Matt's Wall-Mount Hide-Away Cheese Press

- Matt Jones 09-05-21
- This is based on the NEC press: https://cheesemaking.com/collections/cheese-molds-and-presses/products/off-the-wall-cheese-press-plans

- I modified the measurements and materials to fit my needs: location, measurements, disassembly & storage, aesthetics, etc.

- Construction (09-04-21 through 09-05-21) required about 4 hours total, not including two trips to the hardware store. But a lot of planning, thought experiments and about one hour of Matlab calculations went into it before I started construction.

- My MAIN GOALS were:

- Should be easily disassembled and stored when not in use.
- Should allow force of up to at least 100 Lbs. For my 8" Tomme hoop, the surface area is 50 sq. in., so 100 Lbs of force produces 2 Lbs/sq.in. (2 psi) of pressure.
- Force and pressure should be easily adjustable over a wide range (e.g., 5-100+ Lbs, 0.1-2+ psi), by adjusting the applied weight and by moving the fulcrum location between defined distances. Force and pressure should be properly and precisely calibrated. Or calibrate-able once it's built and tested.

- Theory of Operation and Calculations:

(see separate Matlab *.mlx file for exact calculations & calibration graphs)

- These apply to a 2nd-order lever style press, such as the off-the-wall press design from New England Cheese Supply, which is a wall-mount Dutch Press.
- There is a wall-mounted pivot at distance d0 = 0, a fulcrum that presses the cheese at distance d1 and a suspended weight of W1 at distance d2.

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        Pivot     Fulcrum                    Weight (W1)
        d0----------d1---------------------------------d2
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- The downward **force** on the cheese will be the Mechanical Advantage (MA = d2/d1) times the applied weight (W) plus the empty press weight (W0). *Note: The empty press weight (W0) is <u>not</u> constant; it depends on the fulcrum distance d1.*

$$F = MA * W1 + W0$$

- The **pressure** is the force divided by the surface area of the follower pressing on the cheese. For a standard 8" Tomme hoop, the area is A = pi x r^2 = ~50 sq.in.
- The total length d2 is fixed, but the fulcrum distance d1 and the weight W1 are adjustable.

- Principles of Construction

- This is basically a wall-mounted hinge, two pieces of wood with some carefully placed notches for the fulcrum which will apply force to the cheese, some appropriate mounting screws for your specific wall type and some rope to hold the weight W1.

- The hinge itself, and how you securely attach it to the wall, are probably the critical bits. The hinge pivot point must stick out a bit from the wall, to allow full range of motion of the crossbeam without bumping the wall. Thus a standard flush door hinge is inappropriate. I used a "Decorative Gate T-Hinge". Also, the crossbeam itself may need to be cut at ~10˚ angle where it attaches to the hinge, to allow range of motion as cheese compresses. *You will have to think about this for your own application; my plans may not work for you out of the box, depending on what hinge you get and what wall type you have.*

The Hinge:

This is the "T-Hinge" I used. It came in a 2-pack but I only used one. About $30 at my local hardware store for a 2-pack.

Note: 1) The hinge pin is removable for disassembly & storage and 2) the hinge pin cap (upper left) had to have 1/4 shaved off with a Dremel cutting tool in order to fit around the bolts. The original design is to first assemble the hinge, then screw it to your gate. But my goal was the opposite: I want to be able to assemble and disassemble the hinge at will, even after it's been screwed in place. So, I had to shave off a bit of the pin so that it would fit around the bolts after they were screwed to the wall. That took about 10 minutes with a Dremel cutting head. Wear eye protection because it throws off small metal sparks.

The Crossbeam:

- I used a 2x4, 38" long, with a) four notches cut at specific places on the bottom to provide selectable fulcrum distances d1 and b) provide an attachment point on the top for the applied weight W1 at 36 inches.

The Piston:

- This piece of wood translates the force of the crossbeam and the applied weight onto the follower and the cheese. The top is cut at a 60˚ angle to fit the 90˚ notches in the crossbeam, with angle to spare as the cheese shrinks under pressure.

The bottom of my piston is shaped to fit the follower of my 8" Tomme hoop.

Disassembly & Storage:
- When I'm *not* actively pressing cheese, here's the footprint in my kitchen:

The other parts of the press tucked away out of sight, to the right of my fermentation station:

- When I *am* actively pressing cheese, here's what it looks like:

- Initial Impressions:

- It was very easy to build, if you're comfortable with a saw, a drill and measurements.
- A total of ~$35 USD. Would have been half that if my Home Depot had a single pack hinge instead of a 2-pack.
- Has worked great on a 4 gal Kefalotyri (above, 100 Lbs, 2 psi) and a 4 gal Emmental, so far.
- Assembly & disassembly and storage are trivial, leaving an almost decorative looking plaque on the kitchen wall when not in use. Overall, I'm extremely pleased!

- Measurements and Calibration

- The wood is pine 2"x4".
- The crossbeam is 38" long.
- The notch on top for hanging the weight W1 is 36" from the pivot point of the hinge.
- The four notches at the bottom for positioning the piston are 6", 9", 12" and 18" from the pivot point.
- All notches are 90° wedges, 1/2" deep.
- The piston is cut at a 60° angle on top, to fit the crossbeam notches and give extra angle of motion.
- The bottom is cut to fit into my NEC 8" Tomme hoop follower.

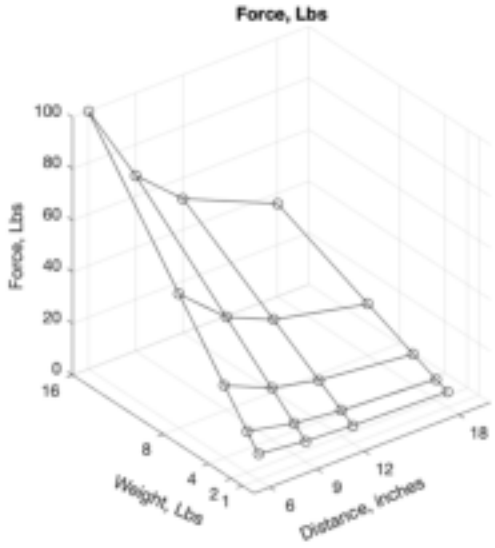
If we *assume* that the whole empty press weighs a constant 4 Lbs, then the following formula yields the following tables of forces and pressures:

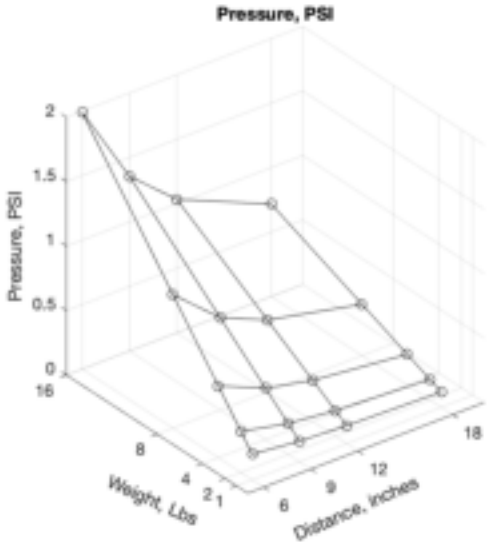
$$F = MA * W1 + W0$$

*Note: The empty press weight (W0) is **not** constant; it depends on the fulcrum distance d1. The tables and graphs below still need to be adjusted for the increasing force of the empty press as the fulcrum is moved to smaller distances. So these values are slight underestimates of the true force and pressure. Probably at most a 10% error for the shortest distance.*

Weight_Lbs	F_6in	F_9in	F_12in	F_18in
1	10	8	7	6
2	16	12	10	8
4	28	20	16	12
8	52	36	28	20
16	100	68	52	36

Weight_Lbs	PSI_6in	PSI_9in	PSI_12in	PSI_18in
1	0.19904	0.15924	0.13933	0.11943
2	0.31847	0.23885	0.19904	0.15924
4	0.55732	0.39809	0.31847	0.23885
8	1.035	0.71656	0.55732	0.39809
16	1.9904	1.3535	1.035	0.71656


Force, Lbs
Force, Lbs
100
80
60
40
20
0
16
8
4
2
1
Weight, Lbs
6
9
12
18
Distance, inches


Pressure, PSI
Pressure, PSI
2
1.5
1
0.5
0
16
8
4
2
1
Weight, Lbs
6
9
12
18
Distance, inches