

Off-road kart plans

Chassis Construction

This is the layout for a Kart seating an average person but it is advised that you roughly lays out this design on the ground, placing a wheel at all four corners, the seat and the engine side by side. The measurements given below will not need to be altered much as there is room for movement for a bigger seat and/or bigger engine on both sides. My advice on going to construct this is to draw out the shape below on a 8 * 4 foot sheet of plywood, if your desperate you can draw it out on a strip of felt underlay with chalk. But the sheet of ply is the much better option, as you can work from this right through out the welding and bending operations what you can do is place all the sections of pipe cut to the exact length on this sheet, drive in nails both sides of the pipe and weld all the sections together without too much distortion taking place. But be ware of fires. I'll take no responsibility if you burn your house down.

The most complex detail in this chassis is the pipe bending. Like myself a lot of people are not the owner of a pipe bender capable of bending 25mm mild steel tubing with a wall of 3mm. What I did an what a lot of ye will need to do is to go to your local engineering firm show him this plan and get him to bend that section out. Stay Clear of Dear Firms. One engineering firm told me that it would cost too much to set up the machine. A place down the road supplied that section of pipe and did all the bending for £30. So shop around. If desperation kicks in got to this link. [Pipe bending](#)

A welder is a necessity in this entire project. It doesn't have to weigh a ton, a small 120 amp welder will be sufficient. I only have a 100 amp welder and I have to be very patient with it. But I got my Kart built. If all you have is a 100 amp welder or less you will definitely need to use 2.5 SWG welding rods.

This is the most important section of the entire Kart, spend a good week or two making this section. Have no holes in the joints or anywhere for that matter. If this section is constructed well it will serve you for years and for a number of engines. Mine went through 4 major engine and drive changes as ca be seen in my "Pictures of various karts.." at my homepage. *Plans+pics on last pages*

****Remember this is the support for every single thing ****

Below are a few methods of fixing the rotating live axle to the chassis.

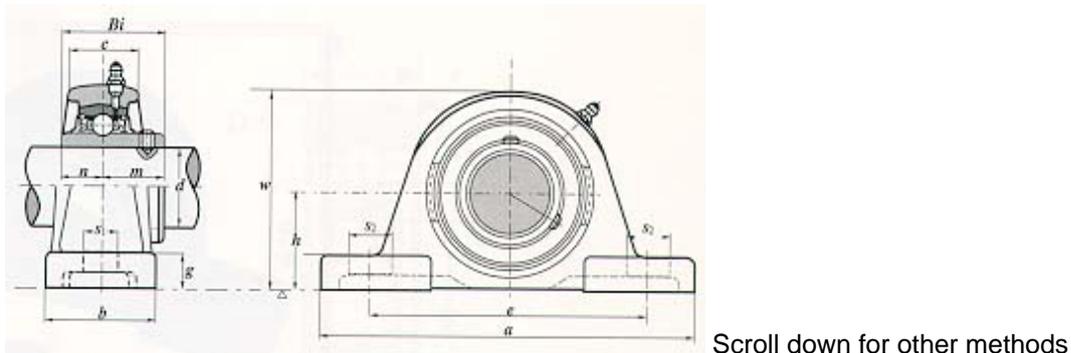
The axle I recommend for this kart is either 25mm or 30mm of Diameter. So all fixtures are based on this measurement. This axle can be a plain metal bar cut to the correct length with the bearings grub screwed to the axle. Depending on the hubs you decide upon, these can be keyed/grub screwed to the axle as well. If you decide upon, the quick, simple and very effective stainless hubs from a wheelbarrow with flat grooved tyres, all you need do is to spot the hub onto the axle, which can be easily ground off at any time. On the wheelbarrow wheels I used, the internal diameter was 25mm, but my axle was turned on a lathe, with my bearings pressed on all requiring different diameters. But if it is possible to get access to a lathe, a length of 120mm at both ends could be turned from a 30mm axle down the required diameter. If you don't, you will have to opt for a 25mm axle.

Don't forget that the brakes and sprocket have to be mounted to this axle, so wait before you go rushing in welding things together. This section is next in the free plans page. [Brake and Sprocket](#)

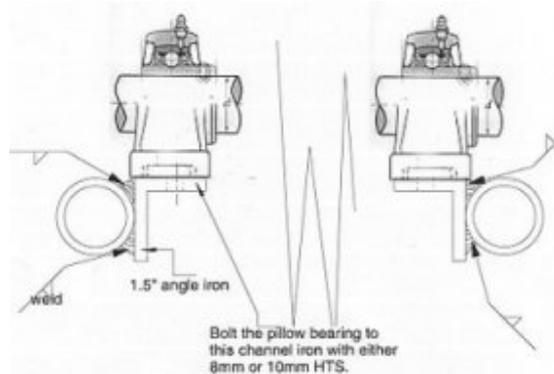
If you decide upon proper aluminium/plastic hubs, I have plans drawn up for a proper axle hub. Only if you have access to a lathe and the appropriate materials should you set about making hubs. Stick with wheelbarrow hubs, etc with an internal diameter + bush. [Plans For Hubs](#)

This first method is the one you **should** use.

This first method is the most easiest and simplest of them all. I know the diagram looks a bit complicated but all it is, is a housing for a self aligning bearing. The whole unit just bolts onto the chassis on both sides. Easy, simple, quick, less hassle, lasts forever. A grub screw secures the spinning sleeve of the bearing inside the housing to the axle. The little nib you see is for a bit of oil now and again. Some come grease packed requiring no attention ever. The ONLY problem is that they will set you back from between £30 and £50 quid, for an axle of diameter of 30mm. Too dear for the Kart I was building. However you will have to weld a plate to the chassis onto which you can bolt on this bearing, otherwise you would have to drill 4 8mm holes in the chassis, which will destroy the chassis. Take note - NEVER DRILL ANY HOLES IN THE CHASSIS, believe me I learned the hard way, the hole chassis bent out of shape with the middle of the ground nearly hitting off the ground, I had to straighten it all out and weld heavy angle iron to reinforce it.

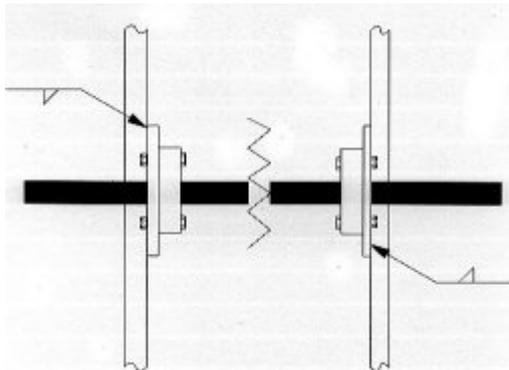


Scroll down for other methods



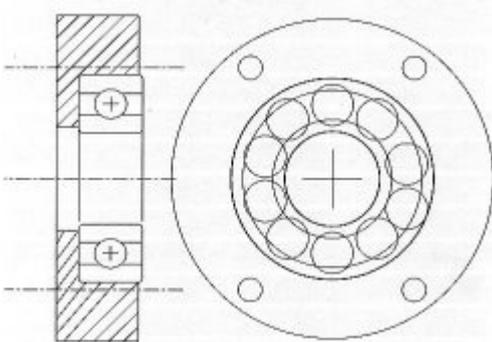
The method I used for my Kart is the following.

This design/method would not be possible for me to make without the very helpful assistance of a lathe lecturer in a training college. This may well be far beyond many of your capabilities but take a look. I bought two ordinary plane roller bearings for £8 each. I then got a housing turned out to house them (see fig below), and in turn the whole unit was pressed onto the rear axle. There were four holes in each of the housings onto which I could bolt onto a plate which was in turn welded to the chassis as shown (weld symbol left).

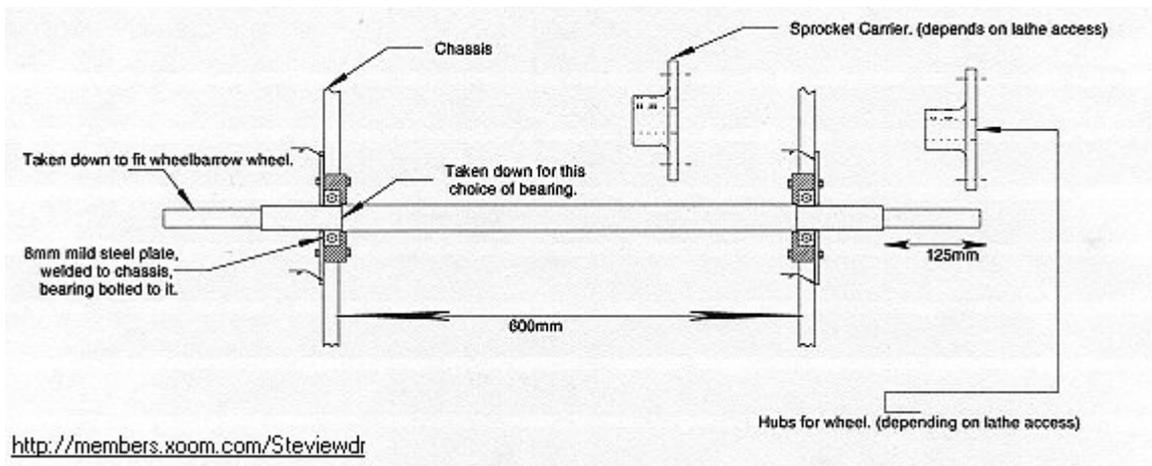


As you can see from the section the bearing was simply pressed into the housing.

See also the four mounting holes.

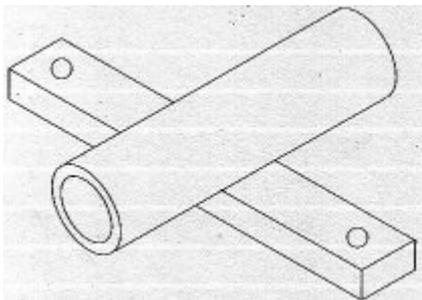


You can also see the setup I have at the moment, including everything except for the hubs, the wheelbarrow wheels are just spotted to the axle. Whatever bearing method you decide to use you will either have to take down the ends of a 30mm axle on a lathe, or opt for a slightly weaker 25mm axle. You will also see that a 8mm steel plate is welded to the chassis, onto which the bearings can be bolted onto. This aids easy removal, without weakening the axle. Forget about the machined hubs unless you know someone with a lathe. If you are using a 30mm axle, I suggest that about 125mm should be taken down at both ends. The brakes and sprocket mountings will be discussed later, so weld nothing permanently, to axle or to chassis.



<http://members.xoom.com/Steviedr>

Another crude and very cheap method is to use a VERY simple bushing arrangement on the axle.



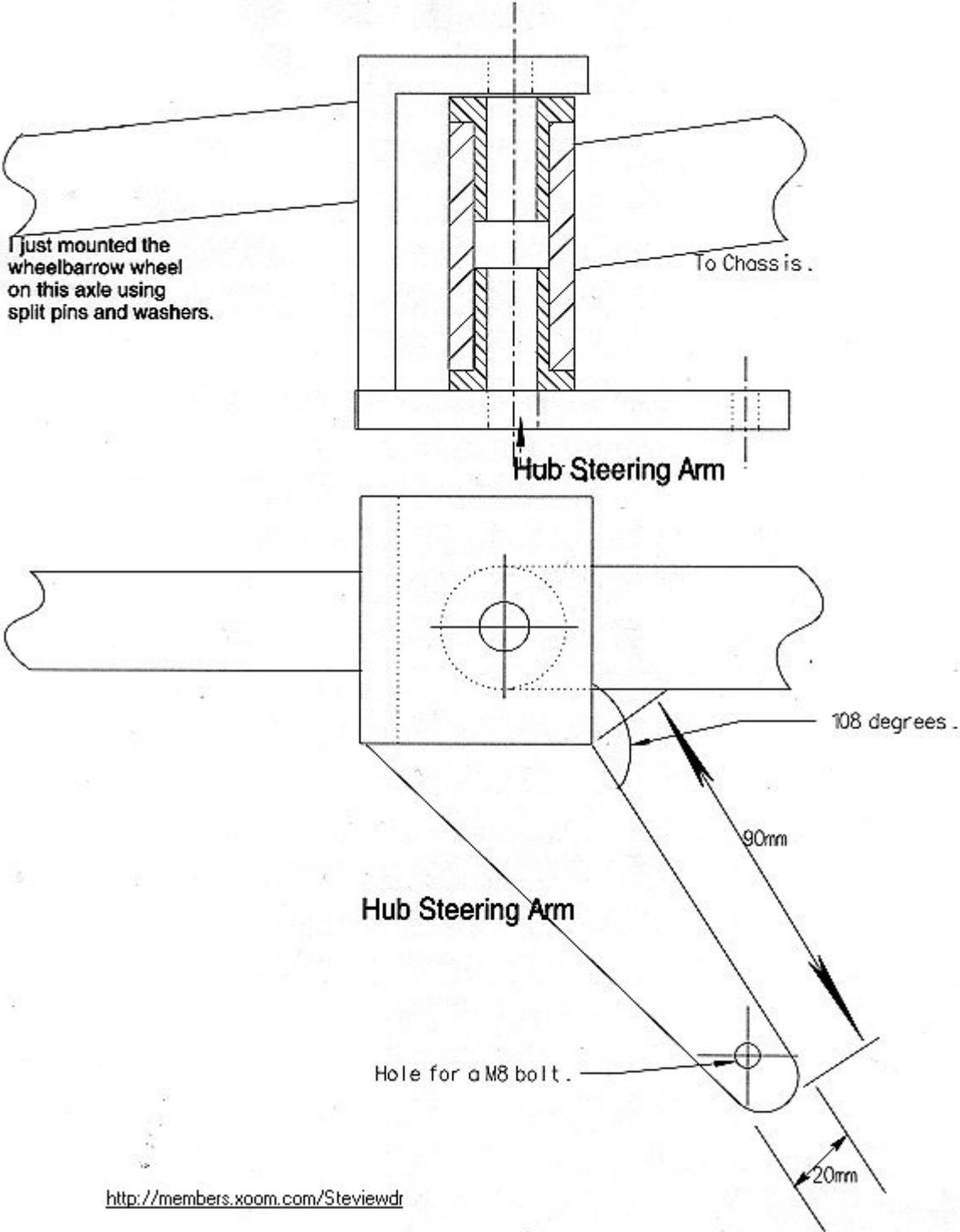
least 150-200mm long.

This I do not recommend but I had no choice when I was starting out, but to use it. All it is, is a pipe welded to a flat bar bolted to the chassis in which the axle could spin. This needs constant greasing, and WILL WEAR AWAY, through time. If the engine you have will drive you over 30mph DO NOT use this method. Both the axle and the pipe will wear away. Even if a brass sleeve were slotted into this pipe, first, it still would wear. It is just held onto the axle by split pins and washers which necessitates the drilling of a hole in the axle !!.(very worrying!!). This is to allow easy removal for greasing. The pipe should be at

The King Pins are M10mm HTS 8.8 (high tensile steel) bolts, with a lock nut and washer, these run through the U bracket and the hub pivot bushes which are pressed into the chassis pivots.

Make sure you Weld all items exceptionally well, weld a ring once, grind down, clear off the slag, and make another pass. Make sure you get all the way around, and that there are no pits, holes, cracks, etc.

This next drawing shows the steering arm, it's angles, sizes etc



As you can see from the drawing, it takes a bit of lathe work, including the threading of the last 20mm to take a M16 HTS nut and washer. Also interference fits must be taken into account when pressing the bearings into the hub. But when it is constructed it will be the perfect set-up, and will last forever. Appropriate bearings must be obtained from your local engineering store to fit the 21mm part of the axle, and to fit the internal part of the hub. The nut I recommend is a M16 castle finish nut, requiring a pin to be slotted through the axle. This will keep the nut stationary for good!. Again the external diameter of the hub and the hole alignment will all depend on the size of the wheel.

The Brakes and Sprocket mountings.

This is now the time to become well acquainted with your local motorcycle supplier/repair agent as a lot of second hand parts from motorbikes will be needed, such as the brake, low cost quality sprockets and chains.

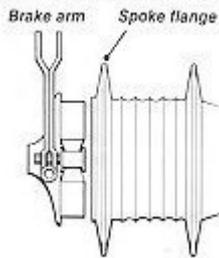
I will talk firstly about the **Brakes** of this kart.

Basically there are two types of brakes 1: Drum Brakes and 2: Disc Brakes. The latter been the most effective, nevertheless when the Drum brake is set-up correctly is can be better than a poor set-up of Disc brakes. The brakes that you will use on your kart will depend on the amount of money you are willing to spend. I' m using Drum brakes on my kart at the moment, they only cost me £10 from the rear brake of a Honda 90, compared to around £40-50 for a front disc and calliper of a motorbike. And if you ever drove my kart in the rain you will realise how gentle you have to be on the drum brake pedal, otherwise the whole rear will lock up and you will spin off doing 180's. In my opinion drums are easier and much cheaper, nevertheless I have provided plans for both options, so well in good if you happen to come across a disc and calliper of a motorbike.

Drum Brakes.

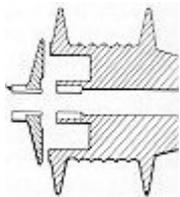
This type of braking method has disadvantages however, and the use of a lathe is almost a must, even if is it to get it done in a local engineering firm, it's only a small bit to be turned out as you will see. Firstly you will need the **rear** brake from a motorbike, preferably 75cc or higher. The front brake is useless as it has no mounting/securing arm to stop the brake plate from rotating. Cut away all the spokes and remove the sprocket and cush drive, then bolt a plate to this side. (right side on the picture

CONVERSION OF MOTOR CYCLE REAR DRUM BRAKE



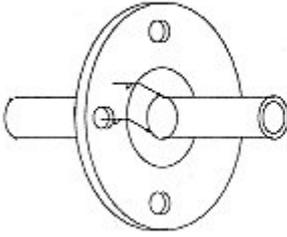
to the left) When the brake is finally set-up and all the diameters all matched up all on has to do is to spot this plate to the axle. Refer to the picture below of the positioning of the brake. Only weld up when EVERYTHING is all finished, the shoes working correctly, as when this steel plate is spot welded to the axle one must grind off the weld to remove the brake. A bit crude I must admit, but if you want to go to the bother of making a keyway in the axle and then tapping the fixing plate to the axle, go ahead.

The bigger the bike it comes from the better as the internal diameter will be bigger, and will fit your axle better. When you obtain the drum and shoes, concentrate firstly on the open drum. Take out the bearing if there is anyone. Measure the internal diameter. If this measurement is smaller than your axle then unfortunately the difference must be taken from the drum on a Lathe. But the internal diameter may be too big!, in this case you will have to hunt down a pipe to use as bushing, you can weld to, which will take up the difference between the axle and the drum. If it is too small you will need a lathe. But not all Lathes have an internal cutting tool, and a drill bit of 30mm - I have never seen. In this case, your axle will need a bit of lathe work ie.- taking down. (If this is too much Lathe work to handle, then stick with the straight forward Disc Brake)



On the left side of this picture (to the left) you can see the piece to which the shoes are attached, and this is stationary with respect to the live axle and drum(to the right of the picture).

Method 3. The only way I can suggest to people without "lathe access" is to get a steel pipe (internal diameter to suit the axle), then to get an 6/8mm steel plate, drill out the center (or use a cutting torch)



Tack the pipe to the 6mm steel plate.
Spin the pipe and align the pipe.
Weld the pipe to the plate.
Mark the radius of the internal sprocket diameter onto the plate. Spin the pipe and transfer the mark all the way around the plate.
Calculate the exact positions of the attaching holes based on this line. Make sure that the sprocket is concentric with the center of the pipe.

to fit snugly onto the steel pipe. Spot the plate to the pipe, spot the pipe to the axle, rotate the axle somehow, and hammer the plate to the appropriate side until it wobbles no more!. Weld the plate fully to the pipe. Mark on the plate the

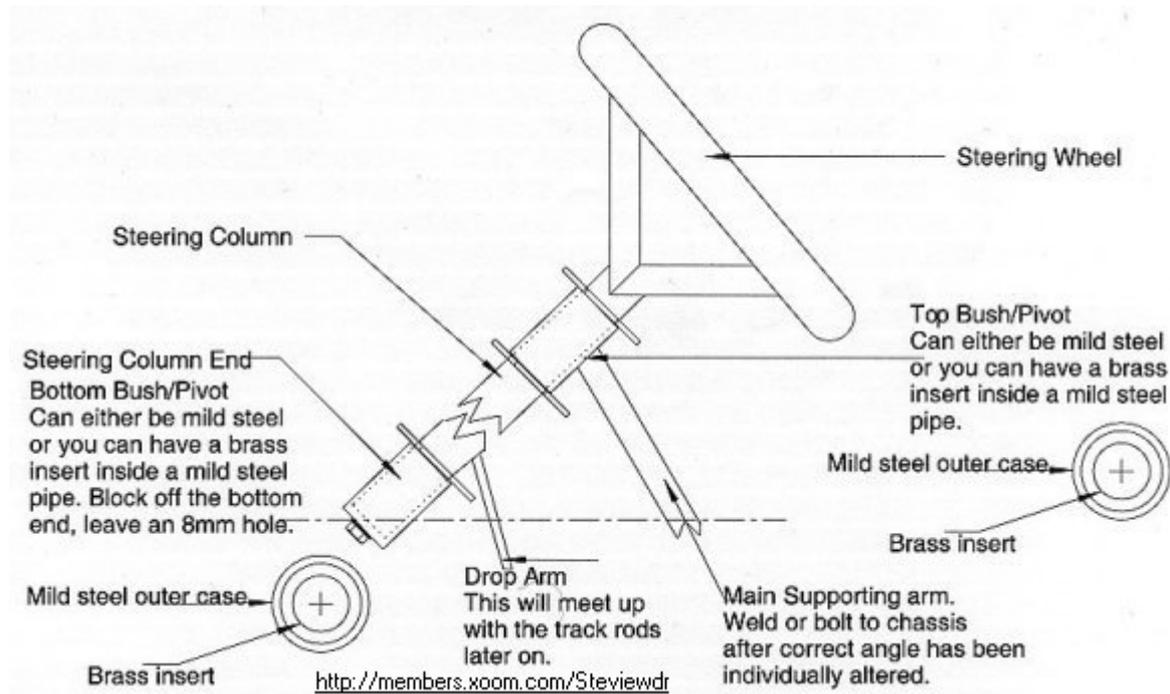
diameter of the four holes from the center of the sprocket. Now spin the axle again. Hold a sharp point to the plate to where the point you just marked and with the axle spinning it should make a uniform circle. Drill the appropriate holes on this circle. This is to keep the sprocket Concentric to the axle. Bolt up and hopefully! it should be satisfactorily enough!.

Remember if you have any questions just e-mail me (kartbuilding@g-mail.com)

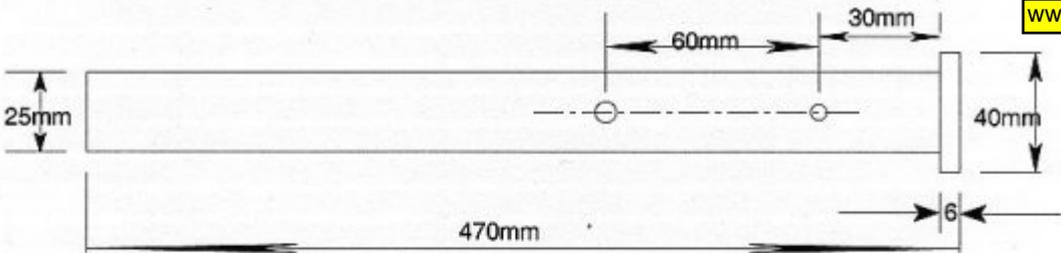
Steering

Steering Column.

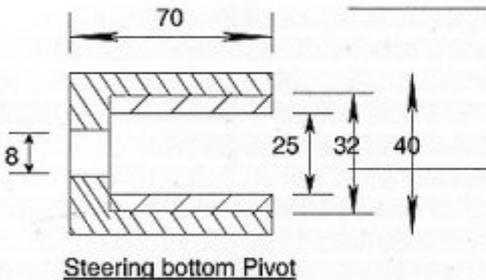
This first Diagram shows the main Steering Column, with all its supports. The Top Column Support is either a brass bushing pressed into a mild steel pipe, or simply a suitable sized steel pipe. The steering column will turn inside this and is prevented from moving by two split pins and washers. The reason the brass bushing is inside a mild steel pipe is to facilitate its fixing to the strut, by welding. The other end of this strut can either be welded or bolted to the chassis, however this can only be done with a person sitting in the kart and to adjust the height etc. and then finally to weld it in position.



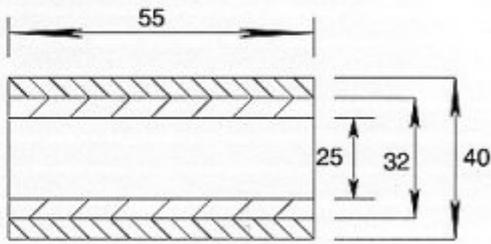
The bottom Bushing/pivot can also either be bolted or more simply welded to the chassis, all of which should be done with a person/ driver sitting in the kart. A vice-grips or a clamp can be used to keep everything in the correct position before welding. The bottom pivot can either be turned out on a lathe, or an ordinary pipe, with a suitable washer welded on.



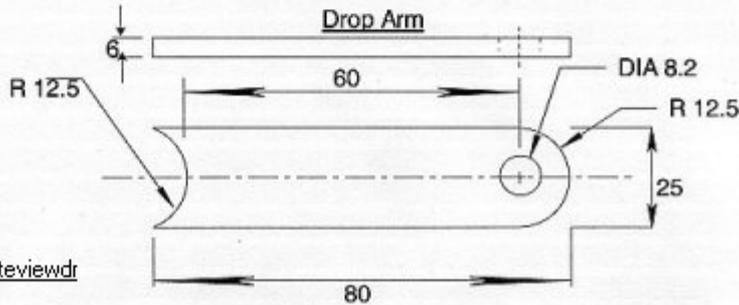
Steering Column. 25mm OD tubing



Steering bottom Pivot



Top Column Support



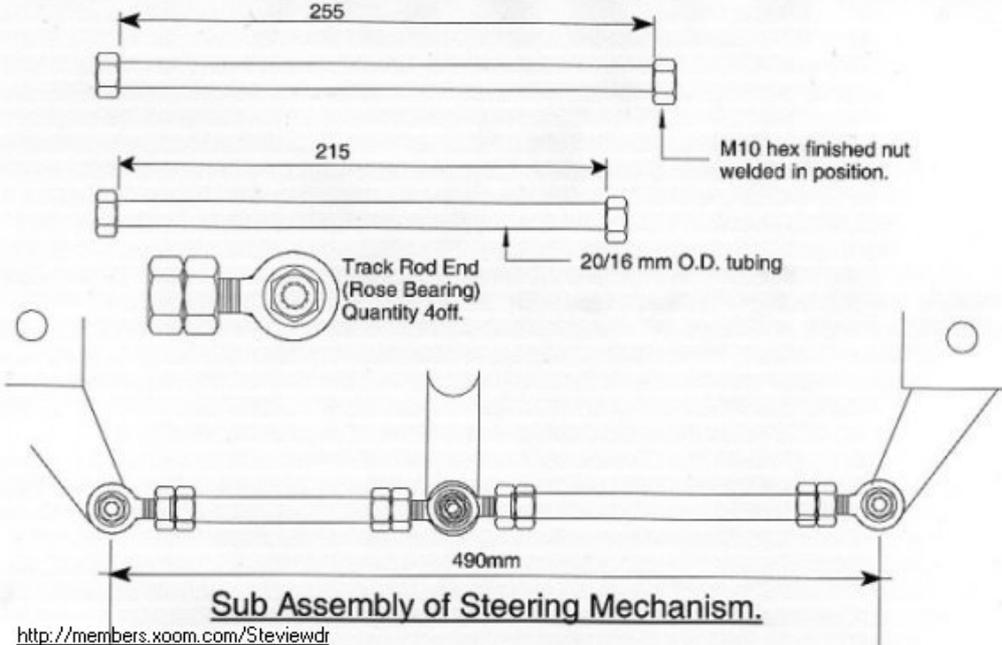
Drop Arm

<http://members.xoom.com/Stevewdr>

However it is my recommendation to leave the installation of the Steering column and Drop Arm until the near end of the kart's completion. This can then be adjusted to fit everything else i.e.. drop arm, seating position, pedals.

Track Rods.

The installation and construction of these is fairly simple. Basically the rods are 16/20mm mild steel tubing, cut to the given length, with nuts (M10) welded to each end of each pipe.



Sub Assembly of Steering Mechanism.

<http://members.xoom.com/Stevewdr>

receive "rose end bearings", which as well as providing a suitable fixing to the Steering Arms as well as providing a certain amount of adjustment. In the middle the Drop Arm will simply bolt to these "rose bearings". At the ends where they meet the "hub steering arm" they simply bolt together

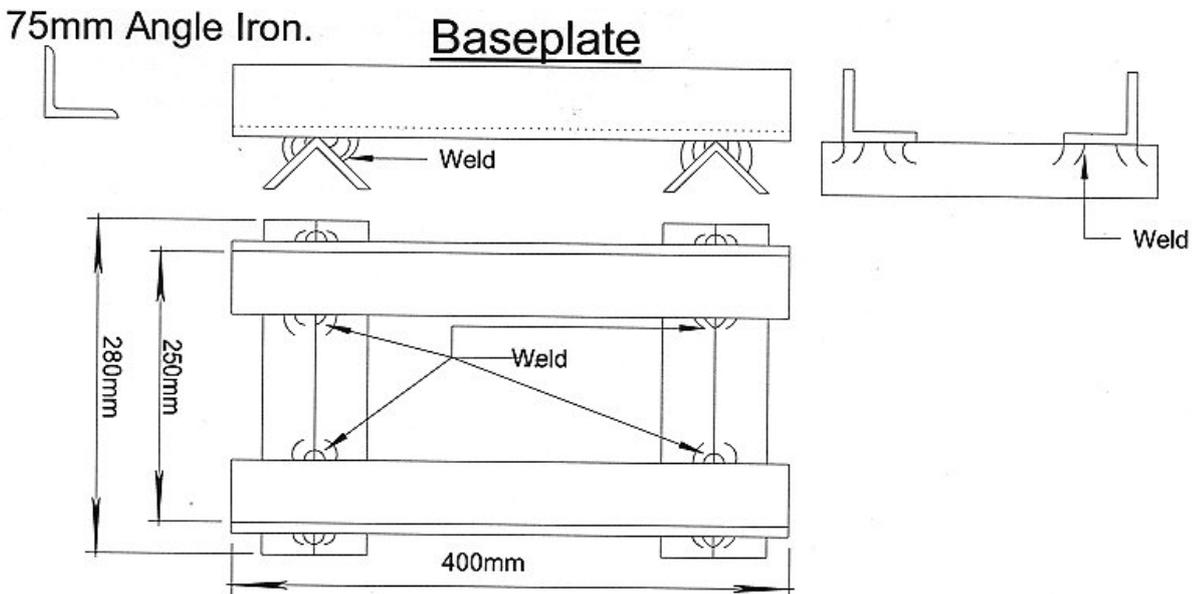
Once the track rods are in place the steering wheel and drop arm can be installed accordingly.

There are a few ways of mounting the engine to the chassis. The main function of the cradle/mounting is to prevent the engine from Rocking (if it was loosely secured). To prevent the chain from loosing it's tension due to engine movement, and to prevent the engine from coming clean off the kart on a rough road. Therefore all welding as on the rest of the kart must be up to scratch. All bolts again as with the rest of the kart must be High Tensile (8.8). My hope is to be able to take the engine off the kart and to easily bolt it back on the kart at any stage, only requiring the removal of 4 bolts, cables and chain. And for the future provide a universal mounting/ Base plate for any better engines one may come across, and all they'll need to be mounted to the engine is a personal Cradle.

The way I have mounted my engine (a motorbike engine) to my chassis (as you might be able to see in the link to "pictures of my kart" on my main home page) is quite simple. **If you are planning of having any other sort of engine skip on down the page to "GENERAL PURPOSE ENGINES"** It's construction is totally out of light 1.5" (75mm) angle iron. The Base plate is constructed out of this angle iron as well as the engine Cradle. The main reason I used angle iron is because, firstly it's fairly strong, secondly I had a load of the stuff from an old roof rack of a van, and thirdly the engine can slide along this channel to adjust the chain etc, preventing sideways movement of the engine, thus upsetting the chain alignment, and only requiring fixing bolts.

Base plate

This first diagram is for the "Base plate". This is the item which will be welded to the chassis, in the general location of where the engine will be fixed. it is made up out of four lengths of angle iron, in a rectangular shape as shown.



Do not weld this to the chassis yet, until the engine is in it's cradle. Sizes may vary depending on size of engine, bulky etc. This is for a typical 100cc engine. The Method and Construction remains the very same.

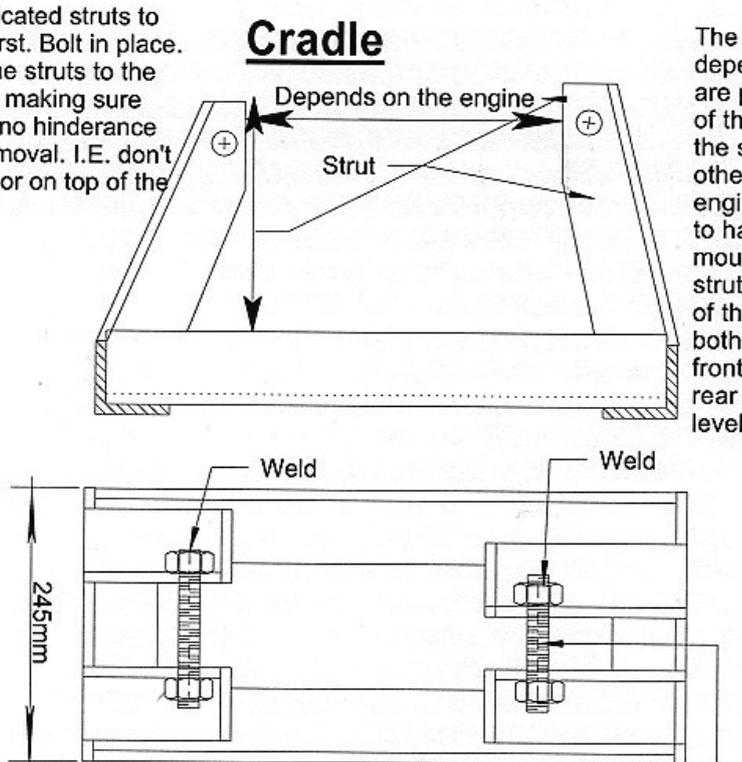
Cradle

This next diagram shows the apparatus which will be bolted to the engine, which in turn will be bolted to the Base plate. The hope is to be able to unbolt the engine totally from the kart with nothing extra bolted to it, and even to refit it back in a motorbike!. This is in case any overhauling, opening up of the engine is required.

There is no exact measurements that can be quoted, the only measurement been the width of the Cradle to make sure it will fit the Base plate. All the runners, struts etc. are all firstly bolted to the engine and then welded to the Cradle. Making life a bit easier. There is a photo of how my engine is secured to it's cradle as a starting point. Depending on the size of the engine you may want three or even four supports. For anything below 125's I'd say it's all right with two, the front and the back supports. Again use 8mm (or 10mm if it will fit) threaded bar (high tensile) to bolt the engine to the struts, as in the diagram below.

Again I'd say to fashion it out of 75mm mild steel angle iron. Again to fit the Base plate nicely.

Bolt the fabricated struts to the engine first. Bolt in place. Then weld the struts to the lower frame, making sure that there is no hindrance to engine removal. I.E. don't weld in over or on top of the engine.



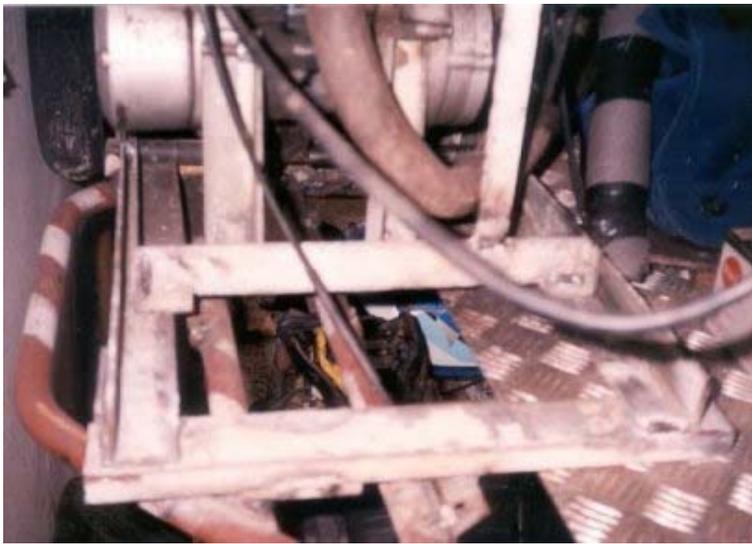
The height of the strut depends on how high the holes are positioned from the base of the engine. The distance the struts are apart from each other also depends on the engine. One thing to note is to have the engine level in it's mountings. I.E. make the two struts the same, so the height of the holes are the same for both. Also try and have the front struts adjusted with the rear struts so the engine is level in that direction also.

Use 10/8mm threaded bar. Slot them through the engine and the struts, weld one nut to the threaded bar, and place a lock nut at the other end.

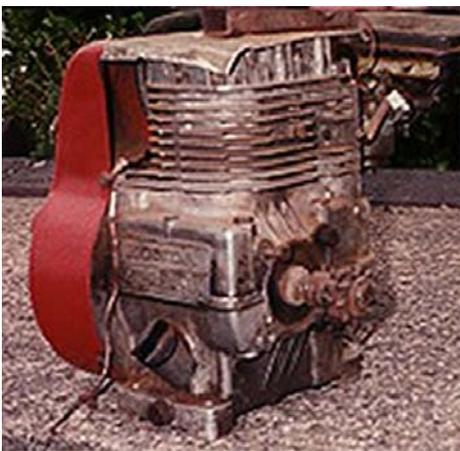
Bolting them together.

When the two items (base plate and cradle) are finished, and the engine in the cradle, put them together sitting on the chassis. Find the correct location for the chain alignment etc. then weld the Base plate to the chassis. Now fit the engine + cradle onto the base plate. Obtain the correct length of chain required. Fit the chain. Mark and drill four 8mm holes going right through both the base plate and the cradle. Remove the engine and make the hole into an 8mm slot either by using a cutting torch or by drilling a load of holes close together. this is to give a certain amount of chain adjustment. Re fit the engine, tighten up the tensioning bolt until the chain is at the correct tension, slot through the 8mm bolts and tighten everything up. And there you have it!. Any Further Questions just E-mail me.

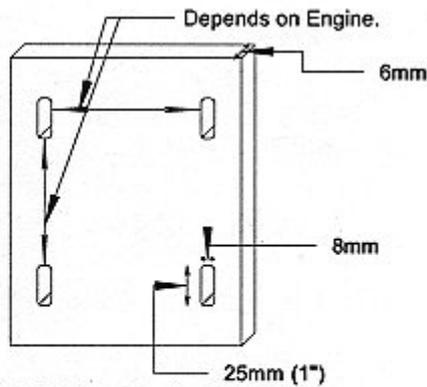
(kartbuilding@g-mail.com)



GENERAL PURPOSE ENGINES



Normal generator, lawnmower, chainsaw etc. engines can be mounted more easily. Just requiring a Base plate as all these engines will have 4 mounting holes conveniently placed on their underside. Follow this easy diagram. All that has to be done is for the base plate to be welded to the chassis with four 8mm slots in the correct positions. It's as easy as that. There's no need to make things more complicated than they have to be. See Diagram below. You can clearly see from the photo below the fixing holes with can be used to mount the engine with ease. For similar idea of the channel see the bottom diagram for engine mounting of a plain engine.



Fix this to the chassis by either welding or bolting. Make sure that there are no obstructions to the bolts which will be going through the plate.

Seats

This is a relatively easy part. Although the seat is a fairly important part of the kart, what you need in a Kart seat is plenty of "side support", as well as a nice snug fit, so you will be able to steer the kart, instead of using the steering wheel as a rigid support.

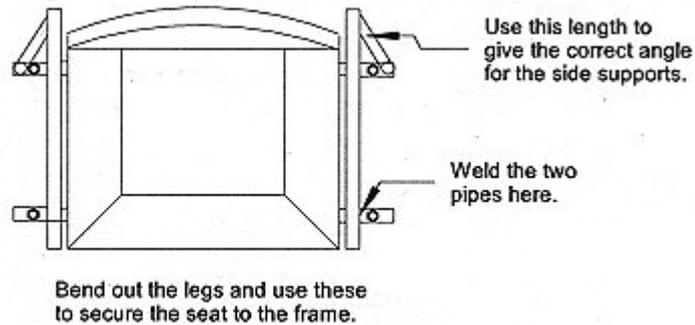
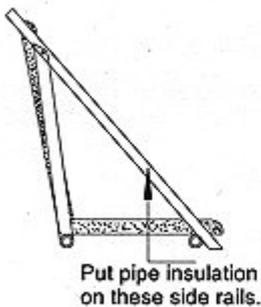
The best seat around is of course a plastic seat out of a proper racing kart, even an old second-hand one. You might pick one of these up for half nothing in a karting place/circuit.

But if your like myself, you can always improvise. The next best thing to a racing seat is an ordinary plastic seat, with support installed either side of the seat. Take an ordinary plastic seat, bend the four legs out flat. Leave around 50mm sticking out from under the seat. Now either bolt or easier yet weld 20mm (3/4") lengths of pipe at either side of the seat, running from the top back of the chair to the legs bent out at the front bottom. The top of the pipe can be bolted to the plastic seat.

Then as in the photo, put some pipe insulation around the side supports, and secure with tape. Now all you have to do is to put the seat on the frame, sit in the seat. Adjust the seat, to the side, forward/backwards to suit the pedals and steering wheel. When you are happy with the position of the seat, drill holes through the flattened out legs and floor pan, and bolt up with 6mm bolts and locknuts.

A Modified Ordinary Plastic Seat.

A Racing Kart Seat.



Pedals.

The next thing we must coincide is the Pedals. Again there is no need to make things complicated. Pedals are the easiest part of the kart. They are nothing fancy, but if you wanted one could fashion them out of chrome plated 15mm O.D. tubing. But 10/8 mm steel rod WILL suffice. Again depending on how technical minded you are you may or may not bother to fashion brass bushing for each pedal. I done without them. Depending on where your seat is positioned you may want to adjust the position of the pedals along the shaft, or bring the entire pedal shaft closer towards you. The Diagram is fairly easy to follow, it's just a matter of where to place the pedal shaft on the chassis. You can either Spot weld the shaft to the chassis or you can bolt it to the chassis. The spot can easily be ground or cut off with a hack saw.

The pedals are held on the shaft by means of spit pins and washers, this allows easy removal for greasing etc. You can if you have access to a Lathe to make a better job of the Pedals, make bushings. If you are going to make Brass/Nylon bushings for the Pedals to pivot on, there are two measurements alterations to be taken into consideration. The Pipe that was going to spin on the pedal shaft, it's outside Diameter must be increased by 8mm, to allow room for the bushing to fit inside this small length of pipe. Having access to a lathe, you can make your own measurements to suit your materials etc.

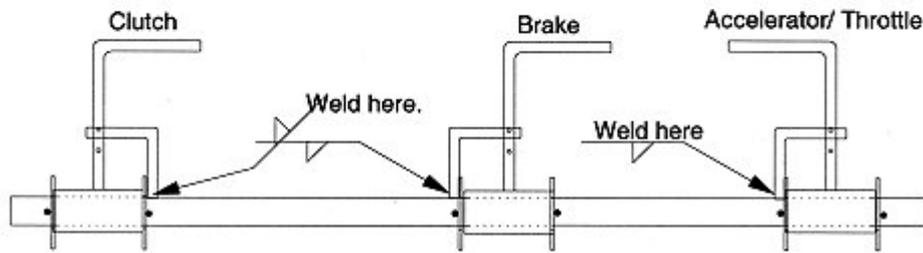
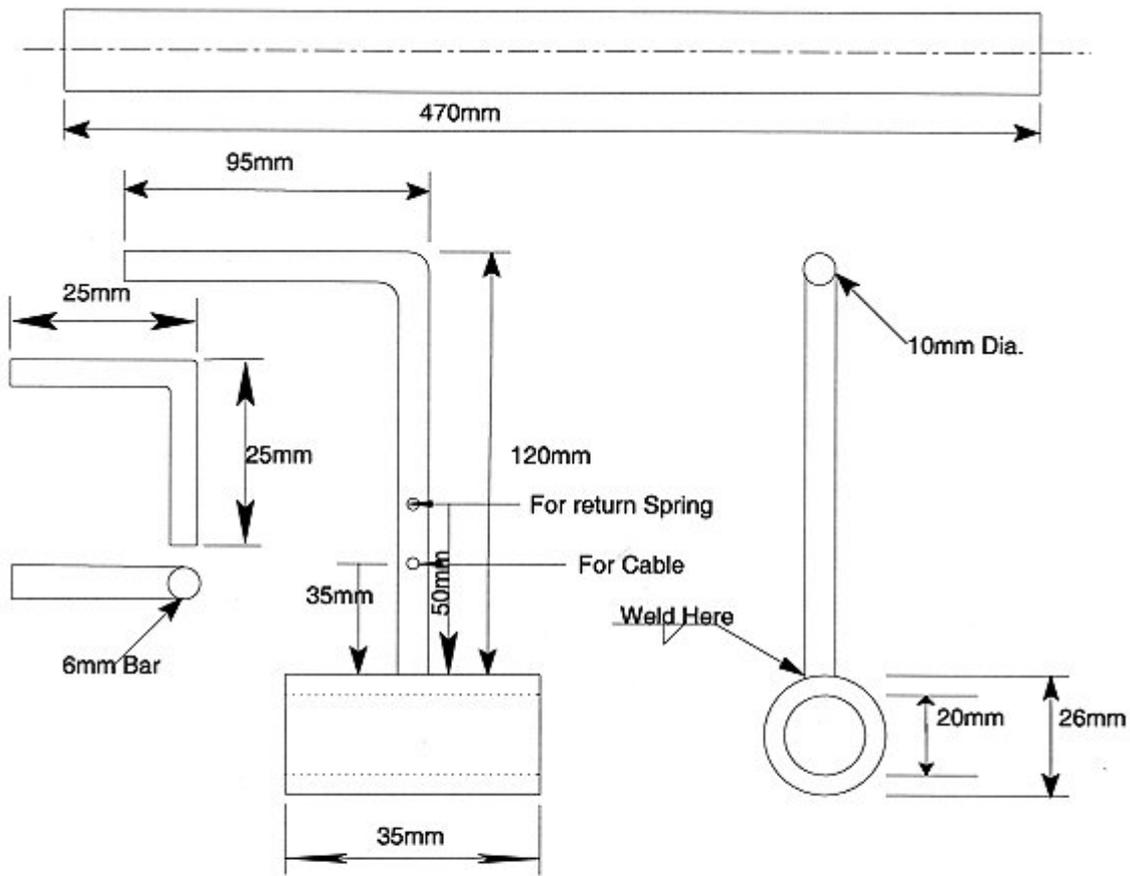
The bar bent into the L shape for the pedal, is to be welded to a bushing/pipe to spin freely on the pedal shaft. Remember you can't weld to brass!, You will have to make an outside metal jacket to weld the L shaped bar to, to make the pedals, if you want to use brass bushings.

You will see that there are two holes drilled in the pedals. Keep these holes as small as possible, just the right diameter to suit the cable. The top one is for a return spring for the Pedal itself. The other end of the spring can be fixed to any stationary point on the chassis. The bottom hole is for the Cable.

There are also small Pedal Stops to be made. These can easily be made out of light 6mm rod. They are basically made into the shape and measurements given on the Left middle of the diagram below. These will be easiest welded to the pedal shaft, by a small weld, which can be broken off with a bit of force if needed.

At the very bottom of the diagram you can see the Layout of the pedals, the only unknown measurement is that of the positioning of the pedals along the pedal shaft, this will be determined by sitting into the Kart and to adjust them to suit individual requirements. As this stage is one of the last ones, the positioning of the pedals shouldn't be affected by anything else. (*diagram on next page*)

Diagram

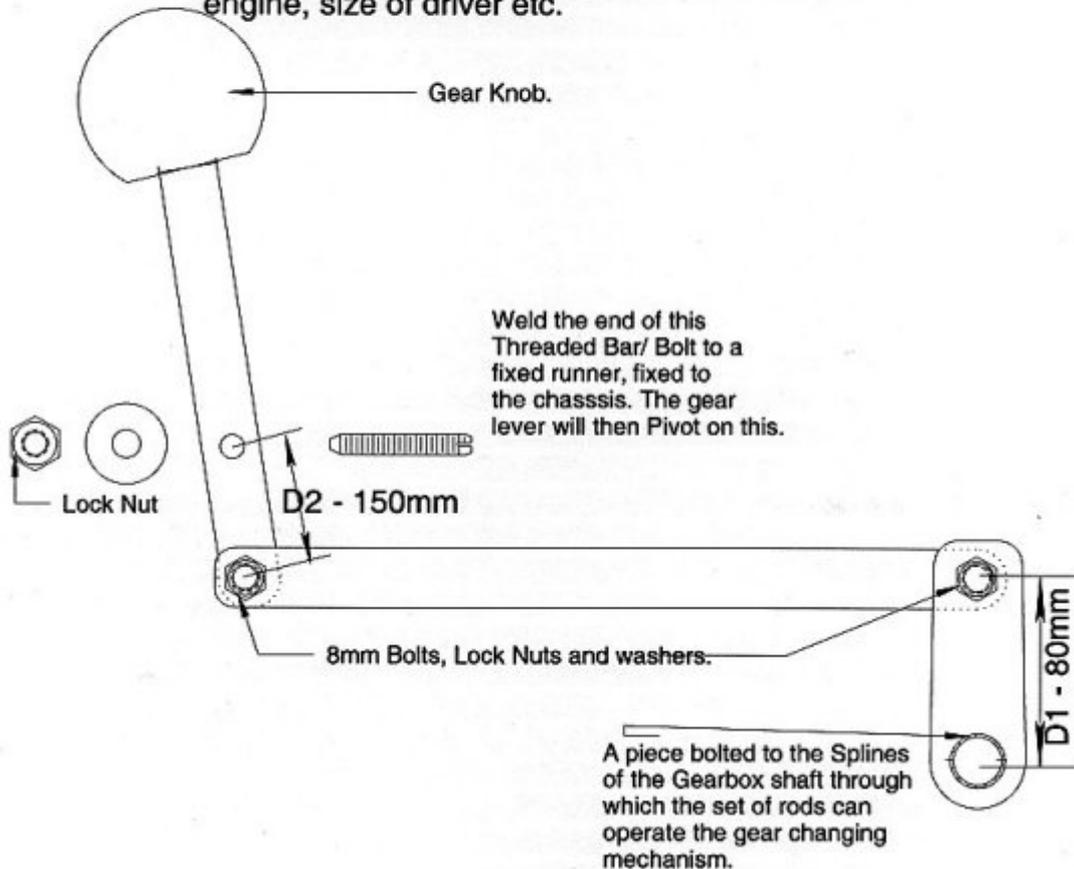


Gear-Changing

There is an easy way and there is a hard way. The easy way is to just weld a length of round steel 13mm thick to the butt of the old foot operated gear selector, and have it so it is close at hand. All one has to do then is to get a round piece of wood/ aluminium and to bolt it to the top of the new gear change lever. And that's all there is to that way.

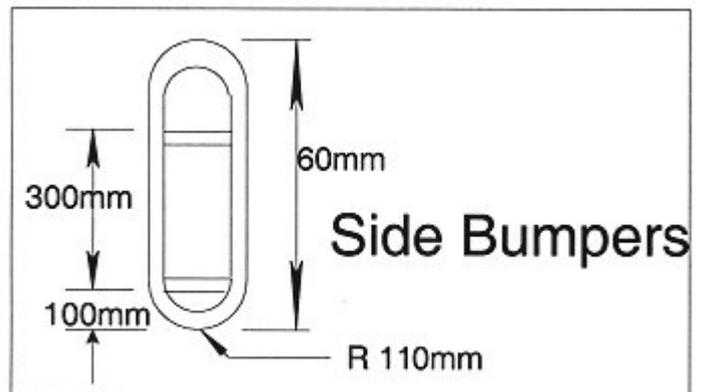
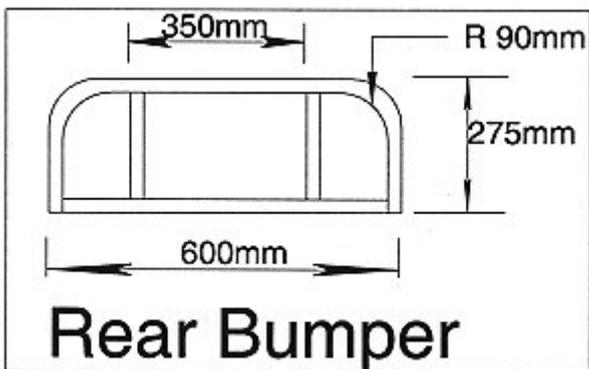
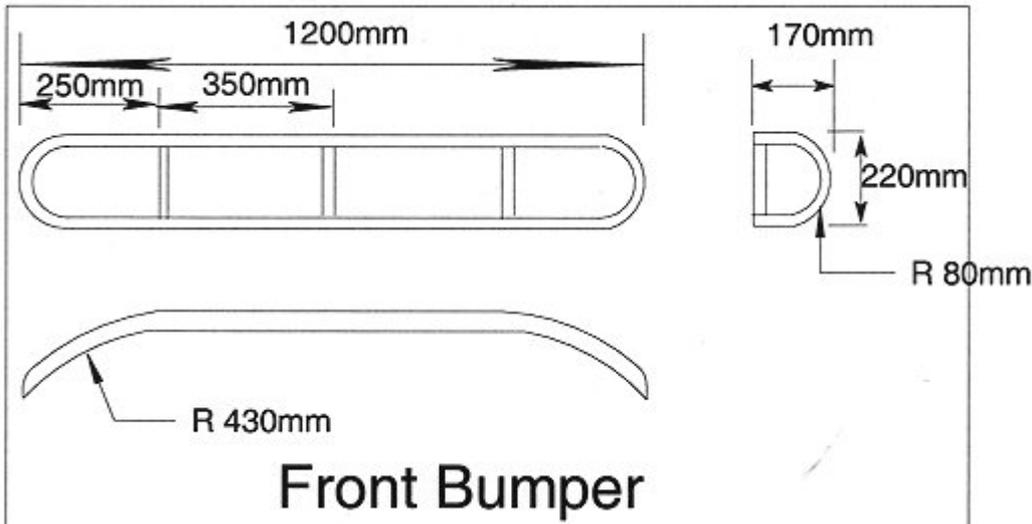
However if you have a sensitive gearbox, that is that gear changing is too delicate then a series of rods should be used to gear down the rotation of the gear selector shaft. It is more easily followed in the diagram. Also another benefit is that you can have the gear lever really close to hand for positive and quick gear changing. Another thing is to try and keep the actual gear changing operating arm as small as possible in length. Too long and it will give terrible gear change. A nice short stubby operating arm and you will feel gears been selected more positively and smoothly. You can experiment around with $D1$ and $D2$. Remember making $D1$ longer then you will have to move the operating arm more to get it to go into gear. But if it is too short then the gear changing will be too delicate. You can also change $D2$ too, however it's affects are in reverse of that with $D1$. i.e.. making it longer will make gear changing too delicate and too fast for comfort. The sizes given are a very good approximation for all typical engines and gearboxes.

There are only two Distances that have to be maintained, they are the Distance $D1$, from the splined shaft to the first pivot point. And the distance of the hole from the bottom of the operating arm to the hole near the bottom $D2$. All other Lengths are to suit individual requirements, to suit engine, size of driver etc.

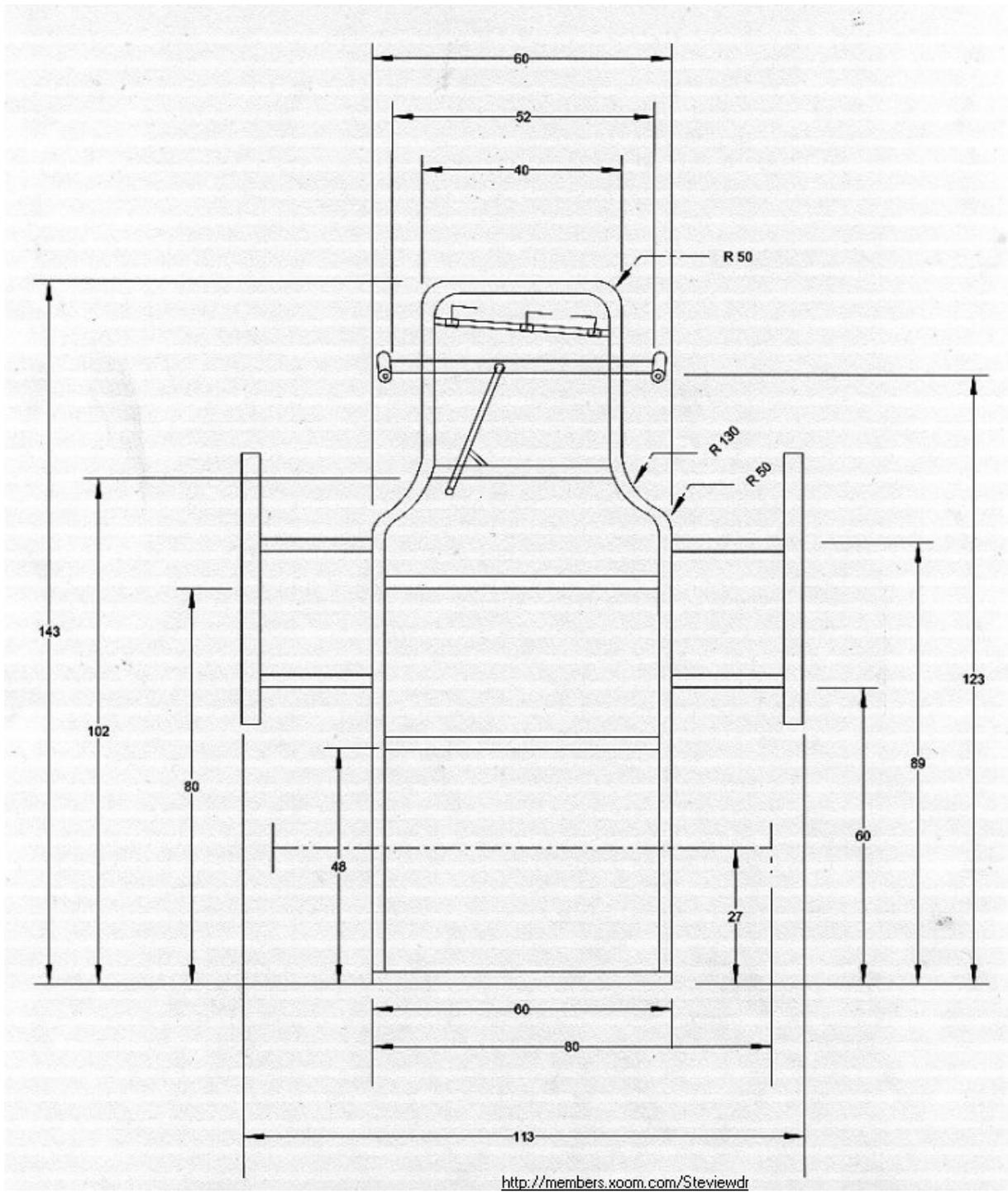


Bumpers

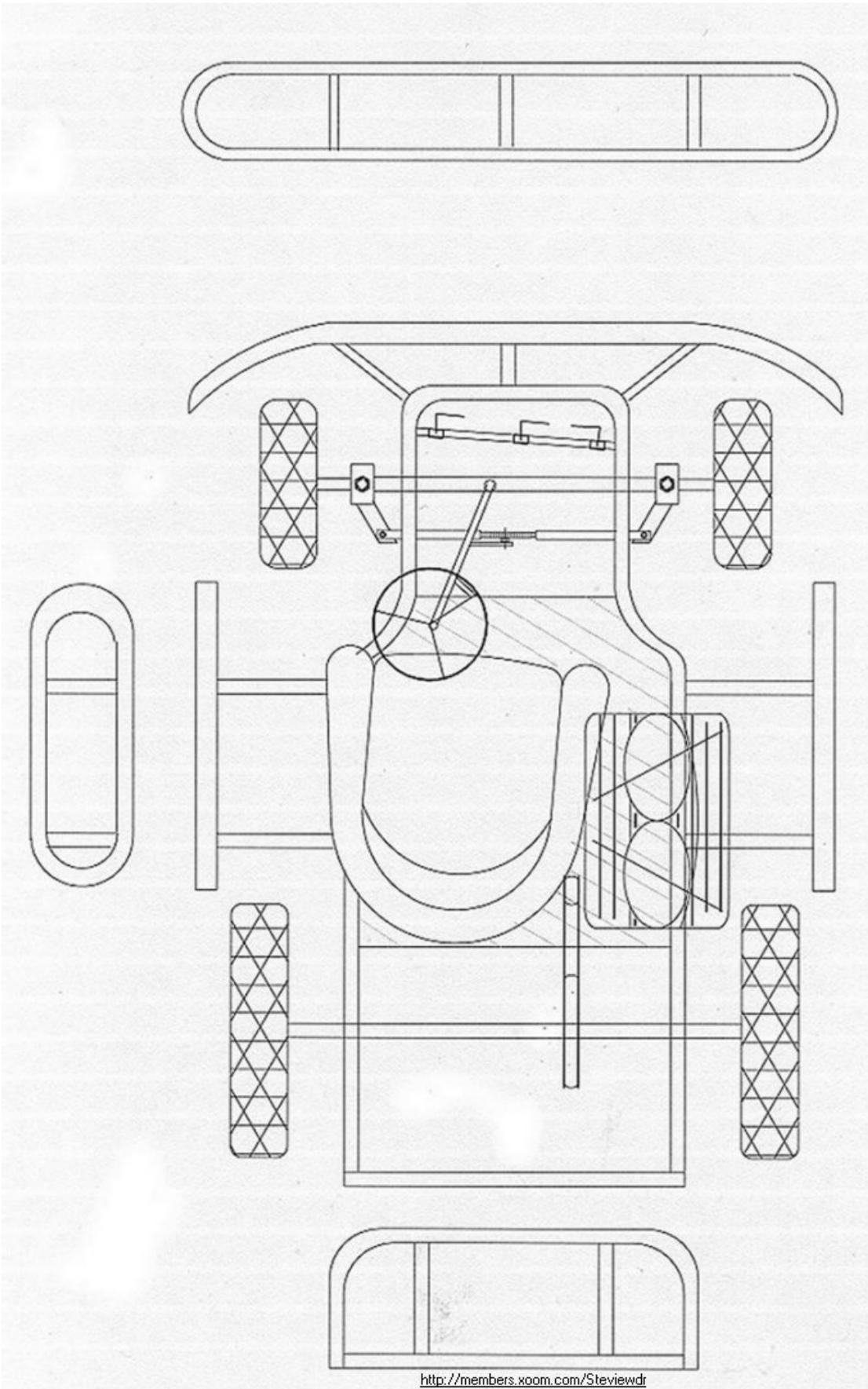
As you will see from the pictures of my kart, I didn't bother with bumpers. Mostly because of my lack of time and of course a Pipe Bender etc. But for anybody else's Kart I'm sure it is a must, even if it was only to be for aesthetic purposes. There's not much I can say, that hasn't been said about bending in the "Chassis" section. My only advice is: **If you don't have or have access to a pipe bender Forget about it!** But here are the measurements anyways for those who are fortunate to have access to a pipe bender. All the piping used should be at least 25mm thick, especially if your using thin walled pipe. For thick walled pipe around 2-3mm I'd suggest heating the pipe until it was RED before trying to bend it. A nice option would be to use Chrome plated Bumpers as that's what they have on the fancy racing Karts. It would look a nice feature, especially if the Pedals were also Chrome plated.



Chassis diagram



General view



<http://members.xoom.com/Stevewdr>