 1500 pounds, the one being shown weighing approximately 1400 pounds. Owing to the fact that these cars are designed primarily for use on one-half mile and mile dirt tracks, it is necessary to give thought to their performance on these tracks. While the car must be low, in order to have a low center of gravity, it must not be too low or you







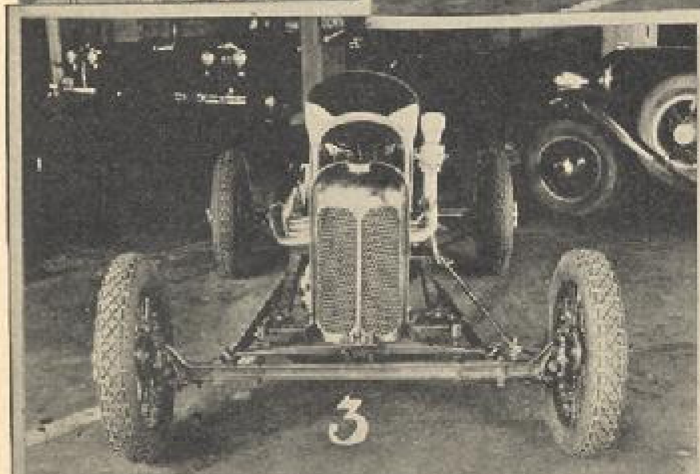


Fig. 33 (1). Don Campbell, builder of the Single-Seater
Fig. 36 (3). Head-on view of the Single-Seater

Fig. 35 (5). The Single-Seater complete

Fig. 34 (2). Steering Gear, Instrument Panel and Cowl Frame
Fig. 37 (4). Right side the Single-Seater Dirt Track Car

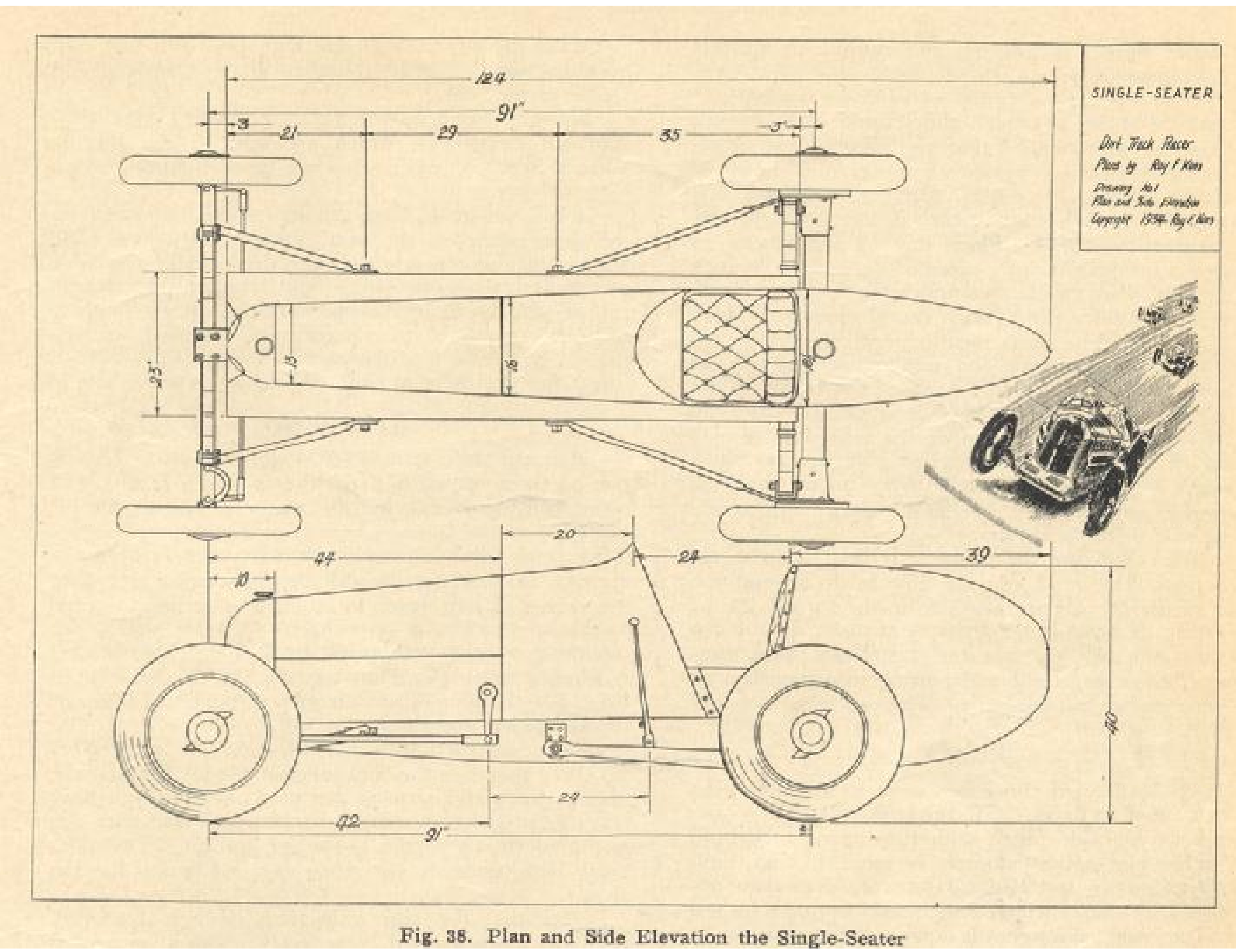


Fig. 38. Plan and Side Elevation the Single-Seater

will have what is known as a "floater." Experienced racing car drivers have learned that it is possible to get the weight so low that the car simply floats across the track as it comes to one of the banked turns. In other words, a floater is a car which tends to slip away from under you on the turns, much after the fashion of a stone which is skipped over the water. Too much weight on the front end of a racer, used on dirt tracks, is likely to cause the car to be carried out of its course, owing to an improper distribution of weight. While this is true on all tracks, it is vitally true on the half-milers. A properly balanced car ought to be so designed that when a tendency to skid occurs it may be pulled out of the skid by putting on power and actually forcing it out, rather than having to slow up in order to bring it around. Sometimes this matter is helped by using a locked differential. Do not attempt to set the engine too far back. Six inches is recommended in this case.

Rebuilding the Car Frame

It is suggested that you spend considerable time going over the dimensions and general plans of the racing car as it is shown in Drawing No. 1. You will note that the frame width is 23 inches and that the radiator itself is but 13 inches wide. The radiator is supported on the old Model T frame cross member. The space between the outer edge of the Model T frame and the radiator shell is filled in by means of false work. That is, sheet metal is fitted over the upper surface of the frame and run to the hood line and to the radiator shell line, to from what might be termed a hood still, although in this case the hood does not come down to the sill. This gives the effect as shown in the plan or top view in Drawing No. 1, Fig. 38.

You will note that the body lines are rather uniform and have a nice, easy, free curve, running from the radiator shell all the way to the tail of the body. In order to form a surface on which to mount the body sills, it is necessary to use some ⅛" metal, 4½" wide and bolt this to the upper surface of the frame, from the cowl line rearward. The same metal may be used from the steering gear mounting bracket forward, thus forming the hood sill mentioned above. In this manner the opening which would otherwise appear between the narrow body and the wider frame is automatically closed up and made neat in appearance.

After you have studied the plans well enough to have them in mind, the next thing to do is to start work on the Model T frame, converting it to your racer demands. On Drawing No. 2, Fig. 29, you will find the frame details designated as (14). Here you will note that the total length of the frame is 86 inches. You will also note that two Model T front cross members are used, one being set 6 inches back of the other. The forward one is used for mounting the Z-bracket (3), in order to undersling the front end of the racer.

In shortening the frame, cut off the rear portion of it. Move the cross member forward to the new position, fitting it in position and running in gussets to strengthen the frame.

In order to make a frame of sufficient strength to stand the beating to which this frame will be subjected, it is recommended that you use the method illustrated in the cross section of the frame, shown in the side view near the center, where you will see that a piece of ½ inch round steel is used to truss or strengthen the frame. Place this ½ inch metal in position and then cut out a piece of ⅛ inch or 3/16 inch flat metal, which can be set under the U-shaped side member and above the ½ inch round member. Have a welder weld these parts together until the frame appears as though it were one solid piece. It will be necessary perhaps to cut out a bit of the frame to the rear, as shown, in order to have clearance for the axle. This will depend somewhat upon the axle you are useing. You may eliminate the welding by laying a length of ⅛"x1½x1½ angle iron under the side members and riveting the channel flange and angle leg on 6" rivet hole centers.

When assembling the frame it is best to make use of rivets. That is, if you are able to do a good job of riveting. If you are not able to do a good job of riveting, we would suggest that you make use of cap screws with SAE threads and castellated nuts, running them on snug tight and putting in cotter keys to keep them from coming loose. The cap screws should be ⅜".

Axles

Possibly the next thing you want to give attention to is that of the axles. Of course it will not be possible for you to do much with the torque tube until you have your engine definitely in mind, in fact, built and ready to be installed. However, since you are going to use an axle which does have a torque tube you will necessarily have to cut it down. What you can do is go right along and build the axles under and after the engine and transmission are in place then you can, as a last measure, proceed to shorten the torque tube.

Front Axle

The front axle is illustrated at (15) Drawing No. 2. Here you will note the parts which are used in its construction. You will also note the geometrical factors which are mentioned as caster, camber and toe-in. You will note, for instance, that the chamber of the right wheel is 0°, that is, the wheel sets absolutely vertical when it is tested with a framing square or plumb bob on a level floor. The reason for building this in that manner is that when you are driving the car on a dirt track a wheel with camber tends to roll over the earth and side-slip. By setting the wheel vertical it will dig into the track in a better fashion and makes the car come around the turns better.

You will note also that the axle beam is an Overland-4, of 1925 vintage. You will recall that these Overlands used a spring perch of the general type of those used on all Ford cars. By using the Model A spring perches and a Model T spring, which is cut down, it is possible to get a very good axle job out of this beam.

The Dodge-4, 1925 spindle bodies are used. It will be found necessary to heat and bend the drag link arm of the left hand spindle body around so as to have 5 inches between the center of the ball and the center of the king pin. This will allow it to clear the spring perch. Use only a medium red heat for this.

Make use of 1923 Dodge king pins and king pin bushings, which will be found to fit the Overland and Dodge equipment.

The hubs used on this front axle are Dodge 1925 standard equipment, which are sent to the Dayton Wire Wheel Co., where they are fitted for the Dayton Wire wheels.

It will be noted that smaller wheels are used on the front than on the rear, these being 18 x 4.50. Heavy duty motorcycle tires are used. The idea back of this design is to provide a light front end which gets rid of dangerous gyroscopic effects, which tend to make the car hard to control at high speeds on the turns. In the case of the rear, wider tires are used—this being desirable in order to secure better traction.

Rear Axle

The rear axle is a 1926 Model T Ford. This is one of those which had the larger brake drums. In order to convert this job the rivets are cut at the inner ends of the tubes, where they are attached to the differential case. The axle tubes are then turned one-quarter forward in the differential case where they are reriveted. In order to mount the spring a special U-shaped bracket is provided to bolt on the spring mounting position on the left hand side. This bracket is illustrated at (7) Drawing No. 2. No shackle is used, but the bolt is run directly through the sides of the U-bracket and the spring eye.

This construction *is not used on the right hand side*. In that case the conventional Model T rear axle, spring perch and shackle are used; so that you have one side of the rear spring shackled and the other one anchored rigidly to the U-shaped bracket. This does away with tendency for side-sway and makes the job steady.

Note that the rear axle tread is not shortened, standard 56-inch tread being used. This is in accord with racing requirements. As illustrated in Drawing No. 2 at (1) Model A rear radius rods are converted to fit the converted Model T rear axle. All dimensions necessary for constructing these are given. Also dimensions for mounting them are given in Drawing No. 1. Note that a piece of 2" x ½" steel is slipped into the flattened end of the radius rod, where it is welded into position. One bolt only is used for fastening this radius rod to the dust shield of the rear axle at the hub position. Use a ⅝" bolt for attaching.

The front axle radius rods are illustrated at (2) in Drawing No. 2. Part of the frame is illustrated also so that the design of this unit is quite simple.

The gear ratio used on the half-mile tracks is 11-40 and on the mile tracks, 9-40. Special pinion gears are used so that it is not necessary to pull the entire axle—merely drop the torque tube from the axle, change the gear on the drive shaft and reinstall. This is done in order to accommodate the car to the different tracks encountered while racing.

The standard Model T passenger car axle shafts are not heavy enough for racing duties. Accordingly it is best that special shafts be purchased from a company catering to that line of supply or that Model T ton truck axle be used and remachined to fit the differential at the inner end and take the special hub at the outer end. Special hubs are furnished by the Dayton Wire Wheel Company, Dayton, Ohio, and are bored to fit the oversized shafts. Special bearings which have rollers of smaller diameter are necessary, thus permitting the use of the larger and stronger shafts.

These bearings are 1¼" inside diameter. The wheels used on the rear axle are Dayton wire wheels, 17 x 5.50, thus giving the larger tire section mentioned previously.

The torque tube (16) Drawing No. 2, is a combination of Model A, at the front, and Model T torque tube at the rear. This tube, of course, will have to be determined according to the design of the engine and transmission being used. For instance, if a Model T transmission is used then the Model T torque tube complete will be used, the only thing being necessary is to shorten it and shorten the propeller shaft. When joining two of these torque tubes, the method used was cutting them near the center and bronze welding, setting on four ¼" x ½" steel strips on edge and brazing around them.

In order to prevent the pinion gear floating to the rear it is a good plan to install the thrust bearing on the forward end of the propeller shaft, just back of the rear half of the universal. Have a collar ½" wide made to fit into the torque tube and over the propeller shaft. Have it lock to the propeller shaft by means of two concealed screws. The thrust bearing is one of the ordinary type found in most salvage shops and being similar to those used in some rear axles, to receive the side thrust or to receive the up-and-down thrust of the steering gear wormscrew shaft. These consist of two steel plates having grooves in them in which the ball bearings, which are mounted in another plate, are allowed to rotate.

Some of the "boys," when building these racers, make use of the 1932 Chevrolet rear axle. In this case the same general plan of mounting is followed. This gives an axle which is sturdy and at the same time has complete ball bearing mounting. With this axle it is also possible to remove and replace the differential rather easily and by this means it is possible to have a greater variety of rear axle gear ratios. Further discussion of this is found in my book, AUTOMOBILE RACING, Edition 2, where the relative advantages of different gear ratios for different types of cars are discussed.

Brakes are an absolute necessity on racing cars and the better the brakes the safer the car. Most of the big time racers have four-wheel brakes. By making use of the external type of contracting bands on the Ford T rear brake drums, a very efficient brake is secured. These brakes are actuated by the brake handle illustrated in (6) Drawing No. 2, which is connected by means of a Ford T cross shaft to and through flexible cables to the brake shoe actuating mechanism.

Springs

The front spring is a six-leaf Model T Ford spring, rebuilt as illustrated at (12) Drawing No. 2. After it has been rebuilt and mounted in position the leaves are held together by means of friction tape, carefully wound round and covering the entire exposed surface of the spring. When mounting this spring on the Z-bracket (3) Drawing No. 2, it will be found

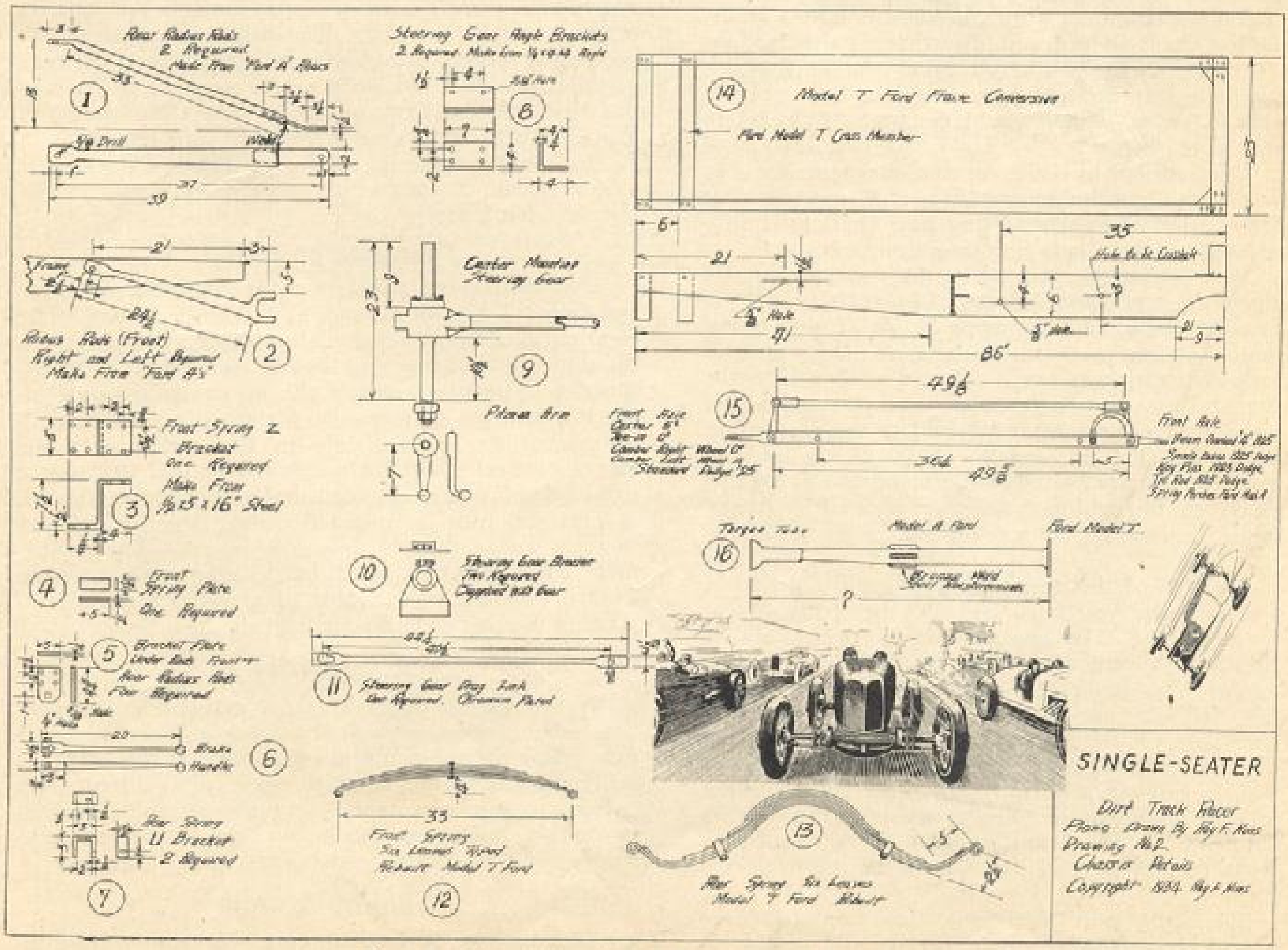


Fig. 39. Chassis Details the Single-Seater Dirt Track Car

Note: Large Shop Blueprints are available from publisher. Price $2.00 for sets of three sheets that it is necessary to make use of the plate (4) Drawing No. 2. The spring is mounted under the Z-bracket rather than on top. The plate (4) is within the U-bolt used for mounting. U-bolts to do this work may be secured in the local salvage shops. The ends of the main leaves in the front spring are cut off and new eyes are rolled.

The rear spring is rebuilt as illustrated at (13) Drawing No. 2 . Five inches from the ends of the spring heat is applied and the springs are bent as illustrated. In order to check the amount of bend, lay a straight edge under the main leaf and measure to the eye, from this straight edge, a distance of 2½", which gives the proper amount of bend.

Shock Absorbers

Hartford shock absorbers are used on all four corners of the frame. These are set up quite tight. It is considered advisable to have the arms mounted near the road wheel mounting position, especially on the front, this change being contemplated with reference to the racer illustrated. Hydraulic shocks, Ford A type can be used in place of the Hartford type.

Steering Gear

Center steering is used for all one-man cars for dirt track racing. While two-man cars are permitted on dirt tracks, the most popular track sport today is that of following the single-man or single-seater car. Unless you are able to pick up one of these steering gears, especially built for dirt track racing cars, at a local salvage station or through some one you know, the best plan is to order it direct from the factory. Then you know that you have a good gear—one which will handle your car and one in which flaws are not likely to develop, which would endanger your safety and that of others.

Do not attempt to use a conventional steering gear and stretch it out by having a special mounting or bracket welded on to the steering gear shaft to lengthen it. This is not a safe nor sane practice.

When you get the gear from the factory you will likely find it provided with several brackets, similar to those illustrated in (10) Drawing No. 2. It was necessary, in addition to these brackets, to make up two more brackets such as are illustrated at (8) Drawing No. 2. These are angle iron brackets which are turned with the legs out and bolted to the car frame. The brackets (10) go over the shafts of the steering gear and in turn are bolted to the brackets (8) so that the gear may be positioned and then secured by clamping the clamp bolts which are on the top of the brackets (10).

The length of the steering column will have to be determined after you have laid out the steering gear for its position. The one used is approximately 31 inches from the center of the cross shaft of the steering gear to the hub of the steering wheel on the upright shaft. Do not depend upon this measurement entirely, but get the body laid out and the steering wheel in position. Sometimes it is necessary to move the wheel in or out a bit in order to accommodate the job to the driver who is going to use it. The steering wheel should be in a position just slightly extended beyond the sloping cowl line. It is 17 inches in diameter.

The steering gear used is a Ross cam-and-lever gear. It is likely that the Ross factory will be able to supply a steering wheel. The best form of steering wheels are those which have a spring steel spider provided. Sometimes these are made by the boys from a blank of saw steel. In other cases they are purchased from the steering gear manufacturers or from supply houses.

Engine

The engine is a sixteen-valve, double overhead cam Frontenac. Camshafts are chain-driven. The block is a Model T Ford. The crankshaft is manufactured from a solid billet of steel, and is what the boys term a circular shaft with 1-⅝" bearings for both mains and rods. The rods are slightly over 7 inches in length on center. They are quite similar to standard Chevrolet rods.

Pistons are Butler Bros. manufacture, being known as "Bunite." They are dome-shaped and aluminum alloy.

The compression ratio used is 10½ to 1.

The fuel used is 40 per cent C. P. Benzol and 60 per cent good grade Ethyl gas.

Note. Since my book, Automobile Racing, Edition 2, Price $1.00 Postpaid, covers racing engine design and construction so fully, the reader is referred to it as a valuable source of information for racing car engine building.

Transmission

The transmission is Model A Ford, in which the second speed cluster is special, having a ratio of 5 of the clutch shaft to 4 of the transmission shaft. The clutch is the multiple disk Model A Ford. The Model A flywheel, turned down to approximately one-half its original weight, is used. The bell housing or clutch housing is special, being designed to mount on the rear of the Model T Ford block, while receiving at its rear the Model A Ford transmission. The transmission is provided with three speeds forward and reverse.

As noted previously, the forward end of the torque tube is Model A, so that it is received properly by the transmission unit.

Instrument Panel

The instrument panel is made of veneered stock and is fitted into Section A of the body frame. The steering gear is provided with a bracket which comes up under the instrument board panel and is bolted thereto. The panel carries the oil pressure gauge on the left and the air pressure gauge on the right, with the tachometer immediately in the center over the steering wheel. The tachometer is an AC instrument driven from one of the camshafts at camshaft speed. A heat indicator is mounted on the steering column directly under the steering gear wheel. The instrument board is covered with burnished sheet aluminum. Spot or burnish it by means of a ½" dowel rod and a patch of emery cloth over it in the drill press.

Lubrication

A 3½-gallon oil tank is carried under the cowl. The engine operates with dry sump. The scavenger pump and the oil pump are mounted at the front of the engine, being a two-unit device. The oil pressure carried is approximately 80 pounds per inch. Either castor oil, known as the commercial grade, or Kendall GG heavy aviation oil is used.

Cooling System

The radiator is a 4-inch core. A section from an AA Truck core would answer. The circulation of

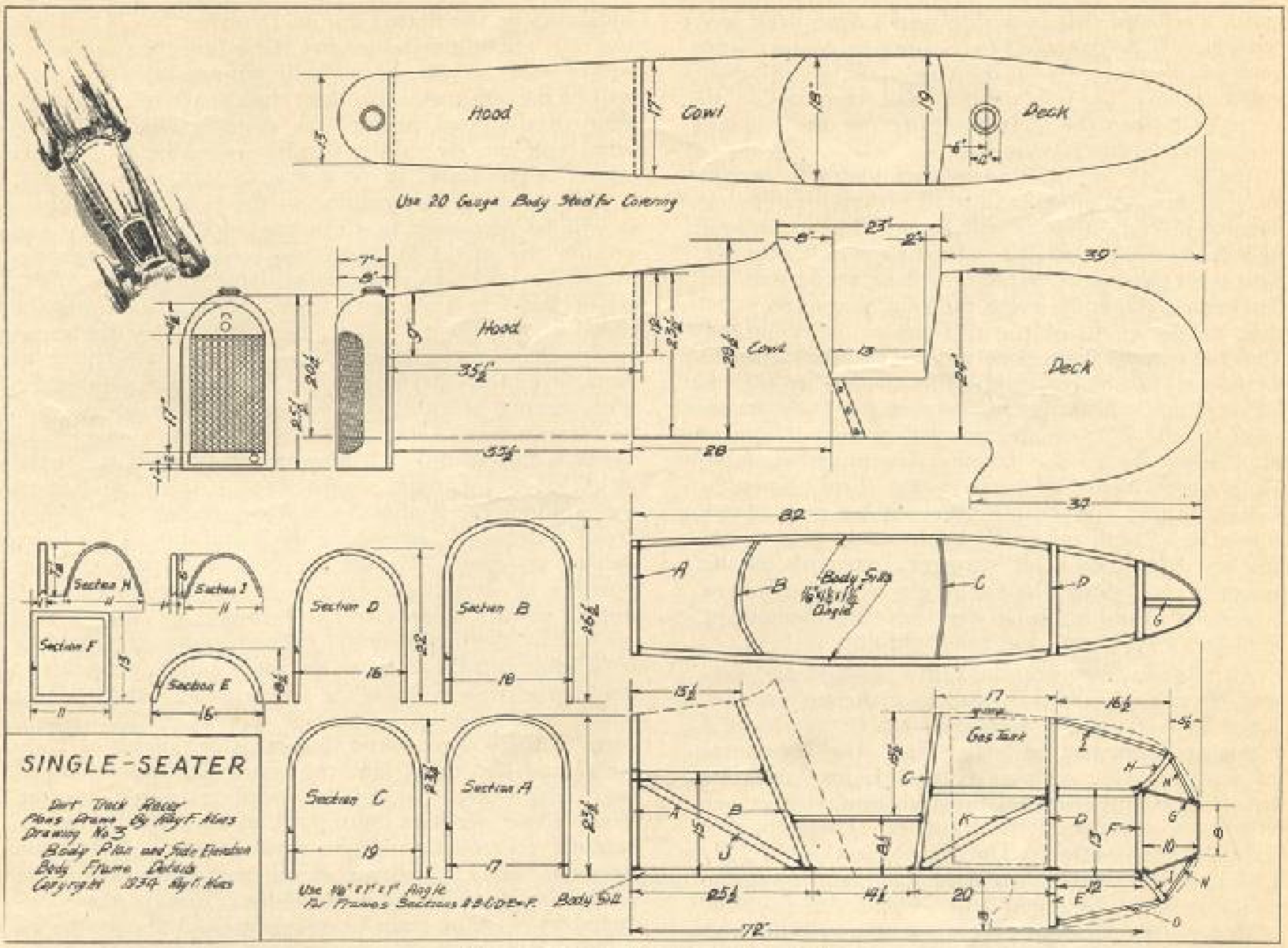


Fig. 40. Body Details the Single-Seater

the water is by pump. Four water outlets are provided on the top and four water inlets on the side of the engine. The pipe manifold on the side of the engine is so baffled as to give equal distribution of the cooling water to the cylinders. The heat indicator is Boyce, and is mounted on the steering column. A U-shaped bracket made from ¼" x 4" flat machinery steel is used to mount the radiator. Ends of this bracket rest on the frame side members.

Fuel System

A 12-gallon welded steel gasoline tank is carried in the body deck. It is removable from the forward end by removing the seat cushions. Pressure feed of 3½ pounds is used, the pressure pump being carried on the right side of the cowl, as illustrated. No valves are used, excepting the check valve between the pump and the gasoline tank. The feed line is ⅜" metal flexible tubing, no rubber whatever being used in its construction. An A. C. fuel pump can be used as in the case of the Studebaker Two Seater.

The carburetor is a Winfield 1¾" down-draft with down-draft manifolding. The manifold has four tubes or inlets, as shown in the pictures of the racer. Note particularly the two equalizing or ramming tubes at the center portion of the intake manifold. These have the upper ends open in the manifold and serve to prevent loading and unsatisfactory operation. No hand control is used for the carburetor, foot accelerator only being provided.

Exhaust System

The tail pipe, which is made from 4" steel tubing, nickel-plated, has manifolded into it the four pipes fitted to the individual ports of the engine. Remember, this engine is a sixteen-valve engine, four valves per cylinder, two intakes and two exhausts, individual exhaust tubes (stacks) connecting the ports with the tail pipe.

Ignition System

Robert Bosch single-spark high tension magneto is used for ignition, one plug per cylinder inserted from center position overhead being used. The engine is timed with the spark fully advanced 35° before top dead center, compression stroke. The spark plugs used are Champion R-1 special racing plugs.

Body

Accepted practice for the manufacture of automobile racing bodies indicates the use of either aluminum or steel throughout. If you are unable to find the money with which to finance the purchase of a racing car body, the general features of design of these are illustrated in Drawing No. 3. These are not identical with the dimensions of the single-seater body. It will be noted, for instance, that the deck section is considerably longer, this being drawn out to give what I think is a little better appearance, although it may not be so practical. On the other hand, the shorter body may be a safer job for use on the track. Not infrequently it is found that in a side-spin a long deck section is likely to be damaged by coming in contact with guard rails or other cars on the track. While the general design may be followed, it will be possible to shorten or lengthen the body as desired by the builder. You may decide this for yourself.

Use ⅛" x 4" or 4½" wide steel plates to lay on the upper surfaces of the Ford T frame, extending them inward. On these it will be possible to lay out the body sills as illustrated in Drawing No. 3, Fig. 40. Refer to the plan view. Here it will be noted that the total length of the body, from the cowl rearward, is 82 inches and the length of the sills proper is 72 inches. These sills are pulled in so as to give the curvature to the sides of the body. Body sills are ⅛" x 1¼" x 1¼" angle iron. Most other parts of the body frame are of ⅛" x 1" x 1" angle, this being true of almost all of the sections of the frame. Inasmuch as angle iron is rather difficult to bend in the form shown in Sections A, B, C and D, etc., the builder may desire to make use of light channel iron instead. The angle iron, however will be a bit stronger, inasmuch as the legs are of equal dimensions. Angle iron also makes it easier for mounting such items as the instrument board, the fire bulkhead, the gas tank, etc.

After the sills have been laid into position and fastened by means of bolts, proceed to make up the sections, A, B, C, D and the square section F. Tack-weld these into position, on the body sills. The horizontal and diagonal braces, such as K and J, may next be worked out and tack-welded into position. Next get out the frame sections, H, G, I and E. These too are tack-welded into position. The frame Sections, L, M, N and O may be made from light flat metal or angle iron. Even light tubing could be welded into position for these, as they merely serve as struts to brace the frame of the body. Note that the section G is made ¼" x 1" flat iron and welded to the section F at its center so as to give the proper extension and form to the tail section.

After all of the body sections have been tack-welded into position, size them up by means of sighting with the eye and further by means of light strips of wood which may be laid over them to see that the natural curvature of the wood as it is brought into position approximately follows the contour of the frame section. If some are found to be too long or too short, or out of proportion, they should be rebuilt before the body frame is finish welded.

It will be noted that the body is really covered in two sections. These being the cowl and the deck. The cowl section is rather easily constructed. The chief difficulty with this will be with reference to the scoop effect over the steering wheel. In the case of the hood it is easy enough to make a pattern by simply laying a piece of heavy paper over the radiator section and Section A of the body, bend the paper to form, remove it and make a pattern of it, laying it out then on the metal which is easily formed up to conform to the two sections which support the hood. The hood is locked into position by means of hood fasteners—four in number—one at each corner of the hood, two being applied to the radiator and two to the body at Section A.

Now, when working over the cowl, it will be found that it is possible to lay a piece of paper for a pattern over Sections A and D, bringing it into form, marking it and trimming it out, allowing, of course, sufficient metal to extend beyond the frame to give the form indicated by the dotted line in Drawing No. 3. Allow not only enough metal to give these lines but about two inches more so when it is finally trimmed to form there will be enough metal to run or roll in a wire, under the edge of the cowl, around the steering wheel. Otherwise, you can see, a sharp edge would be in evidence which might result in very serious injury to a driver.

However, before coming to the point of wiring it, it will be necessary to form the hood completely and stretch the metal to form the scoop effect over the steering wheel. In many cases drivers make no effort, when building their own racer bodies, to form the metal at this point. What they do is allow the metal to run back straight and then erect a small piece of metal over the cowl line in the form of a windbreaker. This cannot be called a windshield inasmuch as it is not transparent, being made from metal.

It is not so difficult, however, to stretch the metal in order to form the scoop effect. Apply heat from the welding torch and use a wood mallet to work up from underneath, stretching the metal out as the hammering proceeds. By the use of a little patience it is possible to stretch the metal out without breaking it, until a proper scoop effect is secured.

In case the metal should split or in case it should be found too difficult to work the metal out by stretching; it is permissible to take the tin snips and slit it, after which it is bent up. When it is bent up into rough form of the scoop desired then cut other pieces of body metal and slip them into the triangular shaped openings which are formed by bending, after slitting. Weld these sections into position and finally use a hammer to smooth out the entire scoop. Holes and irregular spots which are developed while doing this work may be filled in with solder. Rough places induced by welding may be planished out by means of a dolly block and the planishing hammer. When the scoop has been brought into the shape desired, then roll in the wire mentioned in order to give a rounded edge. This wire should be about $\frac{3}{16}$ of an inch in diameter and about one inch of metal will be necessary to roll around it and give a good rolled edge.

The cowl section is fastened to the body sills by means of bolts. Four or five of these, applied at proper points, will clamp the section down as well as hold it to the frame. The frame sections A and B are covered with ordinary hood lacing. When any repairs are necessary to the body it is seen that the removal of a few bolts will quickly remove the entire section, leaving exposed the frame which may be straightened or repaired and making it easy to make repairs on the cowl section.

Likewise with the deck or rear body section. This is built up in one unit. The best plan is to make use of paper patterns insofar as possible, getting an idea of what work must be done in order to bring the body metal to form. It will be noted, of course, that the body is not as wide as it is high. For this reason it may be desirable to build the rear body section in two parts—one part for the left side and another for the right side. In other instances it may be desirable to build the body in three sections—a right, left and bottom section. All edges are joined by welding after the work of forming has been completed. (The Two-Seater body is different in that no frame work is used in the deck section.)

The forming of these body section is considerably more difficult than that encountered with the hood. It will be necessary to turn in the metal, cutting out certain sections and then welding the edges of the body metal together or, what is more difficult, to shrink the metal.

It takes a rather expert body man to shrink metal, especially when as much shrinkage is necessary as would be indicated for the rear body section. It can be done, however. The best plan is to put a little spot of heat on the metal, about the size of a dime. This should be a cherry heat. Apply the heat to a point in the body metal at which a wrinkle has occurred when you attempt to bend the metal to form neatly over the body frame. With this small spot on the wrinkle then simply hammer or flatten out the point over a dolly block at which the heat has been applied. With a little practice it will be found possible to hammer out these wrinkles, thickening the metal and preventing any wrinkles being induced and left to mar the job.

No success whatever will attend your efforts if you allow the metal to wrap over or actually wrinkle and fold in two or three thicknesses. The idea is to apply the heat and upset the metal rather than fold it over. If you do find that you cannot shrink the metal then cut out those sections which show excess metal and weld the edges together. Naturally you are going to find that the work is rather rough as you proceed. The main object, however, is to bring the body metal into somewhat the form desired, weld the edges and then finally, by means of heat and planishing hammer over a dolly block, finish up the job, rounding it out into proper form. Even then you are going to find that you have some high spots which will need to be dressed off with the file or hammered down. There will be low spots or holes which will need to be filled up by means of soldering. It will take a lot of patience and a lot of elbow grease to get a good job of body work. The satisfaction though, in accomplishing a piece of work such as this, is its own reward.

After the rear body section has been formed up, it is mounted in a method quite similar to that for the cowl section. That is, it is bolted on by means of bolts to the body sills or the body plates. Make certain that you use hood lacing riveted to the Sections C, D, F, H, G and elsewhere, where the body will be in contact with the body frame.

After the body has all been fitted together, it being joined by slip-joints, between the cowl and deck sections which in turn are bolted together, all parts should be polished up by means of a file and sandpaper or emery cloth.

Some drivers build up their racer bodies from metal sections salvaged from discarded auto bodies.

The dash is constructed from heavy aluminum, this being a requirement on most tracks. It also affords a good fire wall and becomes a marked safety measure.

The paint work required for the body is just the same as any required for any automotive body. Pyroxylin lacquers are used, the lighter shades being preferred to the darker. Lettering on a light paint is read more readily and the entire job is most presentable. Of course, it is somewhat harder to keep neat and shining, but the effort is worth while.