How to Construct and Use a Bottle Jack Press

Bottle Jack Press Plans II

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Introduction

The original plans for my little bottle jack printing press may be found on my website. They were formulated with a number of constraints. I wanted the press to be easy to construct, and I wanted the over-all cost to be relatively cheap. I wanted the press to be constructed from materials that are available just about anywhere ... no special parts required. In order to make it easy to take the press to workshops and demonstrations, I wanted the press to be easy to disassemble and to be fairly light. My original design fulfilled these requirements quite well, and my little press has served me in my studio and my students in various workshops for quite a number of years. The plans have been adopted and adapted by a number of people, and there are quite a few of these presses now in use.

However, after a number of years, I began to worry about the strength of the original design. The press works quite well for its intended purpose ... to print almost anything but intaglio. I have never had a problem with the press, nor have any of my students, but then I was always right there to indicate the appropriate amount of pressure to use. However, I was concerned that unsupervised individuals unfamiliar with elementary mechanical properties of wood and metal might overstress the press by using too much pressure with the jack. Even the lightest hydraulic bottle jacks have sufficient power to damage the press if extreme pressure is used.

I was asked to conduct a workshop in which participants would build their own
presses from kits of materials. With these concerns about strength, I decided to “beef up” the press design a bit. I have frequently said that for a really robust press, one should just adapt a standard hydraulic press designed for machine shop work. At the time of this writing, small hydraulic presses with heavy duty steel frames can be bought for less than $200. They only require the addition of a bed and platen to make a decent printing press. However, they do have the drawback of being quite heavy and difficult to move. None of my design changes will produce a press as strong as a steel frame machine shop press. But a press made to my design will still be reasonably light compared to a machine shop press, easier to move, easier to disassemble, and also cheaper.

Figure 1: Bottle Jack Press II

I want to assure everyone reading this document that it is very easy for anyone to construct one of these little presses. It does not require any skill, other than the ability to measure, use simple hand tools, like a hand saw and a screw driver.
Tools you will need:

You will not need any fancy tools to construct the press. In fact, simple hand tools will do the job. You will need the following:

1. A saw for cutting wood ... Frankly, I like Japanese pull saws, but any standard carpenter’s saw will do the job. You will not have much cutting to do.

2. A hack saw with a fine tooth blade ... You will need to cut some 5/16 inch diameter threaded rod and some sheet metal that is less than 1/8 inch thick.

3. A hammer ... You will need to bend the sheet metal around a piece of wood.

4. A vise, workmate, or heavy duty wood clamps ... You will need to hold the metal and wooden form together while you bend the metal around the wood. And you will want to hold the various wood and metal bits when sawing.

5. A pair of pliers ... You will use pliers to bend the sheet metal and also to hold a nut on the end of a bolt.

6. A screw driver ... The type needed will depend on the head design of the screws that you buy. One of the inexpensive multi-bit screw drivers should have everything you need.

7. A wrench ... You will need a ½ inch open end wrench, but a standard adjustable wrench will do.

8. A drill and drill bits ... You will need to drill some pilot holes for #8 screws, so a small bit about 3/32 of an inch or smaller will be fine. You could use a hand drill, but it is tedious to do so. A small 1/4 or 3/8 inch electric hand drill will make your job much easier. You can also use a Dremmel tool, if it has a chuck that will accept your drill bits.

9. You will probably also want a metal file, grinding wheel, or something similar to smooth off any sharp edges after cutting the metal pieces.
Materials:

As should be obvious from the title, you are going to need a small, hydraulic jack, commonly known as a bottle jack due to its shape. These jacks come in various designated “strengths” … 2 ton, 4 ton, 6 ton, etc. up to about 20 ton. These designations refer to the maximum weight the jack will support before the seals fail. The heavier weight designation jacks also weigh more. So you want to choose a jack that is powerful enough for our purposes, but yet light enough to move around easily. In my experience, a 2 ton jack is not strong enough, and a 6 ton jack is about right. An 8 ton jack also works well. Larger jacks simply add weight for no useful purpose.

You will need some bits of small hardware, as illustrated in Figure 2.

![Small hardware](image)

**Figure 2: Small hardware**

You will need an assortment of screws. You will need 18 #8 wood screws, 2.5 inches long (no longer). You will need 2 #10 round head screws, 1 inch long (longer is all right). And finally, you will need 28 #8 round head screws 5/16 inch long (no longer).

You will need from 3 to 5 metal circular electrical junction box covers. These are metal plates about 4 inches in diameter, with 2 holes at the edges for screw attachment. Try to get the ones without a small disc punched in the middle for a conduit hole. If the only ones readily available have a disc punched in the middle, remove the punched discs so the metal plates will lie flat against one another.
These plates will be used to make a cup for the jack ram and to spread the pressure out on the top bar. I prefer to use 1 plate to make the cup, and back it with 4 plates, to give over 1/4 inch of steel to protect the top bar. I would suggest 2 plates to back the cup as a minimum. Suit yourself.

You will need 4 S hooks. I find the 3/16 inch size works well. These are used at the ends of the bungee chord to attach to the platen. I had some small turnbuckles lying around, and these also work well, but are considerably more expensive to buy. However, turnbuckles do provide an easy means to adjust the length of the bungee chord.

Next you need some right angle brackets. You will need 12 1-inch brackets ... the ones with a single screw hole in each arm. These are used to connect the pieces together for the press bed.

You will need 4 1.5-inch brackets ... the ones with two holes in each arm. You will use these as hooking points to attach the bungee chord to the platen. You will need to modify each of the 1.5-inch brackets with a hack saw by cutting one arm off between the two holes, as shown in Figure 3.

For the uprights, you are going to need 4 pieces of slotted steel angle. In my area, you can find slotted steel in hardware and building supply stores in 4 ft and 6 ft lengths. Purchase 2 pieces of the 4 ft length and cut them in half. After smoothing
the cutoff ends, my pieces are 23.5 inches long. By using slotted steel, you will avoid the necessity of drilling the metal yourself. If several folks are building presses at the same time, the 6 ft lengths of slotted steel work out cheaper than the 4 ft lengths ... just be sure you buy enough so you will have 4 pieces 2 ft long for each press. You can buy plain steel angle more cheaply than slotted steel, but then you will have to carefully measure and drill the holes in appropriate places. Although the plain steel angle is cheaper, it is not galvanized and so is more prone to rust. So, I recommend just going with the slotted steel. Besides, all those holes lighten the uprights without significantly affecting their tensile strength.

![Figure 4: Upright hardware](image)

You are also going to need 8 bolts, 4.5 inches long, with nuts and washers. The slotted steel is pre-drilled to accept 5/16 inch diameter bolts. I suggest buying one 3 ft piece of 5/16 inch “ready rod” ... ready rod is just a length of threaded rod. Carefully cut it in half, giving 2 pieces 1.5 feet long. The cut each of these in half to give 4 pieces 9 inches long. Finally, cut each of these pieces in half, giving 8 pieces 4.5 inches long as required. Then you will need 16 washers and 16 hex nuts for your 5/16 inch bolts.

You now have all the required hardware bits and pieces, so we will turn to the other parts. First you are going to need a top bar and a bottom bar. Each of these is 20 inches long. Laminated construction is stronger than a singe piece of wood, so I
prefer to make the top and bottom bars by laminating 2x4 pieces together. I will
describe the lamination process further along. For the top bar you will need 3
pieces of 20 inch long 2x4. For the bottom bar you will need 2 pieces of 20 inch
long 2x4. In addition, for the bed of the press you will need 4 pieces if 16 inch long
2x4. The strength of the 16 inch long pieces is not a problem. But for the 20 inch
long pieces used in the top and bottom bars, you want to use the strongest material
you can find. I have been lucky and found old growth fir at a house demolition site;
this lumber was more than 100 years old and was so tough you could not now
drive a nail into it. Oak would be good if you can find it. Pine is quite soft and
would not be as suitable, but go with whatever you can scrounge.

I like to make the bed and the platen from counter top material. Counter top
material is a particle board with a Formica-like substance glued to the surface. It is
usually 5/8 of an inch thick. The surface is impervious to oil and water, and it is
easy to clean if you get ink on it. You can also use melamine material from
furniture and cabinets. I pick up old counter tops and melamine cabinets at house
renovations. On occasion I have also gone to a local counter top manufacturer,
explained what I was doing, and been given a large counter top with a flaw that
they were going to throw away. I sometimes pick up melamine cabinets and
furniture from the boulevard where people put items they no longer want. So it
pays to check around.

If you cannot find counter top or melamine material, you can use medium density
fibre board. You can buy it in 4x8 sheets at a lumber outlet. You will want the 3/4
inch thick material. Medium density fibre board is sort of a super particle board,
but more dense. It is referred to as MDF. If you elect to use this material, be sure to
coat all MDF surfaces with a good quality urethane finish after cutting to required
size. The finish will keep the material from absorbing moisture or oil and make it
possible to clean up any ink you might get on the surface. If you cannot get MDF,
you could use plywood. However, I have found the plywood compresses too easily
under moderate pressures, and is not really suitable.

I designed the press to have a maximum printing area of 16x16 inches, although in
practise I never print quite that big. The platen consists of 2 pieces. One piece is
just a 15x15 inch stiffener. For my own press, I found an old cabinet door of about
the right size.
Figure 5: Platen stiffener

The dimensions of the platen stiffener are not crucial, and it could be a bit smaller.

The other piece of the platen consists of the platen board proper. It begins as a piece 16x18 inches. A rectangular notch one inch deep and 6.5 inches long is cut from the center of each of the 16 inch long sides, as illustrated in Figure 6.

Figure 6: Platen board

You will need another piece of counter top material for the press bed. The minimum size for the press bed is 16x16 inches. However, I found that I like
having a longer bed to make it more convenient to line up and insert the sliding board containing the printing plate, paper, and blankets. So the current design calls for a bed board that is 16x22 inches. I also like having the rounded counter top edge on front of the bed board, so I included it, as in Figure 7.

![Figure 7: Bed board](image)

The only remaining material required is the bungee chord for retracting the platen. I use bungee chords rather than metal springs for a number of reasons. Metal springs are harder to find these days, and they are quite expensive compared to bungee chords. Also, bungee chords are easier to cut to desired length and install. Locally I am able to buy bungee chord by the yard (or meter) from a local hardware and marine supply outlet. I have found that 3/8 inch diameter chord works well. You will need about 5 feet ... 2 pieces that are 30 inches long. I have found that some of the cheaper bottle jacks have a rather rough action, and will not retract with just one strand of bungee chord on each side. But in these cases, installing 2 strands of 3/8 inch bungee chord per side was more than adequate to do the job. If using two stands per side, you will need 10 feet of bungee chord. Using several smaller strands is preferable to using one very large diameter strand. The smaller strands will be much easier to install, and cheaper to replace should one strand fail. If you cannot find bungee chord by the yard then you should be able to buy bungee chords with hook ends attached in about 30 inch lengths. You will also need some plastic electricians tape and some braided nylon string to use to tie off the ends of your bungee chords.
Summary of materials needed

a) 6 ton bottle jack

b) #8 wood screws 2.5 inches long – 18 pieces

c) #10 round head screws 1 inch long – 2 pieces

d) #8 round head screws 5/8 inch long – 28 pieces

e) circular electrical junction box cover – 5 pieces

f) 3/16 inch S hooks – 4 pieces

g) 1 inch right angle brackets – 12 pieces

h) 1.5 inch right angle brackets – 4 pieces

i) slotted steel angle 23.5 inches long – 4 pieces

j) 5/16 inch threaded rod 4.5 inches long – 8 pieces

k) 5/16 inch hex nuts – 16 pieces

l) 5/16 inch flat washers – 16 pieces

m) 2x4 lumber 20 inches long – 5 pieces

n) 2x4 lumber 16 inches long – 4 pieces

o) counter top material 15x15 inches – 1 piece

p) counter top material 16x18 inches – 1 piece

q) counter top material 16x22 inches – 1 piece

r) bungee chord 3/8 inch diameter 30 inches long – 2 pieces
s) braided nylon string – 3 feet

t) wood glue

u) good quality oil based enamel paint or urethane finish

**Making the top and bottom bars**

Perhaps your first step should be the construction of the top and bottom bars. For both the top and bottom bars, begin with two pieces of 2x4, each 20 inches long. Spread a good quality wood glue on the wide side, and press tightly together, using clamps or a vise. Then put at least 3 screws, 2.5 inches long, in each side to hold everything together.

If you are unfamiliar with such construction, a little hint may be in order. The job will be easier if you first drill small pilot holes for your screws. The job will be easier yet if you soap your screws before trying to screw them into place. To soap a screw, first moisten it by spreading saliva on the threads. Then drag the threads across a bar of hand soap. Soaping the screws will make it much easier to drive them into place. Screw them down until the heads are just below the surface of the wood. Use 3 screws, 2.5 inches long, on each side. You should have 2 pieces that look like Figure 8.

![Figure 8: Lamination for top and bottom bars](image)

Lumber designated as 2x4 is in reality 1.5 inches by 3.5 inches. So your laminated constructions will now be 3 inches thick and 3.5 inches wide.
The pressure on the bottom bar will be spread out across its length by the bed board. However, all the pressure on the top bar will be concentrated at its middle. So we need to strengthen the top bar. You should have one more piece of 2x4 lumber 20 inches long. On the wide side, mark a line down the length ½ of an inch from one side (3 inches from the other side). Using your wood saw, cut along the line to give you a piece that is 3 inches wide, 1.5 inches thick, and 20 inches long. (If you have a table saw, this would be a good time to use it; but a hand saw is perfectly adequate for this job.) Spread glue on the 3 inch wide side and clamp it to the edge of one of the pieces you just laminated. Then screw it into place using six of the 2.5 inch wood screws. Your top bar will then look like Figure 9.

![Figure 9: Top bar](image)

At this point, you need to set the top bar and the bottom bar aside for 24 hours to allow the glue to dry. I would also recommend that you paint the top bar, the bottom bar, and the remaining pieces of 2x4 with a good quality oil based enamel paint. Once the paint is dry, it will take less than half a day to complete your press.

**Making the jack ram cup**

While waiting for the glue and paint to dry, you may as well make the cup for the jack ram. The cup positions the ram in the proper place on the top bar and keeps the ram from slipping. To make the cup, begin by carefully locating the center of an edge of a scrap piece of 2x4 or 2x2. Standard 2x4 inch lumber is really just 1.5 inches thick, and 2x2 lumber is really just 1.5 inches square. You can use either as a form; in the figures, I am using 2x2 material. Take one of your circular junction
box covers and screw it to the form, as in Figure 10.

![Figure 10: Metal disc screwed to form](image)

Place the disc and form into a vice, and use the hammer to bend the sides of the disc down to the sides of the form, as in Figure 11.

![Figure 11: Forming Ram Cup](image)
Remove the screws, and you should have a piece that looks like Figure 12.

**Figure 12: Partially formed cup**

Next, you want to mark two lines on each side; each line will be 1.25 inches from one end, which should leave a 1.5 inch space between the two marks. Use the hacksaw to slit each side from the end to the marked line. The result should look like Figure 13.

**Figure 13: Slit partially formed cup**

Then using the pliers, fold each end of each side toward the opposite side, making
a kind of box in the middle. You should now have a piece that looks like figure 14.

Figure 14: Folded ends

The cup can be left in this state, although the depth of it may interfere somewhat with the jack ram when the platen is fully retracted. I would recommend that you use your hacksaw to cut the box down to a depth of about \( \frac{1}{2} \) inch, as in Figure 15.

Figure 15: Finished jack ram cup
Making loop ends on bungee chord

Another small task you can do while waiting for the paint work to dry is to make secure loops on the ends of the bungee chord. If you have purchased bungee chords about 24 to 30 inches long with hooks already on the ends, then you will not need this step ... you can just use your bungee chords as they are. However, if you have purchased bungee chord by the yard, you will need to cut it to length and make loops at each end.

To cut the bungee chord, measure out a 30 inch length, and wrap that point with plastic electrician’s tape. Then use a sharp knife to cut through the middle of the wrap and the bungee chord. That should leave each end of the chord with a wrap of tape, which will keep the chord looking neat and keep it from unravelling. See Figure 16.

![Figure 16: Cutting bungee chord](image)

You now need to make a loop at each end for the S hook. If you are familiar with rope work, you can just form a loop and whip it the way you would a rope. However, I find the process tedious, and I prefer a simpler method.

Braided nylon chord is well suited for tying off the loops. Use a match or lighter to melt the end of the chord so it will not fray. You then need to tie a special knot in the chord; the knot is a slip knot on a slip knot. It will tighten, but will not loosen very easily. To begin, tie an ordinary slip knot in the nylon chord, as in Figure 17.
Next, tighten up the slip knot, but leave a generous loop, as in Figure 18.

Next pull a loop of the chord through the slip knot loop, as in Figure 19.
Now just continue pulling the free end of the string through the slip knot loop, turning the slip knot loop inside out, as in Figure 20.

Finally, you need to tighten the original slip knot loop down onto the chord, leaving a generous loop as in Figure 21.
The knot you have just made is a sort of double slip knot, with a slip knot on the running part of the chord. It will tighten up, but if tightened very firmly, it will not easily loosen. Continue by forming a loop at the end of your bungee chord, and wrap the loop of your double slip knot around it twice, as in Figure 22.

Then tighten the double slip knot as tight as you can ... really reef on it! You
should be able to partially compress the bungee chord. To finish, make a couple of simple overhand knots with the free ends of the chord; use a match or lighter to cut the end of the chord.

You can now simply slip an S hook into the loop you have just made. If you are using small turnbuckles, they frequently have a hook at one end and a closed loop at the other. You can use a vise and pliers to pry open the closed loop on the turnbuckle so you have hooks at both ends. I find it just as easy to put the bungee chord loop through the closed loop on the turnbuckle before I tie the bungee chord. Your finished bungee chords should look like those in Figure 24.
Making the press bed

To continue with the construction of the press, we will next assemble the press bed. The side of the bed board covered with Formica will be the top of the bed; the rough side will be the underside of the bed. Start with the rough side of the bed board facing up. The rounded end of the counter top material (if you have a rounded end) will be the front edge, and the other end will be the back edge. Use a ruler to lay out lines on the bottom of the bed board. Draw one line down the middle, 8 inches from each side, from the back edge to the front edge. Draw another line across the bed, 8 inches from the back edge. Finally, draw one more line across the bed, 16 inches from the back edge. You layout lines should look like those in Figure 25.
Figure 25: Mark out bed board

Place the end of the bottom bar at the edge of the bottom board, lining up the seam of the lamination with the cross line 8 inches from the back edge of the bed board. Then make lines marking the width of the top bar. These marks should be 1.5 inches on each side of the cross line, as in Figure 26. But if you are using old salvaged lumber, it may be a bit wider than 1.5 inches.

Figure 26: Mark width of bottom bar

Next, on the wide side of the bottom bar, draw a line marking the midpoint of the bar; it should be 10 inches from each end, as in Figure 27.
Figure 27: Mark mid-line of bottom bar

The bottom bar and two of the 16 inch pieces of 2x4 will be attached to the bottom board using the 1 inch corner brackets. Place the narrow edge of the bottom bar on a flat surface. Place one leg of a bracket on the flat surface and the other leg against the wide side of the bottom bar, about 6 inches from the center line. Use a pencil to mark on the bottom bar the position of the screw hole. You will make 4 such marks, 2 on each side of the bottom bar. Stand each of the two 2x4 pieces on edge on your flat surface. Place one leg of a bracket on the flat surface and the other leg against the side of the 2x4, about 2 inches from one end; mark on the side of the 2x4 the position of the screw hole. Do the same thing at the opposite end on the same side. So the two 16 inch 2x4s should have hole marks only on one side. After marking the hole positions, carefully drill pilot holes. Then using the 5/8 inch screws, attach 4 of the angle brackets to the bottom bar and two to each of the 2x4 pieces. Your pieces should look as in Figure 28.
After attaching the angle brackets to the bottom bar and the two 2x4's, place them in position on the bottom board. One of the 2x4s goes at the back edge of the bottom board. The other 2x4 is placed at the cross line that is 16 inches from the back edge. The outside edges of the 2x4s should be 16 inches apart. These two bars provide support for the bed at the edges of the platen. The bottom bar is placed on the cross line that is 8 inches from the back edge. Line up the center mark on the bottom bar with the center mark on the bottom board, and line up the edges of the bottom bar with the edge marks you made earlier. Then mark the positions of the screw holes on the bottom of the bed board. Carefully drill pilot holes. You do NOT want to drill all the way through the bottom board ... drill just enough to get the screws started. Then screw the bottom bar and the two 2x4s into position, as in Figure 29. When used with the brackets, the 5/8 inch screws should not go all the way through the bottom board.
You will have remaining two 16 inch lengths of 2x4. To complete the bed, you will use angle brackets and screws to attach these flat across the bottom bar and supports, as in Figure 30.

**Figure 29: Bottom bar and supports attached**

**Figure 30: Completed bed**

**Attaching the uprights and the top bar**

You are now ready to attach the uprights to the completed press bed and install the top bar. Flip the completed bed over from its position in Figure 30 so the counter top is facing up. On each end, you are going to clamp the bottom bar between two
of the slotted angles, with one flat side of each angle against the bottom bar and one flat side next to the bed board. See figure 31.

Figure 31: Clamp bottom bar between uprights

Leave the nut and washer on one end of each bolt, but remove the nut and washer from the other end. Insert one bolt through the lowest hole in one upright, then through the lowest hole in another upright. Then add the washer and nut to the other end of the bolt. The nuts should be on the inside of the angle on both pieces. Place the uprights over one end of the bottom bar and insert another bolt through holes in the uprights as close to the top of the bottom bar as you can. In my case, that would be in the 6th hole from the bottom. Tighten the nuts finger tight. Proceed similarly at the other end of the bottom bar, and you should arrive at the configuration shown in Figure 31.

Before installing the top bar, you need to install the backing plates and cup for the jack ram. The top of the top bar is the side where you can see the seam between the two 2x4s. The bottom of the top bar is the side where the 2x3 is laminated. Begin by marking a center line longitudinally on the bottom of the bar and crosswise center lines down the sides and across the bottom. The result should look like Figure 32.
Lay one of the circular junction box covers on the bar, and center it by eye. You should be able to see the longitudinal center line through the screw holes in the plate. Mark the positions for the two screws, and drill two pilot holes. Then stack your junction box covers, line up their screw holes, and place the jack ram cup on top with its screw holes also in line. Then attach the whole works to the bottom of the top bar with the two #10 round head screws. The result will look like Figure 33.

Go back to the uprights. Insert a bolt through the two uprights on each side, through the 8th hole from the top. Put washers and nuts on the ends, but do not tighten them. You should now be able to slip the top bar between the uprights, cup
side down, resting on the bolts you have just inserted. Then insert the remaining two bolts through the top most holes in the uprights, and put washers and nuts on the bolts. Arrange the uprights and top bar so the uprights are equidistant from the two ends and so there is about 1/4 inch clearance between the bed board and the uprights. Then tighten all the nuts, top and bottom, just a little more than finger tight. The result will look like Figure 34.

Figure 34: Top bar in place

Installing the platen, the jack, and the bungee chords

The platen will be raised by the bungee chords, and you need to make provision to attach the ends of the chord to the platen. When installed, the Formica side of the platen will be facing down toward the bed board. We want only very smooth surfaces for printing. You are going to install the modified 1.5 inch angle brackets as attachment points for the bungee chord. Place some scrap 2x4s under the platen, with the smooth side of the platen facing up. On each side, on each side of the notch, position one of the brackets halfway between the edge of the notch and the edge of the platen. The long side of the bracket should be hanging down, with the one hole side flat on the smooth surface of the platen. Mark the position of the single screw hole in each bracket. Remove the brackets and drill shallow pilot holes. Then using your short screws, attach the brackets to the platen. The result
will look like Figure 35.

**Figure 35: Brackets attached to platen**

Turn the platen over so the smooth side is facing down. Then by holding the platen at an angle, you can slide it between the uprights onto the bed of the press, as in Figure 36.

**Figure 36: Inserting platen**

Once the platen is in place, simply stack the platen stiffener on top. Next use some scrap lumber or an old phone book to prop the platen and stiffener up about 2.5 inches or so from the bed. Leave enough room to position the bottle jack on top of the stiffener so the jack ram is in line with the ram cup on the top bar. See Figure 37.
Now you may apply tension to the press to move the top and bottom bars to their appropriate positions. Close the valve on the jack and slowly apply pressure. As you apply pressure, the top bar will begin to lift. Continue to apply pressure until movement of the jack handle becomes quite stiff. At this point, the top bar will have moved against the topmost bolt on each side, leaving a small gap between the bottom of the top bar and the second bolt. In addition, the bottom bolts on each side of the uprights will have been pulled tightly against the bottom of the bottom bar. The threads of the bolts will begin to bed into the top and bottom bars. Looking at it from the side, things should appear as in Figure 38. Note in particular the gap between the bottom of the top bar and the nearest bolt, and the gap between the top of the bottom bar and the nearest bolt.
Now that the press has been tensioned, you can use your wrench and pliers to tighten the nuts on the end of the bolts. Really tighten the nuts on the top-most and bottom-most bolts quite firmly. However, apply only moderate tightening to the nuts on the other bolts, as the slight gap will mean that the slotted angle will begin to bend if you tighten the nuts too much.

You are now ready to install the bungee chord. On one side of the platen, simply hook the S hooks (or the turnbuckles) on each end of a bungee chord into the protruding angle brackets. If you are using turnbuckles, be sure that they are open as much as possible to give the maximum length. Then stretch the bungee chord up and over the uprights and onto the top bar. Repeat on the other side. If you find you do not have the strength to stretch the chord by hand, you may use a scrap piece of wood to lever the chord into place, as in Figure 39.
Figure 39: Lever bungee chord into place

To avoid the bungee chord slipping off or being cut by the uprights, be sure that the chord rests to the inside of the uprights and across the top bar, as in Figure 1, above, or Figure 40 below. With the bungee chords in place, you may open the valve on the jack. The bungee chords should lift the platen against the jack, causing the ram to retract. You can remove the material you used to block up the platen.

If the platen does not retract fully, then you either need to shorten your bungee chords a bit or use two strand of bungee chord on each side. If using turnbuckles, tighten up the turnbuckles. Otherwise, to shorten the bungee chords just a little, you may try just tying a couple of overhand knots in each one. To shorten them more, cut the nylon tie on one end, move the loop up the chord a bit, and re-tie the loop. The final result should look like Figure 40.
By slightly shifting the jack and/or the platen stiffener, you can adjust the position of the platen so it is hanging freely, is level, and is centered between the uprights. The platen should have a bit of free play to allow it to self-level during printing.

On my press there is a bit more than a 3 inch clearance between the platen and the bed. This amount has proved to be adequate for my needs for many years. However, if you know you are going to frequently require more clearance, you can construct your press with longer uprights from the beginning. Of course that will add to the cost and weight of the press.

If you just need more clearance on rare occasions, there is an alternative. Simply cut 4 pieces of slotted steel about 3 or 4 inches longer than the extra clearance required, and use these as extensions to the existing uprights. Remove the top bar. In its current configuration, the uprights are arranged with one part of the L parallel to the length of the bed and close to it, with the other part of the L against the top bar, oriented toward the end of the bar. Your extensions will have one part of the L
against the top bar but oriented away from the end; the other part of the L will be bolted to the existing upright. Overlap each extension and the existing upright by 2 holes and use 2 bolts to hold each in place. See Figure 41. After the 4 extensions are bolted on, you may reinstall the top bar. With the added clearance, you may need to lengthen the bungee chords.

Figure 41: Upright extension

Making a sliding board

You will find it much easier to use your press if you make a sliding board. A sliding board is just a smooth surface on which you stack your printing plate, your paper, and then your felts (or other backing material). Then you can easily slide the whole sandwich into the press between the bed and the platen. You then close the valve on your jack and apply pressure. Release the valve to allow the platen to rise. Then you can easily remove the sandwich from the press using the sliding board. Remove your felts and your print. Re-ink your plate, and you are ready to go again.

Plexiglass is excellent material to use for a sliding board. It is impervious to oil and water, and it can be easily cleaned if you get any ink on it. Cut a sheet of plexiglass 16x22 inches. That size will support a full half sheet of printing paper. Use red and black permanent felt tip markers to draw lines on one side of the plexiglass. Draw
red lines as follows:

1 longitudinal center line
1 crosswise center line
2 crosswise lines 8 inches on either side of the crosswise center line
2 diagonal lines from corner to corner

Then draw longitudinal and crosswise lines in black at evenly spaced intervals from the central lines to form a grid. Mine are drawn at one inch intervals. My sliding board is shown in Figure 42.

![Sliding board](image)

**Figure 42: Sliding board**

These lines will allow you to more easily place your printing plates and paper so they rest under the center of the platen. The red crosswise lines on either side of the center mark the position of the edge of the platen. I use my sliding plate with the lines on the bottom side, next to the bed, to avoid off-setting the marks onto the paper or any other intervening material. And if I get ink on the sliding board, I do not want to run the risk of removing my lines as I remove the ink.

Where precise registration is not an issue, the plate may be centered by eye on the point at which the red lines cross. Then the paper may be similarly centered on top of the plate. Finally if desired a backing is placed on top of the paper. I almost always use a couple of layers of thin, fabric store felt as a backing. I find the felt
backing greatly assists obtaining even prints.

Template registration

Registration by eye can be pretty hit and miss. An easy improvement can be made by the addition of a clear plastic cover sheet to your sliding board. I like to use the heaviest weight available of clear plastic table cloth material from a fabric supply store. The stuff is clear and fairly soft. Cut a piece the same size as your sliding board. Attach it at one end with tape or with a couple of spring clips. On a piece of news print, draw the outline of the paper you will be using for your prints. Remove your print paper, position the plate on the news print as desired, and then trace around it. Slip the news print onto the sliding board under the plastic sheet so the plate will be positioned about in the middle of the sliding board. See Figure 43 for an example.

In use, simply place the inked plate carefully on its outline. Then using the outline for the paper, carefully place the paper over the plate. Cover with felt and slide everything into the press.

The same technique can be used to print several non-overlapping plates at the same time. An outline of each plate is made in the appropriate position within the outline of the paper. The inked plates may then be placed rather consistently from one print to the next.
**Spring clip registration**

Sometimes we want to print several plates which are registered to the same two intersecting edges on each plate. It is important in such cases to be able to place the plates sequentially in exactly the same position relative to the paper. If we do not need to allow the ink to dry between printings, we can just attach the paper to one end of the sliding sheet, and sequentially place the plates.

Perhaps the simplest technique is to tape matboard in an L configuration to position the plates. You will obtain better results if you leave a gap at the corner of the L, as shown in Figure 44.

![Figure 44: L location of plate](image)

The first plate is inked and put into position. Then the paper is placed on the sliding board over the plate and secured at the top edge with spring clips. After the addition of the felts, the plate is printed. Because the sliding board extends beyond the press bed when properly positioned, the clips will clear the bed and will not cause the sliding board to bend. See Figure 45.
After printing the first plate, the sliding board is removed from the press and the felts are removed. But instead of removing the paper, it is merely curled backward so the first plate can be removed and the second plate can be positioned. Then the paper is flopped down over the second plate and printed as before. The same process is continued until all the plates have been printed on the one sheet. Then the spring clips are removed and the finished print is removed. The next sheet is printed in the same way.

Clip registration is also useful when one has to make several passes with the same plate. For example, the plate might not be transferring ink well in certain places. By not moving the paper, the plate can be re-inked and printed several times to darken light areas.

**Pin registration**

Sometimes it is not possible to leave the paper in position in order to print multiple plates. For example, you may need to let the ink dry between multiple passes. Or, if you are doing a reduction print, you need to print all the images from each state of the plate before modifying the plate to print the next stage. Pin registration is a good solution for these cases.
Pin registration is commonly associated with lithography, but it can be used to good effect with other techniques as well. I have some commercial lithographers registration pins, but I find them too short for my purposes. So, I make my own. See Figure 46.

![Homemade registration pins](image)

**Figure 46: Homemade registration pins**

The stubs on these pins are ½ an inch long. The pins are always positioned to clear the platen, so they can be as long as you like. The stubs are made from 1/4 inch plastic dowel. The end of the dowel is slightly tapered; I use a hand held pencil sharpener for the job, but you could use a file or rotate the dowel against a grindstone. The tabs are cut from old CDs. The CDs cut easily by scoring them with a sharp knife and then bending them quickly so they break along the scored line. The corners of the tabs are rounded with a file, sandpaper, or a grinding wheel. The stubs are welded to the tabs using a drop or two of methylene chloride, but any good glue suitable for plastics will do.

To use registration pins, you must first punch holes along one end of your paper. All the paper to be used for your edition should be punched with exactly the same distance between the holes. For this purpose, you can use a standard 3 hole punch. In North America, standard 3 hole punches make holes that are either 1/4 inch or 6 mm in diameter. The small difference will not matter. For a standard 3 hole punch, I prefer to use the heavy duty kind, as they do not assume you are using 8.5x11
inch paper, and so the edge stop allows greater flexibility.

However, the wider apart you can make the holes, the better your registration. So, you may prefer to make a homemade punch that allows you to space the holes as far apart as you like. To make such a punch, purchase two of the smaller 2 hole punches; I find them in second hand stores for a dollar or two apiece. They have a plastic bottom which is a press fit on the metal body. The plastic bottom is removable so you can dump the waste paper dots that are punched out of your paper. Place two of the 2 hole punches on a board the desired distance apart. Slide a piece of thick paper into the punches so the throats of the punches are in a straight line. Then use a pencil to carefully outline the bases of the two punches where they sit on the board. Remove the bases from the punches and place a couple of screws through each base into the board to hold them in place. You can then reassemble the two punches. See Figure 47 for my two punches.

![Figure 47: Hole punches](image)

After punching holes in one end of your paper, position your paper on the sliding board where desired, with the holes at one end where they will be clear of the platen. Then close to one edge of the paper, slip the stub of a registration pin into a hole and tape the tab down to the sliding board. Similarly place another registration pin into a hole toward the opposite edge and tape it down. See Figure 48.
Figure 48: Placing registration pins

You can now remove the paper and return it to exactly the same location on the sliding board. You can use L location for the plates as previously described.

For example, suppose you wish to do a reduction print. You start with your first state of the block, and make a mat board L to locate the block on the sliding board. Punch all of your paper with the same setting on your hole punch. Ink your block, place a page on the pins, and print. Remove the page and set it aside. Re-ink your block, place it back in the L, place another page on the pins and print it. Continue throughout the edition. Then prepare your block for the next stage... i.e., carve away part of the block. Then ink the block with the second color, place it back in the L, place one of the previously printed pages on the pins and print it. Continue with the other pages. Carry on throughout all the stages of the reduction. At the end of the run, simply tear off the edge with the punched holes.

If you are printing on dampened paper, then there is a problem with pin registration. If the paper is damp, then the punched holes will tend to enlarge or even tear, ruining the registration. To avoid this problem, before dampening the paper, paint about a 1 inch stripe of shellac on both sides of the paper where it will be punched. Let the shellac dry thoroughly, and then punch as usual. When you dampen the paper, the shellac will prevent water from invading the punched area and weakening the holes. Since you are going to tear off the end with the punched holes anyway, the shellac should not interfere with your print.
Transparency registration

Transparency registration is sometimes referred to as flip registration when used in screen printing. There are some minor differences between its use here and its use in screen printing.

Suppose you want to print several plates which are not registered to each other in any way. Perhaps you made an error when creating the plates and you now find their registration is in error. Or perhaps you wish to combine images from several plates that were not originally intended to be printed together. The problem is, how does one register the images after the fact?

The solution is to print a key image onto a transparent sheet and use that sheet to position each plate. Your transparent sheet must be precisely registered, and for that purpose, I prefer pin registration, as it allows the transparent sheet to be removed and later replaced in the same position. (As an aside, when doing screen printing, the transparent sheet is taped to the base at one side. It is used to position the paper for each print, and then flipped out of the way to actually make the print on the paper. Hence the name.)

I like to use clear plastic table cloth material, as previously described. Cut a piece the size of your sliding board, and punch holes for registration pins in one end. One of your plates should be sufficiently detailed that its image will allow you to position the other plates, call it a “key” plate. (You could always make such a plate, even if it will not ultimately be a part of your finished print.) Use a fast drying water based ink to ink this key plate. I use Speedball water based block printing ink because it dries quickly but is easy to wash off after it has dried. Use L registration for the key plate and pin registration for the transparent sheet, and print an image of the key plate on the transparent sheet. As an example, see Figure 49 for the key plate.
The key plate is printed on the transparency sheet using Speedball water based ink, as in Figure 50.

The transparency print does not have to be perfect. It just needs to be good enough to locate the other plates. After the transparency print has dried, it can be used to position the other plates on the sliding board. Simply return the transparency to its
registration pins, slide the next plate under the transparency, and move the plate around until it is properly registered. See Figure 51.

![Figure 51: Positioning next plate](image)

Once the next plate is in position, remove the transparency and tape matboard to the sliding board for L location. See Figure 52.

![Figure 52: L registration of next plate](image)

In this case, the key plate is actually going to be printed last. Two intermediate plates were positioned and registered with the transparency and then printed. The last step was to use the transparency to reposition the key plate and then print it. See Figure 53 for the final print.
Conclusion

The bottle jack press is an inexpensive but wonderfully versatile tool for many sorts of printing. If you build your own, your pride in your own accomplishment will be added to the pleasure of its use. If you have any questions, comments, or suggestions, please do not hesitate to get in touch.