Animating an Excavator

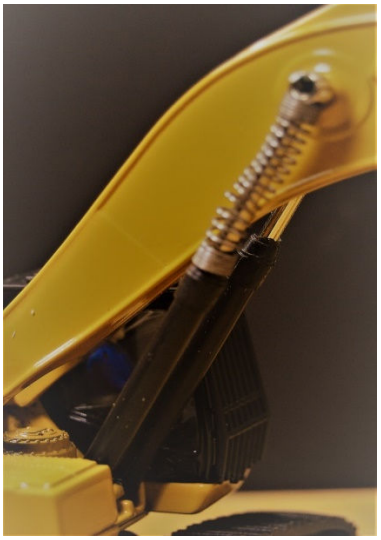
By John Fucile

The request was to create some animation on the club layout. I was asked to work on the committee. One of the suggestions was to have an excavator digging. I took the idea and put together the plan for the water line project. The plan was approved. The project came together over time with much trial and error. The following will describe the making each piece of the project.

Excavator

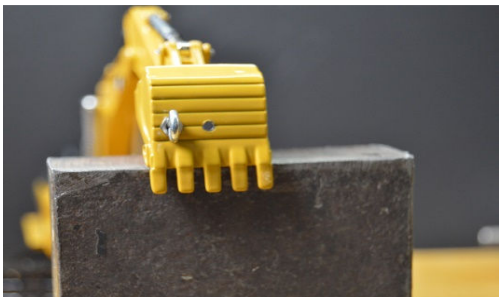
The first thing was to get an excavator. I ordered a 1/64 scale Norscot excavator from 3000TOYS. Once I received the excavator I realized that the digging arm was too stiff. Removing the hydraulic pistons I carefully measured their diameter. Using a slightly larger drill I enlarged the sleeves to allow the piston to slide freely.

After some trials the action was still not right. To resolve this I added some springs to limit the travel and help lift the arm as seen in the following photos.

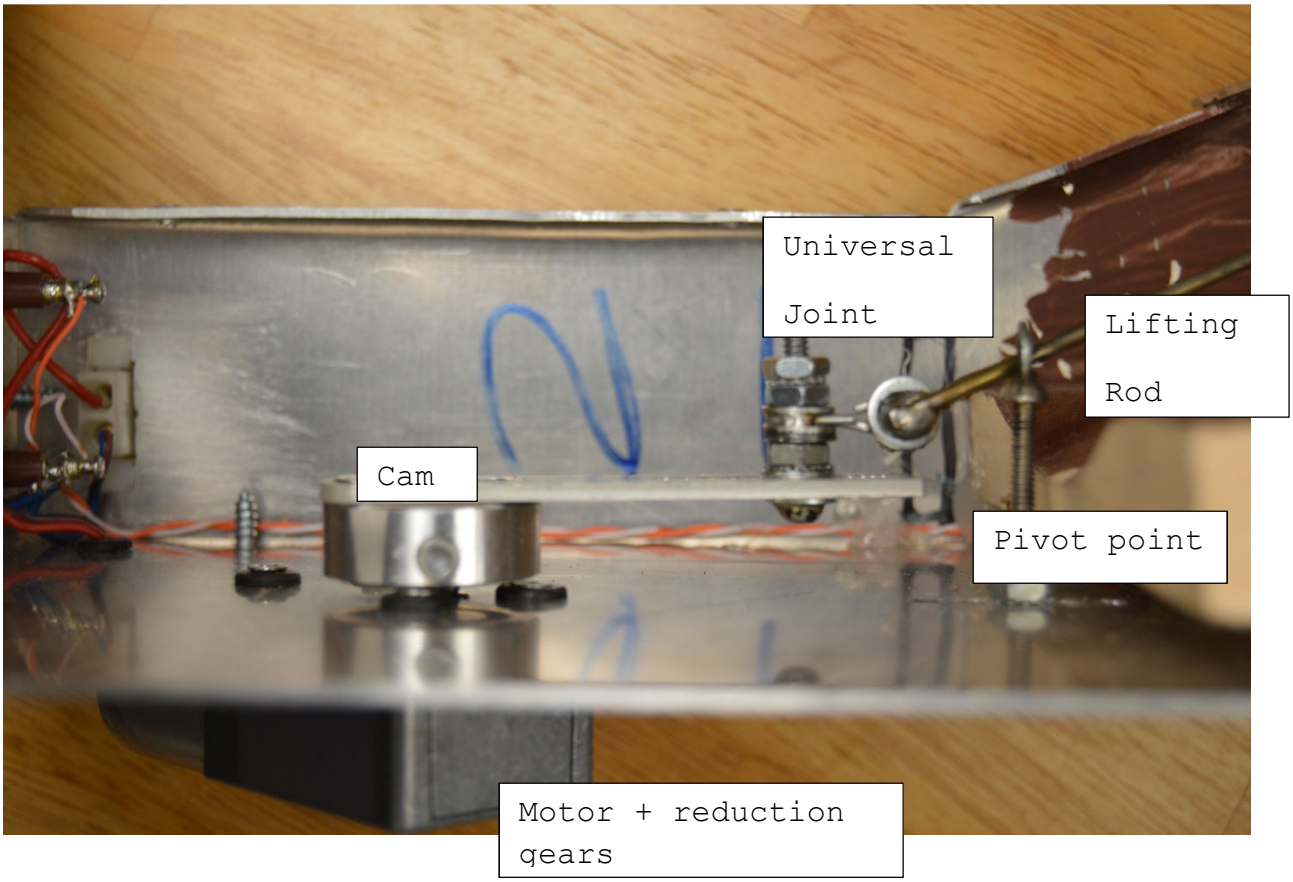


The springs are ballpoint pen springs. On the arm there is only one spring on the side away from the viewer. The spring on the bucket piston was added to prevent it from moving too far back.

The bucket has an eye mounted on the edge again on the side away from the viewer as seen in photo.



Control Box



The above photo is a look at the control box moving parts.

Motor

The motor is a 6 rpm gear reduction motor. The motor was purchased from Amazon. The motor was a *"Uxcell DC 12V 6RPM 6mm Shaft High Torque Turbine Worm Geared Motor".*

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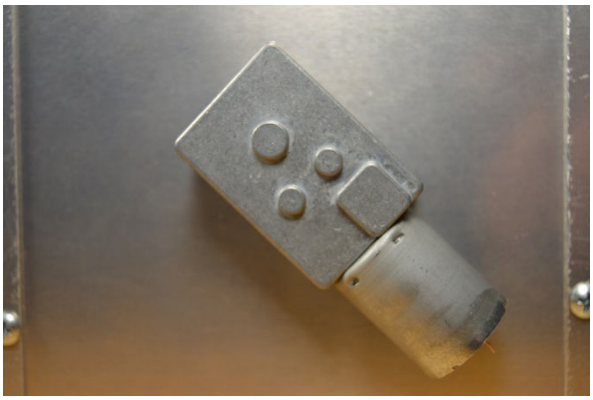


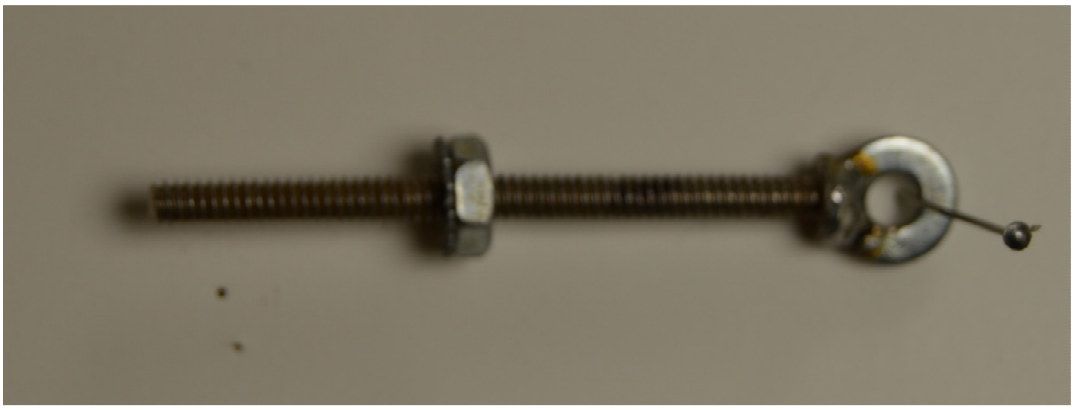
Cam

The cam was made by me and there is a drawing in the appendix.

As you can see many of the parts are made to allow for adjusting the motion.

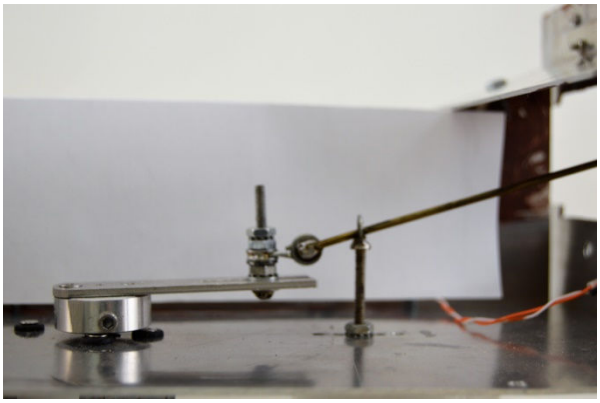
PIVOT POINT

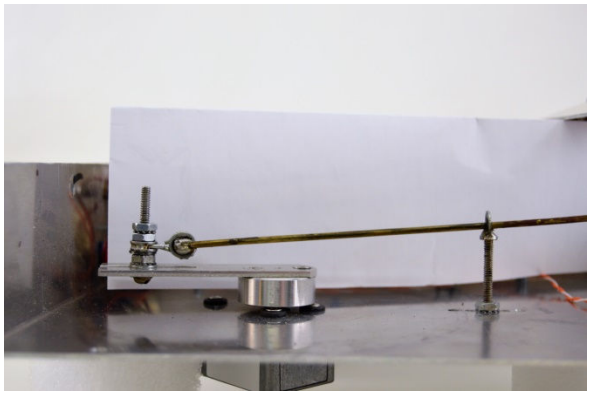
The pivot point as seen below is made up of a 6-32 screw with small washer soldered in the slotted head. The mounting position of the pivot point will control both the back and forth motion and the side sweep of the bucket.



UNIVERSAL JOINT

A universal joint was needed because there is movement in two planes, the bucket moves up and down and in and out in one plain, it also moves to left of center for the second direction. The photos below show the left movement.





I was able to create this by using a small link of a chain and four washers. Then I soldered them all together. After things cooled off I adjusted the assembly to 90 degrees.

LIFTING ROD

The lifting rod is 7 inches long by a 10^{th} of an inch in diameter. See the photo of the brass lift rod below.

The end that hooks to the bucket has a ¼ inch eye hook soldered to it, see photo.

The other end has a ¾ inch 6-32 screw soldered see photo.

Operating Notes:

There are some observations that should be mentioned due to the use of pivot point;

1. The cam must turn in the opposite direction of the excavator motion.

2. It must be noted that the excavator motion varies in speed during the cycle. During the digging when the cam is at the farthest from the pivot point the bucket moves slower. When dumping the cam is closest to the pivot point the motion is faster.

APPENDIX

Illustration 1

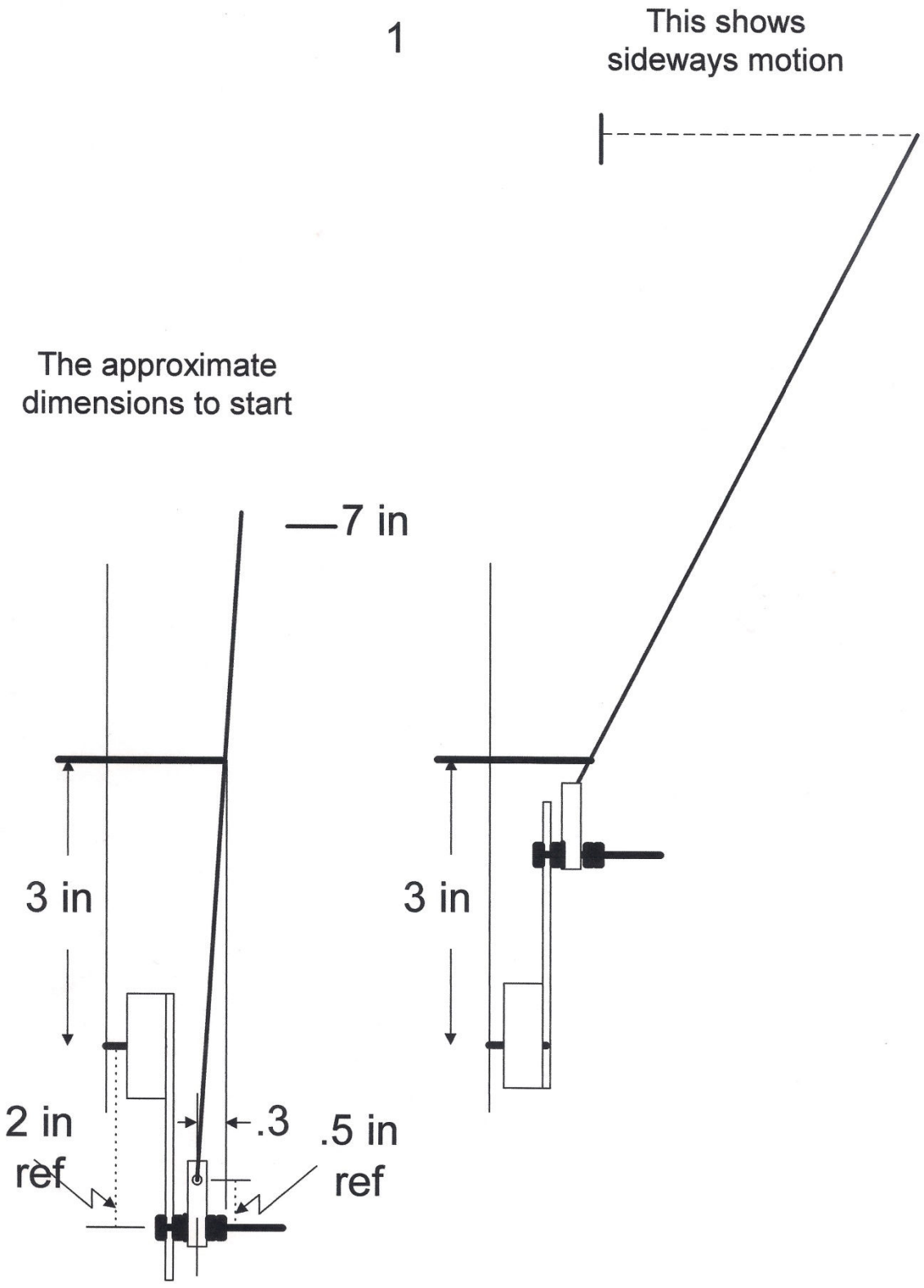
Shows an example of how the offset between the cam and the pivots point creates the sideways motion.

Illustration 2

The back plate illustrating cam direction and the pivot point possible locations.

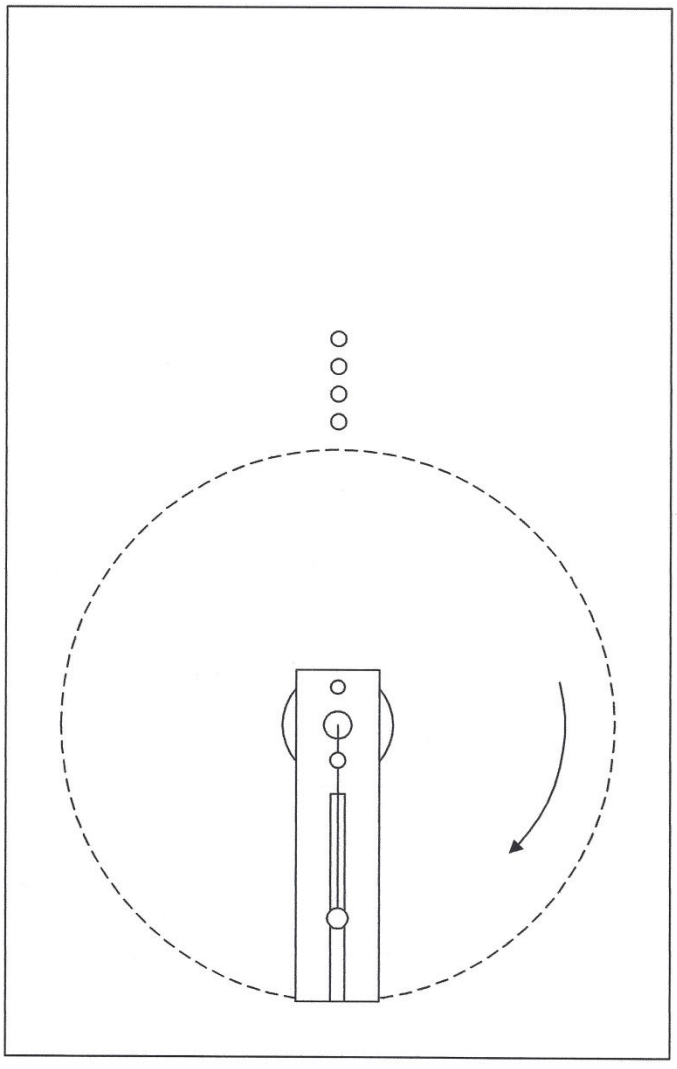
Illustration 3-5

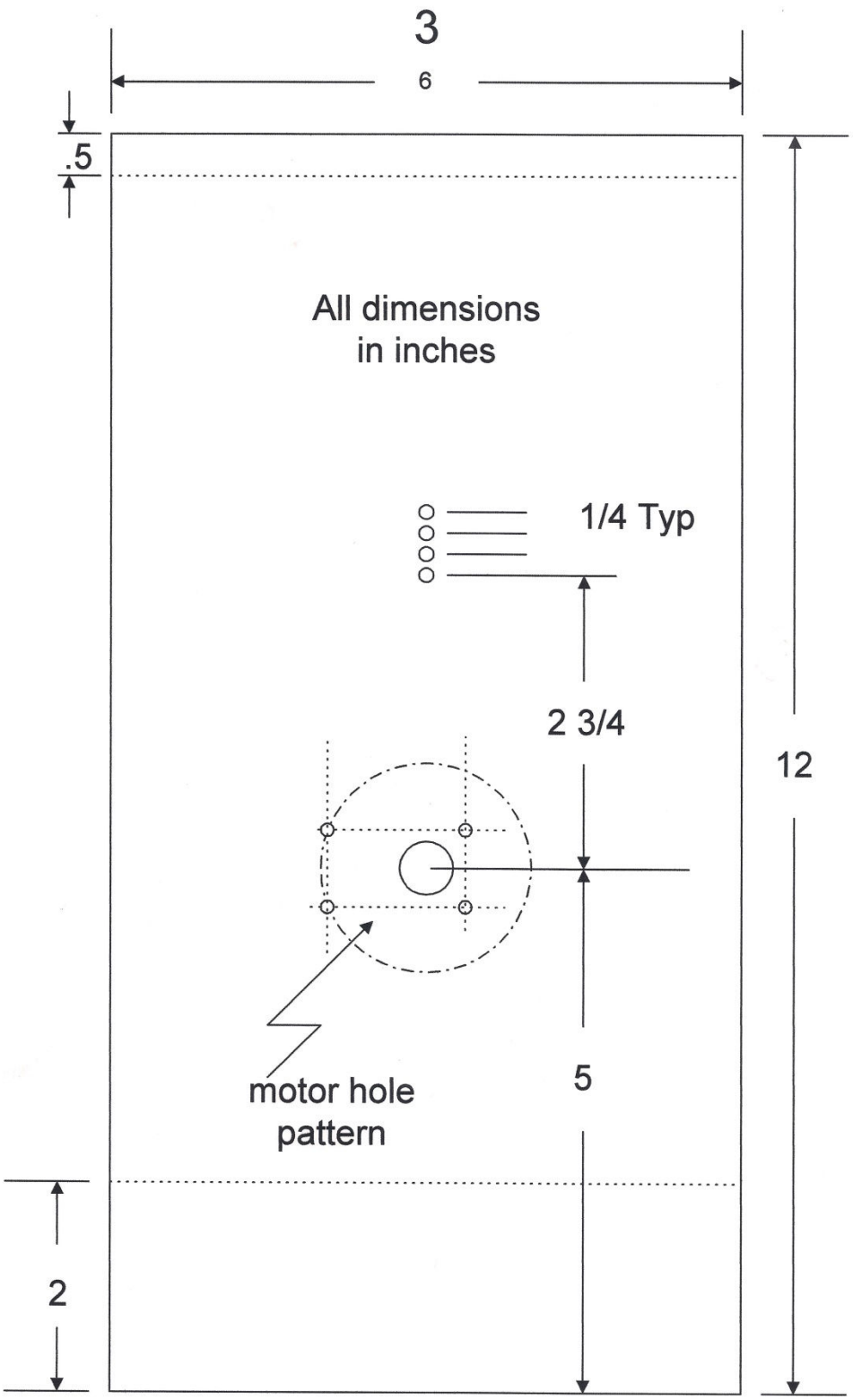
The Aluminum parts to make chassis that hangs below the layout.


1
This shows
sideways motion
The approximate
dimensions to start
—7 in
3 in
3 in
2 in
ref
.3
.5 in
ref

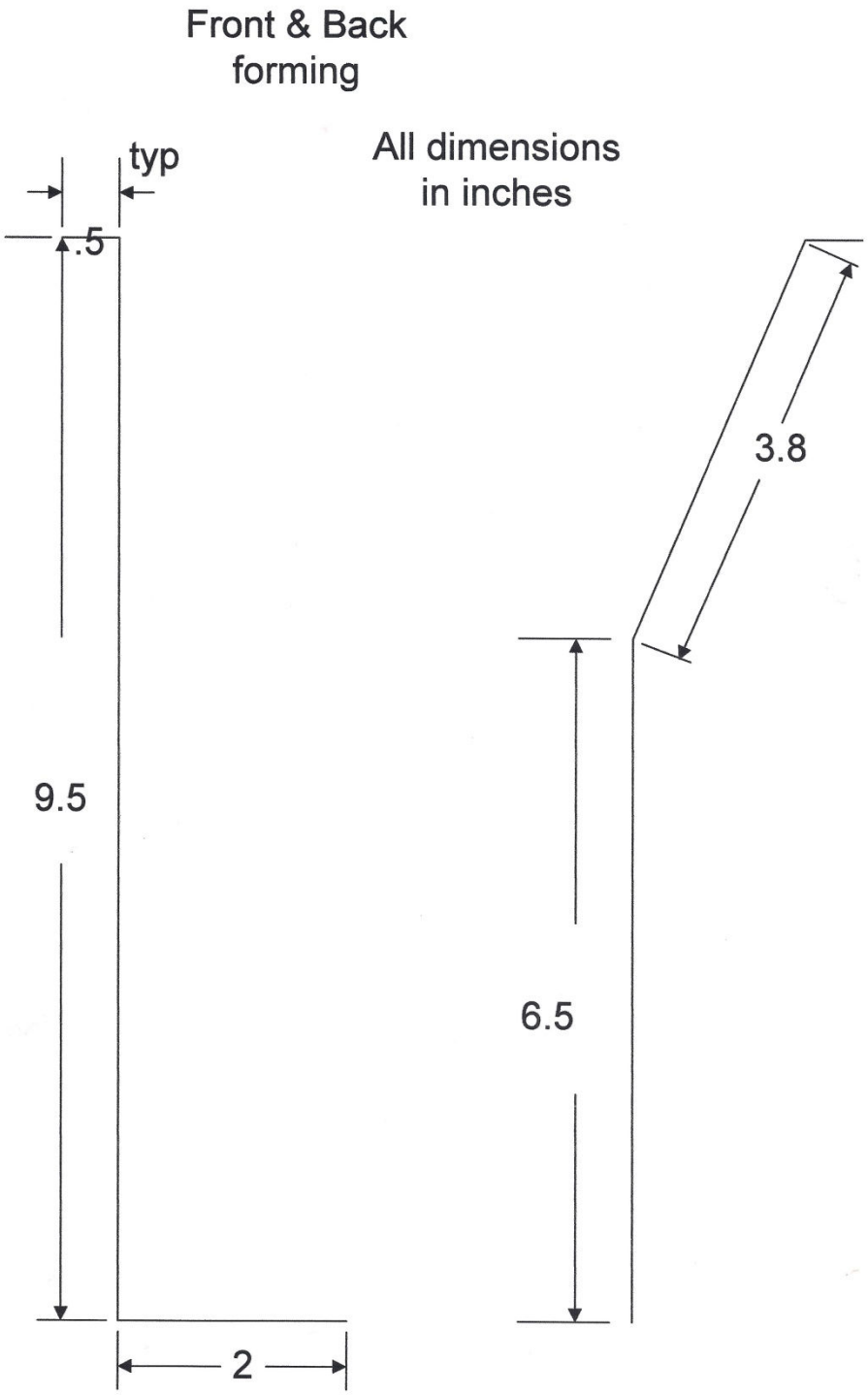
2

Cam action and
adjustment positions
for the pivot point and the location of
the cam. The dimensions shown on
appendix page 1 shows where I ended
up.




3
6
.5
All dimensions
in inches
1/4 Typ
2 3/4
12
motor hole
pattern
5
2

4



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