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UTILIZATION OF METAL SCRAPS FOR THE CONSTRUCTION OF A PROTO-TYPE POTTERS' WHEEL

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ABSTRACT

This paper is concerned with the utilization of metal scraps for the construction of a proto-type potter's wheel. The significance of this study is that through this locally constructed ceramic kick-wheel; learning will be made simple for students while teaching made simple for teachers. Various metal scraps were welded together with the guide of a product design in its given dimensions. The study employed experimental research method, which includes seeking alternative medium from the imported and highly priced kick-wheel. Based on the result obtained for this study, it is conclusive that following the product proto-type design given in its accurate dimensions that the production of ceramic kick-wheel using metal craps is achievable.

INTRODUCTION

Technology is growth; it is the quest for every nation. The technical know-how of the developed world started from what could be described as "the known to unknown" The use of the locally available metal scraps for the construction of a functional potters' wheel is an experimental research product for cottage ceramic industries/institution of higher learning. This would help to alleviate problem of importation of potter's wheel which is too expensive and furthermore *be* a leap towards the much desired technological growth. The choice of metal scraps (or kick-wheel construction is best informed by the fact that there are abundant metal scraps all over the country which we do not take much cognizance of, this is evident when one visits junk-yards of metal scraps especially in most commercial centers. Despite the heap of such piles, little advantage of it is used to the advancement of technology. It is therefore not an over statement to say that Nigeria

is blessed with abundant metal scraps, but lack technical know-how to effectively manage this scarps. An engineering manager at Fuji Xerox as quoted by Stuart (1996) states that "Western man is very good at turning unknown into known. Eastern man is very good at turning knows into commercial success". The great question here is how about an African man. What is the focus? especially now that Africa is said to be developing. Since development is synonymous, with growth the need to encourage the spirit of creativity through the use of “waste materials" if the ingenuity in individual must be developed. Stuart (1996) further contended that both objectives and either turning "unknown to known into commercial success" are achievable, but to achieve the full cycle, he believes in the adoption of new innovation. And those products do not have to be highly innovative, as long as they do the Job properly. He believes that too often we go for high technology products that do not perform. Design can be defined as the presentation of a good conceptual idea on the surface for effective onward utility. Ekeada (1988) sees design as that which needs to do with solid form.

Statement of Problem

The inadequate teaching equipment especially potter’s wheel among others, confronting various tertiary institutions of learning offering ceramic as a course constitute a problem. Therefore, the situation calls for the utilization of locally available metal scraps for the construction of a prototype potter’s wheel.

Basic Assumption

It is Assumed:- That the production of locally constructed kick-wheel will help if fully developed on a large scale to meet the demand of the contemporary ceramic industries/tertiary institutions of learning. That the already existing contemporary ceramic industries that were forced to close down due to lack of technical know-how on ceramic related equipment would re-open having the fore knowledge of the way out to solving ceramic related equipment problem such as kick wheel.

Significance of the Study

Most institutions of higher learning in Nigeria have no kick-wheels due to high cost of importation, but through the locally constructed, kick-wheel, learning will be made simple for students and teaching made simple for teachers. This will help to open more contemporary ceramic cottage-industries, thus reducing unemployment.

Scope:- Metal scraps for this research was sourced from cities like Kano, Kaduna and Katsina since all the components required for this research were not available in a particular city.

Limitation:- The research was limited to adequate property testing, such as ware resistance and durability.

Research Design :- Adetoro (1986), slates that the method of any research depends on the nature of the problem intended to be tackled by the researcher. In this study therefore, the research methodology adopted was basically product development.

Data collection :- Visits were conducted at various junkyards of commercial cities such as Kano, Zaria, Kaduna and Katsina, since not all the components required were available in a given place. Even in a given junk-yard, care must be taken in order to select the best component for effective performance.

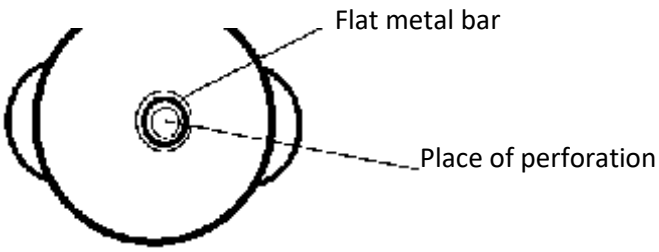
Component Requirements :- Component requirement comprised of scrap metals such *as*, shaft from a car, Boris, flying wheel, angular iron, bolts of various sizes, metal sheets, ball joints, head pan, gloss paint, sand paper, brushes, grease (lubricant).

Beneficiation of Materials :- Naturally, any metal scrap is very rough due to its corrosion. The metal scraps were sandpapered where necessary to allow for smooth painting.

Product Design :- Two types of design were carried out on paper by the researcher as experimental sketches (see figure la -b). Figure, la is specially designed for sit and kick-wheel approach while (figure 1b) is design for stand and kick-wheel approach. The stand and kick wheel was eventually developed.

Method of Production :- Etuokwu, (2007) believes that a collection of scraps materials from the scrap market around us can be assembled to give just exactly what is needed in the ceramics studio. Construction was therefore carried out using scrap metals and welding approach following the specifications as indicated in the cross section view of the product design (see fig 2), The placement of the shaft was rightly done to ensure straightness, which will disallow wobbling at the center.

The procedures for the constructions are as follows:

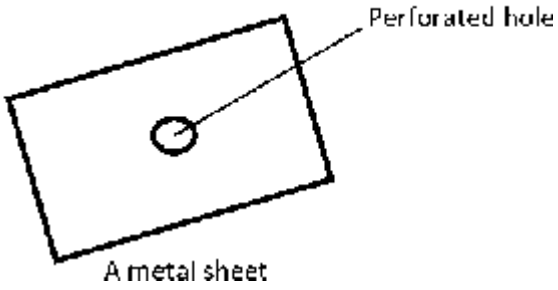


A perforated head pan

a. **Head Pan :-** The head pan of 47cm in diameter was chosen. At the bottom centre of the head pan, a perforation was done using electrode to open up to allow for allowance of the shaft that would pass through as in the diagramme below. A flat metal bar was also used to weld round the perforated place to disallow water used during throwing to spill all over places.

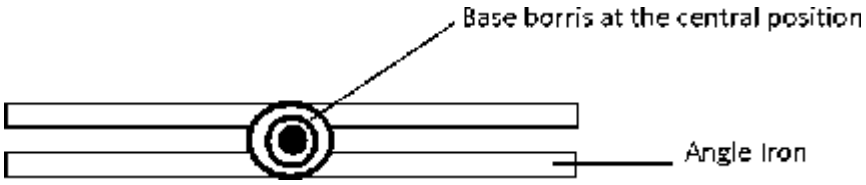
Metal Sheet

A metal sheet of 50cm x 47cm was cut to the size of the frames to further holds the frames top as well as to protect the beneath borris from water contact. The metal sheet was also perforated at the centre allow for to the free passage of shaft.



Angle Iron

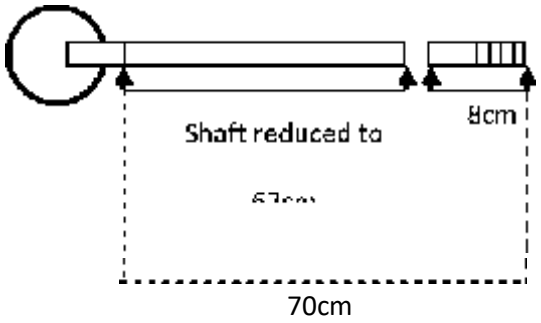
Two angular iron 46'Acm x 46'Acm were cut and welded to side frames to house the base borries.



Shaft

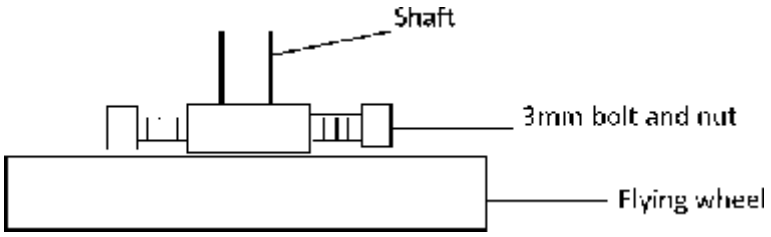
There are different sizes of shaft available. Any of these sizes will do, but it has to go along with the right size of a borris (fitted borris), as well as chosen the right length. If a particular shaft is too long it can be cut to the required size.

It should be noted at this juncture that no shaft comes with treaded head. Treading of shaft head can however be done using a machine or on the alternative big treaded bolt and nut be bought and welded to the shaft.



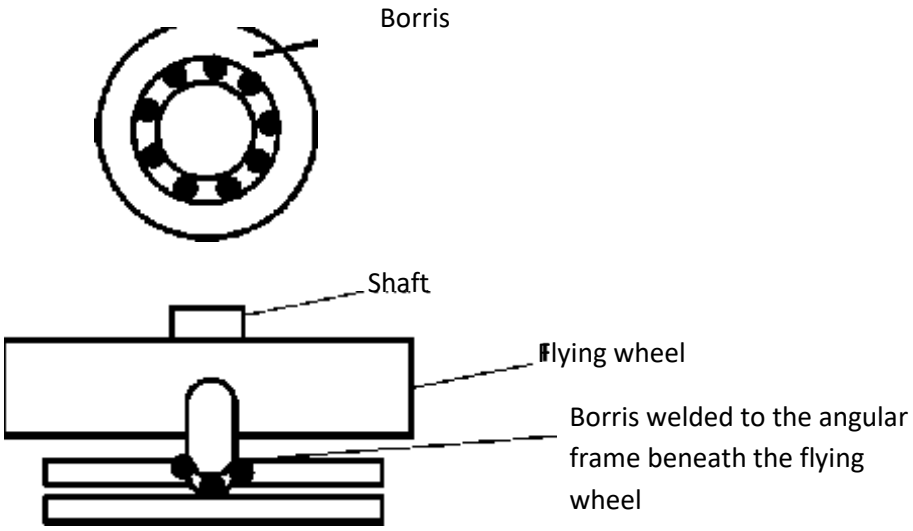
Flying wheel

The flying wheel is a source of weight and a pulling force required for the wheel to work. One or two flying wheels put together could do the job depending on their weights. Bigger flying wheels can be used alone. Some flying wheels are largely perforated at the centre that would call for one to find a small perforated metal thick enough that would allow for the passage of the shaft. Here a flat metal bare could be welded to the flying wheel with 3mm bolt and nut to further hold the flying wheel and the shaft together.



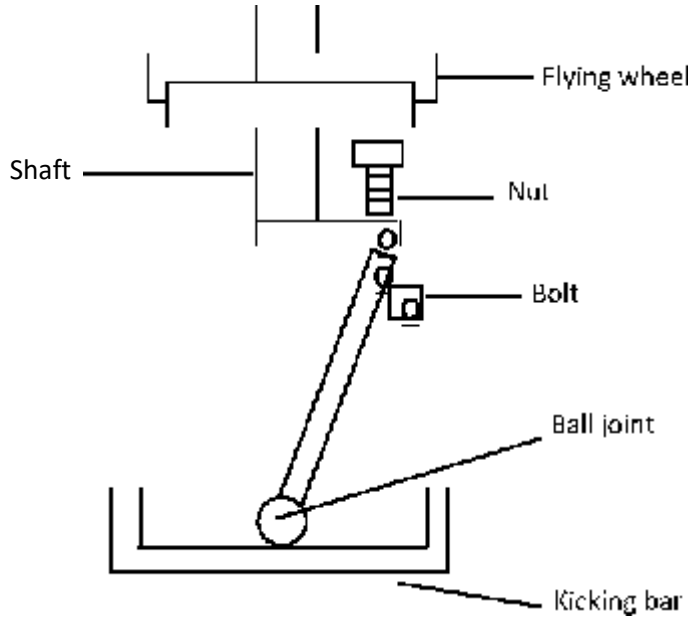
Borris

The function of this is to assist the shaft to turn effectively during kicking or working on the wheel. Good borris must be purchased for this purpose and lubricated with oil grease. The borris to be bought must be the type that will fit in to the shaft to be used. Note that there are two borris to be used one beneath the head pan and the other beneath the flying wheel. The same central position the top borries assumes is the same with that beneath the flying wheel.



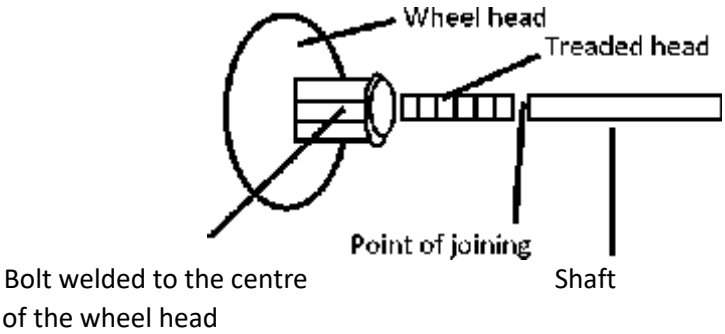
Ball Joint

This is joint that helps to rotate the wheel when kicked. It is a moveable ball inside a socket, welded to the metal the leg is placed to kick. It should also be lubricated with lubricant (grease).



Wheel Head

This could be fabricated. It could also be sourced from the metal junk yard. Any relatively round and strong metal plate could serve. What to further look for is a big treaded nut (bolt and nut) that is relatively big in diameter as the shaft to be used. Weld the nut to the centre point of your flat wheel head. While the tread be welded to the shaft.



Pilot Study

Pilot study according to Afolabi (1996), can be regarded as a small-scale approach of the envisage study or investigation, whereby a proto-type of the main body is developed. Consequently, this approach serves as a means to reduce, to a -large extent, the number of treatment and errors that would have been identified in the pilot study stage. At this stage errors noted were rightly corrected

and finally developed to a full proto-type using the right materials for the stand and kick-wheel approach see (table 1.1)

Material and sources

Table 1.1

S/No	**Raw Material**	**Source**
1	Head pan	Locally Katsina
2	Boris	“ “
3	Shaft	“ “
4	Lubricant (grease)	“ “
5	Iron rod	“ “
6	Gloss paint	“ “
7	Bolts and nuts	“ “
8	Angular Iron	“ “
9	Metal sheet	“ “
10	Ball joint	“ Zaria
11	Flying wheel	“ Kaduna

12	Wheel head	Kano

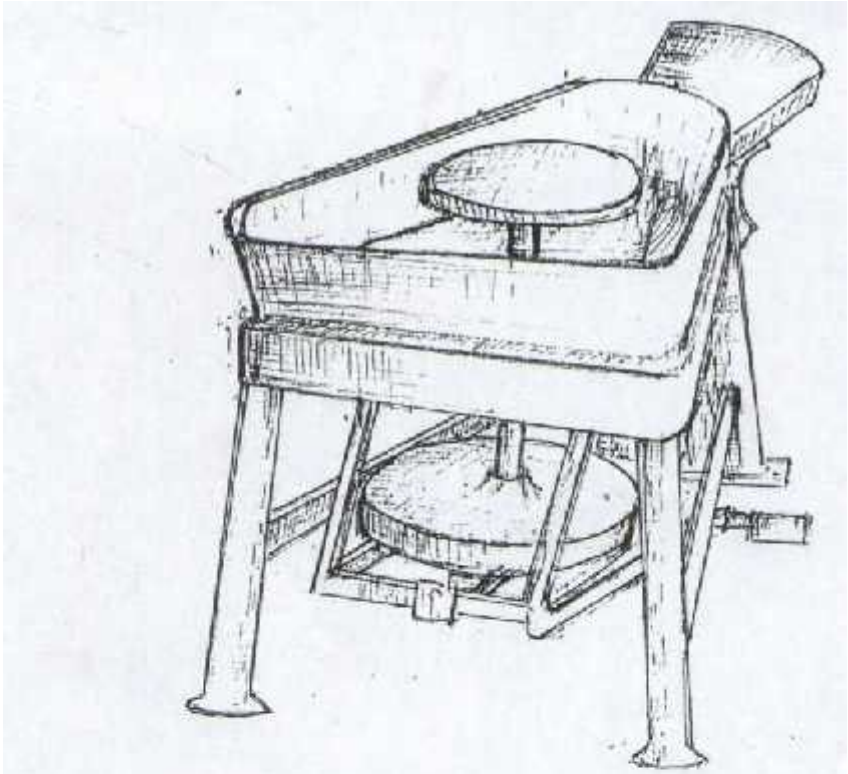
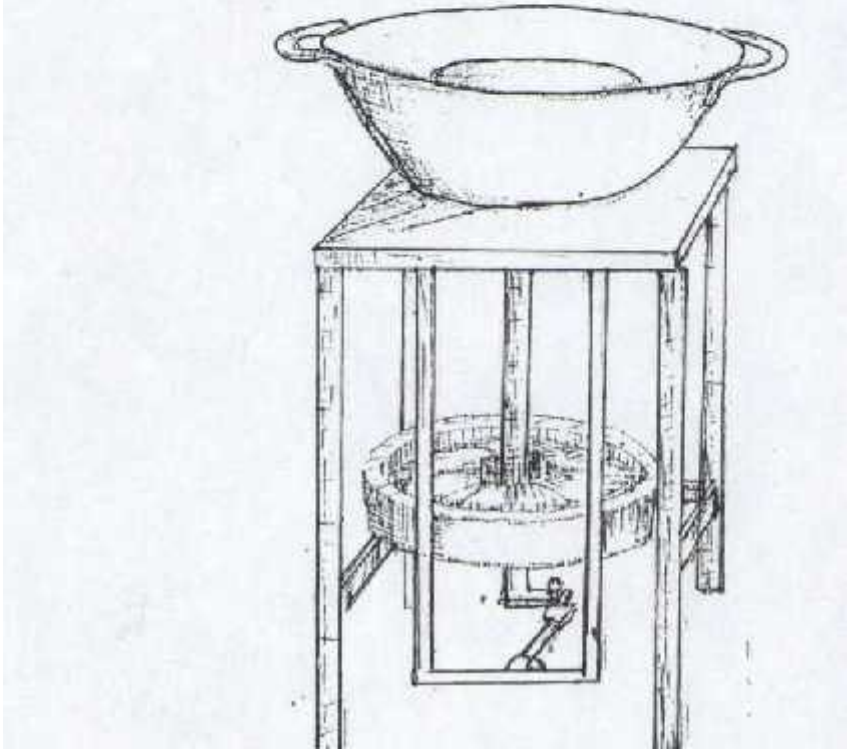


Figure 1 (a) Sit and kick-wheel product design



Head pan

Wheel Head

Treaded head

metal sheet

Borris

Shaft

Flying wheel

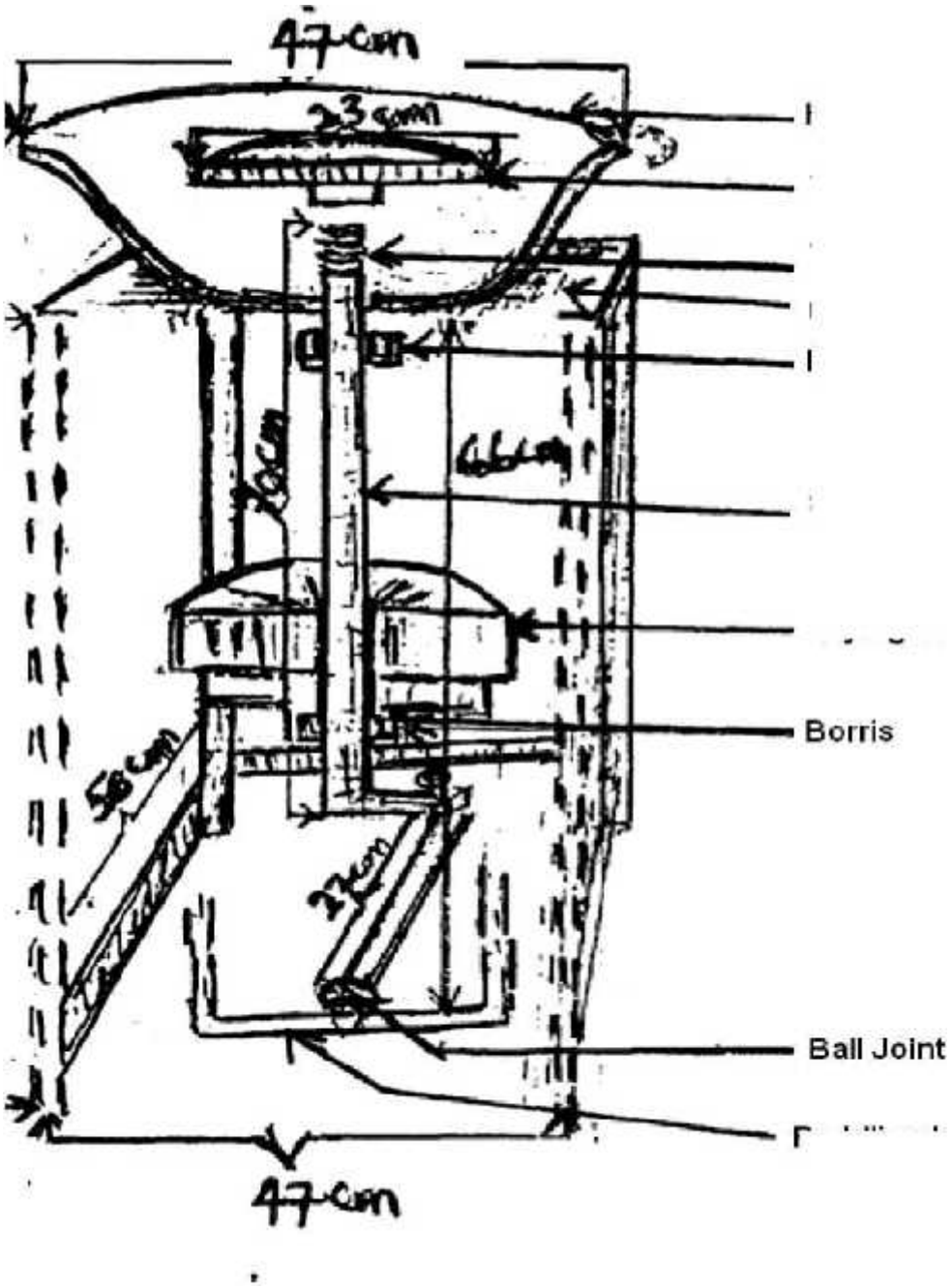


Figure 2 A cross section view of stand and kick-wheel product design

Analysis of Result and Finding

Result of Head Pan :- The head pan used provides convenience when arms are placed upon it as an aid to centering clay.

Result of Shaft :- The shaft placement at an appropriate centre gave effective rotation without much wobbling, which is usually characterized by locally constructed, sit and kick-wheel.

Result of Boris :- The two Boris used also proved good after much lubricant applied, they were able to rotate with ease.

Result of Angular Iron Bar :- The angular iron bar gave further reinforcement to the structure for the construction. It further holds the shaft and the flywheel into position.

Result of the Fly Wheel :- The flywheel is that which gave the required weight and that which determines the extent of rotation during throwing. It balances the wheel top for effective centering on the wheel.

Result of Joint Socket :- The Joint socket serves as an avenue for effective movement of the flywheel. It equally allows for free rotation of both borris and the flywheel.

The rotation was effective with the aid of lubricant.

Result of the Final Design :- On assemblage, the kick-wheel was tested and it did throw fine. The extent of warpage did not in any way hinder its effectiveness in throwing. See (plate 1).

Result of the Tested Throwing :- The kick-wheel throws effectively. Products such as cups, open bowls, flower vases were effectively thrown. Sec (plate,2).

Discussion

Certain issues that required discussions emanated when some throwing samples were carried out. The resultant wobbling of the wheel head was as a result of the improper positioning or the treaded head to the shaft during joining or as a result of a little tilt in the shaft itself. The stand and kick-wheel design was to deviate entirely from the conventional design of sit and kick approach.

Findings

It was discovered that small amount of clay weight of about 1kg throws faster and centre better than 5kg weight of clay. In spite of the standing design approach, the wheel throws fine and also very convenient to use. It was further discovered that the effectiveness of the flywheel during

kicking in terms of the adequate weight needed during throwing to make clay centering and pulling effective was achieved.

All the throwing carried out were excellent, and successful.

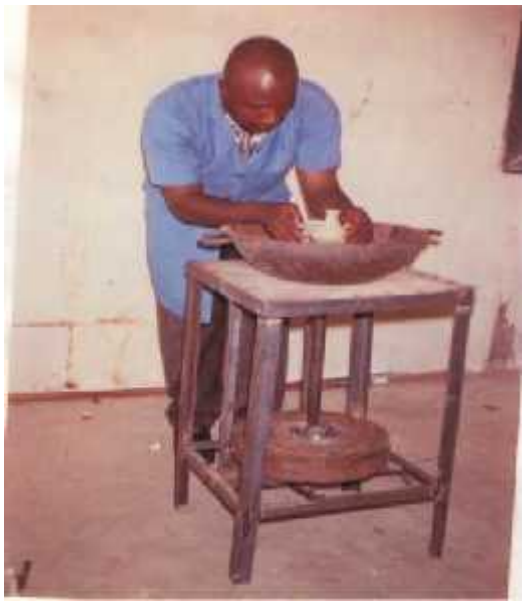


Plate 1: Final construction of a stand and kick-wheel

Plate 2: Sample of the throwing pieces of works

Conclusion

Various components needed for the construction of the kick wheel were cut into specifications required and welded accordingly. Thus the end result of a good design coupled with good finishing resulted into a well-finished and functional proto-type kick-wheel. All the throwing carried out were successful. On the basis of the construction carried out the following conclusion were drawn.

(a) That the scraps and component used in the production of a proto-type kick-wheel if carried
out in the precise dimensions as stated by this study will give consistent result.

(b) That the wobbling of the wheel head can further be reduced if adequate care is taking to properly position the treaded head to the shaft during welding.

(c) That there exist in abundance scraps needed for the production of some proto-type kick wheel.

Recommendations

The following are recommended for further endeavours in the proto-type kick-wheel production

(a) There is need to future study how to overcome completely the wobbling wheel head usually characterized by locally fabricated products.

(b) Adequate fund be provided for a research of this nature for a better result by the ETF (Education Trust Fund) for researches in all tertiary institutions of learning.

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