MECHANICS OF THE WEAVING LOOM

HOW LOOM FEATURES AFFECT YOUR WEAVING

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ENCYCLOPEDIA BRITANNICA:

- **weaving**, production of fabric by interlacing two sets of yarns so that they cross each other, normally at right angles, usually accomplished with a hand- or power-operated loom.

HOW LOOM MECHANICS AFFECT OUR CHOICE OF HOME LOOMS

WHICH LOOM SHOULD I PURCHASE?
WHICH LOOM IS RIGHT FOR MY NEXT PROJECT?

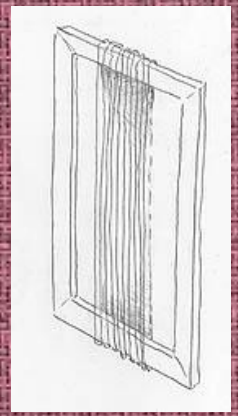
A PRESENTATION OF THE ATTRIBUTES OF
WEAVING LOOMS
AS THEY RELATE TO OUR DESIRED RESULTS
AS WELL AS OUR AVAILABLE RESOURCES

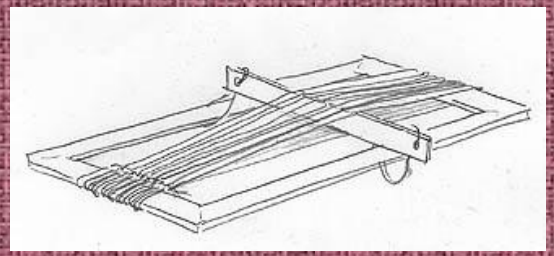
WEAVING AT ITS MOST BASIC LEVEL
STILL IN USE IN NAVAJO AND BACKSTRAP LOOMS

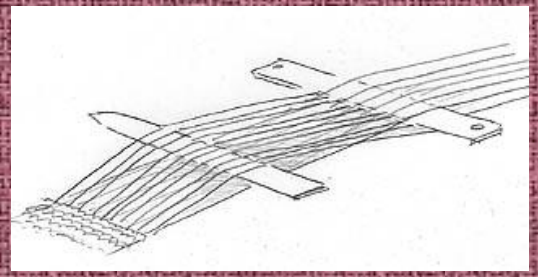
Top Left: frame loom with wound warp
Top Right: frame loom with shed stick inserted

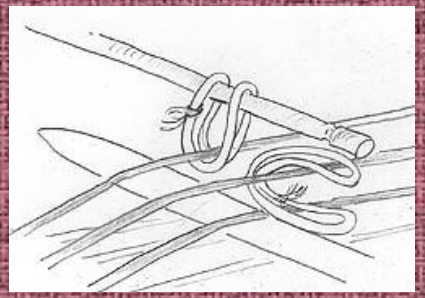
Middle Left: Second shed picked
Middle Right: warp threads from second shed given heddles

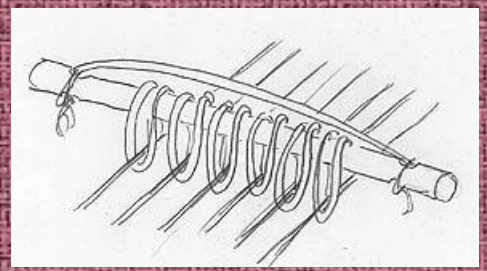
Lower Left: Heddles attached to heddle bar to form second shed
Lower Left: Loom ready to weave

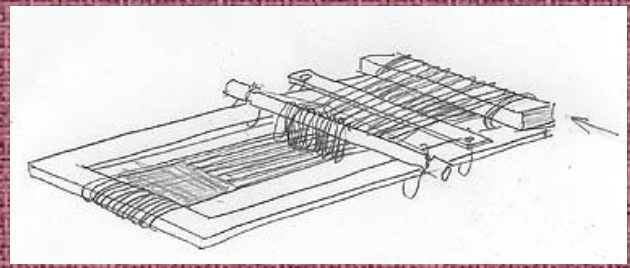












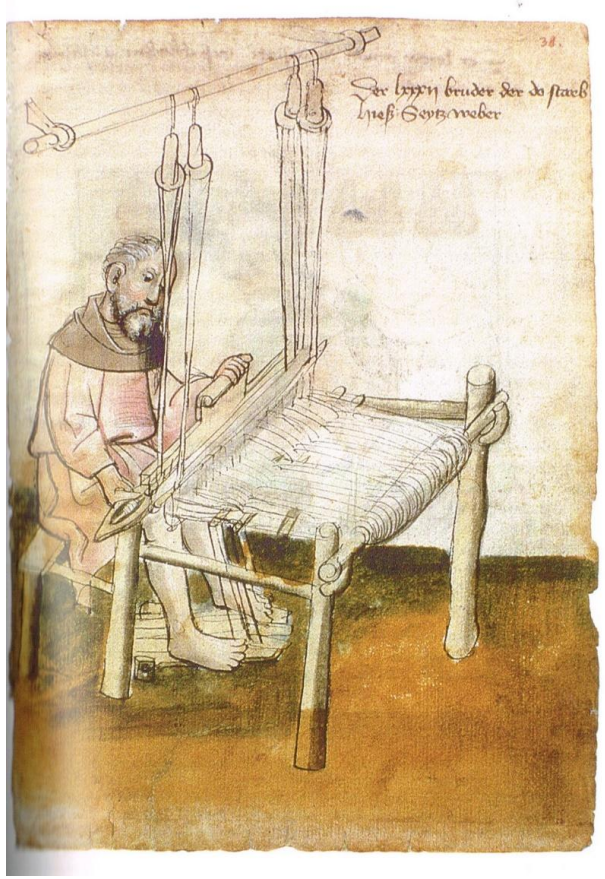
WEAVING BECOMES MORE EFFICIENT WHEN HEDDLE FRAMES OR SHAFTS ARE ADDED TO THE LOOM ALONG WITH TREADLES

The horizontal counterbalance loom with 2 or 4 shafts and treadles was in use by about 1000 AD.

This illustration dates from 1425.

Note the arrangement – the pulleys are supported from the wall or ceiling. There is an overhead beater and boat shuttle.

Actually, there is little difference between this loom and the current Glimakra Julia as a counterbalance loom.



Naama's Loom reproduction
In Middelaldercentret. Nykoping DK

https://www.middelaldercentret.dk/?lang=en
https://www.facebook.com/naamasloom/

RECOMMENDED LOOM FOR BEST RESULTS

BASIC LOOM –
4 SHAFTS / 4 TREADLES / COUNTERBALANCE
For over 1000 years, this basic loom type produced the vast majority of fabrics
In use in many lands on several continents, this simple work horse embodied the features most able to create textiles.

HEAVY FRAME – FOUR LEGS
HANGING BEATER
LONG DISTANCE FROM CLOTH BEAM TO WARP BEAM
PROBABLY WHAT I WOULD RECOMMEND AS THE MOST PRACTICAL LOOM
COUNTERBALANCE SHED
UNFORTUNATELY NOT ALWAYS POSSIBLE TO INCORPORATE INTO A MODERN LIFE

LOOM FRAME TYPES

Four Post Floor Loom with Castle

Low Castle "Jack"

X-Frame Folding Frame

Table Loom with Floorstand

Simple Frame/Rigid Heddle

FOUR POSTER WITH CASTLE

Oxaback Ulla Cyrus

Glimakra Standard

Glimakra Julia

Leclerc Colonial

FOUR POSTER WITH CASTLE

Pros

- Very strong - handles rug tension
- High castle allows hanging beater as well as standing beater
- Treadles can be front or back hinged
- Loom depth usually quite generous
- Use of knee beam keeps fabric away from weaver while weaving

Cons

- Takes considerable floor space
- Heavy

JACK LOOM

Nilus Leclerc

Gilmore Floor Loom

Macomber full sized loom

JACK LOOM FRAME

Pros

- Smaller than four poster frames and fit into smaller spaces
- Allow folding parts so they fit through interior doorways
- Castle type allows for shelf for tools
- Front or back hinged treadles possible
- Friction brakes common
- Allows only standing or sliding beater

Cons

- Do not break down easily
- Must be shipped crated
- No possitility for hanging beater
- No knee beam – cloth hits weavers knees on way to cloth beam

FOLDING

Schacht Baby Wolf

Kessenich Floor Loom

Toika Laila Loom

FOLDING (X-FRAME) LOOM

Pros

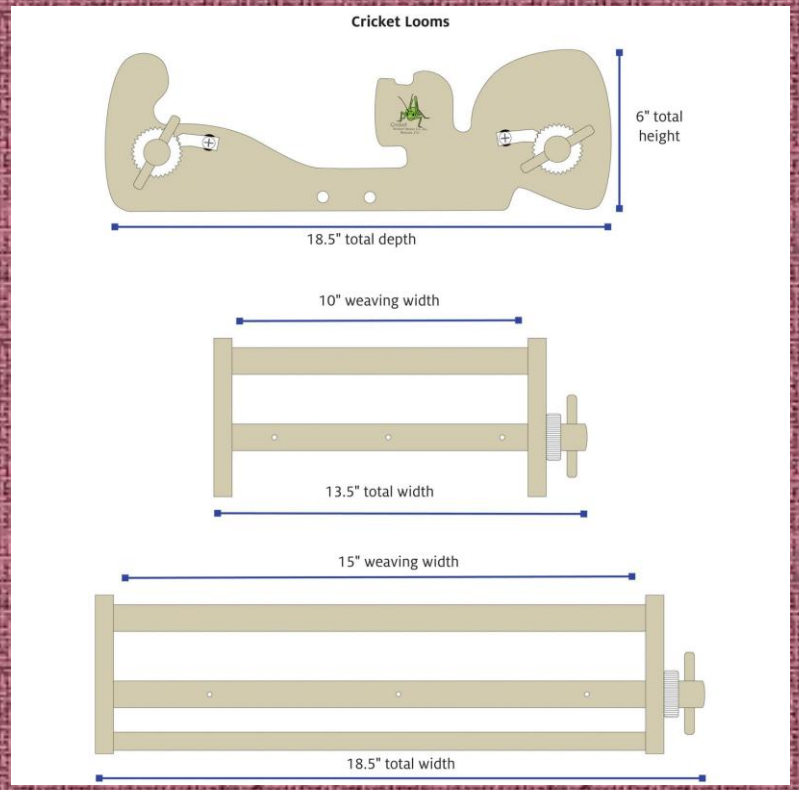
- Folding allows storage when not in use
- Low castle makes
- Standing beater only

Cons

- Low breast beam can make it difficult for weaver to keep good posture when weaving
- Folding option weakens frame

TABLE LOOM(FLOOR STAND)

RIGID HEDDLE / MINI LOOM



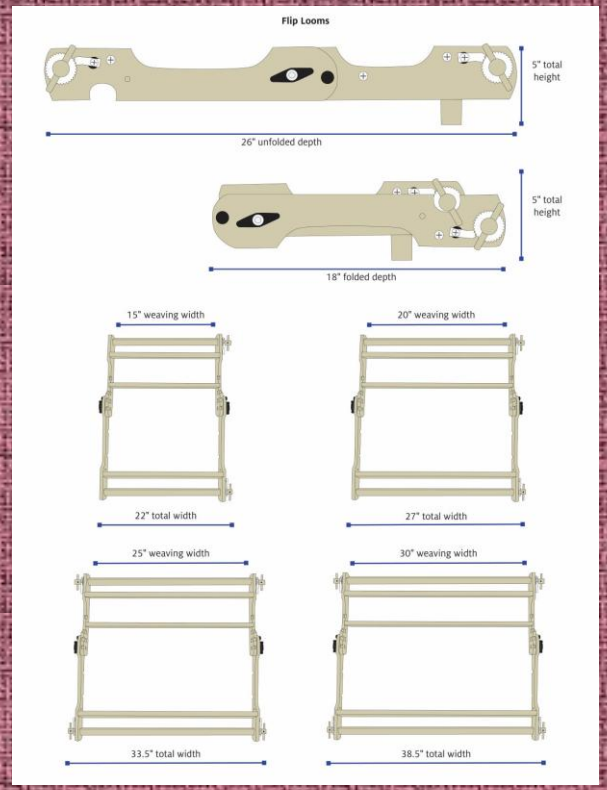


TABLE LOOM FRAME

Pros

- Store easily
- Are portable for workshops
- Allow operation without a tieup
- Floor stands make weaving pleasant
- Allow hanging, standing or sliding beater

Cons

- Small – lack depth
- To fit on table, there is little capacity for both warp and finished fabric
- Can be cramped when warping
- Do now allow long warps

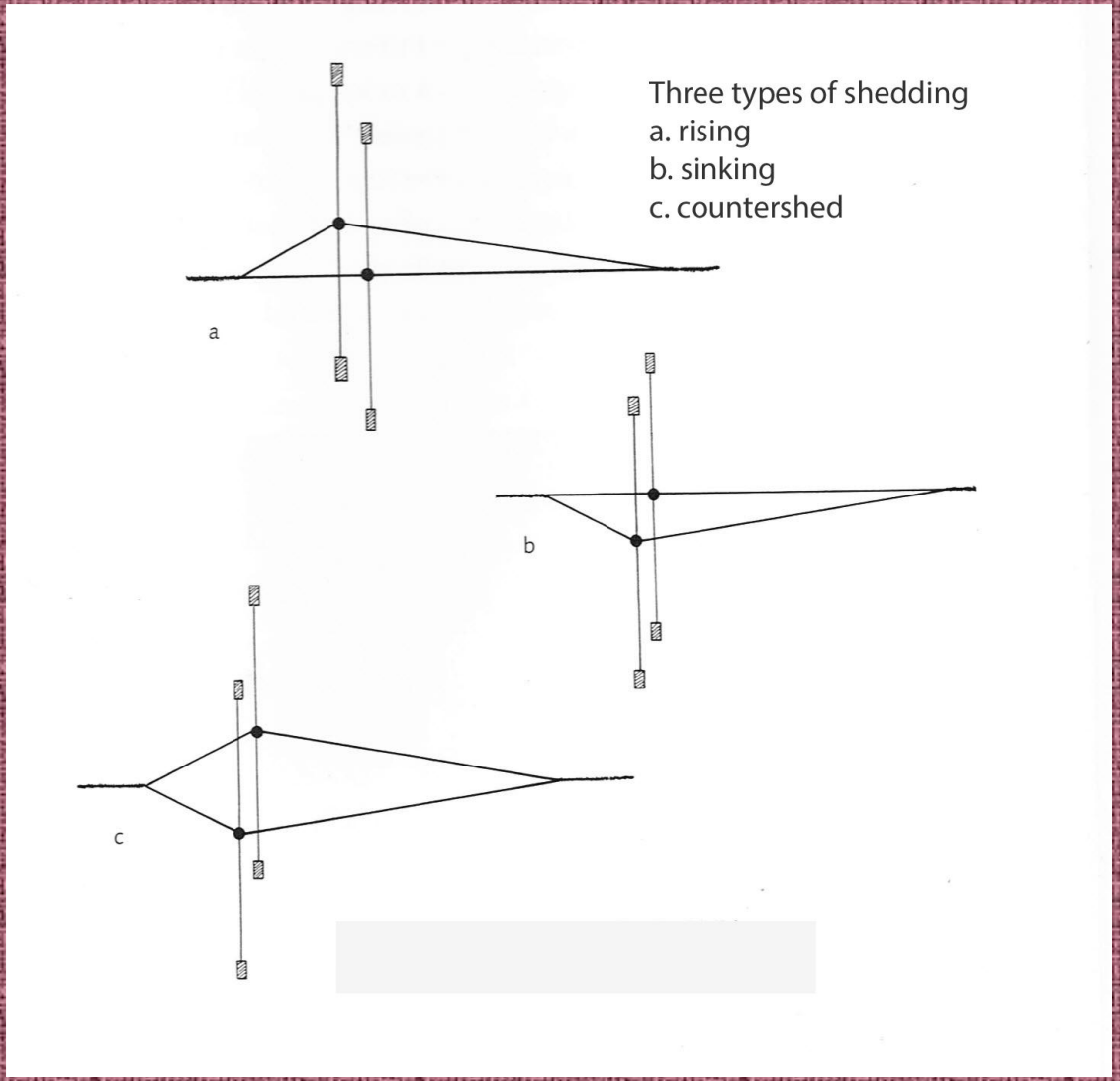
LOOM SHED

The shed is where the weaving takes place by passing the shuttle through an opening between raised/lowered threads

THREE TYPES OF LOOM SHEDDING

A loom shed creates a space to insert weft threads.
It can be created in three ways –

a. A RISING SHED lifts only selected threads, leaving the rest in "neutral" position
b. B. A SINKING SHED lowers selected threads, leaving the rest in "neutral" position
c. A COUNTERSHED raises some selected threads and lowers the rest



RISING SHED

- Rising shed is when a loom produces the shed by raising some shafts and leaving others where they are.
- This type of shed is represented by "JACK" floor looms, TABLE looms, and any other loom where treadling pushes only some shafts upward.
- Because some threads are stretched more than others (those rising) the shed floor is under slightly less tension. This can be compensated somewhat by mounting the shafts at rest with a slight dip.
- This shed does not allow the weft to beat in as firmly as the countershed sinking shed.
- Rising shed does not allow dense setts as well as a countershed .
- Because of the weight of the shafts being lifted, treadling a rising shed loom takes more effort than other loom types. The wider the loom, the more effort it takes to open a shed.
- Despite its popularity in N. America, the rising shed is not the most effective shed

SINKING SHED

- Sinking shed is formed when some shafts are lowered and the rest remain at rest.
- The lowered threads are now at a greater tension than those at rest.
- The shed floor of the sinking shed loom is very firm and does not need to have the threads at rest move or compensate.
- The slightly uneven tension formed by this shed can limit the firmness of the weft packing, but to a lesser extent than the rising shed.
- Sinking shed, found in the David loom from Louet, offers a good compromise between countershed and one way shed.

COUNTERSHED

- A countershed means that some shafts are pulled down and others raised up – in equal amounts. This leads to the same amount of tension on both the shed floor and the shed roof.
- This equal tension allows a firm shed floor. It also provides a place to beat the weft where there is equal resistance from both top and bottom of shed. Because of the firm shed floor, no shuttle race is needed.
- The countershed allows a very firm beat if desired while also providing the possibility for a very delicate beat when weaving delicate fabrics.
- COUNTERBALANCE looms work with pulleys attached to a pair of shafts. When a shaft is lowered, the opposite shaft rises. Using diagrams in weaving texts, it is also possible to weave structures where odd numbers of shafts rise or sink.
- COUNTERMARCHE looms are connected with cords and lams to produce a standalone connection to each shaft that moves with a treadle. There are variations in how this works, but all produce a very deep and firm shed.
- No matter how constructed, a countershed remains the most effective shed type for producing quality fabrics.

BEATER

There are three types of beater

HANGING

STANDING

SLIDING

Beater bar should be adjustable to accommodate a wide variety of reeds

Beater must be square with the loom or the fabric will not be straight

Beater should be easy to reach and operate

HANGING BEATER

HANGING BEATER

Pros

- A hanging beater is the most versatile type.
- On a four poster loom, the hanging beater does NOT require a shuttle race – the back lip of the beater meets the warp on the back swing and supports it the way a shuttle race does.
- On a table loom, a shuttle race will enhance the stability of the warp.
- Weaving with a hanging beater does not impact the shoulder with contact reverberations
- The hanging beater allows very heavy beating as well as the ability to merely "kiss" the fell line for delicate fabrics

Cons

- The hanging beater requires a high castle.
- The hanging beater uses a continuous motion that requires pushing the beater back, beating, bringing the beater forward – it is NOT to be "held back" . This requires a learning curve.
- Not all loom types allow full functionality of a hanging beater

STANDING BEATER

STANDING BEATER

Pros

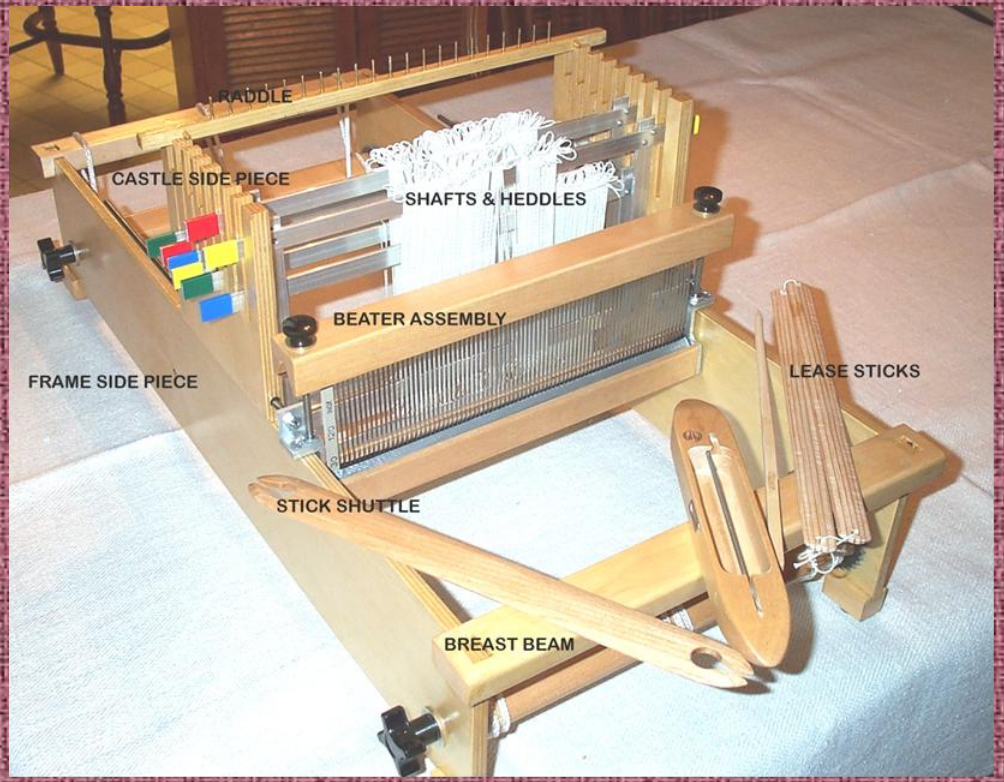
- Most common beater type
- Because beater is away from breast beam when inserting the shuttle, there will be a shuttle race in front of the reed to keep the shuttle from diving
- Does not require a high castle
- Provides a firm beat

Cons

- Heavy beat makes weaving delicate fabrics more difficult
- Contact reverberations at fell line continue to shoulder, can cause shoulder discomfort
- Usually not adjustable

SLIDING BEATER

Sliding beaters work nicely on narrow looms, particularly small table looms.
They guarantee that the reed strikes the fell line perpendicular every time.
Sliding beaters require careful maintenance so they do not become warped in any way – as that renders them sticky and difficult.



TREADLES

Treadles come in t wo versions, front hinged and rear hinged

(Table looms have levers to create sheds as a treadle substitute)

Back Hinged Treadles

Front Hinged Treadles

FRONT HINGED

- Front hinged treadles are connected to the shafts and pull the shed using the whole foot.
- More effort is needed to open a shed with the front hinged treadle so for rising shed floor looms, treadling is heavy
- On a countershed (esp. counterbalance) loom, since little effort is needed to open the shed, front hinged treadles are light to treadle
- The position of the treadle is fixed and spaced wide enough to treadle wearing street shoes
- For plain weave projects, front hinged treadles mean that the weaver does not need to lift their feet to change sheds, which is convenient

BACK HINGED

- Back hinged treadles need less force to open a shed
- Back hinged treadles can have fixed positions or they can swing freely close together
- Fixed back hinged treadles are found on rising shed looms and some countershed looms (Cranbrook) – this allows for easy locating and use of street shoes
- Swinging back hinged treadles are found close together in the center of the loom on countermarche models
  - This centering is necessary because of the pivoting lams that create the sheds – to keep the action of the treadles similar, they must all reside in the center of the weaving width
  - The swing in the treadles allows the weaver to push treadles easily out of the way after identifying the treadle to be depressed

TREADLES - CHOOSING

- Treadles on a loom need to be comfortable for the weaver
- Treadles on a loom need to be sturdy – there are accounts of weavers actually breaking treadles on smaller floor looms
- Treadles should be wide enough that they do not cut into the bottom of the foot
- Treadles mounted on the floor stand of a table loom tend to be less effective than treadles built into the design of a floor loom
- Fixed treadles allow using the whole foot. They should not be spaced so widely that the weaver needs to involve sideways hip movements when treadling
- Swinging treadles on countershed looms are needed to make the treadles similar when in use. They move sideways sufficiently to allow access and the weaver uses only the front of the foot when treadling.

HAND LEVERS

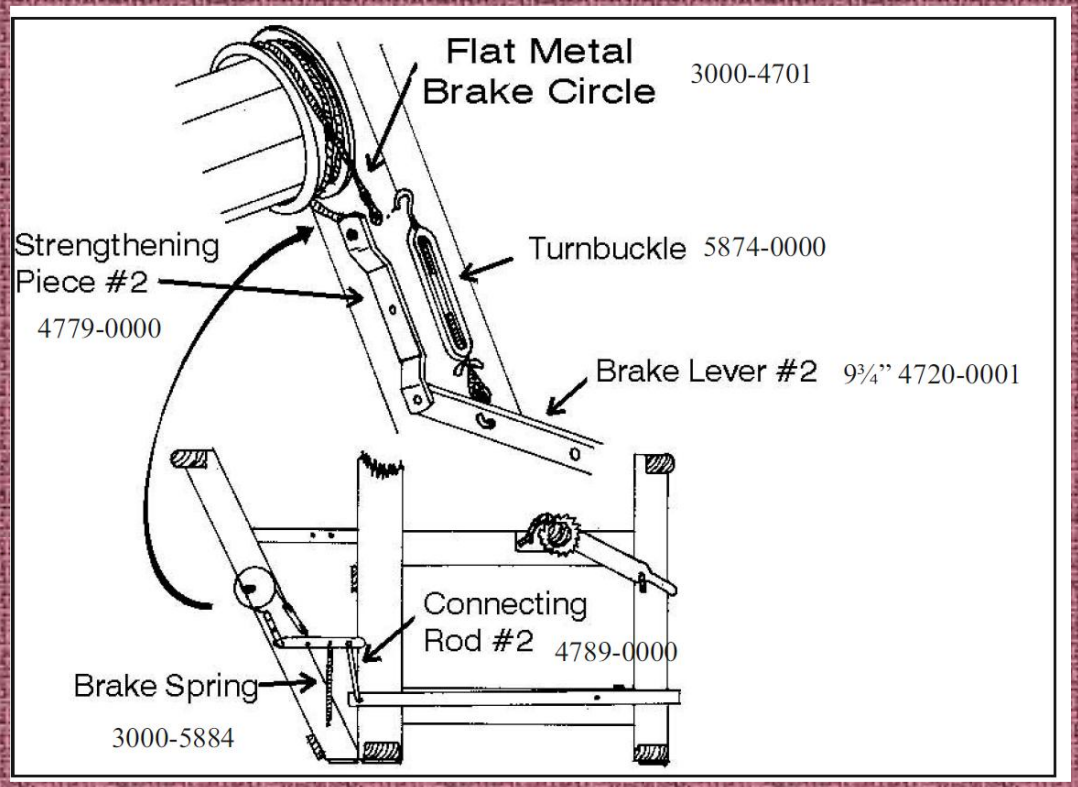
- Table looms rely on hand levers, they should be both functional and comfortable
- Hand levers on one side of the loom are awkward as when passing the shuttle, they are always in the way on one side
- Hand levers on the top of the loom function well but can be difficult to reach
- The best hand levers are on the front of the castle and easy to reach
- Some models with very comfortable hand levers
- Ashford table loom
- Louet Jane
- Glimakra Victoria

TENSIONING

RATCHET AND PAWL

- Ratchet and pawl tension is very common. It provides excellent tension.
- The more notches on the ratchet, the better the fine tuning can be regulated. Some smaller table looms have “half notches” to provide more stopping points.
- It is worth noting that each notch lets off or takes up more warp when the beam is full. This means that at the beginning, you may need to click two notches on the cloth beam when one is let out on the filled warp beam. At the end, one notch on the cloth beam may equal two on the now empty warp beam.
- Wooden parts on a ratchet or pawl may look lovely, but can be weak if they are not properly aligned with the grain. Metal or sturdy plastic are more durable.
- Some looms have larger notches on the warp beam and very fine settings on the cloth beam. This is fine as the weaver usually wishes to release several inches of warp and then fine tension it using the ratches at the breast beam. Many barn looms and the Cranbrook rug looms have this feature.
- Looms that have handles to release the ratchet on the warp beam are ineffective because the weaver must first release the cloth beam.

FRICTION BRAKE



There is a brake band of flat metal wrapped around the warp beam. When a shed is opened, there is a tiny bit of slippage – the weft is inserted, beaten, and when the treadle released the warp should return to the prior tension – with a very tiny advance.
Set correctly this type of brake allows the weaver to proceed for a long sweet spot – possibly something akin to an auto advance
This type of brake works well for many fabrics, but is not firm enough for rugs and similar firm textiles.

Friction brakes are common on jack looms – they allow a warp beam release lever that is functional from the loom bench.

LIVE WEIGHT FRICTION BRAKE

- Live weight tension uses cords/ropes wound around the warp beam combined with weights to hold the tension on the warp
- Live weight tension, properly adjusted creates a natural "auto advance"
- Kati Meek wrote her "Dance With Your Loom" and details how to set up this tension
- Excellent option for household and clothing fabrics

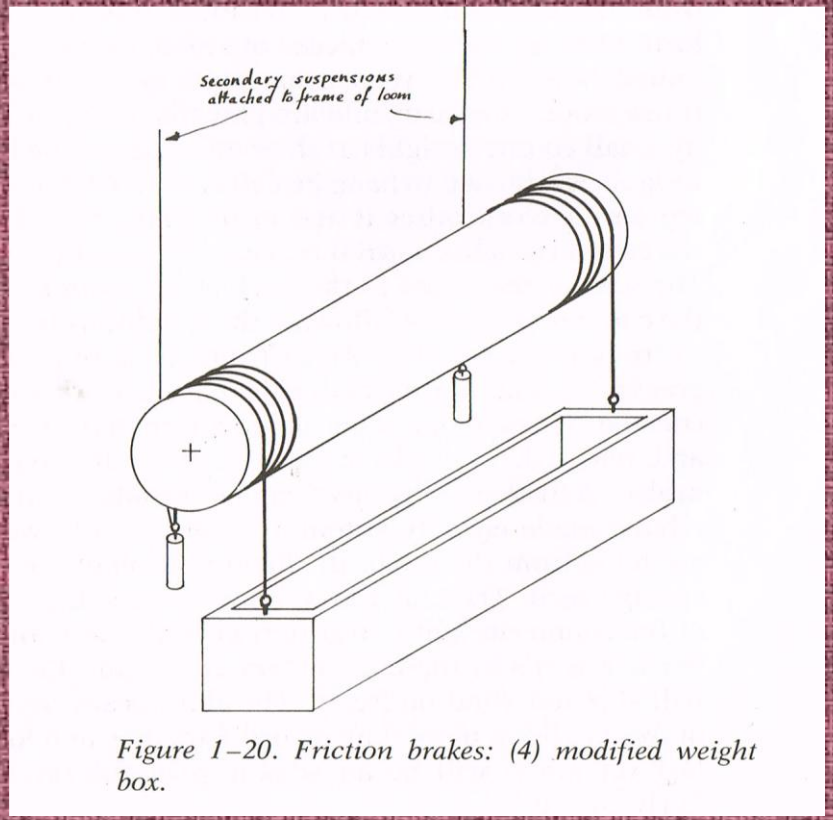


Figure 1–20. Friction brakes: (4) modified weight box.

LOOM DIMENSIONS

DEPTH

EXPOSED WARP

BACK/BREAST BEAM FUNCTION

DEPTH

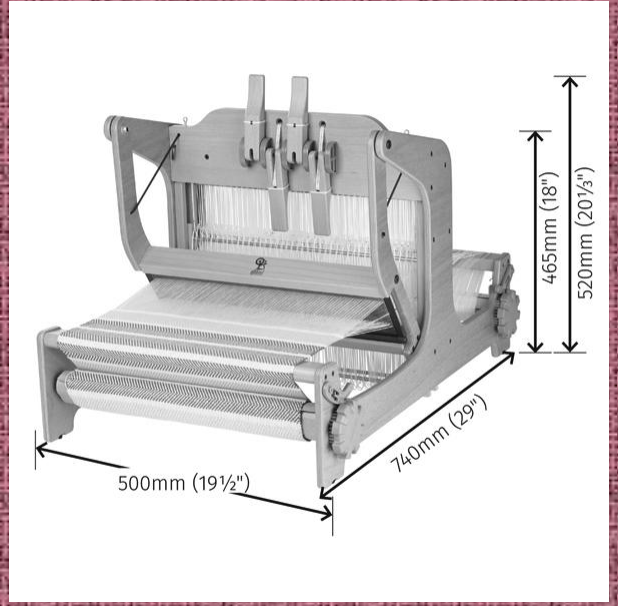
- Loom depth creates the distance that a warp thread is tensioned. There is only so far that a warp thread will stretch per inch. The more inches available for making the shed, the better tension can be regulated, the better one or two slightly loose threads can be absorbed into the fabric without intervention.
- If a loom is not deep enough, it will be difficult to create a good shed under adequate tension, and to fine tune the tension.
- Adding shafts to an existing loom takes extra depth. If the shafts do not have room, the shedding will become difficult.
- How deep should a loom be?
- The four poster counterbalance loom shown at the beginning of this presentation would be at least 45 inches from breast beam to back beam.
- With the additional exposed warp to the warp and cloth beams, nearly 2 yards of warp are available to stretch into a shed.
- A functional loom should be at least 24” deep, 28 inches or more is better. When choosing between models, if space is available, the deeper loom will be more effective.

Leclerc Dorothy – 20”

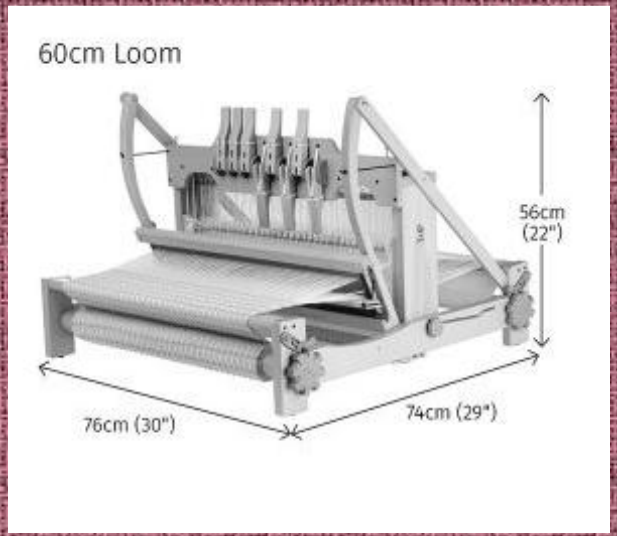
The 20” depth makes weaving on this loom crowded – 8 or 12 shaft versions already need a deeper frame

Louet Jane – 35”

Warp and Cloth beams can be mounted in the floor stand giving greater length of exposed warp



Glimakra Standard Counterbalance Loom
100cm weaving width
53” loom width/
65” loom depth



Ashford Brooklyn or
8 shaft Table Loom – 29"

WEAVING WIDTH

- Weaving width should include a bit of "air"
- On a floor loom, one should allow about 2 inches more than what is billed as maximum weaving width
- Weaving at full width can be frustrating as warp threads can fall off the packing material, heddles can fall off the shaft bars, there might not be enough dents in the available reed
- Purchasing a loom that is far too wide is also not recommended – weaving narrow fabrics becomes awkward, treadling – especially with rising shed – is unnecessarily heavy,
- While double width double weave can produce fabrics nearly twice as wide as the loom width, this is not universally applicable. Many fabrics do not respond to this technique – producing a very visible center line. Weaving accurately is a serious challenge.

HEIGHT

- The height of the breast beam on a floor loom should be enough that the weaver does not need to weave bent over the loom.
- An adjustable weaving bench is necessary to place the weaver at a comfortable height
- The elbows should cleanly clear the breast beam when weaving – a tall loom will need a tall bench adjustment, a short loom a short bench.
- If a loom is too low even with an adjusted bench, the loom can be put on risers.
- If a loom is too tall after bench adjustment, the treadle height can be changed to make them easier to reach
- Table looms present an issue – they must either function on a table that is at a comfortable height or be mounted on a floor stand from the manufacturer. One affordable solution is to purchase a table in a thrift shop and adjust the height.

WARP AND CLOTH BEAMS

- Warp and cloth beams need to be sturdy.
- Very skinny beams lead to torque on the warp – that is when the side of the fabric nearest the tensioning point always lies in front of the other side.
- Thin beams can torque but will hold more warp than a thick one. On a table loom, there needs to be a compromise between stability and capacity. Louet does build table looms with floor stands where warp and cloth beams can be mounted to hold more warp or fabric.
- Sectional warp beams can also be warped "plain beam" if desired.
- Aprons attached to the warp or cloth beam can make weaving nicer for the parts of the warp that are near the beginning or end of the warp
- Aprons, however, need to be maintained well and kept parallel to the back and breast beam or the fabric will not have a straight grain
- If an apron becomes defective, it is easy and effective to replace it with tieon cords
- Tieon cords are very good as well – they may be mounted singly or as a continuous long cord. Using two sticks lashed together to tie on is a good idea.