

BUILDING A HIGH-LEVEL SWITCH STAND WITHOUT CASTINGS

by W. Andrew Morrison

Copywrite 2003, Ooltewah, TN

(These notes are intended for use with the associated **Rev. E** Material List and Sketch Drawings.)

Introduction:

This High-Level Switch Stand design was developed to produce a sturdy model for use on outdoor railroads where the switch stand might be accidentally kicked by adults and might get rough handling by enthusiastic youngsters. It was sized as a compromise to look appropriate on railroads running both 1.5 inch and 2.5 inch scale trains. The advantage of the design is that a few stands can be built quickly with materials from the local hardware store. It can be fabricated without shop machinery but some sort of welding or brazing equipment is required.

The few fasteners are specified to be from stainless steel so that they will not corrode away in the outdoor environment. Nuts should be of the nylon-locking type so that they will not work loose over time. I have been able to find the 6-32 fasteners in my local ACE Hardware store. The 4-40's will probably have to come from a hobby or electronics shop.

If a large number of switch stands are required it would probably make sense to buy or make patterns for castings which would save all the welding and some of the machining time.

A feature of the design is that it includes two alternate base assembly styles. Many people prefer the appearance of the T-leg style. The alternative is the column style which is a little faster to fabricate and weld up. Neither style is an exact scale model of a prototype stand but both of them are approximations of specific real prototypes. The differences are compromises necessary to make hardware store steel shapes look like elaborate castings.

The stand assembly gives excess throw for a 7 1/2 inch gauge turnout and is intended for use with springs on the throw-bar mechanism to take up the excess throw and keep the points against the stock rails. There is enough excess throw that the turnout can be arranged as a spring-switch with a suitable mechanism between the switch stand and the points. (Contact the designer for sketches of a suitable throw-bar mechanism.)

I have built two dozen of these stands over a period of three years and have had no trouble with any of them and they get a lot of favorable comments. They are in use on the Eagle Point Railroad of the Chattanooga Society of Model Engineers, Inc., near Dunlap, TN. Occasionally people will brush against the thin aluminum targets and bend them but they are easily straightened.

Materials:

The steel bar and/or pipe materials can be found at a Home Depot or Lowe's store. You may have trouble finding the 5/16" square steel bar used for the shaft, a key part. Although my ACE Hardware store stopped stocking it ("Nobody buys it"), I found that it

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was in their catalog and they were glad to special order it for me. It came in just a day or so and there was no extra charge for the special order. I looked at substituting other sizes for the shaft but the available sizes were either too flimsy or too heavy-looking.

The washers used for the top plate assembly were found at ACE Hardware. It is important that the hole in the small washer is a free fit around the 5/16" square bar vertical shaft. The vertical shaft is square in order to make it easy to attach the handle and the targets. Running the square shaft in round holes does not negatively affect the operation in any way.

The .025 or .031 thick aluminum sheet used for the targets was found at Lowe's or Home Depot. Do NOT try to use aluminum flashing which is not rigid enough.

The 3M reflector tape used on the targets is found at auto parts stores. This is excellent tape and survives the weather beautifully. The bad news is that it is expensive. I wanted the targets reflectorized for night running but they can be painted if only day time running is typical.

Fabrication:

Fabricate the BASE, Item 1 or 19, depending on the style (T-leg or Column) selected.

Make the HANDLE, Item 4. The 5/16" square steel can be bent cold in a sturdy vise with the use of a hand sledge hammer.

Make the HANDLE BRACKET, Item 5. Only drill the holes on ONE side. This can be bent up in a vise by using a 5/16" thick spacer to form the second bend. Use the first set of holes as guides for drilling the second side's holes. This will compensate for tolerance errors during the bending.

Welding operations:

TIP: Get a spray can of "anti-spatter" spray from your welding supplier and apply it to your fixtures parts before welding; it will make it much easier to clean up your weldments.

Make the SHAFT, Item 3. Drill all the holes and slot the bottom "L" first. Getting the bottom "L" shape bent over and welded to the correct dimension is a little tricky. The design gives plenty of excess throw for a 7 1/2 inch gauge turnout so don't worry if the "L" comes out a little short.

Make the TOP PLATE ASSEMBLY, Items 6 and 7. Drill the holes in Item 6 and mill or file the notches. Make a fixture out of wood or aluminum that will center the small washer, Item 7, on the large washer. Be careful tacking the washers together as too much heat will burn the thinner washer. However, also make sure that the welds are good, I had one washer assembly let go in service from going too easy on the welding.

file: MsWorks: WAM switch stand info

W. A. Morrison, 1 Nov. 2003

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Make the T-LEG or COLUMN weldments, depending on the style selected:

T-LEG, Item 2: Weld straight pairs of the 1/2 inch angle into tees. They only need to be tacked at three or four places, inside and out. Saw the V-notch. Bend to 17 degrees. Weld at the closed-up V-notch. Saw or mill the bottom ends; milling takes longer but will give a nice square surface for the next assembly step.

Make a welding fixture. Mine consists of a 3/8" threaded rod with nuts, a wooden spacer block that fits between the upper part of the T-legs, and a longer block that bears against the bottoms of the T-legs. Each of these blocks has small finishing nails that position the T-legs properly with respect to the threaded rod. Use these blocks and threaded rod to assemble the top plate washer assembly to the T-legs for welding. It is a little fussy to get the nuts tightened on the threaded rod and to keep everything lined up but it is possible. **BE SURE THAT THE NOTCHES IN THE TOP PLATE ARE POSITIONED CORRECTLY WITH RESPECT TO THE T-LEGS.** See the top view of the leg weldment assembly. Weld the T-legs to the bottom side of the Top Plate Assembly.

Replace the long block of your welding fixture with the BASE, Item 1, and tighten up the nuts on the threaded rod again (leave the spacer block between the upper part of the legs). **BE SURE THAT THE BASE IS POSITIONED CORRECTLY WITH RESPECT TO THE NOTCHES IN THE TOP PLATE.** see the top view of the Leg Weldment Assembly.

COLUMN, Items 20 and 21: Tack weld the two pipe nipples together after cutting off the unused threads (it's O.K. if the threads are left on the lower end of item 21 which will be inside item 20). You may have to take a lathe cut off of Item 21 to get these parts to fit together.

Use a threaded rod and nuts to assemble the Top Plate, Column weldment, and Base. **NOTICE THAT THE BASE, ITEM 19, IS DIFFERENT FROM THE ITEM 1 USED ON THE T-LEG STYLE.** Tack weld the top Plate and Base to the Column weldment. **NOTE THE CORRECT POSITION OF THE TOP PLATE NOTCHES IN RELATION TO THE THE BASE.**

Cook up a fixture to hold the GUSSETS, Item 22, in place while they are tack welded. (The flat top of these gussets suggest the steps that were used by switch tenders to stand on when they serviced the oil-burning switch lamps.)

Painting:

Prime and paint all the steel parts gloss black. The gloss finish will weather to a realistic appearance soon enough outdoors.

Unpainted parts:

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TARGETS, Items 8 and 12: Cut out the targets on a small jig saw or or band saw. I used small saws intended for wood-working but found that the thin aluminum is soft enough that the saws went through it with no fuss. Bend the targets in a vice of suitable size. To make the second bend I used a scrap of steel as a bending brake which is easy with the soft aluminum.

After bending, add the reflectorized tape. Put on oversized strips and it is easy to trim them by running an EXACTO blade along the edge of the target. If you plan on adding turnout I.D. numbers to the targets, do not add them until the switch stand is mounted on the turnout and you are sure that you have positioned the targets correctly (It is VERY easy to get them upside-down and pointing in the wrong direction).

Assembly:

Hammer the roll-pins into the holes in the top plate. They should stick up about 3/8 of an inch. Their function is to keep over-enthusiastic switchmen from over-throwing the handle.

Thread the Shaft up through the T-leg or Column weldment. Attach the Handle and Handle Bracket with screws and LOCKING nuts.

Attach the Targets. They are symmetrical so they can be turned over depending on which handle position selects the main route. NOTE that which Shaft holes you use to attach the targets depends on which side of the turnout you mount the switch stand.

Mount the switch stand on the switch ties. NOTE the correct orientation of the Base plate to the turnout points. To ensure clearance for foot rests on 2 1/2 inch scale narrow gauge locomotives we use 34 inch long switchstand ties. 30 inch long ties are O.K. if you're sure that no 2 1/2 inch scale locomotives will ever show up on your railroad but there are a lot of them around.

The screw holes in the Base plate are intended for switchstand ties with a 2 1/4 inch space between them. You need at least this much space to avoid interference with the operating arm between the ties. Mount the switch stand so that the centerline of the vertical Shaft is 2 1/4 inch from the end of the switchstand ties.

End of Switch Stand Instructions; enjoy your new model!

**HIGH LEVEL SWITCH STAND
MATERIAL LIST**

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Revised 1 Nov. 2003, Conforms to Rev. E Assy Drawings.

* Commercially available item with no modification required.

See part drawing for exact size required.

NOTE that Items 1,2, and 20 are for the T-LEG style option.

ITEM	QUAN.	PART NAME	MATERIAL DESCRIPTION	REV.
1	1	Base, T-Leg style	1/8 x 2 steel bar	B
2	2	Leg weldment, T-Style	1/8 X 1/2 steel angle	D
3	1	Shaft	5/16 square steel bar	J
4	1	Handle	5/16 square steel bar	B
5	1	Handle Bracket	22 ga. (.032) sheet steel	E
6 #	1	Top Plate	7/8 nominal I.D. flat washer	C
7 *#	1	Shaft Bearing	3/8 nominal I.D. flat washer	B
8	1	Target, Tail End	.025 or .032 aluminum sheet	C
9*	5	Screw, Pan Head	4-40 X 5/8 (3/4 length O.K.)	
10*	5	Lock washer, Helical	No. 4	
11*	5	Hex nut, 4-40		
12	1	Target, Point End	.025 or .032 aluminum sheet	C
13*	2 ft.	"3M" Reflector Tape	2 inch wide, white	
14*	2 ft.	"3M" Reflector Tape	2 inch wide, red	
15*	4	Black Number on White	reflective background, 1" high no.	
16*	2	Roll Pin, 1/8 dia. X 3/4 in.		
17*	2	Screw, Pan or Socket Hd	6-32 X 5/8 (3/4 length O.K.)	
18*	2	Hex Nut, Nylon Locking	6-32	
19		(deleted part)		
20	1	Base / Leg Weldment	T-leg style option	C

The following parts are for the COLUMN style option:

21	1	Column Top	3/4" NPT X 5" black iron pipe nipple	B
22	2	Gusset	1/8 X 1 steel bar	B
23	1	Column Base	1" NPT X 5" black iron pipe nipple	B
24	1	Base Plate	1/8 X 2 steel bar	C
25	1	Column Weldment	Column style option	E

file: MS Works: WAM Sw. Stand Matls

HIGH LEVEL SWITCH STAND (T-LEG OPTION)

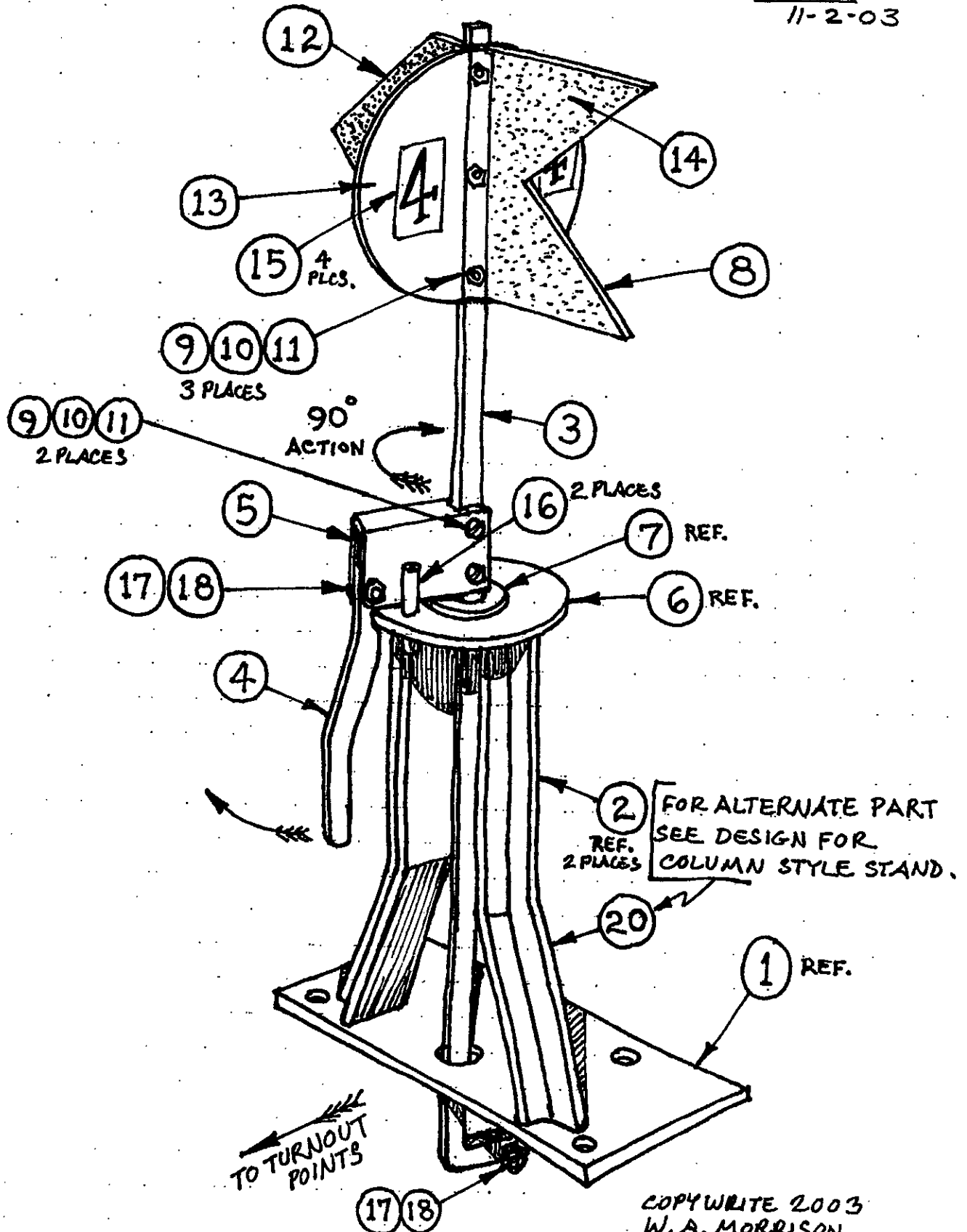
DRAWN 18 DEC. 2000

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ASSEMBLY (SEE COMPUTER PRINT-OUT MATERIAL LIST)

REV. E

11-2-03



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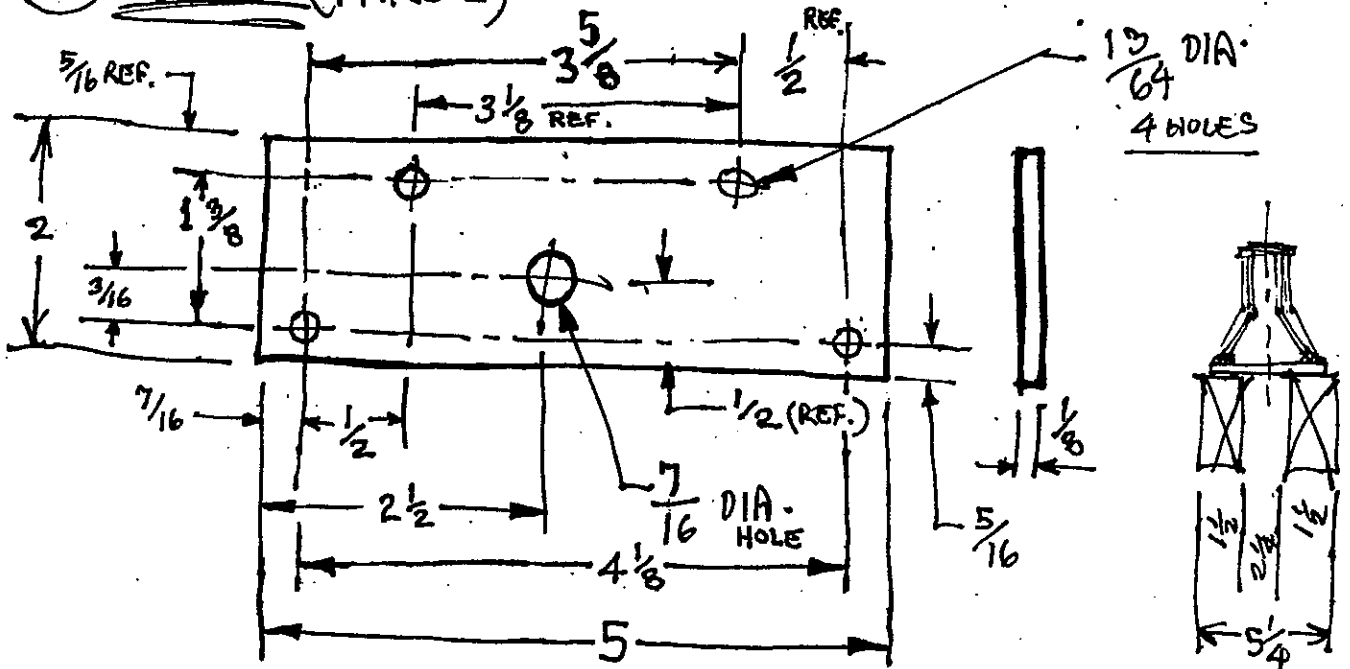
SWITCH STAND (T-LEG STYLE)

DRAWN 6-28-00
W.A. MORRISON

REV. B
7-1-01

MATERIAL: H.R. STEEL BAR

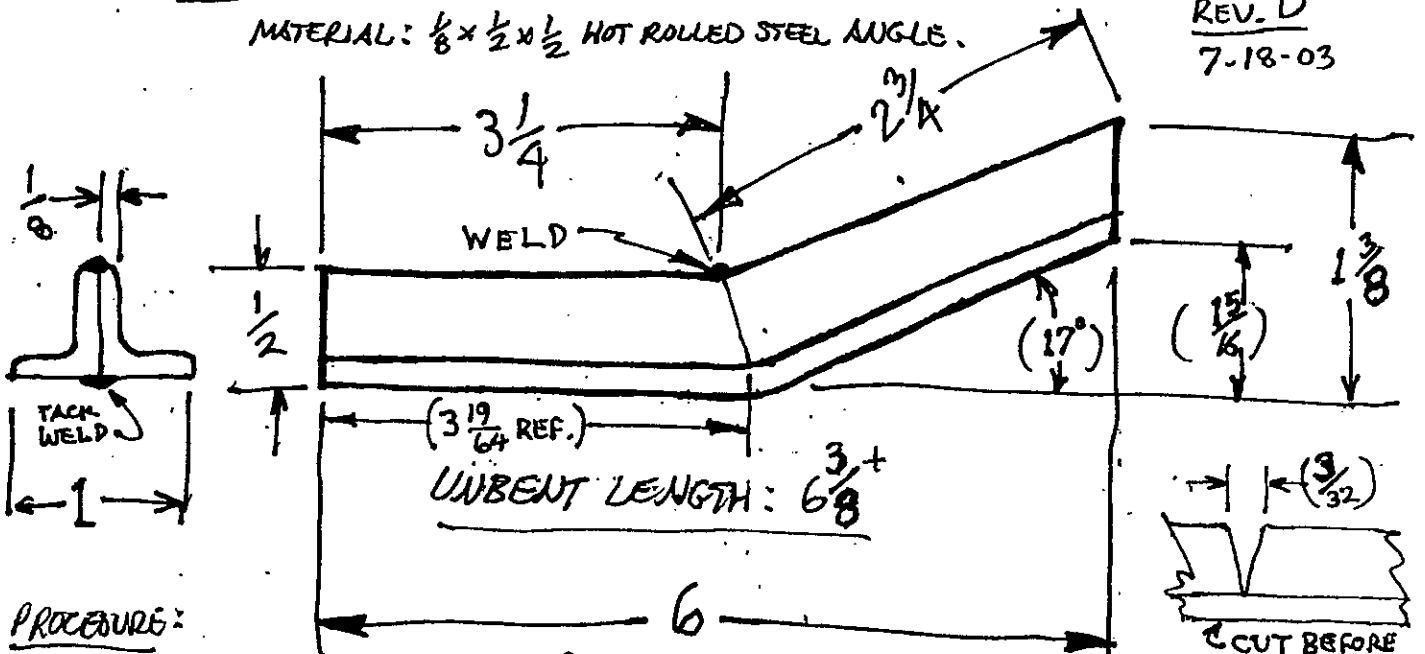
① BASE (MAKE 1)



② LEG (MAKE 4 PIECES AND WELD INTO 2 ASSEMBLIES)

MATERIAL: 1/8 x 1/2 x 1/2 HOT ROLLED STEEL ANGLE.

REV. D
7-18-03



PROCEDURE:

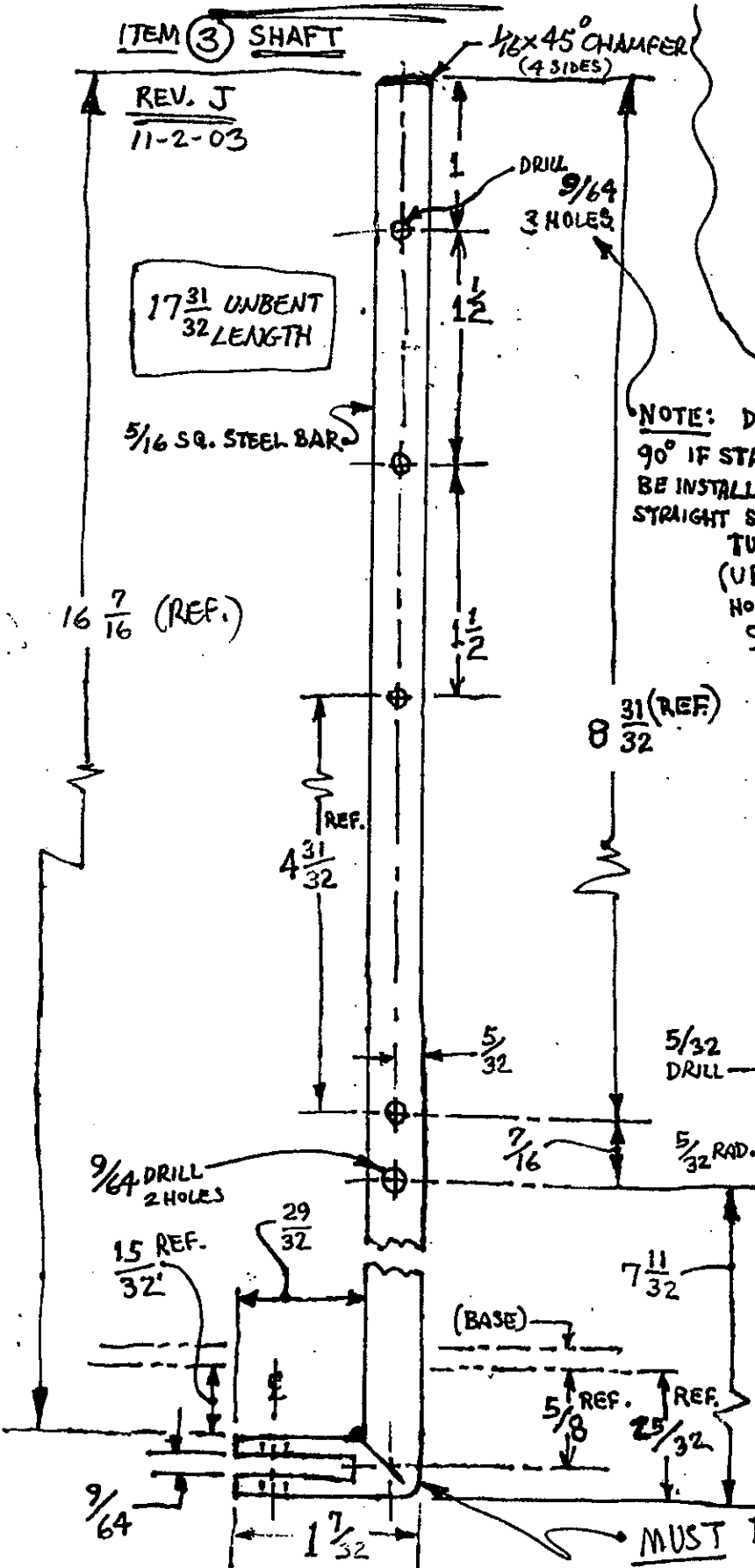
1. CUT 4 PIECES OF ANGLE, 6 3/8 LONG.
2. WELD 2 PAIRS OF ANGLE INTO TEES (WELDER SETTING "D. 2")
3. NOTCH TEES AND BEND TO 17°
4. WELD AT 17° ANGLE.
5. MACHINE OR SAW ENDS.

SWITCH STAND

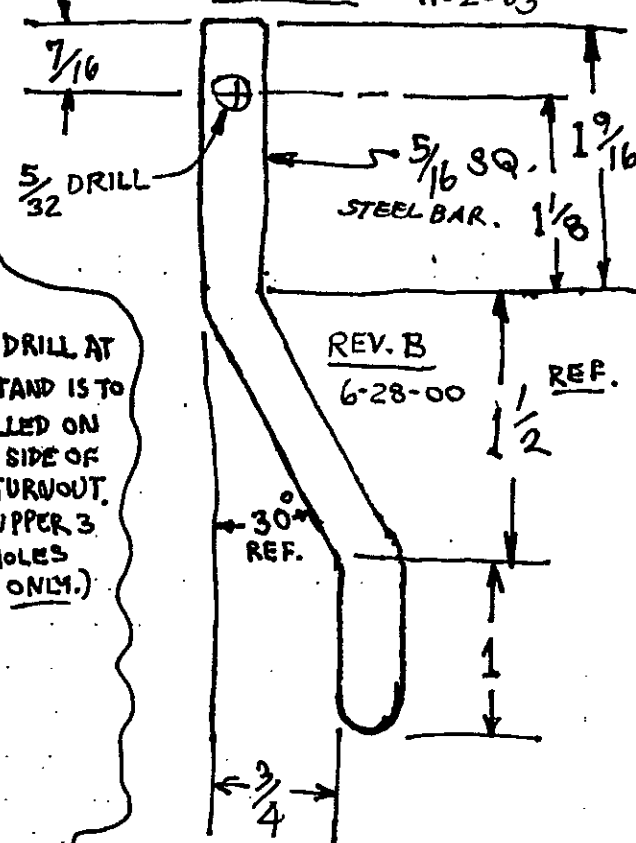
DRAWN BY WA. MORRISON

ITEM (3) SHAFT

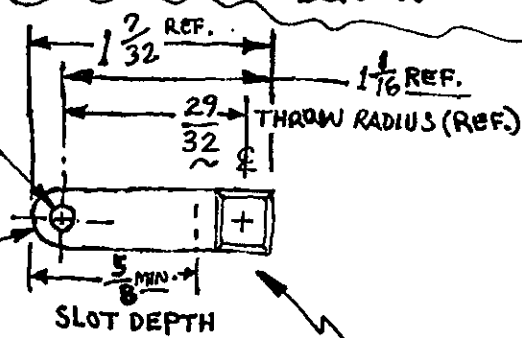
ITEM (4) HANDLE REV. B
11-2-03



NOTE: DRILL AT 90° IF STAND IS TO BE INSTALLED ON STRAIGHT SIDE OF TURNOUT. (UPPER 3 HOLES ONLY.)



LENGTH IS 4 1/4 BEFORE BENDING.



TOP VIEW

TIP: DRILL NO. 26 HOLE BEFORE SLOTTING. CUT SLOT BEFORE BENDING AND WELDING.

MUST BE "V" AND WELDED, NOT COLD BENT.

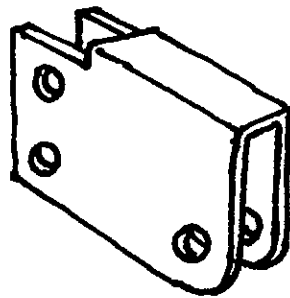
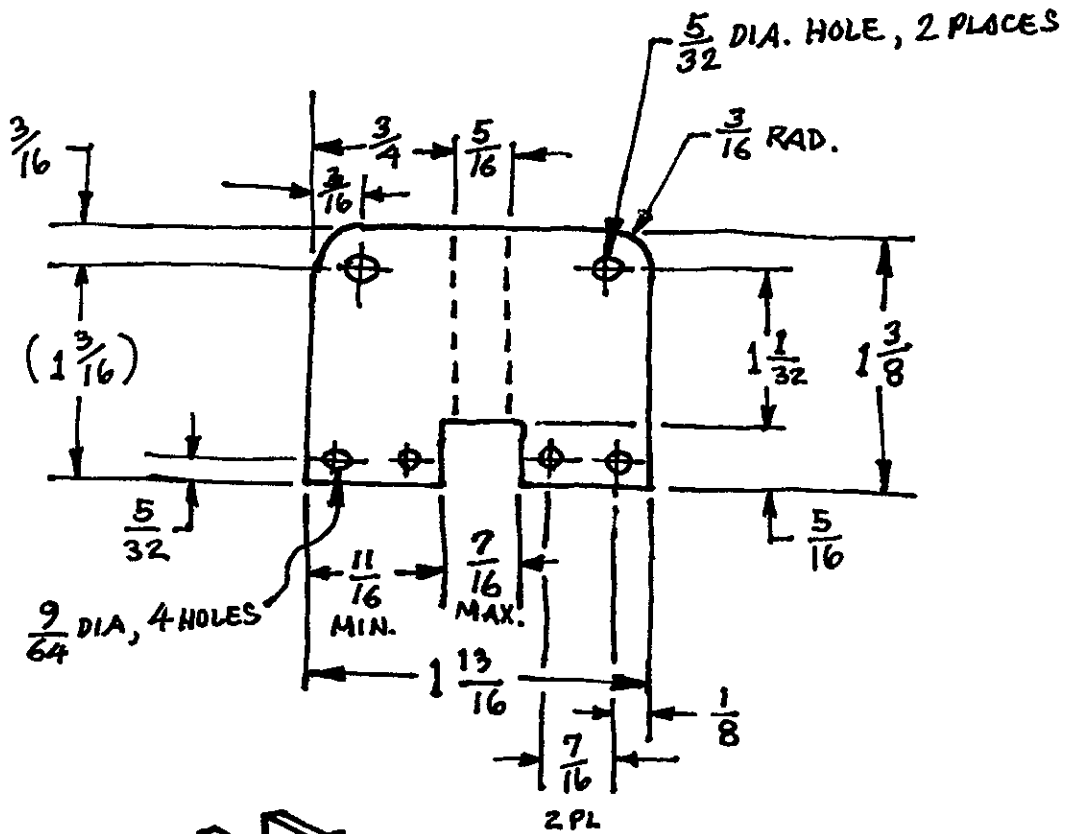
REDRAWN: 3-1-02
W.A. MORRISON

HIGH LEVEL SWITCH STAND

ITEM (5), HANDLE BRACKET

REV. E, 11-2-03

MATERIAL: 22 GA. STEEL (.032 THICK)



PROCEDURE:

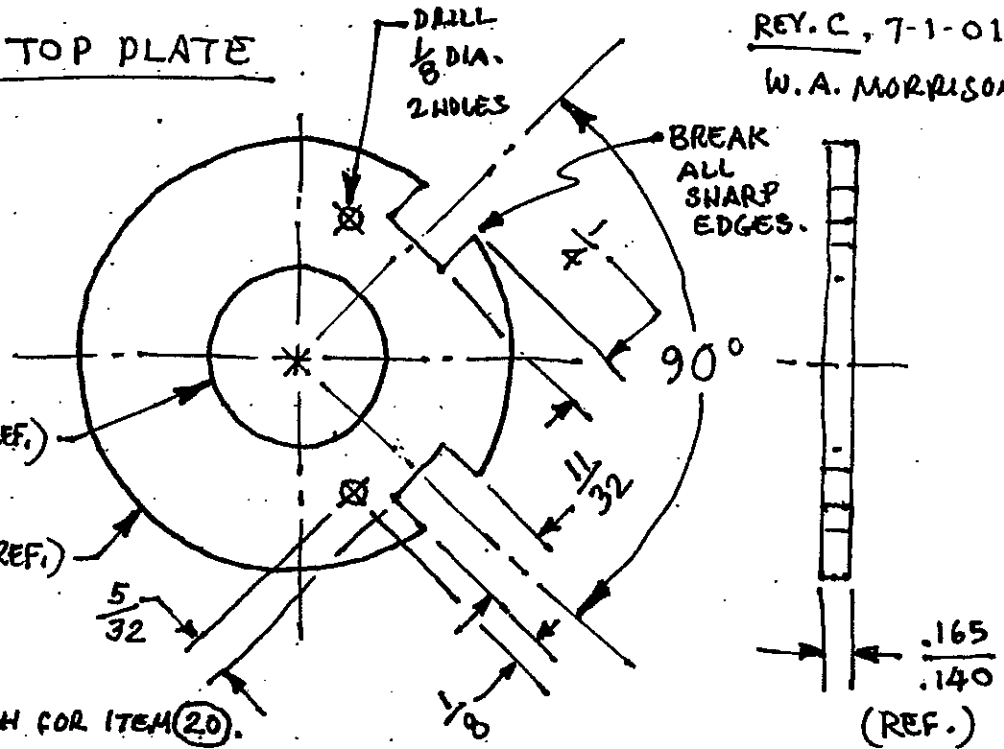
1. LAY OUT AND DRILL HOLES ON ONE HALF ONLY.
2. CUT OUT.
3. BEND AROUND $\frac{5}{16}$ " THICK SPACER.
4. MATCH DRILL HOLES ON UN-DRILLED SIDE.

HIGH LEVEL SWITCH STAND

ITEM (6) TOP PLATE

REV. C, 7-1-01
W. A. MORRISON

MATERIAL:
STEEL FLAT WASHER.
 $\frac{7}{8}$ " NOMINAL SIZE.
(ACE HARDWARE)



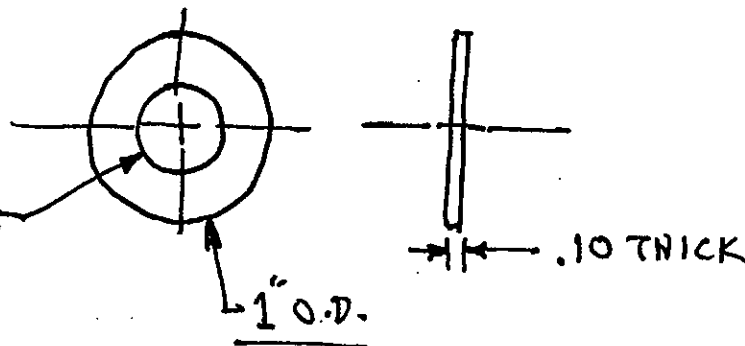
* NOTE:
ROTATE PART 180° TO
MATCH ASSEMBLY SKETCH FOR ITEM (20).

TIP: IF MAKING MULTIPLES, DRILL $\frac{1}{8}$ DIA. HOLES FIRST. ALIGN STACK OF PARTS WITH 4-40 SCREWS THROUGH $\frac{1}{8}$ DIA. HOLES BEFORE MILLING NOTCHES.

12-18-00
W. A. MORRISON
REV. B

ITEM (7) SHAFT BEARING, TOP

MATERIAL:
 $\frac{3}{8}$ " NOMINAL SIZE
STEEL
FLAT WASHER.
(ACE
HARDWARE)



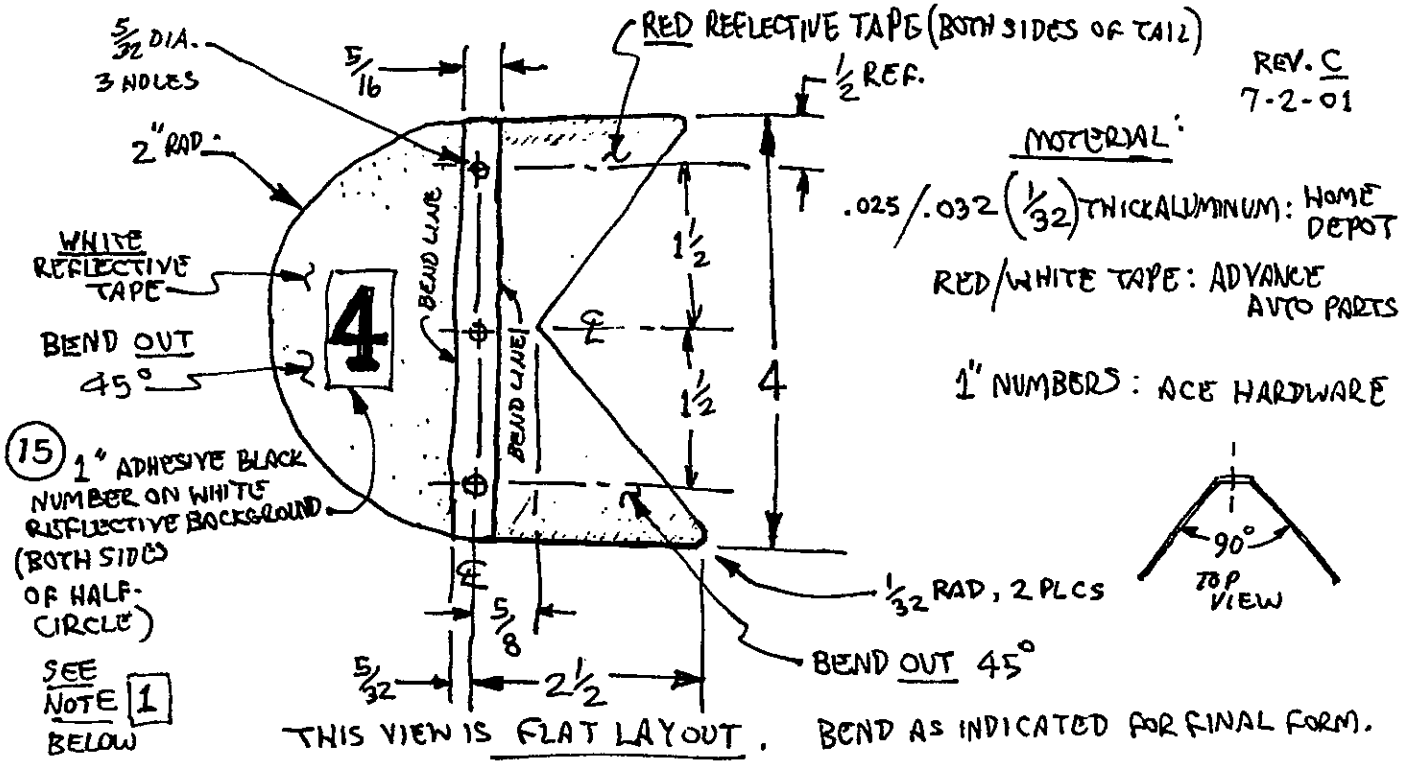
NEXT
ASSEMBLY:
WELD TO ITEM 6.

SWITCH STAND

DRAWN 11-13-00
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ITEM (8) TARGET (TAIL)

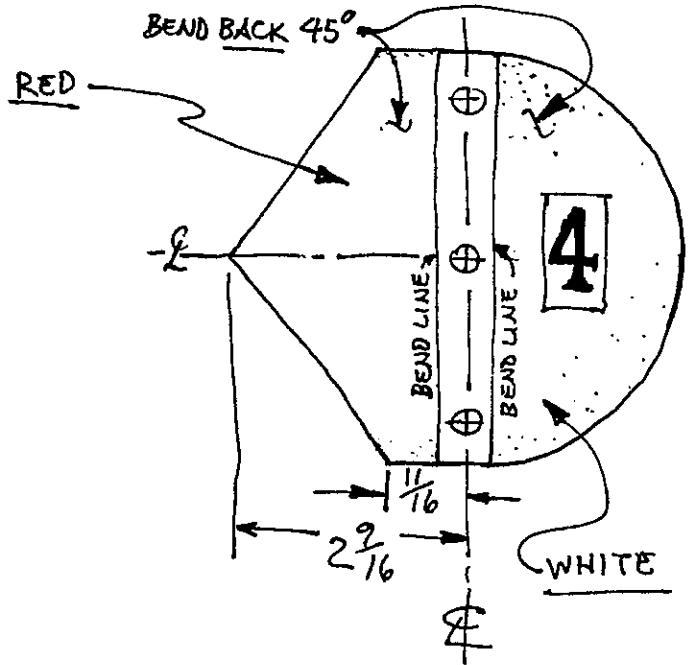
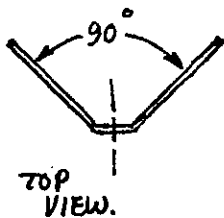
REV. C
7-2-01



ITEM (12) TARGET (POINT)

REV. C, 7-2-01

NOTE: DIMENSIONS NOT SHOWN ARE SAME AS FOR ITEM (8)



SWITCH STAND (T-LEG STYLE)

BASE / ASSEMBLY, LEG WELDMENT (1 of 2) SHEET

W.A. MORRISON
DRAWN 6-28-00
REV. C 12-27-00

TIP: USE FIXTURE TO HOLD PARTS IN ALIGNMENT FOR WELDING.

NOTE: BOTH HANDLE

NOTCHES ARE ON

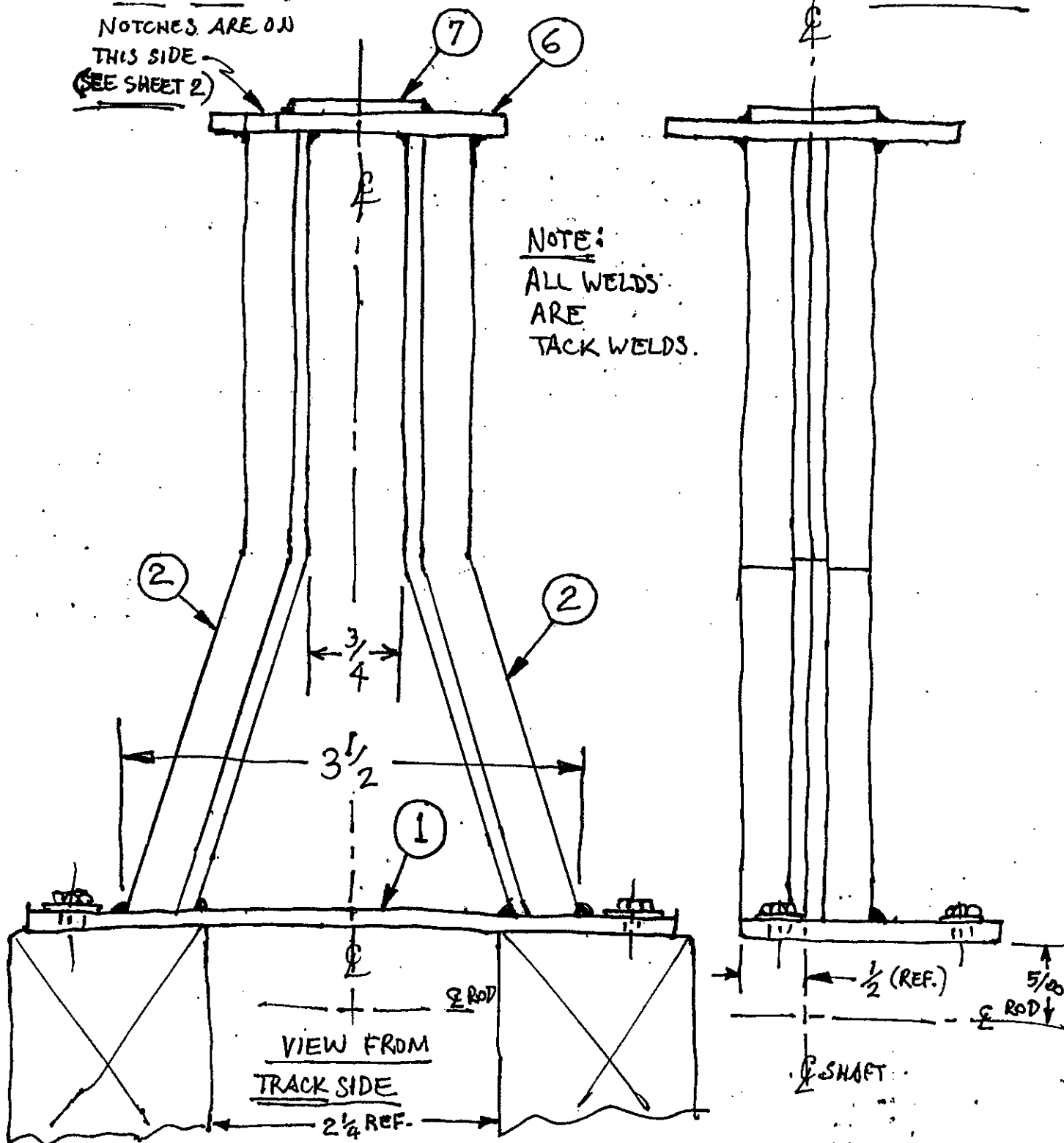
THIS SIDE

(SEE SHEET 2)

SHEET 1 of 2

NOTE:

ALL WELDS ARE TACK WELDS.



SWITCH STAND (T-LEG STYLE)

DRAWN 12-18-00

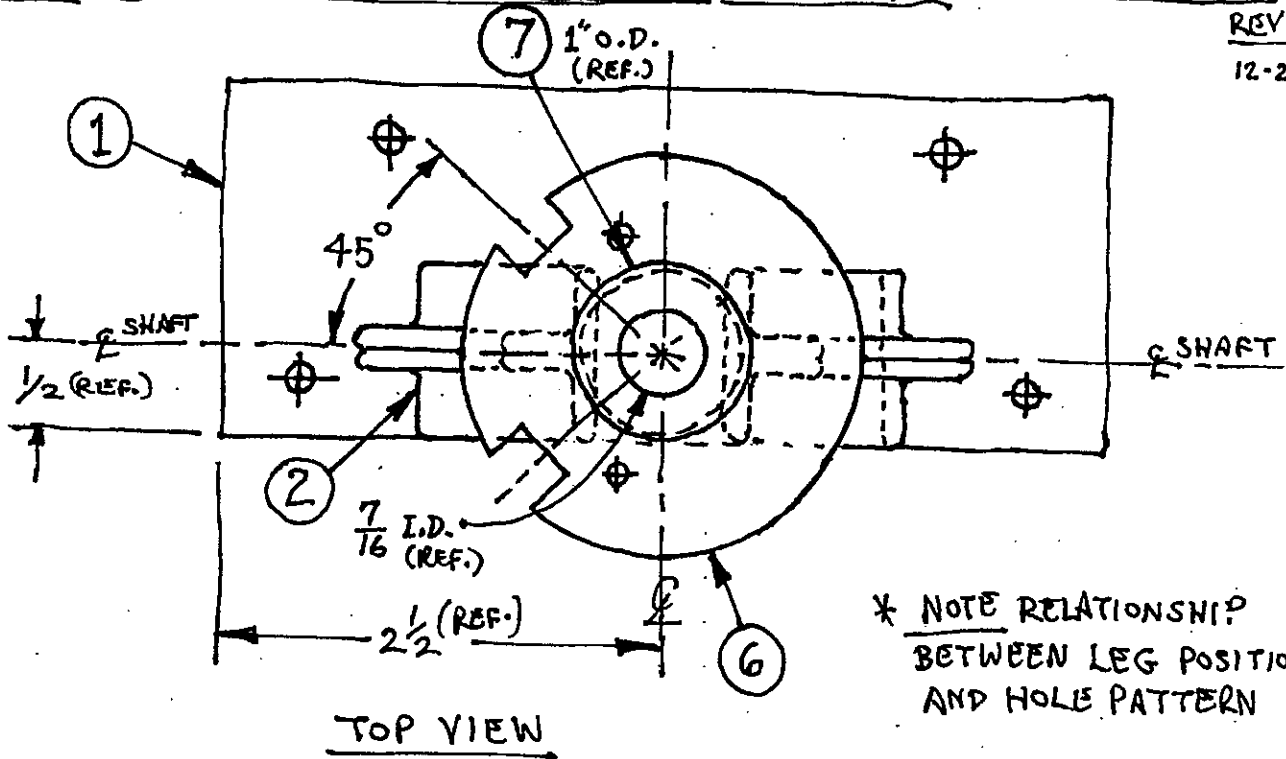
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ITEM (20) ASSEMBLY, BASE/
LEG WELDMENT (2 of 2)

SHEET 2 of 2

REV. C

12-27-00



DRAWN 18 DEC. 2000

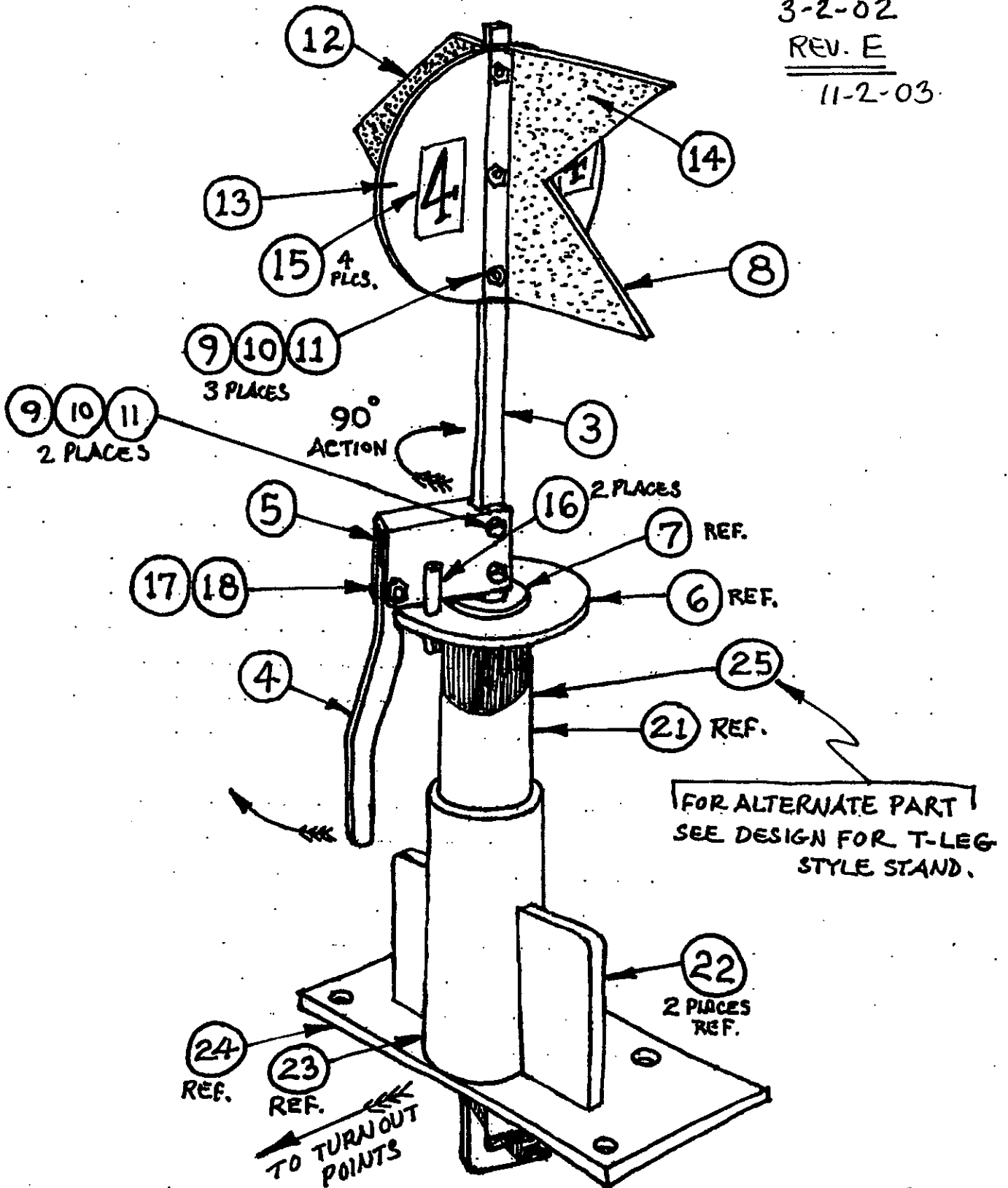
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HIGH LEVEL SWITCH STAND (COLUMN OPTION)

ASSEMBLY (SEE COMPUTER PRINT-OUT MATERIALIST)

REV. C
3-2-02

REV. E
11-2-03

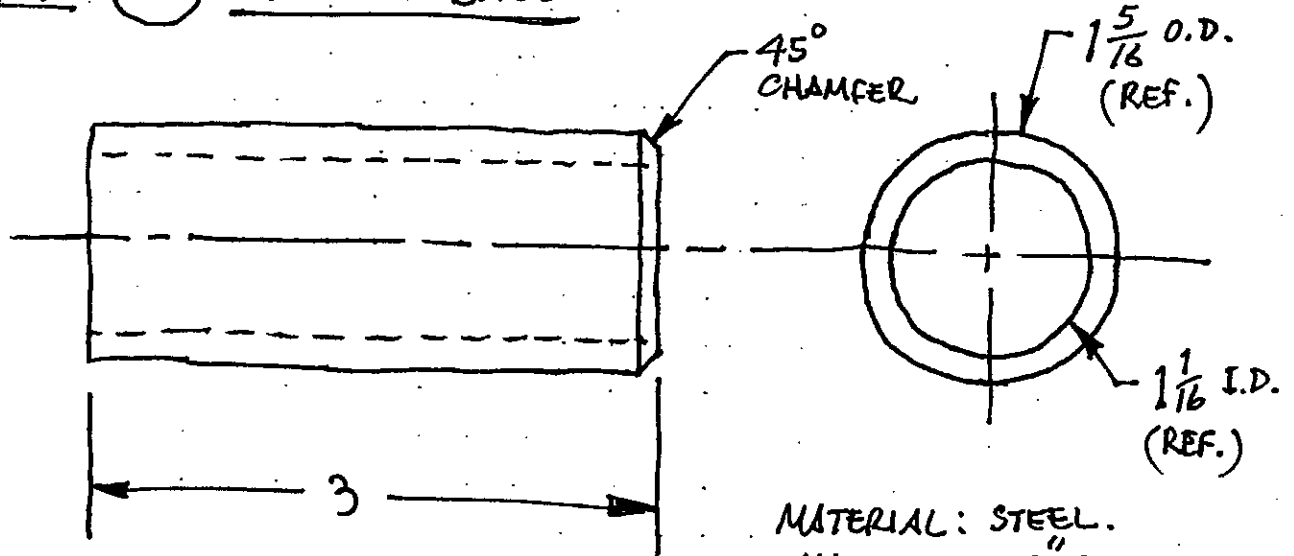


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SWITCH STAND (COLUMN TYPE)

DRAWN 12-19-00
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REV. B, 11-2-03

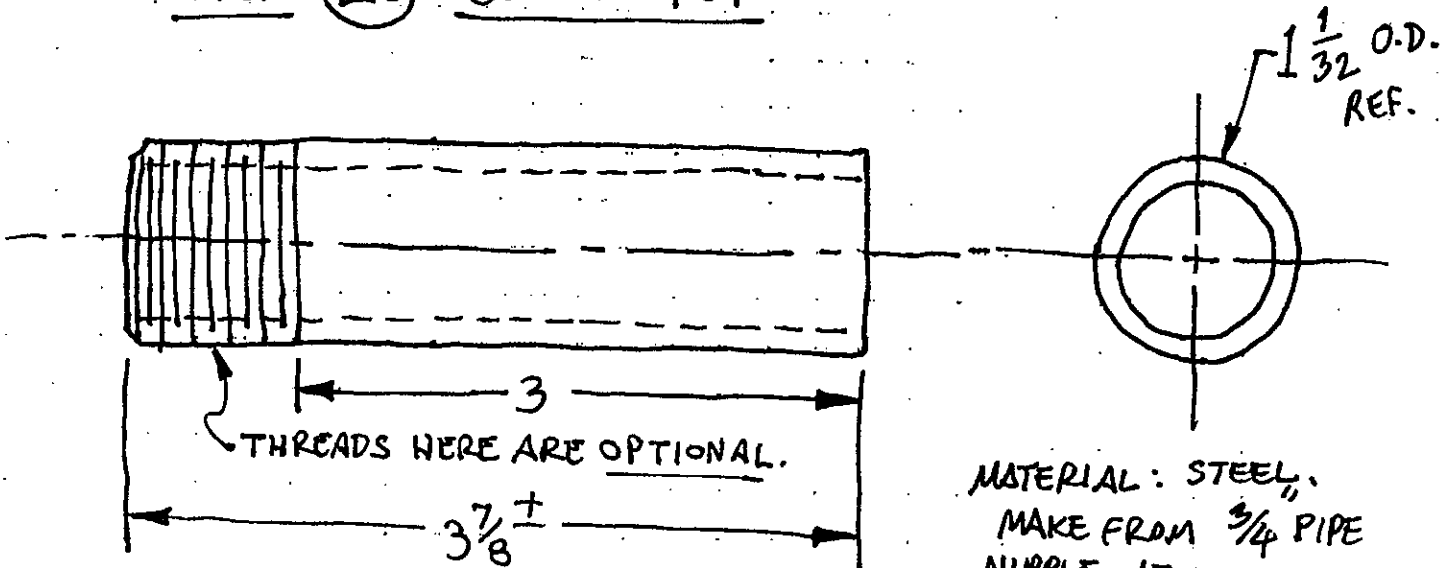
ITEM (23) COLUMN BASE



MATERIAL: STEEL.
MAKE FROM 1" PIPE NIPPLE
AT LEAST 5" LONG.

REV. A, 12-19-00

ITEM (21) COLUMN TOP



MATERIAL: STEEL,
MAKE FROM $\frac{3}{4}$ " PIPE
NIPPLE AT LEAST
5" LONG.

SWITCH STAND (COLUMN TYPE)

DRAWN 12-19-00

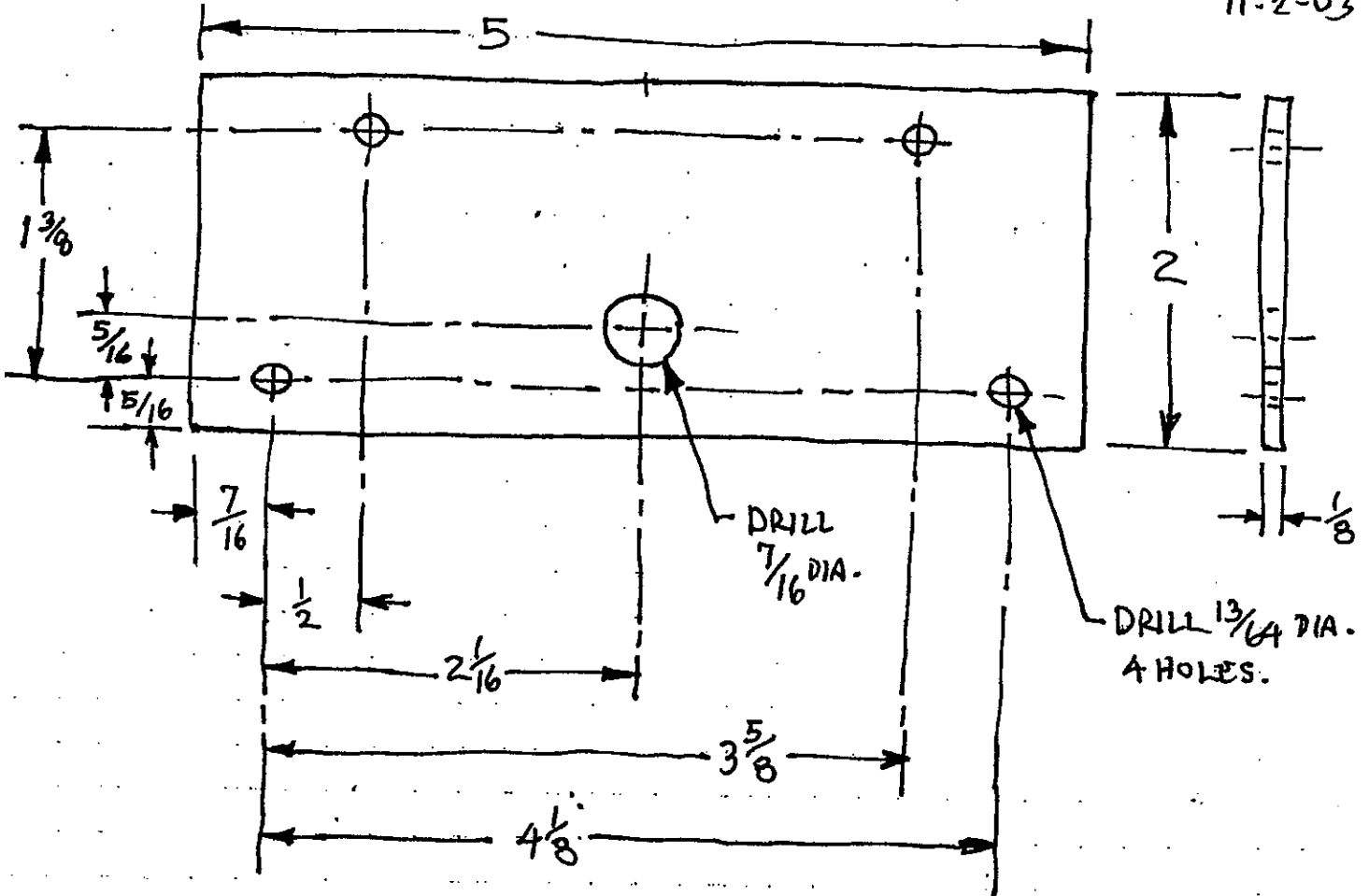
~~W.A. MORRISON~~
W.A. MORRISON

REV. B 01-01-01

ITEM (24) BASE

MATERIAL: H.R. STEEL BAR.

REV. C
11-2-03



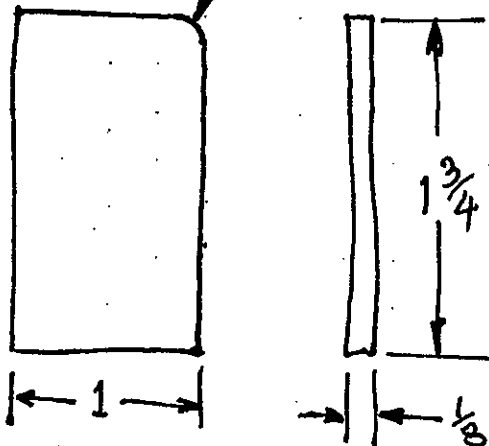
ITEM (22) COLUMN GUSSET

MAKE 2 PARTS

MATERIAL: 1/8 THK STEEL

1/8 RAD.

REV. B 5-23-02



SWITCH STAND (COLUMN TYPE)

DRAWN 12-10-00

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(25) ASSEMBLY, COLUMN WELDMENT

TIP: USE FIXTURE TO HOLD PARTS IN ALIGNMENT FOR WELDING.

REV. E
11-2-03

NOTE: BOTH HANDLE NOTCHES
ARE ON THIS SIDE
(SEE ITEM (20)
TOP VIEW)

