



MODIFICATIONS TO A POTTERY WHEEL

Pottery is formed clay hardened by the application of heat, it includes a range of materials like bricks and tiles, earthen-ware, stoneware, terra cotta, bone china and porcelain.

The potter needs clay and water to mix and form, and some source of heat to bake the formed clay (in the early times the sun provided this).

Fired clay is fragile but is also almost imperishable under normal conditions. Thus fired clay accumulated through the ages reveals man's evolution, his social habits, his ideas, interests and worships.

Clay, a product of decomposition of mineral feldspar, can be classified broadly into two categories -primary and secondary, according to its location. Primary clays are found near to or among their mother rocks. Kaolins (China clays) are primary clays. Secondary clays are clays which have been carried away from their source, collecting impurities on their way.

Clay Shaping Processes:

Clay can be shaped or formed by any of the following processes:-

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|--------------|--------------|
| a. modelling | e. extruding |
| b. throwing | f. pressing |
| c. moulding | g. turning |
| d. jollying | |

In modelling, which is undoubtedly, the most ancient and the simplest of the above processes, shapes are formed entirely by hand using only the potter's fingers and a few rudimentary tools like scrapers and knives. Large pots are made even today by coiling up ropes of clay and smoothing the surfaces on the inside and outside as the shape builds up.

Throwing is the best known of all the shaping processes. The potter imparts his creativeness on a lump of plastic clay spinning on a turntable, using his thumbs, fingers and palms. This paper discusses the modifications effected to the throwing wheel, on which the clay is spun.

In moulding clay is pressed onto a mould having the negative form of the desired shape. The pre-Columbian Americans, lacking the mastery of the throwing wheel, used moulding as their main pottery-making technique.

The jolly consists of a Plaster of Paris mould on a rotating turntable and a profile tool attached to a lever. Clay is placed in or on the rotating mould and on lowering of the profile tool the clay is forced to take the shape of the contour of the mould.

In extruding, plastic clay paste is forced through a die or a mouthpiece with the required profile. Clay is pressed in between two dies whose inside had been formed to the required profile of the article, in the pressing process.

Clay turning is similar to metal turning on a lathe but the clay has to be air-dried to be hard enough to with-stand the turning.

Slip casting is similar to metal casting. Clay in liquid state (casting slip) is poured into a dry Plaster of Paris mould in which the water of the clay paste is absorbed by the Plaster of Paris leaving a coating of clay in the mould.

Pottery Wheels:

Potters are characterised by the throwing wheel they use in the throwing process. Potters' wheels were recorded to have been in existence in Central Asia by 3,500 B.C., in Egypt by around 3,200 B.C., and in Crete 3,000 B.C. The earliest form of the throwing wheel was a rough horizontal circular table turned on a pivot very close to the ground. Another variation was a wheel similar to a cartwheel (with spokes) placed horizontally and turned on a pivot with the help of a long pole inserted into a socket of the wheel (figure 1) the Indian wheel.

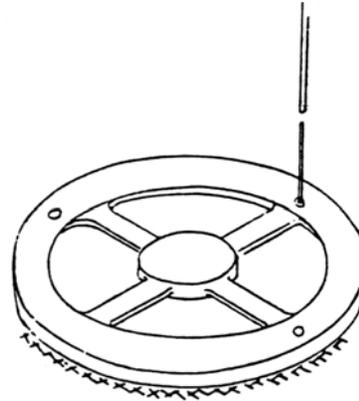


Figure 1: Indian Wheel

Chinese/Japanese handwheels had a heavy wooden disc mounted on a porcelain cup. The potter imparts energy to the wheel by rotating the disc vigorously with the help of a short stick inserted in a hole on the disc (figure 2) the Chinese/Japanese handwheel.

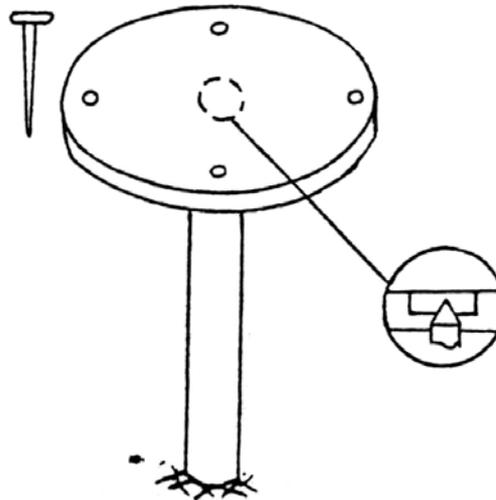


Figure 2: Chinese Handwheel

An improvement to this wheel was made when the work table was raised up to enable the potter to sit comfortably at work, while he imparted momentum to another wheel below, attached to the work table, by kicking it (lower wheel) with his foot. This kickwheel is sometimes referred to as the German wheel (figure 3).

An attempt to transfer kicking of the wheel to a pedal action was made in the St. Ives kickwheel. In this wheel a cranked spindle connecting the worktable to the inertia wheel was linked to a bar, the kicking of which imparted rotary motion to the inertia wheel (figure 4) St. Ives Kickwheel.

The modern potter's wheel has the drive through a friction clutch connected to an electric motor.

The Criteria Demanded in the Modification:

The essential requirements of a potter's wheel are:-

- a flat circular disc to rotate about a vertical axis forming a rotating worktable.
- the worktable continuing to rotate while the potter forms the article using his hands, during which time his feet should remain idle.
- if any energy impartation is required from the potter, it should be through the use of his legs only.

The modification finally demanded a kickwheel suitable for operation by rural female operators.

Modifications Effected:

Criteria (a) and (b), required some form of energy storage and as was done from early times, an inertia wheel was resorted to.

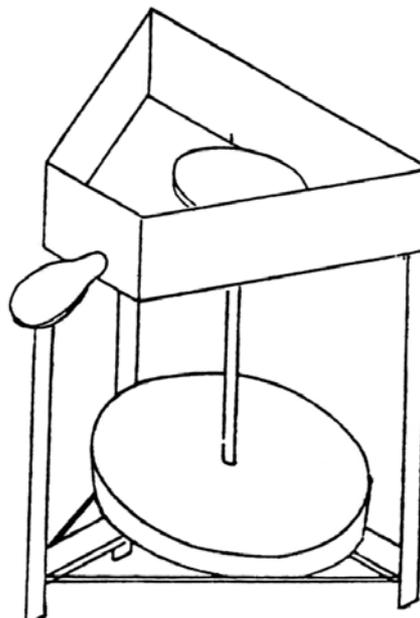


Figure 3: German Kickwheel

Thus the only modification to be effected was modifying the drive mechanism, which should also suit rural female operators. Electric motor drives had to be abandoned due to the rural nature of the use of the wheel.

Using concepts of ergonomics for most effective use of human effort, the drive mechanism was finally developed to consist of:-

- A bicycle freewheel fitted on the shaft connecting the worktable to the inertia wheel.
- A housing to contain the freewheel.
- A thin wire cable wrapped round the housing and taken over two pulleys attached to the frame-
- Two stirrups attached to the end of the wire cable to serve as pedals and footrests.

In operating the drive the operator would push one leg down, engaging the ratchet of the freewheel and thus November 1977 turning the spindle and the wheels (inertia and worktable). At the end of this stroke, the other leg would have come up to the topmost point of its travel and on pushing this foot down the other leg is brought up. Due to the freewheel's one way engagement, this travel does not impart a reverse rotation.

Travel of one limb would thus engage the drive to the inertia wheel while the travel of the other leg would bring the earlier leg to its original position. Up and down motions of the limbs would thus impart rotary motion to the inertia wheel.

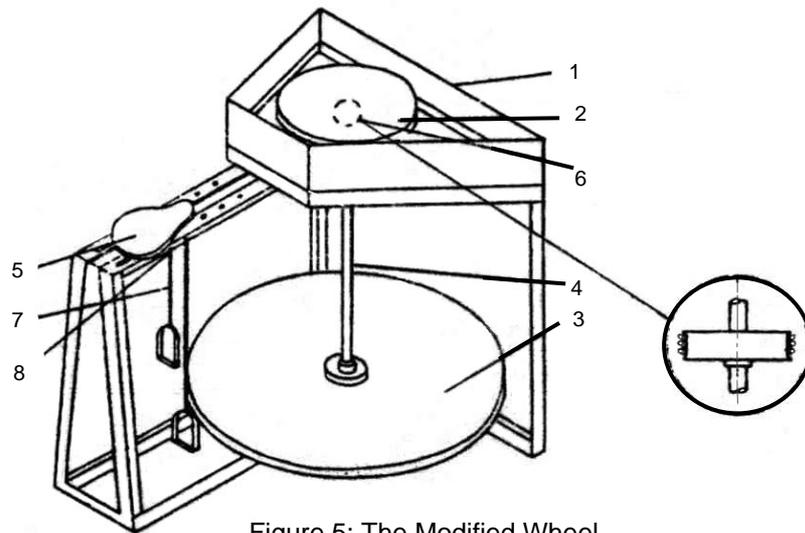


Figure 5: The Modified Wheel

As the drive has been moved away from the inertia wheel and made reciprocatory foot motion, restrictions on the inertia wheel dimensions were removed. This enabled a better inertia wheel with a larger ratio of inertia to weight to be incorporated. A composite inertia wheel consisting of a circular mild steel plate of 1/4" inch thickness with a ring of mild steel at its underside periphery was used. A larger inertia wheel with a higher inertia to weight ratio is permissible.

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|---|------------------------------------------------|
| 1 | Frame |
| 2 | Worktable |
| 3 | Inertia Wheel |
| 4 | Spindle |
| 5 | Seat (adjustable horizontally and vertically) |
| 6 | Drive Mechanism (freewheel and housing) |
| 7 | Cable (length adjustable at hook) |
| 8 | Pulleys (position along seat frame adjustable) |

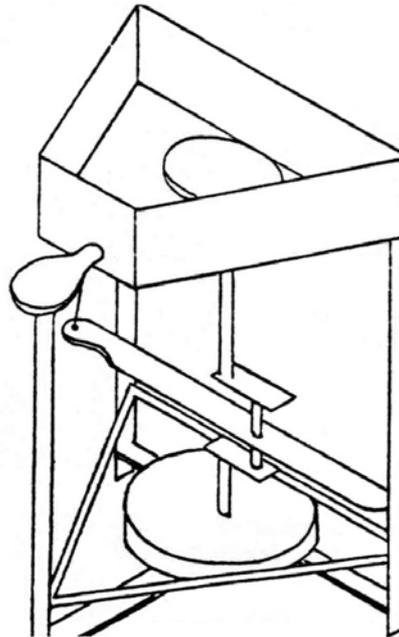


Figure 4: St. Ives Kickwheel

Other modifications included:-

- An adjustable (both horizontally and vertically) operator seat to allow for variation of operator height and length of leg.
- Swivelled pulleys to allow for variation of direction leg stroke for comfortable operations.
- Adjustments in position of stirrups to allow for variation of length of operator legs.

Of the components of the wheel, it is possible to make the following parts from timber:

- The whole framework
- The spindle (with hardwood) connecting the work table to the inertia wheel
- The worktable and the inertia wheel
- The housing for bearings and the freewheel.

Furthermore, the steel cable and the stirrups can be replaced by inelastic synthetic cable with leather strips. Thus, with a few exceptions (the bicycle freewheel and the steel ball bearings), the whole wheel is capable of being produced by most village carpenters in a rural carpentry workshop.

References and further reading

- *Decorative Tile Making With a Wet-clay Hydraulic Press* Appropriate Technology Vol. 17 No 1 June 1990
- *Wooden Jolly to be Used on Adapted Kick Wheel* Appropriate Technology Vol. 3 No 1

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